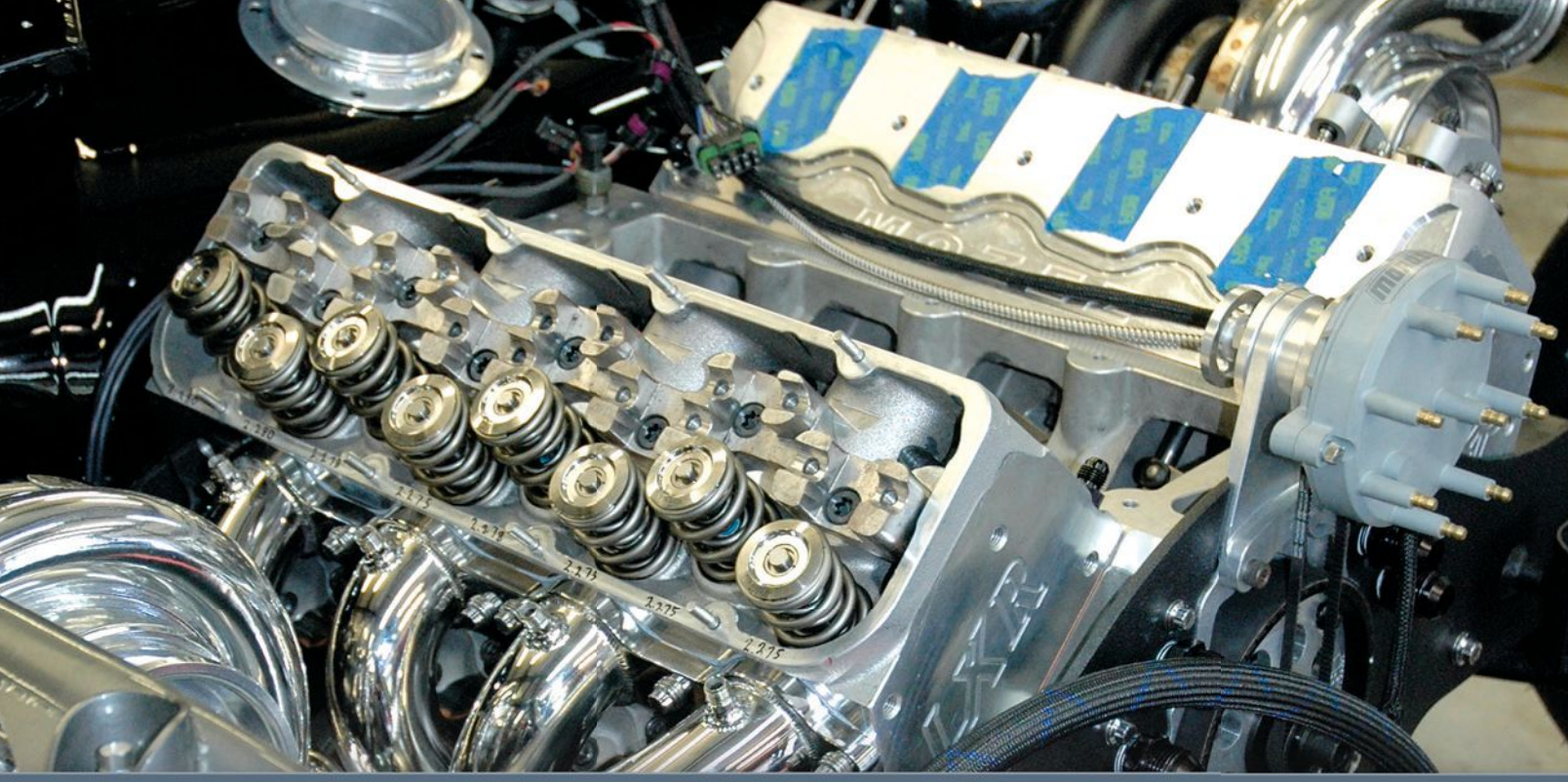


DRAG RACING

READ UP ON THE RAPID ADVANCES UNDER WAY IN THE LATEST SELECTIONS OF DRAG RACE CYLINDER HEADS.

THE essence of drag racing is acceleration, and in a market more competitive than ever, new cylinder heads appear at an accelerating rate. "The engineering advancements are moving faster than ever," noted Kevin Feeney of Racing Head Service (RHS), Memphis, Tennessee, "due to the increasing demands of today's drag race engines, where ever-larger cubic-inch displacements demand increased airflow through the heads."

"Steeper valve angles and taller ports continue to be a trend," added Tony Mamo of Air Flow Research (AFR), Valencia, California, "as well as physically larger ports with more cross-sectional area meant to feed larger engines—or small engines turning higher rpm. Increasing net valve lift also continues to be a trend as cam and spring manufacturers push that envelope a little further each year."

