

## Case Study: DEF reduction, re-generation cycles reduction and cost savings.

EXLCanada: +7 Diesel Nitro Daily with Cetane Boost and Full Throttle Injector Cleaner and Cetane Boost were used in this case study.

Test on a 2008 Freightliner M2-106-TA and 2013 F-550 6.7L Powerstroke.

### Benefits/Results:

Please note these cost savings were calculated before commodities, fuels and lubrications product cost increased substantially to present day levels. The saving below, adjusted to reflect these increases will add to the annual savings.

- Reduced need for regeneration cycles.
  - Regeneration cycles decreased from three/month to once/two months for each truck.
- Annual savings from regeneration of:
  - \$2,640.00/truck for Freightliner
  - \$1,391.00/truck for F-550
  - Increased fuel economy is not included above, this will add to lower operating cost per km/mile.
- Increased DPF life.
- Less downtime.
- Less consumables.
- Cost effective.
- For both trucks, based on analysis, fuel dilution into the engine oil was resolved by decreasing regen cycle amounts.
- Cetane levels were improved providing quicker starts and faster warm-ups in cold temperatures.

### Overview

Purpose: Reduce service costs of regeneration cycles, determine DEF contamination in engine oil relationship and results, parts, labour and fuel reductions.

Report highlights the service records of a 2008 Freightliner (M2-106-TA) with 132,009 miles, over a period of 5,000 miles, and 400 hours of run time.

The 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.



**EXL+7 Diesel Nitro Daily**  
A concentrated cetane booster that tremendously upgrades power and performance in all diesel equipment.

EXL+7 Diesel Nitro Daily contains a powerful injector cleaner, water dispersant, lubricity additives, corrosion inhibitors and fuel stabilizers. Use EXL+7 Diesel Nitro Daily at every fill-up to turn standard pump diesel into premium diesel fuel.

Application: All diesel engines. For diesel fuel only.

Standard Treatment	
95L/25 gallons US	30ml/1 fl oz US
3028L/800 gallons US	947ml/32 fl oz US (1 bottle)

Performance Treatment	
95L/25 gallons US	60ml/2 fl oz US
1574L/400 gallons US	947ml/32 fl oz US (1 bottle)

• Keeps filters from plugging caused by asphaltene, glycerides and bacteria • Reduces particulate matter in filters • Fuel Stabilizer containing anti-oxidants, metal deactivators and dispersants • Lowers freeze point of water in fuel over 32°F over competitors • Military grade non-alcohol-based water demulsifier • Removes internal diesel injector deposits (IDIs) formed by carboxylate salts and waxy soap deposits and carbon coating deposits • Wear scar under 460 µm in un-additized fuel in ASTM D6079 • NACE corrosion test rating of A

**947ml / 32 fl oz US**  
TREATS 3028L/800 GALLONS US OF DIESEL FUEL.

**EXL+7 DIESEL NITRO DAILY**  
CONDITIONNER POUR DIESEL ET CETANE BOOST

• Boosts cetane up to 7 points • Reduces DPF regeneration cycles up to 50% • Increases fuel mileage up to 7.3% and power by up to 12.5% • Inhibits/cleans rust and corrosion in fuel tanks and lines, cylinders and injector tips • Restores power loss up to 87% in Peugeot CEC F96-08 DW-10 test • Lubricity additive for fuel pump and injectors • Improves cold starting, restores throttle response, eliminates black smoke

RESEARCHED • DEVELOPED • TESTED • PROVEN

**DANGER** KEEP OUT OF THE REACH OF CHILDREN. HARMFUL OR FATAL IF SWALLOWED. READ PRECAUTIONS ON BACK.

**DANGER**  
POISON – Keep out of the reach of children. Harmful or fatal if swallowed.  
CALL PHYSICIAN IMMEDIATELY. Causes skin or serious eye irritation. Use in well-ventilated places. Do not breathe vapors. IF SWALLOWED – DO NOT INDUCE VOMITING. Immediately call poison control. Wash thoroughly after handling. If concerned or you feel unwell – seek medical advice. This diesel fuel additive complies with the federal low sulfur content requirements for use in diesel motor vehicles and nonroad engines.

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PO Box 147, Oxbow, Saskatchewan S0C 2B0  
Part No. FA-DN-32B

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Disclaimer: EXLCanada recommends an analysis program is used in conjunction with any additive/maintenance program. EXLCanada and any affiliates will not be held responsible for any damages from the use of EXLCanada products. Contact Murray Hansen, [mhh@exlcanada.com](mailto:mhh@exlcanada.com) or Clint Bennet, [cb@exlcanada.com](mailto:cb@exlcanada.com)

Three types of regeneration cycles:

