VOLUME 38, NUMBER 6 | JUNE 2023

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ON THE COVER
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ACCOUNTING

PAYABLES
Lily Huang

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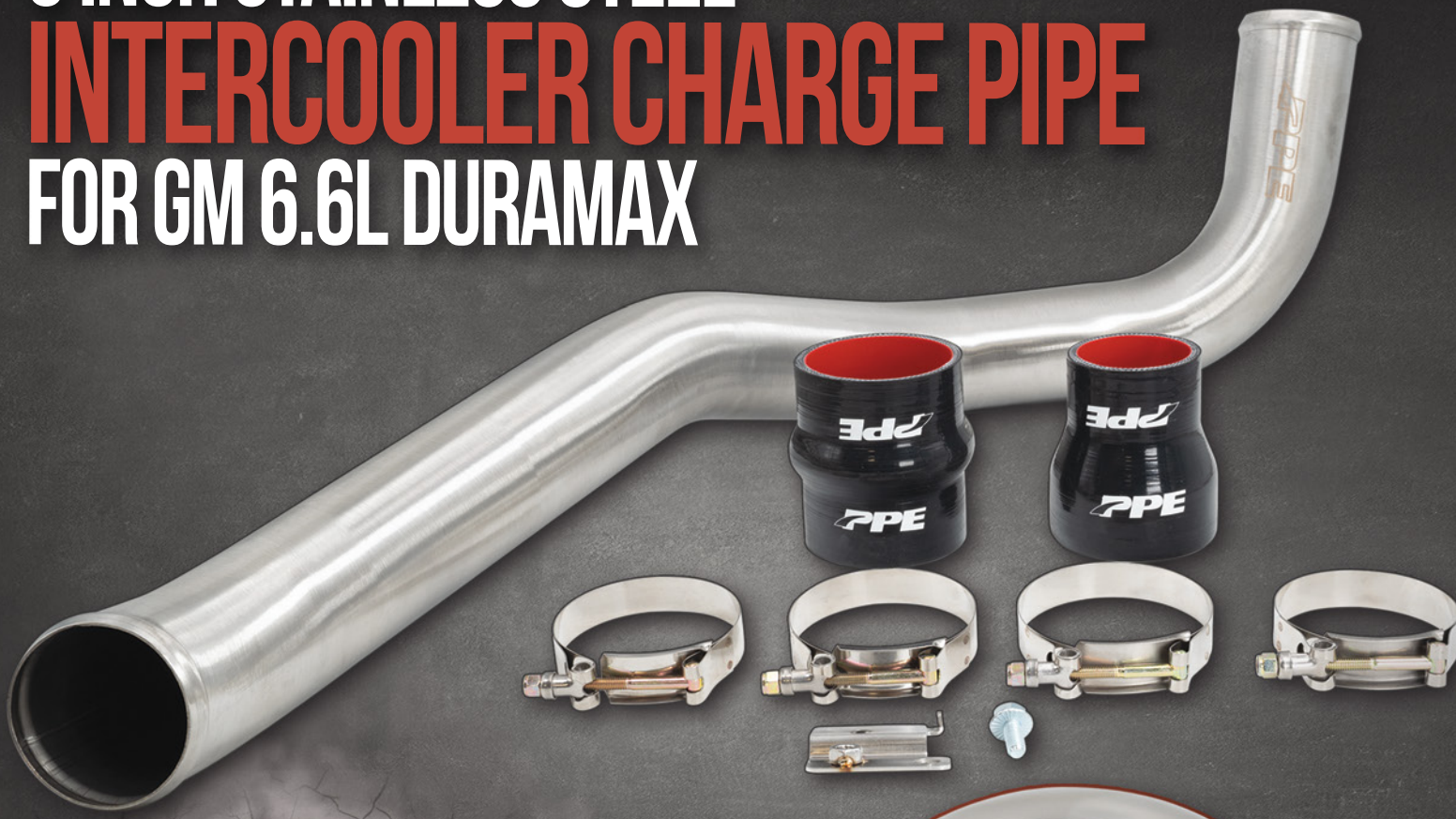

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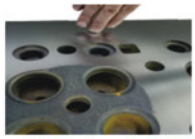

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FEATURED VEHICLES

Resourcefulness is the theme of this month's Featured Vehicles with a Camaro built for Drag Week in a one-car garage while a one-of-a-kind build combines Ford power with a BMW chassis.

2002 BMW 325I

CHAD ANDERSON | WESTLAND, MICHIGAN

RACE SERIES/CLASS: GRIDLIFE, Lake Erie Pro-Am Series, Riverside Drift Series, Drift Indy

ENGINE: 5.0L Gen 2 Coyote (factory long block with upgrades including supercharger, billet oil pump gears, and gapped piston rings)

CAR: Built and fabricated by Chad Anderson

FEATURES: Silver's North America two-way coilovers, Wisefab angle kit, Formula Drift spec roll cage, full S550 Mustang interior swap, Konig Countergram wheels, Big Duck Club widebody, Seems Legit Garage axles, Ford 8.8 differential

FACTS: Anderson's background is in engineering, which puts his skills and creativity to the test to create all the necessary one-off components for this one-of-a-kind build. "This car is extremely special, blending a modern Ford powerplant with a BMW chassis," Anderson explained.

2010 CHEVROLET CAMARO

SCOTT MILES | CRAWFORDSVILLE, INDIANA

RACE SERIES/CLASS: Drag Week

ENGINE: 871 blown big block Chevy on E85 built by Scott Miles and Greg Olin, dyno by BES Engines

CAR: Built by Scott Miles

FEATURES: Aeromotive, MSD, Summit Racing, Proform, AutoMeter, Holley, Mishimoto, Saldana Racing Products, Texas Speed & Performance, Jegs, TCI, Quick Fuel, Flowmaster, Speedway Motors, CVF Racing, Derale Performance, Driveshaft Shop

FACTS: Miles built this in his one-car garage.

ASK THE EXPERTS

OXYGENATED FUELS

Why it's important to understand the benefits, and limitations, of using fuel with a higher oxygen content.

By Drew Hardin

Introducing more air into the combustion process is a sure-fire (pun intended) way to increase power. Getting that extra air into the combustion chamber can take many forms, from air/fuel mapping to forced induction or nitrous oxide injection.

Another means is through the use of fuel with a higher oxygen content than conventional race gas.

OXYGENATED FUEL

We have the US Environmental Protection Agency (EPA) to thank for pioneering the use of gasoline with extra oxygen content. As Ron Finney of Renegade Race Fuel in Bowling Green, Kentucky, explained, oxygenated fuels "were developed and used by the EPA to lean the air/fuel mixture to try to reduce hydrocarbon emissions. People figured out that with more oxygen in the fuel, you can burn more fuel in a given period of time. It doesn't require as much outside air, so you can burn more of it and make more power."

"The oxygenates used in fuels are mainly ether or alcohol-based molecular compounds that carry

"OXYGENATED FUEL CAN AID IN COMPLETE COMBUSTION AND LESS DISTURBANCE IN THE FLAME PROPAGATION IN THE COMBUSTION CHAMBER."

an oxygen molecule," explained Freddie Turza of VP Racing Fuels, San Antonio, Texas. "This enhances combustion and can assist the engine to become more efficient. Most of them also raise the octane value, the number value that relates to the resistance to detonation. Oxygenated fuel can aid in complete combustion and less disturbance in the flame propagation in the combustion chamber."

Because the oxygenates "dramatically change the Stoichiometric value of the fuel," Turza said, more of it has to be burned to make this additional power. "Also, this changes the BTU value. In most cases it lowers the energy of the fuel, requiring more to meet the same energy value of the previous fuel."

That means fuel systems need modification to run oxygenated fuels, including "greater output fuel pumps, injectors compatible with some of the oxygenates, or increased size in carburetor jets," Turza said.

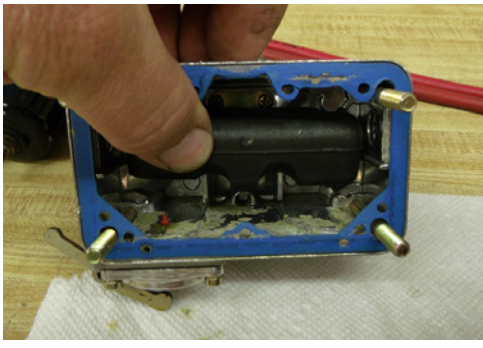
Oxygenated fuels can really help "the circle track racer or road racer where there's a lot of rapid acceleration and deceleration," said one of our sources. "That's where the benefit of the fuel's low- to mid-range torque improvement is key."

The hydroscopic nature of ethanol—it will absorb water out of the atmosphere—means racers shouldn't leave it in the engine for extended periods of time or risk damage to fuel system components, said BOOSTane's Ian Lehn. Carburetors, especially, can "get beat up by ethanol fuels," he said.

Both Finney and Turza pointed out that the oxygenated compounds in these fuels can be hard on fuel system components. "There are stories out there about some company's fuels that eat up the float bowls, eat up the jets, degrade the fuel system hoses, pumps, and everything else," Finney said. "That's just a product of putting too much oxygenate in the fuel. When done properly, there are things you blend in the fuel to mitigate that so there really are no negative effects to the engine."

A bigger downside, Finney believes, is that oxygenated fuels "have a shorter shelf life than a typical, non-oxygenated fuel product. For an automotive race fuel that's 5% oxygen, we say a year or a year and a half is a good shelf life." The fuel will still work beyond that period, he added, "just not at the level it was when it was still new."

That level—the amount of additional power produced by oxygenated fuel—can be misunderstood, Finney said. "Oxygenated fuels really tend to help the midrange, the acceleration of the engine. Everybody gets on



a dyno looking for peak numbers, and if that's all they're looking at, they may feel the 15 or 20 horsepower isn't really worth it for the cost of the fuel. But they totally forget to look at the dyno curve and how much torque increased in the midrange, how much acceleration increased. What moves a vehicle around a track or down a drag strip is that acceleration. We try to get engine builders and racers to look at the whole dyno curve before they make the decision whether it's worth it or not."

ETHANOL

Another way to introduce more oxygen into the combustion process is through the use of an ethanol fuel blend, such as E85. "Ethanol has some incredible benefits to it, especially from a performance standpoint," said Ian Lehn of BOOSTane, Cincinnati, Ohio. "But we want to manage expectations, so racers understand the world they're stepping into and what they need to be conscious of."

Among the benefits racers get from using E85 is its latent heat of evaporation, Lehn said. "It's like a chemical intercooler. As ethanol is sprayed in an engine, it's cooling down the charge temperature. When you can cool down your intake temperatures, you can run a more aggressive tune and get more power out. Also, ethanol has a higher effective octane to the fuel itself, though people more often than not overestimate what they think the octane of ethanol is. If someone made 500 horsepower on 103- or 104-octane race gas, and made almost 500 horsepower on E85, they think it must be 103 or 104 octane. Not quite. There are other benefits in E85 that help it achieve the performance that mimics higher octane fuel."

E85 at the pump usually costs about 30% less per gallon than gasoline. "But ethanol fuel is also 30% less efficient from a brake specific fuel consumption standpoint," Lehn said, "so that 30% drop in efficiency requires more fuel to be used. Usually the first step in going toward an ethanol system is to upgrade the injectors. You have to have the capability of spraying a whole lot more fuel in the system reliably to make the whole thing work."

Lehn also noted that ethanol is "hydroscopic. It has a natural affinity to absorb water out of the atmosphere, so racers must be careful leaving fuel for any extended period of time because it will start to phase separate and pull water into the fuel and fuel system." That can leave deposits on carburetor components, clog fuel injectors, "and have corrosive effects on rubber fuel lines and any type of soft valves and seats," he said.

"These are really two different fuels," Lehn said of E85 and oxygenated fuels. "E85 is predominantly an alcohol-based fuel, while anything under 50% is predominantly gasoline." The choice, then, comes down to "how you're trying to benefit from the fuel. You're either tuning entirely around ethanol or alcohol, or you're trying to get the benefits that alcohol provides an oxygenated fuel in terms of burn rate and flame propagation." Whether a racer chooses an oxygenated fuel or an ethanol-based fuel, "any system should be optimized to exactly what the fuel is." PRI

SOURCES

BOOSTane
boostane.com

Renegade Race Fuel
renegaderacefuel.com

VP Racing Fuels
vpracingfuels.com

STOP DOING THAT...DO THIS INSTEAD

SENSOR PLACEMENT

Taking a calculated approach to installation can improve these components' longevity and yield more reliable data.

By Bradley Iger

Data acquisition has become an indispensable resource across myriad different motorsports disciplines. Whether it's the driveshaft speed and shock position of a drag car, or the steering angle and throttle position of a sports racer, this technology can provide a wealth of information to help dial in a setup or identify potential issues. But to get the most out of it, the data needs to be as reliable as possible, and much of that comes down to how and where the system's sensors are installed on the car.

As Scott Gilman of Trensor, LLC in Irvine, California, pointed out, there's no universal rule of thumb to sensor placement and installation, so it's important to start with a product that's purpose-built for the application. "One of the most common mistakes we see from racers is that they'll place several engine-related sensors in a box that is mounted nowhere near that engine, and they'll have tubes or

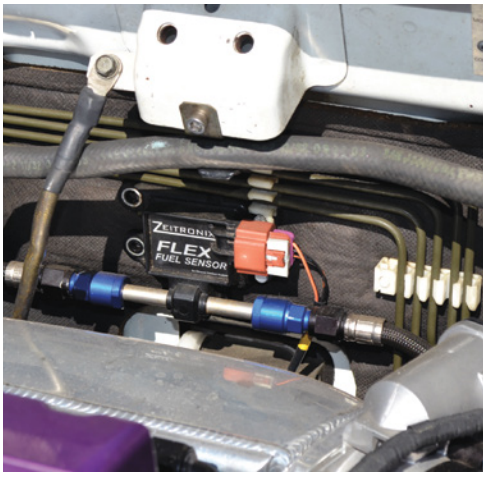
braided lines going from that box over to the engine."

Gilman said that this is typically done because the sensors that are being used aren't designed to withstand the amount of vibration that they'd be subjected to if they were mounted directly on the engine. Rather than seeking out the appropriate sensors for the application, some will attempt to address the problem by placing the sensors in a spot that isolates them from those vibrations, but doing so can introduce other problems.

"By moving the sensor away from the source, the lines are allowing for pressure drop, and they can also act as a heat exchanger," he added. "That means that the sensor isn't getting an accurate picture of what's going on."

Chris Johnson of JMS Chip in Lucedale, Mississippi, said that the orientation of a wideband O2 sensor can have a significant effect on its longevity and accuracy. "We often see people mounting these in the 4 o'clock to 8 o'clock position (with 'straight up' being at the 12 o'clock position). That's a problem because water will start to puddle up on the sensor whenever the engine isn't running, and that will be detrimental to the life of the sensor."

He also told us that excessive exposure to oil and antifreeze will damage wideband O2 sensors, and many times they'll provide false readings before failing entirely. Ideally, these sensors should be oriented in a position between 10



Exposure to heat can affect sensor operation, which is why Chris Johnson of JMS Chip advises maintaining "a foot of distance between any heat source and a sensor." If that's not possible, "that's where I would build shields," with sleeves on the wiring to the sensor and a wrap around the heat source.

Data acquisition has become an indispensable resource for racers to help dial in a setup or identify potential problem areas. But the data needs to be reliable, and the key to making that possible is proper sensor installation.

"WHEN YOU CRANK AN ENGINE FOR THE FIRST TIME, YOU'RE PROBABLY GOING TO WANT WHAT I CALL 'STARTUP SENSORS' IN THERE BECAUSE THOSE SENSORS WILL LIKELY BE EXPOSED TO OIL, WATER, AND OTHER CONTAMINANTS DURING THAT INITIAL STARTUP."

o'clock and 2 o'clock in order to minimize the potential for water to collect in the sensor. Johnson added that the sensors should also be located somewhere that's relatively easy to access.

"When you crank an engine for the first time, you're probably going to want what I call 'startup sensors' in there because those sensors will likely be exposed to oil, water, and other contaminants during that initial startup. If you want data that's as accurate as possible, those sensors need to come out once the engine is warmed up and replaced by sensors that are known to be good," Johnson said.

Gilman said that upward orientation can benefit sensor longevity in other ways, too. "If you know a sensor is going to get a lot of gravel and other debris kicked up on it, you want to avoid mounting it in a downward orientation in order to minimize the chances of the sensor taking a direct impact."

He also cited inadequate wiring lengths as another common issue. "Strain relieving is hugely important in racing applications. For instance, if you have a sensor that's mounted to an engine and a wire harness that is mounted to a tube chassis, you have to consider the fact that those two things are vibrating and moving in different axial planes. The engine may be shaking side to side, whereas that chassis may be flexing up and down. We often see frayed or broken wires, pin damage, and other wear at sensor connection points because the length of wire being used is too short, and that can cause the signal to drop out intermittently."

To avoid the problem, the wire should be long enough so that it can't be pulled taut by the movement of components that can happen at speed. The amount needed can vary significantly based on the situation, but Gilman advised that 5 to 7 inches of extra wire would likely be appropriate in most cases.

Exposure to heat is also a vital consideration when installing sensors. "It's a big concern—I would want to see a foot of distance between any heat source and a sensor," Johnson stressed. "But there are situations where that may not be possible, so that's where you would build shields. I typically won't wrap the sensor itself because you want to be able to get to the connector, but I'll sleeve the wiring going to it, and also wrap the heat source." PRI

SOURCES

JMS Chip
jmschip.com

Trensor
trensor.com

EDITORS' CHOICE

Hundreds of new product announcements cross the desks of PRI editors each month. Following are our top picks for June.

FLEX ERA 1

KC HILITES

kchilites.com

Suitable for Baja racers, rock crawlers, and UTV riders, the new KC Flex Era 1 lights can be utilized for rear-, side- or forward-facing coverage.

"There are a lot of applications, depending on if you're an Ultra4 racer, or even a rock crawler, where you can set the light on the steering knuckle," said Randy Wimenta of KC HiLiTES, Williams, Arizona.

Contained in a compact, 2.7-inch-diameter package, the Flex Era 1 features dual power modes: one for full, high-power output and the other illuminates an eclipse amber backlight.

Users no longer have to guess which beam pattern is best suited for their needs. Each set comes as a master kit with two lights, three beam-pattern lenses, spare O-rings, covers, and all mounting and wiring hardware.

The lights are designed asymmetrically to ensure easy mounting in tight locations, and the mounting brackets feature adjustable depth, width, and height orientation.

"They're small enough to use anywhere on the vehicle, and you can use them on UTVs as a forward- or backward-facing light," added Wimenta.

The machined accent bezels are standard in gold on each FE1 light; however, KC offers red, blue, or gloss black finishes, as well. The lights have a 2,430-lumen rating. —*Mike Magda*

ALPHA PATRIOT RACING GLOVE

IMPACT

impactraceproducts.com

Boasting a vibrant red, white, and blue design, the new Alpha Patriot glove from Impact in Indianapolis, Indiana, is also designed for racer comfort using some unique technology. The construction eliminates troublesome seams and fabric bunching from the palm area using a parabolic pattern and a single-piece palm. There's also an elastic zig-zag gauntlet closure to ensure the gloves stay in place.

"The use of pre-curved, external stitching combined with silicon embossed palms and fingers make the glove exceptionally comfortable to wear with outstanding grip for a maximum driver/vehicle interface," said Ben O'Connor. "A better interface equates to more control, which is a benefit to driving performance and safety."

The glove is approved for any class that requires SFI 3.3/5 specifications. It's available in small, medium, large, and extra-large. Suggested retail price is just under $205.

"We have noticed a considerable interest in patriotism in motorsports over the last few years. We have seen it at the races, and on the custom suit side of the business," added O'Connor. "We also work with several Lucas Oil sponsored athletes, and their brand colors are also red, white, and blue. So it was only natural for us as a US manufacturer to offer a red, white, and blue themed glove." *—Mike Magda*

FORD GODZILLA CAMSHAFTS

COMP CAMS

compcams.com

As Ford's newest pushrod V8, the 7.3-liter Godzilla engine is drawing considerable attention with engine swappers, racers, and even performance-minded truck enthusiasts. To address a wide variety of power needs, COMP Cams in Olive Branch, Mississippi, has developed three new camshafts for the engine.

"The Godzilla offers Super Duty owners a significant amount of performance and drivability as a truck engine. We wanted to be able to help out that customer immediately, while the engine-swap community builds momentum," said Chris Potter.

The Stage 1 camshaft uses the factory cam phaser, and with optimized ECU tuning an increase of 60 horsepower and 15 lb-ft torque was observed. A Stage 2 cam was teamed with an Edelbrock XTS sheetmetal intake. This combo required a phaser limiter, and there was an increase of more than 75 horsepower over stock. Neither camshaft requires changing the stock valve springs.

The Stage 3 camshaft requires a valve-spring kit and phaser limiter, but power picked up nearly 100 horsepower and 25 lb-ft of torque over stock.

"The Stage 3 is made for engine swaps into lighter vehicles and those seeking maximum horsepower while still utilizing the phaser with a limiter," said Potter. "This cam will provide the most average horsepower over a 2,000-rpm range from 4,700 to 6,700 rpm, ideal for WOT performance and shift recovery as it goes down the track." *—Mike Magda*

C3 CORVETTE T-5 TREMEC PERFECTFIT KIT

SILVER SPORT TRANSMISSIONS

shiftsst.com

Vintage C3 Corvette owners looking to upgrade their transmission to run an occasional autocross or weekend drags should consider the new T-5 Tremec PerfectFit Kit from Silver Sport Transmissions (SST) in Rockford, Tennessee, to complete the swap.

Designed for 1968–1979 Corvettes, the kit allows for the installation of a Tremec T-5 transmission that was popular in Fox body Mustangs and other performance models. The T-5, however, had only one shifter position, a 10-spline input shaft and Ford bellhousing bolt pattern—so it wasn't much of an option for any other model.

SST then developed a Tremec T-5 with the Corvette STX shifter and a transmission perch plate to rest the tranny on the stock crossmember. The SST kit works so well that the factory console can be retained.

"The Tremec T-5 has a 300 lb-ft torque capacity and is capable of shifts up to 6,700 rpm," said Misty McComas. "This is the little brother of the Tremec transmission line. It's better to use the TKX 5-speed or Magnum 6-speed for drag racing and road racing. They're all available with PerfectFit Kits and maintain the factory console look of your C3 Corvette."

The TKX has a 600 lb-ft torque capacity and is capable of shifts up to 7,500 rpm. The Magnum is rated at 700 lb-ft with shifts up to 7,800 rpm. —*Mike Magda*

ECOGEN RENEWABLE FUEL

VP RACING

vpracingfuels.com

VP Racing in San Antonio, Texas, is accelerating its renewable fuel initiative by launching EcoGen, a renewable non-alcohol alternative to ethanol- and butanol-based fuels found at the pump.

"There is an ever-increasing demand for renewable fuels in the transportation market to help reduce greenhouse gas (GHG) emissions, and this is rolling into the racing world," said Mark Walls. "Ethanol-free EcoGen fuels are offered with up to 10% renewable content, which enables a 30% greater GHG reduction than standard E10 pump gasoline."

VP has experience in developing more than 80 race fuels, and EcoGen will be a high-octane, cleaner-burning fuel. The fuel can be used in high-performance cars and motorcycles, boats, powersports vehicles, and small engines such as lawn equipment.

"This fuel can be a drop-in replacement for any racing class that uses pump-gas-like fuels, up to 95 octane (AKI)," added Walls. "Many different race series are starting to consider and/or require renewable content to be a part of their race fuel. For marine and small-engine applications, EcoGen does not have the detrimental effects that can be seen with ethanol fuels. In most cases, users will not need to change their setup. This fuel will have a similar oxygen content and burning characteristics as E10 pump gasoline. Additionally, it typically has better material compatibility than pump gasoline." —*Mike Magda*

VIPER YOUTH RACING HELMET

SIMPSON RACING

simpsonraceproducts.com

Getting young racers interested in competition is a goal of many parents, but keeping them safe is a priority once they go to the track. Simpson Racing in New Braunfels, Texas, just released a youth version of its Viper helmet line that is approved for many types of youth racing.

"The Simpson Viper youth helmet is certified to the SFI 24.1 youth helmet standard," said Gary Peters. "It has a wide eye port, which allows the child to concentrate on what is out in front."

The helmet is available in four sizes: small (56 cm), XS (54 cm), 2XS (53 cm), and 3XS (52 cm). Starting with a properly sized shell, the helmet features removable cheek pads and crown padding.

"They can be replaced as the child grows to achieve optimum fit," added Peters.

The helmet comes with one clear face shield installed, and others may be purchased separately. It's also equipped with the necessary hardware that makes it ready for head restraints.

"It comes in weighing no more than 1,200 grams," said Peters. —*Mike Magda*

PRO-STOCK PERFORMANCE VALVE SPRINGS

ELGIN INDUSTRIES

elginind.com

The new Elgin Pro-Stock valve springs for LS engines are optimized to work with the company's Sloppy Stage 2 hydraulic cams.

"The springs maintain stable harmonics matched through their advertised lift cycle. Combine this with super finishing and the result is four times longer lifespan plus higher lift capacity than standard springs," said Rick Simko.

The springs are designed with beehive and conical geometries, which helps reduce dynamic surges. They also feature a micro-engineered surface finish and a proprietary heat-treat process to improve strength and durability.

"The new RV-126918 valve springs are micro-peened in a proprietary process that results in a perfect finish, which is critical for performance springs," said Simko. "This micro-finishing technology is highly sophisticated, which is why the springs are shipped in special packaging to prevent springs from rubbing against one another during shipping."

Five different part numbers have different sizes and spring rates that range from 103 to 127 pounds on the seat and 275 to 370 pounds open.

"Feedback has been extremely positive from racers who are looking for parts that deliver proven performance gains on a tight budget. These springs are matched to street, short-track, and bracket-racing applications," added Simko. —*Mike Magda*

FAST MOVERS

A look at some of North America's in-demand motorsports products and services by region and racing segment.

By Laura Pitts

Motorsports retailers and service providers are constantly tracking the newest parts and trends to give their customers a competitive edge. For the latest on which products and services are moving the retail needle, we present the following sales snapshots from shops across North America.

BERRY PERFORMANCE SALES

Defiance, Ohio

Berry Performance Sales is mainly geared toward racers running the LS engine platform, according to owner Brenon Berry, who pointed to a handful of fast-moving products for this category, like camshafts by Brian Tooley Racing and Texas Speed & Performance. "They have a really good reputation. Customers recognize the name and gravitate to that," Berry said.

Long-tube headers—specifically those

from Texas Speed & Performance and Speed Engineering—are also popular for the motorsports retailer since "they have budget friendly stainless steel options; you could have them shipped to your door for around $300–$700," Berry said.

Additional fast movers include the Holley EFI Terminator X and chassis/suspension components from UMI Performance, including panhard bars, torque arms, K-members, and sub-frame connectors. "The Holley EFI Terminator X systems make it easy and convenient for all skill sets to get their cars tuned and running. The UMI Performance components strengthen every important aspect of your car and are built right in Pennsylvania."

Berry also told us he avoids long lead times by working with several distributors and manufacturers to have several different sources for high demand parts. An additional source of income is Berry's 22-foot open race car trailer rental (pictured). This year, Berry Performance Sales is expanding its marketing reach by sponsoring circle track racers Tommy O'Leary IV, Howard Kelly Jr., and Tim Meine.

NONAME MOTORSPORT

Lindenhurst, New York

Suspension upgrades are the most common modification for race customers of NoName Motorsport, said owner Frank Ciati, who services enthusiasts competing in Audis, Volkswagens, and Porsches at courses like Road Atlanta, Watkins Glen, and New Jersey Motorsports Park.

"My customers prefer handling power over engine power. Some performance junkies want top speed, of course, but for the most part they want better handling to really lay into the corners," Ciati said.

Popular upgrades include KW Automotive coilovers (pictured) and sway bars, plus

spring kits from H&R Special Springs. Michelin tires, specifically Pilot Sports, are a customer favorite.

Brake upgrades are also prevalent, with many customers preferring slotted rotors over drilled, "which can get clogged up easily and be more of an issue than an upgrade at that point," Ciati said.

EBC Brakes and Hawk Performance are usually the go-to brands for braking components, Ciati said.

