VOLUME 38 | NUMBER 8 | AUGUST 2023

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PERFORMANCE RACING INDUSTRY MAGAZINE

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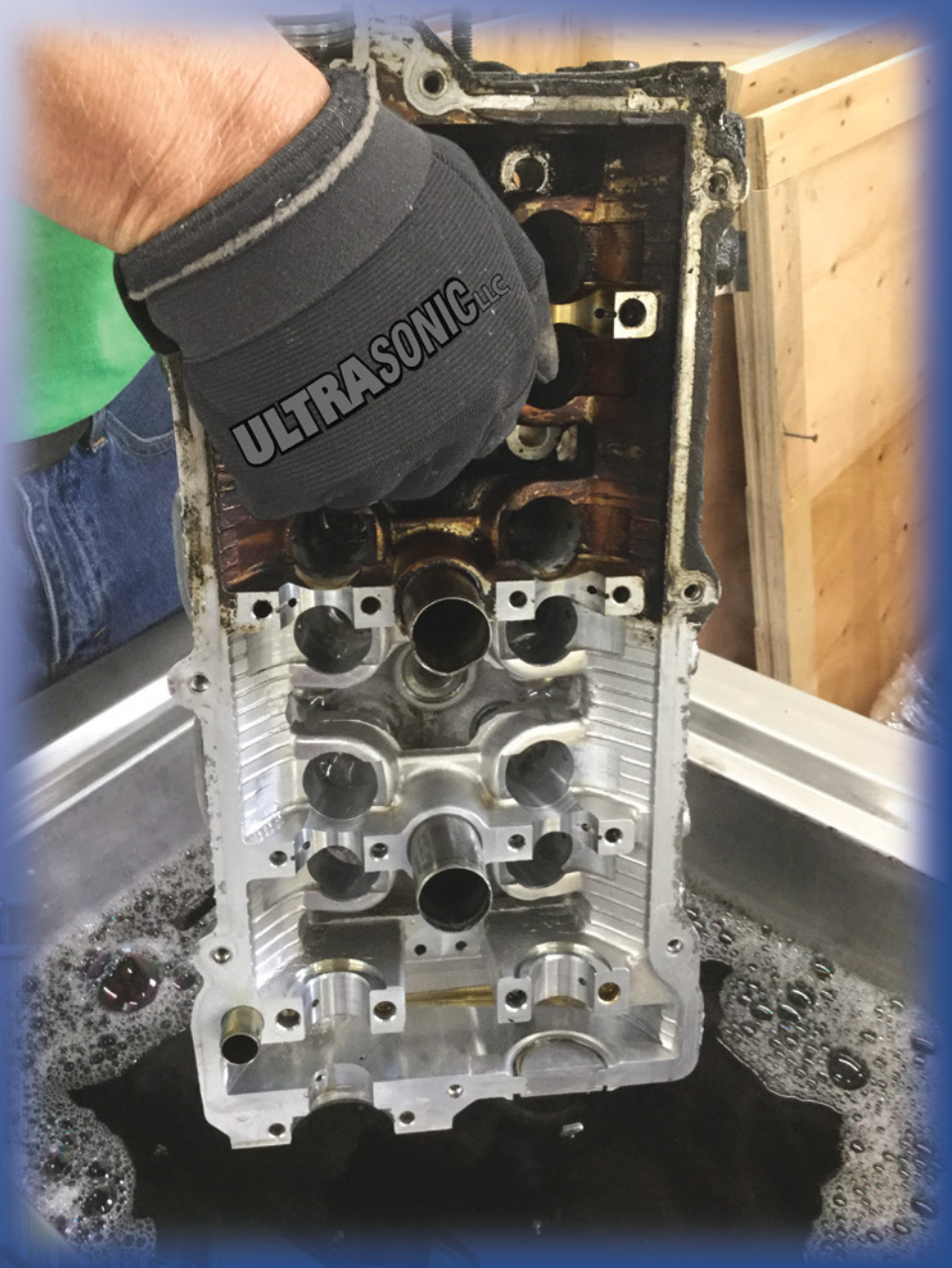

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CONTENTS

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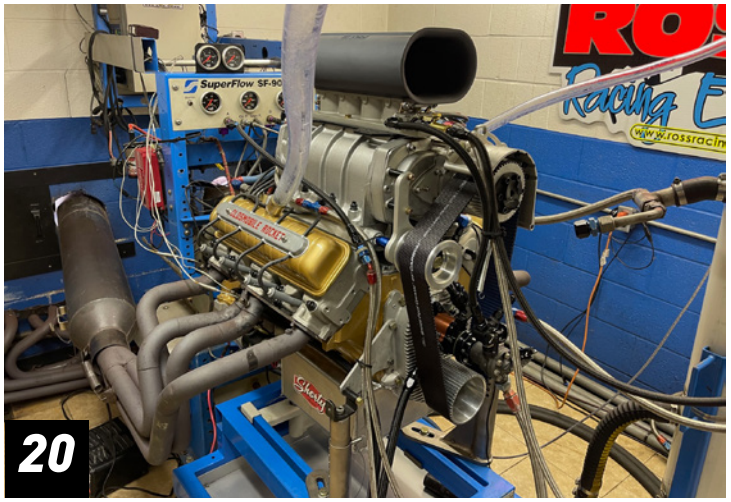

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FEATURES

DEPARTMENTS

ON THE COVER

Cover Photography: We would like to thank Anthony Usher of MEC CNC, who helped arrange the photo of this Robins GH8 SMART.

