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MAGAZINE

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# PROJECT BLACK MAX

## POWER AND USABILITY COMBINED IN ONE COMPLETE PACKAGE

BY RYAN HARRIS

The Cummins may be the true diesel among diesel fanatics, but there's nothing like the feel and sound of a compression-ignition V8.

Our latest in-house Duramax project has had us working a few different areas for horsepower. This big, black beast is a 2005 Chevrolet Silverado 2500 HD with the LLY version of the 6.6-liter Duramax diesel engine. Its transmission had already been upgraded with a Sun Coast Stage 4 kit. And the fuel system had been tweaked to provide more fuel to the rails via a modified single CP3 and PPE fuel pressure relief valve race plug. It also has slightly larger-than-stock injector nozzles that originated from Dynamite Diesel Performance.

But this setup was built for a turbo

charger, but not by a whole lot. What we were after was, as usual, more power. That would take a bigger turbo and some modifications to the fuel system. We started out the project in the August issue of Diesel Tech with the install of a Silverline 4-inch turbo-back exhaust. That exhaust system has proven to be a durable, well-built system that flows ample amounts of hot exhaust gasses and provides a toned-down, unique rumble for the Duramax.

### CLEANER DIESEL, BETTER FUEL

Our next installation was an AirDog II fuel/air separator. What makes the AirDog II unique from other AirDog lift pumps is the adjustable fuel regulator. There is a small external screw near the pump that controls how much pressure

the AirDog II pushes to the CP3. For our application, we needed it to push 150 gallons per hour at about 9 to 10 psi to the CP3, so that when we experienced heavy fueling at wide-open-throttle, upstream pressure to the CP3 would not drop to 0 psi. Should that happen, the lift pump essentially becomes a blockage in the fuel line, starving the CP3 and common rails for fuel.

Another aspect of the AirDog II that appealed to us is the way it utilizes the stock fuel pickup inside the fuel tank. With that feature, we didn't need to poke a hole in the fuel tank and drop in a suction tube. Suction tubes are great, but they can't pick up fuel at near-empty tank levels like the stock basket can and drilling holes in the fuel tank is always something we'd like to avoid on a daily driver. PureFlow



Technologies, makers of the AirDog, recommends drilling two holes in the sides of the fuel basket so that fuel can enter the basket before the higher flow rates suck the basket dry. So you will still need to drop the fuel tank. The AirDog II also utilizes all of the stock fuel lines and connections for an easy installation.

Mounted to the truck, on the frame rail below the cab, the AirDog II is exceptionally quiet. We used a rubber pad between the pump housing bracket and the mounting bracket to further dampen noise and vibrations, but the pump itself hums at a very quite buzz. You cannot hear it running over the sound of the engine at idle. We've been in several trucks where that is not the case.

Why do you even need a lift pump

(top left) The AirDog II features new connectors that maintain the factory lines and avoid splicing the filler neck for the fuel return.

(top right) Our AirDog II unit installed on the frame rail ahead of the fuel cooler.

(middle left) Instead of drilling a hole in the fuel tank and installing a straight suction tube, AirDog has you drill two holes in the stock fuel pickup's fuel basket so there is no way for the pump to suck the basket dry and loose push pressure to the CP3.

(middle) The AirDog II features an external adjustable pressure regulator so you can dial in just the pressure you need for your lift pump application.

(bottom left) The smaller air channels of the T3 exhaust pedestal (left) compared to a T4 help the larger Aurora 5000 charger to spool quick like a small charger.

(bottom center) The ATS Aurora 5000 turbo has a large compressor housing and is capable of building 60 pounds of boost.

(bottom right) To bypass the EGR, we took the up pipe off, cut off the EGR tube and welded a cap in place.



(top left) The Aurora 5000 turbo with the intake and charge tube installed on our LLY Duramax.

(top middle) It's important to add a rubber grommet to protect the water line coming through the bed sheet metal.