T&T MOTORSPORTS

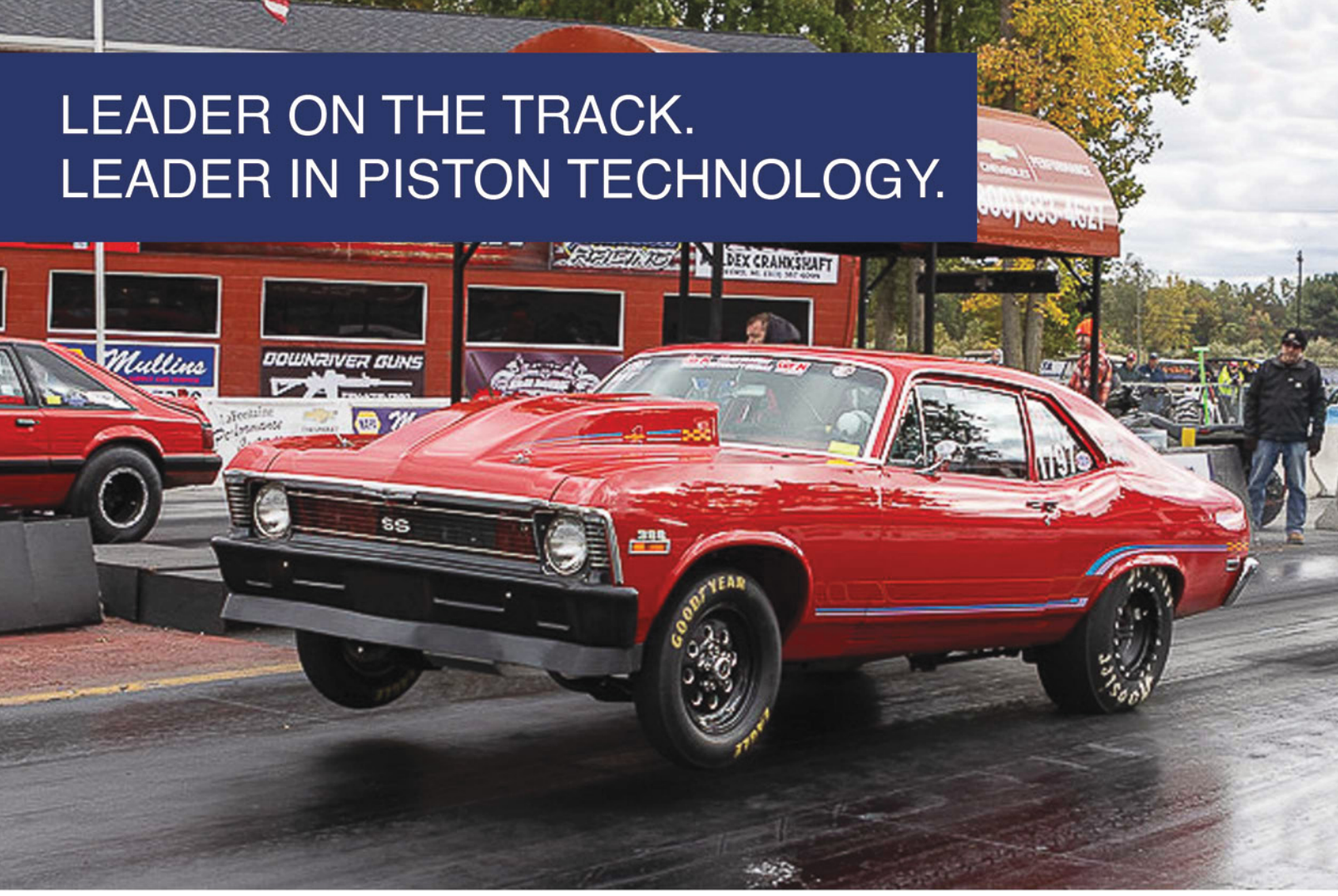
Calgary, Alberta, Canada

Bracket racers are buying a range of components from family-run T&T Motorsports, which serves as a dealer, race car builder, and rebuilder.

Fast movers include carburetors from Advanced Product Design; collector tethers and fasteners from Drag Race Solutions; switch panels, dial-in boards, and delay boxes from Digital Delay; headers and exhaust components from Stainless Works; hoses and plumbing components from Fragola Performance Systems; data recorders from Racepak; Pro 1 Racing & Safety components; and additional products from Driven Racing Oil, ProCharger, Quarter-Max, Bear's Performance, and Hoosier Racing Tire.

FTI Performance transmissions (pictured) and torque converters are also in high demand, said co-owner and general manager Travis Ringguth. "Especially in the last six months, people [are switching] their converters and transmissions since they deliver a high-quality product. We always try to partner with the most reliable brand, even if the margins aren't as great for us."

With help from co-owners (and Travis's parents) Dwaine and Pam Ringguth, T&T also operates some of the highest paying bracket races in the region, The Classics, which it uses to prove its products on track. The Ringguths campaign a dragster running a Sunset Performance engine, a popular platform in Canada "even though they're located as far away as possible in Texas," Ringguth said. He also noted that T&T formed an official partnership with Sunset at the most recent PRI Trade Show. PRI



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NEWLY APPOINTED

MATT PATRICK

DeatschWerks' new technical director began his career at an iconic performance industry giant, honing his expertise across the spectrum of aftermarket products and systems.

By Jim Koscs

For Matt Patrick, the decision to leave his position as vice president of product development for Edelbrock Group to join fuel system manufacturer DeatschWerks in January of this year was laced with emotion. He'd joined COMP Cams 26 years ago with an Automotive Engineering Technology degree from Minnesota State University at Mankato and was there when private equity firm Industrial Opportunity Partners, owner of Edelbrock LLC, acquired COMP Performance Group in 2020.

Patrick's journey in the high-performance industry began during childhood. "I was into cars, and I had an engineering mind," he explained. "My parents gave me things to help encourage that. They bought me a LEGO set, and the next thing you know, I'm mounting electric motors to LEGO dragsters and figuring out how to hook up my toy train transformers to them."

Born and raised in Edina, Minnesota, Patrick recalled getting hooked on truck and tractor pulling after first seeing it at the Metrodome in Minneapolis. At 14, he attended his first NHRA national event in Brainerd. "That became my passion, although I have an appreciation for all motorsports," he said.

> *"FOR VIRTUALLY MY WHOLE CAREER, I'VE BEEN DESIGNING AROUND FUEL SYSTEMS AND HARDWARE."*

PRI: If you were to pick one, what would be the most important tech innovation you've seen in this field in the last 20 years?

Patrick: Without question, it's been easy-to-use, stand-alone fuel injection systems. Everything about precision fuel control and what EFI stand-alones have done has brought the greatest of performance gains and fundamentally helped the industry grow.

PRI: How have the positions you've held throughout your career thus far prepared you for this role?

Patrick: One of the COMP Group companies was FAST, which was EFI systems. I also was a product manager and engineer at Zex Nitrous Systems. So, for virtually my whole career, I've been designing around fuel systems and hardware.

PRI: You hold some patents, if I'm not mistaken. What would you say is the most important one?

Patrick: The one I'm most proud of was the Zex Perimeter Plate nitrous oxide system, where it injects the nitrous from points around the perimeter of the plate, as opposed to a spray bar in the center. Billy Godbold, a cam designer and a brilliant mind, co-developed it.

MATT PATRICK

TITLE:
Technical Director

ORGANIZATION:
DeatschWerks

HOMETOWN:
Oklahoma City, Oklahoma

FAST FACT:
Matt Patrick picked up a new hobby during the COVID-19 pandemic: making pizza. "I've developed my own perfect pizza. I make my own dough and sauce from scratch. And, as an extension of my first job at age 15, I also started making bagels at home."

> *"I FOUND I GOT BETTER DESIGNS COLLABORATING WITH SMART, CREATIVE PEOPLE."*

PRI: How would you describe your approach to innovating?

Patrick: I'm more of a designer than an engineer. I'd always struggled with math, to be honest. When I was younger, I thought that was a weakness. I later realized it was really a strength, because it forced me to build relationships with people who were extremely good at math. I found I got better designs collaborating with smart, creative people.

PRI: What inspires your best ideas?

Patrick: When I recognize there's a need in the market, that begins the process of thinking, "How can I best help performance enthusiasts get the solution to this problem?" You start floating ideas on finding that solution, and then you collaborate with others. That's when the fun creative process begins.

PRI: What key value do you bring to your new role at DeatschWerks?

Patrick: I would say it's two things. The first is a comfort with creating different product lines. Working for COMP Performance Group, we had

a full spectrum of products—fuel injection, valvetrain, cylinder heads, intake manifolds, nitrous, and a tool division. We had to go into new markets, analyze them, understand them, and create relevant products for each. That's how I've worked for many years.

The second one is my experience building teams of talented people who work well together.

PRI: Who has inspired you, professionally or personally?

Patrick: In many ways, the leadership of COMP made me who I am today. I got hired out of school at 24 years old. It was only later that I fully appreciated the iconic owners we had with Scooter Brothers and Ron Coleman. They have been amazing mentors.

PRI: Is there any mistake or misstep you've made that you feel you've learned from, or that has helped shape who you are?

Patrick: Early on, I thought that the ideas and the products—'making a better mousetrap'—was all that mattered. I later learned that focusing on building strong relationships, and building teams of people that complement each other, that's where the magic happens.

"I WOULD TELL YOUNG PEOPLE THAT IF YOU OUTWORK THE COMPETITION, YOU'RE GOING TO WIN."

PRI: Is that the kind of advice you might give to budding engineers?

Patrick: I would. And I would add work ethic to that. That's something that I give credit to the COMP Group leadership. They put in the work and never gave up. Every single one of us can control how much work we want to put into something. I would tell young people that if you outwork the competition, you're going to win.

PRI: Aside from your cell phone, tablet, or computer, what's one thing you can't live without?

Patrick: Fundamental to who I am as a person is my relationship with Jesus Christ. It's the center of my life, and everything flows from that.

PRI: Do you have any cars that you've built, or is there a dream car that you'd like to put in the garage?

Patrick: I've built and raced cars over the years. I bought a 2005 Mustang GT new off the showroom floor. It was my daily driver for about 100,000 miles, and then it became the toy. I built my own turbo system for it and modified the whole car. It makes about 700 horsepower. For dream cars, I think an Audi R8 would be my ultimate daily driver, and a 1963 Pro Mod Vette would be an awesome race car to have. PRI

INDUSTRY INSIGHTS

LARRY CHEN

Photographer, content creator, and ambassador for the industry, this Los Angeles-based phenom's impact on motorsports and the automotive community goes beyond his captivating images, which earned him the title "car culture's most influential photographer."

By Jeff Zurschmeide

Making a living as a photographer is never easy, and it's extremely challenging if your specialty is motorsports and automotive. Most publications and teams have limited budgets, and there are always plenty of aspiring photographers who want a chance to show what they can do. To make it in this business, you have to have something special.

Larry Chen has that special talent and technical skill behind the camera. Based in Los Angeles, California, he's been called "Car culture's most influential photographer," and he received the inaugural SEMA Automotive Influencer of the Year award at the SEMA Industry Awards Banquet during the 2022 SEMA Show. He has more than 830,000 followers on Instagram, and he works for some of the top teams in drifting, rally, and off-road racing, as well as doing general automotive photography. Anyone with an interest in cars and racing has seen and appreciated his work, even if they didn't know it was his. We caught up with Chen recently to ask how he keeps himself at the top of his game.

"I DEFINITELY NEVER INTENDED ON IT GETTING TO THIS POINT! I NEVER THOUGHT IT WAS POSSIBLE."

PRI: Photography is a really tough profession. How did you get into this line of work?
Chen: It wasn't an easy path. People ask me this question multiple times a day because for whatever reason, I guess it looks pretty glamorous from the outside! But they don't realize the effort and the time and the years it took to get to this point. I started in 2004. I decided to start going to races and car culture events to just put my name out there and get photography done. It's just been kind of a slow progress since then.
PRI: Was there a particular race car or event that inspired you to start shooting motorsports?
Chen: What really kicked it off for me was going to track days and playing with my car. That was the big thing that got me into it. It really started with a love for driving.
PRI: If you had the opportunity to write a letter to your younger self back in 2004, knowing what you know now, what would you say to that young man about succeeding as a photographer?
Chen: It's tough to say because I definitely never intended on it getting to this point! I never thought it was possible. I just knew that I enjoyed doing it back then, and I still enjoy doing it now. It's just been such a tough journey to get to this point, but I would talk about all the hours that I've put in, all the sacrifices that I've made. I still have that spark from back then, and that's why it's been good.

"I'VE SHOT IN ICE STORMS, SNOWSTORMS, SANDSTORMS, NEGATIVE 20-DEGREE WEATHER. AND WE'VE SHOT IN 110-, 115-DEGREE WEATHER."

PRI: You talk about it being tough. Can you elaborate on what was tough?
Chen: It's a lot of stuff that you don't see on camera. I've been talking about my story a lot recently, whether on a podcast, or magazine interviews like this one, or on my own blog, my YouTube channel, and Hoonigan's YouTube channel. It's lack of sleep, lack of time with family, lack of time for anything! It's the crazy traveling schedule and crazy conditions that we have to work with. We work in freezing cold or crazy hot. It doesn't matter because racing happens in any condition. I've shot in ice storms, snowstorms, sandstorms, negative 20-degree weather. And we've shot in 110-, 115-degree weather. It is really, really tough. The elements come into play, but then it's also dealing with clients and chasing payment and finding the jobs to begin with. It is so crazy. If you're coming out of high school or college, you can't just say, "Hey, I'm gonna become an automotive photographer." It's a really niche thing, and it's a small group of us that somehow make it work, and it is worth it because it is our passion, without a doubt.

PRI: Is there any special advice that you give to people just starting out in the business?
Chen: It's all the simple things and some of the things that people don't really think about for whatever reason: Show up early, stay late. That's a big thing when it comes to photography. If you're there earlier than other photographers, you can get better shots. Then when it comes to meeting people, just be on time and be easy to work with. Don't be a jerk because nobody wants to work with a jerk. Everybody wants to work with somebody that they like. That's half of it for us.

Then, we spend so much time with our clients and with directors and producers. We live together sometimes for weeks at a time. So you have to try not to get on each other's nerves. That's so much of the battle of being able to work as a team, especially because it's not like a normal office environment where you are in your own cubicle. Being easy to work with seems like it's pretty hard for a lot of people. Another thing is to do whatever you can to be in front of the cool action, because when you're sitting on the couch at home thinking about what you can shoot, you're not out shooting and that's a problem.

"Do whatever you can to be in front of the cool action," Larry Chen advised up-and-coming photographers. "When you're sitting on the couch at home thinking about what you can shoot, you're not out shooting."

PRI: How does your photography directly or indirectly benefit the motorsports industry?
Chen: It's about elevating a certain series or a certain type of racing. There's a time and a place for a well-shot cell phone video or cell phone photo, but if there's a new build, or a new race car, or a race that's happening, you want to have your product, vehicle, race car, race series shown in its best possible light. You want it to look as good as possible and look as amazing and cool and crazy or dangerous or whatever. You want to convey whatever you're trying to convey. You don't want it to look bad and out of focus with the color wrong and small on the screen. You want it to be a good representation of what your product looks like in person. That's where we come in, to show how awesome this stuff is. It's because not everybody can travel to every single race, but they still want to see, and they want to know the story. That's what we're out there to do: tell the story in the best way possible.
PRI: Tell me something about a content creator like yourself that just about nobody knows.
Chen: I really, really try to always pull my weight, and it's never just the "one and done" for me when it comes to these clients. I try to make sure they'll call me back for the next thing that they have going on. I think that's one of the big reasons why we're able to survive. The stuff that they don't see, I don't think it really matters. It's more about what they do see and what the end product is, and what we're able to do to help them. I think that's what matters.
PRI: So much is crowdsourced now, and quality often suffers as people send pictures that are just "good enough." Do you think there's a future for your business model?
Chen: I don't see motorsports and car culture going downhill. It's the biggest it's ever been, and it's not going to slow down anytime soon. From what I can tell, racing is also the biggest it's ever been. There are just so many things that are going on that are elevating the whole industry. Part of it is the fact that it's easily accessible on the media side. When I was growing up, even though there was all this racing that was happening all over the world, I just couldn't see any of it. But now it's so easy to see all this awesome content, and the appetite for good content

"SHOW UP EARLY, STAY LATE. THAT'S A BIG THING WHEN IT COMES TO PHOTOGRAPHY."

On location, a key to success is "being able to work as a team, especially because it's not like a normal office environment," said Larry Chen. "Everybody wants to work with somebody that they like."

is the biggest it's ever been. So I don't see a problem at all.

PRI: Are there any major challenges that you can see coming up in your business?

Chen: The problem that we are running into is that there's just so much to do in the industry, and there are so many events going on every single weekend. It's really hard for us to choose what to do because there are multiple series happening every weekend, and even new series coming out, and new events, and new car culture happenings.

Automotive photography "can look pretty glamorous from the outside," Larry Chen said, "but they don't realize the effort and the time and the years it took to get to this point."

There's just so much to shoot, and we always have to be careful to pick the right ones, or pick the ones that are interesting to us, or those that want to have us. It's a good problem to have, but it still is a problem.

PRI: It sounds like you're saying that there's room for new photographers who want to come up and learn the craft?

Chen: One hundred percent. There is so much. There's a lack of talent and a lack of good videographers and photographers, and even a lack of people that I would want to hire to help us. I don't know why, and maybe part of it is because they see the glamorous side of it, but they don't see the sacrifice and the hours and the lifestyle that we live. Maybe doing this is a casual thing for a lot of people, and that's fine. You can be a casual content creator, but if you want to do it full-time every single day, that's a different level.

PRI: Do you have anyone to acknowledge for giving you a big break or great advice?

Chen: There are too many to name! Off the top of my head, the general manager of PRI, Jim Liaw, was very instrumental in allowing me to practice my craft at Formula Drift for many years. He was a big, big help. And then a lot of people that I started with, back around 2004 to 2006, are the same people that I'm working with today. But now they're working at Toyota, they're working at Nissan, and they're working at Ford. We've all grown up together, and we all still want to work together.

PRI: Was there ever a time when you were discouraged and thought, you know, this is never going to work? If so, how did you get through that time?

Chen: I run into that pretty much all the time! We're always on the edge when it comes to a lot of things that we're shooting, and a lot of projects that we're working on.

"There's a time and a place for a well-shot cell phone photo, but if there's a new build, or a new race car, you want to have it shown in its best possible light," Larry Chen said. "That's where we come in, to show how awesome this stuff is."

Some of them just don't work out, and we have to pivot and make it work somehow. But that's kind of the fun part of it. It's the problem-solving that my team and I are constantly working through. After all these years of shooting, and all of the experience, you would think that we would've run into so many of these scenarios, but there are always new things that we're learning about cars and car culture every single day.

PRI: Is there one aspect of photography that has been lost over the years that you would love to bring back?

Chen: The film era. I look at some of the shots that people created with film, and it blows my mind because I know as a photographer how hard it was to capture this kind of shot. It's extraordinary, but most people won't understand that it's lost. I have quite the collection of film cameras, and I've shot a lot of motorsports and car culture with film. But as time has gone on, I find that it's a lot more fun for me to shoot film of my family and my friends. It's more of a hobby than what I would use as a tool, but really what's lost when I look at those old shots is the skill. It has gotten a lot easier. But it still doesn't distract from the fact that those existed back then.

"YOU CAN BE A CASUAL CONTENT CREATOR, BUT IF YOU WANT TO DO IT FULL-TIME EVERY SINGLE DAY, THAT'S A DIFFERENT LEVEL."

PRI: Is there anything else to say about your business and what you do?

Chen: One of the things I say is that it doesn't make sense why it exists, but somehow it works. This has been such a crazy journey, being able to go to all these events and travel all over the world. I've been to 50 countries on other people's dimes, and I got to meet all these people and have friends all over the world. I got to experience all these car culture moments. It's incredible.

So much of that comes from the fact that car culture is in our souls and in our blood. It's a worldwide phenomenon. There are so many people who are into racing cars and this culture. The root of it obviously comes from transportation. We just like to move around. So it's only natural for us to love these objects that are machines, but they convey so much emotion, and they're beautiful, and they're also ugly, and they're powerful. There's just so many aspects to it that are complicated. I'm just lucky to be a part of it, to capture this small moment in time when cars are this way. PRI

SPECIAL REPORT

RACER SURVEY RESULTS

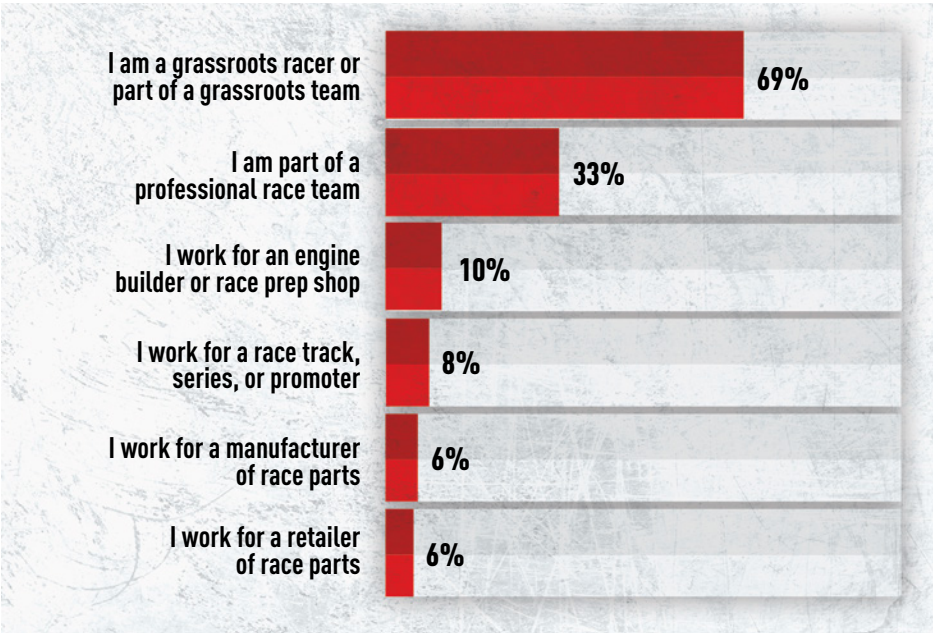
PRI's first-ever poll of teams' buying habits reveals how and where competitors across all types of motorsports, from the grassroots to the professional ranks, source and purchase their parts.

By Steve Statham

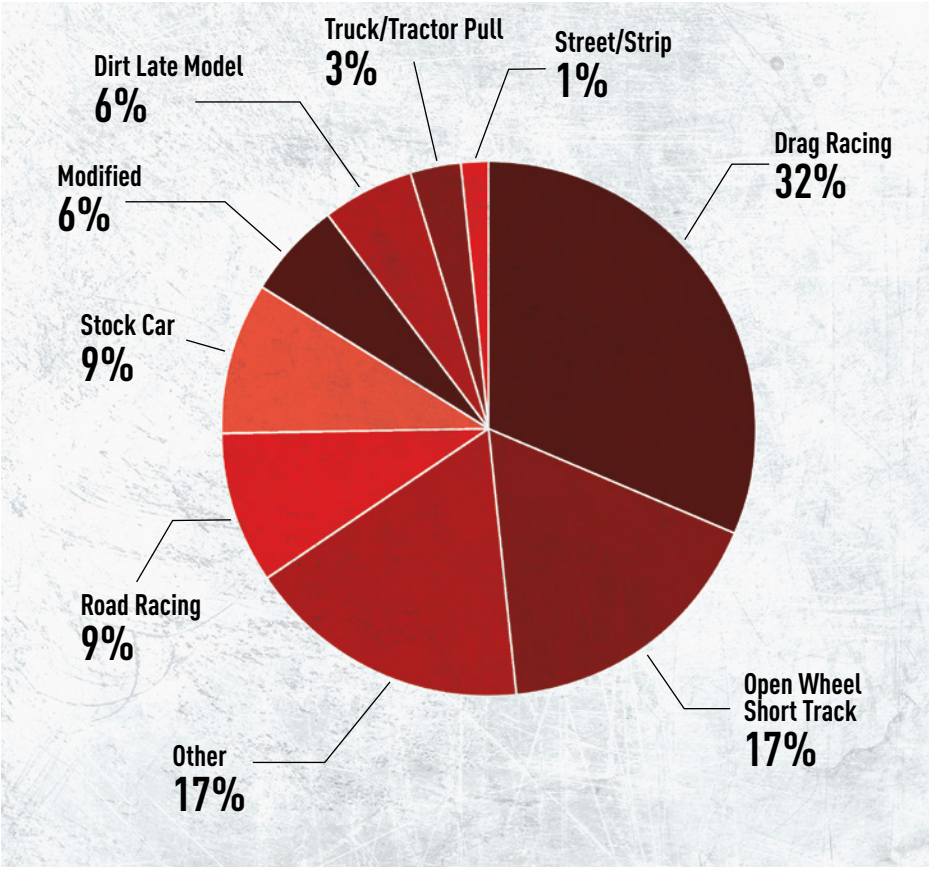
Taking the pulse of the Performance Racing Industry community through membership surveys is always illuminating. In recent years, the annual Racing Business Survey has provided a wealth of insight into the motorsports retail landscape. For 2023 PRI shifted gears to investigate the other side of the parts counter, so to speak, and surveyed the racers themselves about their parts-buying habits. As expected, there was plenty of intriguing and useful information in the inaugural Racer Survey that retail businesses could use to better understand and connect with their customers.

What is your level of involvement within motorsports?

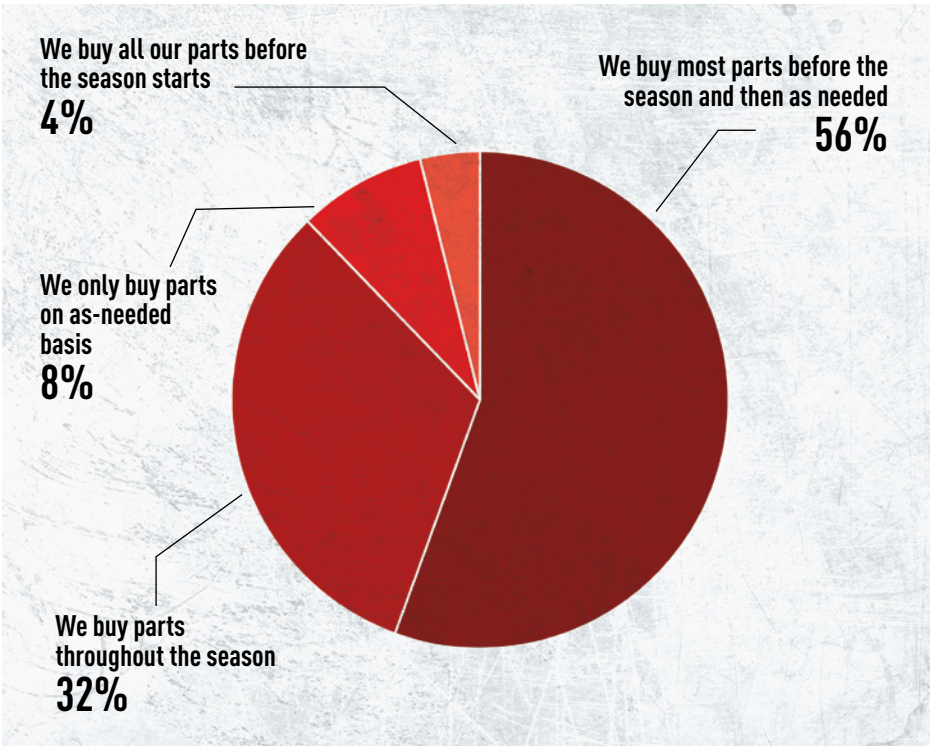
More than one answer provided



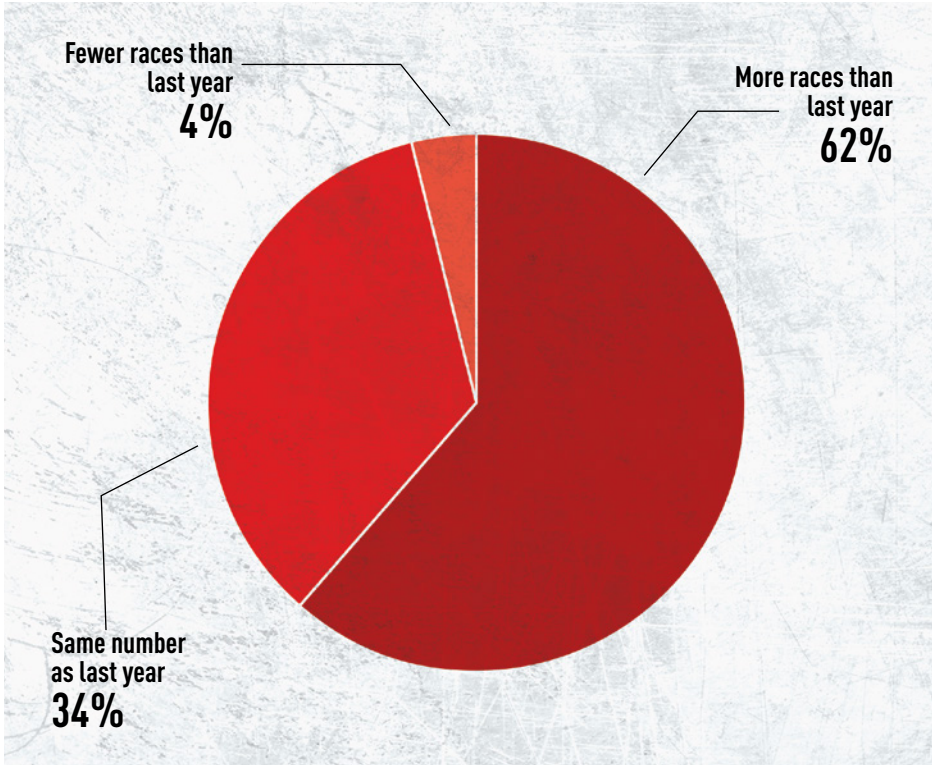
What type of racing does your team mainly participate in?



