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Evaluating the Air Emissions from Solid Waste Refuse Trucks

by

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EVALUATING THE AIR EMISSIONS FROM SOLID WASTE REFUSE TRUCKS

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University of Nebraska, 2015

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The air emissions from solid waste refuse trucks is an issue that has not been widely studied, but is becoming an ever increasing issue. In the United States alone they have generated around 251 million tons of waste in 2012. This study in particular will collect data on 24 different refuse trucks (front-load, side-load, and roll-off, and diesel and compressed natural gas fuel) while on real-life routes in the Raleigh, North Carolina area. The collected data will then be aggregated and summarized based on the type of trucks. A regression analysis will also be done to determine the relationship between the vehicle year, engine year, fuel type, vehicle type, and the emission controls and the five collected emissions, CO_2, CO, HC, NOx, and PM. This regression will focus first on the average emissions data, and then split up based on the truck speed and the slope of the road. From the regression analysis, it was found that the more detailed the emissions data became, the more the emissions are affected. The higher vehicle speeds caused all of the emissions to be affected by the factors in some capacity. The diesel fuel significantly affected the emissions more than the CNG fuel. The front-load trucks affected the emissions more than the side-load and roll-off trucks. Further regression analysis should be done on each of the truck drivers driving habits, the specific truck routes, and the traffic patterns within the routes.

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CHAPTER 1. INTRODUCTION

Refuse trucks are imperative to the operation and proper disposal of solid waste. In 2012, the United States alone generated more than 251 million tons of trash (EPA, 2014). Due to the weight, fuel economy, and stop and go patterns of solid waste refuse trucks, they produce a substantial amount of emissions during a typical route. These emissions are a growing environmental concern. As a result of the enforcement of more stringent environmental standards, the quantitative study of air emissions from solid waste refuse trucks is becoming a more relevant issue. Under the Clean Air Act (CAA), the Environmental Protection Agency (EPA) requires reduction in the most dangerous air pollutants because of their effect on human health and the surrounding environment (EPA, 2014).

This study focuses on determining what factors affect five tailpipe emissions from refuse trucks within a typical collection route in the Raleigh, North Carolina area. These emissions are carbon dioxide (CO_2), carbon monoxide (CO), hydrocarbon (HC), nitrous oxide (NOx), and particulate matter (PM). The data used in this analysis were collected as part of a joint research project between the University of Nebraska-Lincoln and North Carolina State University that was funded by the Environmental Research and Education Fund (EREF).

Emissions data were collected from twenty-four trucks, including front-load, side-load, and roll-off trucks. Twenty-four trucks were tested: six front-load diesel fuel trucks, six side-load diesel fuel trucks, six roll-off diesel fuel trucks, three compressed natural gas (CNG) front-load trucks, and three CNG side-load trucks. Front-load trucks,

as seen in Figure 1, are typically used for commercial or residential purposes. They use a mechanical lifting fork to lift the dumpsters into the trucks to transport.

Figure 1. Front-load Truck (Trucks & Parts, 2010)

The side-load trucks, as shown in Figure 2, are also used primarily in residential areas and are operated by a joystick that controls a lift to dump the trash can into the bed of the truck.

Figure 2. Side-load truck (Trucks & Parts, 2010)

The roll-off truck, Figure 3, is a large truck that is used for commercial purposes. It makes the least amount of stops but carries the largest loads at a time. The waste is collected using a mechanism that pulls the container onto the truck and then the waste transported to the drop-off site.

Figure 3. Roll-off trucks (Trucks & Parts, 2010)

Five different factors potentially affecting emissions are considered: vehicle year, engine year, vehicle type, fuel type, and emission controls. These factors will be analyzed to determine effects on each of the five emissions. All of the trucks used in the study have vehicle and engine years that range from 2002-2013. Eighteen of the trucks use diesel fuel and six use compressed natural gas (CNG) fuel. CNG fuel is an alternative to diesel fuel that is made from methane. CNG fuel is said to produce less CO_2 and NOx than diesel fuel. There are four different emission controls. The emission controls are devices on the trucks that help regulate the amounts of emissions released into the surrounding environment. The exhaust gas recirculation (EGR) control helps reduce NOx emissions. The diesel particulate filter (DPF) helps remove particulate matter from the exhaust pipe. The selective catalytic reduction (SCR) is a device that reduces NOx levels by using ammonia through a catalyst system. Lastly, the 3-way catalytic system (3-WCC) helps convert NOx, CO, HC, and other hazardous air pollutants and is found in many natural gas systems.

The truck data are recorded for every second that is spent in route. The collected data are first aggregated, and then summarized based on truck characteristics. Then, a regression analysis is performed based on the data averages, various speeds that the trucks are traveling, and the slope of the road within each of the truck routes. This will show how the five truck characteristic factors contribute to the five emissions.

CHAPTER 2. LITERATURE REVIEW

The environmental impact of air emissions produced by solid waste refuse trucks is a fairly recent concern due to the increase in environmental standards. The stop and go patterns of the trucks, especially in residential areas, has raised concern. As a result more studies have been conducted to find alternatives that are economically and environmentally sound for improving the amount of emissions produced by the trucks. Solid waste vehicles are everyday necessities, and the types of pollutants produced by the trucks can cause many health related concerns due to a decrease in air quality. Many studies focus on the production of emissions based on fuel type. The most common fuel type for refuse trucks is diesel fuel, but there are other alternatives that have been studied as well, including natural gas, bio-diesel or hybrid vehicles. The majority of studies concentrate on one type of truck in each study. The two most common refuse trucks tested are front-loaders and side-loaders. The roll-off trucks have been tested by very few. There are also a few studies that have considered the route characteristics or the operating conditions of the refuse trucks. Although fuel type is pertinent to understanding the environmental impact, the differing truck types, routes and the speed in which the trucks are traveling are also very important factors that could influence the amount of emissions produced.

The type of fuel has been the topic of most concern for solid waste refuse trucks. Many studies have focused on the impact that diesel fuel may have on the surrounding environment. Alternative fuel options have also been a priority as well. Researchers want to determine if the replacement of diesel fuel with other alternatives, such as natural gas, bio-diesel, or hybrid vehicles, is not only environmentally sound but more

economical in the long run as well. The majority of studies have focused on the comparison of diesel fueled engines to compressed natural gas (CNG), since CNG is becoming a more common resource. Several studies (Lee, 2011; Walkowicz, 2003) have reported that compressed natural gas emits less CO_2 and NOx emissions than their diesel counterparts, and that PM emissions were negligible in both types of fuel trucks. Lee et al. (2011) reported that CNG trucks emitted more CO and HC than diesel fuel trucks, and that the HC emissions in the diesel fuel trucks "were below the detection limit". This was not the case in the study done my Lopez et al (2010). They determined that the CO emissions were higher in CNG trucks as well, but that they "had the same or lower HC emissions than diesels…". They also found that PM emissions were higher in the diesel fuel and non-detectable in the CNG fuel trucks (Lopez, 2010). This difference in reported emissions data could be due to the different trucks tested or different technology used to collect the data. Lopez's study was performed in Madrid, and was published a year before Lee's study, so there could have been a more accurate measuring device used in the later study. It should also be noted that all studies show that CNG fuel does not emit less of all five emissions tested, so it may not be a better fuel alternative. The fuel economy for both diesel and CNG is also necessary to examine as well, because even though one may produce less emissions, if more fuel is needed to get through a daily route it becomes less economical to replace. Few studies compared the fuel economy of both fuel types, but Lopez et al. found that to complete a driving cycle it took less diesel fuel in g/km than CNG fuel (Lopez, 2010). This does not necessarily suggest that diesel fuel is a better alternative, but that it is cheaper to operate. All of the studies are

inconclusive about which fuel type is the better alternative because both still produce significant emissions in some capacity.

The front-load and side-load trucks are similar in weight and body, and are commonly used for residential areas (Sandhu, 2014; Farzaneh, 2009). Roll-off trucks are typically used for commercial or construction purposes to haul large loads with few stops. In a study by Sandhu, et al (2014), it was found that roll-off trucks contribute less emissions and "have almost twice the fuel economy of previously reported values for residential trash collection refuse trucks", which could be explained by the roll-off trucks making the least amount of stops in comparison to the residential refuse trucks (Sandhu, 2014). Typically studies do not perform analysis on multiple types of refuse trucks but rather they examine one truck in particular. The comparison of the different truck types is essential to understanding all of the factors that affect emissions because it could differ based on the truck type.

The operating modes show the speed in which the truck is traveling. These modes include braking and decelerating, idling, and traveling at various speed categories. The lower speeds suggest residential areas while the higher speeds suggest highway driving. Operating modes are vital to understanding when the emissions are most prevalent while the trucks are in route. Both Farzaneh (2009) and Lee (2011) et al. found that the emissions were highest in trash collection modes (residential areas). Farzaneh also found that "more than 75% of all emissions occurred during freeway driving and trash collection", thus making driving to the routes and the landfills almost negligible. This supports the idea that emission production is dependent on the speeds and driving patterns of the trucks. When it came to testing the vehicles based on the operating

modes, Lee et al. focused on CO_2 emissions only. Although their results showed that CO_2 had the highest emission rates in every cycle, it is still imperative to discuss and compare all five of the emissions tested in the study.

The route characteristics take into account how the truck is traveling on the road, the slope, and the road terrain, etc. that the vehicles are traveling on. There are a few studies that focus on the route and whether route optimization is effective in reducing emissions. Apaydin et al. (2008) found that by developing alternative routes for the solid waste vehicles through GIS that not only do the trucks spend less time on the road, but CO_2, NOx, HC, CO, and PM emissions decreased substantially than when the trucks are traveling on the original routes (Apaydin, 2008). Although the idea of route optimization is effective in theory, it may not be feasible to apply to every single solid waste refuse truck route.

All of the studies involving the emissions from solid waste refuse trucks have shown that the environmental impact of the trucks is increasing, so it is necessary to find an improved solution. These solutions could be to find better fuel alternatives, use of a different type of truck, improve the operating modes, or considering route optimization. What many of the studies were lacking was a comparison of all of these different factors. This study will compare the impact of air emissions in all three major types of solid waste refuse trucks; both diesel and CNG fuel, in five different operating modes, and at three different road grades. The vehicle year, engine year, and emission controls of the trucks will also be considered as factors that affect the air emissions. It will combine the findings of the previous studies with a statistical analysis of new collected emissions data based on each of the different factors discussed.

CHAPTER 3. METHODOLOGY

The major objective of this study is to quantify the collected emissions data, summarize the data based on common truck type and fuel type, and analyze it to determine what various factors could possibly affect the five emissions measured (CO_2, CO, HC, NOx, and PM). This will be accomplished through the data collection, data aggregation, descriptive statistics and the regression analysis.

3.1. DATA COLLECTION

The data collection was conducted on 24 refuse trucks that varied by type of trucks, vehicle year, engine year, and fuel type. The truck data was measured while on a typical waste collection route in Raleigh, North Carolina. A typical route ranged from around 5 am in the morning to 5 pm in the afternoon. Several devices were utilized to collect the various data from the trucks. One of these is a portable emissions measurement system (PEMS). The PEMS is placed on the trucks to measure gaseous emissions, particulate matter, and the vehicle exhaust flow rate (EREF Emissions Project, 2014). The type used in this study is from the company Global MRV. It recorded HC, CO and CO_2 using non-dispersive infrared; the NOx is found by using electrochemical sensors; and the PM using light scattering. Next, an electronic control unit port (ECU) is used to record engine revolutions per minute (RPM), fuel use rate, and vehicle speed. Lastly, GPS data is also recorded on the trucks, to determine vehicle location and road grade.

3.2. DATA AGGREGATION

The PEMS, ECU and GPS record every second that the trucks are operating while on their typical routes. In order to determine the activity of each truck, EPA uses a

classification system called the Motor vehicle emission simulator, also known as MOVES (www.epa.gov). EPA uses the scaled tractive power (STP) in MOVES to quantify the data based on the operating mode. An operating mode (OP Mode) is a classification dependent on braking, idling, and various speeds while in route. It is calculated from the STP for every second of the data collected. It is a function of road grade, acceleration, and vehicle speed. (Gururaja, 2011) The equation is shown below:

$$STP_t = \frac{Av_t + Bv_t^2 + Cv_t^3 + mv_t(a_t + g\frac{r_t}{100})}{f_{scale}} \quad [1]$$

Where,

STP_t = scaled tractive power at time t [kW]

A = "rolling term", rolling resistance coefficient, [1.4161kW-s/m]

B = "rotating term", friction losses in the drivetrain or rotational resistance coefficient, [0 kW-s^2/m^2]

C = "drag term", aerodynamic drag coefficient, [0.0036 kW-s^2/m^3]

a_t = v ehicle acceleration at time t [m/s^2]

f_{scale} = "fixed mass factor", power scaling factor [unit less]

g = acceleration due to gravity [9.81 m/s^2]

m = "source mass", mass of individual test vehicle [20.6845 metric ton]

r_t = road grade at time t [%]

v_t = vehicle speed at time [m/s]

Table 1 describes the classification for each OP Mode. First, the acceleration is examined and any acceleration less than 0 is automatically classified as OP Mode "0", or deceleration/braking. Then vehicle speed is examined next. If the vehicle speed is between -1 and 1, then it is classified as Op Mode "1", or idling. The remainder of the

data is then based on first the vehicle speed to determine which subset it falls into and then the calculated STP. These are the OP Modes 11-40. The total time spent in each mode is then summed for all twenty-four trucks.

Table 1. Operation Modes based on Scaled Tractive Power (STP), Vehicle Speed and Acceleration

0	Deceleration/Braking	-	-	$a \leq -2$ OR $a_{t-2} \leq -1$ AND $\leq a_{t-1} \leq -1$ AND $a_t \leq -1$
1	Idle	-	$-1 \leq v_t \leq 1$	-
11	Coast	$STP_t < 0$	$1 \leq v_t \leq 25$	-
12	Cruise/Acceleration	$0 \leq STP_t < 3$	$1 \leq v_t \leq 25$	-
13	Cruise/Acceleration	$3 \leq STP_t < 6$	$1 \leq v_t \leq 25$	-
14	Cruise/Acceleration	$6 \leq STP_t < 9$	$1 \leq v_t \leq 25$	-
15	Cruise/Acceleration	$9 \leq STP_t < 12$	$1 \leq v_t \leq 25$	-
16	Cruise/Acceleration	$12 \leq STP_t$	$1 \leq v_t \leq 25$	-
21	Coast	$STP_t < 0$	$25 \leq v_t \leq 50$	-
22	Cruise/Acceleration	$0 \leq STP_t < 3$	$25 \leq v_t \leq 50$	-
23	Cruise/Acceleration	$3 \leq STP_t < 6$	$25 \leq v_t \leq 50$	-
24	Cruise/Acceleration	$6 \leq STP_t < 9$	$25 \leq v_t \leq 50$	-
25	Cruise/Acceleration	$9 \leq STP_t < 12$	$25 \leq v_t \leq 50$	-
27	Cruise/Acceleration	$12 \leq STP_t < 18$	$25 \leq v_t \leq 50$	-
28	Cruise/Acceleration	$18 \leq STP_t < 24$	$25 \leq v_t \leq 50$	-
29	Cruise/Acceleration	$24 \leq STP_t < 30$	$25 \leq v_t \leq 50$	-
30	Cruise/Acceleration	$30 \leq STP_t$	$25 \leq v_t \leq 50$	-
33	Cruise/Acceleration	$STP_t < 6$	$50 \leq v_t$	-
35	Cruise/Acceleration	$6 \leq STP_t < 12$	$50 \leq v_t$	-
37	Cruise/Acceleration	$12 \leq STP_t < 18$	$50 \leq v_t$	-
38	Cruise/Acceleration	$18 \leq STP_t < 24$	$50 \leq v_t$	-
39	Cruise/Acceleration	$24 \leq STP_t < 30$	$50 \leq v_t$	-
40	Cruise/Acceleration	$30 \leq STP_t$	$50 \leq v_t$	-

3.3. DESCRIPTIVE STATISTICS

To quantify common characteristics of each truck, the route sheets and log sheets recorded by each driver, and the recorded emissions data from the PEMS and ECU

devices on the trucks are used. The route sheets and log sheets recorded by each of the truck drivers show how much waste was collected, the number of stops made, and the route distance traveled. The PEMS records the amount of emissions produced while in route, and the ECU device records the fuel use data. Averages of both the fuel use and emissions data are calculated based on the OP Mode for each truck. The trucks are classified by diesel fuel front-loaders, diesel fuel side-loaders, CNG front-loaders, CNG side-loaders, and diesel fuel roll-offs.

First, the amount of waste per stop is calculated. Both the amount of waste collected and the number of stops are found in the log sheets and route sheets for each truck. The waste is recorded in tons, so it is first converted to kilograms (kg), and then divided by the number of stops per truck. The following is an example of the amount of waste per stop for front-loader 3204.

Given:

Amount of waste: 10.85 tons

Number of stops: 50

$$Waste\ per\ stop = \frac{10.86\ tons \times 907.15\ \frac{kg}{ton}}{50\ stops} = 197\ \frac{kg}{stop} \quad [2]$$

After the waste per stop is calculated for all 24 trucks, the data is then averaged based on the type of truck and fuel type classification.

The fuel use for each truck is a summation of the averages of the engine fuel rate in grams per second (g/s) multiplied by the time spent (data size in seconds) in each operating mode. This value is then converted into gallons. An example calculation for front-load 3204 is shown in Table 2.

Table 2. Fuel Use Calculation Example

OP Mode	Engine Fuel Use Rate (g/s)	Data Size (s)	Fuel Rate (g)
0	0.56	89	49.8
1	1.56	8728	13600.1
11	1.70	1973	3354.1
12	4.08	2642	10779.4
13	9.00	583	5247.0
14	12.43	247	3070.2
15	14.97	210	3143.7
16	15.65	222	3474.3
21	1.69	1079	1823.5
22	5.25	500	2625.0
23	7.86	644	5061.8
24	10.98	630	6917.4
25	13.84	681	9425.0
27	15.28	865	13217.2
28	15.04	44	661.8
33	6.46	1493	9644.8
35	13.33	1117	14889.6
37	14.89	359	5345.5
38	13.36	20	267.2
		Fuel Use (g)	112672.9

Given:

The engine fuel rate is calculated to be 112672.9 grams. Then the conversion to gallons is as follows.

$$Fuel\ use = 112673.9\ g\ \times 0.001 \frac{L}{g} \times 0.2642 \frac{gal}{L} = 29.8\ gal \qquad [3]$$

The compressed natural gas (CNG) trucks must be converted to a diesel fuel equivalent in order to make them equal for comparison purposes. To convert the CNG

trucks, the fuel use calculated must be converted to pounds (lbs.) and then multiplied by a diesel gallon equivalent. This conversion is shown for front-load 3437C below.

$$\frac{150647.7\ g \times 0.002205\ \frac{lb}{g}}{6.429\ \frac{DGE}{lb}} = 51.7\ DGE \quad [4]$$

The calculated fuel use for all 24 trucks is then averaged by the type of truck and fuel type classifications to show a comparison between all 5 types of trucks.

The fuel economy is the fuel use previously calculated for each truck divided by the amount of miles traveled while in route. The mileage is found in the route sheets recorded by the drivers. The equation is shown below for front-load 3204.

Given:

Fuel use: 29.8 gal

Distance traveled: 112.9 mi

$$Fuel\ economy = \frac{112.9\ mi}{29.8\ \ gal} = 3.8\ mpg \quad [5]$$

The values calculated for each truck is then averaged by type of truck classifications to show average fuel economy based on each truck type.

The fuel use and time spent based on idling and driving is calculated from the OP Modes found for each truck. OP Mode 1 is the truck while idling, and the remainder of the OP Modes are classified by the trucks while they driving. For each truck, OP Mode 1 is taken out of the fuel use and amount of time spent and is summed together to show how much time all 24 trucks spend idling. The remainder of the OP Modes are summed for each truck as well to show how much fuel and time is spent while driving.

The amount of emissions and fuel use per ton are also calculated. The five emissions recorded from the PEMS device are averaged for each truck. The amount of waste collected is found in each truck's log sheet, and the fuel use is the same value that was calculated previously. The purpose of this emissions and fuel use per ton is to quantify how much is emitted based on how much each of the trucks collect while in route. A sample calculation of front-load 3204's fuel use and CO_2 emissions is shown below.

Given:

Fuel use: 112673 g

CO_2 emissions: 355220 g

Waste Collected: 11 tons

$$Fuel\ Use\ per\ ton = \frac{112673g}{11\ tons} = 10375\ \frac{g}{ton} \quad [6]$$

$$CO_2 emissions\ per\ ton = \frac{355220g}{11\ tons} = 32709\ \frac{g}{ton} \quad [7]$$

3.4. REGRESSION ANALYSIS

To show what type of relationship the emissions (CO_2, CO, HC, NO_x, and PM) have with five different factors (vehicle year, engine year, vehicle type, fuel type, and emission controls), a simple statistical analysis is performed. The vehicle year and engine year range from 2002-2013. The two fuel types are diesel and CNG fuel. The vehicle types are the three different trucks tested, the front-load, roll-off, and side-load trucks. The emission controls are devices on the trucks that help to reduce emissions from the truck in some way. The exhaust gas recirculation (EGR) control helps reduce

NOx emissions. The diesel particulate filter (DPF) helps remove particulate matter from the exhaust pipe. The selective catalytic reduction (SCR) is a device that reduces NOx levels by using ammonia through a catalyst system. Lastly, the 3 way catalytic system (3-WCC) helps convert NOx, CO, HC, and other hazardous air pollutants and is found in many natural gas systems. The independent variables are the different factors while the dependent variables are the various emissions. Table 3 contains the data for analysis. These values are based on the averages of collected data per truck.

Table 3. Average Emissions Data used for Initial Regression Analysis

Vehicle Year	Engine Year	Vehicle Type	Fuel Type	Emission Controls	CO2 (g/s)	CO (mg/s)	HC (mg/s)	NOx (mg/s)	PM (mg/s)
0	0	0	0	0	16	49	7	114	2.13
0	0	0	0	0	12	68	3	84	1.73
0	0	1	0	0	9	42	17	79	1.73
0	0	1	0	0	8	19	4	62	0.75
0	0	2	0	5	12	85	4	67	2.95
0	0	2	0	5	12	52	6	124	1.45
2	1	0	0	1	14	7	40	52	0.04
2	1	0	0	1	12	7	36	71	0.03
2	2	1	0	2	8	9	4	7	0.07
2	2	1	0	2	8	4	2	13	0.04
2	2	2	0	1	7	1	3	16	0.02
2	2	2	0	3	6	1	4	5	0.01
1	0	0	0	0	16	10	7	106	1.56
1	1	0	0	1	11	25	7	60	0.02
1	0	1	0	0	11	24	4	80	0.98
1	0	1	0	0	10	23	3	78	0.92
1	1	2	0	1	8	4	3	27	0.23
1	1	2	0	1	12	57	5	106	0.64
3	3	0	1	4	9	46	7	2	0.01
3	3	0	1	4	10	81	8	3	0.01
3	3	0	1	4	9	42	11	1	0.01
3	3	2	1	4	7	51	15	2	0.01
3	3	2	1	4	10	99	20	6	0.02
3	3	2	1	4	7	34	7	2	0.01

Five factors are tested – the vehicle year and engine year of each of the trucks, the type of truck (front-load, side-load, roll-off), the fuel type (diesel or CNG), and the emissions controls (EGR, DPF, SCR, 3-WCC). Each of the factors are given dummy variables in order to perform the regression. Dummy variables are numerical values assigned to a subgroup of a sample in a study in order to perform a regression analysis (http://www.socialresearchmethods.net/kb/dummyvar.php). The vehicle year and engine year are grouped by EPA regulations for both diesel and CNG fuel. The dummy variables are listed in Table 4.

Table 4. Dummy Variables for each Factor Tested

Factor	Dummy Variable	Description
Vehicle Year	0	2002-2006
	1	2007-2009
	2	2010-2012
	3	2012-2013 CNG Fuel
Engine Year	0	2002-2006
	1	2007-2009
	2	2010-2012
	3	2012-2013 CNG Fuel
Vehicle Type	0	Front-load
	1	Side-load
	2	Roll-off
Fuel Type	0	Diesel Fuel
	1	CNG Fuel
Emission Controls	0	EGR
	1	EGR, DPF
	2	DPF, SCR
	3	EGR, DPF, SCR
	4	SCR, 3-WCC
	5	None

First, a correlation test is run in excel to determine what the relationships are between the independent and dependent variables. The correlations are then used to help specify which factors are highly correlated to eliminate the models from the regression analysis. A multiple regression analysis is run for each emission measure, using the

program Statistix. Vehicle year and engine year are never run in the same models because they have a 94% correlation, and is too highly correlated. Vehicle year, engine year and fuel type are also eliminated due to the correlations being greater than 75%.

Equation 8 gives the general form of the regression equations. Equations 9 through 60 are an exhaustive list of all possible regression equations including those with highly correlated variables. Only those equations without highly correlated variables will be analyzed, however.

$$E \sim f\begin{pmatrix} CO_2 \\ CO \\ HC \\ NOx \\ PM \end{pmatrix} \quad [8]$$

Where

E = Emission Measure

VY = Vehicle Year

EY = Engine Year

VT = Vehicle Type

FT = Fuel Type

EC = Emission Controls

Models for All Trucks

$E \sim f(VY, EY, VT, FT, EC)$ [9]

Models with VY

$E = a + b_1VY + b_2VT + b_4EC$ [10]

$E = a + b_1VY + b_2VT$ [11]

$E = a + b_1VY + b_4EC$ [12]

$E = a + b_1VY$ [13]

Models with EY

$E = a + b_1EY + b_2VT + b_4EC$ [14]

$E = a + b_1EY + b_2VT$ [15]

$E = a + b_1EY + b_4EC$ [16]

$E = a + b_1EY$ [17]

Models without either VY or EY

$E = a + b_2VT + b_3FT + b_4EC$ [18]

$E = a + b_2VT + b_3FT$ [19]

$E = a + b_2VT + b_4EC$ [20]

$E = a + b_3FT + b_4EC$ [21]

$E = a + b_2VT$ [22]

$E = a + b_3FT$ [23]

$E = a + b_4EC$ [24]

Models by Fuel Type

Models for Diesel Trucks only

$E \sim f(VY, EY, VT, EC)$ [25]

Models with VY

$E = a + b_1VY + b_2VT + b_4EC$ [26]

$E = a + b_1VY + b_2VT$ [27]

$E = a + b_1VY + b_4EC$ [28]

$E = a + b_1 VY$ [29]

Models with EY

$E = a + b_1 EY + b_2 VT + b_4 EC$ [30]

$E = a + b_1 EY + b_2 VT$ [31]

$E = a + b_1 EY + b_4 EC$ [32]

$E = a + b_1 EY$ [33]

Models without either VY or EY

$E = a + b_2 VT + b_4 EC$ [34]

$E = a + b_2 VT$ [35]

$E = a + b_4 EC$ [36]

Model for CNG Trucks only

$E \sim f(VT)$ [37]

$E = a + b_2 VT$ [38]

Models by Truck Type

Models for Front-loader Trucks only

$E \sim f(VY, EY, FT, EC)$ [39]

Models with VY

$E = a + b_1 VY + b_4 EC$ [40]

$E = a + b_1 VY$ [41]

Models with EY

$E = a + b_1 EY + b_4 EC$ [42]

$E = a + b_1 EY$ [43]

Models without either VY or EY

$E = a + b_3FT + b_4EC$ [44]

$E = a + b_3FT$ [45]

$E = a + b_4EC$ [46]

Models for Side-loader Trucks only

$E \sim f(VY, EY, FT, EC)$ [47]

Models with VY

$E = a + b_1VY + b_4EC$ [48]

$E = a + b_1VY$ [49]

Models with EY

$E = a + b_1EY + b_4EC$ [50]

$E = a + b_1EY$ [51]

Models without either VY or EY

$E = a + b_3FT + b_4EC$ [52]

$E = a + b_3FT$ [53]

$E = a + b_4EC$ [54]

Models for Roll-off Trucks only

$E \sim f(VY, EY, EC)$ [55]

Models with VY

$E = a + b_1VY + b_4EC$ [56]

$E = a + b_1VY$ [57]

Models with EY

$E = a + b_1EY + b_4EC$ [58]

$E = a + b_1EY$ [59]

Models without either VY or EY

$$E = a + b_4 EC \quad [60]$$

The first analysis is performed on the emissions data averages, Table 3, to show a basic relationship between the five emissions and five factors. Next, a regression analysis is performed on the OP Modes. The data sets are grouped by the acceleration and vehicle speed, OP Mode 0, OP Mode 1, OP Modes 11-16, OP Modes 21-30, and OP Modes 33-40. The data is shown in Tables 5-9. This analysis is done to show which speed produces the most emissions based on the five factors.

Table 5. OP Mode 0 Data used for Regression Analysis

VT	FT	VY	EY	EC	CO2 (g)	CO (mg)	HC (mg)	NOx (mg)	PM (mg)
0	0	0	0	0	153	1614	346	859	399
0	0	0	0	0	91	1172	103	821	74
0	0	1	0	0	1648	3747	4609	12237	509
0	0	1	1	1	131	2012	1015	1267	4
0	0	2	1	1	205	1341	6632	3479	5
0	0	2	1	1	189	1548	5507	3275	4
1	0	0	0	0	778	27475	14949	16874	2114
1	0	0	0	0	955	6550	2995	10136	156
1	0	1	0	0	1673	13329	2652	19541	433
1	0	1	0	0	667	8385	2311	14272	564
1	0	3	3	2	1412	22960	26901	4436	283
1	0	3	3	2	1445	14409	14457	6351	153
2	0	0	0	5	79	783	168	572	83
2	0	0	0	5	226	1536	468	2370	85
2	0	1	1	1	390	1088	780	2120	18
2	0	1	1	1	1948	11712	3317	21735	229
2	0	2	2	1	12	23	77	82	0
2	0	3	3	3	73	208	463	91	2
0	1	3	3	4	8647	38540	8442	12527	16
0	1	3	3	4	3606	11898	11342	4034	18
0	1	3	3	4	3566	15486	16889	4035	15
2	1	3	3	4	2337	9950	33553	3327	26
2	1	3	3	4	3308	31505	34829	7578	39
2	1	3	3	4	2071	10590	9781	2299	13

Table 6. OP Mode 1 Data used for Regression Analysis

VT	FT	VY	EY	EC	CO2 (g)	CO (mg)	HC (mg)	NOx (mg)	PM (mg)
0	0	0	0	0	42667	302214	39765	397708	6627
0	0	0	0	0	117240	609336	36635	968644	16720
0	0	1	0	0	80028	111379	67144	1354303	7791
0	0	1	1	1	80086	198371	53381	660296	187
0	0	2	1	1	46009	23383	113954	199382	166
0	0	2	1	1	101073	70319	387896	776060	274
1	0	0	0	0	33840	290418	93513	548666	7219
1	0	0	0	0	58219	235295	60010	668675	4387
1	0	1	0	0	30590	188510	30261	409857	1794
1	0	1	0	0	39638	284569	37780	594107	2894
1	0	3	3	2	34418	8538	25620	20302	256
1	0	3	3	2	34340	5559	10438	48785	117
2	0	0	0	5	109762	575464	54128	940612	18300
2	0	0	0	5	124845	391294	83151	1529569	10118
2	0	1	1	1	39368	19524	15541	182097	488
2	0	1	1	1	127303	326412	50406	2023377	3591
2	0	2	2	1	31807	1611	15436	62486	62
2	0	3	3	3	52138	9259	35621	5207	126
0	1	3	3	4	129186	470973	73718	32095	123
0	1	3	3	4	98082	314965	69322	11487	108
0	1	3	3	4	96641	290413	95098	7791	76
2	1	3	3	4	138271	90795	172705	25099	210
2	1	3	3	4	170551	204429	177000	57915	263
2	1	3	3	4	131554	202628	96583	40555	143

Table 7. OP Modes 11-16 Data used for Regression Analysis

VT	FT	VY	EY	EC	CO2 (g)	CO (mg)	HC (mg)	NOx (mg)	PM (mg)
0	0	0	0	0	10464	100834	9740	74011	3416
0	0	0	0	0	30859	336861	15164	276421	9030
0	0	1	0	0	35900	35378	33128	294374	4849
0	0	1	1	1	23105	93652	30778	145168	112
0	0	2	1	1	19691	28333	178422	139556	127
0	0	2	1	1	30822	38077	202735	269761	150
1	0	0	0	0	5257	58480	25831	85927	3465
1	0	0	0	0	4469	29307	7249	51792	697
1	0	1	0	0	5009	31969	5451	54191	791
1	0	1	0	0	5050	40774	5663	74244	1128
1	0	3	3	2	5299	14175	16259	6981	244
1	0	3	3	2	4150	4487	3333	6414	40
2	0	0	0	5	28325	256692	29565	205212	17940
2	0	0	0	5	20024	99028	19354	219527	3577
2	0	1	1	1	8801	6165	5225	40845	324
2	0	1	1	1	20262	77149	15906	148790	1334
2	0	2	2	1	3423	1596	4758	22081	21
2	0	3	3	3	10120	4106	11190	10400	44
0	1	3	3	4	20086	123677	18305	12646	36
0	1	3	3	4	20521	129347	25384	13625	42
0	1	3	3	4	21864	116532	42949	7791	34
2	1	3	3	4	6598	33369	43826	5119	29
2	1	3	3	4	11430	82689	52432	32094	63
2	1	3	3	4	6788	40347	28021	5552	26
0	0	0	0	0	33315	511919	14704	200449	7294
0	0	0	0	0	103232	1737026	21591	677219	20671
0	0	1	0	0	53377	38176	28513	416339	5140
0	0	1	1	1	63634	202775	32431	341636	129
0	0	2	1	1	56266	24713	159806	254091	164
0	0	2	1	1	97743	50945	251000	697886	225
1	0	0	0	0	20672	144688	26321	225479	5685
1	0	0	0	0	28089	126255	15382	229063	2883
1	0	1	0	0	28674	147409	12961	211199	3743
1	0	1	0	0	28505	144570	10901	248901	3253
1	0	3	3	2	24189	46195	17864	27431	222
1	0	3	3	2	18707	21769	5336	27462	68
2	0	0	0	5	88346	1711508	26791	460296	29209
2	0	0	0	5	84999	1078457	32576	730083	13970
2	0	1	1	1	33944	47736	10063	128921	675
2	0	1	1	1	65987	601060	22118	529109	3800
2	0	2	2	1	10844	1987	6203	40641	38
2	0	3	3	3	27609	4285	14609	29079	60
0	1	3	3	4	58754	349138	40947	9202	64
0	1	3	3	4	64586	610331	47235	15625	78

VT	FT	VY	EY	EC	CO2 (g)	CO (mg)	HC (mg)	NOx (mg)	PM (mg)
0	1	3	3	4	58419	332090	66372	7714	54
2	1	3	3	4	22489	432368	64382	8052	50
2	1	3	3	4	28693	335065	63132	36634	67
2	1	3	3	4	36089	252008	62081	9594	51
0	0	0	0	0	16498	69775	6120	85388	3042
0	0	0	0	0	62946	287192	11829	368697	10174
0	0	1	0	0	41231	24434	15265	202517	3989
0	0	1	1	1	31867	112826	12972	135562	54
0	0	2	1	1	34853	11803	64030	129716	83
0	0	2	1	1	42777	17121	87722	218598	74
1	0	0	0	0	12320	152928	9637	88938	2688
1	0	0	0	0	15180	92423	4826	96745	1974
1	0	1	0	0	19161	91982	5087	102428	2447
1	0	1	0	0	21570	118914	3908	148580	2715
1	0	3	3	2	12847	63223	4388	11804	83
1	0	3	3	2	15084	34059	2097	25605	43
2	0	0	0	5	70274	382491	17676	305906	16044
2	0	0	0	5	53020	140121	19919	391053	7647
2	0	1	1	1	62226	26210	17183	224427	1490
2	0	1	1	1	75793	512868	25121	498703	4776
2	0	2	2	1	8414	932	4490	36631	22
2	0	3	3	3	34113	2782	15764	36062	60
0	1	3	3	4	37951	204586	31203	3311	42
0	1	3	3	4	40390	380232	29422	5509	44
0	1	3	3	4	42846	229258	47893	2838	39
2	1	3	3	4	20650	362006	71158	5205	41
2	1	3	3	4	29911	591772	68654	24147	57
2	1	3	3	4	29817	265251	45226	2998	38
0	0	0	0	0	9702	9451	3650	51855	1574
0	0	0	0	0	36861	31723	6719	222107	4905
0	0	1	0	0	37019	21757	12502	176555	3351
0	0	1	1	1	22080	45241	8924	79500	32
0	0	2	1	1	21238	5731	36012	78723	29
0	0	2	1	1	24195	9092	45584	107786	41
1	0	0	0	0	10255	87256	6751	65421	1806
1	0	0	0	0	9422	35593	2266	53380	1299
1	0	1	0	0	19412	45134	4041	90624	2004
1	0	1	0	0	18631	55750	3133	111300	2150
1	0	3	3	2	8051	34667	2271	9564	55
1	0	3	3	2	10026	13744	1340	19164	35
2	0	0	0	5	35495	64595	9348	148377	7022
2	0	0	0	5	38148	49166	14644	272327	5482
2	0	1	1	1	43261	10894	10097	125570	1219
2	0	1	1	1	54095	194771	19330	322153	3511
2	0	2	2	1	3574	204	1424	11621	8

VT	FT	VY	EY	EC	CO2 (g)	CO (mg)	HC (mg)	NOx (mg)	PM (mg)
2	0	3	3	3	21566	1893	9859	20936	34
0	1	3	3	4	31787	152303	28362	1741	34
0	1	3	3	4	26469	277120	20831	8631	28
0	1	3	3	4	31055	124781	33306	861	28
2	1	3	3	4	18343	254511	68374	5142	37
2	1	3	3	4	33032	527973	71660	13872	58
2	1	3	3	4	9506	105798	12023	632	12
0	0	0	0	0	9941	3798	3356	60322	1501
0	0	0	0	0	24972	12363	4109	156175	3145
0	0	1	0	0	30520	16081	10310	130548	2644
0	0	1	1	1	15938	24252	7629	51670	25
0	0	2	1	1	11568	2356	17285	39029	12
0	0	2	1	1	10508	3174	19932	44693	18
1	0	0	0	0	6558	34071	4147	35665	1106
1	0	0	0	0	6710	6029	2169	37921	883
1	0	1	0	0	14041	16778	2542	66699	1353
1	0	1	0	0	14907	22096	2167	84406	1635
1	0	3	3	2	6068	20414	1728	9557	51
1	0	3	3	2	5814	4998	716	13377	25
2	0	0	0	5	9676	13544	2553	41021	1823
2	0	0	0	5	17077	16838	5244	111450	2340
2	0	1	1	1	16455	4469	3529	43534	614
2	0	1	1	1	19550	46029	6342	96162	1244
2	0	2	2	1	2094	68	605	4183	6
2	0	3	3	3	9301	938	4464	8013	14
0	1	3	3	4	15756	69446	10826	394	15
0	1	3	3	4	16040	148964	12888	9716	18
0	1	3	3	4	14218	42607	16022	248	12
2	1	3	3	4	15261	251763	43748	6511	30
2	1	3	3	4	27445	391740	51027	10086	46
2	1	3	3	4	4190	62045	3893	227	5
0	0	0	0	0	10997	2445	2583	67815	1464
0	0	0	0	0	10992	3945	1680	68318	1348
0	0	1	0	0	42770	22060	17949	180981	3837
0	0	1	1	1	7747	9427	4119	23952	11
0	0	2	1	1	6603	1913	9709	19923	6
0	0	2	1	1	7683	3656	14600	31559	10
1	0	0	0	0	5008	20090	3749	27006	870
1	0	0	0	0	3368	2764	1037	18416	405
1	0	1	0	0	5863	4098	1042	27666	605
1	0	1	0	0	16312	11956	2088	87928	1621
1	0	3	3	2	7175	17701	1832	13664	83
1	0	3	3	2	6218	4895	850	22496	32
2	0	0	0	5	2749	3746	713	12075	520
2	0	0	0	5	5559	4897	884	31438	668

VT	FT	VY	EY	EC	CO2 (g)	CO (mg)	HC (mg)	NOx (mg)	PM (mg)
2	0	1	1	1	6306	1551	1228	16851	383
2	0	1	1	1	8180	15007	2333	34175	489
2	0	2	2	1	3600	460	1164	6646	7
2	0	3	3	3	7005	650	3210	4817	8
0	1	3	3	4	3318	15492	2165	88	3
0	1	3	3	4	6033	76210	4903	3855	7
0	1	3	3	4	4352	12379	4737	74	4
2	1	3	3	4	8146	148753	16305	1924	13
2	1	3	3	4	16547	258356	31381	5670	26
2	1	3	3	4	1180	18505	1043	48	1

Table 8. OP Modes 21-30 Data used for Regression Analysis

VT	FT	VY	EY	EC	CO2 (g)	CO (mg)	HC (mg)	NOx (mg)	PM (mg)
0	0	0	0	0	5741	13010	5599	37616	1458
0	0	0	0	0	6018	48468	4456	78403	2034
0	0	1	0	0	50792	44727	36869	268443	8439
0	0	1	1	1	4873	10730	4432	31585	11
0	0	2	1	1	5464	2068	41572	35075	92
0	0	2	1	1	4806	3687	47031	42858	26
1	0	0	0	0	4268	36907	23484	59248	3143
1	0	0	0	0	3679	27702	7171	41544	985
1	0	1	0	0	6930	31597	6689	84956	1208
1	0	1	0	0	7874	23906	5147	102257	1444
1	0	3	3	2	2834	3023	6724	5906	54
1	0	3	3	2	2326	813	936	4946	12
2	0	0	0	5	8518	86476	5174	56759	3748
2	0	0	0	5	7183	30149	4838	101396	929
2	0	1	1	1	1750	1061	1625	10180	41
2	0	1	1	1	1245	5150	1021	7691	43
2	0	2	2	1	2987	192	2349	7781	8
2	0	3	3	3	2763	752	3364	1924	8
0	1	3	3	4	7035	48205	13244	8662	17
0	1	3	3	4	5104	42110	13117	3472	18
0	1	3	3	4	3865	39708	16995	1470	13
2	1	3	3	4	3062	55932	25137	1434	19
2	1	3	3	4	3147	29531	43228	10640	29
2	1	3	3	4	2273	16391	3452	1436	10
0	0	0	0	0	8288	12280	3681	49746	860
0	0	0	0	0	7620	51201	1967	61999	1419
0	0	1	0	0	13095	10845	7251	67616	2088
0	0	1	1	1	7569	9933	4876	49891	12
0	0	2	1	1	5395	1636	17889	20205	19
0	0	2	1	1	7738	3315	31830	48562	20
1	0	0	0	0	4872	14368	5308	40700	865
1	0	0	0	0	7360	13049	3684	43777	797
1	0	1	0	0	18375	35389	5602	137825	1771
1	0	1	0	0	9120	10850	1844	71312	873
1	0	3	3	2	5558	3869	3149	7703	38
1	0	3	3	2	5357	987	1126	9947	18
2	0	0	0	5	14197	133386	4099	78543	3880
2	0	0	0	5	12906	29050	4295	145437	1333

VT	FT	VY	EY	EC	CO2 (g)	CO (mg)	HC (mg)	NOx (mg)	PM (mg)
2	0	1	1	1	2789	962	951	10159	38
2	0	1	1	1	2509	5334	940	14616	67
2	0	2	2	1	3573	101	1526	8396	7
2	0	3	3	3	4314	659	3310	2945	8
0	1	3	3	4	10651	76421	10436	6271	17
0	1	3	3	4	9381	82117	9477	3258	11
0	1	3	3	4	5323	33758	7551	835	6
2	1	3	3	4	2394	36518	6759	263	5
2	1	3	3	4	3397	38975	12828	5541	10
2	1	3	3	4	2947	18414	2288	482	5
0	0	0	0	0	16002	12784	5989	97787	1314
0	0	0	0	0	14665	80174	2661	112512	1900
0	0	1	0	0	17966	11125	7685	88097	2444
0	0	1	1	1	13313	16593	7385	81285	17
0	0	2	1	1	8045	4061	27755	31137	21
0	0	2	1	1	12742	5320	37703	82872	30
1	0	0	0	0	9919	25241	7108	66234	1293
1	0	0	0	0	12911	38183	3859	70218	1240
1	0	1	0	0	34940	49715	7735	224708	2827
1	0	1	0	0	14524	11776	2397	96421	1145
1	0	3	3	2	10485	13392	3810	13402	50
1	0	3	3	2	9474	2549	1257	13459	27
2	0	0	0	5	22393	156449	4729	118422	4893
2	0	0	0	5	19250	48026	5066	218438	2012
2	0	1	1	1	7132	1823	2024	22611	163
2	0	1	1	1	4108	9405	1397	24420	97
2	0	2	2	1	5920	11	2070	11853	10
2	0	3	3	3	6282	766	4099	5067	10
0	1	3	3	4	20566	136390	16622	3660	24
0	1	3	3	4	19730	168159	14622	3701	19
0	1	3	3	4	9423	45929	10745	982	9
2	1	3	3	4	4076	45945	11394	572	8
2	1	3	3	4	4892	83126	15397	5564	10
2	1	3	3	4	4667	30409	2710	500	6
0	0	0	0	0	21874	9970	7847	140987	1682
0	0	0	0	0	20220	52291	3244	152159	1900
0	0	1	0	0	21152	11878	8993	95383	2325
0	0	1	1	1	22413	23983	10381	113152	28
0	0	2	1	1	10575	1330	19213	36626	18

VT	FT	VY	EY	EC	CO2 (g)	CO (mg)	HC (mg)	NOx (mg)	PM (mg)
0	0	2	1	1	15949	6411	38402	106121	32
1	0	0	0	0	11491	20757	9260	76168	1530
1	0	0	0	0	14365	14854	3917	72080	1357
1	0	1	0	0	46316	44165	8481	289524	3419
1	0	1	0	0	18197	13234	2394	113060	1466
1	0	3	3	2	11898	10631	3443	13537	56
1	0	3	3	2	11693	2799	1456	16687	35
2	0	0	0	5	21283	84954	4364	102261	3671
2	0	0	0	5	18035	41356	4756	191973	1730
2	0	1	1	1	13369	2336	2970	38868	374
2	0	1	1	1	5757	14892	1485	32031	156
2	0	2	2	1	6788	11	1842	13551	10
2	0	3	3	3	8431	857	4545	7218	11
0	1	3	3	4	26273	150121	21106	1780	27
0	1	3	3	4	29112	234802	20169	3018	28
0	1	3	3	4	17550	68415	16417	420	15
2	1	3	3	4	4882	72656	12453	338	9
2	1	3	3	4	8570	141432	21395	4069	14
2	1	3	3	4	6371	64434	3938	439	8
0	0	0	0	0	29822	8080	9377	213505	2424
0	0	0	0	0	25910	17744	4299	195738	2208
0	0	1	0	0	28475	14080	9822	131848	2785
0	0	1	1	1	31255	36971	14590	139991	41
0	0	2	1	1	12353	2372	21166	44370	16
0	0	2	1	1	17176	3763	32476	112297	30
1	0	0	0	0	13449	19981	7895	80000	1658
1	0	0	0	0	18373	13253	4774	100844	1921
1	0	1	0	0	52968	39812	9442	312985	4111
1	0	1	0	0	25516	11819	3015	152651	2051
1	0	3	3	2	13451	18544	3562	21962	64
1	0	3	3	2	10253	1777	1157	23478	32
2	0	0	0	5	12199	23126	3696	55857	2029
2	0	0	0	5	16265	18556	4148	161068	1488
2	0	1	1	1	16207	3496	4033	42079	592
2	0	1	1	1	7064	15665	1999	36355	234
2	0	2	2	1	6675	59	1657	12532	10
2	0	3	3	3	6819	613	3821	4651	8
0	1	3	3	4	18820	87289	12315	544	19
0	1	3	3	4	24956	259646	17349	7212	35

VT	FT	VY	EY	EC	CO2 (g)	CO (mg)	HC (mg)	NOx (mg)	PM (mg)
0	1	3	3	4	16815	54479	17632	176	16
2	1	3	3	4	9404	106639	21502	179	16
2	1	3	3	4	12865	195413	36467	2616	19
2	1	3	3	4	5207	57162	3172	157	7
0	0	0	0	0	41845	5392	10253	311331	3644
0	0	0	0	0	22332	10228	3364	162577	2005
0	0	1	0	0	52131	26956	16785	229072	4812
0	0	1	1	1	26737	29454	13946	110434	36
0	0	2	1	1	14953	4076	24221	49341	13
0	0	2	1	1	20017	5642	38532	116359	41
1	0	0	0	0	16058	41195	11736	91820	2085
1	0	0	0	0	20837	18047	5564	114221	2393
1	0	1	0	0	41081	29291	7493	220657	3504
1	0	1	0	0	48764	19436	4855	293425	4128
1	0	3	3	2	23627	15997	6152	47804	202
1	0	3	3	2	23639	7020	2524	64440	107
2	0	0	0	5	7477	9374	1471	33520	1096
2	0	0	0	5	9589	8797	1786	75046	899
2	0	1	1	1	15074	4646	4604	35475	1014
2	0	1	1	1	6971	10436	1753	32037	260
2	0	2	2	1	7103	172	2067	13637	12
2	0	3	3	3	12345	887	6446	6886	14
0	1	3	3	4	8067	31045	5577	340	7
0	1	3	3	4	13357	230619	10109	6812	18
0	1	3	3	4	11079	36326	9443	136	10
2	1	3	3	4	15488	226451	30060	346	24
2	1	3	3	4	16149	225168	33609	1985	25
2	1	3	3	4	2208	25011	1938	79	3
0	0	0	0	0	2095	543	362	16080	178
0	0	0	0	0	353	88	65	2795	35
0	0	1	0	0	27983	11285	8673	127303	2410
0	0	1	1	1	2147	2044	1066	7634	2
0	0	2	1	1	5750	3282	7914	18249	5
0	0	2	1	1	5340	540	10273	28084	7
1	0	0	0	0	3954	11934	3112	23104	516
1	0	1	0	0	1141	796	210	6478	98
1	0	1	0	0	16227	6126	1573	96579	1466
1	0	3	3	2	10585	6274	3007	27232	117
1	0	3	3	2	5484	738	570	16306	29

VT	FT	VY	EY	EC	CO2 (g)	CO (mg)	HC (mg)	NOx (mg)	PM (mg)
2	0	0	0	5	675	701	102	3856	66
2	0	1	1	1	418	181	134	892	33
2	0	1	1	1	470	1071	107	1944	18
2	0	2	2	1	200	0	71	225	0
2	0	3	3	3	2018	284	1263	1144	3
0	1	3	3	4	354	1431	308	2	0
0	1	3	3	4	572	10626	385	764	1
0	1	3	3	4	823	2748	548	5	1
2	1	3	3	4	1642	31777	3144	61	2
2	1	3	3	4	1904	22619	3668	139	3
0	0	1	0	0	9774	3860	3963	41902	944
0	0	2	1	1	1651	0	2460	5060	1
1	0	0	0	0	351	1545	464	2232	58
1	0	1	0	0	1491	466	135	9671	144
1	0	3	3	2	960	922	292	3352	6
1	0	3	3	2	198	0	9	2047	0
2	0	2	2	1	198	0	63	225	0
2	0	3	3	3	63	32	99	30	0

Table 9. OP Modes 33-40 Data used for Regression Analysis

VT	FT	VY	EY	EC	CO2 (g)	CO (mg)	HC (mg)	NOx (mg)	PM (mg)
0	0	1	0	0	12302	4516	4048	56548	1119
0	0	2	1	1	162	109	347	471	0.2
0	0	0	0	0	30480	16580	14320	208721	2400
0	0	0	0	0	27630	20755	7811	179187	1995
0	0	1	0	0	46155	17138	17474	277767	4878
0	0	1	1	1	7045	7748	4933	21027	13
0	0	2	1	1	28002	22297	80826	53983	43
0	0	2	1	1	28613	20228	78182	59457	46
1	0	0	0	0	32046	75553	99317	226084	5238
1	0	0	0	0	41577	51729	22034	283576	3770
1	0	1	0	0	27241	33259	11893	179186	2104
1	0	1	0	0	19189	10738	3024	146167	1491
1	0	3	3	2	28300	1904	7538	4291	122
1	0	3	3	2	28546	4100	3301	20128	113
2	0	0	0	5	6304	3953	1302	28635	685
2	0	0	0	5	11869	3656	4683	198921	783
2	0	1	1	1	4895	1409	2910	12299	81
2	0	1	1	1	12085	45950	3731	28972	617
2	0	2	2	1	10897	14	8211	17888	22
2	0	3	3	3	170	174	262	117	0.4
0	1	3	3	4	1432	13353	2307	406	7
0	1	3	3	4	4075	37294	3891	319	5
0	1	3	3	4	4477	43284	5232	996	6
2	1	3	3	4	1246	11964	3948	35	4
2	1	3	3	4	7057	113461	13501	6978	16
2	1	3	3	4	762	4437	213	47	1
0	0	0	0	0	47109	9384	15694	365854	3042
0	0	0	0	0	36193	13375	6923	231362	2010
0	0	1	0	0	33244	9976	9968	185804	2774
0	0	1	1	1	13754	10380	5664	35656	16
0	0	2	1	1	27602	15833	53297	49605	31
0	0	2	1	1	22895	9233	43851	46684	26
1	0	0	0	0	48182	55862	89492	289553	4649
1	0	0	0	0	53506	13706	12359	317212	3500
1	0	1	0	0	54400	35774	14458	350612	3251
1	0	1	0	0	27107	7796	2524	169124	1754
1	0	3	3	2	31208	1092	7002	7026	184
1	0	3	3	2	40311	2979	3701	44228	183
2	0	0	0	5	7056	3534	1166	32714	636

VT	FT	VY	EY	EC	CO2 (g)	CO (mg)	HC (mg)	NOx (mg)	PM (mg)
2	0	0	0	5	22162	2948	5612	315004	1303
2	0	1	1	1	10739	4909	4673	21465	549
2	0	1	1	1	21530	93074	5037	43921	1326
2	0	2	2	1	12715	0	7010	16287	21
2	0	3	3	3	351	119	349	134	1
0	1	3	3	4	3603	26053	3904	230	7
0	1	3	3	4	4341	62610	3406	1129	5
0	1	3	3	4	11228	75017	8046	701	11
2	1	3	3	4	1116	9063	2328	1	2
2	1	3	3	4	10030	212329	11844	6203	15
2	1	3	3	4	470	2363	105	9	1
0	0	0	0	0	16923	2667	3419	140448	1141
0	0	0	0	0	20727	8241	3500	137448	1182
0	0	1	0	0	30752	7946	6924	176639	2432
0	0	1	1	1	5774	3722	2266	17162	7
0	0	2	1	1	23968	12099	43269	43692	23
0	0	2	1	1	18107	9689	39797	41079	22
1	0	0	0	0	25804	38135	40267	168353	2437
1	0	0	0	0	26501	6652	6649	164664	1782
1	0	1	0	0	19907	11507	4280	136746	1256
1	0	1	0	0	20531	5124	1797	133426	1343
1	0	3	3	2	22840	869	5317	5677	155
1	0	3	3	2	24508	2285	2317	30777	145
2	0	0	0	5	1678	1020	290	8080	139
2	0	0	0	5	4955	862	1224	61937	324
2	0	1	1	1	3665	417	1733	7529	113
2	0	1	1	1	12186	56267	2579	31912	632
2	0	2	2	1	5065	0	1827	4923	9
2	0	3	3	3	186	311	325	206	0.3
0	1	3	3	4	2229	17017	2022	51	5
0	1	3	3	4	844	8009	532	346	1
0	1	3	3	4	3359	15630	2261	42	3
2	1	3	3	4	3821	72594	5493	1418	5
0	0	0	0	0	846	172	177	6801	62
0	0	0	0	0	2458	1010	356	17147	149
0	0	1	0	0	17352	3787	3662	97624	1337
0	0	1	1	1	372	320	170	1108	0.4
0	0	2	1	1	8010	3527	14111	15720	7
0	0	2	1	1	6108	2825	9979	12745	6
1	0	0	0	0	5166	9908	5468	33020	504

VT	FT	VY	EY	EC	CO2 (g)	CO (mg)	HC (mg)	NOx (mg)	PM (mg)
1	0	0	0	0	2638	1104	602	19674	156
1	0	1	0	0	496	210	122	3765	28
1	0	1	0	0	7302	2175	509	53086	482
1	0	3	3	2	4972	476	1352	1843	30
1	0	3	3	2	4427	313	423	4818	36
2	0	1	1	1	390	0	247	673	4
2	0	1	1	1	2798	8458	483	8306	131
2	0	3	3	3	154	275	323	206	0.3
0	1	3	3	4	101	1238	74	0	0.1
0	1	3	3	4	127	417	125	32	0.3
0	1	3	3	4	436	3089	189	4	0.4
2	1	3	3	4	498	10292	651	108	1
0	0	1	0	0	5798	1062	1150	29871	444
0	0	2	1	1	2635	149	4983	5823	2
0	0	2	1	1	2200	0	2918	4919	3
1	0	0	0	0	243	560	349	2001	25
1	0	1	0	0	1448	467	48	10800	99
1	0	3	3	2	1260	920	309	316	11
1	0	3	3	2	595	0	52	671	2
2	0	1	1	1	684	665	138	2293	36
0	1	3	3	4	68	212	37	0	0.1
0	0	1	0	0	4905	364	1314	29917	398
0	0	2	1	1	696	111	1300	1416	1
1	0	0	0	0	77	255	53	668	7
1	0	1	0	0	305	152	20	2192	25
1	0	3	3	2	82	359	6	11	0.5

Last but not least, a regression analysis is done on the road grade of the routes traveled, and is categorized by a slope less than 0, between 0 and 3, and greater than 3. The data used for the regression is shown in Tables 10-12. This will show the relationship between the route characteristics and the emissions produced in relation the five factors.

Table 10. Data used for Road Grade <0 Regression Analysis

VY	EY	VT	FT	EC	CO2 (g/s)	CO (mg/s)	HC (mg/s)	NOx (mg/s)	PM (mg/s)
0	0	0	0	0	14	44	7	100	2
0	0	0	0	0	9	66	3	68	1
1	0	0	0	0	14	10	7	98	2
1	1	0	0	1	9	23	6	53	0
2	1	0	0	1	13	8	43	49	0
2	1	0	0	1	10	7	35	63	0
0	0	2	0	5	9	82	4	56	3
0	0	2	0	5	10	49	5	110	1
1	1	2	0	1	7	4	2	24	0
1	1	2	0	1	11	55	4	96	1
2	2	2	0	1	7	0	4	17	0
2	2	2	0	3	4	1	3	3	0
3	3	0	1	4	8	39	6	2	0
3	3	0	1	4	8	38	10	1	0
3	3	0	1	4	8	61	7	2	0
3	3	2	1	4	6	43	15	2	0
3	3	2	1	4	6	24	7	2	0
3	3	2	1	4	8	60	16	6	0
0	0	1	0	0	7	36	18	69	2
2	2	1	0	2	6	3	2	8	0
1	2	1	0	0	9	21	4	68	1
1	0	1	0	0	6	20	3	57	1
0	0	1	0	0	8	19	5	58	1
2	2	1	0	2	5	6	4	4	0

Table 11. Data used for Road Grade between 0 and 3 Regression Analysis

VY	EY	VT	FT	EC	CO2 (g/s)	CO (mg/s)	HC (mg/s)	NOx (mg/s)	PM (mg/s)
0	0	0	0	0	19	55	8	135	2
0	0	0	0	0	13	72	3	94	2
1	0	0	0	0	17	11	8	113	2
1	1	0	0	1	12	26	7	65	0
2	1	0	0	1	15	7	37	53	0
2	1	0	0	1	12	6	34	72	0
0	0	2	0	5	12	95	4	70	3
0	0	2	0	5	15	60	6	152	2
1	1	2	0	1	9	4	3	28	0
1	1	2	0	1	13	62	5	109	1
2	2	2	0	1	8	0	4	19	0
2	2	2	0	3	7	1	4	5	0
3	3	0	1	4	10	49	7	2	0
3	3	0	1	4	9	40	10	1	0
3	3	0	1	4	10	85	8	3	0
3	3	2	1	4	8	69	18	2	0
3	3	2	1	4	7	35	8	2	0
3	3	2	1	4	10	99	19	5	0
0	0	1	0	0	9	41	15	79	2
2	2	1	0	2	10	4	2	16	0
1	2	1	0	0	14	26	4	93	1
1	0	1	0	0	11	24	3	87	1
0	0	1	0	0	9	19	4	64	1
2	2	1	0	2	8	9	4	8	0

Table 12. Data used for Road Grade >3 Regression Analysis

VY	EY	VT	FT	EC	CO2 (g/s)	CO (mg/s)	HC (mg/s)	NOx (mg/s)	PM (mg/s)
0	0	0	0	0	14	48	6	100	2
0	0	0	0	0	15	65	3	104	2
1	0	0	0	0	20	12	9	123	2
1	1	0	0	1	15	28	8	72	0
2	1	0	0	1	16	6	35	58	0
2	1	0	0	1	14	7	36	82	0
0	0	2	0	5	12	70	4	68	3
0	0	2	0	5	12	44	5	111	1
1	1	2	0	1	12	5	3	37	0
1	1	2	0	1	13	54	5	116	1
2	2	2	0	1	7	0	3	15	0
2	2	2	0	3	7	1	4	5	0
3	3	0	1	4	10	48	7	2	0
3	3	0	1	4	14	61	16	1	0
3	3	0	1	4	11	93	8	3	0
3	3	2	1	4	9	95	21	2	0
3	3	2	1	4	7	36	7	2	0
3	3	2	1	4	12	129	22	6	0
0	0	1	0	0	26	101	24	167	4
2	2	1	0	2	9	6	2	18	0
1	2	1	0	0	12	24	4	76	1
1	0	1	0	0	17	33	3	115	2
0	0	1	0	0	12	26	5	83	1
2	2	1	0	2	17	24	6	24	0

The results that are relevant in this study include the p statistic of the model, the p statistics of each factor in the equations, the coefficient of each factor, and the R^2 and adjusted R^2 values. The p statistic of the model determines whether or not the model is "good". A p statistic of < 0.05 depicts a relevant model as a whole. The same goes for the p statistic for each factor in the different equations. Only the values < 0.05 are significant to the emission. The coefficients of the factors introduce the equation of the line for the model. R^2 and adjusted R^2 signify the amount of variability between the

emission and the factors being tested. The higher the R^2 value, the greater the chance that the factors being tested can be explained by the model.

All of these sections discussed are integral to determining what affects the five air emissions measured. The data aggregation categorizes the data in order to perform the analysis. The descriptive statistics show a comparison between the five types of trucks, and the regression analysis will show what factors produce the most significant amount of emissions in different truck operating conditions. The following are the results from each of the analyses performed on the data sets.

CHAPTER 4. RESULTS

The results summarize the descriptive statistics of the trucks and the multiple regression analysis. The descriptive statistics results will include the amount of waste collected, the fuel use, fuel economy, the fuel use and time spent while idling and driving, and the emissions and fuel use per amount of waste collected. These values are all averaged based on the type of truck and the type of fuel. The multiple regression analysis will show which factors are significant producers of the five emissions. The multiple regression was performed based on the truck emission averages, the five speeds of the trucks while in route, and the road grade. The following data will show the characteristics of the five truck types and also what various driving conditions affect the emissions produced in a noteworthy measure.

4.1. DESCRIPTIVE STATISTICS

Table 13 shows the results from the calculations of the amount of waste per stop for each of the twenty-four trucks. Figure 4 is a summary of the averages of the waste collected based on the five types of trucks. The roll-off trucks collect large amounts of waste with few stops, so the average is exceptionally large in comparison to the remaining four types of trucks.

Table 13. Total Amount of Waste Collected Per Truck in kg/stop

Truck Type	Truck No.	Amount Waste (kg)	No. Stops	Amount Waste(kg/stop)
Front load	3204	9852	50	197
Front load	3237	38002	142	268
Front load	3318	27243	89	306
Front load	3337	30164	109	277
Front load	3417	15204	75	203
Front load	3418	27787	125	222
Front load	3437C	33176	121	274
Front load	3440C	22934	96	239
Front load	3442C	39326	106	371
Side load	10266C	7049	489	14
Side load	10267C	7693	528	15
Side load	10271C	10678	736	15
Roll off	2441	18089	7	2584
Roll off	2413	28440	10	2844
Roll off	2338	47337	7	6762
Roll off	2339	23805	13	1831
Roll off	2442	11240	7	1606
Roll off	2412	21183	11	1926
Side load	1636	1424	299	5
Side load	1637	8700	428	20
Side load	1947	4218	580	7
Side load	1945	16620	669	25
Side load	10046	11149	239	47
Side load	10188	2658	454	6

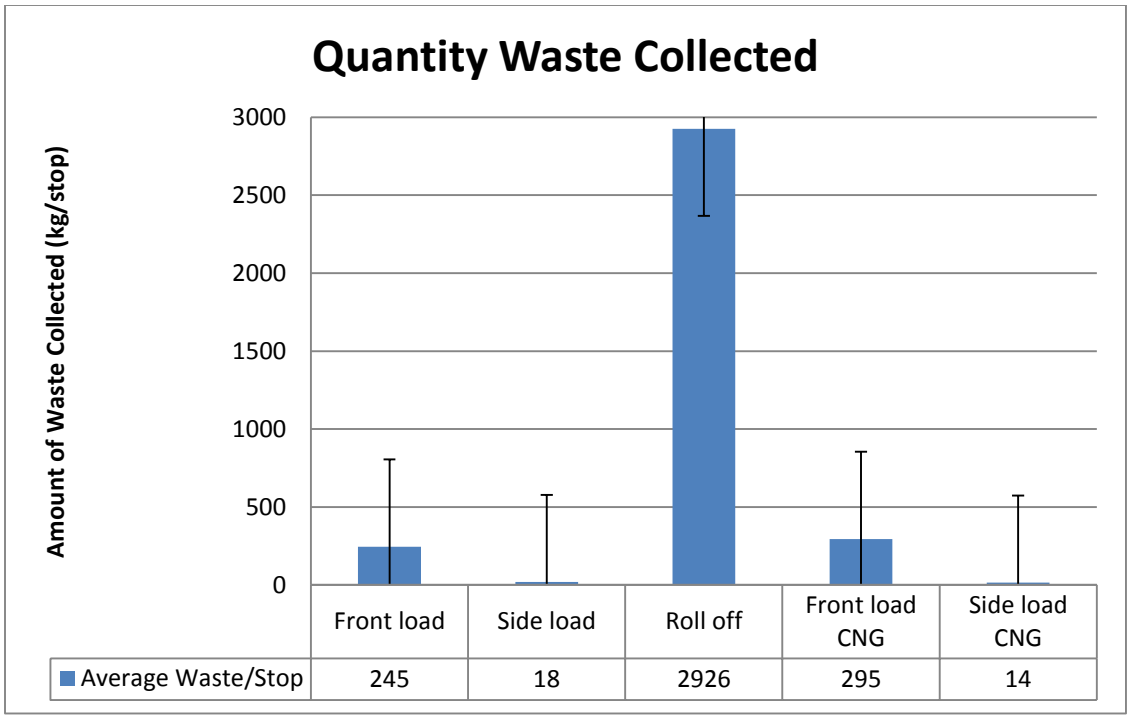


Figure 4. Graph of Average and Standard Deviation of Waste Collected per Truck

The average fuel use calculations are shown in Table 14. The CNG fuel trucks are in diesel fuel gallon equivalents. A summary of the averages based on the type of truck is shown in Figure 5. The largest fuel use is in the front-load CNG vehicle. Roll-off trucks have the least amount because they make the least amount of stops while in route. The front-load trucks, both diesel and CNG fuel, have the highest fuel use rates in comparison to the other trucks.

