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**454ci
DURAMAX
BUILDUP**

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- HOW IT'S MADE:
DURAMAX FACTORY TOUR

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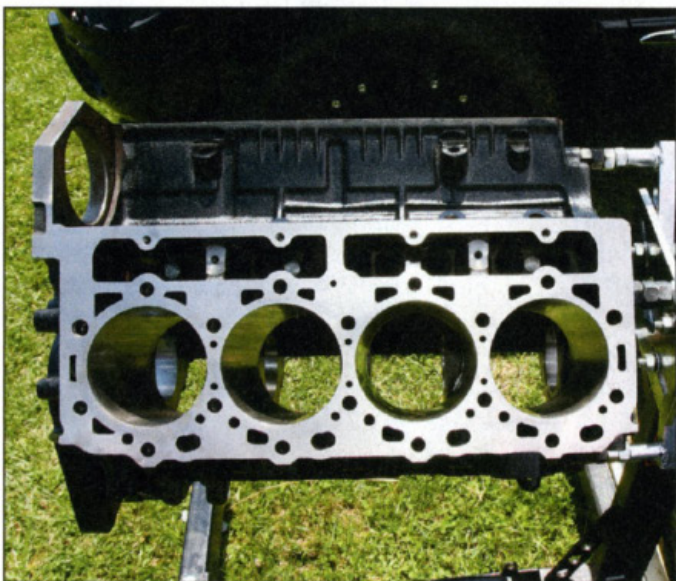


THE 454 RETURNS

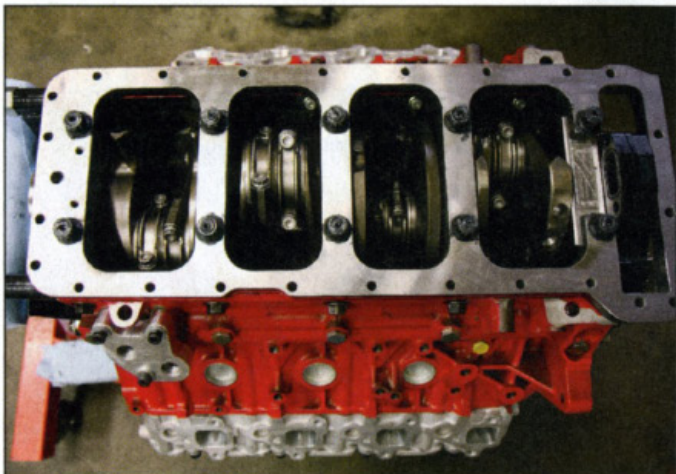
THIS TIME, AS A 1,300HP DIESEL

The 454ci big-block gasoline V-8 may be one of the most coveted, recognizable powerplants ever cast by General Motors. Its large displacement and big bore gave it the kind of low-rpm power a small-block owner could only dream of. Back in the '70s and '80s, the 454ci (7.4L) GM big-block separated the men from the boys.

Today, another engine, also built by the General, is changing the diesel enthusiasts' world: the 6.6L (403ci) Duramax. With common-rail direct-injection, aluminum cylinder heads, six head bolts per cylinder, and turbocharging as standard equipment, it's the powerplant of choice for many hot-rodders, drag racers, and sled pullers alike. And—just like in the days of old—the die-hard Duramax fans are after the same thing: horsepower.



Fleece started with a bare 6.6L Duramax block and had it magnafluxed to ensure no cracks or defects existed. When the block checked out OK, each cylinder was bored to accept a ductile, high-tensile-strength sleeve made by Darton (the engine now features a bore of 4.185 inches). After that, the block was decked to square the cylinder head mating surfaces to the cylinders. Then the engine block was reinforced by filling it halfway up with HardBlok water jacket filler. Once the HardBlok cured, the engine received a final torque-plate hone to ensure each cylinder was perfectly round.

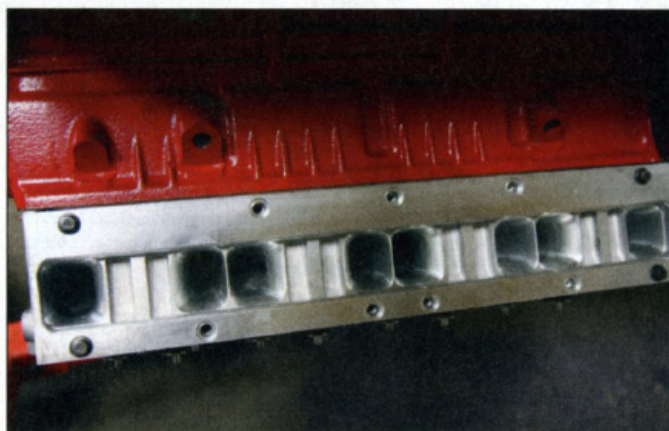


The 454 Duramax's bulletproof bottom end assembly began with a SoCal Diesel stroker crankshaft (0.250-inch longer stroke). The main bearings were align-honed with a set of ARP main-bearing studs securing billet-steel main-bearing caps. One of Fleece Performance's 4140 billet-steel girdles was utilized to increase block rigidity, torsional stiffness, and eliminate any main-bearing-cap walk at high engine speeds.