When do you typically buy parts for your race car?



In 2023, is your team planning to run:



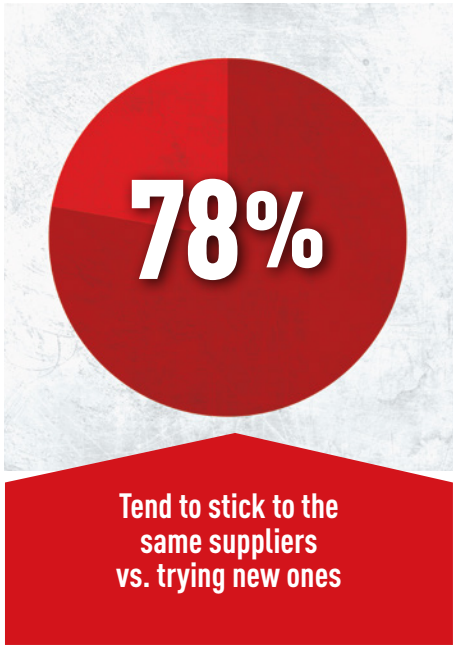
"AS A RACER, I AM ALWAYS LOOKING FOR INNOVATIVE NEW PRODUCTS, BUT THAT HAS TO BE BALANCED WITH CHANGING AWAY FROM SOMETHING THAT YOU KNOW WORKS."

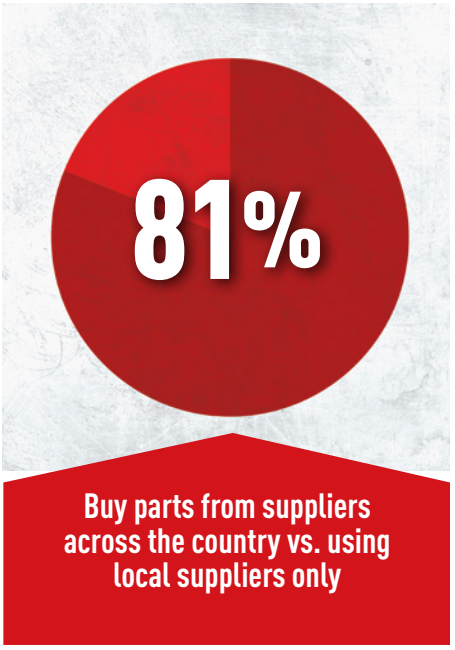
First, a quick snapshot of the racers: Of those who participated in the survey, 69% were grassroots racers or parts of a grassroots racing team, with a similar percentage operating out of the Midwestern US. About half of all respondents reported they made all parts decisions, with the rest sharing responsibility to varying extents. Roughly two-thirds of survey participants install all parts in-house. The largest cohort was drag racers, followed by open wheel short track competitors, but racers from virtually every type of motorsports participated.

Parts buying is naturally influenced by seasonal factors, but most reported they buy parts throughout the year as needed, and almost half the respondents said they purchased parts 10 or more times a year. "It seems like every week," said Ken Roberts of Roberts Motorsports, East Moline, Illinois. His team runs super dirt late models in the Lucas Oil Late Model Dirt Series, winning Rookie of the Year honors in 2022 with driver Garrett Alberson. "We race the Gateway Dirt Nationals at The Dome at America's Center in December, we race Vado Speedway Park in January, we run the Winternationals down South, so we pretty much race year 'round. It seems like we're ordering parts during the busy time, from April through September, at least weekly. The other months, probably every other week."

Of particular interest, especially to motorsports retailers, is that 62% of respondents reported they planned to run more races in 2023 than last year. That implies even greater parts demand as the calendar unfolds.

Racers said they...





TRIED 'N' TRUE VERSUS BRAND NEW

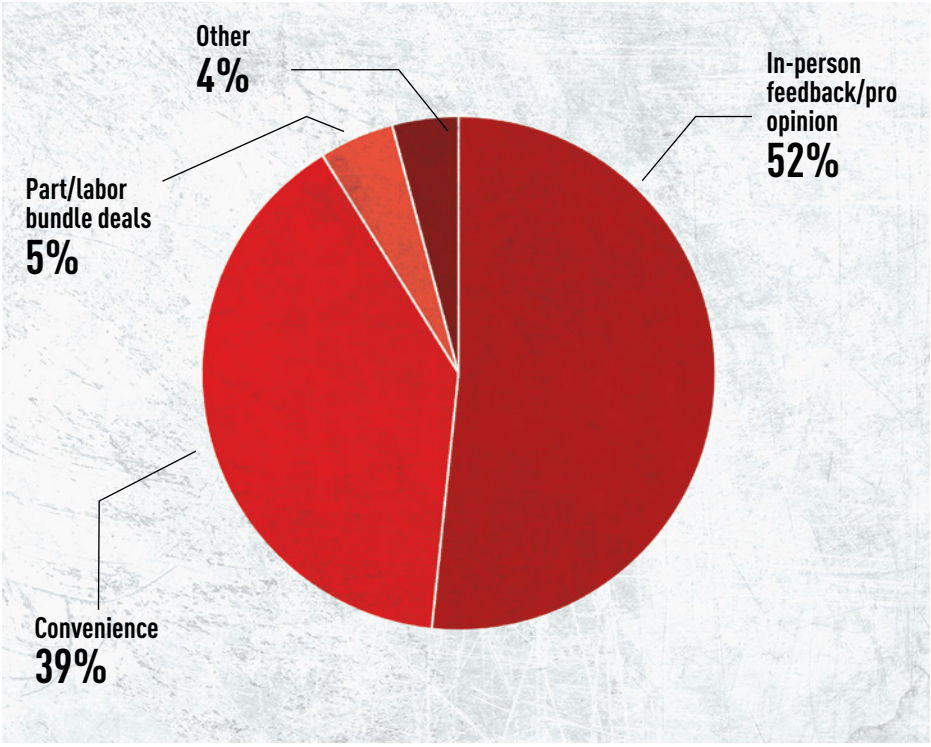
For retailers, the challenge is always how to attract racers who will hopefully become new loyal customers. One of the survey questions asked if racers tended to stick with the same suppliers or if they often tried new ones. More than three-quarters said they tended to stick with the same suppliers, showing the importance of existing relationships.

Patrick Utt with Badger Auto Sport in Riverview, Florida, has owned and operated two racing businesses: Powerhouse Products and RaceQuip. He has raced off and on since 1989, but now road races full time in the Trans-Am TA2 class. "As a racer, I am always looking for innovative new products, but that has to be balanced with changing away from something that you know works," he said. "Supplier commitment to your class or series is important, too. If they are plugged in to teams like yours, they often get feedback that allows them to evolve their products to better suit your needs."

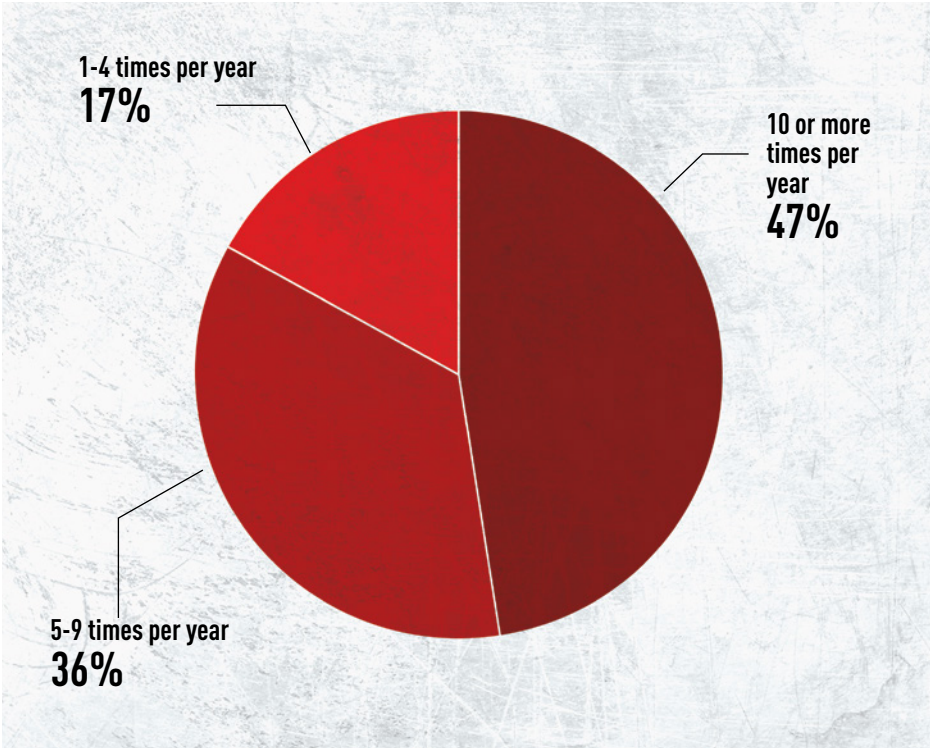
Michael Garman with Desert Star Motorsports and Challenger Motorsports in Pahrump, Nevada, fields cars in a variety of series, including SCCA, NHRA, CIFCA, Western Fuel Altereds, Spec P71, and Optima Ultimate Street Car Invitational. "We always try and stick with long-time suppliers—Don's Hot Rod Shop in Tucson, Randy at D&Z Customs, Discount Tires, or the Goodyear dealer at Carroll Shelby Enterprises in Las Vegas, have been supplying us for years. Recently we've had to go to other places if we need something quickly and they don't have it. Or we may have to use a different brand to fill a hole. We don't like doing that, but with the supply problems today we sometimes have no

For Patrick Utt of Badger Auto Sport, whose car is seen here, "Supplier commitment to your class or series is important. If they are plugged in to teams like yours, they often get feedback that allows them to evolve their products to better suit your needs."

What is the biggest advantage of buying parts at a local shop?



How often do you buy new parts for your race car?



choice. We used a different brand of valve in the Funny Car, and several failed and the motor ate itself."

When racers do step outside of their parts-buying comfort zone, it can be to get a leg up on the competition or to maintain performance while cutting costs. "Usually, we have really good people around us who have been in the industry a long time," Roberts said. "They guide us down to what is usually the higher quality products that'll last through all the different style tracks and track conditions. Every once in a while, we'll try something different. Ironically, this month we're trying a different brand of rearend that they designed and made for us to test.

"I STILL LIKE TO WALK INTO A PARTS SUPPLIER WHENEVER POSSIBLE. I ALWAYS SEEM TO LEARN SOMETHING FROM MY VISIT."

Then they are going to take it back and take it apart to see what they can learn to do any better. So this year we took a little risk and got outside our comfort level by trying a different brand of rearend just to see if there might be more longevity. We do look at options, but we usually stay true to what is known to last, that the top-end teams use."

When it comes to how racers preferred to buy their parts, of those who rely on a local speed shop, 43% reported that they visit one to four times a year, 29% visiting five to nine times a year, and 28% visiting 10 or more times per year. A majority of participants cited the in-person feedback and professional opinion as the main advantage to buying parts at a local shop. But the ease of online shopping is hard to resist.

"Personally, I still like to walk into a parts supplier whenever possible. I always seem to learn something from my visit," Utt said. "If I cannot visit in person, I typically call and ask questions when ordering something

for the first time. After that, a well-executed website is a huge time saver for simple re-orders."

Mansen Way is a hobby racer from Corydon, Indiana, who competes with his Dodge Viper in SCCA and Viper Racing League events. "I prefer online, but I often call to verify with a specialist before pulling the trigger," he said. "If the supplier is within a 30-minute drive, I would go in person, but that's rarely the case for Viper-related parts and components."

For many teams, the combination of online shopping and proven suppliers is the winning combination. "I'd say 90% [of our shopping] is online," Roberts said. "Motor State Distributing is a big supporter. Allstar Performance, they're known to help out the racer, plus they have quick access to the parts. When you're on the road, it's important sometimes to be able to turn that around in a day or two. That's of high importance, and they have a track record of doing that. Performance Bodies is another one. They're real good supporters of dirt track racing and have a history of going out of their way to make sure you get what you need."

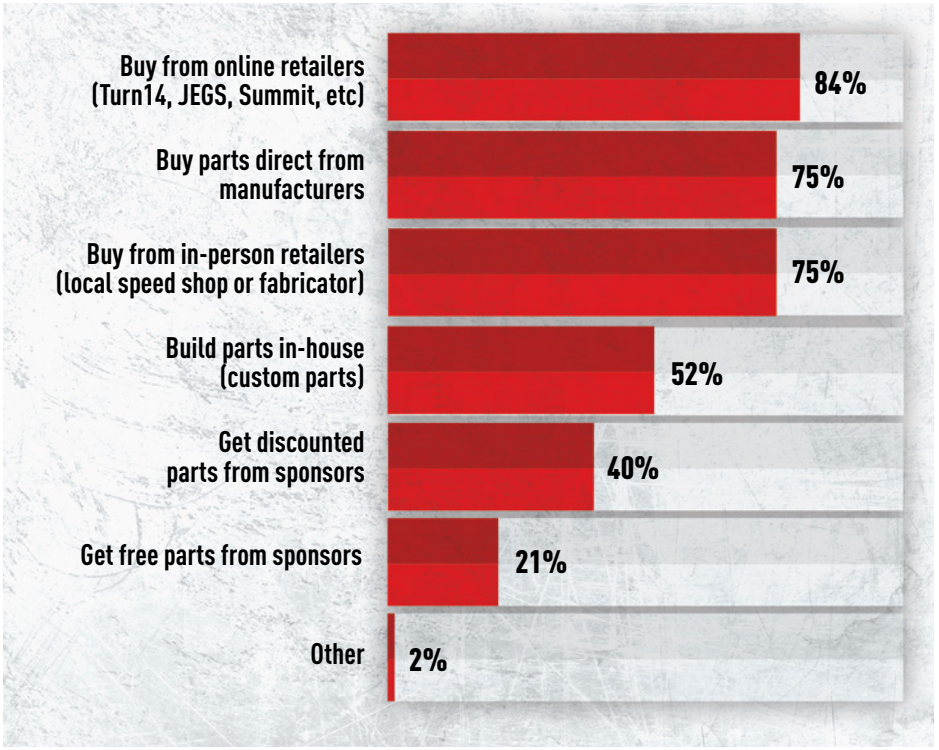
Used components are naturally a part of the racing experience, although the level of used products buying varies dramatically from series to series. "Pretty much the only thing we buy is new," Roberts said. "When you're racing on a national level, you really can't take any chances. I can't think of anything I've bought used."

When it comes to buying used parts, Facebook Marketplace was the biggest source cited in the survey, followed by local resellers and dealers.

"Critical items are always new—motor, transmission, tires, safety equipment," Garman said. "Used stuff would be for add-ons or things that if they fail, no big deal. An example is we have a second tach mounted in front of the motor that we use for fine tuning at the track, that we got used. For the other two cars safety stuff is always new as are brakes, suspension, and so on. Used stuff might be wheels, intakes. The Comet is certified to 8.50, so everything we are doing will be new. Craigslist, Racing Junk, eBay and recently Facebook Marketplace for used parts and also new or custom made."

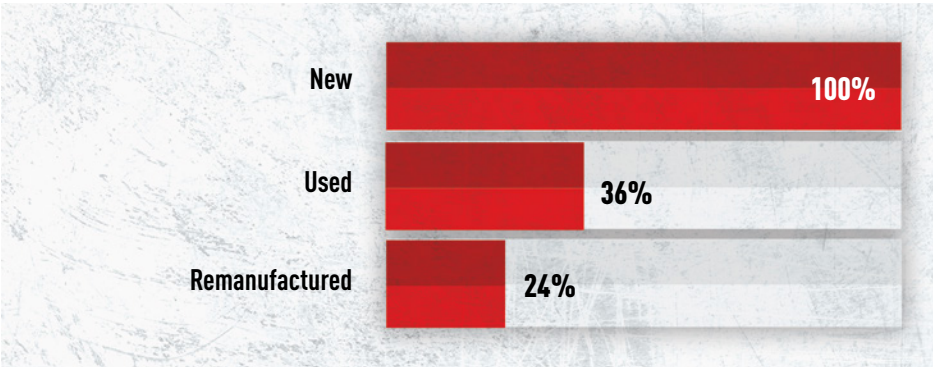
Where do you get parts for your race car?

More than one answer provided



What type of parts do you buy for your race car?

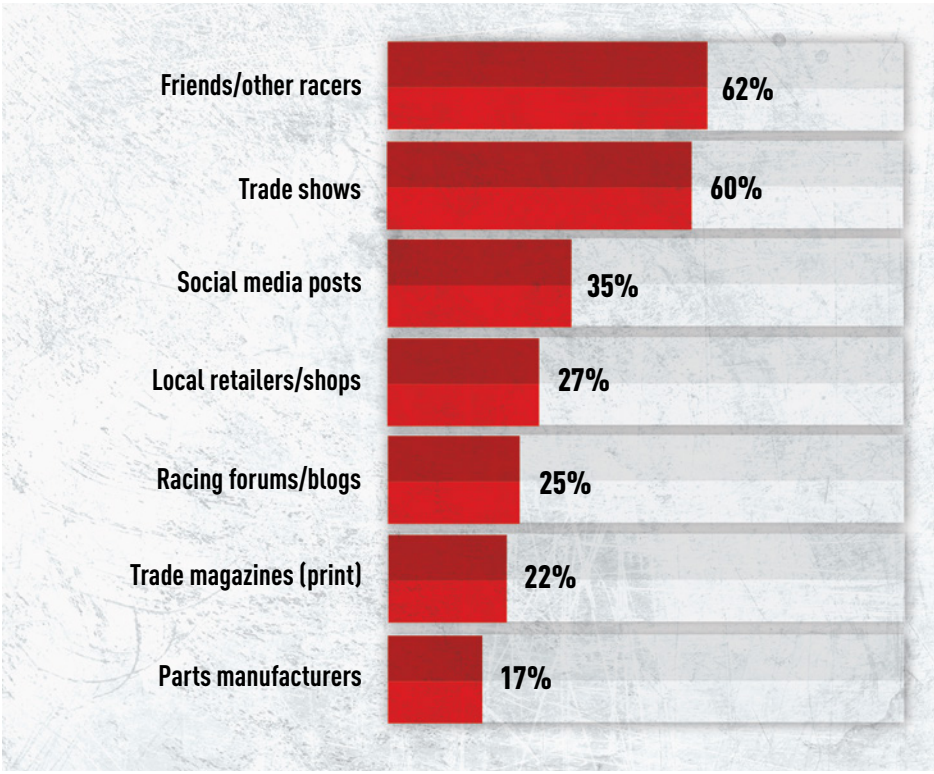
More than one answer provided



Michael Garman with Desert Star Motorsports and Challenger Motorsports, who fields cars in a variety of series, prefers to stick with longtime suppliers. "Recently we've had to go to other places if we need something quickly," he admitted. "We don't like doing that, but with the supply problems today we sometimes have no choice."

Roberts Motorsports runs super dirt late models in the Lucas Oil Late Model Dirt Series, "so we pretty much race year 'round," said Ken Roberts. "It seems like we're ordering parts during the busy time, from April through September, at least weekly. The other months, probably every other week."

What are your top three sources for information about new racing products?



NEW AND NOTEWORTHY

When it comes to learning about new products, relying on trusted sources was a major factor. In the survey, 62% listed friends or other racers as their top source for information about racing products. Trade shows came in a close second.

"The worst way to learn about a new product is to see it on a competitor's car—that means they beat you to it," Utt said. "I would say that my team has an omnichannel approach to learning about what's new. Talking to manufacturers either on the phone or at the track, paying attention to social media, cruising websites, reading consumer and industry magazines, and most importantly—attending the PRI Trade Show and other in-person events."

That in-person, hands-on experience can pay big dividends for retailers. "I'd say what catches our interest is, for example, at The Dome, the parts vendors have a stand, and as we have time we'll go talk, and they'll tell us about some of the things they're doing," Roberts said. "That's how we ended up with the new rearend. We told them of the

"THE WORST WAY TO LEARN ABOUT A NEW PRODUCT IS TO SEE IT ON A COMPETITOR'S CAR—THAT MEANS THEY BEAT YOU TO IT."

demands that we race with and what we felt needed to be more dependable, and they agreed to build one and have us test it for a month. That caught our interest by them being available and showing us first-hand. The PRI Show is a big way too, there's no question about it. For instance, we run the Keizer Wheels, and to be able to see them first-hand on how they come apart, it helped our program. Now, if you bend a rim, instead of throwing the whole rim out, you only have to replace one section of it. That's something we learned by seeing them firsthand."

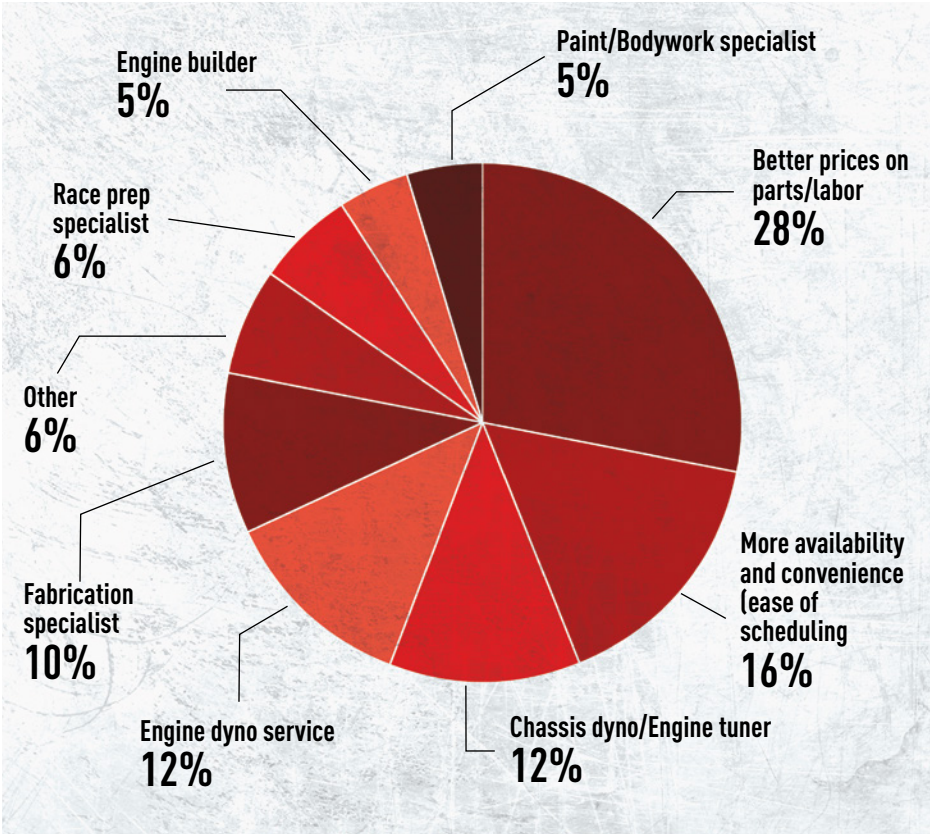
Battle Scarred Motorsports is an organization serving military veterans and first-responders dealing with stress, depression, or PTSD. It has chapters around the country and helps veterans get on track in race cars as a sort of "throttle therapy." "Battle Scarred does endurance racing, so we do ChampCar, Lucky Dog Racing League, and Lemons," said Lesley Farner, Indiana chapter lead.

For Battle Scarred Motorsports, the big trade shows aren't just opportunities to look for new parts but also to interact with their sponsors and suppliers, such as Hawk Performance and Hot Shot's Secret. "Going to the PRI Show, there were so many fantastic parts out there for us to see," said Daniel Johnson, program manager and Louisiana chapter lead. "Plus, we got to meet our vendors that help us out, face-to-face. It was two-fold. We could see new products plus tell our guys that had been helping us throughout the years in person, 'Thank you for your help.'"

Even at the hobby racing level, direct interaction at trade shows pays dividends. "Predominantly, PRI for the latest racing technology along with Viper Parts Rack, DMS and Complete Performance Motorsports, Bad Boyzz Garage," Way said of his primary sources for learning about new parts. "Also a few former Dodge Viper engineers I've met at race events are a wealth of performance information. PRI provides a broad selection of performance parts, tools, consumables, and expertise that is awesome to tap into at the shows. The problem I have is, I never have time to get to all the suppliers in the limited time I have to attend because I spend so much time talking to the vendors with the products I'm interested in."

"We go to SEMA every year to meet with regular suppliers and look at new products. We've been to PRI a couple of times for the same reasons," Garman said. "Some things we'll purchase because of relationships, either with the vendor, another team's recommendation, or maybe even because they help a friend. One of the reasons that we use Wilwood brakes is because they help

Which do you most wish your preferred speed shop could offer but doesn't?



Mansen Way, a hobby racer who competes with a Dodge Viper in SCCA and Viper Racing League events, finds that the PRI Trade Show "provides a broad selection of performance parts, tools, consumables, and expertise that is awesome to tap into."

For Battle Scarred Motorsports, which helps military veterans and first responders with a kind of "throttle therapy," the big trade shows aren't just opportunities to look for new parts but also to interact with their sponsors and suppliers. At the PRI Show "there were so many fantastic parts for us to see," said Daniel Johnson. "Plus, we got to meet our vendors that help us out, face-to-face."

Courtney Hansen, who we've known forever."

Beyond the paddock and the parts counter, social media rounded out the top three sources of information about new products. "I'm always on social media," Johnson said. He reports Facebook Marketplace and several Facebook groups he's in are solid sources for parts. "A lot of times you can do an ISO search [In Search Of parts], and somebody will come through. You know how the racing community is."

"Social media is where I get most of the useful news I'm interested in, so I go to it several times a day to check for new information and upcoming events," Way said. "I monitor several Facebook group memberships and a little Twitter to keep up to date."

In discussing parts buying habits with our sources, some of them spoke about the very specific needs required for their racing ventures, revealing opportunities for ambitious suppliers and manufacturers.

"We go through a lot of spoilers and body panels," Roberts said. "Recently they've come out with these plastic quarter-panels, and they've been a huge savings in time and money. We would go through a right rear quarter-panel almost every weekend. The other that's recently helped is the filler panel. They've gone to a composite plastic, and it lasts probably six times longer than that metal stuff would. Every once in a while, something like that comes through, and you definitely want to get on board with it, because it saves time and money, which is huge when you race this much."

Battle Scarred Motorsports also noted how specialized equipment impacts their team. "If we have veterans who have some kind of physical ailment, we have cars that are set up with hand-controls," Farner said. A local police department donated four Ford Crown Victorias, one of which Battle Scarred converted to hand-control with the help of AMS Vans. "We have a full-out car that we have put six different veterans in that they were able to experience racing as we do."

One of the questions in the Racer Survey presented several options and asked, "Which do you most wish your preferred speed shop could offer but doesn't?" Perhaps not surprisingly, "Better prices on parts/labor" drew the biggest response, but "more availability and convenience (ease of scheduling)," "engine dyno service," and "chassis dyno/engine tuner" also drew considerable support.

Of course, there are many racers who have a foot in both the cockpit and the retail side of the trade, who see both sides of the parts acquisition issue. A noteworthy percentage of racers in our survey reported they worked for a retailer or manufacturer of race parts or worked at an engine builder or race prep shop.