Table 14. Fuel Use in Gallons/Diesel Gallon Equivalents per Truck

Type Truck	Truck No.	Fuel use (gal)
Front load	3204	29.8
Front load	3237	48.1
Front load	3318	58.0
Front load	3337	31.8
Front load	3417	29.6
Front load	3418	40.1
Front load	3437C	51.7
Front load	3440C	49.3
Front load	3442C	45.1
Side load	10266C	33.2
Side load	10267C	50.5
Side load	10271C	31.3
Roll off	2441	22.8
Roll off	2413	21.9
Roll off	2338	35.9
Roll off	2339	30.4
Roll off	2442	27.5
Roll off	2412	22.4
Side load	1636	37.7
Side load	1637	39.2
Side load	1947	24.0
Side load	1945	37.9
Side load	10046	10.5
Side load	10188	17.2

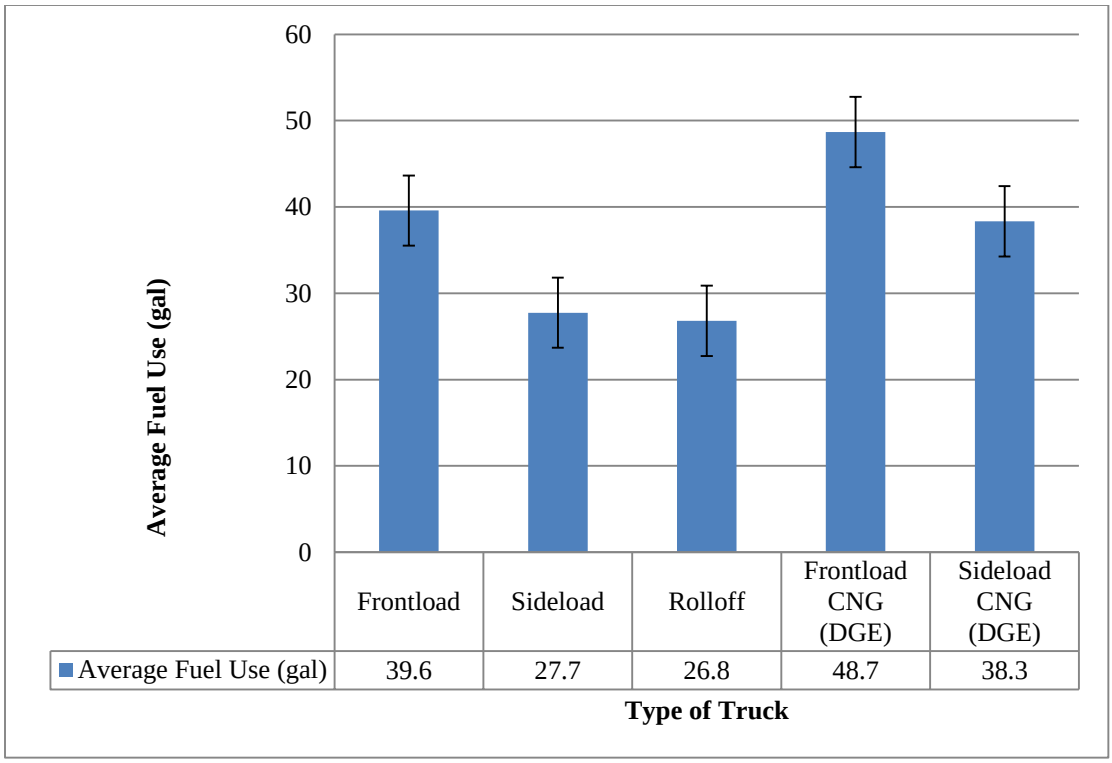


Figure 5. Average and Standard Deviation of Fuel Use per Type of Truck

The average diesel fuel economy calculations based on each truck is found in Table 15. The average fuel economy based on the type of truck is found in Figure 6. The CNG trucks have the lowest fuel economy in comparison to the diesel fuel trucks.

Table 15. Average Diesel Fuel Economy in Miles per Gallon

Type Truck	Truck No.	Fuel use (gal)	Distance Traveled (mi)	Fuel Economy (mi/gal)
Front load	3204	29.8	113	3.8
Front load	3237	48.1	157	3.3
Front load	3318	58.0	176	3.0
Front load	3337	31.8	128	4.0
Front load	3417	29.6	94	3.2
Front load	3418	40.1	112	2.8
Front load	3437C	51.7	113	2.2
Front load	3440C	49.3	120	2.4
Front load	3442C	45.1	91	2.0
Side load	10266C	33.2	48	1.5
Side load	10267C	50.5	82	1.6
Side load	10271C	31.3	39	1.2
Roll off	2441	22.8	123	5.4
Roll off	2413	21.9	135	6.2
Roll off	2338	35.9	169	4.7
Roll off	2339	30.4	140	4.6
Roll off	2442	27.5	138	5.0
Roll off	2412	22.4	164	7.3
Side load	1636	37.7	114	3.0
Side load	1637	39.2	94	2.4
Side load	1947	24.0	93	3.9
Side load	1945	37.9	88	2.3
Side load	10046	10.5	82	7.8
Side load	10188	17.2	83	4.8

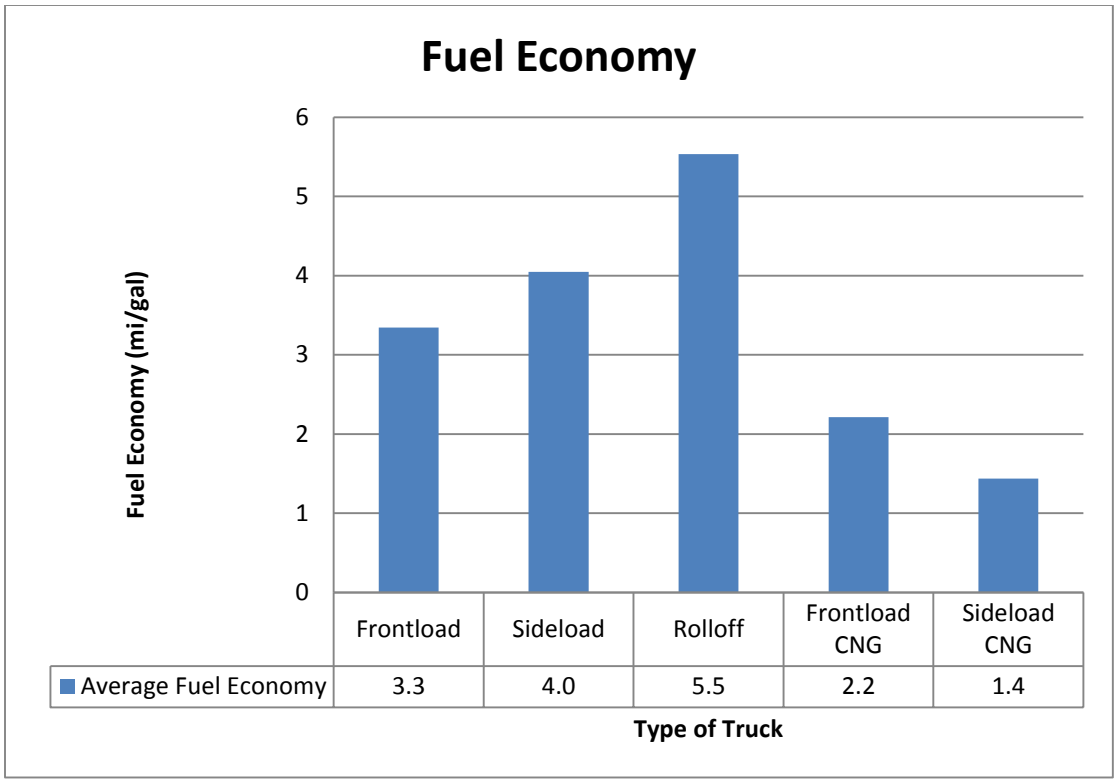


Figure 6. Average and Standard Deviation of Diesel Fuel Economy in Miles per Gallon per Type of Truck

Table 16 shows the total fuel use spent idling and driving based on each truck. Figure 7 is a summation of the total fuel use spent idling and driving. The total fuel used in all of the trucks is around 611 gallons. The largest fuel use while idling is in both types of side-load trucks, which means that there is a lot of time spent idle while in route. The largest fuel use while driving is in the diesel fueled trucks.

Table 16. Total Fuel Use Driving and Idling

Type Truck	Truck No.	Fuel Use Idling (gal)	Fuel Use Driving (gal)
Front load	3204	3.6	26.2
Front load	3237	9.9	38.2
Front load	3318	6.7	51.3
Front load	3337	6.7	25.1
Front load	3417	3.9	25.7
Front load	3418	8.5	31.6
Front load	3437C	11.1	40.6
Front load	3440C	7.4	41.9
Front load	3442C	8.8	36.3
Side load	10266C	11.7	21.5
Side load	10267C	15.5	35.1
Side load	10271C	12.3	18.9
Roll off	2441	2.9	20.0
Roll off	2413	2.9	19.1
Roll off	2338	2.6	33.3
Roll off	2339	3.4	27.0
Roll off	2442	4.9	22.6
Roll off	2412	2.9	19.5
Side load	1636	9.2	28.4
Side load	1637	10.5	28.8
Side load	1947	3.3	20.7
Side load	1945	10.7	27.2
Side load	10046	2.7	7.9
Side load	10188	4.4	12.8
Total		151.0	615.0

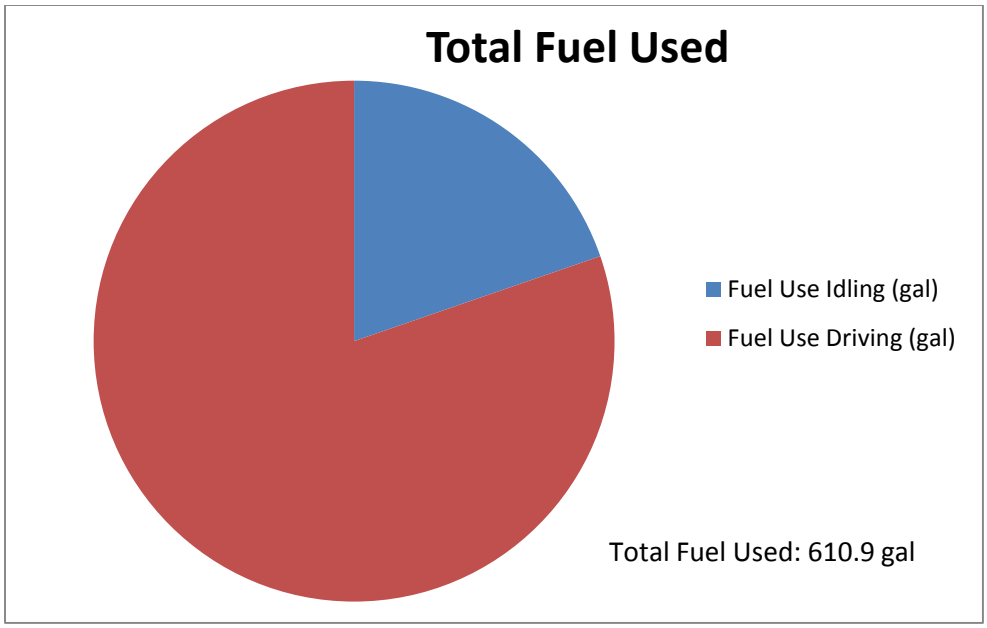


Figure 7. Sum of the Total Fuel Used Idling and Driving in Gallons in all the Truck Routes

The time spent idling and driving per truck is shown in Table 17. Figure 8 is a summation of the amount of time spent idling and driving for all of the trucks. The total time spent while in route is around 183 hours. The time spent idling and driving are almost equivalent. This shows that within a route there are equal amounts of time spent collecting waste or sitting at a stoplight as driving to the next location.

Table 17. Total Time Spent Idling and Driving for each truck

Type Truck	Truck No.	Time Idling (s)	Time Driving (s)
Front load	3204	8728	13399
Front load	3237	23452	25161
Front load	3318	18654	24708
Front load	3337	15986	17569
Front load	3417	9594	15092
Front load	3418	19057	21828
Front load	3437C	23081	22327
Front load	3440C	17209	23093
Front load	3442C	18141	20565
Side load	10266C	26963	10461
Side load	10267C	24944	16573
Side load	10271C	27764	11045
Roll off	2441	12524	14216
Roll off	2413	14251	15517
Roll off	2338	15458	19411
Roll off	2339	16236	18303
Roll off	2442	19458	16713
Roll off	2412	13945	19360
Side load	1636	19406	22020
Side load	1637	20656	17508
Side load	1947	17722	17970
Side load	1945	19213	18184
Side load	10046	10202	6525
Side load	10188	23647	14503
Total		436291	422051

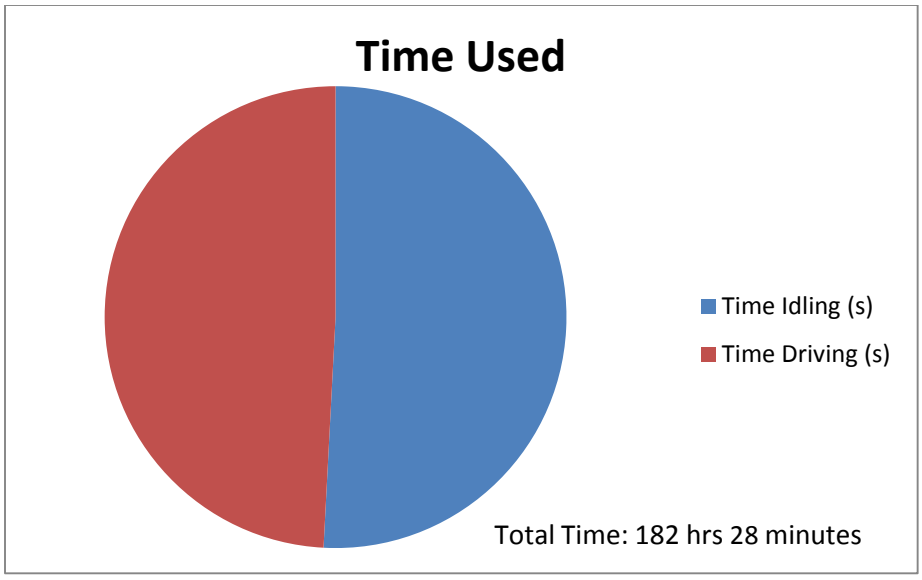
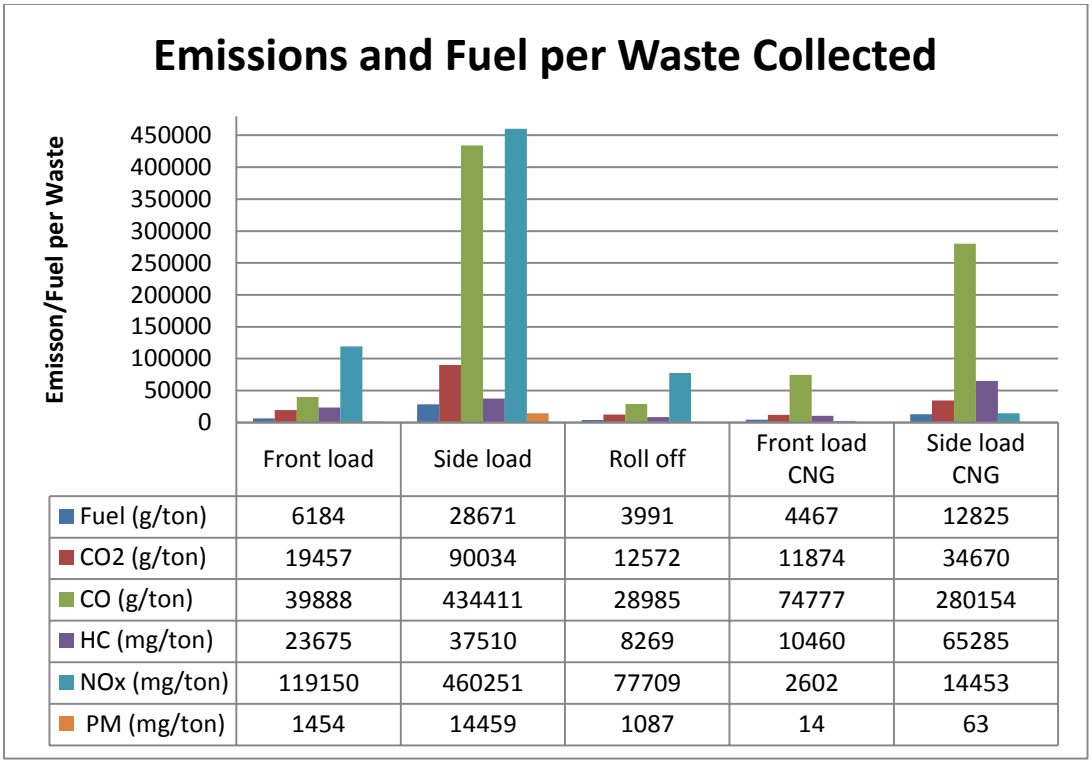


Figure 8. Sum of the Time Used Idling and Driving in all the Truck Routes

Table 18 shows the total amount of emissions and fuel use per ton for each of the 24 trucks. Figure 9 shows the averages of the emissions and fuel used per waste collected. Particulate matter (PM) has the lowest values of mg/ton in majority of the trucks, which shows that it is the emission that is produced the least out of all five of the emissions. The side-load trucks produce a lot more CO and NOx emissions than the rest of the trucks.

Table 18. Total Emissions and Fuel Use per Ton

Type	Truck #	Fuel (g/ton)	CO_2 (g/ton)	CO (g/ton)	HC (mg/ton)	NOx (mg/ton)	PM (mg/ton)
Front load	3204	10388	32709	99235	14433	232460	4344
Front load	3237	4371	13714	79091	3267	97076	2007
Front load	3318	7111	22470	15116	10770	153507	2256
Front load	3337	3526	11110	25615	6972	60387	24
Front load	3417	6663	20916	11043	58646	77305	54
Front load	3418	5044	15820	9227	47962	94167	37
Roll off	2441	3960	12388	56001	22719	106556	2321
Roll off	2442	7639	24076	55590	12851	181293	2195
Roll off	2338	2430	7667	15833	2592	53126	658
Roll off	2339	4124	13005	30606	3659	102774	1214
Roll off	2412	3440	10859	12281	6129	10626	96
Roll off	2413	2352	7439	3600	1663	11877	35
Side load	1636	99572	311578	2239874	115352	1762999	77719
Side load	1637	15491	48686	205844	22300	494476	5788
Side load	1947	19331	61136	30185	19334	205100	1742
Side load	1945	8079	25382	116928	9593	217023	1314
Side load	10046	2807	8876	689	4736	21523	21
Side load	10188	26745	84547	12944	53746	60383	170
Front load	3437C	4325	11427	57645	8650	2657	13
Front load	3440C	5977	15812	129411	12914	4283	20
Front load	3442C	3099	8383	37276	9816	866	8
Side load	10266C	11359	33411	244001	73692	7872	63
Side load	10267C	18867	48874	485602	97623	29920	97
Side load	10271C	8249	21725	110859	24539	5569	30



	Front load	Side load	Roll off	Front load CNG	Side load CNG
Fuel (g/ton)	6184	28671	3991	4467	12825
CO2 (g/ton)	19457	90034	12572	11874	34670
CO (g/ton)	39888	434411	28985	74777	280154
HC (mg/ton)	23675	37510	8269	10460	65285
NOx (mg/ton)	119150	460251	77709	2602	14453
PM (mg/ton)	1454	14459	1087	14	63

Figure 9. Emissions and Fuel per Waste Collected per Truck

All of these sections discussed are integral to determining what affects the five air emissions measured. The data aggregation categorizes the data in order to perform the analysis. The descriptive statistics show a comparison between the five types of trucks, and the regression analysis will show what factors produce the most significant amount of emissions in different truck operating conditions. The following are the results from each of the analysis performed on the data sets.

4.2. REGRESSION ANALYSIS

The following table depicts the results from the correlation analysis. The correlation analysis will show whether two variables are linearly related, and the higher the correlation, the least likely that they should be included in the same regression models. The numerical relationships between each of the variables are described below

in Table 19. The independent variables are the various factors, vehicle year, engine year, vehicle type, fuel type, and emissions controls. The dependent variables are the emissions, CO_2, CO, HC, NOx, and PM.

Table 19. Results from the Correlation Analysis

	Vehicle Year	Engine Year	Vehicle Type	Fuel Type	Emission Controls	CO_2 (g/s)	CO (mg/s)	HC (mg/s)	NOx (mg/s)	PM (mg/s)
Vehicle Year	1.00	0.94	0.00	0.77	0.51	-0.46	0.00	0.28	-0.83	-0.81
Engine Year	0.94	1.00	0.12	0.82	0.62	-0.58	0.13	0.10	-0.89	-0.76
Vehicle Type	0.00	0.12	1.00	0.00	0.35	-0.50	0.08	-0.29	-0.16	-0.01
Fuel Type	0.77	0.82	0.00	1.00	0.66	-0.32	0.49	0.12	-0.64	-0.43
Emission Controls	0.51	0.62	0.35	0.66	1.00	-0.31	0.48	-0.01	-0.50	-0.18
CO2 (g/s)	-0.46	-0.58	-0.50	-0.32	-0.31	1.00	0.22	0.28	0.77	0.56
CO (mg/s)	0.00	0.13	0.08	0.49	0.48	0.22	1.00	-0.04	0.06	0.36
HC (mg/s)	0.28	0.10	-0.29	0.12	-0.01	0.28	-0.04	1.00	-0.02	-0.24
NOx (mg/s)	-0.83	-0.89	-0.16	-0.64	-0.50	0.77	0.06	-0.02	1.00	0.72
PM (mg/s)	-0.81	-0.76	-0.01	-0.43	-0.18	0.56	0.36	-0.24	0.72	1.00

	independent variables
	dependent variables

Independent Variables

It is shown that vehicle year and engine year have a 94% correlation. This is very high, and is presumably because both vehicle year and engine year are classified by the same EPA standards, and typically the vehicle year and engine year are the same unless a truck engine has been replaced. Due to their correlation, vehicle year and engine year `will not run in the same regression models simultaneously. Vehicle year and vehicle type have no correlation because the vehicle year is not dependent on the different trucks.

There are twenty-four different types of trucks with a range of years between 2002 and 2013. Vehicle year and fuel type have a correlation of 77%, which is considered high. This is valid because majority of the newer vehicle years are CNG fuel, while the older vehicles are diesel fuel. Vehicle year and emission controls have a correlation of 51%. There are some emission controls that are grouped by the year, but this relationship is inconclusive and needs to be further investigated.

Engine year and vehicle type have a low correlation of 12%. Much like the vehicle year, the engine year is not dependent on the type of vehicle since there are three types of vehicles with a range of engine years. Engine year and fuel type have a high correlation of 82%, and again like vehicle year, a lot of the newer engine years are CNG fueled trucks. Engine year and emission controls show a correlation of 62% because a lot of the engine years are grouped by the same emission controls.

Vehicle type and fuel type are not correlated. This is because the type of truck is not dependent on the fuel type. There are front-load and side-load trucks with both diesel and CNG fuel used in this study. Vehicle type and emission controls have a low correlation of 35%. This is likely due to the fact that there are three types of vehicles with a range of emission controls. Further analysis will need to be performed to determine the relationship between the two factors.

Fuel type and emission controls are highly correlated with a value of 66%. This is due to the fact that all of the CNG vehicles and many of the older diesel fuel vehicles have the same emission controls. They will still be tested in the same models to determine if there is a relationship between two.

Dependent Variables

The correlation between CO_2 and CO is relatively low with a value of 22%. There could be no real relationship between the two emissions. CO_2 and HC also have a relatively low correlation at 28%. It is noted that both CO and HC have positive low correlations with CO_2 which indicates that they do increase at the same time. CO_2 and NO_x have a high correlation of 77%, which indicates that they have a relationship. CO_2 and PM are also highly correlated with a value of 56%, which shows a relationship as well. CO and HC show no real relationship because it resulted in a -4% correlation, but since the value is negative it indicates that when one is increasing the other decreases. CO and NO_x also have a low correlation of 6%, which supports the idea that there is no relationship between the two emissions. CO and PM have a low result of 36%. HC and NO_x have a correlation of basically zero with a value of -2%, so there is no relationship between the two emissions. HC and PM also have a low negative correlation of -24%, suggesting no relation. NO_x and PM are two highly correlated emissions with a value of 72%, they are highly related because PM is formed by a reaction with NO_x. It is likely that when NOx is significant, PM will also be significant to the various factors.

Independent and Dependent Variables

Vehicle year and CO_2 have a correlation of -46%. This is an inconclusive result so further testing will need to be done to determine how much CO_2 is affected by vehicle year. Vehicle year and CO has a very low correlation of -0.005%, it is so close to zero that there is most likely no relationship between CO and vehicle year. Vehicle year and HC have a low positive correlation of 28%, so based on this test there is most likely no relationship between the two, but will be tested further to confirm this assumption.

Vehicle year and NO_x is highly correlated with a value of -83%, which indicates that vehicle year will be significant in NO_x models. Vehicle year and PM have a -81% correlation, and like vehicle year will likely be significant in PM models.

Engine year and CO_2 have a correlation of -58%, so engine year should be relevant in some models. Engine year and CO,13%, and engine year and HC,10%, both have low correlations, and thus, engine year will probably not be significant to CO and HC models. Engine year and NO_x have a high correlation of -89%, and engine year and PM have a correlation of -76%. Engine year will presumably be significant to both NO_x and PM emissions, due to the high correlations.

Vehicle type and CO_2 have a correlation of -50%. There could be a relationship between the two but it needs further testing. Vehicle type and CO do not have much of a relationship because the correlation results are 7.9%, which is low. There is most likely no relationship but will still need to be tested to determine if vehicle type is indicative of CO emissions. Vehicle type and HC is also not very highly correlated since its correlation is -29%. There is probably no relationship between the two. Vehicle type and NO_x , -16%, and vehicle type and PM ,-1%, both have very low negative results, so vehicle type will likely not be an indicator of NO_x and PM emissions.

Fuel type and CO_2 have a negative low correlation of -32%, which could be due to the CNG being similar but the diesel fuel trucks do not have a real pattern. Fuel type and CO have a 49% correlation which is inconclusive, and will need to be tested further. Fuel type and HC have a very low correlation of 12% which supports the idea that there is no relationship between the two. Fuel type and NO_x is highly correlated at -64%, so

typically as the fuel type goes up the NO_x emissions go in the opposite direction. Fuel type and PM also have a negative correlation of -43%.

Emission controls and CO_2 have a low correlation of -31%, there may be a relationship between the two but the results are inconclusive. Emission controls and CO have a 48% correlation, so further testing will need to be done. Emission controls and HC have pretty much no relationship since there is a correlation of -0.7%. The probability of there being a relationship between the two is unlikely. Emission controls and NO_x have a negative correlation of -50%, but it is pretty high, which is explained by majority of the emission controls working to reduce NO_x emissions. Emission controls and PM have a -18% correlation, which is low, thus, the relationship will need to be tested further.

From the correlation analysis there is not enough information to determine the impact between the factors and the emissions so, further analysis must be done. This testing is performed through a multiple regression analysis on the various models. The following figures will show the p statistic for each of the five factors tested alone based on the five emissions. The models test all of the trucks together and then the diesel fuel, CNG fuel, front-load, side-load, and roll-off trucks are each tested in separate models. The emissions are tested based on the emission averages, each of the five different operating modes categories and the three road grade classifications. The values that are less than the 0.95 line indicate that the factor tested is not a producer of that particular emission. When the factors are tested in the same models, the significance of each factor sometimes changes. The most prominent regression results, where the other factors

influence each other the most significantly, will also be presented as well. The remainder of the regression tables will be located in the Appendix.

4.3. ALL TRUCKS

The data is first tested with all of the trucks simultaneously. Figure 10 shows the results of the p statistics from all of the truck averages. All of the factors that are below the 0.95 line indicate irrelevance to the emission tested. This graph shows that vehicle year, engine year and vehicle type are all producers of CO_2 emissions. Fuel type and emission controls are significant to CO emissions. There are no factors that are relevant to HC emissions. Vehicle year, engine year, fuel type and emission controls are all significant to NOx emissions. Vehicle year, engine year, and fuel type are all relevant to PM emissions.

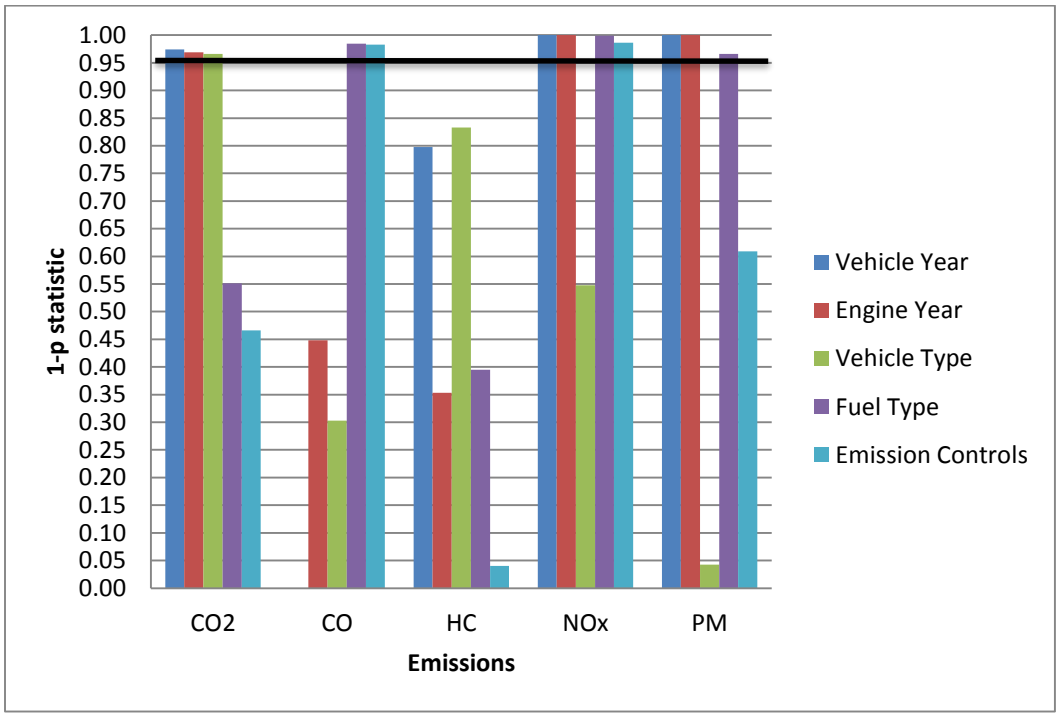


Figure 10. Regression Results from All the Truck Emissions Data Averages

Figure 11 shows the p statistic of each of the five factors while the trucks are braking or decelerating. The results differ quite a bit from the average emission data. Vehicle year, engine year, fuel type and emission controls are all producers of CO_2 emissions. Vehicle year, engine year, and fuel type are all significant to both CO and HC emissions. While the trucks are decelerating or braking, there are no factors that are producers of NOx emissions, and only emission controls are relevant to PM emissions.

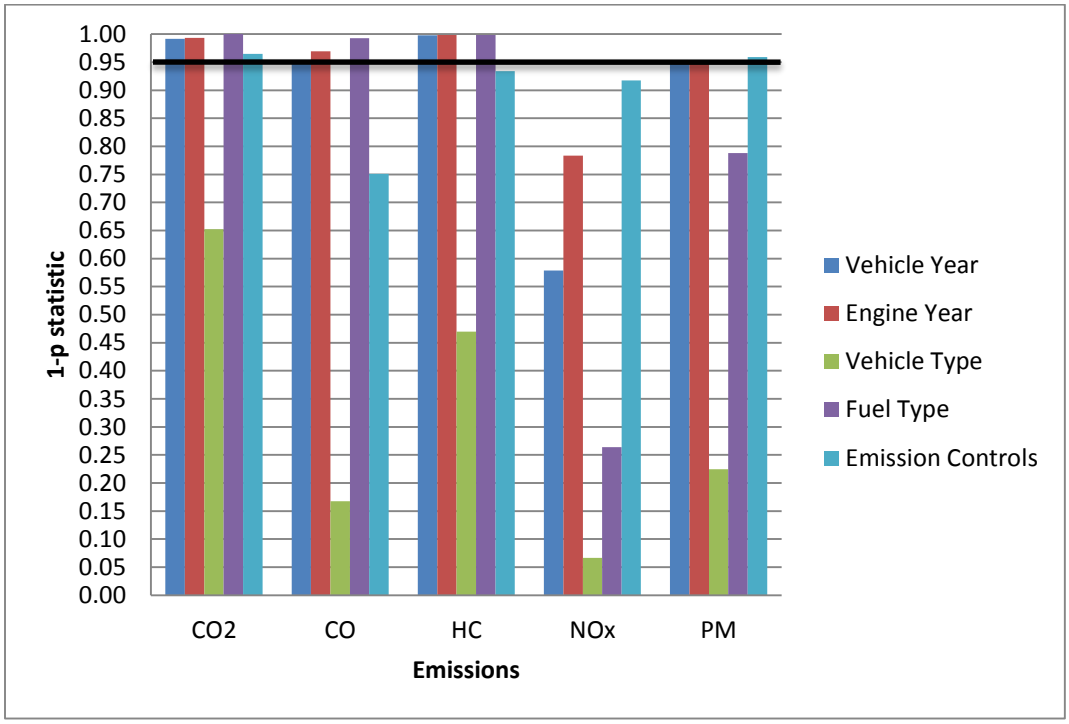


Figure 11. Regression Results from All the Trucks in OP Mode 0

Figure 12 shows all of the trucks while they are idling. There are far less factors that are producers of the emissions than in OP Mode 0. Fuel type and emission controls are significant to CO_2. Vehicle year is the only significant factor to CO. There are no factors that produce HC emissions while idling. Vehicle year, engine year, and fuel type are all producers of NOx emissions. Lastly, vehicle year and engine year are both

significant to PM emissions as well. The vehicle type is the only factor that is not relevant to all five of the emissions measured while the trucks are idling.

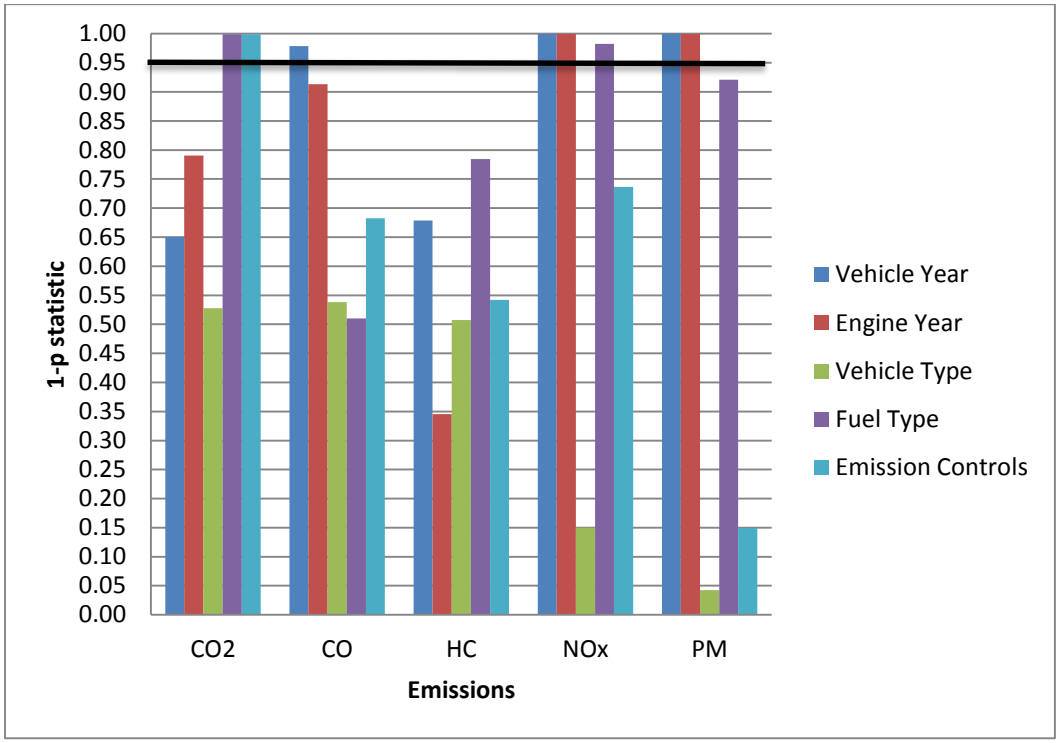


Figure 12. Regression Results from All the Trucks in OP Mode 1

Figure 13 is a graphical representation of the p statistic for the trucks while they are traveling between a speed of 1 and 25 mph. There are no factors that produce CO_2 emissions at this speed. Both fuel type and emission controls are significant factors to CO emissions. Vehicle year and fuel type are producers of HC emissions. Vehicle year, engine year, fuel type and emission controls are all relevant to NOx emissions. Vehicle year, engine year, and fuel type are also producers of PM emissions. Much like the results in OP Mode 1, vehicle type is not relevant to any of the emissions tested while the vehicles are traveling at a speed between 1 and 25 mph.

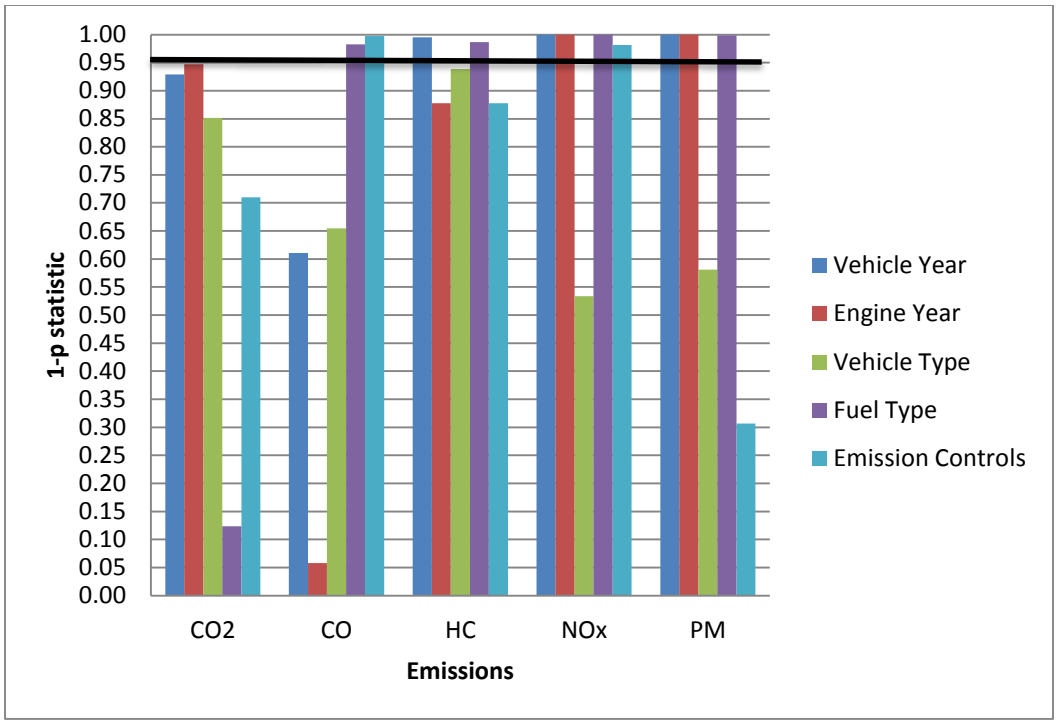


Figure 13. Regression Results from All the Trucks in OP Modes 11-16

Figure 14 shows the p statistic of each emission when the trucks are traveling at a speed between 25 and 50 mph. This speed has the most impact on the emissions, as indicated by the fact that every factor is relevant in some capacity. Vehicle year, engine year, vehicle type, and emission controls are all significant to CO_2 emissions. Vehicle year, engine year, fuel type, and emission controls are relevant to CO emissions. HC is affected by vehicle year, vehicle type and fuel type. All five factors produce NOx emissions. Vehicle year, engine year, fuel type and emission controls are significant to PM emissions.

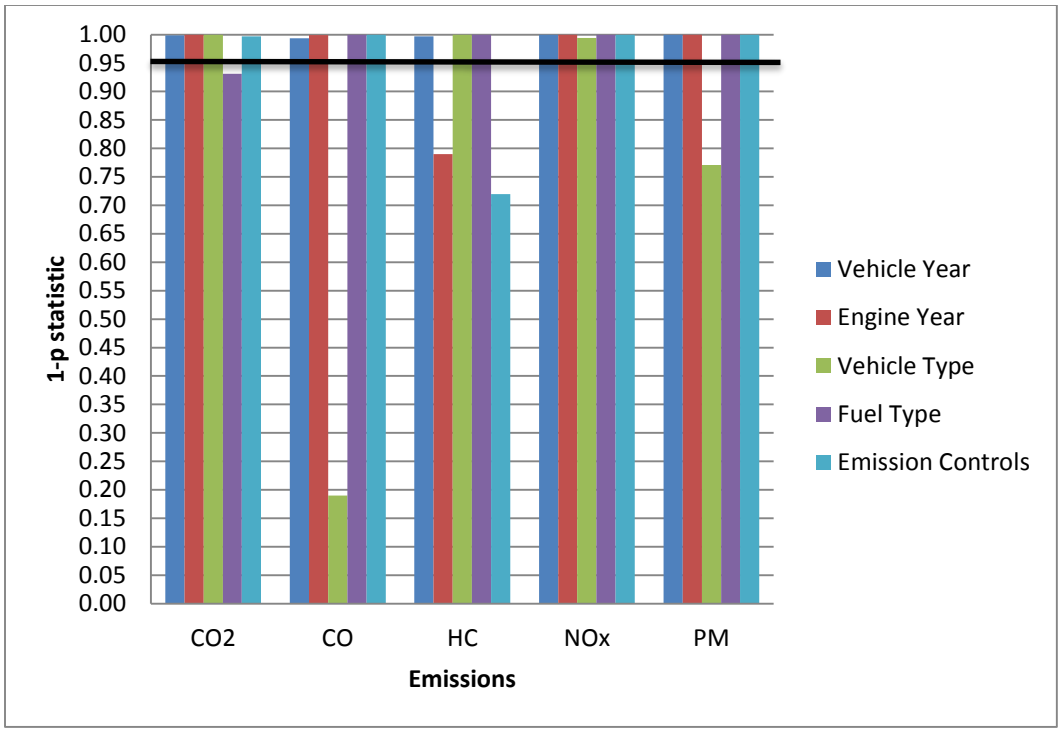


Figure 14. Regression Results from All the Trucks in OP Modes 21-30

Figure 15 shows all of the trucks while traveling at a speed greater than 50 mph. Vehicle year, engine year, fuel type, and emission controls are all relevant to CO_2, NOx, and PM emissions. Fuel type is the only producer of CO emissions. Engine year and emission controls are significant to HC emissions. There are fewer factors that are significant to the five emissions at this speed than in OP Modes 21-30.

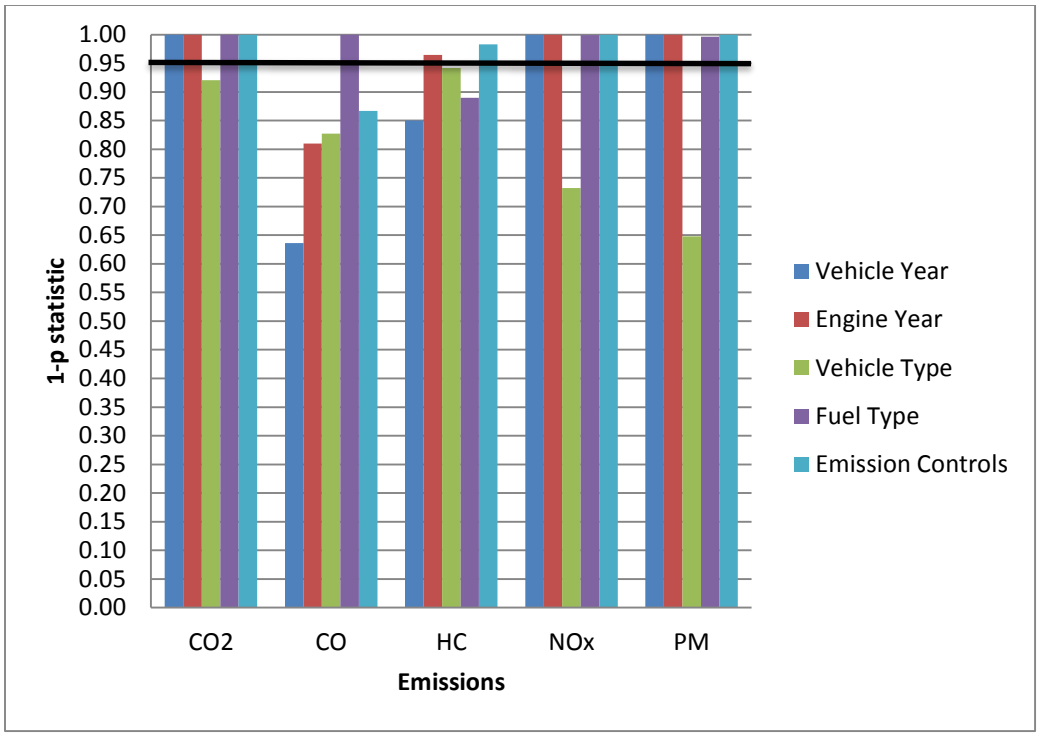


Figure 15. Regression Results from All the Trucks in OP Modes 33-40

Figure 16 represents the p statistics from all of the trucks with a road grade less than 0. This is when the trucks are traveling downhill while in route. Engine year and vehicle type are both producers of CO_2 emissions. Emission controls are the only relevant factors in CO emissions, and there are no relevant factors to HC emissions. NOx is produced by vehicle year, engine year, fuel type, and emission controls. Vehicle year, engine year, and fuel type are all significant to PM emissions. Traveling downhill affects CO_2, NOx, and PM emissions the most significantly.

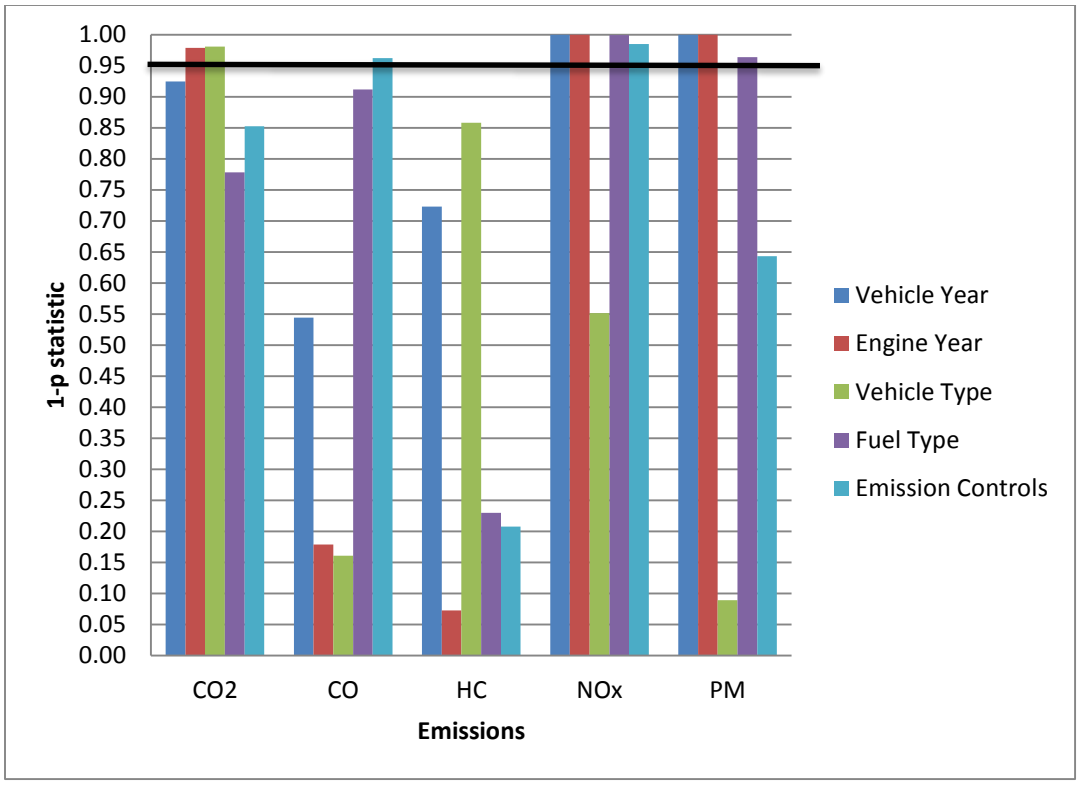


Figure 16. Regression Results from All the Trucks with a Road Grade <0

Figure 17 depicts the p statistic from the regression performed on all of the trucks while traveling at a road grade between 0 and 3. This is typically driving on normal residential roads and highways. Vehicle year, engine year, and vehicle type are all relevant to CO_2 emissions. Both fuel type and emission controls show significance to CO emissions. There are no relevant factors to HC emissions. NOx is produced by vehicle year, engine year, fuel type and emission controls. Lastly, PM is significant to vehicle year, engine year, and fuel type.

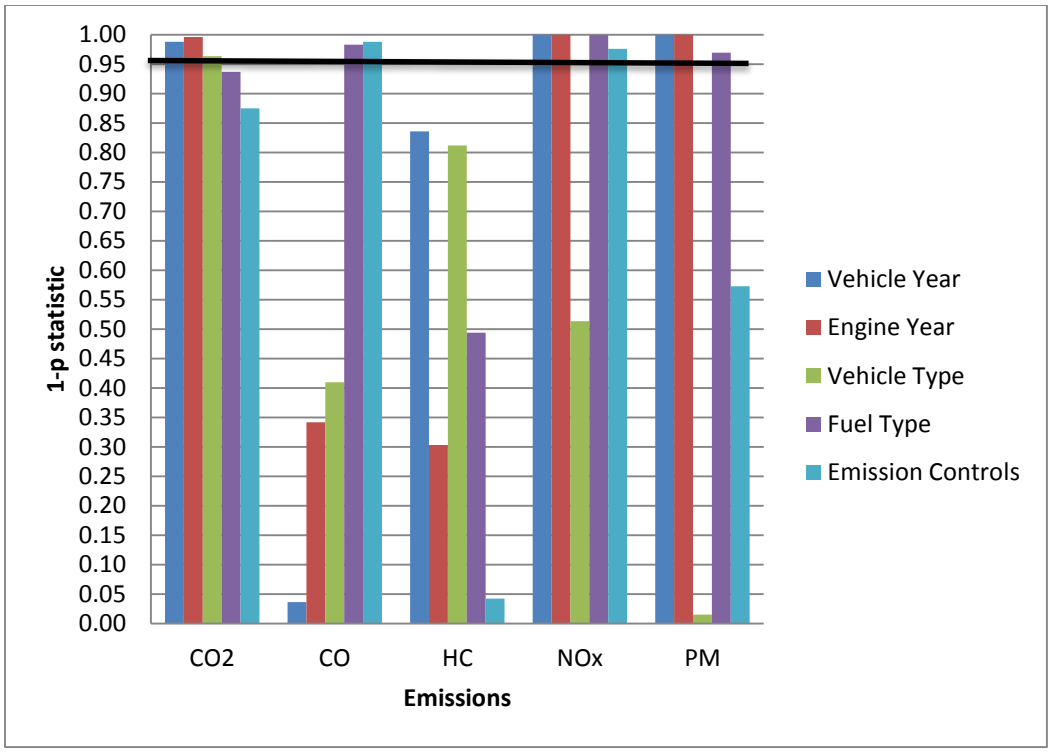


Figure 17. Regression Results from All the Trucks with a Road Grade between 0 and 3

Figure 18 represents the p statistic for each of the factors while traveling on a road grade greater than 3, or uphill. Vehicle year, engine year, vehicle type and emission controls are all producers of CO_2 emissions. Fuel type is the only relevant factor to CO emissions. HC is not significantly produced while traveling uphill, as well. Vehicle year, engine year, fuel type and emission controls are all significant to NOx emissions. PM is produced by vehicle year, engine year, and fuel type. Traveling uphill appears to have the most effect on all of the emissions.

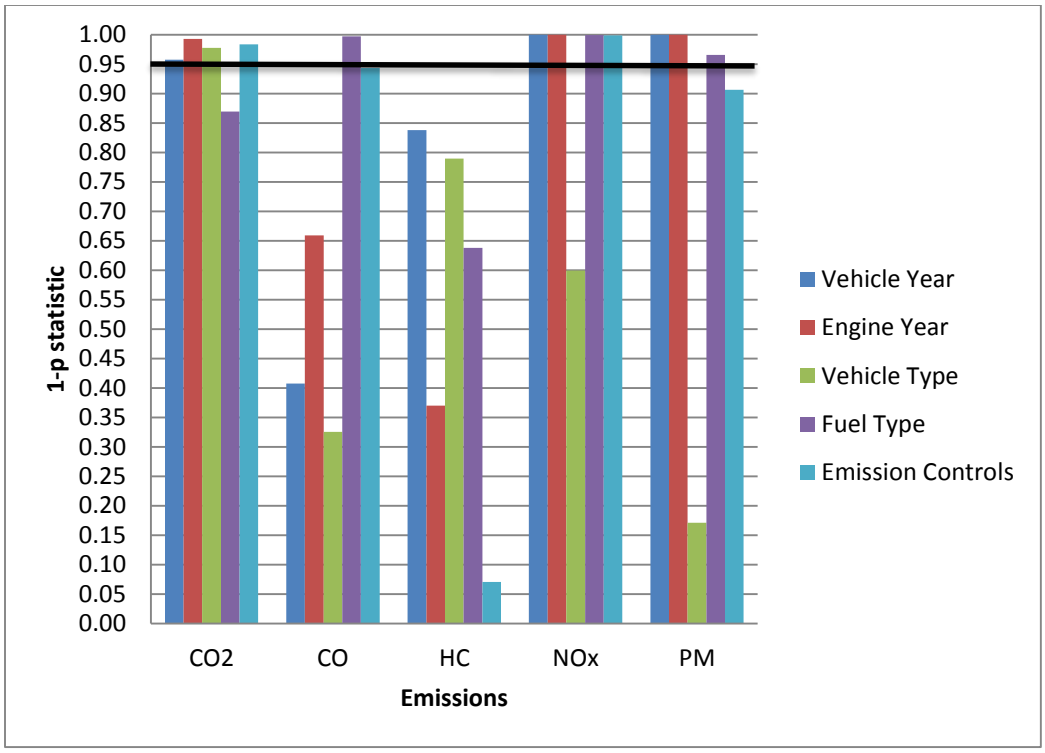


Figure 18. Regression Results from All the Trucks with a Road Grade >3

Tables 20-22 show the results from the models testing all of the trucks while in OP Mode 0 for the CO_2 emission models. The regression shows interesting results in the various models. Equation 2 shows that neither vehicle year, vehicle type and emission controls are relevant, but when vehicle year is not tested in the same model with emission controls it becomes a relevant emission, as shown by the p statistic in parenthesis. The same occurrence happens in the models testing engine year. When emission controls are not included, it becomes a relevant factor. It also shows in equation 12 that when vehicle type and emission controls are in the same model they are both significant, but when each are tested alone, only emission controls is a significant factor. This shows that the factors are definitely affected by one another, and that the correlations hold true.

Table 20. Results from the Models with Vehicle Year

Equation	Constant (p)	VY (p)	VT (p)	EC (p)	N	R^2	Adj. R^2	p stat of Model
10	572.42 (0.3801)	543.93 (0.0886)	-749.69 (0.0742)	396.83 (0.0870)	24	0.4199	0.3329	0.0110
11	626.91 (0.3601)	821.76 (0.0071)	-478.52 (0.2304)	-	24	0.3260	0.2618	0.0159
12	-18.88 (0.9747)	636.04 (0.0583)	-	239.53 (0.2802)	24	0.3170	0.2519	0.0183
13	170.22 (0.7662)	808.33 (0.0082)	-	-	24	0.2770	0.2441	0.0082

Table 21. Results from the Models with Engine Year

Equation	Constant (p)	EY (p)	VT (p)	EC (p)	N	R^2	Adj. R^2	p stat of Model
14	819.22 (0.1647)	564.61 (0.0718)	-805.49 (0.0524)	342.21 (0.1544)	24	0.4300	0.3445	0.0093
15	937.47 (0.1198)	819.76 (0.0034)	615.03 (0.1196)	-	24	0.3676	0.3073	0.0081
16	252.73 (0.6411)	613.10 (0.0676)	-	185.09 (0.4389)	24	0.3087	0.2429	0.0207
17	405.75 (0.4200)	760.95 (0.0068)	-	-	24	0.2883	0.2559	0.0068

Table 22. Results from the Models with Neither VY or EY

Equation	Constant (p)	VT (p)	FT (p)	EC (p)	N	R^2	Adj. R^2	p stat of Model
18	1095.17 (0.0233)	-444.03 (0.2092)	3209.36 (0.0012)	15.46 (0.9446)	24	0.6063	0.5473	0.0003
19	1103.76 (0.0154)	-432.87 (0.1583)	3251.45 (0.0000)	-	24	0.6062	0.5687	0.0001
20	1178.29 (0.0506)	-864.25 (0.0486)	-	597.30 (0.0070)	24	0.3270	0.2629	0.0156
21	820.27 (0.0522)	-	3569.68 (0.0003)	-116.90 (0.5610)	24	0.5732	0.5326	0.0001
22	1916.62 (0.0040)	-432.87 (0.3479)	-	-	24	0.0401	-0.0035	0.3479
23	670.90 (0.0377)	-	3251.45 (0.0000)	-	24	0.5661	0.5464	0.0000
24	599.94 (0.2727)	-	-	451.31 (0.0351)	24	0.1865	0.1496	0.0351

4.4. DIESEL FUEL TRUCKS

Figure 19 represents the p statistics of each of the factors and emission averages in the eighteen diesel fueled trucks tested. CO_2 is produced by vehicle year and the vehicle type. Vehicle year and engine year are significant to CO, NOx, and PM emissions. Vehicle type is the only relevant factor to HC in the emission averages. CO performs similarly to NOx and PM, even though they are not closely correlated.

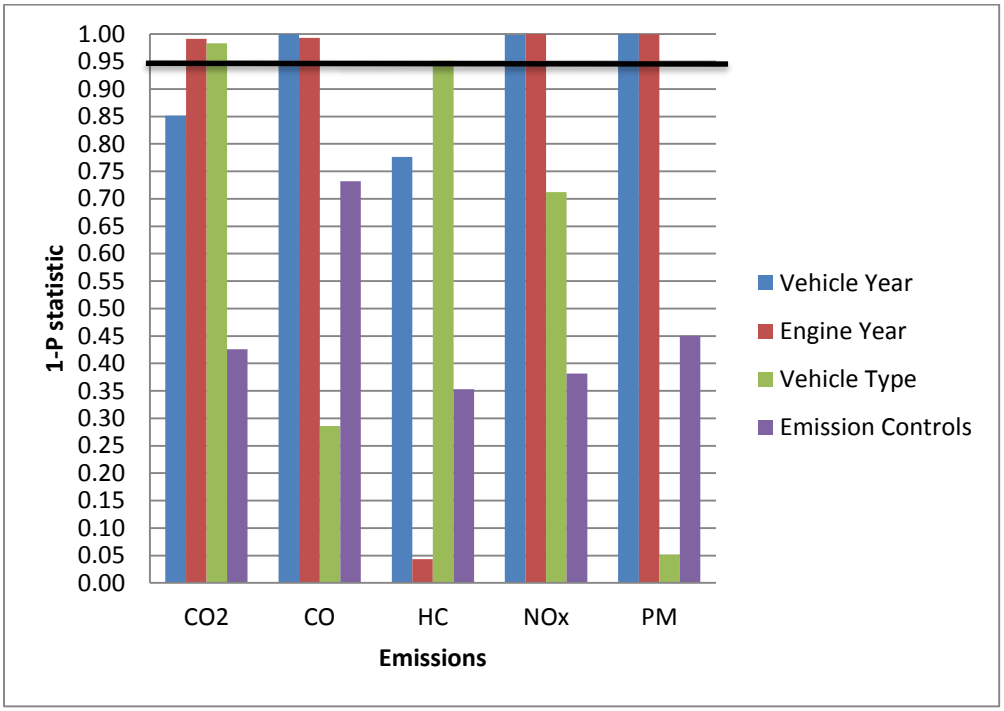


Figure 19. Regression Results from the Diesel Fuel Truck Averages

Figure 20 is a representation of the p statistic while the truck is decelerating or braking in the diesel fuel trucks. It shows that vehicle year and engine year are the only relevant factors and they only produce HC emissions. The four remaining emissions are not significantly affected by the factors tested while the trucks are decelerating or braking.

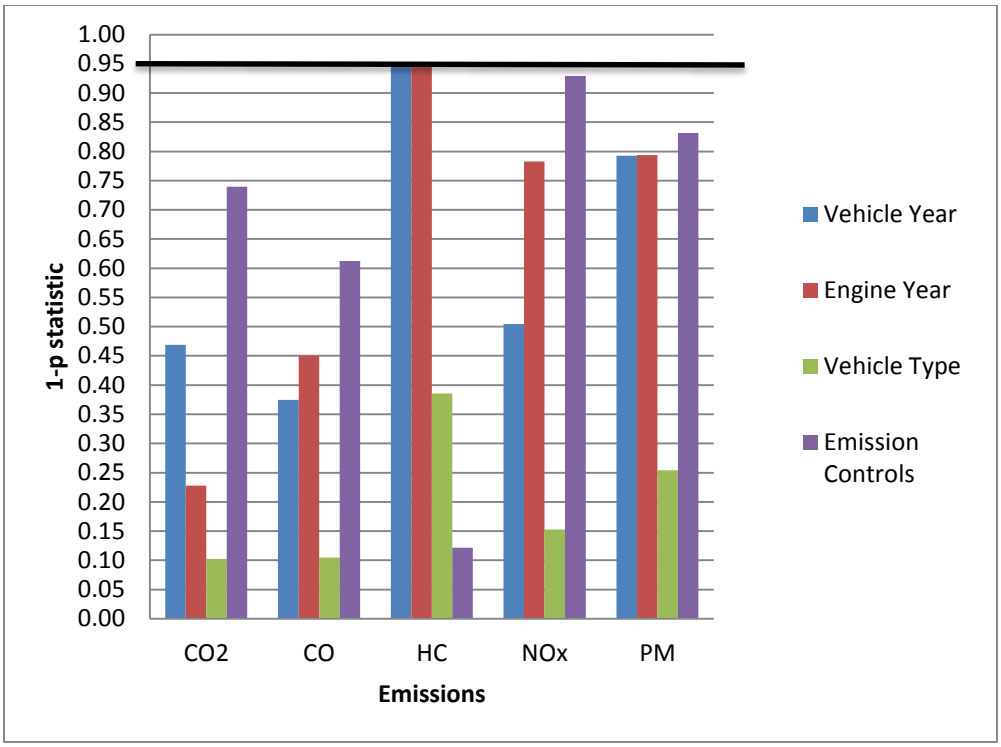


Figure 20. Regression Results from the Diesel Fuel Trucks in OP Mode 0

Figure 21 depicts the p statistic of each factor in relation to the five emissions while the diesel fueled trucks are idling. It shows that vehicle year and engine year are producers of CO, NOx, and PM. The factors do not significantly affect neither CO2 nor HC emissions.

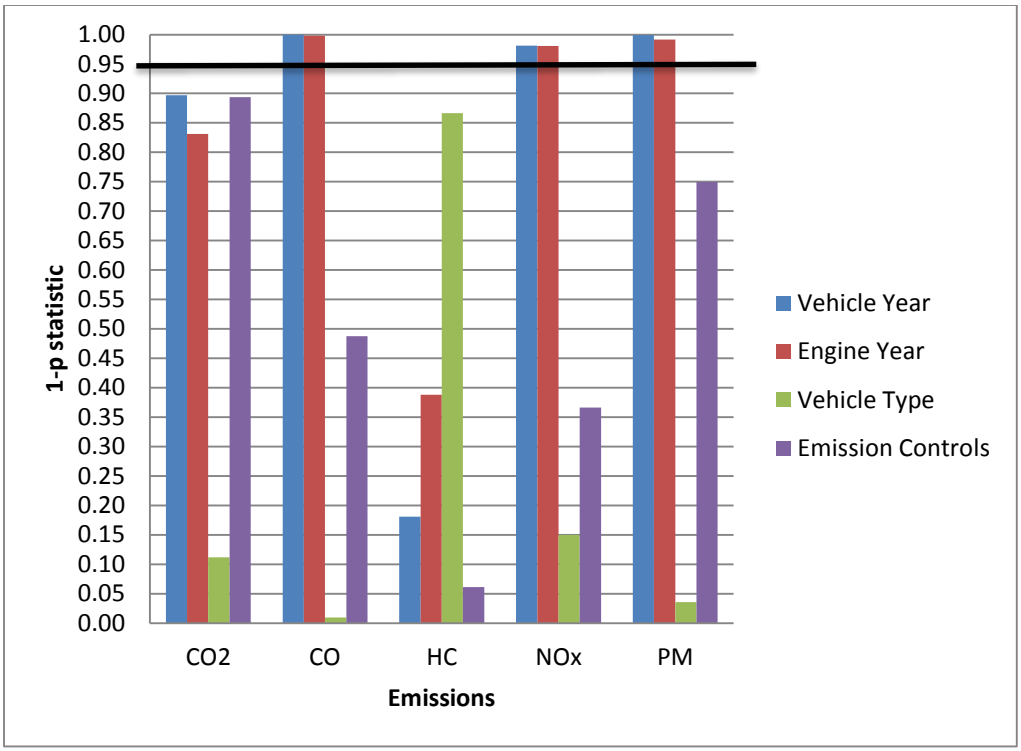


Figure 21. Regression Results from the Diesel Fuel Trucks in OP Mode 1

Figure 22 shows the results of the p statistic for the diesel fuel trucks while they are traveling at a speed between 1 and 25 mph. Vehicle year and engine year are all producers of CO_2, CO, and NOx. The vehicle type is significant to HC emissions. PM is relevant to vehicle year, engine year, and emission controls. There are more emissions produced when the diesel trucks are traveling at a speed than when braking/decelerating and sitting idle.

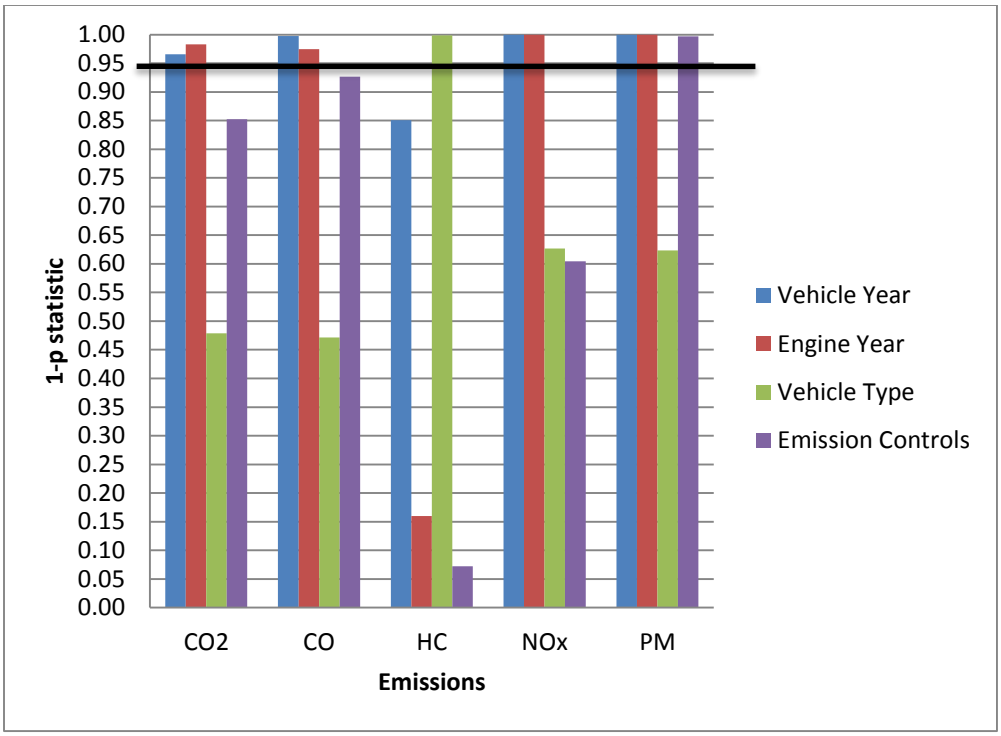


Figure 22. Regression Results from the Diesel Fuel Trucks in OP Modes 11-16

Figure 23 represents the diesel fuel trucks while traveling at a speed between 25 and 50 mph. CO_2 is relevant to all four factors tested, vehicle year, engine year, vehicle type and emission controls. CO is produced by vehicle year, engine year and emission controls. The only factor that affects HC is the vehicle type. Vehicle type, engine type and vehicle type are all significant to NOx emissions. Finally, both vehicle year and engine year are producers of PM emissions. As previously shown before with the emissions averages, this speed shows the most significant amount of emissions produced.

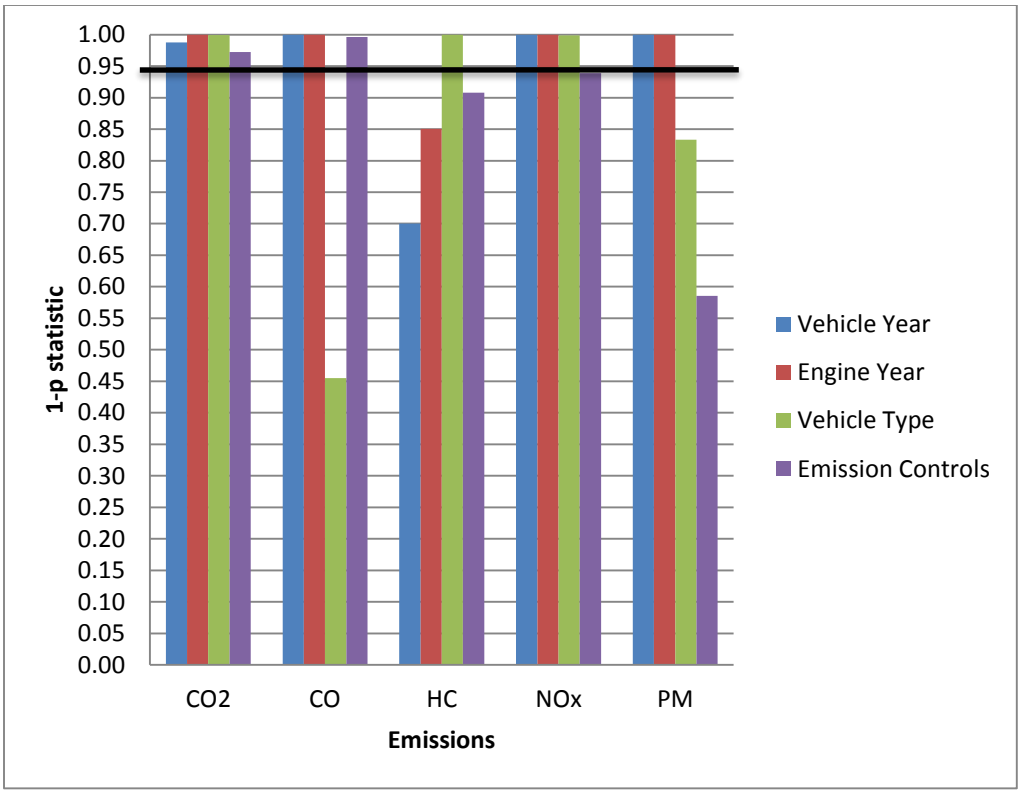


Figure 23. Regression Results from the Diesel Fuel Trucks in OP Modes 21-30

Figure 24 is a representation of the p statistic of the diesel fuel trucks while they are traveling at a speed greater than 50 mph. Vehicle type and emission controls are relevant to CO_2 emissions. Vehicle year, engine year, and emission controls are all producers of CO, NOx, and PM emissions. Again, vehicle type is the only relevant factor to HC emissions.