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FROM THE EXECUTIVE EDITOR

OUR CHANGING WORLD

MEREDITH KAPLAN BURNS
meredithb@performanceracing.com

What was effective just five years ago no longer works today in terms of race strategy, car setup, tuning, manufacturing, design—all across the motorsports spectrum. This August edition of PRI Magazine touches on the critical nature of not accepting the status quo and instead, making different choices that bring remarkable results.

Leading the way in a hefty (both literally and figuratively) way is the shop machinery and tooling that will be on display at the PRI Show Machinery Row in December. Some perfect examples include the GH8 SMART from Robins on this edition's cover, which allows a machine operator to learn to program the machine that can then run automatically. Plus, those who spend hours to hone valve guides manually with hand tools can use this machine to complete a set of V8 heads in as little as 10 to 20 minutes! Turn to the inside cover and you will see ultrasonic cleaning machines from Ultrasonic LLC, or turn to page 40 where our annual Machinery Row Preview coverage begins, with a sneak peek of equipment from a CNC machine to welding equipment to a seat-and-guide machine, and much more. If that hasn't convinced you yet, turn to page 48 for a list of well over 100 machinery and equipment suppliers that have already signed up to exhibit on Machinery Row. If you are in the market for new equipment that can improve processes, save time, offer additional services or machining techniques, or fill a gap from the workforce shortage, then Machinery Row should be your first stop when you visit the Indiana Convention Center and Lucas Oil Stadium, December 7–9.

■ "It seems like we say this every year, but we're still nowhere near the limit of diesel performance." That's the observation from diesel performance tuner extraordinaire Dan Scheid of Scheid Diesel Service Co. He, along with several other diesel performance experts, share their thoughts on the latest innovations that are leading to new records and advancing technology in the diesel race market, beginning on page 56. Our diesel coverage also includes products that promote "clean diesel," beginning on page 62. No more billowing black smoke is necessary to be the fastest in these classes. In fact, the legendary Gale Banks of Banks Power told us, "That's horsepower that you can see, but not feel or use. It's wasted fuel." So, waste no more. Calibrated Power's Nick Priegnitz added, "In general, the attitude in the industry now is to use as little smoke as possible to make the power you need to make. It's kind of the unspoken tuner's rule now. It used to be a 'more smoke is better' mentality, but that has changed." He added, "A sooty truck is just performing under its potential."

■ While we can count on motorsports to evolve and deliver enhanced performance, we at PRI constantly strive to be better and deliver a product the industry expects and demands. We recently welcomed our new Editorial Director Jason Mulroney, who is embracing the digital possibilities of the PRI brand. And, this is my first column as the magazine's Executive Editor. While I'm not new to our industry, having been a part of PRI for 27 years, I look forward to hearing from you about how we can work together to improve PRI along with our industry. Feel free to email me at meredithb@performanceracing.com and share any ideas you have about what we can do together to embrace change. PRI

PRI MAGAZINE

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ACCOUNTING

PAYABLES
Lily Huang

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FEATURED VEHICLES

21st century technology has boosted these 1990s models to new levels of power.

1997 TOYOTA TACOMA SINGLE CAB

DUY BUI | HOUSTON, TEXAS

RACE SERIES/CLASS: ASAG (All Steel All Glass) and local truck events

ENGINE: 3.0 Bullet Billet 2JZ built by Scott Herzog at Arrow Machine, tuning by Chris Delgado

CAR: Wiring by David Aiwase Products, intercooler and custom exhaust fabrication by Speedlab Creations, most fabrication by Teixeira Welding, additional help by Eric LaFerriere and Ulisses Garcia

FEATURES: Precision Turbo & Engine turbocharger, Powerhouse Racing, Turbosmart wastegate and blow-off valve

FACTS: Bui is excited to see what his high-horsepower twin turbo compound setup will do on the track.

1999 FORD CROWN VICTORIA

MIKE GARMAN | PAHRUMP, NEVADA

RACE SERIES/CLASS: Pro Auto Sports ASA

ENGINE: 4.6L DOHC built by Ford/Roush with custom tune by Saleen

CAR: Built by Roush

FEATURES: Fuel Safe fuel cell, Falken Azenis RT660 tires, Cobra wheels, Borla exhaust

FACTS: This car is number 15 of 18 built by Roush for the Bondurant School as an instructor car.

ASK THE EXPERTS

ARE CATALOGS STILL EFFECTIVE?

Catalogs have been a staple in the racing parts sector for decades. But, are they still valuable to buyers? The answer depends on who you're asking and, to a degree, the age of their customers.