Market Evolution

Mike Downs of Trick Flow Specialties, Tallmadge, Ohio, sees the market evolving into three segments, "based on performance expectations, durability and cost.

"The first and largest category is street or entry level," he observed. "It's also known as performance replacement, claimer, bolt-on, etc. Whatever you want to call it, this category typically includes the budget-friendly, mild performance cylinder heads that are a step or two up from OEM equipment.

"The next category is competition-use cylinder heads," continued Downs. "These are the high-end racing heads designed to deliver significant performance increases and assembled with the highest quality components. This category is generally the most expensive because applications are specialized, and many times custom-tailored to suit the needs of a race engine program.

"The third is a middle level that has been growing for the past several years, and typically includes applications like high performance street, weekend bracket racing, etc. Enthusiasts at this level tend to do their own research. They have established a performance goal for their engine project, and they know what products are available and even have an idea of what other components are needed to make the cylinder heads function as a system," he concluded.

Like Downs, Mike Schropp of Livernois Motorsports, Dearborn Heights, Michigan, sees a segmented market. "We've recently introduced our Street Series, targeted toward customers who see a fair amount of street time, but also take their car to the race track. Among their key features are components such as valves, guides, springs, etc. that work well in either environment. Then there's the prep and machine

BY JOHN F. KATZ

CYLINDER HEADS

work that goes into making them. We designed them to be the ultimate value, the biggest bang for the buck.

"Our Pro Series heads are targeted toward customers who will see more time at the track and push their engines even harder: longer track sessions, more runs, more heat, more abuse," he added.

Successful Sales

Bill Mitchell Products (BMP) of Ronkonkoma, New York, reported "exceptional" sales of cylinder heads in the past year. "We've succeeded by not blowing smoke about airflow, air velocity, pinch, or whatever the current catch-phrase may be. Instead, we sell our heads based on their proven capability," said Bill Mitchell Jr. "We ask, 'How much horsepower do you realistically want?' And if the answer is, say, 700, well, our big block Chevy head has been used in hundreds of our own engines that have produced as much as 1100 real-world horsepower. So it's certainly capable of 700 hp. But you have to build the rest of your combination to tap into its potential. Everyone simply wants to bolt on a set of cylinder heads with magical horsepower that powers it, and it just is not that simple. It takes a combination to make horsepower! We can only supply part of the equation. The rest is up to the engine builder to get the rest of it right."

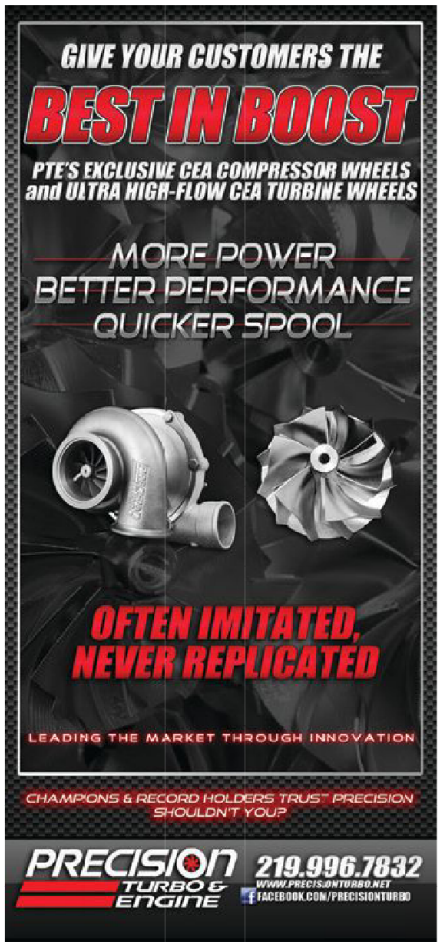
BMP has purchased the entire line of aluminum heads, engine blocks and manifolds formerly sold by the World Products brand. "We've upgraded our machining capabilities, our processes and our foundry tooling," said Mitchell, "so much so that we have virtually an entirely new product line. The quality is second to none, and all the manufacturing is done here in America."

