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FUEL EFFICIENCY

Green Diesel Cats
Fuel Saver Technology

Fuel Consumption and Engine Emissions Tests 2007 Chevrolet Silverado Pickup Truck HD2500 6.6L Turbo Diesel Engine Using Vapster-Diesel Green Diesel Catalyst Fuel Saving Unit

Tests performed by

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Project Summary

A fuel saving device from Vapster-Diesel was designed to be retrofitted onto the fuel line after the fuel filter and before the injector pump. This device is a dual catalyst used on diesel engines to improve the combustion process thereby increasing fuel efficiency and reducing engine emissions. The performance of the 2007 Chevrolet Silverado Duramax 6.6L Turbo Diesel engine with and without the new fuel saving unit is tested in this study. The tests included both engine fuel consumption and engine emissions (CO, CO2, NOX and O2). The average fuel consumption in miles per gallon for each trip was determined over a distance of 125 miles traveled by the truck on Interstate 95 between Boynton Beach and Stuart Florida. The same route was repeated for each test. Approximately 62.5 miles was traveled northbound and the return trip southbound consisted of approximately 62.5 miles. The fuel efficiency increases from 19.5 mpg (baseline) to 23 mpg (with the Vapster-Diesel dual catalyst, fuel saving device). The emissions results show an overall improvement of the engine emissions when the fuel saving unit is used compared to the baseline measurements.

1. Project objectives and goal:

The principal objective of the proposed testing is to determine the changes in the fuel consumption and emissions of the Duramax 6.6L Turbo Diesel engine using the Maximo Diesel RV-4400 Fuel Saving Device. The goal is to retrofit Diesel engines with pre combustion technologies to improve the fuel efficiency and reduce engine emissions.

2. Technical approach:

The performance of the RV-4400 Fuel Saving Device (see Figure 1) installed on the 2007 Chevrolet Silverado HD2500 Pickup truck with the 6.6L Turbo Diesel Engine is tested in this study.

* Information about the truck used for these testing:

- Year Built – 2007
- Manufacturer - Chevrolet
- GVW -7,500 LBS.
- Model – Silverado 2500 HD Series ¾ Ton Pickup
- Engine – 6.6L Duramax Turbo Diesel
- Batteries – (2) 12V
- Exhaust – Stock Single exhaust pipe with catalytic convertor
- Transmission - Stock 6 Speed Allison Automatic
- Brakes – Front: Disc and Calipers, Rear: Shoes
- Tires – Firestone LT245 X 75 R16 Inflated to 80 PSI

Three tests were conducted with the fuel saving unit and four tests without the unit (baseline measurements). The measurements include both the fuel consumption and engine emissions.

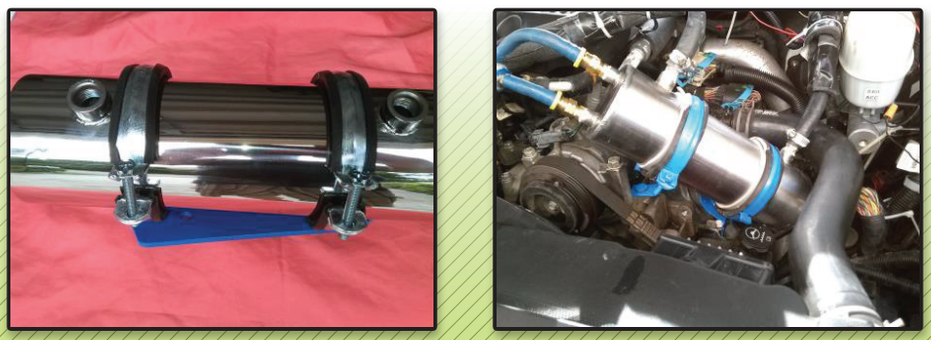

Figure 1 Fuel Saving Unit

2.1 Fuel consumption measurements

The vehicle is equipped with a special removable fuel tank (See Figure 2a) for testing purposes. Before the test was conducted the weight of the fuel tank with fuel was recorded. To minimize city driving, which would affect fuel consumption, the system was turned on right before arriving on the highway. The truck was driven for about 62 miles north on I-95 then back the same distance. Upon exiting the highway the fuel line to the test tank was turned off and the main tank was turned back on. The odometer was recorded at this point in time to end the test. It is noted that the truck was driven off the road system to a safe spot, a driveway or a parking lot to perform this procedure. The driver would manually turn the shutoff valves from underneath the truck. The total time and distance of the trip was recorded. The fuel tank is then weighed and the difference from the starting weight is recorded. With this information the fuel consumption in Miles per Gallons (MPG) was calculated. An industrial scale (see Figure 2b) and a scale readout monitor were used to measure the fuel consumption (see Figure 2c).