(top right) The Snow Performance Boost Cooler pump is easy to mount and install.

(bottom left) The Aurora 5000's compressor wheel.

(bottom middle) The Aurora 5000 features a v-band clamp that holds the compressor housing in place. Being able to remove that allows for easy access to the engine valley for CP3 maintenance.

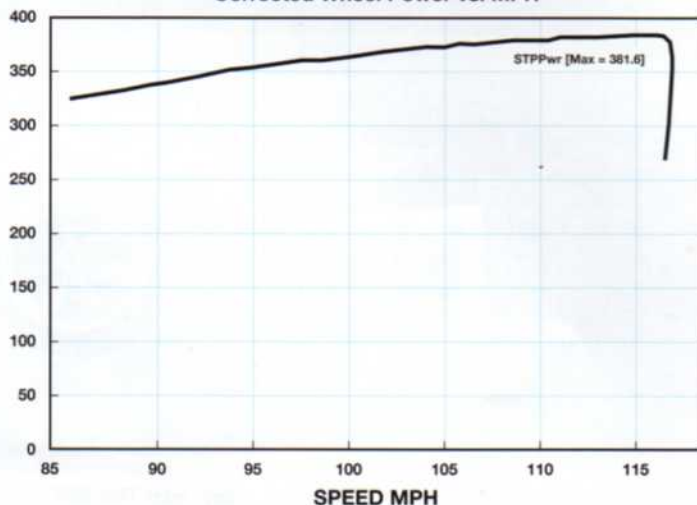
(both charts) This is our towing tune, an EFI Live map built by Powerlabs. The top run shows the what the towing tune does on its own. The power curve is perfect: No spike, just a smooth steady flow of horsepower. When we add a 75-percent water, 25-percent methanol blend and spray it, the towing tune picks up just a few horsepower, but the EGTs during the run dropped about 75 degrees.

like the AirDog in the first place? The benefits of the water and air separation are reason enough to install one on any truck. Diesel fuel, when agitated, has greater tendency to trap air (notice how it foams when you fill a fuel tank?) than other fuels. That air stays in the fuel all the way to the injector nozzles, where it affects the spray pattern and density of the fuel being injected. The AirDog removes the air (and any water) from the fuel and sends pure, clean diesel fuel to the injection system. That makes power and improves overall power train efficiency, resulting in better economy as well.

On the power side of things, a 500-horsepower truck can pull a lot of fuel. The CP3-style fuel pump is a suction pump. It is mounted in the valley of a Duramax engine

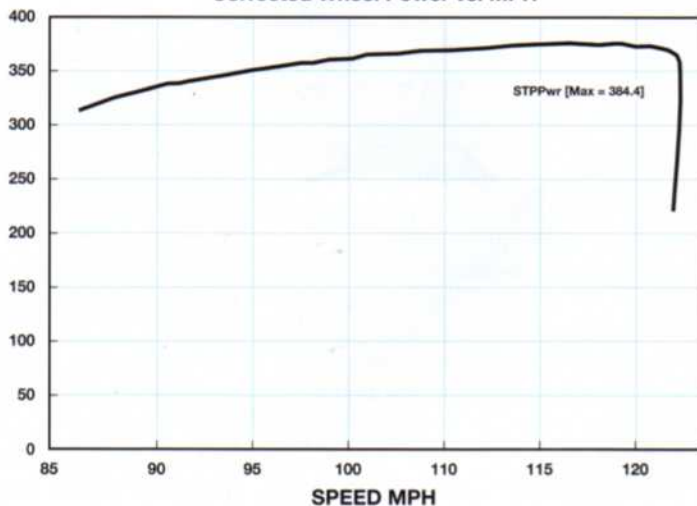
### EFI LIVE CUSTOM TOWING TUNE

Corrected Wheel Power vs. MPH



### TOWING TUNE W/ 75/25 WATER METHANOL BLEND

Corrected Wheel Power vs. MPH





and pulls fuel to itself from the fuel tank. It has to overcome the restriction of the fuel filter and the fuel tank's basket and fuel pickup assembly, not to mention about 10 feet of fuel line. That's a lot of work for the CP3, but it can handle it just fine on a stock engine. The hotter the tuning in the ECM, the harder the CP3 has to work to get fuel past those restrictions and turn

