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Implementation of Sustainability Improvements at the Facility Level: Business Motivations and Impact of P2 Intern Recommendations

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IMPLEMENTATION OF SUSTAINABILITY IMPROVEMENTS AT THE FACILITY LEVEL: BUSINESS MOTIVATIONS AND IMPACT OF P2 INTERN RECOMMENDATIONS

by

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IMPLEMENTATION OF SUSTAINABILITY IMPROVEMENTS

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Many sustainability and pollution prevention (P2) technical assistance programs exist across the Unities States. There is a need to quantify the actual impact using various metrics and, in addition, to identify the driving forces behind a company's decision-making process. The University of Nebraska-Lincoln Partners in Pollution Prevention and the Kansas State University Pollution Prevention Institute intern programs partnered to complete 30 reassessments in 2014 to obtain specific information related to each P2 recommendation. After being reassessed, the clients were surveyed concerning their motivations for implementing and not implementing each recommendation; 23 clients responded to the survey.

The clients surveyed were slightly more engaged in sustainability activities than another national study. Of the clients reassessed in 2014, the overall implementation rate of recommendations was 54%. Clients that received more in-depth assistance implemented a higher percentage of recommendations and reported more benefit in savings for cost, energy, and solid waste than the clients that received assistance for part of a summer. Recommendations with paybacks of less than one year and implementation

costs of less than $1,000 were implemented at a higher rate those with longer paybacks and higher initial costs, but other factors beyond finances were important.

The survey data showed finances were less of a reason for implementation than a barrier to implementation. Finances were most important for equipment/process modification recommendations and least important for training/policies. Availability of capital was more of a financial barrier than poor payback, with other priorities for capital investments more important than a lack of capital. Financial motivations were not as important in the decision making for public institutions as for private sector entities. The relative unimportance of payback in the decision-making process suggests other indirect and intangible benefits often impacted the implementation of recommendations. Social motives were especially important for recycling and training/policies. Health and compliance factors were important for recommendations that directly reduced or eliminated toxins.

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CHAPTER 1: INTRODUCTION

1.1 Background

The United States Environmental Protection Agency (US EPA) defines pollution prevention as any practice that reduces, eliminates, or prevents pollution at its source. Pollution prevention (P2) "protects the environment by conserving and protecting natural resources while strengthening economic growth through more efficient production in industry and less need for households, businesses and communities to handle waste" (US EPA, 2015a). Sustainability is based on the fact that everything we need for our survival and well-being depends on our natural environment. Sustainability is important to make sure that we continue to have the water, materials, and resources to protect human health and our environment (US EPA, 2015b).

In order to help accomplish those goals, many sustainability and pollution prevention (P2) technical assistance programs exist across the Unities States, with a growing number of the programs using student interns to provide direct assistance to businesses and other organizations. The University of Nebraska-Lincoln (UNL) Partners in Pollution Prevention (P3) program and the Kansas State University (KSU) Pollution Prevention Institute (PPI) intern program have been promoting pollution prevention and encouraging sustainable business practices in their respective states for more than a decade.

The P3 program has worked with both area college students and Nebraska businesses since 1997. P3 is an outreach assistance program operated by the University of Nebraska Extension and College of Engineering and funded by the U.S. Environmental Protection Agency Region 7, the Nebraska Department of Environmental Quality, and a wide variety of businesses and industrial partners. After receiving several days of intensive pollution prevention training, student interns provide one-to-one pollution prevention assistance to Nebraska businesses by performing waste assessments or other waste reduction and resource conservation projects, and providing each client with a written report detailing source reduction suggestions. The interns also give oral presentations at the end of the summer to the clients, faculty, fellow students, and funding sponsors along with question-and-answer sessions.

Established in 1989 within the College of Engineering at Kansas State University, the PPI intern program provides technical and regulatory compliance assistance. The program, funded in part by the Environmental Protection Agency, helps businesses advance sustainable practices. After attending several days of pollution prevention training, the interns work at their host company locations for a period of about 10 weeks over the summer.

The UNL and KSU programs have offered assistance modes for projects of varying complexities and depths. The programs both utilize three modes of assistance: partial summer, single summer, and multiple summer. Partial summer assistance is the least intense of the modes, where a student provides assistance to similar clients (often in the same sector). For example, the UNL program has had interns based out of county extension offices work with agriculture producers throughout the state of the Nebraska, as well as interns work with wastewater plants around the state, providing “partial” assistance. The interns typically spend part of the summer (anywhere from a few days to a few weeks) at the business, and then prepare a technical assistance report for the client.

Single summer assistance and multiple summer assistance are similar, and are often referred throughout the thesis as “full” assistance. Full summer clients are those that are assisted by a student intern for a full summer. These clients receive in-depth assistance, oftentimes focused on one or two specific projects or areas, throughout the summer. At the end of the summer, the clients receive a technical assistance report. The report often is more detailed and in depth than for clients that receive partial assistance. Single summer assistance includes clients that have participated with the UNL or KSU program for just one full summer during the period studied, while multiple summer assistance refers to clients that collaborated with one of the programs by hosting a student multiple times during the study period. Oftentimes with multiple summer assistance, the projects are related or a continuation of the previous summer, and the UNL or KSU programs are able to gain a greater relationship with these clients. The two programs and modes of assistance are further detailed in Section 4.1.1 (Technical Assistance Models).

1.2 Purpose for the Study

Understanding the business motivations and barriers in the implementation of sustainability improvements at the facility level is valuable. Knowing what drives a client to implement a P2 recommendation or keeps a client from implementing a P2 recommendation can help improve a technical assistance provider, and thus lead to a higher level of sustainability. The goal of this study was to evaluate the impact of two P2 intern programs in neighboring states to shed light on the possible range of differences as well as compare modes of client assistance that vary in depth, and identify the motivations and barriers to implementing P2 recommendations, which led to the following hypotheses:

- The mode (intensity) of assistance a client receives affects implementation rate and total savings (money, energy, solid waste, etc.) realized by a client.

- Most of the savings (impact) realized by a P2 intern program come from a small percentage of the clients assisted.
- A high percentage of implemented recommendations have a persistence (reoccurrence or longevity) of benefits of at least five years.
- The initial cost and projected payback period of a P2 recommendation has an effect on the implementation rate, and the types of motivations for implementation or non-implementation are affected by the initial cost and projected payback period.
- Sector of the client has an effect on implementation, engagement and motivations.
- Financial benefits are important in the implementation of P2 recommendations, but other indirect and intangible benefits cannot be ignored.
- Financial reasons are the main barrier to implementation of P2 recommendations.
- Financial reasons for implementation are least important for clients in the public sector.

The scope of this study included: (1) reassessments of previously assisted clients within the UNL P3 and KSU PPI programs to determine the implementation status and quantify the impacts of each P2 recommendation; (2) a survey of the reassessed clients to identify the motivations and barriers to implementing P2 recommendations; and (3) an analysis of the results from the reassessments and the surveys.

1.3 Thesis Overview

This thesis has six chapters and nine appendices. Chapter 1 provides an introduction and background information for the research. Chapter 2 is a review of technical literature related to the research topic. Chapter 3 describes methods used for both the reassessments and surveys, as well as the methods of the analysis. Chapters 4 and 5 both include results from the reassessment and survey analyses, with Chapter 4 focusing on impacts of P2 intern recommendations and Chapter 5 focusing on the motivations and barriers to implementation of sustainability improvements. Chapters 4 and 5 are organized such that with limited modification each can be submitted to a journal for possible publication. Chapter 6 presents the conclusions of the research. Appendices include supporting documents and tables that are not included in the discussion but are referenced and/or would be useful as a source of additional information.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

To place this study in context, an overview of several related topics is presented in Chapter 2: first, a review of studies that examined companies' engagement in sustainability activities; next, a summary of the findings from studies on the implementation and impact of pollution prevention assistance programs; and last, a overview of several studies that have focused on the motivations and barriers to implementation of sustainability improvements.

2.2 Engagement in Sustainability Activities

One way of understanding a company's perception of sustainability and pollution prevention is to explore its self-reported engagement in various P2/sustainability activities. This was done in recent years in two large-scale national surveys by Massachusetts Institute of Technology (2011) and United States Department of Labor (2012). The MIT survey respondents included 3,107 manager and executives, representing every major industry and region of the world. According to the MIT results, waste reduction and energy efficiency were activities in which the respondents' organizations engaged more frequently. Using a 1-to-5 Likert scale, "improving efficiencies and reducing waste activity" had the highest average response rate (3.69), and "revising compensation approaching and management incentives to promote sustainability-related strategies" had the lowest average response rate (2.39) (MIT, 2011).

The Green Technology and Practices (GTP) survey, conducted by the US Department of Labor, had a statistical sample size of 35,000 establishments and was designed to collect data on business establishments' use of green technologies and practices during the pay period that included August 12, 2011. Of the businesses surveyed, 75% reported the use of at least one green technology or practice during that pay period. The two most frequently reported types were those that improve energy efficiency (57 %), and those that reduce the creation of waste materials as a result of operations (55%). The least commonly used green technology or practice was generating electricity, heat, or fuel from renewable sources primarily for use within the establishment (about 2 %) (USDL, 2012).

2.3 Implementation and Impact of Benefits

Several P2 and energy efficiency (E2) driven organizations have conducted studies to determine their programs' impacts. Oak Ridge National Laboratories focused on the impact of the U.S. Department of Energy's Industrial Assessment Center (IAC) Program, an energy efficiency program at 30 university-based industrial assessment centers, and found an average implementation rate of 44 ± 4% (Martin et al., 1999). Guillemin and Goldberg (1999) found that the average implementation rate of P2 suggestions by clients of 16 P2 programs in the New England area was 44%. Lindsey (1999) found that a program run by a full-time professional obtained a 62% implementation rate when focused on getting implementation of a specific P2 technology, membrane filtration for in-process recycling. The US DOE (2015) has tracked the implementation rate of its IAC Program through an updated database, and has reported an average implementation rate of 50% dating back 1981. Two previous studies on the UNL P3 program have found an implementation rate of 42% for P3 reassessments from 1997-2004 (Youngblood et al., 2008a) and 44% for reassessments from 2005-2011 (Kekilova et al., 2014).

In terms of monetary savings, the National Pollution Prevention Roundtable tabulated yearly savings totals from 27 P2 programs across the United States and found per client savings ranged from $900 to $900,000, though it appears different assumptions were used when the programs calculated their savings and it is unclear if clients reported potential or actual savings. Guillemin and Goldberg (1999) reported that 67% of 351 Massachusetts firms previously receiving P2 assistance said that P2 activities had saved them money. Andrews et al. (2002) found that 51% of 145 small- and medium-sized Australian businesses surveyed reaped financial benefits from implementing cleaner production. Youngblood et al. (2008a) found an average annual savings of $22,000 per client for the UNL P3 program from 1997-2004. Youngblood et al. (2008b) found that for the UNL P3 program from 1997-2004, in-depth complex technical assistance projects resulted in highest implementation rate and largest savings, whereas simpler projects and short-term assistance for clients resulted in the lowest savings and waste reductions.

When receiving P2 technical assistance, clients often report benefits outside of monetary savings or direct waste savings, or do not even realize the savings. An analysis of 614 publicly traded U.S. manufacturing firms constituting 2,837 firm-year observations for the year 1991-1996 led to the conclusion that managers underestimate the value of pollution prevention and thus underexploit waste prevention (Lenox and King, 2002). Guillemin and Goldberg (1999) reported that 66% of 351 Massachusetts firms said that P2 activities had employee health and safety benefits. Although the benefits were not directly reported, the results of a study on the P3 program illustrated that indirect savings, such as time and labor savings, reduced operating cost and cost of future liability, which may have substantial additional financial savings that often are not quantified (Youngblood et al., 2008a). A survey of 145 clients participating in the P3 program from 1997-2001 found that the most beneficial aspects of participating in the program were assistance in waste reduction and time saved for the waste-related issues (Dvorak et al., 2008).

2.4 Motivations for Implementation

It is important for technical service providers to understand what the driving forces are that lead businesses to implement sustainability improvements. Conventional wisdom would lead one to believe that finances are important, that if a company is going to make a profit by making an inexpensive change that involves pollution prevention, that company will implement that change. While finances clearly are important, a review of literature found there are other factors that also play a role in the decision-making process for sustainability improvements.

When making sustainable manufacturing decisions, the Manufacturing Engineering Division of American Society of Mechanical Engineers (ASME) noted that factors such as time, quality, resources, and costs have to be considered along with environmental performance (Haapala et al., 2013). Two previous studies (Huppe et al., 2006; Hoof and Lyon, 2013) both found that small and medium enterprises tend to implement pollution prevention projects with simple payback periods shorter than two years at a higher frequency. The US DOE has reported that implemented recommendations have a shorter projected payback period on average than recommendations not implemented for its IAC Program, 1.0 years vs. 1.3 years over the 35 years the program has been in place (US DOE, 2015).

A survey of 21 SME manufacturing facilities in the Toronto region found the top three drivers to participate in a program were: mandatory P2 requirements, 50% funding support, and environmental stewardship. Further, it found that cost savings and return on investment were important but not the primary consideration for implementing P2 projects (Granek et al., 2006). From the MIT survey, financial expectations from sustainability-related investments were the same as any other investment in 21% of the responses, whereas 19% of respondents reported that intangible factors influenced decisions. Further, 10% of respondents allowed for longer expected returns in sustainability investments compared to other investments (MIT, 2011). For the P3 program from 1997-2004, Youngblood et al. (2008b) found that when implementation cost of a P2 recommendation is more than $1,000, other factors outside of finances were often important to the client when considering implementation.

Lyon and Maxwell (2002) examined voluntary approaches to environmental regulation in the United States and Europe through a review of then-existing literature and found that implementation was determined by the willingness and ability of firms. Even if direct profitability could be realized, the indirect effects associated with the action eventually determined whether it was profitable. Literature suggested that large firms implement voluntary corporate environmental actions because they make good business sense, but the mechanism linking environmental and financial performance was unclear (Lyon and Maxwell, 2002).

Williams et al. (1993) conducted a study on environmental pressures and their potential impacts on businesses, basing the results on a survey of the expenditures made by 117 firms in the United Kingdom in 1988 and a survey of future development of 25 firms of the West Midlands of the United Kingdom in 1991. It identified the following pressures: governmental, consumer and supplier, investor, community, and workforce. The motivations to implement sustainable practices fit one of two models: a “normative” model in which best management practices were conducted with social responsibilities of companies; and a model built around environmental standards with the use of economic instruments, such as effluent charges and taxes. Large multinational companies adopted the normative model because of their wider exposure to pressures. The larger companies also were more likely to value social issues

(Williams et al., 1993). A study based on nine P2 programs in five regional and district councils of New Zealand found all councils reported participants benefit mainly via indirect benefits related to reduced potential fines or environmental actions, such as potential cleanup costs (Hughey and Chittock, 2011).

Sharfman et al. (2000) presented four case studies undertaken as part of a larger EPA-funded study that described environmentally conscious product and process innovations in high- and low-regulation environments. Among the key findings were: economic incentives have always been motivators for innovation, as was the case for environmental innovation, however regulation provided institutional pressure in addition to economic incentives; participative regulatory relations were helpful in the development of new products; autonomy and/or flexibility of operations was a major motivating factor in two cases when the firm used innovation to be able to pursue its business operations the way it so chose; and the market was beginning to view environmental factors as increasing important business factors, in that the market may force a firm to change its product, the market may see a product as an answer to future problems, or the market may perceive a product to have an advantage over competing products (Sharfman et al., 2000).

2.5 Barriers to Implementation

While several studies have examined what leads to the implementation of sustainability improvements, the barriers to implementation of those improvements have largely been unexplored. But, in order to understand the driving forces behind companies investing in sustainability, it is important to also realize what leads companies to not implement recommendations.

The Community Innovation Survey (CIS) conducted in Spain in 2012 examined the obstacles facing 6,553 firms from 44 industries involved in environmental innovations and how they still managed to achieve the innovations, finding that main difficulties for innovation were (ranked in order from first to fourth): lack of funds in the firm, high innovation costs, lack of external funding sources, and uncertain demand for innovative goods and services. Other obstacles, ranked from most important to least important among the remaining options, were: market dominated by established firms, lack of qualified staff, lack of information on technology, lack of information on markets, difficulty in finding cooperation partners for innovation, lack of innovations demand, and lack of need for previous innovations (Souto and Rodriguez, 2015). Blanchard et al. (2013) and D’Este et al. (2012) also found financial needs, high innovation costs, lack of qualified staff, lack of information, and uncertainty as the major constraints to the generation of innovation.

An analysis of studies and surveys related to energy-efficient investments in the United States identified some barriers to profitable investments in energy savings technologies: managerial compensation is tied to recent performance, explaining why managers prefer the projects with short payback periods; difficulties exist in monitoring the savings because of a lack of historical data for comparison; high costs exist for expanding management teams; and projects with higher anticipated rates of return are more likely to be selected, and some projects also will be selected because their actual returns have been overestimated (DeCanio, 1993).

Trianni and Cagno (2012) performed an investigation of 128 non-energy intensive manufacturing small and medium-sized enterprises (SMEs) in Northern Italy to identify the most relevant barriers to energy efficiency that limit a widespread implementation of the best available technologies and practices. Lack of capital (access to capital) was perceived as very critical. Other major barriers were lack of information on cost-efficient energy efficiency interventions, and the form of information. In addition, awareness of personnel and management did not really represent a barrier. The study also found SMEs of different sizes and sectors exhibit different behaviors with respect to the perception of the barriers. The smaller companies (fewer than 50 employees) suffered more from lack of time or lack of internal skills than larger companies (100-249 employees) because of a less structured organization that typically has few people in charge of activities for enhancing energy efficiency (Trianni and Cagno, 2012).

Rohdin and Thollander (2006) investigated barriers to the implementation of energy efficiency measures in the Swedish non-energy intensive manufacturing industry through a case study using semi-structured interviews of eight companies. The major barriers found were (ranked in order): cost/risk of production disruption/hassle/inconvenience; lack of time or other priorities; cost of obtaining information on the energy consumption of purchased equipment; other priorities for capital investments; lack of sub-metering; and split incentives with energy service companies (Rohdin and Thollander, 2006).

Doniec et al. (2002) identified the broad “finance” category (lack of financial resources, high investment cost related to new technology implementation) as the top barrier to implementation of cleaner production strategies in Polish industrial organizations. Other main barriers were the “human factor” (low awareness level, inadequate mentality, employees’ habits) and “organizational” (problems related to changes, restructuring problems, lack of cooperation between relevant services within the enterprise, small scale activity) categories (Doniec et al., 2002).

Shi et al. (2008) examined the barriers to adoption of cleaner production by small- and medium-sized enterprises in China from the perspectives of government, industry and expert stakeholder groups. The researchers identified 20 barriers and grouped them into four major categories: policy and market barriers; financial and economic barriers; technical and information barriers; and managerial and organizational barriers. The policy and market barriers category was found to be most prominent barrier category, with the financial and economic barriers category following closely behind. Those two external barrier categories were found to be the most significant ones hindering the adoption of cleaner production, while the two internal barrier categories were less of a hindrance. The top three individual barriers were found to be: lack of economic incentive policies; lax environmental enforcement; and high initial capital cost (Shi et al., 2008).

2.6 Summary

A review of literature found that companies appear to be most engaged in waste reduction and energy efficiency in terms of pollution prevention activities, while they seem to be least likely to generate electricity, heat, or fuel from renewable sources. Several P2 technical assistance providers report an implementation rate around 40 to 50%, and most clients that receive assistance realize financial savings. They also report receiving benefits outside of monetary savings or direct waste savings, such as indirect or intangible benefits. While finances clearly are important in driving companies to make sustainability changes, other factors also play a role. Funding and high costs often are barriers to implementation of those sustainability improvements, though there are other external and internal barriers.

CHAPTER 3: METHODS

3.1 Introduction

Data used in this study are a result of reassessments of past clients of the University of Nebraska-Lincoln (UNL) Partners in Pollution Prevention (P3) program and the Kansas State University (KSU) Pollution Prevention Institute (PPI) intern program. The methods of this study include: (1) collection of data from reassessments, where clients previously assisted are interviewed to determine the implementation status and quantify the impacts of each P2 recommendation; (2) collection of data from a survey of reassessed clients; and (3) analyses of the reassessment and survey results.

In order for this study to be performed, UNL's Institutional Review Board (IRB) process had to be completed. The IRB reviews research projects that involve human subjects to ensure that subjects are not placed at undue risk, that they give informed consent to their participation, and that their rights and welfare are protected throughout the project (UNL, 2015). This study was certified as exempt in January 2014, with the approval letter shown in Appendix D. Appendices B and C include the informed consent that was given to each client reassessed and surveyed.

The UNL P3 program has worked with both area college students and Nebraska businesses since 1997. The Pollution Prevention Institute intern program was established in 1989 within the College of Engineering at Kansas State University. Both programs assist a wide variety of businesses and industrial partners through undergraduate student interns providing one-to-one P2 assistance over the summer by performing waste assessments or other waste reduction and resource conservation projects. The two programs and the varying forms of assistance they provide are further detailed in Section 4.1.1 (Technical Assistance Models).

3.2 Sampled Populations

The UNL P3 program performed reassessments of 13 past clients that originally were assessed from 2008 to 2013 and the PPI program performed reassessments of 17 past clients that originally were assessed from 2006 to 2013 for this study. KSU selected its reassessments randomly, dividing its pool of clients that received assistance into sectors to make sure each sector was represented and then using a random number generator. UNL contacted all of its previously assisted clients that had not yet been reassessed and then reassessed those that responded and agreed to be interviewed. On average for both programs, the reassessments performed in 2014 occurred 4.0 years after the initial assistance (maximum of eight years, minimum of one year); it should be noted that some clients for KSU had been at least partially reassessed previously when receiving follow-up assistance via the multiple summer mode of assistance, which is described in Section 4.1.1 (Technical Assistance Models). Of the 30 reassessed clients, surveys were sent to 28 clients; a few clients requested to not be surveyed. Of the 28 clients that received a survey, 23 responded.

Along with the clients reassessed in 2014, this data analysis in some instances also includes 25 UNL clients that were reassessed from 2005-2011 and subsequently surveyed as part of a study by Kekilova et al. (2014). Most of the clients that were reassessed from 2005-2011 received their primary original assistance between 2003 and 2010, though two received assistance before then (with the earliest being 1999). Those reassessment and survey results are included in this paper’s analyses when applicable to increase sample size. In some cases, because some survey questions were not the same and because of the multiple years between when the reassessments were conducted, only reassessments from 2014 are included in some analyses. It is noted when those results are included and when they are not. All of KSU's 2014 reassessments were from clients that received original assistance between 2006 and 2013. UNL's 2014 reassessments were from clients that received original assistance between 2009 and 2013. A detailed breakdown of the clients reassessed and surveyed is in Section 4.2 (Overview of Clients Reassessed and Surveyed).

3.3 Reassessment of Past Clients

The KSU PPI and UNL P3 programs worked together to ensure the reassessments were performed in the same manner and followed the standard operating procedures described in the Quality Assurance Project Plan approved by the US EPA (Appendix A). PPI secured and trained an environmental technician to conduct the reassessments, with direct supervision from the PPI staff. P3 used a graduate student to conduct or head up the reassessments, with direct supervision from the P3 staff. The P3 and PPI teams also met on a regular basis to collaborate, cross-train, and share data.

The cover page for the reassessment forms, which is included in Appendix A and Section 4.1.2 (Reassessment Methods), has some basic information, such as each individual recommendation, if the recommendation was implemented (as suggested or with modification) or not implemented (investigated, not investigated, or the client contact doesn't know if the recommendation was considered) and some brief comments. The reassessment forms (Appendix A and Section 4.1.2) include the specific annual savings realized from each recommendation, along with some key information, such as the initial cost of the recommendation, when it was implemented, and how long the client expects it to continue (referred to as reoccurrence or persistence).

The main parameters reassessed include: initial cost; cost savings; recurring years of benefit; solid wastes diverted from landfill; hazardous wastes diverted from landfill; reduced hazardous materials use; reduced water use; and reduced energy use. Table 3.1 lists the parameters reassessed, along with the units for each category.

Table 3.1. Parameters Reassessed.

Savings information	**Unit**
Cost savings	\$/year
Initial cost	\$
Electricity reduced	kWh/year
Natural gas reduced	therms/year
Other energy	gallons/year (propane, diesel)
Hazardous materials/waste reduced	lbs/year
Water use reduced	gallons/year
Solid waste reduced	lbs/year
GHG emissions reduced	$MTCO_2E$/year
Other parameters/general information: • recommendation description • recurring years of benefit • expected reoccurrence • releases prevented • additional indirect/intangible benefits	

In addition, a client/intern profile form was created for each company reassessed. This form included some basic information about the company reassessed and the intern who performed the original assistance, such as the company contact and position, the number of employees at the company site, the intern's major and school, the intern's GPA, and the intern's extracurricular activities. The QAPP (Appendix A) and Section 4.1.2 (Reassessment Methods) further detail the methods of the reassessments, including example forms and an example reassessment narrative.

3.4 Motivation Survey

After the clients were reassessed, they were sent a mail or email survey to further determine their motivations and justifications for the implementation and non-implementation of specific P2 opportunities presented to them in the original assistance. Of the 30 businesses reassessed by the P3 and PPI programs, 28 verbally agreed to complete a future survey. Of those, 23 completed and returned the survey to the P3 or PPI program.

The survey, which is further is detailed in the QAPP (Appendix A) and Section 4.1.3 (Survey Methods), consisted of three parts:

- Summary with brief information on the original assessment and the reassessment, including descriptions and benefits of the implemented and non-implemented recommendations.
- A definition of pollution prevention and a general question relating to engagement in P2 activities.
- Four specific questions on the motivations for each implemented and non-implemented recommendation.

The one general question assessed each client's level of engagement in various sustainability and P2 activities on a Likert scale (1 to 5). For the specific questions, the clients were given a dozen reasons to select from and were asked why they either implemented or did not implement each recommendation. They were asked to select all the reasons and the top reason in two separate questions for both the implemented and non-implemented recommendations, for a total of four specific questions. The questions are listed in Table 3.2.

Table 3.2. Survey Questions.

Question 1	To what extent is your organization engaged in each of the following activities? Rate on a scale of 1 to 5, with the following assumptions: 1 – not considered; 2- under consideration; 3 –sometimes applied; 4 – frequently applied; 5 – always applied.
Question 2	For each implemented P2 opportunity, what reasons were important to your organization in implementing the opportunity? Please check all that are appropriate.
Question 3	For each implemented P2 opportunity, what was the top reason/justification for implementation? Please write the letter (A – L) that was the top one reason/justification the P2 opportunity was implemented.
Question 4	For each P2 opportunity that has not yet been implemented, what are the reasons? Please check all that are appropriate.
Question 5	For each P2 opportunity that was not implemented, what was the top reason for not implementing it? Please write the letter (A – L) that was the top one reason the P2 opportunity was not implemented

The purpose of the first general question was to explore the clients' self-reported engagement in different types of P2 activities, and to compare those responses to previous large-scale surveys: Second Annual Sustainability and Innovation Survey of Global Corporate Leaders (MIT, 2011), and Green Technologies and Practices Survey (USDL, 2012). The first general question was modeled from those two surveys and was the same as a previous P3 survey (Kekilova, 2013). The purpose of the specific questions was to better understand what was driving the implementation of specific recommendations as well as what barriers there were to recommendations that weren't implemented. Section 4.1.3 (Survey Methods) further details the goals of the survey and the possible responses for the survey questions. The survey was approved by UNL's Institutional Review Board as exempt in January 2014 (Appendix D).

Surveys were sent shortly after the clients were reassessed, typically within a few weeks. To increase the response rate, follow-up phone calls or emails were anticipated and a phone/email script was prepared. Phone calls and/or emails were made about two weeks after the surveys were sent.

3.5 Data Management

A database was generated based on the reassessment reports from the UNL P3 and KSU PPI programs. The database includes both implemented and non-implemented opportunities, and includes data from both the reassessments and the surveys. The main parameters from the reassessments are listed earlier in Table 3.1. The database was kept electronically by the UNL P3 program and shared with the KSU PPI program at the conclusion of the study. The database spreadsheets can be found in Appendix H and I, with the company names omitted for anonymity.

3.5.1 Sector Categories

The sectors for the clients were categorized using the North American Industry Classification System (NAICS) code (United States Census Bureau, 2015). The sectors were generalized into the following groupings: manufacturing, public, health care, hospitality, and other. Clients in the “other” sector were those that did not fit in the rest of the sectors and typically were offices or warehouses. A sector breakdown of the clients reassessed and surveyed is included in Section 4.2 (Overview of Clients Reassessed and Surveyed) and Section 5.2 (Overview of Clients Surveyed).

3.5.2 P2 Categories

As part of the analysis, each individual recommendation was grouped into categories based on the similarities of the recommendations. The P2 categories were developed in part from a handout “P2 Approaches and Methods” (Appendix E) given to P3 interns at the beginning of each summer. The specific categories are defined below:

- **Energy efficiency:** reduction in energy usage for lighting, equipment, motors, insulation, control systems, sensors. This includes purchasing or equipment/process modification if energy efficiency is the main driving force, but generally does not include policies/training related to energy efficiency. It includes a one-time modification, such as reducing compressed air pressure, but not thermostat management, which falls under "training/policies."
- **Equipment/process modification:** replacement of old or inefficient equipment; upgrading capability of existing equipment; process optimization; changes to improve efficiency (e.g., alternative testing for wastewater contamination, reducing operating pressure). This typically does not include energy efficiency-specific modifications, if energy efficiency is the main motivating factor for the modification.
- **Improved housekeeping/preventative maintenance:** minimize leaks, spills, and overflows, and improve housekeeping. This includes leak detection and repair for compressed air and water, routine inspection and maintenance of equipment, and spill prevention programs.
- **In-process recycling/modifying waste stream:** recycling of waste materials onsite (e.g., burning used oil for heat) or modifying the waste stream to become a product.
- **Material substitution:** using less hazardous, toxic or more environmentally friendly materials in a process.
- **Off-site recycling:** any recycling that is done off site. This typically involves more challenging materials such as batteries, solvents, used oil, oil filters, plastics, wood, and pallets.

- **Purchasing:** procedures that lead to purchase of less toxic/hazardous products; purchasing of green/recycled products; purchasing to reduce packaging, spillage, etc. This category depends on the driving force to the P2 opportunity, as in purchasing is the main barrier or there is a barrier associated with the purchasing department.
- **Training/policies:** spill prevention practices; pollution prevention and environmental management system polices and plans; formation of pollution prevention and sustainability teams; inventory tracking; and education materials. This includes policies or training related to energy efficiency, such as instructing employees to turn off computers at night or placing reminders to turn off lights. It does not include purchasing of motion sensors or timers.
- **Water sensor/flow meter:** the installation of water sensors or flow meters or the continued use of them, specifically related to agriculture producers.

For some analyses, because of similarities, the above P2 categories were combined into broader groupings. When that is done, it is noted.

3.6 Statistical Analysis

When possible and/or applicable, an analysis of the reassessment and survey results was performed using SAS output and a Chi-square test with an alpha of 0.05 to determine if a statistical relationship existed. With a 0.05 alpha level (or 95% confidence level), there is a 5% probability that a true null hypothesis will be rejected (Type I error). A Chi-square test was used to identify relationships between two categorical variables in two related studies (Institute for Digital Research and Education, 2013; Kekilova et al., 2014).

CHAPTER 4: RESULTS – P2 INTERN ASSISTANCE PROGRAMS

4.1 Introduction

Sustainability and pollution prevention (P2) technical assistance programs exist in many jurisdictions in the Unities States. A growing number of the programs utilize student interns to provide a portion of the direct one-on-one assistance to businesses and other organizations. There is a need to quantify the actual impact of such technical assistance using various metrics. In the center of the United States, two states have relatively similar programs that utilize interns to assist business clients.

The Kansas State University (KSU) Pollution Prevention Institute (PPI) and the University of Nebraska-Lincoln (UNL) Partners in Pollution Prevention (P3) programs have each operated pollution prevention intern programs for more than a decade. Many businesses and public entities lack internal expertise and resources needed to identify and implement P2 opportunities that result in cost savings, waste reduction, energy savings and/or water savings. The KSU and UNL programs have worked with many organizations that have acted as host companies for interns completing assessments. In the past, both KSU and UNL have completed follow-up assessments, referred to as reassessments where previously assisted clients are interviewed to determine the implementation status and quantify the impacts of each P2 recommendation, with intern host companies to determine recommended project implementation rates and outcomes.

Several P2 organizations have conducted studies to determine their programs' impacts. Oak Ridge National Laboratories focused on the impact of an energy efficiency program (Martin et al., 1999). Goldberg (2000) reported on P2 progress in 16 state and local agencies throughout the New England area. The National Pollution Prevention Roundtable published results of an impact survey of 63 American P2 organizations (Spector and Roy, 2003). Youngblood et al. (2008) and Kekilova et al. (2014) both examined the UNL P3 program. The US Department of Energy has tracked the implementation rate of university-based industrial assessment centers, which also use student interns, for energy-oriented assistance (US DOE, 2015). The objectives of Chapter 4 are to evaluate the impact of two P2 intern programs in neighboring states to shed light on the possible range of difference and to evaluate modes of client assistance that vary in depth and intensity.

4.1.1 Technical Assistance Models

The University of Nebraska-Lincoln has offered pollution prevention/sustainability technical assistance to businesses in the state of Nebraska through the Partners in Pollution Prevention program since 1997. The program has student interns assist businesses by conducting assessments of waste streams and then developing suggestions to minimize waste generation. The program is operated by the University of Nebraska Extension and College of Engineering and is funded by the US EPA Region 7, the Nebraska Department of Environmental Quality, and industrial partners. The businesses come from varying sectors ranging from agricultural producers to manufacturers.

Established in 1989 within the College of Engineering at Kansas State University, the Pollution Prevention Institute intern program provides technical and regulatory compliance assistance. The program, funded in part by the Environmental Protection Agency, helps businesses advance sustainable practices. The program matches top-level engineering and environmental science students with Kansas business and industry. After attending several days of pollution prevention training, the interns work at their host company locations for a period of about 10 weeks over the summer. The interns work on well-defined P2 projects to reduce energy use, emissions, and wastes, benefiting the company bottom line and the environment. Throughout Chapters 4 and 5, the programs are referred to by their university (KSU or UNL).

The two programs each have less than one full-time equivalent staff supervising the program. The interns who assisted businesses primarily were upper level undergraduate engineering students, with some environmental science and business majors as well. At the end of the summer, the interns provide the assisted clients with a written report that includes an analysis of the costs and benefits for each P2 recommendation. Over the years, UNL has offered assistance to a larger percentage of smaller businesses than KSU, though both programs have assisted businesses ranging from small to large and from varying sectors. UNL has specifically assisted several agriculture producers/irrigators, while KSU has worked with several businesses in the hospitality sector. UNL has had some solid waste-specific grants over the years, while KSU has had some grants focused more on energy efficiency in addition to having energy monitoring equipment available for its assessments.

To meet the needs of different clients, the KSU and UNL programs have offered assistance modes for projects of varying complexities and depths. The programs both have had three modes of assistance, with varying levels of intensity: partial summer, single summer, and multiple summer. Table 4.1 highlights the differences in the three assistance modes. Partial summer assistance is the least intense of the modes, where a student provided assistance to similar clients (often in the same sector). For example, KSU has had interns provide “partial” assistance to clients in the hospitality sector in the Kansas City metropolitan area; UNL has had interns based out of county extension offices work with agriculture producers throughout the state of the Nebraska, as well as interns work with wastewater plants around the state, providing “partial” assistance. The interns typically spent part of the summer (anywhere from a few days to a few weeks) at the business, and then prepared a technical assistance report for the client.

Table 4.1. Client Characteristics of Three Assistance Modes. (Percentages in Parentheses are for Clients Reassessed by the UNL and KSU Programs for this Study)

	Mode of assistance		
		Full	
Characteristic	**Partial Summer**	**Single Summer**	**Multiple Summer**
Cost to client	None	Required cost share	Required cost share
Typical business sector for clients	Smaller businesses (62%)	Manufacturing (80%)	Manufacturing (55%)
Description	Client receives assistance from an intern for part of the summer	Client receives assistance from an intern for the entire summer	Client receives assistance from an intern for part the entire summer for multiple years in a row, often with the projects continued from or related to the previous summer
Primary supervision/ support	Program staff and cooperative extension staff	Client’s staff	Client’s staff
Number of clients per student intern	3-10	1.0	1.0

Full summer clients were those that were assisted by a student intern for the full summer. These clients received in-depth assistance, oftentimes focused on one or two specific projects or areas, throughout the summer; at the end of the summer, the clients received a detailed technical assistance report. Full summer assistance is divided into two groups, single summer and multiple summer, for some analyses. Single summer assistance is similar to multiple, but refers to clients that participated with UNL or KSU for just one full summer during the period studied from 2005 to 2013. Multiple summer assistance refers to clients that collaborated with the UNL or KSU program by hosting a student multiple times during the study period. Oftentimes with the multiple summer assistance, the projects were related or a continuation of the previous summer, and the UNL or KSU programs were able to gain a greater relationship with these clients.

4.1.2 Reassessment Methods

The UNL and KSU programs conducted open-ended reassessment interviews in 2014 of 30 clients previously assisted by interns. The KSU and UNL programs worked together to ensure the reassessments were performed in the same manner and followed the procedures described in a Quality Assurance Project Plan approved by the US EPA (Appendix A). KSU secured and trained an environmental technician to conduct the reassessments, with direct supervision from the KSU staff. UNL used a graduate student to conduct or head up the reassessments, with direct supervision from the UNL staff. The UNL and KSU teams also met on a regular basis to collaborate, cross-train, and share data.

Reassessments consisted of:

1. Contact the client to arrange for a visit and discuss what a reassessment is with client. Visit the client for several hours and discuss the status of each original P2 suggestion.
2. Review the original technical assistance report submitted to the client and review the hierarchy of data sources that will be used when collecting data, trying to obtain data from the highest quality sources possible (Tier 1: High-quality direct measures; Tier 2: Moderate-quality indirect measures; Tier 3: Low-quality indirect measures; and Tier 4: Non-Peer Reviewed Low-quality indirect measures).
3. Obtain the client’s description of the actual impact of implementing specific P2 recommendations, using the hierarchy of data sources, along with the client’s answers to several other questions that are part of the reassessment forms.
4. Ask the clients to consult purchasing orders, utility bills and waste disposal manifests to accurately quantify savings (Tier 1). If the purchasing and disposal records are not available,

ask the client to estimate an impact (Tier 2, assuming the client is of the experienced production staff/management). If the client asks for help in making an estimate, offer the potential savings estimated during the original assistance to derive a valid estimation. If necessary, use Tier 3 (equipment data from vendor specifications, or estimated data based on published industry standards, external calculation tool or outside expert opinion) or Tier 4 (estimated data based on non-peer reviewed published industry standards, external calculation tool or outside expert opinion, or estimates of use by new or inexperienced production staff/management) measures to estimate the savings.

5. Prepare a narrative feedback report for the client (and the UNL and KSU programs) that is first reviewed by the UNL or KSU staff and then by the client to confirm the findings.

A filled-out example of the reassessment questionnaire forms for a fictitious client are provided in Table 4.2 and Figure 4.1. Table 4.2 is a portion of the cover page for the reassessment forms and includes some basic information, such as each individual recommendation, if the recommendation was implemented (as suggested or with modification) or not implemented (investigated, not investigated, or the client contact doesn't know if the recommendation was considered) and some brief comments. Figure 4.1 is a portion of the reassessment form for an implemented recommendation, the first recommendation from Table 4.2. It includes the specific annual savings realized from the recommendation, along with some key information, such as the initial cost of the recommendation, when it was implemented, and how long the client expects it to continue (referred to as reoccurrence or persistence).

Table 4.2. Example of a Filled-in Reassessment Form Cover Page.

P2 Recommendation (Brief Description)	Implemented		Not Implemented			Comments (refer to narrative report for more information)
	As Suggested	With Modification	Investigated	Not Investigated	Don't Know	
Replace high bay lighting with T5 fluorescent in Building 3	X					Source: Electricity Implemented as suggested in 2011
Install low-flow toilets in the conference complex	X					Source: Water Implemented as suggested in 2011
Switch from pentachlorophenol to copper naphthenate for treating wood			X			Source: Hazardous Waste Client investigated recommendation but determined it would not be cost effective at this time. Will consider in future.

Company Information		
Company Name, Location & Sector: **Company ABC; City, NE;**		Assessor: **John Doe**
Visitation Date: **June 1, 2014**	Company Contact: **Jim**	Contact Position: **Environ.**
Intern Information (only on 1st page of Reassessment)		
Intern Name(s) & Date(s) of Internship: **Jack Student, 2010 summer**		
Notes:		
Benefits for Implemented		
Data listed below is annual unless otherwise noted; Include the addition of type and units for each category as necessary.		
Description: **Replace high bay lighting in Building 3**		Progress: **Implemented as suggested**
Quantification Possible: ✓ **Yes** No	If no, why not?	
When Benefits Started: **June 2011**	Reoccurrence so far (check time period): __ One Time or _3_ Years	
Is Benefit Still Occurring? ✓**Yes** No	If no, when ended?	
If yes, estimate of how long it will continue: _ Less than 2 more years _ 2-5 more years _X_ 5-15 more years		
Cost Savings		**Energy**
Savings ($/yr): **$21,000/yr**		Electricity Reduced (kWh): **380,000 kWh/yr**
Initial Cost ($): **$50,000**		Other Energy (Type, Quantity, Units):
Hazardous Materials	**Water Use**	**Water Pollutions**
Pounds Reduced:	Gallons Reduced:	Pollutant Reduced (lbs. and type):
Hazardous Waste	**Solid Waste**	**Air Emissions (GHG)**
Pounds Reduced:	Pounds Reduced:	Emissions Reduced (type): **412.5 $MTCO_{2e}$/yr**
Releases & Intangible/Indirect Benefits		
Releases Prevented (avg): **None**		Material Prevented from Release:
How much will be prevented from release (lbs.)?		Where would release have gone?
Additional Indirect/Intangible Benefits: **Potential for increased productivity from better lighting**		

Figure 4.1. Example of an Implemented Recommendation from a Filled-in Reassessment Form.

During the reassessment visit, any comments on implementation and quantification from conversations with clients were documented. Information gathered through the reassessments, in part, was used to understand the clients' perception of the value of the assistance. Although P2 implementation performed by the client beyond the initial technical assistance was documented, it was not included in this analysis (to be conservative) if it was not directly based on interns' work. The Quality Assurance Project

Plan (QAPP) in Appendix A includes the reassessment standard operating proceedures and an example reassessment.

The cost savings discussed in this thesis are only client-provided direct operating costs (e.g., reduced purchasing of raw materials, disposal of waste, direct labor costs). Some of the cost savings are based on actual measurements by the clients and some are the clients' estimate. Waste reduction metrics (hazardous, solid, etc.) were also collected in the same manner. The greenhouse gas (GHG) emissions reductions were calculated by the UNL and KSU staffs based on reductions in energy use (electricity, natural gas, diesel, and propane) and municipal water use. In calculating the greenhouse gas emission reductions, conversion factors for each specific energy source were used from the 2014 EPA GHG spreadsheet based on state-specific data from the US EPA eGrid (US EPA, 2012), and US EPA (2013). The calculator uses global warming potentials (GWPs) from the Intergovernmental Panel on Climate Change's Fourth Assessment Report (AR4) (US EPA, 2014). Region/state-specific electricity conversion factors were used: for each 1,000 kWh, 1.086 metric tons of carbon dioxide equivalent ($MTCO_2E$) was reduced in Nebraska and 0.978 $MTCO_2E$ for Kansas. For water conservation of non-heated water where actual energy use for treatment and pumping is not available, the conversion factors used were 3.583 $MTCO_2E$ for Nebraska and 3.228 $MTCO_2E$ for Kansas per 1,000,000 gallons water. Other factors used were: 5.32 $MTCO_2E$ per 1,000 therms; 5.63 $MTCO_2E$ per 1,000 gallons propane; and 10.5 $MTCO_2E$ per 1,000 gallons diesel. No greenhouse gas emission calculations were calculated for solid waste diverted from a landfill. Example greenhouse gas calculations and assumptions are included in the calculations sections of the QAPP

(Appendix A). The cost savings do not include the value of indirect benefits (e.g., reduced environmental liability, improved worker health and safety) because of the difficulty many clients had in providing estimates of these indirect benefits, but those benefits were documented when given by the client. To complete all of the reassessment steps for one client, on average about 20 work hours were spent.

4.1.3 Survey Methods

After being reassessed, in order to learn more about the clients' thought process in implementing or not implementing recommendations, the clients were sent by postal mail or email (depending on their preference) a five-question survey. An example survey, with recommendations taken from Table 4.2 for the fictitious company, is shown in Table 4.3 and Table 4.4. The survey included one general question to assess each client's level of engagement in various sustainability and P2 activities on a Likert scale (1 to 5), and four questions that were specific to each client's recommendations. The survey respondents also were given a definition of pollution prevention for the survey: "Pollution prevention (P2) is reducing or eliminating waste at the source by modifying production processes, promoting the use of non-toxic or less-toxic substances, implementing energy efficiency and resource conservation, and re-using materials rather than putting them into the waste stream." This preceded the first general question. For the specific questions, the clients were given a dozen reasons to select from and were asked why they either implemented or did not implement each recommendation. They were asked to select all the reasons and the top reason in two separate questions for both the implemented and non-implemented recommendations, for a total of four questions as detailed in Tables 4.3 and 4.4. For

Table 4.3. Example Survey Form.

General Question			
1) To what extent is your organization engaged in each of the following activities? Rate on a scale of 1 to 5, with the following assumptions: 1 – not considered; 2- under consideration; 3 – sometimes applied; 4 – frequently applied; 5 – always applied.			
	Building awareness of pollution prevention in the organization		
	Building culture of innovation by pursuing sustainability/P2 strategies		
	Analyzing risks associated with P2 and sustainability issues (environmental, legal, competitive, reputational, resource access, political risk etc.)		
	Reducing greenhouse gas emissions		
	Generating electricity, heat, or fuel from renewable sources		
	Improving energy efficiency		
	Conserving natural resources (storm water management, soil conservation, sustainable forestry, etc.)		
	Reducing or eliminating the creation of waste materials		
	Reducing the creation or release of pollutants or toxic compounds		
Specific Questions			
2) For each implemented P2 opportunity, what reasons were important to your organization in implementing the opportunity? Please check all that are appropriate.			
Replace high bay lighting with T5 fluorescent in Building 3		Install low-flow toilets in the conference complex	
	A. Acceptable payback period		A. Acceptable payback period
	B. Energy efficiency		B. Energy efficiency
	C. Reduced operating cost		C. Reduced operating cost
	D. Increased employee productivity		D. Increased employee productivity
	E. Health and safety benefits		E. Health and safety benefits
	F. Regulatory compliance		F. Regulatory compliance
	G. Reduced environmental and health risk (spills, vapors, liability etc.)		G. Reduced environmental and health risk (spills, vapors, liability etc.)
	H. Reduced business risk (impact of changes in regulation, input costs etc.)		H. Reduced business risk (impact of changes in regulation, input costs etc.)
	I. Enhanced environmental awareness		I. Enhanced environmental awareness
	J. Improved public image		J. Improved public image
	K. Other companies also implemented the same or similar solution		K. Other companies also implemented the same or similar solution
	L. Corporate commitment to resource use/waste reduction		L. Corporate commitment to resource use/waste reduction
For each implemented P2 opportunity, what was the top reason/justification for implementation? Please write the letter (A – L) from the above list that was the top one reason/justification the P2 opportunity was implemented.			
Replace high bay lighting with T5 fluorescent in Building 3		Install low-flow toilets in the conference complex	

example, as Table 4.3 details, for an implemented recommendation of "Replace high bay lighting with T5 fluorescent," the client was asked to check all the reasons that

Table 4.4. Example Survey Form (Continued).

Specific Questions	
4) For each P2 opportunity that has not yet been implemented, what are the reasons? Please check all that are appropriate.	
Switch from pentachlorophenol to copper naphthenate for treating wood	
	A. Not technically feasible
	B. Lack of capital (financing)
	C. Insufficient financial payback
	D. Other priorities for capital investments
	E. Risk of production disruption/inconvenience/slowdown
	F. Lack of perceived environmental/risk reduction benefits
	G. Limited in-plant expertise/capability
	H. Lack of staff awareness/willingness to change
	I. Customer specifications
	J. Uncertainty/lack of confidence in technology (quality, cost, benefits)
	K. Insufficient information regarding recommendation
	L. Difficulty in coordinating between units within company
5) For each implemented P2 opportunity, what was the top reason/justification for implementation? Please write the letter (A – L) from the above list that was the top one reason/justification the P2 opportunity was implemented.	
Switch from pentachlorophenol to copper naphthenate for treating wood	

recommendation was implemented from a list of 12 possible reasons. The client was then asked to select the top reason. The same was done for all of the non-implemented recommendations, as detailed in Table 4.4 with the recommendation of "Switch from pentachlorophenol to copper naphthenate for treating wood."

The purpose of the first general question was to explore the clients' self-reported engagement in different types of P2 activities, and to compare those responses to previous large-scale surveys performed by Massachusetts Institute of Technology (2011) and United States Department of Labor (2012). The MIT survey respondents included 3,107 manager and executives, representing every major industry and region of the world. The Green Technology and Practices (GTP) survey, conducted by the US Department of Labor, had a statistical sample size of 35,000 establishments and was designed to collect data on the use of green technologies and practices. The first general question for this survey was the exact same as a previous UNL survey (Kekilova et al., 2014), which also received UNL's IRB approval. The question was modeled off the MIT and GTP surveys.

The purpose of the specific questions was to better understand what was driving the implementation of specific recommendations as well as what barriers there were to recommendations that weren't implemented. The 12 possible responses covered the three pillars of sustainability (economic, environmental, and social), with some reasons focused primarily on just one of the pillars of sustainability and some encompassing a combination. The 12 reasons for the implemented recommendations came from a previous UNL survey (Kekilova et al., 2014), which were determined based off a review of several studies (Williams et al., 1993; Sharfman et al., 2000; Dvorak et al., 2008; Youngblood et al., 2008a; Hughey and Chittock, 2011; MIT, 2011; Diamond, 2013). The second specific question asked the client, of all the reasons selected in the previous question, for the top reason. This question was not asked in the previous UNL study but was added to this survey to help understand the top reason a client implements a P2 recommendation.

The final two questions were modeled off the first two specific questions, except for recommendations not implemented. These questions were not part of the previous UNL study, but they were added to this survey to help understand what barriers exist to implementing sustainability improvements. As was the case for the implemented reasons, the client had 12 reasons to select from. The 12 possible responses were not the same as for implemented recommendations, but they did cover the three pillars of sustainability, with some reasons focused primarily on just one of the pillars and some encompassing a combination. Relatively few studies have been performed looking at the barriers to sustainability as they have on the motivations, but the 12 responses came after a thorough review of several previous studies (Trianni and Cagno, 2012; Rohdin and Thollander, 2006; Doniec et al., 2002; Shi et al., 2008) as well as multiple discussions of the UNL and KSU staffs based on previous experiences. As already stated, the survey received UNL's IRB approval.

4.2 Overview of Clients Reassessed and Surveyed

KSU selected its reassessments randomly, dividing its pool of clients that received assistance into sectors to make sure each sector was represented and then using a random number generator. UNL contacted all of its previously assisted clients that had not yet been reassessed and then reassessed those that responded and agreed to be interviewed. On average, the reassessments performed in 2014 occurred 4.0 years after the initial assistance (maximum of eight years, minimum of one year).

Along with the clients reassessed in 2014, this data analysis in some instances also includes 25 UNL clients that were reassessed from 2005-2011 and subsequently surveyed as part of a study by Kekilova et al. (2014). Most of the clients that were reassessed from 2005-2011 received their primary original assistance between 2003 and 2010, though two received assistance before then (with the earliest being 1999). Those reassessment and survey results are included in this paper's analyses when applicable to increase sample size. In some cases, because some survey questions were not the same and because of the multiple years between when the reassessments were conducted, only reassessments from 2014 are included in some analyses. It is noted when those results are included and when they are not. All of KSU's 2014 reassessments were from clients that received original assistance between 2006 and 2013. UNL's 2014 reassessments were from clients that received original assistance between 2008 and 2013.

Figure 4.2 illustrates the past UNL and KSU clients analyzed for this study. This figure lists how many total clients have received assistance, were reassessed (including those that were not part of the analysis for this study), and responded to a survey from the primary time period studied. The outer boxes for both the KSU and UNL program show how many clients have been assisted, from 2005-2013 for UNL (120) and from 2006 to 2013 for KSU (71). The next boxes show how many of those total clients have been reassessed (94 for UNL and 40 for KSU). This box is divided by past reassessments (81 for UNL and 23 for KSU) and those performed in 2014 for this study (13 for UNL and 17 for KSU); some of the clients that were reassessed in 2014 by KSU also were at least partially reassessed previously when they received new assistance, but they are considered 2014 reassessments for this figure. The inner box shows the reassessed clients that have been surveyed (33 for UNL and 15 for KSU), divided for the UNL program by those clients that were previously reassessed and surveyed (25). The previous survey for the UNL program included the same first two questions.

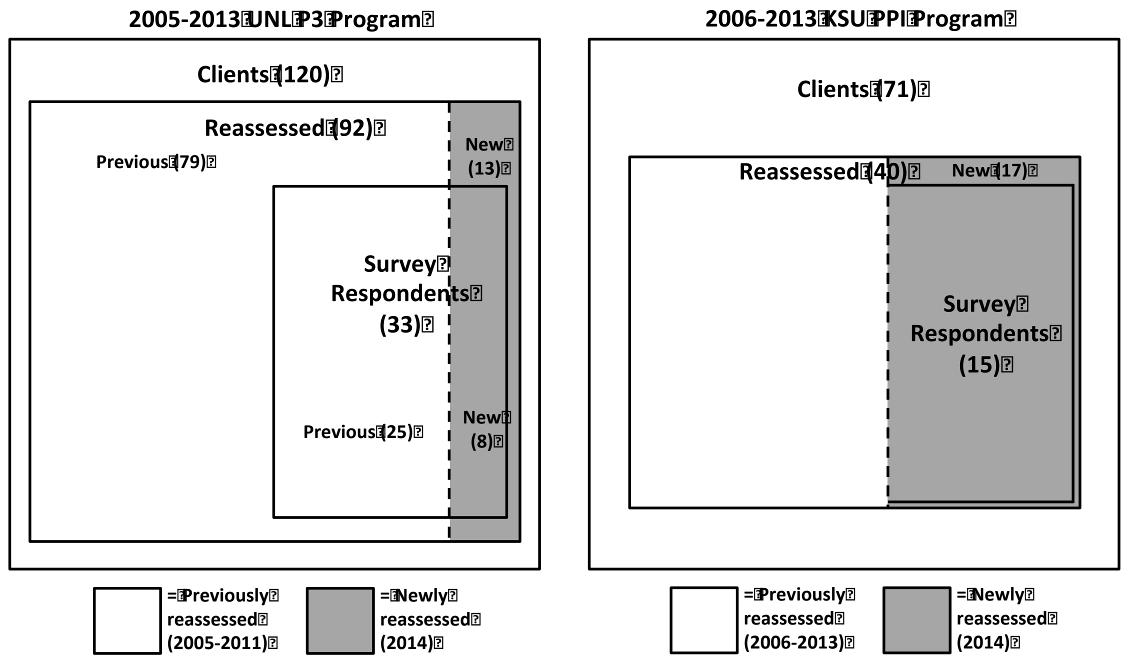

Figure 4.2. Partners Assisted and Reassessed and Surveyed in UNL and KSU Programs During Study Period.

The survey response rate for the clients reassessed in 2014 that were sent a survey was 82% (88% for KSU vs. 73% for UNL); two clients reassessed by UNL requested not to do a survey. The response rate was higher for clients that received full assistance (88%) than partial assistance (75%); two clients that received partial assistance were not sent a survey. The response rate for UNL clients that were reassessed from 2005-2011 and sent a survey in 2012 was 43%; one client, which is included as previously reassessed and as a previous survey respondent in Figure 4.2, was reassessed in 2010 and responded to a new survey sent in 2014. The time between the reassessment visit and survey being sent was several years in many cases for the clients reassessed from 2005-2011, while the clients reassessed in 2014 often were sent a survey a few weeks after the reassessment visit, which may explain the difference in response rates.

Figure 4.3 shows a breakdown of the clients reassessed by program (UNL or KSU), mode of assistance (full or partial), and number of employees at the specific location that received assistance (fewer than 100, 100-250, 251-1,000, or greater than 1,000 employees). This includes surveyed clients from previous UNL reassessments from Kekilova et al. (2014) and clients that were reassessed in 2014. UNL's clients consisted of more that received partial assistance than KSU. Of the 17 clients reassessed by KSU, 65% received full assistance. Only 39% of the UNL clients received full assistance. Smaller businesses typically received partial assistance, while clients with more employees typically received full assistance. Of the clients that had fewer than 100 employees, 95% received partial assistance. Of the clients that had more than 250 employees, 80% received full assistance.

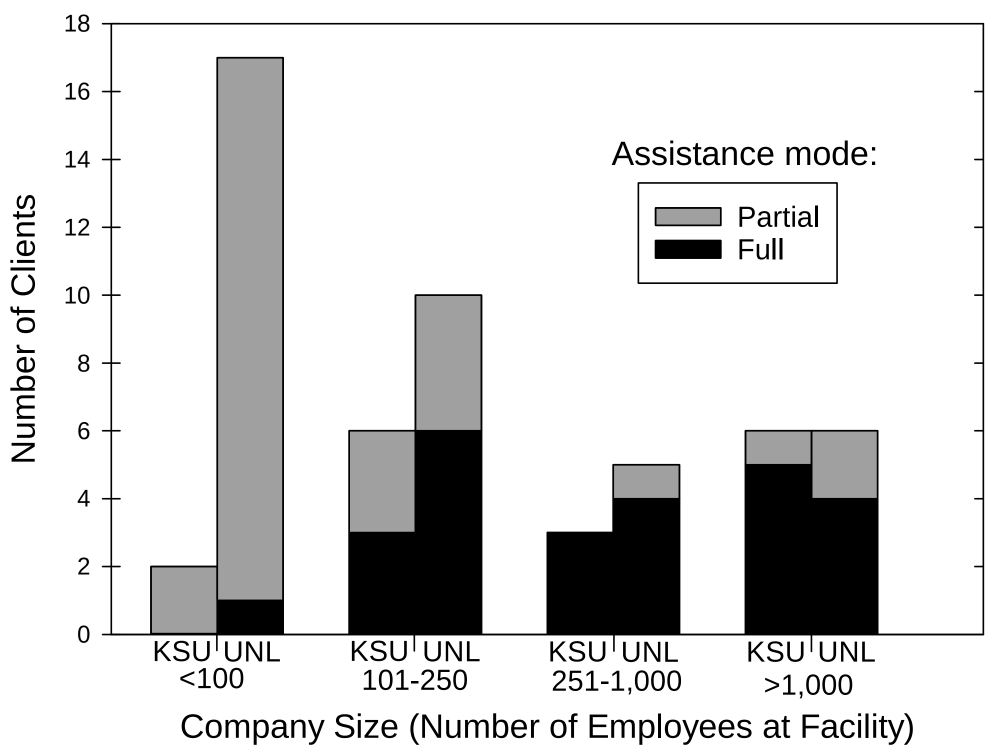

Figure 4.3. Breakdown of Clients Reassessed by Program, Company Size, and Mode of Assistance.