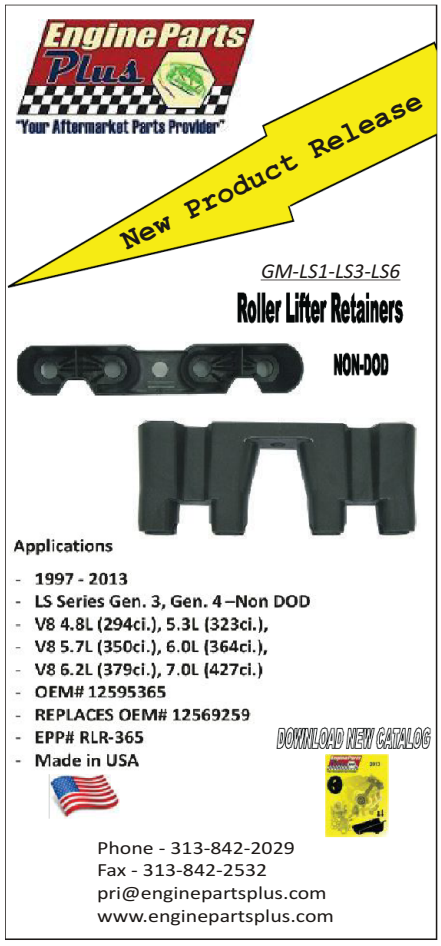
Shortly after we spoke with Mitchell in October, BMP announced that Engine Parts Warehouse (EPW) of Louisville, Kentucky, had acquired the World Products cast iron cylinder head and block division.

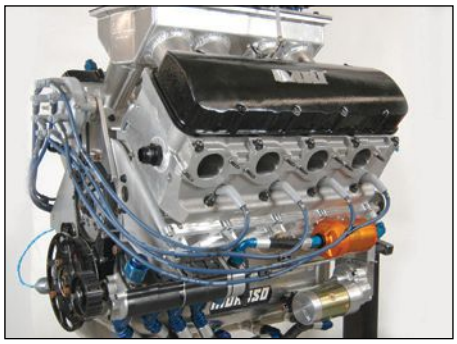
Feeney, of RHS, explained, "One of the biggest hurdles we face is educating the consumer about airflow, and making accurate comparisons when researching a new head for their application. The average consumer just wants to compare advertised flow numbers and assume that the head with the highest cfm is the best. This could not be further from the truth. It takes more than just a big cfm rating to make an engine run. There are numerous tricks of the trade that can enhance the results on a flow bench, but do not ensure that an engine will perform. We concentrate on the quality of the flow, not just the quantity; and on the proper balance to ensure the engine will operate at peak performance. This is why we have developed options for a variety of bore sizes, which require different valve sizes and locations in the cylinder to optimize performance."

Building Big

"We keep finding ways to coax more power out of cylinder heads that are based on 50-year-old designs," observed Jack McInnis of Dart Machinery, Troy, Michigan. And one of the best examples remains the big block Chevrolet.







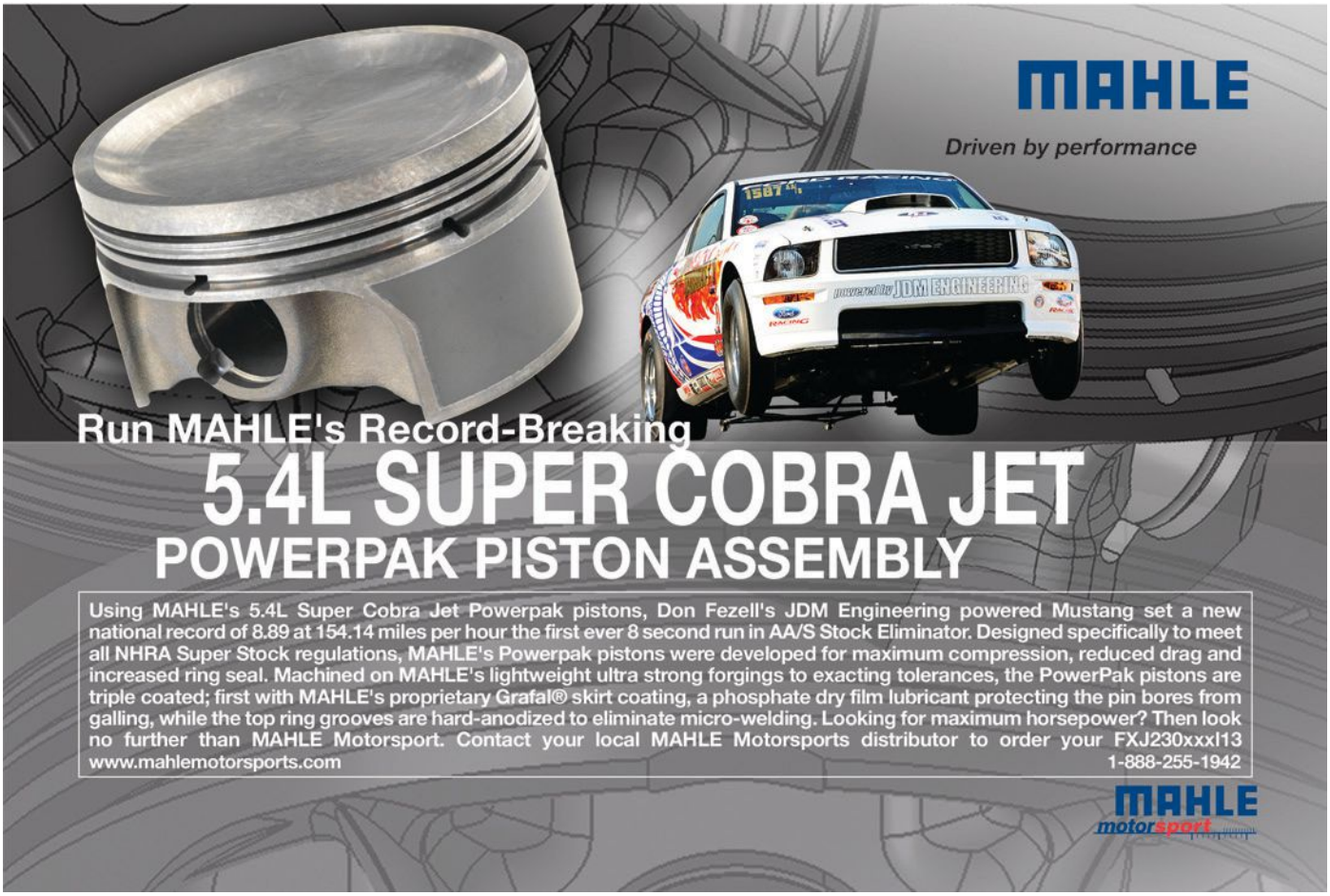
New and improved cylinder heads are appearing in drag racing's ranks at an accelerating rate. These advancements are moving faster due to the increasing demands of today's drag race engines, where ever-larger cubic-inch displacements demand increased airflow through the heads, reported one manufacturer. Photo courtesy of Dart Machinery.