around and push it into the fuel rail at 26,000 psi. Using the AirDog as a lift pump pushes fuel to the CP3 at about 9 psi (that pressure is adjustable on the AirDog II), so there's not chance of the CP3 running out of supply fuel and starving the fuel rail—a key power-loss factor in hot common rail diesels. The AirDog II is a no-brainer addition for all these reasons.

### LIGHTS OF THE AURORA

We couldn't wait too long before we messed with the turbocharger. We turned to ATS Diesel for an Aurora 5000 charger for this Duramax project with installation help from Custom Auto. Many of you may be getting ahead of us and might be thinking that the Aurora 5000 is more of a racing turbo than a daily driver or towing



Ryan Bean's 2002 F-350 with 2005 Cummins Conversion

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(opposite page top left) With the Snow Performance Boost Cooler kit, we installed two nozzles in the cool side of the charge system. A boost sensor located behind the near nozzle reads boost for the control box.

(top right) The Stage II Boost Cooler system lets you set the start pressure and the max boost pressure. The delivery rate of the water/methanol is linear between these two points. You can adjust for different applications, like setting the max 10 or 15 psi above the truck's actual boost max, getting a low, manageable rate of delivery.

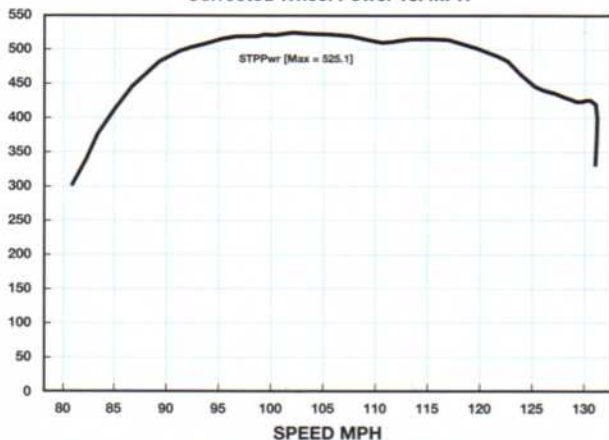
(bottom left) The Iron Bull bumpers and Lightforce flood and fog lights give the truck a unique appearance.

(bottom right) We towed this setup from Spokane, Washington, to Salt Lake City, UT, without any issues with the Duramax.

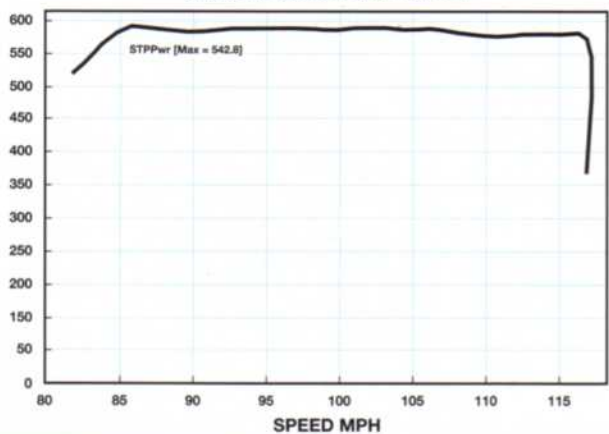
(both charts) These two dyno runs from Custom Auto's Superflow dynamometer show what the top race EFI Live custom tune is doing. The top chart is fuel only; the bottom has the same 75/25 blend of water/methanol (note how water methanol makes more horsepower with a hotter tune). You can see on these charts how the truck runs out of fuel long before it runs out of air. If we weren't worried about head bolts and rods, we could throw a ton of fuel at it and have a line that mimics the towing tune—increasing until the engine ran out of rpm. But we are worried, and so we'll never know...