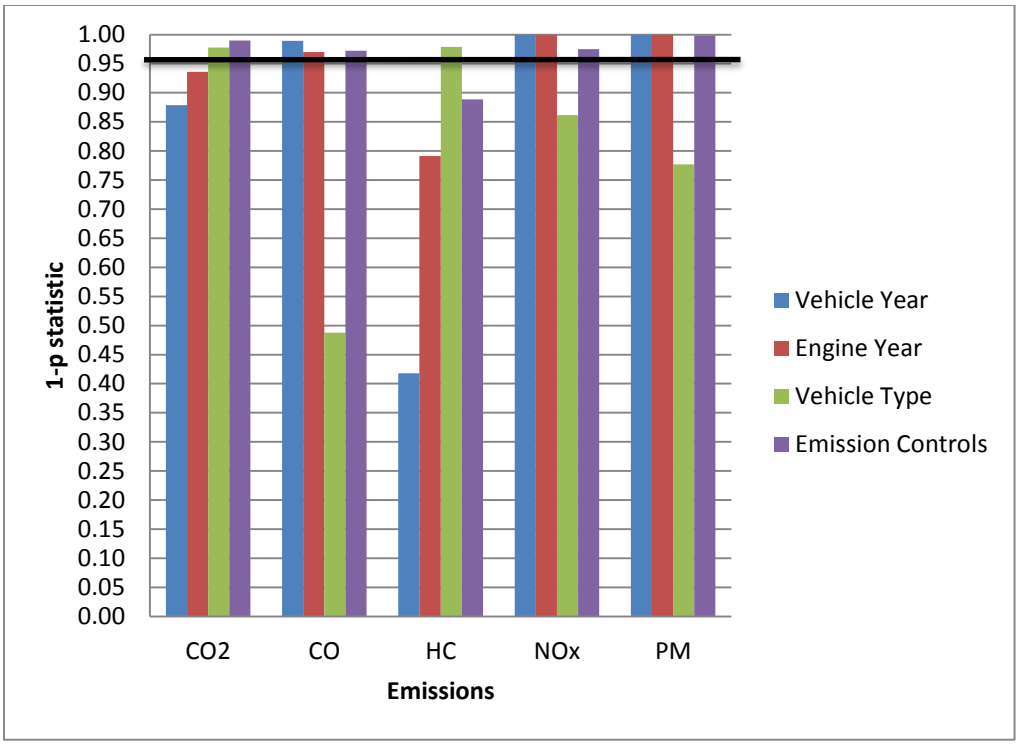


Figure 24. Regression Results from the Diesel Fuel Trucks in OP Modes 33-40

Figure 25 is the p statistic of each factor tested in the diesel fuel trucks while they are traveling downhill. Vehicle type is a producer of both CO_2 and HC emissions. Vehicle year and engine year are relevant to CO, NOx, and PM. The results are very similar to the previous various truck actions.

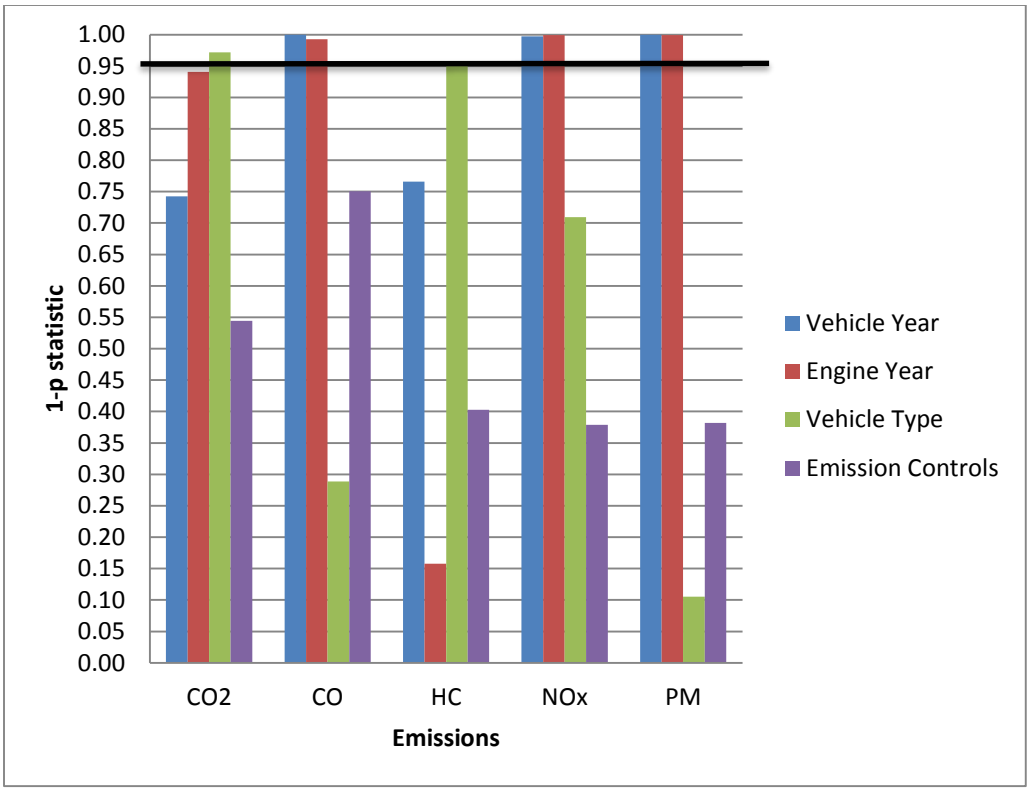


Figure 25. Regression Results from the Diesel Fuel Trucks with a Road Grade <0

Figure 26 shows the p statistic of each factor and whether they are producers of the five emissions tested in the diesel fuel trucks while traveling on a road grade between 0 and 3. Engine year and vehicle type are both relevant to CO_2 emissions. Vehicle year and engine year are both producers of CO, NOx, and PM. Vehicle type is the only significant factor to HC emissions. These results are similar to the road grade going downhill.

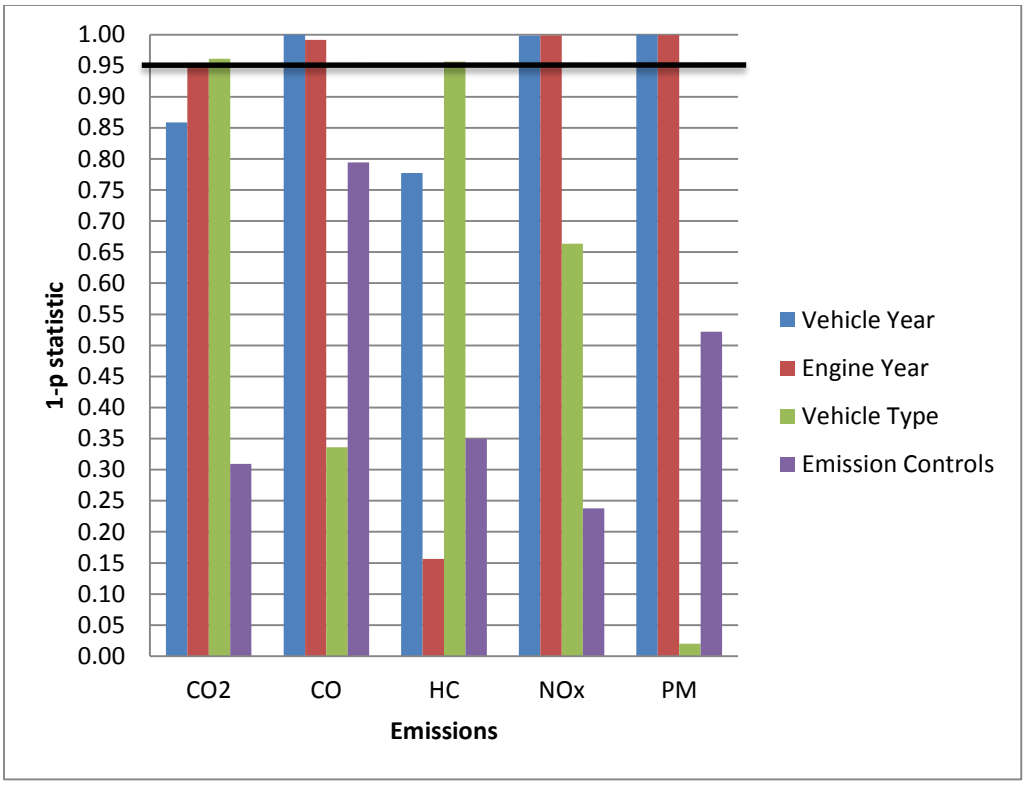


Figure 26. Regression Results from the Diesel Fuel Trucks with a Road Grade between 0 and 3

Figure 27 depicts the results from the regression performed on the diesel fuel trucks while they are traveling uphill. Engine year and vehicle type are producers of CO_2 emissions. Vehicle year and engine year are significant to CO, NOx, and PM emissions. HC is only affected by the vehicle type. The results are almost identical to the previous results when the trucks are traveling on the road with a grade between 1 and 3.

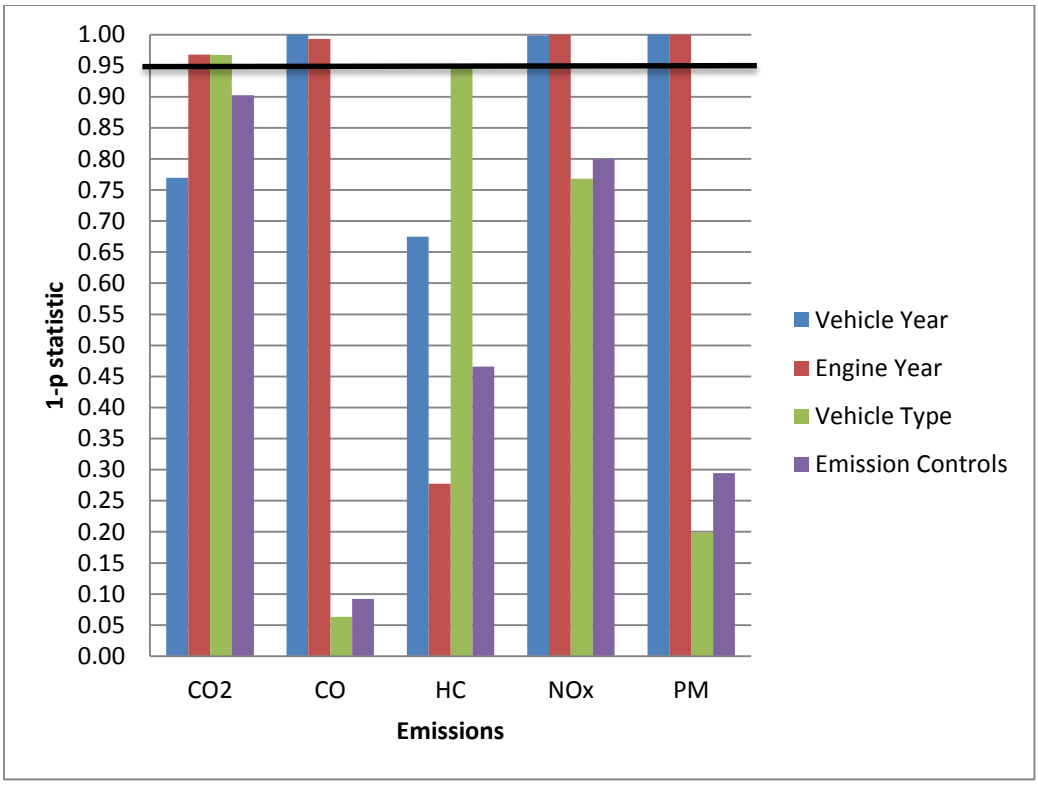


Figure 27. Regression Results from the Diesel Fuel Trucks with a Road Grade >3

Tables 23-25 show the regression results from CO_2 emissions for OP Modes 21-30 from the diesel fuel trucks. It should be noted that in every model with emission controls it is not relevant until it is tested alone, then it becomes a significant factor.

Table 23. Results from the Models with Vehicle Year

Equation	Constant (p)	VY (p)	VT (p)	EC (p)	N	R^2	Adj. R^2	p stat of Model
26	18935.80 (0.0000)	-2013.95 (0.0242)	-3769.91 (0.0079)	-87.94 (0.9081)	132	0.1226	0.1020	0.0008
27	18930.50 (0.0000)	-2026.61 (0.0218)	-3859.65 (0.0011)	-	132	0.1225	0.1089	0.0002
28	16629.30 (0.0000)	-2024.26 (0.0269)	-	-1225.67 (0.0606)	132	0.0727	0.0583	0.0077
29	15416.30 (0.0000)	-2284.30 (0.0126)	-	-	132	0.0470	0.0396	0.0126

Table 24. Results from the Models with Engine Year

Equation	Constant (p)	EY (p)	VT (p)	EC (p)	N	R^2	Adj. R^2	p stat of Model
30	18295.10 (0.0000)	-2919.30 (0.0009)	-3133.49 (0.0247)	135.88 (0.8562)	132	0.1622	0.1426	0.0000
31	18309.80 (0.0000)	-2892.29 (0.0008)	-3002.75 (0.0115)	-	132	0.1620	0.1490	0.0000
32	16550.00 (0.0000)	-3191.10 (0.0003)	-	-751.59 (0.2485)	132	0.1285	0.1149	0.0001
33	15884.50 (0.0000)	-3482.73 (0.0000)	-	-	132	0.1194	0.1126	0.0000

Table 25. Results from the Models with Neither VY or EY

Equation	Constant (p)	VT (p)	EC (p)	N	R^2	Adj. R^2	p stat of Model
34	16746.50 (0.0000)	-3783.71 (0.0087)	-302.86 (0.6934)	132	0.0869	0.0728	0.0028
35	16679.70 (0.0000)	-4097.91 (0.0007)	-	132	0.0858	0.0788	0.0007
36	14420.20 (0.0000)	-	-1445.88 (0.0278)	132	0.0367	0.0293	0.0278

4.5. CNG FUEL TRUCKS

Figure 28 represents the CNG fuel truck emissions averages. There are six CNG fuel trucks, and the only difference between the trucks is the vehicle type. Vehicle type is not significant to any of the five emissions measured.

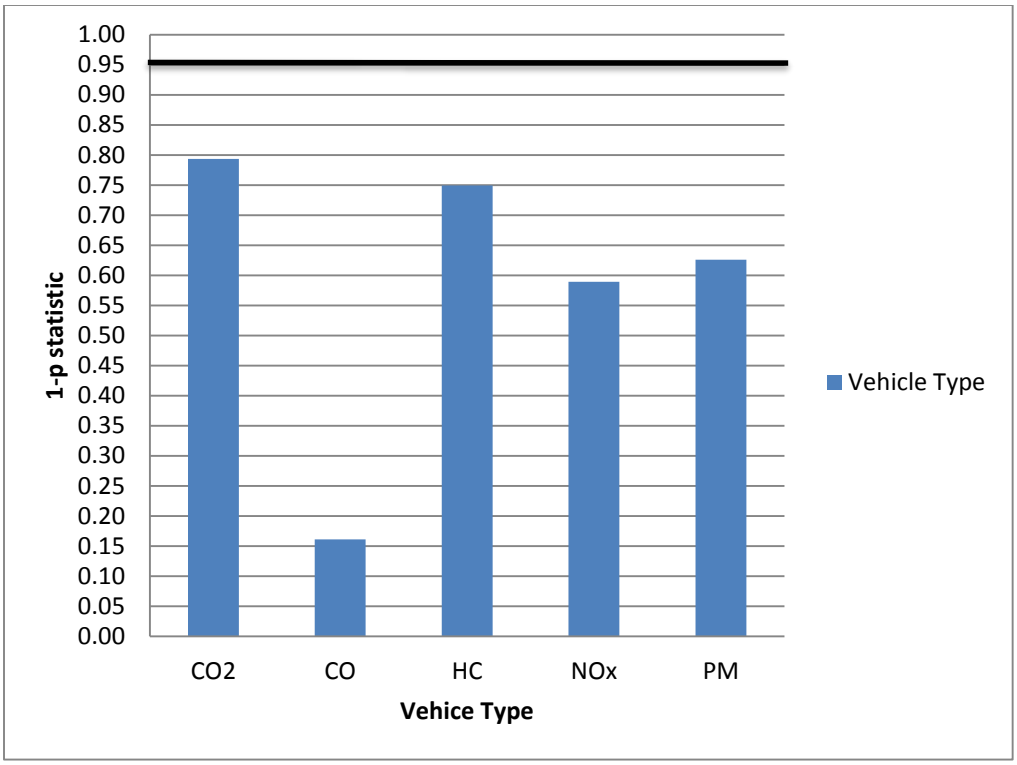


Figure 28. Regression Results from the CNG Truck Averages

Figure 29 shows the p statistic of the vehicle type for each of the emissions while the trucks are decelerating and braking. Much like the emission averages, vehicle type is not significant to any of the emissions tested in this particular operating mode.

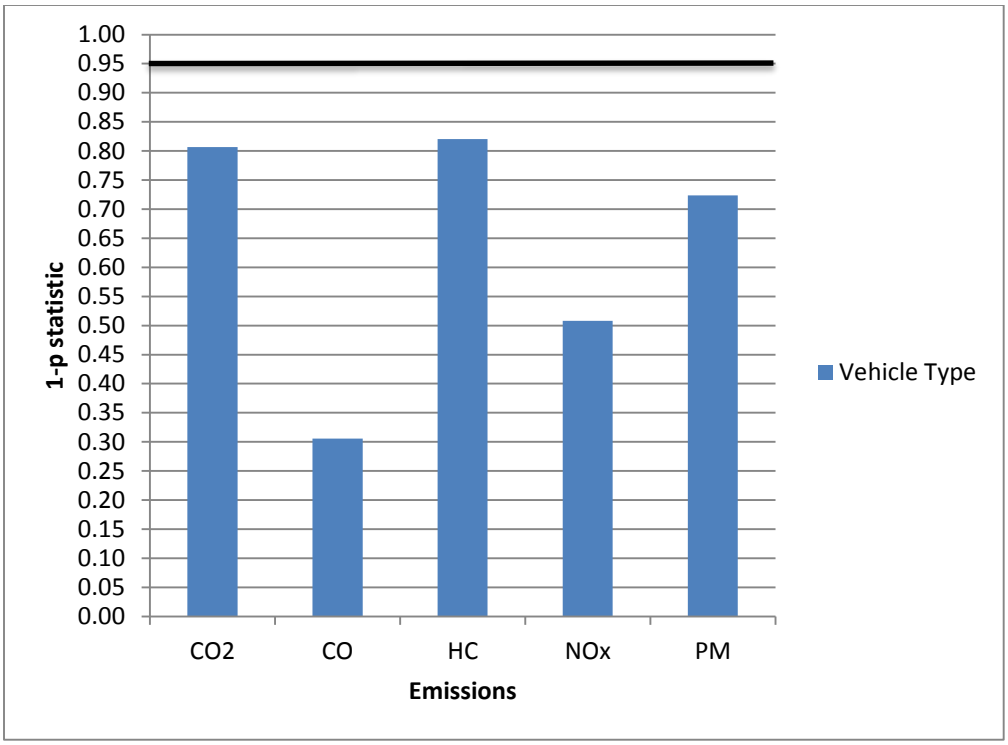


Figure 29. Regression Results from the CNG Trucks in OP Mode 0

Figure 30 represents the p statistic of the CNG fuel trucks while they are idling. Vehicle type is only relevant to CO emissions. PM is not quite at the 0.05 significance level.

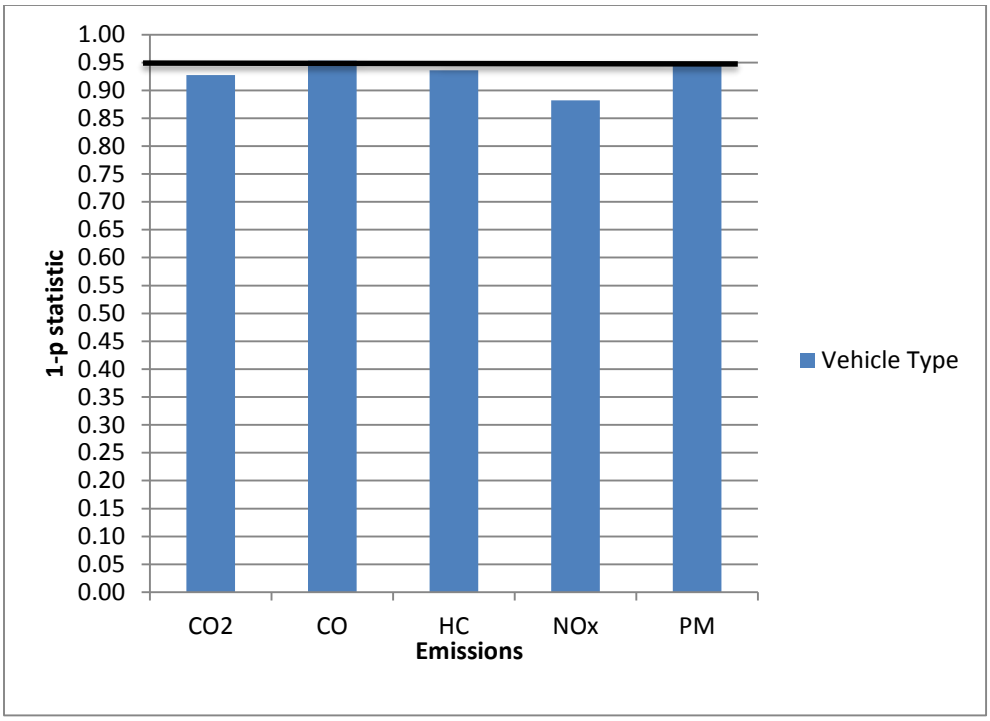


Figure 30. Regression Results from the CNG Trucks in OP Mode 1

Figure 31 shows the regression results from the CNG fuel trucks while they are traveling at a speed between 1 and 25 mph. In this mode both CO_2 and HC are produced by vehicle type. This operating mode shows significance to only two emissions, but it is the most produced out of all of the various truck conditions tested.

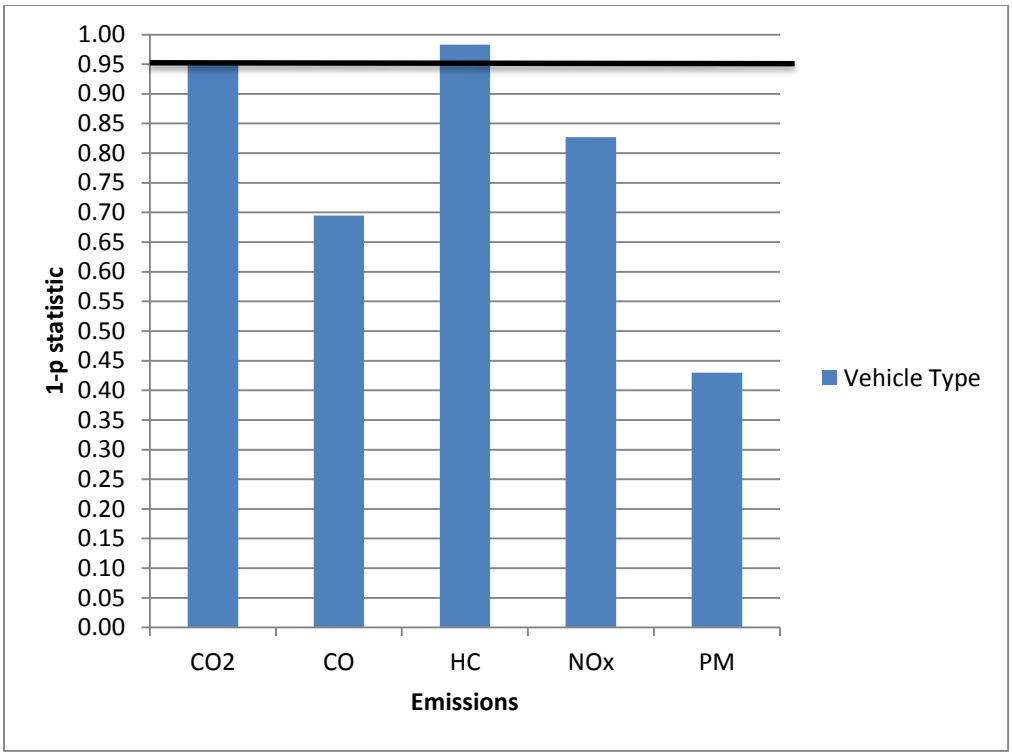


Figure 31. Regression Results from the CNG Trucks in OP Modes 11-16

Figure 32 depicts the results from the CNG fuel trucks while they are traveling at a speed between 25 and 50 mph. Vehicle type is only significant to CO_2 emissions.

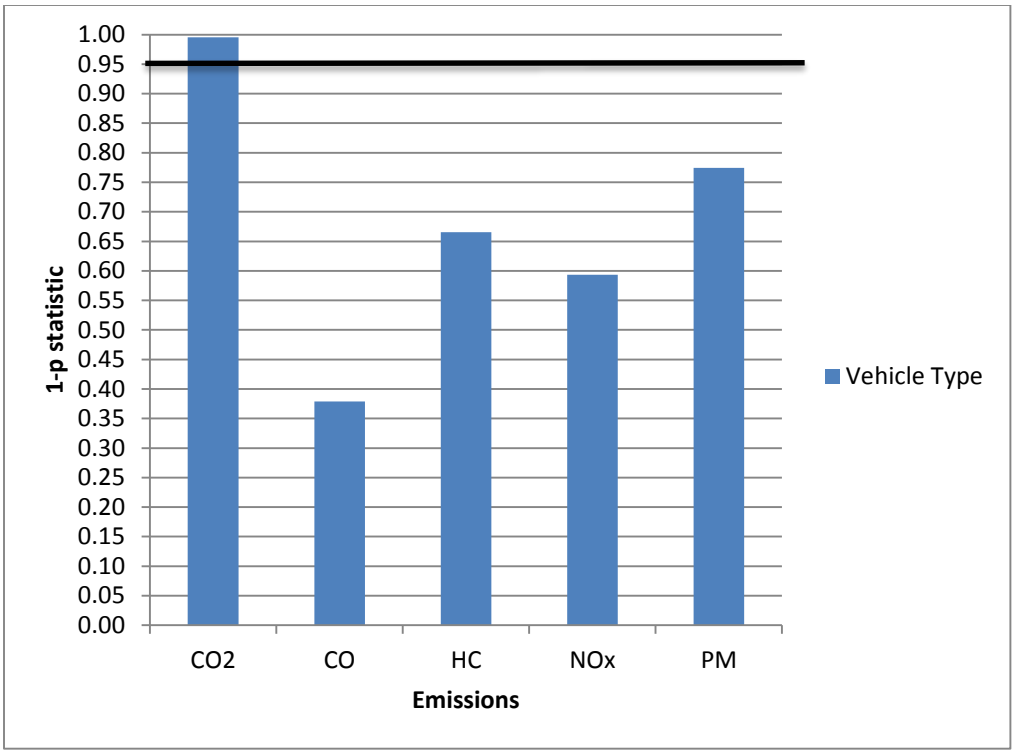


Figure 32. Regression from the CNG Trucks in OP Modes 21-30

Figure 33 shows the regression results from the CNG trucks while they are traveling at a speed greater than 50 mph. In this mode there are no relevant emissions.

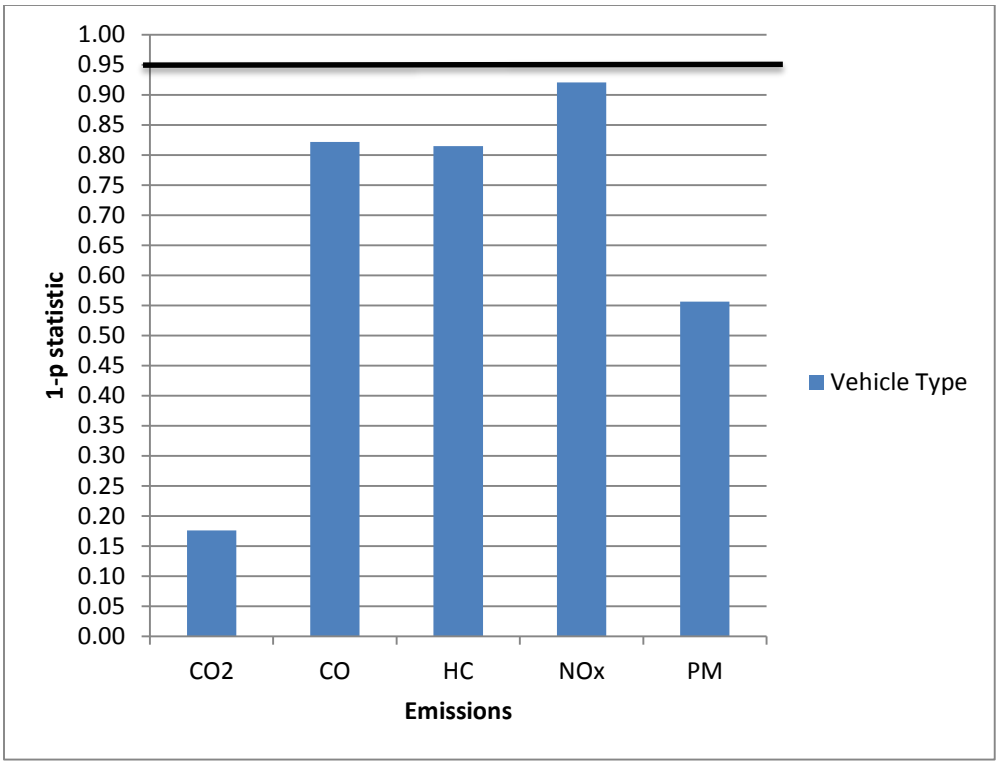


Figure 33. Regression Results from the CNG Trucks in OP Modes 33-40

Figure 34 shows the results from the CNG trucks while they are traveling on a road that is downhill. None of the emissions are relevant to vehicle type in this this case.

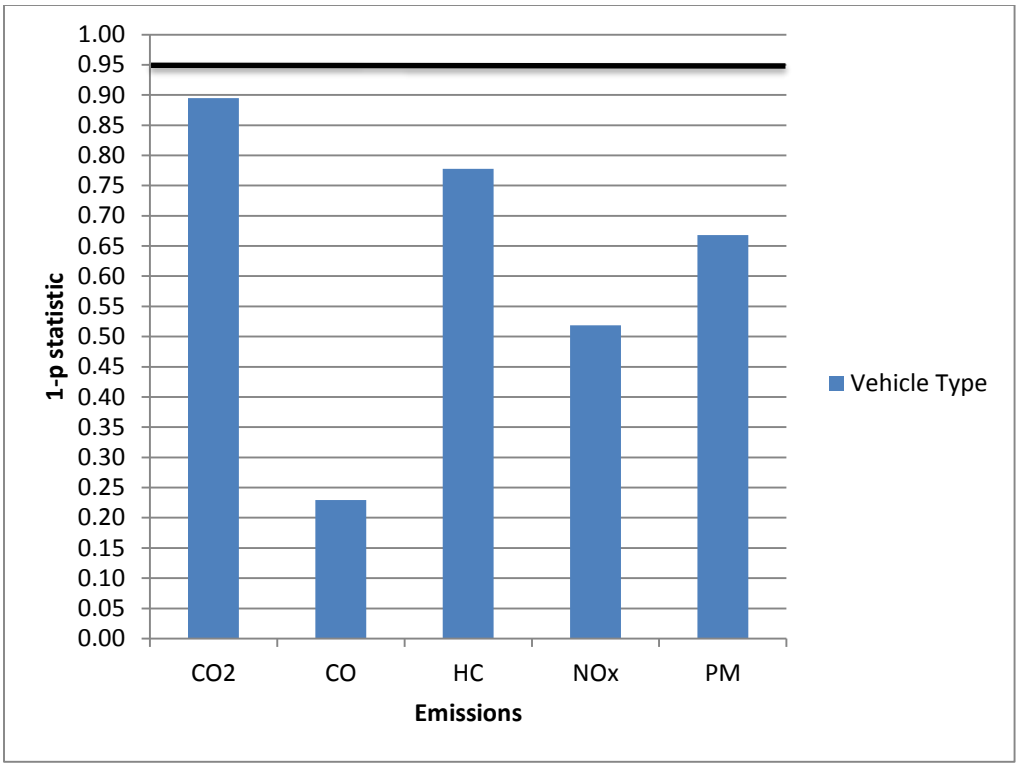


Figure 34. Regression Results from the CNG Trucks with a Road Grade <0

Figure 35 represents the regression results from the CNG trucks while they are traveling on a road that has a slope between 1 and 3. The emissions are not relevant in this case as well.

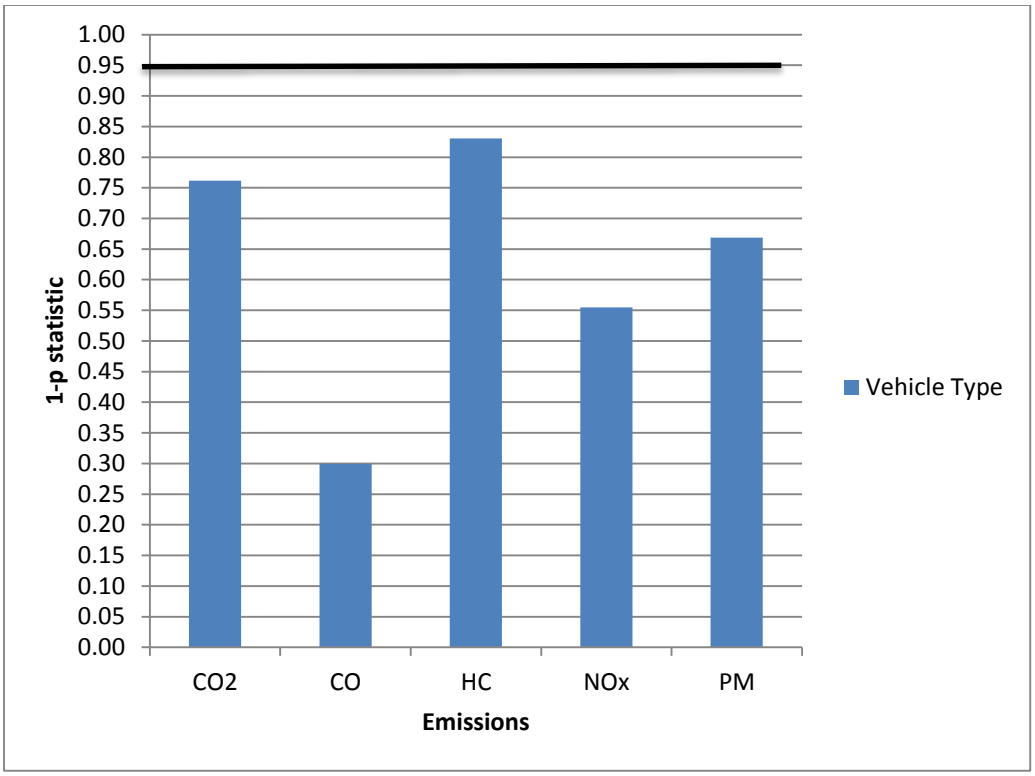


Figure 35. Regression Results from the CNG Trucks with a Road Grade between 0 and 3

Figure 36 shows the results from the regression done on the CNG trucks while they are traveling uphill. The emissions are not significant in this case as well. The CNG fuel does not have much of an impact on the type of vehicle to produce significant emissions.

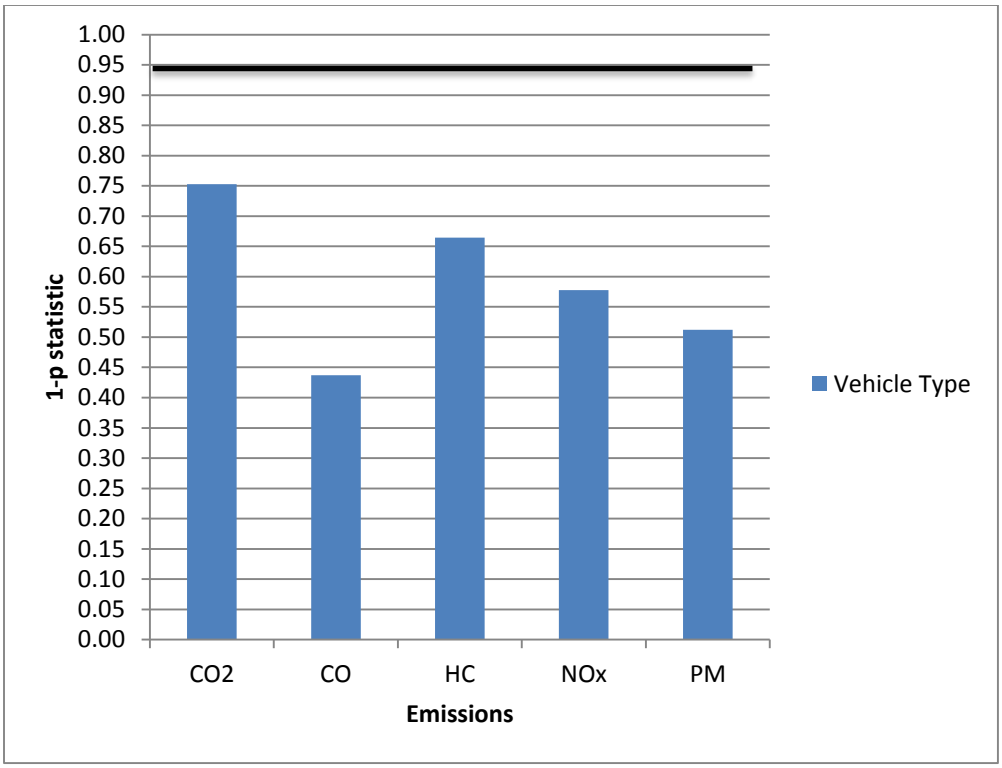


Figure 36. Regression Results from the CNG Trucks with a Road Grade >3

4.6. FRONT-LOAD TRUCKS

Figure 37 represents the p statistic of each of the factors and emissions in the front-load truck averages. It shows that vehicle year, engine year, fuel type, and emission controls are all producers of CO_2 and NOx emissions. PM is relevant to vehicle year, engine year, and emission controls. Neither CO nor HC produce significant emissions in the front-load truck averages.

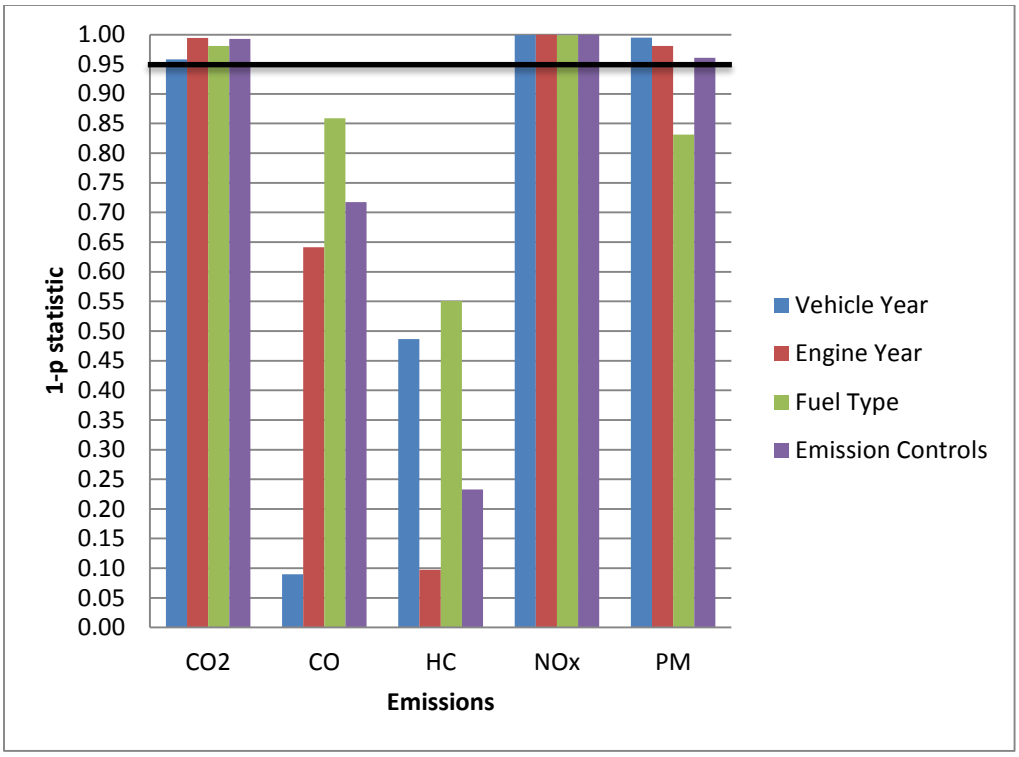


Figure 37. Regression Results from the Front-load Truck Averages

Figure 38 is a summary of the p statistic for the front-load trucks while they are decelerating or braking. In this particular mode vehicle year, engine year, fuel type and emission controls are all relevant to CO_2, CO, and HC emissions. Neither NOx nor PM are significantly produced. It is interesting to note that in this particular mode, the emissions produced are different from the front-load truck averages.

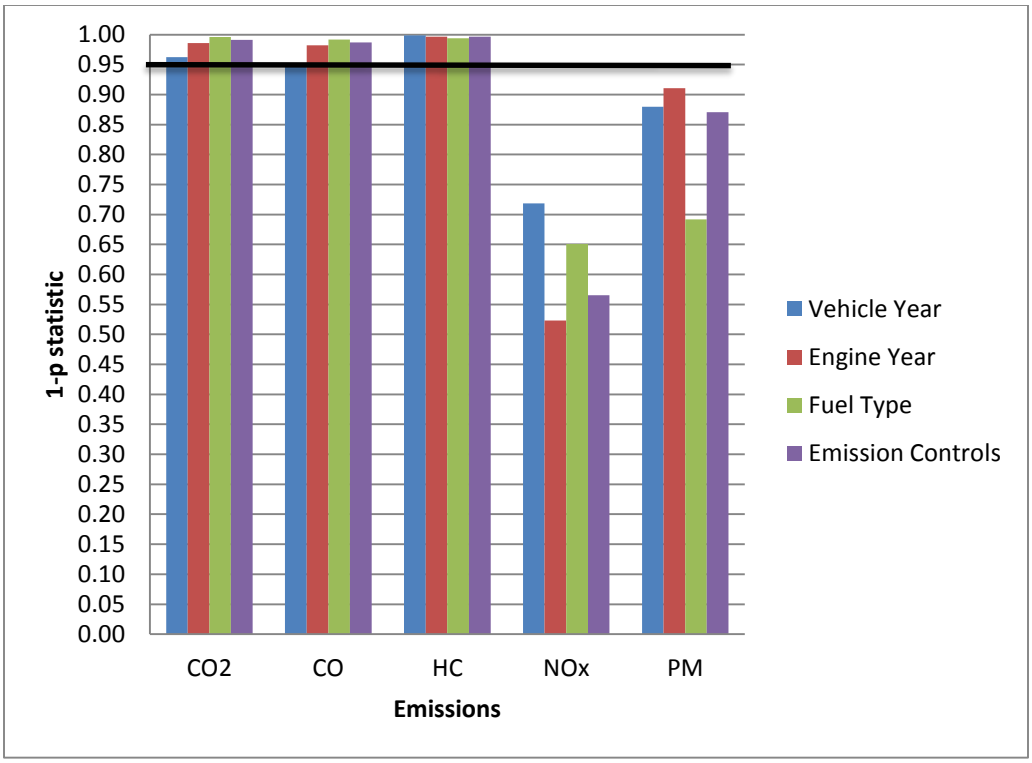


Figure 38. Regression Results from the Front-load Trucks in OP Mode 0

Figure 39 is a graphical representation of the p statistic of the front-load trucks while they are idling. Vehicle year, engine year, fuel type and emission controls are all significant to NOx emissions. Vehicle year and engine year are producers of PM emission as well. CO_2, CO, and HC are not significantly produced in the front-load trucks while they are idling.

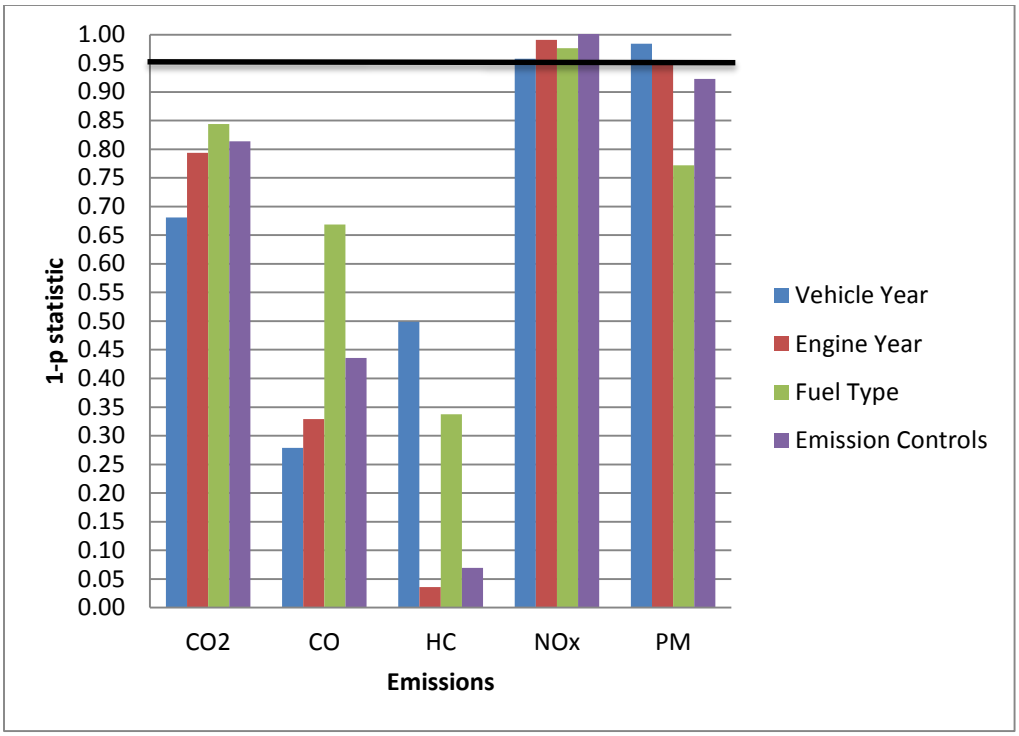


Figure 39. Regression Results from the Front-load Trucks in OP Mode 1

Figure 40 shows the p statistic of the front-load trucks while they are traveling at a speed between 1 and 25 mph. CO_2, CO and HC are not significantly produced in the trucks while they are traveling at this speed. NOx and PM are both produced by according to all four factors tested, vehicle year, engine year, fuel type, and emission controls.

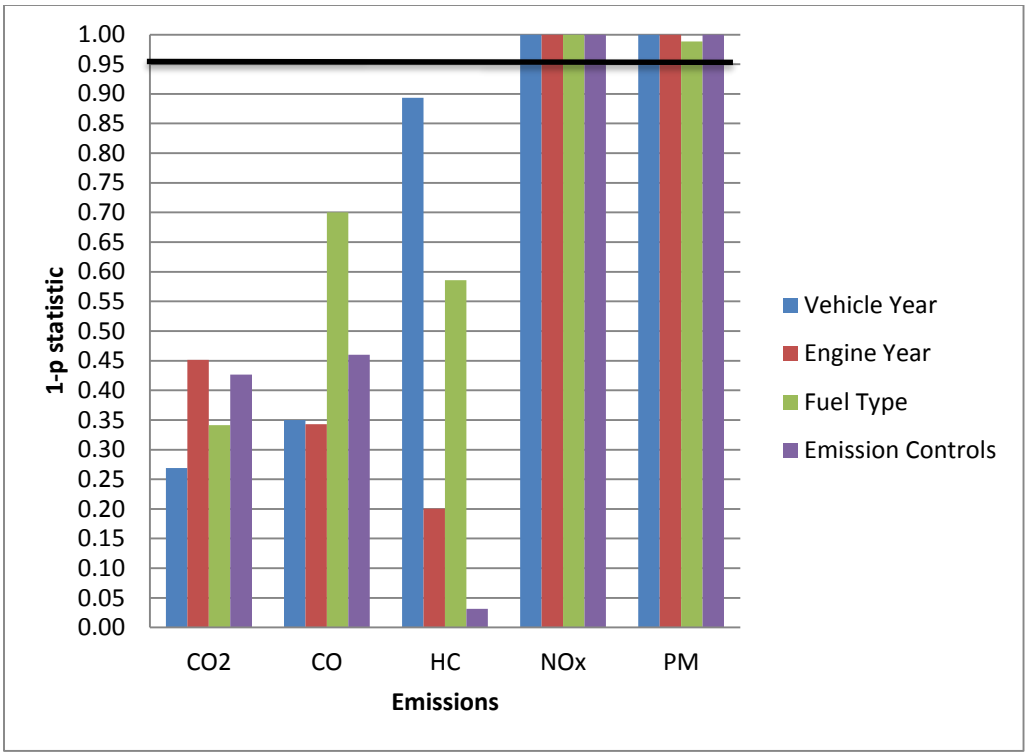


Figure 40. Regression Results from the Front-load Trucks in OP Modes 11-16

Figure 41 illustrates the p statistic from the front-load trucks while they are traveling at a speed between 25 and 50 mph. At this speed, there are more emissions produced by the four factors tested. All four factors, vehicle year, engine year, fuel type, and emission controls are significant to CO, NOx, and PM emissions. Engine year is relevant to CO_2 emissions, and vehicle year is a producer of HC emissions. It is interesting to note that engine year is so different from vehicle year in HC emissions; it is not typical in most models.

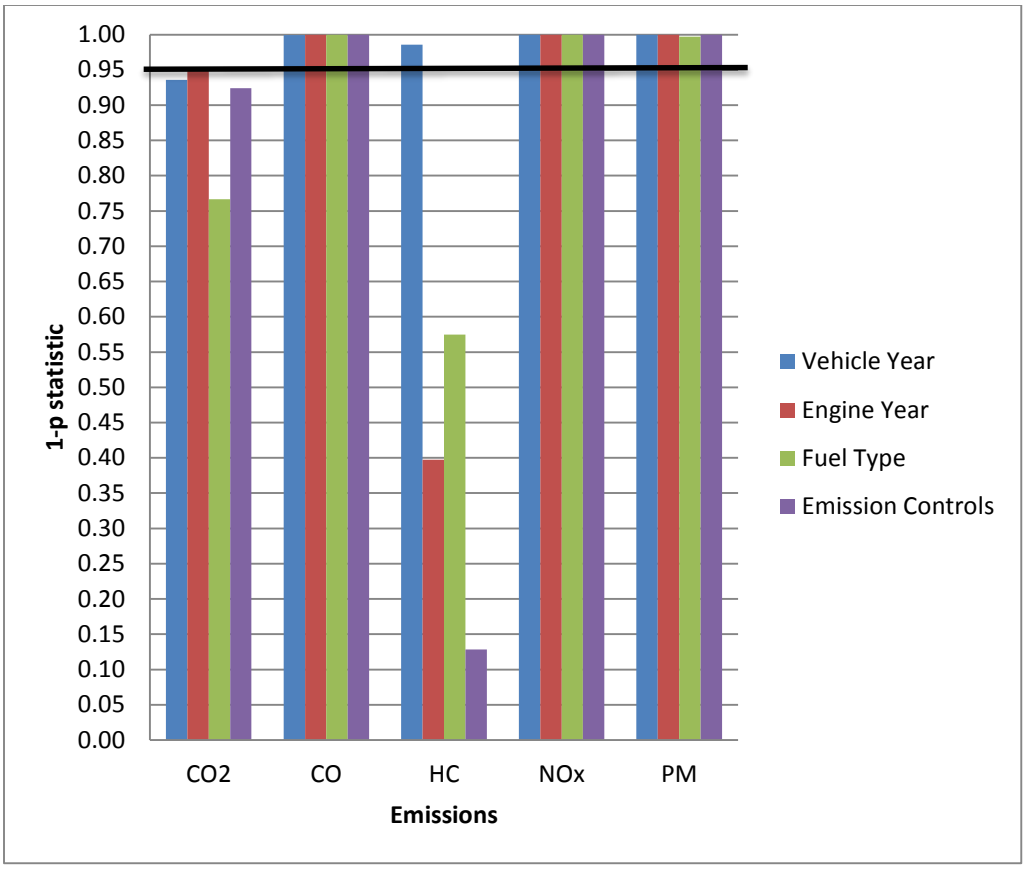


Figure 41. Regression Results from the Front-load Trucks in OP Modes 21-30

Figure 42 shows the p statistic of the front-load trucks while they are traveling at a speed greater than 50 mph. Vehicle year, engine year, fuel type, and emission controls are all significant to CO_2, CO, NOx, and PM emissions. Fuel type is also a producer of HC emissions as well. This traveling speed produces the most amount of emissions in the front-load trucks.

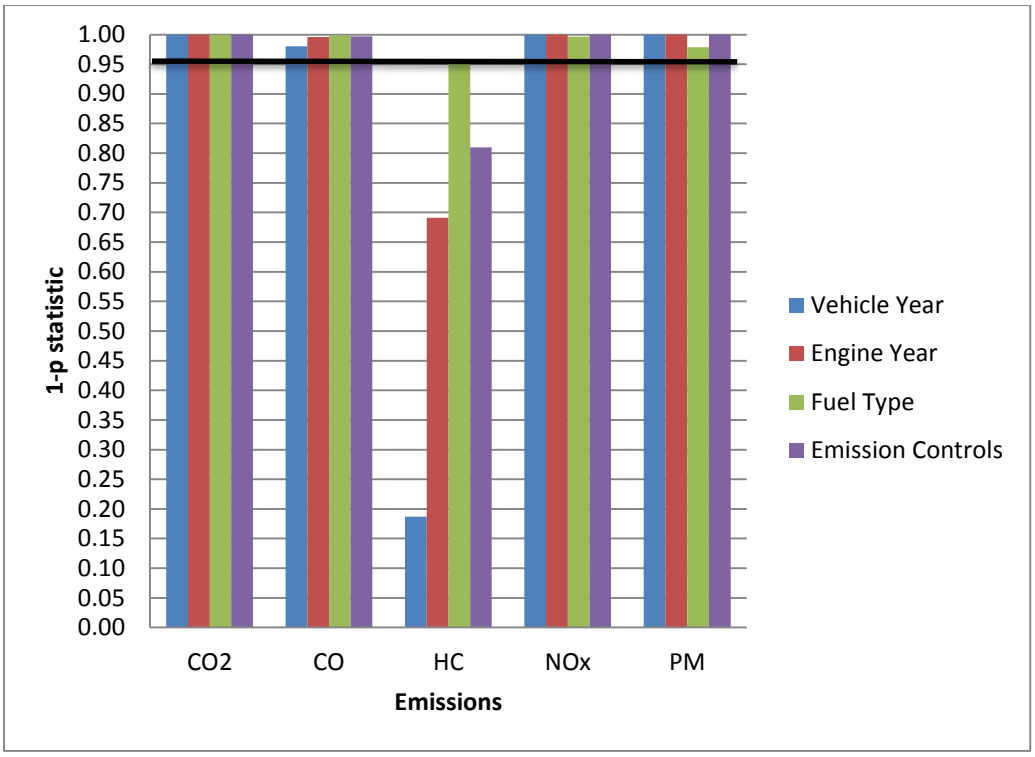


Figure 42. Regression Results from the Front-load Trucks in OP Modes 33-40

Figure 43 shows the p statistic results from the front-load trucks while they are driving downhill. CO_2 is significant to engine year, fuel type, an emission controls. NOx is produced by all four factors tested. Vehicle year, engine year, and emission controls are all relevant to PM emissions. CO and HC are not significantly produced while the front-load trucks are driving downhill.

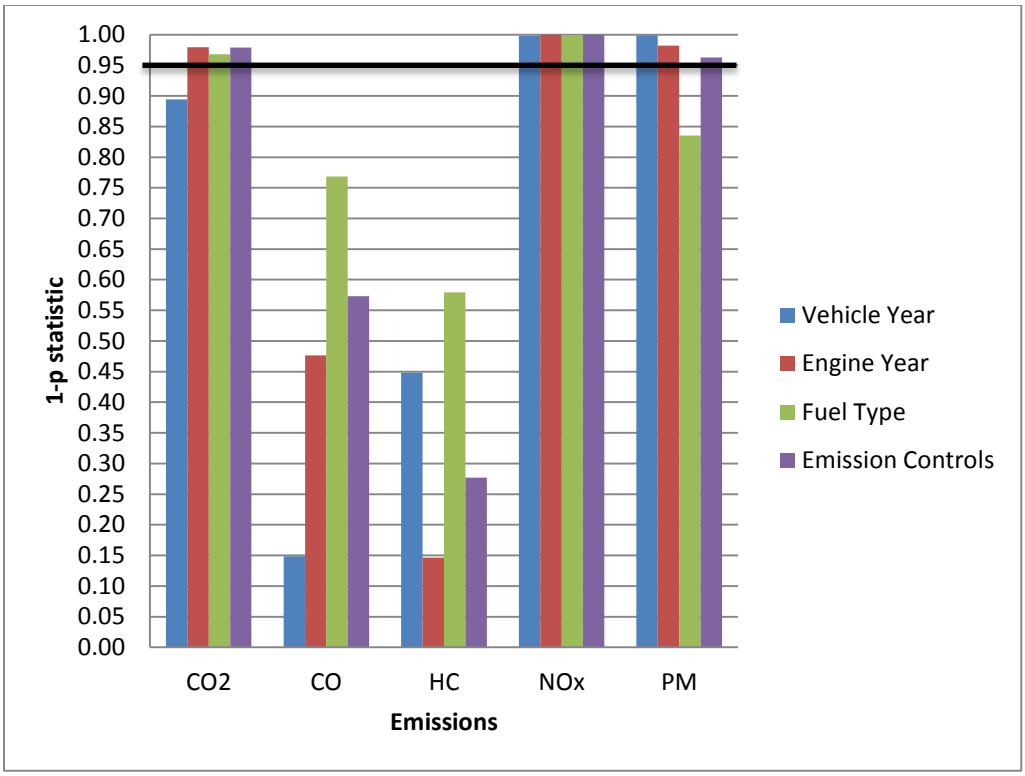


Figure 43. Regression Results from the Front-load Trucks with a Road Grade <0

Figure 44 illustrates the p statistic from the front-load trucks while they are traveling on a road with a slope between 1 and 3. All four factors are producers of both CO_2 and NOx emissions. Vehicle year, engine year, and emission controls are also relevant to PM emissions. Both CO and HC are not significantly produced by the front-load trucks while traveling on a road with a slope between 1 and 3.

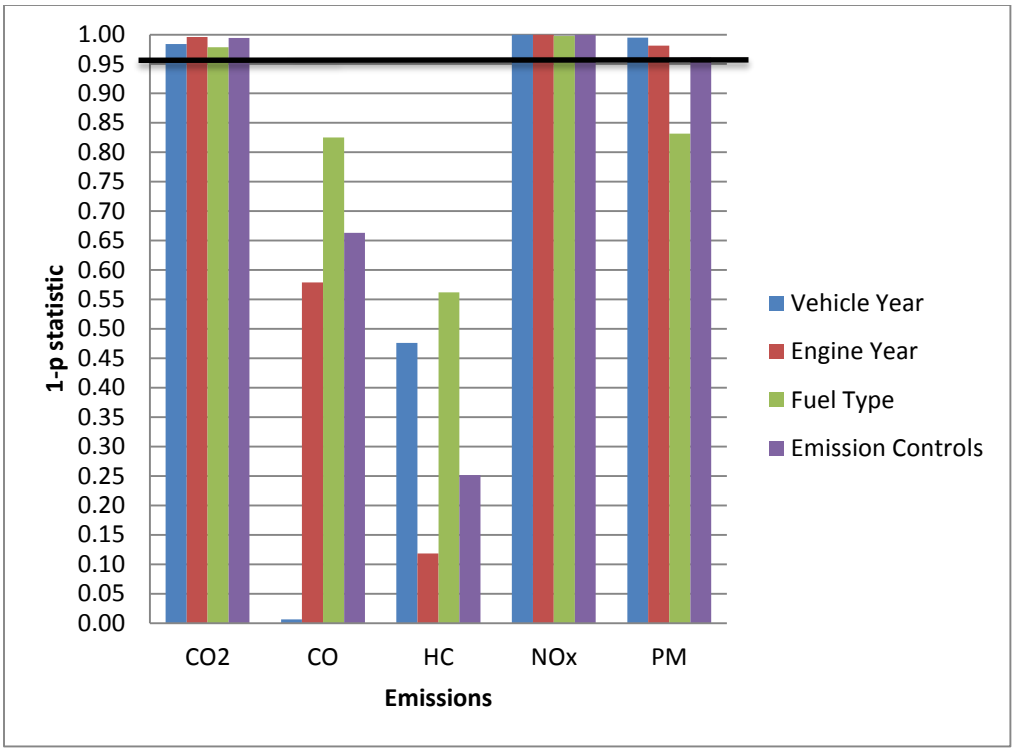


Figure 44. Regression Results from the Front-load Trucks with a Road Grade between 0 and 3

Figure 45 shows the p statistic of the front-load trucks while they are traveling uphill. The regression results between the varying road grades are very similar. CO_2 is produced by the engine year and emission controls. NOx is relevant to all four factors tested. Vehicle year, engine year, and emission controls are all significant to PM emissions. CO and HC are not significant emissions that are produced in the front-load trucks while they are traveling uphill.

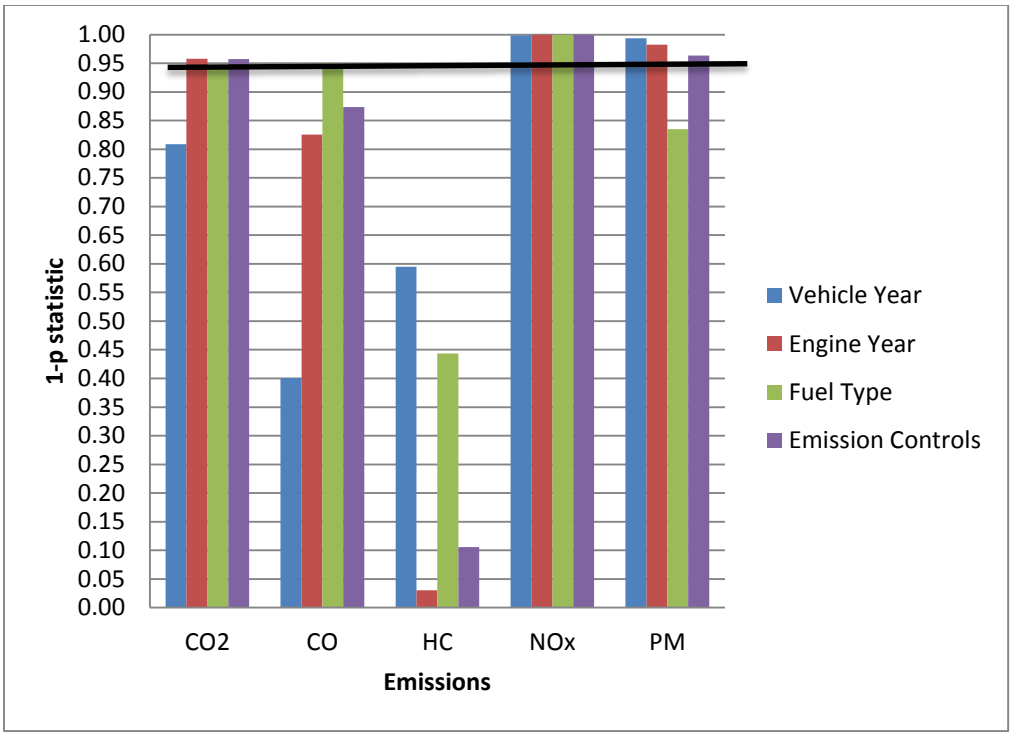


Figure 45. Regression Results from the Front-load Trucks with a Road Grade >3

Tables 26-28 are the regression tables from the front-load HC emissions while in OP Modes 11-16. It is unusual that when each of the factors are tested in models together, they are both significant, but when tested alone they become insignificant. This could be an error, but should definitely be investigated further because it does indicate that the factors do not significantly impact the HC emissions individually.

Table 26. Results from the Models with Vehicle Year

Equation	Constant (p)	VY (p)	EC (p)	N	R^2	Adj. R^2	p stat of Model
32	-68.18 (0.9952)	55021.50 (0.0000)	-34021.10 (0.0001)	54	0.2871	0.2591	0.0002
33	18832.50 (0.1204)	9660.01 (0.1066)	-	54	0.0493	0.0310	0.1066

Table 27. Results from the Models with Engine Year

Equation	Constant (p)	EY (p)	EC (p)	N	R^2	Adj. R^2	p stat of Model
34	12161.90 (0.2689)	199681.00 (0.0007)	-146083.00 (0.0007)	54	0.2026	0.1713	0.0031
35	33030.80 (0.0021)	1426.22 (0.7994)	-	54	0.0013	-0.0180	0.7994

Table 28. Results from the Models with Neither VY or EY

Equation	Constant (p)	FT (p)	EC (p)	N	R^2	Adj. R^2	p stat of Model
36	12161.90 (0.2689)	-199681.00 (0.0007)	53598.60 (0.0010)	54	0.2026	0.1713	0.0031
37	38961.20 (0.0000)	-12086.20 (0.4142)	-	54	0.0129	-0.0061	0.4142
38	35202.00 (0.0007)	-	161.74 (0.9687)	54	0.0000	-0.0192	0.9687

4.7. SIDE-LOAD TRUCKS

Figure 45 is an illustration of the p statistics for the side-load truck emission averages. The emission averages show that vehicle year and engine year are both producers of CO_2, NOx, and PM emissions. Fuel type is also relevant to HC emissions. None of the factors affect CO significantly.

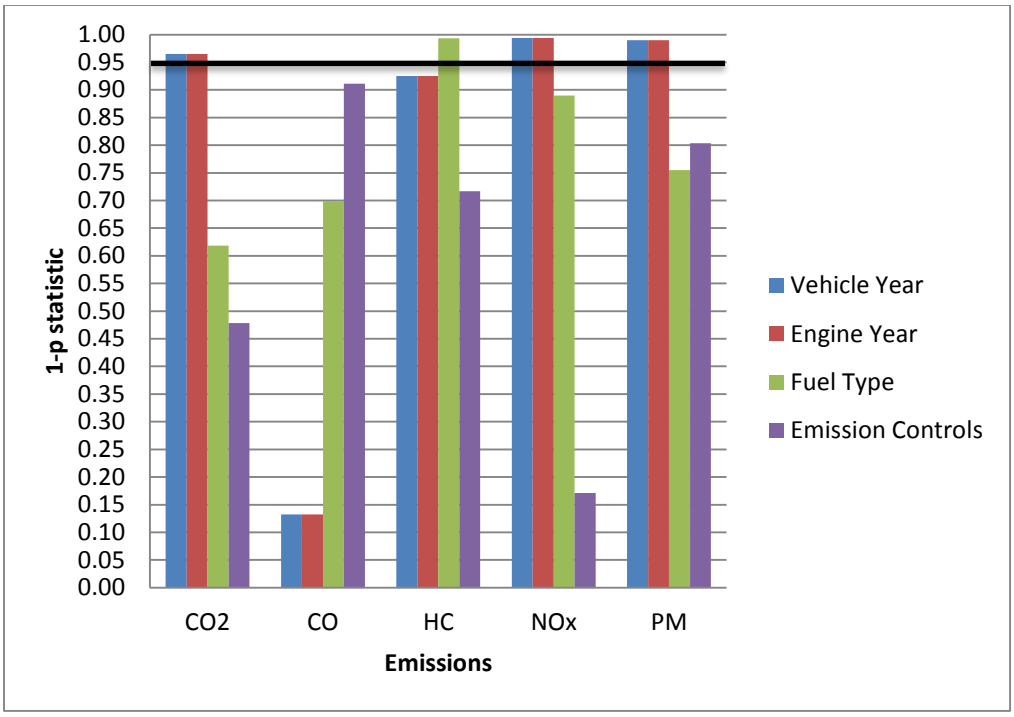


Figure 46. Regression Results from the Side-load Truck Averages

Figure 47 is a summary of the p statistic from the side-load trucks while they are decelerating or braking. Fuel type is the only significant factor, and produces CO_2, CO, and HC emissions. NOx and PM are not significantly emitted by the factors while the side-load trucks are decelerating or braking.