By Drew Hardin

Given the steady decline of print media in the wake of digital media's growth, it should come as no surprise that racing performance parts catalogs are being affected as well. Long a fixture at trade shows, manufacturers' midways, and parts counters, these encyclopedias of parts numbers and fitment guides are in a period of transition.

MY GENERATION

"Our catalog is an extension of our product," said Jeff Stacy of Aeromotive, Lenexa, Kansas. "We try and build a catalog that is cosmetically appealing, easy to use, and has the information in it that our customers are looking for. We think that helps the perception of quality of Aeromotive."

Stacy is a firm believer in the power of the print catalog. "For us, the catalog is something we can give away at trade shows, races, and events that stays with the consumer. You can get lost in what's on the Internet. A paper catalog is something of a reference point."

He also noted that "a lot of our business is done through distribution, so if you go to a Summit, Jegs, Motor State, or Turn 14, these guys still use paper catalogs along with digital assets."

"A PAPER CATALOG IS SOMETHING OF A REFERENCE POINT."

One reason Aeromotive is more "catalog-driven," Stacy said, "is because our product is not year/make/model. The bulk of our business is universal. If a customer says, 'I have a 1979 Camaro. What fuel pump does Aeromotive offer for it?' Well, everything we make will fit on a 1979 Camaro."

He acknowledged that demographics play a role in the decision to print catalogs. "The catalog is maybe not the best way to reach 18–30-year-olds, but most of the 18–30-year-olds don't have the money that 31–60-year-olds do. So we're going to continue to cater to my generation because we're the guys spending a lot of money. There are younger kids that do spend a lot of money on cars, but it's not as prevalent. When you go all digital, you alienate, at least in my opinion, 50% of your customer base.

"That's going to change," he added. "We're the dying breed. In 30 years, everything will be digital. But for now, we will continue to invest a lot of money in our catalog."

ALWAYS ACTIVELY CURRENT

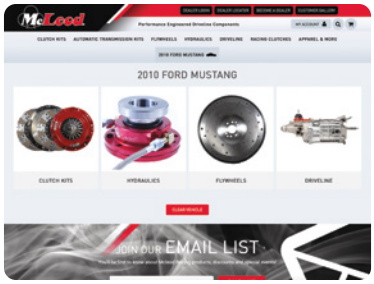
"With technology being our friend these days, there should be no reason why we couldn't have the catalog online," said Krista Baldwin of the Wharton Automotive Group, Anaheim, California. That's why the company, which includes McLeod Racing, FTI Performance, and Silver Sport Transmissions, "is implementing new websites for each company, and on the website there's an interactive catalog. You'll be able to search year/make/model, specific products, or however you want to search on your phone."

> "The paper catalog, in my opinion, will last for quite a while," said Aeromotive's Jeff Stacy. "Sometimes as an industry we try to overcomplicate things. We have to look at what built this industry besides well-engineered, well-built parts, and it was the simple promotion of those parts."

The McLeod website launched two years ago, "and we stopped making catalogs and threw it all online," Baldwin said. After the change-over, "there was a huge influx of sales on the web side for us. Since the interface is very user friendly, our customers are able to navigate the website quickly and make the sale." The Silver Sport Transmissions site is scheduled to go live this summer, and the FTI site will be up later this year. FTI will continue to offer a print catalog until its site is operational.

McLeod does still print a mini-catalog, "a quick overview of the clutches and driveline components we offer," Baldwin said. "We use this at all the events we attend as a tool to differentiate the discs that are available based on the horsepower rating and the use of the vehicle."

The ability to constantly update the catalogs is among the advantages to having them online, said Krista Baldwin. "On the McLeod side, I've probably uploaded a new product every month or two, so it's always actively current."



Baldwin said. “On the McLeod side, I’ve probably uploaded a new product every month or two, so it’s always actively current. Whereas with a catalog, if you buy 5,000 of them, you can’t make a change until those 5,000 are gone.”

There’s also a cost benefit to not printing a catalog, Baldwin noted, as well as “the environmental benefit of not printing all those pages. And if you’re not throwing a catalog into every product box, it saves you on shipping costs. It’s just very economically friendly.”

NOTHING BUT GOOD EXPOSURE

Many companies are going through this transitional period by offering printed and digital catalogs. Supertech of Morgan Hill, California, prints a catalog that it takes to trade shows and sends to a mailing list of customers. That same catalog, in PDF form, is downloadable from Supertech’s website.

PRI CATALOG POLL

Wondering if catalogs are still a worthwhile investment, we spoke to manufacturers of race parts, but we also polled PRI readers and asked them, “In today’s digital age, should manufacturers still offer printed catalogs?” Of the almost 300 votes we received, an astounding 73% confirmed their desire for manufacturers to continue to offer catalogs made from paper.

