Fuel Factor X Catalyst Evaluation For Fuel Efficiency and Emissions Reductions With Doug Andrus Trucking Utilizing The Carbon Mass Balance Test Procedure



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Prepared by:

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For

**MyDailyChoice** 

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# WHAT IS <u>THE</u> CARBON BALANCE TEST PROCEDURE?

### PREFACE

Fuel consumption measurements by reliable and accredited methods have been under constant review for many years. The weight of engineering evidence and scientific theory favors the carbon balance method by which carbon measured in the engine exhaust gas is related to the carbon content of the fuel consumed. This method has certainly proven to be the most suitable for field-testing where minimizing equipment down time is a factor.

The inquiries of accuracy and reliability to which we refer include discussions from international commonwealth and government agencies responsible for the test procedure discussed herein. This procedure enumerates the data required for fuel consumption measurements by the "carbon balance" or "exhaust gas analysis" method. The studies conducted show that the carbon balance has been found to be a more precise fuel consumption test method than the alternative volumetric-gravimetric methods.

The carbon balance test is a fundamental part of the Australian Standards **AS2077-1982**. Further, the carbon balance test procedure has proven to be an intricate part of the United States EPA, FTP and HFET Fuel Economy Tests. Also, Ford Motor Company characterized the carbon balance test procedure as being "at least as accurate as any other method of volumetric-gravimetric testing." (**SAE Paper No. 750002 Bruce Simpson, Ford Motor Company**) Finally, the Carbon Balance procedure is incorporated in the Federal Register Voluntary Fuel Economy Labeling Program, Volume 39.

The following photographic report captures a few of the applicable steps necessary for conducting a reliable and accurate carbon balance test. As will be documented, every effort is made to insure that each test is consistent, repeatable, and precise. More importantly, it will be even clearer as to why the Carbon Balance Test has such a high degree of acceptance and reliability.

# **EXECUTIVE SUMMARY**

The Fuel Factor Xcatalyst manufactured and marketed by MyDailyChoice has proven in laboratory and field-testing to reduce fuel consumption in the range 3% to 10% under comparable load conditions. It has also proven to significantly reduce carbon emissions.

Following discussions with Adam Cleverly and Clay Murdock, Maintenance Manager, Doug Andrus Trucking, it was determined that a fuel consumption analysis should be conducted utilizing at least four (4) late model over-the-road tractors (1664, 1822, 1856, 2040). The designated equipment for this study includes three (3) 2007 Freightliner Columbia trucks, and one (1) 2009 Peterbilt truck. The three (3) 2007 Freightliner Columbia trucks were equipped with MBE 4000 Mercedes engines, while the 2009 Peterbilt was equipped with a C 13 Caterpillar engine with a Diesel Particulate Filter (DPF). Engines with differing mileage accumulations were evaluated in an attempt to determine the affects of the Fuel Factor X catalyst on engines with varying use and horsepower.

An integral part of this evaluation is determining the catalyst's effect on new engine technology. The new 2009 Peterbilt was specifically of interest for testing as a result of the new emissions technology, which is required for compliance by all diesel engine manufacturers to achieve the impending 2010 diesel emissions standards. Most notably, the new technology consists of a Diesel Particulate Filter (DPF) and regeneration catalyst. Of interest is the ability of the active ingredient, in the Syntek catalyst, to reduce exhaust soot levels while at the same time reducing active and passive regeneration temperatures (See Dept. of Interior, Dept. of Mines Paper no. RI 9438, SAE paper no. 900154, Southwest Research paper Diesel Engine Emissions Control Technologies, appendix B, NIOSH paper no. 9462).

Further and included in this evaluation is a detailed analysis of captured data relative to driving fuel consumption profiles for each truck. The data was extracted from the computerized engine control unit (ECU) located on each truck. The purpose for this evaluation is to determine relative fuel consumption based on actual driving time and accumulated mileage. Because each truck fuels at random fuel sites, country wide, calculations for fuel density changes were performed and are incumbent on actual specific gravity readings accumulated and recorded at the time of the baseline and treated segments of this evaluation. It should be noted that all fuel producers begin reformulating fuels, as part of a two step process, beginning in September, and finally in October of each year. Proprietary fuel changes are part of a process to improve pour point, which inherently reduces the energy of the fuel (BTU). In general, average fuel consumption increases, while engine power decreases. Since cross sectional exhaust flows, temperatures, and velocities could not be monitored, balancing calculations were utilized as a means to correct for fuel energy loss based on fuel

specific gravity, at the time of each mass emissions evaluation. The results are included in the *Electronic Control Unit Fuel Consumption Analysis* section of this report.

It was determined that several engines be evaluated, ranging from relatively new, to those with higher miles. A baseline test was conducted after which the equipment was treated by pouring the Fuel Factor X catalyst into the rolling diesel fuel tanks for each test unit. Treatment was facilitated through the use of sixteen (16) ounce containers of Fuel Factor X catalyst, which were used to hand treat each test unit. At a later date, the catalyst treated fuel test was then repeated following the same parameters. The results are contained within the body of this report. Note: catalyst usage was monitored at the end of the treated segment of the evaluation to insure that a proper treatment ratio was properly maintained.

Doug Andrus Trucking is a long haul, contract carrier, with operations extending throughout the United States and into Canada. At the present time, they utilize approximately 275 trucks, from various manufacturers, equipped with a variety of engine types and packages. The existing operational paradigm includes a variety of contract work, which includes a large scale refer presence, as well as a flat bed heavy hauling division.



A baseline test (untreated) was conducted on September 19, 2009 using the Carbon Mass Balance Test Procedure, after which the pre-selected test equipment was treated by adding the Fuel Factor X catalyst to the diesel fuel contained in each individual trucks rolling tank at a treatment ratio of 1:10,000. On October 3, 2009, the test was then repeated following the same parameters. The results are contained within the body of this report.

The data showed that the average improvement in fuel consumption, for all trucks tested, was 7.025%, during steady state testing, using the Carbon Mass Balance test procedure. Further, data extracted from the on board computer

(ECU) for each truck evaluated documented an operational shift, which in fact increased fuel consumption during the catalyst treated segment of the evaluation. Further details will be discussed in the body of this report.

The treated engines also demonstrated a large percentage reduction in soot particulates, in the range 28%, and reductions in harmful exhaust related carbon fractions. Carbon dioxide reductions, based upon the measured reduction in fuel consumption, are also substantial.

# INTRODUCTION

Baseline (untreated) fuel efficiency tests were conducted on all four (4) pieces of equipment on September 19, 2009, employing the Carbon Mass Balance (CMB) test procedure. My Daily Choice supplied four (4) 16 ounce bottles of Fuel Factor X catalyst utilized to dose/treat the fuel tank on each individual test unit, by each individual driver at a treatment ratio of 1:10,000. The 16 ounce containers had graduated treatment markings, which aided in the convenience of treating, each time the test units were fuelled. The test units were then operated on Fuel Factor X catalyst treated fuel for up to 6,000 miles in order to achieve the recommended conditioning period, which is documented in many laboratories and field studies. Tests conducted provide critical documentation, which proves that equipment operated with less than 2,000 to 3,000 treated miles demonstrate lower fuel consumption improvements because of the catalytic stabilization affects that take place while using Fuel Factor X combustion catalyst.

At the end of the treated engine conditioning period (October 3, 2009), the engine tests were repeated, reproducing all engine parameters. The final results, along with the data sheets, are contained within this report.

# **TEST METHOD**

Carbon Mass Balance (CMB) is a procedure whereby the mass of carbon in the exhaust is calculated as a measure of the fuel being burned. The elements measured in this test include the exhaust gas composition, its temperature, and the gas flow rate calculated from the differential pressure and exhaust stack cross sectional area. The CMB is central to the both US-EPA (FTP and HFET) and Australian engineering standard tests (AS2077-1982), although in field-testing we are unable to employ a chassis dynamometer. However, in the case of a stationary equipment test, the engine can be loaded sufficiently to demonstrate fuel consumption trends and potential.

The Carbon Mass Balance formula and equations employed in calculating the carbon flow are a supplied, in part, by doctors' of Combustion Engineering at the university and scientific research facility level.

The Carbon Mass Balance test procedure follows a prescribed regimen, wherein every possible detail of engine operation is monitored to insure the accuracy of the test procedure. Cursory to performing the test, it is imperative to understand the quality of fuel utilized in the evaluation. As important, the quality of fuel must be consistent throughout the entirety of the process.



Fuel density and temperature tests are performed for both the baseline and treated segments of the evaluation to determine the energy content of the fuel. A .800 to .910 Precision Hydrometer, columnar flask and Raytek Minitemp are utilized to determine the fuel density for each prescribed segment of the evaluation.

Next, and essential to the Carbon Balance procedure, is test equipment that is mechanically sound and free from defect. Careful consideration and equipment screening is utilized to verify the mechanical stability of each piece of test equipment. Preliminary data is scrutinized to disqualify all equipment that may be mechanically suspect. Once the equipment selection process is complete, the Carbon Balance test takes only 10 to 20 minutes, per unit, to perform.

Once the decision is made to test a certain piece of equipment, pertinent engine criteria needs to be evaluated as the Carbon Balance procedure continues.

When the selection process is complete, engine RPM is increased and locked in position. This allows the engine fluids, block temperature, and exhaust stream gasses to stabilize. Data cannot be collected when there is irregular fluctuation in engine RPM and exhaust constituent levels. Therefore, all engine operating conditions must be stable and consistent.



An aftermarket throttle position lock is utilized, as one method, to secure engine RPM. This provides a steady state condition in which consistent data can be collected. Should the engine RPM fluctuate erratically and uncontrollably, the test unit would be disqualified from further consideration.

Next, engine RPM and fluid temperatures are monitored throughout the Carbon Balance evaluation. As important, exhaust manifold temperatures are monitored to ensure that engine combustion is consistent in all cylinders. It is imperative that the engine achieve normal operating conditions before any testing begins.



Once engine fluid levels have reached normal operating conditions the Carbon Balance study may begin. The above photograph shows that the engine RPM is locked in place at 1500 RPM. It should be noted that any deviation in RPM, temperature, either fluid or exhaust, would cause this unit to be eliminated from the evaluation due to mechanical inconsistencies.

Once all of the mechanical criteria are met, data acquisition can commence; it is necessary to monitor the temperature and pressure of the exhaust stream. Carbon Balance data cannot be collected until the engine exhaust temperature has peaked. Exhaust temperature is monitored carefully for this reason.



Once the exhaust temperature has stabilized, the test unit has reached its peak operating temperature. Exhaust temperature is critical to the completion of a successful evaluation, since temperature changes identify changes in load and

RPM. As previously discussed, RPM and load must remain constant during the Carbon Balance study.

When all temperatures are stabilized, and desired operating parameters are achieved; it is time to insert the emissions sampling probe into the exhaust tip of each piece of equipment utilized in the study group. The probe has a non-dispersive head, which allows for random exhaust sampling throughout the cross section of the exhaust.



While the emission-sampling probe is in place, and data is being collected, exhaust temperature and pressure are monitored throughout the entirety of the Carbon Balance procedure. This photograph shows the typical location of the exhaust emissions sampling probe.

While data is being collected, exhaust pressure is monitored, once again, as a tool to control load and RPM fluctuations. Exhaust pressure is proportional to load. Therefore, as one increases, or decreases, so in turn does the other. The Carbon Balance test is unique in that all parameters that have a dramatic affect on fuel consumption, in a volumetric test, are controlled and monitored throughout the entire evaluation. This ensures the accuracy of the data being collected. Exhaust pressure is nothing more than an accumulation of combustion events that are distributed through the exhaust matrix.



The above photograph shows one method in which exhaust pressure can be monitored during the Carbon Balance test procedure. In this case, exhaust pressure is ascertained through the use of a Magnahelic gauge. This type of stringent regime further documents the inherent accuracy of the Carbon Balance test.

At the conclusion of the Carbon Balance test, a soot particulate test is performed to determine the engine exhaust particulate level. This valuable procedure helps to determine the soot particulate content in the exhaust stream. Soot particulates are the most obvious and compelling sign of pollution. Any attempt to reduce soot particulates places all industry in a favorable position with environmental policy and the general public.



The above photograph demonstrates a typical method in which soot particulate volume is monitored during the Carbon Balance test. This method is the Bacharach Smoke Spot test. It is extremely accurate, portable, and repeatable. It is a valuable tool in smoke spot testing when comparing baseline (untreated) exhaust to catalyst treated exhaust.



Finally, the data being recorded is collected through a non-dispersive, infrared analyzer. Equipment such as this is EPA approved and CFR 40 rated. This analyzer has a high degree of accuracy, and repeatability. It is central to the Carbon Balance procedure in that it identifies baseline carbon and oxygen levels,

relative to their change with catalyst treated fuel, in the exhaust stream. The data accumulated is accurately measured, as long as the criteria leading up to the accumulation of data is processed carefully. For this reason, the Carbon Balance test is superior to any other test method utilized. It eliminates a multitude of variables that can adversely affect the outcome and reliability of any fuel consumption evaluation.



The above photograph identifies one type of analyzer used to perform the Carbon Mass Balance test. The analyzer is calibrated with known reference gases before the baseline and treated test segments begin. The data collected with this analyzer compares the carbon matrix data collected during the untreated segment of the evaluation with the carbon matrix data collected during the treated segment of the CMB test. This data is then computed and compared to the carbon contained within the raw diesel fuel. A fuel consumption performance factor is then calculated from the data. The baseline performance factor is compared with the catalyst treated performance factor. The difference between the two performance factors identifies the change in fuel consumption during the Carbon Balance test procedure. Note: The Horiba MEXA emissions analyzer is calibrated with the same reference gas for both the baseline and treated segments of the evaluation. In this case, a Scott specialty Mother gas no. CYL#ALM018709 was utilized for calibration purposes.

Essential to performing the aforementioned test procedure is the method in which the task for dosing fuel is performed. It is critical to the success of the Carbon Mass Balance procedure to insure that the equipment evaluated be given meticulous care and consideration to advance the process of testing.

# INSTRUMENTATION

Precision state of the art instrumentation was used to measure the concentrations of carbon containing gases in the exhaust stream, and other factors related to fuel consumption and engine performance. The instruments and their purpose are listed below:

Measurement of exhaust gas constituents HC, CO, CO<sub>2</sub> and O<sub>2</sub>, by Horiba Mexa Series, four gas infrared analyser.

**Note:** The Horiba MEXA emissions analyser is calibrated with the same reference gas for both the baseline and treated segments of the evaluation. In this case, a

Scott specialty mother gas no. CYL#ALM018709 was utilized for calibration purposes.

Temperature measurement; by Fluke Model 52K/J digital thermometer.

Exhaust differential pressure by Dwyer Magnahelic.

