

JAMES MADISON UNIVERSITY.

Madison

Performance Analysis Of A Water Fuel Emulsion Device

Reducing Emissions and
Improving Fuel Economy

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Goal: evaluate the effects of a second generation NoNOx system on fuel economy and exhaust emissions.

Tests were conducted to measure the following parameters.

The British Petroleum's Statistical Review of

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amount of
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Carbon

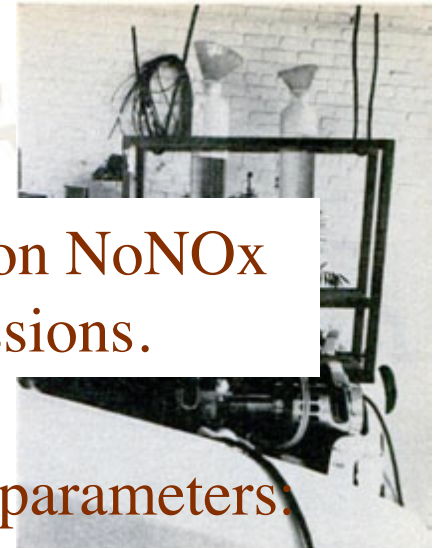
the second largest sources of particulate emissions
the 2.5 micrometer size range, the most
with.

At current consumption rates, this translates into a depletion of the global oil reserves in 54 years!

- Carbon dioxide (CO₂) emissions
- Carbon monoxide (CO) emissions

- Mono largest sources of particulate emissions
- Particulate matter emissions

According to the World Health Organization particulate matter from Diesel exhaust is carcinogenic!





Testing was carried out at Antrim Diesel in Greencastle PA, using their Taylor TD-36 water-brake semi-truck chassis dynamometer.

Average test speed: 59.97 mph
(with 0.16% variation)

Average test power: 192.24 hp
(with 0.14% variation)





Combustion analyzer probes

Gas and particulate emissions testing equipment



Bosch PM meter



Combustion analyzer handsets



The system showed strongly statistically significant reductions in particulate matter and carbon monoxide emissions .

Particulate Matter: Percent Opacity (%)					
	E	D	Δ (E-D)	% Δ	p-value
Average	1.38	2.76	-1.38	-50.0%	<0.001
Stand. Dev.	0.410	0.217			
Particulate Matter: Concentration (mg/m3)					
	E	D	Δ (E-D)	% Δ	p-value
Average	13.4	28.1	-14.7	-52.3%	<0.001
Stand. Dev.	4.351	2.234			
Exhaust Gases: CO (ppm)					
	E	D	Δ (E-D)	% Δ	p-value
Average	37.59	71.99	-34.40	-47.78%	<0.001
Stand. Dev.	17.91	31.17			
Exhaust Gases: NO _x (ppm)					
	E	D	Δ (E-D)	% Δ	p-value
Average	917.79	860.61	57.18	6.64%	<0.001
Stand. Dev.	89.17	83.59			
Fuel Economy (miles/gallon)					
	E	D	Δ (E-D)	% Δ	p-value
Average	5.30	5.45	-0.15	-2.75%	0.05007
Stand. Dev.	0.22	0.19			

The table to the left displays the data collected

- E – emulsion tests
- D – diesel tests
- Δ (E-D) – difference between emulsion and diesel tests (positive = increase w/ E)
- % Δ –percentage change relative to diesel

Our results indicate that significant environmental benefits could be achieved by using this device on Diesel engines.



- Significantly reduced particulate matter emissions
- Fuel economy appears to have been slightly reduced (may be outweighed by emissions improvements)
- These test results should be considered only preliminary
- More testing is needed on the effects of varying speed, load, and water percentage
- Additional tests using a gasoline engine are also in progress

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