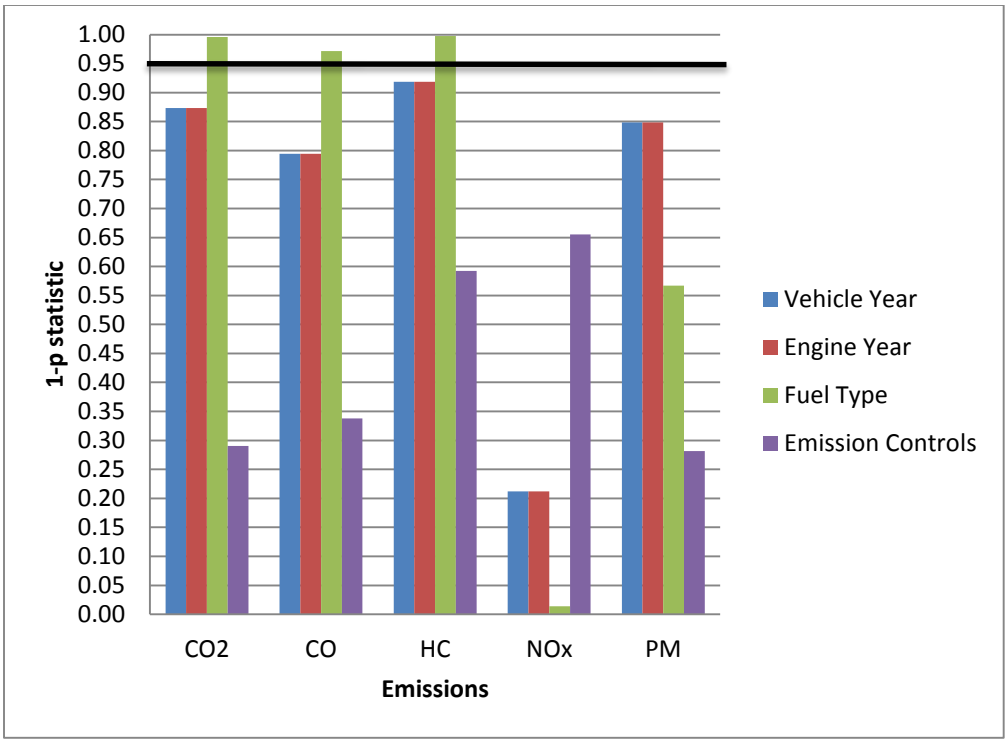


Figure 47. Regression Results from the Side-load Trucks in OP Mode 0

Figure 48 is a graphical representation of the side-load trucks while they are idling. There seem to be more factors affecting the trucks in this mode than while they are decelerating or braking. Fuel type is significant to both CO_2 and HC emissions. Vehicle year and engine year are both relevant to NOx and PM emissions. CO is not significantly produced by any of the factors while the side-load trucks are idling.

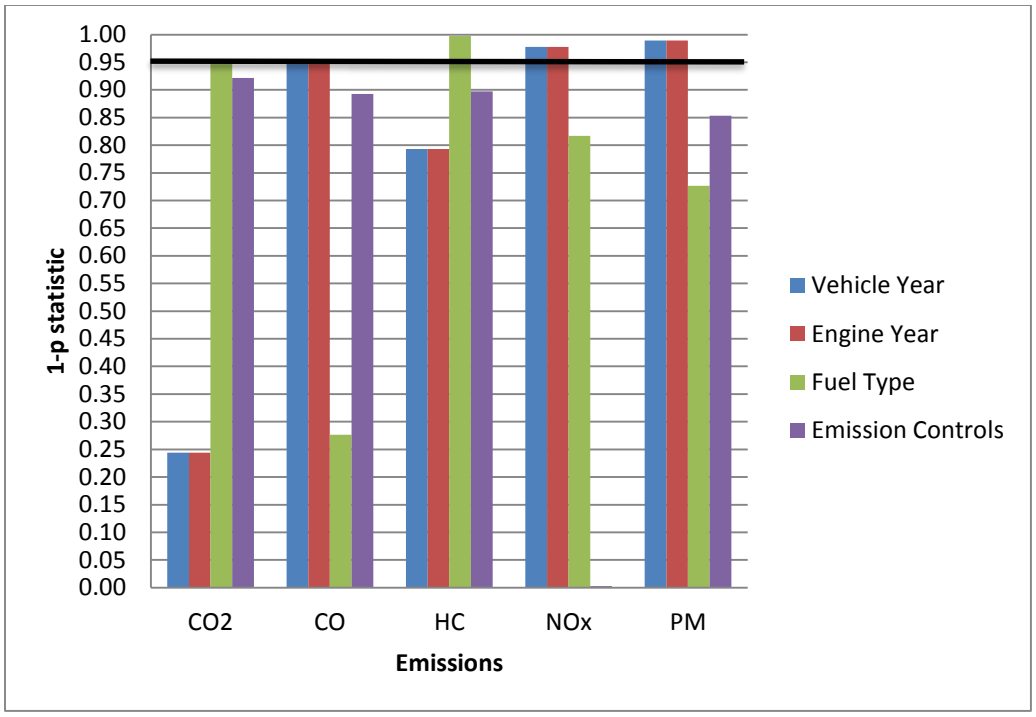


Figure 48. Regression Results from the Side-load Trucks in OP Mode 1

Figure 49 shows the p statistic of the side-load trucks while they are traveling at a speed between 1 and 25 mph. Vehicle year and engine year are significant to CO_2. Emission controls produce CO. All four factors are relevant to HC and PM emissions. Lastly, vehicle year, engine year, and fuel type are producers of NOx emissions. All five emissions tested are affected in some capacity by the side-load trucks while they are traveling at this particular speed.

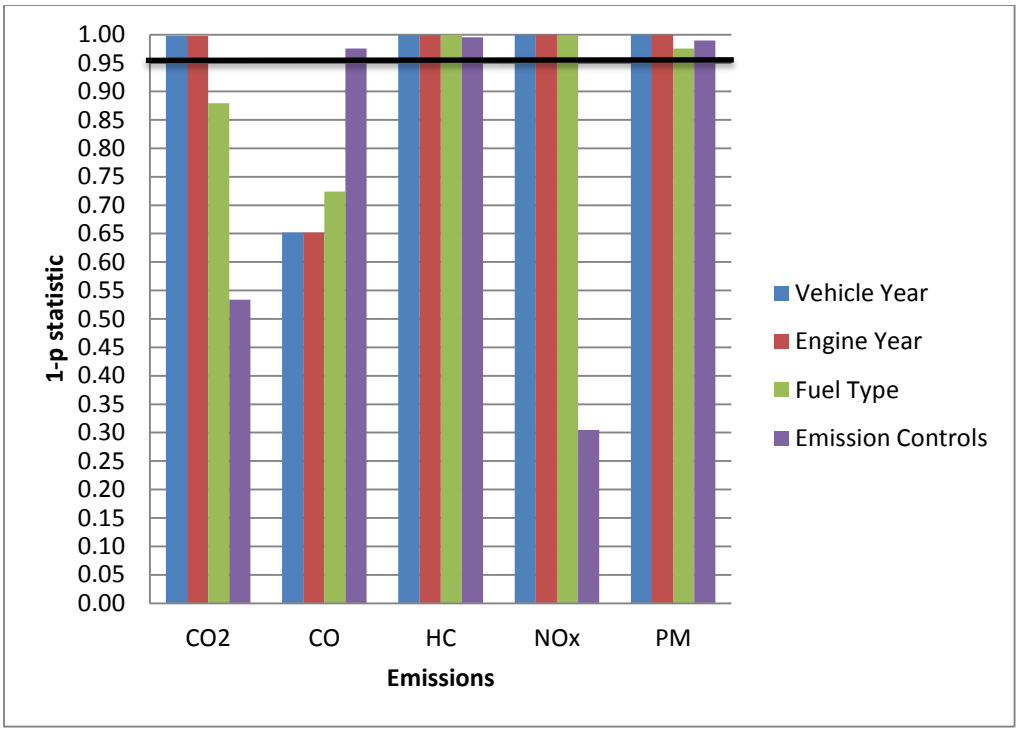


Figure 49. Regression Results from the Side-load Trucks in OP Modes 11-16

Figure 50 shows the p statistic of the side-load trucks while they are traveling at a speed between 25 and 50 mph. All four factors are producers of HC, NOx, and PM emissions. Vehicle year, engine year, and emission controls are relevant to CO_2 emissions. Finally, fuel type and emission controls are both producers of CO emissions. This speed has the most impact on the emissions within the side-load trucks.

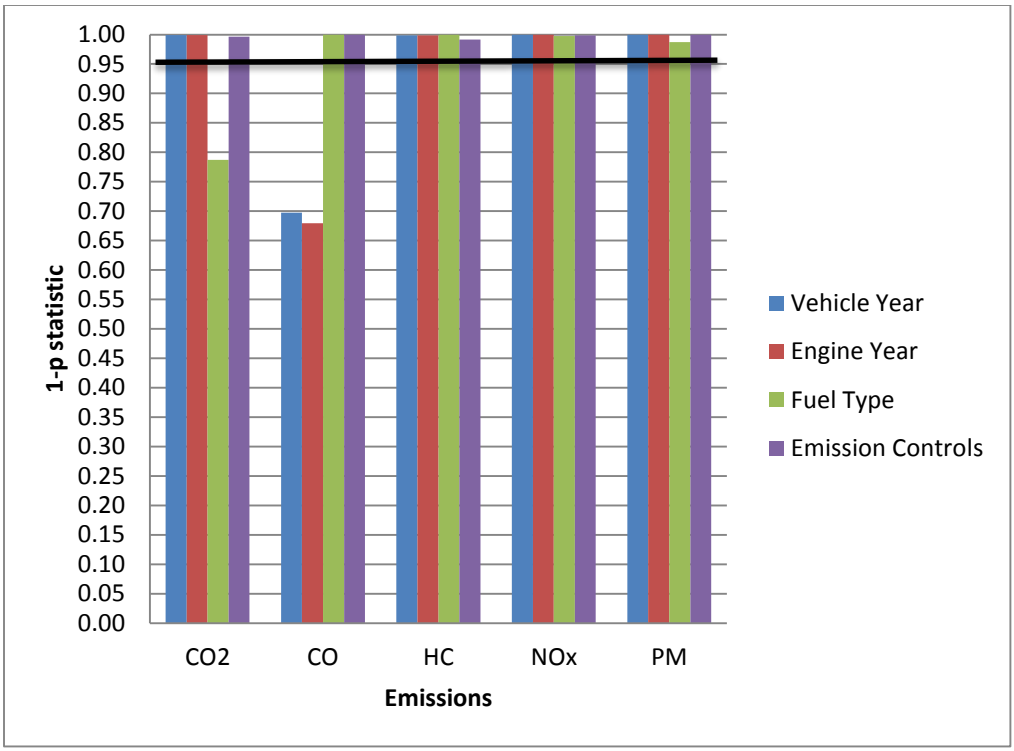


Figure 50. Regression Results from the Side-load Trucks in OP Modes 21-30

Figure 51 illustrates the p statistic of the side-load trucks while they are traveling at a speed greater than 50 mph. In this mode vehicle year and engine year are producers of CO_2, NOx, and PM emissions. Fuel type is significant to CO and PM emissions as well. HC is not significantly affected by any of the factors while traveling at a speed greater than 50 mph.

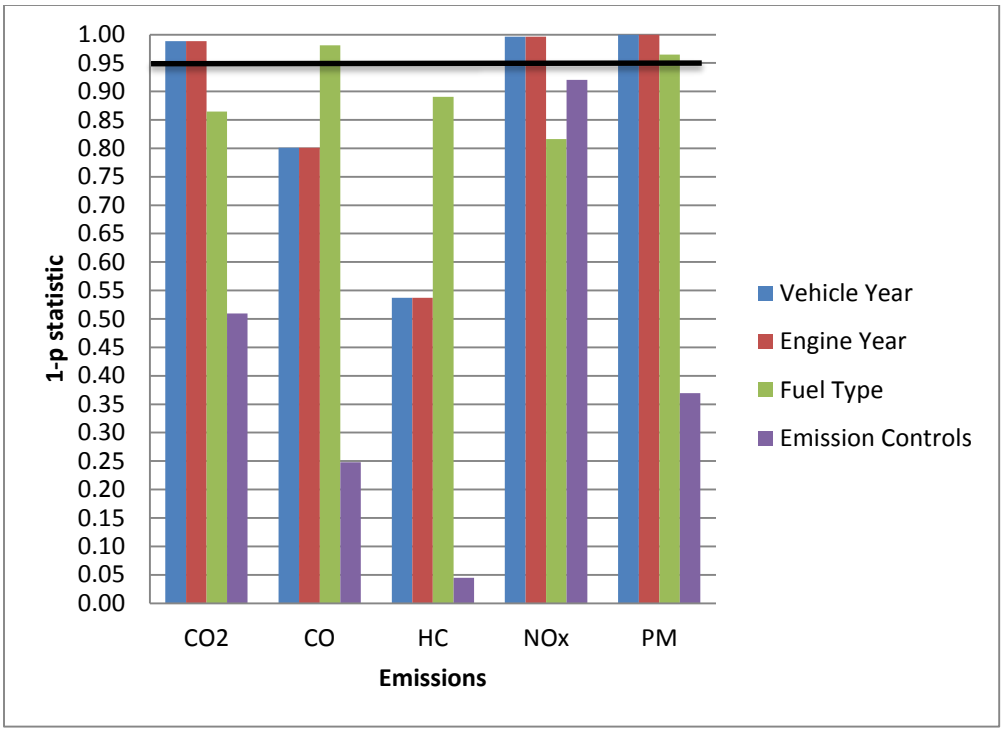


Figure 51. Regression Results from the Side-load Trucks in OP Modes 33-40

Figure 52 shows the p statistic of the side-load trucks when they are driving downhill. Fuel type is a producer of HC emissions. Both vehicle year and engine year are relevant to NOx and PM emissions. CO_2 and CO are not significantly affected by the negative road grade in the side-load trucks.

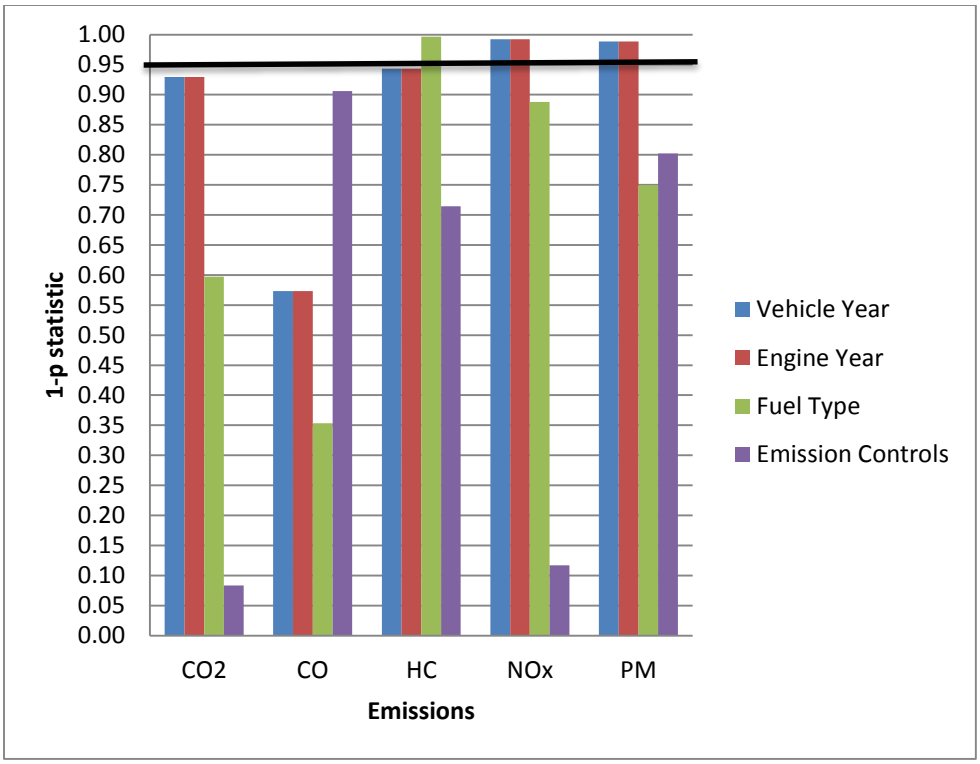


Figure 52. Regression Results from the Side-load Trucks with a Road Grade <0

Figure 53 is a graphical representation of the side-load trucks while they are traveling on the road with a slope between 1 and 3. Vehicle year and engine year are both producers of CO_2, NOx, and PM emissions. Fuel type is relevant to HC emissions. The results are very similar to the road grade less than 0.

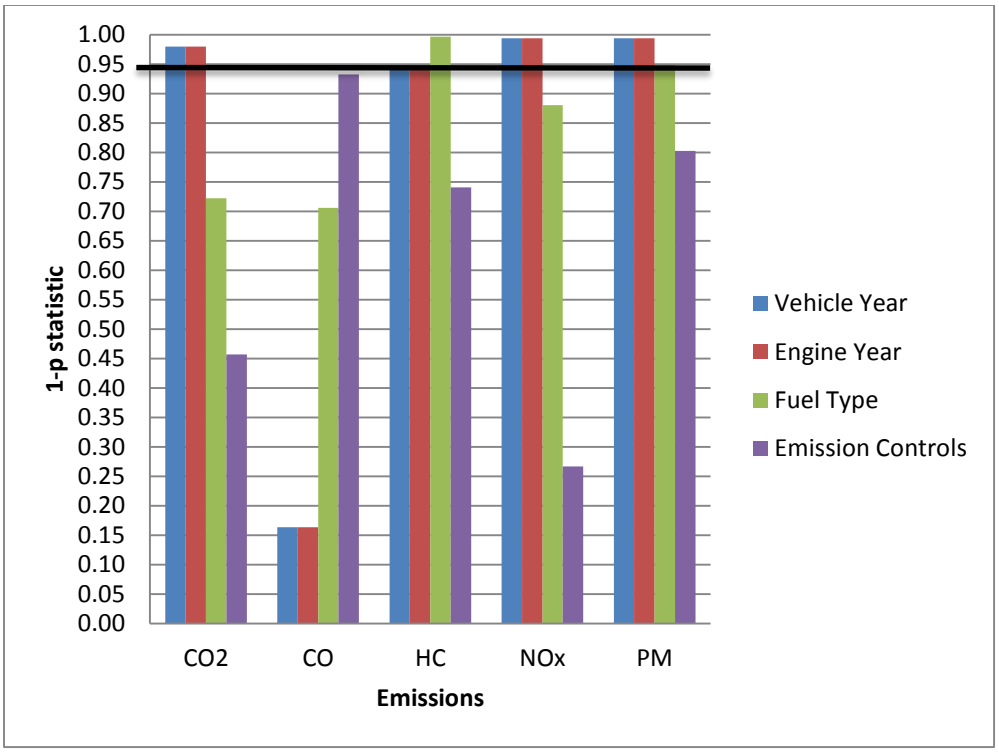


Figure 53. Regression Results from the Side-load Trucks with a Road Grade between 0 and 3

Figure 54 shows the p statistic of the side-load trucks while they are traveling uphill. Fuel type is a producer of HC emissions. NOx and PM are both relevant to vehicle year and engine year. These results are very similar to the regression results with a road grade less than 0.

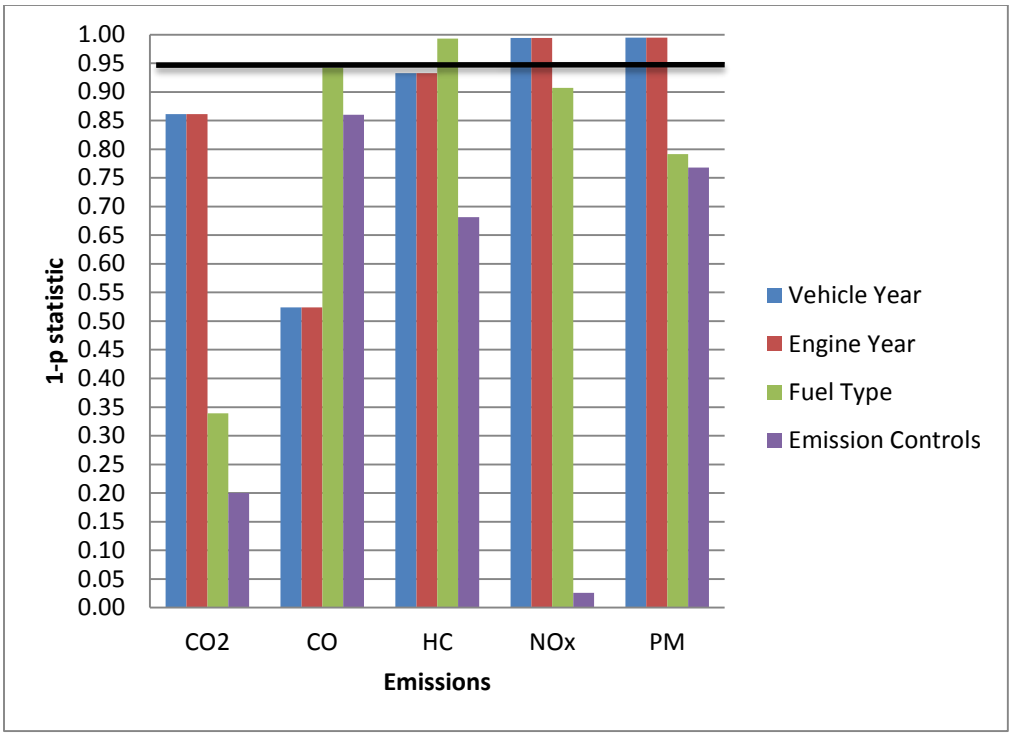


Figure 54. Regression Results from the Side-load Trucks with a Road Grade >3

Tables 29-31 are the full models tested from the NOx emission averages in the side-load trucks. The models were typical, and not much contradiction occurred when the different factors were tested together and separately. But it is interesting to note that the vehicle year and engine year models equations of the line and p statistic are identical. It shows how closely related the two factors are.

Table 29. Results from the Models with Vehicle Year

Equation	Constant (p)	VY (p)	EC (p)	N	R^2	Adj. R^2	p stat of Model
40	88.5113 (0.0176)	-32.1418 (0.0110)	1.44733 (0.8290)	9	0.6890	0.5854	0.0301
41	93.1481 (0.0008)	-32.2222 (0.0058)	-	9	0.6864	0.6416	0.0058

Table 30. Results from the Models with Engine Year

Equation	Constant (p)	EY (p)	EC (p)	N	R^2	Adj. R^2	p stat of Model
42	88.5113 (0.0176)	-32.1418 (0.0110)	1.44733 (0.8290)	9	0.6890	0.5854	0.0301
43	93.1481 (0.0008)	-32.2222 (0.0058)	-	9	0.6864	0.6416	0.0058

Table 31. Results from the Models with Neither VY or EY

Equation	Constant (p)	FT (p)	EC (p)	N	R^2	Adj. R^2	p stat of Model
44	30.0517 (0.3581)	-67.8908 (0.0765)	10.2931 (0.3152)	9	0.4361	0.2481	0.1793
45	57.5000 (0.0120)	-54.1667 (0.1102)	-	9	0.3233	0.2266	0.1102
46	32.0291 (0.4163)	-	2.38350 (0.8286)	9	0.0071	-0.1347	0.8286

4.8. ROLL-OFF TRUCKS

Figure 55 illustrates the p statistic of the roll-off truck emissions data averages. It shows that engine year and emission controls are producers of NOx and PM emissions. Also, PM is significant to vehicle year as well. CO_2, CO, and HC are not significantly affected by the emissions averages.

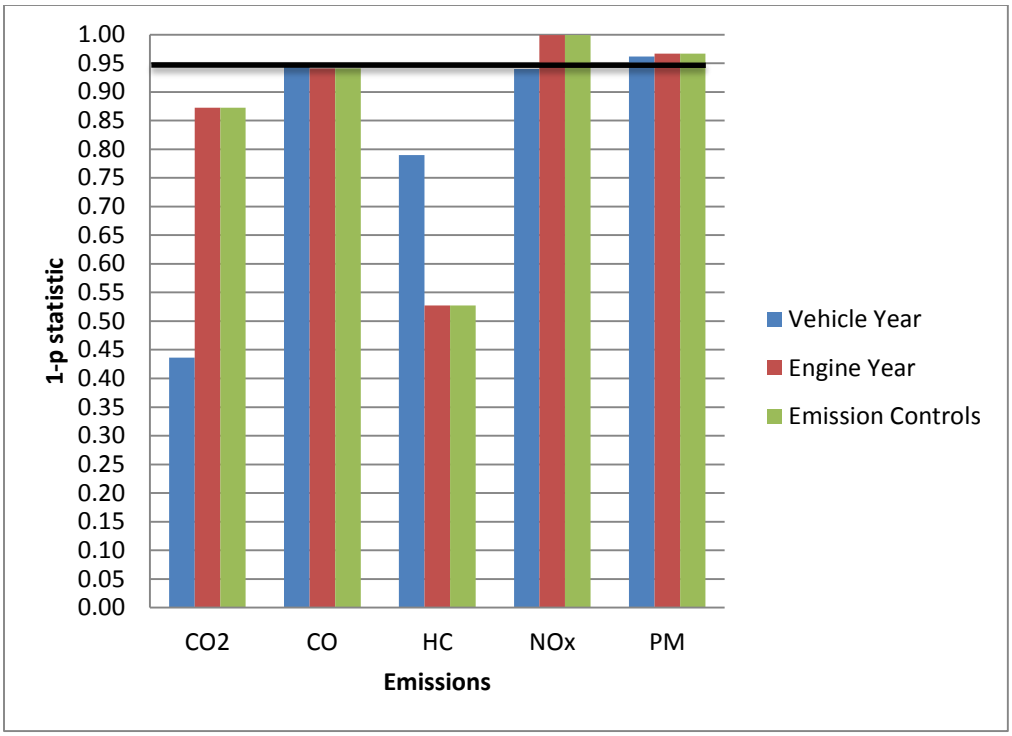


Figure 55. Regression Results from the Roll-off Truck Averages

Figure 56 shows the p statistic of the roll-off trucks while they are idling. The only emission that is relevant in NOx, and it is produced by engine year and emission controls. CO_2, CO, HC, and PM are not statistically significant while the roll-off trucks are idling.

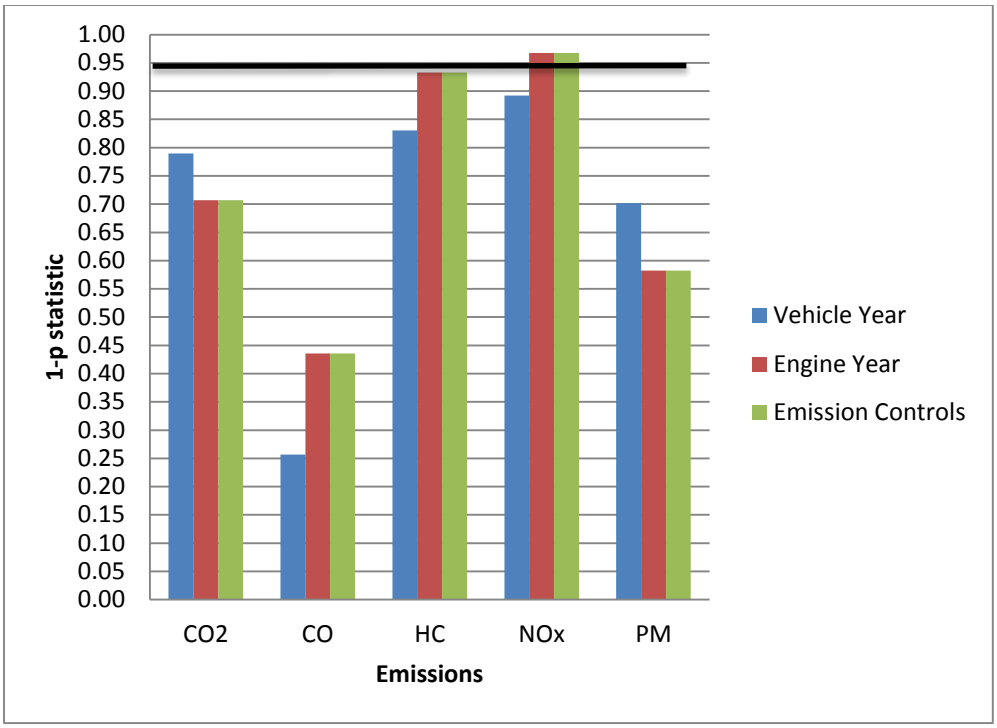


Figure 56. Regression Results from the Roll-off Trucks in OP Mode 0

Figure 57 shows the p statistic of the roll-off trucks while they are idling. There are more emissions affected by this truck mode than while they are decelerating or braking. All three emissions tested produce CO and NOx emissions. Vehicle year is solely a producer of HC and PM emissions. CO_2 is not significantly affected by the roll-off trucks while they are idling.

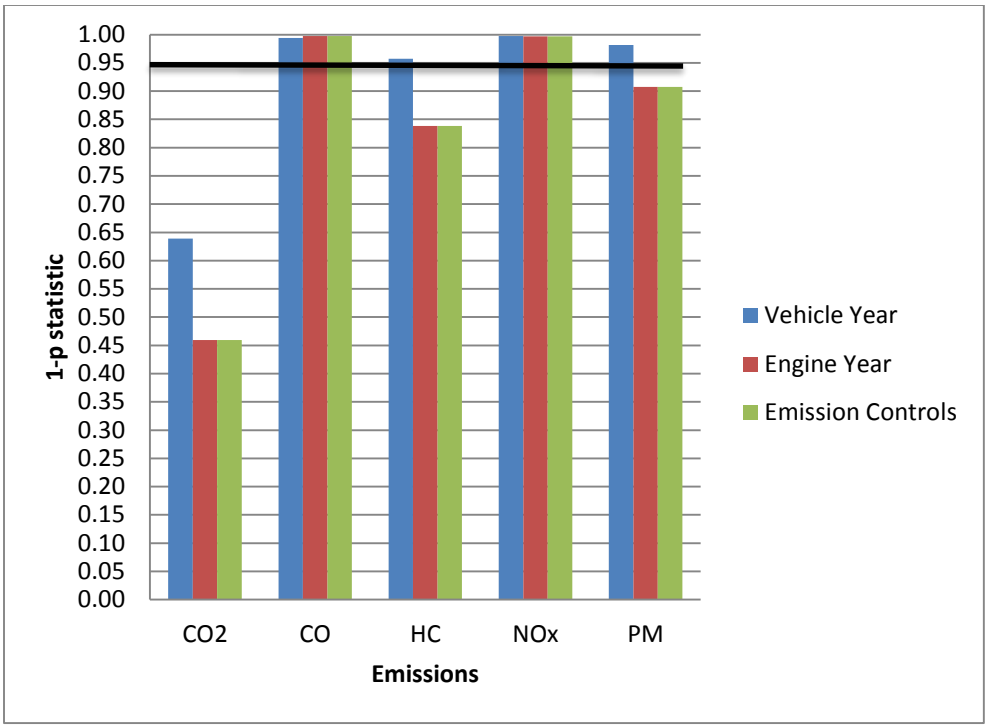


Figure 57. Regression Results from the Roll-off Trucks in OP Mode 1

Figure 58 shows the p statistic of the roll-off trucks while they are traveling at a speed between 1 and 25 mph. All three factors, vehicle year, engine year, and emission controls produce CO, NOx, and PM emissions. CO_2 and HC are not statistically relevant in the roll-off trucks while they are traveling at a speed between 1 and 25 mph.

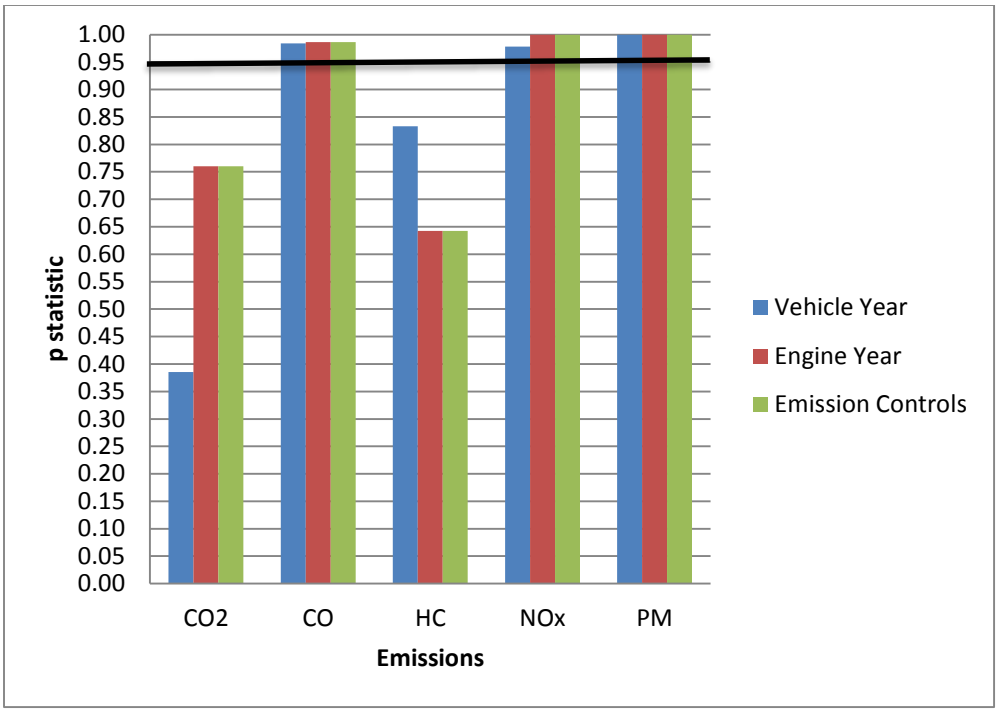


Figure 58. Regression Results from the Roll-off Trucks in OP Modes 11-16

Figure 59 shows the p statistic of the roll-off trucks while they are traveling at a speed between 25 and 50 mph. All three factors, vehicle year, engine year, and emission controls are producers of CO, HC, NOx, and PM. CO_2 is not statistically significant. This mode produces the highest amount of emissions in the roll-off trucks.

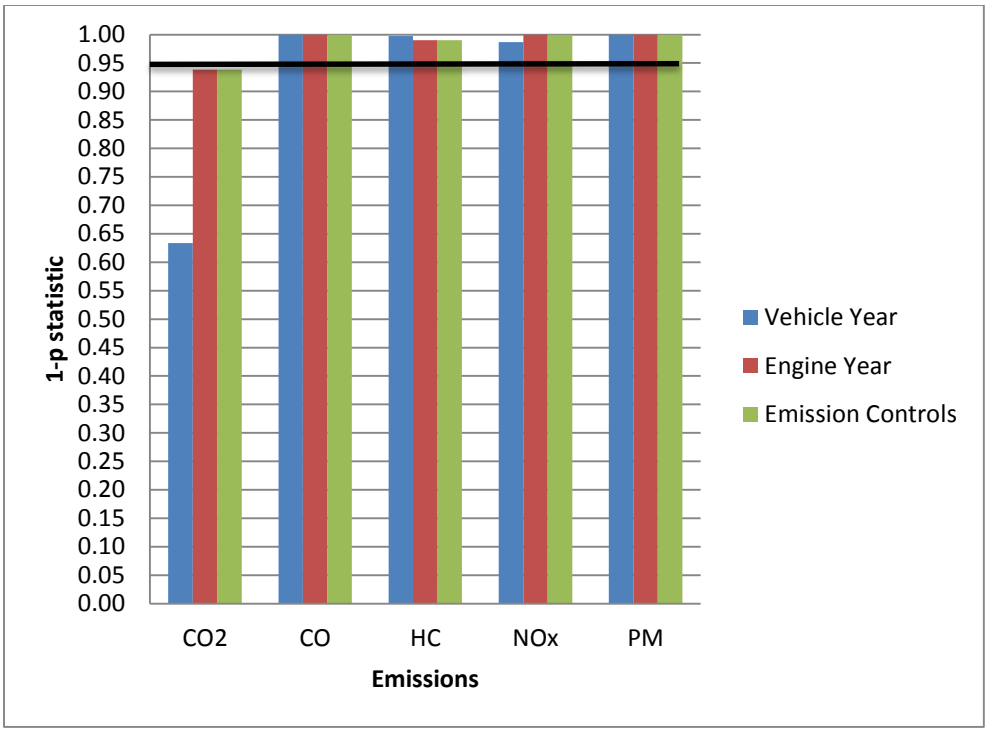


Figure 59. Regression Results from the Roll-off Trucks in OP Modes 21-30

Figure 60 illustrates the p statistic of the roll-off trucks while they are traveling at a speed greater than 50 mph. Vehicle year is significant to CO, HC, NOx and PM. Engine year and emission controls are all relevant factors to CO, NOx, and PM. CO_2 is not statistically significant. This mode also produces substantial emissions in the roll-off trucks.

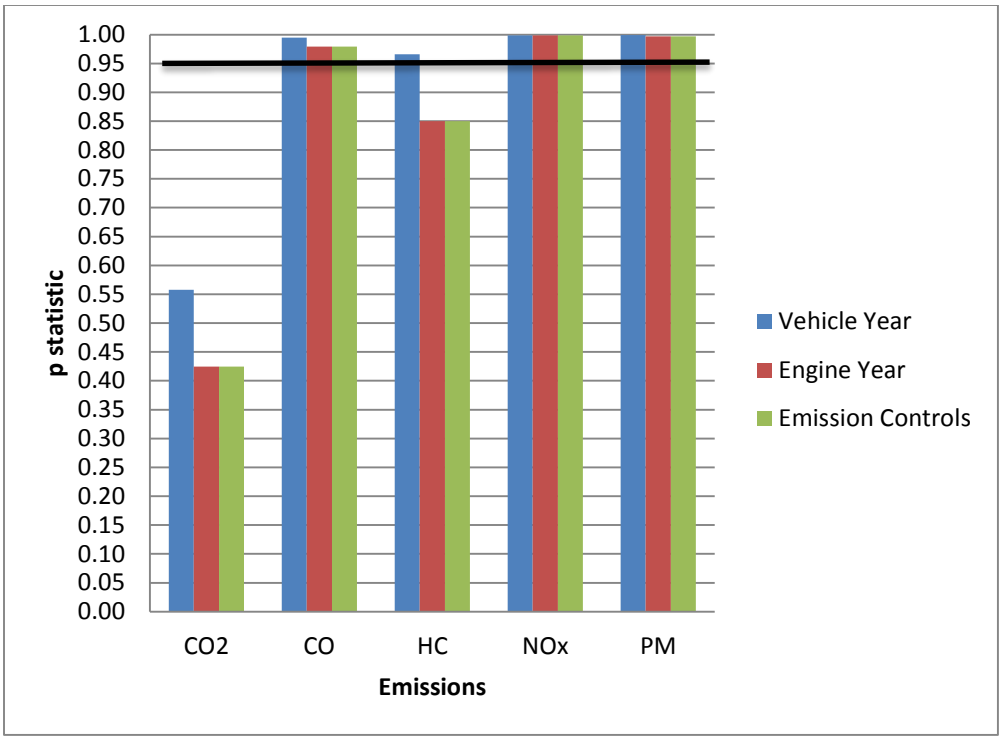


Figure 60. Regression Results from the Roll-off Trucks in OP Modes 33-40

Figure 61 shows the p statistic from the roll-off trucks while they are driving downhill. Vehicle year is a producer of CO, NOx, and PM emissions. Emission controls are significant to both CO and NOx. CO_2 and HC are not statistically relevant while the roll-off trucks are moving downhill.

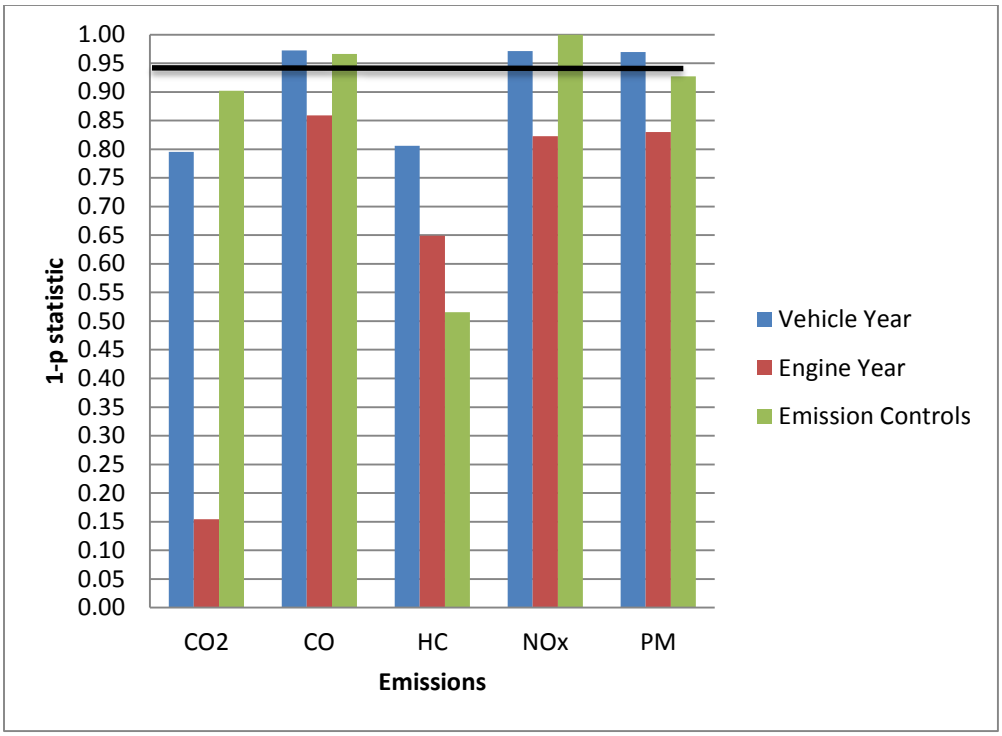


Figure 61. Regression Results from the Roll-off Trucks with a Road Grade <0

Figure 62 illustrates the p statistic of the roll-off trucks while they are traveling on a road with a slope between 1 and 3. Emission controls are the only relevant factor, and they produce CO, NOx, and PM emissions. CO_2 and HC are not significantly affected by the road grade between 0 and 3 in the roll-off trucks.

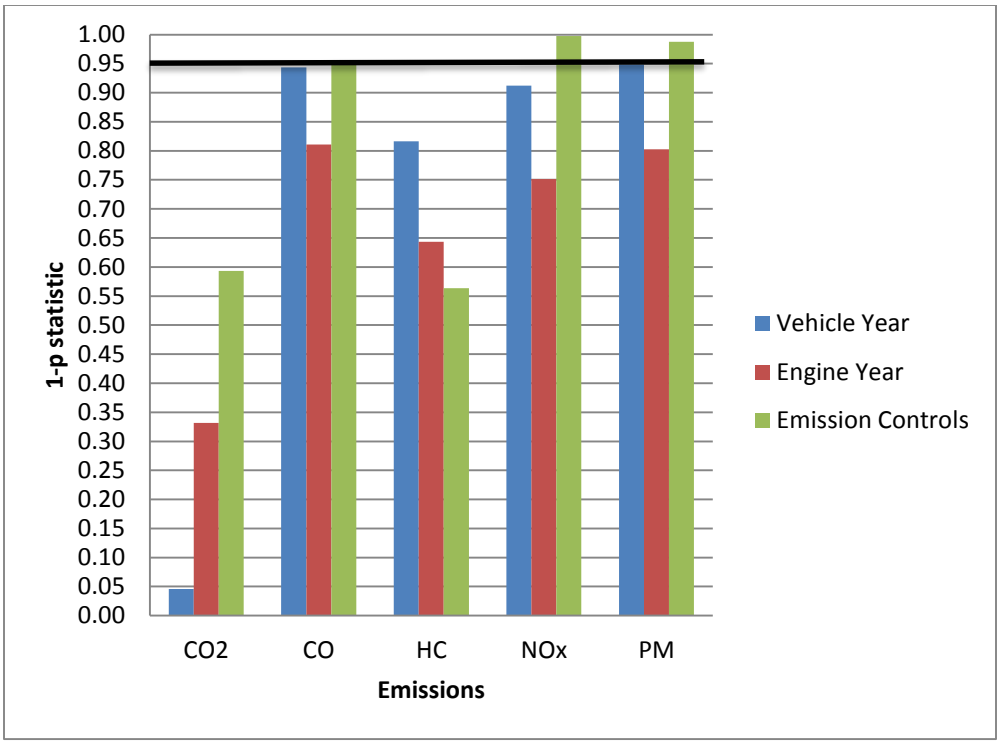


Figure 62. Regression Results from the Roll-off Trucks with a Road Grade between 0 and 3

Figure 63 shows the p statistic of the roll-off trucks while they are traveling uphill. NOx is the only emission produced in this mode, and is only affected by the vehicle year and emission controls. CO_2, CO, HC and PM are not significantly produced when the roll-off trucks are driving uphill.

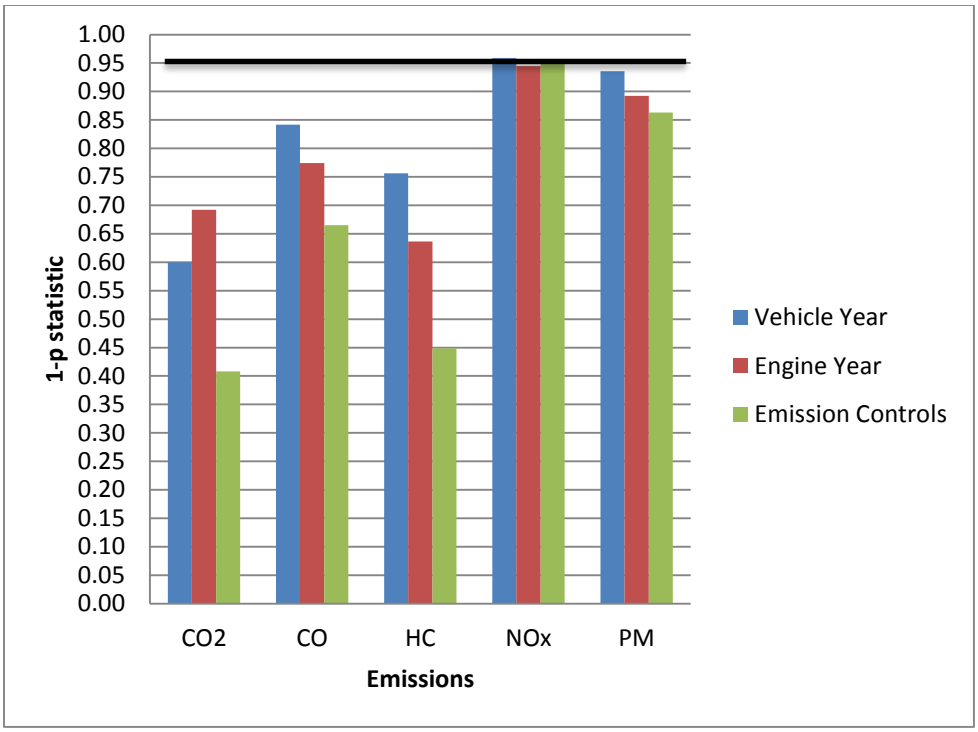


Figure 63. Regression Results from the Roll-off Trucks with a Road Grade >3

Tables 32-34 show the models from the CO_2 emissions of the roll-off trucks in OP Modes 21-30. This model is interesting because when the vehicle year is tested with emission controls, but when both factors are tested alone, they are insignificant. There must be further analysis done to determine why the results are showing this way.

Table 32. Results from the Models with Vehicle Year

Equation	Constant (p)	VY (p)	EC (p)	N	R^2	Adj. R^2	p stat of Model
48	10134.70 (0.0021)	12763.00 (0.0048)	-19592.40 (0.0012)	45	0.2392	0.2029	0.0032
49	16038.30 (0.0000)	-1405.54 (0.3663)	-	45	0.0190	-0.0038	0.3663

Table 33. Results from the Models with Engine Year

Equation	Constant (p)	EY (p)	EC (p)	N	R^2	Adj. R^2	p stat of Model
50	Too highly correlated						
51	16736.30 (0.0000)	-2499.14 (0.0618)	-	45	0.0788	0.0574	0.0618

Table 34. Results from the Models with Neither VY or EY

Equation	Constant (p)	EC (p)	N	R^2	Adj. R^2	p stat of Model
52	16736.30 (0.0000)	-3748.71 (0.0618)	45	0.0788	0.0574	0.0618

The descriptive statistics and the regression analysis provide a lot of specific information about how the trucks operate, and what modes affect them the most. A more in-depth analysis as to why the different modes studied perform the way they do is provided in the discussion of the results below.

CHAPTER 5. DISCUSSION

There was a large amount of output from the regression analysis models. The results illustrated the outputs from the models containing all of the trucks, the diesel fuel, CNG fuel, front-load, side-load, and roll-off trucks in various truck operating modes. The discussion will focus on major patterns and underlying causes of the regression results. The results differ greatly depending on the different operating modes and road grades, the regression analysis is dependent on what the truck is doing at the time of measurement.

The regression analysis performed on the averages of the truck data shows a basic relationship between the five emissions and the five factors. There are a few relationships shown in this analysis. It shows that vehicle year and engine year are almost always producers of the same emissions. This is supported by the high correlations between the two factors. It also shows the differences in the three types of trucks tested and what particular emissions are produced while in route. Overall, the emission averages do not show much of a pattern between the various models, so it is necessary to evaluate with a more in-depth analysis like the operating modes and the road grade.

Op mode 0 is classified by the decelerating and braking of the refuse trucks. Since the decelerating or braking occur at different times within the routes and also rely on the operator of the vehicle, there may be some discrepancies with the results. This is supported by the very low R^2 values of the OP Mode 0 models, indicating that a lot of outside factors affected the data collected. The least amount of emissions are significantly produced in this particular mode.

Operating mode 1 is while the trucks are sitting idle. The regression analysis shows the highest R^2 values in all of the models in this mode, most likely due to the truck not moving so the data is not affected by many outside factors. There are also few factors affecting the emissions during this mode as well, particularly because the truck is not in motion, thus, fewer pollutants are produced.

Operating modes 11-16 indicate when the trucks are moving at a speed between 1 and 25 mph. At this speed, the trucks will most likely be traveling through the residential areas of their particular route. Since the truck is in motion, there may be a lot of stopping to collect waste, stoplights, and stop signs that affect this speed. There is a lot of dependence on the different driver methods and where the route is. This statement is supported by the low R^2 values in the models tested.

Operating modes 21-30 are when the vehicles are traveling at a speed between 25 to 50 mph. This is most likely when the trucks are traveling on main roads between stops. There are probably many traffic lights when the trucks are driving at this speed. This type of travel much like operating modes 11-16, is dependent on the human operation and the route characteristics, so the R^2 values are fairly low as well. This mode also affects the factors the most, and in turn produces the highest amount of emissions in majority of the models tested. This is likely due to the traffic patterns, various stop lights, and the distance needed to travel within the truck route.

Operating modes 33-40 are when the trucks are traveling at a speed greater than 50 mph. This is likely the travel on interstates while in route. Much like OP Modes 21-30, there are a lot more emissions that are relevant in these models. Since travel on the interstate does not have any stoplights, there is minimal human operation besides driving

at a constant speed, so the R^2 values have increased in these particular models. The higher the speed of the truck the greater the emissions are affected by the factors tested.

The three categories of road grade tested all produce very similar results. The emissions stay around the same whether or not the truck is traveling uphill, downhill, or on a flat surface. This could be because the Raleigh area is not very hilly indicating there is not enough of a slope in the road to produce significant emissions in the trucks. The R^2 values vary in these models from very low to high, so there are sometimes outside factors affecting the data collection, but not often.

The models containing all of the trucks were tested based on the averages, OP Modes, and three road grade classifications. The trucks are definitely dependent on the various speeds and slope of the road, but it varies depending on which is tested. Vehicle year, engine year, and fuel type are almost always producers of both NOx and PM emissions except when it comes to OP Mode 0. This is probably due to the fact that when the trucks decelerate or brake the two emissions are not prominent but when the trucks are moving they become significant again. NOx and PM show similar results and this is explained by the high correlations between the two emissions. There are no real patterns to CO_2, CO, nor HC in the models with all of the trucks combined. This lack of a relationship could be explained by the lack of correlation between the emissions.

The models that tested the diesel fuel trucks overall showed that vehicle year and engine year are significant producers of CO_2, CO, NOx and PM emissions, except in OP Mode 0. The vehicle year and engine year then became producers of HC emissions in this particular mode. This could be because the trucks are technically not accelerating so the emissions are not as present in this mode, or could be a discrepancy. Vehicle type

also becomes a prominent producer of HC emissions in majority of the truck modes. This is likely due to one type of truck producing significant amounts of HC in various modes of operation. The diesel fuel trucks overall do produce significant amounts of the five emissions tested in some capacity, and the vehicle and engine year seem to be the underlying cause.

The CNG fuel truck models do not produce many emissions. The only factors that show significance are CO, when the trucks are idling, and CO_2 and HC when the trucks are traveling at a speed between 1 and 25 mph. The remaining modes do not have an apparent effect on the emissions produced. The lack of significance could be due to the fact that there are only six CNG fuel trucks that were tested, and the data sets were small. Or it could mean that this fuel type does not produce enough emissions to be deemed significant, and is a better alternative than the diesel fuel trucks.

The front-load trucks emissions are affected by all four factors tested, the vehicle year, engine year, fuel type and emission controls. NOx and PM are produced in every truck mode except when the trucks are decelerating or braking. NOx and PM seem to only be relevant when the trucks are accelerating. When the front-load trucks are idling or moving slowly, CO_2, CO and HC are not produced. CO and HC are also not produced with the slope of the road changes. The higher speeds yield the greatest effect on the emissions. The front-load trucks are affected the most by the four factors tested, and they produce the most emissions out of the three truck types.

The side-load trucks emissions are generally affected by the vehicle year and engine year. Both vehicle year and engine year produce CO_2, HC, NOx, and PM in the truck speeds ranging from 1-50 mph. The road grades produce NOx and PM emission

from the vehicle year and engine year as well. When the trucks are decelerating or braking, fuel type becomes the producer of CO_2, CO, and HC emissions. The side-load trucks emit less emissions than the front-load trucks. This could be due to the differing routes that the trucks take, or maybe the driving methods differing between the two.

The roll-off trucks are the heaviest trucks with the least amount of stops. They are also all diesel fuel, while the side-load and front-load tested some CNG fuel as well. Overall, decelerating and braking did not have much of an effect on the emissions. When the speed varied from 1-50 mph, vehicle year, engine year and emission controls become producers of CO, NOx, PM, and sometimes HC. The road grade emitted significant amounts of CO, NOx, and PM, when the trucks were traveling downhill, but the remainder of the driving conditions had a very small impact on the emissions. Overall, the roll-off trucks emitted the least amount of emissions in comparison to the front-load and side-load trucks. This is interesting to see that the weight of the trucks does not necessarily mean it will affect the amount of emissions produced.

All of the regression results give some insight into how the various trucks behave, and whether the type of truck and fuel type have an impact on the significance of the emissions produced. The vehicle year and engine year seem to be the most prominent factor to all of the emissions, and the higher truck speeds definitely affect the amount of emissions produced.

CHAPTER 6. CONCLUSION

The study of the air emissions produced from solid waste refuse trucks is vital due to the increasing environmental standards. This study focused on the impact that three different types of refuse trucks and two different fuel types may have on the emission production while they are in route in the Raleigh, North Carolina area. Many of the previous studies did not evaluate three types of trucks while in real life situations. A lot of their focus was on the amount of emissions produced, not on what underlying factors on the trucks tested will produce significant amounts of emissions.

The truck data was first summarized to show similarities between the various truck types. The roll-off trucks collected the most waste, and since they made the least amount of stops, the trucks also had the best fuel economy. Both the front-load diesel and CNG fuel trucks consumed the most fuel while in route. The side-load diesel and CNG fuel trucks had the highest average of emissions per waste collected. The emissions data is then evaluated based on the vehicle year, engine year, vehicle type, fuel type and emission controls through a multiple regression analysis.

The multiple regression analysis was performed on the average emissions data, operating modes, and road grades within the truck routes. The emissions averages showed a basic relationship between the different trucks and the amount of emissions produced. The operating modes affected the amount of emissions produced the most, especially when the trucks were traveling at speeds greater than 25 mph. The road grades did not affect the emissions production as much as the operating modes, but did still produce some significant amounts. Vehicle year and engine year were the most prevalent factors in the regression results. The diesel fuel trucks produced more significant

emissions than the CNG fuel trucks. Out of the three trucks tested, the front-load trucks also produced the most significant emissions. This shows that the weight of the trucks does not have as much of an impact on the emissions produced as what the truck may be doing in route at that particular time.

This study showed the importance of the amount of pollutants that are produced by the solid waste refuse trucks not only in residential areas, but also on highways and in-town roads. The amounts produced are significant enough to look into modifications for the trucks to decrease the amounts emitted. Since this study was done on real life solid waste refuse trucks, there could be some discrepancies with the collected data and results. The technology used to collect the emissions data could have malfunctioned on the routes, the trucks were driven by 24 different drivers with different driving habits, the routes and traffic patterns are different for every truck, and many other outside factors. To further this study, a more in-depth analysis of the routes traveled for each truck, the driver habits, and the traffic patterns should be done to further show which factors produced the most emissions.

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APPENDIX

Emission Averages

Table 35. Results from the Models with CO_2 Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year (p)	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	13.3840 (0.0000)	-1.29087 (0.0118)	-	-1.73841 (0.0051)	-	0.23780 (0.4525)	24	0.4751	0.3964	0.0042
11	13.3867 (0.000)	-1.09667 (0.0099)	-	-1.56667 (0.0050)	-	-	24	0.4597	0.4083	0.0016
12	11.9366 (0.000)	-0.96679 (0.0890)	-	-	-	-0.15903 (0.6434)	24	0.2149	0.1401	0.0788
13	11.8200 (0.0000)	-1.09667 (0.0256)	-	-	-	-	24	0.2067	0.1706	0.0256
14	12.9403 (0.0000)	-	-1.59261 (0.0011)	-1.64775 (0.0029)	-	0.47979 (0.1237)	24	0.5791	0.5159	0.0005
15	13.0615 (0.0000)	-	-1.17316 (0.0023)	-1.37114 (0.0085)	-	-	24	0.5247	0.4794	0.0004
16	11.7488 (0.000)	-	-1.40367 (0.0115)	-	-	0.12217 (0.7243)	24	0.3377	0.2746	0.0132
17	11.8423 (0.0000)	-	-1.29082 (0.0031)	-	-	-	24	0.3336	0.3033	0.0031
18	12.0971 (0.0000)	-	-	-1.75824 (0.0106)	-2.73321 (0.0935)	0.26526 (0.5153)	24	0.3711	0.2768	0.0234
19	12.2444 (0.0000)	-	-	-1.56667 (0.0091)	-2.01111 (0.0791)	-	24	0.3573	0.2961	0.0096
20	12.0263 (0.0000)	-	-	-1.40037 (0.0342)	-	-0.23026 (0.4498)	24	0.2736	0.2044	0.0349
21	11.0085 (0.0000)	-	-	-	-1.30645 (0.4489)	-0.25885 (0.5340)	24	0.1210	0.0373	0.2582

22	11.7417 (0.0000)	-	-	-1.56667 (0.0122)	-	-	24	0.2531	0.2191	0.0122
23	10.6778 (0.0000)	-	-	-	-2.01111 (0.1238)	-	24	0.1043	0.0635	0.1238
24	11.0892 (0.0000)	-	-	-	-	-0.46681 (0.1405)	24	0.0961	0.0550	0.1405
Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	13.7533 (0.0000)	-1.2333 (0.0867)	-	-2.4412 (0.0095)	-	0.4688 (0.2904)	18	0.4808	0.3691	0.0237
27	13.8444 (0.0872)	-1.2333 (0.0872)	-	-1.9333 (0.0117)	-	-	18	0.4356	0.3604	0.0137
28	12.2419 (0.0000)	-1.2333 (0.1575)	-	-	-	-0.2588 (0.5605)	18	0.1462	0.0323	0.3057
29	11.9111 (0.0000)	-1.2333 (0.1483)	-	-	-	-	18	0.1260	0.0714	0.1483
30	13.3467 (0.0000)	-	-1.7791 (0.0130)	-2.0708 (0.0136)	-	0.5374 (0.1785)	18	0.5908	0.5031	0.0048
31	13.4246 (0.0000)	-	-1.7227 (0.0174)	-1.5026 (0.0317)	-	-	18	0.5321	0.4697	0.0034
32	12.2509 (0.0000)	-	-2.0927 (0.0132)	-	-	-0.0482 (0.9018)	18	0.3578	0.2722	0.0361
33	12.2024 (0.0000)	-	-2.1110 (0.0088)	-	-	-	18	0.3572	0.3170	0.0088
34	12.5199 (0.0000)	-	-	-2.4412 (0.0138)	-	0.4688 (0.3238)	18	0.3544	0.2683	0.0376
35	12.6111 (0.0000)	-	-	-1.9333 (0.0165)	-	-	18	0.3096	0.2665	0.0165
36	11.0085 (0.0000)	-	-	-	-	-0.2588 (0.5740)	18	0.0202	0.0411	0.5740
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model

38	9.5000 (0.0003)	-	-	-0.8333 (0.2065)	-	-	6	0.3619	0.2024	0.2065
Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	13.6817 (0.0000)	0.6405 (0.6001)	-	-	-	-1.5762 (0.0919)	9	0.6823	0.5765	0.0321
41	14.5574 (0.0000)	-1.4611 (0.0416)	-	-	-	-	9	0.4698	0.3940	0.0416
42	14.5000 (0.0000)	-	-3.5333 (0.4998)	-	-	1.4000 (0.7116)	9	0.6926	0.5901	0.0291
43	14.3000 (0.0000)	-	-1.6333 (0.0059)	-	-	-	9	0.6849	0.6398	0.0059
43	14.5000 (0.0000)	-	-	-	3.5333 (0.4998)	-2.1333 (0.1691)	9	0.6926	0.5901	0.0291
45	13.4333 (0.0000)	-	-	-	-3.9333 (0.0191)	-	9	0.5674	0.5056	0.0191
46	14.0923 (0.0073)	-	-	-	-	-1.1821 (0.0073)	9	0.6661	0.6184	0.0073
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	10.3981 (0.0012)	-1.4757 (0.0461)	-	-	-	0.3376 (0.4584)	9	0.5414	0.3886	0.0964
49	11.4796 (0.0000)	-1.4944 (0.0348)	-	-	-	-	9	0.4935	0.4211	0.0348
50	10.3981 (0.0012)	-	-1.4757 (0.0461)	-	-	0.3376 (0.4584)	9	0.5414	0.3886	0.0964
51	11.4796 (0.0000)	-	-1.4944 (0.0348)	-	-	-	9	0.4935	0.4211	0.0348
52	7.72759 (0.0061)	-	-	-	-2.6529 (0.2255)	0.6897 (0.2798)	9	0.2800	0.0399	0.3733
53	9.56667 (0.0000)	-	-	-	-1.7333 (0.3818)	-	9	0.1106	-0.0164	0.3818
54	7.80485	-	-	-	-	0.3806	9	0.0610	-0.0731	0.5216

	(0.0055)					(0.5216)				
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	8.70000 (0.0050)	2.0000 (0.0816)	-	-	-	-2.5000 (0.0336)	6	0.8383	0.7305	0.6000
57	9.53333 (0.0008)	-0.5000 (0.5639)	-	-	-	-	6	0.0898	-0.1377	0.5639
58	9.70000 (0.0001)	-	-1.0000 (0.1276)	-	-	-	6	0.4790	0.3488	0.1276
59	9.70000 (0.0001)	-	-	-	-	-1.0000 (0.1276)	6	0.4790	0.3488	0.1276

Table 36. Results from the Models with CO Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	32.1501 (0.0057)	-9.38580 (0.1006)	-	-5.57815 (0.3983)	-	11.4928 (0.0049)	24	0.3382	0.2389	0.0376
11	32.2778 (0.0168)	3.419E-16 (1.0000)	-	2.72222 (0.7037)	-	-	24	0.0070	-0.0875	0.9286
12	27.5057 (0.0053)	-8.34592 (0.1292)	-	-	-	10.2195 (0.0055)	24	0.3135	0.2482	0.0193
13	35.0000 (0.0021)	7.008E-16 (1.0000)	-	-	-	-	24	0.0000	-0.0455	1.0000
14	26.3138 (0.0120)	-	-7.03206 (0.2268)	-4.21255 (0.5283)	-	11.2248 (0.0114)	24	0.2949	0.1892	0.0671
15	29.1490 (0.0141)	-	2.78114 (0.5888)	2.25870 (0.7522)	-	-	24	0.0211	-0.0721	0.0177
16	23.2678 (0.0094)	-	-6.54904 (0.2479)	-	-	10.3105 (0.0113)	24	0.2804	0.2119	0.0316
17	31.1573	-	2.97497	-	-	-	24	0.0163	-0.0284	0.5520

	(0.0017)		(0.5520)							
18	21.7792 (0.0256)	-	-	-0.59812 (0.9321)	19.2626 (0.2775)	4.59740 (0.3141)	24	0.2847	0.1774	0.0765
19	24.3333 (0.0108)	-	-	2.72222 (0.6625)	31.7778 (0.0173)	-	24	0.2466	0.1748	0.0512
20	22.2781 (0.0228)	-	-	-3.12028 (0.6408)	-	8.08962 (0.0191)	24	0.2401	0.1678	0.0559
21	21.4089 (0.0117)	-	-	-	19.7480 (0.2285)	4.41911 (0.2639)	24	0.2844	0.2163	0.0298
22	32.2778 (0.0018)	-	-	2.72222 (0.6969)	-	-	24	0.0070	-0.0381	0.6969
23	27.0556 (0.0002)	-	-	-	31.7778 (0.0152)	-	24	0.2395	0.2050	0.0152
24	20.1900 (0.0166)	-	-	-	-	7.56253 (0.0172)	24	0.2320	0.1971	0.0172
Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	47.0290 (0.0000)	-23.8333 (0.0001)	-	-2.88601 (0.6089)	-	5.27940 (0.0894)	18	0.6910	0.6248	0.0007
27	48.0556 (0.0000)	-23.8333 (0.0002)	-	2.83333 (0.5699)	-	-	18	0.6175	0.5665	0.0007
28	45.2423 (0.0000)	-23.8333 (0.0001)	-	-	-	4.41911 (0.0764)	18	0.6850	0.6429	0.0002
29	50.8889 (0.0000)	-23.8333 (0.0001)	-	-	-	-	18	0.6089	0.5844	0.0001
30	33.3447 (0.0007)	-	-21.8389 (0.0021)	1.66118 (0.8110)	-	6.12172 (0.1044)	18	0.5430	0.4459	0.0101
31	34.2319 (0.0008)	-	-21.1969 (0.0037)	8.13257 (0.2008)	-	-	18	0.4445	0.3705	0.0122
32	34.2238 (0.0001)	-	-21.5872 (0.0014)	-	-	6.59158 (0.0358)	18	0.5410	0.4798	0.0029
33	40.8469 (0.0000)	-	-19.0957 (0.0066)	-	-	-	18	0.3782	0.3393	0.0066

34	23.1957 (0.0318)	-	-	-2.88601 (0.7576)	-	5.27940 (0.2903)	18	0.0821	-0.0403	0.5259
35	24.2222 (0.0253)	-	-	2.83333 (0.7143)	-	-	18	0.0086	-0.0534	0.7143
36	21.4089 (0.0139)	-	-	-	-	4.41911 (0.2679)	18	0.0761	0.0183	0.2679
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	56.3333 (0.0260)	-	-	2.50000 (0.8390)	-	-	6	0.0116	-0.2355	0.8390
Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	52.4008 (0.0022)	-39.3452 (0.0113)	-	-	-	30.2381 (0.0065)	9	0.7352	0.6469	0.0186
41	35.6019 (0.0726)	0.97222 (0.9102)	-	-	-	-	9	0.0019	-0.1406	0.9102
42	42.3333 (0.0155)	-	-131.333 (0.0881)	-	-	102.000 (0.0748)	9	0.5042	0.3389	0.1219
43	27.7619 (0.0733)	-	7.09524 (0.3588)	-	-	-	9	0.1211	-0.0044	0.3588
43	42.3333 (0.0155)	-	-	-	131.333 (0.0881)	-29.3333 (0.1525)	9	0.5042	0.3389	0.1219
45	27.6667 (0.0275)	-	-	-	28.6667 (0.1409)	-	9	0.2824	0.1799	0.1409
46	27.1795 (0.0632)	-	-	-	-	6.02564 (0.2825)	9	0.1622	0.0425	0.2825
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	5.19692 (0.8665)	-1.21151 (0.9038)	-	-	-	12.6929 (0.1181)	9	0.3593	0.1457	0.2630
49	45.8611 (0.0807)	-1.91667 (0.8676)	-	-	-	-	9	0.0043	-0.1380	0.8676