"Having owned and operated two racing businesses, I am more sympathetic to what manufacturers and distributors deal with on a daily basis," Utt observed. "I try to be an easy customer by doing my homework first before ordering and also try to have realistic expectations on backlogs in manufacturing and distribution. I probably pay more attention to a company's background, too—who owns it and how long they have been in business."

The racing parts market is constantly evolving, so we're looking forward to what future PRI Racer Surveys reveal. PRI

"I TRY TO BE AN EASY CUSTOMER BY DOING MY HOMEWORK FIRST BEFORE ORDERING AND ALSO TRY TO HAVE REALISTIC EXPECTATIONS ON BACKLOGS IN MANUFACTURING AND DISTRIBUTION."

SOURCES

Badger Auto Sport

Battle Scarred Motorsports
battlescarred.org

Challenger Motorsports
challengermotorsports.com

Desert Star Motorsports
desertstarmotorsports.com

Roberts Motorsports
facebook.com/garrettalbersonracing/

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By Bradley Iger

SPINNING RECORDS

In contrast to the Cup series, the rule set of NASCAR's Whelen Modified Tour provides a substantial amount of freedom within the cars' chassis design, and that allows builders to bring more innovation and customization to the field. But as our experts point out, that flexibility can prove to be a double-edged sword for those who're just getting up to speed.

Photo courtesy of NASCAR Media

NASCAR's modified racing history is as storied as the organization that created it. It was established in 1948 and is now the sanction's oldest division, with the first NASCAR points-paying race on the beach course in Daytona Beach, Florida. The division has evolved in a variety of different ways in the time since, but its role as a home for technical innovation has remained a hallmark. While recent years have seen organizers tighten the reins in the interest of improving safety and containing costs, Whelen modifieds continue to offer builders and teams a degree of creative freedom that the Cup series cannot.

"We have some guidelines to adhere to with respect to how we build our cars, but the division also allows us to bring some of our own ideas to the table," said Phil Stefanelli of PSR Products, Midland, North Carolina. "For example, we've recently designed something that's a little different as compared to most of what's been out there for the past few years, something with a lot more adjustability. The removal of the chassis height rule last year has allowed us to do more with that; we're playing with a lot of different suspension stuff now that we couldn't do before."

The ruleset for Whelen modifieds allows chassis manufacturers, such as B&R Fabrication, to bring their own perspective to the design of major components in the car's front and rear suspension systems and tailor the car to driver and crew chief preferences.

"WE HAVE SOME GUIDELINES TO ADHERE TO WITH RESPECT TO HOW WE BUILD OUR CARS, BUT THE DIVISION ALSO ALLOWS US TO BRING SOME OF OUR OWN IDEAS TO THE TABLE."

With the majority of the cars' powertrain components consisting of spec parts, chassis design and setup has become a focal point for teams that are looking for a competitive edge. Darius Grala of Mooresville, North Carolina's Fury Race Cars explained, "There's substantially more opportunity for vendors in the Whelen Modified Tour because there are way fewer limitations than you have in a single-supplier model like the Cup series. That allows builders and teams to be more creative, but that flexibility can also add a new level of complexity for teams. That complexity provides more opportunity to get it wrong."

The most effective chassis designs in modified racing tend to be informed by data as well as extensive real-world experience. When it comes to doing things the "right way?" Well, the answer really depends on who you ask.

ROOM TO MOVE

The ruleset for Whelen modifieds offers teams and builders the opportunity to try new things with elements of the chassis design, but it's not a total free-for-all. "You have a 'box' that you have to work within," said Bill Cole of B&R Fabrication, Howell, New Jersey. "There are rules for chassis width, height, track width, wheelbase, and other dimensional elements."

Other aspects of this 'box' focus on the safety side of the car. "There are minimums for tubing diameters, material thicknesses, and the rules for spindle design were updated as well," Grala said. "After a competitor's spindle broke, organizers started scrutinizing their designs more, testing them for strength, and an additional tether was added on the right side. The designs needed to be changed in order to accommodate that."

The situation changes significantly when it comes to the suspension systems, though. "There's a pretty decent-sized window to make changes to A-frame length and angle," Cole said. "Suspension pickup points can be changed, trailing arm angles are pretty open, and we have a lot of leeway on sway bar size and arm length. You can also make changes to the way the sway bars link up to the lowers, too. The kingpin inclination on the spindles is pretty open as well, along with wheel offset, provided that you stay within the track width limits. Shocks are a big one, too—you run pretty much any shock that you want to. And you're trying to build the car as light as possible, and with a center of gravity that's as low as possible, within the limits of the rulebook."

Unlike the Cup series, this approach gives each Whelen modified chassis manufacturer the opportunity to bring their own perspective to the design of major components in the car's front and rear suspension systems. It also gives teams the ability to influence the design of the car based on their own knowledge and experience, and that can help to tailor the car more precisely to the preferences of their respective crew chiefs and drivers.

DISTINCT STRATEGIES

Stefanelli told us that manufacturers like PSR Products have taken full advantage of this relatively open aspect of the modified chassis by developing ground-up, specialized designs.

"Our front and rear suspensions are different from anyone else's," he explained. "We're racers ourselves, and four or five years ago we saw that there was an opening in the modified series, so we sat down and looked at what was out there, and what we could do better. We wanted our cars to be more racer-friendly, so we designed a whole new chassis. We've been very successful with it—Tommy Baldwin won three modified championships with our stuff last year. I don't

Thanks to the relatively open aspect of modified chassis, the team at PSR Products has developed ground-up, specialized designs. "We've been very successful with it," said our source. "Tommy Baldwin won three modified championships with our stuff last year."

want to reveal too much about what we do differently, because that's our advantage here, but I will say that we did extensive research on front-end suspension geometry and sway bar geometry, and at the rear of the car we have a totally different philosophy to the suspension design." He cited other companies that use torque arm systems in the rear, "but we decided to focus on a top link design for our cars. We found through our testing that the top link design gives you more forward bite in the car than a torque arm does."

Grala explained that, since the modified division doesn't put limitations on testing, builders and teams have benefited from knowledge and experience that can be harder to come by through simulation and other means. "Sway bar locations and sizes, along with the sway bar arm designs, are a huge part of the front end of the car. Cup teams used to mess with this stuff continuously before they became spec parts." Since builders in the modified division can also build in adjustability for the suspension pickup points, there's a wealth of different tactics available to teams when it comes to car setup.

"The pickup points change everything," Grala continued, "and the ride height rule is a good example of why you might

want to make adjustments there, or even just because of the differences in tire compounds from year to year. Changing this could even provide an advantage just when moving from track to track. The optimum position for one track design might not be the same for another. Cup cars have some leeway here, too; they just have a specific number of holes that they can bolt the components to. But for modifieds it's essentially open. On our car we use these oval inserts called slugs, which are put into oval cutouts on the chassis. Those inserts have holes in varying locations, but those can be changed. For example, if we have three holes on a slug and someone said to us, 'I need a hole right in between where these are,' we can simply make a slug where the hole is located exactly where they want it to be."

"THE REMOVAL OF THE CHASSIS HEIGHT RULE LAST YEAR HAS ALLOWED US TO DO MORE WITH THAT."

Cole noted that there are a number of adjustments that can improve the car's grip and yield faster lap times in turn, but the factors involved tend to make these settings a moving target.

"Different manufacturers put different kingpin inclinations in the spindles that can affect the amount of negative camber in the wheel, and it changes the cross-weight in the car a little bit," Cole explained. "You have four tires that you have to connect to the race track, and you're doing whatever you can to make sure as much of each tire's surface is doing that as is possible. But, as you go into a corner, the left-front loses camber while the right-front gains it, so that's always a big struggle. Some guys will run way more A-frame length on the left-front to try to keep that camber in it. Each track wants something different, and some tires want more camber gain than others, so the sweet spot is always changing."

The situation at the rearend of the car is even more open to interpretation. "Torque arm rear suspension designs have been around for a while now, but other racers swear by top link setups," he added. "A lot of drivers also like running a short track bar on the left side, others want a really long track bar in the car that goes from one side to the other. Sometimes it just comes down to personal preference, and what they're used to working with. There's a million ways to build a mouse trap, and some will go just as fast as others. There are crew chiefs out there who can make anything go around a race track. Something new comes out every year, but some of these trick setups are really just a selling point. Every once in a while, someone will find something that really works, but people usually end up going back to the stuff that they know well."

Because the modified division doesn't put limitations on testing, builders and teams have benefited from knowledge and experience that can be harder to come by through simulation and other means, noted our source from Fury Race Cars.

PUTTING IT TO THE PAVEMENT

The ability for chassis builders to take varying approaches to suspension design can benefit racers in a variety of ways, but customization and adjustability won't translate to tangible improvements in performance without an effective chassis setup. While many racers still rely on knowledge gained from years of notes and seat time, an increasing number of teams are bringing data acquisition systems and other technologies into their test sessions to help pinpoint what works and what doesn't.

"Data logging allows you to see what the driver is doing and how the suspension is working throughout its travel," said Grala. "From time to time, we'll even mount cameras on the car to monitor what the suspension is doing visually. That can allow us to see what's flexing and what isn't and ensure that the suspension is actually behaving the way it's supposed to."

Data can help inform teams and builders about the car's behavior on a more fundamental level as well. "We'll put a data system on our car and head to a track that we're going to race at to do some testing, and then we'll come back to the shop with

Alongside PSR Products' data logging capabilities, a full pull-down system allows the team to simulate a car going around almost any track they have data from. "Since things are pretty locked down in terms of powertrain and the tires," said our source, "the setup has become the focus."

that data," said Stefanelli. "We have a full pull-down system here, and that allows us to simulate a car going around basically any track that we have data from. From that we can get an understanding of where our roll center needs to be, and all of our components are built around where we want that roll center in the car. It can also help us determine things like sway bar timing, and we can see all of the loads on the tires to get a better sense of what's going on. It helps identify any potential binds in the suspension, too. More often than not, when someone is having a problem with their car and they don't know what's going on, they have a bind in the suspension somewhere. This is really where we're concentrating our efforts in modifieds these days. Since things are pretty locked down in terms of powertrain and the tires, the setup has become the focus."

But there is, of course, still something to be said for talent and experience as well. "A perfect example is Matt Hirschman," said Cole. "His car doesn't have the cutting-edge technology that some of these newer teams use, and yet he just dominates wherever he goes. They're basically working off of an old notebook—they've been to every track more than once and know what to expect from each one of them. If you're a young traveling team and you show up somewhere without even knowing what the track looks like, it's going to hurt you." PRI

SOURCES

B&R Fabrication
facebook.com/BRFabrications/

Fury Race Cars
furyracecars.com

PSR Products
psrproducts.net

Photo courtesy of Tyler Rinken/USMTS

By David Bellm

Modifieds are a lot of different things to a lot of different racers. For some, these wildly popular machines are a relatively inexpensive way to compete in a strong-performing, purpose-built race car. For others, they're the next step up from karts or lower levels of circle track cars. And for others yet, modifieds represent a valuable rung in a ladder that will ultimately lead to a top-level professional driving career.

Regardless of what attracts racers to the world of modifieds, there comes a point for many drivers when it's time to consider taking the step from local Saturday-night events to bigger series that compete in wider areas, or even across the country. Yet, with that decision comes a number of factors that must be considered. Will it add to one's enjoyment of the sport? Does it fit in with overall career plans? Is the cost of moving up manageable?

To help better understand these decisions and the factors that influence them, we spoke with representatives from several series, many of them considered "feeders." Their observations and perspectives provide valuable insight into modified racing and how each stage of competition offers a fitting venue for almost any racer regardless of age, experience level, or budget.

MOVING UP

Many in the sport feel there are significant advantages to getting ample seat time in modifieds. They say the unique characteristics of these cars can teach valuable skills that translate to any series or level of racing one might aspire to. "Folks are realizing that if you can drive a high-horsepower, lightweight modified on 8-inch tires, and you can hang on to that, then you could really do well once you get into the Late Model ranks and 10-inch

FEEDING THE BEAST

HOW SERIES ARE ENSURING THAT EACH LEVEL OF MODIFIED COMPETITION OFFERS A FITTING VENUE FOR NEARLY ANY RACER REGARDLESS OF AGE, EXPERIENCE LEVEL, OR WAR CHEST.

In the Modifieds of Mayhem series, some cars put out in excess of 750 horsepower. "And they're much lighter than a Late Model," said our source. "It truly teaches these kids how to drive cars and how to keep something underneath them."

tires," said Stan Narrison of Modifieds of Mayhem, Montgomery, Alabama. "Some of my modifieds have 650 to 750 horsepower, and they're much lighter than a Late Model. It truly teaches these kids how to drive cars and how to keep something underneath them. Plus, in a modified, with open wheels, guys learn a little bit of respect. When you put fenders on a car, guys like to lean on each other."

"THE EXPENSES OF TRAVELING, FUEL, AND TIME AWAY FROM WORK BECOME THE BIGGEST FACTORS IN WHAT SERIES DRIVERS RACE IN."

Regardless of whether racers are planning to build a career from their modified efforts or just want to play in a bigger sandbox, so to speak, there are many factors that typically influence the decision of whether or not to make the leap to a more expansive series. Foremost among these factors, of course, is money. It costs a lot to race in any series. That's compounded by the need to travel extensively across a multistate area. When that starts to become a challenge, many promoters find that payouts can make a significant difference in which series racers choose to advance into.

"The expenses of traveling, fuel, and time away from work become the biggest factors in what series drivers race in," explained Darlo Mulder of United States Modified Touring Series (USMTS), Webster City, Iowa. "When you get 80 cars for an event, and only 26 of them can make the show, everybody else is getting tow money. Quite frankly, tow money doesn't pay the bills. If you have guys who are struggling just to make the feature every week, pretty soon they're just going to run out of money and not be able to travel with us.

"That's why paying more money now is attracting more drivers to come race with us," Mulder continued. "For almost every one of the swings we do this year, we're doing three days at the same track. So instead of traveling from track to track on the weekend, we're all at the same place. It's going to save a lot on fuel for these guys."

ALL TOGETHER NOW

Along with trying to keep costs under control, many series find that it pays to cooperate with other sanctions to put on events, which helps keep them viable for racers considering stepping up to the next level. Key among the considerations in these cooperative ventures are rulesets. They need to work for everyone to foster a smooth transition for racers moving between series.

"We write our rules to try to accommodate most sanctions without them making major changes," said Mulder. "So, for example, UMP is a huge sanctioning body east of the Mississippi, and we get a lot of their guys who want to come run with us. UMP rollcages are an inch and a half, whereas WISSOTA and IMCA are an inch and three quarters, but we allow the inch-and-a-half roll cages so all the UMP cars can come race with us. They also have open motors where they don't have a whole lot of restrictions. So we made a package for all the open motors to try and get it to where these guys feel like they can come race with us without having to build a brand new car."

Beyond these factors, one of the biggest keys to attracting the right kind of racers to a series is clearly understanding where a particular sanction fits in the overall modified-racing ladder. Doing so keeps expectations realistic and allows promoters to better serve their racers, whether they're eager youngsters on their way to pro careers or seasoned veterans looking to satisfy their urge to race in between their nine-to-five weekday routine.

"People hate to say it, but our series is a B-League," explained Bill Doucette of Modified Racing Series, Meredith, New Hampshire. "There are two steps above us before they get to the top. So we have our place in the ecosystem. Everybody wants to be the big dog, but any sport needs a feeder system. That said, if drivers have raced their

local short track on Saturday night events, they can take their modified and come run with us. We don't have a huge schedule, and we have a fairly small travel area. So they can try out tour racing and see if it's something they want to do."

"USMTS is a professional traveling series," explained Mulder. "There are guys who race just with us as a profession, who have found a home racing here for their career. But building up to that, there are all your stock cars and your B-Mods and all that. Even an IMCA modified is kind of a step down from us."

YOUNG GUNS

Most feeder series for modifieds see up-and-coming young drivers as the future of the sport, bringing new life and energy into the field, even if those racers aren't likely to stay with the series for the long haul. So regardless of young racers' overall aims, sanctions typically do all they can to attract them. Often, such efforts are a combination of reaching these racers in their earlier stages while striving to put on a show worthy of their consideration.

Increasing payouts has helped attract more drivers to the United States Modified Touring Series (USMTS), according to our source, who also noted that "for almost every one of the swings we do this year, we're doing three days at the same track.... It's going to save a lot on fuel for these guys."

Rules within the United States Modified Touring Series (USMTS) are written with an eye toward accommodating teams that also race with other sanctions. For example, "we made a package for all the open motors to try and get it to where these guys feel like they can come race with us without having to build a brand new car," said a source with the sanctioning body.

"Attracting young racers is something our organization thinks about a lot," said Rod Lindquist of WISSOTA Racing Association, St. Cloud, Minnesota. "There are some really good kart operations around here, and a lot of those tracks are actually members of ours. So we already have our foot in the door there. But the best thing one can do to grow the sport, hands down over anything else, is to just have a solid, efficient running organization that puts on good shows."

Whatever trajectory young racers choose for their ascent up the ranks, they need to weigh their options carefully. Typically, this means making the leap to bigger, more prominent series whenever they're able, so they can continue to prove themselves worthy of making the next step beyond. For many young modified racers, doing so means switching to an entirely different type of car, typically Late Models.

"There's a lot of glamour that comes with Late Model programs," said Narrison. "They're usually the feature event at most tracks. And modified racers don't seem to feel the same pressure that there is in Late Models. I think the kids that are moving up realize that they've got to jump into that pretty quickly."

Some sanctions acknowledge career-oriented racers' progression through various types of cars and accommodate this switch by offering a wide range of classes, to provide a built-in career progression within the series. Sanctions that do so aim to entice their more ambitious racers to progress up the ladder with them, rather than leaving for a different organization.

"We have everything from Hornets to Late Models," said Lindquist. "So the only reason people would ever leave our series and go to another series is if they moved out of this territorial part of the country."

THE DOWNSIDE OF MOVING UP

Some promoters feel that young, career-oriented modified competitors often move up and out of their series too fast. They don't build a following the way that drivers who stick around year after year tend to. "I've had some great drivers come through my race track," observed Narrison. "Chandler Smith was racing here. It was boom, boom, boom, and he moved through the ranks. It didn't take long. We've had quite a few who

"THE BEST THING ONE CAN DO TO GROW THE SPORT, HANDS DOWN OVER ANYTHING ELSE, IS TO JUST HAVE A SOLID, EFFICIENT RUNNING ORGANIZATION THAT PUTS ON GOOD SHOWS."

have done that here. It makes it tough as a promoter because you want to make stars out of your guys."

"I think it's been a problem overall in the sport," added Modified Racing Series' Doucette. "I don't think young racers stay long enough in the lower series to build a fan base. Years ago, drivers raced short tracks all over the country, and they built a fan base. It took years. They didn't get to the upper levels until they were in their 30s."

According to some promoters, another potential challenge among intensely ambitious, career-oriented young racers is the problem of burnout. The intensity and high expectations of hot and heavy youngbloods can backfire, causing these fervent competitors to drop out of the sport altogether at a relatively early stage.

"Today's world is all about instant gratification," observed Doucette. "It's not

Acknowledging career-oriented racers' progression through various types of cars, WISSOTA Racing Association goes beyond modifieds classes and offers "everything from Hornets to Late Models," said one official.

about the longevity of building a career and making a name for yourself. I see teams come in, and if they're not up to the Cup level in two years, they don't think they're going to make it."

According to some promoters, one potential solution is to do whatever possible to encourage modified racers to simply enjoy whatever level of the sport they're at and let everything build on that foundation in due time. The reasoning is that, even if racers find that their career hasn't panned out the way they'd hoped, there is still the satisfaction of participating and competing.

"Teach kids to enjoy the sport," said Doucette. "Only a small percentage will ever make the big leagues. But if they learn to enjoy the sport, they'll play it their entire life."

FOR THE FUN OF IT

Like most aspects of running a race series, some sanctions are more in tune with driver satisfaction than others. Those that are have found that the general satisfaction racers get from their events can't be left to chance. Instead, it's an attitude that should be fostered consciously and consistently.

"You have to remember that racers are a customer of the series," said Doucette. "So our mantra is to make everything racer-friendly. Cater to them and do everything you can to get them to come back the next time. A lot of that comes down to just making it an enjoyable experience. It can be as simple as just going over and saying hello. That means a lot to people. At the end of the day, if they get a pat on the back and someone says, 'Thank you for coming,' at least they know they were appreciated."

"THIS IS A GREAT SPORT FOR PEOPLE TO FIND THEIR LANE AND RUN WITH IT."

Along with concerns about young drivers having the right motivation is the matter of whether or not the youngest of competitors are even ready to jump into a modified to begin with. Some sanctions suggest that young racers should be evaluated carefully before being allowed to enter a series, regardless of whether the driver's age fits the letter of the rules.

Today's sanctions are taking tangible steps to keep driver satisfaction among their top priorities. "You have to remember that racers are a customer of the series," said one of our sources. "So our mantra is to make everything racer-friendly. Cater to them and do everything you can to get them to come back the next time."

"For years, our minimum age was 16," noted Doucette. "Now we've started to lighten up on that a little bit, but I'm still very leery of a 13-year-old coming in and racing with a bunch of veterans. I have to talk to the kid and see him run first. Then I can make a judgment if he's ready. The proof is in the pudding—watch him race."

KEEPING IT REAL

Ultimately, the decision of whether or not to move up to a higher level of modified series is a personal one, dictated by emotional factors as much or more than practical considerations. Some drivers would rather stay where they are and continue to race modifieds in a local series because that's simply what they enjoy. Others see modifieds as just another car and class to be mastered in a larger quest to build a major-league racing career.

"First off, know what you want to do," advised Lindquist. "You have to recognize your abilities. You have to be clear about what your goals are. If you just love the sport and you want to compete, then put yourself into the class you want to race in, that you feel you're best in. That could even mean going down a class. I have a guy in our series who ran several years in a modified, but he found he had more fun going down and running a Hornet.

"This is a great sport for people to find their lane and run with it," he added. "It all comes down to what's in your heart as a competitor." PRI

SOURCES

Modifieds of Mayhem
modifiedsofmayhem.com

Modified Racing Series
themodifiedracingseries.com

United States Modified Touring Series
usmts.com

WISSOTA Racing Association
wissota.org

BUSINESS PROFILE

LEINDECKER
RACING ENGINES

By John F. Katz

JASON LEINDECKER FOUND THAT BUILDING ENGINES REQUIRED CREATING A BRAND AND A REPUTATION THAT COULD STAND UP AGAINST THE LONG-ESTABLISHED COMPETITION. HE SUCCEEDED WITH RACE-WINNING PERFORMANCE, ROCK-SOLID RELIABILITY, AND HIS EMPHASIS ON PROVIDING HIGH-QUALITY CUSTOMER SERVICE.


MOROSO
CRAFTSMAN
CLOYES

Jason Leindecker is a very busy individual. He has been for a long time. He launched the business that became Leindecker Racing Engines while still in college and while driving a truck for his father's company. Upon graduation he joined the Coopersburg, Pennsylvania, police. He is still a fulltime officer, while running not only the race engine business but also Coopersburg Auto Parts, which includes a complete auto repair facility.

Although he's built engines for drag racers, street stocks, and asphalt late models, Leindecker is now laser-focused on dirt-track modifieds. "Most of my business is Northeast-style, dirt modified racing," he noted. "The majority of our motors are 358s, although some of my drivers have big blocks." His regular customers range from the Canadian border to the southern tip of Delaware, and to just west of Harrisburg, Pennsylvania; but he has shipped engines as far west as Arkansas, Kansas, and Texas.

ONE PIECE AT A TIME

Building engines for modifieds has brought Leindecker back to his racing roots. "When I was growing up, my dad had friends who raced dirt modifieds, and every weekend my whole family—myself, my dad, and my brother—would travel to a dirt track somewhere in Pennsylvania or New Jersey. Friday night we'd be one place, Saturday night another, and Sunday night another. That was pretty much every weekend throughout the racing season.

"In 1988, my brother John started racing a street stock at Nazareth Speedway, but I took a different course and went drag racing," he continued. Leindecker still loves "hot rods and 1955, 1956, 1957 Chevys," but mostly, "I got sick of hammering out body panels every week. I started bracket racing, and eventually I was running NHRA Stock and Super Stock. That's where engine building started for me, because to keep up in a class like that you really have to know what's going on. So I started learning about engines."

Leindecker was just 19 in 1997, when he obtained a business license and bought a valve refacer, a seat grinding cabinet, and a flow bench—all secondhand. "I commandeered a corner in my dad's truck garage, doing cylinder heads for myself and some friends. And it just kind of went from there."

The 15 to 20 brand-new engines Leindecker Racing Engines sells each year are just one part of the business, according to Jason Leindecker. "A lot of our work is freshening up motors." Counting refreshes, "we do one or two complete engines a week."

Indeed, it did. Leindecker bought a house and moved into his own garage. Several more moves and more machines followed. "I would just save my money and buy a piece of equipment, and then save my money and buy a piece of equipment. It's tough to be at the mercy of other machine shops and other builders, so I started buying my own machines so I could control every aspect of the build and not rely on anyone else."

Seven years ago, Leindecker moved into his present 5,000-square-foot facility in Coopersburg, about 15 minutes south of Allentown. "That houses my auto repair business, my performance parts store, my machine shop, and my engine-building business. We sell 15–20 brand-new engines each year, but that's only part of it. A lot of our work is freshening up motors that we sold the year before, or a couple of years before, or even motors from another builder." Counting refreshes, "we do one or two complete engines a week." Racers who bring a competitor's motor to Leindecker tend to stay with him.

He stocks crate motors, also. Particularly popular is GM part number 602, a sealed 350 Chevy. "We probably sell a dozen of

those each year." Altogether, building, freshening, repairing, and selling complete engines accounts for about 75% of Leindecker's business. Another 15% is machine work for DIY builders, "and the rest is individual part sales."

BUILDING THE BRAND

Leindecker runs all three operations with just four employees. Two help out with the race engines, one handles street vehicle repairs, and "my wife runs the parts counter. She's the glue that keeps it all together."

Finding reliable help has been "really tough. It's very hard to find someone with the focus the job requires, because one mistake can turn a whole motor to junk. Or they don't want to put in the time that's required. We had a kid washing parts, and after two weeks he thought he should be head engine builder."

Valuing attitude over experience, Leindecker recently hired a regular customer of his repair shop. "He is into trucks, and the trucks he's brought in have been absolutely spotless. You can tell they are well-maintained. One day he said that engine building would be really neat to learn, so now I'm teaching him machine work. If someone has good mechanical ability and a

Jason Leindecker has been doing cylinder head work since he started the business at age 19. "I commandeered a corner in my dad's truck garage, doing cylinder heads for myself and some friends. And it just kind of went from there," he explained.

willingness to learn, I can teach them how to run any machine."

While finding employees has been difficult, "absolutely the hardest thing has been establishing my name, my brand, and my reputation. Especially when I started, being that young, you are hard-pressed to find somebody who is going to throw you $20,000 and say, 'Build me a race engine.' There were so many other engine builders that I had always looked up to, and tried to fashion myself after, because they were so good and had such a reputation. And now it was hard to compete with them."

Leindecker believed that his engines were as good as anyone's, but it seemed like "every racer wanted a particular name, like Pat Morrison, or Kevlar, or Billy the Kid. It took a good 12 to 15 years just to get recognized, to get to where people trusted me and believed that my product was something worth having."

To get to that place, Leindecker donated "a lot of free labor, finding somebody that I could help, and nine times out of 10 doing it for free, just to get going. It was probably not the best business model to take to the bank," but to Leindecker, it seemed like the only way to establish himself.

He still sees customer service as key to his success. He doesn't have a parts truck, but he attends as many races as he can. "I have a lot of racers at a dozen different tracks, and being everywhere at once is, of course, impossible," he explained. "So I try to rotate weekly—one week I am at this track, the next week at another, and so forth. That way, all of my customers see my face, and they know that I'm not just focusing on a few favorites.

"I bring a box full of tools, with everything I need to check valves and valve springs, and any type of diagnostic that I can do at the track. And I always bring my rulebook in case there's a question about anything. Knock on wood, I've never had to make a major repair while I was there, but you just never know. Mostly I try to make myself seen, so my customers know that I am interested in them, that I am invested in their purchase."

CUSTOMERS, SERVICED

Leindecker also makes what he calls "house calls. I would rather go to somebody's garage or race shop to make sure that everything is right, so I don't have to answer a call on Monday morning where they say, 'Hey, this broke,' and then you get the domino effect where everything else is broken, too. My customers might see this as customer service, but I see it as just being friendly.