Ambient pressure determination by use of Brunton ADC altimeter/barometer.

The exhaust soot particulates are also measured during this test program.

Exhaust gas sample evaluation of particulate by use of a Bacharach True Spot smoke meter.

The Horiba infrared gas analyser was serviced and calibrated prior to each series of CMB engine efficiency tests.

# TEST RESULTS

# **Fuel Efficiency**

A summary of the CMB fuel efficiency results achieved, in this test program, is provided in the following tables and appendices. See Table I, and Individual Carbon Mass Balance results, in Appendix II.

Table I: provides the final test results for all four (4) pieces of equipment, included in the evaluation, before and after Fuel Factor X catalyst treatment (see graph III, Appendix I).

Test Segment	Miles	Fuel Change by %
<b>1664</b> Treated	4,430	- 7.3%
<b>1822</b> Treated	3,653	- 6.8%
<b>1856</b> Treated	5,762	- 7.1%
<b>2040</b> Treated	6,210	- 6.9%
Average (Absolute)		- 7.025%

TABLE I

The computer printouts of the calculated CMB test results are located in **Appendix II.** The raw engine data sheets used to calculate the CMB are contained in **Appendix III**. The raw data sheets, and carbon balance sheets show and account for the environmental and ambient conditions during the evaluation.

### Soot Particulate Tests

Concurrent with CMB data extraction, soot particulate measurements were conducted. The results of these tests are summarized in **Table II**. Reductions in soot particulates are the most apparent and immediate. Laboratory testing indicates that carbon and solid particulate reductions occur before observed fuel reductions. Studies show that a minimum 2,000 to 3,000 miles, Fuel Factor X catalyst treated engine operation, are necessary before the conditioning period is complete. Then, and only then, will fuel consumption improvements be observed. For the purpose of this evaluation, observed stack soot accumulation had diminished significantly between baseline and treated segments of the evaluation.

Fuel Type Density	Soot Particulates
1664	
Untreated	2.96 mg/m <sup>3</sup>
Treated	2.15 mg/m <sup>3</sup>
	- 27%
1822	0
Untreated	2.96 mg/m <sup>°</sup>
Treated	2.25 mg/m°
	- 24%
1856	4 44
Untreated	$4.41 \text{ mg/m}^{3}$
Ireated	3.10 mg/m <sup>-</sup>
2040	- 30%
2040	$10 m a / m^3$
Treated	$07 \text{ mg/m}^3$
Treated	.07 mg/m - 30%
	- 0070
Average	- 28%

The reduction in soot particulate density (the mass of the smoke particles) was reduced by an average 28% after fuel treatment and engine conditioning with Fuel Factor X catalyst (See Graph 1 and II, Appendix I). Concentration levels were provided by Bacharach.

### **Electronic Control Unit Fuel Consumption Analysis**

In conjunction with the CMB evaluation, a parallel analysis was performed utilizing the accumulated data extracted from the Electronic Control Unit located on each truck. Pertinent data specific to documenting consistent truck operations and its relationship to fuel consumption was extracted and is included in this section (see Appendix IV). Prior to data consideration it is necessary to determine the actual energy content of the fuel as it pertains to each individual truck. The following table will identify fuel density by test segment (baseline or treated) and total energy loss:

<u>Truck Number</u>	Fuel Density (Baseline)	Fuel Density (Treated)	Energy Loss	
1664	.841 @ 29.1 c.	.819 @ 28.9 c.	2.6%	
1822	.844 @ 28.8 c.	.821 @ 28.6 c.	2.7%	
1856	.842 @ 27.7 c.	.819 @ 27.5 c.	2.7%	
2040	.845 @ 28.4 c.	.820 @ 28.1 c.	3.0%	

Fuel economy also manifested an interesting trend in that all equipment included in the evaluation demonstrated an increase in fuel consumption during the treated segment of the evaluation. See the following table:

<u>Truck Number</u>	MPG Baseline	MPG Treated	Percent Change		
1664	6.88	6.51	+ 5.3%		
1822	6.63	6.08	+ 8.3%		
1856	6.39	5.96	+ 6.7%		
2040	7.37	7.13	+ 3.3%		

Of interest in this data is the fact that fuel consumption increased in all three of the Mercedes powered trucks beyond the potential change in energy due to the reduction in fuel density (BTU). The only truck that truly reflects any observable change in fuel density (carbon chains) is the Caterpillar powered truck (2040). The data suggests that more than just a change in fuel density occurred during the course of the evaluation. Problematic to over-the-road fuel consumption evaluations is the ability to monitor load, wind direction, speed, environmental conditions, tire pressure, fuel changes, idle time, terrain, driver habits, factory deficiencies in data accumulation in the ECU (+ or -5%), etc. For this reason, the EPA and SAE teamed together to develop an over-the-road test specifically designed to counteract the anomalies encountered when performing an over-the-road fuel consumption test. The J1321 test procedure monitors carefully the aforementioned criteria by performing an evaluation on a closed circuit track. Of importance to the test is not only the conditions already mentioned in this section, but a more critical component known as "time". All factions of the test are held to a minimum deviation (as little as + or - 1%) for all the variables previously mentioned, including time. The deviation for time is based on three (3) baseline circuits of the track wherein the average baseline circuit must fall within a time requirement of + or -3%. The most important factor realized from the J1321 test procedure is environmental and physical equipment controls; something that is unachievable in typical over-the-road operations.

In solution, there is almost more water contained in the diesel fuel than the active ingredient contained in the Fuel Factor X catalyst. The fuel catalyst has been thoroughly tested by independent laboratories using ASTM test procedures documenting with certainty that the active ingredient in the catalyst acts as a cetane enhancer and does not diminish potential fuel energy (BTU). As such, it is impossible for the catalyst to diminish fuel consumption as is readily observed in the data.

To best ascertain what might be the criteria behind the sudden fuel reduction the data must be sufficiently analysed to determine the consequential or inconsequential factors behind the accumulated information. A quick review of the exhibited idle time for each individual truck provides an interesting insight. Please review the following table:

Truck Number	Idle % Baseline	Idle % Treated	Percent Difference		
1664	31.95	18.15	- 43%		
1822	38.27	20.10	- 47%		
1856	11.14	10.32	- 7%		
2040	31	22	- 29%		

As observed, general idle time decreased, by percent, an average of 31.5% during the treated segment of the evaluation. Seasonal idle time is generally inconsequential, or

less than 5%, when comparing transient heat and transient cool cycles. A substantial change in idle time reflects something other than transient thermal cycles. To substantiate the aforementioned data, please review the following table:

Truck Number	Driving % Baseline	Driving % Treated	Percent Difference		
1664	68.5	81.85	+ 19%		
1822	61.73	79.90	+ 29%		
1856	88.86	89.68	+ 1%		
2040	69.5	78.5	+ 11%*		
* Calculated from "T	ime" and "Driving Time"				

This table documents the fact that driving time increased by an average of 15%. "Time" is predominately the single most significant indicator in fuel consumption error. Fuel consumption will always decrease as time increases to perform the same unit of work. This is substantiated by the fact that average driving speeds are inconsequential (<.0004% difference) with load varying < .005% (turbo boost). As illustrated by the aforementioned tables, idle time decreased while driving time increased during the treated segment of the evaluation. Of even more importance is the ability to report mileage. As represented by the truck manufacturer, the truck odometer and the ECU mileage indicator or not exact. In many cases the mileage differs between the odometer and ECU as much as 3% as required by law. Depending on the truck representative contacted, it is unclear as to which method for mileage collection is the most accurate.

Another factor that can dramatically affect fuel consumption is PTO time. This is the amount of time that the truck runs at fast idle. This form of operation actually affects fuel consumption and is totalized in the driving fuel consumption data included in the DDEC and CET data sheets (Appendix IV). In general, overall data supplied by the DDEC and CET is over 30 pages of vehicle historical information. As such, the determinations of this report are based on a cover sheet and information provided by the manufacturer. In the case of the trucks included in this evaluation, PTO time increased from .305% baseline to .382% catalyst treated. Again, this data is accumulated and totalized into the driving fuel consumption data for each truck. The data documents an increase in PTO time of 25% during the treated segment of the evaluation, a dramatic increase in PTO time with an incalculable affect on overall fuel consumption.

Other factors such as time in top gear (25% overdrive), although nominal in nature, affect the data collection process and overall reliability of the data collected. As indicated in the data, top gear usage averaged 81.88% baseline when compared to 80.82% catalyst treated; a .013% decline in overdrive use during the treated segment of the evaluation; again, incalculable in nature.

The data tabulated for top gear-1, again, identifies a slight change in operational parameters. The data indicates that the average truck time in top gear-1 is 7.29% baseline and 7.76% catalyst treated. Again, the data would appear nominal in nature but actually represents a 6.4% increase in top gear-1 during the treated segment of the evaluation.

The ECU data overwhelmingly provides documentation that there was indeed a trend change in operation during the treated segment of the evaluation. As such, it would be

difficult to express the detrimental affect of each and every deviation in data in a concise fuel consumption number. However, based upon the data overview presented in this section, it would be significant. The data presented and accumulated by the ECU, in each truck, does not provide enough repeatable data to indicate any trend other than an increased trend in usage, which should have shown a reduction in fuel consumption.

# Conclusion

These carefully controlled engineering standard test procedures conducted on all four pieces of test equipment; provide clear evidence of reduced fuel consumption in the range of 7.025%. In general, improvements utilizing the Carbon Mass Balance test, under static test conditions, generate results 2% - 3% less than those results generated with an applied load. However, engine design can and will produce data equal to or equivalent to data collected utilizing other methods of fuel evaluation.

Fuel Factor X catalyst's effect on improved combustion is also evidenced by the substantial reduction in soot particulates (smoke) in the range of 28% (see **Appendix I**). Reductions in soot and solid particulates, improves the efficiency of the diesel particulate filter (DPF) and regeneration unit. The similar reduction in other harmful carbon emissions likewise substantiates the improved combustion created by the use of Fuel Factor X combustion catalyst (see raw data sheets, **Appendix III**).

In addition to the fuel consumption analysis, a detailed compilation of carbon emissions reductions were determined. The study documented a significant reduction in annual C02 emissions of 3,433 metric tonnes. Reductions in Nitrogen and Methane levels were also observed **(Appendix V)**.

Additional to the fuel economy benefits measured and a reduction in soot particulates, a significant reduction, over time, in engine maintenance costs will be realized following treatment with My Daily Choice. These savings are achieved through lower soot levels in the engine lubricating oil, which is a result of more complete combustion of the fuel. Engine wear rates are reduced resulting in less carbon build-up in the combustion area. My Daily Choice also acts as an effective biocide should you experience water bottoms in fuel storage tanks; and, an excellent fuel system lubricant, which improves fuel system lubrication with today's low sulphur diesel fuels. Appendix I

# **Exhaust Particulate and Fuel Graphs**



Soot Particulate Graph I



Soot Particulate Graph II

Appendix II

Carbon Mass Balance Compilation Sheets

COMPANY :	Doug Andrus Tr	ucking		LOCATION :	Idaho Falls, Ida	ho	
EQUIPMENT : ENG. TYPE : RATING :	2007 Freightline MBE 4000 Mer	r Columbia cedes		UNIT NR. : MODEL : FUEL :	1664 Long Haul Truc Diesel	k	
BASELINE TEST				DATE :	09/19/09		
TRUCK MILES AMB. TEMP (C) : BAROMETRIC (mb)	405,084 22.8 1020			ENG. RPM: STACK(mm): LOAD:	1500 123.75 High Idle		
PRES DIFF (Pa):         EXHST TEMP (C):         HC (ppm)       :         CO (%)       :         CO2 (%)       :         O2 (%)       :         CARB FLOW(g/s):         REYNOLDS NR. :	<i>TEST 1</i> 149 137.1 9 0.02 2.15 10.36 1.422 5.45E+04	<i>TEST 2</i> 149 137.3 10 0.02 2.13 10.32 1.409	<i>TEST 3</i> 149 137.2 10 0.02 2.14 10.34	<i>TEST 4</i> 149 137.3 11 0.02 2.15 10.32 1.422	TEST 5         149         137.3         10         0.02         2.14         10.36         1.415	AVERAGE 149 137 10.0 0.020 2.14 10.34 1.417	% ST.DEV 0.00 0.07 7.07 0.00 0.39 0.19 0.39
TREATED TEST		*****		DATE :	10/03/09		
TRUCK MILES AMB. TEMP (C) : BAROMETRIC(mb):	409,514 20.3 1019			ENG. RPM: STACK(mm): LOAD:	1500 123.75 High Idle		

BAROMETRIC(mb):	1019		LOA	AD: H	ign idle		
	TEST 1	TEST 2	TEST 3	TEST 4	TEST 5	AVERAGE	% ST.DEV
PRES DIFF (Pa):	142.5	142.5	142.5	142.5	142.5	143	0.00
EXHST TEMP (C):	134.2	134.3	134.5	134.6	134.5	134	0.37
HC (ppm) :	5	6	5	5	6	5.4	10.14
CO (%) :	0.01	0.02	0.02	0.01	0.01	0.014	39.12
CO2 (%) :	2.03	2.04	2.02	2.04	2.03	2.03	0.43
O2 (%) :	10.28	10.26	10.25	10.28	10.26	10.27	0.13
CARB FLOW(g/s):	1.310	1.323	1.310	1.316	1.310	1.314	0.45
REYNOLDS NR. :	5.35E+04	Т	OTAL HOURS	ON TREATED	FUEL :	4430	üd kouissen serve seprendpokteriset

PERCENTAGE CHANGE IN FUEL CONSUMPTION ((TREATED-BASE)/BASE\*100) :

REMARKS:

-7.3 %

COMPANY :	Doug Andrus Ti	rucking		LOCATION :	Idaho Falls, Ida	ho	
EQUIPMENT : ENG. TYPE : RATING :	2007 Freightline MBE 4000 Mer	er Columbia cedes		UNIT NR. : MODEL : FUEL :	1822 Long Haul Truc Diesel	:k	
BASELINE TEST				DATE :	09/19/09		
TRUCK MILES	341,827			ENG. RPM:	1500		
AMB. TEMP (C):	22.1			STACK(mm):	123.75		
BAROMETRIC (mb)	1019			LOAD:	High Idle		
	TEST 1	TEST 2	TEST 3	TEST	4 TEST 5	AVERAGE	% ST.DEV
PRES DIFF (Pa):	149	149	149	14	9 149	149	0.00
EXHST TEMP (C):	134.7	134.6	134.8	134.	6 134.7	135	0.06
HC (ppm) :	12	11	12	. 1	3 12	12.0	5.89
CO (%) :	0.02	0.02	0.02	0.0	2 0.02	0.020	0.00
CO2 (%) :	2.25	2.26	2.23	2.2	6 2.25	2.25	0.54
O2 (%) :	10.38	10.35	10.36	10.3	6 10.37	10.36	0.11
CARB FLOW(g/s):	1.492	1.498	1.479	1.49	9 1.492	1.492	0.55
REYNOLDS NR. :	5.46E+04					gand de canangilitza constato que const	
TREATED TEST				DATE :	10/03/09		

TREATED TEST			]	DATE :	10/03/09		
TRUCK MILES	345,480		1	ENG. RPM:	1500		
AMB. TEMP (C) :	20.4		:	STACK(mm):	123.75		
BAROMETRIC(mb):	1017		1	LOAD:	High Idle		
	TEST 1	TEST 2	TEST 3	TEST 4	TEST 5	AVERAGE	% ST.DEV
PRES DIFF (Pa):	147	147	147	147	147	147	0.00
EXHST TEMP (C):	132	131.9	131.7	131.6	5 131.7	132	0.22
HC (ppm) :	6	7	7	6	5 7	6.6	8.30
CO (%) :	0.01	0.01	0.01	0.01	0.01	0.010	0.00
CO2 (%) :	2.10	2.13	2.12	2.11	2.13	2.12	0.62
O2 (%) :	10.27	10.29	10.26	10.28	3 10.30	10.28	0.15
CARB FLOW(g/s):	1.379	1.399	1.393	1.386	1.399	1.391	0.63
REYNOLDS NR. :	5.44E+04	Т	OTAL HOU	JRS ON TREAT	ED FUEL :	3653	

PERCENTAGE CHANGE IN FUEL CONSUMPTION ((TREATED-BASE)/BASE\*100) :

-6.8 %

REMARKS:

.