50	5.19692 (0.8665)	-	-1.21151 (0.9038)	-	-	12.6929 (0.1181)	9	0.3593	0.1457	0.2630
51	45.8611 (0.0807)	-	-1.91667 (0.8676)	-	-	-	9	0.0043	-0.1380	0.8676
52	3.44828 (0.8897)	-	-	-	13.0575 (0.6212)	11.2069 (0.1813)	9	0.3854	0.1805	0.2322
53	33.3333 (0.0548)	-	-	-	28.0000 (0.3010)	-	9	0.1512	0.0299	0.3010
54	3.06796 (0.8956)	-	-	-	-	12.7282 (0.0890)	9	0.3576	0.2658	0.0890
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	30.5000 (0.0207)	-7.00000 (0.5194)	-	-	-	-5.00000 (0.5906)	6	0.6871	0.4785	0.1750
57	32.1667 (0.0048)	-12.0000 (0.0528)	-	-	-	-	6	0.6495	0.5619	0.0528
58	27.0000 (0.0039)	-	-10.2500 (0.0588)	-	-	-	6	0.6318	0.5398	0.0588
59	27.0000 (0.0039)	-	-	-	-	-10.2500 (0.0588)	6	0.6318	0.5398	0.0588

Table 37. Results from the Models with HC Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	9.21567 (0.0341)	2.68493 (0.2209)	-	-2.98158 (0.2503)	-	-0.41012 (0.7751)	24	0.1614	0.0356	0.3073
11	9.21111 (0.0302)	2.35000 (0.1920)	-	-3.27778 (0.1601)	-	-	24	0.1579	0.0777	0.1646
12	6.73320 (0.0681)	3.24076 (0.1363)	-	-	-	-1.09072 (0.4131)	24	0.1027	0.0172	0.3207

13	5.93333 (0.0898)	2.35000 (0.2021)	-	-	-	-	24	0.0729	0.0307	0.2021
14	11.4760 (0.0058)	-	0.98215 (0.6603)	-3.53213 (0.1833)	-	0.12553 (0.9372)	24	0.1034	-0.0311	0.5249
15	11.5077 (0.0044)	-	1.09190 (0.5225)	-3.45976 (0.1540)	-	-	24	0.1031	0.0177	0.3190
16	8.92201 (0.0131)	-	1.38716 (0.5403)	-	-	-0.64107 (0.6738)	24	0.0182	-0.0753	0.8243
17	8.43147 (0.0107)	-	0.79499 (0.6468)	-	-	-	24	0.0097	-0.0353	0.6468
18	11.9903 (0.0027)	-	-	-3.43488 (0.2170)	1.90783 (0.7790)	0.21753 (0.9012)	24	0.0981	-0.0372	0.5487
19	12.1111 (0.0014)	-	-	-3.27778 (0.1742)	2.50000 (0.5973)	-	24	0.0974	0.0115	0.3409
20	12.0397 (0.0021)	-	-	-3.68469 (0.1539)	-	0.56341 (0.6448)	24	0.0945	0.0082	0.3527
21	9.86369 (0.0049)	-	-	-	4.69512 (0.4737)	-0.80637 (0.6097)	24	0.0248	-0.0680	0.7679
22	12.7361 (0.0004)	-	-	-3.27778 (0.1668)	-	-	24	0.0850	0.0435	0.1668
23	8.83333 (0.0012)	-	-	-	2.50000 (0.6049)	-	24	0.0124	-0.0325	0.6049
24	9.57390 (0.0051)	-	-	-	-	-0.05901 (0.9598)	24	0.0001	-0.0453	0.9598

Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]

Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	10.7799 (0.0373)	4.00000 (0.1839)	-	-7.94073 (0.0386)	-	1.56068 (0.4067)	18	0.3475	0.2077	0.1033
27	11.0833 (0.0302)	4.00000 (0.1788)	-	6.25000 (0.0436)	-	-	18	0.3134	0.2218	0.0596
28	5.86369 (0.2324)	4.00000 (0.2358)	-	-	-	-0.80637 (0.6419)	18	0.1045	-0.0149	0.4370
29	4.83333 (0.2533)	4.00000 (0.2236)	-	-	-	-	18	0.0911	0.0343	0.2236

30	13.9576 (0.0049)	-	1.76934 (0.5870)	-8.30914 (0.0429)	-	1.49243 (0.4523)	18	0.2725	0.1166	0.2032
31	14.1739 (0.0037)	-	1.92583 (0.5480)	-6.73146 (0.0453)	-	-	18	0.2414	0.1403	0.1259
32	9.56045 (0.0361)	-	0.51083 (0.8866)	-	-	-0.85778 (0.6436)	18	0.0148	-0.1165	0.8940
33	8.69856 (0.0295)	-	0.18660 (0.9565)	-	-	-	18	0.0002	-0.0623	0.9565
34	14.7799 (0.0015)	-	-	-7.94073 (0.0427)	-	1.56068 (0.4198)	18	0.2564	0.1573	0.1084
35	15.0833 (0.0010)	-	-	-6.25000 (0.0482)	-	-	18	0.2223	0.1737	0.0482
36	9.86369 (0.0119)	-	-	-	-	-0.80637 (0.6468)	18	0.0134	-0.0482	0.6468
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	8.66667 (0.0367)	-	-	2.66667 (0.2505)	-	-	6	0.3107	0.1383	0.2505
Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	1.14286 (0.8388)	22.3571 (0.0080)	-	-	-	-14.6429 (0.0094)	9	0.7207	0.6276	0.0218
41	9.27778 (0.3034)	2.83333 (0.5137)	-	-	-	-	9	0.0633	-0.0705	0.5137
42	5.66667 (0.3882)	-	85.0000 (0.0339)	-	-	-63.0000 (0.0327)	9	0.5611	0.4148	0.0845
43	14.6667 (0.0806)	-	-0.50000 (0.9025)	-	-	-	9	0.0023	-0.1402	0.9025
43	5.66667 (0.3882)	-	-	-	-85.0000 (0.0339)	22.0000 (0.0433)	9	0.5611	0.4148	0.0845
45	16.6667 (0.0232)	-	-	-	-8.00000 (0.4491)	-	9	0.0841	-0.0467	0.4491
46	15.4744	-	-	-	-	-0.88462	9	0.0134	-0.1276	0.7671

	(0.0581)					(0.7671)				
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	-2.44895 (0.5669)	3.11183 (0.0555)	-	-	-	1.51297 (0.1626)	9	0.5671	0.4228	0.0811
49	2.39815 (0.4411)	3.02778 (0.0749)	-	-	-	-	9	0.3843	0.2964	0.0749
50	-2.44895 (0.5669)	-	3.11183 (0.0555)	-	-	1.51297 (0.1626)	9	0.5671	0.4228	0.0811
51	2.39815 (0.4411)	-	3.02778 (0.0749)	-	-	-	9	0.3843	0.2964	0.0749
52	3.29310 (0.2908)	-	-	-	9.39655 (0.0201)	0.32759 (0.7238)	9	0.6829	0.5772	0.0319
53	4.16667 (0.0264)	-	-	-	9.83333 (0.0066)	-	9	0.6757	0.6293	0.0066
54	3.01942 (0.5031)	-	-	-	-	1.42233 (0.2832)	9	0.1618	0.0420	0.2832
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	10.5000 (0.0703)	-7.0000 (0.2845)	-	-	-	3.25000 (0.5360)	6	0.4470	0.0784	0.4112
57	9.41667 (0.0440)	-3.7500 (0.2100)	-	-	-	-	6	0.3575	0.1969	0.2100
58	7.0000 (0.0743)	-	-2.0000 (0.4726)	-	-	-	6	0.1356	-0.0805	0.4726
59	7.0000 (0.0743)	-	-	-	-	-2.0000 (0.4726)	6	0.1356	-0.0805	0.4726

Table 38. Results from the Models with NOx Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	102.174 (0.0000)	-30.0611 (0.0000)	-	-7.20479 (0.2618)	-	-0.63953 (0.8572)	24	0.7134	0.6704	0.0000
11	102.167 (0.0000)	-30.5833 (0.0000)	-	-7.66667 (0.1832)	-	-	24	0.7129	0.6856	0.0000
12	96.1751 (0.0000)	-28.7179 (0.0000)	-	-	-	-2.28417 (0.4874)	24	0.6943	0.6652	0.00000
13	94.5000 (0.0000)	-30.5833 (0.0000)	-	-	-	-	24	0.6870	0.6728	0.00000
14	89.4080 (0.0000)	-	-32.8500 (0.0000)	-4.43517 (0.3955)	-	3.10638 (0.3334)	24	0.8018	0.7720	0.0000
15	90.1927 (0.0000)	-	-30.1342 (0.0000)	-2.64430 (0.5856)	-	-	24	0.7920	0.7722	0.0000
16	86.2011 (0.0000)	-	-32.3414 (0.0000)	-	-	2.14380 (0.4700)	24	0.7943	0.7747	0.0000
17	87.8415 (0.0000)	-	-30.3611 (0.0000)	-	-	-	24	0.7890	0.7794	0.0000
18	72.0828 (0.0000)	-	-	-7.05348 (0.4422)	-58.9665 (0.0159)	-0.08903 (0.8847)	24	0.4402	0.3562	0.0078
19	71.6111 (0.0000)	-	-	-7.66667 (0.3357)	-61.2778 (0.0008)	-	24	0.4396	0.3862	0.0023
20	70.5556 (0.0000)	-	-	0.66732 (0.9454)	-	-11.5394 (0.0218)	24	0.2462	0.1744	0.0514
21	67.7159 (0.0000)	-	-	-	-53.2429 (0.0191)	-2.95159 (0.5669)	24	0.4230	0.3681	0.0031

22	56.2917 (0.0003)	-	-	-7.66667 (0.4525)	-	-	24	0.0259	-0.0184	0.4525
23	63.9444 (0.0000)	-	-	-	-61.2778 (0.0007)	-	24	0.4137	0.3871	0.0007
24	71.0022 (0.0000)	-	-	-	-	-11.4266 (0.0137)	24	0.2460	0.2117	0.0137
Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	106.112 (0.0000)	-30.5000 (0.0021)	-	-12.7546 (0.2169)	-	0.85042 (0.8718)	18	0.5376	0.4385	0.0110
27	106.278 (0.0000)	-30.5000 (0.0015)	-	-11.8333 (0.1524)	-	-	18	0.5367	0.4749	0.0031
28	98.2159 (0.0000)	-30.5000 (0.0022)	-	-	-	-2.95159 (0.5079)	18	0.4823	0.4133	0.0072
29	94.4444 (0.0000)	-30.5000 (0.0018)	-	-	-	-	18	0.4665	0.4331	0.0018
30	92.7432 (0.0000)	-	-36.8623 (0.0001)	-5.07931 (0.5488)	-	2.27221 (0.6035)	18	0.6853	0.6179	0.0008
31	93.0725 (0.0000)	-	-36.6240 (0.0001)	-2.67732 (0.6974)	-	-	18	0.6790	0.6362	0.0002
32	90.0552 (0.0000)	-	-37.6316 (0.0001)	-	-	0.83554 (0.8148)	18	0.6768	0.6338	0.0002
33	90.8947 (0.0000)	-	-37.3158 (0.0000)	-	-	-	18	0.6756	0.6553	0.0000
34	75.6124 (0.0001)	-	-	-12.7546 (0.3599)	-	0.85042 (0.9060)	18	0.0711	-0.0527	0.5751
35	75.7778 (0.0001)	-	-	-11.8333 (0.2879)	-	-	18	0.0702	0.0121	0.2879
36	67.7159 (0.0000)	-	-	-	-	-2.95159 (0.6183)	18	0.0159	-0.0456	0.6183
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model

38	2.00000 (0.1234)	-	-	0.66667 (0.4107)	-	-	6	0.1739	-0.0326	0.4107
Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	98.1706 (0.0000)	-6.22619 (0.5110)	-	-	-	-19.8095 (0.0170)	9	0.9344	0.9125	0.0003
41	109.176 (0.0000)	-32.6389 (0.0008)	-	-	-	-	9	0.8173	0.7912	0.0008
42	101.333 (0.0000)	-	-62.0000 (0.0927)	-	-	21.6667 (0.3781)	9	0.9574	0.9432	0.0001
43	98.2381 (0.0000)	-	-32.5952 (0.0000)	-	-	-	9	0.9509	0.9439	0.0000
43	101.333 (0.0000)	-	-	-	62.0000 (0.0927)	-40.3333 (0.0034)	9	0.9574	0.9432	0.0001
45	81.1667 (0.0000)	-	-	-	-79.1667 (0.0011)	-	9	0.8014	0.7730	0.0011
46	94.1795 (0.0000)	-	-	-	-	-23.6410 (0.0000)	9	0.9290	0.9189	0.0000
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	88.5113 (0.0176)	-32.1418 (0.0110)	-	-	-	1.44733 (0.8290)	9	0.6890	0.5854	0.0301
49	93.1481 (0.0008)	-32.2222 (0.0058)	-	-	-	-	9	0.6864	0.6416	0.0058
50	88.5113 (0.0176)	-	-32.1418 (0.0110)	-	-	1.44733 (0.8290)	9	0.6890	0.5854	0.0301
51	93.1481 (0.0008)	-	-32.2222 (0.0058)	-	-	-	9	0.6864	0.6416	0.0058
52	30.0517 (0.3581)	-	-	-	-67.8908 (0.0765)	10.2931 (0.3152)	9	0.4361	0.2481	0.1793
53	57.5000 (0.0120)	-	-	-	-54.1667 (0.1102)	-	9	0.3233	0.2266	0.1102
54	32.0291	-	-	-	-	2.38350	9	0.0071	-0.1347	0.8286

	(0.4163)					(0.8286)				
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	70.500 (0.0009)	8.5000 (0.3343)	-	-	-	-38.750 (0.0091)	6	0.9718	0.9529	0.0047
57	83.4167 (0.0051)	-30.2500 (0.0601)	-	-	-	-	6	0.6282	0.5352	0.0601
58	74.7500 (0.0000)	-	-32.3750 (0.0006)	-	-	-	6	0.9594	0.9492	0.0006
59	74.7500 (0.0000)	-	-	-	-	-32.3750 (0.0006)	6	0.9594	0.9492	0.0006

Table 39. Results from the Models with PM Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	1.55333 (0.0000)	-0.74530 (0.0000)	-	-0.13739 (0.2703)	-	0.17485 (0.0184)	24	0.7366	0.6971	0.0000
11	1.55528 (0.0000)	-0.60250 (0.0000)	-	-0.01111 (0.9298)	-	-	24	0.6499	0.6165	0.0000
12	1.43894 (0.0000)	-0.71968 (0.0000)	-	-	-	0.14349 (0.0325)	24	0.7197	0.6930	0.0000
13	1.54417 (0.0000)	-0.60250 (0.0000)	-	-	-	-	24	0.6497	0.6338	0.0000
14	1.19236 (0.0000)	-	-0.73695 (0.0000)	-0.05669 (0.6508)	-	0.23317 (0.0059)	24	0.7182	0.6759	0.0000
15	1.25126 (0.0000)	-	-0.53310 (0.0000)	0.07774 (0.5757)	-	-	24	0.5844	0.5448	0.0001
16	1.15137 (0.0000)	-	-0.73045 (0.0000)	-	-	0.22087 (0.0045)	24	0.7152	0.6881	0.0000
17	1.32038 (0.0000)	-	-0.52642 (0.0000)	-	-	-	24	0.5780	0.5588	0.0000

18	0.79903 (0.0101)	-	-	-0.09182 (0.6752)	-1.14255 (0.0462)	0.11175 (0.4299)	24	0.2143	0.0965	0.1762
19	0.86111 (0.0042)	-	-	-0.01111 (0.9538)	-0.83833 (0.0383)	-	24	0.1888	0.1116	0.1111
20	0.76943 (0.0193)	-	-	0.05778 (0.7959)	-	-0.09539 (0.3813)	24	0.0368	-0.0549	0.6745
21	0.74218 (0.0060)	-	-	-	-1.06804 (0.0439)	0.08438 (0.4913)	24	0.2072	0.1317	0.0873
22	0.65153 (0.0256)	-	-	-0.01111 (0.9574)	-	-	24	0.0001	-0.0453	0.9574
23	0.85000 (0.0001)	-	-	-	-0.83833 (0.0339)	-	24	0.1887	0.1518	0.0339
24	0.80810 (0.0051)	-	-	-	-	-0.08563 (0.3908)	24	0.0337	-0.0103	0.3908

Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]

Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	1.71927 (0.0000)	-0.87750 (0.0000)	-	-0.16086 (0.3959)	-	0.13233 (0.1912)	18	0.7178	0.6573	0.0004
27	1.74500 (0.0000)	-0.87750 (0.0000)	-	-0.01750 (0.9119)	-	-	18	0.6798	0.6371	0.0002
28	1.61968 (0.0000)	-0.87750 (0.0000)	-	-	-	0.08438 (0.3003)	18	0.7024	0.6627	0.0001
29	1.72750 (0.0000)	-0.87750 (0.0000)	-	-	-	-	18	0.6795	0.6595	0.0000
30	1.26744 (0.0000)	-	-0.91597 (0.0001)	0.02986 (0.8777)	-	0.16766 (0.1111)	18	0.7057	0.6427	0.0005
31	1.29174 (0.0000)	-	-0.89839 (0.0001)	0.20710 (0.2402)	-	-	18	0.6449	0.5976	0.0004
32	1.28324 (0.0000)	-	-0.91145 (0.0000)	-	-	0.17611 (0.0434)	18	0.7052	0.6659	0.0001
33	1.46019 (0.0000)	-	-0.84488 (0.0001)	-	-	-	18	0.6095	0.5851	0.0001
34	0.84117 (0.0294)	-	-	-0.16086 (0.6305)	-	0.13233 (0.4532)	18	0.0383	-0.0899	0.7461

35	0.86750 (0.0225)	-	-	-0.01750 (0.9484)	-	-	18	0.0003	-0.0622	0.9484
36	0.74218 (0.0167)	-	-	-	-	0.08438 (0.5495)	18	0.0228	-0.0382	0.5495
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	0.01000 (0.0132)	-	-	0.00167 (0.3739)	-	-	6	0.2000	0.0000	0.3739
Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	1.75067 (0.0025)	-0.86845 (0.0589)	-	-	-	0.18738 (0.4878)	9	0.7254	0.6339	0.0207
41	1.64657 (0.0011)	-0.61861 (0.0049)	-	-	-	-	9	0.7004	0.6576	0.0049
42	1.80667 (0.0000)	-	-5.31000 (0.0000)	-	-	3.53333 (0.0001)	9	0.9738	0.9651	0.0000
43	1.30190 (0.0041)	-	-0.51476 (0.0194)	-	-	-	9	0.5658	0.5038	0.0194
43	1.80667 (0.0000)	-	-	-	5.31000 (0.0000)	-1.77667 (0.0000)	9	0.9738	0.9651	0.0000
45	0.91833 (0.0312)	-	-	-	-0.90833 (0.1688)	-	9	0.2517	0.1448	0.1688
46	1.19397 (0.0081)	-	-	-	-	-0.34705 (0.0392)	9	0.4776	0.4030	0.0392
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	0.83816 (0.0965)	-0.63951 (0.0036)	-	-	-	0.26390 (0.0387)	9	0.8304	0.7739	0.0049
49	1.68361 (0.0031)	-0.65417 (0.0102)	-	-	-	-	9	0.6340	0.5817	0.0102
50	0.83816 (0.0965)	-	-0.63951 (0.0036)	-	-	0.26390 (0.0387)	9	0.8304	0.7739	0.0049

51	1.68361 (0.0031)	-	-0.65417 (0.0102)	-	-	-	9	0.6340	0.5817	0.0102
52	-0.32862 (0.5196)	-	-	-	-1.47598 (0.0267)	0.42448 (0.0228)	9	0.6799	0.5732	0.0328
53	0.88333 (0.0609)	-	-	-	-0.87000 (0.2452)	-	9	0.1869	0.0707	0.2452
54	-0.28563 (0.6920)	-	-	-	-	0.28252 (0.1964)	9	0.2255	0.1149	0.1964
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	1.24000 (0.0221)	-0.29000 (0.5219)	-	-	-	-0.30250 (0.4478)	6	0.7598	0.5997	0.1177
57	1.34083 (0.0059)	-0.59250 (0.0381)	-	-	-	-	6	0.6991	0.6238	0.0381
58	1.09500 (0.0043)	-	-0.52000 (0.0332)	-	-	-	6	0.7179	0.6474	0.0332
59	1.09500 (0.0043)	-	-	-	-	-0.52000 (0.0332)	6	0.7179	0.6474	0.0332

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Table 40. Results from the Models with CO_2 Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	572.42 (0.3801)	543.93 (0.0886)	-	-749.69 (0.0742)	-	396.83 (0.0870)	24	0.4199	0.3329	0.0110
11	626.91 (0.3601)	821.76 (0.0071)	-	-478.52 (0.2304)	-	-	24	0.3260	0.2618	0.0159
12	-18.88 (0.9747)	636.04 (0.0583)	-	-	-	239.53 (0.2802)	24	0.3170	0.2519	0.0183
13	170.22 (0.7662)	808.33 (0.0082)	-	-	-	-	24	0.2770	0.2441	0.0082
14	819.22 (0.1647)	-	564.61 (0.0718)	-805.49 (0.0524)	-	342.21 (0.1544)	24	0.4300	0.3445	0.0093
15	937.47 (0.1198)	-	819.76 (0.0034)	615.03 (0.1196)	-	-	24	0.3676	0.3073	0.0081
16	252.73 (0.6411)	-	613.10 (0.0676)	-	-	185.09 (0.4389)	24	0.3087	0.2429	0.0207
17	405.75 (0.4200)	-	760.95 (0.0068)	-	-	-	24	0.2883	0.2559	0.0068
18	1095.17 (0.0233)	-	-	-444.03 (0.2092)	3209.36 (0.0012)	15.46 (0.9446)	24	0.6063	0.5473	0.0003
19	1103.76 (0.0154)	-	-	-432.87 (0.1583)	3251.45 (0.0000)	-	24	0.6062	0.5687	0.0001
20	1178.29 (0.0506)	-	-	-864.25 (0.0486)	-	597.30 (0.0070)	24	0.3270	0.2629	0.0156
21	820.27 (0.0522)	-	-	-	3569.68 (0.0003)	-116.90 (0.5610)	24	0.5732	0.5326	0.0001
22	1916.62 (0.0040)	-	-	-432.87 (0.3479)	-	-	24	0.0401	-0.0035	0.3479
23	670.90 (0.0377)	-	-	-	3251.45 (0.0000)	-	24	0.5661	0.5464	0.0000

24	599.94 (0.2727)	-	-	-	-	451.31 (0.0351)	24	0.1865	0.1496	0.0351
Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	557.79 (0.0822)	114.95 (0.4540)	-	224.59 (0.3569)	-	-192.20 (0.1438)	18	0.1680	-0.0103	0.4465
27	541.66 (0.1024)	95.33 (0.5490)	-	18.01 (0.9305)	-	-	18	0.0255	-0.1044	0.8240
28	696.16 (0.0170)	115.57 (0.4494)	-	-	-	-125.29 (0.2383)	18	0.1141	-0.0040	0.4031
29	558.65 (0.0319)	96.21 (0.5311)	-	-	-	-	18	0.0250	-0.0360	0.5311
30	642.61 (0.0307)	-	71.35 (0.6457)	210.03 (0.3982)	-	-191.87 (0.1511)	18	0.1462	-0.0367	0.5146
31	622.10 (0.0411)	-	41.11 (0.7970)	12.25 (0.9545)	-	-	18	0.0056	-0.1270	0.9587
32	760.67 (0.0046)	-	89.28 (0.5586)	-	-	-132.37 (0.2286)	18	0.0999	-0.0201	0.4540
33	632.35 (0.0079)	-	43.36 (0.7722)	-	-	-	18	0.0054	-0.0568	0.7722
34	680.73 (0.0151)	-	-	225.38 (0.3477)	-	-184.09 (0.1520)	18	0.1328	0.0171	0.3536
35	644.94 (0.0231)	-	-	25.96 (0.8978)	-	-	18	0.0011	-0.0614	0.8978
36	820.27 (0.0009)	-	-	-	-	-116.90 (0.2603)	18	0.0784	0.0208	0.2603
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	5272.85 (0.0125)	-	-	-1350.51 (0.1931)	-	-	6	0.3791	0.2239	0.1931
Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										

Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	160.85 (0.9021)	-430.74 (0.7580)	-	-	-	1549.93 (0.1385)	9	0.6527	0.5369	0.0419
41	-700.22 (0.6055)	1635.83 (0.0375)	-	-	-	-	9	0.4838	0.4100	0.0375
42	630.78 (0.5581)	-	-6465.77 (0.2591)	-	-	6009.84 (0.1655)	9	0.7193	0.6258	0.0221
43	-227.77 (0.8168)	-	1690.45 (0.0139)	-	-	-	9	0.6027	0.5460	0.0139
43	630.78 (0.5581)	-	-	-	6465.77 (0.2591)	-455.93 (0.7621)	9	0.7193	0.6258	0.0221
45	402.82 (0.5675)	-	-	-	4870.03 (0.0041)	-	9	0.7146	0.6738	0.0041
46	-115.27 (0.8965)	-	-	-	-	1284.86 (0.0090)	9	0.6466	0.5962	0.0090
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	-182.97 (0.8684)	535.52 (0.1478)	-	-	-	125.80 (0.6302)	9	0.3294	0.1059	0.3016
49	221.24 (0.7465)	528.30 (0.1264)	-	-	-	-	9	0.3007	0.2008	0.1264
50	-182.97 (0.8684)	-	535.52 (0.1478)	-	-	125.80 (0.6302)	9	0.3294	0.1059	0.3016
51	221.24 (0.7465)	-	528.30 (0.1264)	-	-	-	9	0.3007	0.2008	0.1264
52	893.73 (0.1396)	-	-	-	2336.60 (0.0055)	-164.62 (0.3524)	9	0.7541	0.6721	0.0149
53	454.74 (0.1653)	-	-	-	2117.10 (0.0042)	-	9	0.7124	0.6713	0.0042
54	825.67 (0.4225)	-	-	-	-	107.60 (0.7095)	9	0.0211	-0.1188	0.7095
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										

Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	866.52 (0.0606)	303.65 (0.5193)	-	-	-	-174.38 (0.7727)	6	0.3776	-0.0373	0.4910
57	916.34 (0.0140)	179.09 (0.2105)	-	-	-	-	6	0.3569	0.1961	0.2105
58	1018.34 (0.0065)	-	136.78 (0.2932)	-	-	-	6	0.2677	0.0846	0.2932
59	1018.34 (0.0065)	-	-	-	-	205.18 (0.2932)	6	0.2677	0.0846	0.2932

Table 41. Results from the Models with CO Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	4791.06 (0.2753)	3156.22 (0.1367)	-	-1149.30 (0.6709)	-	582.22 (0.6976)	24	0.1782	0.0550	0.2593
11	4871.01 (0.2569)	3563.84 (0.0505)	-	-751.45 (0.7589)	-	-	24	0.1718	0.0930	0.1381
12	3884.58 (0.2987)	3297.43 (0.1089)	-	-	-	341.06 (0.8016)	24	0.1706	0.0916	0.1403
13	4153.83 (0.2366)	3542.75 (0.0467)	-	-	-	-	24	0.1680	0.1302	0.0467
14	6050.08 (0.1241)	-	3548.30 (0.0868)		-	142.33 (0.9270)	24	0.2079	0.0891	0.1892
15	6099.26 (0.1088)	-	3654.42 (0.0296)		-	-	24	0.2075	0.1321	0.0869
16	5034.00 (0.1357)	-	3635.27 (0.0738)	-	-	-139.49 (0.9229)	24	0.1956	0.1190	0.1018
17	4918.68 (0.1101)	-	3523.85 (0.0307)	-	-	-	24	0.1952	0.1586	0.0307
18	7884.87 (0.0280)	-	-	318.52 (0.9021)	16287.30 (0.0187)	-1207.37 (0.4707)	24	0.3066	0.2026	0.0576

19	7214.11 (0.0333)	-	-	-553.46 (0.8072)	13000.60 (0.0085)	-	24	0.2879	0.2201	0.0283
20	8306.70 (0.0374)	-	-	-1814.06 (0.5116)	-	1745.44 (0.1983)	24	0.0794	-0.0082	0.4194
21	8082.07 (0.0101)	-	-	-	16028.80 (0.0126)	-1112.42 (0.4421)	24	0.3061	0.2400	0.0216
22	10464.30 (0.0058)	-	-	-553.46 (0.8327)	-	-	24	0.0021	-0.0433	0.8327
23	6660.65 (0.0060)	-	-	-	13000.60 (0.0071)	-	24	0.2858	0.2533	0.0071
24	7092.74 (0.0387)	-	-	-	-	1439.01 (0.2491)	24	0.0599	0.0172	0.2491
Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	5502.26 (0.1699)	1102.70 (0.5718)	-	2254.27 (0.4661)	-	-1864.46 (0.2587)	18	0.1045	-0.0873	0.6596
27	5345.83 (0.1851)	912.45 (0.6418)	-	250.29 (0.9220)	-	-	18	0.0159	-0.1153	0.8868
28	6891.20 (0.0524)	1108.93 (0.5634)	-	-	-	-1192.94 (0.3685)	18	0.0686	-0.0556	0.5867
29	5581.88 (0.0756)	924.66 (0.6255)	-	-	-	-	18	0.0152	-0.0463	0.6255
30	5927.53 (0.0980)	-	1411.46 (0.4695)	1958.25 (0.5263)	-	-1940.68 ().2396)	18	0.1179	-0.0711	0.6113
31	5720.10 (0.1128)	-	1105.59 (0.5721)	-42.20 (0.9872)	-	-	18	0.0228	-0.1074	0.8408
32	7028.28 (0.0252)	-	1578.67 (0.4055)	-	-	-1385.92 (0.3045)	18	0.0913	-0.0298	0.4876
33	5684.79 (0.0397)	-	1097.84 (0.5495)	-	-	-	18	0.0228	-0.0382	0.5495
34	6681.72 (0.0502)	-	-	2261.88 (0.4538)	-	-1786.66 (0.2649)	18	0.0831	-0.0392	0.5217
35	6334.32 (0.0620)	-	-	326.33 (0.8955)	-	-	18	0.0011	-0.0613	0.8955

36	8082.07 (0.0055)	-	-	-	-	-1112.42 (0.3878)	18	0.0469	-0.0126	0.3878
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	21974.30 (0.0469)	-	-	-2313.05 (0.6943)	-	-	6	0.0427	-0.196	0.6943
Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	1299.84 (0.8247)	-2585.82 (0.6810)	-	-	-	6963.01 (0.1378)	9	0.6227	0.4969	0.0537
41	-2568.50 (0.6717)	6698.19 (0.0520)	-	-	-	-	9	0.4384	0.3582	0.0520
42	2177.55 (0.6687)	-	-21972.50 (0.4078)	-	-	21428.60 (0.2817)	9	0.6563	0.5417	0.0406
43	-883.67 (0.8396)	-	7109.12 (0.0177)	-	-	-	9	0.5762	0.5156	0.0177
43	2177.55 (0.6687)	-	-	-	21972.50 (0.4078)	-543.94 (0.9393)	9	0.6563	0.5417	0.0406
45	1905.58 (0.5669)	-	-	-	20068.70 (0.0081)	-	9	0.6559	0.6068	0.0081
46	-357.74 (0.9287)	-	-	-	-	5371.73 (0.0128)	9	0.6109	0.5554	0.0128
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	-2755.94 (0.7727)	3739.48 (0.2271)	-	-	-	1155.92 (0.6083)	9	0.2539	0.0053	0.4153
49	958.18 (0.8710)	3673.15 (0.2056)	-	-	-	-	9	0.2176	0.1059	0.2056
50	-2755.94 (0.7727)	-	3739.48 (0.2271)	-	-	1155.92 (0.6083)	9	0.2539	0.0053	0.4153
51	958.18 (0.8710)	-	3673.15 (0.2056)	-	-	-	9	0.2176	0.1059	0.2056

52	4750.04 (0.4510)	-	-	-	15885.90 (0.0428)	-821.93 (0.6696)	9	0.5361	0.3815	0.0998
53	2558.24 (0.4361)	-	-	-	14790.00 (0.0282)	-	9	0.5206	0.4521	0.0282
54	4287.35 (0.6038)	-	-	-	-	1028.85 (0.6623)	9	0.0288	-0.1099	0.6623
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	17012.50 (0.0842)	-6155.47 (0.5611)	-	-	-	10069.30 (0.4793)	6	0.2025	-0.3292	0.7122
57	14135.60 (0.0587)	1036.90 (0.7432)	-	-	-	-	6	0.0299	-0.2126	0.7432
58	13934.80 (0.0333)	-	1583.32 (0.5644)	-	-	-	6	0.0896	-0.1380	0.5644
59	13934.80 (0.0333)	-	-	-	-	2374.98 (0.5644)	6	0.0896	-0.1380	0.5644

Table 42. Results from Models for HC Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	-1072.14 (0.7685)	4708.55 (0.0123)	-	1011.03 (0.6568)	-	434.39 (0.7302)	24	0.3800	0.2870	0.0205
11	-1012.49 (0.7760)	5012.67 (0.0023)	-	1307.85 (0.5266)	-	-	24	0.3762	0.3168	0.0070
12	-274.71 (0.9295)	4584.34 (0.0116)	-	-	-	646.53 (0.0073)	24	0.3737	0.3141	0.0073
13	235.71 (0.9357)	5049.39 (0.0018)	-	-	-	-	24	0.3639	0.3350	0.0018
14	1179.25 (0.7173)	-	4706.75 (0.0110)	509.17 (0.8199)	-	43.23 (0.9739)	24	0.3866	0.2946	0.0185
15	1194.18	-	4738.97	533.23	-	-	24	0.3866	0.3281	0.0059

	(0.7042)		(0.0019)	(0.7958)						
16	1537.34 (0.5817)	-	4676.09 (0.0094)	-	-	142.55 (0.9070)	24	0.3850	0.3264	0.0061
17	1655.18 (0.5151)	-	4789.96 (0.0012)	-	-	-	24	0.3846	0.3566	0.0012
18	3745.21 (0.2283)	-	-	2180.00 (0.3573)	16502.00 (0.0096)	-822.00 (0.5863)	24	0.3943	0.3034	0.0165
19	3288.54 (0.2615)	-	-	1586.33 (0.4400)	14264.30 (0.0019)	-	24	0.3850	0.3264	0.0061
20	4172.60 (0.2450)	-	-	19.31 (0.9940)	-	2169.73 (0.0913)	24	0.1456	0.0642	0.1916
21	5094.87 (0.0676)	-	-	-	14733.00 (0.0130)	-172.17 (0.8969)	24	0.3674	0.3071	0.0082
22	6894.62 (0.0491)	-	-	1586.33 (0.5303)	-	-	24	0.0181	-0.0265	0.5303
23	4874.88 (0.0232)	-	-	-	14264.30 (0.0017)	-	24	0.3669	0.3381	0.0017
24	4185.52 (0.1739)	-	-	-	-	2172.99 (0.0658)	24	0.1456	0.1068	0.0658

Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]

Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	2595.01 (0.4043)	3099.34 (0.0595)	-	-1338.19 (0.5840)	-	1.68 (0.9990)	18	0.2447	0.0829	0.2548
27	2595.16 (0.3871)	3099.51 (0.0501)	-	-1336.38 (0.4930)	-	-	18	0.2447	0.1440	0.1218
28	1770.50 (0.5020)	3095.64 (0.0534)	-	-	-	-396.95 (0.7005)	18	0.2278	0.1248	0.1439
29	1334.83 (0.5629)	3034.32 (0.0497)	-	-	-	-	18	0.2199	0.1711	0.0497
30	4089.23 (0.1371)	-	3407.75 (0.0363)	-2049.86 (0.3952)	-	-151.51 (0.9033)	18	0.2897	0.1375	0.1755
31	4073.04 (0.1245)	-	3383.87 (0.0299)	-2206.04 (0.2639)	-	-	18	0.2889	0.1941	0.0775

32	2936.98 (0.2054)	-	3232.71 (0.0412)	-	-	-732.23 (0.4851)	18	0.2507	0.1508	0.1148
33	2227.17 (0.2712)	-	2978.67 (0.0467)	-	-	-	18	0.2251	0.1766	0.0467
34	5910.11 (0.0525)	-	-	-1316.81 (0.6239)	-	220.36 (0.8752)	18	0.0179	-0.1130	0.8732
35	5952.96 (0.0430)	-	-	-1078.09 (0.6143)	-	-	18	0.0162	-0.0452	0.6143
36	5094.87 (0.0365)	-	-	-	-	-172.17 (0.8785)	18	0.0015	-0.0609	0.8785
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	12224.00 (0.1121)	-	-	6915.17 (0.1796)	-	-	6	0.3975	0.2469	0.1796
Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	-180.88 (0.9240)	2958.11 (0.1777)	-	-	-	809.26 (0.5612)	9	0.8037	0.7383	0.0076
41	-630.47 (0.7033)	4037.12 (0.0013)	-	-	-	-	9	0.7914	0.7615	0.0013
42	1685.80 (0.4170)	-	255.98 (0.9801)	-	-	255.98 (0.9801)	255.98 (0.9801)	255.98 (0.9801)	255.98 (0.9801)	255.98 (0.9801)
43	1336.87 (0.4106)	-	3570.90 (0.0037)	-	-	3570.90 (0.0037)	3570.90 (0.0037)	3570.90 (0.0037)	3570.90 (0.0037)	3570.90 (0.0037)
43	1685.80 (0.4170)	-	-	-	-255.98 (0.9801)	2698.55 (0.3620)	9	0.7275	0.6367	0.0202
45	3035.08 (0.0616)	-	-	-	9188.95 (0.0060)	-	9	0.6833	0.6381	0.0060
46	1715.34 (0.2749)	-	-	-	-	2629.63 (0.0035)	9	0.7275	0.6885	0.0035
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model

48	-12203.80 (0.2954)	6940.45 (0.0762)	-	-	-	2936.57 (0.2841)	9	0.4893	0.3191	0.1332
49	-2768.30 (0.7117)	6771.95 (0.0814)	-	-	-	-	9	0.3716	0.2818	0.0814
50	-12203.80 (0.2954)	-	6940.45 (0.0762)	-	-	2936.57 (0.2841)	9	0.4893	0.3191	0.1332
51	-2768.30 (0.7117)	-	6771.95 (0.0814)	-	-	-	9	0.3716	0.2818	0.0814
52	1612.41 (0.7971)	-	-	-	25542.20 (0.0068)	-275.06 (0.8877)	9	0.7585	0.6780	0.0141
53	878.91 (0.7855)	-	-	-	25175.50 (0.0023)	-	9	0.7577	0.7230	0.0023
54	868.46 (0.9377)	-	-	-	-	2700.73 (0.4076)	9	0.0998	-0.0288	0.4076
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	8971.90 (0.1695)	-6490.86 (0.4249)	-	-	-	15589.80 (0.1930)	6	0.6955	0.4926	0.1680
57	4517.66 (0.4232)	4644.74 (0.1697)	-	-	-	-	6	0.4116	0.2645	0.1697
58	5726.47 (0.1728)	-	4984.18 (0.0669)	-	-	-	6	0.6094	0.5118	0.0669
59	5726.47 (0.1728)	-	-	-	-	7476.26 (0.0669)	6	0.6094	0.5118	0.0669

Table 43. Results from the Models for NOx Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	8166.58 (0.0054)	148.22 (0.9067)	-	934.55 (0.5739)	-	-1487.07 (0.1163)	24	0.1450	0.0167	0.3606

11	7962.38 (0.0081)	-892.91 (0.4335)	-	-81.60 (0.9591)	-	-	24	0.0298	-0.0626	0.7280
12	8903.68 (0.0007)	33.40 (0.9783)	-	-	-	-1290.97 (0.1325)	24	0.1310	0.0482	0.2289
13	7884.50 (0.0018)	-895.20 (0.4210)	-	-	-	-	24	0.0297	-0.0144	0.4210
14	8525.88 (0.0017)	-	-305.38 (0.8064)	871.55 (0.5958)	-	-1294.47 (0.1913)	24	0.1470	0.0191	0.3537
15	8078.58 (0.0027)	-	-1270.52 (0.2270)	151.13 (0.9236)	-	-	24	0.0690	-0.0197	0.4721
16	9138.83 (0.0002)	-	-357.85 (0.7694)	-	-	-1124.47 (0.2194)	24	0.1346	0.0522	0.2191
17	8209.24 (0.0003)	-	-1256.07 (0.2164)	-	-	-	24	0.0686	0.0262	0.2164
18	8186.59 (0.0010)	-	-	1636.79 (0.3277)	5601.70 (0.1831)	-2448.00 (0.0300)	24	0.2187	0.1015	0.1679
19	6826.59 (0.0063)	-	-	-131.21 (0.9351)	-1062.30 (0.7418)	-	24	0.0056	-0.0891	0.9428
20	8331.67 (0.0009)	-	-	903.33 (0.5724)	-	-1432.44 (0.0740)	24	0.1444	0.0629	0.1945
21	9199.94 (0.0001)	-	-	-	4273.50 (0.2784)	-1960.09 (0.0470)	24	0.1794	0.1012	0.1255
22	6561.01 (0.0043)	-	-	-131.21 (0.9337)	-	-	24	0.0003	-0.0451	0.9337
23	6695.38 (0.0003)	-	-	-	-1062.30 (0.7359)	-	24	0.0053	-0.0399	0.7359
24	8936.17 (0.0001)	-	-	-	-	-1279.85 (0.0823)	24	0.1310	0.0915	0.0823

Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]

Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	7778.93 (0.0170)	-845.15 (0.5664)	-	3761.22 (0.1203)	-	-3019.90 (0.0244)	18	0.3353	0.1929	0.1161
27	7525.56 (0.0400)	-1153.30 (0.5007)	-	515.34 (0.8167)	-	-	18	0.0331	-0.0958	0.7770

28	10096.40 (0.0017)	-834.75 (0.5911)	-	-	-	-1899.48 (0.0884)	18	0.2054	0.0994	0.1783
29	8011.57 (0.0064)	-1128.16 (0.4956)	-	-	-	-	18	0.0295	-0.0312	0.4956
30	7784.65 (0.0067)	-	-1702.49 (0.2411)	4121.62 (0.0830)	-	-2893.75 (0.0254)	18	0.3848	0.2530	0.0710
31	7475.35 (0.0189)	-	-2158.57 (0.1979)	1138.76 (0.6055)	-	-	18	0.1101	-0.0086	0.4170
32	10101.50 (0.0005)	-	-1350.56 (0.3784)	-	-	-1726.11 (0.1214)	18	0.2316	0.1292	0.1386
33	8428.19 (0.0012)	-	-1949.41 (0.2170)	-	-	-	18	0.0936	0.0369	0.2170
34	6874.95 (0.0110)	-	-	3755.39 (0.1119)	-	-3079.53 (0.0185)	18	0.3190	0.2282	0.0561
35	6276.15 (0.0376)	-	-	419.23 (0.8474)	-	-	18	0.0024	-0.0600	0.8474
36	9199.94 (0.0004)	-	-	-	-	-1960.09 (0.0710)	18	0.1894	0.1388	0.0710
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	6865.17 (0.0408)	-	-	-1232.09 (0.4917)	-	-	6	0.1250	-0.0937	0.4917
Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	1719.03 (0.5890)	2739.43 (0.4263)	-	-	-	-935.28 (0.6831)	9	0.1878	-0.0829	0.5358
41	2238.63 (0.4164)	1492.39 (0.2813)	-	-	-	-	9	0.1629	0.0433	0.2813
42	4639.04 (0.1444)	-	-10087.70 (0.5012)	-	-	8122.33 (0.4623)	9	0.1609	-0.1189	0.5909
43	3478.71 (0.1696)	-	935.43 (0.4768)	-	-	-	9	0.0747	-0.0575	0.4768
43	4639.04	-	-	-	10087.70	-1965.40	9	0.1609	-0.1189	0.5909

	(0.1444)				(0.5012)	(0.6332)				
45	3656.34 (0.0884)	-	-	-	3208.82 (0.3495)	-	9	0.1255	0.0006	0.3495
46	3475.08 (0.1512)	-	-	-	-	750.53 (0.4348)	9	0.0893	-0.0408	0.4348
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	10186.80 (0.1710)	-639.15 (0.7597)	-	-	-	-1474.39 (0.3743)	9	0.1427	-0.1431	0.6302
49	5449.40 (0.2440)	-554.55 (0.7878)	-	-	-	-	9	0.0110	-0.1302	0.7878
50	10186.80 (0.1710)	-	-639.15 (0.7597)	-	-	-1474.39 (0.3743)	9	0.1427	-0.1431	0.6302
51	5449.40 (0.2440)	-	-554.55 (0.7878)	-	-	-	9	0.0110	-0.1302	0.7878
52	9046.50 (0.1416)	-	-	-	2182.02 (0.7116)	-1706.88 (0.3444)	9	0.1493	-0.1342	0.6156
53	4494.81 (0.1774)	-	-	-	-93.82 (0.9861)	-	9	0.0000	-0.1428	0.9861
54	8982.95 (0.1161)	-	-	-	-	-1452.67 (0.3445)	9	0.1280	0.0034	0.3445
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	13505.10 (0.0129)	3401.36 (0.4119)	-	-	-	-9157.83 (0.1485)	6	0.7846	0.6411	0.0999
57	16121.60 (0.0044)	-3139.95 (0.1079)	-	-	-	-	6	0.5159	0.3949	0.1079
58	15205.70 (0.0010)	-	-3270.76 (0.0327)	-	-	-	6	0.7198	0.6497	0.0327
59	15205.70 (0.0010)	-	-	-	-	-4906.14 (0.0327)	6	0.7198	0.6497	0.0327

Table 44. Results from Models with PM Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	480.83 (0.0100)	-86.89 (0.2937)	-	30.05 (0.7787)	-	-77.22 (0.201)	24	0.2298	0.1143	0.1481
11	470.23 (0.0124)	-140.95 (0.0591)	-	-22.71 (0.8214)	-	-	24	0.1626	0.0828	0.1552
12	504.53 (0.0021)	-90.58 (0.2572)	-	-	-	-70.91 (0.1945)	24	0.2267	0.1530	0.0673
13	448.55 (0.0041)	-141.59 (0.0524)	-	-	-	-	24	0.1605	0.1224	0.0524
14	431.12 (0.0107)	-	-74.01 (0.3660)	40.65 (0.7033)	-	-75.80 (0.2378)	24	0.2184	0.1012	0.1684
15	404.93 (0.0152)	-	-130.53 (0.0609)	-1.54 (0.9879)	-	-	24	0.1606	0.0806	0.1592
16	459.71 (0.0021)	-	-76.46 (0.3390)	-	-	-67.87 (0.2519)	24	0.2126	0.1376	0.0813
17	403.60 (0.0035)	-	-130.68 (0.0523)	-	-	-	24	0.1606	0.1224	0.0523
18	382.28 (0.0173)	-	-	57.27 (0.6182)	68.12 (0.8113)	-121.59 (0.1099)	24	0.1874	0.0655	0.2357
19	314.73 (0.0450)	-	-	-30.54 (0.7728)	-262.88 (0.2219)	-	24	0.0737	-0.0146	0.4478
20	384.05 (0.0143)	-	-	48.35 (0.6484)	-	-109.24 (0.0424)	24	0.1850	0.1074	0.1167
21	417.74 (0.0036)	-	-	-	21.65 (0.9348)	-104.52 (0.1132)	24	0.1770	0.0986	0.1294
22	249.01 (0.0809)	-	-	-30.54 (0.7755)	-	-	24	0.0038	-0.0415	0.7755
23	284.19 (0.0109)	-	-	-	-262.88 (0.2119)	-	24	0.0699	0.0276	0.2119

24	416.40 (0.0027)	-	-	-	-	-101.07 (0.0408)	24	0.1767	0.1393	0.0408
Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	492.83 (0.0373)	-125.79 (0.2605)	-	96.91 (0.5764)	-	-124.27 (0.1853)	18	0.2108	0.0416	0.3305
27	482.40 (0.0450)	-138.47 (0.2281)	-	-36.66 (0.8025)	-	-	18	0.1013	-0.0185	0.4487
28	552.54 (0.0086)	-125.52 (0.2498)	-	-	-	-95.40 (0.2043)	18	0.1923	0.0846	0.2015
29	447.82 (0.0173)	-140.26 (0.2072)	-	-	-	-	18	0.0975	0.0411	0.2072
30	420.71 (0.0450)	-	-116.83 (0.2998)	121.18 (0.4932)	-	-120.40 (0.2037)	18	0.1995	0.0280	0.3587
31	407.84 (0.0547)	-	-135.81 (0.2373)	-2.93 (0.9845)	-	-	18	0.0979	-0.0224	0.4619
32	488.82 (0.0087)	-	-106.49 (0.3296)	-	-	-86.07 (0.2672)	18	0.1712	0.0607	0.2445
33	405.39 (0.0137)	-	-136.35 (0.2063)	-	-	-	18	0.0978	0.0415	0.2063
34	358.28 (0.0692)	-	-	96.04 (0.5838)	-	-133.15 (0.1597)	18	0.1332	0.0177	0.3421
35	332.39 (0.0976)	-	-	-48.20 (0.7461)	-	-	18	0.0067	-0.0553	0.7461
36	417.74 (0.0113)	-	-	-	-	-104.52 (0.1683)	18	0.1151	0.0598	0.1683
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	16.55 (0.0365)	-	-	4.77 (0.2761)	-	-	6	0.2842	0.1053	0.2761
Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										

Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	249.68 (0.0800)	-55.35 (0.6769)	-	-	-	-24.77 (0.7828)	9	0.3186	0.0915	0.3164
41	263.44 (0.0353)	-88.38 (0.1201)	-	-	-	-	9	0.3092	0.2105	0.1201
42	327.21 (0.0049)	-	-979.48 (0.0437)	-	-	656.94 (0.0589)	9	0.6620	0.5493	0.0386
43	233.37 (0.0241)	-	-87.91 (0.0893)	-	-	-	9	0.3569	0.2651	0.0893
43	327.21 (0.0049)	-	-	-	979.48 (0.0437)	-322.54 (0.0233)	9	0.6620	0.5493	0.0386
45	165.95 (0.0722)	-	-	-	-149.40 (0.3080)	-	9	0.1472	0.0254	0.3080
46	214.20 (0.0340)	-	-	-	-	-58.83 (0.1293)	9	0.2968	0.1964	0.1293
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	129.05 (0.0849)	-29.35 (0.1749)	-	-	-	-7.01 (0.6498)	9	0.2970	0.0626	0.3474
49	106.52 (0.0288)	-28.95 (0.1514)	-	-	-	-	9	0.2702	0.1660	0.1514
50	129.05 (0.0849)	-	-29.35 (0.1749)	-	-	-7.01 (0.6498)	9	0.2970	0.0626	0.3474
51	106.52 (0.0288)	-	-28.95 (0.1514)	-	-	-	9	0.2702	0.1660	0.1514
52	72.55 (0.2601)	-	-	-	-41.96 (0.5199)	-1.13 (0.9525)	9	0.0905	-0.2127	0.7524
53	69.54 (0.0546)	-	-	-	-43.46 (0.4331)	-	9	0.0899	-0.0401	0.4331
54	73.77 (0.2296)	-	-	-	-	-6.02 (0.7186)	9	0.0197	-0.1203	0.7186
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										

Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	1134.78 (0.1395)	-636.65 (0.4857)	-	-	-	496.73 (0.6719)	6	0.3133	-0.1445	0.5690
57	992.86 (0.0823)	-281.84 (0.2979)	-	-	-	-	6	0.2633	0.0791	0.2979
58	816.46 (0.0996)	-	-199.39 (0.4175)	-	-	-	6	0.1694	-0.0383	0.4175
59	816.46 (0.0996)	-	-	-	-	-299.08 (0.4175)	6	0.1694	-0.0383	0.4175

OP Mode 1

Table 45. Results from the Models with CO_2 Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	60789.60 (0.0004)	-5485.97 (0.4310)	-	-4777.24 (0.5988)	-	17389.70 (0.0022)	24	0.4194	0.3323	0.0111
11	63177.40 (0.0019)	6688.83 (0.3696)	-	7105.58 (0.4963)	-	-	24	0.0613	-0.0281	0.5144
12	57021.60 (0.0001)	-4899.03 (0.4675)	-	-	-	16387.20 (0.0015)	24	0.4111	0.3550	0.0039
13	69958.90 (0.0001)	6888.29 (0.3493)	-	-	-	-	24	0.0399	-0.0037	0.3493
14	58080.60 (0.0002)	-	-5348.90 (0.4362)	-4178.48 (0.6420)	-	17784.40 (0.0029)	24	0.4189	0.3318	0.0111
15	64226.00 (0.0005)	-	7910.99 (0.2520)	5719.18 (0.5823)	-	-	24	0.0843	-0.0029	0.3968
16	55142.00 (0.0001)	-	-5097.36 (0.4475)	-	-	16969.40 (0.0022)	24	0.4125	0.3565	0.0038
17	69170.40 (0.0000)	-	8457.85 (0.2093)	-	-	-	24	0.0707	0.0284	0.2093
18	53666.20 (0.0001)	-	-	1497.85 (0.8666)	39100.50 (0.0896)	8279.08 (0.1588)	24	0.4829	0.4053	0.0037
19	58265.70 (0.0000)	-	-	7477.18 (0.3611)	61638.00 (0.0009)	-	24	0.4275	0.3730	0.0029
20	54678.90 (0.0002)	-	-	-3621.79 (0.6830)	-	15367.80 (0.0016)	24	0.4006	0.3435	0.0046
21	54593.50 (0.0000)	-	-	-	37885.10 (0.0752)	8725.57 (0.0890)	24	0.4821	0.4328	0.0010
22	73675.20 (0.0000)	-	-	7477.18 (0.4720)	-	-	24	0.0238	-0.0206	0.4720
23	65742.90 (0.0000)	-	-	-	61638.00 (0.0008)	-	24	0.4037	0.3766	0.0008

24	52255.20 (0.0000)	-	-	-	-	14756.00 (0.0010)	24	0.3957	0.3682	0.0010
Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	77164.00 (0.0001)	-14311.60 (0.0517)	-	-11632.00 (0.2923)	-	13232.10 (0.0330)	18	0.4006	0.2721	0.0601
27	78274.20 (0.0001)	-12961.40 (0.1114)	-	2590.29 (0.7995)	-	-	18	0.1612	0.0494	0.2675
28	69997.10 (0.0000)	-14343.80 (0.0513)	-	-	-	9767.09 (0.0528)	18	0.3493	0.2626	0.0398
29	80717.10 (0.0000)	-12835.00 (0.1030)	-	-	-	-	18	0.1575	0.1048	0.1030
30	69226.90 (0.0001)	-	-13794.20 (0.0635)	-8763.39 (0.4334)	-	13727.70 (0.0303)	18	0.3853	0.2535	0.0707
31	70694.20 (0.0001)	-	-11630.60 (0.1566)	5387.05 (0.6156)	-	-	18	0.1302	0.0143	0.3511
32	64300.90 (0.0000)	-	-14542.50 (0.0465)	-	-	11245.00 (0.0314)	18	0.3567	0.2709	0.0366
33	75201.70 (0.0000)	-	-10641.20 (0.1686)	-	-	-	18	0.1150	0.0597	0.1686
34	61856.10 (0.0002)	-	-	-11730.70 (0.3364)	-	12222.40 (0.0673)	18	0.2070	0.1012	0.1756
35	64232.70 (0.0002)	-	-	1510.18 (0.8881)	-	-	18	0.0013	-0.0611	0.8881
36	54593.50 (0.0001)	-	-	-	-	8725.57 (0.1062)	18	0.1548	0.1020	0.1062
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	107970.00 (0.0007)	-	-	19411.20 (0.0728)	-	-	6	0.5940	0.4924	0.0728
Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										

Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	80190.10 (0.0050)	-8433.10 (0.6855)	-	-	-	13053.10 (0.3700)	9	0.2573	0.0098	0.4096
41	72938.40 (0.0036)	8971.09 (0.3191)	-	-	-	-	9	0.1411	0.0184	0.3191
42	79978.00 (0.0030)	-	-45012.40 (0.6154)	-	-	40757.20 (0.5377)	9	0.2691	0.0255	0.3904
43	74155.50 (0.0009)	-	10301.00 (0.2062)	-	-	-	9	0.2171	0.1052	0.2062
43	79978.00 (0.0030)	-	-	-	45012.40 (0.6154)	-4255.19 (0.8627)	9	0.2691	0.0255	0.3904
45	77850.40 (0.0002)	-	-	-	30119.30 (0.1560)	-	9	0.2651	0.1602	0.1560
46	74784.30 (0.0006)	-	-	-	-	7863.54 (0.1860)	9	0.2349	0.1257	0.1860
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	36530.70 (0.3891)	5635.36 (0.6550)	-	-	-	18094.90 (0.0976)	9	0.3995	0.1993	0.2165
49	94671.90 (0.0177)	4597.13 (0.7557)	-	-	-	-	9	0.0147	-0.1260	0.7557
50	36530.70 (0.3891)	-	5635.36 (0.6550)	-	-	18094.90 (0.0976)	9	0.3995	0.1993	0.2165
51	94671.90 (0.0177)	-	4597.13 (0.7557)	-	-	-	9	0.0147	-0.1260	0.7557
52	48594.90 (0.1170)	-	-	-	49783.40 (0.1251)	12103.40 (0.1932)	9	0.5928	0.4570	0.0675
53	80870.80 (0.0015)	-	-	-	65921.30 (0.0489)	-	9	0.4471	0.3681	0.0489
54	47144.90 (0.1647)	-	-	-	-	17903.40 (0.0784)	9	0.3774	0.2885	0.0784
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										

Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	46029.40 (0.0087)	-10915.80 (0.3795)	-	-	-	10548.70 (0.5071)	6	0.3349	-0.1085	0.5424
57	43015.50 (0.3609)	-3381.04 (0.3609)	-	-	-	-	6	0.2099	0.0123	0.3609
58	40571.50 (0.0016)	-	-2064.06 (0.5403)	-	-	-	6	0.1006	-0.1243	0.5403
59	40571.50 (0.0016)	-	-	-	-	-3096.09 (0.5403)	6	0.1006	-0.1243	0.5403

Table 46. Results from the Models with CO Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	343007.00 (0.0000)	-116955.00 (0.0001)	-	-77718.70 (0.0194)	-	72765.80 (0.0004)	24	0.6039	0.5445	0.0003
11	352999.00 (0.0000)	-66010.70 (0.0244)	-	-27995.90 (0.4727)	-	-	24	0.2383	0.1658	0.0574
12	281708.00 (0.0000)	-107407.00 (0.0005)	-	-	-	56457.90 (0.0042)	24	0.4758	0.4259	0.0011
13	326280.00 (0.0000)	-66796.50 (0.0211)	-	-	-	-	24	0.2189	0.1834	0.0211
14	277098.00 (0.0000)	-	-101207.00 (0.0009)	-63618.80 (0.0788)	-	75386.80 (0.0014)	24	0.4897	0.4132	0.0032
15	303148.00 (0.0001)	-	-44998.90 (0.1100)	-21663.40 (0.6037)	-	-	24	0.1390	0.0570	0.2077
16	232356.00 (0.0001)	-	-97376.80 (0.0019)	-	-	62977.20 (0.0054)	24	0.4022	0.3453	0.0045
17	284419.00 (0.0000)	-	-47070.30 (0.0865)	-	-	-	24	0.1276	0.0880	0.0865
18	213820.00 (0.0026)	-	-	-58576.00 (0.2344)	-41932.20 (0.7281)	37263.90 (0.2388)	24	0.1122	-0.0209	0.4864

19	234522.00 (0.0009)	-	-	-31663.20 (0.4675)	59508.40 (0.4945)	-	24	0.0468	-0.0440	0.6046
20	212734.00 (0.0021)	-	-	-53085.60 (0.2432)	-	29661.80 (0.1799)	24	0.1067	0.0217	0.3057
21	177555.00 (0.0043)	-	-	-	5600.19 (0.9612)	19803.00 (0.4795)	24	0.0455	-0.0454	0.6133
22	249399.00 (0.0002)	-	-	-31663.20 (0.4619)	-	-	24	0.0249	-0.0195	0.4619
23	202859.00 (0.0001)	-	-	-	59508.40 (0.4897)	-	24	0.0219	-0.0225	0.4897
24	177209.00 (0.0033)	-	-	-	-	20694.40 (0.3175)	24	0.0454	0.0020	0.3175
Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	351215.00 (0.0000)	-144628.00 (0.0000)	-	-29634.10 (0.4662)	-	39138.30 (0.0812)	18	0.7159	0.6551	0.0004
27	354499.00 (0.0000)	-140634.00 (0.0001)	-	12432.90 (0.7293)	-	-	18	0.6443	0.5969	0.0004
28	332957.00 (0.0000)	-144710.00 (0.0000)	-	-	-	30310.60 (0.0934)	18	0.7045	0.6652	0.0001
29	366224.00 (0.0000)	-140028.00 (0.0001)	-	-	-	-	18	0.6413	0.6189	0.0001
30	266474.00 (0.0002)	-	-130919.00 (0.0007)	-2469.32 (0.9597)	-	43220.50 (0.1081)	18	0.5889	0.5008	0.0050
31	271093.00 (0.0002)	-	-124107.00 (0.0014)	42082.30 (0.3428)	-	-	18	0.5024	0.4361	0.0053
32	265086.00 (0.0000)	-	-131129.00 (0.0004)	-	-	42521.00 (0.0554)	18	0.5888	0.5340	0.0013
33	306305.00 (0.0000)	-	-116377.00 (0.0017)	-	-	-	18	0.4706	0.4375	0.0017
34	196519.00 (0.0193)	-	-	-30631.80 (0.6692)	-	28934.00 (0.4448)	18	0.0395	-0.0886	0.7394
35	202145.00 (0.0145)	-	-	713.40 (0.9902)	-	-	18	0.0000	-0.0625	0.9902

36	177555.00 (0.0088)	-	-	-	-	19803.00 (0.5124)	18	0.0273	-0.0335	0.5124
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	358783.00 (0.0017)	-	-	-96416.40 (0.0469)	-	-	6	0.6685	0.5857	0.0469
Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	415747.00 (0.0017)	-295253.00 (0.0116)	-	-	-	205228.00 (0.0105)	9	0.6975	0.5967	0.0277
41	301731.00 (0.0376)	-21615.30 (0.7212)	-	-	-	-	9	0.0193	-0.1207	0.7212
42	340977.00 (0.0114)	-	-992282.00 (0.0860)	-	-	748663.00 (0.0793)	9	0.4417	0.2556	0.1740
43	234025.00 (0.0482)	-	23760.90 (0.6711)	-	-	-	9	0.0273	-0.1117	0.6711
43	340977.00 (0.0114)	-	-	-	992282.00 (0.0860)	-243619.00 (0.1191)	9	0.4417	0.2556	0.1740
45	219167.00 (0.0252)	-	-	-	139616.00 (0.3316)	-	9	0.1345	0.0109	0.3316
46	226482.00 (0.0444)	-	-	-	-	23534.10 (0.5643)	9	0.0497	-0.0861	0.5643
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	177024.00 (0.1427)	-97231.60 (0.0228)	-	-	-	63710.80 (0.0413)	9	0.7353	0.6470	0.0186
49	381734.00 (0.0045)	-100887.00 (0.0515)	-	-	-	-	9	0.4397	0.3597	0.0515
50	177024.00 (0.1427)	-	-97231.60 (0.0228)	-	-	63710.80 (0.0413)	9	0.7353	0.6470	0.0186
51	381734.00 (0.0045)	-	-100887.00 (0.0515)	-	-	-	9	0.4397	0.3597	0.0515

52	-11076.40 (0.9295)	-	-	-	-170478.00 (0.2260)	86876.40 (0.0590)	9	0.4841	0.3121	0.1373
53	220594.00 (0.0366)	-	-	-	-54643.20 (0.7234)	-	9	0.0190	-0.1211	0.7234
54	-6111.06 (0.9629)	-	-	-	-	67014.80 (0.1073)	9	0.3276	0.2316	0.1073
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	262856.00 (0.0038)	-26316.90 (0.6015)	-	-	-	-88428.50 (0.2360)	6	0.9281	0.8801	0.0193
57	288122.00 (0.0007)	-89480.10 (0.0061)	-	-	-	-	6	0.8757	0.8446	0.0061
58	249698.00 (0.0003)	-	-80883.10 (0.0025)	-	-	-	6	0.9200	0.9000	0.0025
59	249698.00 (0.0003)	-	-	-	-	-121325.00 (0.0025)	6	0.9200	0.9000	0.0025

Table 47. Results from the Models with HC Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	69455.70 (0.0486)	8840.62 (0.5810)	-	-18740.90 (0.3745)	-	7088.68 (0.5422)	24	0.0864	-0.0506	0.6036
11	70429.10 (0.0421)	13803.50 (0.3137)	-	-13897.10 (0.4682)	-	-	24	0.0689	-0.0198	0.4727
12	54674.20 (0.0702)	11143.20 (0.4797)	-	-	-	3156.23 (0.7675)	24	0.0487	-0.0418	0.5917
13	57166.00 (0.0447)	13413.40 (0.3214)	-	-	-	-	24	0.0447	0.0013	0.3214
14	79952.20 (0.0147)	-	-1020.76 (0.9487)	-20709.20 (0.3264)	-	10808.10 (0.3857)	24	0.0723	-0.0669	0.6738

15	83686.90 (0.0099)	-	7037.64 (0.5848)	-14694.10 (0.4557)	-	-	24	0.0358	-0.0561	0.6822
16	65387.80 (0.0210)	-	225.92 (0.9886)	-	-	6768.50 (0.5627)	24	0.0253	-0.0675	0.7640
17	70983.20 (0.0074)	-	5632.62 (0.6548)	-	-	-	24	0.0093	-0.0358	0.6548
18	78349.70 (0.0110)	-	-	-15782.90 (0.4705)	36812.30 (0.4986)	3673.01 (0.7926)	24	0.0936	-0.0424	0.5697
19	80390.20 (0.0060)	-	-	-13130.20 (0.4875)	46811.10 (0.2216)	-	24	0.0904	0.0037	0.3699
20	79303.10 (0.0090)	-	-	-20603.00 (0.3153)	-	10346.90 (0.2975)	24	0.0721	-0.0163	0.4560
21	68578.30 (0.0103)	-	-	-	49619.60 (0.3317)	-1031.71 (0.9327)	24	0.0691	-0.0196	0.4717
22	92093.00 (0.0013)	-	-	-13130.20 (0.4928)	-	-	24	0.0216	-0.0228	0.4928
23	67260.00 (0.0014)	-	-	-	46811.10 (0.2158)	-	24	0.0264	0.0687	0.2158
24	65515.70 (0.0126)	-	-	-	-	6866.59 (0.4579)	24	0.0253	-0.0190	0.4579
Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	96260.20 (0.0215)	4830.03 (0.7992)	-	-53090.50 (0.0928)	-	14443.30 (0.3670)	18	0.1919	0.0187	0.3787
27	97472.00 (0.0188)	6303.84 (0.7378)	-	-37566.40 (0.1408)	-	-	18	0.1417	0.0273	0.3178
28	63549.10 (0.0880)	4683.23 (0.8179)	-	-	-	-1371.77 (0.9216)	18	0.0040	-0.1288	0.9702
29	62043.50 (0.0583)	4471.33 (0.8192)	-	-	-	-	18	0.0034	-0.0589	0.8192
30	104313.00 (0.0069)	-	-5402.27 (0.7769)	-51895.10 (0.1023)	-	15373.60 (0.3400)	18	0.1928	0.0199	0.3763
31	105956.00 (0.0057)	-	-2979.26 (0.8744)	-36048.00 (0.1692)	-	-	18	0.1366	0.0214	0.3324

32	75142.30 (0.0254)	-	-9833.44 (0.6259)	-	-	671.92 (0.9623)	18	0.0166	-0.1145	0.8819
33	75793.60 (0.0107)	-	-9600.33 (0.6118)	-	-	-	18	0.0165	-0.0450	0.6118
34	101426.00 (0.0045)	-	-	-53057.20 (0.0823)	-	14784.10 (0.3383)	18	0.1880	0.0798	0.2097
35	104301.00 (0.0033)	-	-	-37041.10 (0.1335)	-	-	18	0.1351	0.0810	0.1335
36	68578.30 (0.0203)	-	-	-	-	-1031.71 (0.9387)	18	0.0004	-0.0621	0.9387
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	79379.40 (0.0147)	-	-	34691.70 (0.0639)	-	-	6	0.6175	0.5218	0.0639
Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	15228.60 (0.8042)	144016.00 (0.0612)	-	-	-	-90691.80 (0.0771)	9	0.4690	0.2920	0.1497
41	65613.00 (0.3535)	23093.10 (0.5012)	-	-	-	-	9	0.0670	-0.0663	0.5012
42	47848.10 (0.4545)	-	517384.00 (0.1410)	-	-	-380156.00 (0.1405)	9	0.3247	0.0995	0.3080
43	102156.00 (0.1161)	-	1459.12 (0.9640)	-	-	-	9	0.0003	-0.1425	0.9640
43	47848.10 (0.4545)	-	-	-	-517384.00 (0.1410)	137229.00 (0.1561)	9	0.3247	0.0995	0.3080
45	116463.00 (0.0423)	-	-	-	-37083.10 (0.6624)	-	9	0.0288	-0.1099	0.6624
46	107546.00 (0.0890)	-	-	-	-	-2066.87 (0.9306)	9	0.0012	-0.1415	0.9306
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model