"One of my standout customers is 14 years old and runs a 358 modified, a DIRT-series big block modified, and some

Lightning Bodies owner Rick Laubach started buying engines from Leindecker Racing Engines for a customer's car three years ago, and has since switched to Leindecker engines for his own race car as well. "He's becoming one of the major players in the business," Laubach said about Jason Leindecker.

"IF SOMEONE HAS GOOD MECHANICAL ABILITY AND A WILLINGNESS TO LEARN, I CAN TEACH THEM HOW TO RUN ANY MACHINE."

Super DIRTcar Series races, too. He's just tremendous." One night last year, just as Leindecker was arriving home from a night out with his wife—a rare night that he wasn't at a race track—the young racer phoned from a local speedway. He had finished second in the heat race but had broken a pushrod. Could Leindecker fix his engine before the feature?

"Fortunately, that track is only 20 minutes from my house," said Leindecker, who immediately drove to his shop to get his tools and arrived at the track about 40 minutes after the phone call. "I was able to fix the motor so he could run the feature."

Brad Brightbill, who campaigns sportsman modifieds at multiple tracks in central Pennsylvania, recalled a similar experience. "The first year I was with Jason, I stripped out a head bolt, and he was at my shop the next morning getting it patched up and ready to race again."

Brad's father is Kenny Brightbill, a local legend who, since 1967, has scored more than 441 wins at 41 tracks—mostly in dirt modifieds. Brad began campaigning sportsman modifieds around 2002, initially powered by engines he built with his father. About 10 years ago, however, Brad switched teams, and by 2018 found himself looking for a new engine builder. "One of the guys I raced with said, 'Hey, you should talk to Jason, he'll give you a good deal.' So I gave him a call, and he got me back on the track. We won the 2019 track championship at Grandview [Speedway in Bechtelsville]. Then we went back out and won the 2020 championship at Big Diamond [Speedway in Pottsville]. And we won almost every big sportsman race there was in the area," including the Coalcracker 72 at Big Diamond and the Firecracker 40 at Grandview, for 18 feature wins and two track championships in

just two years.

"Last year we had to switch over to a crate motor," Brightbill continued, "so I got a crate motor from Jason. He's an all-around great guy, who gives great customer service. He will bend over backward to help anybody. If you have a problem with your motor, he's at your shop the next day. Any time I was running behind and didn't have time to run up to his shop to get my motor, he would deliver it to me. Not many builders would go out of their way like that. It doesn't matter what time of the day or night I call him; if he doesn't answer he calls me back pretty quick."

Rick Laubach owns Lightning Bodies in Quakertown, Pennsylvania, and has driven modifieds for 27 years, winning 128 races and 10 significant championships. In addition to his own spec-motor car, he currently drives and maintains modifieds for owners Gary Herman and Ryan Kerr, all under the banner of Shaker Motorsports. He's run engines from some of the biggest names in the business, but three years ago he started buying Leindecker engines for Herman's cars and has since switched to Leindecker for his own car as well. He expressed concern that some of the best-known builders are reaching retirement age, while "Jason is up-and-coming. He got his name up there big by winning a lot of races. He's becoming one of the major players in the business."

Leindecker's customer service, Laubach agreed, "is second to none. I needed a certain kind of oil for Ryan Kerr's car, which has an engine out of Wisconsin, but my usual supplier didn't have it. So I called Jason, and he said, 'I can get your oil, it will be here tomorrow.' And I said, 'Let me know when it comes in.' Well about 2:30 the next afternoon Jason pulls up to my shop with two cases of oil. He had driven to Lancaster to pick it up"—a three-hour round trip from Coopersburg—"for an engine that he didn't build. He just wants to help people out."

RANGE OF MOTION

With endorsements like that, it's hardly

Jason Leindecker grew his business one piece of equipment at a time so he could have more control over every aspect of an engine's build. A 2,500-square-foot addition to his existing shop will afford him more room for machining equipment, as well as a new dyno cell.

Jason Leindecker's customers feel his service is second to none. "I am just trying to keep racing alive," he said, "to do whatever I have to do to keep my racers racing."

surprising that Leindecker ranks his customers as by far his best promotion. "I have advertised in racing magazines and newspapers," he told us. "I usually have a big booth at the motorsports show in Philadelphia. I have a Facebook page, too, but very little of my business comes from social media. Most of my business comes from word-of-mouth."

And his business is still growing. "We are in the process of building a new 2,500-square-foot facility that will eventually house some newer CNC equipment and an up-to-date dyno cell," all on a property adjacent to Leindecker's existing shop in Coopersburg. When we spoke in March, he expected construction to be completed by next summer. "That's our plan for the future."

That, and continuing to provide not only the customer service but the reliability that Leindecker believes to be just as critical to his success. "I am not looking to take your money. I just want to build a product that keeps racing going, because we all know it's getting super expensive, and car counts are down yearly. So I am just trying to keep racing alive, to do whatever I have to do to keep my racers racing." PRI

By Drew Hardin

The appeal of front-engine dragsters, gassers, and other vintage quarter-milers is stronger than ever. Surprisingly, nostalgia isn't the only reason.

Photo courtesy of NDRL

DRAG RACING'S TIME MACHINE

"Preserving the past. Building the future.' That's what the Nostalgia Drag Racing League is all about."

Butch Hill, president of the Mooresville, Indiana-based NDRL, used that phrase to describe his diverse group of drag racers, but that same kind of looking back/looking ahead philosophy applies to many of the nostalgia drag racing associations currently in action across the US.

There's no question that the emotions associated with the "good old days" motivate some of these racers to bring out or re-create the cars they ran when they were younger. Or to keep the memory of drag racing heroes alive by building and racing tribute cars. But these men and women aren't merely reliving the past. They are doing what they can to encourage current and future generations to appreciate an earlier, simpler time in drag racing history. Fostering that appreciation will bring newcomers into the fold, they believe, and keep this drag racing niche alive and thriving. So far, it's working, and there are no signs that nostalgia drag racing is going to slow down, so to speak, anytime soon. Following is a look at some of today's premier nostalgia drag race associations and what's keeping them on track.

MID-ATLANTIC NOSTALGIA DRAG RACING ASSOCIATION

MANDRA was formed in the late 1990s "when about 12 guys" started their own

nostalgia racing group, explained MANDRA president Merritt Snyder. "They did it for racing fun, as a family activity, and for the camaraderie among members. And it has gone very well."

Recent end-of-the-season banquets have drawn 75–100 racers, even more for the 20th anniversary party. The cars they race are an eclectic mix, ranging from Snyder's 1965 Mercury Comet to altereds, gassers, and vintage Funny Cars. The appropriately named English brothers race a Jaguar and an MGA, both 8-second cars.

That mix is "purely by accident," Snyder said. "Nostalgia is the thing that is common among them, but it's not like we're looking for any specific kind of car." Member cars have to be at least 40 years old. Electronic fuel injection is not allowed, nor are import tuner-type cars. "The only rules we have are, no delay boxes, and no electronics that affect the performance of the car."

The racing is done bracket-style, and "everybody races together," Snyder said. They participate in 16–17 events a year at eight tracks in the Pennsylvania/Maryland/New Jersey area. "The Reading area, Maple Grove or South Mountain, are the two tracks that are central to where all our people live."

Snyder said MANDRA adds an average of "a half-dozen new members per year. A lot of people are unhappy with NHRA tracks, because if you get involved in their points system, you're a slave to their points system. You have to keep going there every week, because you can't afford to skip races and miss points. Ours is a much more relaxed way of doing it. We only count points for 70% of the races." That allows someone who can't make it to all the events to still be competitive for the championship.

While Snyder acknowledged that MANDRA hasn't tried "as hard as we should to look for younger members," it did put a new Family Race Car category in place last year in which members of a family can race the same car "and get points for it regardless of who's driving. The car gets the points, not the driver. We have a guy and his daughter racing a car, a guy and his grandson, and two father-and-son teams racing.

"It's difficult to get younger people involved because it's pretty expensive to come up with a 40-year-old car and build it into a race car," Snyder added. "I remember a time when I said I wanted to build a $2,500 car. You can't even buy the body for $2,500 anymore." Plus, because all MANDRA cars run in one class, "we have an elapsed time restriction. The slowest ET we're going to allow is 14 seconds in the quarter-mile, so it takes a little bit more money to get something together. It's hard for young people to do that, and we do recognize that."

"SOME OF THE COMPANIES ARE STARTING TO REALIZE THERE'S SOMETHING TO THIS AND THEY NEED TO GET ON BOARD."

The Bob Glidden tribute car Mike Ruth races in Nostalgia Pro Stock was originally built in 1979 but has been updated "to be safe and meet all the current specs," Ruth said. "Safety is our utmost concern."

MIDWEST NOSTALGIA PRO STOCK ASSOCIATION

"Our motto is 'Paying tribute to the legends,'" said Mike Ruth. "We're trying to keep alive the memories of the guys from the heyday of Pro Stock—Bill Jenkins, Bob Glidden, Don Carlton, Butch Leal, Sox & Martin, that's our deal. It's not so much about us; it's more about keeping those names alive and their accomplishments."

For the most part, participants drive accurate reproductions of 1990 and earlier Pro Stocks. Ruth drives a Bob Glidden tribute made from a Pro Stock car built in 1979 (but not raced by Glidden). His brother, Jim, campaigns an original 1985 Pontiac that Don Ness built for Butch Leal, though it's now finished in the "Party Time" livery raced by the Jim Ruth who once owned the IHRA.

The diversity of cars racing with MANDRA "was purely by accident," said Merritt Snyder. "Nostalgia is the thing that's common among them." Member cars range from front engine dragsters to an 8-second Jaguar.

The Nostalgia Pro Stocks take part in about 15 races a year, plus a half-dozen static displays. At the races, "we pair the cars up evenly, 1970s cars together and 1980s cars together," Ruth said. "It's all about the show. We're entertainers. We're there to make people feel good and have a good time. We want to put on the best show we can, so people don't forget guys like Bob Glidden, Lee Shepherd, and Bill Jenkins." Ruth is proud of the fact that in November, there will be a large gathering of Nostalgia Pro Stocks at the Muscle Car and Corvette Nationals in Chicago, which is the most prestigious muscle car show in the country, he noted.

Ruth has seen racing industry support grow for these cars. "Some of the companies are starting to realize there's something to this and they need to get on board." Major supporters of their racing efforts to date include Powermaster, ARP, McLeod, and Hairy Glass, "a supplier back in the day," Ruth explained. He suggested that the

fiberglass manufacturer should reach out to the Nostalgia Pro Stock racers, "and the response was overwhelming. Now if you're a Nostalgia Pro Stock guy, they'll give you a discount on parts going on a Nostalgia Pro Stocker."

Ruth sees his corner of nostalgia drag racing "growing in leaps and bounds. There are more cars, and more groups. A new group started this year in the Chicago area, though they're going more into the newer cars, into the 1990s, so they're going faster.

"I don't think it's ever going to be a giant thing, but it'll be around forever," he added. "Nostalgia has a lot to do with it. It brings you back to an era where you can actually have rivalries. 'Hey, I got a Mustang, your Camaro sucks.' 'Well, my Demon can beat both of them.' It's especially hard to get rivalries going in Pro Stock now because they're all Camaros. Plus, we're super fan friendly. In the pits, we don't have any ropes up, so if people want to sit in the car, we take pictures of them, and do the hero cards and all that."

He said the appeal of a vintage Pro Stock race car isn't limited to those who grew up with them. "A lot of the younger guys like it. They love the hood scoops since Pro Stocks don't have them anymore. They love the dual four barrels, the Lencos. We have a fan base of younger guys, but as far as them racing, it's still fairly expensive for a guy in his 20s to be able to do. But every year we bring newer cars in, so that's one good thing."

> *"IN KEEPING WITH THE NOSTALGIC DRAG RACE ERA, THERE IS NO TRACTION CONTROL, NO DELAY OR CROSSOVER BOXES, NO OPTIONAL THROTTLE STOP CONTROLLERS, NO BUMP BOXES, NO NITROUS."*

NOSTALGIA DRAG RACING LEAGUE

Unlike some of the nostalgia drag racing groups that make what are essentially exhibition passes, in the NDRL championship points series "we really are racing," said Hill. NDRL classes are intended for vehicles with a nostalgia appearance, 1979 and older body types, and no modern rear engine dragsters. "In keeping with the nostalgic drag race era, there is no traction control, no delay or crossover boxes, no optional throttle stop controllers, no bump boxes, no nitrous."

All NDRL races are quarter-mile, and cars are grouped in five classes—Pro-7.0, Pro-7.5, Pro-Comp, Pro-Gas, and Modified Production. "Most of the cars in the Pro 7.0 and Pro 7.5 classes are front engine dragsters, altereds, Funny Cars and some door slammers," Hill explained. "Pro-Comp also has front engine dragsters, altereds and roadsters, with an index range from 8.0 to 11.0 seconds on half-second indexes. Pro-Gas is made up of door slammers with two working doors, a roof or convertible top, and no center steer." Indexes are the same as Pro-Comp.

"For years, people have been asking us for more indexes, and this year we added 10.5 and 11.0 to both Comp and Gas. We did it to drive income. Not for us; we are a 501 (C) non-profit, but we saw an income stream that needed to be put in place for the tracks. It's the tracks we work with that provide most of the NDRL's payouts, so we needed to make this financially sound for our championship series to show up."

Unlike some of the nostalgia race groups that make what are essentially exhibition passes, "we really are racing," said Butch Hill of the NDRL. "Half of what we're about is the camaraderie after the race, but when it comes to elimination time, the place gets serious."

The Modified Production class was another recent addition. "We did two races with this class last year, and this will be the first year with a full points schedule," Hill said. "These are shifter cars only. I call them the Pro Stocks of the past. Back in the '70s, this was the class to watch. They're high-winding, gear-shifting, and they come out of the hole with a lot of rpm. No delay boxes, pedal magnets, air shifters, or electric shifters. The index range is from 8.75 to 12.0 seconds on quarter-second indexes. They have to do it the way it used to be."

"FOR YEARS, PEOPLE HAVE BEEN ASKING US FOR MORE INDEXES, AND THIS YEAR WE ADDED 10.5 AND 11.0 TO BOTH COMP AND GAS."

At any given event there will be around 125 NDRL cars, Hill said, with Pro-Gas the biggest class. "We haven't run 10.50 and 11 until this year, and we haven't had our first race yet, so we'll see, but I think we'll get even more cars. We're just here to have fun and race. Half of what we're about is the camaraderie after the race, hanging and talking and barbequing and just having a good time. But when it comes to elimination time, the place gets serious. Everybody's out to win."

Hill believes one reason for the sport's growth is the fact that "after so many guys sat around due to COVID-19 restrictions for two years, they were more than ready to dust off those race cars and get out to the tracks. Also, with so much you see on TV about drag racing, the sport is bigger than ever before."

Racers "are seeing what NDRL is doing and are getting into the game more and more," Hill continued. "And I don't see it slowing down. Not any time soon. We have several engine builders who are NDRL sponsors. I know several more engine builders, and every one of them is slammed building engines, getting them ready to compete in NDRL."

NOSTALGIA GASSERS RACING ASSOCIATION

The name of the association "kinda hits it on the head," said Bryan Huffman, president of the Nostalgia Gassers Racing Association, Kewanee, Illinois. Car bodies have to be from 1965 or older, and straight axles are not mandated to achieve the iconic nose-high gasser look, "but a nose-high appearance is required." Engine rules "are pretty open," he said, though no EFI or turbos are allowed. "We want Roots blowers, that type of engine, as long as it's not too modern looking. We want vintage wheels, a vintage-correct paint job—none of the swirls and squiggles and fancy stuff they have out now. We want plain-looking cars with decals on them, tinted windows, stuff that gives it a nostalgic look."

Huffman described the Nostalgia Gassers as "an entertainment group. We're expected to be available to the fans and put on a show for them. We talk to people, put kids in cars, hand out hero cards, and sign them for the

"Everywhere we go, people come to us and say, 'You guys are the reason we're here. We came to see the gassers,'" said Bryan Huffman of the Nostalgia Gassers Racing Association.

kids. We race heads-up and nobody loses. Ten to 12 cars go up every round. We match each other up, run somebody different each round, and try to keep it fair looking. Since nobody loses, that gives the crowd an opportunity to see the cars in several rounds rather than having the field cut in half after the first round. We can put on a full show for the crowd, and they even give us a little gas money when we leave. That's the cat's meow as far as I'm concerned."

Growth within the group has been steady. "We started with 12 cars 12 years ago, and now we're up to 42," he explained. "Typically, we'll lose a couple each year, but pick up two or three. Most of the guys have run in competition before, but now they're a little bit older. They don't want to hunt for that hundredth or thousandth. They just want to come out and present their car. Most of our group grew up with gassers, like myself. When I started going to the drag strip, the primary thing I watched were the gassers, and I was in love with them from that day on. Most of our guys are that way."

But not all of them. "We have younger guys, they just like the gassers. They don't want to seriously compete. They just want to race once in a while, go to the track, and put on a show."

Huffman recalled one particular 9-year-old who was fascinated by his car at an event (he races a fiberglass 1941 Willys coupe and a steel 1941 Willys pickup). "I sat him in my car, talked to him, signed autographs. You could tell his eyes were lit up like silver dollars. And he said, 'I want to do this one day.' Ten years later, he came up and said, 'Bryan, I made it. I got my car here.' We planted that in him many years ago, and he worked his tail off for 10 years to be able to have his own car and be at the track."

NOSTALGIA SUPER STOCK INC.

"We do drag racing the way it was: heads-up match racing, run whatcha brung," said Rich Berlisk, president of Nostalgia Super Stock Inc. (NSS), Springfield, Illinois. An earlier version of this racing group, formed in the late 1980s, competed in a bracket-race format, "but in 1990 it picked up more steam with heads-up match racing. The reason we continue to do it is because

we seem to put on a better show than index bracket racing does."

The cars competing in NSS are the "factory muscle cars of the late 1950s through the 1960s, up to the time when Pro Stock began," Berlisk said. "Our oldest car is from 1958; primarily everything is mid-'60s Fords, Mercury Comets, Dodges, Plymouths, full-size Pontiacs like the Catalina, the smaller Pontiacs like the LeMans, and Chevrolets." Several years ago, NSS added a class of altered-wheelbase cars, "and we have four AWB cars right now, all early 1960s GM and Mopar cars. They run along with our Super Stocks and may run against a Super Stock if the times are comparable."

The ETs the cars run range from 8 to 12 seconds, Berlisk said. "We pair up the cars. If the track that brings us in wants three runs, you'll run three times, even if you lose. If the track asks for a winner and a runner-up, I have a formula for that. I pair the two cars with the closest ET. It could be two

"We are the only ones still doing the heads-up match racing like from back in the day," said Rich Berlisk of Nostalgia Super Stock Inc. "We're there to put on a show and educate the general public about the way drag racing was back in the '40s and '50s."

12.20 cars or two 8.50 cars, or anything in between, usually within a couple hundredths. That will put on a good show. We're there to put on a show and educate the general public about the way drag racing was invented back in the '40s and '50s."

To that end, engines must look like they did in period, with carburetors and era-correct intake manifolds. The AWB cars can run mechanical fuel injection, though one racer was allowed to operate his Kinsler injection system with electronic controls, "and you really can't tell it's there. It looks the part," Berlisk said.

Last year, the group's roster included 42 cars, up from the handful that started racing back in the 1980s. "In the last five to six years we've seen growth," Berlisk said. "It seems like we lose one through attrition but then pick up two." Often people will approach him to join; sometimes he'll recruit a vintage car he spots at a race. A few years ago, at Union Grove he and a prior president saw "a 1963-1/2 Ford running in a bracket race, and we wondered, what's he doing that for? We went over and asked him, 'Would you like to run with us?' Afterward he said he enjoyed it so much he wanted to know how to hook up with us."

"WE'RE TRYING TO KEEP ALIVE THE MEMORIES OF THE GUYS FROM THE HEYDAY OF PRO STOCK."

The demographic of the NSS members skews older; the youngest are in their early 40s, except for a 16-year-old son of a member who wants to race.

"I would like to see younger people get into it, but there may be a cost factor for the stuff that we're building compared to putting a tuner car together," Berlisk noted. "Some of my members have spent 50 grand on a motor. So their pocketbooks might not be able to take it, but I know a lot of them would like it." PRI

SOURCES

Mid-Atlantic Nostalgia Drag Racing Association
mandraracing.com

Midwest Nostalgia Pro Stock Association
mwnpsa.com

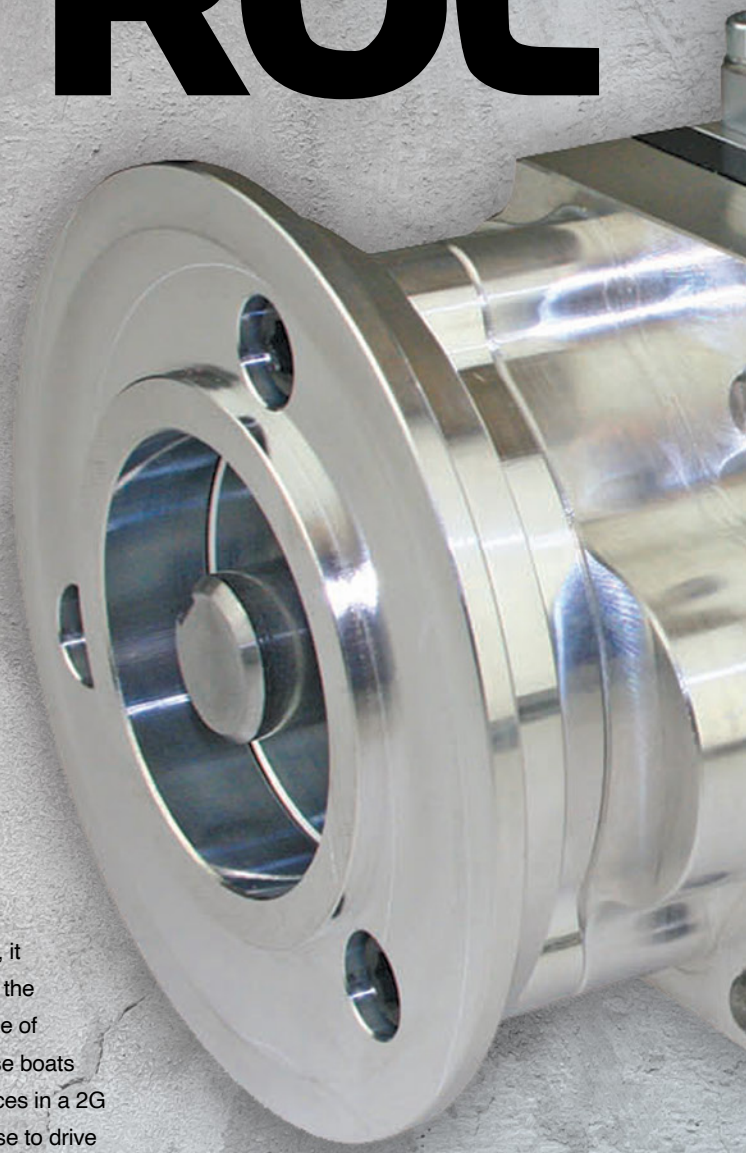
Nostalgia Drag Racing League
nostalgiadragleague.com

Nostalgia Gassers Racing Association
nostalgiagassers.com

Nostalgia Super Stock Inc.
nostalgiasuperstock.com

EXERTING CONTROL

Oil system manufacturers are constantly updating and upgrading this most fundamental aspect of an engine's operation in order to prevent the (potentially disastrous) consequences of inadequate oiling.

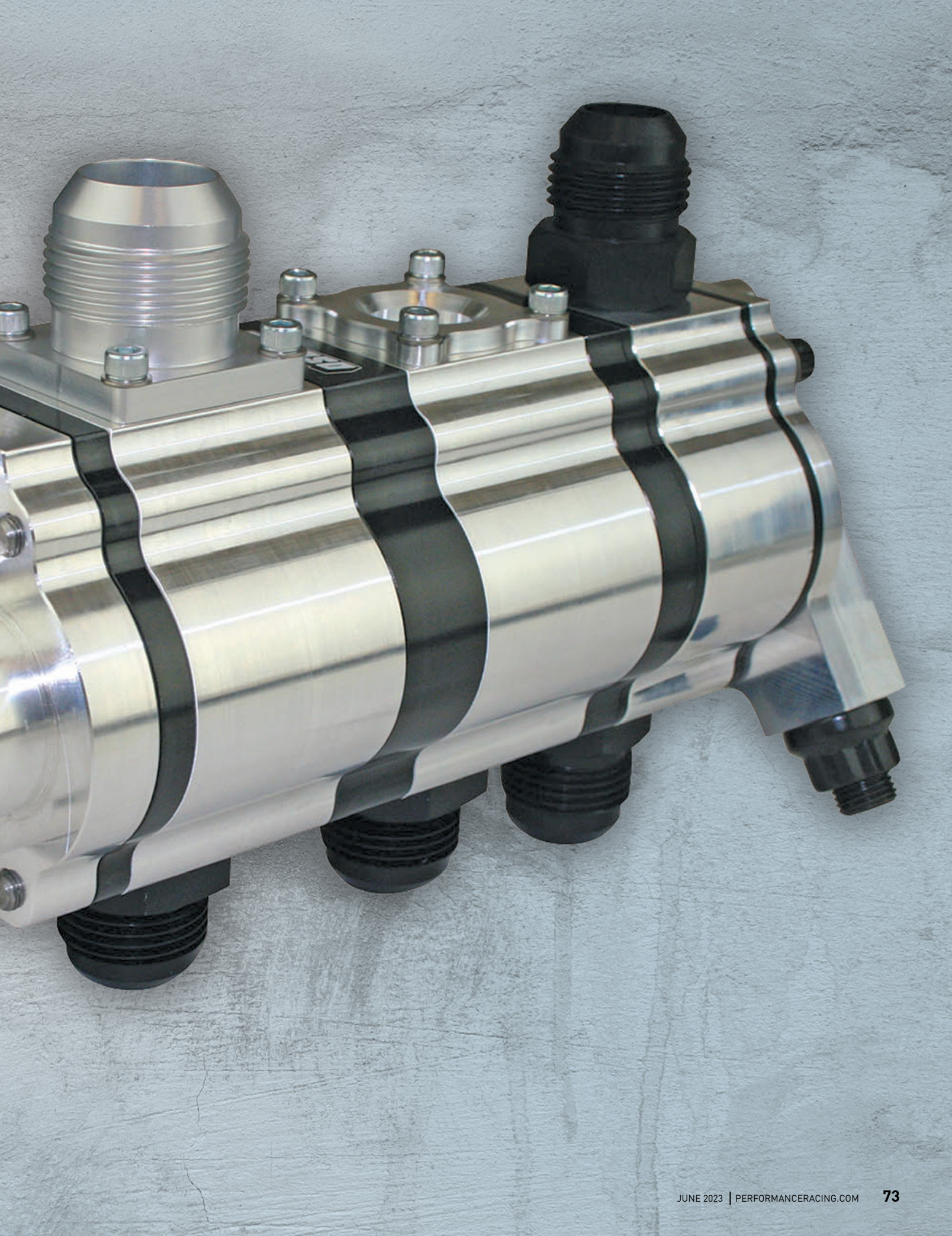


By Drew Hardin

Engines, in one form or another, have been around for a very long time. So, it would seem that by now something as fundamental to the engine's function as its lubrication system would be dialed in. Yet there are forces at work that keep an optimized oiling system a constantly moving target, from ever-thinner oils to ever-more-powerful engines. Plus, basic fluid dynamics keep system developers on their toes.

"Oil is the only thing in the engine that's completely footloose and fancy free to go wherever it wants," said John Schwarz of Aviaid Oil Systems, Chatsworth, California. "Where the oil goes is impacted by what a vehicle is doing. In drag racing, it all goes to the back of the pan, or the back of the valley, or the back of the cylinder head. In road racing, it goes to the front of the pan, the back of the pan, the left side of the pan, the right side of the pan. In circle track racing it typically goes to the right side of the pan. In hydroplane racing, it goes to the wrong side of the pan. Those boats still turn left, but the engine is in the boat backwards, and centrifugal forces in a 2G turn can be so significant that it will overcome the windage and crankcase to drive the oil to the side of the pan where the pickups typically are not placed."

Oil, Schwarz said, "is the one thing in an engine that's completely uncontrolled. The better you can control it, the better the system will operate overall."