Figure 2a Fuel tank

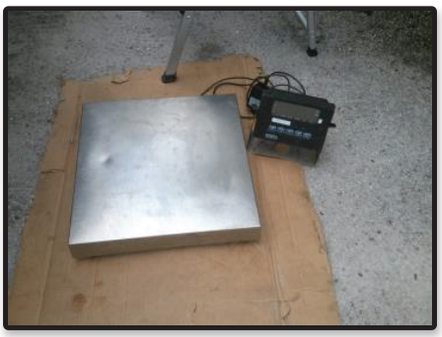

Fig2b Industrial scale

Fig2c Scale readout monitor

2.2 Engine emissions measurements

Real time monitoring of the engine emissions was recorded using the EMS, Emissions Systems, Inc. 5 gas Analyzer Model 5002 (See Figure 3). The measurements included CO, CO2, NOx, and O2. Emissions were recorded for the baseline and using the retrofit fuel saver unit. Two sets of data were included for the engine at idle and the engine at 1800 rpms.

Figure 3 Gas Analyzer

3. Results | 3.1 Fuel Consumption:

The fuel consumption in miles per ounces and converted to miles per gallons with and without the RV-4400 fuel saving unit are summarized in Table 1 and Figures 4 and 5. Table 1 includes the engine RPMs on the highway (1800), the average speed of the truck in miles per hour (65 MPH), the distance in miles, and the amount of fuel consumed for each trip in gallons. The fuel consumption MPG (Miles per gallons) is given by: MPG = distance/volume of fuel consumed for each trip. The results in Table 1 and Figures 4 and 5 show a net decrease of fuel consumption when the engine is equipped with the fuel saving unit. The engine efficiency in miles per gallons increases with the fuel saving unit. The average engine efficiency with the fuel saving unit is about 23 MPG compared to the baseline data of 19.5 MPG (without fuel saving unit). This represents about 18% decrease of the fuel consumption with the fuel saving unit.

	Volume Ounces	DISTANCE (MILES)	Volume GALLONS	MPG
Trip 1	692.48	121.4	5.41	22.4
Trip 2	674.56	125.1	5.27	23.7
Trip 3	720.64	129.2	5.63	22.9
Trip 4	815.36	124.1	6.37	19.5
Trip 5	792.32	129.3	6.19	20.9
Trip 6	921.60	125.6	7.20	17.4
Trip 7	810.24	126.5	6.33	20.0

Trips with the system off are highlighted in yellow

Table 1. Fuel consumption with and without fuel saving unit (average speed of 65 MPH and engine rpm of 1800