Of all the clients reassessed for this study, 36% were from the manufacturing sector as determined by the North American Industry Classification System (NAICS) codes. Most reassessed manufacturers (90%) were originally assisted using the full summer mode. The rest of the clients included those in the hospitality, health care, public (school districts, waste water treatment plants, government offices, etc.), agriculture producer, and other (warehouses, offices, etc.) sectors. Sector differences are not discussed in detail in this chapter. How sector impacts pollution prevention motivations is discussed in Chapter 5.

4.3 Engagement Results

One approach to understanding the clients' perceptions was to explore their self-reported engagement in various pollution prevention and sustainability activities on a 1-to-5 Likert scale, with 1 being not considered and 5 being always applied. This was the first question asked on the survey, a general question that was the exact same for all of the clients. The general question, as well as the rest of the survey, was sent after the in-person reassessment to the contact who met with the UNL or KSU program to discuss the reassessment. It typically was the same contact who worked directly with the intern during the original assessment, often an environmental or facilities coordinator. Table 4.5 lists the average results from the engagement question, divided by mode of assistance (full and partial), along with responses from the MIT (2011) and GTP surveys (2012). The first column is each engagement activity rated by the survey respondents. The average responses from the MIT and GTP surveys are presented in columns 2 and 3, respectively; neither survey provided standard error data. Because not all of the responses

Table 4.5. Average and Standard Error for Level of Engagement by Program and Mode of Assistance.

Engagement Activity	**Responses to other surveys (sample size in parentheses)**		**Responses to this study's surveys (number of clients in parentheses) (Likert scale used: 1 – not considered; 2 – under consideration; 3 – sometimes applied; 4 – frequently applied; 5 – always applied)**				
			Total (48)	**Assistance mode**		**Program**	
	MIT (3,107)	GTP (35,000)		Full (24)	Partial (24)	KSU (15)	UNL (33)
Improving energy efficiency	3.69	57%	**3.9 ±0.1**	4.2* ±0.1	3.6* ±0.2	4.2 ±0.2	3.8 ±0.2
Reducing or eliminating the creation of waste materials	3.69	55%	**3.6 ±0.1**	3.9 ±0.2	3.3 ±0.2	3.3 ±0.2	3.7 ±0.2
Reducing the creation or release of pollutants or toxic compounds	n/a	13%	**3.6 ±0.2**	3.8 ±0.2	3.5 ±0.2	3.7 ±0.2	3.6 ±0.2
Building awareness of pollution prevention in the organization	3.22	n/a	**3.4 ±0.1**	3.6 ±0.2	3.3 ±0.2	3.9 ±0.2	3.2 ±0.2
Analyzing risks associated with P2 and sustainability issues (environmental, legal, competitive, reputational, resource access, political risk etc.)	3.10	n/a	**3.3 ±0.2**	3.6 ±0.2	3.1 ±0.2	3.3 ±0.3	3.3 ±0.2
Building culture of innovation by pursuing sustainability/P2 strategies	3.06	n/a	**3.2 ±0.1**	3.3 ±0.2	3.1 ±0.2	3.4 ±0.1	3.0 ±0.2
Conserving natural resources (storm water management, soil conservation, sustainable forestry, etc.)	n/a	19%	**3.2 ±0.2**	3.6* ±0.2	2.9* ±0.3	3.3 ±0.3	3.2 ±0.2
Reducing greenhouse gas emissions	2.83	13%	**3.0 ±0.2**	3.4* ±0.2	2.5* ±0.2	3.1 ±0.3	2.9 ±0.2
Generating electricity, heat, or fuel from renewable sources	n/a	2%	**1.9 ±0.1**	2.0 ±0.2	1.9 ±0.2	1.7 ±0.2	2.0 ±0.2
Average	-	-	**3.3**	3.5*	3.0*	3.3	3.2

*Statistically significant difference at alpha of 0.05

were offered in these surveys, "n/a" indicates a response is not available for that particular survey. Responses for the GTP survey were provided in percentage of total establishments that reported application of the activity, while MIT also used a Likert scale. Columns 4-8 show the average response for the UNL and KSU surveys, along with standard error (standard deviation of the mean divided by the square root of the number of observations of the sample), by mode of assistance and by program, and the total average response for all surveys.

Although some literature from the statistics field has cautioned against using averages from Likert scale questions for comparisons and there has been debate on how to statistically analyze Likert scale data (Jamieson, 2004; Allen and Seaman, 2007; Norman, 2010), the results are presented in this manner in part because only averages were available from the MIT study. Similarities between the respondents to the MIT survey and this study are visible from Table 4.5. Despite the differences in measurements (responses for the GTP survey were provided in percentage of total establishments that reported application of the activity), the GTP survey results showed similar trends to this survey in some cases, such as low engagement in generating energy from renewable sources and high engagement in energy efficiency and waste reduction. The respondents from this survey provided on average slightly higher results than the MIT survey for the activities that were the same in this survey and the MIT survey. This may be explained by the fact that these surveys were more recent than the MIT surveys, and/or perhaps the clients assessed from the UNL and KSU programs are slightly more environmentally conscientious than the national average. But, with the average response similar to the MIT survey, it would be reasonable to assume these clients as a whole are not atypical of business people in the United States.

In order to compare and statistically analyze the differences between the modes of assistance and between the programs in terms of engagement activities, the survey respondents were divided into those that selected 4 or 5 (frequently applied or always applied) and those that selected 1, 2, or 3 (not considered, under consideration, or sometimes applied). A Chi-square test was used to determine if a statistical relationship existed at an alpha of 0.05.

Comparing the KSU and UNL intern programs, the two programs were similar in terms of engagement relative to the number of clients that said they frequently or always apply various P2 engagement activities. For all activities, KSU's clients were slightly more engaged than UNL (48% with a response of 4 or 5 for KSU vs. 46% for UNL or 3.3 for KSU vs. 3.2 for UNL on a Likert scale average), but the differences were not statistically significant (Chi-square with one degree of freedom = 0.2708, $p = 0.603$). None of the individual engagement activities between the two programs yielded statistically significant differences at an alpha of 0.05, suggesting the two programs and the clients they work with have been similar in nature.

Comparing the modes of assistance for all clients surveyed, respondents that were provided full assistance had a statistically significant higher level of engagement for all the activities on average than those provided partial assistance (55% vs. 40%; Chi-square with one degree of freedom = 12.05, $p = 0.0005$). The most significant differences were in conserving natural resources (58% vs. 25%; Chi-square with one degree of freedom = 5.49, $p = 0.0192$), reducing greenhouse gas emissions (50% vs. 21%; Chi-square with one degree of freedom = 4.46, $p = 0.0346$), and improving energy efficiency (88% vs.

63%; Chi-square with one degree of freedom = 4.0, $p = 0.0455$). There was not an overall difference between full and partial for KSU, though the sample size was only five for KSU clients that received partial assistance. The overall difference between full and partial assistance for UNL was significant (61% vs. 35%; Chi-square with one degree of freedom = 19.77, $p = 0.00001$).

The higher responses by clients receiving full assistance may be a function of them being larger and more complex organizations that have a greater emphasis on sustainability (as most full summer clients were larger in number of employees than partial summer clients). Those clients that interacted with an intern on-site for an entire summer also may have become more engaged overall. Although the question was worded such that it was to represent all of the clients' activities and is independent of the clients' work with a P2 intern program, the survey occurred after the clients received assistance.

4.4 Reassessment Results

Reassessment data was used in this study to quantify the implementation rates and impacts (savings) gained by the clients from implementation of technical assistance P2 recommendations from the interns. Implementation rates and impacts were analyzed on the basis of mode of assistance, P2 assistance program, client sector, and category of P2 recommendation. Parts of this data came from close-ended questions. The example reassessments forms, as discussed previously and shown in Table 4.2 and Figure 4.1, detail much of the information that was collected from the clients during the reassessments.

4.4.1 Implementation Rate

One way to analyze the success of the original assessments is to look at the implementation rate. An analysis of reports from in-person reassessments of 55 past UNL P3 and KSU PPI clients was performed. This includes clients that were reassessed in 2014 by both UNL and KSU for this study, as well as those previously surveyed UNL clients that were reassessed from 2005-2011. Some clients were assisted over multiple years, referred to as multiple summer for the mode of assistance. Most clients received between two and seven total recommendations in a summer, though some received as few as one and some more than 10. In all, from the 55 clients that were reassessed, there were 504 recommendations. Taking into account that some companies were reassessed over multiple summers, including one for as many as six consecutive summers, the 504 recommendations came from 78 client summers for an average of 6.5 recommendations per client per summer. In determining the implementation rate: P2 opportunities that were presented to the client that weren't recommended at this time, often because of long payback periods, weren't included; and recommendations that included options, for instance doing one thing or another where it was not possible to do both, counted as one recommendation.

Table 4.6 lists the implementation rate by program and mode of assistance, with the number of clients and the number of recommendations in each category in parentheses below the implementation rate percentage. Column 1 is the program (KSU or UNL) and the combined total. Column 2 is the implementation rate for clients that received partial summer assistance, divided in the second and third rows by the KSU and

UNL programs. Column 3 is single summer assistance and Column 4 is multiple summer assistance, both divided in the second and third rows by the programs. Column 5 is the totals of all the modes of assistance.

Table 4.6. Implementation Rate by Program and Mode of Assistance (Number of Clients/Number of Recommendations in Parentheses).

Mode of assistance/ Program	**Partial summer**	**Single summer**	**Multiple summer**	**Total**
KSU	39% (6/31)	62% (5/13)	64% (6/74)	57% (17/118)
UNL	42% (23/187)	49% (10/99)	58% (5/100)	48% (38/386)
Total	41% (29/218)	51% (15/112)	60% (11/174)	50% (55/504)

Overall, it was found that 50% of all recommendations made by interns were implemented for clients reassessed in 2014 and previously surveyed clients, though some recommendations were implemented with modification. This is slightly higher than the implementation rate of 42% reported by Youngblood et al. (2008a) for UNL reassessments from 1997-2004 and the 44% reported by Kekilova et al. (2014) for all UNL reassessments from 2005-2011. Looking only at the new KSU and UNL reassessments performed in 2014, the implementation rate was 54% (57% for KSU and 52% for UNL). The overall implementation rate of 50% falls right in line with the 50% average found by the US Department of Energy for energy-related P2 recommendations made by student-driven Industrial Assessment Centers from 1981 to 2014 (US DOE, 2015) and is consistent with other studies that found implementation rates in the 40 to 60% range student-driven assistance programs (Martin et al., 1999; Guillemin and

Goldberg, 1999; Lindsey, 1999). KSU's implementation rate was higher than UNL's (57% vs. 48%), though not statistically significant (Chi-square with one degree of freedom = 2.8327, p = 0.0924). As discussed below, the mode of assistance is important and more of UNL's reassessments were from clients that received partial assistance than KSU's.

The implementation rate was analyzed by mode of assistance received on the original assessment: multiple, single, or partial summer assistance. As listed in Table 4.6, the greater the contact between the client and the intern program, the higher the implementation rate. A statistically significant relationship was found between the mode of assistance and implementation rate (Chi-square with two degrees of freedom = 14.1, p = 0.0009). Combining the single and multiple summer modes of assistance, full assistance resulted in an implementation rate of 57% versus an implementation rate of 41% for partial level of assistance, a statistically significant difference (Chi-square with one degree of freedom = 10.9861, p = 0.00092). This is consistent with the findings of Youngblood et al. (2008b) that in-depth complex technical assistance projects result in a higher implementation rate than simpler projects and short-term assistance. Interns that spent a full summer with a client (full assistance) are able to develop a better relationship and are able to provide the client with a more detailed report than those who spend part of a summer there (partial assistance). Interns also are able to better understand the clients' processes and equipment. Further, clients receiving multiple summer assistance are able to create an even greater relationship with the intern program, which explains why multiple summer assistance has a higher implementation rate than single summer (60% vs. 51%).

When the implementation data was separated into nine different types of P2 recommendations (energy efficiency, equipment/process modification, improved housekeeping/preventative maintenance, in-process recycling/modify waste stream, material substitution, off-site recycling, purchasing, training/policies, water sensors/flow meters) and analyzed by implementation rate based off mode of assistance, two types of recommendations stood out. Training/policies recommendations were implemented 83% of the time for clients receiving full assistance, while they were implemented only 38% of the time for clients receiving partial assistance for a statistically significant difference between the two modes of assistance (Chi-square with one degree of freedom = 11.9056, $p = 0.00056$). A statistically significant difference (Chi-square with one degree of freedom = 4.5351, $p = 0.0332$) also was found for improved housekeeping/preventative maintenance recommendations for full assistance (89% implementation rate) vs. partial assistance (64%). An intern that is with a client for an entire summer likely has a better understanding of the client's culture and what would be successful in terms of training or policies than an intern who is there for only a small portion of the summer, which may explain the difference in percentages. Although not as extreme, the same also could be said for recommendations related to improved housekeeping or preventative maintenance.

4.4.2 Impact

Another way of considering a P2 program's success is the impact of implementation in terms of cost savings, energy and natural resources use reductions, and reduced waste production. The impact for reassessments performed in 2014 by UNL and KSU was calculated and analyzed and is listed in Table 4.7; this does not include previous UNL reassessments that were performed between 2005 and 2011 because the costs would not be an accurate comparison. The first column of the table lists the mode of assistance with the multiple and single summer clients combined into full because their results were similar. The number of clients for each mode of assistance is listed in the parentheses, with clients that received assistance for multiple summers counting as the number of summers assisted for normalization. For example, one specific client received assistance over six summers and is considered to be six clients for normalization because that client received assistance over six full summers. The second column in the table notes which row includes the total, average per client, and median values. The subsequent columns include data for client-reported annual cost savings, electrical and natural gas usage reduction, solid waste and hazardous waste disposal reduction, and water use

Table 4.7. Impact by Mode of Assistance
(Number of Originally Assisted Summer Clients in Parentheses).

Impact/ Assist-ance	Measure -ment	Cost savings \$/yr	Electricity kWh/yr	Natural gas therms/yr	Solid waste lbs/yr	Haz. waste lbs/yr	Water gal/yr	GHG $MTCO_2$ E/yr
Full (30)	Total	\$2,727,626	9,183,980	555,273	24,243,850	29,600	34,983,500	12,280
	Average	\$90,921	306,132	18,509	808,128	987	1,116,117	409
	Median	\$46,209	69,914	0	0	0	0	147
Partial (17)	Total	\$108,169	1,086,248	6,800	31,400	12,863	49,892,505	1,130
	Average	\$6,363	63,914	400	1,847	757	2,934,853	66
	Median	\$2,136	10,307	0	0	0	0	20
Total (47)	Total	\$2,835,795	10,270,228	562,073	24,275,250	42,463	84,876,005	13,410
	Average	\$60,336	218,515	11,959	516,495	903	1,805,872	285
	Median	\$20,300	21,000	0	0	0	0	63
Other notable impacts:	• 1,250,000 lbs/yr primary sludge and topsoil. • 1,329,000 cubic feet/yr of Argon. •1,504,432 cubic feet/yr of welding gas. • 360 gallons/yr of diesel.							

reduction. The last column is the annual greenhouse gas emissions reductions, which were calculated by the UNL and KSU programs. Additional notable reductions are listed in the final row of the table.

A large percentage of the savings in each category in Table 4.7, with the exception of water savings, comes from clients that received full assistance compared to partial assistance. On average, the cost savings impact for clients that received full assistance was found to be nearly $91,000 compared to about $6,400 for clients that received partial assistance. The median cost savings for full summer assistance was $46,209, compared to only $2,136 for partial level of assistance. This is consistent with the findings of Youngblood et al. (2008b) that in-depth complex projects result in larger savings than simpler projects where the client receives short-term assistance. The one exception to full summer assistance being many times higher in impact than partial summer assistance was for water. Included in this analysis were several agricultural irrigators assisted by interns based out of extension offices who assisted the extension agents in providing one-on-one education of producers related to the value of a new technology (soil moisture sensors), which help producers determine when to use the irrigation system. One irrigator was able to realize an annual savings of 29 million gallons of water.

Clients that received assistance over multiple summers were considered multiple clients, based off the number of summers they were assisted, for determining the average and median impact in this analysis; this was done because these clients realized savings each summer they were assisted. The median savings for natural gas, solid waste and water were all zero, as less than 50% of businesses realized a savings in those three areas. The cost savings in Table 4.7 do not include the value of indirect benefits (e.g., reduced environmental liability, improved worker health and safety) because of the difficulty in providing estimates of these indirect benefits. Although data was collected concerning energy and water reduction benefits and releases prevented, these were rarely a major focus of projects; due to the small sample size, they are not discussed in this study.

Also, Table 4.7 does not include the impacts from a number of opportunities that clients implemented on their own after receiving assistance that were not directly recommended by a student during the original assistance, though the client often indicated the student's assistance played a role in leading the client to implement an opportunity on its own. For example, one client added an outdoor LED system that has amounted to an annual savings of $333,000 and 3.7 million kWh. Another client switched from a water vacuum pump to a closed oil pump, resulting in an annual savings of $120,000 and 4 million gallons of water.

Another way to analyze impact is through the Pareto analysis, which is shown for the clients reassessed in 2014 by UNL and KSU in Figure 4.4. Pareto analysis is a statistical method to explain the distribution of a set of numbers, such as wealth or impact, where typically the top 20% of ranked items account for 80% or more of the total; it's often called the 80-20 rule (Freivalds and Niebel, 2009). In Figure 4.4, the impact of the 20% of clients with the largest reported values for each metric were displaced in light gray, as opposed to the impact from the other 80% of clients. Different clients may be in the top 20% for each metric (e.g., some clients primarily implemented natural gas reductions and others primarily solid waste reductions).

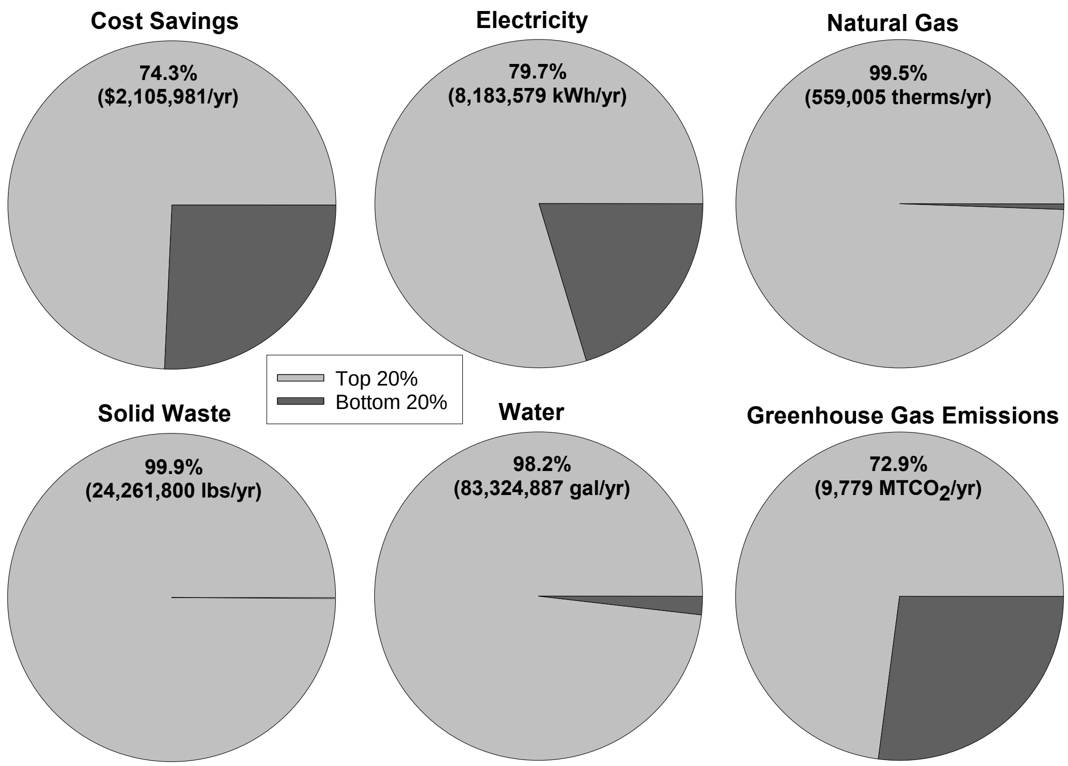

Figure 4.4. Pareto Analysis by Client (Light Gray is the Impact from the 20% of Clients that Provided the Most Impact for Each Specific Metric, with the Percentage Listed in the Gray of the Circle and the Value Listed Below in Parentheses).

As Figure 4.4 illustrates, cost savings is close to the 80-20 rule (the top one-fifth account for 74% of the total); greenhouse gas emissions and electricity also are close. Natural gas, solid waste and water come from almost exclusively the top 20% of clients. This shows that a few clients often accounted for a large percentage of the savings in a particular metric. A Pareto analysis also was performed for implemented recommendations, which yielded similar results where a large percentage of the savings coming from a small number of the individual recommendations, but is not shown for brevity.

4.5 Number of Motivations

As part of the survey, clients were asked to select from a list of 12 applicable justifications for both implementation and non-implementation of each recommendation presented to them in the original assessment. After analyzing the number of justifications the client selected for both implementation and non-implementation, it was found that clients that received full assistance gave fewer motivations than those that received partial assistance. Those that received full assistance gave on average 3.7 motivations for implementation compared to 5.3 for those that received partial assistance, while the difference for non-implemented recommendations was 1.9 reasons for full and 2.6 reasons for partial assistance. An analysis also was performed on the individual recommendations to see if the number of motivations may be a function of the implementation cost of the recommendations, but the differences were minimal and no trends were seen (4.7 for less than $1,000 vs. 5.1 for at least $1,000 for implemented recommendations and 2.6 for less than $1,000 vs. 2.0 for at least $1,000 for non-implemented recommendations).

The difference between number of motivations selected for full and partial assistance suggests that clients that received full assistance may have had a stronger emphasis on the source reduction recommendations, thus selected fewer reasons. This may because of the relationship and depth of assistance they had with the interns who made the recommendations and/or because clients that receive full assistance typically were bigger companies and had a greater focus on sustainability than clients receiving partial assistance. This stronger priority is illustrated in the engagement results, where it was found clients receiving full assistance responded on average higher than those receiving partial assistance in various P2 activities. This also was seen with a higher implementation rate and a greater impact for full assistance over partial assistance.

4.6 Conclusion

The clients reassessed and surveyed by the UNL and KSU sustainability technical assistance intern programs were slightly more active than a national study in engagement in sustainability activities, with those large companies that received assistance for a full summer by one of the two programs being more engaged at a statistically significant level than those that received assistance for only part of a summer. Recommendations were implemented about half the time, with recommendations for clients that received more intense assistance being implemented at a statistically significant higher percentage than the recommendations for clients that received assistance for part of a summer.

On average, clients that received full assistance reported an order of magnitude or more of impact in savings for cost, natural gas, and solid waste than those that received partial assistance. The savings realized from the assistance of a student intern was sizable: on average, students that spent an entire summer with a client helped that business see an annual savings of more than $90,000 and a reduction of more than 400 $MTCO_2E$ from energy and water savings. The Pareto analysis showed a large majority of the implemented impact for each metric from a small percentage of clients, especially for solid waste, water, and natural gas. Clients that received full assistance selected fewer reasons on average for implementing or not implementing a specific recommendation than those clients that received partial assistance.

CHAPTER 5: RESULTS – GENERAL BUSINESS SUSTAINABILITY

5.1 Introduction

A challenge to technical assistance providers is to identify the driving forces beyond the decision a business may make to implement a change to improve their overall environmental sustainability. The data from reassessments and a survey of clients has been analyzed to identify trends related to motivations. The objective of Chapter 5 is to identify the driving forces and barriers to implementing P2 recommendations, considering the importance of client sector as well as the type of recommendation.

5.1.1 Technical Assistance Models

This chapter includes results from both the University of Nebraska-Lincoln (UNL) Partners in Pollution Prevention (P3) program and the Kansas State University (KSU) Pollution Prevention Institute (PPI) intern program. The two programs have student interns assist businesses and other organizations by conducting assessments of waste streams and developing recommendations to minimize waste generation. Over the years, UNL has offered assistance to a larger percentage of small businesses than KSU, though both programs have assisted business ranging from small to large and from varying sectors, including both public and private entities.

The two programs each have less than one full-time equivalent staff supervising the program. The interns primarily are upper-level undergraduate engineering students who receive several days of pollution prevention training before spending much of the summer working with host companies. At the end of the summer, the interns provide the clients with written reports detailing the P2 recommendations.

Both the KSU and UNL programs have offered different assistance modes based on the depth of a project. The two programs have had three modes of assistance, with varying intensity levels: partial summer, single summer, and multiple summer. Partial summer was the least intense, with a student providing assistance to multiple similar clients in one summer. For this mode of assistance, the students typically spent only part of a summer at the business. Single summer and multiple summer mode of assistance both refer to clients that had an intern there for an entire summer. The difference between the two was that single summer assistance was for clients that participated with the UNL or KSU program for just one full summer, while multiple summer assistance refers to clients that collaborated with one of the programs by hosting a student multiple times during the study period. Oftentimes with multiple summer assistance, the projects were related or a continuation of the previous summer. The two programs and modes of assistance are further detailed in Section 4.1.1 (Technical Assistance Modes).

5.1.2 Reassessment Methods

The UNL and KSU programs conducted open-ended reassessment interviews in 2014 of 30 clients previously assisted by students. These reassessments were performed in order to determine the implementation status of previous recommendations, quantify the impact (savings) of implemented recommendations, and gather other valuable information. The reassessment standard operating procedures and example forms are detailed in Section 4.1.2, Section 3.3 and the QAPP (Appendix A).

5.1.3 Survey Methods

After being reassessed, in order to learn more about the clients' motivations for implementing or not implementing recommendations, the clients were sent a five-question survey. The survey included one general question to assess each client's level of engagement in various sustainability and P2 activities, and four questions that were specific to each client's recommendations to identify the client's motivations for implementing or not implementing each recommendation. The survey's components, along with an example survey, are further detailed in Section 4.1.3, Section 3.4, and the QAPP (Appendix A).

The survey sent to companies reassessed in 2014 was similar to a previous UNL P3 survey (Kekilova et al. 2014). The first general question relating to level of engagement and the first specific question on reasons for implementation of a recommendation were the same. The final three specific questions, which asked for the top reason to implement a recommendation and the reasons (both all and the top) for not implementing a recommendation, were new for this survey. In a few analyses where it was relevant, results from the previous UNL P3 survey (Kekilova et al. 2014) were included. It is noted in this chapter when those results are included.

Of the 30 clients that were reassessed in 2014, 23 responded to surveys. There were a few cases where the client did not answer all questions of the survey, which explains why the number of recommendations isn't the same for the top reason and all the reasons later in this chapter when the survey results are discussed.

5.2 Overview of Clients Surveyed

The client base assisted by UNL P3 and KSU PPI is highly varied by sector and company size. The sectors for the clients were categorized using the North American Industry Classification System (NAICS) code. The sectors were generalized into the following groupings: manufacturing, public, health care, hospitality, and other. Clients in the "other" sector were those that did not fit in the rest of the sectors and typically were offices or warehouses. As noted previously, the clients received either full (multiple and single summer) assistance, where the intern spent the entire summer with the client, or partial assistance, where the intern spent only part of the summer with the client. A profile of surveyed clients by sector (manufacturing, public, other, health care, or

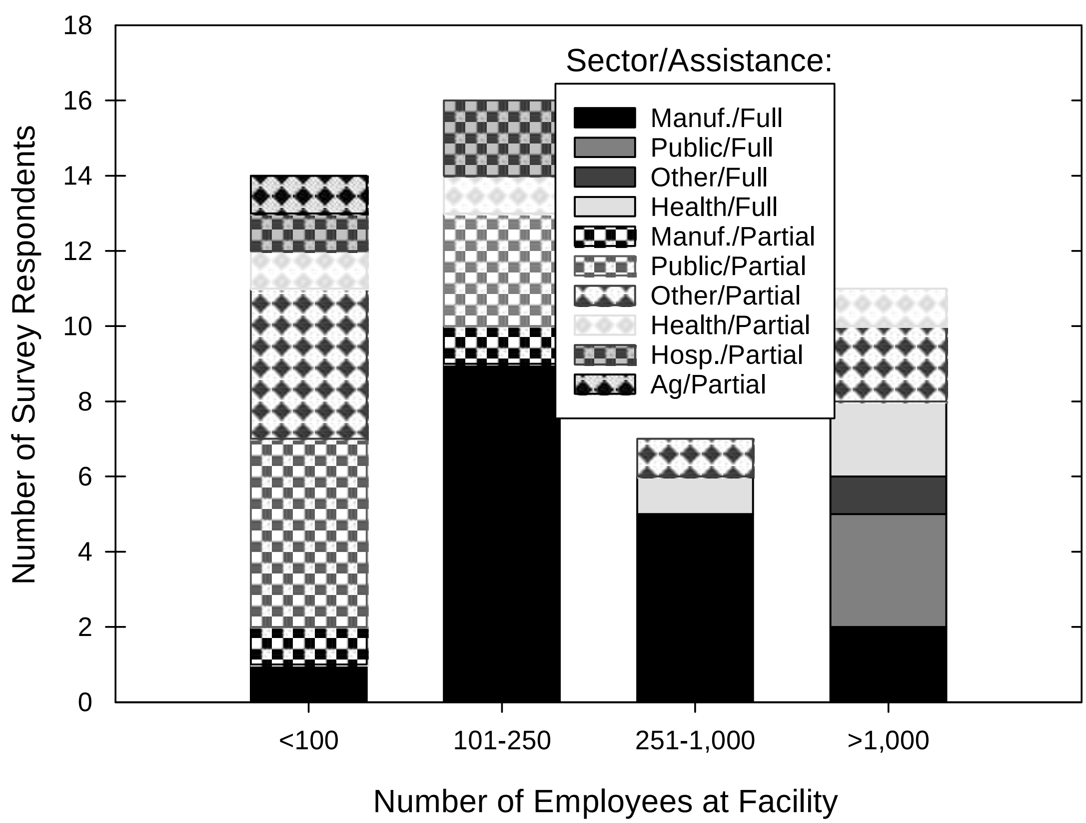

Figure 5.1. Number of Survey Respondents by Sector, Mode of Assistance and Number of Employees.

hospitality), mode of assistance (full or partial), and number of employees (fewer than 100, 100-250, 251-1,000, or greater than 1,000) is provided in Figure 5.1. This includes clients that were previously surveyed (Kekilova et al., 2014). The largest number of surveyed past clients came from the manufacturing sector (40%), with 89% of the surveyed manufacturing clients receiving full assistance. Public had the next highest number of surveyed clients at 23% of the total. Smaller businesses typically received partial assistance, while clients with more employees typically received full assistance. Of the surveyed clients that had fewer than 100 employees, 93% received partial assistance. Of the surveyed clients that had more than 250 employees, 78% received full assistance. The majority of the surveyed smaller clients (fewer than 100 employees) came from the public (36%) or other (29%) sector.

5.3 Engagement results

As done in the previous chapter, one approach to understanding the clients' motivations was to explore their self-reported engagement in various pollution prevention and sustainability activities on a 1-to-5 Likert scale, with 1 being not considered and 5 being always applied. Table 5.1 lists the average results from the engagement question, divided by client sector, along with responses from the MIT (2011) and GTP (2012) surveys. The table includes surveyed clients from both reassessments performed in 2014 and Kekilova et al. (2014). The first column shows each engagement activity rated by the survey respondents. The average responses from the MIT and GTP surveys are presented in columns 2 and 3, respectively; neither survey provided standard error data. Because not all of the responses were offered in these surveys, "n/a" indicates a response is not available for that particular survey. Columns 4-10 show the average response, along with standard error (standard deviation of the mean divided by the square root of the number of observations of the sample). Columns 4-9 show the average response by sector, and the final column shows the total average response.

As discussed in the previous chapter, similarities between MIT and this survey – regardless of sector – are visible from Table 5.1. Despite the differences in measurements (responses for the GTP survey were provided in percentage of total establishments that reported application of the activity), the GTP survey results showed similar trends to this survey in some cases, such as low engagement in generating energy from renewable sources and high engagement in energy efficiency and waste reduction. Overall differences between this survey and the MIT survey are detailed further in the previous chapter. With the average response similar to the MIT survey, it would be reasonable to assume those clients as a whole are not atypical in the United States. The MIT survey respondents included more than 3,000 managers and executives representing every major industry and region of the world, while the GTP survey had a statistical sample size of 35,000 establishments and was designed to collect data on the use of green technologies and practices. Neither national survey detailed the differences in responses by sector.

Table 5.1 Average and Standard Error for Level of Engagement by Sector (Number of Client Respondents in Parentheses).

Engagement Activity	**Responses to other surveys**		**Responses to this study's surveys** (Likert scale used: 1 – not considered; 2 – under consideration; 3 – sometimes applied; 4 – frequently applied; 5 – always applied)						
	MIT (3,107)	**GTP (35,000)**	**Ag (1)**	**Health care (6)**	**Hospi-tality (3)**	**Manu-fact-uring (19)**	**Other (8)**	**Public (10)**	**Total (48)**
Improving energy efficiency	3.69	57%	4.0	4.0 ±0.3	4.3 ±0.3	4.3 ±0.2	2.7 ±0.4	4.1 ±0.2	**3.9 ±0.1**
Reducing or eliminating the creation of waste materials	3.69	55%	4.0	2.5 ±0.4	3.3 ±0.7	4.2 ±0.1	3.3 ±0.4	3.4 ±0.2	**3.6 ±0.1**
Reducing the creation or release of pollutants or toxic compounds	n/a	13%	4.0	3.2 ±0.5	3.3 ±0.7	4.2* ±0.2	3.0 ±0.5	3.5 ±0.2	**3.6 ±0.2**
Building awareness of pollution prevention in the organization	3.22	n/a	3.0	3.5 ±0.3	3.7 ±0.3	3.6 ±0.2	2.8 ±0.3	3.5 ±0.3	**3.4 ±0.1**
Analyzing risks associated with P2 and sustainability issues (environmental, legal, competitive, reputational, resource access, political risk etc.)	3.1	n/a	4.0	2.8 ±0.4	3.7 ±0.3	3.8 ±0.2	2.6 ±0.5	3.2 ±0.3	**3.3 ±0.2**
Building culture of innovation by pursuing sustainability/P2 strategies	3.06	n/a	4.0	3.3 ±0.2	3.3 ±0.3	3.1 ±0.2	2.9 ±0.4	3.2 ±0.3	**3.2 ±0.1**
Conserving natural resources (storm water management, soil conservation, sustainable forestry, etc.)	n/a	19%	4.0	3.0 ±0.6	2.3 ±0.7	3.7* ±0.2	2.6 ±0.3	3.1 ±0.4	**3.2 ±0.2**
Reducing greenhouse gas emissions	2.83	13%	4.0	3.3 ±0.4	3.3 ±0.3	3.3* ±0.3	2.3 ±0.4	2.6 ±0.4	**3.0 ±0.2**
Generating electricity, heat, or fuel from renewable sources	n/a	2%	3.0	1.8 ±0.3	1.3 ±0.3	1.9 ±0.2	2.0 ±0.3	2.0 ±0.4	**1.9 ±0.1**
Average	-	-	3.8	3.1	3.2	3.6*	2.7	3.2	**3.3**

*Statistically significant difference at alpha of 0.05 compared to rest of the sectors combined

As was performed in Section 4.3, in order to compare and statistically analyze the differences between sectors in terms of engagement activities, the survey respondents were divided into those that selected 4 or 5 (frequently applied or always applied) and those that selected 1, 2, or 3 (not considered, under consideration, or sometimes applied). A Chi-square test was used to determine if a statistical relationship existed.

Comparing the sectors in terms of engagement relative to the numbers of clients that said they frequently or always apply various P2 engagement activities (4 or 5 on the Likert scale), manufacturing was significantly more engaged than the rest of the sectors (60% with a response of 4 or 5 for manufacturing vs. 38% for all others; Chi-square with one degree of freedom = 20.64, $p = 0.000006$). Overall, manufacturing was statistically more engaged than health care (60% vs. 37%, $p = 0.0028$), other (60% vs. 24%, $p = 0.0000$), and public (60% vs. 42%, $p = 0.0046$). The sample sizes of agriculture (78% with a response of 4 or 5) and hospitality (48%) were not high enough to realize a statistical difference. Other (24% with 4 or 5) was statistically less engaged than all of the sectors. With 89% of the surveyed manufacturing clients receiving full assistance, this corresponds with the findings of Chapter 4 that clients receiving full assistance were more engaged than those receiving partial.

The “other” sector included offices and warehouses where the client typically did not own the building and therefore may not reap some of the long-term benefits of pollution prevention activities, which may explain why that sector is lower in engagement than the rest of the sectors. Manufacturing was significantly higher than the rest of the sectors combined in the following engagement activities: reducing or eliminating the creation of waste materials, conserving natural resources, and reducing greenhouse gas emissions. This may be a function of these activities applying more to clients in the manufacturing sector than the rest of the sectors.

5.4 Reassessment Results

Reassessment data was used for this chapter to quantify the implementation rates and persistence, or reoccurrence, of technical assistance recommendations from the interns. Implementation rates were analyzed on the basis of client sector, category of P2 recommendation, and finances of the recommendation (initial cost and payback period). Parts of this data came from close-ended questions. The example reassessments forms, as discussed in the previous chapter, detail much of the information that was collected from the clients during the reassessments.

5.4.1 Implementation Rate

One way to analyze the success of the original assessments is to look at the implementation rate. An analysis of reports from in-person reassessments of 55 past UNL P3 and KSU PPI clients was performed. This includes clients that were reassessed in 2014 by both P3 and PPI for this study, as well as those previously surveyed P3 clients that were reassessed from 2005-2011. Most clients received between two and seven total recommendations, though some received as few as one and some more than 10. In all, from the 55 clients that were reassessed, there were 504 recommendations.

Sector

The implementation rate was analyzed by sector and mode of assistance (full or partial). There was not a statistically significant difference between the sectors for the same mode of assistance; the implementation was dependent on the mode of assistance, not the sector. For all sectors, the implementation rate for partial assistance was between

7 and 22% lower than that for full assistance. As noted in the previous chapter, the difference between full and partial was significant (41% vs. 57%).

P2 Categories

The implementation rate also was analyzed based on types of recommendations (P2 categories). There were nine P2 categories (including an agriculture-specific category called water sensors/flow meters), which were introduced previously. Table 5.2 lists the implementation rate by P2 category and mode of assistance. Column 1 is the P2 category. Columns 2 and 3 are implementation rates by mode of assistance (partial and full, respectively) for each category, and the fourth column is the total implementation rate for each category. In parentheses under the percentages are the numbers of recommendations.

Table 5.2 Implementation Rate by P2 Category and Mode of Assistance (Number of Recommendations in Parentheses).

Mode of assistance/ P2 category	**Partial**	**Full**	**Total**
Water sensor irrigation/ flow meter	100% (4)	- (0)	100% (4)
Improved housekeeping/ preventative maintenance	64% (14)	89% (38)	83% (52)
Off-site recycling	52% (29)	69% (29)	60% (58)
Training/policies	38% (39)	80% (30)	57% (69)
In-process recycling/ modify waste stream	30% (10)	63% (19)	52% (29)
Energy efficiency	37% (49)	48% (71)	43% (120)
Equipment/process modification	37% (54)	41% (73)	39% (127)
Material substitution	50% (6)	25% (16)	32% (22)
Purchasing	23% (13)	40% (10)	30% (23)
Total	**41% (218)**	**57% (286)**	**50% (504)**

Outside of water sensor/flow meter recommendations for agricultural irrigators, which had a sample size of only four, improved housekeeping/preventative maintenance recommendations were implemented at the highest rate (84%), a statistically significant difference from the rest of the categories (Chi-square with one degree of freedom = 24.7883, $p = 0.00001$). These included those that minimize leaks, spills, and overflows, and improve housekeeping. They typically required little to no initial cost and had a short payback period, which helps explain the high implementation rate. Other types of recommendations that had high implementation rates included off-site recycling (60%) and training/policies (57%), though not statistically significant different from all other categories. Off-site recycling recommendations often were those that could be considered low hanging fruit. As stated in Chapter 4, training/policies recommendations were implemented at a statistically significant higher rate for clients that received full assistance than partial (80% vs. 38%), as were improved housekeeping/preventative maintenance recommendations (89% vs. 64%). About half of the recommendations fell into the P2 categories of energy efficiency or equipment/process modification, which had similar rates (43% and 39%, respectively). The implementation rates for P2 categories also were analyzed by client sector and no notable differences or trends were found.

Implementation Cost/Payback Period

The implementation rate was analyzed based on the direct implementation cost and the projected simple payback period (e.g., reduced operating cost divided by implementation cost); the reported operating costs tended to only include easily quantifiable factors such as reduced material and utility inputs and reduced waste disposal costs, and did not include more difficult to quantify factors such as worker safety, reduced liability and regulatory compliance costs. Figure 5.2 illustrates the implementation rate versus projected payback period in years, separating the implementation costs into less than $1,000 and $1,000 or greater and the payback periods into less than one year, from one to two years, between two and four years, and greater than four years. The recommendations were separated at initial costs of $1,000 in order to maintain data sizes (approximately a 60-40 split) and because $1,000 appeared to best represent a relative division point in the data. The figure also shows the number of recommendations for each respective payback period and implementation cost. This includes clients that were reassessed in 2014 by both P3 and PPI for this study, as well as those previously surveyed P3 clients that were reassessed from 2005-2011. Not included in the figure are a number of recommendations that had unknown implementation costs or unknown payback periods, as well as some that had no implementation cost and no cost savings, which explains why there are only 373 recommendations represented.

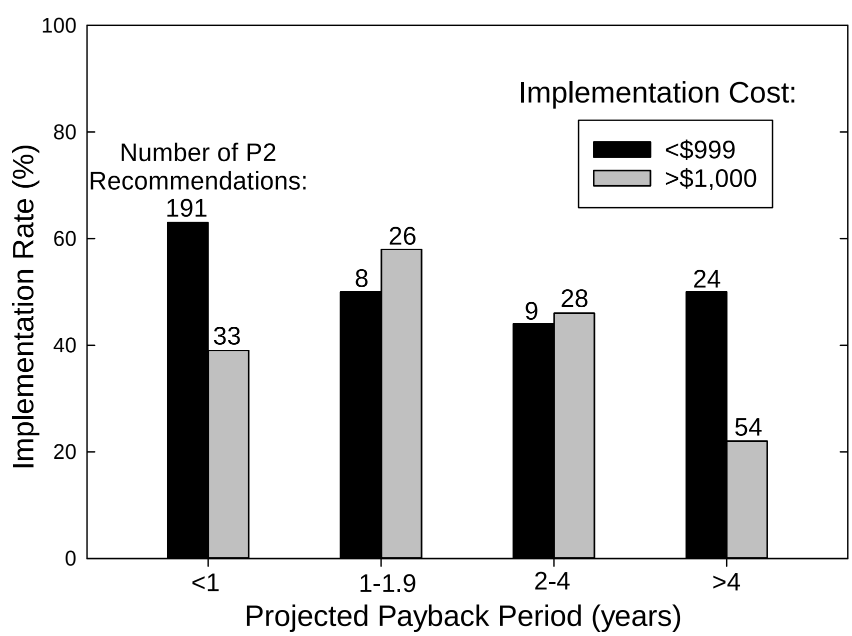

Figure 5.2. Implementation Rate by Payback Period and Implementation Cost.

Figure 5.2 shows the highest implementation rate occurs with a payback period of less than a year and an implementation cost of less than $1,000 (63%) and the lowest implementation rate at a payback period of greater than four years and an implementation cost of at least $1,000 (22%). This is consistent with past findings (Huppe et al., 2006; Hoof and Lyon, 2013) that small and medium enterprises tend to implement pollution prevention projects with simple payback periods shorter than two years at a higher frequency. It also falls in line with the findings by the US Department of Energy for energy-related P2 recommendations made by student-driven Industrial Assessment Centers that the average projected payback period is shorter for recommendations implemented than not implemented (US DOE, 2015). Within the respective projected payback categories, significant differences are seen in implementation between the costs for less than one year (63% for less than $1,000 vs. 39% for at least $1,000; Chi-square with one degree of freedom = 6.4057, $p = 0.0114$) and greater than four years (50% vs. 22%; Chi-square with one degree of freedom = 6.0185, $p = 0.0142$), but not significant for the other two payback period categories. Outside of the differences between the highest and lowest implementation rates seen at the far left and far right of the figure, respectively, the differences are less extreme (with implementation rate ranging between 39% and 58%) and follow no trend. This suggests there are other factors beyond implementation cost and payback period that are important in considering implementation of recommendations, which is consistent with previous studies (Granek et al. 2006, Youngblood et al. 2008b, MIT 2011) that found risk-based factors, indirect financial considerations and social factors often are important.

5.4.2 Persistence

As part of the interview for reassessments conducted in 2014, clients were asked to define the period of persistence (longevity) of benefits after the recommendations were originally implemented. The client also was asked when the recommendation was implemented, which in most cases was within a year of the client receiving initial technical assistance, and if the recommendation was still occurring. Only 2% of 129 recommendations that initially were implemented were no longer occurring during the reassessment visit, with the benefits realized by the client for less than a year in all cases. More than 95% of the recommendations where the client gave an estimate of how long the recommendation was expected to continue had a persistence of at least five years. In addition, of those recommendations where an implementation date was available, the recommendations on average already had seen a reoccurrence of 2.8 years. In other words, they were implemented on average 2.8 years before the reassessment and had an overall expected reoccurrence of at least five years. This suggests that sustainability improvements almost always continue for multiple years after they are implemented. These results are similar to findings of Kekilova et al. (2014), though with a higher rate of anticipated persistence of benefits. Kekilova et al. found via a survey of clients assisted two to eight years previously that only 48% of implemented off-site recycling recommendations had a persistence of more than a year, while 82% of all other implemented recommendations had a persistence of more than a year. The difference in the persistence rates may be a function of differences between data collection methodologies (in-person versus survey), length of time since the previous survey, and/or differences in the clients (with more partial assistance clients in Kekilova clientele).

5.5 Motivations

The reassessment results, particularly the implementation rate data, illustrated a need to further research the range of motivations for implementation of facility-level sustainability and P2 recommendations. In most cases, the data analysis for this section includes only results from clients that were reassessed and surveyed by P3 and PPI in 2014. In some cases, to increase sample size and when it is applicable, surveyed clients that were reassessed from 2005-2011 are included in the results. When that is the case, it is explicitly noted in this section.

For each implemented and non-implemented recommendation, each survey respondent identified motivations from a predetermined list of 12 options, first selecting all that applied and then identifying the top motivation. Figure 5.3 illustrates the percent of implemented recommendations for which each motivation was selected by respondents. There are three lines on the figure: the solid one for when the client was asked to select the top motivation for implementation; the dotted line for when the client was asked to select all the motivations; and the dashed line for the respondents' selection of the top justification when acceptable financial payback was not selected as one of the reasons (a subset of the solid line for top motivation). The numbers of recommendations are listed in parentheses for each line. The y-axis corresponds to the percent of recommendations that has a particular motivation selected. Also shown at the bottom of the figure is a line that groups the motivations into the following categories: financial, social, and health/compliance, with "energy efficiency" and "other companies implemented" each standing on its own. The 12 motivations a respondent could select from for implemented

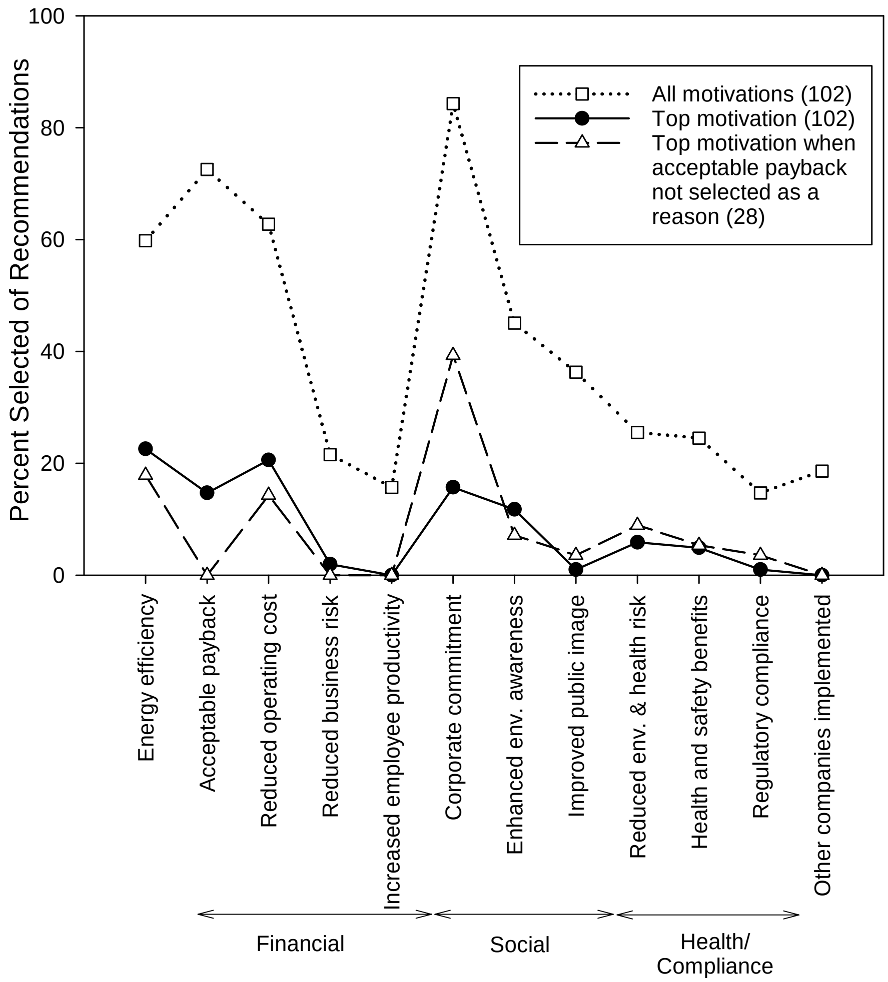

Figure 5.3. Motivations Provided by Respondent for Each Implemented Recommendation (Number of Recommendations in Parentheses).

recommendations were grouped into those categories because of similarities within them and in order to be able to analyze what types of driving forces are most important in the decision-making process.

The frequencies that an option was selected as one of several motivations versus the top motivation were similar. The options most commonly selected as one of the motivations were also the ones most commonly selected as the top motivation. The reported motivations for non-implementation are shown in Figure 5.4, and like the data in the previous figure for implementation, the reasons most commonly selected as one of the motivations for non-implementation were also the ones most commonly selected as the top motivation. Those motivations are grouped into the following categories: financial, feasibility, personnel, and other. The two figures illustrate that the clients selected more than twice as many reasons for implementation than non-implementation when they were asked to select all the reasons that apply: 4.8 per implemented recommendation versus

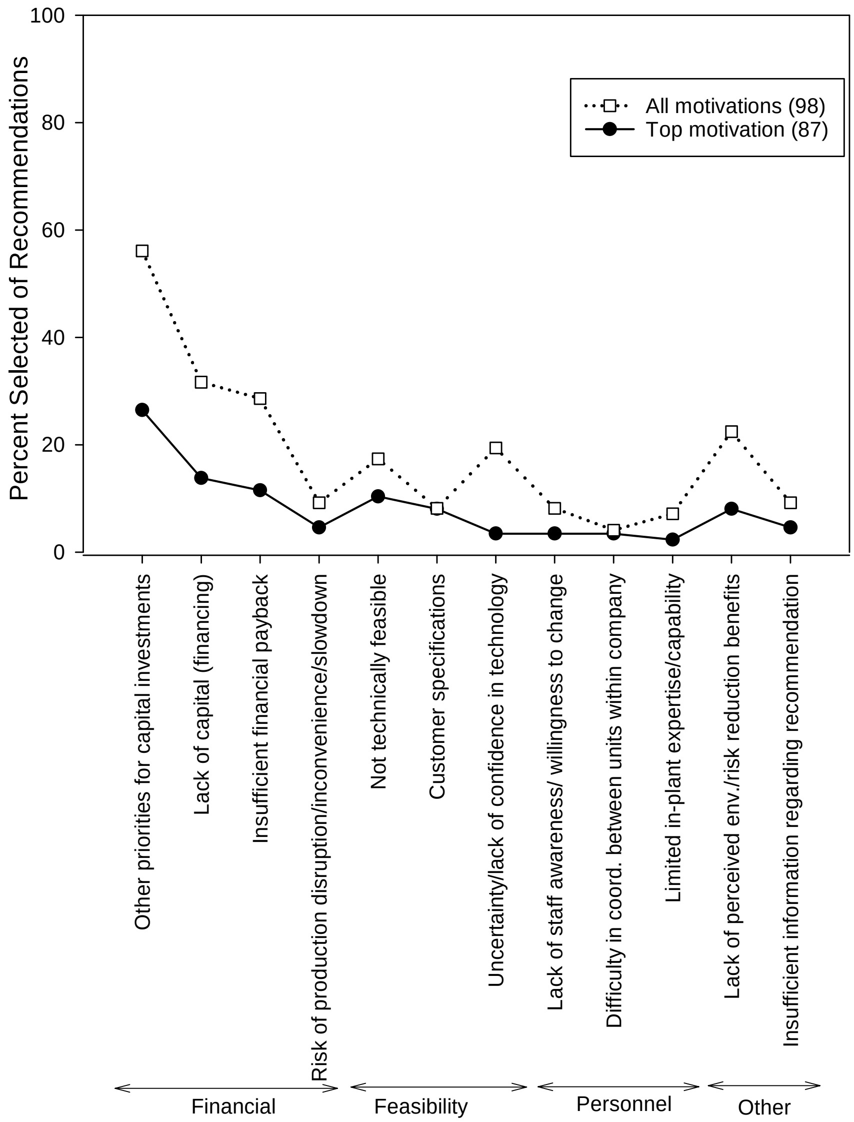

Figure 5.4. Motivations Provided by Respondent for Each Non-Implemented Recommendation (Number of Recommendations in Parentheses).

2.2 per non-implementation recommendation on average. This suggests that if an insurmountable barrier is identified, the evaluation of the recommendation often ends right then. In addition, that barrier often is financial in nature.

When the survey respondent was asked to select the top motivation for each implemented recommendation, a financial justification accounted for 37% of the top motivations. For recommendations not implemented, a financial reason accounted for 56% of the top motivations. This suggests that finances may be more of a barrier to implementation than a reason to implement a P2 recommendation. Further, the top financial reasons not to implement a recommendation was “other priorities for capital investments” (26%). This reason also was selected more than any other reason when the client was asked to select all the reasons for non-implementation of a recommendation (56%). “Lack of capital” was the second most selected reason. Combined the two capital reasons accounted for 40% of the top reasons to not implement a recommendation compared to only 11% for “insufficient financial payback,” suggesting capital is more of a barrier than a poor payback. Further, the barrier is not a lack of capital as much as it is other priorities for investments. The relative unimportance of payback here suggests an appreciation of the indirect and intangible benefits.

This is consistent with past finding that financial reasons are major barriers to the implementation of a sustainability improvement (Souto and Rodriguez, 2015; Trianni and Cagno, 2012; Rohdin and Thollander, 2006; Doniec et al., 2002). That capital was the top barrier in this study is similar to the findings of Trianni and Cagno (2012) and Doniec et al. (2002). Most other studies did not differentiate between other priorities for capital and lack of capital or did not include both of them as options. This study suggests that both are key barriers, but other priorities for capital may be more of a barrier than simply not having enough capital on hand.

In order to better understand motivations where acceptable payback was not a reason for implementation, an analysis was done on the implemented recommendations where acceptable payback was not even selected as one of the reasons for implementation. This is illustrated in Figure 5.3 with the third line. While the percentages for most of the top reasons were similar for the implemented recommendations that did not select acceptable payback as a reason, corporate commitment to resource use/waste reduction as the top reason jumped from 16% for all implemented recommendations to 39%. This highlights the importance of corporate commitment when the payback period may not meet standard corporate expectations, which is consistent with the findings of Williams et al. (1993) that social issues are important.

While “energy efficiency” and “reduced operating cost” were the most selected reasons when the survey respondent was asked to pick the top motivation for each recommendation, as Figure 5.3 shows, corporate commitment to resource use/waste reduction was selected more than any other justification when the client was asked to select all the reasons for implementation (84% of all recommendations). “Improved public image” and “enhanced environmental awareness” also were often selected as a reason for implementation (54% of the recommendations had at least one selected, and 27% had both selected), though they weren’t often selected as the top reason for implementation. This further suggests the importance of these social reasons even though they may not be the top reason why a P2 recommendation is implemented, and that there are other factors beyond implementation cost and payback period that are important in considering implementation of recommendations. Williams et al. (1993) also found that social issues are important to companies in the implementation of sustainability improvements.

5.5.1 Implementation Cost/Payback Period

Similar to implementation rate data, the recommendations were divided into categories for implementation cost and payback period and analyzed based on the financial motivations. Table 5.3 shows the percent of recommendations that had a financial reason as the top justification for implementing or not implementing based off payback period and initial cost. The first column is the payback period (less than one year, greater than or equal to one year, nothing, or unknown). “Nothing” for the payback period is where the recommendation had no initial cost and no cost savings. “Unknown” is where the payback period was unknown; typically the recommendation was expected to have some cost savings and some implementation cost, but those values were not able to be calculated or estimated. Columns 2 and 3 are recommendations that had implementation costs of less than $1,000, divided into implemented and not implemented. Columns 3 and 4 are for recommendations with implementation costs of at least $1,000, again divided into implemented and not implemented. The recommendations were separated at initial costs of $1,000 for the same reasons they were when analyzing the implementation rate, in order to maintain data sizes and because $1,000 seemed to best represent a relative division point in the data. The next two columns are for recommendations where the implementation cost was unknown. The last two columns are the totals for each payback period. The percent values within the table are the percent of

Table 5.3. Percent Top Reason is Financial for Implementation and Non-implementation by Payback Period and Implementation Cost (Number of Recommendations in Parentheses).

Implementation cost/ Payback	**<$999**		**>$1,000**		**Unknown**		**Total**	
	Implemented	Not implemented	Implemented	Not implemented	Implemented	Not implemented	Implemented	Not implemented
<1 year	41% (51)	26% (23)	44% (9)	83% (12)	-	-	42% (60)	46% (35)
≥1 year	33% (6)	40% (5)	45% (21)	71% (34)	-	-	43% (27)	67% (39)
Nothing	17% (6)	0% (2)	-	-	-	-	17% (6)	0% (2)
Unknown	-	0% (1)	-	-	6% (9)	70% (10)	6% (9)	64% (11)
Total	38% (63)	26% (31)	45% (30)	74% (46)	6% (9)	78% (10)	37% (102)	56% (87)

recommendations where the client selected a financial reason as the top reason for either implementing or not implementing the recommendation. In parentheses is the number of recommendations within that category.

For implemented opportunities, there was little variation between the payback period and initial cost categories for percent of recommendations where the top reason for implementation was a financial one. The financial reasons for implementation were actually slightly higher for the least financially appealing recommendations than the most (45% vs. 41%). There was not a statistical significant difference in financial motivations based on payback period and initial cost for implemented opportunities (using Chi-square with an alpha level of 0.05). Overall, as mentioned previously, regardless of payback period and initial cost, a financial reason was given as the top motivation for implementation for 37% of the recommendations. Clearly, other factors often were more important to clients in making decisions about implementation.