Properly sizing an oil pan for LS engines is "trickier than other engines," said Scott Hall of Moroso, because the skirted engine block takes away pan capacity. "We have to build a variety of oil pan sizes for LS engines to fit into everything from a COPO Camaro to a road racing car or a sand rail." Shown here is one of Moroso's pans for 2016 and newer COPO Camaros.

OIL CAPACITY

The foundation of an oiling system, the oil pan, has been reengineered to work with some of today's most popular engine families.

"One of the biggest things we deal with is how LS engines fit in cars," said Scott Hall of Moroso, Guilford, Connecticut. "The reason it's so much trickier than other engines is because, while most blocks have the oil pan rail at the centerline of the crankshaft, an LS has a skirted block, which takes away some of the oil pan capacity. We have to build a variety of oil pan sizes for LS engines to fit into everything from a COPO Camaro to a road racing car or a sand rail.

"The key factors we always look at with any type of oil pan are, how much oil are we looking to get into it, and how does the crank centerline of the engine relate to the lowest point of the car?" Hall added.

With a traditional engine block "you could put an oil pan on there with a kick-out pouch to get some of the oil off the rotating assembly," added Moroso's Frank Thibodeau. "That would help free up some windage and get the engine to spin a little faster. But we can't do that in an LS because the crank is recessed into the block. It's very similar to the old Hemi motors. In those situations we try to control the oil the best we can with the maximum depth we can put in there, since getting the oil away from the rotating assembly will help. We also build features into the pan, like windage trays and scrapers, to help control the oil and keep it off the rotating assembly as much as possible."

Another design Moroso uses for these engines is a T-sump pan, "where the sump is wider than the width of the pan," Hall explained. "We're trying to find the capacity needed so these pans will fit in the envelope we're given."

OIL CONTROL

Yet even the most carefully designed and constructed pan can't do its job properly if the oil isn't getting to it.

"One problem we run across quite often in the drag race and truck pull markets is customers not having enough oil to go from A to B," said Mark Mittel of System 1 Filtration Products, Tulare, California. "The inherent problem is that the right-hand valve cover is full of oil that can't get back to the sump. It's draining back through the heads, but then when it's trying to return to the pan, it falls on top of a rotating mass that flings it right back up again. It's a tough situation to get enough oil back in the pan to make the complete run or the complete pull." The situation is more pronounced in the right-side valve cover because "that's the way the crank and rods are turning," Mittel explained. "It flings the oil back up on the 2-4-6-8 side of the motor." Some racers overfill the crankcase as a way to mitigate the problem, but the excess oil can create "a horsepower-robbing situation."

Mittel's solution is to install a drain from the back of the valve cover to the oil pan. He

When oil accumulates in the right-side valve cover and can't drain back to the pan, Mark Mittel of System 1 Filtration Products recommends plumbing an external drain line from the back of the valve cover to the oil pan, as seen on this big block Chevy from a nostalgia drag racer. This has worked "for many, many customers," he said.

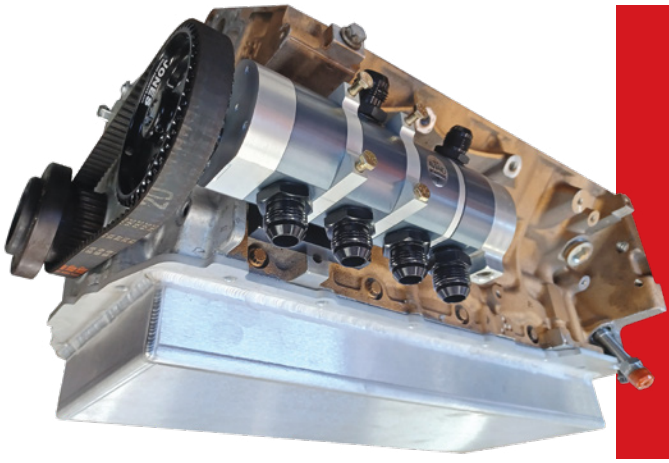
"THE KEY FACTORS WE ALWAYS LOOK AT WITH ANY TYPE OF OIL PAN ARE, HOW MUCH OIL ARE WE LOOKING TO GET INTO IT, AND HOW DOES THE CRANK CENTERLINE OF THE ENGINE RELATE TO THE LOWEST POINT OF THE CAR?"

recommends using hose "that's a minimum of a -12 AN, though a -16 is preferred." The line needs to be plumbed so that "the oil returns underneath the windage tray, because that's more of a low-pressure area, versus the high-pressure area right next to the spinning crankshaft." This has worked for "many, many customers," he added, "especially the Bonneville guys. They have to run a full five miles dealing with oil. This can also help in a Funny Car or an Altered, where you can't put a very big pan under it. Now they can carry the right amount of oil, and it pretty much ensures the oil goes all the way back to the oil pan."

Another way to address this situation is to plumb an oil accumulator into the system, Mittel said, "especially with some of these cars where you can't put a big pan on. If your oil pressure drops below a certain level—whatever pressure you set on the accumulator—it will turn on, and here comes two or three more quarts of oil to feed the motor."

THE DRY SUMP SOLUTION

A dry sump oiling system will solve many of these oil control problems because it allows the placement of oil pickups "in places where oil is accumulating, not necessarily in the center of the pan where you're trying to have a one-size-fits-all kind of pickup," said Schwarz. "Chrysler Hemis, for example, have a real tendency



To eliminate windage and provide a constant supply of oil during hard acceleration, braking, or cornering, Aviaid offers this dry sump lubrication system for the Chevrolet LT engine family. These systems are available in both right- and left-hand (seen here) configurations.

to pack oil in the valve covers. With a dry sump you have the ability to add scavenge sections specifically for the purpose of scavenging the cylinder heads and getting the oil back to the tank where it belongs." There is also flexibility in where the sump tank is mounted for a weight placement advantage, he added.

For race vehicles subjected to high G forces, "like a rock climber that goes up steep hills, oil control is a problem," said Mike Cofini of Clear View Filtration, Spokane, Washington. "A dry sump works better for those type of applications. It's the same thing on a drag race car. When you throw the parachutes out, oil pressure can drop or could go to zero because all the oil gets thrown to the front of the motor and away from the pickup screen."

"Anybody who can afford a dry sump should put it in their car, because it's the best oiling system you can have," said Thibodeau. "There's a reason every serious race car in the world has a dry sump."

To Hall, the "biggest advantage" of a dry sump system is that its shallow oil pan "allows you to have the engine far lower in the car than you would normally have with a wet sump system." For an LS engine, Moroso makes a dry sump pan that's 4 inches deep, compared to a standard pan that's 6–6.5 inches deep, "so you're gaining 2–2.5 inches of lower center of gravity by going with a dry sump system. That's a real benefit."

Oil capacity is another reason to run a dry sump system. "In a Funny Car or alcohol Funny Car, there's only about 4 inches of pan clearance, and in such a small pan you can't have 10–12 quarts of oil," said Cofini. "Because the pan is so close to the ground, or because of other chassis components, there's not room for very much oil in there."

"With a dry sump system, you can put five gallons of oil in a car," Schwarz added, "and with that higher capacity, the engine will be circulating cooler, cleaner oil. You can't do that with a wet sump, especially because nine times out of 10, even with the older engines everything's getting lower to the ground. Nobody wants to run a high center of gravity. So the first question we get asked a lot of the time is, 'How shallow an oil pan can we put in this thing?'

"There's nothing that a dry sump system can't help improve with regard to an engine," Schwarz said.

"Dry sump usage and popularity have never been this strong," said Thibodeau. "We are selling more dry sump pumps

"ONE PROBLEM WE RUN ACROSS QUITE OFTEN IN THE DRAG RACE AND TRUCK PULL MARKETS IS CUSTOMERS NOT HAVING ENOUGH OIL TO GO FROM A TO B."

than we ever had as a company. In the 34 years I've been at Moroso, dry sumps were typically confined to drag racing and higher levels of circle track, but now you're seeing them at all kinds of different levels of drag racing. A lot of different racers are using dry sumps. So now we're making them for so many different applications. We make them with a V-band clamp on the front so it can be put on the front of a centrifugal supercharger drive mount. For LS motors, we took the bolt pattern on the block that was used for an A/C compressor—which is not used on a race car—to develop an adapter to bolt the dry sump to the block."

This "explosion of dry sump pumps in our industry," as Thibodeau called it, has brought with it "a bigger need for different types of pressure section widths, depending on the volume needed for these dry sump pumps. Not every one of them will need the same amount of volume to support that motor. So we have five different pressure width options to accommodate the specific types of needs a motor would require."

On the subject of dry sump oil pressure, Cofini pointed out that "it's virtually impossible to suck oil through the same size line as you're putting 80–90 pounds of pressure out the other side. You should be using the next size up line to suck out of a dry sump tank as you're pushing through the other side." Testing on a flow bench demonstrated to him that "it's only a matter of time before it starts not sucking the correct amount of oil through there and creates a vacuum, which will reduce the oil pressure and the volume going through it." So with an LS engine, for example, "if you're sucking through a number 12 line and pushing through a number 10 line, everything's great."

DRY SUMP ALTERNATIVES

If a dry sump system doesn't fit a racer's budget, there are lower-cost alternatives.

"One option is an external wet sump pump, which is a belt-driven, single-stage pump," said Hall. "It allows you to build a shallower wet sump pan and have the pump outside." He called this setup "a big option for all the COPO Camaros when the NHRA allowed them to go to an external wet sump

pump," and he said it's also popular "with Ford and LS guys. Instead of the oil pickup going the entire distance of the pan and getting in the way of the rotating assembly, now the pickup's in the rear, the pump's outside, you can prime the pump, the pump doesn't get hot, and now you can do more with larger strokes and use the shallower versions of wet sump pans."

"A wet sump oil pump with a dry sump attitude" is how Verne Schumann of Schumann's Sales & Service in Blue Grass, Iowa, describes his ER-VAC oiling system. The ER stands for energy recovery. As Schumann explained, "The bypass oil never sees the pan again. It goes back through a re-routing high-pressure hose to the pickup tube, and we re-pressurize the intake tube," promoting additional oil flow no matter the orientation of the oil in the pan. VAC stands for vacuum; the ER-VAC system is a closed-loop system not vented to the outside air. It's similar to when a drag racer "introduces a vacuum pump to suck the oil pan into a vacuum reading, which gives you horsepower," Schumann said.

The ER-VAC system works well in many racing environments, but where it really "dominates," Schumann said, is in monster truck competition. "They stand the truck on its nose for 6, 8, 10 seconds before it drops down, because the longer they stand on the nose the more points they score. But with a conventional oiling system, when the truck is on its nose, all the oil in the pan runs to the front of the motor, and the pickup, usually in the back of the motor, is now sucking air." With the ER-VAC system in place, "the trucks can sit there for 10–15 seconds before they drop down on the ground and it doesn't hurt the motor. We forcefully pipe the oil back to the intake stream and pressurize the intake side of the pump. So if the bypass oil is set at 60 psi, it's going to go in the intake at 60 psi. And guess what else does that? A dry sump, for big dollars." Schumann quoted prices for dry sump systems as "$3,000–$7,000 installed; our pumps run from $300–$500. Is it as good as a dry sump? No. But if the rules say wet sump only, we're a killer item."

Clear View Filtration won a Best New Engine Product award at the PRI Trade Show for its billet dry sump tank with a see-through oil filter assembly mounted to the top. "That way it filters the oil before it goes into the tank," said Mike Cofini.

PROPER PRESSURE & VOLUME

"So many people call me with bearing problems," said Cofini, who spent 30 years as an engine builder before starting his business making see-through oil filters. "I tell them they need to have more oil pressure, especially in boosted applications, because we're using that oil pressure as a shock absorber between the connecting rod and the bearings."

"I TELL THEM THEY NEED TO HAVE MORE OIL PRESSURE, ESPECIALLY IN BOOSTED APPLICATIONS, BECAUSE WE'RE USING THAT OIL PRESSURE AS A SHOCK ABSORBER BETWEEN THE CONNECTING ROD AND THE BEARINGS."

shock absorber between the connecting rod and the bearings. When these turbo cars make 30–40 pounds of boost, we've already squished the oil out of the bearing." On such an "extreme application," Cofini recommends "a minimum of 10 pounds per 1,000 rpm. I even like to see 12 or 13 pounds for every 1,000 rpm, especially if you're running the motor up over 9,500, which a lot of guys do now."

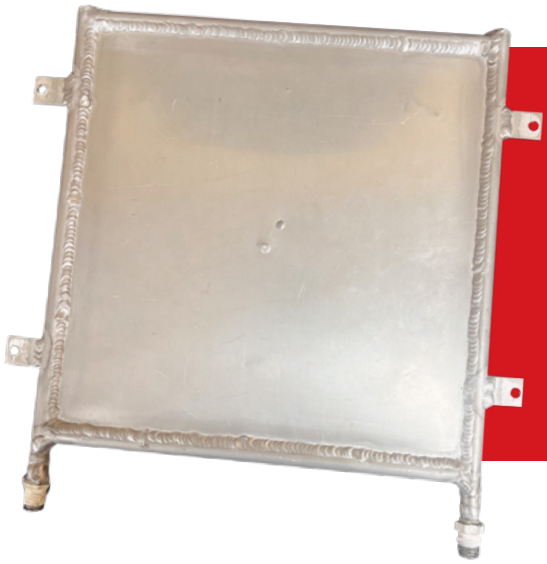
The popularity of drag-and-drive events like Drag Week and Sick Week has complicated oil pressure recommendations, Hall said. "You have to have enough oil pump in the thing to keep the race car side happy, but at the same time you don't need to make 150 pounds of oil pressure driving down the road. But when you're at the track, there's a balance you need to achieve. A street car making 20 pounds of oil pressure at a stoplight is okay, but in a large-cubic-inch engine, something with huge valve springs and overlap, you have to be careful that there's a balance of oil viscosities and oil pump sizes."

Schumann has a new product "just around the corner" called DialAdjust that will enable the driver to adjust oil pressure at the turn of a knob. "Let's say in a circle track application, during qualifying the driver can turn down the oil pressure for one lap to make a better horsepower rating," Schumann said. "Later in the race, say at lap 70 or 80 of a 100-lap race, when the oil is getting hotter and more contaminated and the oil pressure is dropping, he can crank it up again."

The DialAdjust system will be available for "all engine families," Schumann said, and will require no internal engine modifications. "We'll pick up the oil for the transition and control the pressure through the oil pump filter area, and then pump it back into the pan. Adjustability will be by two means: Both the volumetric gallons per minute and the pressure will be controlled. The two always work hand-in-hand."

Oil volume is a critical part of the oiling system that can be misunderstood, Cofini believes. He's seen it in questions from customers about the size of the oil filter a particular application should run.

"The biggest thing that makes the filter



The new Heat X-Changer from Schumann's Sales & Service is a plate, mounted in the floor of the oil pan, which carries engine coolant to the pan to cool the oil. Or heat it, said Verne Schumann. "Drag strip people will hook it to a heat gun to pre-heat the oil while leaving the engine stone cold. Cold cylinder heads make horsepower, but the hot oil must be there to keep the engine lubricated. It's the best of both worlds."

assembly different is the type of engine and how big the oil passage feed hole is going into the motor," he said. "Horsepower has nothing to do with it. Some people think that the more horsepower you make, the bigger the filter you need, but that's not true. For example, a Ford has a half-inch feed hole in the block, so at 90 pounds of pressure, it can only run about 12 gallons a minute through that hole. That hole dictates the entire system.

"We have also learned how important the inside of a fitting is to our oil system," Cofini added. "Take a block adapter for a big block Chevy. The big block has a .600 feed hole on the block. If you put a number 10 line on that, which is a half-inch hole, you've restricted oil to the engine. You could have an oil pump the size of a dump truck and a four-inch hose feeding your motor, but if it has to run through a half-inch hole at 80 pounds of pressure, that's all the volume you get to the entire motor."

Also important when choosing an oil filter is to match the weight of the oil with the filter material. "One of the problems we have is somebody trying to run too fine of a filter with too heavy of an oil," said Mittel. "It can cut the flow rate by a third at least, or half." For a drag racer or tractor puller running straight 60- or 70-weight oil, for example, "for 99% of the applications we would steer them to a 75-micron element. Some companies have a 75-, 80-, even a 100-micron filter, but you can reach a point of no return. If the diameter of the holes in the filter are too big, it's like not having a filter at all."

Mittel also pointed out that while blending a straight-weight oil with an oil additive can improve the oil's lubricating properties—"all the added zinc and phosphorous are your friends"—it will also raise the oil's thickness. So a straight 50 can become a 60, which may then be too thick for the filter. "And if they're using a traditional paper-style filter on there, more than likely it will tear the paper inside the filter to let it flow. In most cases the racer never knows that it's torn a hole in the paper, so they're not getting any filtration at all. So always be mindful of the other side of the filter." PRI

SOURCES

Aviaid Oil Systems
aviaid.com

Clear View Filtration
seethroughfilter.com

Moroso
moroso.com

Schumann's Sales & Service
schumannssalesandservice.com

System 1 Filtration Products
system1filters.com

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DIALED IN

ADVANCES IN MEASUREMENT AND TESTING PROCEDURES ARE HELPING TO DELIVER CONSISTENT, REPEATABLE RESULTS ON TRACK.

By Bradley Iger

As various series tighten rulesets to address rising costs across a range of motorsports disciplines, chassis setup has become a crucial element of competitive race programs. While the benefits of a well-sorted setup have been understood for some time now, in recent years it has become much more difficult to overcome any potential shortcomings with an additional dose of horsepower or a clever aero tweak. As a result, many teams are taking an increasingly sophisticated approach to the setup process, and they're utilizing equipment that can provide a level of accuracy that was unheard of not so long ago.

"With the digital caster camber gauges we're using, the margin of error is down to less than a tenth of a percent," said Ben Baker of Longacre Racing Products, Boonville, Indiana. "When you compare that to the analog-style needle gauges, the accuracy really comes down to whoever is reading the gauge. The gauge itself might be very accurate, but it's open to interpretation by the person who is looking at the measurements. There are some chassis height gauges out there measuring within ten thousandths of an inch. In the pavement world, that kind of accuracy is really critical."

And detailed accuracy required in other industries, such as aviation and the US military, is benefiting motorsports, according to Carter Gerlach of Intercomp Racing in Medina, Minnesota, which is an ISO9001:2015 Certified US manufacturer and offers weighing and measurement products for all three industries and more. "We take that level of precision from our other markets and float it into our racing market products," he said, noting that Intercomp RFX Wireless Scales are used exclusively by all NASCAR divisions including ARCA for tech inspections, "which is really indicative of the accuracy and the precision of the product."


HOOSIER

TECH-DRIVEN PRECISION

While the exactness of today's chassis setup equipment is allowing racers to take a more scientific approach to their tuning strategies, Steve Arpin of Longhorn Chassis in China Grove, North Carolina, pointed out that chassis manufacturing quality can have a profound effect on the end result.

"It really starts on the jigs," Arpin said. "Teams in every motorsport discipline have always had their 'special' cars. I remember that during one of Kevin Harvick's best years in the Cup series, he had this one specific car that he put aside for the Chase. You'd assume that if anyone would have the budgets to have identical cars produced, it would be teams in the Cup series, yet they still had these certain cars that worked better than the rest of them. That led us to wonder why. What are the differences that make one car stand out among the others? It starts with the materials, the tubing wall thicknesses, and how it's all put together. You have to think about the chassis itself as a spring because it flexes out on the race track. That means that the consistency and repeatability you're looking for in a chassis setup starts at that level."

The importance of quality is reinforced by Steve Watt at Maxwell Industries in Ventura, California, who said that inconsistent parts manufacturing can make it difficult to hone in on the right settings. "With torsion arms, for instance, the manufacturer can make a difference. When some of the titanium ones first came out, we tested them and discovered that they were a softer rate than the aluminum ones. That kind of thing can really impact how you're setting up the car, and it can kind of take you off of the 'system' of settings that you know you like."

Moving beyond the importance of a solid foundation, Keith Berner of Accu-Force Shock Dynos in Millersburg, Ohio, said that the accessibility of advanced chassis equipment is bringing a level of exactness to grassroots and sportsman racers that simply wasn't available in the past. "We're at the point where regional and local competitors are using lasers to get measurements down to the thousandth. We used to use tape measures to do everything, and now we're using things like micrometers and linear potentiometers that can tell you exactly where you're at. When I first started building spring smashers, I thought that if we went to a tenth of inch, or maybe even a hundredth, that would be plenty accurate. But once we started using them, we realized that we had to go to the thousandth. Part of it comes down to the level of competition we're seeing today. If you don't do it, you're not going to keep up with the guy who is."

Equipment has continued to evolve as "the chassis builders and the experts in the industry that are fabricating and developing setups within the cars are asking for numbers to be tested, so we need equipment to test them," an Intercomp representative told us. "Maybe five years ago they weren't asking for that to be tested on the cars."

Gerlach cited Intercomp's variable speed shock dynamometers, which feature a 40-inch mast height to rate a wide variety of shocks, with either a 3-hp or 8-hp motor, and simulates travel velocities of up to 55 inches per second to gather data for all markets.

To complement a race car suspension program, Intercomp also offers its traditional spring rater for testing springs alone, or its coil rating option, Gerlach explained, which allows testing of the entire coilover assembly without disassembling the shock and spring.

He acknowledged that Intercomp is "not a shock company, but we're a shock testing company. Really, far and away, I would say shocks have changed in the cars and in the market the most in the past five years. That is a continual moving target and something that is really not slowing down. Racers and the teams are putting a lot more emphasis on their shock programs and accuracy with the testing and validating their shock program with our shock dynos and spring raters."

As series continue to crack down on the gray areas of their respective rulesets, this level of exactness has become a necessity for those who want to extract all of the performance potential from their car without running into trouble at tech inspection. "As far as measuring suspension travel goes, things have changed quite a bit in the last eight years or so," said Dave Dunlap of Basic Racing Enterprises in Asheboro, North Carolina. "With how close we're running the cars to the ground now, it's not really good enough to get it in the ballpark with a tape measure. We're now getting to within an eighth of an inch to the ground without hitting it, and that's thanks to things like the setup plates that companies like Wehrs and DRP Performance are producing. Today we can get a really clear picture of what's going on with the suspension, and before we were just sort of guessing."

BUILDING A BASELINE

Chassis setups require a holistic approach in order to be truly effective, but generally

speaking, there is a hierarchy to the process. For Baker, that starts at the front end of the race car.

"You have to have the front end right or nothing else will work. If you don't have the camber, caster, toe, and the bump steer set where it should be, it doesn't matter what you're doing in terms of weight distribution, or what your load numbers are—it's just not going to work. So that's the number-one thing in my mind. The next priority for me is the scaling process, and getting the corner weights where you want them. From there, it's the load numbers."

"OUR SPRING SMASHER GOES DOWN TO THE THOUSANDTHS BECAUSE WE NEED THAT LEVEL OF PRECISION. WHAT WE FOUND WAS THAT 10 THOUSANDTHS ON A HEAVIER SPRING MIGHT BE 20 OR 30 POUNDS OF DIFFERENCE. IN TODAY'S WORLD, THAT MATTERS."

While it's important to establish a reliable combination of static settings, today's competitive chassis setups are largely based on how the car will behave on the race track. To get a better understanding of how that differs from those static settings, teams are using setup equipment that can replicate the forces that are applied to the car at race pace.

"We don't drive around the race track with the car ever at ride height—the only time it's at that height is when it's sitting in the pits," said Arpin. "When we're scaling the cars, we're setting the percentages to make sure the car has proper weight distribution, and to make sure it's heavy enough to pass tech inspection at the end of the race. Everything

else is done 'in posture,' whether that's with load sticks or spring smashers. That allows you to replicate the attitude of the car when it's going around the race track, so all of the setup adjustments really happen there."

Berner told us that understanding the car's dynamic position with the data provided by this equipment helps to deliver the consistent, repeatable performance that teams are striving for. "Spring smashers have been a game changer because they let us look at things that we weren't able to see before, and pull-down rigs have benefited racing in much the same way. Over the years, these products have gotten more and more refined and have taken everything that much further. Our spring smasher goes down to the thousandths because we need that level of precision. What we found was that 10 thousandths on a heavier spring might be 20 or 30 pounds of difference. In today's world, that matters."

Although one incremental change here or there might not have a profound effect on a given car's lap time, this level of accuracy can be used to improve a number of different aspects of a chassis setup. Enough small changes in the mix can add up to something that has a meaningful impact on race day.

"The top-running teams have a deep understanding of every single point on their cars," Arpin said. "Improving one detail on the car might get you a hundredth of a second, and that might be considered a negligible benefit on its own. But if you stack up 20 different improvements that each get you a hundredth of a second, that can make a very big difference. Two-tenths of a second can be the gap between the national-level teams and the Saturday night racer."

He added that this level of precision in chassis setup can help identify potential handling problems before they cause problems out on the course. "If you look at the Lucas Oil series, for example, there are virtually no DNFs for the teams that finish in the top five. Being able to look at the car with that much detail gives you a better handling car, so obviously you have more control. Having more control makes it easier to avoid wrecks and not get torn up."

Gerlach cited a continual evolution in racing chassis setup equipment as

The availability of advanced chassis setup equipment, such as this chassis rigidity tool from Accu-Force Shock Dynos, is bringing greater precision to grassroots and sportsman racers. "We're at the point where regional and local competitors are using lasers to get measurements down to the thousandth," said a company source.

"the chassis builders and the experts in the industry that are fabricating and developing setups within the cars are asking for numbers being tested, so we need equipment to test them. Where maybe five years ago they weren't asking for that to be tested on the cars."

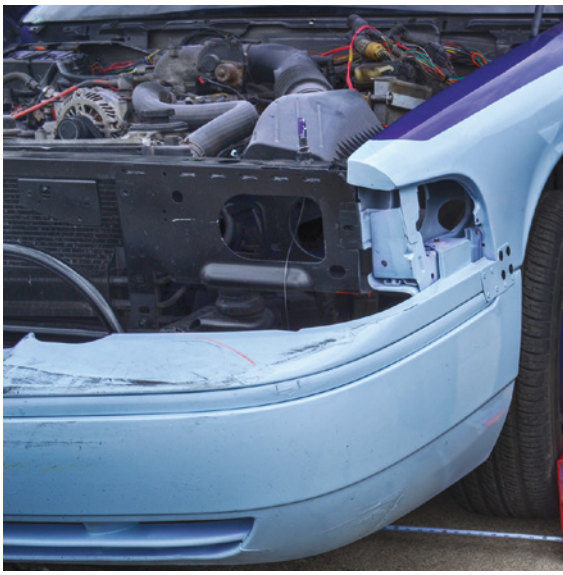
To deliver those numbers, Gerlach pointed to several of Intercomp's products including its digital air gauge that reads out to .01 PSI with accuracy of 0.1%, 6061-T6 billet aluminum scales, precision hub scales, caster camber gauges, turn plates, shock dynos, spring testers, and RFX Wireless suspension load sticks.

Intercomp's Microflex scale systems have four load cells per pad for enhanced capacity and ultra-low deflection, he noted, and offer the company's highest level of accuracy, repeatability, and stability for consistent chassis setup. They are available with system capacities of up to 16,000 lbs. (7,300 kg), and are an optimal choice for teams using pull down rigs and EV manufacturers that are doing weight and balance on the heavier EV vehicles.

Suspension load sticks are one of Intercomp's newest products. Gerlach explained that these are installed on all four corners of the race car "in the shop or in the pits, where you're able to pull a corner of the car into motion and see how much load is applied to that corner as we're simulating what it's supposed to be doing on the track." This provides a picture of the race car's load distribution in different chassis attitudes and allows racers to select the spring rates required to get the car into the dynamic ride heights needed to carry maximum speed and momentum through a turn. Intercomp's Load Stick allows the user to read from one to all four corners of the race car on one RFX Wireless Indicator.

TRANSLATING DATA TO PERFORMANCE

Although the ability of today's chassis setup equipment to accurately simulate the dynamic forces on the car is a valuable tool for teams, real-world testing is still a critical element of the process due to varying track conditions and other external factors. But rather than relying solely on driver feedback to make adjustments, Watt noted that many teams are incorporating data acquisition systems into their test sessions in order to minimize the amount of guesswork that's required back in the garage.



"You can put a system in the car that will tell you exactly how fast and how much your shocks moved, and the speed that they moved at, and there are shock dynos available now that will actually play that track data back," he said. "That allows you to run your shock on a dyno as if it is running five laps around the track, and that can help establish a baseline for a course."