COMPANY :	Doug Andrus Tr	ucking		LOCATION :	Idaho Falls, Idah	0	
EQUIPMENT : ENG. TYPE : RATING :	2007 Freightline MBE 4000 Merc	er Columbia cedes		UNIT NR. : MODEL : FUEL :	1856 Long Haul Truck Diesel	:	
BASELINE TEST				DATE :	09/19/09		
TRUCK MILES	311,183			ENG. RPM:	1500		
AMB. TEMP (C):	22.6			STACK(mm):	123.75		
BAROMETRIC (mb)	1020			LOAD:	High Idle		
	TEST 1	TEST 2	TEST 3	TEST 4	TEST 5	AVERAGE	% ST.DEV
PRES DIFF (Pa):	149	149	149	149	149	149	0.00
EXHST TEMP (C):	135.6	135.8	135.7	135.8	135.9	136	0.08
HC (ppm)	9	8	8	9	8	8.4	6.52
CO (%) :	0.02	0.02	0.02	0.02	0.02	0.020	0.00
CO2 (%) :	2.14	2.16	2.13	2.16	2.15	2.15	0.61
O2 (%) :	10.29	10.26	10.27	10.25	10.28	10.27	0.15
CARB FLOW(g/s):	1.418	1.430	1.411	1.431	1.424	1.423	0.59
REYNOLDS NR. :	5.46E+04						

TREATED TEST				DATE :	10/03/09		
TRUCK MILES	316,945			ENG. RPM:	1500		
AMB. TEMP (C) :	20.2			STACK(mm):	123.75		
BAROMETRIC(mb):	1018			LOAD:	High Idle		
	TEST 1	TEST 2	TEST 3	TEST 4	TEST 5	AVERAGE	% ST.DEV
PRES DIFF (Pa):	146	146	146	146	5 146	146	0.00
EXHST TEMP (C):	132.4	132.5	132.6	132.5	5 132.6	133	0.41
HC (ppm) :	4	5	5	4	4	4.4	12.45
CO (%) :	0.01	0.01	0.01	0.01	0.01	0.010	0.00
CO2 (%) :	2.03	2.02	2.01	2.03	2.01	2.02	0.50
O2 (%) :	10.18	10.19	10.15	10.16	10.18	10.17	0.16
CARB FLOW(g/s):	1.328	1.322	1.315	1.328	1.315	1.322	0.49
REYNOLDS NR. :	5.42E+04	T	OTAL HOU	JRS ON TREAT	ED FUEL :	5762	

PERCENTAGE CHANGE IN FUEL CONSUMPTION ((TREATED-BASE)/BASE\*100) :

-7.1 %

REMARKS:

COMPANY :	Doug Andrus Tr	rucking		LOCATION :	Idaho Falls, Idal	ho	
EQUIPMENT : ENG. TYPE : RATING :	2009 Peterbilt C-13 Caterpillar	DPF		UNIT NR. : MODEL : FUEL :	2040 Long Haul Truc Diesel	k	
BASELINE TEST				DATE :	09/19/09		
TRUCK MILES AMB. TEMP (C) : BAROMETRIC (mb)	98,019 22.1 1018			ENG. RPM: STACK(mm): LOAD:	1500 123.75 High Idle		
PRES DIFF (Pa):           EXHST TEMP (C):           HC (ppm)         :           CO (%)         :           CO2 (%)         :           O2 (%)         :	<i>TEST 1</i> 63 132.7 7 0.01 1.60 10.10	<i>TEST 2</i> 63 132.6 8 0.01 1.64 10.14	TEST 3 63 132.4 7 0.01 1.62 10.12	TEST 4 6: 132.; 0.0 1.6• 10.1•	TEST 5         63           5         132.6           7         8           0.01         1.64           4         10.16	AVERAGE 63 133 7.4 0.010 1.63 10.13	% ST.DEV 0.00 7.40 0.00 1.10 0.23
CARB FLOW(g/s):	0.690	0.707	0.698	0.70	0.707	0.702	1.10
REYNOLDS NR. :	3.56E+04				=		
TREATED TEST				DATE :	10/03/09		
TRUCK MILES AMB. TEMP (C) : BAROMETRIC(mb):	104,229 19.6 1016			ENG. RPM: STACK(mm): LOAD:	1500 123.75 High Idle		
PRES DIFF (Pa):           EXHST TEMP (C):           HC (ppm)         :           CO (%)         :           CO2 (%)         :           O2 (%)         :	<i>TEST 1</i> 62 128.7 4 0.01 1.51 10.00	<i>TEST 2</i> 62 128.6 4 0.01 1.52 10.05	TEST 3 62 128.6 5 0.01 1.53 9.99	TEST 4 6: 128. 0.0 1.5: 10.0:	TEST 5           2         62           7         128.7           4         4           1         0.01           3         1.52           5         10.01	AVERAGE 62 128 4.2 0.010 1.52 10.02	% ST.DEV 0.00 0.58 10.65 0.00 0.57 0.28
CARB FLOW(g/s):	0.648	0.652	0.657	0.65	6 0.652	0.653	0.56
REYNOLDS NR. :	3.55E+04	Т	OTAL HO	URS ON TREAT	ED FUEL :	6210	

PERCENTAGE CHANGE IN FUEL CONSUMPTION ((TREATED-BASE)/BASE\*100) :

-6.9 %

REMARKS:

Appendix III

**Raw Data Sheets** 

Form
Data
Field
Balance
Mass
Carbon

	Company: Deng Andens	Location:	Talaho	Falls,	2.96 mg/m3		Date: 5	60-66-6
	xhaust Manifold Temp:	MilevH	ours: 405,0	84 ID#:	1444	Fuel Spe	cific Gravity:	·841 8.29.16
xhaust Manifold Temp: <u> </u>	ype of Equipment: Faeight livee	Columbia	E	khaust Side:	RISIS	Barometri	c Pressure:	2701
xhaust Manifold Temp: <u>Construction</u> (Mile) Hours: <u>405,084</u> ID#: 164 Fuel Specific Gravity: 374, 529, 10 Spe of Equipment: <i>Construction</i> (Construction) Exhaust Side: <u>Artic</u> Barometric Pressure: 1020	PM: 1500 Load: Stall-A	LOF-Lig	WS OF			Oil Pressure	Temp.	2
xhaust Manifold Temp: <u>Anile Mile Mours: 405,084</u> ID#: 1664 Fuel Specific Gravity: 349, 8,29,16 ype of Equipment: <u>Taright Jivee Columbia</u> Exhaust Side: <u>Lysk</u> Barometric Pressure: 122 tPM: 1500 Load: Stalle ACAF-Lights aft Oil Pressure Temp. <u>A</u>	Fuel Type Exhaust P CO Temp °C Inches	HC PPM	C02	02	Ambient Temp.	<b>Instrument</b> Calibration	Observer	Time Begin

Fuel Type	Exhaust Temp °C	P Inches Of H <sub>2</sub> O	CO	HC PPM	C02	02	Ambient Temp. C.	Instrument Calibration	Observer	Time Begin To Time End
Dieset	137.1	149	20.	6	2.15	10.36	22.8	yes		12:25 D-M
	137.3	149	20.	<i>a</i> 1	2.13	10.32				
	137.2	641	20.	01	41.2	10.34				
	137.3	bhi	201	11	215	10.32				
	137.3	641	70,	01	2.14	10.36	22.8			12:35

	Les va	1	28.96							
	-3-07 5 Janches	ty: .25	. 819.0 2	1019	Time Begin To Time End	12:25 p.m.				12:35
	Date: /Z	Inlet Veloci	ific Gravity.	c Pressure:	Observer					
ı Form	xhaust Diamete	acedes Air	Fuel Spec	Barometrio Oil Pressure	Instrument Calibration	Xes				
ld Data	-2-2. 1/5m 21.5	HODD Me	1444	They	Ambient Temp. C.	20.3				20.3
nce Fie	Smoke N	PPT MBE	514 ID#:-	xhaust Side:	02	12.J	92.01	12.25	12,28	10.26
ss Bala	itch: 27	Model: 23	Hours: 429	a sheid	C02	2,03	40'2	2.02	2.04	2.03
on Ma	Location Fan Clu	Engine Make	Milesh	Celumbin	HC PPM	Ń	\$	S	5	q
Carb	6	d::b		linea A	6	la.	20.	74.	101	10.
	Did Rus	Treate		trepht :	P Inches Of H2O	142.5	142.5	5.241	142.5	142.5
	Daugh	Baseline:	ifold Temp:	pment: (	Exhaust Temp °C	134.2	134.3	134.5	1346	134.5
	Company: Water Temp:	Test Portion:	Exhaust Man	Type of Equi	Fuel Type	Diesel				

	here re	2	28.85								
	-19-09 5-Inchest	ty: 25	.844 0	1019		Time Begin To Time End	12:10 p.m.				12:20
	Date:	Inlet Veloci	ific Gravity:	c Pressure:	Femp. Z	Observer					
ı Form	≥ Xhaust Diameto	-s Air	Fuel Spec	Barometric	Oil Pressure	Instrument Calibration	Jes				
Id Data	2.96mg/m	Merced	1822	Lour		Ambient Temp. C.	22.1				22.1
nce Fie	Fells, J Smoke N	T MBE	827 ID#:	xhaust Side:	F	62	10.38	10.35	10.36	10.36	12.37
ss Bala	: Idaha utch: sff	/Model: 201	Hours: 341	E	2 they	C02	2.25	226	2 23	2.2	2,25
oon Ma	Location Fan Ch	Engine Make	Milevi	Columb	- aft-	HC PPM	7	11	12-	13	12
Cart	N N	ed:		liver	dic- Au	CO	ra.	-la.	70.	-20.	70,
	Anden_ Oil Pres	× Treat	Ø	Freight	d: 54a	P Inches Of H <sub>2</sub> O	bhl	641	149	المط	149
	End	Baseline:	ifold Temp:	pment:	20 Loa	Exhaust Temp °C	134.7	134.6	134.8	134.6	134.7
	Company: Water Temp:	Test Portion:	Exhaust Man	Type of Equi	RPM: 150	Fuel Type	Diert				

-

rbon Mass Balance Field Data Form	Location:     I dr loc     I dr loc     I dr loc       Fan Clutch:     OF     Smoke No:     Exhaust Diameter:     123.75	Engine Make/Model: 2007 MBE 400 Merceles Air Inlet Velocity: . 20	Miles/Hours: 345,42 ID#: 1822 Fuel Specific Gravity: 821,828,4	AL DIF- Light off Oil Pressure Temp. &	HCCO202AmbientInstrumentObserverTimePPMPPMCalibrationBeginToC.C.C.ToTo	8:1 20 4.2 20.4 Yes 1:18	7 2.13 12.29	7 2.12 10.26	6 2.1 12.38	7 2.13 /0.30
ince Field	Smoke No:	DODT MBE 42	42 ID#: /	eft.	02 An Ti	2 22.21	12.29	42.01	82.91	10.30
ss Balan	itch: DA	Model: 22	Iours: 3454	stole	C02	Z.B	2,13	2.12	2.11	2.13
on Ma	Location Fan Clu	Engine Make	Miles H	- PFF-	HC PPM	Þ	L	7	ę	7
Carl	l l	ed: X	Liver	lie- Ac	CO	(2.	la.	Ia.	la.	10.
-	0il Pres	Treat	Theight	d: 5 har	P Inches Of H <sub>2</sub> O	241	141	147	147	147
	prug h	Baseline:	ifold Temp: pment:	Z Loa	Exhaust Temp °C	132-	131.9	131.7	131.6	131.7
(	Company: Water Temp:	Test Portion:	Exhaust Man Type of Equi <sub>l</sub>	RPM: /50	Fuel Type	Dieset				

	2 2	ő	27.75			10-							
	-19-DF	ty: +25	842 8	1020	R.	Time	Begin To Time Fud	NUMP AND Y	11:42				11:52
	Date: 9-	Inlet Veloci	ific Gravity:	c Pressure:	Femp.	Ohserver.							
a Form	az Exhaust Diamet	ales)es Air	Fuel Spec	Barometri	Oil Pressure	Instrument	Calibration		Yes				
eld Data	4.41 mg) n	HOP Me	1856	CANT		Ambient	Temp. C.		22.6				22.6
nce Fie	Smoke N	DW CO	.83 ID#:	xhaust Side:	ЪĤ	02			12.29	10.26	10.27	10.23	10.28
ss Bala	1: 1-3 a	e/Model: 20	Hours: 3/1,	mbia I	- USNA	C0,	4		2.14	2.16	2,13	2.16	2.15
oon Ma	Location Fan Ch	Engine Make	Mile	Colm	CPF-	HC	PPM		6	60	ß	6	~
Carl	s:	ted:		Timer	Wic-A	C0			-24.	70.	20.	701	70.
	oil Pre	X_Treat	8	Freight	id: 5 h	P	Inches Of H <sub>2</sub> O		149	541	145	149	641
	T Ena	Baseline:	ifold Temp:	pment:	ZD Loa	Exhaust	Temp °C		135.6	135.8	135.7	135.8	135.9
	Company: <u> </u>	Test Portion:	Exhaust Mai	Type of Equi	RPM: 15	Fuel Type			Diesel				