However, when looking at the top reason for non-implementation, there was more variation between the two extremes in terms of the frequency financial reasons were given (26% for shorter than one year projected payback and less than $1,000 initial cost vs. 71% for at least one year and at least $1,000). The statistical analysis found a statistically significant relationship between the four payback/cost categories and percent of financial motivations (Chi-square with three degrees of freedom = 15.5, $p = 0.001$). Even the non-implemented recommendations that had a projected simple payback of less than one year but an implementation cost of at least $1,000 were not implemented because of financial reasons (79%), suggesting the main barrier may be based more off the availability of capital for implementing a recommendation than the payback period. This is further seen in the large difference in financial motivations for recommendations not implemented based on initial cost independent of payback period (73% vs. 21%). While finances certainly are one of the top barriers in the decision-making process (56% of non-implemented recommendations), companies are concerned with more than payback and reduced operating costs; indirect and intangible benefits clearly are important.

The findings in this section and the previous section are consistent with results of a survey conducted in the Toronto region that found cost savings and return on investment are important, but they are not the primary consideration for implementation of sustainability improvements (Grenek et al., 2006), as well as the findings of Lyon et al. (2002) that large firms implement voluntary environmental actions for solid economic reasons, however the mechanism linking environmental and financial performance is unclear. Williams et al. (1993) and Hughey and Chittock (2011) also found reasons beyond finances important to pollution prevention practices.

5.5.2 Sector

The motivations were analyzed by client sector (manufacturing, public, health care, hospitality, and other) for all of the implemented and non-implemented recommendations. Figure 5.5 illustrates the percent top motivation for implementation and the top motivation for non-implementation of recommendations by sector, with the reasons divided into categories as previously grouped at the bottom of Figure 5.3 and Figure 5.4. The “n” at the top of the “Implemented” and “Non-implemented” portions of the figure represents the number of recommendations in that respective client sector.

Ignoring the “other” sector because of its small sample size, energy efficiency was selected as the top motivation for implementation at a similar rate (15-25%) for all sectors. Clients in the manufacturing and health care sectors were similar in the rate of selecting a top financial motivation; however, they differed on specific financial motivation. Acceptable payback period was more important for clients in the health care sector (35%) than all other sectors (9% combined), a statistically significant difference (Chi-square with one degree of freedom = 9.5428, p = 0.0020). Reduced operating cost was more important for clients in the manufacturing sector (35%) than all other sectors (10%), a statistically significant difference (Chi-square with one degree of freedom = 9.292, p = 0.0023). Along with acceptable payback, corporate commitment to resource use/waste reduction (30%) was an important reason to implement recommendations in the health care sector. This compares to 11% for all other sectors (Chi-square with one degree of freedom = 4.884, p = 0.0271), including only 7% in manufacturing. This may suggest corporate commitment is not as much of the main driving force to implement P2 recommendations in the pool of manufacturers studied compared to all other sectors, and

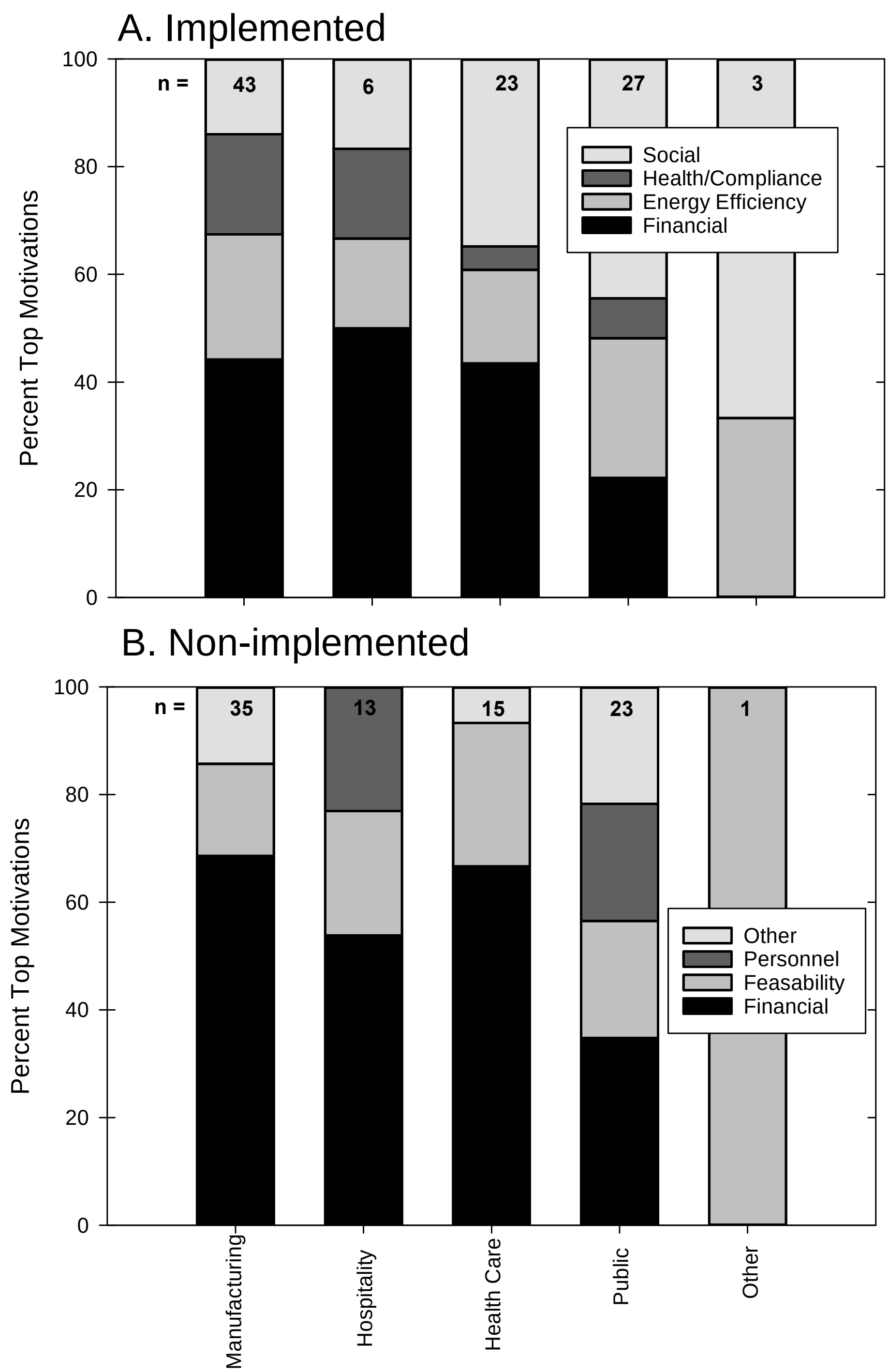

Figure 5.5. Top Motivations Provided by Respondent for Each Recommendation by Client Sector (Number of Recommendations Notated by "n" for Each Sector)

corporate commitment is especially important for the health care providers examined in this study.

A financial reason was selected by public sector respondents as the top motivation, for both implementation and non-implementation, less frequently than the rest of the sectors. The difference was approaching statistical significance for implementation (Chi-square with one degree of freedom = 3.5499, p = 0.0596) and was statistically significant for non-implementation (Chi-square with one degree of freedom = 5.8964, p = 0.0152). Oftentimes, clients in the public sector are driven as much or more so by approval of boards, the public, and meeting specific criteria than by finances. Social motivations were more frequently provided by the public (44%) and health care (35%) sectors than hospitality (17%) and manufacturing (14%) when implementing recommendations. Health/compliance reasons were more important for manufacturing (19%) and hospitality (17%) than public (7%) and health care (4%), though it should be noted that hospitality is a sample size of only six implemented recommendations. This corresponds to the level of engagement results (Figure 5.1), which found the manufacturing and hospitality sectors had higher average responses for analyzing risks associated with P2 sustainability issues.

5.5.3 Types of Recommendations

Another way to analyze the motivations for implementation and non-implementation is to look at the types of recommendations. Figure 5.6 shows the top motivation for implementation and non-implementation based off P2 category, with the reasons divided into the same categories as they were for sectors. The types of P2 recommendations were broken down into five categories, two of which included more than one specific type of recommendation: energy efficiency, equipment/process modification, recycling (both in-process and off-site recycling), training/policies, and other (improved housekeeping/preventative maintenance, material substitution,

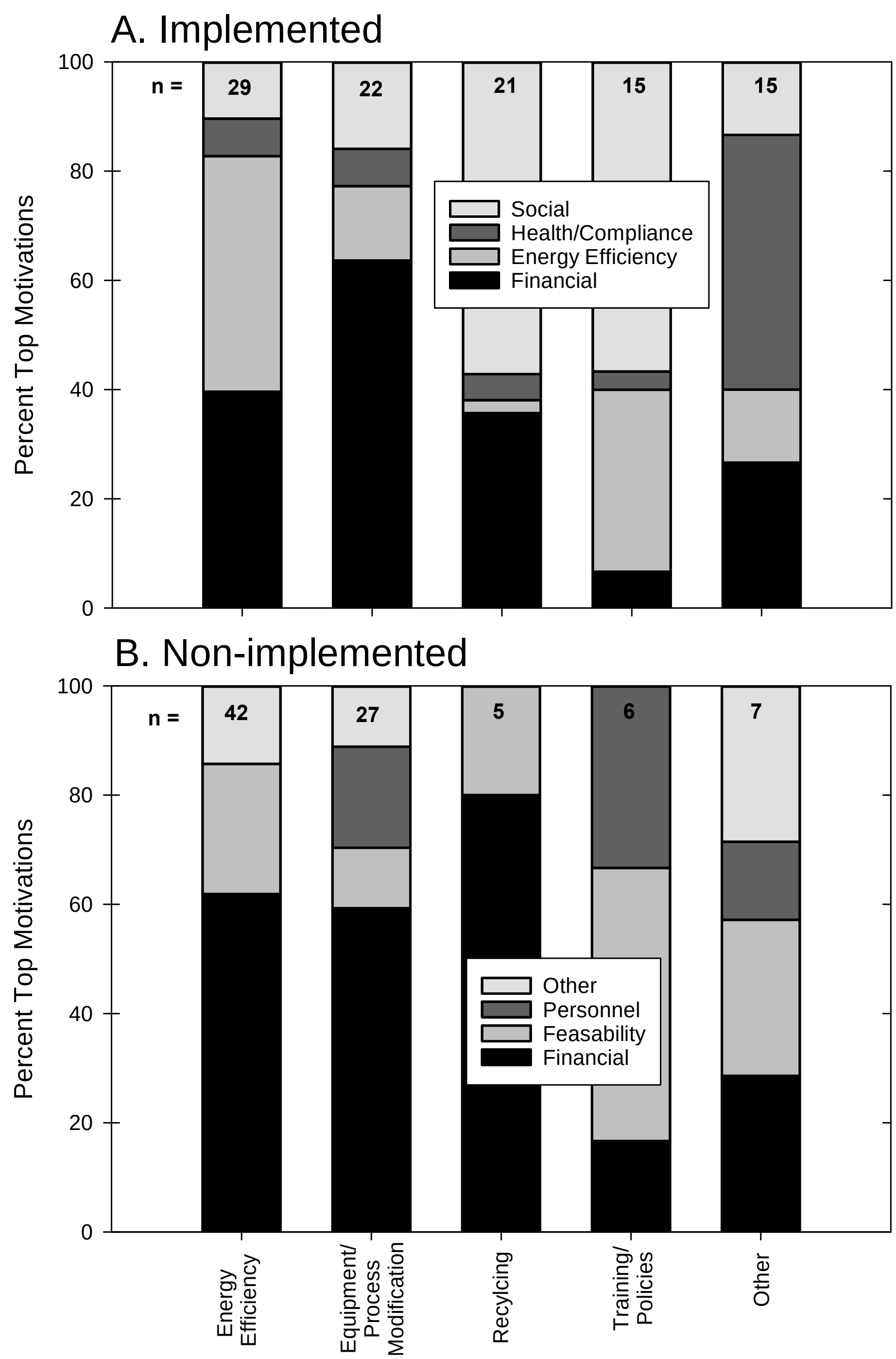

Figure 5.6. Top Motivations Provided by Respondent for Each Recommendation by P2 Category (Number of Recommendations Notated by "n" for Each Category)

purchasing). The types of P2 recommendations were divided into those four categories because of the similarities between the types of recommendations and the similarities between the motivations with each individual type of recommendation. For the implemented recommendations, “other” was mainly improved housekeeping/preventative maintenance (10 of the 15 recommendations in that category). Almost four-fifths of the recommendations not implemented fit the category of either energy efficiency (48%) or equipment/process modification (31%), which limited the analysis of non-implemented recommendations on the basis of motivation and type of recommendation.

A statistical analysis found a statistically significant relation between the five types of P2 categories shown in Figure 5.6 and the number of implemented recommendations that had a financial motivation (Chi-square with four degrees of freedom = 14.1312, $p = 0.0069$). Financial reasons were most frequently provided for the implementation of equipment/process modification recommendations (64%), while training/policies (7%) were least frequently provided. This suggests finances are not the main driving forces for recommendations dealing with training and policies, which typically had low initial costs but also did not realize significant monetary savings. Although the sample size was only six non-implemented recommendations, finances also was not a barrier for training/policies recommendations (17% selected a financial reason as the top motivation for non-implementation). Only energy efficiency and equipment/process modification types of recommendations had financial and energy efficiency reasons account for more than half of top motivations for implementation, suggesting indirect and intangible benefits outside of finances or even energy efficiency are important for the implementation of recommendations that deal with recycling, training, and improved housekeeping/preventative maintenance. Social reasons were especially important for recycling and training/policies recommendations (provided 57% of the time for each category compared to no higher than 16% for the other categories), a statistical significant difference (Chi-square with one degree of freedom = 24.4477, p = 0.000). Of the social reasons, corporate commitment to resource use/waste reduction was especially important: 43% for training/policies and 33% for recycling compared to only 4% for all other categories combined, a statistical significant difference (Chi-square with one degree of freedom = 22.6472, p = 0.000).

Health/compliance reasons were most important with recommendations in the "other" category. An analysis of those recommendations where a health/compliance reason was selected as the top motivation for implementation found that several of those recommendations led to the reduction or elimination of toxins. In order to increase the sample size, an analysis was performed on implemented recommendations that reduced or eliminated toxins of UNL surveyed clients that were reassessed from 2005-2011 for Kekilova et al. (2014) in addition to those that were reassessed and surveyed in 2014. These implementations came from varying categories, as at least one implemented recommendation came from each type described earlier. When the survey respondent was asked to check all justifications for implemented recommendations, health/compliance motivations were selected most frequently when toxins were reduced or eliminated: reduced environmental and health risk (68% for toxins vs. 28% for others); health and safety benefits (55% vs. 28%); and regulatory compliance (45% vs. 22%). This highlights the importance of health, safety, and regulatory compliance when toxins are involved.

While energy efficiency and equipment/process modification recommendations had similar percentages for a financial reason being the top motivation not to implement, the specific reasons varied. Of the energy efficiency recommendations not implemented, 40% had other priorities for capital investments selected as the top reason not to implement with only 7% as lack of capital. Of the equipment/process modification recommendations, only 15% had other priorities for capital investments as the top reason with 22% as lack of capital. This suggests that clients may have the capital for energy efficiency recommendations, but that there are other uses for investments the client deems a priority. This is the case even though in both Kansas and Nebraska, low interest loans for energy efficiency projects have been available to the private sector.

For all categories of recommendations, a feasibility reason was occasionally selected as the top justification for non-implementation, though no trends were visible solely based off the categories. A further analysis determined that many of those non-implemented recommendations had an initial cost of less than $1,000 and a payback period of less than one year. Of the 23 non-implemented recommendations with a low initial cost and payback, nearly half selected a feasibility reason as the top motivation to not implement (22% not technically feasible, 22% customer specifications, and 4% insufficient information regarding recommendation). This suggests that there may have been some recommendations the client felt did not make sense with the company's business model despite the student's finding that the recommendation had attractive finances.

5.6 Conclusion

Based on the results of the survey of past clients reassessed by the UNL and KSU sustainability technical assistance programs, clients in the manufacturing sector had the highest average level of engagement in pollution prevention/sustainability activities, notably more engaged than other sectors. Improved housekeeping/preventative maintenance recommendations were implemented at a much higher rate than other types of recommendations. Almost all of the implemented recommendations had a persistence (reoccurrence) of at least five years after it was initially implemented. Recommendations with paybacks of less than one year and implementation costs of less than $1,000 were implemented at the highest rate, and recommendations with paybacks of more than four years and costs of more than $1,000 were implemented at the lowest rate, though there were other factors beyond finances that were important in considering implementation of recommendations.

There were more reasons given for implementation than non-implementation of each pollution prevention recommendation when a client was asked to select all justifications that applied. Finances were less of a motivation than a barrier for implementation, and finances were most important for equipment/process modification recommendations and least important for training/policies. Capital was more of a financial barrier for implementation than poor payback. Finances were not as important for public institutions, which typically are not driven by profit but by meeting expectations of boards and the public. Other indirect and intangible benefits were important when considering the implementation of recommendations. Social motives, particularly corporate commitment to resource use/waste reduction, were especially important for recycling and training/policies recommendations. Corporate commitment also was important for recommendations that an acceptable payback was not a reason for implementation. Health and compliance factors were important for recommendations that involved toxins and VOCs.

CHAPTER 6: CONCLUSIONS

From the analysis of reassessments and surveys of the UNL and KSU sustainability technical assistance intern programs, a better understanding of the programs' impact and of the driving forces and barriers to implementation was gained. Several key conclusions were made regarding the impact of intern recommendations and business motivations to implementation of sustainability improvements.

The clients reassessed and surveyed by the two programs during the study period were slightly more active than a national study in engagement in sustainability activities, with large companies that received assistance for a full summer being more engaged than those that received assistance for only part of a summer. Clients in the manufacturing sector had the highest average level of engagement in P2 activities.

Recommendations from the two programs were implemented about half the time, with recommendations for clients that received assistance for an entire summer being implemented at a higher percentage than for clients that received assistance for part of a summer. The savings realized from the clients were sizable. On average, clients that received full assistance reported an order of magnitude or more of impact in savings for cost, natural gas, and solid waste than those that received partial assistance. Improved housekeeping/preventative maintenance recommendations were implemented at a higher rate than other types of recommendations, and training/policies recommendations were implemented at a much higher percentage for clients receiving assistance for an entire summer than part of a summer.

Almost all of the implemented recommendations had an expected persistence (reoccurrence) of at least five years after they were initially implemented. The Pareto analysis showed a large majority of the savings coming from a small percentage of clients. Clients that received full assistance selected fewer reasons on average for implementing or not implementing a recommendation than those clients that received partial assistance.

Recommendations with paybacks of less than one year and implementation costs of less than $1,000 were implemented at the highest rate, and recommendations with paybacks of more than four years and costs of more than $1,000 were implemented at the lowest rate, though there were other factors beyond finances that were important in considering implementation of recommendations.

There were more motives given for implementation than non-implementation of each P2 recommendation when the clients were asked for all reasons that applied. Finances were less of a motivation than a barrier for implementation, and finances were most important for implementation of equipment/process modification recommendations and least important for implementation of training/policies. Capital was more of a financial barrier for implementation than poor payback. Finances were not as important for public institutions, which typically are not driven by profit but by expectations of boards and the public.

Other indirect and intangible benefits were important when considering the implementation of recommendations. Social motives, particularly corporate commitment to resource use/waste reduction, were especially important for recycling and training/policies recommendations. Corporate commitment also was important for recommendations that an acceptable payback was not a reason for implementation. Health and compliance factors were important for recommendations that involved the reduction or elimination of toxins.

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APPENDIX A: QUALITY ASSURANCE PROJECT PLAN (QAPP) FOR EPA

A1: Title and Approval Sheet

Quality Assurance Project Plan (QAPP)

for Source Reduction Assistance

Kansas State University (KSU)
Pollution Prevention Institute (PPI)
In partnership with
University of Nebraska – Lincoln (UNL)

Project Officials	Name	Signature	Date
Project PI and manager Director, KSU PPI	Nancy Larson		
Project QA officer K-State	Bruce Snead		
Project subcontractor Director, UNL P3	Bruce Dvorak		
EPA Project officer	Jeannette Kerr		
EPA Quality assurance manager	Diane Harris		

*Effective date of this plan.

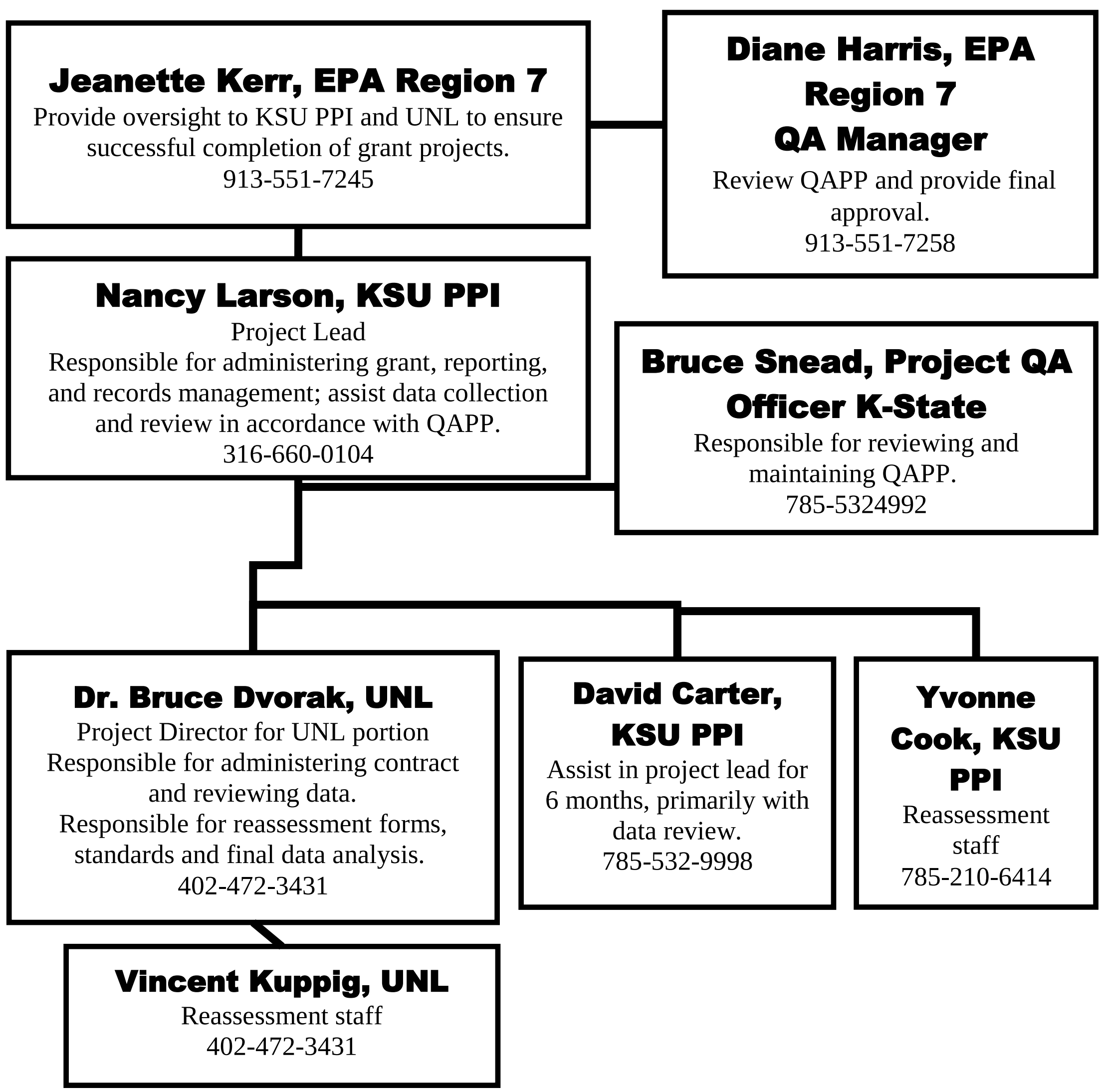
A2: Table of Contents

A3. Distribution List

The following individuals will receive copies of the approved QAPP:

Nancy Larson, Project PI, KSU PPI
David Carter, Project reviewer, KSU PPI
Yvonne Cook, reassessment staff, KSU PPI
Bruce Dvorak, subcontractor, UNL, P3
Vincent Kuppig, subcontractor staff, UNL P3
Jeannette Kerr, EPA Region 7
Christina Schmaltz, EPA Region 7

A4. Project Task/Organization



A5. Problem Definition/Background

The Kansas State University Pollution Prevention Institute (KSU) and the University of Nebraska – Lincoln (UNL) Partners in Pollution Prevention (P3) have each hosted pollution prevention (P2) intern programs for multiple years. Many organizations lack internal expertise and resources needed to identify and implement P2 opportunities, some of whom have worked with KSU and UNL as host companies for interns completing assessments. In the past, both KSU and UNL have completed follow-up assessments with intern host companies to determine recommended project implementation rates and outcomes. This program will complete on-site reassessments in both states, and then further study what motivates these past intern companies to implement recommendations and changes that produce measurable environmental outcomes, as well as factors that prevent companies from making the changes.

Actual reassessments and documentation associated with the reassessments will be performed by undergraduate students, graduate students, and hourly staff members under the supervision of the KSU and UNL P3 programs. This quality assurance project plan (QAPP) will be used as a guidance template for the KSU and UNL Partnership to Reassess P2 Implementation and Study Related Motivating Drivers program under the requirements of Source Reduction Assistance. All staff involved with this project will be trained on the contents of this QAPP, and the importance of using and documenting generally acceptable data collection procedures.

A6. Project /Task Description

The project strategy includes the following systematic tasks:

- Update existing reassessment forms for collecting environmental and behavior change data from past intern host companies.
- Obtain IRB approvals for survey tools to be used with project. These approvals are required if data is to be presented in any papers or manuscripts.
- Develop a QAPP for submittal to EPA. Survey tools and a standard operating procedure document are included as Appendix A-C of the QAPP.
- Identify a list of industry contacts as potential participants. Industries that have hosted multiple interns will be prioritized. The remaining reassessments will be selected from a list of industry types, pulling from different sectors to get a good representation.
- Train existing staff and environmental technicians to perform on-site reassessments of past clients. The QAPP will be included in the training.
- Reassess past intern projects (up to 25 total). This will be done with the assistance and oversight of KSU and UNL project leads.
- Review the reassessment results collected during the initial reassessment. *Unless otherwise specified, the word review is used in this document as a verb and means to exam formally with the possibility or intent to change if needed.* The review will compare the initial intern recommendations and the responses or answers provided by the host industry during the reassessment. The review will also include a close

examination of which of the four-tier data valuation categories (data quality indicator) has been assigned and request clarification as needed. If new data results are collected, the review will include replicating the calculations to confirm the same data outcome. This will be done by KSU and UNL professional staff. Reassessment staff will follow up with clients as needed to obtain complete surveys.

- Send a reassessment summary to each client for review and comment.
- Send out a short, six-question survey concerning motivation for implementing specific P2 suggestions. The survey after the fact will result in specific answers from the client, separate from the narrative gathered by the reassessment staff, as both types of data are useful. The survey will also quantify the length of time the client continued to gain benefit from each P2 suggestion implemented.
- Analyze the data. UNL will use a graduate student to enter the reassessment data and perform an initial data analysis. Under Dr. Dvorak's guidance, the student will prepare a short report, which will be part of the final report.
- Collaborate to publish the study and data nationally. This will ensure the partnership work, methodology, and data are transferred to both industry and technical assistance providers.

A7. Quality Objectives and Criteria

The primary objective is to obtain environmental outcomes from the previous intern clients through a reassessment process. The reassessment staff will evaluate client implementation and re-evaluate environmental outcomes (behaviors and performance data) related to recommendations of the original/previous P2 intern. The goal is to collect the best possible data, despite potential limitations associated with client willingness or ability to provide detailed information.

Data gathered for this project will include environmental performance data (e.g., gallons, kWh, and pounds), financial data (e.g., cost of electricity, labor rates, and equipment costs), and changes in behavior (e.g., additional P2 opportunities implemented and further P2 assistance). The reassessment staff will use a KSU- and UNL-developed standard method for collecting the information.

The second objective will be to investigate client motivations that led to action or a decision not to take action. With input from KSU, the UNL developed a survey tool and method to collect this information.

Both KSU and UNL teams will use the same tools for all work. These tools are contained in the appendix.

Use of common tools and methods will allow this project to meet the precision data quality indicator (DQI). A four-tiered data valuation system will be used to address the accuracy of the DQI. The following are the four levels of data accuracy:

Tier 1: High-quality direct measures

- Utility bills (electricity, natural gas, water)
- Purchasing invoices (for diesel fuel costs and quantities)
- Metered/measured by business (e.g., Waste or material use logs)
- Initial estimate, based on meter/measurement by business
- Initial estimate, based on meter/measurement by intern;
- Equipment data (e.g., motor horsepower and efficiency, pipe sizes) from nameplate

Tier 2: Moderate-quality indirect measures

- Verbal estimates of use by experienced production staff / management
- Previous intern's tier 2 data

Tier 3: Low-quality indirect measures

- Equipment data from vendor specifications used to make usage estimates
- Estimated data based on published industry standards, external calculation tool, or outside expert opinion.

Tier 4: Non-peer reviewed low-quality indirect measures

- Estimated data based on non-peer reviewed published industry standards, external calculation tool, or outside expert opinion.
- Estimates of use by new or inexperienced production staff / management

Other DQIs, including but not limited to bias, accuracy, and comparability, will be utilized as part of the data review and analysis.

A8. Special Training Certification

If site-specific health and safety training is required for gathering data, the host company is responsible for providing it.

A9. Documents and Records

All staff involved in the project has reviewed the draft QA project plan. When EPA finalizes the plan and approves it, the updated copy will be provided to and reviewed with all project staff. KSU and UNL will provide standardized reassessment forms and a notebook for staff performing reassessments. These will be used to record all data collected during reassessments. In most cases, a short narrative report will be written to summarize each reassessment. Data collected on-site as part of the reassessment, as well as phone and e-mail correspondence will all be maintained as part of the records.

It is not anticipated that equipment will be used as part of this project, but if it is, KSU will maintain all records (including calibration records) for a three-year period past the close out period. KSU and UNL will document the type of equipment used and associated procedures as part of the file. For example, if the equipment is calibrated, then this will be documented. Calibration documentation will remain with the equipment storage at the respective primary university locations.

Reassessment forms, summary report, motivation survey, and any further notes or site-specific documents will be maintained by reassessment staff and then provided to KSU and UNL staff. When the project is complete, KSU will maintain all documents and records for a period of at least three years from the date of close out. These documents, both hard copy and electronic will be maintained at the KSU Wichita satellite office managed by the project lead, Nancy Larson.

Due to the proprietary nature of some data, the host company may be reluctant or unwilling to release copies of such to the staff. Consequently, KSU and UNL may be unable to maintain these records, but will have the name and contact information of the host company employee with access to these records in their final reports.

B1. Sampling Process Design (Experimental Design)

This project data collection design does **not** include collecting samples that would need to be analyzed by a certified laboratory.

As previously stated, it is not anticipated that equipment will be used as part of this project, but if it is, KSU will maintain all records (including calibration records) for a three-year period past the close out period. KSU and UNL will document the type of equipment used and associated procedures as part of the file. For example, if the equipment is calibrated, then this will be documented.

KSU reassessment staff will reassess up to 20 different intern projects and UNL will reassess at least five. Partners will collaborate to select a sampling of host companies representing a variety of industry and institutions. Host companies that have hosted interns multiple years will be prioritized.

In most cases, measurements made by a previous KSU or UNL intern as part of a previous project will be used. More precise methods of gathering data – such as utility records and equipment installed and calibrated by the host company – will be encouraged to quantify environmental and economic savings. The highest tier data will be sought first to the extent resources are available. As noted in section A7, a four-tiered data valuation system will be used to address the accuracy DQI.

A tiered system of greenhouse gas (GHG) conversation factors (based on source reduction type) will be used to address the accuracy of the DQI. The highest level (e.g., A) will be used when possible. Results will be reported to the nearest tenth.

A. Data from the US EPA's 2014 EPA Pollution Prevention Programs GHG Calculator spreadsheet will be used for electricity, other stationary sources (e.g. natural gas, diesel, propane), mobile sources (e.g., diesel, gasoline), and for municipal unheated water when direct energy use data for pumping and treatment is not available. For electricity and municipal water, the state-specific conversation factors will be utilized.
B. US EPA Warm model (http://epa.gov/epawaste/conserve/tools/warm/index.html) for specific cases of source reduction (especially for organic/food waste reductions).

In each case, the following will be listed in the calculation appendix for each reassessment: tool used, version, and key assumptions / input factor.

B2. Sampling Methods
Not applicable.

B3. Sample Handling and Custody
Not applicable.

B4. Analytical Methods
Not applicable.

B5. Quality Control
Not applicable.

B6. Instrument/Equipment Testing, Inspection, and Maintenance
Not applicable.

B7. Instrument/Equipment Calibration and Frequency
Not applicable.

B8. Inspection/Acceptance of Supplies and Consumables
Not applicable.

B9. Non-direct Measurements
By design, this project will follow up with past host companies to determine whether P2 recommendations have been implemented. When projects have been implemented, the reassessment staff will refer to the original intern's data collection and calculations to

determine if expected results are still applicable to the recommendation. In some situations, staff and interns are merely using data that has already been gathered by the host company or third parties, such as utility companies or private consultants. In all cases, staff will make attempts to verify implemented P2 data and will then categorize it as Tier 1, 2, 3 or 4. The highest tier data will be sought first to the extent resources are available.

B10. Data Management

Data collected as part of this project will be recorded on reassessment forms, within a narrative summary report, and disaggregated by tiers for the final report. KSU and UNL will maintain these field documents and electronic documents in Word and Excel as part of overall data and records management. As noted above in section A9, KSU will be responsible for maintaining data records for at least three years after project close out.

Examples of standard engineering equations and conversions used by KSU and UNL staff are noted below.

- *Energy conservation:* Several of the past intern facilities have implemented lighting efficiency projects that result in energy use reduction. For example, if a facility implements lighting-efficiency projects that reduce energy use by about 380,000 kWh per year, at a cost of .056 per kWh, the facility would realize a cost savings of approximately $21,000, and greenhouse gas reductions of 412.5 $MTCO_2e$ a year. The detailed calculations for this example are provided in Appendix A.
- *Water conservation:* A number of businesses, including hospital and lodging facilities, have implemented water conservation projects. For example, low flow toilets may be implemented at a facility resulting in 250,000 gallons a year of water savings, cost savings of $5,000 a year, and greenhouse gas reductions of 0.9 $MTCO_2e$ a year. The detailed calculations for this example are provided in Appendix A.
- Toxics Source Reduction– Source reduction quantities and cost impacts will be estimated. For example, a business has switched from using pentachlorophenol to copper naphthenate for wood treating, reducing the quantity of sludge requiring incineration and reducing TRI reported emissions. The detailed calculations for an example are provided in Appendix A.

The project staff will document the equations and demonstrate how the data was calculated in the client summary report and in some cases as part of the field notes. In all cases, staff must document their data collection methodology, sample size, and calculations as part of their reports. Reassessment standard operating procedures are in Appendix B.

As with most data gathered by KSU, environmental and economic data collected will be entered into KSU PPI's database system, and possibly the Region 7 P2 Results

Measurement Application on the Pollution Prevention Regional Information Center website. KSU will coordinate with UNL to ensure data reported to Region 7 is not duplicated.

C1. Assessments and Response Action

As noted in the work plan, staff will fill out reassessment forms (examples provided in Appendix A) and prepare a short narrative report with appendices that documents key assumptions, calculations, and literature data sources used. It is expected that KSU and UNL will find that most companies reassessed have implemented at least one or more projects that were originally recommended by the intern.

Most of the on-site reassessments will take place between May – September 2014. Most of the final motivational surveys will be sent and collected between August and October 2014. All reassessments will be conducted by KSU or UNL staff, primarily reassessment staff as noted in section A.3.

Results of each reassessment will be reported to and reviewed by either KSU or UNL staff, then by the host company. KSU and UNL will meet once a month to review project progress and ensure data collection consistency. Problems or concerns that arise when working with host companies or gathering data will be addressed immediately or as part of a meeting. In some cases the EPA technical project advisor may be asked to join a meeting.

C2. Reports to Management

KSU and UNL management will be kept informed of the internal project progress as part of the reassessment review process, through internal meetings, and the monthly project team meetings that involve most or all of the KSU and UNL project team (see A.4). Reassessment staff will gathered data and send draft calculations to KSU and UNL as part of a draft summary report. As previously noted, KSU and UNL staff will review summary report and once finalized, the summary report will be sent to host-company. Next, KSU and UNL will send a short client motivation survey concerning motivations for implementing specific suggestions to the host company clients. See Appendix C for the survey. The survey after the fact is to get some very specific answers from the client, separate from the narrative, as both types of data are useful. The survey will also quantify the length of time the client continued to gain benefit from each implemented P2 suggestion. All data will be available for data analysis at least three months before the end of the project in March 2015. This reassessment data will be entered and an initial data analysis performed by both KSU and UNL. Data from the client motivation survey will be analyzed and then combined with past survey data by UNL staff. These will be complied into a short report by UNL, which will become a part of the final report.

KSU will submit the semi-annual progress reports and the final report to EPA Region 7. The final report will be collaboratively prepared by KSU and UNL to publish the study and data nationally, and ensure partnership work, methodology, and data are transferred to both industry and technical assistance providers.

D1. Data Review, Verification and Validation

In preparation for each reassessment, staff reviews the previous intern report and recommendations. Staff then asks the host company specifically whether the past recommendations were implemented or not. If implement, staff reviews the expected environmental and cost saving results (previously calculated by the original intern) with the host company representative. It is at this point that the host-company can indicate if data seems appropriate or not. Next, staff will ask about additional P2 projects the host company has implemented and the related measures. As part of the internal review of the data, KSU/UNL reviewers determine whether data collected can be verified and appropriately categorized using the four-tier data quality and objective system as detailed above in section A7. If it does meet the quality objectives as defined in A7, then the data will be accepted, if not it will be questioned for further clarification or rejected. In cases where the KSU/UNL reviewer has questions, or the client reviewer disagrees with the estimate, the reassessor will be asked to re-calculate the impact measurements. If the data cannot be validated, then the data will be rejected. This process and the related calculation will be documented in the field notes as well as in the summary report. KSU and UNL will collaborate on data decisions to ensure consistency.

D2. Verification and Validation

All data collected from KSU and UNL clients for the purpose of reporting to EPA under this project are collected and verified using the procedures noted below:

1. Reassessor (undergraduate student, graduate student, or hourly worker) collects data on site, with follow-up data collected via phone or e-mail directly from the client.
2. When required, the reassessor will make calculations based on the information provided by the client. In these cases, an appendix (as noted above and an example provided in Appendix A) will be prepared and attached to the reassessment form and also the reassessment summary.
3. Data is documented by the reassessment staff, and then reviewed by KSU or UNL, before it is sent to the client in summary format for review and comment. After the client has had an opportunity to review the data, P2 staff will review data second time before finalizing results and reports. Data will be categorized into tiers 1-4 as previously described. In some cases, data from the KSU/UNL review will be compared to data results from other similar studies and to examples published in the technical literature. Data will be accepted if it is considered

reasonable and can be reproduced by the reassessment staff and the KSU/UNL reviewer. In cases where the KSU/UNL reviewer has questions, or the client reviewer disagrees with the estimate, the reassessor will be asked to re-calculate the impact measurements. If the data cannot be validated, then the data will be rejected. This process and the related calculation will be documented in the field notes as well as in the summary report. KSU and UNL will collaborate on data decisions to ensure consistency.

4. Once data and technical reports have been through a KSU/UNL review and edited, the final product will be reviewed for grammatical edits by the KSU editor.
5. UNL will be responsible for statistically analyzing data, and looking for relationships and notable trends. UNL will then prepare a short report, which will be part of the final report.

D3. Reconciliation with User Requirements

After a staff member has gathered data for a project, he or she will send draft calculations to both the host company contact, and the KSU or UNL specialist. The host company and KSU/UNL will review the data (and data source tier valuation) to determine if it is an appropriate and accurate documentation of the data or environmental metric. As noted above in D2, UNL will be responsible for statistically analyzing data, and looking for relationships and notable trends. UNL will then prepare a short report, which will be part of the final report.

Appendix A.1: Example Reassessment Form and Narrative Report

Example Narrative Report for Reassessment

Note: The below example is only a portion of the report narrative which provides context to the calculation pages and the summary impact forms.

BACKGROUND

The UNL Partners in Pollution Prevention (P3) program staff visited Company ABC in City, Nebraska, on June 1, 2014, to conduct a reassessment of the P2 analysis for the facility performed in 2010 by P3 intern Jack Student.

The reassessment was performed by UNL graduate student John Doe to determine which recommendations from the 2010 waste assessment report were implemented and what the benefits were for the facility. An interview was held with Environmental Coordinator Jim Professional to review the recommendations.

P2 OPPORTUNINTIES

Three out of four recommendations from the 2010 report were implemented. The three recommendations that have been implemented are: (1) replace high bay lighting with T5 fluorescent in Building 3; (2) install low-flow toilets in the company's conference complex; and (3) switch from pentachlorophenol to copper naphthenate for treating wood. The one recommendation that has not been implemented is: replace T12 office lighting with T8 fluorescent.

In addition, there was one P2 opportunity presented in the original 2010 report that was not recommended because of a high payback period that has not been implemented: install geothermal heat pump in Building 3. There also was an opportunity that was not recommended to be performed until later because of the equipment's life expectancy that has not been implemented yet: upgrade wastewater evaporator when current one needs to be replaced in approximately 2016.

The following is a brief description of each recommendation and information on its implementation.

Recommendations implemented

1. Replace high bay lighting with T5 fluorescent in Building 3. It was recommended that Company ABC improve its high bay lighting in Building 3 by switching from high-pressure sodium lights and metal halide lights to T5 fluorescent. This recommendation was implemented as suggested in 2011. The client agreed with the intern's initial estimation of an annual reduction of 380,000 kWh in electricity and a cost savings of $21,000 per year. The initial cost, including installation, was approximately $50,000 after Nebraska Public Power District incentives, according to the client based off the company's purchasing records. This P2 recommendation also results in the reduction of approximately 412.5 $MTCO_2E$ in greenhouse gases annually. This P2 recommendation is expected to continue for at least another five years. Calculations can be found in Appendix A.1.1.

2. Install low-flow toilets in the conference complex. It was recommended that Company ABC purchase low-flow toilets in the bathrooms in its conference complex. This recommendation has been implemented as suggested, with low-flow toilets (1.3 gallons per flush) having been purchased and installed beginning in 2011 to replace the previous toilets that used 6.4 gallons per flush. Based off assumptions detailed in Appendix B, which the client agreed with, this recommendation has resulted in a savings of approximately 250,000 gallons of water and $350 per year. It had a total initial cost of approximately $5,000, according to the client based off the company's purchasing records. This P2 recommendation also results in the reduction of approximately 0.9 $MTCO_2E$ in greenhouse gases annually. This P2 recommendation is expected to continue for at least five more years. Calculations can be found in Appendix A.1.2.

3. Switch from pentachlorophenol to copper naphthenate for treating wood. The intern recommended the company switch to copper naphthenate, which is substantially less toxic and does not require TRI reporting. Copper naphthenate treated wood waste is neither a listed nor a characteristic hazardous waste according to the current EPA regulations under the Resources Conservation and Recovery Act, and it may be disposed of in landfills in accordance with federal, state and local regulations. This recommendation was implemented as suggested in 2012. The implementation cost $25,000 in new equipment and installations, according to the client based off the company's purchasing records. The annual cost of copper naphthenate was the same as pentachlorophenol, according to the client based off the company's purchasing records, thus no cost savings were credited for the purchase price. The switch to copper naphthenate reduced the cost of waste disposal (incineration in the pentachlorophenol case). According to the client based off the company's disposal records, it reduced the pentachlorophenol sludge to be disposed by 4,000 pounds per year with cost savings of $6,500 and reduced the cost of disposing of wood scraps, gloves, boots and aprons by 4,600 pounds per year at a cost of $7,000, for an approximate total hazardous waste savings of 8,600 pounds per year and an approximate total cost savings of $13,500 per year. This recommendation also reduced 5 pounds of pentachlorophenol annually released to water, as reported in the client's 2010 TRI. This recommendation is expected to continue for at least another five years. Calculations can be found in Appendix A.1.3.

Recommendations not implemented

1. Replace T12 office lighting with T8 fluorescent. Switching from T12 to T8 lighting in the offices potentially could have saved $8,700 annually and reduced electricity usage by 108,000 kWh per year at an initial cost of $19,000. This opportunity was not investigated because the client indicated office lighting has not been a high priority at Company ABC.

P2 opportunities not recommended

There were two opportunities that were not recommended in the original 2010 report that have not been implemented: (1) **install geothermal heat pump in Building 3** ($30,000 cost savings and 33,000 therms reduction in energy annually with a $630,000 initial cost); (2) **upgrade wastewater evaporator when current one needs to be replaced** ($5,000 cost savings and 600 therms reduction in energy annually with an initial cost of $40,000). The first opportunity listed above was not recommended because of the extremely long payback period and the second was not recommended until the current wastewater evaporator needs to be replaced, which was not expected to be until 2016.

Appendix A.1.1:Calculations for Opportunity 1: High bay lighting in Building 3

All values are from Jack Student's 2010 assessment report and confirmed by the company representative during the reassessment visit. The reassessing student visually confirmed the reasonableness of the data during a building walk through.

<u>Previous lighting fixtures</u>

Hours of operation (based off client)

24 hours/day * 365 days/year = 8,760 hours/year

Metal halide electricity (# of fixtures per wattage use counted by intern)

95 fixtures * 458 watts/fixture * 8,760 hours/year * 1 kW/1,000 watt

+ 4 fixtures * 1,060 watts/fixture * 8,760 hours/year * 1 kW/1,000 watt

= 420,000 kWh/year

Pressure sodium electricity (# of fixtures per wattage use counted by intern)

129 fixtures * 468 watts/fixture * 8,760 hours/year * 1 kW/1,000 watt

+ 12 fixtures * 1,060 watts/fixture * 8,760 hours/year * 1 kW/1,000 watt

= 640,000 kWh/year

Total annual electricity used

420,000 + 640,000 = **1,060,000 kWh/year**

Total annual cost (electricity unit cost according to client, based off bills)

1,060,000 kWh/year * $0.056/kWh = **$59,000/year**

<u>New (replacement) lighting fixtures</u>

T5 fluorescent electricity (# of fixtures per wattage use counted by intern and confirmed by the company)

240 fixtures * 324 watts/fixture * 8,760 hours/year * 1 kw/1,000 watt = **680,000 kWh/year**

Total annual cost (electricity unit cost according to client, based off bills)

680,000 kWh/year * $0.056/kWh = **$38,000/year**

Initial cost (according to client, based off purchasing records)

240 fixtures * $200/fixture (materials)

+ 240 fixtures * 1 hour/fixture * $60/hour (installation & labor)

– $12,500 (NPPD incentives)

= **$50,000**

<u>Total annual savings</u>

Electricity

1,060,000 – 680,000 = **380,000 kWh/year**

Cost

$59,000 – $38,000 = **$21,000/year**

<u>Greenhouse gas reduction</u>

Assumptions:

- GHG conversion based on Nebraska conversion factor
- For each 1000 kWh used 1.086 Metric Tons of Carbon Dioxide is reduced (MTCO2E) (based on US EPA eGrid data that is in the 2014 EPA Pollution Prevention Programs GHG Calculator Spreadsheet). Factor used in original assessment.
- All savings are from electric reduction

Calculation:

- 380,000 kWh/yr * 1.086 $MTCO_2E$/1,000 kWh = **412.5 $MTCO_2E$/year**

Source: 2014 EPA Pollution Prevention Programs GHG Calculator Spreadsheet, based on the data from: U.S. EPA, Clean Energy. "eGRID 2012 Version 1.0." May 2012. (http://www.epa.gov/cleanenergy/energy-resources/egrid/index.html)

Appendix A.1.2: Calculations for Opportunity 2: Low-flow toilet calculations

Assumptions

— Approximately 250 uses of one flush per day
— Approximately 180 days per year use of this conference complex
— Approximately 10 days per year where only complex staff are in attendance
— Approximately 50 flushes per conference event
— Approximately 60 conference events per year
— Approximately 10 flushes per day during non-conference periods
— Approximately 60 non-conference days
Note: The numbers above were determined based off client estimates.

— Total flushes per year = 250 flushes/day * 180 days/year + 50 flushes/day * 10 staff days/year + 50 flushes/conf. event * 60 conf. events/year + 10 flushes/non-conf. day * 60 summer days/year = 49,000 flushes/year
— Previous toilets used 6.4 gallons/flush
— New toilets use 1.3 gallons/flush
— $1.40/1,000 gallons (according to Nebraska League of Municipalities for the 2014 water rates for city that Company ABC is located in. Company ABC did not share their most recent water bills, but did confirm that these costs are reasonable.)

Calculations

Previous water usage
49,000 flushes/year * 6.4 gallons/flush = 313,600 gallons/year
313,600 gallons/year * $1.40/1,000 gallons = $440/year
Current water usage
49,000 flushes/year * 1.3 gallons/flush = 63,700 gallons/year
63,700 gallons/year * $1.40/1,000 gallons = $90/year
Water savings: 313,600 – 63,700 = **250,000 gallons/year**
Cost savings: 250,000 gallons/year * $1.40/1,000 gallons = **$350/year**
Initial cost
= **$5,000** (according to client, based off purchasing records)

Greenhouse gas reduction

Assumptions: GHG conversion based on Nebraska conversion factor (using factor used during original assessment).
Calculation: 250,000 gallons/year * 3.58 $MTCO_2E$/1,000,000 gallons non-heated water = **0.9 $MTCO_2E$/year**

Sources: 2014 EPA Pollution Prevention Programs GHG Calculator Spreadsheet, based on data from:

(1) Water and Sustainability: US Electrical consumption for water supply and treatment, the next half century, EPRI, Palo Alto, CA, 2000 and

(2) U.S. EPA, Clean Energy. "eGRID 2012 Version 1.0." May 2012. (http://www.epa.gov/cleanenergy/energy-resources/egrid/index.html)

Appendix A.1.3: **Calculations for Opportunity 3: Wood treatment calculations**

Assumptions

- 4,000 pounds per year of pentachlorophenol sludge disposed previously (according to client based off company's disposal records)
- $1.63 per pound in disposal costs for pentachlorophenol sludge (according to client based off company's bills)
- 4,600 pounds per year in disposal of wood scraps, gloves, boots and aprons (according to client based off company's disposal records)
- $1.52 per pound in disposal costs for wood scraps, gloves, boots and aprons (according to client based off company's bills)
- $25,000 initial cost in equipment and installation costs (according to client based off purchasing records)

Calculations

Pentachlorophenol sludge disposal costs
4,000 pounds/year * $1.62/pound = $6,500/year

Wood scraps, gloves, boots and aprons disposal costs
4,600 pounds/year * $1.52/pound = $7,000/year

Hazardous waste savings
4,000 pounds/year + 4,600 pounds/year = **8,600 pounds/year**

Cost savings
$6,500/year + $7,000/year = **$13,500/year**

2014 Pollution Prevention Reassessment Form (use one reassessment form for each management report/business reassessed)

Your name, number, email: **John Doe, 402-555-5555, jdoe@unl.edu** Date of Revisit: **June 1, 2014**

Business: **Company ABC** Contact name, number, email: **Jim Professional, 402-555-5255, pro@companyabc.com**

This is a reassessment of the **2010** (year) project completed by **Jack Student** (original intern).

P2 Opportunity (Brief Description)	Implemented		Not Implemented			Doing Before Assessment	Comments (refer to narrative report for more information)
	As Suggested	With Modification	Investigated	Not Investigated	Don't Know		
Replace high bay lighting with T5 fluorescent in Building 3	X						Source: Electricity Implemented as suggested in 2011
Install low-flow toilets in the conference complex	X						Source: Water Implemented as suggested in 2011
Switch from pentachlorophenol to copper naphthenate for treating wood	X						Source: Hazardous Waste Implemented as suggested in 2012
Replace T12 office lighting with T8 fluorescent				X			Source: Electricity Client indicated office lighting has not been a high priority
Install geothermal pump in Building 3				X			Source: Natural gas Opportunity was not recommended because of lengthy payback period.
Upgrade wastewater evaporator when current one needs to be replaced				X			Source: Natural gas Opportunity was not recommended at this time – only when current evaporator needs to be replaced in 2016

(Note: This and the following pages are your understanding of the client's perception until the client approves the report)

Note for Comments Column: Be sure to indicate what source was reduced for each opportunity implemented above (solid waste, hazardous material or waste, water use or water pollution, electricity, natural gas, diesel, coal, air emissions). Add any other comments which clarify status or future plans, particularly for those not implemented. Refer to the narrative report for further details on each opportunity.

How many of the P2 opportunities that you checked in NOT Implemented categories did client say he/she was still interested in? _0_
How many of the P2 opportunities that you checked in NOT Implemented categories did client ask you to investigate further? __0___

As you reassessed the business, did you make any other P2 suggestions? (yes or no) _No___
If yes, please prepare an appropriate management report and fill out impact forms as a new assessment.

Instructions and Additional Information

Fill out the following sections for each of the P2 opportunities that you checked in the **Implemented** categories above. Copy and insert as many additional opportunity sections as you need, numbering sequentially to coincide with the accompanying management report wherein you provide a brief discussion of all P2 opportunities. Explain why each is in its category in the above table. Include discussion of metrics with proper units for each opportunity in the table.

Try to obtain metrics for all implemented opportunities – they are very important for program analysis. Include how these metrics were obtained (sources of data) on the following page. If an opportunity was implemented but no savings metrics were obtained, still list the opportunity and give a brief reason why (e.g., client refused to provide information, no impact existed, promoting good practices in others, health/safety benefits, not enough time has passed to quantify, still working on, or other reasons).

For the sources of data, select the source(s) from the list of possible sources that was used to come up with the savings and write it under the particular category. Include a brief description with this.

If calculations were required quantify the savings, attach an appendix with those calculations. Include any assumptions made in these calculations. If the initial intern's calculations were used, include that appendix from the original assessment report.

2014 P2 Reassessment Benefits and Sources of Data Form

Company Information

Company Name, Location & Sector: **Company ABC; City, NE; manufacturing**		Assessor: **John Doe**
Visitation Date: **June 1, 2014**	Company Contact: **Jim Professional**	Contact Position: **Env. Coordinator**

Intern Information (only on 1st page of Reassessment)

Intern Name(s) & Date(s) of Internship: **Jack Student, 2010 summer**

Benefits for Opportunity #1

Data listed below is annual unless otherwise noted; Include the type and units for each category as necessary.

Description: **Replace high bay lighting in Building 3**	Progress: **Implemented**	✓ if Progress Changed:
Quantification Possible: ✓**Yes** No	If no, why not?	
Month/Year Benefits Started: **2011**	Reoccurrence so far (check time period): ___ One Time or __3__ Years	
Is Benefit Still Occurring? ✓**Yes** No	If no, when ended?	

If yes, estimate of how long it will continue: ___ Less than 2 more years ___ 2-5 more years __X__ 5-15 more years

Cost Savings		**Energy**
Savings ($/yr): **$21,000/yr**		Electricity Reduced (kWh): **380,000 kWh/yr**
Initial Cost ($): **$50,000**		Other Energy (Type, Quantity, Units):
Hazardous Materials	**Water Use**	**Water Pollutions**
Pounds Reduced:	Gallons Reduced:	Pollutant Reduced (lbs. and type):
Hazardous Waste	**Solid Waste**	**Air Emissions (GHG)**
Pounds Reduced:	Pounds Reduced:	Emissions Reduced (type): **412.5 $MTCO_{2e}$/yr**
Releases & Intangible/Indirect Benefits		
Releases Prevented (avg):		Material Prevented from Release:
How much will be prevented from release (lbs.)?		Where would release have gone?
Additional Indirect/Intangible Benefits:		

Sources of Data for Opportunity #1

For each of the savings/benefits for the above opportunity description, select the source(s) of data that was used to come up with the values. Select from the following list and include a brief description with it. NOTE: If calculations are made to quantify the impact, include them in an appendix to the reassessment report. Include a copy of the intern's calculations/appendix if used.

1a. Bills	1b. Metered/measured by business
1c. Initial estimate – based on meter/measurement by business	1d. Initial estimate – based on meter/measurement by intern
2a. Initial estimate – based on indirect methods (wattage, # dumpsters, etc.):	2b. Verbal estimate by experienced client staff
3a. Use of external calculation tool/published industry standard (list tools); (appears to be peer reviewed)	3b. Outside expert opinion for input (list expert or ref. source)
4a. Estimate by inexperienced client staff	4b. Use of external calculation tool/published industry standard (list tools; unclear if peer reviewed)
Cost Savings: 1a (unit cost based off bills), **2b** (confirmed by client). Based off energy savings.	**Energy: 1d** number of light fixtures; **2a** wattage of lights; **2b** confirmed by client
Hazardous Materials:	**Water Use:**
Hazardous Waste:	**Water Pollutions:**
Solid Waste:	**Air Emissions: 3a** EPA e-grid study conv. factor multiplied by energy savings from above
Releases:	

Notes:

Company Information

Company Name, Location & Sector: **Company ABC; City, NE; manufacturing**		Assessor: **John Doe**
Visitation Date: **June 1, 2014**	Company Contact: **Jim Professional**	Contact Position: **Env. Coordinator**

Benefits for Opportunity #2

Data listed below is annual unless otherwise noted; Include the type and units for each category as necessary.

Description: **Install low-flow toilets in the conference complex**	Progress: **Implemented**	✓ if Progress Changed:
Quantification Possible: ✓**Yes** No	If no, why not?	
Month/Year Benefits Started: **2011**	Reoccurrence so far (check time period): ___ One Time or __3__ Years	
Is Benefit Still Occurring? ✓**Yes** No	If no, when ended?	
If yes, estimate of how long it will continue: ___ Less than 2 more years ___ 2-5 more years __X__ 5-15 more years		

Cost Savings		**Energy**
Savings ($/yr): **$350/yr**		Electricity Reduced (kWh):
Initial Cost ($): **$5,000**		Other Energy (Type, Quantity, Units):
Hazardous Materials	**Water Use**	**Water Pollutions**
Pounds Reduced:	Gallons Reduced: **250,000**	Pollutant Reduced (lbs. and type):
Hazardous Waste	**Solid Waste**	**Air Emissions (GHG)**
Pounds Reduced:	Pounds Reduced:	Emissions Reduced (type): **0.9 $MTCO_{2e}$/yr**

Releases & Intangible/Indirect Benefits	
Releases Prevented (avg):	Material Prevented from Release:
How much will be prevented from release (lbs.)?	Where would release have gone?
Additional Indirect/Intangible Benefits:	

Sources of Data for Opportunity #2

For each of the savings/benefits for the above opportunity description, select the source(s) of data that was used to come up with the values. Select from the following list and include a brief description with it. NOTE: If calculations are made to quantify the impact, include them in an appendix to the reassessment report. Include a copy of the intern's calculations/appendix if used.

