City of Columbus

Test Subject A– 2008 Freightliner M2-106-TA

Test Subject B- 2013 F-550 6.7L Powerstroke

Reducing the Fleet Owner's need to perform regeneration cycles.

Overview

Lubrication Specialties, Inc. has performed extensive product testing on class 3-6 trucks owned by the City of Columbus. This test was intended to reduce service costs of regeneration cycles for the city, as well as reduce the harmful effects of fuel contamination in the engine oil. The following report highlights the service records of a 2008 Freightliner (M2-106-TA) with 132,009 miles. The tests were performed over a period of 5,000 miles, and 400 hours of run time. This same procedure was performed on a 2013 F-550 6.7L Powerstroke with 91,655 miles. Each test proved to yield a significant decrease in the need to perform regeneration cycles.

A regeneration cycle consists of cleaning out the soot residue from a truck's diesel particulate filter (DPF). This cleaning can be achieved through either a passive or active regeneration process. During a regeneration cycle, excess fuel is metered into the combustion chamber to increase the temperature of the exhaust in order to burn off soot. If the soot is not removed, the vehicle will emit dangerous pollutants into the air from the exhaust. Regeneration cycles require truck downtime and if not done properly, will lead to expensive diesel particulate filter replacements. The line of duty for each of the tested trucks require nearly 100 hours of idle time every month. During constant idle, the exhaust fails to reach the high temperatures needed to assist in the removal of soot resulting in a frequent need to perform regeneration cycles. If regenerations are performed more frequently than the manufacturer intended, the engine oil will begin to become diluted with excess fuel that makes its way past the piston rings. Based on analysis, fuel dilution was the main problem the City of Columbus trucks were facing as a result of the frequent regeneration cycles.

By using Hot Shot's Secret fuel additives, regeneration cycles were decreased from three times every month, to once every two months for each of the subject trucks. By reducing the need to perform regeneration cycles, the problem of fuel dilution in the engine oil was also resolved. It is evident that the Hot Shot's Secret products had a dramatic effect on the performance of these trucks.

Problems:

- Frequent regeneration cycles with high costs in maintenance and downtime

- Fuel dilution from excessive regeneration cycles

- Loss of fuel economy

- Noticeable rough idling

Process to Minimize Regeneration Cycles

The initial cleanup was achieved by pouring Hot Shot's Secret Diesel Extreme into the fuel tanks and running the trucks close to empty. Diesel Extreme cleaned out the tank, lines and injector tips, while improving the overall burn quality of the fuel. Cetane levels were also improved which provided quicker starts and faster warm-ups in cold temperatures. At each of the following fuel fill-ups, Hot Shot's Secret Everyday Diesel Treatment was added to the tanks. This ensured that the entire fuel system remained clean and free of contamination while dramatically reducing the accumulation of soot in the DPF. To review this process, please refer to the service record history included at the end of this report.

Benefits/Results:

- Annual savings of $2,640.00/truck for Freightliner

- Annual savings of $1,391.00/truck for F-550

- Reduced need for regeneration cycles

- Increased fuel economy

- Resolved fuel dilution issues

- Increased DPF life

Test Subject A – 2008 Freightliner

Cost Analysis

During regeneration cycles, trucks are run at high RPM to generate the heat needed to remove soot. By doing so, excessive amounts of fuel, DEF (diesel exhaust fluid) and labor are required. The process typically lasts for an equivalent of 30 miles and decreases the truck's fuel economy to an average of 6 mpg. With an average diesel fuel price of $2.75/gal, each regeneration costs $14.00 in fuel alone. Average labor charges $40.00/hour added an additional $80 to the total. Research suggests that DEF consumption during regeneration is about 3% of the truck's fuel usage which adds to the end cost. Based on each of these costs, a regeneration cycle for a truck of this size totals about $95.00 after fuel, DEF and labor are factored in.

Before HSS	After HSS
Annual Regens 36	Annual Regens 6
Labor Expense $2,880.00	Labor Expense $480.00
Fuel Expense $504.00	Fuel Expense $84.00
DEF Expense $36.00	DEF Expense $6.00
	Hot Shot's Secret $210.00
Annual Expenses $3,420.00	**Annual Expenses** $780.00

*Annual regeneration expenses per truck

Results

Before this test, regeneration cycles had been performed three times a month costing $3,420.00/year for this truck. By using Hot Shot's Secret fuel additives, regeneration cycles were cut to once every two months. The City of Columbus was able to save $2,640.00/year on this particular truck after considering the cost of a year's supply of Hot Shot's Secret product ($210.00).

Test Subject B –2013 F-550 6.7L Powerstroke

Cost Analysis

The average regeneration process typically lasts for an equivalent of 30 miles and decreases the truck's fuel economy to an average of 8 mpg. With an average diesel fuel price of $2.75/gal each regeneration costs $10.00 in fuel alone. Average labor charges of $40.00/hour added an additional $40.00 to the total. Research suggests that DEF consumption during regeneration is about 3% of the truck's fuel usage which also adds to the end cost. Based on each of these costs, a regeneration cycle for a truck of this size totals roughly $51.00 after fuel, DEF and labor are factored in.

Before HSS	After HSS
Annual Regens 36	Annual Regens 6
Labor Expense $1,440.00	Labor Expense $240.00
Fuel Expense $360.00	Fuel Expense $60.00
DEF Expense $30.00	DEF Expense $4.00
	Hot Shot's Secret $135.00
Annual Expenses $1,830.00	**Annual Expenses** $439.00

*Annual regeneration expenses per truck

Results

Before this test, regeneration cycles had been performed three times a month costing $1,830.00/year for this truck. By using Hot Shot's Secret fuel additives, regeneration cycles were cut to once every two months. The City of Columbus was able to save $1,391.00/year on this particular truck after considering the cost of a year's supply of Hot Shot's Secret product ($135.00) for this truck.

Conclusion

Hot Shot's Secret Diesel Extreme and Everyday Diesel Treatment had a dramatic effect on the regeneration cycle frequency based on the service records provided. As previously stated, fuel dilution was a major issue with the City of Columbus due to the frequent regeneration cycles. Oil analysis had consistently shown an "excessive" amount of fuel in the oil. After eliminating the need to perform frequent regenerations, the oil analysis for both trucks now show an "acceptable" level of fuel contaminants within the oil.

Between the two subject trucks alone, the City of Columbus was able to save a total of $4,031.00 every year in maintenance, while extending the life of both engines. Statements from the driver of the truck also revealed that the vehicle ran better overall while using Hot Shot's Secret products.

Diesel Extreme   Everyday Diesel Treatment

Service Records
2008 Freightliner M2-106-TA

5/13/2015	Regeneration Cycle	*Added 16oz Diesel Extreme
5/22/2015	General Maintenance	*Added 3oz EDT
5/26/2015	General Maintenance	*Added 3oz EDT
6/5/2015	Fuel System Review	*Added 3oz EDT
6/25/2015	General Maintenance	*Added 3oz EDT
7/3/2015	General Maintenance	*Added 3oz EDT
7/16/2015	General Maintenance	*Added 3oz EDT
7/18/2015	Regeneration Cycle	*Added 16oz Diesel Extreme
8/21/2015	General Maintenance	*Added 3oz EDT
9/12/2015	Regeneration Cycle	*Added 3oz EDT
9/25/2015	General Maintenance	*Added 3oz EDT
9/30/2015	General Maintenance	*Added 3oz EDT

"Since I have been adding Diesel Extreme and the Everyday Diesel Treatment to the fuel, I have noticed a big difference in the need for regeneration cycles. My truck idles and runs better."

-Ron Thomas (Driver of subject truck)