Werner Coach

Trial Results

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Werner Coach, in Phoenixville, Pennsylvania, conducted a 120 day Trial to examine the benefits of the Smart Emissions Reducer. Their fleet is unique in that their busses are quite old (1998-9) with a lot of miles, and their busses are Dina Busses, which were imported from Mexico. Of special consideration is Bus # 908 which required a repower mid way through the Trial, and Bus #948 was in need of a repower at the conclusion of the test. This means the most indicative data is from Bus #926, which remained stable throughout the entire Trial period.

*** Bus #908 received a new engine part way through the Trial Program**

**** Bus #948 was in need of a new engine at the end of the Trial Program**

Bus #926 saw a reduction in opacity of 39.17%. The stock opacity reading was 13.2% and the end reading was 8.03%. Bus #908 received an engine rebuild part way through the program. Even with a fresh engine, the end opacity reading was 30.2%. The new engine most likely was not fully broken in by the end of the Trial period, or the exhaust system was still loaded with carbon from the old engine (either of which could explain the 30% opacity).

Bus #926

Bus #926 traveled a total of 24,839 miles over 135 days. This extrapolates to 67,200 miles per year. At the stock fuel economy rating (5.73 MPG), 11,727.75 gallons of fuel would be consumed per year. At an average cost of $3.85 per gallon, this equates to annual fuel expenditures of $45,151.83. With the Smart Emissions Reducer installed (6.78 MPG), 9911.5 gallons, or $38,159.29 in fuel per year. This represents a savings of $6992.54 per year in fuel. The cost of the Smart Emissions Reducer is $1518.99 (installed). **This puts the Return on Investment (ROI) right at the 80 day mark**. First year savings is $5473.55.

For every gallon of diesel fuel burned, 10.85 kg of carbon dioxide (CO_2) is formed. By reducing the fuel consumption by 1816.25 gallons, CO_2 is reduced by 19,706.31 kg, or 19.7 metric tons per year. The form of the data for opacity does not allow for conversion to tons per year, but the black soot emitted by diesel engines, measured as opacity, has over 600 TIMES the Greenhouse Effect of carbon dioxide! Therefore, total GHG impact is reduced by a factor *many* times greater overall than the quantifiable 19.7 metric tons of CO_2! At $6.75 per metric ton, this unofficially equates to an additional savings of $132.98 per year.

- **ROI = 80 Days (less than 3 months)**
- **First Year Fuel Savings = $5473.55**
- **Annual Fuel Savings = $6992.54**
- **Reduction in CO_2 Emissions = 19,706 kg (19.7 Metric Tons)**

Bus #908

Bus #908 traveled 16,214 miles over the 135 days. This extrapolates to 43,870 miles per year. [Again, it should be noted this bus was out of service for a period of time while being repowered.] At the stock fuel economy rating (5.89 MPG), 7448.22 gallons of fuel would be consumed annually, at a cost of $28,675.64 (at $3.85/gal). With the Smart Emissions Reducer installed (7.09 MPG), 6187.59 gallons of fuel would be consumed at a cost of $23,822 per year; a savings of $4853.64 per year. **The ROI is 115 days,** or less than 4 months.

The reduction in CO_2 is 13,677.84 kg per year (13.7 metric tons). At current market value of $6.75/ton, this equals another $92.32 in carbon tax savings.

- **ROI = 115 Days (less than 4 months)**
- **First Year Fuel Savings = $3334.65**
- **Annual Fuel Savings = $4853.64**
- **Reduction in CO_2 Emissions = 13,678 kg (13.67 Metric Tons)**

Bus #948

Bus #948 traveled 19413 miles as of the September cleaning, which equates to approximately 67,535 miles per year. At the stock fuel economy rating (6.6 MPG), this bus would consume 10,232.58 gallons

of fuel per year at a cost of $39,395.45. With the Smart Emissions Reducer installed (7.61 MPG), annual fuel costs would be $34,166.85, for a savings of $5228.60. **The ROI is 107 days** (about 3 ½ months).

Carbon Dioxide reduction is 14,734 kg (14.7 metric tons) per year

- **ROI = 107 Days (About 3 ½ Months)**
- **First Year Fuel Savings = $3709.61**
- **Annual Fuel Savings = $5228.60**
- **Reduction in CO_2 Emissions = 14,734 kg (14.7 Metric Tons)**

Projections

The average increase in fuel economy for the Trial Program vehicles is about 18%. Assuming this would be the fleet average with the Smart Emissions Reducer implemented Company-wide, we can calculate total fuel savings for Werner Coach. Assuming an average mileage accumulation of 60,000 miles per year, and a corporate average fuel economy in stock condition of 6.21 MPG (taken from the AveMi/GalBus column of the October 2013 Fuel composite) for 24 busses, that equates to 1.44 million miles, 231,884 gallons of fuel, for $892,753.62 expended for fuel. Factoring in an 18% increase in fuel economy expected from installing the Smart Emissions Reducer, annual fuel savings of $121,794.46. The cost to retrofit 24 full size busses would be $36,455.76, for a first year savings of $85,338.70. Carbon Dioxide reductions would be 384,428 kg (384.4 Metric Tons).

- **At a gain of 18% in fuel economy, Werner Coach would save $85,338.70 the first year**
- **The second and subsequent years would yield a savings of $121,794.46 per year**
- **CO_2 reductions of 384.4 metric tons**
- **Probably many thousands of metric tons of Particulate Matter pollution will be reduced from the exhaust emissions** (as well as CO, HC, and NO_X constituents not tested for in this trial)

	Mileage	Opacity	MPG	Mileage	Opacity	MPG
Bus 908*	28584	51.50%	5.89	37586	69.20%	5.9
Bus 926	52981	13.20%	5.73	67252	11.90%	6.07
Bus 948**	54020	27.60%	6.6	69342	26.50%	6.85
	June			August		

	Mileage	Opacity	MPG	Mileage	Opacity	MPG
Bus 908*	NA	NA	NA	44798	30.20%	7.09
Bus 926	70912	NA	6	77820	8.03%	6.78
Bus 948**	73433	NA	7.61	NA	NA	7.13
	September			October		

	ΔOpac%	**ΔMPG%**
Bus 908*	**-41.36%**	**20.37%**
Bus 926	**-39.17%**	**18.32%**
Bus 948**	**-4%**	**15.30%**