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More Smiles per Mile

Using Water-Methanol on Clean Diesels for Fuel Economy and Towing Power

BY RICHARD HOLDENER
PHOTOGRAPHY: RICHARD HOLDENER

We all own diesels for a variety of reasons, but the bottom line is that they offer the best bang for the buck, in terms of power and fuel economy. From a power standpoint, they not only offer superior torque as compared to their gasoline counterparts, they also offer a secondary performance benefit.

When it comes time to upgrade the power output of the stock motor, nothing compares to a turbo diesel. Adding a simple programmer to a gas motor can yield gains of 15 to 20 hp on certain applications. This is a drop in the bucket, compared to gains of 100 hp (or more) and 200 lb/ft of torque when applied to a turbo diesel.

The same can be said of water-methanol injection. While performance gains on a diesel motor are easily obtained, the vast majority of diesel owners cites towing power and fuel

mileage as the primary reasons for choosing a turbo diesel powerplant. The combination of impressive towing power and a dramatic increase in fuel mileage over a traditional gas motor makes the diesel a no-brainer.

As much as we love diesel motors in stock trim, we can't leave anything stock for long, especially when the performance mods simultaneously yield improvements in fuel economy. Let's face facts: A full-sized turbo diesel truck is not going to knock down hybrid-like fuel mileage. Trucks are big, heavy and not terribly aerodynamic, but they provide a valuable service. When it comes to heavy hauling, one pumped-up Duramax turbo diesel is worth a whole fleet of tiny, little hybrid motors.

Despite the obvious dichotomy, diesel owners are every bit as interested in improving their fuel economy. As luck would



To illustrate the performance and economy offered by the MPG-MAX system from Snow Performance, this 2008 Silverado was first run on the chassis dyno.

have it, the MPG-MAX, from Snow Performance, offered a desirable combination of performance and economy. Toss in the fact that the improvements in performance and economy came with



Impressive even in stock trim, the 6.8L Duramax motor produced 245 hp and 556 lb/ft of torque at the wheels.

built-in safety features, and you have one impressive system. After all, adding a ton of fuel to improve the power output of a diesel motor is pretty easy. Doing so with the proper safety margin requires considerably more research and development.

To establish the benefits of Snow Performance's MPG-MAX water-methanol injection system, we followed along with ICM as its crew put a 2008 Chevy Silverado equipped with an LLM Duramax engine to the test. The idea was to verify both the performance and fuel economy gains offered by the fully programmable water-methanol injection system on one of the newer-generation clean diesels.

The performance portion of the equation was simple enough, requiring only direct back-to-back dyno testing on Kaz Motorsport's Dyno Dynamics (load-bearing) chassis dyno. Rather than run the usual mixture, ethanol was substituted in place of methanol. The two alcohols share similar caloric (energy) and burn characteristics, so the choice was more one of regional availability.

Run in stock trim, the Duramax produced peak numbers of 245 hp and 556 lb/ft of torque at the wheels at a peak boost pressure of 28 psi. After tuning the MPG-MAX system, the peak numbers jumped to 297 hp and 674 lb/ft. There was obviously consider-

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The MPG-MAX system offers a sophisticated 2D digital controller and multiple (mpg and power) modes to provide precise tuning of the water-methanol (or ethanol) injection.

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To prepare for the installation of the MPG-MAX, it was necessary to remove the aluminum inlet elbow.



Removing the factory air intake provided access to the bolts that secure the aluminum intake.



Here is a shot of the removed intake manifold. Take care to cover the inlets to protect them from debris. Note the soot buildup from the EGR system.

ably more power to be had with increased injection—but the goal was not maximum power; rather, it was a beneficial combination of improved torque (for towing) and fuel economy.



Once removed, the intake elbow was drilled and tapped to accept the supplied nozzles.



Here, the nozzles have been inserted into the elbow. Two nozzles allow the motor to run in "MPG" or "Power" mode. The two can also be combined to offer additional power.

Having verified the power gains, it was time to test the fuel economy.

Before getting to those results, however, a few words are in order on test procedures. Multiple methods are available to test fuel mileage, but (unfortunately) each method offers inherent inaccuracies. Many modern vehicles offer fuel mileage computers, but these are wildly inaccurate.