When we heard a rumor that the folks at Fleece Performance Engineering were putting together a 454ci (7.4L) Duramax, we had to see it for ourselves. So we headed to its shop in North Salem, Indiana, to get a look at a one-of-a-kind engine built to be used in a 3.0 Class sled pulling rig. If this is any indication of how Fleece's new, big-block, Duramax engine program will operate, the Cummins camp will definitely have its hands full. **DP**



Forged Carrillo connecting rods and forged pistons from Mahle round out the rotating assembly. The pistons feature custom fuel bowls designed to excel with a short-duration combustion process. The pistons were also fly-cut to match the increased-duration camshaft. In addition, Fleece reworked the factory piston cooling oil jets (boring them larger) for increased oil flow to the bottom of each piston.



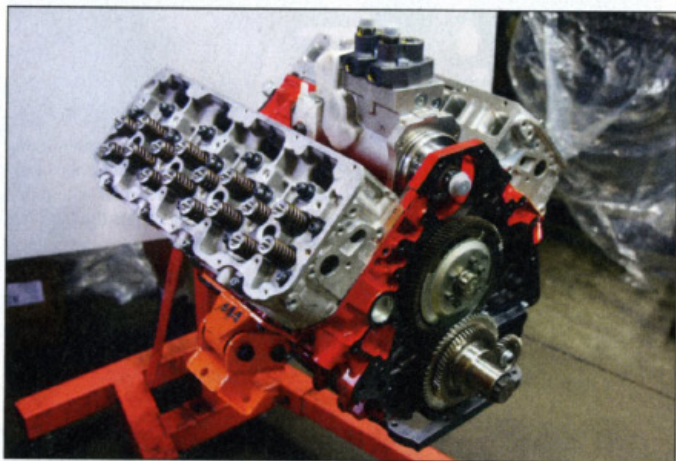
The stock, aluminum cylinder heads were CNC-ported and received a three-angle valve grind, and fire-rings were cut and installed (fire-ring grooves were also cut in the block). Cylinder head cooling will be handled by a Meziere Enterprises electric water pump. Glow-plug-deleting plugs from SoCal Diesel were also threaded into each cylinder head.



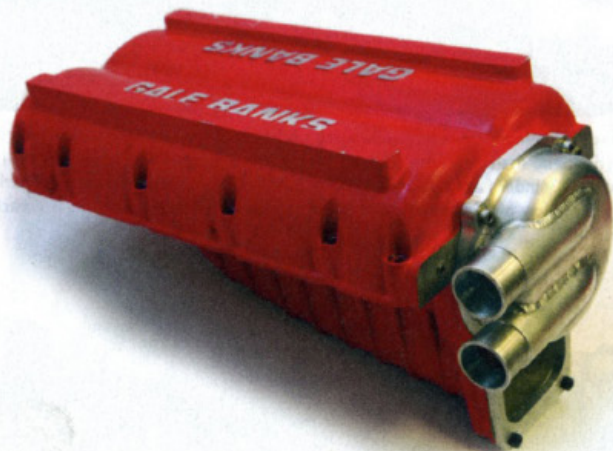
The custom-ground camshaft came from SoCal Diesel. The Duramax uses a large-diameter camshaft, so SoCal can get pretty radical with its cam profiles without experiencing any camshaft flexing at higher speeds. The Duramax engine architecture also places the camshaft high up in the block, which means shorter pushrods (for less pushrod flex at high speed), and more room for the stroker crankshaft.



In this high-performance application, solid copper head gaskets were used for the best seal possible between the cylinder heads and the block (arrow), and also because factory gaskets aren't available for the bore size of each cylinder in this particular application. A set of ARP 625 head studs secure the heads to the block.



The additional bore of the engine allowed Fleece to utilize large, 35mm intake and exhaust valves, which will be essential in allowing the big-cubic-inch Duramax to breathe properly. SoCal Diesel provided the stainless steel intake valves, Inconel exhaust valves, springs, retainers, and 0.083-inch-wall-thickness chromoly pushrods.



Because the folks at Fleece felt the stock LBZ intake manifolds would be a detriment to the type of airflow they were after, and due to the fact that they wanted to utilize an air-to-water intercooler, plans for something truly unique were put on the table. Fleece contacted Gale Banks Engineering to order an air-to-water intercooled intake that Banks uses on its Duramax boat engines. The aluminum intake features individual intake manifold runners (as shown in "800hp Twin-Turbo Duramax Crate Engine," Sept. '10). Take note that the intake charge will enter the intake manifold from the rear of the engine.