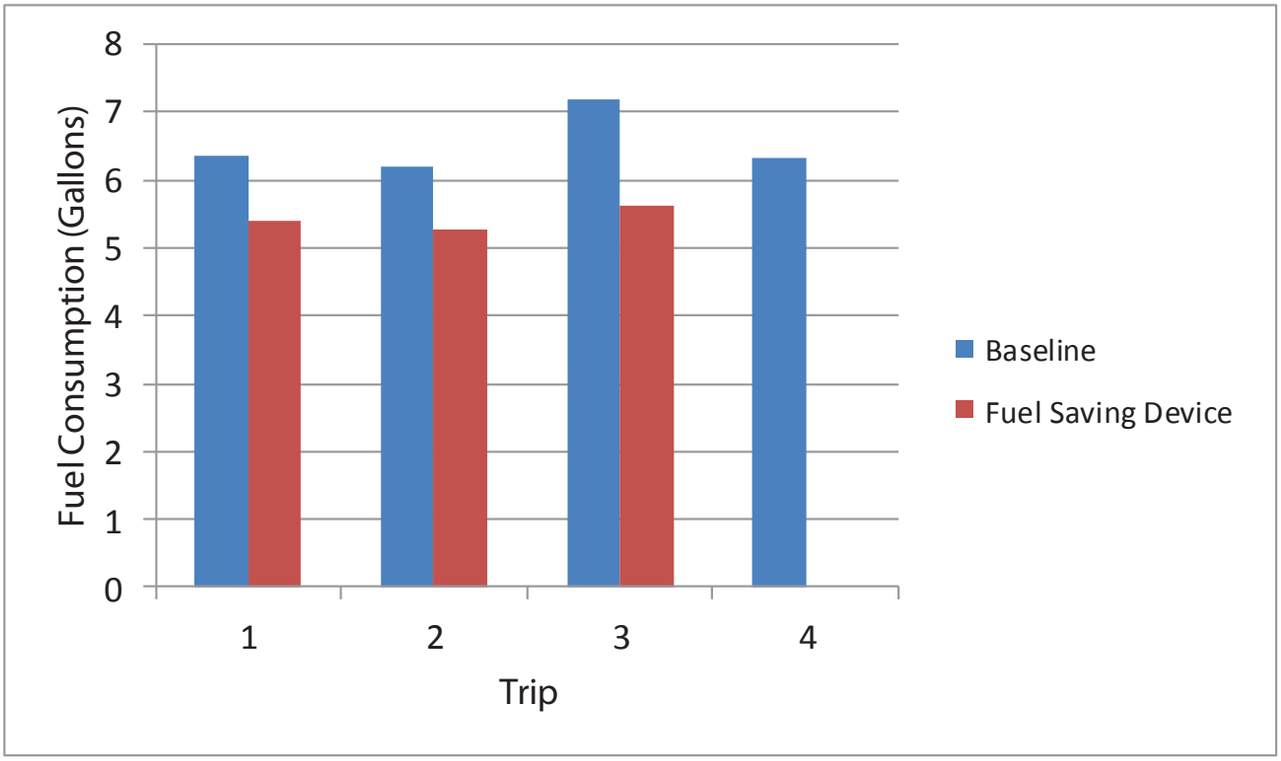

Figure 4 Fuel Consumption

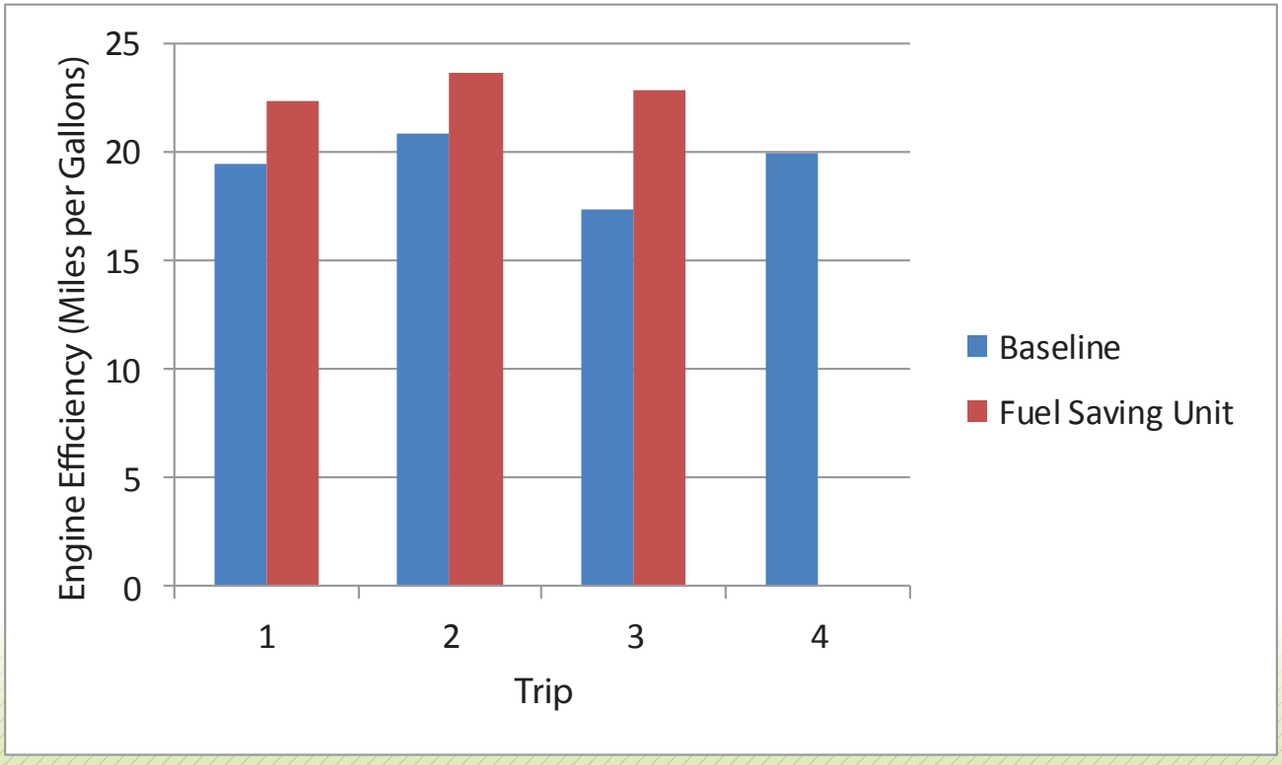

Figure 5 Engine Efficiency in Miles Per Gallons

	CO [%]	CO2 [%]	NOX [ppm]	O2 [%]
Without Fuel Saving @ 1800 rpm	0.01	1.6	77	18.31
Without Fuel Saving @ 1800 rpm	0.01	1.8	76	18.02
Without Fuel Saving @ 1800 rpm	0.01	1.7	76	18.18
Average	0.01	1.7 0	76.3 3	18.17
With Fuel Saving @ 1800 rpm	0.00	1.8	73	18.14
With Fuel Saving @ 1800 rpm	0.00	2.0	74	17.93
With Fuel Saving @ 1800 rpm	0.00	1.8	73	18.11
Average	0.00	1.86	73.33	18.06
Difference %	100 (-)	9.4 (+)	3.9(-)	0.6 (-)
Idle – Without Fuel Saving un it	0.0 4	3.3	24	15.86
Idle – Without Fuel Saving unit	0.03	3.3	30	15.58
Idle – Without Fuel Saving unit	0.03	3.2	29	15.81
Average	0.0 33	3.27	27.7	15.75
Idle – With Fuel Saving unit	0.01	3.0	14	16.58
Idle – With Fuel Saving unit	0.02	3.1	9	16.73
Id le – With Fuel Saving unit	0.02	3.1	9	16.73
Average	0.0 16	3.07	10.7	16.68
% difference	46 (-)	6.11 (-)	61.4 (-)	5.90 (+)

Table 2. Engine emissions with and without fuel saving unit at 1800 rpms and idle