For fun, compare the average fuel economy supplied by the ECU and onboard display to the actual mileage verified by gallons used, compared to odometer mileage. Even this method is inaccurate, because it is difficult to fill the tank exactly the same on each fill-up. The fill-up is affected by usage, temperature (air and fuel), angle of the vehicle and even the nozzle position in the filler neck.

Recognizing the potential problems with each method, the boys at ICM came up with an intricate solution to eliminate the variables. Fuel tanks (both diesel and water-ethanol) were constructed and positioned in the bed of the vehicle. This method

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Exhaust gas temperatures are critical on modified diesel applications, especially ones that tow, so ICM installed this EGT probe to log the temperatures during testing. A full set of gauges is always recommended on serious tow or modified diesels.



To properly measure the amount of fuel and water-ethanol supplied to the motor during testing, ICM designed these fuel tanks and mounted them in the bed of the truck. The dedicated fuel tanks allowed precise measurements of the fuel usage.

eliminated many of the problems, including inaccurate measurements and variables in fuel temperature. All the diesel fuel and water-ethanol used by the engine in the test cycle could be directly measured and verified.

Having the proper test rig, all that was left was to drive the test route with and without the water-ethanol and measure fuel (and water-eth) usage. To further illustrate the gains offered, the test procedure was duplicated while towing a 7,000-pound trailer. To improve the repeatability and accuracy of the results, four runs were made in each configuration at identical speeds and loads.

Tested in stock trim without the trailer, the 2008 Silverado managed 16.27 miles per gallon. This dropped to 9.65 miles per gallon lugging the heavy trailer over the same test route. After introduction of the MPG-MAX water-ethanol system, the fuel economy improved to 17.78 miles per gallon without the trailer (a 9.3 percent improvement) and 12.54 miles per gallon lugging the trailer (29.9 percent increase).

Obviously, the results indicate that the Duramax was relying on the MGP-MAX system considerably more while lugging the trailer but offered measurable gains even without it. Every bit as important was the fact that although the MPG-MAX system greatly improved the towing power and mileage, the system did so while decreasing the all important EGTs. And according to

TEST RESULTS

Average Cost per Mile: Stock vs. MPG-MAX

As we have come to expect, the Snow water-ethanol injection system offered significant improvements in power. The peak numbers jumped from 245 hp and 556 lb/ft of torque to 297 hp and 674 lb/ft of torque.

In addition to the power gains, the MPG-MAX system improved the (towing) fuel economy by nearly 30 percent. Included in the mix was improved safety, because the water-ethanol injection decreased both the inlet air and exhaust gas temperatures. This safety feature is critical for towing applications, especially over those long grades!

2008 Duramax Stock vs. Snow Performance MPG-MAX

TOWING

Cost per mile	STOCK	MPG-MAX
(\$4 per gallon) diesel	\$0.38	\$0.328
(\$1.50 per gallon) 50% ethanol		\$0.022
Total	\$0.38	\$0.35
<i>\$15 savings per 500 miles</i>	\$190	\$175

EMPTY

Cost per mile	STOCK	MPG-MAX
Diesel	\$0.25	\$0.225
Ethanol		\$0.008
Total	\$0.25	\$0.23
<i>\$10 savings per 500 miles</i>	\$125	\$115

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The MPG-MAX pump was also fed by a dedicated fuel tank. Note the shutoff valve that allowed the motor to run with or without the MPG-MAX system.

Snow, its MPG-MAX system does not affect the new generation of emissions equipment. In fact, Snow claims the more consistent and clean burn reduces the soot buildup on the DPF, which slows the need for regeneration.

Even considering the additional cost of the water-ethanol mixture, the MPG-MAX lived up to its claims by offering substantial power and economy gains. Since most diesel owners log serious mileage on their trucks, the savings can be considerable over time. Most owners would be satisfied with the power and safety offered by the system—but toss in fuel economy, and you've got one potent system.



This test apparatus was used to measure the fuel.

A water-methanol system is something to look into if you tow heavy loads and have installed any type of aftermarket programmer that is already boosting EGTs. The reduction of EGTs under heavy load, especially in hot weather (during which the inter-cooler may not be working as thermally efficiently as it would in cold weather) is, alone, worth the price of admission. DW

SOURCE

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Run on the chassis dyno after installation of the Snow Performance MPG-MAX system, the 6.6L Duramax produced 297 hp and 674 lb/ft of torque (gains of 54 hp and 108 lb/ft). The power gains were combined with fuel economy improvements as high as 29.9 percent (while towing).