charger. And that it might have boost capabilities that would exceed the strengths of the Duramax engine's stock head bolts and connecting rods. Certainly it could, with aggres-

**EFI LIVE CUSTOM RACE TUNE**  
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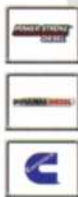
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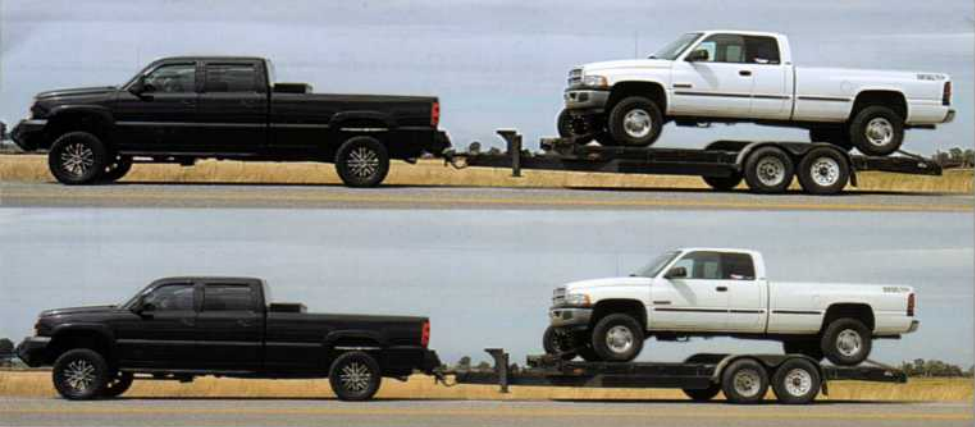
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sive tuning. But you don't always have to build a race truck just because you have a big turbo. You can take a charger like this, match it with a semi-hot tuning map and have a reliable, powerful, usable truck with a very broad range of power. That was our goal. Did we reach it? Check out the dyno sheets and see for yourself.

We have been around several Duramax trucks running over 40 lbs. of boost and putting more than 600 hp to the rear wheels on stock engine hard parts. It's not widely recommended to take that chance on stock internals, but we feel safe with the Aurora 5000 on this truck with these fueling capabilities. And our confidence lies partially with the turbo and the T3 pedestal and partly with the EFI Live tuning (which we'll get to later). Basically, we're running this charger at about 80 percent of its capacity with tuning that maximizes its power output below 40 lbs. of boost pressure.

The Aurora 5000 is surprisingly quick-spooling for a compressor wheel and housing this large. The tight T3 pedestal creates turbine pressures that

equate into fast spool-up. The end result is a quick truck that is fun to drive around town and at the track. And it handles towing without much worry. We recently hauled a 10,000-lb. trailer load from Spokane, WA, to Salt Lake City, UT, and back to Idaho Falls, ID, with this charger and a meaty towing tune. On flat stretches of interstate, the truck could maintain 80 mph at 1,000 degrees F on the EGT and about 12 psi of boost in fifth gear. We did have to keep an eye on the EGT gauge on inclines and manually drop a gear when the needle hit 1,250 degrees F and leave it there until the incline ended. Dropping out of overdrive would kick the boost up to 18-20 psi and bring egts back down to below 1,100 degrees F for the duration of the climb. When we were on stretches of highway where speeds were limited to 65 mph, the truck spent more time in fourth and egts hovered around 850 degrees F with the higher boost pressures. We never ran out of power in fifth gear, even with the heavy load. As you can see in the dyno chart from the towing tune, the engine builds power as it goes. There's just no point in stressing

(top left) The trailer load resting solely on the factory leaf springs, and the load supported by the Ride-Rite helper air bags. The difference has a tremendous effect on road handling in the tow vehicle.