48	-31065.80 (0.4787)	23165.20 (0.1140)	-	-	-	21768.50 (0.0648)	9	0.5763	0.4350	0.0761
49	38879.00 (0.2911)	21916.20 (0.2070)	-	-	-	-	9	0.2164	0.1045	0.2070
50	-31065.80 (0.4787)	-	23165.20 (0.1140)	-	-	21768.50 (0.0648)	9	0.5763	0.4350	0.0761
51	38879.00 (0.2911)	-	21916.20 (0.2070)	-	-	-	9	0.2164	0.1045	0.2070
52	15269.50 (0.5143)	-	-	-	92827.10 (0.0071)	10166.50 (0.1886)	9	0.8188	0.7584	0.0060
53	42380.30 (0.0154)	-	-	-	106382.00 (0.0025)	-	9	0.7524	0.7170	0.0025
54	12565.80 (0.7571)	-	-	-	-	20981.30 (0.1025)	9	0.3349	0.2399	0.1025
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	76761.40 (0.0058)	-42740.60 (0.0685)	-	-	-	34744.80 (0.1851)	6	0.8396	0.7326	0.0643
57	66834.30 (0.0039)	-17922.90 (0.0427)	-	-	-	-	6	0.6825	0.6032	0.0427
58	55391.10 (0.0117)	-	-12453.90 (0.1615)	-	-	-	6	0.4237	0.2796	0.1615
59	55391.10 (0.0117)	-	-	-	-	-18680.90 (0.1615)	6	0.4237	0.2796	0.1615

Table 48. Results from Models with NOx Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	927058.00 (0.0000)	-32613.00 (0.0009)	-	19578.70 (0.8608)	-	33297.40 (0.5917)	24	0.4709	0.3915	0.0046

11	931630.00 (0.0000)	-302821.00 (0.0004)	-	42331.70 (0.6773)	-	-	24	0.4630	0.4119	0.0015
12	942500.00 (0.0000)	-328538.00 (0.0006)	-	-	-	37405.70 (0.5055)	24	0.4700	0.4196	0.0013
13	972031.00 (0.0000)	-301632.00 (0.0003)	-	-	-	-	24	0.4585	0.4338	0.0003
14	777381.00 (0.0001)	-	-335856.00 (0.0004)	53314.00 (0.6183)	-	64840.10 (0.3109)	24	0.5070	0.4331	0.0023
15	799786.00 (0.0000)	-	-287512.00 (0.0003)	89399.80 (0.3798)	-	-	24	0.4804	0.4309	0.0010
16	814876.00 (0.0000)	-	-339065.00 (0.0003)	-	-	75239.60 (0.2073)	24	0.5007	0.4532	0.0007
17	877076.00 (0.0000)	-	-278963.00 (0.0003)	-	-	-	24	0.4605	0.4360	0.0003
18	582557.00 (0.0040)	-	-	-6627.19 (0.9621)	-724755.00 (0.0471)	44495.30 (0.6203)	24	0.2432	0.1296	0.1269
19	607277.00 (0.0017)	-	-	25508.30 (0.8333)	-603628.00 (0.0199)	-	24	0.2336	0.1606	0.0612
20	563787.00 (0.0082)	-	-	88268.70 (0.5365)	-	-86899.00 (0.2148)	24	0.0738	-0.0144	0.4469
21	578454.00 (0.0012)	-	-	-	-719377.00 (0.0335)	42519.80 (0.5839)	24	0.2431	0.1710	0.0537
22	456370.00 (0.0169)	-	-	25508.30 (0.8502)	-	-	24	0.0017	-0.0437	0.8502
23	632785.00 (0.0000)	-	-	-	-603628.00 (0.0172)	-	24	0.2319	0.1970	0.0172
24	622856.00 (0.0011)	-	-	-	-	-71988.40 (0.2638)	24	0.0564	0.0135	0.2638

Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]

Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	902385.00 (0.0013)	-291037.00 (0.0221)	-	-18399.30 (0.9194)	-	69137.10 (0.4744)	18	0.3314	0.1882	0.1204
27	908186.00 (0.0010)	-283982.00 (0.0218)	-	55911.30 (0.7052)	-	-	18	0.3056	0.2130	0.0649

28	891049.00 (0.0003)	-291087.00 (0.0177)	-	-	-	63656.10 (0.4090)	18	0.3309	0.2417	0.0491
29	960915.00 (0.0000)	-281254.00 (0.0189)	-	-	-	-	18	0.2987	0.2549	0.0189
30	756529.00 (0.0016)	-	-309618.00 (0.0140)	46196.20 (0.7957)	-	82390.00 (0.3844)	18	0.3700	0.2350	0.0827
31	765335.00 (0.0012)	-	-296632.00 (0.0155)	131124.00 (0.3843)	-	-	18	0.3337	0.2448	0.0476
32	782496.00 (0.0002)	-	-305673.00 (0.0112)	-	-	95477.20 (0.2210)	18	0.3668	0.2824	0.0325
33	875051.00 (0.0000)	-	-272548.00 (0.0191)	-	-	-	18	0.2980	0.2541	0.0191
34	591089.00 (0.0184)	-	-	-20407.10 (0.9237)	-	48603.00 (0.6645)	18	0.0151	-0.1162	0.8918
35	600539.00 (0.0137)	-	-	32246.20 (0.8502)	-	-	18	0.0023	-0.0601	0.8502
36	588454.00 (0.0047)	-	-	-	-	42519.80 (0.6338)	18	0.0145	-0.0471	0.6338
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	17124.20 (0.1165)	-	-	12032.70 (0.1181)	-	-	6	0.4962	0.3702	0.1181
Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	794709.00 (0.0100)	74771.60 (0.7544)	-	-	-	-257746.00 (0.1476)	9	0.6362	0.5149	0.0482
41	937901.00 (0.0037)	-268890.00 (0.0419)	-	-	-	-	9	0.4687	0.3928	0.0419
42	906885.00 (0.0031)	-	-556795.00 (0.5864)	-	-	195156.00 (0.7929)	9	0.6490	0.5320	0.0432
43	879006.00 (0.0006)	-	-291940.00 (0.0092)	-	-	-	9	0.6446	0.5938	0.0092
43	906885.00	-	-	-	556795.00	-361639.00	9	0.6490	0.5320	0.0432

	(0.0031)				(0.5864)	(0.2269)				
45	726066.00 (0.0014)	-	-	-	-708942.00 (0.0235)	-	9	0.5430	0.4777	0.0235
46	842640.00 (0.0007)	-	-	-	-	-211733.00 (0.0107)	9	0.6297	0.5768	0.0107
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	1368894.00 (0.0419)	-438754.00 (0.0350)	-	-	-	-15466.50 (0.9052)	9	0.5507	0.4009	0.0907
49	1319198.00 (0.0047)	-437867.00 (0.0223)	-	-	-	-	9	0.5496	0.4852	0.0223
50	1368894.00 (0.0419)	-	-438754.00 (0.0350)	-	-	-15466.50 (0.9052)	9	0.5507	0.4009	0.0907
51	1319198.00 (0.0047)	-	-437867.00 (0.0223)	-	-	-	9	0.5496	0.4852	0.0223
52	516688.00 (0.3842)	-	-	-	-886303.00 (0.1769)	102701.00 (0.5707)	9	0.2806	0.0408	0.3723
53	790558.00 (0.0307)	-	-	-	-749368.00 (0.1833)	-	9	0.2375	0.1286	0.1833
54	542503.00 (0.3964)	-	-	-	-	-557.41 (0.9975)	9	0.0000	-0.1429	0.9975
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	608670.00 (0.0025)	-106688.00 (0.3235)	-	-	-	-127031.00 (0.3666)	6	0.9382	0.8970	0.0154
57	644965.00 (0.0003)	-197425.00 (0.0028)	-	-	-	-	6	0.9150	0.8937	0.0028
58	555326.00 (0.0003)	-	-173594.00 (0.0032)	-	-	-	6	0.9095	0.8869	0.0032
59	555326.00 (0.0003)	-	-	-	-	-260391.00 (0.0032)	6	0.9095	0.8869	0.0032

Table 49. Results from the Models with PM Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	8077.56 (0.0000)	-4082.00 (0.0000)	-	-685.72 (0.4005)	-	1358.21 (0.0060)	24	0.6922	0.6460	0.0000
11	8264.06 (0.0000)	-3131.09 (0.0001)	-	242.38 (0.7844)	-	-	24	0.5471	0.5040	0.0002
12	7536.71 (0.0000)	-3997.75 (0.0000)	-	-	-	1214.33 (0.0071)	24	0.6808	0.6504	0.0000
13	8495.39 (0.0000)	-3124.29 (0.0000)	-	-	-	-	24	0.5455	0.5248	0.0000
14	5941.84 (0.0002)	-	-3791.24 (0.0000)	-220.55 (0.8056)	-	1566.66 (0.0072)	24	0.6146	0.5568	0.0002
15	6483.20 (0.0003)	-	-2623.15 (0.0005)	651.35 (0.5137)	-	-	24	0.4421	0.3889	0.0022
16	5786.73 (0.0000)	-	-3777.96 (0.0000)	-	-	1523.64 (0.0048)	24	0.6134	0.5766	0.0000
17	7046.32 (0.0000)	-	-2560.87 (0.0005)	-	-	-	24	0.4303	0.4044	0.0005
18	3732.97 (0.0430)	-	-	-848.41 (0.5297)	-7808.72 (0.0283)	1269.47 (0.1519)	24	0.2204	0.1035	0.1647
19	4438.23 (0.0168)	-	-	68.43 (0.9554)	-4352.94 (0.0861)	-	24	0.1339	0.0514	0.2211
20	3530.72 (0.0779)	-	-	174.03 (0.9012)	-	-146.21 (0.8292)	24	0.0024	-0.0926	0.9751
21	3207.71 (0.0442)	-	-	-	-7120.27 (0.0309)	1016.57 (0.1864)	24	0.2044	0l1287	0.0906
22	3349.99 (0.0585)	-	-	68.43 (0.9575)	-	-	24	0.0001	-0.0453	0.9575
23	4506.66 (0.0009)	-	-	-	-4352.94 (0.0788)	-	24	0.1337	0.0944	0.0788
24	3647.18 (0.0354)	-	-	-	-	-116.81 (0.8506)	24	0.0016	-0.0437	0.8506

Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	8288.19 (0.0001)	-3874.03 (0.0003)	-	-1486.36 (0.2625)	-	1740.94 (0.0211)	18	0.6662	0.5947	0.0012
27	8434.25 (0.0005)	-3696.38 (0.0014)	-	384.85 (0.7595)	-	-	18	0.5053	0.4393	0.0051
28	7372.38 (0.0001)	-3878.14 (0.0003)	-	-	-	1298.17 (0.0348)	18	0.6337	0.5848	0.0005
29	8797.20 (0.0000)	-3677.61 (0.0010)	-	-	-	-	18	0.5021	0.4710	0.0010
30	6027.63 (0.0023)	-	-3524.29 (0.0019)	-754.96 (0.6139)	-	1852.19 (0.0300)	18	0.5672	0.4645	0.0070
31	6225.60 (0.0045)	-	-3232.37 (0.0077)	1154.27 (0.4275)	-	-	18	0.3869	0.3052	0.0255
32	5603.26 (0.0009)	-	-3588.75 (0.0011)	-	-	1638.31 (0.0200)	18	0.5590	0.5002	0.0022
33	7191.42 (0.0001)	-	-3020.36 (0.0085)	-	-	-	18	0.3598	0.3198	0.0085
34	4144.47 (0.0715)	-	-	-1513.08 (0.4615)	-	1467.60 (0.1826)	18	0.1153	-0.0027	0.3990
35	4429.84 (0.0601)	-	-	76.82 (0.9644)	-	-	18	0.0001	-0.0624	0.9644
36	3207.71 (0.0801)	-	-	-	-	1016.57 (0.2505)	18	0.0816	0.0242	0.2505
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	102.06 (0.0180)	-	-	51.65 (0.0504)	-	-	6	0.6570	0.5713	0.0504
Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	10419.20	-5534.85	-	-	-	1421.43	9	0.6235	0.4980	0.0534

	(0.0075)	(0.0959)				(0.4839)				
41	9629.52 (0.0044)	-3639.62 (0.0158)	-	-	-	-	9	0.5886	0.5298	0.0158
42	10379.40 (0.0013)	-	-30404.10 (0.0177)	-	-	20233.70 (0.0260)	9	0.7741	0.6989	0.0115
43	7488.85 (0.0126)	-	-2944.02 (0.0482)	-	-	-	9	0.4493	0.3706	0.0482
43	10379.40 (0.0013)	-	-	-	30404.10 (0.0177)	-10170.40 (0.0079)	9	0.7741	0.6989	0.0115
45	5294.21 (0.0523)	-	-	-	-5192.15 (0.2279)	-	9	0.1996	0.0853	0.2279
46	6871.22 (0.0197)	-	-	-	-	-1984.64 (0.0775)	9	0.3792	0.2905	0.0775
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	4652.08 (0.0995)	-3786.52 (0.0020)	-	-	-	1857.81 (0.0161)	9	0.8685	0.8247	0.0023
49	10621.50 (0.0034)	-3893.12 (0.0109)	-	-	-	-	9	0.6277	0.5745	0.0109
50	4652.08 (0.0995)	-	-3786.52 (0.0020)	-	-	1857.81 (0.0161)	9	0.8685	0.8247	0.0023
51	10621.50 (0.0034)	-	-3893.12 (0.0109)	-	-	-	9	0.6277	0.5745	0.0109
52	-2751.92 (0.3676)	-	-	-	-9342.36 (0.0200)	3074.91 (0.0128)	9	0.7264	0.6352	0.0205
53	5447.85 (0.0697)	-	-	-	-5242.48 (0.2734)	-	9	0.1679	0.0491	0.2734
54	-2479.81 (0.5781)	-	-	-	-	1986.48 (0.1464)	9	0.2759	0.1725	0.1464
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	5803.45 (0.0070)	-3459.62 (0.0686)	-	-	-	2380.94 (0.2430)	6	0.8741	0.7902	0.0447

57	5123.18 (0.0036)	-1758.95 (0.0186)	-	-	-	-	6	0.7860	0.7324	0.0186
58	4073.64 (0.0161)	-	-1295.73 (0.0923)	-	-	-	6	0.5484	0.4354	0.0923
59	4073.64 (0.0161)	-	-	-	-	-1943.59 (0.0923)	6	0.5484	0.4354	0.0923

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Table 50. Results from Models with CO2 Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	30033.50 (0.0000)	-4914.81 (0.0020)	-	-5116.48 (0.0136)	-	3513.39 (0.0024)	144	0.0978	0.0785	0.0023
11	30515.90 (0.0000)	-2455.02 (0.0790)	-	-2715.69 (0.1663)	-	-	144	0.0360	0.0224	0.0753
12	25998.00 (0.0000)	-4286.19 (0.0072)	-	-	-	2439.79 (0.0240)	144	0.0576	0.0442	0.0153
13	27924.10 (0.0000)	-2531.25 (0.0709)	-	-	-	-	144	0.0228	0.0159	0.0709
14	27962.80 (0.0000)	-	-5352.17 (0.0006)	-4638.36 (0.0226)	-	4120.14 (0.0007)	144	0.1118	0.0928	0.0008
15	29386.50 (0.0000)	-	-2280.24 (0.0800)	-2345.36 (0.2362)	-	-	144	0.0359	0.0222	0.0761
16	24700.80 (0.0000)	-	-5072.95 (0.0013)	-	-	3215.37 (0.0055)	144	0.0781	0.0650	0.0032
17	27358.90 (0.0000)	-	-2504.50 (0.0526)	-	-	-	144	0.0262	0.0193	0.0526
18	24827.50 (0.0000)	-	-	-5438.38 (0.0139)	-10364.40 (0.0586)	3581.04 (0.0118)	144	0.0586	0.0384	0.0370
19	26816.90 (0.0000)	-	-	-2852.08 (0.1503)	-615.98 (0.8761)	-	144	0.0148	0.0008	0.3497
20	24559.00 (0.0000)	-	-	-4081.32 (0.0521)	-	1702.03 (0.0934)	144	0.0342	0.0205	0.0862
21	21460.50 (0.0000)	-	-	-	-5951.31 (0.2573)	1959.92 (0.1236)	144	0.0169	0.0030	0.3007
22	26662.90 (0.0000)	-	-	-2852.08 (0.1488)	-	-	144	0.0146	0.0077	0.1488

23	23964.80 (0.0000)	-	-	-	-615.98 (0.8766)	-	144	0.0002	-0.0069	0.8766
24	21827.80 (0.0000)	-	-	-	-	1012.61 (0.2901)	144	0.0079	0.0009	0.2901
Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	29723.40 (0.0000)	-4488.83 (0.0206)	-	-5560.30 (0.0681)	-	3943.32 (0.0146)	108	0.0975	0.0714	0.0134
27	30054.30 (0.0000)	-4086.45 (0.0384)	-	-1321.90 (0.6048)	-	-	108	0.0439	0.0257	0.0945
28	26297.50 (0.0000)	-4504.20 (0.0216)	-	-	-	2286.97 (0.0870)	108	0.0680	0.0502	0.0248
29	28807.60 (0.0000)	-4150.93 (0.0345)	-	-	-	-	108	0.0415	0.0324	0.0345
30	27686.60 (0.0000)	-	-5173.77 (0.0076)	-4478.32 (0.1409)	-	4191.20 (0.0093)	108	0.1127	0.0871	0.0059
31	28134.60 (0.0000)	-	-4513.20 (0.0218)	-158.04 (0.9519)	-	-	108	0.0528	0.0348	0.0579
32	25169.30 (0.0000)	-	-5556.16 (0.0041)	-	-	2922.51 (0.0313)	108	0.0939	0.0766	0.0056
33	28002.40 (0.0000)	-	-4542.23 (0.0168)	-	-	-	108	0.0528	0.0438	0.0168
34	24922.10 (0.0000)	-	-	-5591.27 (0.0723)	-	3626.62 (0.0269)	108	0.0495	0.0314	0.0695
35	25627.30 (0.0000)	-	-	-1662.44 (0.5211)	-	-	108	0.0039	-0.0055	0.5211
36	21460.50 (0.0000)	-	-	-	-	1959.92 (0.1476)	108	0.0197	0.0104	0.1476
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	28580.20 (0.0000)	-	-	-5231.35 (0.0487)	-	-	36	0.1095	0.0833	0.0487

Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	30569.20 (0.0000)	2390.70 (0.6980)	-	-	-	-2461.60 (0.5568)	54	0.0091	-0.0298	0.7923
41	31936.80 (0.0000)	-891.44 (0.7310)	-	-	-	-	54	0.0023	-0.0169	0.7310
42	33422.00 (0.0000)	-	-11442.20 (0.6672)	-	-	7371.23 (0.7058)	54	0.0098	-0.0291	0.7787
43	32369.00 (0.0000)	-	-1438.42 (0.5486)	-	-	-	54	0.0070	-0.0121	0.5486
43	33422.00 (0.0000)	-	-	-	11442.20 (0.6672)	-4071.01 (0.5815)	54	0.0098	-0.0291	0.7787
45	31386.50 (0.0000)	-	-	-	-2806.28 (0.6585)	-	54	0.0038	-0.0154	0.6585
46	32101.70 (0.0000)	-	-	-	-	-990.40 (0.5736)	54	0.0061	-0.0130	0.5736
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	33937.30 (0.0000)	-7181.44 (0.0027)	-	-	-	1149.63 (0.5156)	54	0.1712	0.1387	0.0083
49	37631.20 (0.0000)	-7247.41 (0.0024)	-	-	-	-	54	0.1643	0.1482	0.0024
50	33937.30 (0.0000)	-	-7181.44 (0.0027)	-	-	1149.63 (0.5156)	54	0.1712	0.1307	0.0083
51	37631.20 (0.0000)	-	-7247.41 (0.0024)	-	-	-	54	0.1643	0.1482	0.0024
52	20004.10 (0.0031)	-	-	-	-13972.90 (0.0444)	3021.57 (0.1378)	54	0.0864	0.0505	0.1000
53	28061.60 (0.0000)	-	-	-	-9944.11 (0.1209)	-	54	0.0456	0.0273	0.1209
54	20411.10 (0.0033)	-	-	-	-	1393.66 (0.4662)	54	0.0103	-0.0088	0.4662
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										

Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	10608.90 (0.0000)	5819.03 (0.0597)	-	-	-	-8881.79 (0.0312)	36	0.1396	0.0874	0.0837
57	13146.50 (0.0000)	-525.11 (0.6146)	-	-	-	-	36	0.0075	-0.0217	0.6146
58	13518.40 (0.0000)	-	-1072.00 (0.2398)	-	-	-	36	0.0404	0.0122	0.2398
59	13518.40 (0.0000)	-	-	-	-	-1608.00 (0.2398)	36	0.0404	0.0122	0.2398

Table 51. Results from the Models with CO Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	125425.00 (0.0019)	-54045.50 (0.0047)	-	-14140.30 (0.5673)	-	55203.20 (0.0001)	144	0.1151	0.0962	0.0006
11	133005.00 (0.0017)	-15396.80 (0.3689)	-	23581.50 (0.3281)	-	-	144	0.0120	-0.0020	0.4278
12	114272.00 (0.0011)	-52308.20 (0.0055)	-	-	-	52236.10 (0.0001)	144	0.1131	0.1005	0.0002
13	155511.00 (0.0000)	-14734.90 (0.3894)	-	-	-	-	144	0.0052	-0.0018	0.3894
14	93711.70 (0.0099)	-	-44792.20 (0.0181)	-7419.09 (0.7636)	-	55521.70 (0.0002)	144	0.0999	0.0806	0.0020
15	112897.00 (0.0028)	-	-3395.78 (0.8319)	23480.70 (0.3363)	-	-	144	0.0066	-0.0075	0.6271
16	88494.00 (0.0053)	-	-44345.60 (0.0185)	-	-	54074.50 (0.0001)	144	0.0993	0.0865	0.0006
17	133197.00 (0.0000)	-	-1150.62 (0.9420)	-	-	-	144	0.0000	-0.0070	0.9420
18	64318.00 (0.0641)	-	-	1828.89 (0.9450)	35026.10 (0.5958)	28934.60 (0.0910)	144	0.0650	0.0449	0.0240

19	80392.80 (0.0173)	-	-	22726.10 (0.3372)	113793.00 (0.0172)	-	144	0.0456	0.0321	0.0372
20	65225.10 (0.0596)	-	-	-2757.26 (0.9122)	-	35284.60 (0.0040)	144	0.0631	0.0498	0.0101
21	65450.30 (0.0320)	-	-	-	33542.00 (0.5897)	29479.80 (0.0514)	144	0.0649	0.0517	0.0088
22	108841.10 (0.0008)	-	-	22726.10 (0.3452)	-	-	144	0.0063	-0.0007	0.3452
23	103119.00 (0.0000)	-	-	-	113793.00 (0.0172)	-	144	0.0393	0.0326	0.0172
24	63380.00 (0.0358)	-	-	-	-	34818.90 (0.0024)	144	0.0630	0.0564	0.0024
Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	158546.00 (0.0008)	-76768.70 (0.0011)	-	-17210.90 (0.6354)	-	40184.40 (0.0374)	108	0.1262	0.1010	0.0028
27	161918.00 (0.0007)	-72668.30 (0.0023)	-	25980.50 (0.3936)	-	-	108	0.00889	0.0715	0.0076
28	147942.00 (0.0003)	-76816.30 (0.0011)	-	-	-	35057.50 (0.0272)	108	0.1243	0.1076	0.0009
29	186420.00 (0.0000)	-71400.90 (0.0026)	-	-	-	-	108	0.0825	0.0738	0.0026
30	111561.00 (0.0078)	-	-65739.50 (0.0058)	-3598.99 (0.9228)	-	41941.90 (0.0332)	108	0.1005	0.0745	0.0114
31	116044.00 (0.0065)	-	-59129.10 (0.0136)	39634.50 (0.2144)	-	-	108	0.0602	0.0423	0.0384
32	109538.00 (0.0025)	-	-66046.80 (0.0050)	-	-	40922.30 (0.0134)	108	0.1004	0.0883	0.0039
33	149207.00 (0.0000)	-	-51849.30 (0.0255)	-	-	-	108	0.0462	0.0372	0.0255
34	76433.60 (0.0617)	-	-	-17740.50 (0.6408)	-	34768.00 (0.0834)	108	0.0319	0.0135	0.1820
35	83194.00 (0.0433)	-	-	19924.80 (0.5284)	-	-	108	0.0038	-0.0056	0.5284

36	65450.30 (0.0488)	-	-	-	-	29479.80 (0.0734)	108	0.0299	0.0209	0.0734
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	188583.00 (0.0000)	-	-	28328.60 (0.3050)	-	-	36	0.0309	0.0024	0.3050
Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	226623.00 (0.0011)	-175044.00 (0.0150)	-	-	-	120679.00 (0.0137)	54	0.1170	0.0824	0.0419
41	159579.00 (0.0141)	-14138.40 (0.6501)	-	-	-	-	54	0.0040	-0.0152	0.6501
42	181401.00 (0.0041)	-	-580544.00 (0.0651)	-	-	437204.00 (0.0586)	54	0.0719	0.0355	0.1491
43	118943.00 (0.0273)	-	12803.50 (0.6572)	-	-	-	54	0.0038	-0.0153	0.6572
43	181401.00 (0.0041)	-	-	-	580544.00 (0.0651)	-143341.00 (0.0994)	54	0.0719	0.0355	0.1491
45	109731.00 (0.0146)	-	-	-	78852.10 (0.2996)	-	54	0.0207	0.0018	0.2996
46	114415.00 (0.0263)	-	-	-	-	12959.80 (0.5401)	54	0.0073	-0.0118	0.5401
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	56843.60 (0.5937)	-28482.90 (0.3814)	-	-	-	56333.40 (0.0275)	54	0.1071	0.0721	0.0556
49	237849.00 (0.0018)	-31715.10 (0.3480)	-	-	-	-	54	0.0170	-0.0019	0.3480
50	56843.60 (0.5937)	-	-28482.90 (0.3814)	-	-	56333.50 (0.0275)	54	0.1071	0.0721	0.0556
51	237849.00 (0.0018)	-	-31715.10 (0.3480)	-	-	-	54	0.0170	-0.0019	0.3480

52	3860.30 (0.9649)	-	-	-	22799.60 (0.8051)	54645.00 (0.0496)	54	0.0945	0.0590	0.0794
53	149580.00 (0.0044)	-	-	-	95659.70 (0.2762)	-	54	0.0228	0.0040	0.2762
54	3196.24 (0.9707)	-	-	-	-	57301.30 (0.0246)	54	0.0935	0.0760	0.0246
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	65823.70 (0.0000)	-4871.28 (0.7891)	-	-	-	-13924.60 (0.5640)	36	0.1671	0.1166	0.0489
57	69802.20 (0.0000)	-14817.40 (0.0162)	-	-	-	-	36	0.1585	0.1338	0.0162
58	63388.10 (0.0000)	-	-13342.50 (0.0139)	-	-	-	36	0.1653	0.1407	0.0139
59	63388.10 (0.0000)	-	-	-	-	-20013.70 (0.0139)	36	0.1653	0.1407	0.0139

Table 52. Results from the Models with HC Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	18153.30 (0.0019)	5465.04 (0.0473)	-	-8260.44 (0.0223)	-	2138.91 (0.2821)	144	0.0891	0.0696	0.0044
11	18447.00 (0.0016)	6962.53 (0.0036)	-	-6798.87 (0.0418)	-	-	144	0.0815	0.0685	0.0025
12	11638.10 (0.0230)	6479.93 (0.0192)	-	-	-	405.60 (0.8278)	144	0.0543	0.0409	0.0195
13	11958.30 (0.0145)	6771.68 (0.0051)	-	-	-	-	144	0.0540	0.0474	0.0051
14	23202.20 (0.0000)	-	1632.89 (0.5502)	-9241.54 (0.0110)	-	3415.32 (0.1098)	144	0.0654	0.0454	0.0233

15	24382.40 (0.0000)	-	4179.32 (0.0633)	-7340.80 (0.0327)	-	-	144	0.0481	0.0346	0.0309
16	16702.80 (0.0005)	-	2189.22 (0.4310)	-	-	1612.64 (0.4314)	144	0.0211	0.0072	0.2231
17	18035.90 (0.0001)	-	3477.41 (0.1223)	-	-	-	144	0.0167	0.0098	0.1223
18	23956.20 (0.0000)	-	-	-7973.09 (0.0360)	10985.60 (0.2434)	2161.43 (0.3733)	144	0.0721	0.0522	0.0147
19	25157.00 (0.0000)	-	-	-6412.06 (0.0565)	16869.50 (0.0125)	-	144	0.0668	0.0536	0.0076
20	24240.70 (0.0000)	-	-	-9411.49 (0.0092)	-	4153.05 (0.0173)	144	0.0630	0.0497	0.0102
21	19020.00 (0.0000)	-	-	-	17455.50 (0.0537)	-215.27 (0.9211)	144	0.0424	0.0288	0.0471
22	29374.30 (0.0000)	-	-	-6412.06 (0.0611)	-	-	144	0.0245	0.0176	0.0611
23	18744.90 (0.0000)	-	-	-	16869.50 (0.0133)	-	144	0.0424	0.0356	0.0133
24	17942.60 (0.0001)	-	-	-	-	2563.24 (0.1224)	144	0.0167	0.0098	0.1224

Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]

Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	26114.90 (0.0001)	5125.32 (0.1168)	-	-20350.20 (0.0001)	-	5478.74 (0.0446)	108	0.1493	0.1248	0.0007
27	26574.60 (0.0001)	5684.38 (0.0858)	-	-14461.40 (0.0010)	-	-	108	0.1155	0.0987	0.0016
28	13576.40 (0.0265)	5069.05 (0.1461)	-	-	-	-583.34 (0.8063)	108	0.0201	0.0014	0.3446
29	12936.10 (0.0187)	4978.94 (0.1492)	-	-	-	-	108	0.0195	0.0103	0.1492
30	31002.80 (0.0000)	-	1112.03 (0.7362)	-20554.00 (0.0002)	-	5719.01 (0.0393)	108	0.1298	0.1047	0.0023
31	31614.10 (0.0000)	-	2013.40 (0.5450)	-14658.90 (0.0014)	-	-	108	0.0934	0.0761	0.0058

32	19449.20 (0.0004)	-	-643.01 (0.8537)	-	-	-103.86 (0.9664)	108	0.0004	-0.0186	0.9791
33	19348.50 (0.0001)	-	-679.05 (0.8401)	-	-	-	108	0.0004	-0.0090	0.8401
34	31597.00 (0.0000)	-	-	-20314.80 (0.0001)	-	5840.36 (0.0331)	108	0.1289	0.1123	0.0007
35	32732.60 (0.0000)	-	-	-13987.80 (0.0016)	-	-	108	0.0902	0.0816	0.0016
36	19020.00 (0.0001)	-	-	-	-	-215.27 (0.9279)	108	0.0001	-0.0094	0.9279
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	26875.00 (0.0000)	-	-	8739.33 (0.0169)	-	-	36	0.1567	0.1319	0.0169
Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	-68.18 (0.9952)	55021.50 (0.0000)	-	-	-	-34021.10 (0.0001)	54	0.2871	0.2591	0.0002
41	18832.50 (0.1204)	9660.01 (0.1066)	-	-	-	-	54	0.0493	0.0310	0.1066
42	12161.90 (0.2689)	-	199681.00 (0.0007)	-	-	-146083.00 (0.0007)	54	0.2026	0.1713	0.0031
43	33030.80 (0.0021)	-	1426.22 (0.7994)	-	-	-	54	0.0013	-0.0180	0.7994
43	12161.90 (0.2689)	-	-	-	-199681.00 (0.0007)	53598.60 (0.0010)	54	0.2026	0.1713	0.0031
45	38961.20 (0.0000)	-	-	-	-12086.20 (0.4142)	-	54	0.0129	-0.0061	0.4142
46	35202.00 (0.0007)	-	-	-	-	161.74 (0.9687)	54	0.0000	-0.0192	0.9687
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model

48	-9055.24 (0.1786)	8005.90 (0.0002)	-	-	-	5442.07 (0.0010)	54	0.3438	0.3180	0.0000
49	8430.74 (0.0858)	7693.65 (0.0011)	-	-	-	-	54	0.1865	0.1709	0.0011
50	-9055.24 (0.1786)	-	8005.90 (0.0002)	-	-	5442.07 (0.0010)	54	0.3438	0.3180	0.0000
51	8430.74 (0.0858)	-	7693.65 (0.0011)	-	-	-	54	0.1865	0.1709	0.0011
52	6936.75 (0.1388)	-	-	-	31343.50 (0.0000)	1518.35 (0.2950)	54	0.5280	0.5095	0.0000
53	10985.70 (0.0001)	-	-	-	33368.00 (0.0000)	-	54	0.5716	0.5083	0.0000
54	6023.83 (0.3323)	-	-	-	-	5170.02 (0.0049)	54	0.1422	0.1257	0.0049
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	9113.80 (0.0000)	-4198.53 (0.1213)	-	-	-	4158.13 (0.2422)	36	0.0944	0.0395	0.1948
57	7925.76 (0.0000)	-1228.44 (0.1667)	-	-	-	-	36	0.0555	0.0277	0.1667
58	7014.54 (0.0000)	-	-726.69 (0.3575)	-	-	-	36	0.0250	-0.0037	0.3575
59	7014.54 (0.0000)	-	-	-	-	-1090.04 (0.3575)	36	0.0250	-0.0037	0.3575

Table 53. Results from the Models with NOx Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	199681.00 (0.0000)	-61323.20 (0.0000)	-	-11577.40 (0.3739)	-	6899.27 (0.3391)	144	0.2448	0.2287	0.0000

11	200628.00 (0.0000)	-56492.90 (0.0000)	-	-6862.93 (0.5686)	-	-	144	0.2399	0.2291	0.0000
12	190549.00 (0.0000)	-59900.80 (0.0000)	-	-	-	4469.96 (0.5027)	144	0.2405	0.2298	0.0000
13	194078.00 (0.0000)	-56685.50 (0.0000)	-	-	-	-	144	0.2381	0.2328	0.0000
14	173076.00 (0.0000)	-	-65571.50 (0.0000)	-5485.96 (0.6623)	-	13923.70 (0.0627)	144	0.2812	0.2658	0.0000
15	177887.00 (0.0000)	-	-55190.20 (0.0000)	2263.06 (0.8500)	-	-	144	0.2632	0.2527	0.0000
16	169218.00 (0.0000)	-	-65241.20 (0.0000)	-	-	12853.60 (0.0679)	144	0.2803	0.2700	0.0000
17	179844.00 (0.0000)	-	-54973.80 (0.0000)	-	-	-	144	0.2630	0.2578	0.0000
18	135615.00 (0.0000)	-	-	-20102.40 (0.1604)	-163752.00 (0.0000)	13985.90 (0.1287)	144	0.1655	0.1476	0.0000
19	143385.00 (0.0000)	-	-	-10001.40 (0.4315)	-125679.00 (0.0000)	-	144	0.1516	0.1396	0.0000
20	131374.00 (0.0000)	-	-	1338.51 (0.9261)	-	-15701.40 (0.0257)	144	0.0384	0.0248	0.0633
21	123170.00 (0.0000)	-	-	-	-147439.00 (0.0000)	7993.61 (0.3274)	144	0.1536	0.1416	0.0000
22	111966.00 (0.0000)	-	-	-10001.40 (0.4662)	-	-	144	0.0037	-0.0033	0.4662
23	133384.00 (0.0000)	-	-	-	-125679.00 (0.0000)	-	144	0.1479	0.1419	0.0000
24	132270.00 (0.0000)	-	-	-	-	-15475.30 (0.0187)	144	0.0383	0.0316	0.0187

Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]

Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	198768.00 (0.0000)	-49623.20 (0.0002)	-	-36033.60 (0.0778)	-	22338.00 (0.0384)	108	0.1550	0.1307	0.0005
27	200642.00 (0.0000)	-47343.80 (0.0004)	-	-12024.00 (0.4796)	-	-	108	0.1193	0.1025	0.0013

28	176566.00 (0.0000)	-49722.80 (0.0002)	-	-	-	11604.10 (0.1937)	108	0.1293	0.1127	0.0007
29	189303.00 (0.0000)	-47930.30 (0.0003)	-	-	-	-	108	0.1151	0.1067	0.0003
30	175012.00 (0.0000)	-	-54875.60 (0.0000)	-24571.40 (0.2244)	-	24825.20 (0.0204)	108	0.1809	0.1573	0.0001
31	177666.00 (0.0000)	-	-50962.90 (0.0001)	1018.35 (0.9531)	-	-	108	0.1372	0.1208	0.0004
32	161201.00 (0.0000)	-	-56973.70 (0.0000)	-	-	17864.20 (0.0470)	108	0.1692	0.1533	0.0001
33	178518.00 (0.0000)	-	-50775.90 (0.0001)	-	-	-	108	0.1372	0.1291	0.0001
34	145690.00 (0.0000)	-	-	-36375.90 (0.0942)	-	18836.90 (0.0984)	108	0.0331	0.0147	0.1710
35	149353.00 (0.0000)	-	-	-15969.30 (0.3735)	-	-	108	0.0075	-0.0019	0.3735
36	123170.00 (0.0000)	-	-	-	-	7993.61 (0.3959)	108	0.0068	-0.0026	0.3959
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	5770.56 (0.0059)	-	-	1934.33 (0.1730)	-	-	36	0.0539	0.0261	0.1730
Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	190076.00 (0.0000)	25033.60 (0.4967)	-	-	-	-65492.90 (0.0111)	54	0.3119	0.2849	0.0001
41	226461.00 (0.0000)	-62290.20 (0.0004)	-	-	-	-	54	0.2181	0.2031	0.0004
42	206116.00 (0.0000)	-	60.83 (0.9997)	-	-	-50132.00 (0.6687)	54	0.3055	0.2783	0.0001
43	213278.00 (0.0000)	-	-67975.50 (0.0000)	-	-	-	54	0.3030	0.2896	0.0000
43	206116.00	-	-	-	-60.83	-50071.20	54	0.3055	0.2783	0.0001

	(0.0000)				(0.9997)	(0.2607)				
45	181081.00 (0.0000)	-	-	-	-175310.00 (0.0000)	-	54	0.2879	0.2742	0.0000
46	206123.00 (0.0000)	-	-	-	-	-50087.60 (0.0000)	54	0.3055	0.2922	0.0000
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	237019.00 (0.0000)	-80402.70 (0.0000)	-	-	-	2751.62 (0.8047)	54	0.3816	0.3574	0.0000
49	245860.00 (0.0000)	-80560.60 (0.0000)	-	-	-	-	54	0.3809	0.3690	0.0000
50	237019.00 (0.0000)	-	-80402.70 (0.0000)	-	-	2751.62 (0.8047)	54	0.3816	0.3574	0.0000
51	245860.00 (0.0000)	-	-80560.60 (0.0000)	-	-	-	54	0.3809	0.3690	0.0000
52	80518.00 (0.0690)	-	-	-	-173815.00 (0.0004)	25734.00 (0.0620)	54	0.2239	0.1935	0.0016
53	149142.00 (0.0000)	-	-	-	-139503.00 (0.0020)	-	54	0.1685	0.1525	0.0020
54	85580.50 (0.0843)	-	-	-	-	5483.75 (0.6950)	54	0.0030	-0.0162	0.6950
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	84646.00 (0.0000)	24367.80 (0.2906)	-	-	-	-70811.40 (0.0244)	36	0.3533	0.3141	0.0008
57	104878.00 (0.0000)	-26211.80 (0.0022)	-	-	-	-	36	0.2442	0.2220	0.0022
58	96829.90 (0.0000)	-		-	-	-	36	0.3307	0.3110	0.0002
59	96829.90 (0.0000)	-	-	-	-	-40351.70 (0.0002)	36	0.3307	0.3110	0.0002

Table 54. Results from the Models with PM Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	4089.13 (0.0000)	-2304.75 (0.0000)	-	-189.70 (0.5719)	-	873.46 (0.0000)	144	0.3702	0.3567	0.0000
11	4209.07 (0.0000)	-1693.22 (0.0000)	-	407.16 (0.2225)	-	-	144	0.2705	0.2601	0.0000
12	3939.50 (0.0000)	-2281.44 (0.0000)	-	-	-	833.66 (0.0000)	144	0.3688	0.3598	0.0000
13	4597.65 (0.0000)	-1681.79 (0.0000)	-	-	-	-	144	0.2627	0.2575	0.0000
14	2941.56 (0.0000)	-	-2232.22 (0.0000)	63.40 (0.8501)	-	1032.56 (0.0000)	144	0.3574	0.3437	0.0000
15	3298.35 (0.0000)	-	-1462.36 (0.0000)	638.06 (0.0658)	-	-	144	0.2329	0.2220	0.0000
16	2986.15 (0.0000)	-	-2236.04 (0.0000)	-	-	1044.93 (0.0000)	144	0.3573	0.3482	0.0000
17	3849.98 (0.0000)	-	-1401.35 (0.0000)	-	-	-	144	0.2142	0.2087	0.0000
18	1650.08 (0.0022)	-	-	-352.17 (0.3872)	-4948.19 (0.0000)	921.13 (0.0006)	144	0.1502	0.1320	0.0000
19	2161.82 (0.0001)	-	-	313.09 (0.4039)	-2440.67 (0.0014)	-	144	0.0745	0.0614	0.0043
20	1521.92 (0.0084)	-	-	295.72 (0.4761)	-	24.05 (0.9046)	144	0.0047	-0.0094	0.7173
21	1432.05 (0.0025)	-	-	-	-4662.42 (0.0000)	816.15 (0.0006)	144	0.1456	0.1335	0.0000
22	1551.65 (0.0029)	-	-	313.09 (0.4192)	-	-	144	0.0046	-0.0024	0.4192
23	2474.91 (0.0000)	-	-	-	-2440.67 (0.0014)	-	144	0.0699	0.0633	0.0014
24	1719.82 (0.0007)	-	-	-	-	74.00 (0.6933)	144	0.0011	-0.0059	0.6933

Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	4045.61 (0.0000)	-2088.26 (0.0000)	-	-599.26 (0.2597)	-	1146.42 (0.0001)	108	0.3378	0.3187	0.0000
27	4141.80 (0.0000)	-1971.28 (0.0000)	-	632.94 (0.1791)	-	-	108	0.2298	0.2151	0.0000
28	3676.38 (0.0000)	-2089.92 (0.0000)	-	-	-	967.90 (0.0001)	108	0.3296	0.3168	0.0000
29	4738.71 (0.0000)	-1940.40 (0.0000)	-	-	-	-	108	0.2164	0.2090	0.0000
30	2889.82 (0.0000)	-	-2017.16 (0.0000)	-179.75 (0.7404)	-	1219.20 (0.0000)	108	0.3192	0.2995	0.0000
31	3020.14 (0.0000)	-	-1825.01 (0.0000)	1077.00 (0.0307)	-	-	108	0.1983	0.1830	0.0000
32	2788.78 (0.0000)	-	-2032.51 (0.0000)	-	-	1168.28 (0.0000)	108	0.3185	0.3055	0.0000
33	3921.30 (0.0000)	-	-1627.19 (0.0000)	-	-	-	108	0.1616	0.1537	0.0000
34	1811.98 (0.0070)	-	-	-613.67 (0.3221)	-	999.08 (0.0026)	108	0.0900	0.0727	0.0071
35	2006.24 (0.0040)	-	-	468.67 (0.3764)	-	-	108	0.0074	-0.0020	0.3764
36	1432.05 (0.0088)	-	-	-	-	816.15 (0.0028)	108	0.0814	0.0728	0.0028
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	32.29 (0.0000)	-	-	1.94 (0.5702)	-	-	36	0.0096	-0.0196	0.5702
Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	5046.15	-2647.76	-	-	-	656.28	54	0.3573	0.3321	0.0000

	(0.0000)	(0.0019)				(0.2366)				
41	4681.55 (0.0000)	-1772.71 (0.0000)	-	-	-	-	54	0.3392	0.3265	0.0000
42	5076.41 (0.0000)	-	-14972.10 (0.0000)	-	-	9968.01 (0.0001)	54	0.4541	0.4327	0.0000
43	3652.41 (0.0000)	-	-1444.04 (0.0001	-	-	-	54	0.2626	0.2484	0.0001
43	5076.41 (0.0000)	-	-	-	14972.10 (0.0000	-5004.04 (0.0000)	54	0.4541	0.4327	0.0000
45	2574.39 (0.0000)	-	-	-	-2542.10 (0.0116)	-	54	0.1163	0.0993	0.0116
46	3348.87 (0.0000)	-	-	-	-	-973.11 (0.0003)	54	0.2215	0.2065	0.0003
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	3339.26 (0.0319)	-2437.04 (0.0000)	-	-	-	1075.65 (0.0038)	54	0.4309	0.4086	0.0000
49	6795.45 (0.0000)	-2498.76 (0.0000)	-	-	-	-	54	0.3283	0.3154	0.0000
50	3339.26 (0.0319)	-	-2437.04 (0.0000)	-	-	1075.65 (0.0038)	54	0.4309	0.4086	0.0000
51	6795.45 (0.0000)	-	-2498.76 (0.0000)	-	-	-	54	0.3283	0.3154	0.0000
52	-1424.00 (0.2874)	-	-	-	-5943.42 (0.0001)	1850.90 (0.0000)	54	0.3507	0.3253	0.0000
53	3511.73 (0.0002)	-	-	-	-3475.55 (0.0244)	-	54	0.0937	0.0763	0.0244
54	-1250.89 (0.4164)	-	-	-	-	1158.46 (0.0106)	54	0.1192	0.1022	0.0106
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	1980.09 (0.0000)	-26.20 (0.9509)	-	-	-	-909.82 (0.1129)	36	0.4460	0.4125	0.0001

57	2240.03 (0.0000)	-676.07 (0.0000)	-	-	-	-	36	0.4015	0.3839	0.0000
58	1966.99 (0.0000)	-	-628.38 (0.0000)	-	-	-	36	0.4660	0.4297	0.0000
59	1966.99 (0.0000)	-	-	-	-	-942.57 (0.0000)	36	0.4460	0.4297	0.0000

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Table 55. Results from the Models with CO2 Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	18759.70 (0.0000)	-1959.64 (0.0085)	-	-3615.40 (0.0002)	-	-89.36 (0.8678)	173	0.1469	0.1318	0.0000
11	18751.30 (0.0000)	-2023.26 (0.0015)	-	-3672.78 (0.0000)	-	-	173	0.1468	0.1367	0.0000
12	15918.30 (0.0000)	-1547.22 (0.0425)	-	-	-	-831.63 (0.1108)	173	0.0735	0.0626	0.0015
13	15344.60 (0.0000)	-2159.00 (0.0012)	-	-	-	-	173	0.0595	0.0540	0.0012
14	18204.50 (0.0000)	-	-2650.52 (0.0003)	-3440.23 0.0003)	-	403.88 (0.4700)	173	0.1789	0.1643	0.0000
15	18336.20 (0.0000)	-	-2346.43 (0.0001)	-3235.67 (0.0003)	-	-	173	0.1763	0.1667	0.0000
16	15804.10 (0.0000)	-	-2500.18 (0.0008)	-	-	-234.84 (0.6703)	173	0.1111	0.1007	0.0000
17	15627.90 (0.0000)	-	-2689.61 (0.0000)	-	-	-	173	0.1102	0.1050	0.0000
18	16619.10 (0.0000)	-	-	-3576.59 (0.0005)	-2536.41 (0.3264)	-365.43 (0.5818)	173	0.1162	0.1005	0.0001
19	16418.10 (0.0000)	-	-	-3834.30 (0.0000)	-3545.67 (0.0520)	-	173	0.1146	0.1042	0.0000
20	16570.10 (0.0000)	-	-	-3245.17 (0.0008)	-	-828.01 (0.0777)	173	0.1112	0.1007	0.0000
21	14420.20 (0.0000)	-	-	-	494.99 (0.8440)	-1445.88 (0.0183)	173	0.0509	0.0397	0.0118
22	15563.40 (0.0000)	-	-	-3819.73 (0.0000)	-	-	173	0.0947	0.0894	0.0000

23	12612.80 (0.0000)	-	-	-	-3481.19 (0.0689)	-	173	0.0192	0.0135	0.0689
24	14386.20 (0.0000)	-	-	-	-	-1366.34 (0.0029)	173	0.0507	0.0451	0.0029
Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	18935.80 (0.0000)	-2013.95 (0.0242)	-	-3769.91 (0.0079)	-	-87.94 (0.9081)	132	0.1226	0.1020	0.0008
27	18930.50 (0.0000)	-2026.61 (0.0218)	-	-3859.65 (0.0011)	-	-	132	0.1225	0.1089	0.0002
28	16629.30 (0.0000)	-2024.26 (0.0269)	-	-	-	-1225.67 (0.0606)	132	0.0727	0.0583	0.0077
29	15416.30 (0.0000)	-2284.30 (0.0126)	-	-	-	-	132	0.0470	0.0396	0.0126
30	18295.10 (0.0000)	-	-2919.30 (0.0009)	-3133.49 (0.0247)	-	135.88 (0.8562)	132	0.1622	0.1426	0.0000
31	18309.80 (0.0000)	-	-2892.29 (0.0008)	-3002.75 (0.0115)	-	-	132	0.1620	0.1490	0.0000
32	16550.00 (0.0000)	-	-3191.10 (0.0003)	-	-	-751.59 (0.2485)	132	0.1285	0.1149	0.0001
33	15884.50 (0.0000)	-	-3482.73 (0.0000)	-	-	-	132	0.1194	0.1126	0.0000
34	16746.50 (0.0000)	-	-	-3783.71 (0.0087)	-	-302.86 (0.6934)	132	0.0869	0.0728	0.0028
35	16679.70 (0.0000)	-	-	-4097.91 (0.0007)	-	-	132	0.0858	0.0788	0.0007
36	14420.20 (0.0000)	-	-	-	-	-1445.88 (0.0278)	132	0.0367	0.0293	0.0278
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	12326.50 (0.0000)	-	-	-3274.67 (0.0044)	-	-	41	0.1895	0.1687	0.0044

Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	18240.00 (0.0000)	-1619.06 (0.5670)	-	-	-	-485.62 (0.7992)	65	0.0542	0.0237	0.1775
41	18525.20 (0.0000)	-2267.34 (0.0644)	-	-	-	-	65	0.0532	0.0382	0.0644
42	20188.70 (0.0000)	-	-26299.90 (0.0283)	-	-	17759.30 (0.0431)	65	0.1208	0.0924	0.0185
43	17660.20 (0.0000)	-	-2219.41 (0.0488)	-	-	-	65	0.0602	0.0453	0.0488
43	20188.70 (0.0000)	-	-	-	26299.90 (0.0283)	-8540.52 (0.0107)	65	0.1208	0.0924	0.0185
45	15918.40 (0.0000)	-	-	-	-3591.98 (0.2334)	-	65	0.0225	0.0070	0.2334
46	17159.60 (0.0000)	-	-	-	-	-1472.74 (0.0758)	65	0.0492	0.0341	0.0758
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	6830.11 (0.0001)	-1925.92 (0.0003)	-	-	-	1236.19 (0.0020)	63	0.3005	0.2772	0.0000
49	10666.20 (0.0000)	-1974.70 (0.0006)	-	-	-	-	63	0.1786	0.1651	0.0006
50	6830.11 (0.0001)	-	-1925.92 (0.0003)	-	-	1236.19 (0.0020)	63	0.3005	0.2772	0.0000
51	10666.20 (0.0000)	-	-1974.70 (0.0006)	-	-	-	63	0.1786	0.1651	0.0006
52	2988.72 (0.0319)	-	-	-	-4519.58 (0.0036)	1827.00 (0.0001)	63	0.2461	0.2210	0.0002
53	7704.91 (0.0000)	-	-	-	-1927.80 (0.2128)	-	63	0.0253	0.0094	0.2128
54	3212.99 (0.0301)	-	-	-	-	1279.76 (0.0036)	63	0.1308	0.1165	0.0036
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										

Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	10134.70 (0.0021)	12763.00 (0.0048)	-	-	-	-19592.40 (0.0012)	45	0.2392	0.2029	0.0032
57	16038.30 (0.0000)	-1405.54 (0.3663)	-	-	-	-	45	0.0190	-0.0038	0.3663
58	16736.30 (0.0000)	-	-2499.14 (0.0618)	-	-	-	45	0.0788	0.0574	0.0618
59	16736.30 (0.0000)	-	-	-	-	-3748.71 (0.0618)	45	0.0788	0.0574	0.0618

Table 56. Results from the Models with CO Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	17674.90 (0.0084)	-2589.92 (0.4200)	-	-11735.30 (0.0050)	-	15661.60 (0.0000)	173	0.2454	0.2320	0.0000
11	19149.90 (0.0109)	8559.54 (0.0060)	-	-1677.45 (0.6977)	-	-	173	0.0439	0.0326	0.0220
12	8451.90 (0.1541)	-1251.24 (0.6994)	-	-	-	13252.20 (0.0000)	173	0.2092	0.1999	0.0000
13	17593.90 (0.0055)	8497.54 (0.0062)	-	-	-	-	173	0.0430	0.0374	0.0062
14	15989.90 (0.0076)	-	-1960.36 (0.5346)	-11390.20 (0.0059)	-	15596.40 (0.0000)	173	0.2442	0.2308	0.0000
15	21076.30 (0.0014)	-	9782.52 (0.0006)	-3490.81 (0.4193)	-	-	173	0.0667	0.0557	0.0028
16	8042.37 (0.1297)	-	-1462.60 (0.6490)	-	-	13481.70 (0.0000)	173	0.2095	0.2002	0.0000
17	18154.40 (0.0009)	-	9412.28 (0.0009)	-	-	-	173	0.0631	0.0576	0.0009
18	13786.30 (0.0091)	-	-	-4514.79 (0.2569)	51515.70 (0.0000)	5290.00 (0.0473)	173	0.3402	0.3284	0.0000

19	16696.20 (0.0012)	-	-	-783.99 (0.8288)	66126.00 (0.0000)	-	173	0.3246	0.3166	0.0000
20	14781.10 (0.0088)	-	-	-11246.00 (0.0064)	-	14685.30 (0.0000)	173	0.2425	0.2336	0.0000
21	11010.50 (0.0177)	-	-	-	55342.30 (0.0000)	3926.12 (0.0966)	173	0.3353	0.3275	0.0000
22	32636.30 (0.0000)	-	-	-1055.78 (0.8102)	-	-	173	0.0003	-0.0055	0.8102
23	15918.20 (0.00000)	-	-	-	66139.10 (0.0000)	-	173	0.3244	0.3204	0.0000
24	7212.95 (0.1467)	-	-	-	-	12819.80 (0.0000)	173	0.2085	0.2039	0.0000
Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	25315.30 (0.0000)	-11072.20 (0.0000)	-	-3613.75 (0.1568)	-	6222.32 (0.0000)	132	0.3256	0.3098	0.0000
27	25691.40 (0.0000)	-10176.00 (0.0000)	-	2736.21 (0.2289)	-	-	132	0.2185	0.2064	0.0000
28	23104.30 (0.0000)	-11082.10 (0.0000)	-	-	-	5131.71 (0.0000)	132	0.3149	0.3043	0.0000
29	28182.70 (0.0000)	-9993.34 (0.0000)	-	-	-	-	132	0.2096	0.2035	0.0000
30	19072.50 (0.0000)	-	-10921.20 (0.0000)	-1257.14 (0.6259)	-	6682.05 (0.0000)	132	0.3201	0.3041	0.0000
31	19796.50 (0.0000)	-	-9592.60 (0.0000)	5172.07 (0.0311)	-	-	132	0.1983	0.1859	0.0000
32	18372.40 (0.0000)	-	-11030.20 (0.0000)	-	-	6326.01 (0.0000)	132	0.3188	0.3082	0.0000
33	23974.00 (0.0000)	-	-8575.59 (0.0000)	-	-	-	132	0.1688	0.1624	0.0000
34	13278.90 (0.0001)	-	-	-3689.62 (0.2150)	-	5040.73 (0.0020)	132	0.0742	0.0599	0.0069
35	14390.00 (0.0000)	-	-	1539.86 (0.5449)	-	-	132	0.0028	-0.0048	0.5449

36	11010.50 (0.0000)	-	-	-	-	3926.12 (0.0037)	132	0.0631	0.0559	0.0037
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	87635.50 (0.0000)	-	-	-5717.59 (0.6213)	-	-	41	0.0063	-0.0192	0.6213
Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	22773.80 (0.0491)	-23319.60 (0.0540)	-	-	-	33139.50 (0.0001)	65	0.3525	0.3316	0.0000
41	3309.76 (0.7756)	20920.60 (0.0005)	-	-	-	-	65	0.1743	0.1612	0.0005
42	20773.20 (0.0404)	-	-117735.00 (0.0234)	-	-	105017.00 (0.0064)	65	0.3674	0.3470	0.0000
43	5821.58 (0.5128)	-	24660.70 (0.0000)	-	-	-	65	0.2860	0.2747	0.0000
43	20773.20 (0.0404)	-	-	-	117735.00 (0.0234)	-12718.30 (0.3683)	65	0.3674	0.3470	0.0000
45	14414.00 (0.0438)	-	-	-	73221.40 (0.0000)	-	65	0.3590	0.3488	0.0000
46	7213.15 (0.3883)	-	-	-	-	18921.80 (0.0000)	65	0.3122	0.3013	0.0000
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	-26282.40 (0.1072)	6601.12 (0.1936)	-	-	-	16646.70 (0.0000)	63	0.2554	0.2305	0.0001
49	25374.90 (0.0456)	5944.24 (0.3026)	-	-	-	-	63	0.0174	0.0013	0.3026
50	-26282.40 (0.1072)	-	6601.12 (0.1936)	-	-	16646.70 (0.0000)	63	0.2554	0.2305	0.0001
51	25374.90 (0.0456)	-	5944.24 (0.3026)	-	-	-	63	0.0174	0.0013	0.3026

52	-11769.50 (0.3398)	-	-	-	42624.00 (0.0023)	11336.40 (0.0053)	63	0.3443	0.3224	0.0000
53	17494.30 (0.0193)	-	-	-	58706.00 (0.0000)	-	63	0.2528	0.2406	0.0000
54	-13884.60 (0.2931)	-	-	-	-	16497.40 (0.0001)	63	0.2339	0.2213	0.0001
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	21215.40 (0.0000)	676.28 (0.8767)	-	-	-	-8830.47 (0.1272)	45	0.3161	0.2835	0.0003
57	23876.20 (0.0000)	-5709.60 (0.0002)	-	-	-	-	45	0.2766	0.2598	0.0002
58	21565.20 (0.0000)	-	5327.30 (0.0001)	-	-	-	45	0.3157	0.2997	0.0001
59	21565.20 (0.0000)	-	-	-	-	-7990.95 (0.0001)	45	0.3157	0.2997	0.0001

Table 57. Results from the Models with HC Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	8773.23 (0.0000)	1531.29 (0.0252)	-	-3947.99 (0.0000)	-	588.53 (0.2346)	173	0.1531	0.1381	0.0000
11	8828.66 (0.0000)	1950.26 (0.0010)	-	-3570.04 (0.0000)	-	-	173	0.1460	0.1359	0.0000
12	5670.43 (0.0000)	1981.65 (0.0057)	-	-	-	-222.03 (0.6479)	173	0.0505	0.0394	0.0122
13	5517.26 (0.0000)	1818.32 (0.0033)	-	-	-	-	173	0.0494	0.0438	0.0033
14	10264.10 (0.00000)	-	356.94 (0.5980)	-4211.02 (0.0000)	-	999.83 (0.0614)	173	0.1290	0.1135	0.0000

15	10590.10 (0.0000)	-	1109.72 (0.0448)	-3704.62 (0.0000)	-	-	173	0.1107	0.1003	0.0000
16	7325.83 (0.0000)	-	540.96 (0.4516)	-	-	217.99 (0.6853)	173	0.0101	-0.0015	0.4211
17	7489.34 (0.0000)	-	716.80 (0.2102)	-	-	-	173	0.0092	0.0034	0.2102
18	10375.70 (0.0000)	-	-	-3503.63 (0.0002)	5614.87 (0.0169)	141.69 (0.8129)	173	0.1566	0.1416	0.0000
19	10453.70 (0.0000)	-	-	-3403.70 (0.0000)	6006.20 (0.0003)	-	173	0.1563	0.1464	0.0000
20	10484.20 (0.0000)	-	-	-4237.29 (0.0000)	-	1165.72 (0.0070)	173	0.1276	0.1173	0.0000
21	8221.66 (0.0000)	-	-	-	8584.43 (0.0002)	-916.73 (0.0982)	173	0.0832	0.0724	0.0006
22	11901.50 (0.0000)	-	-	-3428.39 (0.0001)	-	-	173	0.0893	0.0840	0.0001
23	7075.76 (0.0000)	-	-	-	6063.43 (0.0005)	-	173	0.0683	0.0629	0.0005
24	7632.60 (0.0000)	-	-	-	-	462.82 (0.2804)	173	0.0068	0.0010	0.2804

Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]

Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	11390.80 (0.0000)	1026.97 (0.1203)	-	-6977.59 (0.0000)	-	1079.43 (0.0584)	132	0.2862	0.2695	0.0000
27	11456.10 (0.0000)	1182.44 (0.0747)	-	-5876.02 (0.0000)	-	-	132	0.2659	0.2545	0.0000
28	7121.76 (0.0000)	1007.89 (0.1874)	-	-	-	-1026.37 (0.0617)	132	0.0348	0.0199	0.1015
29	6106.05 (0.0000)	790.13 (0.2998)	-	-	-	-	132	0.0083	0.0006	0.2998
30	12589.20 (0.0000)	-	-154.61 (0.8154)	-6936.12 (0.0000)	-	1212.26 (0.0368)	132	0.2729	0.2558	0.0000
31	12720.60 (0.0000)	-	86.43 (0.8960)	-5769.73 (0.0000)	-	-	132	0.2476	0.2359	0.0000

32	8726.40 (0.0000)	-	-756.24 (0.3174)	-	-	-752.19 (0.1848)	132	0.0293	0.0142	0.1470
33	8060.34 (0.0000)	-	-1048.11 (0.1496)	-	-	-	132	0.0159	0.0083	0.1496
34	12507.20 (0.0000)	-	-	-6970.55 (0.0000)	-	1189.02 (0.0369)	132	0.2726	0.2613	0.0000
35	12769.30 (0.0000)	-	-	-5737.01 (0.0000)	-	-	132	0.2475	0.2417	0.0000
36	8221.66 (0.0000)	-	-	-	-	-916.73 (0.0919)	132	0.0217	0.0142	0.0919
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	11627.00 (0.0000)	-	-	1549.97 (0.3346)	-	-	41	0.0239	-0.0011	0.3346
Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	2968.30 (0.1607)	15103.20 (0.0000)	-	-	-	-9071.75 (0.0000)	65	0.4349	0.4167	0.0000
41	8296.47 (0.0009)	2992.69 (0.0142)	-	-	-	-	65	0.0917	0.0773	0.0000
42	7418.29 (0.0010)	-	48865.50 (0.0000)	-	-	-35596.90 (0.0000)	65	0.2446	0.2202	0.0002
43	12486.30 (0.0000)	-	598.46 (0.6026)	-	-	-	65	0.0043	-0.0115	0.6026
43	7418.29 (0.0010)	-	-	-	-48865.50 (0.0000)	13268.60 (0.0000)	65	0.2446	0.2202	0.0002
45	14052.60 (0.0000)	-	-	-	-2425.54 (0.4252)	-	65	0.0101	-0.0056	0.4252
46	13046.30 (0.0000)	-	-	-	-	136.51 (0.8716)	65	0.0004	-0.0154	0.8716
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model

48	-5148.03 (0.0618)	3096.82 (0.0005)	-	-	-	1979.00 (0.0030)	63	0.2714	0.2471	0.0001
49	993.10 (0.6145)	3018.73 (0.0014)	-	-	-	-	63	0.1552	0.1413	0.0014
50	-5148.03 (0.0618)	-	3096.82 (0.0005)	-	-	1979.00 (0.0030)	63	0.2714	0.2471	0.0001
51	993.10 (0.6145)	-	3018.73 (0.0014)	-	-	-	63	0.1552	0.1413	0.0014
52	1232.01 (0.5452)	-	-	-	11362.20 (0.0000)	533.20 (0.4143)	63	0.3792	0.3585	0.0000
53	2608.40 (0.0250)	-	-	-	12118.60 (0.0000)	-	63	0.3722	0.3619	0.0000
54	668.18 (0.7819)	-	-	-	-	1908.93 (0.0085)	63	0.1082	0.0936	0.0085
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	6952.63 (0.0000)	-2485.20 (0.0810)	-	-	-	1475.79 (0.4223)	45	0.2050	0.1672	0.0081
57	6507.95 (0.0000)	-1417.97 (0.0026)	-	-	-	-	45	0.1926	0.1738	0.0026
58	5667.18 (0.0000)	-	-1072.86 (0.0100)	-	-	-	45	0.1445	0.1246	0.0100
59	5667.18 (0.0000)	-	-	-	-	-1609.29 (0.0100)	45	0.1445	0.1246	0.0100

Table 58. Results from the Models with NOx Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	120450.00 (0.0000)	-30034.10 (0.0000)	-	-12831.90 (0.0172)	-	-2621.73 (0.3859)	173	0.3555	0.3440	0.0000

11	120203.00 (0.0000)	-31900.50 (0.0000)	-	-14515.60 (0.0039)	-	-	173	0.3526	0.3450	0.0000
12	110365.00 (0.0000)	-28570.30 (0.0000)	-	-	-	-5256.23 (0.0668)	173	0.3334	0.3256	0.0000
13	106739.00 (0.0000)	-32437.00 (0.0000)	-	-	-	-	173	0.3201	0.3161	0.0000
14	108190.00 (0.0000)	-	-34539.50 (0.0000)	-9699.51 (0.0527)	-	2110.50 (0.4842)	173	0.4295	0.4194	0.0000
15	108878.00 (0.0000)	-	-32950.50 (0.0000)	-8630.57 (0.0695)	-	-	173	0.4279	0.4212	0.0000
16	101422.00 (0.0000)	-	-34115.60 (0.0000)	-	-	309.66 (0.9148)	173	0.4167	0.4098	0.0000
17	101654.00 (0.0000)	-	-33865.90 (0.0000)	-	-	-	173	0.4167	0.4132	0.0000
18	88011.30 (0.0000)	-	-	-14727.00 (0.0180)	-57930.10 (0.0003)	-3377.38 (0.4035)	173	0.2183	0.2044	0.0000
19	86153.50 (0.0000)	-	-	-17108.90 (0.0020)	-67258.00 (0.0000)	-	173	0.2150	0.2058	0.0000
20	86892.60 (0.0000)	-	-	-7157.70 (0.2363)	-	-13942.50 (0.0000)	173	0.1552	0.1453	0.0000
21	78957.00 (0.0000)	-	-	-	-45448.00 (0.0028)	-7826.29 (0.0323)	173	0.1918	0.1823	0.0000
22	69940.50 (0.0000)	-	-	-16832.50 (0.0057)	-	-	173	0.0439	0.0383	0.0057
23	69174.20 (0.0000)	-	-	-	-66970.30 (0.0000)	-	173	0.1697	0.1649	0.0000
24	82075.70 (0.0000)	-	-	-	-	-15129.90 (0.0000)	173	0.1482	0.1432	0.0000

Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]

Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	124434.00 (0.0000)	-27928.00 (0.0000)	-	-24396.40 (0.0035)	-	2581.87 (0.5640)	132	0.2494	0.2318	0.0000
27	124590.00 (0.0000)	-27556.20 (0.0000)	-	-21761.60 (0.0018)	-	-	132	0.2474	0.2358	0.0000

28	109507.00 (0.0000)	-27994.80 (0.0000)	-	-	-	-4780.83 (0.2135)	132	0.1976	0.1852	0.0000
29	104776.00 (0.0000)	-29009.10 (0.0000)	-	-	-	-	132	0.1879	0.1816	0.0000
30	111774.00 (0.0000)	-	-33366.30 (0.0000)	-33366.30 (0.0000)	-	-17156.10 (0.0311)	132	0.3233	0.3075	0.0000
31	112274.00 (0.0000)	-	-32448.50 (0.0000)	-12714.70 (0.0606)	-	-	132	0.3172	0.3066	0.0000
32	102220.00 (0.0000)	-	-34854.40 (0.0000)	-	-	-242.90 (0.9477)	132	0.2982	0.2873	0.0000
33	102005.00 (0.0000)	-	-34948.70 (0.0000)	-	-	-	132	0.2982	0.2928	0.0000
34	94073.80 (0.0000)	-	-	-24587.80 (0.0075)	-	-398.52 (0.9351)	132	0.0793	0.0650	0.0049
35	93986.00 (0.0000)	-	-	-25001.20 (0.0011)	-	-	132	0.0792	0.0722	0.0011
36	78957.00 (0.0000)	-	-	-	-	-7826.29 (0.0613)	132	0.0267	0.0192	0.0613
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	2548.59 (0.0001)	-	-	-353.33 (0.4065)	-	-	41	0.0177	-0.0075	0.4065
Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	121065.00 (0.0000)	-21112.40 (0.1281)	-	-	-	-14542.30 (0.1210)	65	0.4443	0.4264	0.0000
41	129606.00 (0.0000)	-40526.00 (0.0000)	-	-	-	-	65	0.4222	0.4130	0.0000
42	121950.00 (0.0000)	-	-130001.00 (0.0283)	-	-	67650.10 (0.1166)	65	0.4664	0.4492	0.0000
43	112318.00 (0.0000)	-	-38271.60 (0.0000)	-	-	-	65	0.4446	0.4358	0.0000
43	121950.00	-	-	-	130001.00	-62350.50	65	0.4664	0.4492	0.0000