"Our latest and greatest new head is our SR20," noted Jason Neugent of Brodix, Mena, Arkansas, "a conventional-style, big block Chevy head with a 20-degree valve angle. It's fully CNC-ported, with 440cc raised, oval-style ports; and it flows over 500 cfm." Another significant feature of the SR20 is its small combustion chamber—just 95cc, "for customers who are trying to get a little more compression without having to do it all with the piston—or by milling a bunch of material off of the head. Typically, with our conventional-style heads we can get down to 112 or even 110cc;" the smaller-still chambers of the SR20 required an entirely new casting.

Neugent expects the SR20 to be a hot seller in bracket racing. "It was originally designed for the Texas Pro Stock Association, and we've seen interest among truck pullers as well."

Curtis Boggs of Race Flow Development (RFD), in Virginia Beach, Virginia, confirmed a growing demand for big block heads with the stock valve location, especially among "racers who can't afford these fancy heads that need their own pistons and other specialized parts. So we've done a lot of development on those heads. We've released some new port programs for Brodix castings—for example, we have a version of their SR20 that flows 550 cfm." RFD also helped develop the ports for the Edelbrock BV3 head described below; and continues to specialize in custom porting for Pro Stock, Pro Stock Motorcycle and other drag race classes.

"We've done a lot more conventional-style, cylinder-head-and-manifold combinations," added Mike Weinle of Weinle Motorsports, Cleves, Ohio. "Customers want big horsepower without spending a lot of money; that's always been true, but in the last couple of years the cylinder head manufacturers have released a new generation of conventional heads that make a lot more horsepower than before. Based on my own experience racing Pro Stock, I've always steered



customers toward the Big Chief-style heads, which used to make 200 more horsepower than conventional heads. But with new technology, conventional heads have now closed the gap to 100 horsepower or less."

Meanwhile, "the trend toward ever-larger, big block Chevrolet engines continues," said Rick Roberts of Edelbrock, Torrance, California. "Five-inch-bore-spacing blocks and related parts are now readily available and affordable. We offer a cylinder-head-and-manifold package for five-inch-bore-space blocks from Dart, Brodix, Sonny Leonard and Donovan that is unique in architecture, and will fill the void for the ready-to-run sportsman combination in this emerging market. Our BV3—BV stands for Big Victor—is a symmetrical-port head similar to the GM DRCE3 used in Pro Stock. It will be available in both 4.84- and 5.00-inch bore space, both with matching manifolds. And for the traditional spread-port customer, we have expanded our line to include 12-, 14- and 18-degree versions, again each with matching manifolds."

Roberts also pointed to the industry's continuing "advances in foundry technology," which contribute to "the quality of the castings." One such advance is Hot Isostatic Pressing, or HIPping, which uses heat and a high-pressure inert gas to squeeze the internal porosity out of a casting without altering its dimensions. "We are now HIPping all our race castings to improve the properties of the metal as well as overall strength."

"Dart always puts a tremendous amount of effort into maintaining the high quality of our US made castings," said McInnis, "because a good casting is essential to producing a good part. Much of what we've done this year has been incremental development. We've made structural changes in certain castings to accommodate the increasing valve-train demands our customers are placing on these heads. We have revised some port designs and added larger-diameter valves. Our 380 PRO2 big block head has received a re-worked intake port and a 2.350 valve, which has demonstrated significant power gains. We have also developed a new port for our 15-degree, small block head."