1a. Bills	1b. Metered/measured by business
1c. Initial estimate – based on meter/measurement by business	1d. Initial estimate – based on meter/measurement by intern
2a. Initial estimate – based on indirect methods (wattage, # dumpsters, etc.):	2b. Verbal estimate by experienced client staff
3a. Use of external calculation tool/published industry standard (list tools); (appears to be peer reviewed)	3b. Outside expert opinion for input (list expert or ref. source)
4a. Estimate by inexperienced client staff	4b. Use of external calculation tool/published industry standard (list tools; unclear if peer reviewed)

Cost Savings: 3b unit cost based off Nebraska League of Municipalities and based off water use savings to right; **2b** confirmed by client	**Energy:**
Hazardous Materials:	**Water Use: 2b** number of flushes per day; **2a** amount of water per flush
Hazardous Waste:	**Water Pollutions:**
Solid Waste:	**Air Emissions: 4b** EPA calculator based off water use savings from above
Releases:	

Notes:

Company Information

Company Name, Location & Sector: **Company ABC; City, NE; manufacturing**		Assessor: **John Doe**
Visitation Date: **June 1, 2014**	Company Contact: **Jim Professional**	Contact Position: **Environ.**

Benefits for Opportunity #3

Data listed below is annual unless otherwise noted; Include the addition of type and units for each category as necessary.

Description: **Switch from pentachlorophenal for treating wood**	Progress: **Implemented**	✓ if Progress Changed:
Quantification Possible: ✓**Yes** No	If no, why not?	
Month/Year Benefits Started: **2012**	Reoccurrence so far (check time period): ___ One Time or __2__ Years	
Is Benefit Still Occurring? ✓**Yes** No	If no, when ended?	
If yes, estimate of how long it will continue: ___ Less than 2 more years ___ 2-5 more years __X__ 5-15 more years		

Cost Savings		**Energy**
Savings ($/yr): **$13,500/yr**		Electricity Reduced (kWh):
Initial Cost ($): **$25,000**		Other Energy (Type, Quantity, Units):
Hazardous Materials	**Water Use**	**Water Pollutions**
Pounds Reduced:	Gallons Reduced:	Pollutant Reduced (lbs. and type):
Hazardous Waste	**Solid Waste**	**Air Emissions (GHG)**
Pounds Reduced: **8,600/yr**	Pounds Reduced:	Emissions Reduced (type):

Releases & Intangible/Indirect Benefits	
Releases Prevented (avg): **1**	Material Prevented from Release: **Pentachlorophenol**
How much will be prevented from release (lbs.)? **5 lbs/yr**	Where would release have gone? **Water**
Additional Indirect/Intangible Benefits:	

Sources of Data for Opportunity #3

For each of the savings/benefits for the above opportunity description, select the source(s) of data that was used to come up with the values. Select from the following list and include a brief description with it. NOTE: If calculations are made to quantify the impact, include them in an appendix to the reassessment report. Include a copy of the intern's calculations/appendix if used.

1a. Bills	1b. Metered/measured by business
1c. Initial estimate – based on meter/measurement by business	1d. Initial estimate – based on meter/measurement by intern
2a. Initial estimate – based on indirect methods (wattage, # dumpsters, etc.):	2b. Verbal estimate by experienced client staff
3a. Use of external calculation tool/published industry standard (list tools); (appears to be peer reviewed)	3b. Outside expert opinion for input (list expert or ref. source)
4a. Estimate by inexperienced client staff	4b. Use of external calculation tool/published industry standard (list tools; unclear if peer reviewed)
Cost Savings: 1a Disposal costs ($/pound) based off bills according to the client and based off hazardous waste savings below	**Energy:**
Hazardous Materials:	**Water Use:**
Hazardous Waste: 1a Disposal records	**Water Pollutions:**
Solid Waste:	**Air Emissions:**
Releases: 1 Company's TRI	

Notes:

Additional Questions:

Other P2 opportunities the client implemented since first assessment:

None.

Did your business contact report that the previous P2 intern assessment had an impact on the business? (yes or no) **No**

If yes, what impact? (Increased awareness began looking for P2 opportunities when making business decisions, improved employee involvement, improved employee morale, etc.). BE SPECIFIC.

If the client could speak with the intern who first assessed this business, what suggestions would they give him/her to improve the rate of implementation of opportunities or acceptance of P2 by the business?

None.

Have there been changes to management since the original assessment? (yes or no) **No**

If yes, how so?

Has the client hired additional personnel to assist with the intern's recommendations or further P2 assistance since the original assessment? Or have employees had their job duties expanded/modified? (yes or no) **No**

If yes, how so?

How has the client's workforce changed since the original assessment? More employees? Fewer employees? Were any of the changes because of the original assessment?

No significant changes.

Has the client made other changes in terms of tracking data, training, hiring, etc. as a result of the original assessment? (yes or no)

No

If yes, how so?

Who did the initial intern meet with/interact with? (Title of contact; if multiple people, please explain)

Jim Professional, environmental coordinator

Is the original contact still there? (yes or no) **Yes**

If yes, did you meet with the original contact? (yes or no)

If no (to either question), who did you meet with? (Title of contact)

Did the client report implementing/establishing a P2/sustainability/environmental policy within the last three years ? (yes or no)

No

If yes, how so? Explain. (Health & Safety team?)

Did the client report establishing some form of an environmental management system (EMS), 15001, other certifications, etc. within the last three years? (yes or no) **No**

If yes, how so? Explain.

Does the client have any additional comments about initial assessment or the reassessment, interest in having a P2 intern in the future, etc:

No comments

Does the client have interest in having a P2 intern in the future? (yes or no) **No**

If yes, how so?

Is the client willing to respond to a three-part mail or e-mail survey that will be sent within the next month? (yes or no) **Yes**

Would the client prefer the survey e-mailed or mailed? Who should it be addressed to? Would a follow up phone call be preferred?

Mail is fine

Appendix A.2: Reassessment Instructions (Standard Operating Procedure)

Reassessments: Method of helping the programs learn about successes from past implementation of P2 suggestions, and how to improve the assistance provided to clients. Also valuable for helping students learn about assessment process and encouraging businesses to renew efforts to implement suggestions.

1. Arrange for reassessment visit and discuss what a reassessment is with client (via phone or in person). Confirm that the client has a copy of the original technical assistance report. If the client has lost or does not remember the report, be sure to arrange to get the client a copy.

2. Review the original technical assistance report submitted to the client.
    - List the original recommendations/suggestions made to the client on the reassessment form. Prepare a list of questions based on what is needed to complete the reassessment form.
    - Review the original report's "impact" form. Identify waste reduction and cost savings estimates, and understand how the original intern made each of these estimates.
    - Note the reduction /savings for each recommendation in the original report.
    - Consider how to help the client make estimates of potential savings.
    - Review the hierarchy of data sources that will be used when collecting data. Aim to obtain data from the highest quality source possible.

        Tier 1: High-quality direct measures
        - Utility bills (electricity, natural gas, water)
        - Purchasing invoices (for diesel fuel costs and quantities)
        - Metered/measured by business (e.g., Waste or material use logs)
        - Initial estimate, based on meter/measurement by business
        - Initial estimate, based on meter/measurement by intern;
        - Equipment data (e.g., motor horsepower and efficiency, pipe sizes) from nameplate

        Tier 2: Moderate-quality indirect measures
        - Verbal estimates of use by experienced production staff / management
        - Previous intern's tier 2 data

Tier 3: Low-quality indirect measures

- Equipment data from vendor specifications used to make usage estimates
- Estimated data based on published industry standards, external calculation tool, or outside expert opinion.

Tier 4: Non-Peer Reviewed Low-quality indirect measures

- Estimated data based on non-peer reviewed published industry standards, external calculation tool, or outside expert opinion.
- Estimates of use by new or inexperienced production staff / management

- Note the media (solid waste, water, hazardous materials/waste, energy, etc.) involved in each original recommendation.

– Include in your list questions that will help you complete the last two pages of the reassessment form (e.g., other P2 opportunities the client implemented since first assessment, “P2 policy”, “P2 team” and “EMS”, did the previous P2 intern assessment have an impact on the business, etc.).

3. Complete the “client profile form” for internal program information related to the original intern and information related to the original key contact at the partner company

4. Visit client and discuss the status of each original P2 suggestion. Visits typically last anywhere from 20 minutes to several hours. The client may include a site tour or you may ask for one.

   Go through each P2 opportunity on the reassessment form and ask the client if the opportunity was implemented. You may need to refer to the original report to help the client. If an opportunity was implemented, determine if it was implemented as suggested or with modification. If the opportunity was not implemented, find out if it was investigated or not. In some instances, especially if the original contact is no longer at the business, the client may not know. Check the appropriate box on the reassessment form for the respective P2 opportunity. There is also a box to check if the client was performing the opportunity before the original assessment. On the comments section, indicate the source (solid waste, hazardous waste, water use or water pollution, electricity, natural gas, diesel, coal, air emissions). Also include a brief comment that would complement the more detailed narrative report. The comments are both to help the Program Staff know the key media reduced and to provide information to help the Program Staff confirm which recommendation from the initial report is discussed.

The second page of the form is general questions related to the number of P2 opportunities. This information is general information to help the KSU PPI and UNL P3 programs know if there are additional P2 assistance opportunities with this client related to these topics.

Then obtain the client's description (and perception) of the actual outcome of each opportunity that was implemented and record the savings on the "Benefits" portion of the "P2 Reassessment Benefits and Sources of Data Form" and record the sources on the "Sources of Data" portion. Note that the benefits are annual unless otherwise noted. For each implemented opportunity, answer the questions on the "Benefits" portion. Determine when the benefits started, the reoccurrence of the benefits, if the benefits are still occurring, and how long the benefits will continue. If the client is unsure how long the benefit will continue, investigate the anticipated equipment life.

In obtaining savings, stress that you want the reduction/savings outcomes to be as accurate as possible. If a suggestion WAS implemented, determine reductions/savings by following the hierarchy of data sources mentioned above:

- Ask clients to consult purchasing orders, utility bills, and waste disposal manifests or other existing measurements/records to accurately quantify savings. If a measurement made by the client, note key information on the measurement equipment and method. These are the ideal methods for obtaining reductions/savings.
- If the client does not have bills or ways to measure/meter the savings (the top two methods in the hierarchy of sources), see if the reductions/savings can be determined based off the initial report – based on meter/measurement by the business, meter/measurement by intern, or indirect methods.
- If the purchasing or disposal records are not available and the original intern report can't be used as a starting point, ask the client to estimate the outcomes based on any other methods routinely used by the client. These will be data sources from tiers 1 and 2.
- If the client is unable to estimate the savings, use an external calculation tool (e.g., EPA calculator, Department of Energy tip sheet, etc.) or expert opinion for input (e.g., data from surveys sent to producers in the Nebraska Ag Water Management Network on water savings from water moisture sensors, spokesperson from NDEQ/KDHE, etc.).
- In some cases, you may have multiple sources of data savings. Be sure to record the sources of the data so you can properly fill out the reassessment forms, as shown in the example reassessment form in the Appendix. For each data source, list the source and the tier number following the example.
- Note that if savings are not directly given to you, or if any calculations are required to determine additional savings, you will need an appendix.

If a suggestion was NOT implemented, learn **why** by asking follow-up questions.

Ask the client questions from the last two pages of the reassessment form (e.g., additional P2 implementation, P2 policy, P2 team, EMS, etc.).

Note that until the client approves the report, this is your understanding of the client's perception.

5. If you have questions about specific data or estimates provided by the client, you may want to share the reassessment report data/appendices with the client to make sure the savings/data are appropriate. Note that the final impact projections will be shared with the client again in step 8. Include with this appendices showing calculations/assumptions/sources for determining the savings. Share the savings with the client for all data (e.g., cost savings, energy, solid waste, water use, etc.). If the client disagrees with any of the values, explain how you obtained the values by referring to the appendix calculations/assumptions/sources. If necessary, make adjustments to the data so the client finds the values acceptable.

6. Prepare a narrative feedback report for the client (and the UNL P3/KSU PPI program). In this report, start with a background paragraph. Then for each original P2 recommendation, state what the recommendation was and the metrics expected from implementation, what was learned about the implementation status and any direct benefits realized, and then discuss any additional indirect benefits realized. At the end of the report, explain what else you learned from the reassessment, in terms of other overall indirect benefits of the assistance, and how to improve future assistance to enhance the likelihood of P2 implementation. Include a calculation appendix with calculations, assumptions and sources of data when necessary. Do this for any savings that were not directly given to you and required some form of calculation or assumption.

   As part of the discussion of additional or indirect benefits, consider factors like liability reduction or employee exposure reduction from the implementation of a suggestion.

   See the Appendix for example calculations/assumptions/sources.

7. Complete the reassessment forms using the information you have gathered. Typically you do not share the "reassessment form" with the client. The UNL P3/KSU PPI staff will review your reassessment report and form, and may ask you to respond to specific questions. In some cases you may need to contact the client to gather additional information to complete the reassessment. Make any modifications based on review and submit it to staff for review again.

8. Share the quantified results with the client, asking that they respond to you by a specific deadline (often two weeks later) if they have any comments.

9. Submit your report and completed reassessment forms to your key contact within the P2 program.

Appendix A.3: Example Survey

University of Nebraska-Lincoln Partners in Pollution Prevention (P3) Survey: Reasons and Motivations for Implementation

Please complete and return by Sept. 14, 2014.

SUMMARY

A P2 assessment of Company ABC was conducted in 2010 by P3 intern Jack Student. According to a reassessment conducted in 2104 by graduate student John Doe, three out of four recommended opportunities were implemented. In addition, there were two opportunities that were not recommended that have not been implemented. A brief description of the implemented opportunities and their direct benefits is summarized in Table 1 below. A brief description of the opportunities not implemented is summarized in Table 2 below.

Table 1. Summary of **Implemented** P2 Opportunities.

##	P2 Opportunity	Direct Benefits
1	Replace high bay lighting with T5 fluorescent in Building 3	Cost savings of $21,000/yr Reduction of 380,000 kWh/yr
2	Install low-flow toilets in the conference complex	Cost savings $350/yr Reduction of 250,000 gallons of water
3	Switch from pentachlorophenol to copper napthenate for treating wood	Cost savings of $13,500 Reduction of 8,600 lbs/yr hazardous waste

Table 2. Summary of P2 Opportunities **Not Implemented.**

##	P2 Opportunity	Projected Direct Benefits (if available)
1	Replace T12 office lighting with T8 fluorescent	Cost savings of $8,700/yr Reduction of 108,000 kWh/yr
2	Install geothermal pump in Building 3	Cost savings of $30,000/yr Reduction of 33,000 therms/yr
3	Upgrade wastewater evaporator when current one needs replacing	Cost savings of $5,000/yr Reduction of 600 therms/yr

GENERAL QUESTION

Definition of Pollution Prevention for this survey - “Pollution prevention (P2) is reducing or eliminating waste at the source by modifying production processes, promoting the use of non-toxic or less-toxic substances, implementing energy efficiency and resource conservation, and re-using materials rather than putting them into the waste stream.”

Question 1: To what extent is your organization engaged in each of the following activities? Rate on a scale of 1 to 5, with the following assumptions: 1 – not considered; 2- under consideration; 3 –sometimes applied; 4 – frequently applied; 5 – always applied.

____ Building awareness of pollution prevention in the organization

____ Building culture of innovation by pursuing sustainability/P2 strategies

____ Analyzing risks associated with P2 and sustainability issues (environmental, legal, competitive, reputational, resource access, political risk etc.)

____ Reducing greenhouse gas emissions

____ Generating electricity, heat, or fuel from renewable sources

____ Improving energy efficiency

____ Conserving natural resources (storm water management, soil conservation, sustainable forestry, etc.)

____ Reducing or eliminating the creation of waste materials

____ Reducing the creation or release of pollutants or toxic compounds

SPECIFIC QUESTIONS

Question 2: For each implemented P2 opportunity, what reasons were important to your organization in implementing the opportunity? Please check all that are appropriate in Table 3 below.

Table 3. Implemented P2 Opportunities from 2010 Assistance Projects.

Reason/justification	Implemented P2 opportunities		
	1. Replace high bay lighting with T5 fluorescent in Building 3	2. Install low-flow toilets in the conference complex	3. Switch from penta-chlorophenol to copper napthenate for treating wood
A. Acceptable payback period			
B. Energy efficiency			
C. Reduced operating cost			
D. Increased employee productivity			
E. Health and safety benefits			
F. Regulatory compliance			
G. Reduced environmental and health risk (spills, vapors, liability etc.)			
H. Reduced business risk (impact of changes in regulation, input costs etc.)			
I. Enhanced environmental awareness			
J. Improved public image			
K. Other companies also implemented the same or similar solution			
L. Corporate commitment to resource use/waste reduction			

Question 3: For each implemented P2 opportunity, what was the top reason/justification for implementation? Please write the letter (A – L) from the above list that was the top one reason/justification the P2 opportunity was implemented.

____ 1. Replace high bay lighting with T5 fluorescent in Building 3

____ 2. Install low-flow toilets in the conference complex

____ 3. Switch from pentachlorophenol to copper napthenate for treating wood

Question 4: For each P2 opportunity that has not yet been implemented, what are the reasons? Please check all that are appropriate in Table 4 below.

Table 4. P2 Opportunities Not Implemented from 2010 Assistance Project.

Reason/justification	Not implemented P2 opportunities		
	1. Replace T12 office lighting with T8 fluorescent	2. Install geothermal heat pump in Building 3	3. Upgrade wastewater evaporator when current one needs replacing
A. Not technically feasible			
B. Lack of capital (financing)			
C. Insufficient financial payback			
D. Other priorities for capital investments			
E. Risk of production disruption/inconvenience/slowdown			
F. Lack of perceived environmental/risk reduction benefits			
G. Limited in-plant expertise/capability			
H. Lack of staff awareness/willingness to change			
I. Customer specifications			
J. Uncertainty/lack of confidence in technology (quality, cost, benefits)			
K. Insufficient information regarding recommendation			
L. Difficulty in coordinating between units within company			

Question 5: For each P2 opportunity that was not implemented, what was the top reason for not implementing it? Please write the letter (A – L) from the above list that was the top one reason the P2 opportunity was not implemented.

____ 1. Replace T12 office lighting with T8 fluorescent

____ 2. Install geothermal pump

____ 3. Upgrade wastewater evaporator when current one needs replacing

APPENDIX B: IRB INFORMED CONSENT FORM FOR REASSESSMENTS

Partners in Pollution Prevention Program
A partnership between US EPA, NDEQ, UNL, and Nebraska Business/Industry

INFORMED CONSENT FORM – REASSESSMENTS

Identification of Project:
Partners in Pollution Prevention (P3) Program - Reassessments.

Purpose of the Research:
Starting 1997, the UNL P3 program has used student interns to provide education and technical assistance during the summer to business clients throughout the State of Nebraska. The purpose of this study is to learn clients' implementation of the recommendations from the original assistance reports and to gather specific metrics (direct cost savings, reduced waste generation, and reduced water and energy use) related to these recommendations. This will help the P3 intern program better understand the implementation rate and justifications for implementation of pollution prevention recommendations. Main benefit will be improvement of technical assistance program aimed to these clients.

Procedures:
Past P3 clients will be contacted and permission obtained for the Secondary Investigator to visit and perform a reassessment on site. Reassessment interviews with client representative typically last between 30 minutes and 2 hours, depending upon the complexity of the original assistance. The total number of companies to be reassessed is about 10. After the reassessment, the Secondary Investigator will provide reassessment report and additional technical assistance suggestions to clients that show an interest in further evaluation of unimplemented P2 suggestions from the original report. The individual participating in reassessment should be someone in an ownership, production management, or environmental management position and be appropriate to participate in the reassessment on behalf of the client.

Risks and/or Discomforts:
There are no known risks or discomforts associated with this research. In the event of problems resulting from participation in the study, you may contact Dr. Bruce Dvorak, P3 Program Director, for assistance or referral at 402-472-3431 or bdvorak1@unl.edu.

Benefits and Compensation:
Participants will have the opportunity to contribute to improving the program for future students and/or business clients.

Confidentiality:
Data in records (word documents and excel spreadsheets) will be by company and not by specific individual.
The data from the reassessment will be maintained confidentially by the Department of Civil Engineering. The information obtained in this study may be published in a graduate student thesis, scientific journals or presented at scientific meetings, but the data will be reported as aggregated data (without individually identifiable information). The name of the participating entities (e.g., company or agency) will not be identified in the results of research or other possible reports.

Opportunity to Ask Questions:
You may ask any questions concerning this research and have those questions answered before agreeing to participate in or at any time during the study. The principal investigator for this research study is Dr. Bruce I. Dvorak, PhD, PE and he may be reached at 402-472-3431, or by email at bdvorak1@unl.edu. Vincent Kuppig is the Secondary Investigator for this study and he may be reached by email at

vkuppig@huskers.unl.edu. If you have questions concerning your rights as a research subject that have not been answered by the investigator, or to report any concerns about the study, you may contact the University of Nebraska-Lincoln Institutional Review Board at 402-472-6965.

Freedom to Withdraw:
You are free to decide not to participate in this study or to withdraw at any time without adversely affecting your relationship with the investigators or the University of Nebraska. Your decision will not result in any loss or benefits to which you are otherwise entitled.

Consent, Right to Receive a Copy:
You are voluntarily making a decision whether or not to participate in this research study. Your response to the survey is your indication that you agree to participate, having read and understood the informed consent information presented above. You do not need to sign or return this form, it is yours to keep.

APPENDIX C: IRB INFORMED CONSENT FORM FOR SURVEYS

University of Nebraska Lincoln

Partners in Pollution Prevention Program
A partnership between US EPA, NDEQ, UNL, and Nebraska Business/Industry

INFORMED CONSENT FORM – SURVEY

Identification of Project:
Partners in Pollution Prevention (P3) Program – Strategic Planning: study of the motivations for implementation of P2 opportunities and its outcomes.

Purpose of the Research:
Starting in 1997, the UNL P3 program has used student interns to provide education and technical assistance during the summer to a diverse business client population, primarily small- to medium-sized businesses throughout the State of Nebraska. The purpose of this study is to understand the reasons and motivations for the implementation and non-implementation of specific pollution prevention suggestions. This will help the P3 intern program and other similar intern programs become better at understanding business motivations for implementing pollution prevention suggestions. Main benefits will be improvement of student training and technical assistance for businesses.

Procedures:
The survey questions will be distributed among the past participants of the UNL P3 Program and the Kansas State Pollution Prevention Institute. The total number of companies is around 25. Participants have to answer the questions and mail them back in an enclosed envelope. It will take participants approximately 5-10 minutes to complete the survey. The individual completing the survey should be someone in an ownership, production management, or environmental management position and be appropriate in making the decision to participate in the survey on behalf of the client.

Risks and/or Discomforts:
There are no known risks or discomforts associated with this research. In the event of problems resulting from participation in the study, you may contact Dr. Bruce Dvorak, P3 Program Director, for assistance or referral at 402-472-3431 or bdvorak1@unl.edu.

Benefits and Compensation:
Participants will have the opportunity to contribute to improving the program for future students and/or business clients.

Confidentiality:
Data in records (word documents and excel spreadsheets) will be by company and not by specific individual.
The data from the survey will be maintained confidentially by the Department of Civil Engineering. The information obtained in this study may be published in a graduate student thesis, scientific journals or presented at scientific meetings, but the data will be reported as aggregated data (without individually identifiable information). The name of the participating entities (e.g., company or agency) will not be identified in the results of research or other possible reports.

Opportunity to Ask Questions:
You may ask any questions concerning this research and have those questions answered before agreeing to participate in or at any time during the study. The principal investigator for this research study is Dr. Bruce I. Dvorak, PhD, PE and he may be reached at 402-472-3431, or by email at bdvorak1@unl.edu. Vincent

Kuppig is the secondary investigator for this study and he may be reached by email at vkuppig@huskers.unl.edu. If you have questions concerning your rights as a research subject that have not been answered by the investigator, or to report any concerns about the study, you may contact the University of Nebraska-Lincoln Institutional Review Board at 402-472-6965.

Freedom to Withdraw:
You are free to decide not to participate in this study or to withdraw at any time without adversely affecting your relationship with the investigators or the University of Nebraska. Your decision will not result in any loss or benefits to which you are otherwise entitled.

Consent, Right to Receive a Copy:
You are voluntarily making a decision whether or not to participate in this research study. Your response to the survey is your indication that you agree to participate, having read and understood the informed consent information presented above. You do not need to sign or return this form, it is yours to keep.

APPENDIX D: IRB APPROVAL LETTER

January 13, 2014

Bruce Dvorak
Department of Civil Engineering
N114 SLNK, UNL, 68588-6105

Vincent Kuppig
Department of Civil Engineering

IRB Number: 20130114052EX
Project ID: 14052
Project Title: Pollution Prevention Program: Reassessments of Past Clients

Dear Bruce:

This letter is to officially notify you of the certification of exemption of your project. Your proposal is in compliance with this institution's Federal Wide Assurance 00002258 and the DHHS Regulations for the Protection of Human Subjects (45 CFR 46) and has been classified as exempt, category 2.

You are authorized to implement this study as of the Date of Final Approval: 01/13/2014.

We wish to remind you that the principal investigator is responsible for reporting to this Board any of the following events within 48 hours of the event:
* Any serious event (including on-site and off-site adverse events, injuries, side effects, deaths, or other problems) which in the opinion of the local investigator was unanticipated, involved risk to subjects or others, and was possibly related to the research procedures;
* Any serious accidental or unintentional change to the IRB-approved protocol that involves risk or has the potential to recur;
* Any publication in the literature, safety monitoring report, interim result or other finding that indicates an unexpected change to the risk/benefit ratio of the research;
* Any breach in confidentiality or compromise in data privacy related to the subject or others; or
* Any complaint of a subject that indicates an unanticipated risk or that cannot be resolved by the research staff.

This project should be conducted in full accordance with all applicable sections of the IRB Guidelines and you should notify the IRB immediately of any proposed changes that may affect the exempt status of your research project. You should report any unanticipated problems involving risks to the participants or others to the Board.

If you have any questions, please contact the IRB office at 472-6965.

Sincerely,

Becky R. Freeman, CIP
for the IRB

APPENDIX E: P2 APPROACHES AND METHODS HANDOUT

CE 422/822 **P2 Approaches and Methods** 2014

Categories of Pollution Prevention Opportunities:

1) Practices and Procedures
   a) Purchasing
      - purchase only the amount of raw materials needed for a production run or a set period of time
      - develop review procedures for all materials purchased
      - replace hazardous materials if possible

   b) Inventory Control

      Waste is often created by using excess or outdate material
      - buy only what you know you will use
      - rotate inventory so older material is used first
      - store material to prevent spills and leaks
      - set up an inventory tracking system
      - label all containers with contents and date
      - don't accept free samples unless you know you will use them

      A potential management resource to alleviate inventory control problems is *Just-in-Time* (JIT) manufacturing:
      - stockless production
      - customer/supplier networking
      - pull system
      - JIT transportation

   c) Improved Housekeeping/ Preventative maintenance

   The use of improved operating practices can reduce spills, overflows, leaks and other inefficiencies. These practices will often increase profits with little or not capital outlay:
      - inspect and maintain equipment routinely
      - replace seals and gaskets on a regular basis
      - repair leaks immediately
      - use tight-fitting lids to prevent evaporation
      - wipe up spills whenever possible rather than hosing them down
      - use spigots and pumps instead of pouring
      - label all containers with contents and date
      - have a spill prevention program
      - use drip pans

   d) Training
      - Explain the environmental, health and safety consequences of spills or poor management practices.
      - provide employee incentives (bonuses, awards, other recognition)
      - train employees on proper waste handling, equipment use, etc.

e) Waste Segregation

- In most cases, it is easier to reuse/treat/dispose a waste that contains only one contaminant than a waste containing many different contaminants.
- When hazardous wastes are mixed with non-hazardous wastes, the resulting waste is hazardous waste.

2) Equipment Modifications

Old or inefficient processes and equipment often account for excess use of toxic substances and unnecessary generation of (hazardous) waste.

- change equipment operating conditions, such as flow rates, temperatures, pressures, etc.
- use more efficient equipment
- modify photocopiers so they use a refillable toner cartridge
- replace incandescent lighting with energy-efficient compact fluorescent lighting

3) Material Substitution

Hazardous materials used either in the formation of a product or in a production process may be replaced with less hazardous or non-hazardous materials.

Examples:

- Chlorinated solvents => non-hazardous solvents
- Oil-based paints ===> water-based paints

4) Product Reformulation

Product reformulation is a more difficult waste reduction technique, yet reformulation can be very effective.

Examples of product reformulation include:

- using double sided photocopies instead of single sided copies.
- reusing envelopes (e.g., intra-company mail).
- reducing the aluminum thickness in a soda can.
- elimination of pigments that contain heavy metals from ink, dyes and paint formulations
- development of new paint, ink and adhesive formulations based on water rather than organic solvents.

5) Process Modification

Changing the processes or operations used to create the same end product while minimizing waste or increasing efficiency.

<u>Examples</u>:

- use different equipment (using a different technology)
- incineration oven instead of (hazardous) solvent to test bitumen content in asphalt
- shape metal parts by dry grinding and milling instead of using a grinding and milling using a cutting fluid.
- keep food warm by better insulating it instead of using a heating lamp
- performing the COD test using non-hazardous Manganese instead hazardous Dichromate (equipment used also changes).

6) In-Process Recycling

Use and reuse of waste materials to reduce the amount of waste generated.
Examples:

- recycling a waste back into the production process as a raw material
- purchasing distillation or recovery units (for fluids and solvents)
- reduce salt consumption of industrial (ion exchange) water softeners by capture and reusing last 1/3rd of brine that passes through resin during recharge process. This brine contains relatively little hardness, but contains high sodium concentrations.
- joining a waste exchange

7) Energy Efficiency (E2)

- reduce thermostat setting
- turn lights off
- change lighting type
- use fume hood only when needed
- insulate ovens / pipes
- insulate buildings
- add time to energy using devices
- use energy star appliances
- eliminate compressed air leaks (or inappropriate uses of compressed air)
- replace old motors / compressors

APPENDIX F: SUPPORTING TABLES

Table F.1. Implementation Rate by Sector and Level of Assistance (Number of Recommendations and Number of Clients in Parentheses).

Sector/Level of assistance	**Partial**	**Full**	**Total**
Agriculture	100% (9/3)	- (0/0)	**100% (9/3)**
Manufacturing	50% (16/2)	57% (195/18)	**56% (211/20)**
Public	39% (100/10)	61% (33/3)	**44% (133/13)**
Health Care	33% (30/3)	55% (38/4)	**46% (68/7)**
Other	40% (43/7)	50% (20/1)	**43% (63/8)**
Hospitality	35% (20/3)	- (0/0)	**35% (20/3)**
Total	**41% (218/29)**	**57% (286/26)**	**50% (504/55)**

Table F.2. Implementation Rate by Sector, Mode of Assistance, and P2 Category.

Sector/Mode of assistance/ P2 category	Manufacturing			Public			Health Care		
	Partial	**Full**	**Total**	**Partial**	**Full**	**Total**	**Partial**	**Full**	**Total**
E2 (# recomm.)	100% 1	47% 47	**48%** 48	30% 20	50% 6	**35%** 26	42% 12	47% 17	**45%** 29
Equipment/ process mod. (# recomm.)	50% 6	47% 49	**47%** 55	28% 25	33% 6	**29%** 31	50% 2	27% 11	**31%** 13
Imp. house. (# recomm.)	50% 2	86% 34	**86%** 36	100% 5	- 0	**100%** 5	50% 2	100% 2	**75%** 4
In-process recycling (# recomm.)	50% 2	69% 13	**67%** 15	0% 5	50% 2	**14%** 7	0% 1	100% 1	**50%** 2
Material sub (# recomm.)	- 0	27% 11	**27%** 11	50% 4	33% 3	**43%** 7	- 0	- 0	**-** 0
Off-site recycling (# recomm.)	50% 2	50% 18	**50%** 20	55% 11	100% 9	**75%** 20	33% 3	100% 2	**60%** 5
Purchasing (# recomm.)	0% 1	29% 7	**25%** 8	29% 7	50% 2	**33%** 9	50% 2	- 0	**50%** 2
Training (# recomm.)	50% 2	81% 16	**78%** 18	48% 23	60% 5	**50%** 28	13% 8	100% 5	**46%** 13
Watermark (# recomm.)	- 0	- 0	- 0	- 0	- 0	- 0	- 0	- 0	- 0
Total (# recomm.)	**50%** 16	**57%** 195	**56%** 211	**39%** 100	**61%** 33	**44%** 133	**33%** 30	**55%** 38	**46%** 68

Table F.3. Implementation Rate by Sector, Mode of Assistance, and P2 Category (Continued).

Sector/Mode of assistance/ P2 category	Other			Hospitality			Agriculture			Total		
	Partial	**Full**	**Total**	**Partial**	**Full**	**Total**	**Partial**	**Full**	**Total**	**Partial**	**Full**	**Total**
E2 (# recomm.)	33% 6	100% 1	**43%** 7	40% 10	- 0	**40%** 10	- 0	- 0	- 0	**37%** 49	**48%** 71	**43%** 120
Equipment/ process mod. (# recomm.)	38% 8	29% 7	**33%** 15	22% 9	- 0	**22%** 9	100% 4	- 0	**100%** 4	**37%** 54	**41%** 73	**39%** 127
Imp. house. (# recomm.)	25% 4	100% 2	**50%** 6	- 0	- 0	- 0	100% 1	- 0	**100%** 1	**67%** 14	**89%** 83	**83%** 52
In-process recycling (# recomm.)	100% 1	33% 3	**50%** 4	100% 1	- 0	**100%** 1	- 0	- 0	- 0	**30%** 10	**63%** 19	**52%** 29
Material sub (# recomm.)	50% 2	0% 2	**25%** 4	- 0	- 0	- 0	- 0	- 0	- 0	**50%** 6	**25%** 16	**32%** 22
Off-site recycling (# recomm.)	54% 13	- 0	**54%** 13	- 0	- 0	- 0	- 0	- 0	- 0	**52%** 29	**69%** 29	**60%** 58
Purchasing (# recomm.)	0% 3	100% 1	**25%** 4	- 0	- 0	- 0	- 0	- 0	- 0	**23%** 13	**40%** 10	**30%** 23
Training (# recomm.)	33% 6	75% 4	**50%** 10	- 0	- 0	- 0	- 0	- 0	- 0	**38%** 39	**80%** 30	**57%** 69
Watermark (# recomm.)	- 0	- 0	- 0	- 0	- 0	- 0	100% 4	- 0	**100%** 4	**100%** 4	- 0	**100%** 4
Total (# recomm.)	**40%** 43	**50%** 20	**43%** 63	**35%** 20	- 0	**35%** 20	**100%** 9	- 0	**100%** 0	**41%** 218	**57%** 286	**50%** 504

Table F.4. Percent of Clients Selecting "4" or "5" for Level of Engagement by Mode of Assistance and Program (Number of Client Respondents in Parentheses).

Engagement Activity	**Responses to other surveys**		**Responses to this study's surveys**				
	MIT (3,107)	GTP (35,000)	Total (48)	Full (24)	Partial (24)	KSU (15)	UNL (33)
Reducing or eliminating the creation of waste materials	3.69	57%	**63%**	75%	50%	60%	61%
Improving energy efficiency	3.69	55%	**75%**	88%	63%	87%	70%
Reducing the creation or release of pollutants or toxic compounds	n/a	13%	**60%**	58%	63%	53%	67%
Conserving natural resources (storm water management, soil conservation, sustainable forestry, etc.)	3.22	n/a	**42%**	58%	25%	47%	39%
Analyzing risks associated with P2 and sustainability issues (environmental, legal, competitive, reputational, resource access, political risk etc.)	3.10	n/a	**54%**	58%	50%	47%	58%
Building awareness of pollution prevention in the organization	3.06	n/a	**48%**	54%	42%	67%	39%
Reducing greenhouse gas emissions	n/a	19%	**35%**	50%	21%	33%	36%
Building culture of innovation by pursuing sustainability/P2 strategies	2.83	13%	**35%**	46%	25%	40%	33%
Generating electricity, heat, or fuel from renewable sources	n/a	2%	**8%**	8%	8%	0%	12%
Total	-	-	**47%**	55%	38%	48%	46%

Table F.5. Percent of Clients Selecting “4” or “5” for Level of Engagement by Sector (Number of Client Respondents in Parentheses).

Engagement Activity	**Responses to other surveys**		**Responses to this study’s surveys**						
	MIT (3,107)	**GTP (35,000)**	**Ag (1)**	**Health care (6)**	**Hospi-tality (3)**	**Manu-fact-uring (19)**	**Other (8)**	**Public (10)**	**Total (48)**
Reducing or eliminating the creation of waste materials	3.69	55%	100%	17%	67%	89%	50%	45%	**63%**
Improving energy efficiency	3.69	57%	100%	83%	100%	84%	25%	82%	**75%**
Reducing the creation or release of pollutants or toxic compounds	n/a	13%	100%	50%	67%	74%	38%	55%	**60%**
Conserving natural resources (storm water management, soil conservation, sustainable forestry, etc.)	n/a	19%	100%	50%	0%	63%	13%	27%	**42%**
Analyzing risks associated with P2 and sustainability issues (environmental, legal, competitive, reputational, resource access, political risk etc.)	3.1	n/a	100%	33%	67%	68%	38%	45%	**54%**
Building awareness of pollution prevention in the organization	3.22	n/a	0%	33%	67%	58%	13%	64%	**48%**
Reducing greenhouse gas emissions	2.83	13%	100%	33%	33%	53%	13%	18%	**35%**
Building culture of innovation by pursuing sustainability/P2 strategies	3.06	n/a	100%	33%	33%	42%	25%	27%	**35%**
Generating electricity, heat, or fuel from renewable sources	n/a	2%	0%	0%	0%	11%	0%	18%	**8%**
Total	-	-	78%	37%	48%	60%	24%	42%	**47%**

Table F.6. Top Implemented Motivation by Sector (Percent of Opportunities with Motivation Selected as Top Reason).

Sector (# of opportunities implemented)	Acceptable payback	Reduced operating cost	Increased employee productivity	Reduced business risk	Reduced env. & health risk	Health and safety benefits	Regulatory compliance	Enhanced env. Awareness	Improved public image	Corporate commitment	Energy efficiency	Other companies implemented
Health care (23)	35%	9%	0%	0%	4%	0%	0%	0%	4%	30%	17%	0%
Hospitality (6)	0%	50%	0%	0%	0%	0%	17%	17%	0%	0%	17%	0%
Manufacturing (43)	7%	35%	0%	2%	9%	9%	0%	7%	0%	7%	23%	0%
Other (3)	0%	0%	0%	0%	0%	0%	0%	33%	0%	33%	33%	0%
Public (27)	15%	4%	0%	4%	4%	4%	0%	26%	0%	19%	26%	0%
Total (102)	**15%**	**21%**	**0%**	**2%**	**6%**	**5%**	**1%**	**12%**	**1%**	**16%**	**23%**	**0%**

Table F.7. All Implemented Motivations (Percent of Opportunities with Motivation Selected as a Reason).

# of implemented opportunities	Acceptable payback	Reduced operating cost	Increased employee productivity	Reduced business risk	Reduced env. & health risk	Health and safety benefits	Regulatory compliance	Enhanced env. Awareness	Improved public image	Corporate commitment	Energy efficiency	Other companies implemented
102	73%	63%	16%	22%	25%	25%	15%	45%	36%	84%	60%	19%

Table F.8. Top Non-Implemented Motivation by Sector (Percent of Opportunities with Motivation Selected as Top Reason).

Sector (# of opportunities not implemented)	Insufficient financial payback	Lack of capital (financing)	Other priorities for capital investments	Risk of production disruption/ inconvenience/slowdown	Lack of perceived env./risk reduction benefits	Lack of staff awareness/ willingness to change	Difficulty in coord. between units within company	Limited in-plant expertise/capability	Customer specifications	Not technically feasible	Uncertainty/lack of confidence in technology	Insufficient information regarding recommendation
Health care (15)	0%	47%	20%	0%	0%	0%	0%	0%	7%	13%	7%	7%
Hospitality (13)	0%	8%	38%	8%	0%	0%	23%	0%	23%	0%	0%	0%
Manufacturing (35)	20%	11%	31%	6%	6%	0%	0%	0%	6%	11%	0%	9%
Other (1)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%
Public (23)	13%	0%	17%	4%	22%	13%	0%	9%	4%	13%	4%	0%
Total (87)	**11%**	**14%**	**26%**	**5%**	**8%**	**3%**	**3%**	**2%**	**8%**	**10%**	**3%**	**5%**

Table F.9. All Non-Implemented Motivations (Percent of Opportunities with Motivation Selected as a Reason).

# of opportunities not implemented	Insufficient financial payback	Lack of capital (financing)	Other priorities for capital investments	Risk of production disruption/ inconvenience/slowdown	Lack of perceived env./risk reduction benefits	Lack of staff awareness/ willingness to change	Difficulty in coord. between units within company	Limited in-plant expertise/capability	Customer specifications	Not technically feasible	Uncertainty/lack of confidence in technology	Insufficient information regarding recommendation
98	29%	32%	56%	9%	22%	8%	4%	7%	8%	17%	19%	9%

APPENDIX G: SAMPLE SAS STATISTICAL ANALYSIS

G.1 Coding for implementation rate by mode of assistance analysis

```
data assistance;
input implementation$ mode$ count;
datalines;
Yes Partial 90
Yes Single 57
Yes Multiple 105
No Partial 128
No Single 55
No Multiple 69
;
run;
proc freq
data = assistance;
tables implementation * mode
/ chisq;
weight count;
```

G.2 Output for implementation rate by mode of assistance analysis

Mode of Assistance

The FREQ Procedure

Table of implementation by mode

Frequency Percent Row Pct Col Pct	implementation	mode			
		Multiple	**Partial**	**Single**	**Total**
	No	69 13.69 27.38 39.66	128 25.40 50.79 58.72	55 10.91 21.83 49.11	252 50.00
	Yes	105 20.83 41.67 60.34	90 17.86 35.71 41.28	57 11.31 22.62 50.89	252 50.00
	Total	174 34.52	218 43.25	112 22.22	504 100.00

Statistics for Table of implementation by mode

Statistic	DF	Value	Prob
Chi-Square	2	14.1078	0.0009
Likelihood Ratio Chi-Square	2	14.1959	0.0008
Mantel-Haenszel Chi-Square	1	4.1445	0.0418
Phi Coefficient		0.1673	
Contingency Coefficient		0.1650	
Cramer's V		0.1673	

Sample Size = 504

G.3 Coding for implementation rate by payback (greater than 4 years) and initial cost

```
data paybackvcost;
     input implementation$ category$ count;
     datalines;
     Yes 999four 12
     Yes 1000four 12
     No 999four 12
     No 1000four 42
;
run;
proc freq
     data = paybackvcost;
     tables implementation * category
          / chisq;
     weight count;
```

G.4 Output for implementation rate by payback (greater than 4 years) and initial cost

Payback vs Cost

Chi-Squared Test: Payback vs Cost

The FREQ Procedure

Table of implementation by category

Frequency / Percent / Row Pct / Col Pct	implementation	category: 1000four	category: 999four	Total
	No	42	12	54
		53.85	15.38	69.23
		77.78	22.22	
		77.78	50.00	
	Yes	12	12	24
		15.38	15.38	30.77
		50.00	50.00	
		22.22	50.00	
	Total	54	24	78
		69.23	30.77	100.00

Statistics for Table of implementation by category

Statistic	DF	Value	Prob
Chi-Square	1	6.0185	0.0142
Likelihood Ratio Chi-Square	1	5.8104	0.0159
Continuity Adj. Chi-Square	1	4.7851	0.0287
Mantel-Haenszel Chi-Square	1	5.9414	0.0148
Phi Coefficient		0.2778	
Contingency Coefficient		0.2676	
Cramer's V		0.2778	

Sample Size = 78

APPENDIX H: INDIVIDUAL OPPORTUNITY DATABASE WITH SURVEY RESPONSES

Note: Company names are not included in the spreadsheet below; previous reassessments by UNL (2005-2011) do not include specific savings.

Recommendation #	Year of assessment	Year of reassessment	Company #	Level of assis-tance	Company sector	Program (UNL/KSU)	P2 suggestion	P2 category	Implemented	Not implemented	Doing before	Originally Recommended	Originally Not recommended
1	2010	2014	1	Multi	Manufacturing	UNL	Replace high bay lighting with T5 fluorescent in Building 3	Energy efficiency	X			X	
2	2010	2014	1	Multi	Manufacturing	UNL	Replace workspace lighting with T5 fluorescent in Building 3	Energy efficiency	X			X	
3	2010	2014	1	Multi	Manufacturing	UNL	Install select occupancy sensors	Energy efficiency	X			X	
4	2010	2014	1	Multi	Manufacturing	UNL	De-lamp vending machines	Energy efficiency	X			X	
5	2010	2014	1	Multi	Manufacturing	UNL	Replace T12 office lighting with T8 fluorescent	Energy efficiency		X		X	
6	2010	2014	1	Multi	Manufacturing	UNL	Install vending and snack misers	Energy efficiency		X		X	
7	2009	2014	1	Multi	Manufacturing	UNL	Install wastewater evaporator	Equipment/process modification	X			X	
8	2010	2014	2	Partial	Public	UNL	Join OPPD's lighting incentive program and redo facility lighting	Energy efficiency		X		X	
9	2010	2014	2	Partial	Public	UNL	Drill gaps in clarifier's teeth or replace weir	Equipment/process modification	X			X	
10	2010	2014	2	Partial	Public	UNL	Run sludge recycling through one pump	Equipment/process modification		X		X	
11	2010	2014	2	Partial	Public	UNL	Control aeration with DO meter and manually control oxidation rotor speed accordingly	Training/policies	X			X	
12	2010	2014	2	Partial	Public	UNL	Control blowers based on depth in digester	Training/policies	X			X	
13	2010	2014	2	Partial	Public	UNL	Install VFD's	Energy efficiency		X		X	
14	2012	2014	3	Partial	Public	UNL	Install VFDs in blower room	Energy efficiency	X			X	

Recommendation #	Specific status/ category	No longer occurring?	Reoccurrence so far (yrs)	Expected reoccurrence category (yrs)	Initial cost ($)	Actual cost savings ($/yr)	Projected/potential cost savings ($/yr)	Actual payback period (yr)	Projected payback period (yr)	Toxins category	Solid waste (lbs/yr)	Haz. waste (lbs/yr)	Haz. materials, lbs/yr
1	As suggested		3	5-15 more	$50,000.00	$21,000.00	$21,000.00	2.38	2.38	0			
2	As suggested		3	5-15 more	$925.00	$140.00	$140.00	6.61	6.61	0			
3	As suggested		3	5-15 more	$5,200.00	$2,200.00	$2,200.00	2.36	2.36	0			
4	As suggested		4	5-15 more	$0.00	$150.00	$150.00	0.00	0.00	0			
5	Not investigated			5-15 more	$8,600.00		$8,700.00	#DIV/0!	0.99				
6	Not investigated			5-15 more	$2,600.00		$1,900.00	#DIV/0!	1.37				
7	As suggested		0	5-15 more	$37,000.00	$21,000.00	$21,000.00	1.76	1.76	0			
8	Investigated			5-15 more	$279.00		$176.00	#DIV/0!	1.59				
9	With modification		2	5-15 more	$1,000.00	$0.00	$0.00	#DIV/0!	#DIV/0!	0			
10	Investigated			5-15 more	$0.00		$480.00	#DIV/0!	0.00				
11	As suggested		2	5-15 more	$200.00	$1,400.00	$1,400.00	0.14	0.14	0			
12	As suggested		2	5-15 more	$0.00	$2,000.00	$2,000.00	0.00	0.00	0			
13	Investigated			5-15 more	$3,775.00		$4,320.00	#DIV/0!	0.87				
14	As suggested		1	5-15 more	$2,000.00	$2,000.00	$2,000.00	1.00	1.00	0			

Recommendation #	Electricity (kWh/yr)	Water (gal/yr)	Natural gas (therms/yr)	Diesel fuel (gal/yr)	Gasoline (gal/yr)	GHG, MTCO2E/yr	Releases (lbs/yr)	Releases (type)
1	380,000					412.68	5.1	Mercury
2	2,600					2.8236	0.4	Mercury
3	40,000					43.44		
4	2,700					2.9322		
5	108,000					117.288		
6	33,000					35.838		
7			3,900			20.748		
8	2,800					3.0408		
9						0		
10	9,600					10.4256		
11	28,000					30.408		
12	30,000					32.58		
13	86,400					93.8304		
14	20,000					21.72		

						Survey #2: All reasons for implementing opportunity												Survey #3: Top reason for implementing opportunity											
Recommendation #	Survey #1 responded	Survey #2 responded	Survey #3 responded	Survey #4 responded	Survey #5 responded	**A2**: Acceptable payback	**B2**: Energy efficiency	**C2**: Reduced operating cost	**D2**: Increased employee productivity	**E2**: Health and safety benefits	**F2**: Regulatory compliance	**G2**: Reduced env. and health risk	**H2**: Reduced business risk	**I2**: Enhanced env. awareness	**J2**: Improved public image	**K2**: Other companies also implemented	**L2**: Corporate commitment	**A3**: Acceptable payback	**B3**: Energy efficiency	**C3**: Reduced operating cost	**D3**: Increased employee productivity	**E3**: Health and safety benefits	**F3**: Regulatory compliance	**G3**: Reduced env. and health risk	**H3**: Reduced business risk	**I3**: Enhanced env. awareness	**J3**: Improved public image	**K3**: Other companies also implemented	**L3**: Corporate commitment
1	X	X	X			1	1	1	1								1		1										
2	X	X	X			1	1	1	1					1			1		1										
3	X	X	X			1	1	1						1			1									1			
4	X	X	X			1	1	1						1			1									1			
5	X			X	X																								
6	X			X	X																								
7	X	X	X			1		1		1		1		1			1							1					
8																													
9																													
10																													
11																													
12																													
13																													
14																													

Recommendation #	Survey #4: All reasons for not implementing												Survey #5: Top reason for not implementing												Initial cost category	Projected payback category
	A4: Not technically feasible	**B4**: Lack of capital	**C4**: Insufficient financial payback	**D4**: Other priorities for capital investments	**E4**: Risk of production disruption/inconv./slow	**F4**: Lack of env./risk reduction benefits	**G4**: Limited in-plant expertise/capability	**H4**: Lack of staff awareness	**I4**: Customer specifications	**J4**: Uncertainty/lack of confidence in tech.	**K4**: Insufficient info regarding rec.	**L4**: Difficulty in coord. between units	**A5**: Not technically feasible	**B5**: Lack of capital	**C5**: Insufficient financial payback	**D5**: Other priorities for capital investments	**E5**: Risk of production disruption/inconv./slow	**F5**: Lack of env./risk reduction benefits	**G5**: Limited in-plant expertise/capability	**H5**: Lack of staff awareness	**I5**: Customer specifications	**J5**: Uncertainty/lack of confidence in tech.	**K5**: Insufficient info regarding rec.	**L5**: Difficulty in coord. between units		
1																									>1,000	2-4 years
2																									<999	>4 years
3																									>1,000	2-4 years
4																									<999	<1 year
5			1	1											1										>1,000	<1 year
6	1		1												1										>1,000	1-1.9 years
7																									>1,000	1-1.9 years
8																									<999	1-1.9 years
9																									>1,000	>4 years
10																									<999	<1 year
11																									<999	<1 year
12																									<999	<1 year
13																									>1,000	<1 year
14																									>1,000	1-1.9 years

Recommendation #	Year of assessment	Year of reassessment	Company #	Level of assis-tance	Company sector	Program (UNL/KSU)	P2 suggestion	P2 category	Implemented	Not implemented	Doing before	Originally Recommended	Originally Not recommended
15	2012	2014	3	Partial	Public	UNL	Control aeration based on oxygen levels	Training/policies		X		X	
16	2012	2014	3	Partial	Public	UNL	Upgrade lighting to lower wattage	Energy efficiency	X			X	
17	2012	2014	3	Partial	Public	UNL	Switch to smaller disinfection unit	Equipment/process modification	X			X	
18	2012	2014	3	Partial	Public	UNL	Remove nonessential lighting	Energy efficiency		X		X	
19	2011	2014	4	Partial	Public	UNL	Power down computers at night	Training/policies	X			X	
20	2011	2014	4	Partial	Public	UNL	Low-flow toilets	Equipment/process modification	X			X	
21	2011	2014	4	Partial	Public	UNL	Default double-sided printing and copying	Training/policies	X			X	
22	2011	2014	4	Partial	Public	UNL	Use green cleaning products	Purchasing	X			X	
23	2011	2014	4	Partial	Public	UNL	Install occupancy sensors	Energy efficiency		X		X	
24	2011	2014	4	Partial	Public	UNL	Use natural light in offices and classrooms	Training/policies		X		X	
25	2011	2014	4	Partial	Public	UNL	Use green tipped fluorescent lighting	Purchasing		X		X	
26	2011	2014	4	Partial	Public	UNL	Delamp vending machines	Energy efficiency		X		X	
27	2011	2014	4	Partial	Public	UNL	Upgrade exit signs to LED	Energy efficiency		X		X	
28	2011	2014	4	Partial	Public	UNL	Use rain barrels	In-process recycling/modify waste stream		X		X	
29	2011	2014	4	Partial	Public	UNL	Compost extra food	Equipment/process modification		X		X	
30	2011	2014	4	Partial	Public	UNL	Move automatic hand dryers closer to the sink	Equipment/process modification		X		X	
31	2011	2014	4	Partial	Public	UNL	Use less or local fertilizer	Equipment/process modification		X		X	
32	2011	2014	4	Partial	Public	UNL	Raise thermostat by 2 degrees during summer	Training/policies		X		X	

Recommendation #	Specific status/ category	No longer occurring?	Reoccurrence so far (yrs)	Expected reoccurrence category (yrs)	Initial cost ($)	Actual cost savings ($/yr)	Projected/potential cost savings ($/yr)	Actual payback period (yr)	Projected payback period (yr)	Toxins category	Solid waste (lbs/yr)	Haz. waste (lbs/yr)	Haz. materials, lbs/yr
15	Investigated			5-15 more	$0.00		$4,400.00	#DIV/0!	0.00				
16	With mod.		1	5-15 more	$0.00	$16.00	$16.00	0.00	0.00	0			
17	As suggested	X	1	<1 year	$0.00	$120.00	$120.00	0.00	0.00	0			
18	Investigated			5-15 more	$0.00		$140.00	#DIV/0!	0.00				
19	As suggested			5-15 more	$0.00	$1,400.00	$1,400.00	0.00	0.00	0			
20	As suggested		3	5-15 more	$5,000.00	$350.00	$350.00	14.29	14.29	0			
21	With mod.		3	5-15 more	$0.00	$880.00	$880.00	0.00	0.00	0	1,400		
22	As suggested		3	5-15 more	$0.00	$0.00	$0.00	#DIV/0!	#DIV/0!	1			
23	Not invest.			5-15 more	$4,320.00		$1,258.00	#DIV/0!	3.43				
24	Not invest.			5-15 more	Unknown		$1,750.00	#VALUE!	#VALUE!				
25	Not invest.			5-15 more	Unknown		Unknown	#VALUE!	#VALUE!				
26	Not invest.			5-15 more	$0.00		$1,280.00	#DIV/0!	0.00				
27	Not invest.			5-15 more	$700.00		$1,150.00	#DIV/0!	0.61				
28	Not invest.			5-15 more	$0.00		$0.00	#DIV/0!	#DIV/0!				
29	Not invest.			5-15 more	Unknown		Unknown	#VALUE!	#VALUE!				
30	Not invest.			5-15 more	$0.00		$1,200.00	#DIV/0!	0.00		770		
31	Not invest.			5-15 more	$0.00		$0.00	#DIV/0!	#DIV/0!				
32	Not invest.			5-15 more	$0.00		$1,440.00	#DIV/0!	0.00				

Recommendation #	Electricity (kWh/yr)	Water (gal/yr)	Natural gas (therms/yr)	Diesel fuel (gal/yr)	Gasoline (gal/yr)	GHG, MTCO2E/yr	Releases (lbs/yr)	Releases (type)
15	46,000					49.956		
16	160					0.17376		
17	1,200					1.3032		
18	1,500					1.629		
19	18,000					19.548		
20		250,000				0.89575		
21						0		
22						0		
23	15,725					17.07735		
24	21,900					23.7834		
25						0		
26	16,000					17.376		
27	14,470					15.71442		
28						0		
29						0		
30						0		
31						0		
32	18,000					19.548		

						Survey #2: All reasons for implementing opportunity												Survey #3: Top reason for implementing opportunity											
Recommendation #	Survey #1 responded	Survey #2 responded	Survey #3 responded	Survey #4 responded	Survey #5 responded	**A2**: Acceptable payback	**B2**: Energy efficiency	**C2**: Reduced operating cost	**D2**: Increased employee productivity	**E2**: Health and safety benefits	**F2**: Regulatory compliance	**G2**: Reduced env. and health risk	**H2**: Reduced business risk	**I2**: Enhanced env. awareness	**J2**: Improved public image	**K2**: Other companies also implemented	**L2**: Corporate commitment	**A3**: Acceptable payback	**B3**: Energy efficiency	**C3**: Reduced operating cost	**D3**: Increased employee productivity	**E3**: Health and safety benefits	**F3**: Regulatory compliance	**G3**: Reduced env. and health risk	**H3**: Reduced business risk	**I3**: Enhanced env. awareness	**J3**: Improved public image	**K3**: Other companies also implemented	**L3**: Corporate commitment
15																													
16																													
17																													
18																													
19	X	X	X				1							1					1										
20	X	X	X				1			1	1			1	1		1		1										
21	X	X	X					1						1						1									
22	X	X	X							1	1	1		1										1					
23	X			X	X																								
24	X			X	X																								
25	X			X	X																								
26	X			X	X																								
27	X			X	X																								
28	X			X	X																								
29	X			X	X																								
30	X			X	X																								
31	X			X	X																								
32	X			X	X																								

Recommendation #	Survey #4: All reasons for not implementing												Survey #5: Top reason for not implementing												Initial cost category	Projected payback category
	A4: Not technically feasible	**B4**: Lack of capital	**C4**: Insufficient financial payback	**D4**: Other priorities for capital investments	**E4**: Risk of production disruption/inconv./slow	**F4**: Lack of env./risk reduction benefits	**G4**: Limited in-plant expertise/capability	**H4**: Lack of staff awareness	**I4**: Customer specifications	**J4**: Uncertainty/lack of confidence in tech.	**K4**: Insufficient info regarding rec.	**L4**: Difficulty in coord. between units	**A5**: Not technically feasible	**B5**: Lack of capital	**C5**: Insufficient financial payback	**D5**: Other priorities for capital investments	**E5**: Risk of production disruption/inconv./slow	**F5**: Lack of env./risk reduction benefits	**G5**: Limited in-plant expertise/capability	**H5**: Lack of staff awareness	**I5**: Customer specifications	**J5**: Uncertainty/lack of confidence in tech.	**K5**: Insufficient info regarding rec.	**L5**: Difficulty in coord. between units		
15																									<999	<1 year
16																									<999	<1 year
17																									<999	<1 year
18																									<999	<1 year
19																									<999	<1 year
20																									>1,000	>4 years
21																									<999	<1 year
22																									<999	Nothing
23				1			1									1									>1,000	2-4 years
24								1												1					>1,000	>4 years
25						1												1							<999	>4 years
26						1												1							<999	<1 year
27						1												1							<999	<1 year
28	1		1			1	1						1												<999	Nothing
29	1			1			1	1											1						<999	>4 years
30				1												1									<999	<1 year
31						1					1							1							<999	Nothing
32	1												1												<999	<1 year

Recommendation #	Year of assessment	Year of reassessment	Company #	Level of assis-tance	Company sector	Program (UNL/KSU)	P2 suggestion	P2 category	Implemented	Not implemented	Doing before	Originally Recommended	Originally Not recommended
33	2011	2014	4	Partial	Public	UNL	Add light switch reminders	Training/policies		X		X	
34	2010	2014	5	One	Health care	UNL	Install sensors in public restrooms	Energy efficiency	X			X	
35	2010	2014	5	One	Health care	UNL	Install occupancy sensors in offices	Energy efficiency	X			X	
36	2010	2014	5	One	Health care	UNL	Install Dyson Hand Dryers in restrooms	Equipment/process modification		X		X	
37	2010	2014	5	One	Health care	UNL	Install occupancy sensors in patients' restrooms	Energy efficiency		X		X	
38	2010	2014	5	One	Health care	UNL	Install waterless urinals	Equipment/process modification		X		X	
39	2010	2014	5	One	Health care	UNL	Install automatic pool covers	Energy efficiency		X			X
40	2010	2014	5	One	Health care	UNL	Install solar pool water heating systems for indoor and outdoor pools	Energy efficiency		X		X	
41	2010	2014	5	One	Health care	UNL	Install VFDs on 10hp and 5hp fan motors	Energy efficiency		X		X	
42	2010	2014	5	One	Health care	UNL	Geothermal heat pump	Energy efficiency		X		X	
43	2010	2014	5	One	Health care	UNL	Solar water heating for kitchen and laundry services	Energy efficiency		X		X	
44	2011	2014	6	Partial	Public	UNL	Power down computers at night	Training/policies	X			X	
45	2011	2014	6	Partial	Public	UNL	Low-flow toilets	Equipment/process modification	X			X	
46	2011	2014	6	Partial	Public	UNL	Default double-sided printing and copying	Training/policies		X		X	
47	2011	2014	6	Partial	Public	UNL	Use green cleaning products	Purchasing	X			X	
48	2011	2014	6	Partial	Public	UNL	Install occupancy sensors	Energy efficiency		X		X	
49	2011	2014	6	Partial	Public	UNL	Use natural light in offices and classrooms	Training/policies		X		X	
50	2011	2014	6	Partial	Public	UNL	Use green tipped fluorescent lighting	Purchasing		X		X	

Recommendation #	Specific status/ category	No longer occuring?	Reoccurrence so far (yrs)	Expected reoccurrence category (yrs)	Initial cost ($)	Actual cost savings ($/yr)	Projected/potential cost savings ($/yr)	Actual payback period (yr)	Projected payback period (yr)	Toxins category	Solid waste (lbs/yr)	Haz. waste (lbs/yr)	Haz. materials, lbs/yr
33	Not invest.			5-15 more	$15.00		$50.00	#DIV/0!	0.30				
34	As suggested		4	5-15 more	$1,660.00	$1,400.00	$1,400.00	1.19	1.19	0			
35	As suggested		4	5-15 more	$1,100.00	$310.00	$310.00	3.55	3.55	0			
36	Investigated			5-15 more	$35,100.00		$54,000.00	#DIV/0!	0.65		27,700		
37	Not invest.			5-15 more	$19,800.00		$2,150.00	#DIV/0!	9.21				
38	Don't know			5-15 more	$4,400.00		$1,300.00	#DIV/0!	3.38				
39	Not invest.			5-15 more	Unknown		Unknown	#VALUE!	#VALUE!				
40	Not invest.			5-15 more	$34,700.00		$14,800.00	#DIV/0!	2.34				
41	Not invest.			5-15 more	$7,900.00		$2,900.00	#DIV/0!	2.72				
42	Not invest.			5-15 more	$632,000.00		$30,000.00	#DIV/0!	21.07				
43	Not invest.			5-15 more	$97,500.00		$10,000.00	#DIV/0!	9.75				
44	As suggested		3	5-15 more	$0.00	$3,700.00	$3,700.00	0.00	0.00	0			
45	As suggested		3	5-15 more	$5,000.00	$170.00	$170.00	29.41	29.41	0			
46	Don't know			5-15 more	$0.00		$240.00	#DIV/0!	0.00		375		
47	As suggested		3	5-15 more	$0.00	$0.00	$0.00	#DIV/0!	#DIV/0!	1			
48	Investigated			5-15 more	$2,040.00		$800.00	#DIV/0!	2.55				
49	Not invest.			5-15 more	Unknown		$940.00	#VALUE!	#VALUE!				
50	Not invest.			5-15 more	Unknown		Unknown	#VALUE!	#VALUE!				