1. **Passive** -- This occurs when the load and speed of the engine produce temperatures greater than 350 degrees C, and it burns off the trapped soot as the vehicle operates.
2. **Active** -- If the duty cycle does not produce high enough exhaust temperatures, the DPF becomes loaded with soot, which is indicated by its pressure sensors. Active regeneration is then required. During active regeneration, raw fuel is injected into the diesel oxidation catalyst (DOC) to achieve appropriate regeneration temperatures in the DPF. Neither active generation or passive regeneration require input from the vehicle operator, and no check engine light codes are shown the vehicle dashboards for either regeneration process.
3. **Manual** -- This type of regeneration occurs only when the vehicle is stationary, and it requires action on the part of the vehicle operator. The check engine light will illuminate on the vehicle dashboard, usually after an extended period of idling (when hydrocarbons build up and can cause overheating of the DPF). The vehicle operator must set the park brake and enable the parked regeneration to begin. Engine rpm increases and raw fuel is injected into the exhaust gas at the exit of the engine to generate the appropriate regeneration temperatures. The stationary vehicle manual regeneration processes take about 30 minutes.

Regeneration cycles possible requirements/issues:

- Truck downtime awaiting regeneration cycle when **passive** conditions not met.
- Extra fuel.
- Loss of fuel economy.
- Rough idling.
- Fuel in engine oil.
  - 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.
- Extra maintenance parts and labour.
  - DPF replacement.
  - Engine oil/filters replacement.
  - Extra labour.

Test Procedure

- Initial cleanup
  - Add EXL **Full Throttle Injector Cleaner and Cetane Boost** as per recommended treatment rate to fuel tanks.
    - Run trucks almost empty to cleaned out tank, lines and injector tips, and improving overall burn quality of the fuel
- Each subsequent refueling:
  - Add EXL **+7 Diesel Nitro Daily with Cetane Boost** per recommended treatment rate.
    - Ensures entire fuel system remains clean and free of contamination.
    - Reducing soot accumulation in DPF.
- To review this process, refer to service record history at report end.

## Test 2008 Freightliner

### Cost Analysis Note (US\$)

During regeneration cycles, trucks run at high RPM to generate heat needed to remove soot. Using large amounts of fuel, DEF (diesel exhaust fluid) and operator labor. The process typically lasts the 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 (insert present fuel costs), each regeneration costs \$14.00 in fuel alone. Average labor charges \$40.00/hour (use your present labour rates) added an additional \$80 to the total. Research shows 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.

### Data/Calculations Summary

	Before EXLCanada	Using EXLCanada Full Throttle and +7 Diesel Nitro Daily
Annual Regens	36	6
Labour Expense	\$2,880.00	\$480.00
Fuel Expense	\$504.00	\$84.00
DEF Expense	\$36.00	\$6.00
EXLCanada Product	\$0.00	\$210.00
Annual Expenses	\$3,420.00	\$780.00

### Results

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

## Test 2013 F-550 6.7L Powerstroke

### Cost Analysis

Please use your fuel and labour costs to calculate your savings in similar equipment.

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 EXLCanada	Using EXLCanada Full Throttle and +7 Diesel Nitro Daily
Annual Regens	36	6
Labour Expense	\$1,440.00	\$240.00
Fuel Expense	\$360.00	\$60.00
DEF Expense	\$30.00	\$4.00
EXLCanada Product	\$0.00	\$135.00
Annual Expenses	\$1,830.00	\$439.00

### Results

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

### Conclusion

**+7 Diesel Nitro Daily with Cetane Boost and Full Throttle Injector Cleaner and Cetane Boost** had a dramatic effect on the regeneration cycle frequency based on the service records provided. Fuel dilution was a major issue due to 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.

Annual savings of \$4,031.00 (both trucks) every year in maintenance/consumables, while extending engine life. Statements from the driver of the truck also revealed that the vehicle ran better overall when using EXLCanada products.

**Service Records**

2008 Freightliner M2-106-TA

<b>May 13,</b>	<b>Regeneration Cycle</b>	Added 474 ml/16 oz Full Throttle
May 22	General Maintenance	Added 90 ml/3 oz +7 Diesel Nitro
May 26	General Maintenance	Added 90 ml/3 oz +7 Diesel Nitro
Jun 5	Fuel System Review	Added 90 ml/3 oz +7 Diesel Nitro
Jun 25	General Maintenance	Added 90 ml/3 oz +7 Diesel Nitro
July 3	General Maintenance	Added 90 ml/3 oz +7 Diesel Nitro
Jul 16	General Maintenance	Added 90 ml/3 oz +7 Diesel Nitro
<b>July 18</b>	<b>Regeneration Cycle</b>	Added 474 ml/16 oz Full Throttle
Aug 21	General Maintenance	Added 90 ml/3 oz +7 Diesel Nitro
<b>Sep 12</b>	<b>Regeneration Cycle</b>	Added 474 ml/16 oz Full Throttle
Sep 25	General Maintenance	Added 90 ml/3 oz +7 Diesel Nitro
Sep 30	General Maintenance	Added 90 ml/3 oz +7 Diesel Nitro

“Since I have been adding Full Throttle and the +7 Diesel Nitro Treatment to the fuel, I have noticed a big difference in the need for regeneration cycles. My truck idles and runs better.”

-R. T. (Truck Operator)