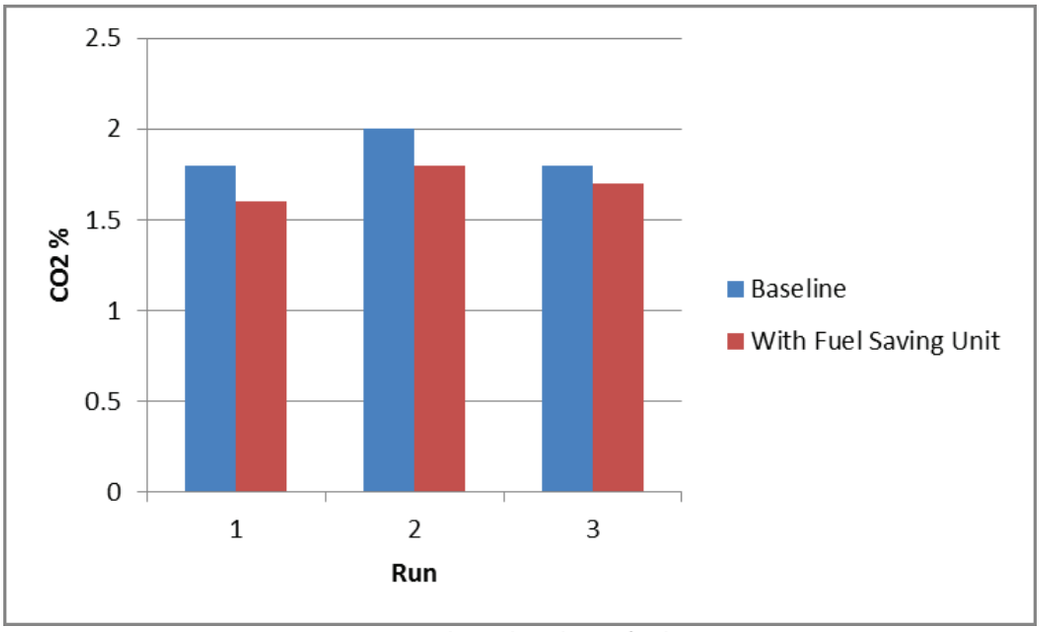

Figure 6 CO2 emissions with and without fuel saving at 1800 rpms

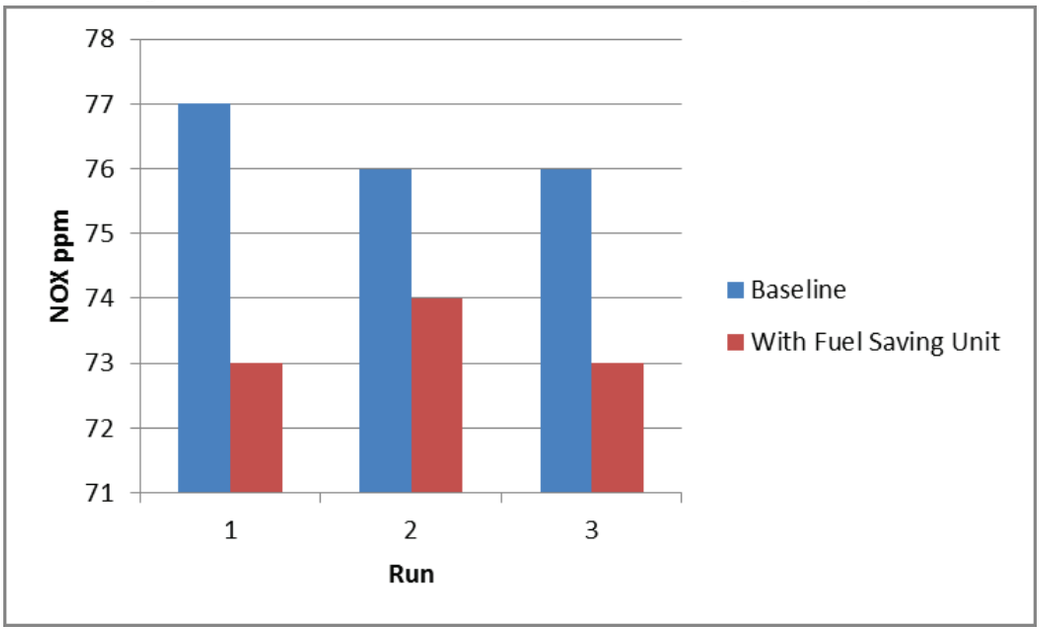

Figure 7 NOX emissions with and without fuel saving at 1800 rpms

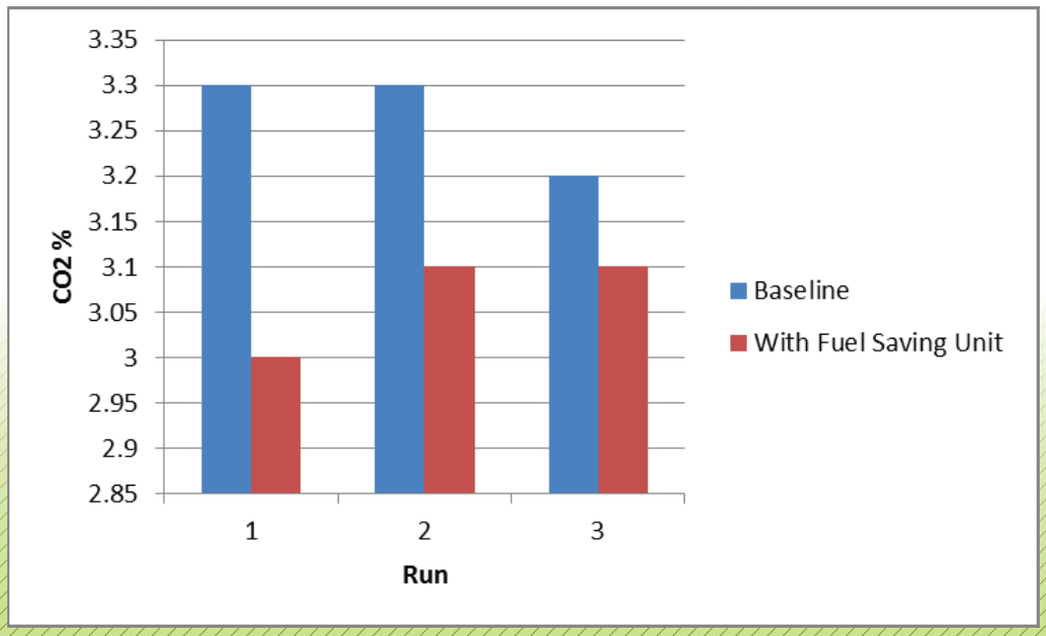

Figure 8 CO2 emissions with and without fuel saving – Idle

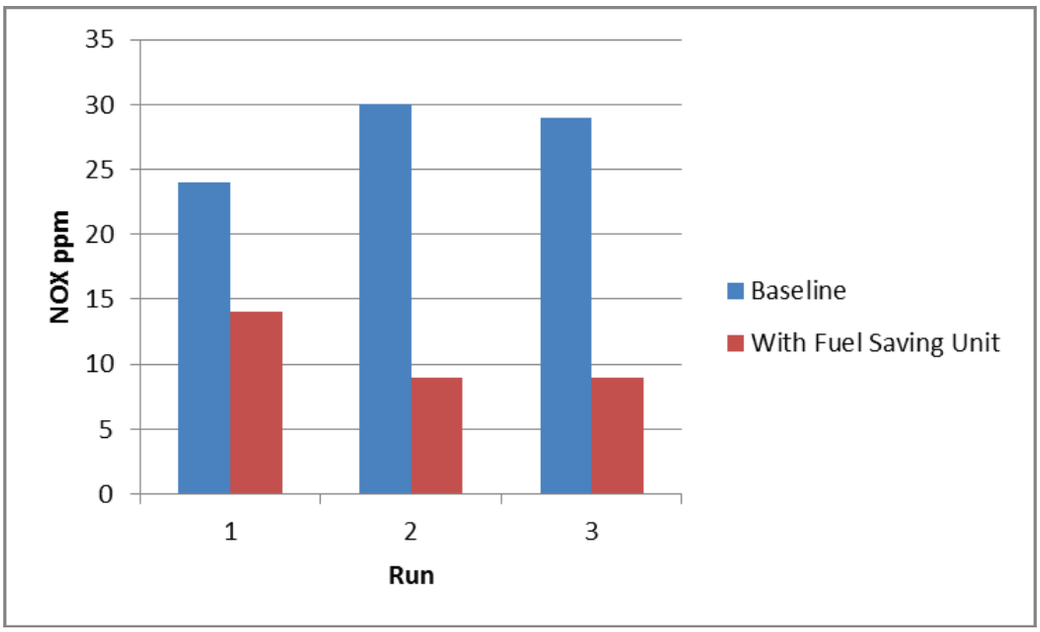

Figure 9 NOX emissions with and without fuel saving – Idle

4. Conclusions

Fuel consumption and engine emissions tests were performed in this study with and without fuel saving unit. The 2007 Chevrolet Silverado Duramax 6.6L Turbo Diesel engine was used for this testing. The average fuel consumption in miles per gallon for each trip was determined over a distance of 125 miles traveled by the truck on Interstate 95 between Boynton Beach and Stuart Florida. Three trips for baseline measurements and four trips with fuel saving unit were used in this study to record the fuel consumption and engine emissions. The results show an average fuel saving of 18% when the Diesel engine is equipped with the fuel saving unit. The fuel efficiency increases from 19.5 mpg (baseline) to 23 mpg (with fuel saving unit). The engine emissions results at high engine speed (1800 rpm) show a 100 % decrease of CO emissions, 9.4 % increase of CO2 emissions, 3.9% decrease of NOX, and 0.6% decrease of O2 emissions when the fuel saving unit is used compared to the baseline measurements. For the idle measurements, the engine emissions results show a 46% decrease of CO emissions, 6.11% decrease for CO2, 61 % decrease for NOX and 5.9 % increase for O2 when the fuel saving unit is used.

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