Recommendation #	Electricity (kWh/yr)	Water (gal/yr)	Natural gas (therms/yr)	Diesel fuel (gal/yr)	Gasoline (gal/yr)	GHG, MTCO2E/yr	Releases (lbs/yr)	Releases (type)
33	864					0.938304		
34	20,000					21.72		
35	4,400					4.7784		
36	- 10,500					-11.403		
37	31,000					33.666		
38		438,000				1.569354		
39						0		
40			21,400			113.848		
41	41,000					44.526		
42	- 55,000		33,000			115.83		
43			9,855			52.4286		
44	46,000					49.956		
45		190,000				0.68077		
46						0		
47						0		
48	10,000					10.86		
49	11,800		11,760			75.378		
50						0		

Recommendation #	Survey #1 responded	Survey #2 responded	Survey #3 responded	Survey #4 responded	Survey #5 responded	Survey #2: All reasons for implementing opportunity												Survey #3: Top reason for implementing opportunity											
						A2: Acceptable payback	**B2**: Energy efficiency	**C2**: Reduced operating cost	**D2**: Increased employee productivity	**E2**: Health and safety benefits	**F2**: Regulatory compliance	**G2**: Reduced env. and health risk	**H2**: Reduced business risk	**I2**: Enhanced env. awareness	**J2**: Improved public image	**K2**: Other companies also implemented	**L2**: Corporate commitment	**A3**: Acceptable payback	**B3**: Energy efficiency	**C3**: Reduced operating cost	**D3**: Increased employee productivity	**E3**: Health and safety benefits	**F3**: Regulatory compliance	**G3**: Reduced env. and health risk	**H3**: Reduced business risk	**I3**: Enhanced env. awareness	**J3**: Improved public image	**K3**: Other companies also implemented	**L3**: Corporate commitment
33	X			X	X																								
34																													
35																													
36																													
37																													
38																													
39																													
40																													
41																													
42																													
43																													
44	X	X	X				1	1						1	1	1	1		1										
45	X	X	X			1	1	1	1					1	1	1	1		1										
46	X			X																									
47	X																												
48	X			X																									
49	X			X																									
50	X			X																									

Recommendation #	Survey #4: All reasons for not implementing												Survey #5: Top reason for not implementing												Initial cost category	Projected payback category
	A4: Not technically feasible	**B4**: Lack of capital	**C4**: Insufficient financial payback	**D4**: Other priorities for capital investments	**E4**: Risk of production disruption/inconv./slow	**F4**: Lack of env./risk reduction benefits	**G4**: Limited in-plant expertise/capability	**H4**: Lack of staff awareness	**I4**: Customer specifications	**J4**: Uncertainty/lack of confidence in tech.	**K4**: Insufficient info regarding rec.	**L4**: Difficulty in coord. between units	**A5**: Not technically feasible	**B5**: Lack of capital	**C5**: Insufficient financial payback	**D5**: Other priorities for capital investments	**E5**: Risk of production disruption/inconv./slow	**F5**: Lack of env./risk reduction benefits	**G5**: Limited in-plant expertise/capability	**H5**: Lack of staff awareness	**I5**: Customer specifications	**J5**: Uncertainty/lack of confidence in tech.	**K5**: Insufficient info regarding rec.	**L5**: Difficulty in coord. between units		
33								1												1					<999	<1 year
34																									>1,000	1-1.9 years
35																									>1,000	2-4 years
36																									>1,000	<1 year
37																									>1,000	>4 years
38																									>1,000	2-4 years
39																									Unknown	Unknown
40																									>1,000	2-4 years
41																									>1,000	2-4 years
42																									>1,000	>4 years
43																									>1,000	>4 years
44																									<999	<1 year
45																									>1,000	>4 years
46		1		1		1				1															<999	<1 year
47																									<999	Nothing
48		1		1		1				1															>1,000	2-4 years
49		1		1		1				1															>1,000	>4 years
50		1		1		1				1															<999	>4 years

Recommendation #	Year of assessment	Year of reassessment	Company #	Level of assis-tance	Company sector	Program (UNL/KSU)	P2 suggestion	P2 category	Implemented	Not implemented	Doing before	Originally Recommended	Originally Not recommended
51	2011	2014	6	Partial	Public	UNL	Delamp vending machines	Energy efficiency		X		X	
52	2011	2014	6	Partial	Public	UNL	Upgrade exit signs to LED	Energy efficiency	X			X	
53	2011	2014	6	Partial	Public	UNL	Compost extra food	Equipment/process modification		X		X	
54	2011	2014	6	Partial	Public	UNL	Move automatic hand dryers closer to the sink	Equipment/process modification		X		X	
55	2011	2014	6	Partial	Public	UNL	Use less or local fertilizer	Equipment/process modification		X		X	
56	2011	2014	6	Partial	Public	UNL	Raise thermostat by 2 degrees during summer	Training/policies	X			X	
57	2011	2014	6	Partial	Public	UNL	Add light switch reminders	Training/policies		X		X	
58	2011	2014	6	Partial	Public	UNL	Use rain barrels	In-process recycling/modify waste stream		X		X	
59	2009	2014	7	One	Manufacturing	UNL	Dispose of pallets to local resident who can use for firewood	In-process recycling/modify waste stream	X			X	
60	2009	2014	7	One	Manufacturing	UNL	Replace current petroleum-based coolant with vegetable-based coolant	Material substitution		X		X	
61	2009	2014	7	One	Manufacturing	UNL	Aerate standing coolant to prevent bacterial growth	Equipment/process modification		X		X	
62	2009	2014	7	One	Manufacturing	UNL	Reduce use of clay absorbent	Equipment/process modification	X			X	
63	2009	2014	7	One	Manufacturing	UNL	Use environmentally friendly absorbent pads as opposed to clay-based absorbent	Purchasing		X		X	
64	2009	2014	7	One	Manufacturing	UNL	Repair leaks found during summer 2009 assessment (and continue searching for leaks)	Improved housekeeping/ preventative maintenance	X			X	
65	2009	2014	7	One	Manufacturing	UNL	Install a condensate drain valve for air dryer	Equipment/process modification		X		X	
66	2009	2014	7	One	Manufacturing	UNL	Install jet nozzles for parts ejection	Equipment/process modification	X			X	
67	2009	2014	7	One	Manufacturing	UNL	Upgrade lighting with a new high bay lighting system and occupancy sensors	Energy efficiency	X			X	
68	2009	2014	7	One	Manufacturing	UNL	Retrofit 7 incandescent exit signs with LED lights	Energy efficiency	X			X	

Recommendation #	Specific status/ category	No longer occurring?	Reoccurrence so far (yrs)	Expected reoccurrence category (yrs)	Initial cost ($)	Actual cost savings ($/yr)	Projected/potential cost savings ($/yr)	Actual payback period (yr)	Projected payback period (yr)	Toxins category	Solid waste (lbs/yr)	Haz. waste (lbs/yr)	Haz. materials, lbs/yr
51	Not invest.			5-15 more	$0.00		$1,600.00	#DIV/0!	0.00				
52	As suggested		3	5-15 more	$720.00	$860.00	$860.00	0.84	0.84	0			
53	Not invest.			5-15 more	Unknown		$0.00	#VALUE!	#VALUE!				
54	Not invest.			5-15 more	$0.00		$1,200.00	#DIV/0!	0.00		770		
55	Not invest.			5-15 more	$0.00		$0.00	#DIV/0!	#DIV/0!				
56	As suggested		3	5-15 more	$0.00	$1,340.00	$1,340.00	0.00	0.00	0			
57	Not invest.			5-15 more	$18.00		$70.00	#DIV/0!	0.26				
58	Not invest.			5-15 more	$0.00		$0.00	#DIV/0!	#DIV/0!				
59	With mod.		5	5-15 more	Unknown	Unknown	Unknown	#VALUE!	#VALUE!	0			
60	Investigated			5-15 more	$0.00		$425.00	#DIV/0!	0.00			400	
61	Not invest.			5-15 more	$369.00		$260.00	#DIV/0!	1.42			144	
62	As suggested		5	5-15 more	$0.00	$380.00	$380.00	0.00	0.00	0	2,400		
63	Not invest.			5-15 more	$300.00		$250.00	#DIV/0!	1.20		4,800		
64	As suggested		5	5-15 more	$0.00	$7,800.00	$7,800.00	0.00	0.00	0			
65	Don't know			5-15 more	$630.00		$3,750.00	#DIV/0!	0.17				
66	Don't know			5-15 more	$460.00	$1,000.00	$1,000.00	0.46	0.46	0			
67	As suggested		5	5-15 more	$30,000.00	$24,200.00	$24,200.00	1.24	1.24	0			
68	As suggested		5	5-15 more	$700.00	$150.00	$150.00	4.67	4.67	0			

Recommendation #	Electricity (kWh/yr)	Water (gal/yr)	Natural gas (therms/yr)	Diesel fuel (gal/yr)	Gasoline (gal/yr)	GHG, MTCO2E/yr	Releases (lbs/yr)	Releases (type)
51	20,000					21.72		
52	10,800					11.7288		
53						0		
54						0		
55						0		
56	16,700					18.1362		
57	875					0.95025		
58						0		
59						0		
60						0		
61						0		
62						0		
63						0		
64	81,000					87.966		
65	62,500					67.875		
66	16,700					18.1362		
67	252,000					273.672		
68	1,600					1.7376		

Recommendation #	Survey #1 responded	Survey #2 responded	Survey #3 responded	Survey #4 responded	Survey #5 responded	**Survey #2: All reasons for implementing opportunity**												**Survey #3: Top reason for implementing opportunity**											
						A2: Acceptable payback	**B2**: Energy efficiency	**C2**: Reduced operating cost	**D2**: Increased employee productivity	**E2**: Health and safety benefits	**F2**: Regulatory compliance	**G2**: Reduced env. and health risk	**H2**: Reduced business risk	**I2**: Enhanced env. awareness	**J2**: Improved public image	**K2**: Other companies also implemented	**L2**: Corporate commitment	**A3**: Acceptable payback	**B3**: Energy efficiency	**C3**: Reduced operating cost	**D3**: Increased employee productivity	**E3**: Health and safety benefits	**F3**: Regulatory compliance	**G3**: Reduced env. and health risk	**H3**: Reduced business risk	**I3**: Enhanced env. awareness	**J3**: Improved public image	**K3**: Other companies also implemented	**L3**: Corporate commitment
51	X			X																									
52	X																												
53	X			X																									
54	X			X																									
55	X			X																									
56	X	X	X			1	1	1						1	1	1	1		1										
57	X			X																									
58	X			X																									
59	X	X	X					1							1					1									
60	X			X	X																								
61	X			X	X																								
62	X	X	X					1						1						1									
63	X			X	X																								
64	X	X	X			1	1	1												1									
65	X			X	X																								
66	X																												
67	X	X	X			1	1	1	1	1					1			1											
68	X																												

Recommendation #	Survey #4: All reasons for not implementing												Survey #5: Top reason for not implementing												Initial cost category	Projected payback category
	A4: Not technically feasible	**B4**: Lack of capital	**C4**: Insufficient financial payback	**D4**: Other priorities for capital investments	**E4**: Risk of production disruption/inconv./slow	**F4**: Lack of env./risk reduction benefits	**G4**: Limited in-plant expertise/capability	**H4**: Lack of staff awareness	**I4**: Customer specifications	**J4**: Uncertainty/lack of confidence in tech.	**K4**: Insufficient info regarding rec.	**L4**: Difficulty in coord. between units	**A5**: Not technically feasible	**B5**: Lack of capital	**C5**: Insufficient financial payback	**D5**: Other priorities for capital investments	**E5**: Risk of production disruption/inconv./slow	**F5**: Lack of env./risk reduction benefits	**G5**: Limited in-plant expertise/capability	**H5**: Lack of staff awareness	**I5**: Customer specifications	**J5**: Uncertainty/lack of confidence in tech.	**K5**: Insufficient info regarding rec.	**L5**: Difficulty in coord. between units		
51		1		1		1				1															<999	<1 year
52																									<999	<1 year
53		1	1	1		1				1															<999	>4 years
54		1	1	1		1				1															<999	<1 year
55		1	1	1		1				1															<999	Nothing
56																									<999	<1 year
57		1	1	1		1				1															<999	<1 year
58		1	1	1		1				1															<999	Nothing
59																									<999	>4 years
60	1				1				1								1								<999	<1 year
61		1	1					1						1											<999	1-1.9 years
62																									<999	<1 year
63			1				1				1												1		<999	1-1.9 years
64																									<999	<1 year
65											1												1		<999	<1 year
66																									<999	<1 year
67																									>1,000	1-1.9 years
68																									<999	>4 years

Recommendation #	Year of assessment	Year of reassessment	Company #	Level of assis-tance	Company sector	Program (UNL/KSU)	P2 suggestion	P2 category	Implemented	Not implemented	Doing before	Originally Recommended	Originally Not recommended
69	2009	2014	7	One	Manufacturing	UNL	Install a high volume low speed fan	Energy efficiency		X		X	
70	2009	2014	7	One	Manufacturing	UNL	Install hanging PVC strips over doors in packaging area	Energy efficiency		X		X	
71	2012	2014	8	Partial	Agriculture	UNL	Raise sprinkler nozzles to the top of the pivot	Equipment/process modification	X			X	
72	2011	2014	8	Partial	Agriculture	UNL	Repair broken sprinkler	Improved housekeeping/ preventative maintenance	X			X	
73	2011	2014	8	Partial	Agriculture	UNL	Replace natural gas engine	Equipment/process modification		X			X
74	2011	2014	8	Partial	Agriculture	UNL	Continue to use Watermark sensors and consider buying more	Watermark/flow meter	X			X	
75	2011	2014	9	Partial	Agriculture	UNL	Continue to use Watermark sensors and consider buying more	Watermark/flow meter	X			X	
76	2011	2014	9	Partial	Agriculture	UNL	Upgrade 2 natural gas engines (home)	Equipment/process modification		X			X
77	2011	2014	9	Partial	Agriculture	UNL	Upgrade natural gas engine (NP)	Equipment/process modification		X			X
78	2011	2014	9	Partial	Agriculture	UNL	Raise sprinkler nozzles to the top of the pivot	Equipment/process modification	X			X	
79	2012	2014	9	Partial	Agriculture	UNL	Upgrade engine	Equipment/process modification	X			X	
80	2011	2014	9	Partial	Agriculture	UNL	Upgrade pump	Equipment/process modification	X			X	
81	2013	2014	10	Partial	Agriculture	UNL	Install flow meter	Watermark/flow meter	X			X	
82	2013	2014	10	Partial	Agriculture	UNL	Reduce irrigation with Watermark sensors	Watermark/flow meter	X			X	
83	2011	2014	11	Partial	Public	UNL	Change Inside Perimeter lighting from T12 to T8	Energy efficiency	X			X	
84	2011	2014	11	Partial	Public	UNL	Switch high bay lights from metal halide to T5 fluorescent	Energy efficiency		X		X	
85	2013	2014	12	One	Manufacturing	UNL	Apply sludge to wet distillers grain solubles	In-process recycling/modify waste stream	X			X	
86	2009	2014	55	One	Public	UNL	Building Control System (monitor when buildings heated/cooled)	Energy efficiency	X			X	

Recommendation #	Specific status/ category	No longer occurring?	Reoccurrence so far (yrs)	Expected reoccurrence category (yrs)	Initial cost ($)	Actual cost savings ($/yr)	Projected/potential cost savings ($/yr)	Actual payback period (yr)	Projected payback period (yr)	Toxins category	Solid waste (lbs/yr)	Haz. waste (lbs/yr)	Haz. materials, lbs/yr
69	Don't know			5-15 more	$9,287.00		$2,300.00	#DIV/0!	4.04				
70	Don't know			5-15 more	$700.00		$1,100.00	#DIV/0!	0.64				
71	With mod.		1	2-5 more	Unknown	$1,930.00	$1,930.00	#VALUE!	#VALUE!	0			
72	As suggested		4	2-5 more	$5.00	$0.00	$0.00	#DIV/0!	#DIV/0!	0			
73	Not invest.			5-15 more	$16,500.00		$360.00	#DIV/0!	45.83				
74	As suggested		4	5-15 more	$179.00	$1,010.00	$1,010.00	0.18	0.18	0			
75	As suggested		9	5-15 more	$179.00	$3,000.00	$3,000.00	0.06	0.06	0			
76	Not invest.			5-15 more	$33,000.00		$1,120.00	#DIV/0!	29.46				
77	Not invest.			5-15 more	$16,500.00		$550.00	#DIV/0!	30.00				
78	With mod.		1	5-15 more	$540.00	Unknown	Unknown	#VALUE!	#VALUE!	0			
79	With mod.		1	5-15 more	Unknown	Unknown	Unknown	#VALUE!	#VALUE!	0			
80	With mod.		0	5-15 more	Unknown	Unknown	Unknown	#VALUE!	#VALUE!	0			
81	Not invest.			5-15 more	$1,500.00	$500.00	$500.00	3.00	3.00	0			
82	Not invest.			5-15 more		$1,000.00	$1,000.00	0.00	0.00	0			
83	As suggested		3	5-15 more	$0.00	$30.00	$30.00	0.00	0.00	0			
84	Not invest.			5-15 more	$1,850.00		$220.00	#DIV/0!	8.41				
85	As suggested		0	5-15 more	$120,000.00	$789,000.00	$789,000.00	0.15	0.15	0	9,306,000		
86	With mod.			5-15 more	$0.00	$103,000.00	$103,000.00	0.00	0.00	0			

Recommendation #	Electricity (kWh/yr)	Water (gal/yr)	Natural gas (therms/yr)	Diesel fuel (gal/yr)	Gasoline (gal/yr)	GHG, MTCO2E/yr	Releases (lbs/yr)	Releases (type)
69			2,150			11.438		
70			1,030			5.4796		
71						0		
72		540,000				1.93482		
73			770			4.0964		
74		7,200,000	1,500			7.98		
75		29,000,000	5,300			28.20		
76			1,300			6.916		
77			650			3.458		
78						0		
79						0		
80						0		
81	7,000	3,510,000				7.60		
82	14,000	7,000,000				15.20		
83	660					0.71676		
84	5,000					5.43		
85	- 18,600			360		-16.4196		
86	1,320,000		16,500			1521.3		

Recommendation #	Survey #1 responded	Survey #2 responded	Survey #3 responded	Survey #4 responded	Survey #5 responded	Survey #2: All reasons for implementing opportunity												Survey #3: Top reason for implementing opportunity											
						A2: Acceptable payback	**B2**: Energy efficiency	**C2**: Reduced operating cost	**D2**: Increased employee productivity	**E2**: Health and safety benefits	**F2**: Regulatory compliance	**G2**: Reduced env. and health risk	**H2**: Reduced business risk	**I2**: Enhanced env. awareness	**J2**: Improved public image	**K2**: Other companies also implemented	**L2**: Corporate commitment	**A3**: Acceptable payback	**B3**: Energy efficiency	**C3**: Reduced operating cost	**D3**: Increased employee productivity	**E3**: Health and safety benefits	**F3**: Regulatory compliance	**G3**: Reduced env. and health risk	**H3**: Reduced business risk	**I3**: Enhanced env. awareness	**J3**: Improved public image	**K3**: Other companies also implemented	**L3**: Corporate commitment
69	X			X	X																								
70	X			X	X																								
71																													
72																													
73																													
74																													
75																													
76																													
77																													
78																													
79																													
80																													
81	X																												
82	X																												
83	X	X	X			1	1	1	1	1	1	1	1	1	1		1								1				
84	X			X	X																								
85	X	X	X			1		1			1	1	1		1		1	1											
86	X	X	X			1	1	1								1	1		1										

Recommendation #	Survey #4: All reasons for not implementing												Survey #5: Top reason for not implementing												Initial cost category	Projected payback category
	A4: Not technically feasible	**B4**: Lack of capital	**C4**: Insufficient financial payback	**D4**: Other priorities for capital investments	**E4**: Risk of production disruption/inconv./slow	**F4**: Lack of env./risk reduction benefits	**G4**: Limited in-plant expertise/capability	**H4**: Lack of staff awareness	**I4**: Customer specifications	**J4**: Uncertainty/lack of confidence in tech.	**K4**: Insufficient info regarding rec.	**L4**: Difficulty in coord. between units	**A5**: Not technically feasible	**B5**: Lack of capital	**C5**: Insufficient financial payback	**D5**: Other priorities for capital investments	**E5**: Risk of production disruption/inconv./slow	**F5**: Lack of env./risk reduction benefits	**G5**: Limited in-plant expertise/capability	**H5**: Lack of staff awareness	**I5**: Customer specifications	**J5**: Uncertainty/lack of confidence in tech.	**K5**: Insufficient info regarding rec.	**L5**: Difficulty in coord. between units		
69											1												1		>1,000	>4 years
70	1												1												<999	<1 year
71																									<999	<1 year
72																									<999	>4 years
73																									>1,000	>4 years
74																									<999	<1 year
75																									<999	<1 year
76																									>1,000	>4 years
77																									>1,000	>4 years
78																									<999	<1 year
79																									>1,000	>4 years
80																									>1,000	>4 years
81																									>1,000	2-4 years
82																									<999	<1 year
83																									<999	<1 year
84					1					1							1								>1,000	>4 years
85																									>1,000	<1 year
86																									<999	<1 year

Recommendation #	Year of assessment	Year of reassessment	Company #	Level of assis-tance	Company sector	Program (UNL/KSU)	P2 suggestion	P2 category	Implemented	Not implemented	Doing before	Originally Recommended	Originally Not recommended
87	2009	2014	55	One	Public	UNL	Nutritional Services (compost food and use disposable dishes)	Equipment/process modification	X			X	
88	2009	2014	55	One	Public	UNL	Provide separate marked containers for recycling	Off-site recycling	X			X	
89	2009	2014	55	One	Public	UNL	Request suppliers take back pallets/reduce packaging	Training/policies	X			X	
90	2009	2014	55	One	Public	UNL	Install recyclable carpet	Purchasing	X			X	
91	2009	2014	55	One	Public	UNL	Create a list of local recycling companies (from WasteCap)	Training/policies	X			X	
92	2009	2014	55	One	Public	UNL	Recycle concrete and asphalt	Off-site recycling	X			X	
93	2009	2014	55	One	Public	UNL	Salvage and reuse bricks (and recycle when unusable)	Off-site recycling	X			X	
94	2009	2014	55	One	Public	UNL	Recycle untreated wood and pallets	Off-site recycling	X			X	
95	2009	2014	55	One	Public	UNL	Recycle cardboard	Off-site recycling	X			X	
96	2009	2014	55	One	Public	UNL	Recycle ceiling tiles	Off-site recycling	X			X	
97	2009	2014	55	One	Public	UNL	Recycle carpet	Off-site recycling	X			X	
98	2009	2014	55	One	Public	UNL	Install photovoltaic solar panels on schools	Energy efficiency		X		X	
99	2009	2014	55	One	Public	UNL	Install green roofs on buildings	Energy efficiency		X			X
100	2009	2014	55	One	Public	UNL	Design concrete mixes with maximum allowable pozzolan content	Material substitution		X		X	
101	2009	2014	55	One	Public	UNL	Use certified wood products	Purchasing		X		X	
102	2009	2014	55	One	Public	UNL	Improve and reevaluate waste generation formula	Training/policies		X		X	
103	2009	2014	55	One	Public	UNL	Develop forms for cost estimations	Training/policies		X		X	
104	2009	2010	1	Multi	Manufacturing	UNL	Adjust fan placement on small kettle	Training/policies	X			X	

Recommendation #	Specific status/ category	No longer occurring?	Reoccurrence so far (yrs)	Expected reoccurrence category (yrs)	Initial cost ($)	Actual cost savings ($/yr)	Projected/potential cost savings ($/yr)	Actual payback period (yr)	Projected payback period (yr)	Toxins category	Solid waste (lbs/yr)	Haz. waste (lbs/yr)	Haz. materials, lbs/yr
87	With mod.			5-15 more	$0.00	$0.00	$0.00	#DIV/0!	#DIV/0!	0	143,000		
88	As suggested			5-15 more	$0.00	$0.00	$0.00	#DIV/0!	#DIV/0!	0			
89	As suggested			5-15 more	$0.00	$0.00	$0.00	#DIV/0!	#DIV/0!	0			
90	As suggested			5-15 more	Unknown	Unknown	Unknown	#VALUE!	#VALUE!	0			
91	As suggested			5-15 more	$0.00	$0.00	$0.00	#DIV/0!	#DIV/0!	0			
92	As suggested			5-15 more	$0.00	$3,000.00	$3,000.00	0.00	0.00	0	1,500,000		
93	As suggested			5-15 more	$0.00	$0.00	$0.00	#DIV/0!	#DIV/0!	0			
94	As suggested			5-15 more	$0.00	$4,400.00	$4,400.00	0.00	0.00	0	420,000		
95	As suggested			5-15 more	$0.00	$1,380.00	$1,380.00	0.00	0.00	0	68,000		
96	As suggested			5-15 more	$0.00	$3,360.00	$3,360.00	0.00	0.00	0	168,000		
97	As suggested			5-15 more	$0.00	$180.00	$180.00	0.00	0.00	0	36,000		
98	Not invest.			5-15 more	$3,000.00		$95.00	#DIV/0!	31.58				
99	Not invest.			5-15 more	Unknown		Unknown	#VALUE!	#VALUE!				
100	Don't know			5-15 more	Unknown		Unknown	#VALUE!	#VALUE!				
101	Not invest.			5-15 more	Unknown		Unknown	#VALUE!	#VALUE!				
102	Not invest.			5-15 more	$0.00		$0.00	#DIV/0!	#DIV/0!				
103	Not invest.			5-15 more	$0.00		$0.00	#DIV/0!	#DIV/0!				
104	As suggested		1	5-15 more	$0.00	$90.00	$90.00	0.00	0.00	0			

Recommendation #	Electricity (kWh/yr)	Water (gal/yr)	Natural gas (therms/yr)	Diesel fuel (gal/yr)	Gasoline (gal/yr)	GHG, MTCO2E/yr	Releases (lbs/yr)	Releases (type)
87						0		
88						0		
89						0		
90						0		
91						0		
92						0		
93						0		
94						0		
95						0		
96						0		
97						0		
98	1,350					1.4661		
99						0		
100						0		
101						0		
102						0		
103						0		
104			75			0.399		

						Survey #2: All reasons for implementing opportunity												Survey #3: Top reason for implementing opportunity											
Recommendation #	Survey #1 responded	Survey #2 responded	Survey #3 responded	Survey #4 responded	Survey #5 responded	**A2**: Acceptable payback	**B2**: Energy efficiency	**C2**: Reduced operating cost	**D2**: Increased employee productivity	**E2**: Health and safety benefits	**F2**: Regulatory compliance	**G2**: Reduced env. and health risk	**H2**: Reduced business risk	**I2**: Enhanced env. awareness	**J2**: Improved public image	**K2**: Other companies also implemented	**L2**: Corporate commitment	**A3**: Acceptable payback	**B3**: Energy efficiency	**C3**: Reduced operating cost	**D3**: Increased employee productivity	**E3**: Health and safety benefits	**F3**: Regulatory compliance	**G3**: Reduced env. and health risk	**H3**: Reduced business risk	**I3**: Enhanced env. awareness	**J3**: Improved public image	**K3**: Other companies also implemented	**L3**: Corporate commitment
87	X	X	X			1								1	1		1									1			
88	X	X	X			1		1	1					1	1	1	1									1			
89	X	X	X			1										1	1									1			
90	X	X	X			1								1	1	1	1									1			
91	X	X	X											1		1	1									1			
92	X	X	X			1								1		1	1	1											
93	X	X	X			1								1		1	1	1											
94	X	X	X			1								1		1	1	1											
95	X	X	X			1								1		1	1	1											
96	X	X	X			1								1		1	1									1			
97	X	X	X			1								1		1	1									1			
98	X			X	X																								
99	X			X	X																								
100	X			X	X																								
101	X			X	X																								
102	X																												
103	X																												
104	X	X	X			1	1	1	1	1		1							1										

Recommendation #	Survey #4: All reasons for not implementing												Survey #5: Top reason for not implementing												Initial cost category	Projected payback category
	A4: Not technically feasible	**B4**: Lack of capital	**C4**: Insufficient financial payback	**D4**: Other priorities for capital investments	**E4**: Risk of production disruption/inconv./slow	**F4**: Lack of env./risk reduction benefits	**G4**: Limited in-plant expertise/capability	**H4**: Lack of staff awareness	**I4**: Customer specifications	**J4**: Uncertainty/lack of confidence in tech.	**K4**: Insufficient info regarding rec.	**L4**: Difficulty in coord. between units	**A5**: Not technically feasible	**B5**: Lack of capital	**C5**: Insufficient financial payback	**D5**: Other priorities for capital investments	**E5**: Risk of production disruption/inconv./slow	**F5**: Lack of env./risk reduction benefits	**G5**: Limited in-plant expertise/capability	**H5**: Lack of staff awareness	**I5**: Customer specifications	**J5**: Uncertainty/lack of confidence in tech.	**K5**: Insufficient info regarding rec.	**L5**: Difficulty in coord. between units		
87																									<999	Nothing
88																									<999	Nothing
89																									<999	Nothing
90																									Unknown	Unknown
91																									<999	Nothing
92																									<999	<1 year
93																									<999	Nothing
94																									<999	<1 year
95																									<999	<1 year
96																									<999	<1 year
97																									<999	<1 year
98		1		1	1						1					1									>1,000	>4 years
99			1	1							1					1									>1,000	>4 years
100							1	1			1								1						>1,000	>4 years
101									1												1				Unknown	Unknown
102																									<999	Nothing
103																									<999	Nothing
104																									<999	<1 year

Recommendation #	Year of assessment	Year of reassessment	Company #	Level of assis-tance	Company sector	Program (UNL/KSU)	P2 suggestion	P2 category	Implemented	Not implemented	Doing before	Originally Recommended	Originally Not recommended
105	2009	2010	1	Multi	Manufacturing	UNL	Cover small kettle with custom kettle covers	Energy efficiency	X			X	
106	2009	2010	1	Multi	Manufacturing	UNL	Divert cooling water from beta acid recovery system to tanks	In-process recycling/modify waste stream	X			X	
107	2009	2010	1	Multi	Manufacturing	UNL	Replace alkaline batteries with rechargeable	Equipment/process modification	X			X	
108	2009	2010	1	Multi	Manufacturing	UNL	Install 2 rapid roll doors	Energy efficiency	X			X	
109	2009	2010	1	Multi	Manufacturing	UNL	Cover large kettles	Energy efficiency		X		X	
110	2009	2010	1	Multi	Manufacturing	UNL	Install a heat exchange on large kettle exhaust	Energy efficiency		X		X	
111	2009	2010	1	Multi	Manufacturing	UNL	Insulate sides small kettle	Energy efficiency		X		X	
112	2009	2010	1	Multi	Manufacturing	UNL	Cover acid and flux baths	Energy efficiency		X		X	
113	2009	2010	1	Multi	Manufacturing	UNL	Prevent filter press from leaking into acid system	Equipment/process modification		X		X	
114	2009	2010	1	Multi	Manufacturing	UNL	Install more hand dryers	Equipment/process modification		X		X	
115	2009	2010	13	Partial	Other	UNL	Trash recycling	Off-site recycling	X			X	
116	2009	2010	13	Partial	Other	UNL	Eliminate use of disposable dishware	Equipment/process modification	X			X	
117	2009	2010	13	Partial	Other	UNL	Set computer monitors to sleep mode when not in use	Training/policies	X			X	
118	2009	2010	13	Partial	Other	UNL	Reduce waste food	Training/policies	X			X	
119	2009	2010	13	Partial	Other	UNL	Join WasteCap	Training/policies		X		X	
120	2009	2010	13	Partial	Other	UNL	Recycle #10 cans	Off-site recycling	X			X	
121	2008	2009	1	Multi	Manufacturing	UNL	Insulate boiler piping	Energy efficiency	X			X	
122	2008	2009	1	Multi	Manufacturing	UNL	Retrofit exit signs with energy efficient LED lights	Energy efficiency		X		X	

Recommendation #	Specific status/ category	No longer occurring?	Reoccurrence so far (yrs)	Expected reoccurrence category (yrs)	Initial cost ($)	Actual cost savings ($/yr)	Projected/potential cost savings ($/yr)	Actual payback period (yr)	Projected payback period (yr)	Toxins category	Solid waste (lbs/yr)	Haz. waste (lbs/yr)	Haz. materials, lbs/yr
105	As suggested		1	5-15 more	$1,160.00	$53,000.00	$53,000.00	0.02	0.02	0			
106	As suggested		1	5-15 more	$390.00	$55.00	$55.00	7.09	7.09	0			
107	As suggested		1	5-15 more	$230.00	$12,000.00	$12,000.00	0.02	0.02	1	650		
108	As suggested		1	5-15 more	$38,000.00	$63,500.00	$63,500.00	0.60	0.60	0			
109	Investigated			5-15 more	$0.00		$98,000.00	#DIV/0!	0.00				
110	Investigated			5-15 more	$243,000.00		$103,000.00	#DIV/0!	2.36				
111	Investigated			5-15 more	$398.00		$3,090.00	#DIV/0!	0.13				
112	Not invest.			5-15 more	$5,480.00		$49,000.00	#DIV/0!	0.11				
113	Investigated			5-15 more	$1,100.00		$15,000.00	#DIV/0!	0.07				
114	Investigated			5-15 more	$4,754.00		$5,466.00	#DIV/0!	0.87		407		
115	With mod.		1	5-15 more	$0.00	$6,281.00	$6,281.00	0.00	0.00	0	13,660		
116	As suggested		1	5-15 more	$0.00	$51,500.00	$51,500.00	0.00	0.00	0	12,000		
117	With mod.		1	5-15 more	$0.00	$91,993.00	$91,993.00	0.00	0.00	0			
118				5-15 more	$0.00	$1,840.00	$1,840.00	0.00	0.00	0	4,000		
119	Investigated			5-15 more	$0.00		$230.00	#DIV/0!	0.00				
120				5-15 more	$0.00	$20.00	$20.00	0.00	0.00	0	700		
121	As suggested		1	5-15 more	$980.00	$4,070.00	$4,070.00	0.24	0.24	0			
122	Investigated			5-15 more	$466.00		$441.00	#DIV/0!	1.06				

Recommendation #	Electricity (kWh/yr)	Water (gal/yr)	Natural gas (therms/yr)	Diesel fuel (gal/yr)	Gasoline (gal/yr)	GHG, MTCO2E/yr	Releases (lbs/yr)	Releases (type)
105			46,500			247.38		
106		110,000				0.39413		
107						0		
108			55,000			292.6		
109			92,000			489.44		
110			89,000			473.48		
111			2,690			14.3108		
112	140,000	800,000	36,600			349.6184		
113						0		Reduce chlorine concentration
114						0		
115						0		
116						0		
117	1,319,580					1433.06388		
118						0		
119						0		
120						0		
121			4,500			23.94		
122	9,000					9.774		

Recommendation #	Survey #1 responded	Survey #2 responded	Survey #3 responded	Survey #4 responded	Survey #5 responded	Survey #2: All reasons for implementing opportunity												Survey #3: Top reason for implementing opportunity											
						A2: Acceptable payback	**B2**: Energy efficiency	**C2**: Reduced operating cost	**D2**: Increased employee productivity	**E2**: Health and safety benefits	**F2**: Regulatory compliance	**G2**: Reduced env. and health risk	**H2**: Reduced business risk	**I2**: Enhanced env. awareness	**J2**: Improved public image	**K2**: Other companies also implemented	**L2**: Corporate commitment	**A3**: Acceptable payback	**B3**: Energy efficiency	**C3**: Reduced operating cost	**D3**: Increased employee productivity	**E3**: Health and safety benefits	**F3**: Regulatory compliance	**G3**: Reduced env. and health risk	**H3**: Reduced business risk	**I3**: Enhanced env. awareness	**J3**: Improved public image	**K3**: Other companies also implemented	**L3**: Corporate commitment
105	X	X	X			1	1	1									1		1										
106	X	X	X			1											1												1
107	X	X	X			1		1									1			1									
108	X	X	X			1	1	1	1								1		1										
109	X			X	X																								
110	X			X	X																								
111	X			X	X																								
112	X			X	X																								
113	X			X	X																								
114	X			X	X																								
115	X	X	X			1		1		1		1		1	1	1	1												1
116	X	X	X			1								1	1		1									1			
117	X	X	X			1	1	1			1					1	1		1										
118	X																												
119	X			X	X																								
120	X																												
121	X	X	X			1	1	1									1		1										
122	X			X	X																								

Recommendation #	Survey #4: All reasons for not implementing												Survey #5: Top reason for not implementing												Initial cost category	Projected payback category
	A4: Not technically feasible	**B4**: Lack of capital	**C4**: Insufficient financial payback	**D4**: Other priorities for capital investments	**E4**: Risk of production disruption/inconv./slow	**F4**: Lack of env./risk reduction benefits	**G4**: Limited in-plant expertise/capability	**H4**: Lack of staff awareness	**I4**: Customer specifications	**J4**: Uncertainty/lack of confidence in tech.	**K4**: Insufficient info regarding rec.	**L4**: Difficulty in coord. between units	**A5**: Not technically feasible	**B5**: Lack of capital	**C5**: Insufficient financial payback	**D5**: Other priorities for capital investments	**E5**: Risk of production disruption/inconv./slow	**F5**: Lack of env./risk reduction benefits	**G5**: Limited in-plant expertise/capability	**H5**: Lack of staff awareness	**I5**: Customer specifications	**J5**: Uncertainty/lack of confidence in tech.	**K5**: Insufficient info regarding rec.	**L5**: Difficulty in coord. between units		
105																									>1,000	<1 year
106																									<999	>4 years
107																									<999	<1 year
108																									>1,000	<1 year
109	1									1			1												<999	<1 year
110			1	1						1					1										>1,000	2-4 years
111	1		1										1												<999	<1 year
112	1												1												>1,000	<1 year
113	1	1			1												1								>1,000	<1 year
114			1	1											1										>1,000	<1 year
115																									<999	<1 year
116																									<999	<1 year
117																									<999	<1 year
118																									<999	<1 year
119										1												1			<999	<1 year
120																									<999	<1 year
121																									<999	<1 year
122			1	1											1										<999	1-1.9 years

Recommendation #	Year of assessment	Year of reassessment	Company #	Level of assis-tance	Company sector	Program (UNL/KSU)	P2 suggestion	P2 category	Implemented	Not implemented	Doing before	Originally Recommended	Originally Not recommended
123	2008	2009	1	Multi	Manufacturing	UNL	Replace non-insulated ceiling areas in all buildings	Energy efficiency		X		X	
124	2008	2009	1	Multi	Manufacturing	UNL	Insulate Building 14	Energy efficiency		X		X	
125	2008	2009	1	Multi	Manufacturing	UNL	Replace existing electric convection heaters	Energy efficiency		X		X	
126	2008	2009	1	Multi	Manufacturing	UNL	Replace existing insulation in Buildings 1-5	Energy efficiency		X			X
127	2008	2009	1	Multi	Manufacturing	UNL	Install a boiler economizer	Energy efficiency		X			X
128	2006	2014	14	One	Manufacturing	KSU	Erosion control	Equipment/process modification	X			X	
129	2011	2014	15	Multi	Health care	KSU	Re-lamping Linear Fluorescents (32-watt T8 lamps/ballasts to 25-watt)	Energy efficiency	X			X	
130	2011	2014	15	Multi	Health care	KSU	Re-lamping Parking Lot (400-watt metal halide with 330-watt retrofit)	Energy efficiency	X			X	
131	2011	2014	15	Multi	Health care	KSU	Hand Washing Sinks (install 1.5 or 1.0 gpm aerators)	Equipment/process modification		X		X	
132	2011	2014	15	Multi	Health care	KSU	Sterilizers - Water Conservation Kits (retrofit sterilizers)	Equipment/process modification		X		X	
133	2011	2014	15	Multi	Health care	KSU	Sterilizers - Replacements (replace three units)	Equipment/process modification	X			X	
134	2011	2014	15	Multi	Health care	KSU	Blue Wrap Donation (for reuse)	In-process recycling/modify waste stream	X			X	
135	2011	2014	15	Multi	Health care	KSU	Reusable To-Go Containers (use in cafeteria)	Equipment/process modification		X		X	
136	2012	2014	15	Multi	Health care	KSU	Burner Replacement	Energy efficiency		X		X	
137	2012	2014	15	Multi	Health care	KSU	Aquanomics (switch to ozone laundry)	Equipment/process modification		X		X	
138	2012	2014	15	Multi	Health care	KSU	Re-lamping Basement	Energy efficiency		X		X	
139	2012	2014	15	Multi	Health care	KSU	Leak Detection (steam trap audits and maintenance)	Improved housekeeping/ preventative maintenance	X			X	
140	2012	2014	15	Multi	Health care	KSU	Recycling Program (and addition of cardboard dumpsters)	Off-site recycling	X			X	

Recommendation #	Specific status/ category	No longer occurring?	Reoccurrence so far (yrs)	Expected reoccurrence category (yrs)	Initial cost ($)	Actual cost savings ($/yr)	Projected/potential cost savings ($/yr)	Actual payback period (yr)	Projected payback period (yr)	Toxins category	Solid waste (lbs/yr)	Haz. waste (lbs/yr)	Haz. materials, lbs/yr
123	Not invest.			5-15 more	$3,600.00		$2,000.00	#DIV/0!	1.80				
124	Not invest.			5-15 more	$10,716.00		$5,600.00	#DIV/0!	1.91				
125	Not invest.			5-15 more	$123,210.00		$71,624.00	#DIV/0!	1.72				
126	Not invest.			5-15 more	$1,000,000.0 0		$65,000.00	#DIV/0!	15.38				
127	Not invest.			5-15 more	$40,000.00		$8,640.00	#DIV/0!	4.63				
128	As suggested			5-15 more	$300,000.00	$175,000.00	$175,000.00	1.71	1.71	0			
129	As suggested			5-15 more	$65,133.00	$46,000.00	$46,000.00	1.42	1.42	0			
130	As suggested				$4,003.40	$2,000.00	$2,000.00	2.00	2.00	0			
131	Investigated				$3,067.50		$9,000.00	#DIV/0!	0.34				
132	Investigated				$4,290.00		$3,438.00	#DIV/0!	1.25				
133	As Suggested				$211,178.00	$17,000.00	$17,000.00	12.42	12.42	0			
134	As Suggested				$0.00	$164.00	$164.00	0.00	0.00	0	8,000		
135	Investigated				$3,809.00		$2,189.00	#DIV/0!	1.74		1,490		
136	Investigated				$85,950.00		$13,516.00	#DIV/0!	6.36				
137	Investigated				Unknown		$50,000.00	#VALUE!	#VALUE!				
138	Investigated				$474.00		$2,412.00	#DIV/0!	0.20				
139	As Suggested			5-15 more	$1,543.00	$918.00	$918.00	1.68	1.68	0			
140	As Suggested				$600.00	Unknown	Unknown	#VALUE!	#VALUE!	0	79,200		

Recommendation #	Electricity (kWh/yr)	Water (gal/yr)	Natural gas (therms/yr)	Diesel fuel (gal/yr)	Gasoline (gal/yr)	GHG, MTCO2E/yr	Releases (lbs/yr)	Releases (type)
123			2,270			12.0764		
124			6,230			33.1436		
125	1,276,297					1386.058542		
126			63,000			335.16		
127			9,600			51.072		
128						-	1,250,000	Primary sludge/ top soil
129	569,865					557.32797		
130	22,000					21.516		
131		1,588,000				5.126064		
132		648,240				2.09251872		
133		3,144,000				10.148832		
134						0		
135						0		
136	8,400		22,100			125.7872		
137	28,125	1,206,114	2,550			44.96558599		
138	34,760					33.99528		
139			1,568			8.34176		
140						0		

						Survey #2: All reasons for implementing opportunity												Survey #3: Top reason for implementing opportunity											
Recommendation #	Survey #1 responded	Survey #2 responded	Survey #3 responded	Survey #4 responded	Survey #5 responded	**A2**: Acceptable payback	**B2**: Energy efficiency	**C2**: Reduced operating cost	**D2**: Increased employee productivity	**E2**: Health and safety benefits	**F2**: Regulatory compliance	**G2**: Reduced env. and health risk	**H2**: Reduced business risk	**I2**: Enhanced env. awareness	**J2**: Improved public image	**K2**: Other companies also implemented	**L2**: Corporate commitment	**A3**: Acceptable payback	**B3**: Energy efficiency	**C3**: Reduced operating cost	**D3**: Increased employee productivity	**E3**: Health and safety benefits	**F3**: Regulatory compliance	**G3**: Reduced env. and health risk	**H3**: Reduced business risk	**I3**: Enhanced env. awareness	**J3**: Improved public image	**K3**: Other companies also implemented	**L3**: Corporate commitment
123	X			X	X																								
124	X			X	X																								
125	X			X	X																								
126	X			X	X																								
127	X			X	X																								
128																													
129	X	X	X			1	1	1			1	1	1		1		1	1											
130	X	X	X			1	1	1	1						1		1	1											
131	X			X																									
132	X			X	X																								
133	X	X	X			1	1	1	1			1					1			1									
134	X	X	X					1		1					1		1										1		
135	X			X	X																								
136	X			X	X																								
137	X			X	X																								
138	X			X	X																								
139	X	X	X			1	1	1									1		1										
140	X	X	X												1		1												1

Recommendation #	Survey #4: All reasons for not implementing												Survey #5: Top reason for not implementing												Initial cost category	Projected payback category
	A4: Not technically feasible	**B4**: Lack of capital	**C4**: Insufficient financial payback	**D4**: Other priorities for capital investments	**E4**: Risk of production disruption/inconv./slow	**F4**: Lack of env./risk reduction benefits	**G4**: Limited in-plant expertise/capability	**H4**: Lack of staff awareness	**I4**: Customer specifications	**J4**: Uncertainty/lack of confidence in tech.	**K4**: Insufficient info regarding rec.	**L4**: Difficulty in coord. between units	**A5**: Not technically feasible	**B5**: Lack of capital	**C5**: Insufficient financial payback	**D5**: Other priorities for capital investments	**E5**: Risk of production disruption/inconv./slow	**F5**: Lack of env./risk reduction benefits	**G5**: Limited in-plant expertise/capability	**H5**: Lack of staff awareness	**I5**: Customer specifications	**J5**: Uncertainty/lack of confidence in tech.	**K5**: Insufficient info regarding rec.	**L5**: Difficulty in coord. between units		
123					1	1												1							>1,000	1-1.9 years
124				1		1										1									>1,000	1-1.9 years
125			1	1											1										>1,000	1-1.9 years
126			1	1	1	1										1									>1,000	>4 years
127						1												1							>1,000	>4 years
128																									>1,000	1-1.9 years
129																									>1,000	1-1.9 years
130																									>1,000	2-4 years
131	1	1	1	1									1												>1,000	<1 year
132				1												1									>1,000	1-1.9 years
133																									>1,000	>4 years
134																									<999	<1 year
135		1	1	1										1											>1,000	1-1.9 years
136		1	1	1										1											>1,000	>4 years
137		1												1											Unknown	Unknown
138		1	1	1										1											<999	<1 year
139																									>1,000	1-1.9 years
140																									<999	<1 year

Recommendation #	Year of assessment	Year of reassessment	Company #	Level of assis-tance	Company sector	Program (UNL/KSU)	P2 suggestion	P2 category	Implemented	Not implemented	Doing before	Originally Recommended	Originally Not recommended
141	2012	2014	15	Multi	Health care	KSU	Dual Flush Toilets (1.6 gpf toilets and retrofit public toilets)	Equipment/process modification		X		X	
142	2010	2014	16	Partial	Hospitality	KSU	Upgrade Ice Machines in Hallways (with Energy Star models)	Energy efficiency		X			X
143	2010	2014	16	Partial	Hospitality	KSU	Low-Flow Showerheads (1.67 to 1.0 gpm)	Equipment/process modification		X		X	
144	2010	2014	16	Partial	Hospitality	KSU	Faucet Aerators (Guestrooms and Hallway)	Equipment/process modification	X			X	
145	2010	2014	16	Partial	Hospitality	KSU	Dual Flush Toilets (or low-flow versions)	Equipment/process modification		X			X
146	2010	2014	16	Partial	Hospitality	KSU	Guestroom Occupancy Sensors	Energy efficiency		X		X	
147	2010	2014	16	Partial	Hospitality	KSU	Dining, Lobby, and Kitchen Occupancy Sensors	Energy efficiency		X		X	
148	2010	2014	16	Partial	Hospitality	KSU	Hallway and Stairwells Occupancy Sensors	Energy efficiency		X		X	
149	2011	2014	16	Partial	Hospitality	KSU	Lighting Upgrade (30W T8 to 22W T5)	Energy efficiency	X			X	
150	2011	2014	16	Partial	Hospitality	KSU	Dusk/Dawn Timers in lobby area, stairwells	Energy efficiency		X		X	
151	2011	2014	16	Partial	Hospitality	KSU	Guestroom Refrigerator and Dishwasher	Energy efficiency		X			X
152	2011	2014	16	Partial	Hospitality	KSU	PTAC (Packaged Terminal AC)	Energy efficiency		X			X
153	2011	2014	16	Partial	Hospitality	KSU	SPU (Single Packaged Vertical Units) Upgrade	Energy efficiency		X			X
154	2011	2014	16	Partial	Hospitality	KSU	Condenser Unit CoolNSave System	Energy efficiency		X			X
155	2011	2014	16	Partial	Hospitality	KSU	Recycle Dumpster (use of trash haulers program that segregates recyclables from trash)	In-process recycling/modify waste stream	X			X	
156	2011	2014	16	Partial	Hospitality	KSU	Air Handler	Energy efficiency		X			X
157	2011	2014	17	Multi	Manufacturing	KSU	Compressed Air Audit	Improved housekeeping/ preventative maintenance	X			X	
158	2011	2014	17	Multi	Manufacturing	KSU	Water Conservation (reuse of rinse runoff)	In-process recycling/modify waste stream	X			X	

Recommendation #	Specific status/ category	No longer occurring?	Reoccurrence so far (yrs)	Expected reoccurrence category (yrs)	Initial cost ($)	Actual cost savings ($/yr)	Projected/potential cost savings ($/yr)	Actual payback period (yr)	Projected payback period (yr)	Toxins category	Solid waste (lbs/yr)	Haz. waste (lbs/yr)	Haz. materials, lbs/yr
141	Investigated				$1,534.00		$199.00	#DIV/0!	7.71				
142	Not invest.				$2,138.00		$149.00	#DIV/0!	14.35				
143	Don't Know				$5,728.50		$1,778.00	#DIV/0!	3.22				
144	As suggested		4	5-15 more	$327.00	$2,016.00	$2,016.00	0.16	0.16	0			
145	Don't Know				$40,138.00		$386.00	#DIV/0!	103.98				
146	Investigated				$2,062.80		$3,423.00	#DIV/0!	0.60				
147	Investigated				$120.23		$294.00	#DIV/0!	0.41				
148	Investigated				$378.90		$1,170.00	#DIV/0!	0.32				
149	As suggested			5-15 more	$1,780.00	$870.00	$870.00	2.05	2.05	0			
150	Investigated				$156.55		$291.00	#DIV/0!	0.54				
151	Don't know				$95,062.50		$6,421.00	#DIV/0!	14.80				
152	Don't know				$6,856.00		$1,766.00	#DIV/0!	3.88				
153	Don't know				$163,534.00		$23,362.00	#DIV/0!	7.00				
154	Don't know				$9,990.00		$2,077.00	#DIV/0!	4.81				
155	As suggested			5-15 more	$454.00	$657.00	$657.00	0.69	0.69	0	30,000		
156	Don't know				$1,196.00		$366.00	#DIV/0!	3.27				
157	As suggested				$0.00	$10,395.00	$10,395.00	0.00	0.00	0			
158	As suggested		2		Unknown	$9,105.00	$9,105.00	#VALUE!	#VALUE!	0			

Recommendation #	Electricity (kWh/yr)	Water (gal/yr)	Natural gas (therms/yr)	Diesel fuel (gal/yr)	Gasoline (gal/yr)	GHG, MTCO2E/yr	Releases (lbs/yr)	Releases (type)
141		15,330				0.04948524		
142	1,032	10,652				1.043680656		
143		336,259				1.085444052		
144		381,118				1.230248904		
145		73,023				0.235718244		
146	38,036					37.199208		
147	3,267					3.195126		
148	13,008					12.721824		
149	10,307					10.080246		
150	3,241					3.169698		
151	71,347					69.777366		
152	19,629					19.197162		
153	259,578					253.867284		
154	30,298					29.631444		
155						0		
156	4,067					3.977526		
157	173,250					169.4385		
158		1,000,000	2,820			18.2304		

Recommendation #	Survey #1 responded	Survey #2 responded	Survey #3 responded	Survey #4 responded	Survey #5 responded	Survey #2: All reasons for implementing opportunity												Survey #3: Top reason for implementing opportunity											
						A2: Acceptable payback	**B2**: Energy efficiency	**C2**: Reduced operating cost	**D2**: Increased employee productivity	**E2**: Health and safety benefits	**F2**: Regulatory compliance	**G2**: Reduced env. and health risk	**H2**: Reduced business risk	**I2**: Enhanced env. awareness	**J2**: Improved public image	**K2**: Other companies also implemented	**L2**: Corporate commitment	**A3**: Acceptable payback	**B3**: Energy efficiency	**C3**: Reduced operating cost	**D3**: Increased employee productivity	**E3**: Health and safety benefits	**F3**: Regulatory compliance	**G3**: Reduced env. and health risk	**H3**: Reduced business risk	**I3**: Enhanced env. awareness	**J3**: Improved public image	**K3**: Other companies also implemented	**L3**: Corporate commitment
141	X			X	X																								
142	X			X	X																								
143	X			X	X																								
144	X	X	X			1	1	1						1	1	1	1			1									
145	X			X	X																								
146	X			X	X																								
147	X			X	X																								
148	X			X	X																								
149	X	X	X			1	1	1						1	1	1	1			1									
150	X			X	X																								
151	X																												
152	X																												
153	X																												
154	X																												
155	X	X	X											1	1	1	1									1			
156	X																												
157	X	X	X			1	1	1		1		1					1		.5	.5									
158	X	X	X			1	1	1				1	1	1	1		1		.5	.5									