	يا معر		27.52							
	-3-29	ty: +20	1018		Time Begin To Time End	12:5J P.m.				1:05
	Date: /2	Inlet Veloci	cific Gravity c Pressure:	Temp. 2	Observer					4 <sub>84</sub> =
a Form	₹ Xhaust Diamet	aledes Air	Fuel Spec Barometri	Oil Pressure	Instrument Calibration	Yes				
old Data	T	400 Me	LISS		Ambient Temp. C.	20.2				20.2
ince Fie	Smoke N	38W LO	TH2 ID#:	¥4	02	12.18	10.19	51.01	10.161	10.78
iss Bala	1: Tdn b utch: eff	e/Model: 202	Harris 210	thigh	C02	2.03	2:02	2.01	2.23	[e. Z
bon Ma	Location Fan Cl	Engine Make	p/wmbit	c off -	HC PPM	Ą	Ś	λ	4	4
Car	Xing Ss:	ted: X	wer	-240	CO	<i>[a</i> ,	101	10.	10.	la,
	Oil Pra	Trea	neightli	id: 54	P Inches Of H2O	141	141	146	14/	146
	Enders:	Baseline:	pment: F	22 L05	Exhaust Temp °C	132.4	132.5	132.6	132.5	132.6
	Company: Water Temp:	Test Portion: Exhaust Man	Type of Equi	RPM: /51	Fuel Type	l iese)				

	D 2 ches ~ 23	A	5028.46		ne gin End	11				~ ~
	-6(-	ty: .	181	Jal Ja	Tin Beg T	11:			-	11:2
	Date: 7	r Inlet Veloci	cific Gravity	Tenp.	Observer					
1 Form	Xhaust Diame	Pillar Ai	Fuel Spe Rarometr	Oil Pressure	Instrument Calibration	Yes				
eld Data	L). IDmg/m3	13 Cater	204D		Ambient Temp. C.	22.)				22.1
ince Fie	Smoke ?	2 6ad	xhaust Side:	plf	02	10.10	pr.al	10.12	hi.al	10.16
ss Bala	i: Idaha utch: of	e/Model: 2	Hours: 98	they -	C02	1. bo	1.44	1.62	1.64	471
bon Ma	Location Fan Cl	Engine Make	DFF	AC PA	HC PPM	7	00	7	7	ŝo
Carl	s:	ted:	bilt -	da die	CO	10.	(a.	<i> a</i> .	10.	10.
	oil Pre	Treat	Peter	d: S	P Inches Of H <sub>2</sub> O	63	\$3	63	63	63
	Drug A	Baseline:	uifold Temp: pment:	p Loa	Exhaust Temp °C	L.2.E/	132.6	132.4	132.5	132.6
	Company:	Test Portion:	Exhaust Man Type of Equi	RPM: 150	Fuel Type	Diew)				

	s2 ctres m m	20	71.27 @ 4	16		me o End	2				ž,
	5-4	city: _	y: .8	ay	Ø	Ti Time	1.1				1:5
	Date: /23, Z	· Inlet Velo	cific Gravit	c Pressure: Tamn	T AMP.	Observer					
a Form	Thanst Diamet	Pilar Air	Fuel Spe	Barometri Oil Prosentro	AINSCALLIN	<b>Instrument</b> Calibration	Yes				
ld Data	10:07 20;0	Cater-	2040	K-PART		Ambient Temp. C.	151				19.6
nce Fie	Smoke N	209 C13	:#01 6-12	xhaust Side:		02	10.0	12.05	9.99	10.01	10.01
ss Bala	itch: pff	/Model: 24	Hot :suof	E	cally-	C02	1.5/	1.52	1.53	1.53	1.52
oon Ma	Location Fan Clu	Engine Make	WIEN		AL DEL-	HC PPM	4	4	S	4	4
Carl	5 ::	ed: X		Le Det	- 714	CO	la.	10-	(2.	14.	10.
	Oil Pres	Treat	Å.	trabil]		P Inches Of H <sub>2</sub> O	42	42	62	62	29
	Бна	Baseline:	uifold Temp:	pment: //	1 100	Exhaust Temp °C	128.7	128.6	128.4	128.7	128.7
	Company: <u>}</u> Water Temp:	Test Portion:	Exhaust Man	Type of Equi	not min	Fuel Type	Diuse)				

Appendix IV

**ECU Data Sheets** 

	DDEC Report	s - Trip Activity	<i>y</i>
Print Date: Sep 19,	2009 07:12 AM (MDT)		-
Doug Andrus Dist.		Trip: 07/28/09 (	08:05 AM (MST) to 09/1
Idaho Falle ID 83400	-	Venicle ID: 1664	
(208) 523-1034	_	Odomotor: 405084	1 mi
,,	···· · ····	000000000000000000000000000000000000000	• 1 1111
Trip Distance	17418.5 mi	Trip Time	459:24:49
Trip Fuel	2633.63 gal	Fuel Consumption	5.73 gal/h
Fuel Economy	6.61 mpg	Idle Time	146:46:20
Avg Drive Load	62 %	Idle Percent	31.95 %
Avg Vehicle Speed	55.7 mph	Idle Fuel	103.63 gal
Driving Time	312:38:29	VSG(PTO) Total Time	3:51:40
Driving Percent	68.05 %	VSG(PTO) Percent	0.84 %
Driving Fuel	2530.00 gal	VSG(PTO) Total Fuel	4.88 gal
Driving Economy	6.88 mpg		
Vobiele Coose Limitin		Stop Idle Time	130:07:38
Time Time	30.40.50	Stop Idle Percent	28.32 %
Dergent	39:49:59 10 74 9	stop lale Fuel	90.75 gal
Distance	12.74 đ	Oregon Down Triwit	
Fuel	2510.6 ML	Over Rev Limit	1800 rpm
1001	109.13 gai	Counte	102
Top Gear		Dercont	0:26:31
Time	242.50.13	Fercent	0.10 8
Percent	77.67 %	Highest RDM	3531 mm
Distance	14963.1 mi	Occurred 09/15/0	9 12:45:14 (MST)
Fuel	1889.50 gal		5 <b>11</b> , 10, 11 (1, 10, 1)
Time	27:48:05	Diag. Records	0
		Hard Brake Count	2
Top Gear - 1		Brake Count	3396
Percent	8.89 %	Eng. Brake Time	14:33:15
Distance	1494.6 mi		
Fuel	401.38 gal	Optimized Idle Time	
Change in the		Active	0:00:00
Cruise Rimo	226 21 22	Run	0:00:00
Percent	226:31:29	Battery	0:00:00
Distance	12024 4 mi	Engine Temp.	0:00:00
Fuel	1988 75 gal	Extended Idle	0:00:00
, del	1966.75 gui	Excended idie	0.00.00
Top Gear Cruise		Continuous	0.00.00
Time	210:37:40	oon a maoag	0.00100
Percent	67.37 %	Optimized Idle Batter	v Charging Starts
Distance	13051.9 mi	Normal Count	0
Fuel	1688.38 gal	Alternate Count	0
		Continuous Run	0
Speeding A(>=66 mph an	1d <71 mph)		
Count	1021	Fan On Time	
Time	4:58:19	Total Time	4:33:23
Percent	1.59 %	Engine System	0:00:00
opeeuting s(>=/1 mph)	<i>C</i> <b>A</b>	Manual	4:33:23
Time	04	A/ C	0:00:00
Dercent	0:TT:#\	Bump On Mime	
+ 6+06110	V.U0 %	Pump on Time	0 - 00 - 00
Highest Speed	76 0 mph	Distance	0:00:00
Occurred 08/15/09	9 14:43:18 (MST)	Fuel	0.0 mi 0.00 mal
		ruc.	0.00 gar
Coasting Time	0:00:00	Engine Utilization	36.17 %
Coasting Percent	0.00 %	Vehicle Utilization	24.61 %
DDD Deservestion			
DP# Regeneration			

091990AE.XTR Engine S/N: 0000846635 ECM S/W Version: 14.230 Version 6.42 Page 1

Print Date: Oct 09,	2009 04:41	PM (MDT)		
Doug Andrug Distribut				
6300 S 45 W	ING		Trip: 09/19/200 Vehicle ID: 1664	9 to 10/09/2009 (MST
Idaho Falls, ID 83402			Driver ID:	
2085231034			Odometer: 412643	.9 mi
Trip Distance	7559.8	3 mi	Trip Time	162.55.06
Trip Fuel	1163-63	- dal	Fuel Consumption	7.14 gal/h
Fuel Economy	6.50	pam (	Idle Time	29:34:18
Avg Drive Load	63	3 8	Idle Percent	18.15 %
Avg Vehicle Speed	56.7	/ mph	Idle Fuel	20.38 gal
Driving Time	133:20:48	3	VSG(PTO) Time	0.49.35
Driving Percent	81.85	5 8	VSG(PTO) Percent	0.51 %
Driving Fuel	114325	gal	VSG(PTO) Fuel	1.00 gal
Driving Economy	6.61	mpg >		2100 302
Vehiele Grand Timitiu	A construction of the second second	and the second	Stop Idle Time	23:48:44
Wenicie speed Limiting	14 01 04		Stop Idle Percent	14.62 %
Bergent	14:01:04	0.	Stop Idle Fuel	16.38 gal
Distance	10.51 206 0	. 6		1.0.0
Fuel	000.U 35 43	. m T	Over Kev Limit	1800 rpm
Puei	20.00	gai	Count	9
Top Gear			Percent	0.02:08
Time	106.56.28		rercent	0.02 6
Percent	80.20	8	Highest RPM	2275 rom
Distance	6598.3	mi	Occurred 10/05/	19 13 38 43 (MST)
Fuel	889.38	qal	00001100 10/00/	20.00.40 (HDT)
		•	Diag, Records	0
Pop Gear - 1			Hard Brake Count	1
Time	11:23:44		Brake Count	1184
Percent	8.55	웜	Eng. Brake Time	4:33:42
Distance	611.3	mi		
Fuel	167.50	gal	Optimized Idle Time	
			Active	0:00:00
Cruise			Run	0:00:00
Time	102:53:13		Battery	0:00:00
Percent	77.16	8	Engine Temp.	0:00:00
Distance	6331.4	mı	Thermostat	0:00:00
Fuel	950.88	gal	Extended Idle	0:00:00
Top Gear Cruise			continuous	0.00.00
Time	95:46:54		Optimized Idle Batter	v Charging Starts
Percent	71.83	60	Normal Count	0
Distance	5939.2	mi	Alternate Count	0
Fuel	814.25	gal	Continuous Run	0
Speeding A(>=66 mph an	d <71 mph)		Fan On Time	
Count	339		Total Time	0:00:00
Time	1:38:30		Engine System	0:00:00
Percent	1.23	웅	Manual	0:00:00
Speeding B(>=71 mph)			A/C	0:00:00
Count	19			
Time	0:03:53			
Percent	0.05	do.	Pump On Time	
			Time	0:00:00
lighest Speed	74.0	mph	Distance	0.0 mi
Occurred 09/22/09	09:28:27 (1	4ST)	Fuel	0.00 gal
Coasting Time	0:00:00		Engine Utilization	33.29 %
Coasting Percent	0.00	윢	Vehicle Utilization	27.25 %
OPF Regeneration				
Parked Regen Count	0			
Parked Regen Count Driving Regen Count	0			

## DDEC® Reports - Trip Activity

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100991AA.XTR Engine S/N: 0000846635 ECM S/W Version: 14.230 Version 6.4 Page 1