Sonny's Racing Engines & Components of Lynchburg, Virginia, has developed yet another super-big-bore head, this one a symmetrical-port wedge head for a 5.000-inch bore spacing. "We had input from Pro Line Racing and other turbocharged engine builders," said Sonny Leonard. "We can machine it with or without water jackets for turbo applications, and the version with water has excellent flow." Sonny's will offer various runner volumes—all CNC-machined—to accommodate engine displacements ranging

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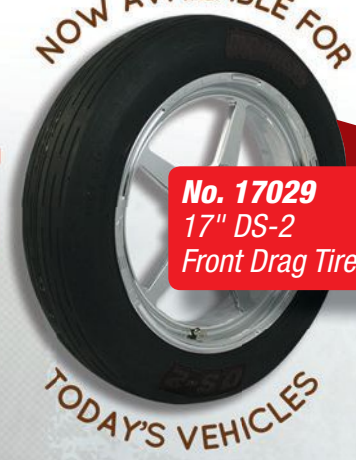

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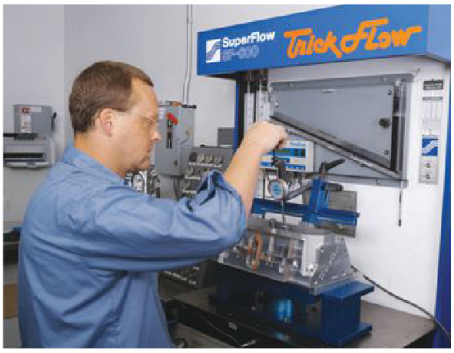


One supplier sees the drag race cylinder head market evolving into three distinct segments, based on performance expectations, durability and cost. He cited the first and largest category as street or entry level, where the budget-friendly, mild performance cylinder heads that are a step or two up from OEM equipment are popular. Competition-use cylinder heads are for high-end racing, while the middle level, which he said has been growing for the past several years, typically includes applications like high performance street, weekend bracket racing, etc. Photo courtesy of Trick Flow.

from 500 to 650 cubic inches.

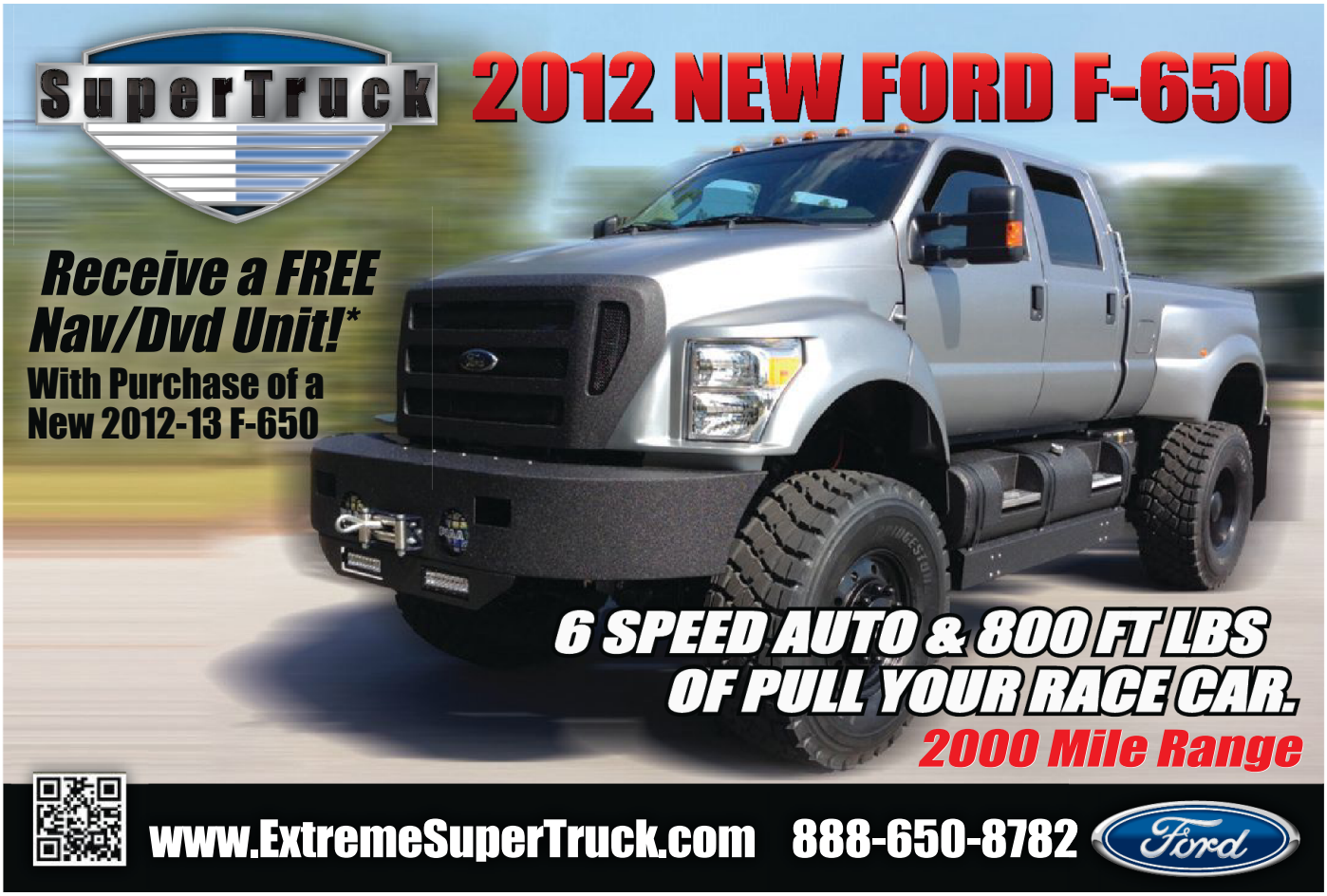
Sonny's has also designed a solid billet hemispherical head with a 4.900 bore spacing for NHRA and ADRL Pro Modified. "It features ultra-high intake ports for more CFM," Leonard noted. "The high port also helps the air/fuel mixture remain in suspension through the short turn into the combustion chamber."