Recommendation #	Survey #4: All reasons for not implementing												Survey #5: Top reason for not implementing												Initial cost category	Projected payback category
	A4: Not technically feasible	**B4**: Lack of capital	**C4**: Insufficient financial payback	**D4**: Other priorities for capital investments	**E4**: Risk of production disruption/inconv./slow	**F4**: Lack of env./risk reduction benefits	**G4**: Limited in-plant expertise/capability	**H4**: Lack of staff awareness	**I4**: Customer specifications	**J4**: Uncertainty/lack of confidence in tech.	**K4**: Insufficient info regarding rec.	**L4**: Difficulty in coord. between units	**A5**: Not technically feasible	**B5**: Lack of capital	**C5**: Insufficient financial payback	**D5**: Other priorities for capital investments	**E5**: Risk of production disruption/inconv./slow	**F5**: Lack of env./risk reduction benefits	**G5**: Limited in-plant expertise/capability	**H5**: Lack of staff awareness	**I5**: Customer specifications	**J5**: Uncertainty/lack of confidence in tech.	**K5**: Insufficient info regarding rec.	**L5**: Difficulty in coord. between units		
141		1	1	1										1											>1,000	>4 years
142		1		1												1									>1,000	>4 years
143									1												1				>1,000	2-4 years
144																									<999	<1 year
145		1		1												1									>1,000	>4 years
146				1												1									>1,000	<1 year
147				1												1									<999	<1 year
148	1			1		1			1												1				<999	<1 year
149																									>1,000	2-4 years
150	1			1		1			1												1				<999	<1 year
151																									>1,000	>4 years
152																									>1,000	2-4 years
153																									>1,000	>4 years
154																									>1,000	>4 years
155																									<999	<1 year
156																									>1,000	2-4 years
157																									<999	<1 year
158																									Unknown	Unknown

Recommendation #	Year of assessment	Year of reassessment	Company #	Level of assis-tance	Company sector	Program (UNL/KSU)	P2 suggestion	P2 category	Implemented	Not implemented	Doing before	Originally Recommended	Originally Not recommended
159	2011	2014	17	Multi	Manufacturing	KSU	Production Lighting (replace lighting)	Energy efficiency		X		X	
160	2011	2014	17	Multi	Manufacturing	KSU	Burn-Off Oven (upgrade to burner-over that can better target parts)	Energy efficiency		X		X	
161	2012	2014	17	Multi	Manufacturing	KSU	Filter Changing Schedule	Training/policies	X			X	
162	2012	2014	17	Multi	Manufacturing	KSU	Vortex A/C and VFD (Install VFD on Vortex A/C)	Energy efficiency		X		X	
163	2012	2014	17	Multi	Manufacturing	KSU	Electricity Conservation: vending misers	Energy efficiency		X		X	
164	2012	2014	17	Multi	Manufacturing	KSU	Argon Leak (fix leak)	Improved housekeeping/ preventative maintenance	X			X	
165	2012	2014	17	Multi	Manufacturing	KSU	Washer Chemical (replace with more environmental friendly)	Material substitution	X			X	
166	2012	2014	17	Multi	Manufacturing	KSU	Powder Coat Booth Pumps (install new ones — currently awaiting approval)	Energy efficiency	X			X	
167	2012	2014	17	Multi	Manufacturing	KSU	Painter Training	Training/policies		X		X	
168	2013	2014	17	Multi	Manufacturing	KSU	Cardboard Bailer (acquire bailer)	Off-site recycling		X		X	
169	2013	2014	17	Multi	Manufacturing	KSU	Distiller Review (intern review of distiller efficiency)	Equipment/process modification	X			X	
170	2013	2014	17	Multi	Manufacturing	KSU	Air Leak Audit (Implement Air Audit program)	Improved housekeeping/ preventative maintenance	X			X	
171	2013	2014	17	Multi	Manufacturing	KSU	Welding Gas Leaks (fix leaks)	Improved housekeeping/ preventative maintenance	X			X	
172	2013	2014	17	Multi	Manufacturing	KSU	Gas Leaks (fix leaks)	Improved housekeeping/ preventative maintenance	X			X	
173	2013	2014	17	Multi	Manufacturing	KSU	Electricity Conservation: E-room close off	Energy efficiency		X		X	
174	2013	2014	17	Multi	Manufacturing	KSU	Roof Waste (reflective coating for roof)	Equipment/process modification		.		X	
175	2007	2014	18	Multi	Manufacturing	KSU	Destoner/Vertical Lift	Equipment/process modification	X			X	
176	2007	2014	18	Multi	Manufacturing	KSU	Orifice	Equipment/process modification	X			X	

Recommendation #	Specific status/ category	No longer occurring?	Reoccurrence so far (yrs)	Expected reoccurrence category (yrs)	Initial cost ($)	Actual cost savings ($/yr)	Projected/potential cost savings ($/yr)	Actual payback period (yr)	Projected payback period (yr)	Toxins category	Solid waste (lbs/yr)	Haz. waste (lbs/yr)	Haz. materials, lbs/yr
159	Investigated				$128,480.00		$24,720.00	#DIV/0!	5.20				
160	Investigated				$18,000.00		$1,159.00	#DIV/0!	15.53				
161	As suggested			5-15 more	$0.00	$18,552.00	$18,552.00	0.00	0.00	0	16,000		
162	Investigated				$1,050.00		$2,033.00	#DIV/0!	0.52				
163	Investigated				$1,210.00		$1,531.00	#DIV/0!	0.79				
164	As suggested		2	5-15 more	$0.00	$30,294.00	$30,294.00	0.00	0.00	0			
165	As suggested				Unknown	$30,168.00	$30,168.00	#VALUE!	#VALUE!	1			
166	As suggested		0		$16,830.00	$13,782.00	$13,782.00	1.22	1.22	0			
167	Investigated				$4,000.00		$32,000.00	#DIV/0!	0.13			6,000	
168	Investigated				Unknown		$1,176.00	#VALUE!	#VALUE!		150,000		
169	As suggested		2	5-15 more	$19,250.00	$18,000.00	$18,000.00	1.07	1.07	1		16,000	
170					$0.00	$4,399.00	$4,399.00	0.00	0.00	0			
171	As suggested				$0.00	$30,294.00	$30,294.00	0.00	0.00	0			
172	As suggested				$0.00	$1,799.00	$1,799.00	0.00	0.00	0			
173	Investigated				$1,000.00		$51,182.00	#DIV/0!	0.02				
174	Investigated				$285,000.00		$852,000.00	#DIV/0!	0.33				
175	As suggested		6	5-15 more	$90.00	$10,815.00	$10,815.00	0.01	0.01	0			
176	As suggested		6	5-15 more	$90.00	$10,412.00	$10,412.00	0.01	0.01	0			

Recommendation #	Electricity (kWh/yr)	Water (gal/yr)	Natural gas (therms/yr)	Diesel fuel (gal/yr)	Gasoline (gal/yr)	GHG, MTCO2E/yr	Releases (lbs/yr)	Releases (type)
159	254,700					249.0966		
160			2,250			11.97		
161						0		
162	25,413					24.853914		
163	19,138					18.716964		
164						0	1,329,000 cubic feet of Argon	
165			60,000			319.2		
166	172,275					168.48495		
167						0		
168						0		
169						0		
170	54,988					53.778264		
171						0	1,504,342 cubic feet of welding gas	
172			5,940			31.6008		
173	522,652					511.153656		
174						0		
175		2,150,000				6.9402		
176		2,070,000				6.68196		

						Survey #2: All reasons for implementing opportunity												Survey #3: Top reason for implementing opportunity											
Recommendation #	Survey #1 responded	Survey #2 responded	Survey #3 responded	Survey #4 responded	Survey #5 responded	**A2**: Acceptable payback	**B2**: Energy efficiency	**C2**: Reduced operating cost	**D2**: Increased employee productivity	**E2**: Health and safety benefits	**F2**: Regulatory compliance	**G2**: Reduced env. and health risk	**H2**: Reduced business risk	**I2**: Enhanced env. awareness	**J2**: Improved public image	**K2**: Other companies also implemented	**L2**: Corporate commitment	**A3**: Acceptable payback	**B3**: Energy efficiency	**C3**: Reduced operating cost	**D3**: Increased employee productivity	**E3**: Health and safety benefits	**F3**: Regulatory compliance	**G3**: Reduced env. and health risk	**H3**: Reduced business risk	**I3**: Enhanced env. awareness	**J3**: Improved public image	**K3**: Other companies also implemented	**L3**: Corporate commitment
159	X			X	X																								
160	X			X	X																								
161	X	X	X			1	1	1	1	1	1	1	1				1							.5					.5
162	X			X	X																								
163	X			X	X																								
164	X	X	X			1	1	1		1		1					1					.5		.5					
165	X	X	X				1			1	1	1	1	1	1		1					.5		.5					
166	X	X	X	X	X	1	1	1											.5	.5									
167	X			X	X																								
168	X			X	X																								
169	X	X	X			1	1	1			1	1	1	1	1		1							.5					.5
170	X	X	X			1	1	1		1		1					1		.5	.5									
171	X	X	X			1	1	1		1		1					1					.5		.5					
172	X	X	X			1	1	1		1		1					1					.5		.5					
173	X			X	X																								
174	X			X	X																								
175	X	X	X			1	1	1					1				1			1									
176	X	X	X			1	1	1					1				1			1									

Recommendation #	Survey #4: All reasons for not implementing												Survey #5: Top reason for not implementing												Initial cost category	Projected payback category
	A4: Not technically feasible	**B4**: Lack of capital	**C4**: Insufficient financial payback	**D4**: Other priorities for capital investments	**E4**: Risk of production disruption/inconv./slow	**F4**: Lack of env./risk reduction benefits	**G4**: Limited in-plant expertise/capability	**H4**: Lack of staff awareness	**I4**: Customer specifications	**J4**: Uncertainty/lack of confidence in tech.	**K4**: Insufficient info regarding rec.	**L4**: Difficulty in coord. between units	**A5**: Not technically feasible	**B5**: Lack of capital	**C5**: Insufficient financial payback	**D5**: Other priorities for capital investments	**E5**: Risk of production disruption/inconv./slow	**F5**: Lack of env./risk reduction benefits	**G5**: Limited in-plant expertise/capability	**H5**: Lack of staff awareness	**I5**: Customer specifications	**J5**: Uncertainty/lack of confidence in tech.	**K5**: Insufficient info regarding rec.	**L5**: Difficulty in coord. between units		
159				1												1									>1,000	>4 years
160				1												1									>1,000	>4 years
161																									<999	<1 year
162				1												1									>1,000	<1 year
163				1												1									>1,000	<1 year
164																									<999	<1 year
165																									Unknown	Unknown
166				1												1									>1,000	1-1.9 years
167				1												1									>1,000	<1 year
168				1												1									Unknown	Unknown
169																									>1,000	1-1.9 years
170																									<999	<1 year
171																									<999	<1 year
172																									<999	<1 year
173				1												1									>1,000	<1 year
174		1	1	1												1									>1,000	<1 year
175																									<999	<1 year
176																									<999	<1 year

Recommendation #	Year of assessment	Year of reassessment	Company #	Level of assis-tance	Company sector	Program (UNL/KSU)	P2 suggestion	P2 category	Implemented	Not implemented	Doing before	Originally Recommended	Originally Not recommended
177	2007	2014	18	Multi	Manufacturing	KSU	Flume	Equipment/process modification	X			X	
178	2007	2014	18	Multi	Manufacturing	KSU	Orifice	Equipment/process modification	X			X	
179	2007	2014	18	Multi	Manufacturing	KSU	Belt Timer	Equipment/process modification	X			X	
180	2007	2014	18	Multi	Manufacturing	KSU	Belt Timer	Equipment/process modification	X			X	
181	2007	2014	18	Multi	Manufacturing	KSU	Sweep Clean	Equipment/process modification	X			X	
182	2007	2014	18	Multi	Manufacturing	KSU	Chip Orifice	Equipment/process modification		X		X	
183	2007	2014	18	Multi	Manufacturing	KSU	Orifice	Equipment/process modification		X		X	
184	2008	2014	18	Multi	Manufacturing	KSU	Insulation	Energy efficiency	X			X	
185	2008	2014	18	Multi	Manufacturing	KSU	Hand Dryer (Dyson Airblade)	Equipment/process modification	X			X	
186	2009	2014	18	Multi	Manufacturing	KSU	Lighting Project	Energy efficiency	X			X	
187	2009	2014	18	Multi	Manufacturing	KSU	Wastewater Belt Cake Sale	In-process recycling/modify waste stream	X			X	
188	2008	2014	19	One	Manufacturing	KSU	Slag Treatment Project (Furnace slag)	In-process recycling/modify waste stream		X		X	
189	2008	2014	19	One	Manufacturing	KSU	EP Dust Treatment	In-process recycling/modify waste stream		X		X	
190	2008	2014	19	One	Manufacturing	KSU	Furnace Brick/Cleaning Project	Material substitution	X			X	
191	2007	2014	20	Multi	Public	KSU	Parts Washer Solvent (CUP program)	Material substitution	X			X	
192	2007	2014	20	Multi	Public	KSU	Sodium Analyzers using MEA (replace MEA with DIPA)	Material substitution		X		X	
193	2007	2014	20	Multi	Public	KSU	Silver Reclamation from Film Fixer	In-process recycling/modify waste stream		X		X	
194	2007	2014	20	Multi	Public	KSU	Ammonium Hydroxide (use of waste-exchange partner)	In-process recycling/modify waste stream	X			X	

Recommendation #	Specific status/ category	No longer occurring?	Reoccurrence so far (yrs)	Expected reoccurence category (yrs)	Initial cost ($)	Actual cost savings ($/yr)	Projected/potential cost savings ($/yr)	Actual payback period (yr)	Projected payback period (yr)	Toxins category	Solid waste (lbs/yr)	Haz. waste (lbs/yr)	Haz. materials, lbs/yr
177	As suggested		6	5-15 more	$90.00	$14,436.00	$14,436.00	0.01	0.01	0			
178	As suggested		6	5-15 more	$90.00	$5,634.00	$5,634.00	0.02	0.02	0			
179	As suggested		6	5-15 more	$90.00	$5,432.00	$5,432.00	0.02	0.02	0			
180	As suggested		6	5-15 more	$90.00	Unknown	Unknown	#VALUE!	#VALUE!	0			
181	As suggested		6	5-15 more	$90.00	$10,110.00	$10,110.00	0.01	0.01	0			
182	Investigated				$56.00		$8,400.00	#DIV/0!	0.01				
183	Investigated				$56.00		$2,264.00	#DIV/0!	0.02				
184	As suggested		6	5-15 more	$136,000.00	$14,000.00	$14,000.00	9.71	9.71	0			
185	As suggested		4	5-15 more	$35,280.00	$6,300.00	$6,300.00	5.60	5.60	0	19,200		
186	As suggested			5-15 more	$470,000.00	$124,000.00	$124,000.00	3.79	3.79	0			
187	As suggested			5-15 more	$0.00	$262,000.00	$262,000.00	0.00	0.00	0	12,400,000		
188	Investigated				Unknown		$0.00	#VALUE!	#VALUE!	1		72,000	
189	Investigated				Unknown		$23,000.00	#VALUE!	#VALUE!	1			730,000
190	With mod.				Unknown	Unknown	Unknown	#VALUE!	#VALUE!	0			
191	As suggested			5-15 more	Unknown	Unknown	Unknown	#VALUE!	#VALUE!	1			3,200
192	Investigated				Unknown		$270.00	#VALUE!	#VALUE!	1		57	
193	Investigated				Unknown		$320.00	#VALUE!	#VALUE!	1		480	
194	As suggested	X	1 time	<1 year	$1,166.88	$2,333.00	$2,333.00	0.50	0.50	1			10,400

Recommendation #	Electricity (kWh/yr)	Water (gal/yr)	Natural gas (therms/yr)	Diesel fuel (gal/yr)	Gasoline (gal/yr)	GHG, MTCO2E/yr	Releases (lbs/yr)	Releases (type)
177		2,870,000				9.26436		
178		1,120,000				3.61536		
179		1,080,000				3.48624		
180						0		
181		2,010,000				6.48828		
182		1,670,000				5.39076		
183		450,000				1.4526		
184	245,622					240.218316		
185						0		
186	1,979,000					1935.462		
187						0		
188						0		
189						0		
190						0		
191						0		
192						0		
193						0		
194						0		

Recommendation #	Survey #1 responded	Survey #2 responded	Survey #3 responded	Survey #4 responded	Survey #5 responded	Survey #2: All reasons for implementing opportunity												Survey #3: Top reason for implementing opportunity											
						A2: Acceptable payback	**B2**: Energy efficiency	**C2**: Reduced operating cost	**D2**: Increased employee productivity	**E2**: Health and safety benefits	**F2**: Regulatory compliance	**G2**: Reduced env. and health risk	**H2**: Reduced business risk	**I2**: Enhanced env. awareness	**J2**: Improved public image	**K2**: Other companies also implemented	**L2**: Corporate commitment	**A3**: Acceptable payback	**B3**: Energy efficiency	**C3**: Reduced operating cost	**D3**: Increased employee productivity	**E3**: Health and safety benefits	**F3**: Regulatory compliance	**G3**: Reduced env. and health risk	**H3**: Reduced business risk	**I3**: Enhanced env. awareness	**J3**: Improved public image	**K3**: Other companies also implemented	**L3**: Corporate commitment
177	X	X	X			1	1	1					1				1			1									
178	X	X	X			1	1	1					1				1			1									
179	X	X	X			1	1	1					1				1			1									
180	X	X	X			1	1	1					1				1			1									
181	X	X	X			1	1	1					1				1			1									
182	X			X	X																								
183	X			X	X																								
184	X	X	X			1	1	1					1				1			1									
185	X	X	X			1				1				1	1		1									1			
186	X	X	X			1	1	1	1				1	1	1		1			1									
187	X	X	X			1		1					1	1	1		1												1
188	X			X	X																								
189	X			X	X																								
190	X	X	X							1	1	1										1							
191	X	X	X								1	1	1				1												1
192	X			X	X																								
193	X			X	X																								
194	X	X	X												1		1												1

	Survey #4: All reasons for not implementing												Survey #5: Top reason for not implementing													
Recommendation #	**A4**: Not technically feasible	**B4**: Lack of capital	**C4**: Insufficient financial payback	**D4**: Other priorities for capital investments	**E4**: Risk of production disruption/inconv./slow	**F4**: Lack of env./risk reduction benefits	**G4**: Limited in-plant expertise/capability	**H4**: Lack of staff awareness	**I4**: Customer specifications	**J4**: Uncertainty/lack of confidence in tech.	**K4**: Insufficient info regarding rec.	**L4**: Difficulty in coord. between units	**A5**: Not technically feasible	**B5**: Lack of capital	**C5**: Insufficient financial payback	**D5**: Other priorities for capital investments	**E5**: Risk of production disruption/inconv./slow	**F5**: Lack of env./risk reduction benefits	**G5**: Limited in-plant expertise/capability	**H5**: Lack of staff awareness	**I5**: Customer specifications	**J5**: Uncertainty/lack of confidence in tech.	**K5**: Insufficient info regarding rec.	**L5**: Difficulty in coord. between units	Initial cost category	Projected payback category
177																									<999	<1 year
178																									<999	<1 year
179																									<999	<1 year
180																									<999	<1 year
181																									<999	<1 year
182									1												1				<999	<1 year
183									1												1				<999	<1 year
184																									>1,000	>4 years
185																									>1,000	>4 years
186																									>1,000	2-4 years
187																									<999	<1 year
188		1			1		1							1											Unknown	Unknown
189		1			1		1							1											Unknown	Unknown
190																									Unknown	Unknown
191																									Unknown	Unknown
192	1												1												Unknown	Unknown
193			1												1										Unknown	Unknown
194																									>1,000	<1 year

Recommendation #	Year of assessment	Year of reassessment	Company #	Level of assis-tance	Company sector	Program (UNL/KSU)	P2 suggestion	P2 category	Implemented	Not implemented	Doing before	Originally Recommended	Originally Not recommended
195	2008	2014	20	Multi	Public	KSU	Reduce Styrofoam	Training/policies	X			X	
196	2008	2014	20	Multi	Public	KSU	Hand dryers (install in restrooms)	Equipment/process modification		X		X	
197	2008	2014	20	Multi	Public	KSU	Recycling Plastics (bottles)	Off-site recycling	X			X	
198	2008	2014	20	Multi	Public	KSU	Recycling Wood Pallets — Not on survey (not recommended)	Off-site recycling		X			X
199	2008	2014	20	Multi	Public	KSU	Recycling Tires	Off-site recycling	X			X	
200	2009	2014	20	Multi	Public	KSU	HVAC Unit Replacement	Equipment/process modification	X			X	
201	2009	2014	20	Multi	Public	KSU	UVC Germicidal Lamps (install lamps to irradiate HVAC unit evaporator coils)	Equipment/process modification		X		X	
202	2009	2014	20	Multi	Public	KSU	Warehouse Lighting (update warehouse lighting)	Energy efficiency	X			X	
203	2009	2014	20	Multi	Public	KSU	Office Lighting (install timers)	Energy efficiency		X		X	
204	2009	2014	20	Multi	Public	KSU	Purchase electric vehicle for use as mail van	Equipment/process modification		X		X	
205	2009	2014	20	Multi	Public	KSU	Purchase Electric Utility vehicle for on-site use	Equipment/process modification		X		X	
206	2010	2014	21	Partial	Hospitality	KSU	Upgrade Kitchen Hoods	Energy efficiency		X		X	
207	2010	2014	21	Partial	Hospitality	KSU	Faucet Aerators in Guestrooms (0.5 gpm multi-stream laminar flow)	Equipment/process modification		X		X	
208	2010	2014	21	Partial	Hospitality	KSU	Aerators for Kitchen Hand Washer Faucets	Equipment/process modification		X		X	
209	2010	2014	21	Partial	Hospitality	KSU	Low-Flow Kitchen Sprayer (0.64 gpm)	Equipment/process modification		X		X	
210	2012	2014	21	Partial	Hospitality	KSU	Aerators in public and employee restrooms	Equipment/process modification		X		X	
211	2012	2014	21	Partial	Hospitality	KSU	Lighting Upgrades and Sensors	Energy efficiency	X			X	
212	2012	2014	21	Partial	Hospitality	KSU	Vending Misers	Energy efficiency		X		X	

Recommendation #	Specific status/ category	No longer occuring?	Reoccurrence so far (yrs)	Expected reoccurrence category (yrs)	Initial cost ($)	Actual cost savings ($/yr)	Projected/potential cost savings ($/yr)	Actual payback period (yr)	Projected payback period (yr)	Toxins category	Solid waste (lbs/yr)	Haz. waste (lbs/yr)	Haz. materials, lbs/yr
195	As suggested				$475.50	$2,022.50	$2,022.50	0.24	0.24	0			
196	Investigated				$55,250.00		$16,404.50	#DIV/0!	3.37		8,400		
197	As suggested				$0.00	Unknown	Unknown	#VALUE!	#VALUE!	0			
198	Not invest.				Unknown		Unknown	#VALUE!	#VALUE!		4,800		
199	As suggested			5-15 more	Unknown	Unknown	Unknown	#VALUE!	#VALUE!	0			
200	As suggested				$478,452.00	$8,417.00	$8,417.00	56.84	56.84	0	1,000		
201	Investigated				$400.00		Unknown	#DIV/0!	#VALUE!				
202	As suggested				$30,778.00	$31,000.00	$31,000.00	0.99	0.99	0			
203					$52,375.00		$52,000.00	#DIV/0!	1.01				
204	Investigated				$14,500.00		$600.00	#DIV/0!	24.17				
205	Investigated				$45,000.00		$1,600.00	#DIV/0!	28.13				
206	Investigated				$45,135.00		$4,500.00	#DIV/0!	10.03				
207	Investigated				$1,125.00		$5,112.00	#DIV/0!	0.22				
208	Investigated				$10.89		$99.00	#DIV/0!	0.11				
209	Investigated				$18.06		$868.00	#DIV/0!	0.02				
210					$60.00		$1,141.00	#DIV/0!	0.05				
211	As suggested				$180.00	$95.00	$95.00	1.89	1.89	0			
212					$3,800.00		$1,710.00	#DIV/0!	2.22				

Recommendation #	Electricity (kWh/yr)	Water (gal/yr)	Natural gas (therms/yr)	Diesel fuel (gal/yr)	Gasoline (gal/yr)	GHG, MTCO2E/yr	Releases (lbs/yr)	Releases (type)
195						0		
196						0		
197						0		
198						0		
199						0		
200	107,640					105.27192		
201						0		
202	394,000					385.332		
203	670,000					655.26		
204					190	0		
205					670	0		
206	50,000					48.9		
207		639,115				2.06306322		
208		12,410				0.04005948		
209		108,510				0.35027028		
210		249,164				0.804301392		
211	1,050					1.0269		
212	36,000					35.208		

Recommendation #	Survey #1 responded	Survey #2 responded	Survey #3 responded	Survey #4 responded	Survey #5 responded	Survey #2: All reasons for implementing opportunity												Survey #3: Top reason for implementing opportunity											
						A2: Acceptable payback	**B2**: Energy efficiency	**C2**: Reduced operating cost	**D2**: Increased employee productivity	**E2**: Health and safety benefits	**F2**: Regulatory compliance	**G2**: Reduced env. and health risk	**H2**: Reduced business risk	**I2**: Enhanced env. awareness	**J2**: Improved public image	**K2**: Other companies also implemented	**L2**: Corporate commitment	**A3**: Acceptable payback	**B3**: Energy efficiency	**C3**: Reduced operating cost	**D3**: Increased employee productivity	**E3**: Health and safety benefits	**F3**: Regulatory compliance	**G3**: Reduced env. and health risk	**H3**: Reduced business risk	**I3**: Enhanced env. awareness	**J3**: Improved public image	**K3**: Other companies also implemented	**L3**: Corporate commitment
195	X	X	X											1	1		1												1
196	X			X	X																								
197	X	X	X											1	1		1												1
198	X																												
199	X	X	X														1												1
200	X	X	X			1	1	1											1										
201	X			X	X																								
202	X	X	X			1	1		1	1												1							
203	X			X	X																								
204	X			X	X																								
205	X			X	X																								
206	X			X	X																								
207	X			X	X																								
208	X			X	X																								
209	X			X	X																								
210	X			X	X																								
211	X	X	X			1	1	1						1	1		1		1										
212	X			X	X																								

Recommendation #	Survey #4: All reasons for not implementing												Survey #5: Top reason for not implementing												Initial cost category	Projected payback category
	A4: Not technically feasible	**B4**: Lack of capital	**C4**: Insufficient financial payback	**D4**: Other priorities for capital investments	**E4**: Risk of production disruption/inconv./slow	**F4**: Lack of env./risk reduction benefits	**G4**: Limited in-plant expertise/capability	**H4**: Lack of staff awareness	**I4**: Customer specifications	**J4**: Uncertainty/lack of confidence in tech.	**K4**: Insufficient info regarding rec.	**L4**: Difficulty in coord. between units	**A5**: Not technically feasible	**B5**: Lack of capital	**C5**: Insufficient financial payback	**D5**: Other priorities for capital investments	**E5**: Risk of production disruption/inconv./slow	**F5**: Lack of env./risk reduction benefits	**G5**: Limited in-plant expertise/capability	**H5**: Lack of staff awareness	**I5**: Customer specifications	**J5**: Uncertainty/lack of confidence in tech.	**K5**: Insufficient info regarding rec.	**L5**: Difficulty in coord. between units		
195																									<999	<1 year
196								1												1					>1,000	2-4 years
197																									<999	<1 year
198																									<999	>4 years
199																									<999	>4 years
200																									>1,000	>4 years
201						1												1							<999	Unknown
202																									>1,000	<1 year
203								1		1												1			>1,000	1-1.9 years
204			1												1										>1,000	>4 years
205			1												1										>1,000	>4 years
206		1		1										1											>1,000	>4 years
207				1								1												1	>1,000	<1 year
208				1								1												1	<999	<1 year
209					1			1									1								<999	<1 year
210				1								1												1	<999	<1 year
211																									<999	1-1.9 years
212				1						1	1	1				1									>1,000	2-4 years

Recommendation #	Year of assessment	Year of reassessment	Company #	Level of assis-tance	Company sector	Program (UNL/KSU)	P2 suggestion	P2 category	Implemented	Not implemented	Doing before	Originally Recommended	Originally Not recommended
213	2007	2014	22	One	Manufacturing	KSU	Pelletization (diverting waste to be used as alternate fuel source)	In-process recycling/modify waste stream	X			X	
214	2007	2014	22	One	Manufacturing	KSU	Air Leak Audit (maintenance of the compressed air supply system)	Improved housekeeping/ preventative maintenance	X			X	
215	2012	2014	23	Partial	Hospitality	KSU	Lighting Upgrades and Sensors	Energy efficiency	X			X	
216	2012	2014	23	Partial	Hospitality	KSU	1.0 GPM Aerators	Equipment/process modification	X			X	
217	2009	2014	24	Partial	Health care	KSU	Vending Misers (install on 5 machines)	Energy efficiency	X			X	
218	2009	2014	24	Partial	Health care	KSU	Kitchen Hoods (install intelli-hood kitchen hood retrofit)	Energy efficiency		X		X	
219	2009	2014	24	Partial	Health care	KSU	U-bulb Savings (replace 2x2 fixtures with 4x2)	Energy efficiency		X		X	
220	2009	2014	24	Partial	Health care	KSU	Manual Light Shut-off	Training/policies		X		X	
221	2009	2014	24	Partial	Health care	KSU	De-Lamping	Energy efficiency		X		X	
222	2009	2014	25	Multi	Health care	KSU	Aerator Replacement	Equipment/process modification	X			X	
223	2009	2014	25	Multi	Health care	KSU	Steam Traps (audit and maintenance program)	Improved housekeeping/ preventative maintenance	X			X	
224	2007	2014	25	Multi	Health care	KSU	Computer and Monitor Power Management (installation of software)	Energy efficiency		X		X	
225	2007	2014	25	Multi	Health care	KSU	Re-Lighting (De-lamping and integration of timers and sensors)	Energy efficiency	X			X	
226	2008	2014	25	Multi	Health care	KSU	Energy Programs (employee awareness)	Training/policies	X			X	
227	2007	2014	25	Multi	Health care	KSU	Energy Star Products (Energy Star awareness program)	Energy efficiency	X			X	
228	2010	2014	25	Multi	Health care	KSU	eQuest Modeling (model tool of facility)	Training/policies	X			X	
229	2011	2014	25	Multi	Health care	KSU	VFDs and Increasing Supply Temperature	Energy efficiency	X			X	
230	2011	2014	25	Multi	Health care	KSU	Storage Center (producing ice ahead of time instead of during peak times)	Energy efficiency		X			X

Recommendation #	Specific status/ category	No longer occuring?	Reoccurrence so far (yrs)	Expected reoccurrence category (yrs)	Initial cost ($)	Actual cost savings ($/yr)	Projected/potential cost savings ($/yr)	Actual payback period (yr)	Projected payback period (yr)	Toxins category	Solid waste (lbs/yr)	Haz. waste (lbs/yr)	Haz. materials, lbs/yr
213	As suggested			5-15 more	$10,000.00	$0.00	$0.00	#DIV/0!	#DIV/0!	0	50,000		
214	As suggested			5-15 more	$0.00	$37,200.00	$37,200.00	0.00	0.00	0			
215	As suggested			5-15 more	$16,877.00	$26,447.00	$26,447.00	0.64	0.64	0			
216	As suggested			5-15 more	$933.00	$3,100.00	$3,100.00	0.30	0.30	0			
217	As suggested	X	1	<1 year	$800.00	$606.00	$606.00	1.32	1.32	0			
218	Don't know				$3,919.00		$3,919.00	#DIV/0!	1.00				
219	Don't know				$6,162.00		$6,919.00	#DIV/0!	0.89				
220	Don't know				Unknown		$3,321.00	#VALUE!	#VALUE!				
221	Don't know				$13,643.00		$8,527.00	#DIV/0!	1.60				
222	As suggested			5-15 more	$2,924.00	$41,000.00	$41,000.00	0.07	0.07	0			
223	As suggested			5-15 more	$0.00	$45,000.00	$45,000.00	0.00	0.00	0			
224	Investigated				Unknown		$22,500.00	#VALUE!	#VALUE!				
225	As suggested			5-15 more	$10,945.00	$31,409.00	$31,409.00	0.35	0.35	0			
226	With mod.			5-15 more	$0.00	$53,000.00	$53,000.00	0.00	0.00	0			
227	As suggested				$0.00	$27,090.00	$27,090.00	0.00	0.00	0			
228	As suggested			5-15 more	Unknown	$20,000.00	$20,000.00	#VALUE!	#VALUE!	0			
229	As suggested		3	5-15 more	$79,864.00	$71,000.00	$71,000.00	1.12	1.12	0			
230	Investigated				$60,000.00		$5,459.00	#DIV/0!	10.99				

Recommendation #	Electricity (kWh/yr)	Water (gal/yr)	Natural gas (therms/yr)	Diesel fuel (gal/yr)	Gasoline (gal/yr)	GHG, MTCO2E/yr	Releases (lbs/yr)	Releases (type)
213						0		
214						0		
215	347,991					340.335198		
216		620,000				2.00136		
217	8,750					8.5575		
218	Unknown		Unknown			#VALUE!		
219	89,305					87.34029		
220	48,136					47.077008		
221	123,582					120.863196		
222		6,399,000				20.655972		
223			61,000			324.52		
224	450,000					440.1		
225	436,258					426.660324		
226	1,062,500					1039.125		
227	500,000					489		
228						0		
229	1,015,716					993.370248		
230						0		

Recommendation #	Survey #1 responded	Survey #2 responded	Survey #3 responded	Survey #4 responded	Survey #5 responded	Survey #2: All reasons for implementing opportunity												Survey #3: Top reason for implementing opportunity											
						A2: Acceptable payback	**B2**: Energy efficiency	**C2**: Reduced operating cost	**D2**: Increased employee productivity	**E2**: Health and safety benefits	**F2**: Regulatory compliance	**G2**: Reduced env. and health risk	**H2**: Reduced business risk	**I2**: Enhanced env. awareness	**J2**: Improved public image	**K2**: Other companies also implemented	**L2**: Corporate commitment	**A3**: Acceptable payback	**B3**: Energy efficiency	**C3**: Reduced operating cost	**D3**: Increased employee productivity	**E3**: Health and safety benefits	**F3**: Regulatory compliance	**G3**: Reduced env. and health risk	**H3**: Reduced business risk	**I3**: Enhanced env. awareness	**J3**: Improved public image	**K3**: Other companies also implemented	**L3**: Corporate commitment
213	X	X	X			1					1	1	1	1	1		1								1				
214	X	X	X			1	1	1		1	1	1	1		1		1					1							
215	X	X	X				1	1		1	1	1	1	1	1		1						1						
216	X	X	X				1	1		1				1	1		1			1									
217	X	X	X			1												1											
218	X			X	X																								
219	X			X	X																								
220	X			X	X																								
221	X			X	X																								
222	X	X	X			1											1	1											
223	X	X	X			1	1	1	1								1	1											
224	X			X	X																								
225	X	X	X			1	1										1	1											
226	X	X	X														1												1
227	X	X	X														1												1
228	X	X	X				1	1									1												1
229	X	X	X			1	1	1									1	1											
230	X																												

Recommendation #	Survey #4: All reasons for not implementing												Survey #5: Top reason for not implementing												Initial cost category	Projected payback category
	A4: Not technically feasible	**B4**: Lack of capital	**C4**: Insufficient financial payback	**D4**: Other priorities for capital investments	**E4**: Risk of production disruption/inconv./slow	**F4**: Lack of env./risk reduction benefits	**G4**: Limited in-plant expertise/capability	**H4**: Lack of staff awareness	**I4**: Customer specifications	**J4**: Uncertainty/lack of confidence in tech.	**K4**: Insufficient info regarding rec.	**L4**: Difficulty in coord. between units	**A5**: Not technically feasible	**B5**: Lack of capital	**C5**: Insufficient financial payback	**D5**: Other priorities for capital investments	**E5**: Risk of production disruption/inconv./slow	**F5**: Lack of env./risk reduction benefits	**G5**: Limited in-plant expertise/capability	**H5**: Lack of staff awareness	**I5**: Customer specifications	**J5**: Uncertainty/lack of confidence in tech.	**K5**: Insufficient info regarding rec.	**L5**: Difficulty in coord. between units		
213																									>1,000	>4 years
214																									<999	<1 year
215																									>1,000	<1 year
216																									<999	<1 year
217																									<999	1-1.9 years
218		1		1						1						1									>1,000	1-1.9 years
219				1												1									>1,000	<1 year
220				1					1	1											1				<999	<1 year
221		1								1												1			>1,000	1-1.9 years
222																									>1,000	<1 year
223																									<999	<1 year
224	1	1	1	1									1												<999	<1 year
225																									>1,000	<1 year
226																									<999	<1 year
227																									<999	<1 year
228																									Unknown	Unknown
229																									>1,000	1-1.9 years
230																									>1,000	>4 years

Recommendation #	Year of assessment	Year of reassessment	Company #	Level of assis-tance	Company sector	Program (UNL/KSU)	P2 suggestion	P2 category	Implemented	Not implemented	Doing before	Originally Recommended	Originally Not recommended
231	2010	2014	25	Multi	Health care	KSU	Print Room Organization	Training/policies	X			X	
232	2010	2014	25	Multi	Health care	KSU	AutoCad mapping Steam Trap & Fire Dampening Systems	Training/policies	X			X	
233	2012	2014	25	Multi	Health care	KSU	Lawn Irrigation Conservation Program (application of data collected and analyzed)	Training/policies	X			X	
234	2010	2014	26	One	Manufacturing	KSU	Customer-service lighting (replace T12s with T8s)	Energy efficiency	X			X	
235	2010	2014	26	One	Manufacturing	KSU	Existing metal halide replacement	Energy efficiency	X			X	
236	2010	2014	26	One	Manufacturing	KSU	Boiler efficiency/replacement	Energy efficiency	X			X	
237	2010	2014	26	One	Manufacturing	KSU	Rotovac system water conservation	Equipment/process modification		X		X	
238	2010	2014	26	One	Manufacturing	KSU	Blow-mold grinder energy assessment	Equipment/process modification		X		X	
239	2013	2014	27	Multi	Health care	KSU	Sterilizers (replace two units)	Equipment/process modification		X		X	
240	2013	2014	27	Multi	Health care	KSU	Lighting (LED spots in OR suites)	Energy efficiency	X			X	
241	2013	2014	27	Multi	Health care	KSU	Waste segregation (blue wrap recycling)	Off-site recycling	X			X	
242	2013	2014	27	Multi	Health care	KSU	HVAC setback (reduction or air changes in OR during unoccupied hours)	Energy efficiency		X		X	
243	2013	2014	27	Multi	Health care	KSU	OR purchasing and reprocessing (St. Francis location)	Equipment/process modification	X			X	
244	2003	2005	28	Multi	Manufacturing	UNL	Recycle bulbs and batteries	Off-site recycling	X			X	
245	2003	2005	28	Multi	Manufacturing	UNL	Switch to low-mercury bulbs	Energy efficiency	X			X	
246	2003	2005	28	Multi	Manufacturing	UNL	Larger containers for hazardous wastes	Improved housekeeping/ preventative maintenance	X			X	
247	2003	2005	28	Multi	Manufacturing	UNL	Used oil recycling	Off-site recycling	X			X	
248	2003	2005	28	Multi	Manufacturing	UNL	Use haz. waste manifests	Training/policies	X			X	

Recommendation #	Specific status/ category	No longer occuring?	Reoccurrence so far (yrs)	Expected reoccurrence category (yrs)	Initial cost ($)	Actual cost savings ($/yr)	Projected/potential cost savings ($/yr)	Actual payback period (yr)	Projected payback period (yr)	Toxins category	Solid waste (lbs/yr)	Haz. waste (lbs/yr)	Haz. materials, lbs/yr
231	As suggested		4		$0.00	Unknown	Unknown	#VALUE!	#VALUE!	0			
232	As suggested			5-15 more	Unknown	Unknown	Unknown	#VALUE!	#VALUE!	0			
233	As suggested		2	5-15 more	Unknown	$25,000.00	$25,000.00	#VALUE!	#VALUE!	0			
234	As suggested		3		$10,500.00	$4,531.50	$4,531.50	2.32	2.32	0			
235	As suggested			5-15 more	$15,222.00	$6,990.00	$6,990.00	2.18	2.18	0			
236	As suggested		3		$12,400.00	$130,000.00	$130,000.00	0.10	0.10	0			
237	Investigated				Unknown		Unknown	#VALUE!	#VALUE!				
238	Investigated				Unknown		Unknown	#VALUE!	#VALUE!				
239	Investigated				$28,460.00		$6,920.00	#DIV/0!	4.11				
240	With mod.		1	5-15 more	$291.00	$8,484.00	$8,484.00	0.03	0.03	0			
241	As suggested		1	5-15 more	$0.00	$3,614.00	$3,614.00	0.00	0.00	0	18,000		
242	Investigated				$650,000.00		$117,061.00	#DIV/0!	5.55				
243	As suggested		1	5-15 more	$0.00	$158,600.00	$158,600.00	0.00	0.00	0	8,400		
244					$0.00	Unknown	$1.84	#VALUE!	0.00	0			
245					$0.00	Unknown	Unknown	#VALUE!	#VALUE!	1			
246					$0.00	Unknown	$5,690.00	#VALUE!	0.00	1			
247					$0.00	Unknown	$3,500.00	#VALUE!	0.00	0			
248					Unknown	Unknown	Unknown	#VALUE!	#VALUE!	1			

Recommendation #	Electricity (kWh/yr)	Water (gal/yr)	Natural gas (therms/yr)	Diesel fuel (gal/yr)	Gasoline (gal/yr)	GHG, MTCO2E/yr	Releases (lbs/yr)	Releases (type)
231						0		
232						0		
233		3,230,500				10.428054		
234	60,420					59.09076		
235	93,206					91.155468		
236			297,470			1582.5404		
237		9,358,235				30.20838258		
238						0		
239		1,027,416				3.316498848		
240	84,840					82.97352		
241						0		
242	2,128,500					2081.673		
243						0		
244								
245								
246								
247								
248								

						Survey #2: All reasons for implementing opportunity												Survey #3: Top reason for implementing opportunity											
Recommendation #	Survey #1 responded	Survey #2 responded	Survey #3 responded	Survey #4 responded	Survey #5 responded	**A2**: Acceptable payback	**B2**: Energy efficiency	**C2**: Reduced operating cost	**D2**: Increased employee productivity	**E2**: Health and safety benefits	**F2**: Regulatory compliance	**G2**: Reduced env. and health risk	**H2**: Reduced business risk	**I2**: Enhanced env. awareness	**J2**: Improved public image	**K2**: Other companies also implemented	**L2**: Corporate commitment	**A3**: Acceptable payback	**B3**: Energy efficiency	**C3**: Reduced operating cost	**D3**: Increased employee productivity	**E3**: Health and safety benefits	**F3**: Regulatory compliance	**G3**: Reduced env. and health risk	**H3**: Reduced business risk	**I3**: Enhanced env. awareness	**J3**: Improved public image	**K3**: Other companies also implemented	**L3**: Corporate commitment
231	X	X	X														1												1
232	X	X	X														1												1
233	X	X	X			1	1	1	1								1												1
234	X	X	X				1												1										
235	X	X	X				1							1					1										
236	X	X	X			1	1	1										1											
237	X			X	X																								
238	X			X	X																								
239	X			X	X																								
240	X	X	X			1	1	1		1		1		1	1		1		1										
241	X	X	X				1			1		1		1	1		1							1					
242	X			X	X																								
243	X	X	X			1				1		1		1	1		1	1											
244	X	X				1		1																					
245	X	X				1						1	1				1												
246	X	X				1																							
247	X	X				1						1	1				1												
248	X	X							1		1																		

Recommendation #	Survey #4: All reasons for not implementing												Survey #5: Top reason for not implementing												Initial cost category	Projected payback category
	A4: Not technically feasible	**B4**: Lack of capital	**C4**: Insufficient financial payback	**D4**: Other priorities for capital investments	**E4**: Risk of production disruption/inconv./slow	**F4**: Lack of env./risk reduction benefits	**G4**: Limited in-plant expertise/capability	**H4**: Lack of staff awareness	**I4**: Customer specifications	**J4**: Uncertainty/lack of confidence in tech.	**K4**: Insufficient info regarding rec.	**L4**: Difficulty in coord. between units	**A5**: Not technically feasible	**B5**: Lack of capital	**C5**: Insufficient financial payback	**D5**: Other priorities for capital investments	**E5**: Risk of production disruption/inconv./slow	**F5**: Lack of env./risk reduction benefits	**G5**: Limited in-plant expertise/capability	**H5**: Lack of staff awareness	**I5**: Customer specifications	**J5**: Uncertainty/lack of confidence in tech.	**K5**: Insufficient info regarding rec.	**L5**: Difficulty in coord. between units		
231																									<999	<1 year
232																									Unknown	Unknown
233																									Unknown	Unknown
234																									>1,000	2-4 years
235																									>1,000	2-4 years
236																									>1,000	<1 year
237		1												1											Unknown	Unknown
238	1		1	1											1										Unknown	Unknown
239		1		1										1											>1,000	>4 years
240																									<999	<1 year
241																									<999	<1 year
242	1												1												>1,000	>4 years
243																									<999	<1 year
244																									<999	<1 year
245																									<999	Unknown
246																									<999	<1 year
247																									<999	<1 year
248																									<999	Unknown

Recommendation #	Year of assessment	Year of reassessment	Company #	Level of assis-tance	Company sector	Program (UNL/KSU)	P2 suggestion	P2 category	Implemented	Not implemented	Doing before	Originally Recommended	Originally Not recommended
249	2003	2005	28	Multi	Manufacturing	UNL	Order materials when needed	Purchasing	X			X	
250	2003	2005	28	Multi	Manufacturing	UNL	storage area inspections	Improved housekeeping/ preventative maintenance	X			X	
251	2003	2005	28	Multi	Manufacturing	UNL	Leak detention and repair plan	Improved housekeeping/ preventative maintenance	X			X	
252	2003	2005	28	Multi	Manufacturing	UNL	Train employees	Training/policies	X			X	
253	2003	2005	28	Multi	Manufacturing	UNL	Maintain Total Dissolved Solids record	Improved housekeeping/ preventative maintenance	X			X	
254	2003	2005	28	Multi	Manufacturing	UNL	Fugitive dust emission Plan	Improved housekeeping/ preventative maintenance	X			X	
255	2003	2005	28	Multi	Manufacturing	UNL	LDAR check	Improved housekeeping/ preventative maintenance	X			X	
256	2003	2005	28	Multi	Manufacturing	UNL	LDAR reports	Improved housekeeping/ preventative maintenance	X			X	
257	2003	2005	28	Multi	Manufacturing	UNL	Simplify TRI Reports	Improved housekeeping/ preventative maintenance	X			X	
258	2003	2005	28	Multi	Manufacturing	UNL	Replace secondary containment at rail load	Improved housekeeping/ preventative maintenance	X			X	
259	2003	2005	28	Multi	Manufacturing	UNL	Have Copy SPCC and SWPPP on site	Training/policies	X			X	
260	2003	2005	28	Multi	Manufacturing	UNL	Use spill pallets for containment of used oil	Improved house./prev. maint.	X			X	
261	2003	2005	28	Multi	Manufacturing	UNL	Display maps of drainage systems	Training/policies	X			X	
262	2003	2005	28	Multi	Manufacturing	UNL	Fill drums for oil full	Improved housekeeping/ preventative maintenance	X			X	
263	2003	2005	28	Multi	Manufacturing	UNL	Purchase aerosol can depressurizer	Off-site recycling		X		X	
264	2003	2005	28	Multi	Manufacturing	UNL	Recycle computer monitors	Off-site recycling		X		X	
265	2003	2005	28	Multi	Manufacturing	UNL	Use less hazardous materials in lab	Material substitution		X		X	
266	2003	2005	28	Multi	Manufacturing	UNL	Perform smaller scale experiments in the lab	Equipment/process modification		X		X	

Recommendation #	Specific status/ category	No longer occurring?	Reoccurrence so far (yrs)	Expected reoccurrence category (yrs)	Initial cost ($)	Actual cost savings ($/yr)	Projected/potential cost savings ($/yr)	Actual payback period (yr)	Projected payback period (yr)	Toxins category	Solid waste (lbs/yr)	Haz. waste (lbs/yr)	Haz. materials, lbs/yr
249					Unknown	Unknown	Unknown	#VALUE!	#VALUE!	0			
250					Unknown	Unknown	Unknown	#VALUE!	#VALUE!	0			
251					Unknown	Unknown	Unknown	#VALUE!	#VALUE!	0			
252					Unknown	Unknown	Unknown	#VALUE!	#VALUE!	0			
253					Unknown	Unknown	Unknown	#VALUE!	#VALUE!	1			
254					Unknown	Unknown	Unknown	#VALUE!	#VALUE!	0			
255					Unknown	Unknown	Unknown	#VALUE!	#VALUE!	0			
256					Unknown	Unknown	Unknown	#VALUE!	#VALUE!	0			
257					Unknown	Unknown	Unknown	#VALUE!	#VALUE!	0			
258					Unknown	Unknown	Unknown	#VALUE!	#VALUE!	1			
259					Unknown	Unknown	Unknown	#VALUE!	#VALUE!	0			
260					$0.00	Unknown	$500.00	#VALUE!	0.00	0			
261					Unknown	Unknown	Unknown	#VALUE!	#VALUE!	0			
262					Unknown	Unknown	Unknown	#VALUE!	#VALUE!	0			
263					Unknown		Unknown	#VALUE!	#VALUE!				
264					Unknown		Unknown	#VALUE!	#VALUE!				
265					Unknown		Unknown	#VALUE!	#VALUE!				
266					Unknown		Unknown	#VALUE!	#VALUE!				

						Survey #2: All reasons for implementing opportunity												Survey #3: Top reason for implementing opportunity											
Recommendation #	Survey #1 responded	Survey #2 responded	Survey #3 responded	Survey #4 responded	Survey #5 responded	**A2**: Acceptable payback	**B2**: Energy efficiency	**C2**: Reduced operating cost	**D2**: Increased employee productivity	**E2**: Health and safety benefits	**F2**: Regulatory compliance	**G2**: Reduced env. and health risk	**H2**: Reduced business risk	**I2**: Enhanced env. awareness	**J2**: Improved public image	**K2**: Other companies also implemented	**L2**: Corporate commitment	**A3**: Acceptable payback	**B3**: Energy efficiency	**C3**: Reduced operating cost	**D3**: Increased employee productivity	**E3**: Health and safety benefits	**F3**: Regulatory compliance	**G3**: Reduced env. and health risk	**H3**: Reduced business risk	**I3**: Enhanced env. awareness	**J3**: Improved public image	**K3**: Other companies also implemented	**L3**: Corporate commitment
249	X	X				1																							
250	X	X								1		1	1																
251	X	X									1																		
252	X	X							1	1	1	1	1	1															
253	X	X						1	1		1		1																
254	X	X									1																		
255	X	X									1																		
256	X	X									1																		
257	X	X							1		1																		
258	X	X								1	1	1	1	1															
259	X	X								1	1																		
260	X	X								1	1	1																	
261	X	X									1	1																	
262	X	X						1				1	1																
263	X																												
264	X																												
265	X																												
266	X																												

Recommendation #	Survey #4: All reasons for not implementing												Survey #5: Top reason for not implementing												Initial cost category	Projected payback category
	A4: Not technically feasible	**B4**: Lack of capital	**C4**: Insufficient financial payback	**D4**: Other priorities for capital investments	**E4**: Risk of production disruption/inconv./slow	**F4**: Lack of env./risk reduction benefits	**G4**: Limited in-plant expertise/capability	**H4**: Lack of staff awareness	**I4**: Customer specifications	**J4**: Uncertainty/lack of confidence in tech.	**K4**: Insufficient info regarding rec.	**L4**: Difficulty in coord. between units	**A5**: Not technically feasible	**B5**: Lack of capital	**C5**: Insufficient financial payback	**D5**: Other priorities for capital investments	**E5**: Risk of production disruption/inconv./slow	**F5**: Lack of env./risk reduction benefits	**G5**: Limited in-plant expertise/capability	**H5**: Lack of staff awareness	**I5**: Customer specifications	**J5**: Uncertainty/lack of confidence in tech.	**K5**: Insufficient info regarding rec.	**L5**: Difficulty in coord. between units		
249																									<999	Unknown
250																									<999	Unknown
251																									Unknown	Unknown
252																									Unknown	Unknown
253																									<999	<1 year
254																									Unknown	Unknown
255																									<999	<1 year
256																									<999	<1 year
257																									Unknown	Unknown
258																									Unknown	Unknown
259																									Unknown	Unknown
260																									<999	<1 year
261																									Unknown	Unknown
262																									<999	<1 year
263																									<999	>4 years
264																									<999	>4 years
265																									<999	Unknown
266																									Unknown	Unknown

Recommendation #	Year of assessment	Year of reassessment	Company #	Level of assis-tance	Company sector	Program (UNL/KSU)	P2 suggestion	P2 category	Implemented	Not implemented	Doing before	Originally Recommended	Originally Not recommended
267	2003	2005	28	Multi	Manufacturing	UNL	Reduce amount of wastewater to treatment	Equipment/process modification		X		X	
268	2003	2005	28	Multi	Manufacturing	UNL	Treat soil for phosphorous and nitrogen	Equipment/process modification		X		X	
269	2003	2005	28	Multi	Manufacturing	UNL	Have insulation tested for asbestos	Improved housekeeping/ preventative maintenance		X		X	
270	2003	2005	28	Multi	Manufacturing	UNL	Have sludge dewatered; dry solids to landfill	Equipment/process modification		X		X	
271	2003	2005	28	Multi	Manufacturing	UNL	Pump wet sludge to neighboring farms	In-process recycling/modify waste stream		X		X	
272	2003	2005	28	Multi	Manufacturing	UNL	Remove unused equipment from premises as soon as possible	Improved housekeeping/ preventative maintenance		X		X	
273	2003	2005	28	Multi	Manufacturing	UNL	purchase secondary drum	Improved housekeeping/ preventative maintenance	X			X	
274	2003	2005	28	Multi	Manufacturing	UNL	use measuring dipstick	Improved housekeeping/ preventative maintenance	X			X	
275	2003	2005	28	Multi	Manufacturing	UNL	apply correct amount of sludge	Improved housekeeping/ preventative maintenance	X			X	
276	2007	2008	30	One	Manufacturing	UNL	Destratification fans	Equipment/process modification	X			X	
277	2007	2008	30	One	Manufacturing	UNL	wheel media blasting process	Equipment/process modification		X		X	
278	2007	2008	30	One	Manufacturing	UNL	acid recycler	In-process recycling/modify waste stream		X		X	
279	2003	2006	31	Multi	Manufacturing	UNL	Keep production operation consistent	Improved housekeeping/ preventative maintenance	X			X	
280	2003	2006	31	Multi	Manufacturing	UNL	Research burnishing compound substitute	Material substitution		X		X	
281	2003	2006	31	Multi	Manufacturing	UNL	Investigate alternative oils or processes	Material substitution		X		X	
282	2000	2005	32	One	Manufacturing	UNL	Lighting in a galvanizer	Energy efficiency	X			X	
283	2000	2006	32	One	Manufacturing	UNL	Reservoir filtration	In-process recycling/modify waste stream	X			X	
284	2000	2006	32	One	Manufacturing	UNL	Separate sulfur acid bath	Equipment/process modification	X			X	

Recommendation #	Specific status/ category	No longer occuring?	Reoccurrence so far (yrs)	Expected reoccurrence category (yrs)	Initial cost ($)	Actual cost savings ($/yr)	Projected/potential cost savings ($/yr)	Actual payback period (yr)	Projected payback period (yr)	Toxins category	Solid waste (lbs/yr)	Haz. waste (lbs/yr)	Haz. materials, lbs/yr
267					Unknown		Unknown	#VALUE!	#VALUE!				
268					Unknown		Unknown	#VALUE!	#VALUE!				
269					Unknown		Unknown	#VALUE!	#VALUE!				
270					Unknown		Unknown	#VALUE!	#VALUE!				
271					Unknown		Unknown	#VALUE!	#VALUE!				
272					Unknown		Unknown	#VALUE!	#VALUE!				
273					Unknown	Unknown	Unknown	#VALUE!	#VALUE!	0			
274					Unknown	Unknown	Unknown	#VALUE!	#VALUE!	0			
275					Unknown	Unknown	Unknown	#VALUE!	#VALUE!	0			
276					$52,289.00	$22,000.00	$22,000.00	2.38	2.38	0			
277					$250,000.00	$15,000.00	$15,000.00	16.67	16.67				
278					$200,000.00	$4,750.00	$4,750.00	42.11	42.11				
279					Unknown	$2,050.00	$2,050.00	#VALUE!	#VALUE!	0			
280					Unknown		Unknown	#VALUE!	#VALUE!				
281					Unknown		Unknown	#VALUE!	#VALUE!				
282					Unknown	$10,000.00	$10,000.00	#VALUE!	#VALUE!	0			
283					Unknown	$15,000.00	$15,000.00	#VALUE!	#VALUE!	0			
284					Unknown	Unknown	Unknown	#VALUE!	#VALUE!	0			

Recommendation #	Survey #1 responded	Survey #2 responded	Survey #3 responded	Survey #4 responded	Survey #5 responded	Survey #2: All reasons for implementing opportunity												Survey #3: Top reason for implementing opportunity											
						A2: Acceptable payback	**B2**: Energy efficiency	**C2**: Reduced operating cost	**D2**: Increased employee productivity	**E2**: Health and safety benefits	**F2**: Regulatory compliance	**G2**: Reduced env. and health risk	**H2**: Reduced business risk	**I2**: Enhanced env. awareness	**J2**: Improved public image	**K2**: Other companies also implemented	**L2**: Corporate commitment	**A3**: Acceptable payback	**B3**: Energy efficiency	**C3**: Reduced operating cost	**D3**: Increased employee productivity	**E3**: Health and safety benefits	**F3**: Regulatory compliance	**G3**: Reduced env. and health risk	**H3**: Reduced business risk	**I3**: Enhanced env. awareness	**J3**: Improved public image	**K3**: Other companies also implemented	**L3**: Corporate commitment
267	X																												
268	X																												
269	X																												
270	X																												
271	X																												
272	X																												
273	X																												
274	X																												
275	X																												
276	X	X				1	1	1																					
277	X																												
278	X																												
279	X																												
280	X																												
281	X																												
282	X	X								1		1																	
283	X																												
284	X																												

Recommendation #	Survey #4: All reasons for not implementing												Survey #5: Top reason for not implementing												Initial cost category	Projected payback category
	A4: Not technically feasible	**B4**: Lack of capital	**C4**: Insufficient financial payback	**D4**: Other priorities for capital investments	**E4**: Risk of production disruption/inconv./slow	**F4**: Lack of env./risk reduction benefits	**G4**: Limited in-plant expertise/capability	**H4**: Lack of staff awareness	**I4**: Customer specifications	**J4**: Uncertainty/lack of confidence in tech.	**K4**: Insufficient info regarding rec.	**L4**: Difficulty in coord. between units	**A5**: Not technically feasible	**B5**: Lack of capital	**C5**: Insufficient financial payback	**D5**: Other priorities for capital investments	**E5**: Risk of production disruption/inconv./slow	**F5**: Lack of env./risk reduction benefits	**G5**: Limited in-plant expertise/capability	**H5**: Lack of staff awareness	**I5**: Customer specifications	**J5**: Uncertainty/lack of confidence in tech.	**K5**: Insufficient info regarding rec.	**L5**: Difficulty in coord. between units		
267																									Unknown	Unknown
268																									Unknown	Unknown
269																									Unknown	Unknown
270																									Unknown	Unknown
271																									>1,000	>4 years
272																									Unknown	Unknown
273																									Unknown	Unknown
274																									<999	<1 year
275																									<999	<1 year
276																									>1,000	2-4 years
277																									>1,000	>4 years
278																									>1,000	>4 years
279																									<999	Unknown
280																									Unknown	Unknown
281																									Unknown	Unknown
282																									>1,000	<1 year
283																									>1,000	1-1.9 years
284																									Unknown	Unknown

Recommendation #	Year of assessment	Year of reassessment	Company #	Level of assis-tance	Company sector	Program (UNL/KSU)	P2 suggestion	P2 category	Implemented	Not implemented	Doing before	Originally Recommended	Originally Not recommended
285	2005	2006	32	One	Manufacturing	UNL	Waste exchange for scrap wood	In-process recycling/modify waste stream	X			X	
286	2005	2006	32	One	Manufacturing	UNL	Clean-up program for dry floor	Improved housekeeping/ preventative maintenance	X			X	
287	2005	2006	32	One	Manufacturing	UNL	Use of alternative substrate for chem-treated galvanized steel	Material substitution		X		X	
288	2005	2006	32	One	Manufacturing	UNL	Chemical change in pretreatment	Material substitution		X		X	
289	2005	2006	32	One	Manufacturing	UNL	Dispose of floor dry in a non-hazardous landfill	Off-site recycling		X		X	
290	2005	2006	32	One	Manufacturing	UNL	Cardboard alternative for Floor Dry	Equipment/process modification		X		X	
291	2005	2006	32	One	Manufacturing	UNL	Clean up spills immediately	Improved housekeeping/ preventative maintenance		X		X	
292	2005	2006	32	One	Manufacturing	UNL	Recycle rusty metal	Off-site recycling		X		X	
293	2005	2006	32	One	Manufacturing	UNL	Recycle cardboard	Off-site recycling		X		X	
294	2005	2006	32	One	Manufacturing	UNL	Insulate paint line pretreatment tanks	Energy efficiency		X		X	
295	2000	2005	32	One	Manufacturing	UNL	purchase new mills	Equipment/process modification		X		X	
296	2005	2006	32	One	Manufacturing	UNL	Cover zinc tank on galvanizing line	Energy efficiency		X		X	
297	2000	2005	32	One	Manufacturing	UNL	Re-Uz-It Pads	Purchasing		X		X	
298	2000	2005	32	One	Manufacturing	UNL	SorbIts Laundry	Purchasing		X		X	
299	2000	2005	32	One	Manufacturing	UNL	Return flow impeder	Equipment/process modification		X		X	
300	2000	2005	32	One	Manufacturing	UNL	Coolant flow on rollers	Equipment/process modification		X		X	
301	2000	2005	32	One	Manufacturing	UNL	De-ionized water for acid bath	Material substitution		X		X	
302	2000	2005	32	One	Manufacturing	UNL	Electrogalvanizing	Equipment/process modification		X		X	

Recommendation #	Specific status/ category	No longer occurring?	Reoccurrence so far (yrs)	Expected reoccurrence category (yrs)	Initial cost ($)	Actual cost savings ($/yr)	Projected/potential cost savings ($/yr)	Actual payback period (yr)	Projected payback period (yr)	Toxins category	Solid waste (lbs/yr)	Haz. waste (lbs/yr)	Haz. materials, lbs/yr
285					$0.00	Unknown	$5,856.00	#VALUE!	0.00	0			
286					$0.00	Unknown	$2,608.00	#VALUE!	0.00	0			
287					Unknown		Unknown	#VALUE!	#VALUE!				
288					Unknown		Unknown	#VALUE!	#VALUE!				
289					Unknown		Unknown	#VALUE!	#VALUE!				
290					Unknown		Unknown	#VALUE!	#VALUE!				
291					Unknown		Unknown	#VALUE!	#VALUE!				
292					Unknown		Unknown	#VALUE!	#VALUE!				
293					Unknown		Unknown	#VALUE!	#VALUE!				
294					Unknown		Unknown	#VALUE!	#VALUE!				
295					Unknown		Unknown	#VALUE!	#VALUE!				
296					Unknown		Unknown	#VALUE!	#VALUE!				
297					Unknown		Unknown	#VALUE!	#VALUE!				
298					Unknown		Unknown	#VALUE!	#VALUE!				
299					Unknown		Unknown	#VALUE!	#VALUE!				
300					Unknown		Unknown	#VALUE!	#VALUE!				
301					Unknown		Unknown	#VALUE!	#VALUE!				
302					Unknown		Unknown	#VALUE!	#VALUE!				