(top right) The in-cab gauge and control is easy to use and read. The compressor for the air bags mounts beneath the bed.

(bottom left) The Ride-Rite air bag mounted between the axle and the frame rail.

(bottom center) Colby Hulse assembles the air bag system.

(bottom right) The 20-inch Mamba Type M3 wheels are the icing on the cake for this big, black Chevy.

transmission shafts and running too hot EGTs when there's not a race to win.

We'll admit we were hesitant at first about throwing the Aurora 5000 under the hood of a truck we were relying on as a daily driver and towing vehicle.



Some similar applications we've tested and ridden in seem to labor too much to light the turbo in around-town driving, especially if there's a trailer in tow. But the Aurora 5000 has been a pleasant surprise, performing far better in those conditions than we ever hoped it would. It's made the big, heavy truck a blast to drive and a mean one to pull up next to at a rural stoplight.

## COOL AS SNOW

Heat is always an issue to consider, whether building a towing vehicle or a race truck. Heat robs power, wears components like seals, rings and gaskets, causes premature wear and can lead to catastrophic failure. The best way to combat heat is to decrease fuel delivered during combustion or increase airflow. But that is at the sacrifice of power. What we'd really like is a product that can battle charge air and exhaust gas heat while adding horsepower instead of robbing it. That product exists and it's found in a Snow Performance Water/Methanol injection system.

Powerlabs Diesel installed our Snow Performance Stage 2 Boost Cooler kit,

with a seven-gallon reservoir for increased range on a vehicle that spends extended time periods on the road.

During some closely-watched testing periods with no load in or behind the truck, here's what we found. On uphill climbs at freeway speeds, the truck without water/methanol would pull the climb at 18 lbs. of boost and hold egt temps of 1,070 degrees F. With the Boost Cooler control set to start spraying at 12 psi and max out at 50 psi (which turned out to be about 6 psi above this truck's max boost), and the system on and running with a 50/50 blend of methanol and water, egt's dropped to 990 degrees F and turbo boost increased to 22 psi (in the same gear as the test run without water/methanol). It makes power and provides a net decrease in exhaust gas temps, not to mention a drop in charge temp as well. Is the Snow Performance Boost Cooler system worth the money? You bet. Where else can you get more power and lower egt's in a simple, easy-to-use package?

## POWER FROM THE PC

We also took advantage of switching

(top left) The Viper Electronics digital two-way remote shows all sorts of information, like remaining run time.

(top right) The seven-gallon Snow Performance water tank sits off to the side of the bed while the Better Built single lid crossover box cover the front of the bed. The SEC-series box features upgraded handles that better match the style of the factory GM handles.

from a hand-held programmer to EFI Live custom tuning while the truck was at Powerlabs Diesel. We built five custom programs and installed a 5-position DSP switch for on-the-fly changing ability between the tuning maps. For the five tunes, there is one "stock" map, which uses the original LLY map with a little fuel pulled out to compensate for the DDP nozzles. The second tune is a towing tune, the third is a street driving tune (low smoke, but still quick), the fourth and fifth are both race tunes, with the fifth map having the most top-end fuel.

Custom tuning allows you to take the local altitude and specific driving habits and demands into consideration.

*Continued on page 52*

### SOURCES:

**CSilverline Diesel Exhaust**  
ANSA Automotive  
ansaaautomotive.com

**ATS Diesel**  
866-209-3695  
atsdiesel.com

**Snow Performance**  
866-365-2762  
snowperformance.net

**Broadway Ford Body Shop**  
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**PureFlow Technologies**  
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**Dynomite Diesel Performance**  
360-794-7974  
dynomitediesel.com

**Firestone Ride-Rite**  
ride-rite.com

**Powerlabs Diesel**  
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powerlabsdiesel.com

**Mamba Wheels**  
mambawheels.com

**Better Built**  
dawsbetterbuilt.com

**Iron Bull Bumpers**  
ironbullbumpers.com

**Titan Tanks**  
titanfueltanks.com

**Viper Electronics**  
viper.com

**Sun Coast Converters**  
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suncoastconverters.com

**Royal Purple Oil**  
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**Ideal Audio**  
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idealaudio.net



Continued from page 34

We run between 4,500- and 6,500-foot elevations and do everything from midnight runs to Wal-Mart to 2.8-class sled pulls.