	(0.0000)				(0.0283)	(0.0002)				
45	90774.70 (0.0000)	-	-	-	-88226.10 (0.0000)	-	65	0.3364	0.3259	0.0000
46	106977.00 (0.0000)	-	-	-	-	-27414.30 (0.0000)	65	0.4230	0.4139	0.0000
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	44301.20 (0.0000)	-27765.60 (0.0000)	-	-	-	11314.90 (0.0000)	63	0.6414	0.6295	0.0000
49	79413.00 (0.0000)	-28212.10 (0.0000)	-	-	-	-	63	0.5010	0.4928	0.0000
50	44301.20 (0.0000)	-	-27765.60 (0.0000)	-	-	11314.90 (0.0000)	63	0.6414	0.6295	0.0000
51	79413.00 (0.0000)	-	-28212.10 (0.0000)	-	-	-	63	0.5010	0.4928	0.0000
52	-11189.30 (0.2370)	-	-	-	-67370.20 (0.0000)	20100.30 (0.0000)	63	0.5088	0.4924	0.0000
53	40697.60 (0.0000)	-	-	-	-38855.70 (0.0024)	-	63	0.1415	0.1274	0.0024
54	-7846.21 (0.5210)	-	-	-	-	11943.20 (0.0013)	63	0.1566	0.1428	0.0013
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	63013.50 (0.0003)	84487.00 (0.0005)	-	-	-	-149106.00 (0.0000)	45	0.4628	0.4372	0.0000
57	107942.00 (0.0000)	-23340.90 (0.0131)	-	-	-	-	45	0.1349	0.1147	0.0131
58	106714.00 (0.0000)	-	-29483.60 (0.0002)	-	-	-	45	0.2821	0.2654	0.0002
59	106714.00 (0.0000)	-	-	-	-	-44225.40 (0.0002)	45	0.2821	0.2654	0.0002

Table 59. Results from the Models with PM Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	1842.14 (0.0000)	-636.17 (0.0000)	-	-121.27 (0.2237)	-	45.88 (0.4150)	173	0.3384	0.3266	0.0000
11	1846.46 (0.0000)	-603.51 (0.0000)	-	-91.81 (0.3220)	-	-	173	0.3357	0.3279	0.0000
12	1746.83 (0.0000)	-622.34 (0.0000)	-	-	-	20.98 (0.6893)	173	0.3325	0.3247	0.0000
13	1761.30 (0.0000)	-606.90 (0.0000)	-	-	-	-	173	0.3319	0.3280	0.0000
14	1562.60 (0.0000)	-	-699.42 (0.0000)	-52.55 (0.5739)	-	131.15 (0.0214)	173	0.4054	0.3949	0.0000
15	1605.37 (0.0000)	-	-600.67 (0.0000)	13.88 (0.8775)	-	-	173	0.3864	0.3792	0.0000
16	1525.93 (0.0000)	-	-697.12 (0.0000)	-	-	121.40 (0.0249)	173	0.4043	0.3973	0.0000
17	1616.99 (0.0000)	-	-599.20 (0.0000)	-	-	-	173	0.3864	0.3828	0.0000
18	1148.75 (0.0000)	-	-	-118.90 (0.3244)	-901.67 (0.0037)	-29.47 (0.7086)	173	0.1175	0.1018	0.0001
19	1132.53 (0.0000)	-	-	-139.68 (0.1912)	-983.06 (0.0000)	-	173	0.1167	0.1064	0.0000
20	1131.33 (0.0000)	-	-	-1.08 (0.9926)	-	-193.92 (0.0008)	173	0.0723	0.0613	0.0017
21	1075.65 (0.0000)	-	-	-	-800.89 (0.0062)	-65.39 (0.3505)	173	0.1124	0.1019	0.0000
22	895.56 (0.0000)	-	-	-135.64 (0.2294)	-	-	173	0.0084	0.0026	0.2294
23	993.91 (0.0000)	-	-	-	-980.72 (0.0000)	-	173	0.1078	0.1026	0.0000
24	1130.61 (0.0000)	-	-	-	-	-194.10 (0.0003)	170	0.0723	0.0668	0.0003

Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	1895.85 (0.0000)	-641.77 (0.0000)	-	-194.93 (0.2109)	-	63.31 (0.4540)	132	0.2622	0.2449	0.0000
27	1899.68 (0.0000)	-632.66 (0.0000)	-	-130.32 (0.3133)	-	-	132	0.2589	0.2474	0.0000
28	1776.59 (0.0000)	-642.31 (0.0000)	-	-	-	4.48 (0.9492)	132	0.2531	0.2415	0.0000
29	1781.03 (0.0000)	-641.36 (0.0000)	-	-	-	-	132	0.2530	0.2473	0.0000
30	1585.62 (0.0000)	-	-730.31 (0.0000)	-36.66 (0.8053)	-	104.58 (0.1963)	132	0.3368	0.3213	0.0000
31	1596.95 (0.0000)	-	-709.51 (0.0000)	63.96 (0.6152)	-	-	132	0.3281	0.3177	0.0000
32	1565.20 (0.0000)	-	-733.49 (0.0000)	-	-	94.20 (0.1710)	132	0.3365	0.3262	0.0000
33	1648.61 (0.0000)	-	-696.94 (0.0000)	-	-	-	132	0.3267	0.3216	0.0000
34	1198.20 (0.0000)	-	-	-199.33 (0.2661)	-	-5.17 (0.9572)	132	0.0147	-0.0006	0.3858
35	1197.06 (0.0000)	-	-	-204.69 (0.1670)	-	-	132	0.0146	0.0071	0.1670
36	1075.65 (0.0000)	-	-	-	-	-65.39 (0.4144)	132	0.0051	0.0025	0.4144
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	14.81 (0.0000)	-	-	-1.65 (0.2256)	-	-	41	0.0374	0.0127	0.2256
Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	1750.02	-410.69	-	-	-	-181.71	65	0.2761	0.2528	0.0000

	(0.0000)	(0.1989)				(0.3985)				
41	1856.74 (0.0000)	-653.27 (0.0000)	-	-	-	-	65	0.2677	0.2561	0.0000
42	2241.26 (0.0000)	-	-6644.63 (0.0000)	-	-	4426.86 (0.0000)	65	0.5331	0.5180	0.0000
43	1611.00 (0.0000)	-	-642.11 (0.0000)	-	-	-	65	0.3054	0.2944	0.0000
43	2241.26 (0.0000)	-	-	-	6644.63 (0.0000)	-2217.77 (0.0000)	65	0.5331	0.5180	0.0000
45	1132.38 (0.0000)	-	-	-	-1117.57 (0.0030)	-	65	0.1317	0.1179	0.0030
46	1475.98 (0.0000)	-	-	-	-	-432.10 (0.0000)	65	0.2564	0.2446	0.0000
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	630.58 (0.0070)	-560.23 (0.0000)	-	-	-	290.02 (0.0000)	63	0.6135	0.6007	0.0000
49	1530.55 (0.0000)	-571.67 (0.0000)	-	-	-	-	63	0.4236	0.4142	0.0000
50	630.58 (0.0070)	-	-560.23 (0.0000)	-	-	290.02 (0.0000)	63	0.6135	0.6006	0.0000
51	1530.55 (0.0000)	-	-571.67 (0.0000)	-	-	-	63	0.4236	0.4142	0.0000
52	-489.86 (0.0208)	-	-	-	-1375.68 (0.0000)	469.26 (0.0000)	63	0.5095	0.4931	0.0000
53	721.49 (0.0000)	-	-	-	-709.98 (0.0128)	-	63	0.0972	0.0824	0.0128
54	-421.60 (0.1097)	-	-	-	-	302.69 (0.0002)	63	0.2071	0.1941	0.0002
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	1417.37 (0.0000)	559.69 (0.0962)	-	-	-	-1521.69 (0.0010)	45	0.4809	0.4562	0.0000

57	1875.88 (0.0000)	-540.74 (0.0000)	-	-	-	-	45	0.3267	0.3111	0.0000
58	1706.86 (0.0000)	-	-551.27 (0.0000)	-	-	-	45	0.4451	0.4322	0.0000
59	1706.86 (0.0000)	-	-	-	-	-826.90 (0.0000)	45	0.4451	0.4322	0.0000

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Table 60. Results from the Models with CO_2 Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	21489.30 (0.0000)	-1924.36 (0.1383)	-	-1394.70 (0.3813)	-	-2629.47 (0.0059)	105	0.2067	0.1832	0.0000
11	21760.80 (0.0000)	-4020.49 (0.0003)	-	-2923.72 (0.0604)	-	-	105	0.1447	0.1279	0.0003
12	20385.50 (0.0000)	-1694.29 (0.1816)	-	-	-	-2911.70 (0.0013)	105	0.2006	0.1850	0.0000
13	19207.60 (0.0000)	-4008.41 (0.0004)	-	-	-	-	105	0.1144	0.1058	0.0004
14	20279.70 (0.0000)	-	-1740.27 (0.1748)	-1085.03 (0.4886)	-	-2530.39 (0.0141)	105	0.2039	0.1803	0.0000
15	19698.80 (0.0000)	-	-3828.61 (0.0002)	-2118.89 (0.1727)	-	-	105	0.1547	0.1381	0.0002
16	19557.90 (0.0000)	-	-1669.01 (0.1904)	-	-	-2717.10 (0.0063)	105	0.2001	0.1844	0.0000
17	18092.80 (0.0000)	-	-4002.60 (0.0001)	-	-	-	105	0.1391	0.1307	0.0001
18	19416.00 (0.0000)	-	-	-1649.55 (0.3281)	-5449.44 (0.2391)	-2447.43 (0.0334)	105	0.2003	0.1765	0.0000
19	18191.00 (0.0000)	-	-	-3279.81 (0.0339)	-12772.10 (0.0001)	-	105	0.1635	0.1471	0.0001
20	19350.00 (0.0000)	-	-	-913.35 (0.5601)	-	-3438.96 (0.0000)	105	0.1892	0.1733	0.0000
21	18493.00 (0.0000)	-	-	-	-3775.07 (0.3791)	-2949.48 (0.0044)	105	0.1926	0.1768	0.0000
22	15299.00 (0.0000)	-	-	-2890.27 (0.0795)	-	-	105	0.0296	0.0201	0.0795

23	15262.60 (0.0000)	-	-	-	-12342.60 (0.0002)	-	105	0.1255	0.1171	0.0002
24	18770.80 (0.0000)	-	-	-	-	-3565.64 (0.0000)	105	0.1865	0.1786	0.0000
Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	21845.10 (0.0000)	-1676.26 (0.2683)	-	-2872.24 (0.2163)	-	-1755.47 (0.2027)	84	0.1060	0.0725	0.0291
27	21969.30 (0.0000)	-2183.14 (0.1379)	-	-4455.08 (0.0253)	-	-	84	0.0875	0.0650	0.0245
28	20038.30 (0.0000)	-1484.37 (0.3256)	-	-	-	-2666.28 (0.0240)	84	0.0886	0.0661	0.0233
29	18184.60 (0.0000)	-2337.58 (0.1210)	-	-	-	-	84	0.0291	0.0172	0.1210
30	20621.40 (0.0000)	-	-1341.11 (0.3766)	-2466.08 (0.2878	-	-1774.48 (0.2055)	84	0.1010	0.0673	0.0356
31	20476.90 (0.0000)	-	-1934.28 (0.1831)	-3879.85 (0.0594)	-	-	84	0.0827	0.0600	0.0304
32	19304.50 (0.0000)	-	-1453.78 (0.3372)	-	-	-2489.40 (0.0446)	84	0.0881	0.0656	0.0239
33	17663.60 (0.0000)	-	-2653.70 (0.0639)	-	-	-	84	0.0413	0.026	0.0639
34	19952.90 (0.0000)	-	-	-2609.15 (0.2591)	-	-2155.36 (0.1066)	84	0.0921	0.0697	0.0200
35	19362.10 (0.0000)	-	-	-4591.43 (0.0221)	-	-	84	0.0622	0.0508	0.0221
36	18493.00 (0.0000)	-	-	-	-	-2949.48 (0.0103)	84	0.0776	0.0664	0.0103
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	2793.89 (0.0061)	-	-	165.55 (0.8241)	-	-	21	0.0027	-0.0498	0.8241

Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	20799.30 (0.0000)	-1337.26 (0.7034)	-	-	-	-3692.28 (0.1155)	44	0.3091	0.2754	0.0005
41	23482.20 (0.0000)	-6325.42 (0.0003)	-	-	-	-	44	0.2655	0.2480	0.0003
42	22191.60 (0.0000)	-	-20383.00 (0.1673)	-	-	10437.80 (0.3331)	44	0.3385	0.2062	0.0002
43	20655.60 (0.0000)	-	-6249.28 (0.0001)	-	-	-	44	0.3230	0.3069	0.0001
43	22191.60 (0.0000)	-	-	-	20383.00 (0.1673)	-9945.17 (0.0177)	44	0.3385	0.3062	0.0002
45	17058.60 (0.0000)	-	-	-	-14264.70 (0.0007)	-	44	0.2399	0.2218	0.0007
46	19760.60 (0.0000)	-	-	-	-	-4475.42 (0.0001)	44	0.3066	0.2901	0.0001
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	11162.50 (0.0001)	-2305.64 (0.0126)	-	-	-	-462.25 (0.4689)	30	0.2229	0.1653	0.0332
49	9852.23 (0.0000)	-2314.38 (0.0115)	-	-	-	-	30	0.2074	0.1790	0.0115
50	11162.50 (0.0001)	-	-2305.64 (0.0126)	-	-	-462.25 (0.4689)	30	0.2229	0.1653	0.0332
51	9852.23 (0.0000)	-	-2314.38 (0.0115)	-	-	-	30	0.2074	0.1790	0.0115
52	7085.18 (0.0042)	-	-	-	-3712.74 (0.1927)	-61.86 (0.9353)	30	0.0781	0.0098	0.3336
53	6933.34 (0.0000)	-	-	-	-3808.35 (0.1354)	-	30	0.0779	0.0449	0.1354
54	7309.44 (0.0035)	-	-	-	-	-485.46 (0.4905)	30	0.0171	-0.0180	0.4905
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										

Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	23573.80 (0.0002)	-5781.25 (0.4643)	-	-	-	5387.20 (0.6042)	31	0.0300	-0.0393	0.6525
57	22024.60 (0.0000)	-1908.10 (0.4422)	-	-	-	-	31	0.0205	-0.0133	0.4422
58	20683.20 (0.0000)	-	-1226.24 (0.5751)	-	-	-	31	0.0110	-0.0231	0.5751
59	20683.20 (0.0000)	-	-	-	-	-1839.36 (0.5751)	31	0.0110	-0.0231	0.5751

Table 61. Results from the Models with CO Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	7604.50 (0.1797)	887.03 (0.7641)	-	3715.17 (0.3085)	-	1666.93 (0.4381)	105	0.0319	0.0032	0.3489
11	7432.41 (0.1885)	2215.85 (0.3578)	-	4684.48 (0.1717)	-	-	105	0.0261	0.0070	0.2596
12	10544.70 (0.0317)	274.18 (0.9245)	-	-	-	2418.72 (0.2321)	105	0.0219	0.0027	0.3238
13	11523.30 (0.0178)	2196.49 (0.3640)	-	-	-	-	105	0.0080	-0.0016	0.3640
14	7803.03 (0.1093)		1474.35 (0.6132)	3638.74 (0.3096)	-	1270.31 (0.5839)	105	0.0335	0.0048	0.3262
15	8094.61 (0.0937)	-	2522.75 (0.2511)	4157.76 (0.2274)	-	-	105	0.0306	0.0116	0.2048
16	10223.40 (0.0169)	-	1235.36 (0.6708)	-	-	1896.47 (0.3971)	105	0.0235	0.0044	0.2971
17	11246.00 (0.0062)	-	2864.16 (0.1903)	-	-	-	105	0.0166	0.0070	0.1903
18	8063.68 (0.0560)	-	-	9377.86 (0.0084)	43558.30 (0.0000)	-5885.47 (0.0141)	105	0.1964	0.1725	0.0001

19	5118.04 (0.2151)	-	-	5457.46 (0.0903)	25949.00 (0.0002)	-	105	0.1467	0.1300	0.0003
20	8590.60 (0.0622)	-	-	3493.29 (0.3259)	-	2040.06 (0.2432)	105	0.0310	0.0120	0.2003
21	13310.70 (0.0007)	-	-	-	34039.30 (0.0003)	-3031.21 (0.1650)	105	0.1388	0.1219	0.0005
22	10993.70 (0.0082)	-	-	4666.04 (0.1730)	-	-	105	0.0180	0.0084	0.1730
23	9990.78 (0.0011)	-	-	-	25234.30 (0.0003)	-	105	0.1223	0.1138	0.0003
24	10806.00 (0.0075)	-	-	-	-	2524.54 (0.1330)	105	0.0218	0.0123	0.1330
Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	13749.60 (0.0001)	-3401.45 (0.0544)	-	5544.42 (0.0411)	-	-4069.75 (0.0120)	84	0.1536	0.1218	0.0038
27	14037.50 (0.0001)	-4576.56 (0.0101)	-	1874.88 (0.4240)	-	-	84	0.0837	0.0611	0.0290
28	17237.30 (0.0000)	-3771.86 (0.0359)	-	-	-	-2311.57 (0.0943)	84	0.1079	0.0859	0.0098
29	15630.20 (0.0000)	-4511.57 (0.0109)	-	-	-	-	84	0.0764	0.0651	0.0109
30	11368.50 (0.0002)	-	-2926.35 (0.0990)	6390.46 (0.0194)	-	-4050.10 (0.0142)	84	0.1431	0.1109	0.0061
31	11038.70 (0.0004)	-	-4280.22 (0.0150)	3163.64 (0.1957)	-	-	84	0.0758	0.0530	0.0411
32	14781.10 (0.0000)	-	-2634.38 (0.1470)	-	-	-2197.50 (0.1356)	84	0.0821	0.0595	0.0311
33	13332.60 (0.0000)	-	-3693.60 (0.0297)	-	-	-	84	0.0564	0.0449	0.0297
34	9909.83 (0.0006)	-	-	6078.28 (0.0272)	-	-4881.20 (0.0024)	84	0.1132	0.0913	0.0077
35	8571.99 (0.0037)	-	-	1589.04 (0.5121)	-	-	84	0.0053	-0.0069	0.5121

36	13310.70 (0.0000)	-	-	-	-	-3031.21 (0.0276)	84	0.0578	0.0463	0.0276
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	23324.90 (0.1071)	-	-	15619.10 (0.1782)	-	-	21	0.0933	0.0456	0.1782
Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	7844.77 (0.0951)	-2693.44 (0.5484)	-	-	-	5773.72 (0.0556)	44	0.1990	0.1599	0.0106
41	3649.40 (0.3904)	5106.69 (0.0195)	-	-	-	-	44	0.1232	0.1023	0.0195
42	7798.25 (0.0438)	-	-17151.80 (0.3670)	-	-	16745.50 (0.2326)	44	0.2079	0.1693	0.0084
43	5334.11 (0.0996)	-	5523.06 (0.0042)	-	-	-	44	0.1796	0.1600	0.0042
43	7798.25 (0.0438)	-	-	-	17171.80 (0.3670)	-406.28 (0.9893)	44	0.2079	0.1693	0.0084
45	7588.55 (0.0052)	-	-	-	15736.30 (0.0019)	-	44	0.2078	0.1889	0.0019
46	5752.62 (0.0619)	-	-	-	-	4196.37 (0.0029)	44	0.1919	0.1726	0.0029
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	1789.55 (0.9329)	9275.73 (0.2082)	-	-	-	1601.98 (0.7625)	30	0.0614	-0.0081	0.4249
49	6330.38 (0.6694)	9306.03 (0.1991)	-	-	-	-	30	0.0582	0.0246	0.1991
50	1789.55 (0.9329)	-	9275.73 (0.2082)	-	-	1601.98 (0.7625)	30	0.0614	-0.0081	0.4249
51	6330.38 (0.6694)	-	9306.03 (0.1991	-	-	-	30	0.0582	0.0246	0.1991

52	20339.70 (0.2151)	-	-	-	50479.50 (0.0161)	-4064.04 (0.4533)	30	0.1992	0.1399	0.0498
53	10364.30 (0.2666)	-	-	-	44198.70 (0.0187)	-	30	0.1820	0.1528	0.0187
54	17290.60 (0.3317)	-	-	-	-	1695.36 (0.7519)	30	0.0036	-0.0320	0.7519
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	25346.50 (0.0001)	-14626.30 (0.0703)	-	-	-	9961.49 (0.3394)	31	0.2641	0.2115	0.0137
57	22481.80 (0.0000)	-7464.42 (0.0052)	-	-	-	-	31	0.2392	0.2130	0.0052
58	18033.40 (0.0001)	-	-5547.57 (0.0208)	-	-	-	31	0.1710	0.1424	0.0208
59	18033.40 (0.0001)	-	-	-	-	-8321.36 (0.0208)	31	0.1710	0.1424	0.0208

Table 62. Results from the Models with HC Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	16010.90 (0.0000)	-786.91 (0.6684)	-	-3067.57 (0.1768)	-	-1797.49 (0.1797)	105	0.0714	0.0439	0.0570
11	16196.50 (0.0000)	-2219.82 (0.1418)	-	-4112.80 (0.0559)	-	-	105	0.0547	0.0361	0.0569
12	13583.20 (0.0000)	-280.89 (0.8764)	-	-	-	-2418.24 (0.0568)	105	0.0544	0.0359	0.0576
13	12604.90 (0.0001)	-2202.82 (0.1501)	-	-	-	-	105	0.0200	0.0105	0.1501
14	15930.50 (0.0000)	-	-1487.16 (0.4115)	-3017.44 (0.1752)	-	-1352.08 (0.3481)	105	0.0760	0.0485	0.0456

15	15620.20 (0.0000)	-	-2603.04 (0.0584)	-3569.88 (0.0968)	-	-	105	0.0678	0.0496	0.0278
16	13923.40 (0.0000)	-	-1288.97 (0.4768)	-	-	-1871.33 (0.1808)	105	0.0589	0.0405	0.0452
17	12914.40 (0.0000)	-	-2896.17 (0.0356)	-	-	-	105	0.0422	0.0329	0.0356
18	15172.70 (0.0000)	-	-	-3278.73 (0.1708)	-3020.05 (0.6440)	-1579.01 (0.3281)	105	0.0717	0.0441	0.0562
19	14382.40 (0.0000)	-	-	-4330.53 (0.0439)	-7744.43 (0.0812)	-	105	0.0628	0.0445	0.0365
20	15136.10 (0.0000)	-	-	-2870.73 (0.1948)	-	-2128.51 (0.0515)	105	0.0697	0.0515	0.0251
21	13338.20 (0.0000)	-	-	-	308.02 (0.9597)	-2576.93 (0.0767)	105	0.0542	0.0357	0.0582
22	12628.80 (0.0000)	-	-	-4094.33 (0.0584)	-	-	105	0.0343	0.0250	0.0584
23	10515.80 (0.0000)	-	-	-	-7177.33 (0.1103)	-	105	0.0246	0.0151	0.1103
24	13315.50 (0.0000)	-	-	-	-	-2526.65 (0.0168)	105	0.0542	0.0450	0.0168

Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]

Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	17319.10 (0.0001)	-741.36 (0.7294)	-	-5735.64 (0.0836)	-	-689.78 (0.7233)	84	0.0668	0.0318	0.1348
27	17367.90 (0.0001)	-940.52 (0.6476)	-	-6357.58 (0.0234)	-	-	84	0.0653	0.0422	0.0648
28	13711.10 (0.0003)	-358.17 (0.8682)	-	-	-	-2508.59 (0.1349)	84	0.0310	0.0071	0.2795
29	11967.00 (0.0008)	-1160.92 (0.5821)	-	-	-	-	84	0.0037	-0.0084	0.5821
30	17107.80 (0.0000)	-	-1254.93 (0.5580)	-5485.41 (0.0963)	-	-510.23 (0.7959)	84	0.0694	0.0345	0.1222
31	17066.20 (0.0000)	-	-1425.49 (0.4819)	-5891.92 (0.0413)	-	-	84	0.0686	0.0456	0.0561

32	14178.50 (0.0000)	-	-1505.55 (0.4862)	-	-	-2100.46 (0.2319)	84	0.0365	0.0127	0.2220
33	12794.00 (0.0000)	-	-2518.00 (0.2085)	-	-	-	84	0.0192	0.0073	0.2085
34	16482.20 (0.0000)	-	-	-5619.28 (0.0865)	-	-866.64 (0.6431)	84	0.0654	0.0423	0.0646
35	16244.70 (0.0000)	-	-	-6416.33 (0.0214)	-	-	84	0.0629	0.0515	0.0214
36	13338.20 (0.0000)	-	-	-	-	-2576.93 (0.1112)	84	0.0307	0.0188	0.1112
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	2463.50 (0.0275)	-	-	1148.44 (0.1855)	-	-	21	0.0904	0.0425	0.1855
Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	1023.60 (0.8508)	18449.00 (0.0011)	-	-	-	-13170.60 (0.0004)	44	0.2631	0.2271	0.0019
41	10593.80 (0.0614)	655.85 (0.8130)	-	-	-	-	44	0.0013	-0.0224	0.8130
42	6449.45 (0.1596)	-	74661.20 (0.0020)	-	-	-56992.40 (0.0014)	44	0.2424	0.2055	0.0034
43	14836.00 (0.0011)	-	-2511.37 (0.3091)	-	-	-	44	0.0246	0.0014	0.3091
43	6449.45 (0.1596)	-	-	-	-74661.20 (0.0020)	17668.80 (0.0074)	44	0.2424	0.2055	0.0034
45	15568.80 (0.0000)	-	-	-	-13105.30 (0.0412)	-	44	0.0956	0.0740	0.0412
46	15354.00 (0.0004)	-	-	-	-	-2366.42 (0.1905)	44	0.0405	0.0176	0.1905
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model

48	2341.44 (0.1556)	399.61 (0.4716)	-	-	-	18.29 (0.9638)	30	0.0195	-0.0532	0.7668
49	2393.28 (0.0405)	399.96 (0.4629)	-	-	-	-	30	0.0194	-0.0156	0.4629
50	2341.44 (0.1556)	-	399.61 (0.4716)	-	-	18.29 (0.9638)	30	0.0195	-0.0532	0.7668
51	2393.28 (0.0405)	-	399.96 (0.4629)	-	-	-	30	0.0194	-0.0156	0.4629
52	3175.43 (0.0180)	-	-	-	2751.34 (0.0865)	-291.60 (0.4937)	30	0.1050	0.0387	0.2237
53	2459.69 (0.0019)	-	-	-	2300.69 (0.1092)	-	30	0.0890	0.0565	0.1092
54	3009.25 (0.0287)	-	-	-	-	22.31 (0.9555)	30	0.0001	-0.0356	0.9555
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	27658.90 (0.0003)	-23791.40 (0.0194)	-	-	-	23281.20 (0.0762)	31	0.2377	0.1833	0.0224
57	20963.70 (0.0014)	-7053.28 (0.0343)	-	-	-	-	31	0.1454	0.1159	0.0343
58	15763.20 (0.0051)	-	-4305.36 (0.1500)	-	-	-	31	0.0701	0.0380	0.1500
59	15763.20 (0.0051)	-	-	-	-	-6458.05 (0.1500)	31	0.0701	0.0380	0.1500

Table 63. Results from the Models of NOx Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	141599.00 (0.0000)	-42411.40 (0.0000)	-	-10580.40 (0.2651)	-	-3165.40 (0.5711)	105	0.3478	0.3284	0.0000
11	141926.00 (0.0000)	-44934.80 (0.0000)	-	-12421.00 (0.1630)	-	-	105	0.3457	0.3328	0.0000

12	133226.00 (0.0000)	-40666.10 (0.0000)	-	-	-	-5306.41 (0.3134)	105	0.3396	0.3267	0.0000
13	131079.00 (0.0000)	-44883.50 (0.0000)	-	-	-	-	105	0.3330	0.3265	0.0000
14	115916.00 (0.0000)	-	-40182.60 (0.0000)	-3935.74 (0.6758)	-	-27.09 (0.9965)	105	0.3322	0.3124	0.0000
15	115910.00 (0.0000)	-	-40204.90 (0.0000)	-3946.81 (0.6621)	-	-	105	0.3322	0.3191	0.0000
16	113298.00 (0.0000)	-	-39924.10 (0.0000)	-	-	-704.35 (0.9044)	105	0.3311	0.3179	0.0000
17	112918.00 (0.0000)	-	-40529.00 (0.0000)	-	-	-	105	0.3310	0.3245	0.0000
18	94768.80 (0.0000)	-	-	-3522.20 (0.7563)	-26281.40 (0.3990)	-16224.10 (0.0364)	105	0.1561	0.1311	0.0006
19	86648.80 (0.0000)	-	-	-14329.30 (0.1663)	-74823.70 (0.0007)	-	105	0.1186	0.1013	0.0016
20	94450.90 (0.0000)	-	-	28.32 (0.9979)	-	-21006.00 (0.0001)	105	0.1501	0.1335	0.0002
21	92798.10 (0.0000)	-	-	-	-22706.20 (0.4306)	-17296.10 (0.0125)	105	0.1553	0.1388	0.0002
22	69706.30 (0.0000)	-	-	-12047.20 (0.2676)	-	-	105	0.0119	0.0023	0.2676
23	73854.80 (0.0000)	-	-	-	-72947.30 (0.0009)	-	105	0.1018	0.0931	0.0009
24	94468.90 (0.0000)	-	-	-	-	-21002.10 (0.0000)	105	0.1501	0.1419	0.0000

Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]

Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	146419.00 (0.0000)	-44631.80 (0.0000)	-	-12791.60 (0.3577)	-	-4887.38 (0.5529)	84	0.2811	0.2542	0.0000
27	146764.00 (0.0000)	-46043.00 (0.0000)	-	-17198.40 (0.1434)	-	-	84	0.2779	0.2601	0.0000
28	138372.00 (0.0000)	-43777.20 (0.0000)	-	-	-	-8943.70 (0.2001)	84	0.2734	0.2555	0.0000

29	132154.00 (0.0000)	-46639.20 (0.0000)	-	-	-	-	84	0.2585	0.2494	0.0000
30	117343.00 (0.0000)	-	-42746.90 (0.0000)	-1226.53 (0.9302)	-	-3394.48 (0.6880)	84	0.2629	0.2352	0.0000
31	117067.00 (0.0000)	-	-43881.60 (0.0000)	-3981.00 (0.7477)	-	-	84	0.2614	0.2431	0.0000
32	116688.00 (0.0000)	-	-42803.00 (0.0000)	-	-	-3750.06 (0.6108)	84	0.2628	0.2446	0.0000
33	114217.00 (0.0000)	-	-44610.50 (0.0000)	-	-	-	84	0.2604	0.2514	0.0000
34	96035.90 (0.0000)	-	-	-5786.76 (0.7120)	-	-15534.90 (0.0877)	84	0.0612	0.0380	0.0774
35	91778.10 (0.0000)	-	-	-20074.10 (0.1384)	-	-	84	0.0266	0.0147	0.1384
36	92798.10 (0.0000)	-	-	-	-	-17296.10 (0.0252)	84	0.0596	0.0482	0.0252
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	327.53 (0.5264)	-	-	761.23 (0.0797)	-	-	21	0.1528	0.1083	0.0797
Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	148803.00 (0.0000)	-57844.50 (0.0077)	-	-	-	4251.68 (0.7558)	44	0.4278	0.3999	0.0000
41	145713.00 (0.0000)	-52100.60 (0.0000)	-	-	-	-	44	0.4265	0.4128	0.0000
42	142743.00 (0.0000)	-	-325919.00 (0.0002)	-	-	208836.00 (0.0011)	44	0.5111	0.4873	0.0000
43	112012.00 (0.0000)	-	-43137.90 (0.0000)	-	-	-	44	0.3644	0.3493	0.0000
43	142743.00 (0.0000)	-	-	-	325919.00 (0.0002)	-117084.00 (0.0000)	44	0.5111	0.4873	0.0000
45	82312.40	-	-	-	-81984.90	-	44	0.1876	0.1683	0.0033

	(0.0000)				(0.0033)					
46	103872.00 (0.0000)	-	-	-	-	-29623.60 (0.0001)	44	0.3180	0.3018	0.0001
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	38386.00 (0.1263)	-28035.10 (0.0023)	-	-	-	13202.70 (0.0383)	30	0.3711	0.3245	0.0019
49	75809.20 (0.0003)	-27785.40 (0.0039)	-	-	-	-	30	0.2606	0.2342	0.0039
50	38386.00 (0.1263)	-	-28035.10 (0.0023)	-	-	13202.70 (0.0383)	30	0.3711	0.3245	0.0019
51	75809.20 (0.0003)	-	-27785.40 (0.0039)	-	-	-	30	0.2606	0.2342	0.0039
52	-12601.40 (0.5597)	-	-	-	-68485.70 (0.0144)	20734.30 (0.0071)	30	0.2867	0.2339	0.0105
53	38291.90 (0.0098)	-	-	-	-36441.90 (0.1839)	-	30	0.0622	0.0287	0.1839
54	-8464.64 (0.7202)	-	-	-	-	12920.50 (0.0794)	30	0.1059	0.0739	0.0794
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	150481.00 (0.0000)	-31970.20 (0.4580)	-	-	-	-21840.10 (0.6996)	31	0.3101	0.2608	0.0055
57	156761.00 (0.0000)	-47672.30 (0.0012)	-	-	-	-	31	0.3063	0.2824	0.0012
58	134495.00 (0.0000)	-	-41201.90 (0.0016)	-	-	-	31	0.2961	0.2718	0.0016
59	134495.00 (0.0000)	-	-	-	-	-61802.90 (0.0016)	31	0.2961	0.2718	0.0016

Table 64. Results from the Models with PM Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	1590.21 (0.0000)	-428.59 (0.0000)	-	-59.96 (0.6204)	-	-122.23 (0.0891)	105	0.3200	0.2998	0.0000
11	1602.83 (0.0000)	-526.02 (0.0000)	-	-131.04 (0.2549)	-	-	105	0.3002	0.2865	0.0000
12	1542.76 (0.0000)	-418.70 (0.0000)	-	-	-	-134.36 (0.0464)	105	0.3184	0.3050	0.0000
13	1488.40 (0.0000)	-525.48 (0.0000)	-	-	-	-	105	0.2912	0.2843	0.0000
14	1316.76 (0.0000)		380.03 (0.0002)	9.75 (0.9358)	-	-104.10 (0.1868)	105	0.2952	0.2743	0.0000
15	1292.87 (0.0000)	-	-465.95 (0.0000)	-32.78 (0.7795)	-	-	105	0.2829	0.2688	0.0000
16	1323.25 (0.0000)	-	-380.67 (0.0002)	-	-	-102.43 (0.1759)	105	0.2951	0.2813	0.0000
17	1268.02 (0.0000)	-	-468.64 (0.0000)	-	-	-	105	0.2823	0.2753	0.0000
18	1111.60 (0.0000)	-	-	71.38 (0.6076)	178.71 (0.6390)	-335.05 (0.0005)	105	0.1931	0.1691	0.0001
19	943.92 (0.0000)	-	-	-151.79 (0.2482)	-823.70 (0.0030)	-	105	0.0909	0.0730	0.0078
20	1113.76 (0.0000)	-	-	47.24 (0.7134)	-	-302.51 (0.0000)	105	0.1913	0.1754	0.0000
21	1151.54 (0.0000)	-	-	-	106.25 (0.7631)	-313.30 (0.0003)	105	0.1909	0.1751	0.0000
22	757.40 (0.0000)	-	-	-126.66 (0.3523)	-	-	105	0.0084	-0.0012	0.3523
23	808.39 (0.0000)	-	-	-	-803.82 (0.0037)	-	105	0.0788	0.0699	0.0037
24	1143.72 (0.0000)	-	-	-	-	-295.96 (0.0000)	105	0.1902	0.1823	0.0000

Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	1643.20 (0.0000)	-489.41 (0.0000)	-	31.87 (0.8554)	-	-229.63 (0.0291)	84	0.2897	0.2630	0.0000
27	1659.45 (0.0000)	-555.71 (0.0000)	-	-175.18 (0.2488)	-	-	84	0.2458	0.2272	0.0000
28	1663.25 (0.0000)	-491.54 (0.0000)	-	-	-	-219.52 (0.0134)	84	0.2894	0.2718	0.0000
29	1510.63 (0.0000)	-561.77 (0.0000)	-	-	-	-	84	0.2333	0.2239	0.0000
30	1316.84 (0.0000)	-	-453.62 (0.0002)	157.07 (0.3765)	-	-217.55 (0.0444)	84	0.2664	0.2389	0.0000
31	1299.13 (0.0000)	-	-526.35 (0.0000)	-16.26 (0.9182)	-	-	84	0.2282	0.2091	0.0000
32	1400.72 (0.0000)	-	-446.45 (0.0002)	-	-	-172.02 (0.0689)	84	0.2592	0.2409	0.0000
33	1287.34 (0.0000)	-	-529.36 (0.0000)	-	-	-	84	0.2281	0.2187	0.0000
34	1090.73 (0.0000)	-	-	108.68 (0.5713)	-	-346.38 (0.0023)	84	0.1252	0.1036	0.0044
35	995.79 (0.0000)	-	-	-209.89 (0.2228)	-	-	84	0.0181	0.0061	0.2228
36	1151.54 (0.0000)	-	-	-	-	-313.30 (0.0011)	84	0.1217	0.1110	0.0011
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	3.93 (0.0081)	-	-	0.8410 (0.4439)	-	-	84	0.0312	-0.0198	0.4439
Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	1540.44	-576.31	-	-	-	7.78	44	0.3198	0.2866	0.0004

	(0.0000)	(0.0474)				(0.9668)				
41	1534.78 (0.0000)	-565.80 (0.0001)	-	-	-	-	44	0.3198	0.3036	0.0001
42	1690.86 (0.0000)	-	-5014.64 (0.0000)	-	-	3339.24 (0.0000)	44	0.5411	0.5188	0.0000
43	1199.48 (0.0000)	-	-493.01 (0.0001)	-	-	-	44	0.3027	0.2860	0.0001
43	1690.86 (0.0000)	-	-	-	5014.64 (0.0000)	-1675.39 (0.0000)	44	0.5411	0.5188	0.0000
45	826.14 (0.0001)	-	-	-	-822.21 (0.0213)	-	44	0.1200	0.0990	0.0213
46	1092.78 (0.0000)	-	-	-	-	-329.72 (0.0005)	44	0.2505	0.2327	0.0005
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	541.50 (0.0004)	-211.95 (0.0001)	-	-	-	23.52 (0.4879)	30	0.4467	0.4057	0.0003
49	608.15 (0.0000)	-211.50 (0.0001)	-	-	-	-	30	0.4365	0.4161	0.0001
50	541.50 (0.0004)	-	-211.95 (0.0001)	-	-	23.52 (0.4879)	30	0.4467	0.4057	0.0003
51	608.15 (0.0000)	-	-211.50 (0.0001)	-	-	-	30	0.4365	0.4164	0.0001
52	160.58 (0.2297)	-	-	-	-442.41 (0.0103)	71.86 (0.1106)	30	0.2266	0.1693	0.0312
53	336.96 (0.0002)	-	-	-	-331.35 (0.0354)	-	30	0.1486	0.1182	0.0354
54	187.31 (0.2066)	-	-	-	-	21.38 (0.6304)	30	0.0084	-0.0270	0.6304
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	2206.74 (0.0000)	-1023.43 (0.0856)	-	-	-	476.36 (0.5345)	31	0.3376	0.2903	0.0031

57	2069.75 (0.0000)	-680.95 (0.0008)	-	-	-	-	31	0.3282	0.3051	0.0008
58	1695.03 (0.0000)	-	-535.29 (0.0032)	-	-	-	31	0.2625	0.2370	0.0032
59	1695.03 (0.0000)	-	-	-	-	-802.93 (0.0032)	31	0.2625	0.2370	0.0032

Road Grade <0

Table 65. Results from the Models with CO_2 Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	11.2175 (0.0000)	-0.9520 (0.0677)	-	-1.5015 (0.0183)	-	0.1153 (0.7292)	24	0.3647	0.2694	0.0257
11	11.2188 (0.0000)	-0.8579 (0.0462)	-	-1.4182 (0.0130)	-	-	24	0.3608	0.2999	0.0091
12	9.9674 (0.0000)	-0.6721 (0.2279)	-	-	-	-0.2275 (0.5081)	24	0.1549	0.0744	0.1708
13	9.8006 (0.0000)	-0.8579 (0.0754)	-	-	-	-	24	0.1367	0.0974	0.0754
14	10.9834 (0.0000)	-	-1.0526 (0.0324)	-1.3716 (0.0224)	-	0.1784 (0.5842)	24	0.4038	0.3143	0.0142
15	11.0334 (0.0000)	-	-0.9115 (0.0241)	-1.2663 (0.0221)	-	-	24	0.3945	0.3369	0.0052
16	9.9962 (0.0000)	-	-0.9465 (0.0768)	-	-	-0.0925 (0.7860)	24	0.2213	0.1471	0.0723
17	9.9224 (0.0000)	-	-1.0245 (0.0213)	-	-	-	24	0.2185	0.1830	0.0213
18	10.2635 (0.0000)	-	-	-1.4912 (0.0294)	-1.8258 (0.2622)	0.1011 (0.8070)	24	0.2933	0.1873	0.0685
19	10.3197 (0.0000)	-	-	-1.4182 (0.0176)	-1.5506 (0.1736)	-	24	0.2911	0.2236	0.0270
20	10.2162 (0.0000)	-	-	-1.2522 (0.0512)	-	-0.2299 (0.4413)	24	0.2462	0.1745	0.0514
21	9.3402 (0.0000)	-	-	-	-0.6158 (0.7125)	-0.3434 (0.3988)	24	0.0988	0.0130	0.3354
22	9.9320 (0.0000)	-	-	-1.4182 (0.0195)	-	-	24	0.2241	0.1889	0.0195

23	8.9015 (0.0000)	-	-	-	-1.5506 (0.2220)	-	24	0.0670	0.0246	0.2220
24	9.3783 (0.0000)	-	-	-	-	-0.4414 (0.1477)	24	0.0928	0.0516	0.1477
Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	11.6268 (0.0000)	-0.9817 (0.2081)	-	-2.1076 (0.0352)	-	0.2849 (0.5576)	18	0.3623	0.2256	0.0894
27	11.6822 (0.0000)	-0.9817 (0.1974)	-	-1.7990 (0.0259)	-	-	18	0.3458	0.2586	0.0415
28	10.3219 (0.0000)	-0.9817 (0.2644)	-	-	-	-0.3434 (0.4514)	18	0.1146	-0.0034	0.4012
29	9.8832 (0.0000)	-0.9817 (0.2574)	-	-	-	-	18	0.0794	0.0218	0.2574
30	11.3315 (0.0000)	-	-1.1581 (0.1384)	-1.7579 (0.0743)	-	0.2293 (0.6295)	18	0.3904	0.2598	0.0670
31	11.3922 (0.0000)	-	-1.1857 (0.1185)	-1.5026 (0.0576)	-	-	18	0.3798	0.2972	0.0278
32	10.5138 (0.00000	-	-1.5053 (0.0717)	-	-	-0.2801 (0.5108)	18	0.2284	0.1256	0.1430
33	10.1901 (0.0000)	-	-1.5464 (0.0591)	-	-	-	18	0.2051	0.1554	0.0591
34	10.6451 (0.0000)	-	-	-2.1076 (0.0379)	-	0.2849 (0.5663)	18	0.2829	0.1873	0.0826
35	10.7005 (0.0000)	-	-	-1.7990 (0.0283)	-	-	18	0.2665	0.2206	0.0283
36	9.3402 (0.0000)	-	-	-	-	-0.3434 (0.4554)	18	0.0353	-0.0250	0.4554
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	8.0075 (0.0001)	-	-	-0.6566 (0.1051)	-	-	6	0.5214	0.4017	0.1051

Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	11.5038 (0.0001)	1.1933 (0.3865)	-	-	-	-1.8118 (0.0819)	9	0.6118	0.4823	0.0585
41	12.5104 (0.0000)	-1.2225 (0.1058)	-	-	-	-	9	0.3299	0.2342	0.1058
42	12.4148 (0.0000)	-	-1.2655 (0.8369)	-	-	-0.1527 (0.9729)	9	0.5587	0.4116	0.0859
43	12.4366 (0.0206)	-	-1.4727 (0.0206)	-	-	-	9	0.5586	0.4956	0.0206
43	12.4148 (0.0000)	-	-	-	1.2655 (0.8369)	-1.4182 (0.4184)	9	0.5587	0.4116	0.0859
45	11.7057 (0.0000)	-	-	-	-3.6982 (0.0323)	-	9	0.5032	0.4323	0.0323
46	12.2687 (0.0000)	-	-	-	-	-1.0775 (0.0212)	9	0.5553	0.4918	0.0212
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	9.4612 (0.0018)	-1.1336 (0.0962)	-	-	-	0.0210 (0.9618)	9	0.3941	0.1921	0.2225
49	9.5277 (0.0000)	-1.1347 (0.0704)	-	-	-	-	9	0.3938	0.3072	0.0704
50	9.4612 (0.0018)	-	-1.1336 (0.0962)	-	-	0.0208 (0.9618)	9	0.3941	0.1921	0.2225
51	9.5277 (0.0000)	-	-1.1347 (0.0704)	-	-	-	9	0.3938	0.3072	0.0704
52	7.4179 (0.0053)	-	-	-	-1.7582 (0.3738)	0.2586 (0.6495)	9	0.1348	-0.1536	0.6477
53	8.1076 (0.0000)	-	-	-	-1.4133 (0.4026)	-	9	0.1018	-0.0265	0.4026
54	7.4691 (0.0035)	-	-	-	-	0.0538 (0.9164)	9	0.0017	-0.1409	0.9164
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										

Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	7.4812 (0.0037)	0.1994 (0.8860)	-	-	-	-1.1844 (0.3636)	6	0.5393	0.2322	0.3127
57	7.8761 (0.0007)	-0.9850 (0.2049)	-	-	-	-	6	0.3639	0.2049	0.2049
58	7.0288 (0.0003)	-	1.1043 (0.0619)	-	-	-1.8631 (0.0190)	6	0.8787	0.7978	0.0423
59	7.0288 (0.0017)	-	-0.1377 (0.8456)	-	-	-	6	0.0107	-0.2367	0.8456
60	7.5810 (0.0002)	-	-	-	-	-1.0348 (0.0982)	6	0.5356	0.4195	0.0982

Table 66. Results from the Models with CO Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	33.5866 (0.0005)	-11.7874 (0.0113)	-	-6.3050 (0.2223)	-	10.3593 (0.0015)	24	0.4203	0.3334	0.0109
11	33.7017 (0.0033)	-3.3273 (0.4657)	-	1.1767 (0.8407)	-	-	24	0.0275	-0.0651	0.7463
12	28.3370 (0.0006)	-10.6121 (0.0190)	-	-	-	8.9201 (0.0026)	24	0.3743	0.3147	0.0073
13	34.8784 (0.0003)	-3.3273 (0.4555)	-	-	-	-	24	0.0256	-0.0187	0.4555
14	27.3873 (0.0025)	-	-8.5044 (0.0663)	-4.1832 (0.4393)	-	9.3840 (0.0062)	24	0.3223	0.2206	0.0467
15	30.0156 (0.0041)	-	-1.0799 (0.8047)	1.3567 (0.8201)	-	-	24	0.0049	-0.0899	0.9498
16	24.3765 (0.0020)	-	-8.1806 (0.0722)	-	-	8.5579 (0.0069)	24	0.3012	0.2346	0.0232

17	31.2058 (0.0005)	-	-0.9588 (0.8209)	-	-	-	24	0.0024	-0.0430	0.8209
18	21.0585 (0.0149)	-	-	-2.5606 (0.6776)	5.0229 (0.7430)	5.1747 (0.1995)	24	0.1989	0.0788	0.2085
19	23.9333 (0.0055)	-	-	1.1767 (0.8319)	19.1096 (0.0955)	-	24	0.1284	0.0454	0.2362
20	21.1886 (0.0122)	-	-	-3.2182 (0.5727)	-	6.0853 (0.0360)	24	0.1945	0.1178	0.1032
21	19.4732 (0.0095)	-	-	-	7.1007 (0.6174)	4.4114 (0.2068)	24	0.1918	0.1148	0.1069
22	28.7107 (0.0010)	-	-	1.1767 (0.8390)	-	-	24	0.0019	-0.0434	0.8390
23	25.1101 (0.0001)	-	-	-	19.1096 (0.0881)	-	24	0.1265	0.0868	0.0881
24	19.0350 (0.0090)	-	-	-	-	5.5417 (0.0377)	24	0.1819	0.1447	0.0377

Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]

Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	43.9732 (0.0000)	-22.6505 (0.0002)	-	-2.9873 (0.5868)	-	5.3019 (0.0808)	18	0.6833	0.6155	0.0009
27	45.0041 (0.0000)	-22.6505 (0.0003)	-	2.7565 (0.5726)	-	-	18	0.6032	0.5503	0.0010
28	42.1237 (0.0000)	-22.6505 (0.0001)	-	-	-	4.4114 (0.0703)	18	0.6763	0.6332	0.0002
29	47.7606 (0.0000)	-22.6505 (0.0002)	-	-	-	-	18	0.5944	0.5690	0.0002
30	32.4493 (0.0012)	-	-18.7739 (0.0053)	2.6820 (0.7094)	-	4.4012 (0.2412)	18	0.4865	0.3764	0.0219
31	33.6146	-	-19.3045	7.5826	-	-	18	0.4316	0.3558	0.0145

	(0.0009)		(0.0045)	(0.2181)						
32	33.6967 (0.0003)	-	-18.2442 (0.0040)	-	-	5.1784 (0.0918)	18	0.4812	0.4120	0.0073
33	39.6807 (0.0000)	-	-17.4847 (0.0075)	-	-	-	18	0.3689	0.3295	0.0075
34	21.3227 (0.0383)	-	-	-2.9873 (0.7390)	-	5.3019 (0.2687)	18	0.0889	-0.0325	0.4973
35	22.3536 (0.0308)	-	-	2.7565 (0.7112)	-	-	18	0.0088	-0.0531	0.7112
36	19.4732 (0.0186)	-	-	-	-	4.4114 (0.2495)	18	0.0819	0.0246	0.2495
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	46.2025 (0.0068)	-	-	-1.9828 (0.7705)	-	-	6	0.0238	-0.2203	0.7705
Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	49.4277 (0.0008)	-35.6548 (0.0058)	-	-	-	25.7312 (0.0044)	9	0.7681	0.6907	0.0125
41	35.1326 (0.0409)	-1.3466 (0.8514)	-	-	-	-	9	0.0054	-0.1367	0.8514
42	39.9862 (0.0103)	-	-116.2560 (0.0803)	-	-	88.7463 (0.0714)	9	0.4771	0.3028	0.1430
43	27.3082 (0.0475)	-	4.1851 (0.5234)	-	-	-	9	0.0605	-0.0737	0.5234
43	39.9862 (0.0103)	-	-	-	116.2560 (0.0803)	-27.5100 (0.1231)	9	0.4771	0.3028	0.1430
45	26.2312 (0.0205)	-	-	-	19.9712 (0.2315)	-	9	0.1969	0.0822	0.2315
46	26.5720	-	-	-	-	3.7898	9	0.0922	-0.0375	0.4271

	(0.0420)					(0.4271)				
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	15.1067 (0.5342)	-6.7473 (0.3994)	-	-	-	10.0866 (0.1103)	9	0.4270	0.2361	0.1881
49	47.4211 (0.0307)	-7.3076 (0.4268)	-	-	-	-	9	0.0923	-0.0374	0.4268
50	15.1067 (0.5342)	-	-6.7473 (0.3994)	-	-	10.0866 (0.1103)	9	0.4270	0.2361	0.1881
51	47.4211 (0.0307)	-	-7.3076 (0.4268)	-	-	-	9	0.0923	-0.0374	0.4268
52	3.1389 (0.8806)	-	-	-	-3.8098 (0.8625)	10.7270 (0.1358)	9	0.3520	0.1360	0.2721
53	31.7442 (0.0405)	-	-	-	10.4928 (0.6467)	-	9	0.0317	-0.1066	0.6467
54	3.2499 (0.8661)	-	-	-	-	10.2831 (0.0942)	9	0.3485	0.2554	0.0942
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	27.3487 (0.0127)	-6.9319 (0.4075)	-	-	-	-4.5930 (0.5155)	6	0.7818	0.6364	0.1019
57	28.8797 (0.0027)	-11.5249 (0.0274)	-	-	-	-	6	0.7425	0.6782	0.0274
58	24.7328 (0.0131)	-	-1.7001 (0.7395)	-	-	-8.5169 (0.1834)	6	0.7268	0.5447	0.1428
59	24.7328 (0.0122)	-	-7.3780 (0.1408)	-	-	-	6	0.4565	0.3206	0.1408
60	23.8828 (0.0026)	-	-	-	-	-9.7919 (0.0340)	6	0.7147	0.6434	0.0340

Table 67. Results from the Models with HC Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	9.6510 (0.0318)	2.5690 (0.2555)	-	-3.1370 (0.2419)	-	-0.6059 (0.6830)	24	0.1562	0.0296	0.3236
11	9.6532 (0.0284)	2.0741 (0.2633)	-	-3.5746 (0.1399)	-	-	24	0.1489	0.0679	0.1839
12	7.0481 (0.0650)	3.1538 (0.1597)	-	-	-	-1.3220 (0.3389)	24	0.0948	0.0086	0.3513
13	6.0786 (0.0945)	2.0741 (0.2767)	-	-	-	-	24	0.0535	0.0105	0.2767
14	12.1142 (0.0060)	-	0.3400 (0.8773)	-3.7712 (0.1674)	-	0.1937 (0.9000)	24	0.0995	-0.0356	0.5426
15	12.1684 (0.0045)	-	0.4933 (0.7829)	-3.6568 (0.1450)	-	-	24	0.0987	0.0129	0.3356
16	9.3999 (0.0148)	-	0.6320 (0.7785)	-	-	-0.5510 (0.7109)	24	0.0071	-0.0875	0.9283
17	8.9602 (0.0121)	-	0.1670 (0.9271)	-	-	-	24	0.0004	-0.0450	0.9271
18	12.3329 (0.0027)	-	-	-3.6624 (0.2014)	1.1252 (0.8721)	0.1216 (0.9463)	24	0.0996	-0.0355	0.5421
19	12.4004 (0.0015)	-	-	-3.5746 (0.1507)	1.4561 (0.7643)	-	24	0.0994	0.0136	0.3333
20	12.3620 (0.0021)	-	-	-3.8098 (0.1514)	-	0.3256 (0.7951)	24	0.0984	0.0125	0.3371
21	10.0654 (0.0053)	-	-	-	4.0972 (0.5438)	-0.9702 (0.5521)	24	0.0210	-0.0723	0.8004

22	12.7644 (0.0005)	-	-	-3.5746 (0.1419)	-	-	24	0.0954	0.0543	0.1419
23	8.8258 (0.0017)	-	-	-	1.4561 (0.7703)	-	24	0.0040	-0.0413	0.7703
24	9.8125 (0.0052)	-	-	-	-	-0.3180 (0.7920)	24	0.0032	-0.0421	0.7920
Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	10.9954 (0.0428)	4.0933 (0.1960)	-	-8.1137 (0.0439)	-	1.4484 (0.4635)	18	0.3373	0.1953	0.1139
27	11.2770 (0.0345)	4.0933 (0.1884)	-	-6.5445 (0.0436)	-	-	18	0.3104	0.2185	0.0616
28	5.9722 (0.2438)	4.0933 (0.2452)	-	-	-	-0.9702 (0.5927)	18	0.1051	-0.0142	0.4348
29	4.7325 (0.2843)	4.0933 (0.2339)	-	-	-	-	18	0.0873	0.0302	0.2339
30	14.4239 (0.0069)	-	1.1217 (0.7340)	-8.4524 (0.0531)	-	1.5022 (0.4740)	18	0.2564	0.0971	0.2320
31	14.8216 (0.0046)	-	0.9405 (0.7713)	-6.7797 (0.0540)	-	-	18	0.2276	0.1247	0.1441
32	10.4924 (0.0334)	-	-0.5477 (0.8771)	-	-	-0.9471 (0.6187)	18	0.0194	-0.1113	0.8631
33	9.3979 (0.0318)	-	-0.6866 (0.8420)	-	-	-	18	0.0026	-0.0598	0.8420
34	15.0887 (0.0019)	-	-	-8.1137 (0.0478)	-	1.4484 (0.4746)	18	0.2500	0.1500	0.1156
35	15.3703 (0.0013)	-	-	-6.5445 (0.0478)	-	-	18	0.2231	0.1746	0.0478
36	10.0654 (0.0135)	-	-	-	-	-0.9702 (0.5974)	18	0.0178	-0.0436	0.5974
Models for CNG Fuel Trucks-E~f(VT) [37]										

Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	7.9167 (0.0268)	-	-	2.3652 (0.2222)	-	-	6	0.3430	0.1787	0.2220
Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	0.6936 (0.9062)	23.4429 (0.0080)	-	-	-	-15.5386 (0.0089)	9	0.7224	0.6299	0.0214
41	9.3262 (0.3261)	2.7247 (0.5515)	-	-	-	-	9	0.0529	-0.0824	0.5515
42	5.6548 (0.4213)	-	87.2411 (0.0401)	-	-	-64.8653 (0.0382)	9	0.5409	0.3878	0.0968
43	14.9213 (0.0885)	-	-0.7904 (0.8538)	-	-	-	9	0.0052	-0.1369	0.8538
43	5.6548 (0.4213)	-	-	-	-87.2411 (0.0401)	22.3757 (0.0522)	9	0.5409	0.3878	0.0968
45	16.8427 (0.0267)	-	-	-	-8.9260 (0.4205)	-	9	0.0947	-0.0347	0.4205
46	15.7211 (0.0644)	-	-	-	-	-1.1122 (0.7228)	9	0.0191	-0.1210	0.7228
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	-2.1328 (0.5478)	2.8527 (0.0394)	-	-	-	1.3167 (0.1455)	9	0.6088	0.4785	0.0599
49	2.0855 (0.4264)	2.7795 (0.0565)	-	-	-	-	9	0.4266	0.3446	0.0565
50	-2.1328 (0.5478)	-	2.8527 (0.0394)	-	-	1.3167 (0.1455)	9	0.6088	0.4785	0.0599
51	2.0855 (0.4264)	-	2.7795 (0.0565)	-	-	-	9	0.4266	0.3446	0.0565
52	3.1301	-	-	-	8.5817	0.2338	9	0.7327	0.6436	0.0191

	(0.2180)				(0.0116)	(0.7524)				
53	3.7536 (0.0159)	-	-	-	8.8935 (0.0035)	-	9	0.7278	0.6889	0.0035
54	2.8802 (0.4654)	-	-	-	-	1.2336 (0.2857)	9	0.1603	0.0403	0.2857
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	11.5343 (0.0640)	-8.4287 (0.2347)	-	-	-	4.1631 (0.4597)	6	0.4974	0.1623	0.3563
57	10.1466 (0.0455)	-4.2656 (0.1943)	-	-	-	-	6	0.3775	0.2219	0.1943
58	8.5270 (0.1283)	-	-2.4141 (0.5964)	-	-	-0.3478 (0.9411)	6	0.2196	-0.3007	0.6894
59	8.5270 (0.0739)	-	-2.6460 (0.3507)	-	-	-	6	0.2179	0.0224	0.3507
60	7.3199 (0.0867)	-	-	-	-	-2.1584 (0.4846)	6	0.1289	-0.0889	0.4846

Table 68. Results from thr Models with NOx Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	89.0392 (0.0000)	-26.0323 (0.0000)	-	-6.4123 (0.2796)	-	-0.5932 (0.8567)	24	0.6868	0.6399	0.0000
11	89.0326 (0.0000)	-26.5167 (0.0000)	-	-6.8407 (0.1984)	-	-	24	0.6863	0.6564	0.0000
12	83.7003 (0.0000)	-24.8369 (0.0000)	-	-	-	-2.0569 (0.4977)	24	0.6675	0.6358	0.0000
13	82.1919 (0.0000)	-26.5167 (0.0000)	-	-	-	-	24	0.6600	0.6445	0.0000

14	80.2259 (0.0000)	-	-25.4739 (0.0000)	-2.4856 (0.6552)	-	-0.1516 (0.9623)	24	0.7052	0.6610	0.0000
15	80.1834 (0.0000)	-	-25.5938 (0.0000)	-2.5751 (0.6140)	-	-	24	0.7052	0.6771	0.0000
16	78.4369 (0.0000)	-	-25.2814 (0.0000)	-	-	-0.6424 (0.8282)	24	0.7022	0.6739	0.0000
17	77.9242 (0.0000)	-	-25.8236 (0.0000)	-	-	-	24	0.7015	0.6880	0.0000
18	62.9857 (0.0000)	-	-	-6.3050 (0.4430)	-51.2450 (0.0189)	-0.7418 (0.8875)	24	0.4264	0.3403	0.0099
19	62.5736 (0.0000)	-	-	-6.8407 (0.3374)	-53.2643 (0.0010)	-	24	0.4258	0.3711	0.0030
20	61.6585 (0.0000)	-	-	0.4048 (0.9627)	-	-10.0322 (0.0245)	24	0.2391	0.1667	0.0567
21	59.0822 (0.0000)	-	-	-	-46.1287 (0.0229)	-2.6212 (0.5700)	24	0.4088	0.3525	0.0040
22	49.2575 (0.0004)	-	-	-6.8407 (0.4485)	-	-	24	0.0264	-0.0179	0.4485
23	55.7329 (0.0000)	-	-	-	-53.2643 (0.0009)	-	24	0.3994	0.3721	0.0009
24	61.9294 (0.0000)	-	-	-	-	-9.9639 (0.0153)	24	0.2390	0.2044	0.0153
Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	92.4624 (0.0000)	-26.3436 (0.0035)	-	-11.3656 (0.2342)	-	0.7668 (0.8752)	18	0.5045	0.3983	0.0173
27	92.6115 (0.0000)	-26.3436 (0.0025)	-	-10.5350 (0.1681)	-	-	18	0.5036	0.4374	0.0052
28	85.4258 (0.0000)	-26.3436 (0.0036)	-	-	-	-2.6212 (0.5239)	18	0.4498	0.3764	0.0113
29	82.0765 (0.0000)	-26.3436 (0.0029)	-	-	-	-	18	0.4341	0.3988	0.0029
30	82.1655 (0.0000)	-	-27.0758 (0.0029)	-3.1894 (0.7370)	-	-0.5323 (0.9123)	18	0.5168	0.4133	0.0147

31	82.0246 (0.0000)	-	-27.0116 (0.0020)	-3.7821 (0.6169)	-	-	18	0.5164	0.4519	0.0043
32	80.6820 (0.0000)	-	-27.7057 (0.0014)	-	-	-1.4565 (0.7063)	18	0.5127	0.4478	0.0046
33	78.9990 (0.0000)	-	-27.9193 (0.0009)	-	-	-	18	0.5080	0.4772	0.0009
34	66.1188 (0.0001)	-	-	-11.3656 (0.3623)	-	0.7668 (0.9054)	18	0.0703	-0.0536	0.5787
35	66.2679 (0.0001)	-	-	-10.5350 (0.2907)	-	-	18	0.0694	0.0113	0.2907
36	59.0822 (0.0000)	-	-	-	-	-2.6212 (0.6212)	18	0.0156	-0.0459	0.6212
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	1.9208 (0.1268)	-	-	0.5478 (0.4812)	-	-	6	0.1308	-0.0865	0.4812
Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	84.2031 (0.0001)	-1.2905 (0.8887)	-	-	-	-20.0211 (0.0157)	9	0.9178	0.8904	0.0006
41	95.3260 (0.0001)	-27.9853 (0.0020)	-	-	-	-	9	0.7655	0.7320	0.0020
42	88.7939 (0.0000)	-	-46.9558 (0.2057)	-	-	13.4986 (0.5984)	9	0.9382	0.9177	0.0002
43	86.8655 (0.0000)	-	-28.6363 (0.0000)	-	-	-	9	0.9351	0.9258	0.0000
43	88.7939 (0.0000)	-	-	-	46.9558 (0.2057)	-33.4572 (0.0108)	9	0.9382	0.9177	0.0002
45	72.0653 (0.0000)	-	-	-	-70.1445 (0.0011)	-	9	0.8015	0.7731	0.0011
46	83.3759 (0.0000)	-	-	-	-	-20.8153 (0.0000)	9	0.9175	0.9057	0.0000
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										

Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	79.9628 (0.0193)	-28.1410 (0.0138)	-	-	-	0.6239 (0.9196)	9	0.6643	0.5524	0.0378
49	81.9617 (0.0011)	-28.1756 (0.0075)	-	-	-	-	9	0.6637	0.6157	0.0075
50	79.9628 (0.0193)	-	-28.1410 (0.0138)	-	-	0.6239 (0.9196)	9	0.6643	0.5524	0.0378
51	81.9617 (0.0011)	-	-28.1756 (0.0075)	-	-	-	9	0.6637	0.6157	0.0075
52	28.7904 (0.3333)	-	-	-	-59.0813 (0.0861)	8.3268 (0.3658)	9	0.4141	0.2189	0.2011
53	50.9953 (0.0123)	-	-	-	-47.9789 (0.1119)	-	9	0.3208	0.2237	0.1119
54	30.5112 (0.3864)	-	-	-	-	1.4436 (0.8829)	9	0.0033	-0.1391	0.8829
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	63.4980 (0.0009)	-0.7372 (0.9200)	-	-	-	-27.9341 (0.0175)	6	0.9693	0.9489	0.0054
57	72.8094 (0.0028)	-28.6713 (0.0288)	-	-	-	-	6	0.7363	0.6704	0.0288
58	61.4074 (0.0004)	-	3.4440 (0.3815)	-	-	-31.0700 (0.0032)	6	0.9772	0.9619	0.0034
59	61.4074 (0.0147)	-	-17.2694 (0.1773)	-	-	-	6	0.4007	0.2509	0.1773
60	63.1294 (0.0000)	-	-	-	-	-28.4870 (0.0004)	6	0.9692	0.9615	0.0004

Table 69. Results from Models with PM Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	1.3896 (0.0000)	-0.6580 (0.0000)	-	-0.1286 (0.2587)	-	0.1492 (0.0263)	24	0.7249	0.6836	0.0000
11	1.3913 (0.0000)	-0.5362 (0.0000)	-	-0.0209 (0.8541)	-	-	24	0.6457	0.6120	0.0000
12	1.2826 (0.0000)	-0.6341 (0.0000)	-	-	-	0.1198 (0.0488)	24	0.7063	0.6783	0.0000
13	1.3704 (0.0000)	-0.5362 (0.0000)	-	-	-	-	24	0.6451	0.6290	0.0000
14	1.1226 (0.0000)	-	-0.5833 (0.0000)	-0.0225 (0.8609)	-	0.1368 (0.0761)	24	0.6252	0.5690	0.0002
15	1.1609 (0.0000)	-	-0.4750 (0.0000)	0.0583 (0.6476)	-	-	24	0.5596	0.5177	0.0002
16	1.1065 (0.0000)	-	-0.5815 (0.0000)	-	-	0.1324 (0.0620)	24	0.6246	0.5888	0.0000
17	1.2121 (0.0000)	-	-0.4698 (0.0000)	-	-	-	24	0.5551	0.5349	0.0000
18	0.7229 (0.0097)	-	-	-0.0846 (0.6674)	-0.9802 (0.0559)	0.0883 (0.4869)	24	0.2048	0.0855	0.1957
19	0.7719 (0.0042)	-	-	-0.0209 (0.9035)	-0.7398 (0.0409)	-	24	0.1848	0.1072	0.1170
20	0.6975 (0.0175)	-	-	0.0437 (0.8261)	-	-0.0894 (0.3576)	24	0.0410	-0.0503	0.6444
21	0.6705 (0.0057)	-	-	-	-0.9115 (0.0546)	0.0631 (0.5664)	24	0.1972	0.1207	0.0996
22	0.5870 (0.0245)	-	-	-0.0209 (0.9107)	-	-	24	0.0006	-0.0448	0.9107
23	0.7511 (0.0002)	-	-	-	-0.7398 (0.0363)	-	24	0.1842	0.1471	0.0363
24	0.7268 (0.0047)	-	-	-	-	-0.0820 (0.3567)	24	0.0387	-0.0050	0.3567

Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	1.5479 (0.0000)	-0.7856 (0.0001)	-	-0.1482 (0.3881)	-	0.1073 (0.2393)	18	0.7114	0.6495	0.0005
27	1.5687 (0.0000)	-0.7856 (0.0000)	-	-0.0320 (0.8212)	-	-	18	0.6802	0.6376	0.0002
28	1.4561 (0.0000)	-0.7856 (0.0000)	-	-	-	0.0631 (0.3904)	18	0.6950	0.6543	0.0001
29	1.5367 (0.0000)	-0.7856 (0.0000)	-	-	-	-	18	0.6791	0.6590	0.0000
30	1.1851 (0.0002)	-	-0.7135 (0.0008)	0.0673 (0.7506)	-	0.0730 (0.5017)	18	0.5776	0.4871	0.0060
31	1.2045 (0.0001)	-	-0.7224 (0.0005)	0.1486 (0.3898)	-	-	18	0.5633	0.5050	0.0020
32	1.2164 (0.0000)	-	-0.7003 (0.0005)	-	-	0.0925 (0.2908)	18	0.5745	0.5177	0.0016
33	1.3233 (0.0000)	-	-0.6867 (0.0005)	-	-	-	18	0.5404	0.5117	0.0005
34	0.7623 (0.0283)	-	-	-0.1482 (0.6219)	-	0.1073 (0.4978)	18	0.0323	-0.0968	0.7819
35	0.7831 (0.0216)	-	-	-0.0320 (0.8948)	-	-	18	0.0011	-0.0613	0.8948
36	0.6705 (0.0163)	-	-	-	-	0.0631 (0.6180)	18	0.0159	-0.0456	0.6180
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	0.0098 (0.0069)	-	-	0.0015 (0.3320)	-	-	6	0.2332	0.0414	0.3320
Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	1.5299	-0.7142	-	-	-	0.1282	9	0.6958	0.5944	0.0282