						Survey #2: All reasons for implementing opportunity												Survey #3: Top reason for implementing opportunity											
Recommendation #	Survey #1 responded	Survey #2 responded	Survey #3 responded	Survey #4 responded	Survey #5 responded	**A2**: Acceptable payback	**B2**: Energy efficiency	**C2**: Reduced operating cost	**D2**: Increased employee productivity	**E2**: Health and safety benefits	**F2**: Regulatory compliance	**G2**: Reduced env. and health risk	**H2**: Reduced business risk	**I2**: Enhanced env. awareness	**J2**: Improved public image	**K2**: Other companies also implemented	**L2**: Corporate commitment	**A3**: Acceptable payback	**B3**: Energy efficiency	**C3**: Reduced operating cost	**D3**: Increased employee productivity	**E3**: Health and safety benefits	**F3**: Regulatory compliance	**G3**: Reduced env. and health risk	**H3**: Reduced business risk	**I3**: Enhanced env. awareness	**J3**: Improved public image	**K3**: Other companies also implemented	**L3**: Corporate commitment
285	X	X				1		1							1														
286	X																												
287	X																												
288	X																												
289	X																												
290	X																												
291	X																												
292	X																												
293	X																												
294	X																												
295	X																												
296	X																												
297	X																												
298	X																												
299	X																												
300	X																												
301	X																												
302	X																												

Recommendation #	Survey #4: All reasons for not implementing												Survey #5: Top reason for not implementing												Initial cost category	Projected payback category
	A4: Not technically feasible	**B4**: Lack of capital	**C4**: Insufficient financial payback	**D4**: Other priorities for capital investments	**E4**: Risk of production disruption/inconv./slow	**F4**: Lack of env./risk reduction benefits	**G4**: Limited in-plant expertise/capability	**H4**: Lack of staff awareness	**I4**: Customer specifications	**J4**: Uncertainty/lack of confidence in tech.	**K4**: Insufficient info regarding rec.	**L4**: Difficulty in coord. between units	**A5**: Not technically feasible	**B5**: Lack of capital	**C5**: Insufficient financial payback	**D5**: Other priorities for capital investments	**E5**: Risk of production disruption/inconv./slow	**F5**: Lack of env./risk reduction benefits	**G5**: Limited in-plant expertise/capability	**H5**: Lack of staff awareness	**I5**: Customer specifications	**J5**: Uncertainty/lack of confidence in tech.	**K5**: Insufficient info regarding rec.	**L5**: Difficulty in coord. between units		
285																									<999	<1 year
286																									<999	<1 year
287																									<999	2-4 years
288																									>1,000	>4 years
289																									<999	<1 year
290																									Unknown	Unknown
291																									<999	<1 year
292																									<999	<1 year
293																									Unknown	Unknown
294																									>1,000	>4 years
295																									Unknown	Unknown
296																									>1,000	2-4 years
297																									<999	Unknown
298																									<999	Unknown
299																									>1,000	2-4 years
300																									>1,000	Unknown
301																									>1,000	>4 years
302																									>1,000	>4 years

Recommendation #	Year of assessment	Year of reassessment	Company #	Level of assis-tance	Company sector	Program (UNL/KSU)	P2 suggestion	P2 category	Implemented	Not implemented	Doing before	Originally Recommended	Originally Not recommended
303	2004	2005	33	One	Manufacturing	UNL	Compressed air leaks	Improved housekeeping/ preventative maintenance	X			X	
304	2004	2005	33	One	Manufacturing	UNL	Repair holes	Improved housekeeping/ preventative maintenance	X			X	
305	2004	2005	33	One	Manufacturing	UNL	Material exchange	Off-site recycling	X			X	
306	2004	2005	33	One	Manufacturing	UNL	Air compressor recovery	Energy efficiency	X			X	
307	2004	2005	33	One	Manufacturing	UNL	Air conditioning zoning	Improved housekeeping/ preventative maintenance	X			X	
308	2004	2005	33	One	Manufacturing	UNL	Aerosol cans (Eliminate use)	Equipment/process modification		X		X	
309	2004	2005	33	One	Manufacturing	UNL	Thermal insulation for Hyde hot water heater	Energy efficiency		X		X	
310	2004	2005	33	One	Manufacturing	UNL	Reduce evaporation from open water tank for Hyde water heating unity	Equipment/process modification		X		X	
311	2004	2005	33	One	Manufacturing	UNL	Electric rate peaking demand (decrease demand cost of electric bill)	Energy efficiency		X		X	
312	2006	2008	34	One	Manufacturing	UNL	Repair leaks in air compressor	Improved housekeeping/preventative maintenance	X			X	
313	2006	2008	34	One	Manufacturing	UNL	Replace air compressors	Energy efficiency	X			X	
314	2006	2008	34	One	Manufacturing	UNL	Recycle new wastes	Off-site recycling	X			X	
315	2006	2008	34	One	Manufacturing	UNL	Install occupancy sensors	Energy efficiency	X			X	
316	2006	2008	34	One	Manufacturing	UNL	Reminder posters	Training/policies	X			X	
317	2006	2008	34	One	Manufacturing	UNL	install a rain sensor, pb 0.8 yr	Equipment/process modification		X		X	
318	2006	2008	34	One	Manufacturing	UNL	peak demand schedule	Energy efficiency		X		X	
319	2006	2008	34	One	Manufacturing	UNL	paper shredder	Purchasing		X		X	
320	2006	2008	34	One	Manufacturing	UNL	separate light for cubicles	Energy efficiency		X		X	

Recommendation #	Specific status/ category	No longer occuring?	Reoccurrence so far (yrs)	Expected reoccurrence category (yrs)	Initial cost ($)	Actual cost savings ($/yr)	Projected/potential cost savings ($/yr)	Actual payback period (yr)	Projected payback period (yr)	Toxins category	Solid waste (lbs/yr)	Haz. waste (lbs/yr)	Haz. materials, lbs/yr
303					Unknown	$500.00	$500.00	#VALUE!	#VALUE!	0			
304					Unknown	$500.00	$500.00	#VALUE!	#VALUE!	0			
305					$0.00	$170.00	$170.00	0.00	0.00	0			
306					Unknown	Unknown	Unknown	#VALUE!	#VALUE!	0			
307					Unknown	Unknown	Unknown	#VALUE!	#VALUE!	0			
308					Unknown		Unknown	#VALUE!	#VALUE!				
309					Unknown		Unknown	#VALUE!	#VALUE!				
310					Unknown		Unknown	#VALUE!	#VALUE!				
311					Unknown		Unknown	#VALUE!	#VALUE!				
312					$0.00	$5,000.00	$10,000.00	0.00	0.00	0			
313					$22,000.00	$10,000.00	$14,000.00	2.20	1.57	0			
314					Unknown	Unknown	Unknown	#VALUE!	#VALUE!	0			
315					Unknown	Unknown	Unknown	#VALUE!	#VALUE!	0			
316					Unknown	Unknown	Unknown	#VALUE!	#VALUE!	0			
317					$113.00		$114.00	#DIV/0!	0.99				
318					Unknown		Unknown	#VALUE!	#VALUE!				
319					Unknown		$1,900.00	#VALUE!	#VALUE!				
320					Unknown		Unknown	#VALUE!	#VALUE!				

						Survey #2: All reasons for implementing opportunity												Survey #3: Top reason for implementing opportunity											
Recommendation #	Survey #1 responded	Survey #2 responded	Survey #3 responded	Survey #4 responded	Survey #5 responded	**A2**: Acceptable payback	**B2**: Energy efficiency	**C2**: Reduced operating cost	**D2**: Increased employee productivity	**E2**: Health and safety benefits	**F2**: Regulatory compliance	**G2**: Reduced env. and health risk	**H2**: Reduced business risk	**I2**: Enhanced env. awareness	**J2**: Improved public image	**K2**: Other companies also implemented	**L2**: Corporate commitment	**A3**: Acceptable payback	**B3**: Energy efficiency	**C3**: Reduced operating cost	**D3**: Increased employee productivity	**E3**: Health and safety benefits	**F3**: Regulatory compliance	**G3**: Reduced env. and health risk	**H3**: Reduced business risk	**I3**: Enhanced env. awareness	**J3**: Improved public image	**K3**: Other companies also implemented	**L3**: Corporate commitment
303	X	X						1																					
304	X	X						1																					
305	X	X						1																					
306	X	X						1																					
307	X	X								1																			
308	X																												
309	X																												
310	X																												
311	X																												
312	X	X				1	1	1																					
313	X	X				1	1																						
314	X	X										1																	
315	X	X				1	1	1						1															
316	X																												
317	X																												
318	X																												
319	X																												
320	X																												

Recommendation #	Survey #4: All reasons for not implementing												Survey #5: Top reason for not implementing												Initial cost category	Projected payback category
	A4: Not technically feasible	**B4**: Lack of capital	**C4**: Insufficient financial payback	**D4**: Other priorities for capital investments	**E4**: Risk of production disruption/inconv./slow	**F4**: Lack of env./risk reduction benefits	**G4**: Limited in-plant expertise/capability	**H4**: Lack of staff awareness	**I4**: Customer specifications	**J4**: Uncertainty/lack of confidence in tech.	**K4**: Insufficient info regarding rec.	**L4**: Difficulty in coord. between units	**A5**: Not technically feasible	**B5**: Lack of capital	**C5**: Insufficient financial payback	**D5**: Other priorities for capital investments	**E5**: Risk of production disruption/inconv./slow	**F5**: Lack of env./risk reduction benefits	**G5**: Limited in-plant expertise/capability	**H5**: Lack of staff awareness	**I5**: Customer specifications	**J5**: Uncertainty/lack of confidence in tech.	**K5**: Insufficient info regarding rec.	**L5**: Difficulty in coord. between units		
303																									<999	2-4 years
304																									>1,000	2-4 years
305																									<999	<1 year
306																									<999	<1 year
307																									<999	<1 year
308																									<999	2-4 years
309																									>1,000	Unknown
310																									Unknown	Unknown
311																									Unknown	Unknown
312																									<999	<1 year
313																									>1,000	1-1.9 years
314																									Unknown	Unknown
315																									<999	2-4 years
316																									<999	Unknown
317																									<999	<1 year
318																									<999	Unknown
319																									>1,000	2-4 years
320																									>1,000	>4 years

Recommendation #	Year of assessment	Year of reassessment	Company #	Level of assis-tance	Company sector	Program (UNL/KSU)	P2 suggestion	P2 category	Implemented	Not implemented	Doing before	Originally Recommended	Originally Not recommended
321	2002	2005	35	Multi	Manufacturing	UNL	Safety Kleen recycling parts washer	In-process recycling/modify waste stream	X			X	
322	2002	2005	35	Multi	Manufacturing	UNL	Add of remote parts washers	Equipment/process modification	X			X	
323	2002	2005	35	Multi	Manufacturing	UNL	Plastic runners/scrap recycle	Off-site recycling	X			X	
324	2002	2005	35	Multi	Manufacturing	UNL	Propane torches-change supplier	Purchasing	X			X	
325	2004	2005	35	Multi	Manufacturing	UNL	Changing mold release	Material substitution	X			X	
326	2005	2007	35	Multi	Manufacturing	UNL	Install VFDs on water cooling tower	Energy efficiency	X			X	
327	2005	2007	35	Multi	Manufacturing	UNL	Air pressure reduction	Equipment/process modification	X			X	
328	2005	2007	35	Multi	Manufacturing	UNL	Compressed air leak repair	Improved housekeeping/ preventative maintenance	X			X	
329	2005	2007	35	Multi	Manufacturing	UNL	Blow-off nozzle replacement	Equipment/process modification	X			X	
330	2005	2007	35	Multi	Manufacturing	UNL	Alternative testing for wastewater contamination	Equipment/process modification	X			X	
331	2007	2008	35	Multi	Manufacturing	UNL	Cardboard recycling procedure	Off-site recycling	X			X	
332	2007	2008	35	Multi	Manufacturing	UNL	Change plastic recyclers	Off-site recycling	X			X	
333	2007	2008	35	Multi	Manufacturing	UNL	Fix sprinklers for Irrigation system	Improved housekeeping/ preventative maintenance	X			X	
334	2007	2008	35	Multi	Manufacturing	UNL	Adjust irrigation program	Improved housekeeping/ preventative maintenance	X			X	
335	2002	2005	35	Multi	Manufacturing	UNL	Baler Work Instruction	Training/policies		X		X	
336	2002	2005	35	Multi	Manufacturing	UNL	Changing aerosol degreaser	Equipment/process modification		X		X	
337	2002	2005	35	Multi	Manufacturing	UNL	Changing bulk degreaser	Equipment/process modification		X		X	
338	2007	2008	35	Multi	Manufacturing	UNL	Pallet shelving	Off-site recycling		X		X	

Recommendation #	Specific status/ category	No longer occurring?	Reoccurrence so far (yrs)	Expected reoccurrence category (yrs)	Initial cost ($)	Actual cost savings ($/yr)	Projected/potential cost savings ($/yr)	Actual payback period (yr)	Projected payback period (yr)	Toxins category	Solid waste (lbs/yr)	Haz. waste (lbs/yr)	Haz. materials, lbs/yr
321					$300.00	$1,707.00	$1,707.00	0.18	0.18	1			
322					$50.00	$337.00	$337.00	0.15	0.15	1			
323					$0.00	$23,000.00	$23,000.00	0.00	0.00	0			
324					$0.00	Unknown	$130.00	#VALUE!	0.00				
325					Unknown	Unknown	Unknown	#VALUE!	#VALUE!	1			
326					$4,200.00	$4,141.00	$1,840.00	1.01	2.28	0			
327					$0.00	$5,574.00	$5,574.00	0.00	0.00	0			
328					$4,216.00	$30,662.00	$27,162.00	0.14	0.16	0			
329					$472.00	$69,237.00	$69,237.00	0.01	0.01	0			
330					$175.00	$18,000.00	$18,000.00	0.01	0.01	0			
331					$0.00	$1,140.00	$1,140.00	0.00	0.00	0			
332					$0.00	$20,900.00	$31,418.00	0.00	0.00	0			
333					$0.00	$0.00	Unknown	#DIV/0!	#VALUE!	0			
334					$0.00	Unknown	Unknown	#VALUE!	#VALUE!	0			
335					Unknown		Unknown	#VALUE!	#VALUE!				
336					Unknown		Unknown	#VALUE!	#VALUE!				
337					Unknown		Unknown	#VALUE!	#VALUE!				
338					$5,227.00		$10,780.00	#DIV/0!	0.48				

Recommendation #	Survey #1 responded	Survey #2 responded	Survey #3 responded	Survey #4 responded	Survey #5 responded	**Survey #2: All reasons for implementing opportunity**												**Survey #3: Top reason for implementing opportunity**											
						A2: Acceptable payback	**B2**: Energy efficiency	**C2**: Reduced operating cost	**D2**: Increased employee productivity	**E2**: Health and safety benefits	**F2**: Regulatory compliance	**G2**: Reduced env. and health risk	**H2**: Reduced business risk	**I2**: Enhanced env. awareness	**J2**: Improved public image	**K2**: Other companies also implemented	**L2**: Corporate commitment	**A3**: Acceptable payback	**B3**: Energy efficiency	**C3**: Reduced operating cost	**D3**: Increased employee productivity	**E3**: Health and safety benefits	**F3**: Regulatory compliance	**G3**: Reduced env. and health risk	**H3**: Reduced business risk	**I3**: Enhanced env. awareness	**J3**: Improved public image	**K3**: Other companies also implemented	**L3**: Corporate commitment
321	X	X				1		1	1	1		1																	
322	X	X				1	1	1	1	1		1																	
323	X	X				1		1									1												
324	X																												
325	X	X								1				1			1												
326	X	X					1	1						1															
327	X	X				1	1	1																					
328	X	X				1	1	1																					
329	X	X				1	1	1																					
330	X	X						1																					
331	X	X				1		1									1												
332	X	X				1											1												
333	X	X				1		1									1												
334	X	X				1		1									1												
335	X																												
336	X																												
337	X																												
338	X																												

Recommendation #	Survey #4: All reasons for not implementing												Survey #5: Top reason for not implementing												Initial cost category	Projected payback category
	A4: Not technically feasible	**B4**: Lack of capital	**C4**: Insufficient financial payback	**D4**: Other priorities for capital investments	**E4**: Risk of production disruption/inconv./slow	**F4**: Lack of env./risk reduction benefits	**G4**: Limited in-plant expertise/capability	**H4**: Lack of staff awareness	**I4**: Customer specifications	**J4**: Uncertainty/lack of confidence in tech.	**K4**: Insufficient info regarding rec.	**L4**: Difficulty in coord. between units	**A5**: Not technically feasible	**B5**: Lack of capital	**C5**: Insufficient financial payback	**D5**: Other priorities for capital investments	**E5**: Risk of production disruption/inconv./slow	**F5**: Lack of env./risk reduction benefits	**G5**: Limited in-plant expertise/capability	**H5**: Lack of staff awareness	**I5**: Customer specifications	**J5**: Uncertainty/lack of confidence in tech.	**K5**: Insufficient info regarding rec.	**L5**: Difficulty in coord. between units		
321																									<999	<1 year
322																									<999	<1 year
323																									<999	<1 year
324																									<999	<1 year
325																									<999	<1 year
326																									>1,000	1-1.9 years
327																									<999	<1 year
328																									>1,000	<1 year
329																									<999	<1 year
330																									<999	<1 year
331																									<999	<1 year
332																									<999	<1 year
333																									<999	<1 year
334																									<999	Unknown
335																									Unknown	Unknown
336																									>1,000	Unknown
337																									>1,000	Unknown
338																									>1,000	<1 year

Recommendation #	Year of assessment	Year of reassessment	Company #	Level of assis-tance	Company sector	Program (UNL/KSU)	P2 suggestion	P2 category	Implemented	Not implemented	Doing before	Originally Recommended	Originally Not recommended
339	2007	2008	35	Multi	Manufacturing	UNL	Replace aerosol cans	Purchasing		X		X	
340	2007	2008	35	Multi	Manufacturing	UNL	Reduce CA pressure	Energy efficiency		X		X	
341	2005	2007	35	Multi	Manufacturing	UNL	Install ultrasonic light switch sensors	Energy efficiency		X		X	
342	2005	2007	35	Multi	Manufacturing	UNL	Use HVLS fans for destratification	Equipment/process modification		X		X	
343	2001	2006	36	One	Manufacturing	UNL	Shut down the plating area on weekends	Energy efficiency	X			X	
344	2001	2006	36	One	Manufacturing	UNL	Replace Cr (III)	Equipment/process modification	X			X	
345	2001	2006	36	One	Manufacturing	UNL	Reduce amount of aerosol cans	Equipment/process modification	X			X	
346	2001	2006	36	One	Manufacturing	UNL	replace naphta solvent	Material substitution		X		X	
347	2001	2006	36	One	Manufacturing	UNL	recycle of vulcanized fiber paper	Off-site recycling		X		X	
348	2001	2006	36	One	Manufacturing	UNL	shut down motors	Training/policies		X		X	
349	2001	2006	36	One	Manufacturing	UNL	upgrade lawn sprinkler system	Equipment/process modification		X		X	
350	2001	2006	36	One	Manufacturing	UNL	locate trash bins	Improved housekeeping/ preventative maintenance		X		X	
351	2007	2009	37	Partial	Manufacturing	UNL	Reuse wire spools	In-process recycling/modify waste stream	X			X	
352	2007	2009	37	Partial	Manufacturing	UNL	Reduce air pressure	Equipment/process modification	X			X	
353	2007	2009	37	Partial	Manufacturing	UNL	Repair leaks in compressor system	Improved housekeeping/ preventative maintenance	X			X	
354	2007	2009	37	Partial	Manufacturing	UNL	Employee input to the P2 Program	Training/policies	X			X	
355	2007	2009	37	Partial	Manufacturing	UNL	switch to Recycling Enterprises	Purchasing		X		X	
356	2007	2009	37	Partial	Manufacturing	UNL	reuse extra bubble wrap at UPS	In-process recycling/modify waste stream		X		X	

Recommendation #	Specific status/ category	No longer occurring?	Reoccurrence so far (yrs)	Expected reoccurrence category (yrs)	Initial cost ($)	Actual cost savings ($/yr)	Projected/potential cost savings ($/yr)	Actual payback period (yr)	Projected payback period (yr)	Toxins category	Solid waste (lbs/yr)	Haz. waste (lbs/yr)	Haz. materials, lbs/yr
339					$0.00		$3,980.00	#DIV/0!	0.00				
340					$0.00		$14,250.00	#DIV/0!	0.00				
341					$261.00		$126.00	#DIV/0!	2.07				
342					$150.00		$0.00	#DIV/0!	#DIV/0!				
343					$0.00	$2,200.00	Unknown	0.00	#VALUE!	0			
344					Unknown	Unknown	$0.00	#VALUE!	#VALUE!	1			
345					Unknown	Unknown	$0.00	#VALUE!	#VALUE!	1			
346					Unknown		Unknown	#VALUE!	#VALUE!				
347					Unknown		Unknown	#VALUE!	#VALUE!				
348					Unknown		Unknown	#VALUE!	#VALUE!				
349					Unknown		Unknown	#VALUE!	#VALUE!				
350					Unknown		Unknown	#VALUE!	#VALUE!				
351					$600.00	$40.00	$221.00	15.00	2.71	0			
352					$0.00	$1,000.00	$605.00	0.00	0.00	0			
353					$360.00	$83.00	$83.00	4.34	4.34	0			
354					$0.00	Unknown	Unknown	#VALUE!	#VALUE!	0			
355					$0.00		$66.00	#DIV/0!	0.00				
356					$0.00		$12.00	#DIV/0!	0.00				

						Survey #2: All reasons for implementing opportunity												Survey #3: Top reason for implementing opportunity											
Recommendation #	Survey #1 responded	Survey #2 responded	Survey #3 responded	Survey #4 responded	Survey #5 responded	**A2**: Acceptable payback	**B2**: Energy efficiency	**C2**: Reduced operating cost	**D2**: Increased employee productivity	**E2**: Health and safety benefits	**F2**: Regulatory compliance	**G2**: Reduced env. and health risk	**H2**: Reduced business risk	**I2**: Enhanced env. awareness	**J2**: Improved public image	**K2**: Other companies also implemented	**L2**: Corporate commitment	**A3**: Acceptable payback	**B3**: Energy efficiency	**C3**: Reduced operating cost	**D3**: Increased employee productivity	**E3**: Health and safety benefits	**F3**: Regulatory compliance	**G3**: Reduced env. and health risk	**H3**: Reduced business risk	**I3**: Enhanced env. awareness	**J3**: Improved public image	**K3**: Other companies also implemented	**L3**: Corporate commitment
339	X																												
340	X																												
341	X																												
342	X																												
343	X	X				1	1	1	1	1	1	1	1				1												
344	X	X				1	1	1	1	1	1	1	1				1												
345	X	X				1	1	1	1	1	1	1	1				1												
346	X																												
347	X																												
348	X																												
349	X																												
350	X																												
351	X	X						1		1				1			1												
352	X	X					1	1						1			1												
353	X	X					1	1						1			1												
354	X	X					1	1		1				1															
355	X																												
356	X																												

Recommendation #	Survey #4: All reasons for not implementing												Survey #5: Top reason for not implementing												Initial cost category	Projected payback category
	A4: Not technically feasible	**B4**: Lack of capital	**C4**: Insufficient financial payback	**D4**: Other priorities for capital investments	**E4**: Risk of production disruption/inconv./slow	**F4**: Lack of env./risk reduction benefits	**G4**: Limited in-plant expertise/capability	**H4**: Lack of staff awareness	**I4**: Customer specifications	**J4**: Uncertainty/lack of confidence in tech.	**K4**: Insufficient info regarding rec.	**L4**: Difficulty in coord. between units	**A5**: Not technically feasible	**B5**: Lack of capital	**C5**: Insufficient financial payback	**D5**: Other priorities for capital investments	**E5**: Risk of production disruption/inconv./slow	**F5**: Lack of env./risk reduction benefits	**G5**: Limited in-plant expertise/capability	**H5**: Lack of staff awareness	**I5**: Customer specifications	**J5**: Uncertainty/lack of confidence in tech.	**K5**: Insufficient info regarding rec.	**L5**: Difficulty in coord. between units		
339																									<999	<1 year
340																									<999	<1 year
341																									<999	2-4 years
342																									<999	>4 years
343																									<999	<1 year
344																									<999	>4 years
345																									<999	<1 year
346																									<999	>4 years
347																									<999	>4 years
348																									Unknown	Unknown
349																									>1,000	2-4 years
350																									Unknown	Unknown
351																									<999	2-4 years
352																									<999	<1 year
353																									<999	>4 years
354																									<999	Unknown
355																									<999	<1 year
356																									<999	<1 year

Recommendation #	Year of assessment	Year of reassessment	Company #	Level of assis-tance	Company sector	Program (UNL/KSU)	P2 suggestion	P2 category	Implemented	Not implemented	Doing before	Originally Recommended	Originally Not recommended
357	2007	2009	37	Partial	Manufacturing	UNL	plastic bottle recycling	Off-site recycling		X		X	
358	2007	2009	37	Partial	Manufacturing	UNL	alternative to open blowing	Equipment/process modification		X		X	
359	2007	2009	37	Partial	Manufacturing	UNL	switch to mechanical agitator	Equipment/process modification		X		X	
360	2007	2009	37	Partial	Manufacturing	UNL	set goals to improve recycling program	Training/policies		X		X	
361	2004	2008	38	Partial	Manufacturing	UNL	Optimize operational procedure	Equipment/process modification	X			X	
362	2004	2008	38	Partial	Manufacturing	UNL	Insulate pipe and heated tanks	Energy efficiency	X			X	
363	2004	2008	38	Partial	Manufacturing	UNL	Separate used oil from condensate	Off-site recycling	X			X	
364	2004	2008	38	Partial	Manufacturing	UNL	Improve waste treatment process	Equipment/process modification	X			X	
365	2004	2008	38	Partial	Manufacturing	UNL	secondary containment for haz.storage	Improved housekeeping/ preventative maintenance		X		X	
366	2004	2008	38	Partial	Manufacturing	UNL	reduce water use pH/conductivity meter	Equipment/process modification		X		X	
367	2007	2008	39	One	Manufacturing	UNL	Storm-water pollution prevention plan	Training/policies	X			X	
368	2007	2008	39	One	Manufacturing	UNL	Create labeling procedures	Training/policies	X			X	
369	2007	2008	39	One	Manufacturing	UNL	Update and restructure MSDS system	Training/policies	X			X	
370	2007	2008	39	One	Manufacturing	UNL	Replace adhesive containers	Equipment/process modification	X			X	
371	2007	2008	39	One	Manufacturing	UNL	Recycle purged plastics	Off-site recycling	X			X	
372	2007	2008	39	One	Manufacturing	UNL	Train empty-container/solvent policy	Training/policies	X			X	
373	2007	2008	39	One	Manufacturing	UNL	Label parts washer	Training/policies	X			X	
374	2007	2008	39	One	Manufacturing	UNL	Create instruction for blue glue mix	Training/policies	X			X	

Recommendation #	Specific status/ category	No longer occuring?	Reoccurrence so far (yrs)	Expected reoccurrence category (yrs)	Initial cost ($)	Actual cost savings ($/yr)	Projected/potential cost savings ($/yr)	Actual payback period (yr)	Projected payback period (yr)	Toxins category	Solid waste (lbs/yr)	Haz. waste (lbs/yr)	Haz. materials, lbs/yr
357					$0.00		$0.00	#DIV/0!	#DIV/0!				
358					Unknown		Unknown	#VALUE!	#VALUE!				
359					Unknown		Unknown	#VALUE!	#VALUE!				
360					Unknown		Unknown	#VALUE!	#VALUE!				
361					$0.00	$500.00	$500.00	0.00	0.00	0			
362					$300.00	$3,900.00	$3,900.00	0.08	0.08	0			
363					$1,300.00	Unknown	Unknown	#VALUE!	#VALUE!	0			
364					$0.00	Unknown	Unknown	#VALUE!	#VALUE!	0			
365					Unknown		Unknown	#VALUE!	#VALUE!				
366					$534.00		$93.00	#DIV/0!	5.74				
367					$0.00	Unknown	Unknown	#VALUE!	#VALUE!	0			
368					$0.00	Unknown	$5.00	#VALUE!	0.00	0			
369					$0.00	Unknown	Unknown	#VALUE!	#VALUE!	0			
370					$30.00	$642.00	$642.00	0.05	0.05	0			
371					$0.00	$9,762.00	$9,762.00	0.00	0.00	0			
372					$0.00	$420.00	$420.00	0.00	0.00	0			
373					$0.00	$600.00	$600.00	0.00	0.00	0			
374					$0.00	Unknown	Unknown	#VALUE!	#VALUE!	0			

						Survey #2: All reasons for implementing opportunity												Survey #3: Top reason for implementing opportunity											
Recommendation #	Survey #1 responded	Survey #2 responded	Survey #3 responded	Survey #4 responded	Survey #5 responded	**A2**: Acceptable payback	**B2**: Energy efficiency	**C2**: Reduced operating cost	**D2**: Increased employee productivity	**E2**: Health and safety benefits	**F2**: Regulatory compliance	**G2**: Reduced env. and health risk	**H2**: Reduced business risk	**I2**: Enhanced env. awareness	**J2**: Improved public image	**K2**: Other companies also implemented	**L2**: Corporate commitment	**A3**: Acceptable payback	**B3**: Energy efficiency	**C3**: Reduced operating cost	**D3**: Increased employee productivity	**E3**: Health and safety benefits	**F3**: Regulatory compliance	**G3**: Reduced env. and health risk	**H3**: Reduced business risk	**I3**: Enhanced env. awareness	**J3**: Improved public image	**K3**: Other companies also implemented	**L3**: Corporate commitment
357	X																												
358	X																												
359	X																												
360	X																												
361	X	X				1	1	1	1	1	1	1	1	1			1												
362	X	X				1	1	1	1	1	1	1	1	1			1												
363	X	X				1	1	1	1	1	1	1	1	1			1												
364	X	X				1	1	1	1	1	1	1	1	1			1												
365	X																												
366	X																												
367	X	X									1			1	1														
368	X	X										1																	
369	X	X									1																		
370	X	X						1																					
371	X	X						1																					
372	X	X						1																					
373	X	X										1																	
374	X	X										1																	

Recommendation #	Survey #4: All reasons for not implementing												Survey #5: Top reason for not implementing												Initial cost category	Projected payback category
	A4: Not technically feasible	**B4**: Lack of capital	**C4**: Insufficient financial payback	**D4**: Other priorities for capital investments	**E4**: Risk of production disruption/inconv./slow	**F4**: Lack of env./risk reduction benefits	**G4**: Limited in-plant expertise/capability	**H4**: Lack of staff awareness	**I4**: Customer specifications	**J4**: Uncertainty/lack of confidence in tech.	**K4**: Insufficient info regarding rec.	**L4**: Difficulty in coord. between units	**A5**: Not technically feasible	**B5**: Lack of capital	**C5**: Insufficient financial payback	**D5**: Other priorities for capital investments	**E5**: Risk of production disruption/inconv./slow	**F5**: Lack of env./risk reduction benefits	**G5**: Limited in-plant expertise/capability	**H5**: Lack of staff awareness	**I5**: Customer specifications	**J5**: Uncertainty/lack of confidence in tech.	**K5**: Insufficient info regarding rec.	**L5**: Difficulty in coord. between units		
357																									<999	Nothing
358																									>1,000	Unknown
359																									Unknown	Unknown
360																									Unknown	Unknown
361																									<999	<1 year
362																									<999	<1 year
363																									>1,000	Unknown
364																									<999	Unknown
365																									Unknown	Unknown
366																									<999	>4 years
367																									<999	Unknown
368																									<999	Unknown
369																									<999	Unknown
370																									<999	<1 year
371																									<999	<1 year
372																									<999	<1 year
373																									<999	<1 year
374																									<999	Unknown

Recommendation #	Year of assessment	Year of reassessment	Company #	Level of assis-tance	Company sector	Program (UNL/KSU)	P2 suggestion	P2 category	Implemented	Not implemented	Doing before	Originally Recommended	Originally Not recommended
375	2007	2008	39	One	Manufacturing	UNL	Recycle vinyl scraps	Off-site recycling	X			X	
376	2007	2008	39	One	Manufacturing	UNL	buy containers for used rags	Off-site recycling		X		X	
377	2003	2005	40	Partial	Public	UNL	Recycle solvents	Off-site recycling	X			X	
378	2003	2005	40	Partial	Public	UNL	Use aqueous parts cleaner	Material substitution	X			X	
379	2003	2005	40	Partial	Public	UNL	Use refillable spray bottles	Equipment/process modification	X			X	
380	2003	2005	40	Partial	Public	UNL	Switch to a biodegradable parts cleaner	Material substitution	X			X	
381	2003	2005	40	Partial	Public	UNL	Use a lower flow spray nozzle	Equipment/process modification	X			X	
382	2003	2005	40	Partial	Public	UNL	Lease two parts washers instead of three and rearrange the location	Equipment/process modification		X		X	
383	2003	2005	40	Partial	Public	UNL	Reclaim used wash water for additional use (implement a water reclamation system)	In-process recycling/modify waste stream		x		X	
384	2003	2005	40	Partial	Public	UNL	Use aqueous brake cleaner instead of a solvent-based cleaner	Material substitution		X		X	
385	2003	2005	40	Partial	Public	UNL	Recycle antifreeze instead of disposing in the sewer	Off-site recycling		X		X	
386	2003	2005	40	Partial	Public	UNL	Burn used oil	In-process recycling/modify waste stream		X		X	
387	2003	2005	40	Partial	Public	UNL	Introduce recycled oil and reusable oil filters into buses	Equipment/process modification		X		X	
388	2008	2009	41	Partial	Health care	UNL	Install occupancy sensors	Energy efficiency	X			X	
389	2009	2011	41	Partial	Health care	UNL	Select personnel and P2 team	Training/policies	X			X	
390	2009	2011	41	Partial	Health care	UNL	Purchase post-consumer paper	Purchasing	X			X	
391	2009	2011	41	Partial	Health care	UNL	Switch to reusable dishware	Equipment/process modification	X			X	
392	2009	2011	41	Partial	Health care	UNL	Recycle batteries	Off-site recycling	X			X	

Recommendation #	Specific status/ category	No longer occuring?	Reoccurrence so far (yrs)	Expected reoccurrence category (yrs)	Initial cost ($)	Actual cost savings ($/yr)	Projected/potential cost savings ($/yr)	Actual payback period (yr)	Projected payback period (yr)	Toxins category	Solid waste (lbs/yr)	Haz. waste (lbs/yr)	Haz. materials, lbs/yr
375					$0.00	Unknown	$16,380.00	#VALUE!	0.00	0			
376					Unknown		Unknown	#VALUE!	#VALUE!				
377					$0.00	Unknown	$1,500.00	#VALUE!	0.00	1			
378					$0.00	Unknown	$1,500.00	#VALUE!	0.00	1			
379					Unknown	Unknown	$100.00	#VALUE!	#VALUE!	1			
380					Unknown	Unknown	Unknown	#VALUE!	#VALUE!	1			
381					Unknown	Unknown	Unknown	#VALUE!	#VALUE!	0			
382					Unknown		Unknown	#VALUE!	#VALUE!				
383					Unknown		Unknown	#VALUE!	#VALUE!				
384					Unknown		Unknown	#VALUE!	#VALUE!				
385					Unknown		Unknown	#VALUE!	#VALUE!				
386					Unknown		Unknown	#VALUE!	#VALUE!				
387					Unknown		Unknown	#VALUE!	#VALUE!				
388					$214.00	$39.00	$552.00	5.49	0.39	0			
389					Unknown	Unknown	Unknown	#VALUE!	#VALUE!	0			
390					Unknown	Unknown	Unknown	#VALUE!	#VALUE!	0			
391					$0.00	$0.00	Unknown	#DIV/0!	#VALUE!	0			
392					$0.00	Unknown	Unknown	#VALUE!	#VALUE!	0			

Recommendation #	Survey #1 responded	Survey #2 responded	Survey #3 responded	Survey #4 responded	Survey #5 responded	Survey #2: All reasons for implementing opportunity												Survey #3: Top reason for implementing opportunity											
						A2: Acceptable payback	**B2**: Energy efficiency	**C2**: Reduced operating cost	**D2**: Increased employee productivity	**E2**: Health and safety benefits	**F2**: Regulatory compliance	**G2**: Reduced env. and health risk	**H2**: Reduced business risk	**I2**: Enhanced env. awareness	**J2**: Improved public image	**K2**: Other companies also implemented	**L2**: Corporate commitment	**A3**: Acceptable payback	**B3**: Energy efficiency	**C3**: Reduced operating cost	**D3**: Increased employee productivity	**E3**: Health and safety benefits	**F3**: Regulatory compliance	**G3**: Reduced env. and health risk	**H3**: Reduced business risk	**I3**: Enhanced env. awareness	**J3**: Improved public image	**K3**: Other companies also implemented	**L3**: Corporate commitment
375	X	X						1																					
376	X																												
377	X	X				1	1	1		1		1	1	1	1		1												
378	X	X				1	1	1		1		1	1	1	1		1												
379	X	X				1	1	1		1		1	1	1	1		1												
380	X	X				1	1	1		1		1	1	1	1		1												
381	X	X				1	1	1		1		1	1	1	1		1												
382	X																												
383	X																												
384	X																												
385	X																												
386	X																												
387	X																												
388	X	X					1	1						1	1														
389	X	X																											
390	X	X					1							1	1														
391	X	X					1	1						1	1														
392	X	X						1		1				1	1														

Recommendation #	**Survey #4: All reasons for not implementing**												**Survey #5: Top reason for not implementing**												Initial cost category	Projected payback category
	A4: Not technically feasible	**B4**: Lack of capital	**C4**: Insufficient financial payback	**D4**: Other priorities for capital investments	**E4**: Risk of production disruption/inconv./slow	**F4**: Lack of env./risk reduction benefits	**G4**: Limited in-plant expertise/capability	**H4**: Lack of staff awareness	**I4**: Customer specifications	**J4**: Uncertainty/lack of confidence in tech.	**K4**: Insufficient info regarding rec.	**L4**: Difficulty in coord. between units	**A5**: Not technically feasible	**B5**: Lack of capital	**C5**: Insufficient financial payback	**D5**: Other priorities for capital investments	**E5**: Risk of production disruption/inconv./slow	**F5**: Lack of env./risk reduction benefits	**G5**: Limited in-plant expertise/capability	**H5**: Lack of staff awareness	**I5**: Customer specifications	**J5**: Uncertainty/lack of confidence in tech.	**K5**: Insufficient info regarding rec.	**L5**: Difficulty in coord. between units		
375																									<999	<1 year
376																									>1,000	>4 years
377																									<999	Unknown
378																									<999	Unknown
379																									<999	<1 year
380																									<999	>4 years
381																									<999	<1 year
382																									<999	<1 year
383																									Unknown	Unknown
384																									<999	<1 year
385																									<999	<1 year
386																									>1,000	>4 years
387																									<999	<1 year
388																									<999	<1 year
389																									Unknown	Unknown
390																									<999	Unknown
391																									<999	Unknown
392																									<999	>4 years

Recommendation #	Year of assessment	Year of reassessment	Company #	Level of assis-tance	Company sector	Program (UNL/KSU)	P2 suggestion	P2 category	Implemented	Not implemented	Doing before	Originally Recommended	Originally Not recommended
393	2009	2011	41	Partial	Health care	UNL	P2 policy and goals	Training/policies		X		X	
394	2008	2009	41	Partial	Health care	UNL	inventory food waste	Training/policies		X		X	
395	2008	2011	41	Partial	Health care	UNL	napkins from recycled paper	Purchasing		X		X	
396	2008	2009	41	Partial	Health care	UNL	light switch reminders	Training/policies		X		X	
397	2008	2011	41	Partial	Health care	UNL	reduce aesthetic lighting	Energy efficiency		X		X	
398	2008	2011	41	Partial	Health care	UNL	recycle fluorescent lamps	Off-site recycling		X		X	
399	2008	2011	41	Partial	Health care	UNL	reduce stand-by use	Training/policies		X		X	
400	2008	2011	41	Partial	Health care	UNL	rainwater collection system	In-process recycling/modify waste stream		X		X	
401	2008	2011	41	Partial	Health care	UNL	waste composting	Equipment/process modification		X		X	
402	2008	2009	41	Partial	Health care	UNL	Thermostat management	Training/policies		X		X	
403	2008	2009	41	Partial	Health care	UNL	Limit menu	Training/policies		X		X	
404	2008	2009	41	Partial	Health care	UNL	Exit signs	Energy efficiency		X		X	
405	2008	2009	41	Partial	Health care	UNL	Cover swimming pool	Energy efficiency		X		X	
406	2008	2009	41	Partial	Health care	UNL	Standardize recycling	Off-site recycling		X		X	
407	2007	2008	42	Partial	Public	UNL	Develop P2 Policy and goals	Training/policies	X			X	
408	2010	2011	42	Partial	Public	UNL	Install high efficiency lighting	Energy efficiency	X			X	
409	2007	2008	42	Partial	Public	UNL	select a cause champion	Training/policies		X		X	
410	2007	2008	42	Partial	Public	UNL	use good lighting habits/reminders	Training/policies		X		X	

Recommendation #	Specific status/ category	No longer occurring?	Reoccurrence so far (yrs)	Expected reoccurrence category (yrs)	Initial cost ($)	Actual cost savings ($/yr)	Projected/potential cost savings ($/yr)	Actual payback period (yr)	Projected payback period (yr)	Toxins category	Solid waste (lbs/yr)	Haz. waste (lbs/yr)	Haz. materials, lbs/yr
393					Unknown		Unknown	#VALUE!	#VALUE!				
394					Unknown		Unknown	#VALUE!	#VALUE!				
395					Unknown		Unknown	#VALUE!	#VALUE!				
396					$32.00		$92.00	#DIV/0!	0.35				
397					Unknown		Unknown	#VALUE!	#VALUE!				
398					$75.00		$0.00	#DIV/0!	#DIV/0!				
399					$0.00		$3,000.00	#DIV/0!	0.00				
400					$120.00		Unknown	#DIV/0!	#VALUE!				
401					Unknown		$120.00	#VALUE!	#VALUE!				
402					$0.00		$1,447.00	#DIV/0!	0.00				
403					Unknown		Unknown	#VALUE!	#VALUE!				
404					$1,437.00		$910.00	#DIV/0!	1.58				
405					$2,269.00		$3,925.00	#DIV/0!	0.58				
406					$155.00		Unknown	#DIV/0!	#VALUE!				
407					$0.00	$0.00	$0.00	#DIV/0!	#DIV/0!	0			
408					$22,000.00	$18,500.00	$9,400.00	1.19	2.34	0			
409					$0.00		$0.00	#DIV/0!	#DIV/0!				
410					$15.00		$129.00	#DIV/0!	0.12				

Recommendation #	Survey #1 responded	Survey #2 responded	Survey #3 responded	Survey #4 responded	Survey #5 responded	Survey #2: All reasons for implementing opportunity												Survey #3: Top reason for implementing opportunity											
						A2: Acceptable payback	**B2**: Energy efficiency	**C2**: Reduced operating cost	**D2**: Increased employee productivity	**E2**: Health and safety benefits	**F2**: Regulatory compliance	**G2**: Reduced env. and health risk	**H2**: Reduced business risk	**I2**: Enhanced env. awareness	**J2**: Improved public image	**K2**: Other companies also implemented	**L2**: Corporate commitment	**A3**: Acceptable payback	**B3**: Energy efficiency	**C3**: Reduced operating cost	**D3**: Increased employee productivity	**E3**: Health and safety benefits	**F3**: Regulatory compliance	**G3**: Reduced env. and health risk	**H3**: Reduced business risk	**I3**: Enhanced env. awareness	**J3**: Improved public image	**K3**: Other companies also implemented	**L3**: Corporate commitment
393	X																												
394	X																												
395	X																												
396	X																												
397	X																												
398	X																												
399	X																												
400	X																												
401	X																												
402	X																												
403	X																												
404	X																												
405	X																												
406	X																												
407	X	X								1	1	1		1	1														
408	X	X				1	1	1						1	1		1												
409	X																												
410	X																												

Recommendation #	**Survey #4: All reasons for not implementing**												**Survey #5: Top reason for not implementing**												Initial cost category	Projected payback category
	A4: Not technically feasible	**B4**: Lack of capital	**C4**: Insufficient financial payback	**D4**: Other priorities for capital investments	**E4**: Risk of production disruption/inconv./slow	**F4**: Lack of env./risk reduction benefits	**G4**: Limited in-plant expertise/capability	**H4**: Lack of staff awareness	**I4**: Customer specifications	**J4**: Uncertainty/lack of confidence in tech.	**K4**: Insufficient info regarding rec.	**L4**: Difficulty in coord. between units	**A5**: Not technically feasible	**B5**: Lack of capital	**C5**: Insufficient financial payback	**D5**: Other priorities for capital investments	**E5**: Risk of production disruption/inconv./slow	**F5**: Lack of env./risk reduction benefits	**G5**: Limited in-plant expertise/capability	**H5**: Lack of staff awareness	**I5**: Customer specifications	**J5**: Uncertainty/lack of confidence in tech.	**K5**: Insufficient info regarding rec.	**L5**: Difficulty in coord. between units		
393																									Unknown	Unknown
394																									Unknown	Unknown
395																									<999	>4 years
396																									<999	<1 year
397																									<999	<1 year
398																									<999	<1 year
399																									<999	<1 year
400																									<999	Unknown
401																									>1,000	>4 years
402																									<999	<1 year
403																									Unknown	Unknown
404																									>1,000	<1 year
405																									>1,000	<1 year
406																									<999	Unknown
407																									<999	Nothing
408																									>1,000	2-4 years
409																									<999	Nothing
410																									<999	<1 year

Recommendation #	Year of assessment	Year of reassessment	Company #	Level of assis-tance	Company sector	Program (UNL/KSU)	P2 suggestion	P2 category	Implemented	Not implemented	Doing before	Originally Recommended	Originally Not recommended
411	2007	2008	42	Partial	Public	UNL	use timer for lighting	Energy efficiency		X		X	
412	2007	2008	42	Partial	Public	UNL	replace exit signs	Energy efficiency		X		X	
413	2007	2008	42	Partial	Public	UNL	eliminate extra light	Energy efficiency		X		X	
414	2007	2008	42	Partial	Public	UNL	replace T12 with T8 bulbs	Energy efficiency		X		X	
415	2008	2009	43	Partial	Public	UNL	Record system for waste streams	Improved housekeeping/ preventative maintenance	X			X	
416	2008	2009	43	Partial	Public	UNL	Improve recycling	Off-site recycling	X			X	
417	2008	2009	43	Partial	Public	UNL	Recycle concrete/cardboard/wood	Off-site recycling	X			X	
418	2008	2009	43	Partial	Public	UNL	Waste management	Training/policies	X			X	
419	2007	2011	44	Partial	Public	UNL	Use markers instead of aerosol paint	Equipment/process modification	X			X	
420	2007	2011	44	Partial	Public	UNL	Fix leaks	Improved housekeeping/ preventative maintenance	X			X	
421	2007	2011	44	Partial	Public	UNL	Replace incandescent bulbs with CFL	Energy efficiency	X			X	
422	2007	2011	44	Partial	Public	UNL	Decrease use of radian heat	Training/policies	X			X	
423	2007	2011	44	Partial	Public	UNL	Recycle oil filters	Off-site recycling	X			X	
424	2007	2011	44	Partial	Public	UNL	reduce number of aerosol cans in stock	Purchasing		X		X	
425	2007	2011	44	Partial	Public	UNL	replace spray cans	Equipment/process modification		X		X	
426	2007	2011	44	Partial	Public	UNL	use electric motors to crush filters	Equipment/process modification		X		X	
427	2007	2011	44	Partial	Public	UNL	reduce number of parts washers	Equipment/process modification		X		X	
428	2007	2011	44	Partial	Public	UNL	replace parts washers	Equipment/process modification		X		X	

Recommendation #	Specific status/ category	No longer occuring?	Reoccurrence so far (yrs)	Expected reoccurrence category (yrs)	Initial cost ($)	Actual cost savings ($/yr)	Projected/potential cost savings ($/yr)	Actual payback period (yr)	Projected payback period (yr)	Toxins category	Solid waste (lbs/yr)	Haz. waste (lbs/yr)	Haz. materials, lbs/yr
411					$200.00		$62.00	#DIV/0!	3.23				
412					$300.00		$103.00	#DIV/0!	2.91				
413					$0.00		$39.00	#DIV/0!	0.00				
414					$2,015.00		$403.00	#DIV/0!	5.00				
415					$0.00	$0.00	Unknown	#DIV/0!	#VALUE!	0			
416					$0.00	Unknown	Unknown	#VALUE!	#VALUE!	0			
417					$0.00	$1,869.00	$1,869.00	0.00	0.00	0			
418					$0.00	Unknown	$0.00	#VALUE!	#DIV/0!	0			
419					$270.00	$307.00	Unknown	0.88	#VALUE!	1			
420					$68.00	Unknown	$106.00	#VALUE!	0.64	0			
421					$878.00	Unknown	$855.00	#VALUE!	1.03	0			
422					$0.00	Unknown	Unknown	#VALUE!	#VALUE!	0			
423					$0.00	$760.00	Unknown	0.00	#VALUE!	0			
424					$0.00		$7.00	#DIV/0!	0.00				
425					$385.00		$158.00	#DIV/0!	2.44				
426					Unknown		Unknown	#VALUE!	#VALUE!				
427					$0.00		$300.00	#DIV/0!	0.00				
428					$1,250.00		$510.00	#DIV/0!	2.45				

						Survey #2: All reasons for implementing opportunity												Survey #3: Top reason for implementing opportunity											
Recommendation #	Survey #1 responded	Survey #2 responded	Survey #3 responded	Survey #4 responded	Survey #5 responded	**A2**: Acceptable payback	**B2**: Energy efficiency	**C2**: Reduced operating cost	**D2**: Increased employee productivity	**E2**: Health and safety benefits	**F2**: Regulatory compliance	**G2**: Reduced env. and health risk	**H2**: Reduced business risk	**I2**: Enhanced env. awareness	**J2**: Improved public image	**K2**: Other companies also implemented	**L2**: Corporate commitment	**A3**: Acceptable payback	**B3**: Energy efficiency	**C3**: Reduced operating cost	**D3**: Increased employee productivity	**E3**: Health and safety benefits	**F3**: Regulatory compliance	**G3**: Reduced env. and health risk	**H3**: Reduced business risk	**I3**: Enhanced env. awareness	**J3**: Improved public image	**K3**: Other companies also implemented	**L3**: Corporate commitment
411	X																												
412	X																												
413	X																												
414	X																												
415	X	X												1															
416	X	X						1								1	1												
417	X	X						1						1		1	1												
418	X	X						1						1															
419	X	X						1	1																				
420	X	X					1	1	1																				
421	X	X				1	1	1						1			1												
422	X	X				1	1	1																					
423	X	X						1			1			1			1												
424	X																												
425	X																												
426	X																												
427	X																												
428	X																												

Recommendation #	Survey #4: All reasons for not implementing												Survey #5: Top reason for not implementing												Initial cost category	Projected payback category
	A4: Not technically feasible	**B4**: Lack of capital	**C4**: Insufficient financial payback	**D4**: Other priorities for capital investments	**E4**: Risk of production disruption/inconv./slow	**F4**: Lack of env./risk reduction benefits	**G4**: Limited in-plant expertise/capability	**H4**: Lack of staff awareness	**I4**: Customer specifications	**J4**: Uncertainty/lack of confidence in tech.	**K4**: Insufficient info regarding rec.	**L4**: Difficulty in coord. between units	**A5**: Not technically feasible	**B5**: Lack of capital	**C5**: Insufficient financial payback	**D5**: Other priorities for capital investments	**E5**: Risk of production disruption/inconv./slow	**F5**: Lack of env./risk reduction benefits	**G5**: Limited in-plant expertise/capability	**H5**: Lack of staff awareness	**I5**: Customer specifications	**J5**: Uncertainty/lack of confidence in tech.	**K5**: Insufficient info regarding rec.	**L5**: Difficulty in coord. between units		
411																									<999	2-4 years
412																									<999	2-4 years
413																									<999	<1 year
414																									>1,000	>4 years
415																									<999	Unknown
416																									<999	Unknown
417																									<999	<1 year
418																									<999	Unknown
419																									<999	<1 year
420																									<999	<1 year
421																									<999	1-1.9 years
422																									<999	<1 year
423																									<999	<1 year
424																									<999	<1 year
425																									<999	>4 years
426																									>1,000	>4 years
427																									<999	<1 year
428																									>1,000	2-4 years

Recommendation #	Year of assessment	Year of reassessment	Company #	Level of assis-tance	Company sector	Program (UNL/KSU)	P2 suggestion	P2 category	Implemented	Not implemented	Doing before	Originally Recommended	Originally Not recommended
429	2007	2011	44	Partial	Public	UNL	lower temperature	Training/policies		X		X	
430	2007	2011	44	Partial	Public	UNL	lower compressed air pressure	Energy efficiency		X		X	
431	2007	2011	44	Partial	Public	UNL	new reusable plastic pallets	Equipment/process modification		X		X	
432	2007	2011	44	Partial	Public	UNL	recycle wooden pallets via material exchange	Off-site recycling		X		X	
433	2007	2011	44	Partial	Public	UNL	scrap recycle to local companies	Off-site recycling		X		X	
434	2007	2011	44	Partial	Public	UNL	in-process recycling	In-process recycling/modify waste stream		X		X	
435	2007	2011	44	Partial	Public	UNL	change sandblaster abrasive	Material substitution		X		X	
436	2007	2011	44	Partial	Public	UNL	plastic scrap recycling	Off-site recycling		X		X	
437	2007	2011	44	Partial	Public	UNL	reduce amount of shop rags	Training/policies		X		X	
438	2007	2011	44	Partial	Public	UNL	reduce garbage pick up frequency	Purchasing		X		X	
439	2007	2011	44	Partial	Public	UNL	daylight harvesting	Training/policies		X		X	
440	2007	2011	44	Partial	Public	UNL	new welding machines	Equipment/process modification		X		X	
441	2006	2008	45	Partial	Public	UNL	Use natural light	Training/policies	X			X	
442	2006	2008	45	Partial	Public	UNL	Decrease water use in washer area	Training/policies	X			X	
443	2006	2008	45	Partial	Public	UNL	Move oil containers to shaded area	Improved housekeeping/ preventative maintenance	X			X	
444	2006	2008	45	Partial	Public	UNL	Eliminate outdoor storage	Improved housekeeping/ preventative maintenance	X			X	
445	2006	2008	45	Partial	Public	UNL	Recycle wooden pallets	Off-site recycling	X			X	
446	2006	2008	45	Partial	Public	UNL	Wooden cable reel recycle	Off-site recycling	X			X	

Recommendation #	Specific status/ category	No longer occuring?	Reoccurrence so far (yrs)	Expected reoccurrence category (yrs)	Initial cost ($)	Actual cost savings ($/yr)	Projected/potential cost savings ($/yr)	Actual payback period (yr)	Projected payback period (yr)	Toxins category	Solid waste (lbs/yr)	Haz. waste (lbs/yr)	Haz. materials, lbs/yr
429					$0.00		$15.00	#DIV/0!	0.00				
430					$0.00		$360.00	#DIV/0!	0.00				
431					$10,500.00		$70,875.00	#DIV/0!	0.15				
432					$0.00		$593.00	#DIV/0!	0.00				
433					$0.00		$890.00	#DIV/0!	0.00				
434					$5,900.00		$691.68	#DIV/0!	8.53				
435					$3.60		$9.00	#DIV/0!	0.40				
436					$0.00		$30.00	#DIV/0!	0.00				
437					$0.00		$300.00	#DIV/0!	0.00				
438					$0.00		$255.00	#DIV/0!	0.00				
439					Unknown		Unknown	#VALUE!	#VALUE!				
440					Unknown		Unknown	#VALUE!	#VALUE!				
441					$6,400.00	Unknown	$190.00	#VALUE!	33.68	0			
442					$0.00	Unknown	$240.00	#VALUE!	0.00	0			
443					$0.00	Unknown	Unknown	#VALUE!	#VALUE!	0			
444					$0.00	Unknown	Unknown	#VALUE!	#VALUE!	0			
445					$0.00	$450.00	Unknown	0.00	#VALUE!	0			
446					$0.00	$1,200.00	Unknown	0.00	#VALUE!	0			

						Survey #2: All reasons for implementing opportunity												**Survey #3: Top reason for implementing opportunity**											
Recommendation #	Survey #1 responded	Survey #2 responded	Survey #3 responded	Survey #4 responded	Survey #5 responded	**A2**: Acceptable payback	**B2**: Energy efficiency	**C2**: Reduced operating cost	**D2**: Increased employee productivity	**E2**: Health and safety benefits	**F2**: Regulatory compliance	**G2**: Reduced env. and health risk	**H2**: Reduced business risk	**I2**: Enhanced env. awareness	**J2**: Improved public image	**K2**: Other companies also implemented	**L2**: Corporate commitment	**A3**: Acceptable payback	**B3**: Energy efficiency	**C3**: Reduced operating cost	**D3**: Increased employee productivity	**E3**: Health and safety benefits	**F3**: Regulatory compliance	**G3**: Reduced env. and health risk	**H3**: Reduced business risk	**I3**: Enhanced env. awareness	**J3**: Improved public image	**K3**: Other companies also implemented	**L3**: Corporate commitment
429	X																												
430	X																												
431	X																												
432	X																												
433	X																												
434	X																												
435	X																												
436	X																												
437	X																												
438	X																												
439	X																												
440	X																												
441	X	X								1	1	1	1																
442	X	X								1	1	1	1																
443	X	X								1	1	1	1																
444	X	X								1	1	1	1																
445	X	X								1	1	1	1																
446	X	X								1	1	1	1																

Recommendation #	Survey #4: All reasons for not implementing												Survey #5: Top reason for not implementing												Initial cost category	Projected payback category
	A4: Not technically feasible	**B4**: Lack of capital	**C4**: Insufficient financial payback	**D4**: Other priorities for capital investments	**E4**: Risk of production disruption/inconv./slow	**F4**: Lack of env./risk reduction benefits	**G4**: Limited in-plant expertise/capability	**H4**: Lack of staff awareness	**I4**: Customer specifications	**J4**: Uncertainty/lack of confidence in tech.	**K4**: Insufficient info regarding rec.	**L4**: Difficulty in coord. between units	**A5**: Not technically feasible	**B5**: Lack of capital	**C5**: Insufficient financial payback	**D5**: Other priorities for capital investments	**E5**: Risk of production disruption/inconv./slow	**F5**: Lack of env./risk reduction benefits	**G5**: Limited in-plant expertise/capability	**H5**: Lack of staff awareness	**I5**: Customer specifications	**J5**: Uncertainty/lack of confidence in tech.	**K5**: Insufficient info regarding rec.	**L5**: Difficulty in coord. between units		
429																									<999	<1 year
430																									<999	<1 year
431																									>1,000	>4 years
432																									<999	<1 year
433																									<999	<1 year
434																									>1,000	>4 years
435																									<999	<1 year
436																									<999	<1 year
437																									<999	<1 year
438																									<999	<1 year
439																									>1,000	>4 years
440																									>1,000	>4 years
441																									>1,000	>4 years
442																									<999	<1 year
443																									<999	Unknown
444																									<999	Unknown
445																									<999	<1 year
446																									<999	<1 year

Recommendation #	Year of assessment	Year of reassessment	Company #	Level of assis-tance	Company sector	Program (UNL/KSU)	P2 suggestion	P2 category	Implemented	Not implemented	Doing before	Originally Recommended	Originally Not recommended
447	2006	2008	45	Partial	Public	UNL	Adjust sprinkler system	Improved housekeeping/ preventative maintenance	X			X	
448	2006	2008	45	Partial	Public	UNL	Utilize Midwest Refuse's Cardboard Recycling Service	Off-site recycling		X		X	
449	2006	2008	45	Partial	Public	UNL	Eliminate use of Liquid Alive	Equipment/process modification		X		X	
450	2006	2008	45	Partial	Public	UNL	Switch to reeless packaging option	Purchasing		X		X	
451	2006	2008	45	Partial	Public	UNL	Install a rain sensor	Equipment/process modification		X		X	
452	2006	2008	45	Partial	Public	UNL	Convert the northwest grass median to mulch	Equipment/process modification		X		X	
453	2006	2007	46	Partial	Other	UNL	Organic recycling	Off-site recycling	X			X	
454	2006	2007	46	Partial	Other	UNL	recycle plastic film and office paper	Off-site recycling		X		X	
455	2008	2011	47	Partial	Other	UNL	Replace incandescent bulbs with CFL	Energy efficiency	X			X	
456	2008	2011	47	Partial	Other	UNL	alternative solvent tank	Equipment/process modification		X		X	
457	2008	2011	47	Partial	Other	UNL	expand recycling program	Off-site recycling		X		X	
458	2008	2011	47	Partial	Other	UNL	aerosol can alternatives	Purchasing		X		X	
459	2006	2007	49	Partial	Other	UNL	Install T8 lighting	Energy efficiency	X			X	
460	2006	2007	49	Partial	Other	UNL	shade for non-shaded areas/trees	Energy efficiency		X		X	
461	2006	2007	49	Partial	Other	UNL	install timers on pumps and heaters	Energy efficiency		X		X	
462	2006	2007	49	Partial	Other	UNL	install occupancy sensors	Energy efficiency		X		X	
463	2006	2007	49	Partial	Other	UNL	purchase Energy Star washing machines	Energy efficiency		X		X	
464	2006	2007	49	Partial	Other	UNL	use env.friendly cleaning product	Purchasing		X		X	

Recommendation #	Specific status/ category	No longer occurring?	Reoccurrence so far (yrs)	Expected reoccurrence category (yrs)	Initial cost ($)	Actual cost savings ($/yr)	Projected/potential cost savings ($/yr)	Actual payback period (yr)	Projected payback period (yr)	Toxins category	Solid waste (lbs/yr)	Haz. waste (lbs/yr)	Haz. materials, lbs/yr
447					$0.00	Unknown	$1,611.00	#VALUE!	0.00	0			
448					Unknown		$7,500.00	#VALUE!	#VALUE!		147,000		
449					Unknown		$1,040.00	#VALUE!	#VALUE!				
450					Unknown		Unknown	#VALUE!	#VALUE!				
451					$47.50			#DIV/0!	#DIV/0!				
452					Unknown			#VALUE!	#VALUE!				
453					$0.00	$625.00	$625.00	0.00	0.00	0			
454					Unknown		Unknown	#VALUE!	#VALUE!				
455					$180.00	$230.00	$230.00	0.78	0.78	0			
456					$1,600.00		$200.00	#DIV/0!	8.00				
457					$0.00		$370.00	#DIV/0!	0.00				
458					$0.00		Unknown	#DIV/0!	#VALUE!				
459					$550.00	$118.00	$250.00	4.66	2.20	0			
460					$6,000.00		$8,500.00	#DIV/0!	0.71				
461					$440.00		$1,100.00	#DIV/0!	0.40				
462					$376.00		$659.00	#DIV/0!	0.57				
463					$1,125.00		$370.00	#DIV/0!	3.04				
464					Unknown		Unknown	#VALUE!	#VALUE!				