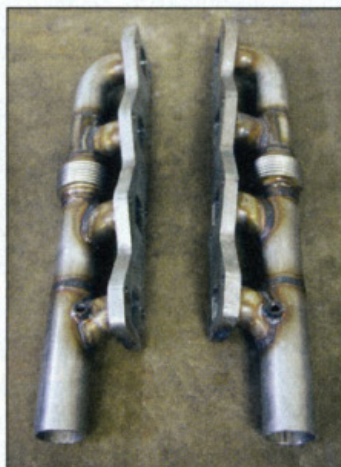
Here you can see the Gale Banks Engineering intake's individual runners, the air-to-water intercooled intake (upside down), and the cupronickel-alloy heat exchanger core (the copper material comes from the marine world, where it's used in order to withstand constant exposure to saltwater). As intake air passes through the heat exchanger, it will be cooled from 400 degrees (compressor outlet temperature) to a cool 33 degrees when it enters the cylinder heads. The Banks intake will be supplied with the 100 gallons per minute of water (at roughly 4,800 rpm, engine speed) that it needs to operate via the factory water pump. The intake also leaves the factory CP3 mounting location uncorrupted, but Fleece will be relocating the turbocharger to the passenger side of the engine.



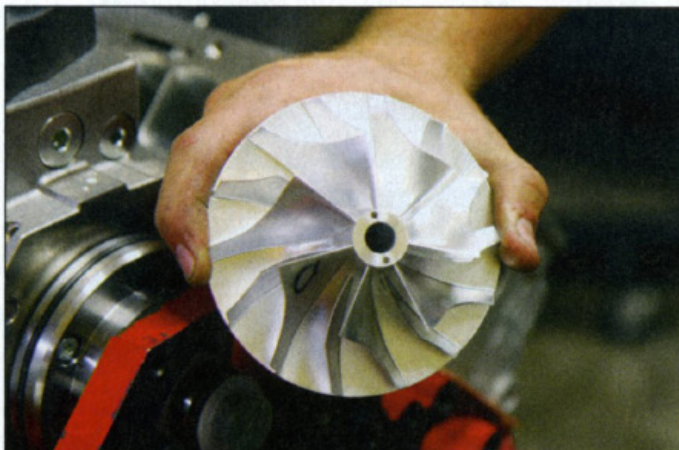
Twin 150-gph AirDog fuel systems will supply fuel to two CP3 injection pumps. Both CP3s are Industrial Injection units that are rated to flow 120 percent more than stock. The first CP3 will retain its factory mounting location (at the front of the lifter valley), while the second pump will be driven via a custom accessory belt drive.



A set of Bosch Motorsport LBZ injectors flowing 385 percent more fuel than the factory units will deliver diesel into each cylinder. Short duration is the strategy here—lots of fuel will be delivered very fast. According to Fleece, these injectors are designed to maximize fuel delivery for short-duration, high-rpm applications.



A set of ProFab Performance headers built by Rick Lance will direct exhaust from the cylinder heads toward the front of the engine, in order to work with the custom turbocharger system (where the compressor will face the firewall for the shortest intake path). All exhaust plumbing will be ceramic-coated before being installed in the vehicle.



This massive, yet lightweight, billet-aluminum compressor wheel will kick-start the forced-induction process. Its inducer measures 3.2 inches in diameter, and it will reside inside a BorgWarner S480 turbocharger.



A huge, 10-blade, 96mm turbine (inducer dimension) wheel will sit in the big 1.32 A/R exhaust housing—that's just under 3.8 inches. The turbocharger inlet on the turbine side will be mounted via a T-6 mounting flange and spent exhaust gases will exit the turbine through a 5-inch-diameter stack in the hood.



Before the Duramax ever sits between the frametrails of a pulling truck, the engine tuning will be handled by Brayden Fleece during a visit to the engine dyno. As you may have guessed, Fleece expects a four-digit horsepower number—but we wouldn't be surprised if more than 1,300 hp is achieved with just the large, single turbocharger.

Sources

ARP

(800) 826-3045 • www.arp-bolts.com

Banks Power

(866) 602-4308 • www.bankspower.com

Bosch Motorsport

(248) 876-2977 • www.bosch-motorsport.de/content/language2/html

Carrillo

(704) 664-2515 • www.cp-carrillo.com

Fleece Performance Engineering

(765) 676-5063 • www.fleeceperformance.com

Industrial Injection

(800) 955-0476 • www.industrialinjection.com

Mahle Motorsports

(888) 255-1942 • www.mahlemotorsports.com

ProFab Performance

(816) 200-8934 • www.profabperformance.com

SoCal Diesel

(661) 775-5620 • www.socaldiesel.com