Berner said that having a precise baseline can be especially helpful for those who find they are suddenly starting from the ground floor again. "Let's say we've got everything dialed in, but you get in a wreck. Instead of sort of getting everything in the ballpark of where it's supposed to be, and not really being sure whether or not there are still problems in the car, you've got everything measured down to a thousandth, or a tenth of a degree, or whatever a particular measurement may be. Once you get the new parts on and set the car up that same way, it should be like the car was never wrecked."

Chassis setups require a holistic approach in order to be truly effective, and for many, that starts at the front end of the car. "If you don't have the camber, caster, toe, and the bump steer set where it should be," said one of our contacts, "it doesn't matter what you're doing in terms of weight distribution, or what your load numbers are—it's just not going to work."

Using outdated, traditional chassis setup equipment doesn't meet the standards of today's race teams, even at the grassroots levels. These competitors are demanding ease of use and increased accuracy, which manufacturers of this equipment are meeting that challenge, such as with this AccuLevel Digital Level from Longacre Racing Products.

Combining real-world data with the detailed information that's available from today's chassis setup equipment has also ushered in components that enable teams to make changes in equally precise increments. "In some cases, we'll put to use a packer that's a sixteenth of an inch to make an adjustment. It's basically a shim that's made out of either plastic or aluminum that goes between the bump stop and the shock that changes your engagement height and puts more load on it. Sometimes a sixteenth of an inch is all you need," said Baker.

He's also quick to point out that while they're an important piece of equipment in today's setup strategies, some of the old school equipment still has its place. "There's this huge misconception that, if you have a load machine or load stick, you don't need scales anymore. It's just not true—there are so many things that those load machines will not tell you that a scale can. Beyond getting percentages, there are situations where a scale will tell you if you have a bent spindle or a bent rearend. There are lots of things that the load machine will not catch."

With the racing as close as it is today, there's really no room for error. "People often wonder why their good car is getting beaten by some other guy, and most of the time it really comes down to the details," said Berner. "There was a point in time where someone might've said, 'Oh, that spindle isn't bent that bad,' and they'd race with it. But those attitudes have changed. Now if you even remotely think a spindle might be damaged, you have to change it or you won't be able to keep up. The whole package has to be right." PRI

SOURCES

Accu-Force Shock Dynos
accuforcetesters.com

Basic Racing Enterprises

Intercomp
intercompracing.com

Longacre Racing Products
longacreracing.com

Longhorn Chassis
longhornchassis.com

Maxwell Industries
maxwellindustries.com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ON A

MISSION

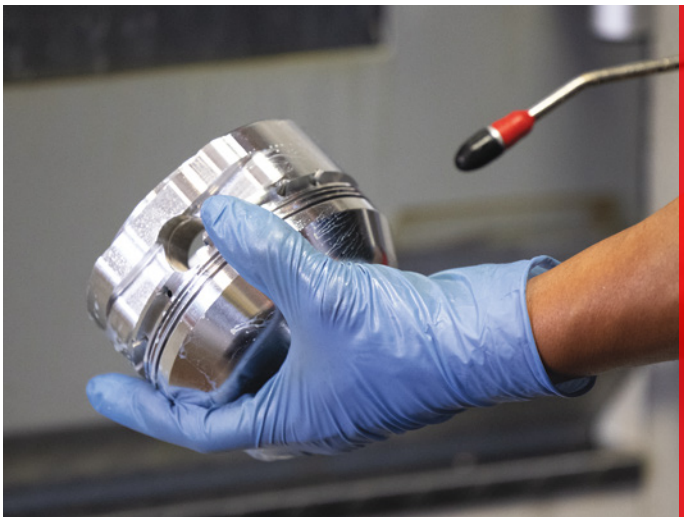
Piston manufacturers are racing to expand lines, keep orders moving, and push the envelope with new materials, all while an unconventional technology draws renewed interest.

By Mike Magda

Golf-ball-like dimples on the top face of a race piston is a technology that has been around for decades, and every so often these seemingly random craters on the crown draw attention at engine seminars or in motorsports chat rooms. Theories about improved combustion efficiency and manipulating the flame front have been debated and most likely tested by leading engine builders. However, no piston company has promoted the quirky science and marketed off-the-shelf product with dimples.

So it was no surprise that Daniel Schierholt was hesitant to try dimpling the pistons on the 506-cubic-inch B1 Mopar that powers his Super Pro ET dragster. (Schierholt is the engineering manager at piston manufacturer UEM/Icon in Carson City, Nevada.) The company recently partnered with Speed of Air (SoA) Engine Technologies in Reno, Nevada, to use SoA's patented dimpling technology on a new line of Hyperformance pistons for diesel engines.

Field testing with DFC Diesel in Canada revealed promising results, so dimpled pistons will be available for select diesel applications through UEM/Icon and under the SoA brand. Icon had also worked with California dirt-track racer Bobby Hogge to provide dimpled pistons for his Chevy small block. Again, improved performance was reported.



Aftermarket piston programs remain healthy, and companies are developing new products. At RaceTec Pistons, "we are constantly changing the lineup," said Alex Gonzalez. "It just depends on what's in demand."

"If it works with diesel and gas, let's try drag racing and methanol," said Schierholt, who switched out the 4.355-inch-bore Icon pistons on his engine with no other changes. "My motor was at 14.5:1 compression ratio. With the dimples it dropped down to 14.32:1."

Schierholt compared time slips on days with near-equal track and air conditions. On each run the car was launched at 5,000 rpm and shifted at 6,800 rpm. The 60-foot times were down slightly with the dimpled pistons, but the car picked up acceleration through the remainder of the run and finished the quarter-mile .16 second quicker and 3 mph faster on the top end.

"As a driver, you can feel it making more power, more torque," said Schierholt. "Also, the engine is using about an eighth- to a quarter-gallon less per run."

While SoA and UEM/Icon are capitalizing on an off-beat cyclical technology that is showing promise, other piston manufacturers are busy keeping up with demand, freshening some popular parts, and creating new lines of product to give the racer and street enthusiast smarter choices. PRI Magazine recently sampled a number of piston companies and found new engines and applications are the prime forces moving development these days.

ACTIVE DEVELOPMENT

Most experienced engine builders already have a good idea of the piston design, construction, and features that suit their programs. Unless rules change or racers apply more boost than they told their tech reps—which certainly would drive new product—aftermarket piston programs remain healthy, and most engineering divisions are once again active in developing new innovations.

"We're constantly changing the lineup. It just depends on what's in demand," said Alex Gonzalez of RaceTec Pistons, Huntington Beach, California, adding that racers have their own preferences on piston options. "Sometimes it's just an upgraded wrist pin, or gas porting the pistons, or making them lighter. It just depends."

"Pretty much everything we have now has been fully maximized to suit today's modern technology," said Nick Diaz of CP-Carrillo, Irvine, California. "The only project in development that I can talk about now is a Godzilla line of pistons and rods."

Over at Race Winning Brands (RWB) in Mentor, Ohio, which oversees Wiseco, JE Pistons, Diamond, and Manley pistons, Diamond is looking at adding product for European exotic and high-performance applications, while Manley continues to offer shelf-focused solutions.

"Wiseco will be launching a new RED series—the acronym stands for Race Engineered Design," said Scott Highland of RWB.

"JE has the SRP Pro 2618 line, which offers customers a similar solution and has been expanded with quite a few more part numbers for LS, Ford Modular, and

Speed of Air and UEM/Icon have applied piston dimpling technology to the big block Mopar in Daniel Schierholt's Super Pro ET dragster. "As a driver, you can feel it making more power, more torque," said Schierholt. "Also, the engine is using about an eighth to a quarter gallon less per run."

Gen 3 Hemi applications," added RWB's Kevin Bailey.

There's even a little taunting going on when the topic of new materials comes up. "We can't speak on it, but we've worked with professional race teams and exotic materials—materials that wouldn't be considered the norm in modern engine building," teased Joe Maylish of MAHLE Motorsports, Fletcher, North Carolina.

The dimples, however, are igniting new discussions among racers, and both Schierholt and SoA's Chris Parkhurst stressed that there is a science behind the technology. The diameter, depth, and placement of the dimples were tested extensively in computer simulations to develop the strategy.

"It's not that you just start putting dimples across the face of the piston," explained Schierholt. "We look at flame travel, location of valves, spark versus compression ignition, the type of fuel, and that will dictate where the dimples go."

"Dimpled pistons have been around for a long time, but it was sort of trial and error," said Parkhurst. "We got into some pretty advanced computational fluid dynamics to optimize designs. There's a reason for every dimple we put on a piston, where we put it, and why we put it there."

The SoA strategy for the diesel pistons

CP-Carrillo is working closely with racers to build pistons for high boost applications. "They communicate to us exactly what's going on with their setup, how their engine's performing, and we try to analyze that data to build better parts," explained Nick Diaz.

also includes a mixture of thermal and anti-friction coatings. "We use coatings for the same reasons that anybody else is using coatings for the most part. However, there's an interrelationship between the fluid dynamics and the thermodynamics of what's going on in an engine," said Parkhurst. "One influences the other. This is where people get kind of sideways with our technology. They just see dimples."

SoA's research into the dimple technology started as a way to reduce NOx emissions and improve fuel economy for large fleets. "Racing was never the goal," said Parkhurst. "We're a green engine company, and we've made a more efficient combustion event with all fuels. The additional horsepower, the additional benefits don't cost anything. We don't bolt anything to the engine. At the end of the day, it's still just the piston."

For CP-Carrillo, it's also the connecting rod. The company is looking to expand piston-and-rod packages that are matched for different racing applications.

"Since we are a manufacturer of the rod and the piston, we have great insight and a vast knowledge of how those components can function together in those high-stress environments," said Diaz. "We're doing a lot of titanium now with our connecting rod line, and we have a new high-grade steel that's available now that is 30% stronger than our standard steel. It's a tremendous upgrade for high-end road racing or drag racing."

Some of the new CP-Carrillo pistons soon to be mated with a complementary rod will cover options for the Ford 7.3-liter Godzilla engine. The company is working with a professional race shop on the development, and Diaz said two bore sizes will be available: standard and +.025.

"They're designed for the 1,500- to 1,800-horsepower range," added Diaz. "They'll be available on our off-the-shelf Bullet series."

Addressing higher horsepower, Diaz said the company is working closely with racers to build pistons suited to higher boost applications. "They communicate to us exactly what's going on with their setup, how their engine's performing, and we try to analyze that data to build better parts," said Diaz. "Ultimately that information trickles down to our shelves. If we find something that's working in a 4,000-hp Pro Mod car, it's going to trickle down to the sportsman racer, eventually.

"We go over the customers' needs and ambitious goals," continued Diaz. "We need to extract as much detailed information from the customer as possible to ensure the block height, stroke, and rod length will yield enough strength for their expected horsepower."

With any new knowledge comes the opportunity to overhaul an existing product. MAHLE Motorsports recently redesigned its venerable small block Chevy dished piston.

"Here was a technology that's been around for a long time, and we said, 'How can we make it better?' Then we did a complete redesign of the forging. We

strengthened key areas, specifically around the pin bore, and just added mass in key areas," said Maylish, adding that a similar upgrade was given to select Mopar big block pistons.

TRENDING SALES

A remarkable trend in the piston market these days is the expansion of off-the-shelf product. Custom pistons are still available within a reasonable turnaround time if there are no labor or materials shortages due to a pandemic. However, more performance and racing features are being engineered into affordable, durable products that can be shipped overnight, if needed. While some are direct shelf parts, others are "made to order," meaning that all the engineering is in place, and pistons can still be produced and shipped in a timely manner.

The RED series at Wiseco illustrates this performance-and-value direction. Standard features include a 2618 alloy forging, skirt coatings, and a 1.5-mm, 1.5-mm, 3-mm ring package. They'll be available for popular domestic applications in a variety of bore sizes and compression ratios.

"It's for a drag race guy or a circle track guy who needs the strength and the features of a capable forged part, but it's in a little bit more of a standardized fashion. So it can hit that middle-of-the-road use application," said Bailey. "This will be Wiseco's moderate to heavy-duty power capable performance and value part and can save customers from spending the extra money on pistons designed for severe-duty applications, like the Professional series, if they don't need it."

"We see the RED series in the 800–1,000-hp range," added Highland.

In developing the SRP Pro 2618 series for JE Pistons, engineers adopted a similar strategy to give racers a budget piston capable of 800–1,000 hp. Within the JE SRP line, it fits on top of SRP and SRP Pro. It has standardized features like skirt coatings, pin oiling, and accumulator grooves.

"There is a variety of Gen III Hemi and Ford Modular available now under SRP Pro 2618, as well as an updated complete line of LS," said Bailey. "LS has the longest list of numbers for varying engine generations and bore/stroke combinations."

For the Diamond brand, the European and sport-compact market of Lamborghini, Audi, Nissan GT-R, and other performance models is growing at a rapid pace. "People are building billet blocks for these applications," noted Highland. "It might be a V10 motor where they're trying to watch the weight, or with power adders they have to have the piston mass in the right areas—you have to balance strength and weight."

"It's an expansion into serving the need in markets with really high horsepower,"

SURFACE TENSION

The latest development in piston rings has nothing to do with the rings themselves or the pistons that support them.

"It's the surface finish," affirmed Lake Speed Jr. of Total Seal, Phoenix, Arizona.

Racers have moved away from ductile-iron, moly-faced rings that were softer and offered the engine builder an easy break-in cycle. The coating was porous, so it held oil. Basically, just about any conventional honing pattern worked with those rings.

"Now we're going to higher compression ratios, more boost, and lots of nitrous. Even with naturally aspirated, everyone wants the engine to live longer," explained Speed. "So we're going to steel rings with a coating like DLC, or CrN. Steel is a better material and can handle all the heat."

These advanced coatings have no porosity to hold oil, which means the cylinder wall's surface finish must retain the oil. The trend toward thinner rings also places more of the lubricating burden on the cylinder finish.

"What's happened is in the last couple of years, cylinder wall finishes are becoming more important because more racers are going away from the old-style rings. Just to give you some numbers: 20 years ago in NASCAR, the state-of-the-art piston ring package was an .043, .043, 3-mm ductile-moly ring set. That engine lasted one race and was down five to eight horsepower from new after the race," explained Speed. "Now we run a 0.5-millimeter (.020 inch) steel top ring with a titanium dioxide coating on the face. Then a .6-mm or .024-inch second ring and a 2-mm oil ring—and the oil rails are coated, they're not chrome. That engine will last 1,500 race miles and not be down on power."

According to Speed, these new rings like a "highly plateaued" surface finish, and the fuel will determine exactly what the finish will look like. For example, high-performance diesel engines will start injecting fuel well before the piston is close to top dead center, so considerable fuel will be sprayed on the cylinder wall.

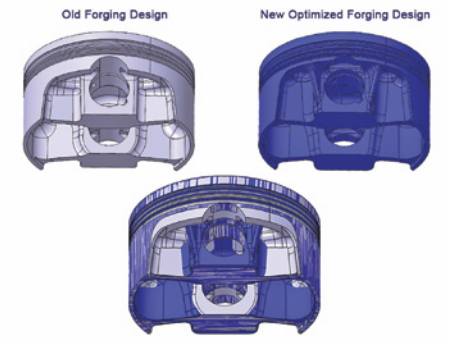
"The diesel guys need a valley depth of 120 to 150 microinches. Whereas in the old days, for a NASCAR or a Pro Stock hone, that valley depth may have only been 30 microinches. So it's four times more," noted Speed.

Today's Pro Stock engines have a valley depth of 50 microinches, and sprint car engines with methanol will be in the 70- or 80-microinch range.

"There's not a standard formula that fits all," said Speed. "You have to understand your application and hone correctly for it."

Since the measurements are so precise, a profilometer and flexible microscope are required to measure the surface roughness, and advanced software packages bring the numbers into clear focus.

"We can measure the crosshatch angle optically with the microscope, then measure the roughness with the profilometer. You see all data on the laptop," concluded Speed. *—Mike Magda*



MAHLE engineers redesigned the venerable small block Chevrolet dished piston by moving metal around to strengthen certain areas and still reduce weight.

added Bailey. "There's 400 hp per cylinder in some sport-compact engines, and failure is not accepted."

The wide range of pistons available from RWB is helpful to a racer stepping up through the ranks.

"Over the past couple of years, we've been helping Samantha Moore, who won the NMRA Limited Street championship a couple of times," said Bailey. "She's developing an increasing power level every year on the Coyote that she's running. The first season she ran our JE Ultra series shelf part, but that ended up needing modifications into a custom part. Now she's running a ProCharger, and there's even more boost. So we had to build a custom version of the Ultra series with ring-land changes and other modifications, plus an upgraded set of rings, to be able to withstand extended use and keep sealing throughout the season in the high-horsepower conditions of her setup."

As mentioned before, piston manufacturers are always looking at new materials, whether exotic alloys proprietary for a particular race team or improved alloys that can also help budget racer upgrades.

"We continue to investigate all types of alloys for pistons," said Highland. "We've looked at metal matrix, obviously. Sure, there are rules concerns, but mainly it's cost concerns. It's not always just the material cost, but the machining technique, and the tooling you need is more expensive, There's also crazy stuff like ceramic materials. We know they exist and do some development on different materials. But we haven't found anything that really has outperformed 2618 for the money."

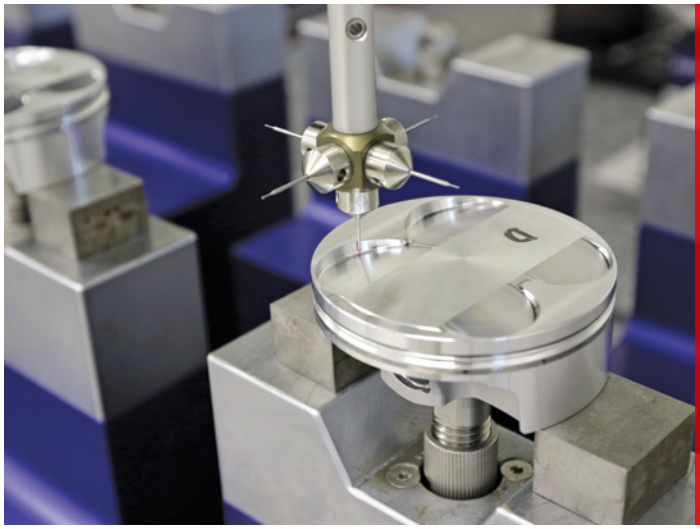
GATHERING INFORMATION

With more choices available to racers and street enthusiasts, company reps stress the importance of working closely with the phone techs and, most important, being honest with their expectations on the track.

"When some guys call up, they're very excited because they've read something on a forum," said Maylish. "They want to get, say, a 2618 alloy, anodized top-ring-groove piston for a hot rod that they're building. Or they're looking at a 4032 alloy and they want to put 25 pounds of boost to it. Both of which are incorrect in application. I think the main thing is that yes, business is booming, business is unbelievable. But as an industry, we have the responsibility to have conversations with our customers to ensure that they're making the correct purchasing decisions. If you don't and they choose the wrong component, it creates a bad experience, and there's potential that they don't want to come back and purchase your product."

"We go over the customers' needs and ambitious goals, and then we can try to fit them into a package," explained Diaz. "Not everything is going to work all the time. That's the tricky part. You've got to get all of that information into the computer and figure out the stresses of the certain components and where they can handle certain improvements."

"All we can do is guide them," said Gonzalez. "We can't choose for them." PRI



Several piston manufacturers under the Race Winning Brands umbrella, including JE Pistons, are making off-the-shelf pistons designed with performance features more commonly found on custom applications.

SOURCES

CP-Carrillo
cp-carrillo.com

Diamond Pistons
diamondracing.net

JE Pistons
jepistons.com

MAHLE Motorsports
mahlemotorsport.com

Manley Performance
manleyperformance.com

RaceTec Pistons
racetecpistons.com

Speed of Air
speedofair.com

Total Seal
totalseal.com

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uempistons.com

Wiseco Pistons
auto.wiseco.com


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MEMBER CHECK-IN

RESTORATIONS BY SABRA

PRI Founding Member Sabra Johnson turns his passionate energy into a vast custom-car business while also striving for greater diversity in motorsports and the performance aftermarket.

By David Bellm

The motorsports world thrives on big personalities, with tall visions and the boundless energy to make them happen. That perfectly describes rancher and self-described "cowboy car builder" Sabra Johnson and his business, Restorations By Sabra. With automotive facilities that cover approximately seven acres in the Houston, Texas, metro area, Johnson and some 30 employees build cars that combine the classic looks of vintage American muscle cars with the brutally capable performance of modern race cars.

Although Johnson enjoys just about any kind of car imaginable, it's clear that this blend of vintage sheetmetal and all-out performance underpinnings is what he relishes most. It's a preference that likely stems from his first taste of automotive work as a youth, when he began lending a hand to a relative dealing in high-priced vehicles from around the world. "My father died when I was two years of age," explained Johnson. "He had mentored my cousin, who was in the exotic-car business—Porsche, Mercedes, the early Lexus, things of that nature. Since my father wasn't there to mentor me, my cousin felt an obligation to me. That's how I really got my foothold in the business."

From that beginning as a teenager, Johnson continued to build experience in the gamut of automotive work, culminating with the 2012 launch of Restorations By Sabra, which specializes in custom performance-car fabrication. Johnson sees the shop's projects primarily as a chance to apply his skills to bring his customers' ideas to life, a philosophy he credits as the secret to his success. "We're vision-driven car builders," he explained, "and that vision starts with clients, not with me. I ask them, 'How fast do you want to go? What do you want it to look like?' Then it's my job to implement that vision. I'm like a painter, creating their vision on a canvas."

However, as is all-too-often the case nowadays, supply-chain challenges have reared their head in Johnson's business, slowing builds and impeding cashflow. This is forcing him to resort to alternative sources at times to keep production moving through his shop. "As a premium builder, I'm always looking to use the same products again and again and again," said Johnson. "But that's challenging if you're committed to one product provider, and that product provider has extreme brokenness in their supply chain. So then I have to build relationships with new vendors. That takes time. And customers don't always understand that. Sometimes they think it's an excuse.

"To overcome that, I have an inventory now of probably $250,000 of performance parts, whereas before I probably had an inventory of $15,000. Right now, I have six LS engines on order. They've been on order for almost six months. That never used to happen. Prior to this, I would have had zero on order."

To help deal with these and other challenges, Johnson often turns to PRI for insight and inspiration. A good friend of former PRI president Dr. Jamie Meyer, Johnson was quick to step up and become a PRI Founding Member when the opportunity was presented. "PRI and SEMA have been my institutions of higher learning—they've taught me a lot," said Johnson. "This industry has given me a great life that has impacted my family in so many positive ways. I've grown so much, because of this organization, so I feel a responsibility to play a role whenever there's a chance. Being a Founding Member is an opportunity to invest and pay it forward."

One of Johnson's proudest achievements as a PRI Founding Member is his work to foster greater inclusion and diversity in motorsports and the performance aftermarket. To that end, he has initiated a comprehensive diversity, equity, and inclusion (DEI) effort within the organization. "Change starts with awareness and understanding," said Johnson. "My focus has been a campaign of internal awareness designed to help others see, sensitize systems, and strategize for equitable participation. I believe that if PRI can get

"We're vision-driven car builders," said Sabra Johnson, "and that vision starts with clients, not with me. I ask them, 'How fast do you want to go? What do you want it to look like?' Then it's my job to implement that vision."

"Cowboy car builder" Sabra Johnson is a PRI Founding Member. "PRI and SEMA have been my institutions of higher learning," he said. "I've grown so much, because of this organization, so I feel a responsibility to play a role whenever there's a chance."

others to feel a new perspective, we could change the entire industry.

"One of the greatest myths is that if you're a pro-DEI person, then you're anti-majority," added Johnson. "But I'm pro everybody."

Through these and other challenges, Johnson is boundlessly optimistic, pressing forward with ambitious goals and high expectations for the year ahead. Restorations By Sabra is the largest performance-car builder in its market, according to Johnson, and he's forging ahead with plans to expand the business further. At the same time, he's in the process of opening a 4,000-square-foot retail store that will carry a wide selection of automobile-related merchandise, with the aim of allowing those who can't afford a full-on pro-touring car build a chance to get at least a small piece of the excitement.

Whatever business endeavor he's pursuing, Sabra Johnson embodies the competitive spirit and desire for success that characterize the best that PRI has to offer. "I don't want to just win," said Johnson. "I want to dominate. My motto is, 'Leave no doubt we are the best.' And that's what I'm always saying to my team: 'Leave no doubt.'"

PRI

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FASTENER STRENGTH AND OPTIMIZED PERFORMANCE

Understanding the properties of these critical components, as well as factors like preload levels and the effect of friction, are essential to the proper assembly of major systems on a high-performance vehicle.

By Bill Holland

They say you can't tell a book by its cover, but you can certainly get a good idea of a fastener's strength by the marking on the head of a bolt.

This is an often understated and important consideration, as many racing associations specify fastener strength minimums for select applications in their rulesets. Plus, most car builders place a premium on reliability "insurance" through the use of stronger fasteners.

It's also part of a larger matrix: Understanding how fasteners are rated, how different manufacturing processes impact strength, how to avoid failures through proper installation, and factors like preload levels and the effect of friction are all essential to the proper assembly of major systems on a performance vehicle.

IDENTIFYING BOLT HEAD MARKINGS

There are two entities that have established the strength standards we use today: SAE International (formerly known as the Society of Automotive Engineers, founded in 1905 by Henry Ford and others) and the ISO (International Organization for Standardization) located in Geneva, Switzerland.

The most common standards employed in high-performance automotive applications are SAE Grade 5 and Grade 8, plus ISO 8.8 and 10.9—generally employed for metric fasteners. An SAE Grade 5 bolt will have three raised "hash marks" on a hex head. It's made from a medium carbon steel, and the minimum tensile strength is 120,000 psi. The Grade 8 bolt is made of a medium carbon alloy and rated at 150,000 psi tensile strength; it is identified by six hash marks on a hex head.

Top left, SAE's Grade 5 rating (120,000 psi) is indicated by three raised hash marks on the head, while Grade 8 bolts (150,000 psi) have six hash marks. Lower left, bolts with an ISO rating of 8.8 have a tensile strength of 120,000 psi, while those with a raised 10.9 on the head are rated at 150,000 psi.

ISO class 8.8 fasteners are equal in strength to SAE Grade 5 at 120,000 psi, and class 10.9 replicate SAE Grade 8 at 150,000 psi. They will have "8.8" or "10.9" in raised digits on the bolt head.

Some suppliers may choose to exceed those standards, however. For example, ARP's polished stainless steel and black oxide finished 8740 chromoly bolts (and studs) are nominally rated at 180,000 psi—some 20% stronger than Grade 8 or ISO 10.9 fasteners.

TENSILE VS. YIELD STRENGTH

Tensile strength is the most commonly used yardstick associated with fastener mechanical property. It represents the maximum tension load that can be applied to the fastener prior to its fracture.

In addition to tensile strength there is a yield strength published for all rated fasteners. This is a measure of how much load a fastener can take before it starts to deform (typically around 0.2%). It is also the threshold at which a fastener starts to fail. For example, the yield strength of SAE Grade 5/ISO 8.8 is 90,000 psi; for Grade 8/10.9 it's 120,000 psi.

MOST CAR BUILDERS PLACE A PREMIUM ON RELIABILITY 'INSURANCE' THROUGH THE USE OF STRONGER FASTENERS.

This is an important factor because almost all modern engines are primarily assembled using TTY (torque to yield) fasteners—often installed robotically. While this process is certainly adequate for OEM applications, placing additional stress on these fasteners through engine modifications can lead to serious consequences. Moreover, since the fastener has been yielded by design, it should never be re-used.

Rolling the threads on a new bolt after heat-treatment results in fastener fatigue life that can be 10 times better than other thread-making procedures.

MANUFACTURING'S IMPACT ON STRENGTH

There are also several elements of fastener manufacturing that, while invisible to the naked eye, absolutely do impact a fastener's durability and service life. This includes the quality of heat-treating process and how the threads are formed as a result.

Generally speaking, there are two primary heat-treatment methods: case hardening and through-hardening. Case hardening is a relatively inexpensive process that affects the surface layer of the component while leaving the core softer than it was before treatment. Through-hardening, by contrast, increases the hardness of the entire component with uniform properties throughout. It is a far more expensive and time-consuming method that requires specialized equipment and multiple steps.