Here are some of the comments we received from survey respondents:

- “Tangible is visible, and actionable.”
- “In my opinion, there’s a time and place where print comes into play. If you’re a manufacturer that’s working with multiple WDs and sales groups, handing out literature at trade shows, yes. If you’re only focused on your E-comm site, then no. It’s like investing—you have to diversify based on your wants/needs and most importantly on where your potential/current clients have weak spots in their marketing.”
- “I love flipping through a paper catalog…. However, I think it’s a waste of resources considering how many people are online. So, if you have a robust online catalog my answer is ‘no.’ If you do not have an online catalog my answer is ‘yes.’ We might need a ‘maybe’ option.”
- “As a retailer I’m more inclined to show a customer products digitally, but prefer to have printed application guides for part numbers and ease of writing an estimate.”
- “Catalogs may be out-dated but they last long after the power goes out. People have lost touch with print. I miss getting my Jegs and Summit catalogs. They are also a great reference for builders and an easy way to get a young gearhead involved.”
- “There are still people who prefer printed catalogs over digital ones. The age of the consumer really plays a role in this decision. Older consumers will generally prefer a printed catalog while digital natives will gravitate toward virtual versions.”
- “When you know what you want, digital is efficient. When exploring for new options/ideas print is best.”
- “Special or targeted materials only, not a full library. It’s 2023, not 1973.”

From a marketing perspective, "if I didn't hand out a single catalog, there's still value doing it," said PROFORM's Ryan Salata. "It helps me learn about our new products and helps me write press releases for the rest of the year."

"We also have a scannable business card with a QR code" for shows, explained Martin Tagliavini. "Our catalogs are getting a little bit large in size, and sometimes people don't want to carry a full catalog at a show. With the business card they can download the print version of the catalog with the QR code."

PROFORM Parts of Warren, Michigan, also takes the multimedia approach. "We have a printed catalog that we mail for free on request for anybody in the US and Canada," said Ryan Salata. "We also have a PDF version of the catalog on our website and a digital flip book with a unique URL." Like Supertech, PROFORM takes QR-coded business cards to trade shows for post-show catalog downloads.

Product education is a big reason why both of these companies continue to invest in catalogs. "I don't think our catalog is used as an ordering tool," said Tagliavini. "It's used more for information: what the product is, how it's made, the differences in products, why choose one versus the other."

"A catalog allows the customer to be exposed to your entire product line, whether or not that's what they're looking for," said Salata. "If they're looking for rockers, but they happen to come across carbs just flipping through the pages, that's nothing but good exposure."

Both recognized that customer demographics play a role in continuing to produce the print catalogs.

"We want to extend [the catalog] to everybody because we know our demographic is changing, and we want to make sure that we cater to a broad demographic, not just to the generational demographic that's going digital," Tagliavini said. "We still want to cater to our core group of engine builders who were with us 20 years ago." Those builders, he said, want the print catalog.

"Our customer base tends to skew a little bit older—over 40—and older people like the paper catalogs more than the younger crowd," Salata said.

Both companies print fewer catalogs now than in the past, but neither is giving them up altogether.

"Have you noticed Amazon has started to print catalogs around Christmas time?" Salata pointed out. "If Amazon does it, it's probably not a bad idea."

"If the time comes when we take 1,000 catalogs to a trade show and come back with 900, then it is time to re-evaluate the catalog printing," Tagliavini said. "But so far we've had success with our catalogs." PRI

SOURCES

Aeromotive
aeromotiveinc.com

PROFORM Parts
proformparts.com

Supertech
supertechperformance.com

Wharton Automotive Group/ McLeod Racing
mcleodracing.com

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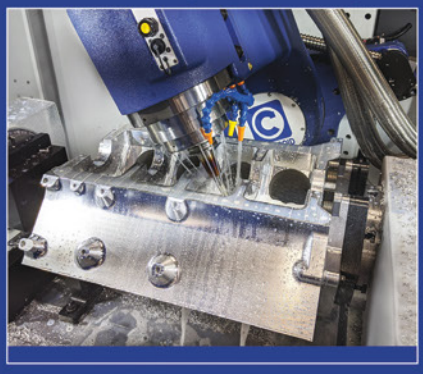
Tony Salloum, VAC Motorsports

Turn-key package



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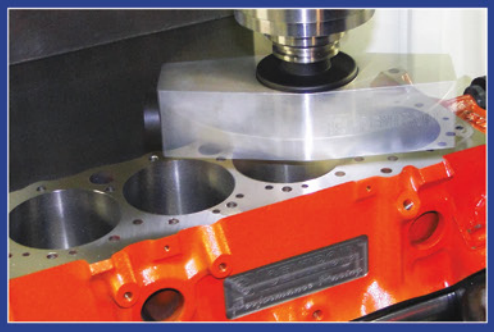

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STOP DOING THAT...DO THIS INSTEAD

HOW TO BUILD FOR THE LONG TERM

While cost constraints might make budget-minded parts an attractive option when selecting components for an engine build, a solid foundation can save money down the road.

By Bradley Iger

There are typically a few primary goals in terms of performance, response characteristics, and reliability when plotting out an engine build. Although these are logical targets to consider in the context of racing, there are other factors that also play important roles here, and they can have a profound impact not only on the immediate result, but also on the long-term viability of the build.