Trick Flow Specialties developed and built the 565-cubic-inch Chevy big block that powers the American Racing Cars dragster that was part of the prize package awarded to 2012 Summit Racing SuperSeries Top Class Champion Tim Butler. "That engine has modified Trick Flow PowerPort 360 cylinder heads," said Downs, "and a massaged R-Series intake manifold. We saw 1013 peak horsepower on the dyno."

Alan Johnson Performance Engineering (AJPE) of Santa Maria, California, specializes in "solid billet cylinder heads designed to withstand severe environments," said Rick Wilkinson. "We ask our customers a series of questions about their specific expectations, as well as their specific application. Then we can recommend the valve material, seat material, spring package, etc. that will best fit their particular engine combination."

AJPE's newest cylinder head is a Top Fuel Hemi Stage 7. "We've increased the intake valve diameter," Wilkinson noted, "which in turn allowed us to increase the size of the port and substantially improve airflow capacity, which in turn increased power levels.

"We also offer a 5.300 Hemi engine package," he continued. "During 2010–2011, we developed and tested a brand-new 5.300-inch-bore-space supercharged Hemi engine for the unlimited classes. We started from a clean sheet of paper and designed a Hemi engine with a large bore diameter, raised cam centerline, auxiliary front drive assem-



bly, and the ability to run reliably at over 10,000 rpm."

MBE of Mooresville, North Carolina, has released new heads for a range of applications. A new 5.000-inch-bore-space head, based on a Brodix casting, "is capable of flowing 594 cfm through 2.570 intake valves, and 378 cfm from 1.820 exhausts," said Matt Bieneman. "An asymmetrical layout that tunes each port individually maximizes the flow."

A "clean-sheet design" Hemi head for alcohol and Pro Mod, Bieneman continued, is cut from aluminum billet, rather than any existing casting, and flows 590 cfm through the intakes. Additionally, MBE has significantly updated its 11 degree Big Chief with new intake and exhaust ports "developed to maximize airflow and port velocity. It will flow 360 cfm through the exhaust using the same 1.800-inch valve" as MBE's previous 11 degree Big Chief design. And the company has released new versions of the Dodge P5, Chevrolet SB2.2, and traditional Chevrolet small block heads.