DDEC* Reports - Trip Activity           Print Date: Sep 18, 2009 10:53 AM (MOT)           Doug Andrus Dist. 6300 6450 Tatho Falls, TD 83402- 10001 523-1034         Trip: 06/30/39 09:44 AM (MST) to 09/16/21 Vehicle DD: 1822 Driver ID: 1822 Driver ID: 1824 Doug Andrus Dist. 6300 6459 Trip Distance Arg Drive Land Arg Vehicle Speed Driving Time 442:40:55 Driving Time 442:40:55 Driving Time 442:40:55 Driving Time 442:40:55 Driving Fuel Driving Precent 1000 fortal Time Fercent Driving Precent 1000 fortal Time Fercent 1000 fortal Time 1000 fortal Time 10000 fortal Time 1000 fortal Time 10000 fortal Time 1000 fortal Tim				09-18-04
Print Date:       Bep 18, 2009       10:53 AM (MDT)         Doug Andrag Dist.       Trip:       06/30/09 03:44 AM (MST) to 09/16/24         Construction       Construction       1222         Calob S ASM       Diversition       1222         Calob S ASM       Construction       1222         Calob S ASM       Construction       256:33:47         Calob S ASM       Construction       5:73 gal/h         Trip Distance       2735:60 Gal       Trip Time       5:73 gal/h         Trip Distance       233:60 Gal       Trip Time       25:33:43         May Delice Speed       58:7 mph       Time       21:6:65         Driving Knoomy       66 %       VsG(PTO) Total Time       2:5:4:65         Driving Knoomy       66 %       VsG(PTO) Total Time       2:5:2 %         Driving Knoomy       66.4 %       Over Rev Limit       1800 rpm         Driving Knoomy       2:5:2 %       Stop Idle Free       3:3:2 %         Valicle Speed Limiting       2:1:0:5:0       Cont       0:0:2 %         Time       2:2:0:5:9       Cont       2:2 %         Time       2:2:2:5:5 mi       Cont       2:2 %         Distance       1:2:1:5:1:1       Cont       1:0:2:1:1:1:1:1		DDEC <sup>®</sup> Reports	- Trip Activity	,
This ball         Description         Trip:         06/30/39 03:44 Ak (MST) to 03/10/L           0300 Andrus Dist.         0300 S 45W         Driver ID:         0400 Print           0300 Andrus Dist.         0306 S 45W         Driver ID:         0400 Print         222           0400 Print         0400 Print         221 Fill         211 Fill         211 Fill         211 Fill           0400 Print         0400 Print         222 Fill         211 Fill         211 Fill         211 Fill           111 Fill         112 Fill         112 Fill         112 Fill         211 Fill         211 Fill           112 Fill         112 Fill         112 Fill         112 Fill         211 Fill         211 Fill           112 Fill         112 Fill         112 Fill         112 Fill         211 Fill         211 Fill           112 Fill         112 Fill         112 Fill         112 Fill         211 Fill         211 Fill           112 Fill         112 Fill         112 Fill         112 Fill         211 Fill         211 Fill           112 Fill         112 Fill         112 Fill         211 Fill         211 Fill         211 Fill           112 Fill         112 Fill         112 Fill         112 Fill         211 Fill         211 Fill         211 Fill <td>During Date: Sen 18, 2</td> <td>009 10:53 AM (MDT)</td> <td></td> <td></td>	During Date: Sen 18, 2	009 10:53 AM (MDT)		
Display         Driver ID.           Cabo Falle, ID B340-7         Conserver: ID.           (208) 533-1034         27396.0 mi         Puel Consumption         2933.131           Trip Distance         27396.0 mi         Puel Consumption         2933.131           Trip Distance         2739.0 mi         Puel Consumption         2933.131           Trip Distance         56.7 mph         Tile Puel         202.75 gal.           Avg Drive Load         56.7 mph         Tile Puel         202.75 gal.           Avg Vanicle Rpeed         56.7 mph         Van(PrO) Total Time         2154:45           Driving Time         467:00.56         Van(PrO) Total Time         2154:45           Driving Kconomy         6.56 mpg         Stop Idle Present         3.38 gal           Driving Kconomy         6.56 mpg         Stop Idle Present         3.00 fpm           Driving Kconomy         6.56 mpg         Stop Idle Present         100.75 gal           Time         12931.5 mi         Count         20         27           Distance         13931.5 mi         Count         20         27           Time         122.6.5 mi         Count         24         24           Distance         3353.25 gal         Diag. Recorde         <	print Date: Sep 11, -		Trip: 06/30/09 09: Vehicle ID: 1822	44 AM (MST) to 09/18/200
Table Pails, TD 53402- (208) 523-1034         Oddmeter:         341825.5 MA           Trip Distance         27356.0 mi         Trip Time         5.73 gal/h           Trip Distance         33.27 WPG         Trip Time         5.73 gal/h           Avg Drive Load         5.3.7 mph         Table Parcent         202.75 gal           Avg Venicle Speed         58.7 mph         Table Parcent         2.23.275 gal           Driving Time         407.00.56         VS0(PTO) Total Time         2.54.45           Driving Knonomy         6.6 %         VS0(PTO) Percent         0.38 gal           Driving Knonomy         6.6.3 mpg         Stop Idle Time         274.00.59           Time         217.05.72         Stop Idle Parcent         190.75 gal           Percent         193.5.5 mi         Court         20           Distance         1566.75 gal         Court         207           Parcent         85.86 %         Court         207           Parcent         55.10 %         Percent         24.56:11           Percent         1225.6 mi         Diag. Records         2           Parcent         125.10 %         Driving McLet Parcent         24.56:11           Percent         1226.5 mi         Diag. Records         0 </td <td>6300 S 45W</td> <td></td> <td>Driver ID:</td> <td>.4</td>	6300 S 45W		Driver ID:	.4
(208) 523-1034       273 66.0 mi       Trip Distance       756.15.47         Trip Distance       273 66.0 mi       Fuel Consumption       29:34:51         Fuel Rocoory       65 %       The Pine Consumption       29:34:51         Fuel Rocoory       65 %       The Pine Consumption       29:34:51         Avg Drive Load       56.7 mph       The Pine       202.75 gal         Avg Drive Load       66.3 mpg       Vs0(PTO) Total Time       2.38 46         Driving Porent       61.73 %       Vs0(PTO) Total Fuel       3.38 gal         Driving Reconomy       6.63 mpg       Stop Idle Fareent       36.22 %         Percent       1931.5 mi       Court       0.02 %         Distance       1931.5 mi       Court       200 rpm         Cop Gear       400:59:43       Time       0.02 %         Time       21:46:75 gal       Highest RPM       2427 fpm         Distance       32:48:29       Diatance       1226:6 mi         Distance       22:48:29       Diatance       1226:6 mi         Distance       295:35:04       Gourted Court       124:00:00         Parcent       22:28: Smi       Distance       0:00:00         Distance       297:48:8 gal       Courtmed Cour	Idaho Falls, ID 83402-		Odometer: 341825.6	mr.
Trip Distance       27396.0 ml       Trip Distance       5.73 gal/h         Trip Dist       6.32 mpg       Table Parcent       38.27 %         Arg Do Load       6.6 %       Table Parcent       38.27 %         Arg Vehicle Speed       58.7 mph       Table Parcent       229.736.0         Driving Time       61.73 %       VSG(PTO) Total Time       2154.45         Driving Time       66.8 mpg       Stop Idle Time       217.05.2         Vehicle Speed Limiting       190.75 gal       Stop Idle Parcent       190.75 gal         Percent       193.5 mi       Over Rev Limit       1800 rpm         Distance       2227.05.25 gal       Time       2247.70m         Percent       85.85 %       Percent       34.2         Percent       1222.5 mi       Diag. Records       0         Time       234.61.29       Diag. Records       0         Time       1324.66.75 gal       Court and anota an	(208) 523-1034		- I Mimo	756:35:47
Trip Distance       1335.50 gal       Fue       Fue       Time       289:34:61         Puel Record       6.3 mpg       1de Percent       30.27 %         Avg Driving Land       6.6 %       1de Percent       202.75 gal         Avg Driving Time       467:00:56       VSG(PTO) Total Time       225:4:46         Driving Puel       6.3.3 mgg       Stop Idle Percent       3.8:27 %         Driving Exect       6.3 mgg       Stop Idle Percent       3.6:28 %         Driving Exect       6.63 mgg       Stop Idle Percent       3.6:28 %         Driving Exect       1321.5 mi       Count       0.075 gal         Time       1921.5 mi       Count       0.09:16 %         Distance       1646.75 gal       Highest RPM       2347 rpm         Time       25226.5 mi       Time       0.02 %         Percent       234.8:29       Diag. Records       0         Time       231.48:29       Diag. Records       0         Time       235.46 %       Count       1840         Percent       1026.6 mi       Diag. Records       0         Distance       1026.6 mi       Diag. Records       0         Percent       262.6 mi       Diag. Records       0		27396.0 mi	Trip Time	5.73 gal/h
1119 Hose       6.32 mpg       111e percent       38.27 %         Arg Vehicle Speed       58.7 mph       111e percent       38.27 %         Arg Vehicle Speed       58.7 mph       111e percent       38.27 %         Arg Vehicle Speed       58.7 mph       111e percent       38.27 %         Driving Tame       6.3.73 %       VSG(PTO) Total Tune       0.38 %         Driving Recommy       6.63 mpg       Stop Idle Time       274:00:59         Time       217:05:29       Stop Idle Preent       36.22 %         Percent       13921.5 mi       0.00:75 gal       100:075 gal         Time       0.00:59:43       Time       0.00:16         Percent       222.65 mi       0.00:16       Percent       2347 rpm         Distance       3535.25 gal       Mignest RDM       2347 rpm         Distance       3535.25 gal       Mignest RDM       2347 rpm         Percent       224.55.8 mi       Occurred 0:9/17/09 10:14:01 (MST)         Distance       122.6 mi       Optimized Idle Time       24/15(11         Percent       224.6 mi       Optimized Idle Time       24/15(11         Percent       225:45 %       Distance       0.00:00         Time       20:140:52       min	Trip Distance	4335.50 gal	rdle Time	289:34:51
Number 1. Source         1 die Fuel         202.70 get           Avg Wehcle Speed         56.7 mph         1 die Fuel         202.70 get           Avg Wehcle Speed         6.7 mph         0 sol (PTO) Total Time         2.54:45           Driving Percent         6.3 mpg         Vs0 (PTO) Total Time         2.54:45           Driving Economy         6.63 mpg         Stop Idle Percent         3.52           Vehicle Speed Limiting         1.31.5 mi         2.00 mit         1.80 mpg           Time         2.17:05:29         Stop Idle Percent         1.80 mpg           Percent         1.35:52         Stop Idle Pres         1.80 mpg           Distance         1.23:15 mi         Count         1.80 mpg           Percent         2.22:6 mi         Stop Idle Pres         2.347 mpm           Distance         2.22:6 smi         Diag. Records         2           Time         2.346:29         Diag. Records         2           Time         3.640         Extreme         2.4156:11           Percent         1.22:6 mi         Diag. Records         2           Time         2.51 %         Stop Idle Time         2.4156:11           Percent         1.22:6 mi         Diag. Records         0	Trip Fuer	6.32 mpg	Idle Percent	38.27 *
Avg Vehicle Speed58.7.mpHVs0(FTO) Total Time2:56:46Driving Perent6.173 %Vs0(FTO) Total Time2:56:46Driving Perent132.75 galStop Idle Percent3.38 galDriving Recommy6.63 mpgStop Idle Percent36.22 %Vehicle Speed Limiting217:06:29Stop Idle Percent36.22 %Time1931.5 miCourt20Fuel1646.75 galTime0:09:16Time65.66 %Court204Distance3535.25 galHighest RPM2347 rpmDistance32:346:29Diag. Records0Time5.10 %Diag. Records0Percent1222.6.8 miDiag. Records0Distance1237.2 miBrake Court840Percent1227.8 miDiag. Records0Time65.45 %Engine Temp.0:00:00Percent1297.2 miExtended IdleDistance295:36:040Time295:36:040Time295:36:040Percent1674.7 miDistance295:36:04Time3.24 %Percent1000Distance295:36:04Time3.24 %Percent0.00 %Distance20:01:02Percent100'01Distance20:01:02Percent100'01Distance20:01:02Percent0:01:13 galCourt0:01:02Percent0:01:01 </td <td>Avg Drive Load</td> <td>66 %</td> <td>Idle Fuel</td> <td>202.75 941</td>	Avg Drive Load	66 %	Idle Fuel	202.75 941
Driving Time467:00:56VSG(PTO) Total Full1.38 galDriving Percent61:73 %Stop Idle Farcent3.38 galDriving Economy6.63 mggStop Idle Percent36.22 %Vehicle Speet Limiting17:05:29Stop Idle Percent36.22 %Time217:05:29Stop Idle Percent36.22 %Percent13931.5 miCount20Distance13931.5 miCount0:09:16Percent25226.5 miDistance23:48:29Time25:26.5 miDiag Percent247:56:11Percent12226.6 miDiag Percent3840Percent1226.8 miDiag Percent3840Cruise105:40:52Battery0:00:00Time61:33 galOptimized Idle Time0:00:00Percent1227.2 miBattery0:00:00Percent1287.2 miDistance0:00:00Percent12957.2 miDistance0:00:00Percent12957.2 miDistance0:00:00Percent12957.2 miDistance0:00:00Percent12957.2 miDistance0:00:00Percent10:13 galContinuous0:00:00Puel0:00:103Time0:00:00Puel0:00:104Normal Count0Puel0:00:105Percent0:00:00Puel0:00:11 %Normal Count0Puel0:00:12 %Percent0:00:00Puel0:00:12 %Percent0:00:00	Avg Vehicle Speed	58.7 mpii		2.54:46
Driving Time       61.73 %       VSG (PTO) Folder:       3.38 gal         Driving Percent       4132.75 gal       500 folde Time       274:00:59         Driving Ronomy       6.63 mpg       5top Idle Time       274:00:59         Yehicle Speed Limiting       117:05:29       5top Idle Freent       190.75 gal         Time       217:05:29       5top Idle Freent       190.75 gal         Percent       132:01:5 mi       190.075 gal       100 rpm         Time       132:02:5 mi       100 rpm       200 rmm         Distance       22:26:5 mi       100 rpm       200 rmm         Distance       22:46:29       100 rpm       200 rmm         Time       21:46:29       110 rpm       0:01:41 rpm         Distance       22:46:29       110 rpm       0:01:41 rpm         Distance       35:5:25 gal       12:26:8 mi       12:26:8 mi         Distance       30:5:40:52       12:26:8 mi       12:26:8 mi         Distance       29:5:3:5:04       12:26:8 mi       12:00:00         Time       2:3:29:20:00:00       2:00:00       12:00:00         Time       2:3:29:20:00:00       2:00:00       12:00:00         Time       2:3:30 rpm       0:00:00       12:00:00 <td></td> <td>467.00.56</td> <td>VSG(PTO) Total Time</td> <td>0.38 %</td>		467.00.56	VSG(PTO) Total Time	0.38 %
Driving Percent Driving Puel Driving Economy4132.75 gal 6.63 mggVentole Speed Limiting 100.75 galStop Idle Time 100.75 gal274:00.59 36.22 % 36.22 %Vehicle Speed Limiting Time Percent217:05.29 104:11 109.75 galStop Idle Fuel 100.75 gal26.22 % 36.22 %Vehicle Speed Limiting Time Percent217:05.29 104:11 109.75 galStop Idle Fuel 100.75 gal26.22 % 36.22 %Top Gear Time Distance Percent105:36.36 % 25226.5 mi Distance PercentCount 25226.5 mi 25226.5 mi Distance Percent2147.7 mpm 200/17/9 10:14:01 (MST)Top Gear - 1 Percent5.10 % 2526.5 mi Distance Puel1225.6 mi 23:48:29Diag.Records Records0 2 414:01 (MST)Top Gear - 1 Percent5.10 % 23:48:29Diag.Records Normal Count Run 0:00:0000 24:55:11Top Gear Cruise Time Puel05:43:3 gal 23:48:29Optimized Idle Time Active 0:00:000 0:00:00Cruise Time Puel295:36:04 30:7Optimized Idle Battery Charging Starts Normal Count 0 Alternate Count 0 0:00:00Speeding A(>=71 mph) Count Time Distance0:00:00 10:01:02Speeding B(>=71 mph) Count Time Distance0:00:00 10:01:02Speeding B(>=71 mph) Count Time Distance0:00:00 0:00:02 ManualSpeeding B(>=71 mph) Count Time Distance0:00:00 0:00:02 ManualSpeeding B(>=71 mph) Count Time Distance0:00:00 0:00:02 ManualSpeeding B(<=71 mph)<	Driving Time	487.00.30	VSG(PTO) Percent	3.38 gal
Driving Puel       6.63 mpg         Driving Fuel       6.63 mpg         Vahicle Speed Limiting Time       217.05.29 Percent         Percent       1393.5 mi 1646.75 gal         Top Gear       400.59.43 Percent         Time       85.86 %         Distance       1555.25 gal         Time       23:46.29         Time       23:46.29         Time       23:46.29         Time       20.011         Time       23:46.29         Time       20.02 %         Time       23:46.29         Time       20.02 %         Time       23:46.29         Time       20.02 %         Time       23:46.29         Time       20.01         Distance       35:5.25 gal         Distance       34:0.38 gal         Percent       1226.6 mi         Distance       36:40.52         Fercent       19287.2 mi         Distance       297.3 5:04         Percent       19287.3 mi         Distance       295:35:04         Percent       2681.13 gal         Speeding A(>=66 mph and <71 mph)	Driving Percent	4132.75 gal	ASG(bio) IOCat treat	
Vahicle Speed Limiting Time       217.05.29 Percent       36.22 $\frac{e}{2}$ Yubicle Speed Limiting Time       217.05.29 Percent       36.46 $\frac{4}{2}$ Percent       13931.5 mi       20         Top Gear       400:59:43       20         Time       400:59:43       2347 rpm         Percent       2526.5 mi       0.02 $\frac{1}{2}$ Time       253.86 $\frac{1}{2}$ 0ccurred         Percent       253.85 25 gal       136.86 $\frac{1}{2}$ Time       23:48:29       Distance       24:56:11         Top Gear       1226.8 mi       0ccurred       0:01:00         Percent       1226.7 mi       24:56:11         Percent       12267.2 mi       Percent       36:40         Percent       12267.2 mi       Percent       3:640         Percent       12267.2 mi       Percent       0:00:00         Time       295:35:04       Percent       0:00:00         Time       26:30.4       Percent       0:00:00         Percent       15:07:19       0:00:00       0:00:00         Puel       295:35:04       Percent       0:00:02         Percent       15:07:19       Normal Count       0         P	Driving Fuer	6.63 mpg	stop Idle Time	274:00:59
Vehicle Speed Limiting Time       217:05:29 46.48 %       Distance       190.75 gdd         Percent       1393.5 mi       0ver Rev Limit       1800 rpm         Distance       1646.75 gal       Time       0.09:16         Tume       85.86 %       0.09:170 gdd       0         Percent       25226.5 mi       Time       0.02 %         Distance       3535.25 gal       Diag. Records       0         Percent       221:48:29       Diag. Records       0         Time       341.38 gal       Diag. Records       0         Percent       1226.6 mi       Distance       1226.7 mi         Distance       1226.8 mi       0       100.00         Percent       1226.8 mi       0       100.00         Time       305:40:52       Distance       0:00:00         Time       63.35 %       Distance       0:00:00         Percent       19287.2 mi       Distance       0:00:00         Puel       285:36:04       Optimized Idle Battery Charging Starts       0         Distance       18764.7 mi       0       0       0         Puel       20:00:00       Time       0:00:00       0         Cont       3.24 %	Driving Reonomy		Stop Idle Percent	36.22 * 100 75 cal