"Usually it comes down to money," said John Schwarz of Aviaid, Chatsworth, California. "Because of that, people have to really understand the application they're using it for. If you're building a street engine—something you're going to rev up a bit every now and then—it's an entirely different context than a track car or purpose-built race engine. For example, there's a perception out there that the crate engines you can buy from OEMs like Chevrolet, Ford, and Chrysler are racing engines, and they're not. They're using production parts, and sometimes they really make too much horsepower for their own good. The LS, simply by virtue of its popularity, is where we see the most of this."

"BUILDING AN ENGINE IS JUST LIKE BUILDING A HOUSE: YOU HAVE TO START WITH A GOOD FOUNDATION."

Tony Lombardi of Ross Racing Engines in Niles, Ohio, pointed out that in the context of motorsports, the use-case ultimately dictates the components that should be used. "One of the first questions I always ask is what they're planning to do with it. That's going to tell you a lot about what level of parts you're going to be using. There's no sense using a set of budget-focused connecting rods when you want to make 1,400 hp. Building an engine is just like building a house: You have to start with a good foundation. It doesn't matter if you've got granite countertops and marble floors if it's sitting on dirt."

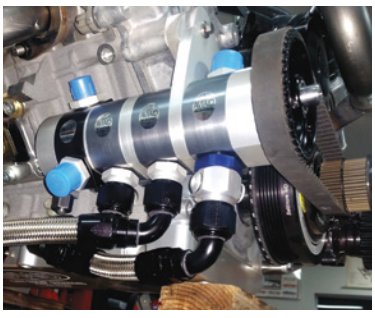
Beyond any specific performance targets a racer might have in mind for an engine, planning for the future by building some additional headroom into the combination offers advantages that can benefit your pocketbook—and minimize potential headaches—down the road.

"One of the first questions I always ask is what they're planning to do with it," said Ross Racing Engines' Tony Lombardi when speaking with customers about their race engines. "That's going to tell you a lot about what level of parts you're going to be using. There's no sense using a set of budget-focused connecting rods when you want to make 1,400 hp."

"There's a balance between just building for today and getting too crazy and over-building for what you might do in the future," Schwarz said. "But if you're planning to use the engine for a long time, it makes sense to focus on using good quality parts simply because they'll last longer, and that can save you a lot of money in the long run. When I was racing, we'd compete in 14 or 15 races a year, and we'd do a rebuild once a year. The quality of the parts allowed us to do that. I've spoken to plenty of guys today who're running these crate motors, and they're doing rebuilds every two or three races."

While the strategic use of high-quality parts can improve durability and make it easier to add power later on, it's important to note that how the additional power is going to be made will dictate whether or not some components will still be usable down the road.

"You want to make sure that the block is a good quality piece, and you're going to use a good quality crankshaft, along with a good gear drive assembly," Lombardi told us. "Those are things you want to invest



"External oiling systems are basically cheap insurance because they last forever, they're transferrable, and they solve a lot of problems," said Aviaid's John Schwarz. An Aviaid pump is seen here on Schwarz's Coyote engine.

in right out of the gate because they'll last you the life of the motor no matter what you do with it. The valvetrain is important, too, but you have to consider whether or not you're going to change cylinder heads later on because every cylinder head takes its own rocker setup. It's not like the old days where you could take a set of stud-mount rockers and swap them over. If you're planning to go from naturally aspirated to a boosted setup, nine times out of 10 you're going to have to change pistons. If you're running a compression ratio of 13:1 or 14:1 with a naturally aspirated setup, that compression ratio is not going to work if you bring in nitrous or forced induction."

Schwarz pointed out that other supplementary components can help achieve these long-term goals as well. "External oiling systems are basically cheap insurance because they last forever, they're transferrable, and they solve a lot of problems. A wet sump system will cost you $800 or $900, and a good dry sump system might cost $2,500, but what you saved with the wet sump is going to vanish with the first unforeseen engine rebuild that you have to do. And, perhaps more importantly, you could have been racing instead of rebuilding an engine. You've got to finish the race before you can win it." PRI

SOURCES

Aviaid
aviaid.com

Ross Racing Engines
rossracingengines.com

EDITORS' CHOICE

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

SJ-210 UPGRADE KIT

TOTAL SEAL

totalseal.com

Total Seal, based in Phoenix, Arizona, has developed an upgrade for the Mitutoyo SJ-210 profilometer that provides full functionality to precisely map the surface finish of any cylinder bore. The kit includes a USB microscope, TraceBoss software, HatchView software, a laptop with pre-installed software, reference scans and a resource library. The complete kit gives the user more information and also makes it easier to find information.

"The combination of visual information and numerical data gives engine builders more insight into what their honing process is creating, which varies from engine to engine because of the differences in block/sleeve hardness," said Lake Speed Jr. "The upgrade kit makes it easier to manage that data. Each scan can be saved with the touch of a button—no more writing down

numbers. In fact, the surface finish measurement files can be emailed to anyone else with the upgrade kit so that they can see your data, which makes collaboration much easier."