The dyno charts tell the story of what this package is capable of and the value of good EFI Live tuning. In the towing tune, the engine builds power in a long, steady, climbing line right up until the engine runs out of RPM. The truck runs as good on the road with a trailer as it looks on paper on a dyno. The same goes for the hotter race tune. Even though it runs out of fuel (purposefully), it maintains a broad power delivery range. Not a spike and a slow decline in power, but broad power that translates into useable power at the tires.

## BACK SUPPORT

Since this is a truck and not a show car with an oversized trunk, it actually gets worked. Early on in the process, we spent some time in the Custom Auto shop installing a set of Firestone Ride-Rite air bag helper springs with

the Firestone Standard Duty Air-Rite air system. The Air-Rite is an on-board mini-compressor with an in-cab switch and pressure gauge. You can monitor and adjust air bag pressure at any time from within the cab. We usually had Ride-Rite air bags on most of our trucks in the past, but this is the first time we've gone the extra step and installed the Air-Rite compressor. It is worth every penny, especially on vehicles that tow trailers or see payloads on a weekly or daily basis. We haven't had to touch an air hose and we love it.

## CAN YOU BREAK A 20?

Normally, we care as much about wheels as we do stereo systems—in that if it doesn't make it faster, why do you want to read about it? However, a blacked-out Chevy like this one deserves a little flair. Mamba 's Type M3 20-inch wheels gave the truck a finished look that we weren't getting with the all-black wheels we had on it previously.

We were originally going to run a

set of Toyo Open Country A/T tires, but found some research indicating that diesel pickups get more miles out of a set of M/Ts. The jury's still out, but either way, a set of 33x12.50R20 tires are definitely not cheap. From a cost standpoint, going with the A/Ts would have saved us about \$20 total, so we're glad we went with the M/Ts so far.

## BUILT BETTER

We certainly don't mind accessories that serve a valuable purpose. The Better Built crossover truck box has left us with a good impression. Unlike other boxes we've used that have wound up having latch problems or easily warped lids, this black diamond plate Better Built single-lid crossover box is tough as nails. We've loaded it with everything from fishing gear to tool sets and crammed it so tight with luggage bags on rainy trips that we had to sit on the lid to get it shut. We've cinched dirt bikes up against it and hit it with ATVs. In short, we've treated it the same as the rest of the truck—by beating the hell out of it. It continues to function as new, and the finish has held up great as well.

The Iron Bull front and rear bumpers really gave the Chevy a look of its own. The stout bumpers are available in several configurations, for winch setups or otherwise. A set of smoked Lightforce lights add the finishing touch.

We'll also get to a full DT Tested product review on this in a later issue, but we've also installed a Viper Electronics remote start/security system on the truck, although we went with the Viper 5901 system more for the remote start aspect, all of its features have proven valuable. The Viper 5901, installed by Ideal Audio in Idaho Falls, ID, is loaded with features that set it apart from other remote start systems. First, it has a 2-way responder so that you can read data on the LC3 key fob display. You can see if the engine is running and the time left before it shuts itself down; whether the vehicle is locked and armed or not; text displaying "door open" or "shock sensor" if an alert is sent from the vehicle and other display features. You can customize the 5901 system with timer starts, custom run times, runtime extensions, etc. Living in the cold region that we do, having a remote start system is almost a necessity. The Viper 5901 system is a luxury. **DT**

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