Time       217:05:29         Percent       13931.5 mi         Distance       13931.5 mi         Fuel       13931.5 mi         Top Gear       13931.5 mi         Time       13931.5 mi         Fuel       1364.75 gal         Time       0:05:16         Percent       22226.5 mi         Distance       1355.25 gal         Fuel       23:48:29         Time       23:48:29         Distance       341.38 gal         Percent       1226.6 mi         Distance       305:40:52         Time       0:00:00         Ren       0:00:00         Ren       0:00:00         Run       0:00:00         Run       0:00:00         Run       0:00:00         Run       0:00:00         Run       0:00:00         Run       0:00:00         Time       65:45 %         Percent       19287.2 mi         Parke       295:35:04         Distance       19287.3 mi         Puel       295:35:04         Distance       19287.3 mi         Puel       269:1.13 gal         Speed	Vehicle Speed Limitin	lg	Stop Idle Fuel	190.75 gai
Percent         49.48 *         Over Rev Limit         120 -           Distance         1391.5 mi         Count         0:09:16           Fuel         1546.75 gal         Count         0:09:16           Time         85.86 *         0:02 *           Percent         25226.5 mi         Percent         2347 rpm           Distance         13535.25 gal         Diag. Records         0           Time         23:48:29         Diag. Records         2           Time         23:48:29         Diag. Records         2           Distance         1226.6 mi         Draw Count         3840           Battery         305:40:52         Battery         0:00:00           Puel         305:40:52         Engine Temp.         0:00:00           Pareent         19287.2 mi         Diag. Records         0:00:00           Run         0:00:00         Run         0:00:00           Puel         295:36:04         Dimemostat         0:00:00           Time         19267.2 mi         Dimemostat         0:00:00           Puel         295:36:04         Dimemostat         0:00:00           Time         19261.7 mi         0:0         Dimemostat         0:00:00 <td>Time</td> <td>217:05:29</td> <td>-</td> <td>1800 rpm</td>	Time	217:05:29	-	1800 rpm
Distance       13931.3 may       Count       0.09:16         Fuel       1646.75 gal       Time       0.02 %         Top Gear       400:59:43       Time       0.02 %         Percent       25226.5 mi       0.02 %         Distance       25226.5 mi       0.02 %         Fuel       23:48:29       Highest RPM       0.02 %         Top Gear - 1       5.10 %       0ccurred       0/17/09 10:14:01 (MST)         Descent       1225.8 mi       0ccurred       0/17/09 10:14:01 (MST)         Distance       1225.8 mi       0ccurred       0/17/09 10:14:01 (MST)         Distance       1225.8 mi       0ccurred       0/17/09 10:14:01 (MST)         Distance       1225.8 mi       0ccurred       0/10:14:01 (MST)         Precent       19287.2 mi       Battery       0:00:00         Precent       19287.2 mi       Battery       0:00:00         Puel       295:36:04       0ctimized Idle Battery Charging Starts         Normal Count       100:07       0       0         Puel       3017       0       0cotimuous Run       0         Speeding A(>=66 mph and <71 mph)	Percent	46,48 *	Over Rev Limit	20
FuelDistrict ofTime BC:0010 50.02 %Top Gear Time85.86 % 25226.5 mi Distance23226.5 mi 2535.25 galHighest RPM Occurred2347 rpm 09/17/09 10:14:01 (MST)Distance Fuel3535.25 galDiag. Records0 2 24:55:11Top Gear - 1 Percent1226.8 mi 1226.8 mi DistanceDiag. Records0 2 24:55:11Cruise Time305:40:52 9267.2 mi DistanceDistance Time 0:00:000:00:00 Run0:00:00 RunCruise Time Percent305:40:52 19267.2 mi DistanceOptimized Idle Time Run0:00:00 0:00:00Top Gear Cruise Time Time Percent295:36:04 19267.2 mi DistanceOptimized Idle Eatery0:00:00 0:00:00Top Gear Cruise Time Time Distance295:36:04 10:00:00Optimized Idle Eatery0:00:00 0:00:00Top Gear Cruise Time Time Distance18764.7 mi 30:17Optimized Idle Eatery Charging Starts Normal Count0Speeding A(>=66 mph and <71 mph) Count30:17 30:17Total Time Count0:00:00 0:00:00Speeding A(>=66 mph and <71 mph) Count0:02:00 30:24 %Pump On Time Time 0:00:00Speeding B(>=71 mph) Count0:02:03 0:00:00Pump On Time Distance0:00:00 0:00:00Speeding B(>=71 mph) Count0:02:03 0:00:00Pump On Time Time 0:00:000:00:00 0:00:00Highest Speed Occurred0:00:00 0:00:00Pump On Time Time 0:00:000:00:00 0:00:00High	Distance	1646.75 gal	. Count	0:09:16
Top Gear         400:59:43         Highest RPM         2347 rpm           Percent         85.86 %         Occurred         09/17/09 10:14:01 (MST)           Percent         25226.5 mi         Distance         2           Time         23:48:29         Highest RPM         09/17/09 10:14:01 (MST)           Time         23:48:29         Hard Brake Count         2           Top Gear - 1         5.10 %         Distance         2           Percent         1226.8 mi         Brake Count         3840           Fuel         305:40:52         Battery         0:00:00           Time         305:40:52         Battery         0:00:00           Percent         19287.2 mi         Battery         0:00:00           Time         295:36:04         Optimized Idle Battery Charging Starts           Percent         2641.13 gal         Continuous         0:00:00           Speeding A(>=66 mph and <71 mph)	Fuel	19461.11.2	Time	0.02 %
Time       400.59:43       Highest RPM       234 7 Fpm         Percent       35.66 %       Occurred       09/17/09 10:14:01 (MST)         Distance       3335.25 gal       Diastance       2         Time       233.48:29       Diastance       2         Top Gear - 1       5.10 %       Distance       24.56:11         Percent       1225.6 mi       Distance       24.56:11         Distance       341.38 gal       Active       0:00:00         Time       305:40:52       Engine Temp.       0:00:00         Time       305:40:52       Engine Temp.       0:00:00         Time       305:40:52       Engine Temp.       0:00:00         Percent       19287.2 mi       Extended Idle       0:00:00         Distance       2681.33 gal       Continuous       0:00:00         Puel       2681.13 gal       Continuous Run       0         Speeding A(>=66 mph and <71 mph)	man door		Percent	
Percent       65.86 %       Cocurred       09/17/09 16:14:01 (MIT)         Percent       3535.25 gal       Diag. Records       0         Time       23:48:29       Diag. Records       0         Percent       1226.8 mi       Jetance       3840         Distance       1226.8 mi       Jetance       24:56:11         Percent       1226.8 mi       Drume       0:00:00         Run       0:00:00       Run       0:00:00         Run       0:00:00       Run       0:00:00         Percent       19287.2 mi       Battende Idle       0:00:00         Puel       295:36:04       0:00:00       0:00:00         Top Gear Cruise       295:36:04       0:00:00       0:00:00         Time       63.3.0 %       Normal Count       0         Percent       19764.7 mi       Alternate Count       0         Distance       2681.13 gal       Continuous Run       0         Speeding A(>=56 mph and <71 mph)	Top Gear Time	400:59:43	Highest RPM	2347 rpm
Distance       2528.5 milling         Puel       23:48:29         Time       23:48:29         Distance       1226.6 milling         Distance       1226.6 milling         Fuel       341.38 gal         Cruise       305:40:52         Time       65:45 %         Distance       1228.7 milling         Puel       65:45 %         Distance       1228.7 milling         Puel       65:45 %         Distance       1228.7 milling         Puel       24:56:11         Optimized Idle Time       0:00:00         Run       0:00:00         Battery       0:00:00         Puel       0:00:00         Puel       0:00:00         Time       19287.2 milling         Puel       295:36:04         Optimized Idle Battery Charging Starts         Normal Count       0         Distance       1976.7 milling         Puel       2681.13 gal         Speeding A(>=66 mph and <71 mph)	Percent	85.86 %	Occurred 09/17/0	9 10:14:01 (MD1)
Fuel1333.22 garDiagDiagDiagRecords2Time23:48:29Hard Brake Count3840Top Gear - 15.10 %Eng. Brake Count3840Percent1226.6 miEng. Brake Count24:56:11Puel341.38 galActive0:00:00Time65:45 %Engine Temp.0:00:00Percent19287.2 miExtended Idle0:00:00Percent19287.2 miExtended Idle0:00:00Puel295:36:04Optimized Idle Eattery Charging StartsTime295:36:04Optimized Idle Battery Charging StartsPuel2681.13 galContinuous0Speeding A(>=66 mph and <71 mph)	Distance	25226.5 Mi	<b>1</b>	D
Time       25.00 %       Barke Count       3840         Top Gear - 1       5.10 %       Brake Count       3840         Percent       1226.8 mi       Brake Count       124:56:11         Fuel       341.38 gal       Optimized Idle Time       24:56:11         Cruise       305:40:52       Battery       0:00:00         Time       65.45 %       Battery       0:00:00         Distance       2874.88 gal       Extended Idle       0:00:00         Top Gear Cruise       295:36:04       Extended Idle       0:00:00         Time       63.30 %       Normal Count       0         Percent       19764.7 mi       Atternate Count       0         Speeding A(>=66 mph and <71 mph)	Fuel	3535.25 904	Diag. Records	2
Top Gear - 1       5.10 %       Eng. Brake Time       24:56:11         Percent       1226.8 mi       Optimized Idle Time       Active       0:00:00         Time       305:40:52       Battery       0:00:00       Battery       0:00:00         Time       305:40:52       Battery       0:00:00       Battery       0:00:00         Percent       19287.2 mi       Battery       0:00:00       Extended Idle       0:00:00         Top Gear Cruise       295:36:04       Continuous       0:00:00       0       0         Time       63.30 %       Optimized Idle Battery Charging Starts       Normal Count       0         Percent       10764.7 mi       Optimized Idle Battery Charging Starts       Normal Count       0         Puel       20511.3 gal       Continuous Run       0       0         Speeding A(>=66 mph and <71 mph)	Time	23.40.25	Hard Brake Count	3840
Top Gear Cruise $5.10 \text{ k}$ IngresonPercent $1226.8 \text{ mi}$ Optimized Idle TimePuel $341.38 \text{ gal}$ Optimized Idle TimeFuel $305:40:52$ BatteryTime $305:40:52$ BatteryPercent $12267.8 \text{ mi}$ Percent $12267.8 \text{ mi}$ Distance $2874.88 \text{ gal}$ Top Gear Cruise $2874.88 \text{ gal}$ Time $295:36:04$ Percent $63.30 \text{ k}$ Distance $2681.13 \text{ gal}$ Speeding A(>=66 mph and <71 mph)			Fro Brake Time	24:56:11
Distance Fuel1225.6 mi 341.38 galOptimized Idle Time Active $0:00:00$ 	Top Gear - +	5.10 %	E119, 50 000	
Fuel $341.38$ galActive $0.0000$ Cruise $305:40:52$ Run $0.00:00$ Time $305:40:52$ Run $0.00:00$ Percent $19287.2$ miEngine Temp. $0:00:00$ Distance $2874.88$ galContinuous $0:00:00$ Puel $2874.88$ galContinuous $0:00:00$ Top Gear Cruise $295:36:04$ Optimized Idle Battery Charging StartsPuel $295:36:04$ Optimized Idle Battery Charging StartsDistance $2681.13$ galContinuous Run $0$ Speeding A(>=66 mph and <71 mph) $3017$ Total Time $0:00:02$ Count $15:07:19$ Engine System $0:00:02$ Percent $3.24$ %Manual $0:00:02$ Speeding B(>=71 mph) $100$ $A/C$ $0:00:00$ Count $0:22:35$ Pump On TimePercent $0.11$ %Pump On TimeHighest Speed $79.0$ mph $0:00:00$ Coasting Time $0:00:00$ Engine Utilization $39.40$ %Coasting Time $0:00:00$ Engine Utilization $24.32$ %	Distance	1226.8 mi	Optimized Idle Time	0,00:00
Cruise       305:40:52       Battery       0:00:00         Percent       65.45 %       Engine Temp.       0:00:00         Distance       2874.88 gal       Continuous       0:00:00         Time       2874.88 gal       Continuous       0:00:00         Top Gear Cruise       295:36:04       Optimized Idle       0:00:00         Time       295:36:04       Optimized Idle Battery Charging Starts         Distance       2681.13 gal       Optimized Idle Battery Charging Starts         Speeding A(>=66 mph and <71 mph)	Fuel	341.38 gai	Active	0:00:00
Cruise Time305:40:52 · 65.45 %Battery rng for Temp.0:00:00 00:00Distance Puel19287.2 mi 2874.88 galExtended Idle0:00:00Top Gear Cruise Time Percent Fuel295:36:04 18764.7 mi 295:36:04Optimized Idle Eattery Charging Starts Normal Count0Speeding A(>=66 mph and <71 mph) Count Time Dercent0Optimized Idle Eattery Charging Starts 0.00:000Speeding A(>=66 mph and <71 mph) Count Time Count0Fan On Time Engine System 0:00:000Speeding B(>=71 mph) Count Time Count100 0.011 %Fan On Time Engine System 0:00:000:00:00Highest Speed Coasting Time Coasting Time Coasting Percent79.0 mph 0.00 %Pump On Time Time 0:00:000:00:00Coasting Time Coasting Percent0:00:00 0.00 %Engine Utilization 24.32 %39.40 % 24.32 %			Run	0:00:00
Time65.45 *Infighte Trans.0:00:00Percent19287.2 miExtended Idle0:00:00Fuel2874.88 galContinuous0:00:00Top Gear Cruise63.30 *Extended Idle0:00:00Time295:36:04Optimized Idle Battery Charging StartsPercent18764.7 miAlternate Count0Fuel2681.13 galContinuous Run0Speeding A(>=56 mph and <71 mph)	Cruise	305:40:52	Battery	0:00:00
Percent19287.2 miInfinite functionDistance2874.88 galExtended Idle $0:00:00$ Top Gear CruiseContinuous $0:00:00$ Time295:36:04Optimized Idle Battery Charging StartsDistance63.30 %Normal Count $0$ Distance2681.13 galOctinuous Run $0$ Speeding A(>=66 mph and <71 mph)	Time	65.45 %	Thermostat	0:00:00
Distance Fuel2874.88 galContinuous0:00:00Top Gear Cruise Time295:36:04 63.30 %Optimized Idle Battery Charging Starts Normal Count0Percent18764.7 mi 2681.13 galAlternate Count0Speeding A(>=66 mph and <71 mph) Count3017 15:07:19Fan On Time Time0:00:02Speeding B(>=71 mph) Count100 0:29:35Fan On Time Distance0:00:02Speeding B(>=71 mph) Count100 0:29:35A/C0:00:00Time0:29:35 PercentPump On Time Time0:00:00Highest Speed Coasting Time Coasting Percent79.0 mph 0:00:00Fuel0:00:00 0:01:09Coasting Time Coasting Percent0:00:00 0:00 %Engine Utilization 24.32 %39.40 % 24.32 %	percent	19287.2 mi	Extended Idle	0:00:00
Top Gear Cruise Time295:36:04 63.30 %Optimized Idle Battery Charging Starts 0 Alternate CountDistance Puel19764.7 mi 2681.13 galOptimized Idle Battery Charging Starts 0 Alternate Count0Speeding A(>=56 mph and <71 mph) Count3017 15:07:19Fan On Time Total Time0Speeding B(>=71 mph) Count100 0:29:35 Percent0.11 %Fan On Time Time0:00:00 0:00:00Highest Speed Coasting Time Coasting Percent79.0 mph 0:00:00 0:00:00Pump On Time Time Time0:00:00 0:00:00Coasting Time Coasting Percent0:00:00 0:00:00 0:00:00Speed 39.40 % 24.32 %	Distance	2874.88 gal		0.00.00
Top Gear Cruise295:36:04Optimized Idle Battery Charging StartsTime63.30 %Normal Count0Distance18764.7 miAlternate Count0Fuel2681.13 galContinuous Run0Speeding A(>=66 mph and <71 mph)	Full F		Continuous	0.00100
Time295:3:004Optimized Tale after, entry entry 0Percent18764.7 miNormal Count0Distance2681.13 galAlternate Count0Fuel2681.13 galContinuous Run0Speeding A(>=66 mph and <71 mph)	Top Gear Cruise	26.04		ry Charging Starts
percent18764.7 miNormal Count0Distance2681.13 galAlternate Count0Fuel2681.13 galContinuous Run0Speeding A(>=66 mph and <71 mph)	Time	63.30 %	Optimized Idle Batte	± y 00000 0 0
Distance Fuel2681.13 galAlternature Continuous Run0Speeding A(>=66 mph and <71 mph) Count3017Fan On Time Total Time0:00:02Time Percent15:07:19Engine System O:00:020:00:02Speeding B(>=71 mph) Count100A/C0:00:00Time Percent0:29:35Pump On Time Time Distance0:00:00Time Percent0:11 %Time Distance0:00:00Highest Speed Coasting Time Coasting Percent0:00:00Engine Utilization 24:32 %39.40 %	Percent	18764.7 mi	Normal Count	o
Speeding A(>=66 mph and <71 mph) Count     Solf     Fan On Time     0:00:02       Time     15:07:19     Total Time     0:00:00       Percent     3.24 %     Manual     0:00:02       Speeding B(>=71 mph)     100     A/C     0:00:00       Count     0:29:35     Pump On Time     0:00:00       Percent     0.11 %     Time     0:00:00       Highest Speed     79.0 mph     Distance     0.00 gal       Coasting Time     0:00:00     Engine Utilization     39.40 %       Coasting Percent     0.00 %     Vehicle Utilization     24.32 %	Distance	2681.13 gal	Continuous Run	0
Speeding A(>=66 mph and <71 mph)	Fuer			
Count         15:07:19         Total Time         0:00:00           Time         3.24 %         Engine System         0:00:02           Speeding B(>=71 mph)         100         A/C         0:00:00           Count         0:29:35         Pump On Time         0:00:00           Time         0.11 %         Time         0.00 mi           Highest Speed         79.0 mph         Distance         0.00 gal           Coasting Time         0:00:00         Engine Utilization         39.40 %           Coasting Percent         0.00 %         Vehicle Utilization         24.32 %	Speeding A(>=66 mph	and $<71 \text{ mph}$	Fan On Time	0:00:02
Time         Information         Inglife         Spectant         0:00:02           Percent         3.24 %         Manual         0:00:00           Speeding B(>=71 mph)         100         A/C         0:00:00           Count         0:29:35         Pump On Time         0:00:00           Time         0.11 %         Time         0.00 mi           Percent         0.11 %         Distance         0.00 gal           Cocurred         09/01/09 13:22:54 (MST)         Fuel         0.00 gal           Coasting Time         0:00:00         Engine Utilization         39.40 %           Coasting Percent         0.00 %         Vehicle Utilization         24.32 %	Count	15.07:19	Total Time	0:00:00
Percent     Mainter     0:00:00       Speeding B(>=71 mph)     100     A/C     0:00:00       Count     0:29:35     Pump On Time     0:00:00       Time     0.11 %     Time     0.0 mi       Percent     0.11 %     Distance     0.00 gal       Highest Speed     09/01/09 13:22:54 (MST)     Fuel     39.40 %       Coasting Time     0:00:00     Engine Utilization     24.32 %	Time	3.24 %	Engine system	0:00:02
Speeding First int100R/CCount0:29:35Pump On Time0:00:00Time0.11 %Time0.0 miPercent79.0 mphDistance0.00 galHighest Speed09/01/09 13:22:54 (MST)Fuel39.40 %Coasting Time0:00:00Engine Utilization24.32 %Coasting Percent0.00 %Vehicle Utilization24.32 %	Percent	r)	A/C	0:00:00
Count0:29:35Pump On Time0:00:00Percent0.11 %Time0.00 miHighest Speed79.0 mphDistance0.00 galOccurred09/01/09 13:22:54 (MST)Fuel39.40 %Coasting Time0:00:00Engine Utilization24.32 %Coasting Percent0.00 %Vehicle Utilization24.32 %	Speeding B(>=/+. mp+	100		
PercentU.II *Time0.00 miHighest Speed79.0 mphDistance0.00 galOccurred09/01/09 13:22:54 (MST)Fuel0.00 galCoasting Time0:00:00Engine Utilization39.40 %Coasting Percent0.00 %Vehicle Utilization24.32 %	Time	0:29:35	Pump On Time	0:00:00
Highest Speed79.0 mphDistance0.00 galOccurred09/01/09 13:22:54 (MST)Fuel0.0039.40 %Coasting Time0:00:00Engine Utilization39.40 %Coasting Percent0.00 %Vehicle Utilization24.32 %	Percent	0.11 *	Time	0.0 mi
Highest Speed     Fuel       Occurred     09/01/09 13:22:54 (MST)     Fuel       Coasting Time     0:00:00     Engine Utilization     39.40 %       Coasting Percent     0.00 %     Vehicle Utilization     24.32 %	-	790 moh	Distance	0.00 gal
Occurred     09/01/09 10.02.01     Engine Utilization     39.40 %       Coasting Time     0:00:00     Vehicle Utilization     24.32 %       Coasting Percent     0.00 %	Highest Speed	13.22:54 (MST)	Fuel	
Coasting Time 0:00:00 Vehicle Utilization 24.32 * Coasting Percent 0.00 %	Occurred 09/0	1/02 #31-67	Engine Utilization	39,40 %
Coasting Percent 0.00 %	Coseting Time	0:00:00	Vehicle Utilization	24.32 8
	Coasting Percent	0.00 %	-	
DPF Regeneration	DPF Regeneration	nt 0		
parked regen count 0	Parked Regen Cou	ount 0		
D114102 V2200 -	DITATUR Keden co			