Basically, the upgrade kit provides both surface finish and cross-hatch measurements. "Making surface finish measurements visual instead of numerical just makes it easier," added Speed. "Surface finish makes a huge difference in terms of horsepower and durability, so it needed to be easier, not harder, to measure." —*Mike Magda*

ELOCKER DIFFERENTIAL FOR 35-SPLINE AXLES

EATON VEHICLE GROUP

eaton.com

A new Eaton ELocker differential is now compatible with 35-spline axles found on the 2018 and newer Jeep Wrangler JL as well as the 2020 and up Jeep Gladiator JT.

"The new 35-spline Eaton ELocker has proven to be reliable and have quick engagement under harsh conditions," said GenRight founder and King of the Hammers (KOH) veteran Tony Pellegrino. "As a KOH competitor, I like the simplicity of an electronic locker over an air locker, so the Eaton ELocker is a great choice."

The ELocker is designed for hardcore off-road users and will work with upgraded aftermarket axles that are necessary for extreme use. With electronic locking, drivers have full control over the traction choices.

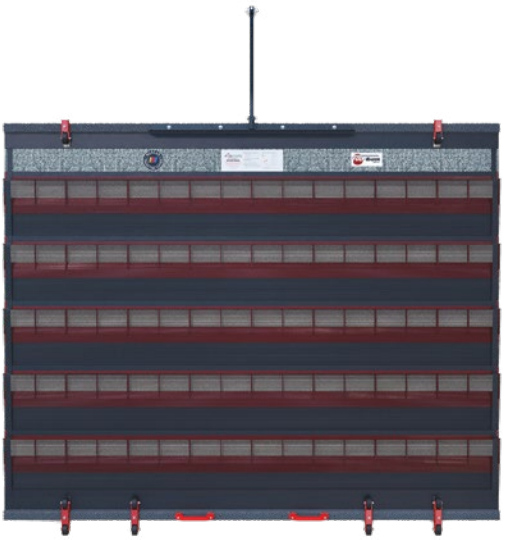
Featuring net-forged gears for extra strength, the ELocker sends all available torque equally to both wheels on the axle by simply pressing a dash switch. When on-road drivability and fuel economy are needed, the ELocker returns to an open differential. The ELocker is available for both front and rear applications.

This new 35-spline ELocker and other differentials in Eaton's aftermarket portfolio (such as the Detroit Truetrac) can be easily installed with one of Eaton's Master Differential Install Kits. Each kit contains all the components needed to properly install an Eaton differential and/or replace a ring and pinion. —*Mike Magda*

FOD-RAZOR MOTOSWEEP TRACK-SWEEPING SYSTEM

FOD CONTROL CORP.

fodcontrol.com



Track owners with an asphalt racing surface can save time and money removing debris with the FOD-Razor MotoSweep motorsport sweeping system.

The friction sweeper is engineered with a series of narrow panels that are covered with nylon brushes. When towed behind a truck, this action pulls the debris under the panels and into durable thermoplastic scoops. There is a mesh cover over the scoops that traps the debris, which is later deposited for disposal.

"The FOD Control Corporation has been providing sweeping solutions to military and civilian airports for more than 40 years," said Pete MacGregor, of the Garland, Texas-based company. "The MotoSweep is the culmination of more than 20 years' experience with high-speed friction sweeping technology in those environments."

FOD said there is a 95–98% capture rate in a single pass with the Razor, and it's most efficient with small debris such as sand, safety wire, hardware, and pavement chunks. It is not designed for "bouncing" objects, such as soda cans.

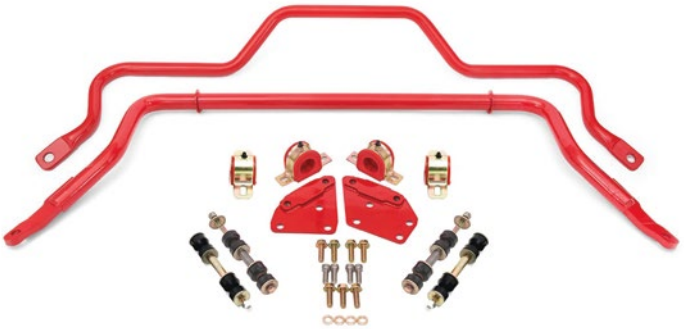
A single Razor can cover just over a million square feet an hour when towed at 25 mph. The capacity can be doubled or even tripled with multiple Razors pulled behind a single truck. A typical Razor weighs around 60 pounds and can be rolled up for easy transportation and storage.

"These sweepers also do an amazing job with the collection of lug nuts on pit roads," added MacGregor. —*Mike Magda*

F/R SWAY-BAR KIT FOR THIRD-GEN GM F-BODY

BMR SUSPENSION

bmrsuspension.com



Designed to improve vehicle handling for competition purposes, this non-adjustable front/rear sway-bar kit from BMR Suspension in Seffner, Florida, for 1982–1992 third generation GM F-body vehicles will reduce body roll and increase cornering ability.

