



“Reduce Hazardous Emissions and Improve Fuel Consumption”

Performance Test Results Rail Locomotive

2009 - 2010

Evaluation Results – Honda Plant Greensburg, IN

- Emission of hazardous **Hydrocarbons** reduced by an **average of 50%**
- Emission of hazardous **Nitrogen Oxides** reduced by **25%**
- These results were obtained after only **30 hours of use.**



Model: GP38-3
Engine: EMD 16-645E

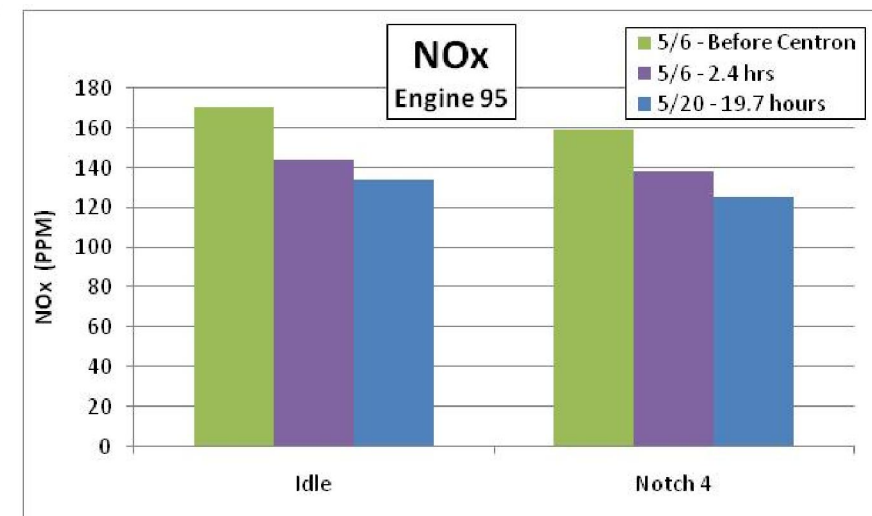
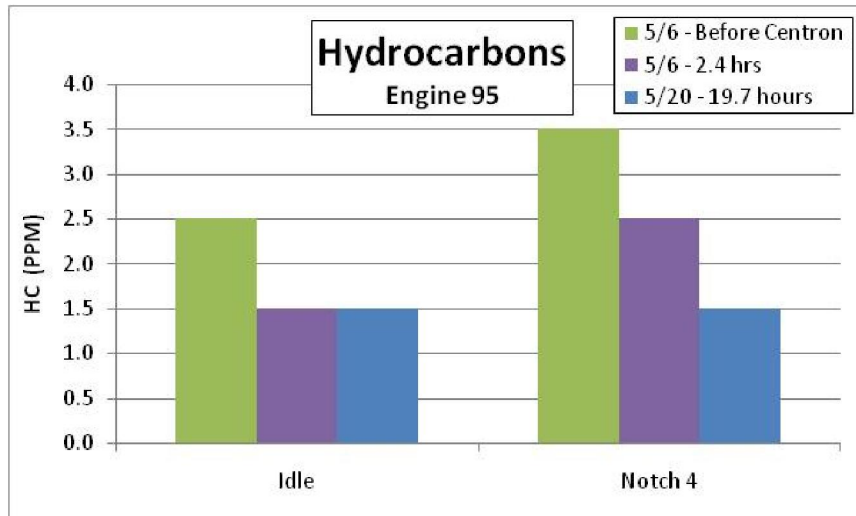
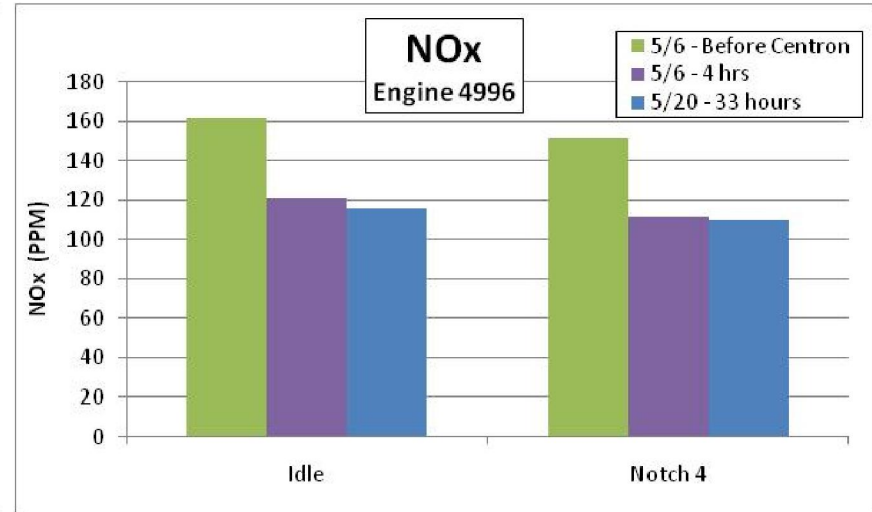
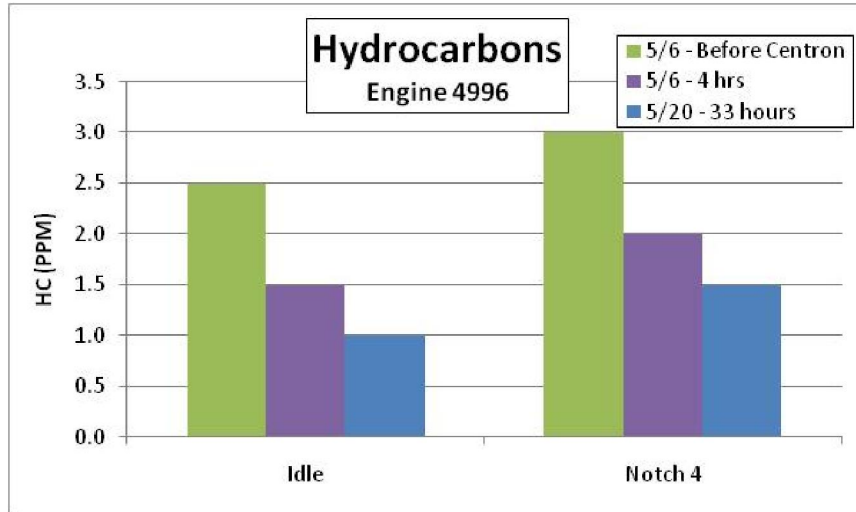
	RESULTS	
	% Change	
	Idle	Notch 4
HC	-58%	-50%
CO	-12%	-38%
CO2	3%	-4%
O2	4%	7%
NOx	-28%	-27%