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Engine S/N: 0000876673 ECM S/W Version: 14.230 Version 6.42 Page 1

# DDEC<sup>®</sup> Reports - Trip Activity Print Date: Oct 12, 2009 10:02 AM (MDT)

Doug Andrus Distributi 6300 S 45 W	ng		Trip: 09/19/2009 Vehicle ID: 1822 Driver ID:	to 10/12/20	09 (MST)
2085231034			Odometer: 348586.	3 mi	
	6850.0		Onin Oime	145,46,23	
Trip Distance	1120 12	101	Fuel Consumption	140.20	cal/b
Trip Fuel	1132.13	gai	Tale dime	29.18.02	gui/n
Fuel Economy	5.97	mpg	Idle Time	29:10:02	ę.
Avg Drive Load	50	75 	Idle Percent	20.10	al
Avg Vehicle Speed	58.0	mpn	Idle Fuer	20.00	gar
Driving Time	116:28:21		VSG(PTO) Time	1:01:50	
Driving Percent	79.90	5	VSG(PTO) Percent	0.71	20
Driving Fuel	1111.25	gal	VSG(PTO) Fuel	1.13	gal
Driving Economy	6.08	mpg			
5			Stop Idle Time	25:36:35	
Vehicle Speed Limiting			Stop Idle Percent	17.5	7 8
Time	42:44:42		Stop Idle Fuel	18.00	gal
Percent	36.70	8			
Distance	2747.4	mi	Over Rev Limit	1800	rpm
Fuel	326.88	gal	Count	14	
			Time	0:04:31	_
Top Gear			Percent	0.05	8
Time	96:10:27				
Percent	82.57	90 9	Highest RPM	2267	rpm
Distance	6052.5	mi	Occurred 10/06/0	9 11:59:30 (1	MST)
Fuel	912.63	gal			
			Diag. Records	0	
Top Gear - 1			Hard Brake Count	0	
Time	7:28:26		Brake Count	1160	
Percent	6.42	8	Eng. Brake Time	6:05:04	
Distance	387.4	mi			
Fuel	110.75	gal	Optimized Idle Time		
		-	Active	0:00:00	
Cruise			Run	0:00:00	
Time	80:04:42		Battery	0:00:00	
Percent	68.75	6	Engine Temp.	0:00:00	
Distance	5029.1	mi	Thermostat	0:00:00	
Fuel	824.75	gal	Extended Idle	0:00:00	
			Continuous	0:00:00	
Top Gear Cruise				<i>a</i> 1 <i>a</i>	
Time	76:03:06		Optimized idle Batter	y charging s	Larus
Percent	65.30	*	Normal Count	0	
Distance	4824.0	mi	Alternate Count	0	
Fuel	746.25	gal	Continuous Run	U	
Speeding A(>=66 mph an	d <71 mph)		Fan On Time		
Count	750		Total Time	0:00:00	
Time	3:33:17		Engine System	0:00:00	
Percent	3.05	율	Manual	0:00:00	
Speeding B(>=71 mph)			A/C	0:00:00	
Count	15				
Time	0:04:07				
Percent	0.06	8	Pump On Time		
			Time	0:00:00	
Highest Speed	76.0	mph	Distance	0.0	mi
Occurred 09/27/09	04:33:37 (1	MST)	Fuel	0.00	gal
Geeshing Time	0.00.00		Engine IItilization	26 27	с <u>р</u>
Coasting Time	0:00:00	Q.	Vehicle Utilization	20.27	e.
coasting Percent	u.00	σ	venicie officiation	20.99	~
DPF Regeneration					
Parked Regen Count	0				
Driving Regen Count	0				