"This product is aimed at grassroots racers who want a bolt-on installation product that will maximize on-track performance," said Kyle Briese. "So far all the feedback we have gotten from these parts has been positive all the way from the customers daily driving the car to the customers really pushing their cars in racing applications."

Manufactured from heavy-duty 35-mm (front) and 25-mm (rear) DOM steel tubing, the bars are cold formed to better resist torsional fatigue and retain their memory longer than hot-formed bars. The bars are also CNC-formed to exact manufacturing tolerances, and thrust washers are welded to the front bar to prevent lateral movement.

"The large increase in sway-bar diameter combined with a lightweight hollow tube design allows for drastic changes in suspension stiffness without a huge increase in overall weight," added Briese.

The sway bars attach to the F-body chassis with low-deflection, 88-durometer polyurethane bushings. Tests indicate that the front sway bar provides a 129% increase in rate, while the rear bar provides a 149% increase. The bars are available in black hammertone or red powdercoat. Installation time is two to three hours. —*Mike Magda*

FAST MOVERS

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

By Dana Ford

Motorsports retailers and service providers are constantly tracking the latest 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 the US.

BOTELER RACING OPERATIONS

Westminster, Maryland

Boteler Racing Operations is a dual-purpose company, selling a variety of racing parts while also manufacturing 1964 Ford Fairlane Thunderbolt fiberglass parts. This blended offering brings in a customer base that is roughly comprised of 85% racers.

Parts moving from the company's shelves the fastest are Product Engineering PE 4400 fuel pumps, Remflex gaskets, Boteler's own Thunderbolt fiberglass parts, and HJC helmets. Customers choose Product Engineering pumps because they come with a two-year warranty and are race proven. Remflex gaskets are preferred because they are designed to crush to fill gaps up to 1/16 inch. They won't leak or burn out, and no re-torque is needed.

Boteler's own fiberglass parts sell well because of their fit, quality, and price. Their reduced weight means improved ETs and mph on the track.

HJC Racing helmets provide a comfortable, fire-resistant, moisture-wicking, comfort-carbon interior and a large vision area, all while meeting/exceeding SNELL ratings. Additional popular products include Geddex Dial-in markers and Power Plus Lubricants fuel fragrances.

Boteler has a multi-faceted sales approach, selling parts through its website (botelerracing.com), social media, trackside, and at other motorsports events. While its customer base is widespread because of its Internet presence, most customers are regional and supported with a trackside presence at its home tracks, South Mountain Raceway in Pennsylvania, and Mason Dixon Dragway in Maryland.

MAR-SCHAN MOTORSPORTS

Douglassville, Pennsylvania

Mar-Schan Motorsports is primarily a retail safety gear business that also provides performance products from Holley, Jesel, Keizer Racing Wheels, Holeshot Wheels, and others. Owner Marc Schankweiler estimates 80% of his business comes from the drag racing market. A smaller percentage comes from dirt and asphalt racers, and he said he's "trying to diversify into that market a little more." Customers compete in NHRA, IHRA, NASCAR, USAC, and SCCA, and are primarily from the US, but include some international customers, too.

Fast movers over the last few years have been NecksGen head-and-neck restraints; SPA Technique fire system products, which include FireAde and FireSense+ by 4Fire; camlock harnesses and racing suits from Pro 1 Racing and Safety Products; plus helmets from Zamp Racing and Stilo. Schankweiler said, "Since the NHRA mandated head-and-neck restraints for Junior Dragsters, the NecksGen has been our bestseller. That's what I put my son in two years before the mandate because I could see the sense it made to protect him with what I thought was the best."

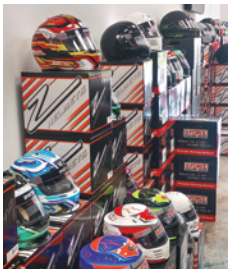
The SPA Technique brands are popular because of the company's helpful tech support and SFI testing videos, reported Schankweiler. Users of the Pro 1 Safety harness rave about the webbing of the belts and the lightweight qualities of its racing suits. Zamp has numerous YouTube videos and attractive price points for its customers, he added.

A key component to Mar-Schan Motorsports' repeat business is a simple principle. As Schankweiler proudly pointed out, "My phone is always on!"

RACEDAY SAFETY

Dallas, Georgia

RaceDay Safety is a shop dealing in auto racing safety gear and equipment with a clientele that consists solely of racers. Its fastest moving items include Zamp helmets, G-Force Racing Gear helmets, and K1 RaceGear driver suits.



According to RaceDay owner Kevin Shaw, these items are popular because "both Zamp and G-Force have a good selection of nicely priced graphic helmets. The younger racers (from 5–40 years old) enjoy adding some style. K1 RaceGear has done a really nice job of becoming the preferred brand for dirt and asphalt oval racers."

RaceDay Safety has been a Zamp and K1 RaceGear dealer for more than a decade and has just become a G-Force dealer this year, giving customers the benefit of products with a proven history behind them.