More for LS

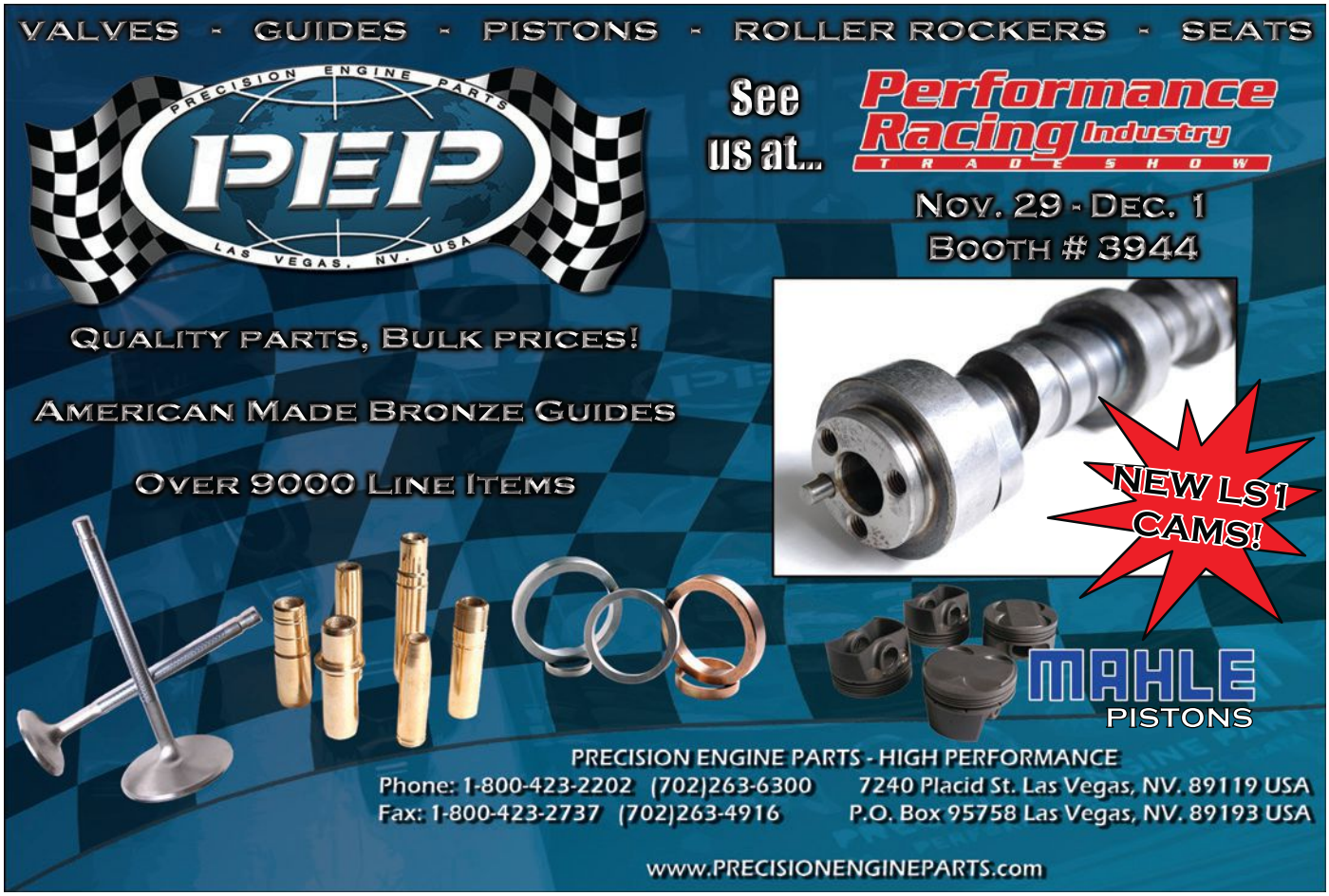
RHS, said Feeney, "continues to focus on the later-model engines and most recently on the LS engine platform. We now offer a Big Port (307cc) intake runner option to handle larger-cubic-inch engines, or smaller engines turning very high rpm. As always, we've kept it simple by not requiring special rocker arms. We fit it with a 2.250 intake valve, but it can accommodate a 4.065-inch bore.

"We also have an LS7 head to fit small-bore engines, which allows racers to take advantage of the wealth of small-bore engines that are available and upgrade them to an LS7 head—which flows a ton of air on a 3.900 bore and even more on a 4.000 or 4.065 bore. As with all of our heads, these feature thick deck surfaces and port walls to handle boosted and nitrous applications."

Brodix based its BR7 head on the GM LS7, and is currently developing a new casting that will accept a larger valve spring. "Most LS7 engines are limited to 1.340-inch spring diameter," Neugent explained. "We're developing a head that will take a 1.550 spring, so you can also run more cam. But, of course, once you modify the casting, all the stock pieces go out the window. It will need sheet-metal valve covers and a shaft-rocker system, but we're lining up suppliers for those parts as well."

AFR, said Mamo, is "developing a set of LS3 castings that we hope to have on the market by the spring of 2013 that have some unique attributes and geometry that should make it a sought-after product for us next year."

For the traditional Chevrolet small block, AFR is "excited about a new raised-runner, in-line 15-degree head



that flows an enormous amount of air—about 400 cfm," said Mamo. "And it's a bolt-on piece that's not much different to install than a 23-degree head."

For the old-style Chevy small block, Edelbrock has released "a new big-port 23-degree head and matching manifold," said Roberts, "that take the good old small block to the 700-plus horsepower range with relative ease."

Focus on Ford

When we spoke in October, Mamo told us that AFR had also spent much time during the past year designing a bolt-on big block Ford head. "It features a unique intake port and chamber design that's more efficient than the aftermarket Ford factory offerings and the handful of products already out in the field," he said.