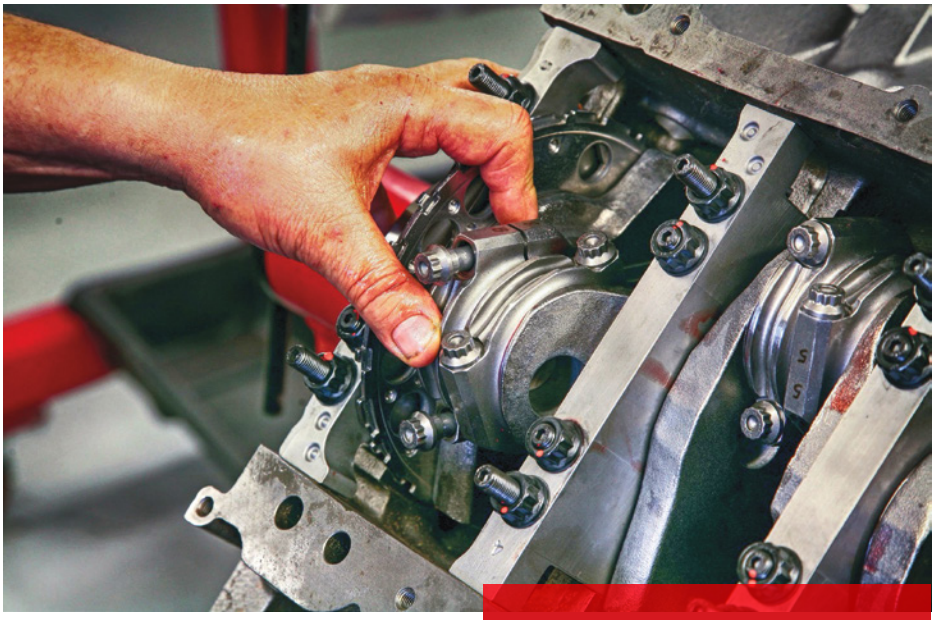
The threads on inexpensive fasteners are cut or rolled on a bolt-making machine prior to heat-treating, when the material is softer and easier to work with. As you might imagine, the threads on better-made fasteners are constructed differently. For example, ARP rolls the threads (versus cutting) after the material has been heat-treated. This results in a fastener fatigue life some 10 times better than you'd get using other procedures.

CRITICAL BOLTS AND AVOIDING FAILURES

Connecting rod bolts are by far the most critical fastener employed in an engine. A failure here can lead to massive carnage—often damaging the crankshaft, pistons, block, and more. It's here where more exotic materials are employed to withstand the increased loads brought on by power-adders and racing fuels.

On cap screws manufactured by ARP for aftermarket connecting rods, the actual alloy is stamped on the head (in addition to the company ID). These alloys include:

- 8740 (190,000 psi)
- ARP2000 (220,000 psi)
- L19 (260,000 psi)
- CA 625 (Custom Age 625+ at 280,000 psi)
- ARP 3.5 (280,000 psi)



When building a high-performance engine, connecting rod bolts are critical in holding together the rotating assembly. Exotic, high-strength bolt materials are often used to withstand the increased pressures brought on by power adders and racing fuels.

Upgraded head studs (or bolts) are also a significant factor in engine performance and reliability. When combustion pressures increase, it is necessary to compensate with stronger fasteners and corresponding clamping force.

CONNECTING ROD BOLTS ARE BY FAR THE MOST CRITICAL FASTENER EMPLOYED IN AN ENGINE. A FAILURE HERE CAN LEAD TO MASSIVE CARNAGE.

Standard 8740 chromoly studs and bolts are sufficient to handle most normally aspirated engines, while stronger fasteners should be employed for supercharged, turbocharged, and nitrous oxide-boosted engines. ARP, for example, uses an alloy strength range similar to the range for its rod bolts. Likewise, increases in combustion pressure (and engine power output) exert more force on the crankshaft and require upgrading main cap fasteners.

PROPER INSTALLATION PROCEDURES

No matter how good a fastener is, it can't do its job unless it is properly installed. A fastener acts much like a spring, as it must be stretched to achieve a rebounding force. For example, a typical 3/8-inch rod bolt will stretch between 0.060–0.065 inches to achieve a 10,000-psi clamping load. When installing rod bolts, it's highly recommended to employ a rod bolt stretch gauge. This will ensure the fastener is accurately preloaded.

The most common causes of rod bolt failures are either too much or insufficient preload. Too much torque on a bolt will stretch it to the point of yield; conversely, not enough clamping force will ultimately lead to rod cap movement in each cycle and imminent failure.

Most fasteners, though, are installed in "blind" holes. So it's imperative to properly apply the required torque loads. ARP maintains a database of instruction sheets on its website (arp-bolts.com), so finding the proper specs is easily accessible.

Since torque wrenches are delicate instruments, it's wise to have them tested

Upgraded head studs (or bolts) are also necessary in a performance engine build to provide the strength and clamping force required when combustion pressures increase. It is critically important to obtain the proper preload.

periodically for accuracy. There are calibration services available nationwide, including by ARP—for free—at NHRA national events.

PRELOAD LEVELS AND THE 'FRICTION FACTOR' EFFECT

It's important to note that when a torque wrench goes "click" at its preset value, that does not mean all of the required torque is used to stretch the fastener. A large portion of the energy is usurped by friction, both in the thread and the underside of the bolt (or nut) and the lubricant. This led ARP To develop a lubricant that is superior to oil, moly, EPL, etc., and delivers 95–100% of the desired preload on the first (and all subsequent) pull of the torque wrench.

Note, too, that most OEM automotive engines are built—often with robotic equipment—using the "torque angle" method. This method calculates the specific amount of fastener rotation required, which then is used to determine the ultimate clamp load required. For hand assembly, a minimal torque reading—say 10 ft.-lbs.— is the starting point, and the fastener is then rotated "X" degrees to its final preload.

TENSILE STRENGTH IS THE MOST COMMONLY USED YARDSTICK ASSOCIATED WITH FASTENER MECHANICAL PROPERTY.

In conclusion, it's a good rule of thumb to be wary of any fastener that does not have a marking on it, or that has markings you are unfamiliar with. Using properly rated fasteners, and understanding how to optimize their capabilities, is critical when assembling the engine, driveline, chassis, and suspension of any race car or high-performance vehicle. PRI

Bill Holland has been involved with ARP's marketing for 25-plus years. His competition background includes drag racing, off-road, and oval track. He currently races vintage sports cars. Holland has authored technical articles for numerous enthusiast magazines and websites. He also has built an AMBR Contender street rod.

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Tracking legal, legislative, and regulatory developments impacting the racing and performance industry.

Edited by Laura Pitts

PRI's Washington, DC-based legal and advocacy teams work continuously to protect and support motorsports venues, sanctioning bodies, and businesses around the nation. We are tracking two vital initiatives this month, including a response to the US Environmental Protection Agency's (EPA) new emissions standards, and a proposed sales tax credit for California manufacturers.

EPA'S NEW EMISSIONS STANDARDS & IMPACT ON SMALL BUSINESS

The EPA has proposed new federal emissions standards intended to dramatically increase sales of electric vehicles (EVs), which would be achieved by reducing multi-pollutant emissions from new light-duty and medium-duty (8,501 to 14,000 lbs.) vehicles for model years 2027 to 2032.

"GOVERNMENT POLICIES SHOULD SUPPORT THE WORK OF SMALL BUSINESS INNOVATORS—THOSE THAT EMPLOY MILLIONS OF AMERICANS—BY LETTING THE MARKET AND INNOVATION DRIVE SOLUTIONS TO THE ENVIRONMENTAL CHALLENGES WE ALL SEEK TO SOLVE."

The EPA maintains its proposal would reduce average fleet GHG levels by 56%, resulting in an industry-wide target for light-duty vehicles of 82 grams per mile of CO2. As a result, the Biden Administration and the EPA estimate that, by 2032, two out of three new vehicles sold in the US would be EVs under its proposed standards. In addition, the proposed standards eliminate an exemption provided to low-volume car manufacturers (those that produce fewer than 5,000 vehicles a year) and lowers the allowable emissions from internal combustion engine (ICE)-powered vehicles over the course of five years by about 13% each year.

PRI and SEMA have significant concerns about the proposed rule. The proposal, as drafted, is essentially the knock-out punch to the ICE technologies upon which the racing industry has built its foundation. The proposal is not technology-neutral, as the EPA and White House suggest. Ultimately, if these regulations are implemented, it will likely lead to more government subsidies (such as tax breaks, funding, and incentives) for large automakers to manufacture EVs, and for consumers to purchase them.

"Government policies should support the work of small business innovators—those that employ millions of Americans—by letting the market and innovation drive solutions to the environmental challenges we all seek to solve. Given the subsidies in place for EV purchases and production, EVs are the de facto choice to achieve climate goals. Other options, such as hydrogen, new synthetic fuels, and multiple renewables, do not enjoy a level playing field of subsidies," said Karen Bailey-Chapman, senior vice president, PRI and SEMA Public & Government Affairs. "A dozen states have recently introduced or passed legislation or resolutions affirming support for the internal combustion engine and for government to remain technology-neutral in the debate to reduce automotive emissions. The federal government should follow the states' lead."

Small businesses will be most vulnerable to the disruptions caused by a seismic shift to battery-electric vehicles. According to the most recent Census Bureau tally of the almost 1,200 auto engine and transmission parts suppliers in the US, more than 60% had 20 or fewer employees. These companies often make specialized components, operate on tight margins, and rely on long-term contracts.

"Large automakers are losing billions a year in their electric-vehicle programs, despite the massive financial infusion of taxpayer dollars they receive from the government and subsidies to purchase EVs. If the large manufacturers are struggling, how are small businesses expected to survive?" said Bailey-Chapman.

Scat Crankshafts in Redondo Beach, California

PRI will update readers on how to file public comments through our action centers when available. For the latest information, visit **performanceracing.com**. To submit specific questions or comments, contact Eric Snyder at erics@sema.org.

VOICE YOUR SUPPORT: CA MANUFACTURING EQUIPMENT SALES TAX CREDIT

California Assembly Member Tim Grayson (D-Concord) has reintroduced PRI- and SEMA-supported legislation (AB 52) that would provide businesses with a state tax credit equal to what they pay in local sales tax for qualified manufacturing equipment. If enacted, AB 52 would effectively eliminate the sales tax on most manufacturing equipment purchases.

Manufacturing is a vital industry in California, accounting for over 10% of the state's GDP and employing nearly 8% of the state's workforce. A total of 38 states already offer sales tax exemptions on manufacturing equipment and R&D, and by failing to do the same, California risks losing businesses to these states that can provide a more attractive business environment. Alternatively, providing incentives for manufacturing and R&D can help the state attract new businesses and create additional jobs.

At press time, the California Legislature had heard testimony from Assembly Member Grayson and key stakeholders, including members from a coalition of California manufacturers.

The bill was set to be voted on May 1. PRI will continue to update readers on the bill's status. For the latest available information, visit **performanceracing.com**. For specific questions or comments, contact Christian Robinson at christianr@sema.org. PRI

INDUSTRY NEWS

LAND SPEED LEGEND CRAIG BREEDLOVE, 86

Five-time world record setter Norman Craig Breedlove Sr. has passed away at the age of 86. He was the first to surpass 400, 500, and 600 mph in the famed "Spirit of America" jet-powered cars.

"He was an American treasure," said wife Yadira "Yadi" Breedlove.

Norman Craig Breedlove Sr.

Breedlove Sr. was voted into the Motorsports Hall of Fame of America (1993), the Dry Lakes Racing Hall of Fame (1995), the International Motorsports Hall of Fame (2000), and the Automotive Hall of Fame (2009). He also earned a life membership into the Bonneville 200 MPH Club (1963).

RENOWNED CHASSIS BUILDER JERRY BICKEL, 75

Renowned chassis builder Melvin "Jerry" Bickel has passed away. He was 75.

Bickel founded Jerry Bickel Race Cars, the chassis builder and parts provider, over 40 years ago in Moscow Mills, Missouri. The company is now known as a one-stop-chassis shop for drag racers. Bickel notably served as crew chief and chassis fabricator for Jim Yates in the 1990s, and built cars for four-time PDRA Pro Nitrous champion Jim Halsey and 2021 NHRA Pro Mod world champion Jose Gonzalez.

NATIONAL SPEEDWAY DIRECTORY PUBLISHER ALLAN BROWN, 75

Allan Brown, the former publisher of the National Speedway Directory, has passed away. He was 75.

Brown, with partners Ross and Nanette Ferguson, purchased the North American race track reference company from Larry Yard in 1980. Brown later bought the company from his partners in 1989 until it was purchased by Tim Frost of Frost Motorsports in 2009.

MARTELLI BROTHERS ACQUIRE PARKER 400, ANNOUNCE UNLIMITED OFF-ROAD RACING SERIES

The Martelli Brothers—organizers of the BFGoodrich Tires Mint 400 in Las Vegas, Nevada, and the California 300 in Barstow, California—have acquired the historic Parker 400 off-road racing series in Parker, Arizona. Officials announced a brand-new desert off-road racing organization called Unlimited Off-Road Racing, including the Mint 400, the California 300, and now the Parker 400.

The Parker 400 will take place in January 2024, followed by the Mint 400 in March, and the California 300 in October. More details are expected to be released at a later date.

In related news, the Bureau of Land Management (BLM) has two off-road racing permits available in Parker and has issued the second permit to Legacy Racing of Las Vegas. The date for the Legacy Racing edition of the off-road race is slated for February 24, 2024.

RACEDECK PARENT COMPANY SNAPLOCK ACQUIRED BY GERFLOR

Gerflor USA, the designer and manufacturer of specialized flooring for several applications, has announced the acquisition of SnapLock Industries, the parent company of RaceDeck modular garage flooring and related sports surface brands. Gerflor USA is the Bolingbrook, Illinois-based subsidiary of the Gerflor company in France.

BANDIMERE SPEEDWAY (CO) SELLS PROPERTY, PLANS TO RELOCATE

The Bandimere family has agreed to sell the Bandimere Speedway property in Morrison, Colorado, but plans to relocate the historic NHRA-sanctioned drag strip to another location in the Denver area. The 2023 Dodge Power Brokers NHRA Mile-High Nationals (July 14–16) will be the last NHRA national event at Bandimere Speedway just outside of Denver.

CAPITAL CITY MOTORSPORTS PARK (AL) LISTED FOR SALE

Capital City Motorsports Park—the NHRA-sanctioned drag strip in Montgomery, Alabama—is listed for sale with an asking price of $4,250,000.

The 138-acre property can accommodate Top Fuel dragsters reaching up to 350 mph and includes a three-story tower with offices and a media center; VIP and owners' suites; a 4,000-square-foot workshop; concessions and merchandise shops; and more.

The race track will continue to host its 2023 schedule.

NGK SPARK PLUGS COMPANY REBRANDS TO NITERRA

Officials with NGK Spark Plugs (U.S.A.)—the Wixom, Michigan-based manufacturer of ignition parts and sensors—have announced its corporate company has rebranded to Niterra. While Niterra will become the Group's overall name, the brands NGK and NTK will continue to exist for the company's respective ignition and sensor businesses.

FORD PERFORMANCE UNVEILS ELECTRIC MUSTANG SUPER COBRA JET 1800

Ford Performance has unveiled the Mustang Super Cobra Jet 1800, described as an aggressive revision to the NHRA world-record-holding Mustang Cobra Jet 1400. It is targeted to best the Cobra Jet 1400's standing world record for full-bodied electric vehicles (EVs) in the quarter mile: 8.128 seconds at 171.97 mph.

"Our changes have made significant improvements to the car, including removing hundreds of pounds in weight and increasing horsepower to 1800," said Ford's Mark Rushbrook.

Electric Mustang Super Cobra Jet 1800

NEW F1-SPEC ROAD COURSE SET FOR ATLANTIC CITY

Officials in New Jersey have approved a $2.7 billion development proposal for a new road course and motorsports destination in Atlantic City. The new facility would be located at the former Atlantic City Municipal Airport, also known as Bader Field, and would include a 2.44-mile Formula 1 specification track. The project, headed by DEEM Enterprises, is expected to take six to nine years to complete. More details will be released later.

Atlantic City road course rendering

BORGWARNER TO EXPAND SOUTH CAROLINA FACILITY

BorgWarner—the American automotive supplier based in Auburn Hills, Michigan—has announced its plan to invest $42 million into expanding its Seneca, South Carolina, production facility, with plans to develop new manufacturing lines, including battery modules. The move is expected to create approximately 122 jobs.

NEW LEADERS FOR SPRINT CARS OF NEW ENGLAND (SCONE)

The Sprint Cars Of New England (SCoNE) has announced Justin St. Louis as the president of SCoNE. He will manage day-to-day operations and work closely with the SCoNE Board of Directors and member promoters.

Dan Douville will serve as race director and will control on-track operations.

SPEEDWAY MOTORSPORTS PROMOTES MICHAEL HODGE TO CHIEF FINANCIAL OFFICER

Concord, North Carolina-based Speedway Motorsports has promoted Michael Hodge to the role of chief financial officer (CFO). Previously chief accounting officer, he is now responsible for the company's financial strategy, reporting, and analysis.

PERTRONIX APPOINTS NEW CHIEF BRAND OFFICER

PerTronix Performance Brands—the San Dimas, California-based provider of aftermarket automotive products, including ignition, exhaust, and fuel systems—has appointed Sarah Lassek as the chief brand officer. She will be responsible for marketing initiatives for all PerTronix brands, including PerTronix Ignition, JBA Performance Exhaust, Doug's Original Headers, Patriot Exhaust, Compu-Fire, Spyke, Aeromotive, Waterman Racing Components, and Taylor Cable Products.

NMRA/NMCA ANNOUNCES EVENT TEAM PROMOTIONS, ADDITIONS

Santa Ana, California-based ProMedia has announced that Gene Bergstrom has been promoted to senior director of racing operations; Michael Washington has been promoted to racing operations manager; Bob Fairey joins as chief starter; Jim Bailey joins as NMCA assistant tech director; Ray Williams Sr. joins as NMCA starter; Jim McConnel has been promoted to power mall manager; Wade Mooney joins as event coordinator, timing, and scoring; Ron Conner joins in the staging, starting line, tech and track prep department; Jacob Segars and Zachary Slayton are now fire/safety captains; and Ron Turransky is now event coordinator of True Street and HEMI Shootouts.

CHRIS ANDERSON APPOINTED EVP OF ELGIN INDUSTRIES

Elgin Industries—the Elgin, Illinois-based manufacturer of engine and chassis components— has announced the appointment of Chris Anderson as executive vice president. He will oversee operating responsibility for the company's domestic and overseas businesses.

LUBRICATION SPECIALTIES (LSI) HIRES BUD PRENATT

Lubrication Specialties (LSI)—the Mt. Gilead, Ohio-based manufacturer of Hot Shot's Secret (HSS) brand—has announced the addition of Bud Prenatt as director of marketing, where he will develop a strategy to promote the HSS brand of performance additives and lubricants.

DAYCO ANNOUNCES FOUR PROMOTIONS

Dayco—the engine products and drive systems supplier based in Roseville, Michigan—has promoted Jay Buckley to director of marketing, catalog, and technical product support; Jerry Reeves moves to Buckley's prior position of director of product management; Jon Crawford to Reeves' former senior product manager position; and Sheila Mann to financial controller for Canada.

VP RACING NAMES STEVE WARD DIRECTOR OF MARKETING

VP Racing Fuels—the provider of racing and performance fuels, lubricants, additives, and branded retail based in San Antonio, Texas—has announced Steve Ward as director of marketing. Ward most recently served as director of marketing at financial services firm H&R Block.

MOTORSPORTS HALL OF FAME OF AMERICA UNVEILS 2024 INDUCTION CLASS

The Motorsports Hall of Fame of America (MSHFA) has announced its 2024 Induction Class, which includes the all-time winningest NHRA Top Fuel Funny Car crew chief Austin Coil (Drag Racing); six-time IndyCar Series champion Scott Dixon (Open Wheel); HANS Device inventors Jim Downing and Dr. Robert Hubbard (Technology); desert racing legend and Hollywood stuntman Bud Ekins (Motorcycles); seven-time NASCAR Cup Series champion Jimmie Johnson (Stock Cars); four-time SCCA national champion and eight-time IndyCar title-winning owner Paul Newman (At Large); and 1966 Can-Am champion and championship-winning constructor John Surtees (Sports Cars).

For all the latest motorsports industry news, visit primag.com/industrynews.

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RUBI SURF 1.7 SPECIFICATIONS

X-axis workhead travel: 42 inches (1065 mm)
Cylinder head length: 34 inches (865 mm)
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RUBI SURF 1.9 SPECIFICATIONS

X-axis workhead travel: 56 inches (1400 mm)
Cylinder head length: 47 inches (1200 mm)
Cutter head diameter: 16.5 inches (420 mm)

COMMON SPECIFICATIONS

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Operator panel:	Rubisurf Smart Series
Waviness:	Below 70 Wt

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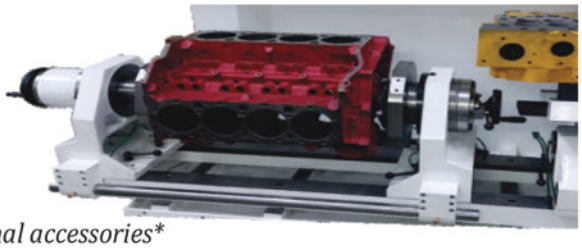

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Concentricity	0.0002" (5 microns) with Honed Guides
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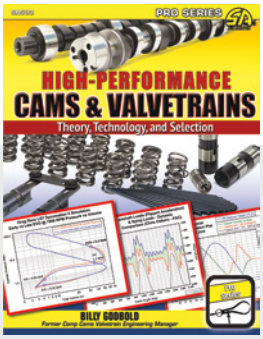
BEND-TECH
bend-tech.com

This Coolant Support System is designed to make the handling of longer tube and pipe materials more efficient. Additional support trolleys carry stock as it is loaded into the machine and hold up long parts to maintain a consistent, cleaner cut, no matter the length. The system also allows operators to cut longer parts while maintaining safety standards.

Contact: 651-257-8715



CARTECH
cartechbooks.com

In *High-Performance Cams and Valvetrains: Theory, Technology, and Selection*, Billy Godbold combines his experience with valvetrains at COMP Cams, Lunati, Crane Cams, and Edelbrock with the techniques he uses with professional teams in NASCAR, NHRA, road racing, dirt track racing, offshore racing, and land speed racing. Specific configurations and applications are covered.

Contact: 651-277-1200

HECK INDUSTRIES
heckind.net

This 90-degree pipe notcher is operated in a standard shop press, arbor press, or iron worker. It's used for tube/pipe fabrication in various industries, including motorsports, and is ideal for creating weld fit-ups. It's offered in three sizes with capacities from 3/8-inch up to 2-3/8-inch tube with 1/8-inch wall.

Contact: 810-632-5400

JESEL
jesel.com

Jesel Sportsman Series Roller Lifters are designed for mild drag engines, street/strip builds, and circle track racing. They have the same 8620 heat-treated bodies that are used in the Pro Series line and are assembled with Jesel's bronze bushing cam rollers. Lifter body diameters from .842- to .905-inch are available with either offset or on-center pushrod seats.

Contact: 732-901-1800

SERAPHINA SAFETY APPAREL
seraphinasafety.com

These flame-resistant performance garments are made from non-igniting fabric and designed to provide superior protection, allowing additional time to escape the hazards of extreme heat and fire. Moisture-wicking, breathable and lightweight, this apparel is easy to wear and keeps women cool and dry in hot, dangerous conditions.

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SHOPSABRE
shopsabre.com

The ShopSabre CNC Plasma machines are engineered, designed, and manufactured in the US for entry-level to professional fabricators. The Langmuir Systems brand offers entry-level prosumer CNC Plasma solutions to help the growing shop get started. The MR-1 is an affordable and capable three-axis gantry mill.

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AD INDEX

PERFORMANCE INDUSTRY REPS

PERFORMANCE INDUSTRY REPS

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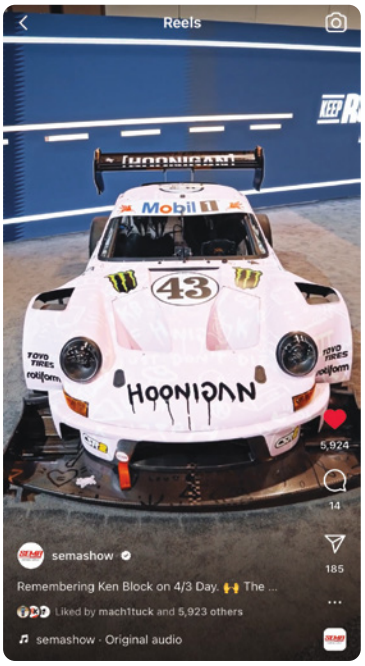
SOCIAL STATUS

A closer look at how racing and performance industry members are using social media to boost their engagement with followers and customers.

The Specialty Equipment Market Association (SEMA) boasts more than 661,000 followers on its SEMA Show Instagram channel and nearly 600,000 on its SEMA Show Facebook page. Additionally, the SEMA Show has accounts on Twitter and TikTok while also hosting multiple other profiles—SEMA News, SEMA Action Network, SEMA Battle of the Builders, SEMA Education—on various social media platforms.

"We utilize the platforms where our audiences live and do our best to curate content to meet the audience where they engage with us," explained Sal Nicosia, SEMA social media manager. "Facebook and Instagram are easy choices for SEMA for all of our profiles, as they are the longest standing platforms where we see the most audience and engagement. Twitter is a great tool to engage with polls, give updates, and tweet across our main pages and membership accounts. LinkedIn is a great choice when it comes to delivering news and giving industry professionals a place to engage with networks and councils, and be part of online events and webinars they offer.



TikTok is where everyone is, and we use it to continue to publish content and reach a new generation of automotive enthusiast."

Let's take a closer look at SEMA's approach to social media and what tips it offers to other businesses in the industry.

"SEMA's social strategy is a blend of show promotion, culture, and lifestyle, as well as stakeholder and initiative collaborations," Nicosia noted. "The strategy is something we evaluate fairly regularly, as all these things change, and SEMA's social presence expands. Overall, we strive to produce and publish content that everyone in the automotive aftermarket can resonate with, regardless of their place in the aftermarket industry."

Patience and consistency are key when it comes to social media—going viral doesn't happen overnight. Regardless of what content a business may create, keeping it steady over time can lead to success. And don't grow impatient, as some content takes time to click with audiences, Nicosia noted.

To help your chances of virality, "use the social media platforms' built-in tools," he added. The platforms like it when users utilize their features, and oftentimes the algorithm they use will put more weight behind those posts. Additionally, "keep up with trends in your industry, and try to create fun, genuine content that promotes your business/product but also gives your online presence some personality."

Current trends include short-form vertical video, livestreaming, social commerce, original content, and more. Hashtags even continue to have some relevance. "Using hashtags on platforms that prioritize them (like Twitter and TikTok) can give the content you publish an advantage in gaining traction," Nicosia explained. "[Beyond] hashtags, keywording for Search Engine Optimization (SEO) has become an even more important tool in ensuring your content's relevancy on social media. Utilizing AI tools like ChatGPT or other SEO/keyword best practices can be crucial in contributing to this."

SEO keywording is the standard practice of using words in the titles and captions of social posts and YouTube videos that you want your content to be most associated with in searches.

"ChatGPT can help with keywording and other aspects of social media and marketing by utilizing the AI's ability to scour the Internet for information," Nicosia said. "Simply ask it for what you want, whether it be a social media post caption, blog post, or any other type of media, and ask it to prioritize keywords. There are a lot of social media tools that incorporate AI features like Hootsuite, Monday, Buffer, and others. However, in my opinion, ChatGPT is the most robust and has the simplest user interface to communicate with right now." PRI

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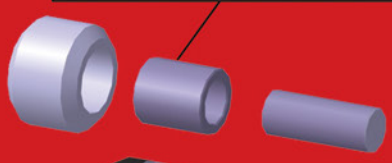

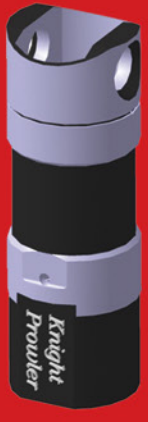

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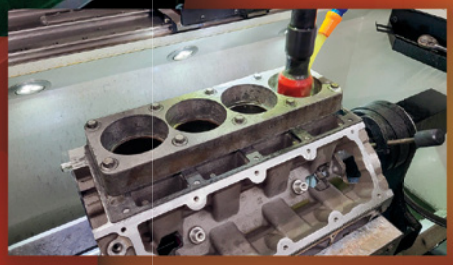

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