Model: SW-12
Engine: EMD 16-645E

	RESULTS	
	% Change	
	Idle	Notch 4
HC	-42%	-58%
CO	-17%	-21%
CO2	1%	-1%
O2	0%	4%
NOx	-21%	-21%



HC and NOx Graphs - Honda Greensburg, IN



Evaluation Results – Toyota Plant San Antonio, TX

- Emission of hazardous **Hydrocarbons** reduced by an **average of 32%**
- Emission of hazardous **Nitrogen Oxides** **reduced by 10%**
- These results were obtained after only **5.5 hours of use.**

NOTE:

NOx reductions are expected to improve. The engine was not up to full operating temp during baseline and ambient temp was 85F; engine was hot and ambient temp was 104F in the afternoon. As the engine and ambient temp go up it will drive the production of NOx

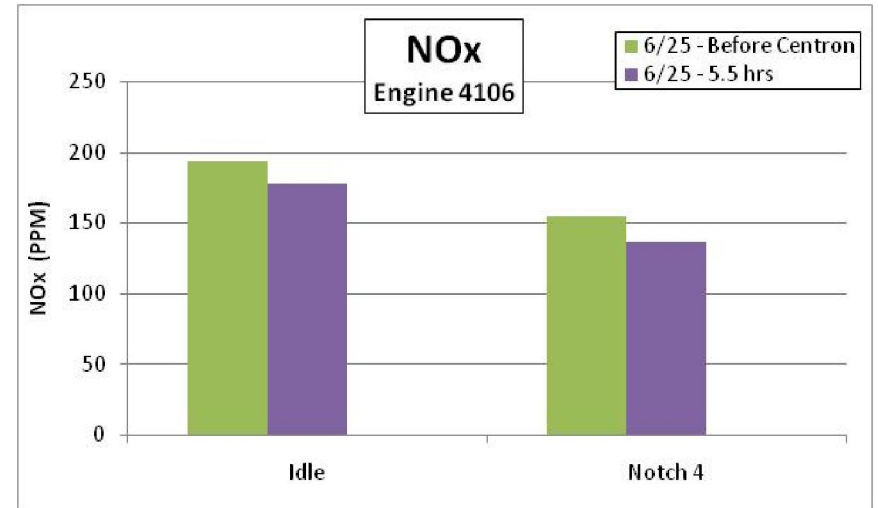
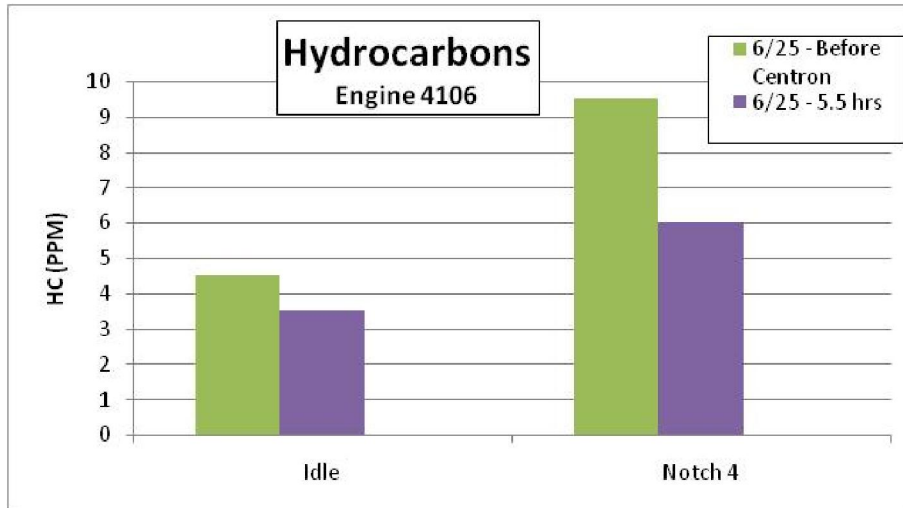
Model: GP-9

Engine: EMD 16-567C 1750HP

	% Change		
	Idle	Notch 4	Average
HC	-22%	-37%	-32%
CO	10%	-7%	0%
CO2	-7%	-2%	-4%
O2	1%	-1%	0%
NOx	-9%	-11%	-10%



HC and NOx Graphs – Toyota San Antonio, TX



Evaluation Results – EBSRR

East Brookfield & Spencer Rail Road

- Fuel Consumption reduced by an **average of 6.9%**
- EBSRR initiated the use of Centron fuel additive in Nov 2008
- EBSRR personnel reported an immediate reduction in exhaust black smoke & sparking, a noted concern of EBSRR
- Locomotives have remained free of visible black smoke w/ Centron
- Improvement in operating condition has been reported

MONTH	2008 Gal/Opr Hr	2009 Gal/Opr Hr
Jan	6.86	5.16
Feb	7.11	8.16
Mar	6.49	8.20
Apr	8.87	7.66
May	9.63	8.93
Jun	9.85	8.41
Jul	10.41	8.62
Average	8.46	7.88
% Change = - 7%		

Evaluation Results – Great Lakes Short Line Rail, MI

- Emission of hazardous **Hydrocarbons** reduced by an **average of 92%**
- Emission of hazardous **Nitrogen Oxides** **reduced by 34%**
- **GPH improvement of 7%**

EMISSIONS DATA						
TEST#	NOTCH	CO ₂	CO	HC	O ₂	NO _x
1	1	1.97	0.013	39	17.9	355
	5	4.42	0.011	58	14.19	747
AVERAGE OF TEST #1		3.195	0.012	48.5	16.045	551.0
5	1	0.065	0.009	4	19.74	102
	5	3.89	0.005	5	15.19	624
AVERAGE OF TEST #5		1.978	0.007	4.00	17.465	363
TOTAL REDUCTION		-1.218	-0.005	-44.50	1.420	-188.00
% IMPROVEMENT		38.1%	41.7%	91.8%	-8.9%	34.1%

Model EMD GP-40-3



Fuel Economy Data

	NOTCH		
	1	4	5
Difference in G.P.H.	1.4	2.4	2.4
% Improvement	13.6%	4.4%	3.4%
Average % Improvement	7.1%		

Evaluation Results - Conclusion

- Centron reduced hazardous **Hydrocarbons** by **32% - 92%**
- Centron reduced hazardous **Nitrogen Oxides** by **10% - 34%**
- Centron improved **Fuel Economy** by an **average of 7%**
- Centron removed **Visible Black Smoke & Sparking**
- Centron improved **Operating Conditions** at both idle & notch positions
- Centron produced **Immediate & Sustained Results**



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