101291AD.XTR Engine S/N: 0000876673 ECM S/W Version: 14.230 Version 6.4 Page 1

Print Date: Sep 19, 20 Doug Andrus Dist. 6300 S 45W Idaho Falls, ID 83402- (208) 523-1034 Trip Distance Trip Fuel Fuel Economy Avg Drive Load Avg Vehicle Speed	09 06:47 AM (MDT) 3498.7 mi 552 38 cpl	Trip: 09/08/09 01 Vehicle ID: 1856 Driver ID: Odometer: 311183.8	:32 PM (MST) to 09/1
Doug Andrus Dist. 6300 S 45W Idaho Falls, ID 83402- (208) 523-1034 Trip Distance Trip Fuel Fuel Economy Avg Drive Load Avg Vehicle Speed	3498.7 mi 552.38 cal	Trip: 09/08/09 01 Vehicle ID: 1856 Driver ID: Odometer: 311183.8	:32 PM (MST) to 09/1
Idaho Falls, ID 83402- (208) 523-1034 Trip Distance Trip Fuel Fuel Economy Avg Drive Load Avg Vehicle Speed	3498.7 mi 552.38 cal	Driver ID: Odometer: 311183.8	
(208) 523-1034 Trip Distance Trip Fuel Fuel Economy Avg Drive Load Avg Vehicle Speed	3498.7 mi	Odometer: 311183.8	•
Trip Distance Trip Fuel Fuel Economy Avg Drive Load Avg Vehicle Speed	3498.7 mi		<u>m1</u>
Trip Fuel Fuel Economy Avg Drive Load Avg Vehicle Speed	552 38 dal	Trip Time	69:32:01
Fuel Economy Avg Drive Load Avg Vehicle Speed	555.50 gar	Fuel Consumption	7.96 gal/n
Avg Drive Load Avg Vehicle Speed	6.32 mpg	Idle Time	7:44:56
Avg Vehicle Speed	68 %	Idle Percent	11.14 8
	56.6 mph	Idle Fuel	5.50 gai
Driving Time	61:47:05	VSG(PTO) Total Time	0:00:00
Driving Percent	88.86 %	VSG(PTO) Percent	0.00 *
Driving Fuel	547.88 gal	VSG(PTO) Total Fuel	0.00 gai
Driving Economy	6.39 mpg		
21114003		Stop Idle Time	5:32:34
Vehicle Speed Limiting		Stop Idle Percent	7.97 *
Time	6:01:14	Stop Idle Fuel	3.75 gal
Percent	9.74 %		
Distance	384.8 mi	Over Rev Limit	1800 rpm
Fuel	6.50 gal	Count	1
1 40+	-	Time	0:00:27
Ton Gear		Percent	0.01 %
Time	50:43:57		
Percent	82.11 %	Highest RPM	2248 rpm
Distance	3110.4 mi	Occurred 09/14/09	20:23:51 (MST)
Fuel	441.38 gal		
Time	4:51:49	Diag. Records	0
1 THE		Hard Brake Count	0
Top Gear - 1		Brake Count	338
Dercent	7.87 %	Eng. Brake Time	3:14:53
Distance	253,4 mi		
Fuel	69.88 gal	Optimized Idle Time	
1.001		Active	0:00:00
Cruise		Run	0:00:00
Time	47:24:52	Battery	0:00:00
Percent	76.74 %	Engine Temp.	0:00:00
Distance	2918.7 mi	Thermostat	0:00:00
Fuel	453.75 gal	Extended Idle	0:00:00
Top Gear Cruise		Continuous	0:00:00
Time	44:44:49		
Dercent	72.42 %	Optimized Idle Battery	, Charging Starts
Distance	2769.9 mi	Normal Count	0
Fuel	402.00 gal	Alternate Count	0
1 494		Continuous Run	0
Speeding A(>=66 mph an	d <71 mph)	Fan On Time	
Count	140	Total Time	0:00:00
Time	∪;ң∠:∠⊥ 1 14 ₽	Engine System	0:00:00
Percent	7.14 0	Manual	0:00:00
speeding B(>=71 mph)	5	A/C	0:00:00
Count	0.01.49		
l'ime		Pump On Time	
Percent	0.U	Time	0:00:00
	74 E mob	Distance	0.0 mi
Highest Speed Occurred 09/16/09	74.5 mpn 13:46:12 (MST)	Fuel	0.00 gal
Coasting Time	0:00:00	Engine Utilization	27.14 %
Coasting Percent	0.00 %	Vehicle Utilization	24.11 %
DPF Regeneration			
Parked Regen Count	0		
Driving Regen Count	0		
			1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 -

091990AA.XTR Engine S/N: 0000865252 ECM S/W Version: 14.230 Version 6.42 Page 1

DDEC® Reports - Trip Activity

Print Date: Oct 16, 3	2009 05:57 PM (MDT)		~
oug Andrus Distribut: 300 S 45 W	ing	Trip: 09/19/2009 Vehicle ID: 1856	t) 10/16/2009 (MS
daho Falls, ID 83402 085231034		Odometer: 321433.5	mi
		mula dimo	203.07.46
rip Distance	10249.7 mi	Fuel Consumption	8.54 gal/h
rip Fuel	1733.88 gal	Fuel Consumption	20.57.16
lel Economy	5.91 mpg	Idle Time	10 32 %
yg Drive Load	66 %	Idle Percent	14 63 000
/g Vehicle Speed	56.3 mph	Idle Fuel	14.03 gai
-li	192,10,30	VSG(PTO) Time	0:37:29
riving Time	102.10.50	VSG(PTO) Percent	0.31 %
iving Percent	1710 25 gal	VSG(PTO) Fuel	0.75 gal
iving fuer	5 96 mpg		
TAING FCOHOMA	5.50 mpg	Stop Idle Time	14:01:57
-	a	Stop Idle Percent	6.91 %
mime	21.07.03	Stop Idle Fuel	9.50 gal
Time	11 59 %	<b>k</b>	
Percent	1329 A mi	Over Rev Limit	1800 rpm
Distance	82 75 gal	Count	13
Fuel	62.75 gar	Time	0:04:46
		Percent	0.04 %
p gear	145.11.11		
Time	140:11:11	Highest RPM	2318 rpm
Percent	/9./0 8	Occurred 09/19/09	10:58:39 (MST)
Distance	8926.3 Ml	OCCULTED 00710700	
Fuel	1363.50 gal	Diag Records	1
		Hard Brake Count	D
op Gear - 1		Brake Count	1209
Time	15:08:37	Brake Count	8.40:17
Percent	8.31 %	Eng. Brake Time	0.40.1
Distance	786.9 mi	Orbinized Idle Time	
Fuel	218.00 gal	Optimized falle fine	0.00.00
		ACTIVE	0.00.00
ruise		Run	0.00.00
Time	127:00:54	Battery	0:00:00
Percent	69.72 %	Engine Temp.	0:00:00
Distance	7830.0 mi	Thermostat	0:00:00
Fuel	1300.38 gal	Extended Idle	0:00:00
		Continuous	0.00.00
op Gear Cruise	110.27.10	Optimized Idle Battery	Charging Starts
Time	TTA:21:TO	Normal Count	0
Percent	00.00 %	Alternate Count	0
Distance	1422.9 ML	Continuous Bun	0
Fuel	1150.25 gai	concentrations man	
pooding Alasha mph a	and <71 mph)	Fan On Time	
Count A(>-00 mpil b	317	Total Time	0:00:00
Dimo	1.35.40	Engine System	0:00:00
LINE	0.88 %	Manual	0:00:00
percent	0.00 0	A/C	0:00:00
Const heering p(>=(+ mbit)	17		
Dime	0:03:25		
Dorcont	0.03 %	Pump On Time	
Fercenc	0.00 0	Time	0:00:00
ichost coord	74 0 mmh	Distance	0.0 mi
Ignest Speed	79.0 mpm 19.17.41.46 (MST)	Fuel	0.00 gal
0000111eu 09/23/0	······································		
oasting Time	0:00:00	Engine Utilization	30.82 8
pasting Percent	0.00 %	Vehicle Utilization	27.64 %
PF Regeneration			
Parked Regen Count	0		
Driving Regen Count	t 0		
		14,000	m 6 A Pago
)1691AA.XTR Engin	ie S/N: 0000865252 ECI	M S/W Version: 14.230 Versio	nio.4 rage

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Page 1 of 1

### Caterpillar Electronic Technician 2009A v1.0 Trip Segment - Driver

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### 9/18/2009 8:12 AM

Parameter     Value       Vehicle ID     2040       Engine Serial Number     LEE20610       ECM Serial Number     17586152RA       Describer Module Part Number     3435735-00	C13 Truck (LEE20610)			
Vehicle ID     2040       Engine Serial Number     LEE20610       ECM Serial Number     17586152RA       Describer Module Part Number     3435735-00	Parameter	Value		
Engine Serial Number     LEE20610       ECM Serial Number     17586152RA       Describer Module Part Number     3435735-00	Vahiele ID	2040		
Engine Serial Number     17586152RA       ECM Serial Number     13435735-00		LEE20610		
ECM Serial Number 3435735-00	Engine Serial Number	17586152RA		
3435735-00	ECM Serial Number	2425735.00		
Personality Module I are realized	Personality Module Part Number	3435755-00		
FEB09	Demonstrative Module Release Date	FEB09		
Personanty Module Recent 11	Personality widdle receipe bar	160		
Personality Module Code	Personality Module Code	0/18/2009 9:14:51 AM		
ECM Date/Time	ECM Date/Time	[9/10/2009 9/1 // C		

Value	Unit
102:45	hours
71:12	hours
100 -19710	Miles
557.0	Gal
7 13	MPG
7.13	MPG
21:32	hours
180	Gal
18.0	0%
<u></u>	hours
	Gal
<u> </u>	
0	0%
37	MPH
38.7	MPH
55.8	MPH
78	RPM
2351	hours
2513:15	hours
2616:00	Miles
94410.9	Miles
98383.9	[]vinea
	Value           102:45           71:12           970           3973:0           557.0           7.13           7.37           31:32           18.0           31           0:00           0.0           0           37           38.7           55.8           78           2351           2513:15           2616:00           94410.9           98383.9

0/10/2000

### Page 1 of 2

### Caterpillar Electronic Technician 2009A v1.0 Trip Segment - Driver

### 10/3/2009 12:02 PM

C13 Truck (LEE20610)

Parameter	Value
Vehicle ID	2040
Engine Serial Number	LEE20610
ECM Serial Number	17586152RA
Personality Module Part Number	3435735-00
Personality Module Release Date	FEB09
Personality Module Code	160
ECM Date/Time	10/3/2009 1:06:52 PM

Description	Value	Unit
Time	125:03	hours
Driving Time	98:06	hours
Distance	5458.0	Miles
Fuel	780.5	Gal
Overall Fuel Economy	6.99	MPG
Driving Fuel Economy	7.13	MPG
Idle Time	26:57	hours
Idle Fuel	14.9	Gal
% Idle Time	22	%
PTO Time	0:00	hours
PTO Fuel	0.0	Gal
% PTO Time	0	%
Avg Load Factor	40	%
Avg Vehicle Speed	43.6	MPH
Avg Driving Speed	55.6	MPH
Max Vehicle Speed	74	MPH
Max Engine Speed	2166	RPM
Start Time	2633:42	hours
End Time	2758:45	hours

file://C:\Documents and Settings\All Users\Application Data\Caterpillar\Electronic Techni... 10/3/2009

Appendix V

**Carbon Footprint Data** 

### Assumptions:

Fleet Average (all locations)

\* Fuel Type = Diesel

\*Annual Fuel Usage = 4,800,000 gallons, or 18,240,000 litres.

\*Average 7.025% reduction in fuel usage with Fuel Factor Xcatalyst.

### Discussion:

When fuel containing carbon is burned in an engine, there are emissions of carbon dioxide ( $CO_2$ , methane ( $CH_4$ ), nitrous oxide ( $N_20$ ), oxides of nitrogen ( $NO_x$ ), carbon monoxide (CO), non methane volatile organic compounds (NMVOC's) and sulfur dioxide ( $SO_2$ ). The amount of each gas emitted depends on the type and quantity of fuel used (the "activity"), the type of combustion equipment, the emissions control technology, and the operating conditions.

The International Greenhouse Partnerships Office section of the Federal Government Department of Science Industry and Technology has produced a workbook outlining how to calculate the quantities of greenhouse gas emissions (see Workbook attached) and is accepted internationally as the accepted approach. The workbook illustrates an example of how to calculate the mass of  $CO_2$  for example on page 21, Table 3.1 and Example 3.1:

```
The CO<sub>2</sub> produced from burning 100 litres of diesel oil is calculated as follows:
```

 $^{\ast}\,$  the CO\_2 emitted if the fuel is completely burned is 2.716 kg CO2/litre (see Appendix A, Table A1)

\* the oxidation factor for oil-derived fuels is 99% (see Table 3.1) Therefore, the CO<sub>2</sub> produced from burning 100 litres of fuel is:

100 litres x 2.716 kg CO<sub>2</sub>/litre x .99 = 268.88 kg

Test Data Basis	Fuel Usage litres	kg CO₂ per litre fuel	Oxidation Factor	System CO₂ kg	System CO <sub>2</sub> tonnes	
"Baseline"	18,240,000	2.716	0.99	49,044,441	49,044	
"Treated"	16,963,200	2.716	0.99	45,611,330	45,611	
C02 reductions with Fuel Factor X catalyst 3,433,111 3,433						

### Based on the above calculations, the Greenhouse gas reductions for C02 are as follows:

The reduction of C02 greenhouse emissions in the amount of 3,433 tonnes (3,785 tons) is <u>significant</u>! Carbon Dioxide accounts for approximately 99.6% of the total greenhouse gas emissions produced. In other words, when diesel oil is burned in an internal combustion engine, the CH4 and N20 emissions contribute less than 0.4% of the greenhouse emissions. This low level is typical of most fossil fuel combustion systems and often is not calculated.

However, by way of additional information, the reduction in  $CH_4$  and  $N_20$  are calculated as follows:

### CH<sub>4</sub> Emissions Reduction

N₂O Emissions R	eduction
	CH <sub>4</sub> Reduction = 230 kg
"Treated"	[18.0g/100 litres] x [16,963,200] x [1kg/1000g] = 3053 kg
"Baseline"	[18.0g/100 litres] x [18,240,000] x [1kg/1000g] = 3283 kg
	* the CH <sub>4</sub> emissions factor for diesel oil used in an internal combustion engine is 4.0 g/GJ (see Table A2) so the total CH <sub>4</sub> emitted is 3.67 x 4 = 18.0g
	* the specific energy content of the fuel is 36.7 MJ/litre (see Table A1), so the total energy in 100 litres is 3,670 MJ, or 3.67 GJ

	N <sub>2</sub> O Reduction = 34kg
"Treated"	[2.7g/100 litres] x [16,963,200] x [1kg/1000g] = 458kg
"Baseline"	[2.7g/100 litres] x [18,240,000] x [1kg/1000g] = 492kg
	* the N <sub>2</sub> O emissions factor for diesel oil used in an internal combustion engine is 1,322 g/GJ so the total N2O emitted is $3.67 \times 0.6 = 2.7 \text{ g}$

Appendix VI

# **Estimated Fuel Savings**

## Estimated Monthly and Annual Fuel Savings With Catalyst Use

The attached information is included as an estimate only and is utilized to establish the magnitude of cost savings derived through the use of the Fuel Factor X catalyst. All numbers are estimates and should not be considered absolute values.

### Estimated: CMB

	Carbon Balance Estimate Only!
Monthly Fuel Consumption:	400,000.00 gals.
Monthly Fuel Costs (\$2.35/gal.):	\$940,000.00
Improvement in Fuel Efficiency:	.07%
Monthly Gross Fuel Savings:	\$65,800.00

Estimated Gross Annual Savings Based On 4,800,000 Gallons of Diesel Fuel Consumed: **\$789,600.00** 

Using the fuel savings data produced from the Carbon Balance test procedure, the results show that Doug Andrus trucking could potentially reduce annual fuel consumption costs by a minimum of \$789,600.00. Other cost reducing factors that will enhance the use of the Fuel Factor X catalyst include reduced repairs due to carbon related failures; extended oil change intervals as experienced by other Fuel Factor X catalyst customers; reduced fuel system repairs with the additional fuel system lubricant contained in the catalyst; and, increased engine life. These factors and many more are the reason that so many companies are opting to implement Fuel Factor X catalyst as part of their preventive maintenance program.

Other benefits in using Fuel Factor X catalyst are as follows:

Demulsifier: Removes water from fuel.Biocide:Helps control bacterial growth in fuel.PolymerizationRetardant:Helps prevent the formation of solids in fuel.Dispersant:Helps to eliminate existing solids in fuel.Lubricant:Lubricates the fuel system (fuel pump and injectors).Detergent:Cleans the fuel pump and injectors.CorrosionProtects against fuel tank corrosion.MetalDeactivator: Prevents catalytic oxidation.