

On January 26, 2010, we furnished a CS138K hydrogen generator unit to be used in a dynamometer test to determine the effects of Hydrogen Assist on the emissions of a diesel engine. The engine used was a Caterpillar 3126 Marine Engine of 7.2 liter displacement. The engine had about 60 hours of operation when the test were performed, and as installed on the dyno there were no emissions control devices. The dyno was owned and operated by Hawthorne Machinery of San Diego who provided us with the raw data sheets.

The President of California Environmental Solutions LLC took samples of exhaust emissions at various RPM settings and HHO production using a certified ECOM gas analyzer. California Environmental Solution is certified by the state of California to perform emissions test in the field to determine compliance with the state's pollution standards.

As a normal starting point on a diesel engine, 1/4 liter of HHO is injected into the air intake per 1 liter of engine displace, or 1.8 lpm for this 7.2 liter engine. For this test, we took reading at HHO production levels of 1 lpm, 2 lpm and 3 lpm.

Below are the pertinent results of the test. Shown are results at idle, 1600 RPM representing an easy cruise, 2000 RPM representing a fast cruise, and one at wide open throttle.

Idle	No HHO	1 lpm HHO	%Change	2 lpm HHO	% Change	3 lpm HHO	% Change
E.G.T.	238°	217°	-8.8%	163°	-31.5%	157°	-34.0%
O2	19.5%	19.9%	+2.1%	20.1%	+3.1%	20.5%	+5.1%
CO	230 ppm	110 ppm	-52.2%	130 ppm	-48.5%	97 ppm	-57.8%
NO	273 ppm	185 ppm	-32.2%	123 ppm	-54.9%	77 ppm	-71.8%
NO2	66 ppm	42 ppm	-36.4%	46 ppm	-30.3%	34 ppm	-48.5%
NOX	339 ppm	227 ppm	-33.0%	169 ppm	-50.2%	111 ppm	-67.3%
CO2	1.1%	.8%	-27.3%	.7%	-36.4%	.4% ppm	-63.6%

1600 RPM	No HHO	1 lpm HHO	% Change	2 lpm HHO	% Change	3 lpm HHO	% Change
E.G.T.	534	441°	-17.4%	435°	-18.5%	412°	-22.9%
O2	12.5%	15.7%	+22.6%	16.1%	+28.8%	18.1%	+44.8%
CO	200 ppm	121 ppm	-39.5%	128 ppm	-36.0%	80 ppm	-60.0%
NO	1,028 ppm	689 ppm	-33.0%	612 ppm	-40.5%	378 ppm	-63.2%
NO2	62 ppm	46 ppm	-25.8%	39 ppm	-37.1%	25 ppm	-59.7%
NOX	1,090 ppm	735 ppm	-32.6%	651 ppm	-40.3%	403 ppm	-63.6%
CO2	6.2%	3.9%	-37.1%	3.6%	-37.1%	2.1%	-66.1%

2000 RPM	No HHO	1 lpm HHO	% Change	2 lpm HHO	% Change	3 lpm HHO	% Change
E.G.T.	814°	743°	-8.7	743°	-8.7%	673°	-17.32%
O2	8.1%	13.1%	+62.0%	13.2%	+63.0%	17.3%	+113.6%
CO	1408 ppm	846 ppm	-39.1%	533 ppm	-62.1%	473 ppm	-66.4%
NO	1055 ppm	658 ppm	-37.6%	648 ppm	-38.6%	381 ppm	-71.0%
NO2	42 ppm	46 ppm	+9.5%	46 ppm	+9.52%	23 ppm	-45.24%
NOX	1097 ppm	704 ppm	-33.8%	694 ppm	-36.7%	407 ppm	-70.0%
CO2	9.5%	5.8%	-40.0%	5.7%	-40.0%	2.7%	-71.6%

2400 RPM Full Throttle	No HHO	1 lpm HHO	% Change	2 lpm HHO	% Change	3 lpm HHO	% Change
E.G.T.	737°	629°	-14.7%	619°	-16.0%	702	-4.8%
O2	10.3%	14.6%	+36.5%	15%	+45.6%	17.6%	+70.9%
CO	269 ppm	83 ppm	-69.1%	78 ppm	-71.0%	101 ppm	-62.45%
NO	1032 ppm	695 ppm	-36.0%	668 ppm	-35.3%	277 ppm	-73.2%
NO2	52 ppm	46 ppm	-16.4%	43 ppm	-17.3%	20 ppm	-61.54%
NOX	1084 ppm	741 ppm	-35.0%	711 ppm	-34.4%	297 ppm	-72.6%
CO2	7.8%	4.7%	-38.2%	4.4%	-43.6%	2.5%	-68.0%