Recommendation #	Survey #1 responded	Survey #2 responded	Survey #3 responded	Survey #4 responded	Survey #5 responded	Survey #2: All reasons for implementing opportunity												Survey #3: Top reason for implementing opportunity											
						A2: Acceptable payback	**B2**: Energy efficiency	**C2**: Reduced operating cost	**D2**: Increased employee productivity	**E2**: Health and safety benefits	**F2**: Regulatory compliance	**G2**: Reduced env. and health risk	**H2**: Reduced business risk	**I2**: Enhanced env. awareness	**J2**: Improved public image	**K2**: Other companies also implemented	**L2**: Corporate commitment	**A3**: Acceptable payback	**B3**: Energy efficiency	**C3**: Reduced operating cost	**D3**: Increased employee productivity	**E3**: Health and safety benefits	**F3**: Regulatory compliance	**G3**: Reduced env. and health risk	**H3**: Reduced business risk	**I3**: Enhanced env. awareness	**J3**: Improved public image	**K3**: Other companies also implemented	**L3**: Corporate commitment
447	X	X								1	1	1	1																
448	X																												
449	X																												
450	X																												
451	X																												
452	X																												
453	X	X																											
454	X																												
455	X	X				1	1	1	1	1	1	1	1	1	1	1													
456	X																												
457	X																												
458	X																												
459	X	X				1	1	1		1																			
460	X																												
461	X																												
462	X																												
463	X																												
464	X																												

Recommendation #	Survey #4: All reasons for not implementing												Survey #5: Top reason for not implementing												Initial cost category	Projected payback category
	A4: Not technically feasible	**B4**: Lack of capital	**C4**: Insufficient financial payback	**D4**: Other priorities for capital investments	**E4**: Risk of production disruption/inconv./slow	**F4**: Lack of env./risk reduction benefits	**G4**: Limited in-plant expertise/capability	**H4**: Lack of staff awareness	**I4**: Customer specifications	**J4**: Uncertainty/lack of confidence in tech.	**K4**: Insufficient info regarding rec.	**L4**: Difficulty in coord. between units	**A5**: Not technically feasible	**B5**: Lack of capital	**C5**: Insufficient financial payback	**D5**: Other priorities for capital investments	**E5**: Risk of production disruption/inconv./slow	**F5**: Lack of env./risk reduction benefits	**G5**: Limited in-plant expertise/capability	**H5**: Lack of staff awareness	**I5**: Customer specifications	**J5**: Uncertainty/lack of confidence in tech.	**K5**: Insufficient info regarding rec.	**L5**: Difficulty in coord. between units		
447																									<999	<1 year
448																									<999	<1 year
449																									<999	<1 year
450																									Unknown	Unknown
451																									<999	<1 year
452																									Unknown	Unknown
453																									<999	<1 year
454																									Unknown	Unknown
455																									<999	<1 year
456																									>1,000	>4 years
457																									<999	<1 year
458																									<999	Unknown
459																									<999	2-4 years
460																									>1,000	<1 year
461																									<999	<1 year
462																									<999	<1 year
463																									>1,000	2-4 years
464																									<999	Unknown

Recommendation #	Year of assessment	Year of reassessment	Company #	Level of assis-tance	Company sector	Program (UNL/KSU)	P2 suggestion	P2 category	Implemented	Not implemented	Doing before	Originally Recommended	Originally Not recommended
465	1999	2007	50	Multi	Other	UNL	Introduce P2 Policy (EMS plan)	Training/policies	X			X	
466	1999	2007	50	Multi	Other	UNL	MSDSs available for employees	Training/policies	X			X	
467	1999	2007	50	Multi	Other	UNL	Reuse Hi-Dri	In-process recycling/modify waste stream	X			X	
468	1999	2007	50	Multi	Other	UNL	Check aerosol cans before disposal	Training/policies	X			X	
469	1999	2007	50	Multi	Other	UNL	Use spill pad covers on drums	Improved housekeeping/ preventative maintenance	X			X	
470	1999	2007	50	Multi	Other	UNL	Use 55 gal. drum spill trays	Improved housekeeping/ preventative maintenance	X			X	
471	1999	2007	50	Multi	Other	UNL	Use higher quality pumps	Energy efficiency	X			X	
472	1999	2007	50	Multi	Other	UNL	Use HVLP paint gun when possible	Equipment/process modification	X			X	
473	1999	2007	50	Multi	Other	UNL	Replace aerosol cans	Purchasing	X			X	
474	1999	2007	50	Multi	Other	UNL	Replace solvent-based parts washer	Equipment/process modification	X			X	
475	1999	2007	50	Multi	Other	UNL	spray technique analysis and training	Training/policies		X		X	
476	1999	2007	50	Multi	Other	UNL	use Laser touch for painting	Equipment/process modification		X		X	
477	1999	2007	50	Multi	Other	UNL	replace disposable wipe-all towels	Equipment/process modification		X		X	
478	1999	2007	50	Multi	Other	UNL	replace Applichem 81-389	Material substitution		X		X	
479	1999	2007	50	Multi	Other	UNL	replace glue with aqueous adhesives	Material substitution		X		X	
480	1999	2007	50	Multi	Other	UNL	use an oil/paint can crusher	Equipment/process modification		X		X	
481	1999	2007	50	Multi	Other	UNL	recycle and reuse Ultra MEC 135	In-process recycling/modify waste stream		X		X	
482	1999	2007	50	Multi	Other	UNL	rewire glue and spray booths	In-process recycling/modify waste stream		X		X	

Recommendation #	Specific status/ category	No longer occurring?	Reoccurrence so far (yrs)	Expected reoccurrence category (yrs)	Initial cost ($)	Actual cost savings ($/yr)	Projected/potential cost savings ($/yr)	Actual payback period (yr)	Projected payback period (yr)	Toxins category	Solid waste (lbs/yr)	Haz. waste (lbs/yr)	Haz. materials, lbs/yr
465					$0.00	$0.00	$0.00	#DIV/0!	#DIV/0!	0			
466					$0.00	Unknown	Unknown	#VALUE!	#VALUE!	0			
467					$4,850.00	$4,015.00	$4,015.00	1.21	1.21	0			
468					$0.00	$432.00	$432.00	0.00	0.00	0			
469					$1,212.00	$2,500.00	$2,500.00	0.48	0.48	0			
470					$780.00	$700.00	$700.00	1.11	1.11	0			
471					$400.00	$60.00	$60.00	6.67	6.67	0			
472					$0.00	Unknown	Unknown	#VALUE!	#VALUE!	0			
473					Unknown	Unknown	Unknown	#VALUE!	#VALUE!	0			
474					$2,020.00	$1,310.00	$1,310.00	1.54	1.54	1			
475					Unknown		Unknown	#VALUE!	#VALUE!				
476					$530/each		Unknown	#VALUE!	#VALUE!				
477					$0.00		$29,155.00	#DIV/0!	0.00				
478					Unknown		$7.72/5 gal	#VALUE!	#VALUE!				
479					Unknown		Unknown	#VALUE!	#VALUE!				
480					Unknown		Unknown	#VALUE!	#VALUE!				
481					Unknown		Unknown	#VALUE!	#VALUE!				
482					Unknown		Unknown	#VALUE!	#VALUE!				

						Survey #2: All reasons for implementing opportunity												Survey #3: Top reason for implementing opportunity											
Recommendation #	Survey #1 responded	Survey #2 responded	Survey #3 responded	Survey #4 responded	Survey #5 responded	**A2**: Acceptable payback	**B2**: Energy efficiency	**C2**: Reduced operating cost	**D2**: Increased employee productivity	**E2**: Health and safety benefits	**F2**: Regulatory compliance	**G2**: Reduced env. and health risk	**H2**: Reduced business risk	**I2**: Enhanced env. awareness	**J2**: Improved public image	**K2**: Other companies also implemented	**L2**: Corporate commitment	**A3**: Acceptable payback	**B3**: Energy efficiency	**C3**: Reduced operating cost	**D3**: Increased employee productivity	**E3**: Health and safety benefits	**F3**: Regulatory compliance	**G3**: Reduced env. and health risk	**H3**: Reduced business risk	**I3**: Enhanced env. awareness	**J3**: Improved public image	**K3**: Other companies also implemented	**L3**: Corporate commitment
465	X	X					1	1	1	1	1	1	1	1	1	1	1												
466	X	X							1	1	1	1		1	1	1													
467	X	X																											
468	X	X				1				1	1				1		1												
469	X	X									1				1														
470	X	X																											
471	X	X																											
472	X	X																											
473	X	X				1	1	1									1												
474	X	X							1		1	1		1	1		1												
475	X																												
476	X																												
477	X																												
478	X																												
479	X																												
480	X																												
481	X																												
482	X																												

Recommendation #	Survey #4: All reasons for not implementing												Survey #5: Top reason for not implementing												Initial cost category	Projected payback category
	A4: Not technically feasible	**B4**: Lack of capital	**C4**: Insufficient financial payback	**D4**: Other priorities for capital investments	**E4**: Risk of production disruption/inconv./slow	**F4**: Lack of env./risk reduction benefits	**G4**: Limited in-plant expertise/capability	**H4**: Lack of staff awareness	**I4**: Customer specifications	**J4**: Uncertainty/lack of confidence in tech.	**K4**: Insufficient info regarding rec.	**L4**: Difficulty in coord. between units	**A5**: Not technically feasible	**B5**: Lack of capital	**C5**: Insufficient financial payback	**D5**: Other priorities for capital investments	**E5**: Risk of production disruption/inconv./slow	**F5**: Lack of env./risk reduction benefits	**G5**: Limited in-plant expertise/capability	**H5**: Lack of staff awareness	**I5**: Customer specifications	**J5**: Uncertainty/lack of confidence in tech.	**K5**: Insufficient info regarding rec.	**L5**: Difficulty in coord. between units		
465																									<999	Nothing
466																									<999	Unknown
467																									>1,000	1-1.9 years
468																									<999	<1 year
469																									>1,000	<1 year
470																									<999	1-1.9 years
471																									<999	>4 years
472																									<999	<1 year
473																									Unknown	Unknown
474																									>1,000	1-1.9 years
475																									Unknown	Unknown
476																									<999	Unknown
477																									<999	<1 year
478																									<999	<1 year
479																									Unknown	Unknown
480																									>1,000	>4 years
481																									>1,000	Unknown
482																									>1,000	Unknown

Recommendation #	Year of assessment	Year of reassessment	Company #	Level of assis-tance	Company sector	Program (UNL/KSU)	P2 suggestion	P2 category	Implemented	Not implemented	Doing before	Originally Recommended	Originally Not recommended
483	1999	2007	50	Multi	Other	UNL	use sludge heater in WWT facility	Equipment/process modification		X		X	
484	1999	2007	50	Multi	Other	UNL	use Flash Jet stripping process	Equipment/process modification		X		X	
485	2005	2006	51	Partial	Other	UNL	Check compressor leaks and seals	Improved housekeeping/ preventative maintenance	X			X	
486	2005	2006	51	Partial	Other	UNL	Recycle paint thinner	Off-site recycling	X			X	
487	2005	2006	51	Partial	Other	UNL	Recycle metal scrap	Off-site recycling	X			X	
488	2005	2006	51	Partial	Other	UNL	Recycle carbide bids	Off-site recycling	X			X	
489	2006	2007	51	Partial	Other	UNL	Burn used-oil for heat	In-process recycling/modify waste stream	X			X	
490	2006	2007	51	Partial	Other	UNL	Replace water cutting system	Equipment/process modification	X			X	
491	2005	2006	51	Partial	Other	UNL	crush and hot drain of oil filters	Equipment/process modification		X		X	
492	2005	2006	51	Partial	Other	UNL	tank for runoff	Improved housekeeping/ preventative maintenance		X		X	
493	2005	2006	51	Partial	Other	UNL	dispose oil absorbent differently	Off-site recycling		X		X	
494	2005	2006	51	Partial	Other	UNL	use more envir. Friendly absorbent	Purchasing		X		X	
495	2005	2006	51	Partial	Other	UNL	put smoke into muni solid waste	Equipment/process modification		X		X	
496	2006	2007	51	Partial	Other	UNL	Crush and recycle used oil filters	Off-site recycling		X		X	
497	2008	2009	52	Partial	Other	UNL	Switch to soy foam	Material substitution	X			X	
498	2008	2009	52	Partial	Other	UNL	Recycle fluorescent bulbs	Off-site recycling	X			X	
499	2008	2009	52	Partial	Other	UNL	foam recycling	Off-site recycling		X		X	
500	2008	2009	52	Partial	Other	UNL	new AC in front room	Equipment/process modification		X		X	

Recommendation #	Specific status/ category	No longer occurring?	Reoccurrence so far (yrs)	Expected reoccurrence category (yrs)	Initial cost ($)	Actual cost savings ($/yr)	Projected/potential cost savings ($/yr)	Actual payback period (yr)	Projected payback period (yr)	Toxins category	Solid waste (lbs/yr)	Haz. waste (lbs/yr)	Haz. materials, lbs/yr
483					$47,500.00		$36,538.46	#DIV/0!	1.30				
484					$3,000,000		$3,333,333.00	#DIV/0!	0.90				
485					Unknown	Unknown	$108.00	#VALUE!	#VALUE!	0			
486					Unknown	Unknown	Unknown	#VALUE!	#VALUE!	0			
487					Unknown	Unknown	Unknown	#VALUE!	#VALUE!	0			
488					Unknown	Unknown	Unknown	#VALUE!	#VALUE!	0			
489					$6,700.00	$3,000.00	$3,000.00	2.23	2.23	0			
490					$6,000.00	$100.00	$100.00	60.00	60.00	0			
491					Unknown		Unknown	#VALUE!	#VALUE!				
492					Unknown		Unknown	#VALUE!	#VALUE!				
493					Unknown		Unknown	#VALUE!	#VALUE!				
494					Unknown		Unknown	#VALUE!	#VALUE!				
495					Unknown		Unknown	#VALUE!	#VALUE!				
496					$2,500.00		$9.00	#DIV/0!	277.78				
497					Unknown	Unknown	Unknown	#VALUE!	#VALUE!	0			
498					$0.00	$0.00	Unknown	#DIV/0!	#VALUE!	0			
499					Unknown		Unknown	#VALUE!	#VALUE!				
500					Unknown		Unknown	#VALUE!	#VALUE!				

Recommendation #	Survey #1 responded	Survey #2 responded	Survey #3 responded	Survey #4 responded	Survey #5 responded	Survey #2: All reasons for implementing opportunity												Survey #3: Top reason for implementing opportunity											
						A2: Acceptable payback	**B2**: Energy efficiency	**C2**: Reduced operating cost	**D2**: Increased employee productivity	**E2**: Health and safety benefits	**F2**: Regulatory compliance	**G2**: Reduced env. and health risk	**H2**: Reduced business risk	**I2**: Enhanced env. awareness	**J2**: Improved public image	**K2**: Other companies also implemented	**L2**: Corporate commitment	**A3**: Acceptable payback	**B3**: Energy efficiency	**C3**: Reduced operating cost	**D3**: Increased employee productivity	**E3**: Health and safety benefits	**F3**: Regulatory compliance	**G3**: Reduced env. and health risk	**H3**: Reduced business risk	**I3**: Enhanced env. awareness	**J3**: Improved public image	**K3**: Other companies also implemented	**L3**: Corporate commitment
483	X																												
484	X																												
485	X																												
486	X																												
487	X																												
488	X																												
489	X																												
490	X																												
491	X																												
492	X																												
493	X																												
494	X																												
495	X																												
496	X																												
497	X	X										1			1														
498	X	X					1					1		1															
499	X																												
500	X																												

Recommendation #	Survey #4: All reasons for not implementing												Survey #5: Top reason for not implementing												Initial cost category	Projected payback category
	A4: Not technically feasible	**B4**: Lack of capital	**C4**: Insufficient financial payback	**D4**: Other priorities for capital investments	**E4**: Risk of production disruption/inconv./slow	**F4**: Lack of env./risk reduction benefits	**G4**: Limited in-plant expertise/capability	**H4**: Lack of staff awareness	**I4**: Customer specifications	**J4**: Uncertainty/lack of confidence in tech.	**K4**: Insufficient info regarding rec.	**L4**: Difficulty in coord. between units	**A5**: Not technically feasible	**B5**: Lack of capital	**C5**: Insufficient financial payback	**D5**: Other priorities for capital investments	**E5**: Risk of production disruption/inconv./slow	**F5**: Lack of env./risk reduction benefits	**G5**: Limited in-plant expertise/capability	**H5**: Lack of staff awareness	**I5**: Customer specifications	**J5**: Uncertainty/lack of confidence in tech.	**K5**: Insufficient info regarding rec.	**L5**: Difficulty in coord. between units		
483																									>1,000	1-1.9 years
484																									>1,000	<1 year
485																									<999	<1 year
486																									Unknown	Unknown
487																									<999	<1 year
488																									Unknown	Unknown
489																									>1,000	2-4 years
490																									>1,000	>4 years
491																									>1,000	>4 years
492																									Unknown	Unknown
493																									Unknown	Unknown
494																									Unknown	Unknown
495																									Unknown	Unknown
496																									>1,000	>4 years
497																									Unknown	Unknown
498																									<999	>4 years
499																									Unknown	Unknown
500																									>1,000	>4 years

Recommendation #	Year of assessment	Year of reassessment	Company #	Level of assis-tance	Company sector	Program (UNL/KSU)	P2 suggestion	P2 category	Implemented	Not implemented	Doing before	Originally Recommended	Originally Not recommended
501	2008	2009	52	Partial	Other	UNL	paper and cardboard recycling	Off-site recycling		X		X	
502	2010	2011	53	Partial	Other	UNL	Switch to refillable spray-bottles	Equipment/process modification	X			X	
503	2010	2011	53	Partial	Other	UNL	join Blue Skyways	Training/policies		X		X	
504	2010	2011	53	Partial	Other	UNL	SmartWay transportation partner	Training/policies		X		X	
505	2010	2011	53	Partial	Other	UNL	Groundwater guardian green site	Training/policies		X		X	
506	2010	2011	53	Partial	Other	UNL	seal concrete floors	Improved housekeeping/ preventative maintenance		X		X	
507	2010	2011	53	Partial	Other	UNL	wastewater bioremediation	Equipment/process modification		X		X	
508	2010	2011	53	Partial	Other	UNL	biodegradable detergent	Material substitution		X		X	
509	2010	2011	53	Partial	Other	UNL	analyze compressed air system	Improved housekeeping/preventative maintenance		X		X	
510	2009	2014	54	Partial	Health care	KSU	Red Bag (infectious) waste audit	Improved housekeeping/preventative maintenance	X			X	
511		2014	54	Partial	Health care	KSU	Vending machine misers	Energy efficiency					
512	2009	2014	54	Partial	Health care	KSU	Kitchen hood shut off	Energy efficiency	X			X	
513	2009	2014	54	Partial	Health care	KSU	Energy Star	Energy efficiency	X			X	
514		2014	54	Partial	Health care	KSU	Solid waste stream						
515	2009	2014	54	Partial	Health care	KSU	Power Management	Energy efficiency	X			X	
516		New	54	Partial	Health care	KSU	LEDs in parking lot — NEW	Energy efficiency					
517		New	54	Partial	Health care	KSU	VFDs on air handling system — NEW	Energy efficiency					
518		New	54	Partial	Health care	KSU	LEDs indoors — NEW	Energy efficiency					

Recommendation #	Specific status/ category	No longer occurring?	Reoccurrence so far (yrs)	Expected reoccurrence category (yrs)	Initial cost ($)	Actual cost savings ($/yr)	Projected/potential cost savings ($/yr)	Actual payback period (yr)	Projected payback period (yr)	Toxins category	Solid waste (lbs/yr)	Haz. waste (lbs/yr)	Haz. materials, lbs/yr
501					Unknown		Unknown	#VALUE!	#VALUE!				
502					$0.00	$12,200.00	$12,200.00	0.00	0.00	0			
503					Unknown		Unknown	#VALUE!	#VALUE!				
504					$0.00		$4,000.00	#DIV/0!	0.00				
505					Unknown		Unknown	#VALUE!	#VALUE!				
506					$260,000.00		$9,300.00	#DIV/0!	27.96				
507					Unknown		Unknown	#VALUE!	#VALUE!				
508					Unknown		$14,200.00	#VALUE!	#VALUE!				
509					Unknown		Unknown	#VALUE!	#VALUE!				
510			4	5-15 more	Unknown	$2,339.00	$2,339.00	#VALUE!	#VALUE!	0		12,863	
511								#DIV/0!	#DIV/0!	0			
512				5-15 more	Unknown	$5,700.00	$5,700.00	#VALUE!	#VALUE!	0			
513				5-15 more	Unknown	$5,496.00	$5,496.00	#VALUE!	#VALUE!	0			
514								#DIV/0!	#DIV/0!	0			
515				5-15 mfoe	Unknown	$8,603.00	$8,603.00	#VALUE!	#VALUE!	0			
516								#DIV/0!	#DIV/0!	0			
517								#DIV/0!	#DIV/0!	0			
518								#DIV/0!	#DIV/0!	0			

Recommendation #	Electricity (kWh/yr)	Water (gal/yr)	Natural gas (therms/yr)	Diesel fuel (gal/yr)	Gasoline (gal/yr)	GHG, MTCO2E/yr	Releases (lbs/yr)	Releases (type)
501								
502								
503								
504								
505								
506								
507								
508								
509								
510						0		
511						0		
512						0		
513	78,871					77.135838		
514						0		
515	119,324					116.698872		
516						0		
517						0		
518						0		

Recommendation #	Survey #1 responded	Survey #2 responded	Survey #3 responded	Survey #4 responded	Survey #5 responded	**Survey #2: All reasons for implementing opportunity**												**Survey #3: Top reason for implementing opportunity**											
						A2: Acceptable payback	**B2**: Energy efficiency	**C2**: Reduced operating cost	**D2**: Increased employee productivity	**E2**: Health and safety benefits	**F2**: Regulatory compliance	**G2**: Reduced env. and health risk	**H2**: Reduced business risk	**I2**: Enhanced env. awareness	**J2**: Improved public image	**K2**: Other companies also implemented	**L2**: Corporate commitment	**A3**: Acceptable payback	**B3**: Energy efficiency	**C3**: Reduced operating cost	**D3**: Increased employee productivity	**E3**: Health and safety benefits	**F3**: Regulatory compliance	**G3**: Reduced env. and health risk	**H3**: Reduced business risk	**I3**: Enhanced env. awareness	**J3**: Improved public image	**K3**: Other companies also implemented	**L3**: Corporate commitment
501	X																												
502	X	X				1		1	1	1	1	1					1												
503	X																												
504	X																												
505	X																												
506	X																												
507	X																												
508	X																												
509	X																												
510	X	X	X			1		1	1	1	1	1	1	1			1			1									
511						1	1	1									1		1										
512	X	X	X			1	1	1									1		1										
513	X	X	X			1	1	1						1			1		1										
514						1		1	1		1	1	1	1			1			1									
515	X																												
516						1	1	1						1		1	1			1									
517						1	1	1									1			1									
518						1	1	1						1		1	1			1									

	Survey #4: All reasons for not implementing												**Survey #5: Top reason for not implementing**													
Recommendation #	**A4**: Not technically feasible	**B4**: Lack of capital	**C4**: Insufficient financial payback	**D4**: Other priorities for capital investments	**E4**: Risk of production disruption/inconv./slow	**F4**: Lack of env./risk reduction benefits	**G4**: Limited in-plant expertise/capability	**H4**: Lack of staff awareness	**I4**: Customer specifications	**J4**: Uncertainty/lack of confidence in tech.	**K4**: Insufficient info regarding rec.	**L4**: Difficulty in coord. between units	**A5**: Not technically feasible	**B5**: Lack of capital	**C5**: Insufficient financial payback	**D5**: Other priorities for capital investments	**E5**: Risk of production disruption/inconv./slow	**F5**: Lack of env./risk reduction benefits	**G5**: Limited in-plant expertise/capability	**H5**: Lack of staff awareness	**I5**: Customer specifications	**J5**: Uncertainty/lack of confidence in tech.	**K5**: Insufficient info regarding rec.	**L5**: Difficulty in coord. between units	Initial cost category	Projected payback category
501																									<999	Unknown
502																									<999	<1 year
503																									Unknown	Unknown
504																									<999	<1 year
505																									Unknown	Unknown
506																									>1,000	>4 years
507																									>1,000	>4 years
508																									<999	<1 year
509																									Unknown	Unknown
510																									<999	<1 year
511																										
512																									<999	<1 year
513																									Unknown	Unknown
514																										
515																									<999	<1 year
516																										
517																										
518																										

Recommendation #	Year of assessment	Year of reassessment	Company #	Level of assis-tance	Company sector	Program (UNL/KSU)	P2 suggestion	P2 category	Implemented	Not implemented	Doing before	Originally Recommended	Originally Not recommended
519		New	54	Partial	Health care	KSU	Water conservation landscaping — NEW	Equipment/process modification					
520	2009	2014	54	Partial	Health care	KSU	Vending miser	Energy efficiency		X		X	
521	2008	2014	54	Partial	Health care	KSU	Solid waste audit	Improved housekeeping/ preventative maintenance		X		X	
522		New	21	Partial	Hospitality	KSU	Outdoor LED metal halide retrofit — NEW	Energy efficiency					
523	2009	2014	48	One	Public	KSU	Lighting	Energy efficiency	X			X	
524	2009	2014	48	One	Public	KSU	Window air conditioning units	Energy efficiency		X		X	
525	2012	2014	29	Partial	Hospitality	KSU	Lighting Upgrades and Sensors	Energy efficiency	X			X	
526	2012	2014	29	Partial	Hospitality	KSU	Showerheads (1.5 GPM)	Equipment/process modification		X		X	
527	2012	2014	29	Partial	Hospitality	KSU	Faucet Aerators	Equipment/process modification	X			X	

Recommendation #	Specific status/ category	No longer occuring?	Reoccurrence so far (yrs)	Expected reoccurrence category (yrs)	Initial cost ($)	Actual cost savings ($/yr)	Projected/potential cost savings ($/yr)	Actual payback period (yr)	Projected payback period (yr)	Toxins category	Solid waste (lbs/yr)	Haz. waste (lbs/yr)	Haz. materials, lbs/yr
519								#DIV/0!	#DIV/0!	0			
520				5-15 more	Unknown	$2,419.00	$2,419.00	#VALUE!	#VALUE!				
521					Unknown	$1,890.00	$1,890.00	#VALUE!	#VALUE!		64,000		
522						$329,432.00	$329,432.00	0.00	0.00	0			
523					Unknown	$6,600.00	$6,600.00	#VALUE!	#VALUE!	0			
524					Unknown	$30,000.00	$30,000.00	#VALUE!	#VALUE!				
525					$4,167.00	$24,886.00	$13,260.00	0.17	0.31	0			
526					$8,816.00	$8,418.00	$8,418.00	1.05	1.05				
527					$984.00	$5,648.00	$5,648.00	0.17	0.17	0			

Recommendation #	Electricity (kWh/yr)	Water (gal/yr)	Natural gas (therms/yr)	Diesel fuel (gal/yr)	Gasoline (gal/yr)	GHG, MTCO2E/yr	Releases (lbs/yr)	Releases (type)
519						0		
520	35,000					34.23		
521						0		
522	3,660,360					3579.83208		
523	110,000					107.58		
524	492,000					481.176		
525	327,435					320.23143		
526		1,414,740				4.56678072		
527		1,201,387				3.878077236		

Recommendation #	Survey #1 responded	Survey #2 responded	Survey #3 responded	Survey #4 responded	Survey #5 responded	Survey #2: All reasons for implementing opportunity												Survey #3: Top reason for implementing opportunity											
						A2: Acceptable payback	**B2**: Energy efficiency	**C2**: Reduced operating cost	**D2**: Increased employee productivity	**E2**: Health and safety benefits	**F2**: Regulatory compliance	**G2**: Reduced env. and health risk	**H2**: Reduced business risk	**I2**: Enhanced env. awareness	**J2**: Improved public image	**K2**: Other companies also implemented	**L2**: Corporate commitment	**A3**: Acceptable payback	**B3**: Energy efficiency	**C3**: Reduced operating cost	**D3**: Increased employee productivity	**E3**: Health and safety benefits	**F3**: Regulatory compliance	**G3**: Reduced env. and health risk	**H3**: Reduced business risk	**I3**: Enhanced env. awareness	**J3**: Improved public image	**K3**: Other companies also implemented	**L3**: Corporate commitment
519						1		1						1	1	1	1			1									
520	X			X	X																								
521	X			X	X																								
522						1	1	1						1	1		1			1									
523																													
524																													
525																													
526																													
527																													

Recommendation #	Survey #4: All reasons for not implementing												Survey #5: Top reason for not implementing												Initial cost category	Projected payback category
	A4: Not technically feasible	**B4**: Lack of capital	**C4**: Insufficient financial payback	**D4**: Other priorities for capital investments	**E4**: Risk of production disruption/inconv./slow	**F4**: Lack of env./risk reduction benefits	**G4**: Limited in-plant expertise/capability	**H4**: Lack of staff awareness	**I4**: Customer specifications	**J4**: Uncertainty/lack of confidence in tech.	**K4**: Insufficient info regarding rec.	**L4**: Difficulty in coord. between units	**A5**: Not technically feasible	**B5**: Lack of capital	**C5**: Insufficient financial payback	**D5**: Other priorities for capital investments	**E5**: Risk of production disruption/inconv./slow	**F5**: Lack of env./risk reduction benefits	**G5**: Limited in-plant expertise/capability	**H5**: Lack of staff awareness	**I5**: Customer specifications	**J5**: Uncertainty/lack of confidence in tech.	**K5**: Insufficient info regarding rec.	**L5**: Difficulty in coord. between units		
519																										
520											1												1		Unknown	Unknown
521		1		1										1											<999	<1 year
522																										
523																									Unknown	Unknown
524																									Unknown	Unknown
525																									>1,000	<1 year
526																									>1,000	1-1.9 years
527																									<999	<1 year

APPENDIX I: CLIENT DATABASE

Note: Company names are not included in the spreadsheets below; previous reassessments by UNL (2005-2011) do not include specific savings.

Company info									Survey: General question #1									
Company #	Year of assessment	Year of reassessment	Company sector	Company size category	Intensity of intern involvement (partial, one, multi summer)	Program (UNL/KSU)	Unique company	Survey returned	Building awareness of P2	Building culture of innovation	Analyzing risks associated with P2	Reducing GHG	Generating electricity, heat or fuel	Improving energy efficiency	Conserving natural resources	Reducing or eliminating creation of waste	Reducing creation or release of pollutants	Average survey general question
1	2010	2014	Manufacturing	251-1,000	Multi	UNL	X	X	4	4	5	4	1	4	4	5	4	3.9
1	2009	2014	Manufacturing	251-1,000	Multi	UNL			Same	Same	Same	Same	Same	Same	Same	Same	Same	#DIV/0!
1	2008	2014	Manufacturing	251-1,000	Multi	UNL			Same	Same	Same	Same	Same	Same	Same	Same	Same	#DIV/0!
2	2010	2014	Public	<100	Partial	UNL	X											#DIV/0!
3	2012	2014	Public	<100	Partial	UNL	X											#DIV/0!
4	2011	2014	Public	<100	Partial	UNL	X	X	2	2	1	2	2	3	1	2	3	2.0
5	2010	2014	Health care	>1,000	One	UNL	X											#DIV/0!
6	2011	2014	Public	<100	Partial	UNL	X	X	3	3	4	2	1	4	3	3	4	3.0
7	2009	2014	Manufacturing	<100	One	UNL	X	X	4	4	4	3	2	4	2	4	3	3.3
8	2011	2014	Agriculture	<100	Partial	UNL	X		No	No	No	No	No	No	No	No	No	#DIV/0!
9	2011	2014	Agriculture	<100	Partial	UNL	X		No	No	No	No	No	No	No	No	No	#DIV/0!
10	2013	2014	Agriculture	<100	Partial	UNL	X	X	3	4	4	4	3	4	4	4	4	3.8
11	2011	2014	Public	<100	Partial	UNL	X	X	4	3	3	3	4	4	3	4	4	3.6
12	2013	2014	Manufacturing	101-250	One	UNL	X	X	4	4	4	4	1	4	4	4	4	3.7
13	2009	2010	Other	>1,000	Partial	UNL	X	X	4	4	3	3	3	4	3	4	4	3.6
14	2006	2014	Manufacturing	251-1,000	One	KSU	X		No	No	No	No	No	No	No	No	No	#DIV/0!
15	2011	2014	Health care	251-1,000	Multi	KSU	X	X	3	3	2	3	1	4	2	2	3	2.6
15	2012	2014	Health care	251-1,000	Multi	KSU			Same	Same	Same	Same	Same	Same	Same	Same	Same	#DIV/0!
16	2010	2014	Hospitality	<100	Partial	KSU	X	X	4	3	4	3	1	4	3	4	4	3.3
16	2011	2014	Hospitality	<100	Partial	KSU			Same	Same	Same	Same	Same	Same	Same	Same	Same	#DIV/0!

Individual company info												
Company #	Implemented opportunities	Not implemented opportunities	Cost savings ($/yr)	Solid waste (lbs/yr)	Haz. waste (lbs/yr)	Haz. materials, lbs/yr	Electricity (kWh/yr)	Water (gal/yr)	Natural gas (therms/yr)	Diesel fuel (gal/yr)	GHG, MTCO2E/yr
1	**4**	**2**	**$23,490.00**				**425300**				**461.8758**
1	6	6	$149,645.00	650				110000	105475		561.52113
1	1	6	$4,070.00						4500		23.94
2	3	3	$3,400.00				58000				62.988
3	3	2	$2,136.00				21360				23.19696
4	**4**	**11**	**$2,630.00**	**1400**			**18000**	**250000**			**20.44375**
5	2	8	$1,710.00				24400				26.4984
6	**5**	**10**	**$6,070.00**				**73500**	**190000**			**80.50177**
7	**6**	**6**	**$33,530.00**	**2400**			**351300**				**381.5118**
8	3	1	$2,940.00					7740000	1500		9.91482
9	4	2	$3,000.00					29000000	5300		28.196
10	**2**	**0**	**$1,500.00**				**21000**	**10510000**			**22.806**
11	**1**	**1**	**$30.00**				**660**				**0.71676**
12	**1**	**0**	**$789,000.00**	**9306000**			**-18600**			**360**	**-16.4196**
13	**5**	**1**	**$151,634.00**	**30360**			**1319580**				**1433.06388**
14	1	0	$175,000.00								**0**
15	**4**	**3**	**$65,164.00**	**8000**			**591865**	**3144000**			**588.992802**
15	2	4	$918.00	79200					1568		8.34176
16	**1**	**6**	**$2,016.00**					**381118**			**1.230248904**
16	2	6	$1,527.00	30000			10307				10.080246

Company info									Survey: General question #1									
Company #	Year of assessment	Year of reassessment	Company sector	Company size category	Intensity of intern involvement (partial, one, multi summer)	Program (UNL/KSU)	Unique company	Survey returned	Building awareness of P2	Building culture of innovation	Analyzing risks associated with P2	Reducing GHG	Generating electricity, heat or fuel	Improving energy efficiency	Conserving natural resources	Reducing or eliminating creation of waste	Reducing creation or release of pollutants	Average survey general question
17	**2011**	**2014**	**Manufacturing**	**101-250**	**Multi**	**KSU**	**X**	**X**	**4**	**4**	**3**	**1**	**2**	**3**	**3**	**3**	**3**	**2.9**
17	2012	2014	Manufacturing	101-250	Multi	KSU			Same	Same	Same	Same	Same	Same	Same	Same	Same	#DIV/0!
17	2013	2014	Manufacturing	101-250	Multi	KSU			Same	Same	Same	Same	Same	Same	Same	Same	Same	#DIV/0!
18	**2007**	**2014**	**Manufacturing**	**101-250**	**Multi**	**KSU**	**X**	**X**	**5**	**4**	**5**	**3**	**3**	**5**	**3**	**4**	**3**	**3.9**
18	2008	2014	Manufacturing	101-250	Multi	KSU			Same	Same	Same	Same	Same	Same	Same	Same	Same	#DIV/0!
18	2009	2014	Manufacturing	101-250	Multi	KSU			Same	Same	Same	Same	Same	Same	Same	Same	Same	#DIV/0!
19	**2008**	**2014**	**Manufacturing**	**101-250**	**One**	**KSU**	**X**	**X**	**4**	**3**	**4**	**4**	**2**	**5**	**4**	**4**	**5**	**3.9**
20	**2007**	**2014**	**Public**	**>1,000**	**Multi**	**KSU**	**X**	**X**	**4**	**3**	**3**	**3**	**1**	**3**	**4**	**4**	**3**	**3.1**
20	2008	2014	Public	>1,000	Multi	KSU			Same	Same	Same	Same	Same	Same	Same	Same	Same	#DIV/0!
20	2009	2014	Public	>1,000	Multi	KSU			Same	Same	Same	Same	Same	Same	Same	Same	Same	#DIV/0!
21	**2010**	**2014**	**Hospitality**	**101-250**	**Partial**	**KSU**	**X**	**X**	**4**	**3**	**3**	**4**	**1**	**4**	**1**	**2**	**2**	**2.7**
21	2012	2014	Hospitality	101-250	Partial	KSU			Same	Same	Same	Same	Same	Same	Same	Same	Same	#DIV/0!
22	**2007**	**2014**	**Manufacturing**	**251-1,000**	**One**	**KSU**	**X**	**X**	**4**	**4**	**4**	**4**	**2**	**5**	**4**	**4**	**4**	**3.9**
23	**2012**	**2014**	**Hospitality**	**101-250**	**Partial**	**KSU**	**X**	**X**	**3**	**4**	**4**	**3**	**2**	**5**	**3**	**4**	**4**	**3.6**
24	**2009**	**2014**	**Health care**	**101-250**	**Partial**	**KSU**	**X**	**X**	**3**	**3**	**3**	**3**	**2**	**4**	**4**	**3**	**4**	**3.2**
25	**2007**	**2014**	**Health care**	**>1,000**	**Multi**	**KSU**	**X**	**X**	**3**	**3**	**2**	**3**	**1**	**4**	**2**	**2**	**3**	**2.6**
25	2008	2014	Health care	>1,000	Multi	KSU			Same	Same	Same	Same	Same	Same	Same	Same	Same	#DIV/0!
25	2009	2014	Health care	>1,000	Multi	KSU			Same	Same	Same	Same	Same	Same	Same	Same	Same	#DIV/0!
25	2010	2014	Health care	>1,000	Multi	KSU			Same	Same	Same	Same	Same	Same	Same	Same	Same	#DIV/0!
25	2011	2014	Health care	>1,000	Multi	KSU			Same	Same	Same	Same	Same	Same	Same	Same	Same	#DIV/0!
25	2012	2014	Health care	>1,000	Multi	KSU			Same	Same	Same	Same	Same	Same	Same	Same	Same	#DIV/0!
26	**2010**	**2014**	**Manufacturing**	**>1,000**	**One**	**KSU**	**X**	**X**	**5**	**3**	**3**	**2**	**1**	**4**	**4**	**4**	**5**	**3.4**
27	**2013**	**2014**	**Health care**	**>1,000**	**Multi**	**KSU**	**X**	**X**	**4**	**4**	**4**	**5**	**3**	**4**	**4**	**4**	**4**	**4.0**
28	**2003**	**2005**	**Manufacturing**	**101-250**	**Multi**	**UNL**	**X**	**X**	**2**	**4**	**4**	**4**	**2**	**4**	**4**	**4**	**4**	**3.6**

Individual company info											
Company #	Implemented opportunities	Not implemented opportunities	Cost savings ($/yr)	Solid waste (lbs/yr)	Haz. waste (lbs/yr)	Haz. materials, lbs/yr	Electricity (kWh/yr)	Water (gal/yr)	Natural gas (therms/yr)	Diesel fuel (gal/yr)	GHG, MTCO2E/yr
17	**2**	**2**	**$19,500.00**				**173250**	**1000000**	**2820**		**187.6689**
17	4	3	$92,796.00	16000			172275		60000		487.68495
17	4	3	$54,492.00		16000		54988		5940		85.379064
18	**7**	**2**	**$84,000.00**					**21100000**			**68.1108**
18	2	0	$20,300.00	19200			245622				240.218316
18	2	0	$386,000.00	12400000			1979000				1935.462
19	**1**	**2**	**$0.00**								**0**
20	**2**	**2**	**$2,333.00**			**13600**					**0**
20	3	2	$2,022.50								0
20	2	4	$39,417.00	1000			501640				490.60392
21	**0**	**4**	**$0.00**								**0**
21	1	2	$95.00				1050				1.0269
22	**2**	**0**	**$37,200.00**	**50000**							**0**
23	**2**	**0**	**$29,547.00**				**347991**	**620000**			**342.336558**
24	**1**	**4**	**$606.00**				**8750**				**8.5575**
25	**2**	**1**	**$58,499.00**				**936258**				**915.660324**
25	1	0	$53,000.00				1062500				1039.125
25	2	0	$86,000.00					6399000	61000		345.175972
25	3	0	$20,000.00								0
25	1	1	$71,000.00				1015716				993.370248
25	1	0	$25,000.00					3230500			10.428054
26	**3**	**2**	**$141,521.50**				**153626**		**297470**		**1732.786628**
27	**3**	**2**	**$170,698.00**	**26400**			**84840**				**82.97352**
28	**22**	**10**									

Company info									Survey: General question #1									
Company #	Year of assessment	Year of reassessment	Company sector	Company size category	Intensity of intern involvement (partial, one, multi summer)	Program (UNL/KSU)	Unique company	Survey returned	Building awareness of P2	Building culture of innovation	Analyzing risks associated with P2	Reducing GHG	Generating electricity, heat or fuel	Improving energy efficiency	Conserving natural resources	Reducing or eliminating creation of waste	Reducing creation or release of pollutants	Average survey general question
29	2012	2014	Hospitality	<100	Partial	KSU	X											#DIV/0!
30	**2007**	**2008**	**Manufacturing**	**101-250**	**One**	**UNL**	**X**	**X**	**3**	**2**	**4**	**4**	**2**	**5**	**3**	**3**	**4**	**3.3**
31	**2003**	**2006**	**Manufacturing**	**251-1,000**	**Multi**	**UNL**	**X**	**X**	**3**	**3**	**4**	**5**	**4**	**5**	**5**	**5**	**3**	**4.1**
32	**2000**	**2006**	**Manufacturing**	**251-1,000**	**One**	**UNL**	**X**	**X**	**3**	**2**	**3**	**4**	**2**	**4**	**4**	**5**	**5**	**3.6**
32	**2005**	**2006**	**Manufacturing**	**251-1,000**	**One**	UNL			Same	Same	Same	Same	Same	Same	Same	Same	Same	**#DIV/0!**
33	**2004**	**2005**	**Manufacturing**	**101-250**	**One**	**UNL**	**X**	**X**	**5**	**4**	**5**	**5**	**1**	**5**	**5**	**5**	**5**	**4.4**
34	**2006**	**2008**	**Manufacturing**	**101-250**	**One**	**UNL**	**X**	**X**	**3**	**3**	**5**	**4**	**4**	**5**	**5**	**5**	**5**	**4.3**
35	**2002**	**2007**	**Manufacturing**	**>1,000**	**Multi**	**UNL**	**X**	**X**	**3**	**3**	**4**	**3**	**3**	**5**	**5**	**4**	**5**	**3.9**
35	2004	2007	**Manufacturing**	>1,000	**Multi**	UNL			Same	Same	Same	Same	Same	Same	Same	Same	Same	**#DIV/0!**
35	2005	2007	**Manufacturing**	>1,000	**Multi**	UNL			Same	Same	Same	Same	Same	Same	Same	Same	Same	**#DIV/0!**
35	2007	2007	**Manufacturing**	>1,000	**Multi**	UNL			Same	Same	Same	Same	Same	Same	Same	Same	Same	**#DIV/0!**
36	**2001**	**2006**	**Manufacturing**	**251-1,000**	**One**	**UNL**	**X**	**X**	**3**	**1**	**2**	**2**	**2**	**4**	**2**	**4**	**3**	**2.6**
37	**2007**	**2009**	**Manufacturing**	**101-250**	**Partial**	**UNL**	**X**	**X**	**2**	**2**	**3**	**2**	**1**	**3**	**4**	**5**	**5**	**3.0**
38	**2004**	**2008**	**Manufacturing**	**<100**	**Partial**	**UNL**	**X**	**X**	**4**	**3**	**4**	**1**	**1**	**3**	**3**	**4**	**5**	**3.1**
39	**2007**	**2008**	**Manufacturing**	**101-250**	**One**	**UNL**	**X**	**X**	**4**	**2**	**3**	**3**	**1**	**4**	**3**	**4**	**4**	**3.1**
40	**2003**	**2005**	**Public**	**<100**	**Partial**	**UNL**	**X**	**X**	**4**	**4**	**4**	**5**	**3**	**5**	**5**	**4**	**4**	**4.2**
41	**2008**	**2009**	**Health care**	**<100**	**Partial**	**UNL**	**X**	**X**	**3**	**3**	**2**	**2**	**2**	**3**	**1**	**1**	**1**	**2.0**
41	**2009**	**2011**	**Health care**	<100	**Partial**	UNL			Same	Same	Same	Same	Same	Same	Same	Same	Same	**#DIV/0!**
42	**2007**	**2008**	**Public**	**101-250**	**Partial**	**UNL**	**X**	**X**	**4**	**3**	**3**	**1**	**1**	**4**	**2**	**3**	**4**	**2.8**
42	2010	2011	**Public**	101-250	**Partial**	UNL			Same	Same	Same	Same	Same	Same	Same	Same	Same	**#DIV/0!**
43	**2008**	**2009**	**Public**	**<100**	**Partial**	**UNL**	**X**	**X**	**4**	**3**	**4**	**2**	**2**	**4**	**2**	**4**	**3**	**3.1**
44	**2007**	**2011**	**Public**	**101-250**	**Partial**	**UNL**	**X**	**X**	**5**	**5**	**4**	**2**	**1**	**5**	**5**	**4**	**4**	**3.9**
45	**2006**	**2008**	**Public**	**101-250**	**Partial**	**UNL**	**X**	**X**	**2**	**2**	**4**	**4**	**4**	**5**	**3**	**3**	**3**	**3.3**
46	**2006**	**2007**	**Other**	**>1,000**	**Partial**	**UNL**	**X**	**X**	**3**	**3**	**2**	**3**	**1**	**4**	**2**	**3**	**4**	**2.8**

Individual company info												
Company #	Implemented opportunities	Not implemented opportunities	Cost savings ($/yr)	Solid waste (lbs/yr)	Haz. waste (lbs/yr)	Haz. materials, lbs/yr	Electricity (kWh/yr)	Water (gal/yr)	Natural gas (therms/yr)	Diesel fuel (gal/yr)	GHG, MTCO2E/yr
29	1	2	$30,534				327435	1201387			324.1095072
30	**1**	**2**									
31	**1**	**2**									
32	**3**	**7**									
32	**2**	**9**									
33	**5**	**4**									
34	**5**	**4**									
35	**4**	**3**									
35	**1**	**0**									
35	**5**	**2**									
35	**4**	**3**									
36	**3**	**5**									
37	**4**	**6**									
38	**3**	**2**									
39	**9**	**1**									
40	**5**	**6**									
41	**1**	**1**									
41	**4**	**13**									
42	**1**	**6**									
42	**1**	**0**									
43	**4**	**0**									
44	**5**	**17**									
45	**7**	**0**									
46	**1**	**1**									

Company info									Survey: General question #1									
Company #	Year of assessment	Year of reassessment	Company sector	Company size category	Intensity of intern involvement (partial, one, multi summer)	Program (UNL/KSU)	Unique company	Survey returned	Building awareness of P2	Building culture of innovation	Analyzing risks associated with P2	Reducing GHG	Generating electricity, heat or fuel	Improving energy efficiency	Conserving natural resources	Reducing or eliminating creation of waste	Reducing creation or release of pollutants	Average survey general question
47	**2008**	**2011**	**Other**	**<100**	**Partial**	**UNL**	**X**	**X**	**3**	**2.5**	**1.5**	**2**	**2**	**2.5**	**3**	**4.5**	**3**	**2.7**
48	**2009**	**2014**	**Public**	**>1,000**	**One**	**KSU**	**X**	**X**	**3**	**3**	**2**	**2**		**4**	**3**	**3**	**4**	**3.0**
49	**2006**	**2007**	**Other**	**<100**	**Partial**	**UNL**	**X**	**X**	**3**	**3**	**4**	**2**	**1**	**3**	**3**	**3**	**3**	**2.8**
50	**1999**	**2007**	**Other**	**>1,000**	**Multi**	**UNL**	**X**	**X**	**3**	**4**	**4**	**4**	**3**	**3**	**4**	**4**	**3**	**3.6**
51	**2005**	**2006**	**Other**	**<100**	**Partial**	**UNL**	**X**	**X**	**1**	**1**	**1**	**1**	**3**	**1**	**1**	**1**	**1**	**1.2**
52	**2008**	**2009**	**Other**	**<100**	**Partial**	**UNL**	**X**	**X**	**2**	**3**	**1**	**1**	**1**	**1**	**3**	**3**	**1**	**1.8**
53	**2010**	**2011**	**Other**	**251-1,000**	**Partial**	**UNL**	**X**	**X**	**3**	**3**	**4**	**2**	**2**	**3**	**2**	**4**	**5**	**3.1**
54	**2009**	**2014**	**Health care**	**>1,000**	**Partial**	**KSU**	**X**	**X**	**5**	**4**	**4**	**4**	**2**	**5**	**5**	**3**	**4**	**4.0**
54	2008	2014	Health care	>1,000	Partial	KSU			**Same**	**Same**	**Same**	**Same**	**Same**	**Same**	**Same**	**Same**	**Same**	**#DIV/0!**
55	**2009**	**2014**	**Public**	**>1,000**	**One**	**UNL**	**X**	**X**	**4**	**4**	**3**	**3**	**1**	**4**	**3**	**3**	**3**	**3.1**

Individual company info											
Company #	Implemented opportunities	Not implemented opportunities	Cost savings ($/yr)	Solid waste (lbs/yr)	Haz. waste (lbs/yr)	Haz. materials, lbs/yr	Electricity (kWh/yr)	Water (gal/yr)	Natural gas (therms/yr)	Diesel fuel (gal/yr)	GHG, MTCO2E/yr
47	**1**	**3**									
48	**1**	**1**	**$6,000.00**				**110000**				**107.58**
49	**1**	**5**									
50	**10**	**10**									
51	**6**	**6**									
52	**2**	**3**									
53	**1**	**8**									
54	**4**	**1**	**$22,138.00**		**12863**		**198195**				**193.83471**
54	**0**	**1**	**$0.00**								**0**
55	**12**	**6**	**$115,320.00**	**2335000**			**1320000**		**16500**		**1521.3**