C&C Motorsports, Manassas, Virginia, specializes in blocks and heads for the Ford 429, including hemispherical heads cast from 356T6 aluminum and featuring raised intake runners and modified water jackets for standard or raised exhaust ports, according to Carroll Carter. Solid (that is, no water jacket) versions are also available, with ports developed in conjunction with Bamber Racing in Bolivar, Missouri, specifically for blown alcohol applications. Combustion chambers can be 86 or 93cc; intake valve sizes range from 2.280 to 2.550 and exhausts from 1.800 to 2.000 inches. Best of all, these heads are direct bolt-on replacements for original Boss or Ford Motorsport A441 heads.

Trick Flow expects to debut a "totally revised" Twisted Wedge for the small block Ford. "Geared toward mid-level performance and racing," said Downs, "our new Twisted Wedge 11R features a new casting with revised intake and exhaust valve angles. Assembled heads will be fitted with lightweight valves and valve springs." Options include CNC Street Port and CNC Competition Port runner finishes, plus several choices in port and chamber volume.

Customized Work

JDE Cylinder Heads and Manifolds in Lynchburg, Virginia, focuses on the individual racer's cylinder heads and will customize and develop the heads according to the particular racing program. "I can actually tailor to your race program," Joel Dubose explained. "What I do is create my own program and my own CNC work, and then I can deliver to you a completed cylinder head."

There are different departments at JDE, and "one of them is where I provide cylinder head programs and castings," Dubose noted. "The other part of it is that I'm a custom shop and I do development work all the way to the point of if I need to come to your shop and help you develop it on the dyno. I can recognize what's going on with the motor—with the cylin-

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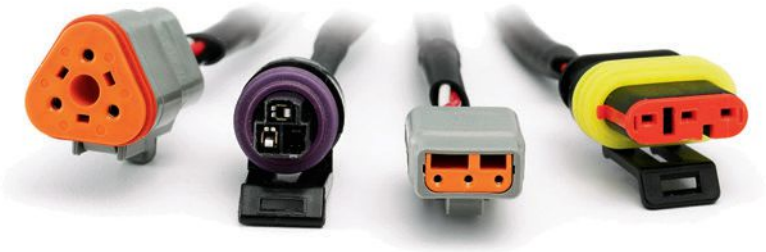

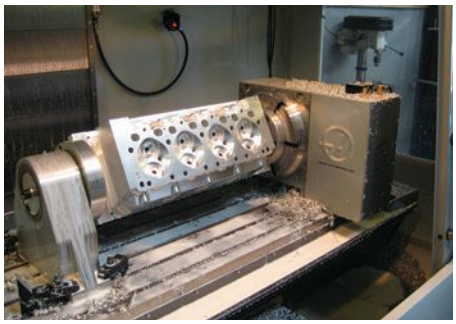

In the current economic environment, reported one cylinder head manufacturer, the emphasis is on longevity. And one way to make a part last longer is to be able to update it with the latest performance tweaks. In addition, Noonan Race Engineering works with budget-minded racers as the company will take back existing cylinder heads, freshen them up, machine new ports, and re-grind the seats for the bigger valves.

der heads and airflow package—on the dyno and make adjustments to the cylinder heads that will help improve them."

The Australian Influence

Australians love drag racing at least as much as their American counterparts—and in fact use many of the same engine platforms. So it shouldn't surprise us that some advances in cylinder head design are coming up from Down Under.

For example: The new Air Strike symmetric-port, canted-valve, small block Chevy head from Pro-Filer Performance Products of New Carlisle, Ohio. "We have several sets running now in Australian Pro Stock, and doing very well," said Mike Green. "Small blocks are following big blocks now, where bigger is better—and Australia's Pro Stock division is based on the small block. We have an Australian dealer, RC Performance, who builds small blocks, and they helped with the development work. We've run a couple of sets on Comp Eliminator cars in the US, and it looks like it's going to be a very good piece" when it's released for sale here in 2013.

The Air Strike head accepts intake valves up to 2.260 and exhausts to 1.600; the intake runner volume is about 370cc. "It will support as big an engine as you can make out of a small block," he added.

In the current economic environment, reported John Noonan of Noonan Race Engineering (NRE), Yatala, Queensland, Australia, "the emphasis is on longevity." And one way to make a part last longer is to be able to update it with the latest performance tweaks. NRE designed its X1 line of cylinder heads for blown alcohol Hemis; the latest and greatest X1 Blackhawk features revised porting that can also be machined into X1 Outlaws and other previous-model X1 heads. "We will take back existing cylinder heads," Noonan explained, "freshen them up, machine the new ports in them, and re-grind the seats for the bigger valves"—4.280 intakes versus 4.250. "And the changeover is only around $1800."