	(0.0035)	(0.0873)				(0.6091)				
41	1.4587 (0.0014)	-0.5433 (0.0062)	-	-	-	-	9	0.6810	0.6355	0.0062
42	1.6209 (0.0000)	-	-4.7567 (0.0000)	-	-	3.1647 (0.0000)	9	0.9865	0.9821	0.0000
43	1.1688 (0.0038)	-	-0.4617 (0.0181)	-	-	-	9	0.5738	0.5130	0.0181
43	1.6209 (0.0000)	-	-	-	4.7567 (0.0000)	-1.5920 (0.0000)	9	0.9865	0.9821	0.0000
45	0.8249 (0.0299)	-	-	-	-0.8152 (0.1650)	-	9	0.2555	0.1492	0.1650
46	1.0721 (0.0075)	-	-	-	-	-0.3113 (0.0373)	9	0.4845	0.4109	0.0373
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	0.7185 (0.1088)	-0.5508 (0.0044)	-	-	-	0.2286 (0.0437)	9	0.8193	0.7590	0.0059
49	1.4508 (0.0035)	-0.5635 (0.0113)	-	-	-	-	9	0.6238	0.5701	0.0113
50	0.7185 (0.1088)	-	-0.5508 (0.0044)	-	-	0.2286 (0.0437)	9	0.8193	0.7590	0.0059
51	1.4508 (0.0035)	-	-0.5635 (0.0113)	-	-	-	9	0.6238	0.5701	0.0113
52	-0.2865 (0.5232)	-	-	-	-1.2719 (0.0289)	0.3928 (0.0244)	9	0.6715	0.5620	0.0354
53	0.7609 (0.0630)	-	-	-	-0.7482 (0.2504)	-	9	0.1832	0.0666	0.2504
54	-0.2495 (0.6906)	-	-	-	-	0.2446 (0.1979)	9	0.2242	0.1134	0.1979
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	1.2421 (0.0246)	-0.5245 (0.2984)	-	-	-	-0.0752 (0.8487)	6	0.7340	0.5567	0.1372

57	1.2672 (0.0058)	-0.5997 (0.0302)	-	-	-	-	6	0.7302	0.6627	0.0302
58	1.0348 (0.0380)	-	-0.1010 (0.7308)	-	-	-0.3861 (0.2998)	6	0.6128	0.3547	0.2409
59	1.0348 (0.0292)	-	-0.3674 (0.1701)	-	-	-	6	0.4110	0.2638	0.1701
60	0.9799 (0.0118)	-	-	-	-	-0.4686 (0.0727)	6	0.5944	0.4930	0.0727

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Table 70. Results from Models with CO_2 Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	14.9287 (0.0000)	-1.6169 (0.0089)	-	-1.7349 (0.0164)	-	0.2413 (0.5241)	24	0.4484	0.3657	0.0068
11	14.9314 (0.0000)	-1.4198 (0.0058)	-	-1.5606 (0.0161)	-	-	24	0.4368	0.3832	0.0024
12	13.4842 (0.0000)	-1.2935 (0.0480)	-	-	-	-0.1547 (0.6916)	24	0.2590	0.1884	0.0430
13	13.3708 (0.0000)	-1.4198 (0.0122)	-	-	-	-	24	0.2532	0.2193	0.0122
14	14.4026 (0.0000)	-	-1.6115 (0.0062)	-1.4943 (0.0295)	-	0.2801 (0.4563)	24	0.4669	0.3870	0.0049
15	14.4811 (0.0000)	-	-1.3899 (0.0043)	-1.3290 (0.0360)	-	-	24	0.4515	0.3993	0.0018
16	13.3271 (0.0000)	-	-1.4958 (0.0171)	-	-	-0.0150 (0.9690)	24	0.3204	0.2557	0.0173
17	13.3152 (0.0000)	-	-1.5085 (0.0039)	-	-	-	24	0.3204	0.2895	0.0039
18	13.3234 (0.0000)	-	-	-1.7935 (0.0255)	-3.6814 (0.0605)	0.3225 (0.5072)	24	0.3466	0.2486	0.0334
19	13.5025 (0.0000)	-	-	-1.5606 (0.0257)	-2.8036 (0.0427)	-	24	0.3317	0.2680	0.0145
20	13.2281 (0.0000)	-	-	-1.3115 (0.0952)	-	-0.3450 (0.3527)	24	0.2172	0.1427	0.0764
21	12.2130 (0.0000)	-	-	-	-2.2261 (0.2640)	-0.2122 (0.6556)	24	0.1563	0.0760	0.1678
22	12.8016 (0.0000)	-	-	-1.5606 (0.0367)	-	-	24	0.1836	0.1465	0.0367

23	11.9419 (0.0000)	-	-	-	-2.8036 (0.0633)	-	24	0.1481	0.1094	0.0633
24	12.3504 (0.0000)	-	-	-	-	-0.5665 (0.1254)	24	0.1034	0.0627	0.1254
Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	15.2475 (0.0000)	-1.4468 (0.0988)	-	-2.5643 (0.0219)	-	0.5522 (0.3077)	18	0.4171	0.2922	0.0502
27	15.3549 (0.0000)	-1.4468 (0.0986)	-	-1.9661 (0.0302)	-	-	18	0.3704	0.2865	0.0311
28	13.6599 (0.0000)	-1.4468 (0.1526)	-	-	-	-0.2122 (0.6795)	18	0.1403	0.0257	0.3218
29	13.3888 (0.0000)	-1.4468 (0.1414)	-	-	-	-	18	0.1301	0.0758	0.1414
30	14.6482 (0.0000)	-	-1.4301 (0.1084)	-2.1325 (0.0576)	-	0.4836 (0.3735)	18	0.4107	0.2845	0.0538
31	14.7762 (0.0000)	-	-1.4884 (0.0921)	-1.5940 (0.0785)	-	-	18	0.3752	0.2918	0.0294
32	13.6563 (0.0000)	-	-1.8512 (0.0557)	-	-	-0.1344 (0.7825)	18	0.2307	0.1282	0.1398
33	13.5010 (0.0000)	-	-1.8709 (0.0458)	-	-	-	18	0.2267	0.1783	0.0458
34	13.8006 (0.0000)	-	-	-2.5643 (0.0291)	-	0.5522 (0.3376)	18	0.2870	0.1919	0.0791
35	13.9080 (0.0000)	-	-	-1.9661 (0.0389)	-	-	18	0.2403	0.1928	0.0389
36	12.2130 (0.0000)	-	-	-	-	-0.2122 (0.6905)	18	0.0102	-0.0517	0.6905
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	9.8880 (0.0002)	-	-	-0.7496 (0.2385)	-	-	6	0.3239	0.1549	0.2385

Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	15.8589 (0.0000)	-0.2657 (0.8610)	-	-	-	-1.3525 (0.2199)	9	0.6868	0.5824	0.0307
41	16.6103 (0.0000)	-2.0691 (0.0158)	-	-	-	-	9	0.5890	0.5302	0.0158
42	16.4789 (0.0000)	-	-6.8489 (0.2706)	-	-	3.4890 (0.4319)	9	0.7471	0.6628	0.0162
43	15.9804 (0.0000)	-	-2.1139 (0.0040)	-	-	-	9	0.7172	0.6768	0.0040
43	16.4789 (0.0000)	-	-	-	6.8489 (0.2706)	-3.3600 (0.0755)	9	0.7471	0.6628	0.0162
45	14.7989 (0.0000)	-	-	-	-4.9109 (0.0216)	-	9	0.5530	0.4891	0.0216
46	15.6886 (0.0000)	-	-	-	-	-1.5160 (0.0059)	9	0.6851	0.6401	0.0059
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	11.9654 (0.0009)	-1.8451 (0.0281)	-	-	-	0.3698 (0.4557)	9	0.6034	0.4713	0.0624
49	13.1501 (0.0000)	-1.8656 (0.0201)	-	-	-	-	9	0.5614	0.4988	0.0201
50	11.9654 (0.0009)	-	-1.8451 (0.0281)	-	-	0.3698 (0.4557)	9	0.6034	0.4713	0.0624
51	13.1501 (0.0000)	-	-1.8656 (0.0201)	-	-	-	9	0.5614	0.4988	0.0201
52	8.6182 (0.0060)	-	-	-	-3.6023 (0.1502)	0.8432 (0.2394)	9	0.3499	0.1331	0.2748
53	10.8667 (0.0000)	-	-	-	-2.4781 (0.2779)	-	9	0.1651	0.0458	0.2779
54	8.7231 (0.0070)	-	-	-	-	0.4235 (0.5429)	9	0.0552	-0.0798	0.5429
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										

Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	8.8222 (0.0022)	3.8648 (0.0556)	-	-	-	-3.7903 (0.0409)	6	0.7989	0.6649	0.0902
57	10.0856 (0.0031)	0.0746 (0.9543)	-	-	-	-	6	0.0009	-0.2488	0.9543
58	9.7103 (0.0015)	-	2.0887 (0.0937)	-	-	-2.4582 (0.0743)	6	0.7219	0.5365	0.1466
59	9.7103 (0.0021)	-	0.4500 (0.6683)	-	-	-	6	0.0506	-0.1867	0.6683
60	10.7546 (0.0006)	-	-	-	-	-0.8916 (0.4067)	6	0.1766	-0.0292	0.4067

Table 71. Results from the Models with CO Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	33.5857 (0.0063)	-10.7776 (0.0767)	-	-5.2236 (0.4542)	-	12.8678 (0.0032)	24	0.3673	0.2724	0.0247
11	33.7286 (0.0202)	-0.2689 (0.9641)	-	4.0699 (0.5989)	-	-	24	0.0135	-0.0805	0.8671
12	29.2365 (0.0050)	-9.8038 (0.0932)	-	-	-	11.6754 (0.0030)	24	0.3489	0.2869	0.0110
13	37.7985 (0.0021)	-0.2689 (0.9635)	-	-	-	-	24	0.0001	-0.0454	0.9635
14	27.4788 (0.0163)	-	-7.1740 (0.2291)	-3.2152 (0.6510)	-	11.7426 (0.0088)	24	0.3102	0.2068	0.0549
15	30.7677 (0.0191)	-	2.1167 (0.7092)	3.7171 (0.6322)	-	-	24	0.0201	-0.0733	0.8083
16	25.1646 (0.0109)	-	-6.9251 (0.2337)	-	-	11.1077 (0.0072)	24	0.3029	0.2366	0.0226
17	34.0288 (0.0024)	-	2.4483 (0.6583)	-	-	-	24	0.0091	-0.0360	0.6583

18	21.7613 (0.0367)	-	-	0.0684 (0.9928)	18.8616 (0.3220)	5.5405 (0.2613)	24	0.2936	0.1876	0.0683
19	24.8393 (0.0154)_	-	-	4.0699 (0.5478)	33.9440 (0.0187)	-	24	0.2464	0.1746	0.0513
20	22.2498 (0.0324)	-	-	-2.4012 (0.7371)	-	8.9600 (0.0158)	24	0.2571	0.1864	0.0441
21	21.8037 (0.0162)	-	-	-	18.8061 (0.2848)	5.5608 (0.1939)	24	0.2936	0.2263	0.0260
22	33.3253 (0.0027)	-	-	4.0699 (0.5902)	-	-	24	0.0134	-0.0314	0.5902
23	28.9092 (0.0002)	-	-	-	33.9440 (0.0169)	-	24	0.2330	0.1981	0.0169
24	20.6429 (0.0212)	-	-	-	-	8.5544 (0.0122)_	24	0.2530	0.2191	0.0122
Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	50.0352 (0.0000)	-26.1302 (0.0001)	-	-3.3942 (0.5814)	-	6.5726 (0.0560)	18	0.7009	0.6367	0.0006
27	51.3132 (0.0000)	-26.1302 (0.0002)	-	3.7261 (0.5063)	-	-	18	0.6080	0.5557	0.0009
28	47.9338 (0.0000)	-26.1302 (0.0001)	-	-	-	5.5608 (0.0445)	18	0.6940	0.6532	0.0001
29	55.0394 (0.0000)	-26.1302 (0.0002)	-	-	-	-	18	0.5959	0.5706	0.0002
30	36.6135 (0.0014)	-	-21.4429 (0.0053)	3.0810 (0.7078)	-	5.5439 (0.1986)	18	0.4955	0.3874	0.0195
31	38.0813 (0.0010)	-	-22.1113 (0.0047)	9.2540 (0.1940)	-	-	18	0.4299	0.3539	0.0148
32	38.0465 (0.0003)	-	-20.8344 (0.0040)	-	-	6.4367 (0.0688)	18	0.4903	0.4223	0.0064
33	45.4845 (0.0000)	-	-19.8904 (0.0085)	-	-	-	18	0.3597	0.3196	0.0085
34	23.9050 (0.0415)	-	-	-3.3942 (0.7402)	-	6.5726 (0.2316)	18	0.1049	-0.0145	0.4356

35	25.1831 (0.0339)	-	-	3.7261 (0.6637)	-	-	18	0.0121	-0.0496	0.6637
36	21.8037 (0.0206)	-	-	-	-	5.5608 (0.2057)	18	0.0981	0.0417	0.2057
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	58.0959 (0.0235)	-	-	4.7573 (0.7008)	-	-	6	0.0409	-0.1989	0.7008
Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	56.7638 (0.0023)	-42.7576 (0.0116)	-	-	-	32.1215 (0.0075)	9	0.7233	0.6310	0.0212
41	38.9185 (0.0680)	0.0710 (0.9939)	-	-	-	-	9	0.0000	-0.1428	0.9939
42	45.8684 (0.0158)	-	-143.1160 (0.0878)	-	-	110.3940 (0.0760)	9	0.4868	0.3157	0.1352
43	30.0979 (0.0737)	-	6.7042 (0.4209)	-	-	-	9	0.0945	-0.0348	0.4209
43	45.8684 (0.0158)	-	-	-	143.1160 (0.0878)	-32.7221 (0.1441)	9	0.4868	0.3157	0.1352
45	29.5073 (0.0307)	-	-	-	28.5885 (0.1750)	-	9	0.2455	0.1378	0.1750
46	29.3550 (0.0648)	-	-	-	-	5.8091 (0.3369)	9	0.1318	0.0078	0.3369
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	5.0264 (0.8760)	-1.7599 (0.8664)	-	-	-	14.4910 (0.0928)	9	0.4032	0.2042	0.2126
49	51.4515 (0.0716)	-2.5649 (0.8363)	-	-	-	-	9	0.0065	-0.1354	0.8363
50	5.0264 (0.8760)	-	-1.7599 (0.8664)	-	-	14.4910 (0.0928)	9	0.4032	0.2042	0.2126

51	51.4515 (0.0716)	-	-2.5649 (0.8363)	-	-	-	9	0.0065	-0.1354	0.8363
52	2.3221 (0.9287)	-	-	-	13.3322 (0.6290)	12.9890 (0.1445)	9	0.4249	0.2332	0.1902
53	36.9596 (0.0496)	-	-	-	30.6509 (0.2939)	-	9	0.1553	0.0346	0.2939
54	1.9338 (0.9368)	-	-	-	-	14.5423 (0.0675)	9	0.4001	0.3144	0.0675
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	29.7167 (0.0193)	-5.0296 (0.6202)	-	-	-	-6.6397 (0.4628)	6	0.7069	0.5115	0.1587
57	31.9300 (0.0049)	-11.6694 (0.0567)	-	-	-	-	6	0.6380	0.5476	0.0567
58	27.6555 (0.0152)	-	-0.9071 (0.8797)	-	-	-9.7316 (0.1944)	6	0.6802	0.4669	0.1809
59	27.6555 (0.0139)	-	-7.3949 (0.1892)	-	-	-	6	0.3843	0.2304	0.1892
60	27.2019 (0.0028)	-	-	-	-	-10.4119 (0.0442)	6	0.6773	0.5966	0.0442

Table 72. Results from the Models with HC Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	8.6810 (0.0327)	2.6639 (0.1944)	-	-2.6827 (0.2674)	-	-0.3363 (0.8018)	24	0.1659	0.0408	0.2939
11	8.6772 (0.0289)	2.3892 (0.1568)	-	-2.9256 (0.1783)	-	-	24	0.1632	0.0835	0.1540
12	6.4473 (0.0613)	3.1640 (0.1194)	-	-	-	-0.9487 (0.4443)	24	0.1116	0.0270	0.2886

13	5.7517 (0.0777)	2.3892 (0.1645)	-	-	-	-	24	0.0859	0.0444	0.1645
14	11.0388 (0.0060)	-	0.6092 (0.7617)	-3.3112 (0.1828)	-	0.3933 (0.7798)	24	0.0950	-0.0407	0.5631
15	11.1489 (0.0044)	-	0.9204 (0.5745)	-3.0790 (0.1773)	-	-	24	0.0914	0.0048	0.3657
16	8.6556 (0.0137)	-	0.8656 (0.6719)	-	-	-0.2605 (0.8468)	24	0.0088	-0.0856	0.9110
17	8.4477 (0.0094)	-	0.6457 (0.6968)	-	-	-	24	0.0070	-0.0381	0.6968
18	11.4170 (0.0024)	-	-	-3.0474 (0.2411)	2.5427 (0.6899)	0.1686 (0.9182)	24	0.0981	-0.0371	0.5488
19	11.5106 (0.0012)	-	-	-2.9256 (0.1942)	3.0017 (0.4990)	-	24	0.0976	0.0117	0.3400
20	11.4828 (0.0018)	-	-	-3.3803 (0.1628)	-	0.6296 (0.5834)	24	0.0907	0.0041	0.3684
21	9.5303 (0.0037)	-	-	-	5.0155 (0.4127)	-0.7398 (0.6156)	24	0.0323	-0.0598	0.7083
22	12.2611 (0.0003)	-	-	-2.9256 (0.1884)	-	-	24	0.0773	0.0353	0.1884
23	8.5851 (0.0008)	-	-	-	3.0017 (0.5062)	-	24	0.0203	-0.0242	0.5062
24	9.2208 (0.0041)	-	-	-	-	0.0586 (0.9574)	24	0.0001	-0.0453	0.9574

Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]

Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	10.4818 (0.0291)	3.7218 (0.1793)	-	-7.5484 (0.0334)	-	1.5104 (0.3834)	18	0.3593	0.2220	0.0920
27	10.7755 (0.0234)	3.7218 (0.1753)	-	-5.9122 (0.0391)	-	-	18	0.3222	0.2319	0.0541
28	5.8085 (0.2040)	3.7218 (0.2348)	-	-	-	-0.7398 (0.6458)	18	0.1046	-0.0148	0.4367
29	4.8633 (0.2173)	3.7218 (0.2226)	-	-	-	-	18	0.0915	0.0347	0.2226

30	13.5785 (0.0044)	-	1.0547 (0.7158)	-7.8669 (0.0417)	-	1.5610 (0.3981)	18	0.2750	0.1196	0.1990
31	13.9918 (0.0029)	-	0.8665 (0.7618)	-6.1288 (0.0493)	-	-	18	0.2356	0.1337	0.1333
32	9.9193 (0.0293)	-	-0.4990 (0.8743)	-	-	-0.7188 (0.6711)	18	0.0148	-0.1165	0.8940
33	9.0888 (0.0209)	-	-0.6044 (0.8434)	-	-	-	18	0.0025	-0.0598	0.8434
34	14.2036 (0.0011)	-	-	-7.5484 (0.0373)	-	1.5104 (0.3973)	18	0.2678	0.1702	0.0965
35	14.4973 (0.0007)	-	-	-5.9122 (0.0436)	-	-	18	0.2308	0.1827	0.0436
36	9.5303 (0.0094)	-	-	-	-	-0.7398 (0.6507)	18	0.0131	-0.0485	0.6507
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	8.5391 (0.0294)	-	-	3.0477 (0.1692)	-	-	6	0.4123	0.2654	0.1692
Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	1.7123 (0.7360)	20.8153 (0.0069)	-	-	-	-13.6936 (0.0080)	9	0.7343	0.6457	0.0188
41	9.3199 (0.5238)	2.5572 (0.5238)	-	-	-	-	9	0.0604	-0.0738	0.5238
42	6.1168 (0.3248)	-	77.4685 (0.0374)	-	-	-57.4958 (0.0359)	9	0.5489	0.3985	0.0918
43	14.3305 (0.0676)	-	-0.5615 (0.8816)	-	-	-	9	0.0034	-0.1390	0.8816
43	6.1168 (0.3248)	-	-	-	-77.4685 (0.0374)	19.9727 (0.0481)	9	0.5489	0.3985	0.0918
45	16.1031 (0.0190)	-	-	-	-7.5640 (0.4379)	-	9	0.0881	-0.0422	0.4379
46	15.0554	-	-	-	-	-0.8842	9	0.0157	-0.1250	0.7484

	(0.0484)					(0.7484)				
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	-2.8157 (0.4891)	3.3255 (0.0365)	-	-	-	1.6084 (0.1237)	9	0.6254	0.5005	0.0526
49	2.3371 (0.4442)	3.2361 (0.0570)	-	-	-	-	9	0.4253	0.3432	0.0570
50	-2.8157 (0.4891)	-	3.3255 (0.0365)	-	-	1.6084 (0.1237)	9	0.6254	0.5005	0.0526
51	2.3371 (0.4442)	-	3.2361 (0.0570)	-	-	-	9	0.4253	0.3432	0.0570
52	3.3158 (0.2565)	-	-	-	9.8743 (0.0121)	0.3611 (0.6760)	9	0.7344	0.6459	0.0187
53	4.2787 (0.0178)	-	-	-	10.3558 (0.0035)	-	9	0.7259	0.6867	0.0035
54	3.0282 (0.5047)	-	-	-	-	1.5115 (0.2595)	9	0.1770	0.0594	0.2595
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	9.7169 (0.0572)	-6.1850 (0.2684)	-	-	-	2.7623 (0.5350)	6	0.4771	0.1285	0.3781
57	8.7961 (0.0330)	-3.4227 (0.1836)	-	-	-	-	6	0.3920	0.2400	0.1836
58	7.4351 (0.1036)	-	-1.6216 (0.6485)	-	-	-0.6603 (0.8587)	6	0.2231	-0.2949	0.6848
59	7.4351 (0.0566)	-	-2.0618 (0.3564)	-	-	-	6	0.2133	0.0167	0.3564
60	6.6244 (0.0576)	-	-	-	-	-1.8765 (0.4366)	6	0.1571	-0.0536	0.4366

Table 73. Results from the Models with NOx Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	112.8300 (0.0000)	-34.8604 (0.0000)	-	-8.4493 (0.2550)	-	0.5623 (0.8911)	24	0.7012	0.6564	0.0000
11	112.8360 (0.0000)	-34.4012 (0.0000)	-	-8.0431 (0.2250)	-	-	24	0.7009	0.6725	0.0000
12	105.7950 (0.0000)	-33.2853 (0.0000)	-	-	-	-1.3664 (0.7183)	24	0.6807	0.6503	0.0000
13	100.4260 (0.0000)		-	-	-	-	24	0.6787	0.6641	0.0000
14	100.6600 (0.0000)	-	-33.2876 (0.0000)	-3.0973 (0.6679)	-	0.8336 (0.8415)	24	0.6970	0.6515	0.0000
15	98.1971 (0.0000)	-	-32.6280 (0.0000)	-2.6051 (0.6940)	-	-	24	0.6964	0.9975	0.0000
16	98.3743 (0.0000)	-	-33.0478 (0.0000)	-	-	0.2220 (0.9539)	24	0.6941	0.6650	0.0000
17	77.9493 (0.0000)	-	-32.8605 (0.0000)	-	-	-	24	0.6941	0.6802	0.0000
18	78.1836 (0.0000)	-	-	-8.3477 (0.4309)	-68.9451 (0.0148)	0.4217 (0.9502)	24	0.4178	0.3304	0.0113
19	76.1637 (0.0001)	-	-	-8.0431 (0.3804)	-67.7972 (0.0011)	-	24	0.4177	0.3622	0.0034
20	72.7812 (0.0000)	-	-	0.6797 (0.9520)	-	-12.0777 (0.0361)	24	0.2107	0.1355	0.0834
21	61.2343 (0.0005)	-	-	-	-62.1712 (0.0180)	-2.0667 (0.7278)	24	0.3990	0.3417	0.0048
22	70.1404 (0.0000)	-	-	-8.0431 (0.4866)	-	-	24	0.0223	-0.0222	0.4866
23	76.6185 (0.0000)_	-	-	-	-67.7972 (0.0010)	-	24	0.3954	0.3679	0.0010
24	77.9493 (0.0000)	-	-	-	-	-11.9629 (0.0241)	24	0.2105	0.1747	0.0241

Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	117.1800 (0.0000)	-35.1551 (0.0022)	-	-14.9309 (0.2114)	-	2.3841 (0.6962)	18	0.5323	0.4320	0.0118
27	117.6440 (0.0000)	-35.1551 (0.0016)	-	-12.3481 (0.1956)	-	-	18	0.5270	0.4639	0.0036
28	107.9360 (0.0000)	-35.1551 (0.0023)	-	-	-	-2.0667 (0.6784)	18	0.4750	0.4050	0.0080
29	105.2960 (0.0000)	-35.1551 (0.0017)	-	-	-	-	18	0.4691	0.4359	0.0017
30	102.4950 (0.0000)	-	-34.5393 (0.0033)	-4.5008 (0.7157)	-	0.7270 (0.9080)	18	0.5040	0.3977	0.0174
31	102.6880 (0.0000)	-	-34.6269 (0.0023)	-3.6914 (0.7069)	-	-	18	0.5035	0.4373	0.0052
32	100.4020 (0.0000)	-	-35.4282 (0.0016)	-	-	-0.5773 (0.9084)	18	0.4991	0.4323	0.0056
33	99.7345 (0.0000)	-	-35.5129 (0.0011)	-	-	-	18	0.4986	0.4673	0.0011
34	82.0250 (0.0002)	-	-	-14.9309 (0.3534)	-	2.3841 (0.7746)	18	0.0632	-0.0617	0.6129
35	82.4886 (0.0001)	-	-	-12.3481 (0.3362)	-	-	18	0.0579	-0.0010	0.3362
36	72.7812 (0.0001)	-	-	-	-	-2.0667 (0.7621)	18	0.0059	-0.0562	0.7621
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	1.7764 (0.1343)	-	-	0.5669 (0.4454)	-	-	6	0.1516	-0.0605	0.4454
Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	112.6100	-14.0820	-	-	-	-17.6509	9	0.9217	0.8956	0.0005

	(0.0000)	(0.2480)				(0.0563)				
41	122.4160 (0.0000)	-37.6165 (0.0004)	-	-	-	-	9	0.8490	0.8274	0.0004
42	113.9630 (0.0000)	-	-89.9612 (0.0611)	-	-	39.4242 (0.2187)	9	0.9470	0.9294	0.0001
43	108.3310 (0.0000)	-	-36.4570 (0.0000)	-	-	-	9	0.9304	0.9204	0.0000
43	113.9630 (0.0001)	-	-	-	89.9612 (0.0611)	-50.5370 (0.0035)	9	0.9470	0.9294	0.0001
45	88.6947 (0.0001)	-	-	-	-86.9184 (0.0023)	-	9	0.7555	0.7206	0.0023
46	103.5830 (0.0000)	-	-	-	-	-26.3167 (0.0001)	9	0.9003	0.8861	0.0001
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	94.7950 (0.0236)	-36.7621 (0.0114)	-	-	-	3.2499 (0.6759)	9	0.6888	0.5851	0.0301
49	105.2070 (0.0010)	-36.9427 (0.0063)	-	-	-	-	9	0.6788	0.6329	0.0063
50	94.7950 (0.0236)	-	-36.7621 (0.0114)	-	-	3.2499 (0.6759)	9	0.6888	0.5851	0.0301
51	105.2070 (0.0010)	-	-36.9427 (0.0063)	-	-	-	9	0.6788	0.6329	0.0063
52	27.8884 (0.4458)	-	-	-	-79.1433 (0.0701)	13.5413 (0.2500)	9	0.4563	0.2751	0.1607
53	63.9984 (0.0148)	-	-	-	-61.0883 (0.1199)	-	9	0.3094	0.2107	0.1199
54	30.1936 (0.5006)	-	-	-	-	4.3207 (0.7329)	9	0.0177	-0.1226	0.7329
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	71.3516 (0.0009)	18.7191 (0.0881)	-	-	-	-48.5139 (0.0050)	6	0.9754	0.9590	0.0039

57	87.5228 (0.0092)	-29.7947 (0.1069)	-	-	-	-	6	0.5178	0.3972	0.1069
58	76.6421 (0.0010)	-	8.1380 (0.2660)	-	-	-40.5780 (0.0077)	6	0.9533	0.9221	0.0101
59	76.6421 (0.0180)	-	-18.9140 (0.2484)	-	-	-	6	0.3130	0.1412	0.2484
60	80.7111 (0.0001)	-	-	-	-	-34.4745 (0.0022)	6	0.9243	0.9054	0.0022

Table 74. Results from Models with PM Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	1.6104 (0.0000)	-0.7800 (0.0000)	-	-0.1417 (0.2565)	-	0.1905 (0.0112)	24	0.7521	0.7150	0.0000
11	1.6125 (0.0000)	-0.6245 (0.0000)	-	-0.0041 (0.9744)	-	-	24	0.6555	0.6227	0.0000
12	1.4924 (0.0000)	-0.7536 (0.0000)	-	-	-	0.1581 (0.0201)	24	0.7352	0.7100	0.0000
13	1.6084 (0.0000)	-0.6245 (0.0000)	-	-	-	-	24	0.6555	0.6398	0.0000
14	1.2943 (0.0000)	-	-0.6918 (0.0000)	-0.0159 (0.9116)	-	0.1760 (0.0441)	24	0.6480	0.5952	0.0001
15	1.3436 (0.0000)	-	-0.5526 (0.0000)	0.0880 (0.5481)	-	-	24	0.5668	0.5255	0.0002
16	1.2828 (0.0000)	-	-0.6906 (0.0000)	0.1728 (0.0318)	-	0.1760 (0.0511)	24	0.6478	0.6143	0.0000
17	1.4207 (0.0000)	-	-0.5448 (0.0000)	-	-	-	24	0.5591	0.5391	0.0000
18	0.8221 (0.0097)	-	-	-0.0997 (0.6565)	-1.2392 (0.0355)	0.1323 (0.3621)	24	0.2284	0.1127	0.1504
19	0.8956 (0.0038)	-	-	-0.0041 (0.9832)	-0.8791 (0.0350)	-	24	0.1949	0.1182	0.1027

20	0.7900 (0.0201)	-	-	0.0626 (0.7865)	-	-0.0924 (0.4119)	24	0.0323	-0.0598	0.7082
21	0.7604 (0.0059)	-	-	-	-1.1583 (0.0337)	0.1026 (0.4146)	24	0.2206	0.1463	0.0731
22	0.6758 (0.0249)	-	-	-0.0041 (0.9846)	-	-	24	0.0000	-0.0454	0.9846
23	0.8915 (0.0001)	-	-	-	-0.8791 (0.0308)	-	24	0.1948	0.1582	0.0308
24	0.8319 (0.0052)	-	-	-	-	-0.0818 (0.4275)	24	0.0289	-0.0153	0.4275
Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	1.7703 (0.0000)	-0.9019 (0.0000)	-	-0.1745 (0.3621)	-	0.1546 (0.1339)	18	0.7283	0.6701	0.0003
27	1.8004 (0.0000)	-0.9019 (0.0000)	-	-0.0071 (0.9654)	-	-	18	0.6792	0.6365	0.0002
28	1.6622 (0.0000)	-0.9019 (0.0000)	-	-	-	0.1026 (0.2174)	18	0.7111	0.6726	0.0001
29	1.7933 (0.0000)	-0.9019 (0.0000)	-	-	-	-	18	0.6792	0.6591	0.0000
30	1.3507 (0.0002)	-	-0.8137 (0.0008)	0.0712 (0.7668)	-	0.1156 (0.3523)	18	0.5875	0.4991	0.0051
31	1.3813 (0.0001)	-	-0.8277 (0.0005)	0.1999 (0.3715)	-	-	18	0.5602	0.5015	0.0021
32	1.3838 (0.0000)	-	-0.7997 (0.0005)	-	-	0.1362 (0.1756)	18	0.5848	0.5294	0.0014
33	1.5412 (0.0000)	-	-0.7797 (0.0006)	-	-	-	18	0.5288	0.4994	0.0006
34	0.8685 (0.0281)	-	-	-0.1745 (0.6098)	-	0.1546 (0.3926)	18	0.0492	-0.0776	0.6852
35	0.8985 (0.0217)	-	-	-0.0071 (0.9798)	-	-	18	0.0000	-0.0625	0.9798
36	0.7604 (0.0166)	-	-	-	-	0.1026 (0.4780)	18	0.0319	-0.0286	0.4780

Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	0.0107 (0.0076)	-	-	0.0017 (0.3315)	-	-	6	0.2336	0.0420	0.3315
Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	1.8292 (0.0027)	-0.8942 (0.0656)	-	-	-	0.1851 (0.5190)	9	0.7175	0.6233	0.0226
41	1.7263 (0.0012)	-0.6475 (0.0052)	-	-	-	-	9	0.6954	0.6519	0.0052
42	1.9031 (0.0000)	-	-5.6088 (0.0000)	-	-	3.7335 (0.0000)	9	0.9811	0.9749	0.0000
43	1.3697 (0.0040)	-	-0.5419 (0.0190)	-	-	-	9	0.5683	0.5066	0.0190
43	1.9031 (0.0000)	-		-	5.6088 (0.0000)	-1.8753 (0.0000)	9	0.9811	0.9749	0.0000
45	0.9654 (0.0311)	-	-	-	-0.9547 (0.1685)	-	9	0.2520	0.1451	0.1685
46	1.2559 (0.0080)	-	-	-	-	-0.3652 (0.0387)	9	0.4794	0.4050	0.0387
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	0.9041 (0.0443)	-0.6887 (0.0010)	-	-	-	0.2837 (0.0147)	9	0.8901	0.8535	0.0013
49	1.8131 (0.0018)	-0.7045 (0.0062)	-	-	-	-	9	0.6801	0.6344	0.0062
50	0.9041 (0.0443)	-	-0.6887 (0.0010)	-	-	0.2837 (0.0147)	9	0.8901	0.8535	0.0013
51	1.8131 (0.0018)	-	-0.7045 (0.0062)	-	-	-	9	0.6801	0.6344	0.0062
52	-0.3525 (0.4729)	-	-	-	-1.5892 (0.0168)	0.4889 (0.0142)	9	0.7283	0.6378	0.0200

53	0.9513 (0.0526)	-	-	-	-0.9373 (0.2267)	-	9	0.2006	0.0864	0.2267
54	-0.3062 (0.6801)	-	-	-	-	0.3038 (0.1794)	9	0.2412	0.1328	0.1794
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	1.1380 (0.0154)	-0.0581 (0.8682)	-	-	-	-0.4835 (0.1812)	6	0.8269	0.7116	0.0720
57	1.2992 (0.0070)	-0.5416 (0.0516)	-	-	-	-	6	0.6534	0.5667	0.0516
58	1.0920 (0.0098)	-	0.0339 (0.8668)	-	-	-0.5525 (0.0677)	6	0.8270	0.7116	0.0720
59	1.0920 (0.0234)	-	-0.3344 (0.1973)	-	-	-	6	0.3737	0.2171	0.1973
60	1.1090 (0.0014)					-0.5271 (0.0122)	6	0.8251	0.7813	0.0122

Road Grade >3

Table 75. Results from the Models with CO_2 Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	17.7119 (0.0000)	-1.2419 (0.1274)	-	-1.9763 (0.0453)	-	-0.4211 (0.4279)	24	0.4080	0.3192	0.0133
11	17.7072 (0.0000)	-1.5858 (0.0236)	-	-2.2804 (0.0129)	-	-	24	0.3886	0.3304	0.0057
12	16.0665 (0.0000)	-0.8734 (0.3010)	-	-	-	-0.8722 (0.1046)	24	0.2730	0.2038	0.0352
13	15.4268 (0.0000)	-1.5858 (0.0429)	-	-	-	-	24	0.1734	0.1358	0.0429
14	17.5040 (0.0000)	-	-1.5068 (0.0493)	-1.8221 (0.0495)	-	-0.2870 (0.5755)	24	0.4529	0.3709	0.0063
15	17.4236 (0.0000)	-	-1.7338 (0.0078)	-1.9915 (0.0221)	-	-	24	0.4441	0.3911	0.0021
16	16.1926 (0.0000)	-	-1.3657 (0.0915)	-	-	-0.6468 (0.2189)	24	0.3334	0.2699	0.0141
17	15.6765 (0.0000)	-	-1.9115 (0.0075)	-	-	-	24	0.2824	0.2498	0.0075
18	16.4440 (0.0000)	-	-	-1.8445 (0.0813)	-1.4774 (0.5613)	-0.6035 (0.3609)	24	0.3446	0.2462	0.0343
19	16.1087 (0.0000)	-	-	-2.2804 (0.0178)	-3.1204 (0.0932)	-	24	0.3159	0.2507	0.0186
20	16.4057 (0.0000)	-	-	-1.6511 (0.0919)	-	-0.8714 (0.0676)	24	0.3331	0.2696	0.0142
21	15.3020 (0.0000)	-	-	-	0.0194 (0.9939)	-1.1534 (0.0696)	24	0.2341	0.1611	0.0608
22	15.3286 (0.0000)	-	-	-2.2804 (0.0224)	-	-	24	0.2152	0.1795	0.0224

23	13.8283 (0.0000)	-	-	-	-3.1204 (0.1307)	-	24	0.1007	0.0598	0.1307
24	15.3008 (0.0000)	-	-	-	-	-1.1503 (0.0166)	24	0.2341	0.1993	0.0166
Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	18.3054 (0.0000)	-1.6241 (0.1847)	-	-2.2278 (0.1376)	-	-0.4893 (0.5204)	18	0.3635	0.2270	0.0883
27	18.2102 (0.0000)	-1.6241 (0.1754)	-	-2.7579 (0.0290)	-	-	18	0.3437	0.2562	0.0425
28	16.9261 (0.0000)	-1.6241 (0.2031)	-	-	-	-1.1534 (0.0917)	18	0.2507	0.1508	0.1148
29	15.4524 (0.0000)	-1.6241 (0.2306)	-	-	-	-	18	0.0885	0.0315	0.2306
30	18.0140 (0.0000)	-	-2.2487 (0.0616)	-1.5488 (0.2767)	-	-0.5972 (0.4067)	18	0.4401	0.3201	0.0386
31	17.8559 (0.0000)	-	-2.1767 (0.0651)	-2.2137 (0.0659)	-	-	18	0.4108	0.3323	0.0189
32	17.2936 (0.0000)	-	-2.5545 (0.0323)	-	-	-1.0460 (0.0914)	18	0.3889	0.3074	0.0249
33	16.0849 (0.0000)	-	-2.7080 (0.0321)	-	-	-	18	0.2563	0.2098	0.0321
34	16.6813 (0.0000)	-	-	-2.2278 (0.1475)	-	-0.4893 (0.5322)	18	0.2750	0.1783	0.0897
35	16.5861 (0.0000)	-	-	-2.7579 (0.0325)	-	-	18	0.2552	0.2086	0.0325
36	15.3020 (0.0000)	-	-	-	-	-1.1534 (0.0975)	18	0.1622	0.1098	0.0975
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	12.0334 (0.0010)	-	-	-1.3256 (0.2472)	-	-	6	0.3143	0.1429	0.2472

Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	15.1518 (0.0000)	1.7886 (0.2679)	-	-	-	-2.1773 (0.0713)	9	0.5718	0.4291	0.0785
41	16.3614 (0.0000)	-1.1146 (0.1912)	-	-	-	-	9	0.2302	0.1202	0.1912
42	16.4238 (0.0000)	-	-1.0875 (0.8826)	-	-	-0.2820 (0.9583)	9	0.4675	0.2900	0.1510
43	16.4641 (0.00000)	-	-1.4702 (0.0423)	-	-	-	9	0.4673	0.3912	0.0423
43	16.4238 (0.0000)	-	-	-	1.0875 (0.8826)	-1.3695 (0.5104)	9	0.4675	0.2900	0.1510
45	15.7391 (0.0000)	-	-	-	-3.7057 (0.0574)	-	9	0.4241	0.3418	0.0574
46	16.2983 (0.0000)	-	-	-	-	-1.0767 (0.0429)	9	0.4654	0.3890	0.0429
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	11.3731 (0.0018)	-1.0699 (0.1736)	-	-	-	0.1135 (0.8286)	9	0.2913	0.0551	0.3559
49	11.7367 (0.0000)	-1.0762 (0.1385)	-	-	-	-	9	0.2853	0.1832	0.1385
50	11.3731 (0.0018)	-	-1.0699 (0.1736)	-	-	0.1135 (0.8286)	9	0.2913	0.0551	0.3559
51	11.7367 (0.0000)	-	-1.0762 (0.1385)	-	-	-	9	0.2853	0.1832	0.1385
52	9.4573 (0.0034)	-	-	-	-1.2240 (0.5853)	0.2873 (0.6633)	9	0.0618	-0.2510	0.8259
53	10.2233 (0.0000)	-	-	-	-0.8410 (0.6611)	-	9	0.0290	-0.1097	0.6611
54	9.4930 (0.0017)	-	-	-	-	0.1447 (0.7997)	9	0.0098	-0.1316	0.7997
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										

Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	19.0584 (0.0293)	-4.9146 (0.5250)	-	-	-	2.0679 (0.7505)	6	0.2130	-0.3117	0.6982
57	18.3691 (0.0093)	-2.8467 (0.4002)	-	-	-	-	6	0.1811	-0.0236	0.4002
58	18.2745 (0.0174)	-	-3.3467 (0.4456)	-	-	0.8920 (0.8399)	6	0.2658	-0.2237	0.6291
59	18.2744 (0.0054)	-	-2.7521 (0.3081)	-	-	-	6	0.2539	0.0674	0.3081
60	16.6011 (0.0067)	-	-	-	-	-1.6181 (0.5919)	6	0.0780	-0.1525	0.5919

Table 76. Results from the Models with CO Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	33.1965 (0.0323)	-4.2336 (0.5821)	-	-3.2817 (0.7183)	-	9.5795 (0.0720)	24	0.1710	0.0467	0.2791
11	33.3029 (0.0411)	3.5897 (0.5995)	-	3.6368 (0.6798)	-	-	24	0.0214	-0.0718	0.7967
12	30.4641 (0.0199)	-3.6218 (0.6215)	-	-	-	8.8304 (0.0638)	24	0.1655	0.0860	0.1497
13	36.9397 (0.0068)	3.5897 (0.5922)	-	-	-	-	24	0.0133	-0.0316	0.5922
14	29.3965 (0.0382)	-	-0.8957 (0.9037)	-2.2747 (0.7998)	-	8.3919 (0.1168)	24	0.1587	0.0325	0.3157
15	31.7469 (0.0305)	-	5.7439 (0.3742)	2.6795 (0.7597)	-	-	24	0.0456	-0.0453	0.6124
16	27.7593 (0.0234)	-	-0.7196 (0.9204)	-	-	7.9427 (0.1061)	24	0.1559	0.0755	0.1687
17	34.0977 (0.0058)	-	5.9829 (0.3411)	-	-	-	24	0.0413	-0.0023	0.3411

18	27.4908 (0.0188)	-	-	4.1607 (0.6196)	48.3735 (0.0288)	-0.7254 (0.8925)	24	0.3409	0.2420	0.0362
19	27.0878 (0.0139)	-	-	3.6368 (0.6156)	46.3987 (0.0038)	-	24	0.3402	0.2774	0.0127
20	28.7436 (0.0243)	-	-	-2.1731 (0.8030)	-	8.0444 (0.0668)	24	0.1580	0.0779	0.1643
21	30.0667 (0.0039)	-	-	-	44.9972 (0.0281)	0.5148 (0.9122)	24	0.3325	0.2689	0.0144
22	38.6874 (0.0024)	-	-	3.6368 (0.6746)	-	-	24	0.0082	-0.0369	0.6746
23	30.7246 (0.0002)	-	-	-	46.3987 (0.0032)	-	24	0.3321	0.3017	0.0032
24	27.2894 (0.0132)	-	-	-	-	7.6774 (0.0566)	24	0.1555	0.1171	0.0566
Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	55.7830 (0.0000)	-25.8248 (0.0004)	-	0.1753 (0.9807)	-	0.4626 (0.9000)	18	0.5975	0.5113	0.0043
27	55.8730 (0.0000)	-25.8248 (0.0003)	-	0.6764 (0.9034)	-	-	18	0.5971	0.5433	0.0011
28	55.8916 (0.0000)	-25.8248 (0.0003)	-	-	-	0.5148 (0.8602)	18	0.5975	0.5439	0.0011
29	56.5494 (0.0000)	-25.8248 (0.0002)	-	-	-	-	18	0.5967	0.5714	0.0002
30	42.7725 (0.0007)	-	-21.6217 (0.0078)	6.7045 (0.4494)	-	-0.5748 (0.8978)	18	0.4080	0.2812	0.0554
31	42.6203 (0.0004)	-	-21.5524 (0.0059)	6.0645 (0.3903)	-	-	18	0.4073	0.3283	0.0198
32	45.8910 (0.0001)	-	-20.2975 (0.0082)	-	-	1.3681 (0.8713)	18	0.3824	0.3001	0.0269
33	47.4720 (0.0000)	-	-20.0969 (0.0068)	-	-	-	18	0.3764	0.3374	0.0068
34	29.9582	-	-	0.1753	-	0.4626	18	0.0009	-0.1323	0.9934

	(0.0172)			(0.9869)		(0.9341)				
35	30.0481 (0.0132)	-	-	0.6764 (0.9365)	-	-	18	0.0004	-0.0621	0.9365
36	30.0667 (0.0036)	-	-	-	-	0.5148 (0.9079)	18	0.0009	-0.0616	0.9079
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	65.5657 (0.0345)	-	-	9.5576 (0.5629)	-	-	6	0.0903	-0.1372	0.5629
Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	51.3803 (0.0026)	-40.1203 (0.0111)	-	-	-	33.8347 (0.0041)	9	0.7803	0.7071	0.0106
41	32.5832 (0.1202)	4.9926 (0.5997)	-	-	-	-	9	0.0414	-0.0956	0.5997
42	41.6298 (0.0162)	-	-138.3860 (0.0742)	-	-	110.2740 (0.0575)	9	0.6064	0.4752	0.0610
43	25.8764 (0.0992)	-	11.2709 (0.1745)	-	-	-	9	0.2460	0.1383	0.1745
43	41.6298 (0.0162)	-	-	-	138.3860 (0.0742)	-28.1126 (0.1650)	9	0.6064	0.4752	0.0610
45	27.5735 (0.0260)	-	-	-	39.9922 (0.0506)	-	9	0.4424	0.3628	0.0506
46	25.6621 (0.0801)	-	-	-	-	9.1453 (0.1263)	9	0.3008	0.2009	0.1263
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	-14.1287 (0.7097)	10.7112 (0.3971)	-	-	-	14.2890 (0.1440)	9	0.3707	0.1610	0.2492
49	31.6489 (0.2749)	9.9174 (0.4763)	-	-	-	-	9	0.0748	-0.0573	0.4763

50	-14.1287 (0.7097)	-	10.7112 (0.3971)	-	-	14.2890 (0.1440)	9	0.3707	0.1610	0.2492
51	31.6489 (0.2749)	-	9.9174 (0.4763)	-	-	-	9	0.0748	-0.0573	0.4763
52	6.0428 (0.8249)	-	-	-	46.3126 (0.1433)	8.5814 (0.3320)	9	0.5134	0.3512	0.1152
53	28.9264 (0.0901)	-	-	-	57.7544 (0.0578)	-	9	0.4231	0.3407	0.0578
54	4.6938 (0.8775)	-	-	-	-	13.9770 (0.1399)	9	0.2836	0.1812	0.1399
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	63.8750 (0.0653)	-35.6879 (0.3427)	-	-	-	11.2302 (0.7103)	6	0.4587	0.0978	0.3983
57	60.1316 (0.0300)	-24.4578 (0.1583)	-	-	-	-	6	0.4285	0.2857	0.1583
58	53.4215 (0.0766)	-	-14.7809 (0.5156)	-	-	-4.4501 (0.8481)	6	0.3479	-0.0868	0.5265
59	53.4215 (0.0382)	-	-17.7477 (0.2258)	-	-	-	6	0.3385	0.1731	0.2258
60	46.0310 (0.0484)	-	-	-	-	-15.5358 (0.3351)	6	0.2305	0.0382	0.3351

Table 77. Results from the Models with HC Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	9.3955 (0.0328)	2.8688 (0.1968)	-	-2.7625 (0.2909)	-	-0.3414 (0.8140)	24	0.1594	0.0333	0.3134
11	9.3917 (0.1563)	2.5900 (0.1563)	-	-3.0091 (0.2000)	-	-	24	0.1570	0.0768	0.1663

12	7.0955 (0.0569)	3.3838 (0.1228)	-	-	-	-0.9720 (0.4676)	24	0.1100	0.0252	0.2943
13	6.3827 (0.0700)	2.5900 (0.1623)	-	-	-	-	24	0.0868	0.0453	0.1623
14	11.7885 (0.0065)	-	0.8567 (0.6934)	-3.4166 (0.2025)	-	0.3665 (0.8094)	24	0.0918	-0.0445	0.5783
15	11.8912 (0.0048)	-	1.1467 (0.5177)	-3.2002 (0.1935)	-	-	24	0.0890	0.0023	0.3756
16	9.3295 (0.0136)	-	1.1212 (0.6107)	-	-	-0.3081 (0.8319)	24	0.0129	-0.0811	0.8724
17	9.0836 (0.0095)	-	0.8611 (0.6297)	-	-	-	24	0.0108	-0.0342	0.6297
18	12.2841 (0.0023)	-	-	-2.8624 (0.3026)	4.9748 (0.4686)	-0.2031 (0.9081)	24	0.1088	-0.0249	0.5011
19	12.1712 (0.0014)	-	-	-3.0091 (0.2123)	4.4219 (0.3553)	-	24	0.1082	0.0233	0.3005
20	12.4129 (0.0018)	-	-	-3.5138 (0.1793)	-	0.6988 (0.5739)	24	0.0845	-0.0027	0.3958
21	10.5119 (0.0028)	-	-	-	7.2975 (0.2659)	-1.0564 (0.5013)	24	0.0589	-0.0307	0.5285
22	13.2767 (0.0003)	-	-	-3.0091 (0.2106)	-	-	24	0.0703	0.0280	0.2106
23	9.1622 (0.0008)	-	-	-	4.4219 (0.3618)	-	24	0.0379	-0.0058	0.3618
24	10.0615 (0.0038)	-	-	-	-	0.1053 (0.9291)	24	0.0004	-0.0451	0.9291

Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]

Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	11.8569 (0.0242)	3.1585 (0.2892)	-	-7.2742 (0.0556)	-	1.1120 (0.5526)	18	0.3023	0.1528	0.1571
27	12.0731 (0.0188)	3.1585 (0.2780)	-	-6.0695 (0.0471)	-	-	18	0.2839	0.1884	0.0818
28	7.3534 (0.1318)	3.1585 (0.3351)	-	-	-	-1.0564 (0.5350)	18	0.0851	-0.0369	0.5133

29	6.0036 (0.1545)	3.1585 (0.3252)	-	-	-	-	18	0.0605	0.0018	0.3252
30	14.7300 (0.0039)	-	0.4816 (0.8758)	-7.4196 (0.0674)	-	1.1351 (0.5616)	18	0.2432	0.0810	0.2579
31	15.0306 (0.0025)	-	0.3447 (0.9086)	-6.1557 (0.0590)	-	-	18	0.2241	0.1206	0.1492
32	11.2789 (0.0183)	-	-0.9838 (0.7634)	-	-	-1.0150 (0.5634)	18	0.0307	-0.0986	0.7917
33	10.1060 (0.0146)	-	-1.1326 (0.7224)	-	-	-	18	0.0081	-0.0539	0.7224
34	15.0154 (0.0011)	-	-	-7.2742 (0.0558)	-	1.1120 (0.5548)	18	0.2418	0.1407	0.1254
35	15.2317 (0.0007)	-	-	-6.0695 (0.0476)	-	-	18	0.2234	0.1748	0.0476
36	10.5119 (0.0063)	-	-	-	-	-1.0564 (0.5343)	18	0.0246	-0.0364	0.5343
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	10.4723 (0.0598)	-	-	3.1118 (0.3354)	-	-	6	0.2303	0.0379	0.3354
Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	1.5619 (0.7502)	20.7561 (0.0060)	-	-	-	-13.1349 (0.0082)	9	0.7430	0.6574	0.0170
41	8.8591 (0.2718)	3.2429 (0.4054)	-	-	-	-	9	0.1007	00.0278	0.4054
42	6.0254 (0.3254)	-	76.6279 (0.0373)	-	-	-56.3592 (0.0370)	9	0.5432	0.3910	0.0953
43	14.0767 (0.0680)	-	0.1404 (0.9698)	-	-	-	9	0.0002	-0.1426	0.9698
43	6.0254 (0.3264)	-	-	-	-76.6279 (0.0373)	20.2687 (0.0440)	9	0.5432	0.3910	0.0953
45	16.1598	-	-	-	-5.6875	-	9	0.0516	-0.0839	0.5566

	(0.0189)				(0.5566)					
46	14.8671 (0.0487)	-	-	-	-	-0.3619 (0.8941)	9	0.0027	-0.1398	0.8941
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	-4.3358 (0.4418)	4.1109 (0.0530)	-	-	-	1.8418 (0.1874)	9	0.5626	0.4168	0.0837
49	1.5649 (0.6891)	4.0086 (0.0670)	-	-	-	-	9	0.4013	0.3158	0.0670
50	-4.3358 (0.4418)	-	4.1109 (0.0530)	-	-	1.8418 (0.1874)	9	0.5626	0.4168	0.0837
51	1.5649 (0.6891)	-	4.0086 (0.0670)	-	-	-	9	0.4013	0.3158	0.0670
52	3.2461 (0.4195)	-	-	-	12.2878 (0.0207)	0.2905 (0.8115)	9	0.6721	0.5628	0.0353
53	4.0208 (0.0778)	-	-	-	12.6751 (0.0071)	-	9	0.6687	0.6214	0.0071
54	2.8882 (0.6225)	-	-	-	-	1.7221 (0.3188)	9	0.1413	0.0186	0.3188
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	14.5401 (0.0839)	-11.1199 (0.2617)	-	-	-	5.8287 (0.4651)	6	0.4465	0.0774	0.4118
57	12.5972 (0.0655)	-5.2913 (0.2439)	-	-	-	-	6	0.3179	0.1474	0.2439
58	10.8010 (0.1477)	-	-3.6417 (0.5596)	-	-	0.2200 (0.9726)	6	0.2084	-0.3193	0.7043
59	10.8010 (0.0886)	-	-3.4951 (0.3633)	-	-	-	6	0.2080	0.0101	0.3633
60	8.9802 (0.1145)	-	-	-	-	-2.5113 (0.5513)	6	0.0955	-0.1307	0.5513

Table 78. Results from the Models with NOx Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	122.8980 (0.0000)	-32.0827 (0.0000)	-	-6.2439 (0.3769)	-	-5.4457 (0.1763)	24	0.7511	0.7137	0.0000
11	122.8370 (0.0000)	-36.5300 (0.0000)	-	-10.1769 (0.1300)	-	-	24	0.7266	0.7006	0.0000
12	117.6990 (0.0000)	-30.9187 (0.0000)	-	-	-	-6.8710 (0.0654)	24	0.7409	0.7162	0.0000
13	112.6600 (0.0000)	-36.5300 (0.0000)	-	-	-	-	24	0.6943	0.6804	0.0000
14	112.8240 (0.0000)	-	-32.4751 (0.0000)	-1.5272 (0.8066)	-	-4.4824 (0.2226)	24	0.7941	0.7632	0.0000
15	111.5680 (0.0000)	-	-36.0215 (0.0000)	-4.1734 (0.4847)	-	-	24	0.7777	0.7566	0.0000
16	111.7240 (0.0000)	-	-32.3569 (0.0000)	-	-	-4.7839 (0.1584)	24	0.7934	0.7738	0.0000
17	107.9070 (0.0000)	-	-36.3939 (0.0000)	-	-	-	24	0.7724	0.7620	0.0000
18	90.5511 (0.0000)	-	-	-4.9100 (0.6358)	-53.9779 (0.0464)	-7.2927 (0.2794)	24	0.4893	0.4127	0.0033
19	86.4996 (0.0000_	-	-	-10.1769 (0.2758)	-73.8301 (0.0006)	-	24	0.4577	0.4061	0.0016
20	89.1531 (0.0000)	-	-	2.1576 (0.8381)	-	-17.0786 (0.0028)	24	0.3741	0.3145	0.0073
21	87.5113 (0.0000)	-	-	-	-49.9935 (0.0461)	-8.7563 (0.1396)	24	0.4834	0.4342	0.0010
22	68.0421 (0.0003)	-	-	-10.1769 (0.4005)	-	-	24	0.0323	-0.0117	0.4005
23	76.3227 (0.0000)	-	-	-	-73.8301 (0.0006)	-	24	0.4254	0.3993	0.0006
24	90.5969 (0.0000)	-	-	-	-	-16.7141 (0.0015)	24	0.3729	0.3443	0.0015

Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	129.0480 (0.0000)	-35.9525 (0.0013)	-	-9.0199 (0.4233)	-	-6.0675 (0.3081)	18	0.5893	0.5013	0.0050
27	127.8680 (0.0000)	-35.9525 (0.0012)	-	-15.5931 (0.1048)	-	-	18	0.5565	0.4973	0.0022
28	123.4640 (0.0000)	-35.9525 (0.0011)	-	-	-	-8.7563 (0.0804)	18	0.5693	0.5119	0.0018
29	112.2750 (0.0000)	-35.9525 (0.0017)	-	-	-	-	18	0.4684	0.4351	0.0017
30	116.7230 (0.0000)	-	-39.8661 (0.0002)	3.0186 (0.7656)	-	-7.9802 (0.1375)	18	0.6816	0.6133	0.0009
31	114.6100 (0.0000)	-	-38.9039 (0.0003)	-5.8671 (0.5038)	-	-	18	0.6251	0.5751	0.0006
32	118.1270 (0.0000)	-	-39.2699 (0.0001)	-	-	-7.1054 (0.0991)	18	0.6795	0.6367	0.0002
33	109.9160 (0.0000)	-	-40.3120 (0.0001)	-	-	-	18	0.6134	0.5892	0.0001
34	93.0956 (0.0000)	-	-	-9.0199 (0.5682)	-	-6.0675 (0.4658)	18	0.1209	0.0037	0.3803
35	91.9158 (0.0000)	-	-	-15.5931 (0.2317)	-	-	18	0.0881	0.0311	0.2317
36	87.5113 (0.0000)	-	-	-	-	-8.7563 (0.1998)	18	0.1010	0.0448	0.1988
Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	1.8372 (0.1514)	-	-	0.6554 (0.4223)	-	-	6	0.1662	-0.0422	0.4223
Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	104.0450	-0.6525	-	-	-	-25.4809	9	0.9550	0.9399	0.0001

	(0.0000)	(0.9374)				(0.0033)				
41	118.2010 (0.0001)	-34.6270 (0.0014)	-	-	-	-	9	0.7888	0.7587	0.0014
42	108.8470 (0.0000)	-	-45.2441 (0.1710)	-	-	7.1806 (0.7481)	9	0.9679	0.9571	0.0000
43	107.8210 (0.0000)	-	-35.4990 (0.0000)	-	-	-	9	0.9673	0.9626	0.0000
43	108.8470 (0.0000)	-	-	-	45.2441 (0.1710)	-38.0635 (0.0033)	9	0.9679	0.9571	0.0000
45	89.8155 (0.0000)	-	-	-	-87.9783 (0.0000)	-	9	0.8487	0.8271	0.0004
46	103.6270 (0.0000)	-	-	-	-	-25.8824 (0.00000	9	0.9549	0.9485	0.0000
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	97.1096 (0.0110)	-31.8051 (0.0106)	-	-	-	-1.2747 (0.8462)	9	0.6904	0.5873	0.0297
49	93.0260 (0.0007)	-31.7343 (0.0057)	-	-	-	-	9	0.6883	0.6438	0.0057
50	97.1096 (0.0110)	-	-31.8051 (0.0106)	-	-	-1.2747 (0.8462)	9	0.6904	0.5873	0.0297
51	93.0260 (0.0007)	-	-31.7343 (0.0057)	-	-	-	9	0.6883	0.6438	0.0057
52	39.3220 (0.2437)	-	-	-	-65.1349 (0.0881)	7.2402 (0.4732)	9	0.4084	0.2112	0.2071
53	58.6293 (0.0092)	-	-	-	-55.4813 (0.0930)	-	9	0.3507	0.2579	0.0930
54	41.2191 (0.2971)	-	-	-	-	-0.3483 (0.9744)	9	0.0002	-0.1427	0.9744
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	125.2550 (0.0185)	-29.7277 (0.4898)	-	-	-	-22.5054 (0.5420)	6	0.7291	0.5486	0.1410

57	132.7560 (0.0043)	-52.2331 (0.0415)	-	-	-	-	6	0.6867	0.6083	0.0415
58	121.7630 (0.0090)	-	-22.7452 (0.3401)	-	-	-27.7423 (0.2841)	6	0.7712	0.6187	0.1094
59	121.7630 (0.0050)	-	-41.2400 (0.0553)	-	-	-	6	0.6421	0.5526	0.0553
60	110.3910 (0.0036)	-	-	-	-	-44.8012 (0.0453)	6	0.6735	0.5919	0.0453

Table 79. Results from the Models with PM Emissions

Models for All Trucks- E~f(VY, EY, VT, FT, EC) [9]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
10	1.9267 (0.0000)	-0.7801 (0.0000)	-	-0.1024 (0.5633)	-	0.06541 (0.6200)	24	0.6381	0.5838	0.0001
11	1.9274 (0.0000)	-0.7267 (0.0000)	-	-0.0552 (0.7290)	-	-	24	0.6300	0.5948	0.0000
12	1.8414 (0.0000)	-0.7610 (0.0000)	-	-	-	0.0420 (0.6384)	24	0.6318	0.5967	0.0000
13	1.8722 (0.0000)	-0.7267 (0.0000)	-	-	-	-	24	0.6278	0.6109	0.0000
14	1.6192 (0.0000)	-	-0.7038 (0.0002)	0.0220 (0.9060)	-	0.0056 (0.6075)	24	0.5795	0.5164	0.0005
15	1.6348 (0.0000)	-	-0.6599 (0.0000)	0.0548 (0.7503)	-	-	24	0.5738	0.5332	0.0001
16	1.6350 (0.0000)	-	-0.7055 (0.0001)	-	-	0.0599 (0.5463)	24	0.5792	0.5391	0.0001
17	1.6828 (0.0000)	-	-0.6550 (0.0000)	-	-	-	24	0.5717	0.5522	0.0000
18	1.1283 (0.0042)	-	-	-0.0010 (0.9708)	-0.8540 (0.2155)	-0.0626 (0.7201)	24	0.1947	0.0739	0.2183
19	1.0935 (0.0032)	-	-	-0.0552 (0.8148)	-1.0245 (0.0390)	-	24	0.1893	0.1121	0.1104

20	1.1062 (0.0051)	-	-	0.1019 (0.6963)	-	-0.2174 (0.0953)	24	0.1288	0.0458	0.2351
21	1.1221 (0.0012)	-	-	-	-0.8459 (0.1842)	-0.0656 (0.6642)	24	0.1946	0.1179	0.1031
22	0.8374 (0.0199)	-	-	-0.0552 (0.8288)	-	-	24	0.0022	-0.0432	0.8288
23	1.0383 (0.0002)	-	-	-	-1.0245 (0.0347)	-	24	0.1872	0.1502	0.0347
24	1.1744 (0.0008)	-	-	-	-	-0.2002 (0.0939)	24	0.1223	0.0824	0.0939
Models for Diesel Trucks- E~f(VY, EY, VT, EC) [25]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
26	2.1819 (0.0000)	-1.0484 (0.0002)	-	-0.0184 (0.9423)	-	-0.0601 (0.6543)	18	0.6523	0.5778	0.0016
27	2.1702 (0.0000)	-1.0484 (0.0001)	-	-0.0835 (0.6829)	-	-	18	0.6471	0.6001	0.0004
28	2.1705 (0.0000)	-1.0484 (0.0001)	-	-	-	-0.0656 (0.5394)	18	0.6522	0.6058	0.0004
29	2.0867 (0.0000)	-1.0484 (0.0001)	-	-	-	-	18	0.6430	0.6207	0.0001
30	1.7357 (0.0001)	-	-1.0161 (0.0005)	0.2884 (0.3170)	-	-0.1088 (0.4554)	18	0.5973	0.5110	0.0043
31	1.7069 (0.0001)	-	-1.0030 (0.0004)	0.1672 (0.4700)	-	-	18	0.5803	0.5244	0.0015
32	1.8699 (0.0000)	-	-0.9591 (0.0005)	-	-	-0.0253 (0.8319)	18	0.5663	0.5085	0.0019
33	1.8407 (0.0000)	-	-0.9628 (0.0003)	-	-	-	18	0.5650	0.5378	0.0003
34	1.1336 (0.0200)	-	-	-0.0184 (0.9646)	-	-0.0610 (0.7829)	18	0.0093	-0.1228	0.9325
35	1.1219 (0.0170)	-	-	-0.0835 (0.8011)	-	-	18	0.0041	-0.0582	0.8011
36	1.1221 (0.0049)	-	-	-	-	-0.0656 (0.7058)	18	0.0091	-0.0528	0.7058

Models for CNG Fuel Trucks-E~f(VT) [37]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
38	0.0124 (0.0122)	-	-	0.0015 (0.4880)	-	-	6	0.1270	-0.0912	0.4880
Models for Front-load Trucks- E~f(VY, EY, FT, EC) [39]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
40	1.8234 (0.0038)	-0.8337 (0.0980)	-	-	-	0.1385 (0.6491)	9	0.6869	0.5826	0.0307
41	1.7464 (0.0015)	-0.6490 (0.0066)	-	-	-	-	9	0.6750	0.6285	0.0066
42	1.9533 (0.0000)	-	-5.7578 (0.0000)	-	-	3.8331 (0.0000)	9	0.9979	0.9972	0.0000
43	1.4057 (0.0036)	-	-0.5557 (0.0175)	-	-	-	9	0.5774	0.5170	0.0175
43	1.9533 (0.0000)	-	-	-	5.7578 (0.0000)	-1.9247 (0.0000)	9	0.9979	0.9972	0.0000
45	0.9910 (0.0297)	-	-	-	-0.9786 (0.1648)	-	9	0.2558	0.1495	0.1648
46	1.2889 (0.0074)	-	-	-	-	-0.3745 (0.0366)	9	0.4870	0.4137	0.0366
Models for Side-load Trucks- E~f(VY, EY, FT, EC) [47]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
48	0.8637 (0.0414)	-0.5805 (0.0017)	-	-	-	0.2116 (0.0358)	9	0.8610	0.8147	0.0027
49	1.5414 (0.0014)	-0.5922 (0.0054)	-	-	-	-	9	0.6927	0.6488	0.0054
50	0.8637 (0.0414)	-	-0.5805 (0.0017)	-	-	0.2116 (0.0358)	9	0.8610	0.8147	0.0027
51	1.5414 (0.0014)	-	-0.5922 (0.0054)	-	-	-	9	0.6927	0.6488	0.0054
52	-0.1948 (0.6566)	-	-	-	-1.3178 (0.0238)	0.3820 (0.0257)	9	0.6794	0.5726	0.0329

53	0.8239 (0.0444)	-	-	-	-0.8085 (0.2085)	-	9	0.2151	0.1030	0.2085
54	-0.1564 (0.8051)	-	-	-	-	0.2285 (0.2319)	9	0.1966	0.0818	0.2319
Models for Roll-off Trucks- E~f(VY, EY, EC) [55]										
Equation	Constant (p)	Vehicle Year (p)	Engine Year	Vehicle Type (p)	Fuel Type (p)	Emission Controls (p)	N	R^2	Adj. R^2	p stat of Model
56	2.5092 (0.0483)	-1.2100 (0.3514)	-	-	-	0.0015 (0.9988)	6	0.6170	0.3617	0.2370
57	2.5087 (0.0641)	-1.2085 (0.0641)	-	-	-	-	6	0.6170	0.5213	0.0641
58	2.2031 (0.0458)	-	-0.5978 (0.4368)	-	-	-0.4577 (0.5644)	6	0.5756	0.2927	0.2764
59	2.2031 (0.0234)	-	-0.9029 (0.1075)	-	-	-	6	0.5167	0.3958	0.1075
60	1.9042 (0.0279)	-	-	-	-	-0.9060 (0.1372)	6	0.4624	0.3280	0.1372