RaceDay Safety has customers throughout the US and Canada, with roughly 15% of the customer base from racers at tracks in its local area of north Georgia, east Alabama, and southeastern Tennessee. To capture new customers, its marketing involves traditional advertising in outlets including Speedway Illustrated magazine and RacingJunk.com. "We have scaled back our own social media," explained Shaw, "letting our loyal customers spread the word through their own social media pages." PRI

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A01-23

NEWLY APPOINTED

KIRK MILLER

For a new vice president of direct sales, EV powertrain startup Hypercraft chose a veteran of the small-displacement turbo tuner market who later pivoted to EVs.

By Jim Koscs

Kirk Miller's long journey to recently joining Hypercraft began decades ago. His love of motorsports started on ice-racing tracks in New York state and at the drag strip and motocross track of Old Bridge Township Raceway Park. Miller opened his own race-prep and performance shop when he was just 22 years old.

After moving from New Jersey to California in 1993, Miller became the US director of GReddy Performance Products, just as the sport-compact scene was heating up. He later joined AEM Performance Electronics, where he capped a 24-year run as vice president of sales and marketing.

Miller explained that Hypercraft, which has operations in Utah and California, is designing and engineering complete EV drive solutions for vehicles at a fleet level, including powersports, industrial, military, and marine. Stealth EV, which Hypercraft purchased in 2022, is the aftermarket sales division for both consumers and builders.

He shared his outlook with PRI.

PRI: How did your role at AEM prepare you for this new role at Hypercraft?
Miller: At AEM, most of my focus was on the EV conversion and motorsports segments for roughly three years prior to our selling the company to Holley Performance Products in 2021. I am now reaching out to race, fabrication, and dyno shops that I've worked with over the years to show them what we have in the works. I'm also checking in with distributors that are very interested in this segment.
PRI: How does your deep background in the traditional hot rodding and performance market prepare you for the EV performance segment?
Miller: I've developed a great set of relationships over the past decades, which I think in some cases gives me a bit of an advantage, because there's already credibility and trust in place. People in the performance aftermarket that are interested in this segment may look to their trusted suppliers.
PRI: Coming from AEM, which helped develop Ford's 1,400-hp electric Cobra Jet Mustang, you've seen the potential for EV performance for the hot rodding world. How would you describe the level of enthusiasm for this market?
Miller: Enthusiasm and excitement are currently somewhat polarized. On the one hand, with EVs you lose the sound, that's a big part of what makes racing and performance cars exciting. On the other, the performance levels using EV powertrains are amazing, and in many cases, superior to what an ICE-powered vehicle is capable of. Additionally, drag strips and other tracks are restricted by noise. So why not trial events with EV race or street cars, or a mix of those? There's no noise coming out of the track, except maybe some tire noise, but not enough to disrupt local neighborhoods. If I were a track owner or promoter, I'd be excited about having this. We've had race tracks and manufacturers telling us they'd like to embrace this. It could help tracks that are having trouble.
PRI: You have said, "This is one of the most exciting times to be involved in the automotive aftermarket." What excites you most about this new role?
Miller: What excites me most is that Hypercraft is a startup. For me, it's like looking back at the early stages of my career in the mid-1980s in the import tuner market. We were getting small displacement turbocharged engines to work with devices from different manufacturers, making things that had no means of communicating with each other to work in sync.

We see a phenomenal opportunity for a programmable vehicle control unit, or other devices, to make various EV components communicate with each other. Hypercraft is completely focused on that right now. We can bring completely engineered packages to shops that can install them into vehicles. Our mission is to lower the technical and cost bars for making the jump to an EV drivetrain.
PRI: The performance aftermarket has been through some major transitions before. How does the EV phase compare?
Miller: I can't think of a time in automobile history when the aftermarket didn't eventually follow what the OEMs were doing regarding propulsion. My background was in the tuner segment with smaller-

KIRK MILLER

TITLE:
Vice President of Direct Sales

ORGANIZATION:
Hypercraft

HOMETOWN:
Carson, California

FAST FACT:
At 16, Kirk Miller had his own ice-racing car. "My dad was in the D-Stock class, and I had an A-Super-Modified. In my first year of racing, we were both New York state champs in our classes. I didn't realize how well ice racing would play into my road racing career, being able to comfortably race in rain because I was so used to spending half my time going sideways on ice. It was just fun and normal to me."

displacement imports. There was a lot of resistance to that segment from the traditional V8 hot rod and motorsport market people. OEMs are now hyper-focused on EVs, so that tells me that's where the aftermarket focus is going to be as well.

The performance EV aftermarket is in its infancy. There are many young people—or not that young in years but young at heart—who embrace this technology for several reasons. Mainly, they like that it's just great performance. Also, the cost of maintaining performance electric motors is almost non-existent.

PRI: Is Hypercraft using repurposed Tesla hardware or developing its own?

Miller: On the Stealth EV side, we are upcycling Tesla drive units and battery packs out of wrecked vehicles. We refurbish and bench-test these drive units, and then sell them with other devices in a fully engineered motor and battery package that the customer installs in a build. On the Hypercraft side, we're sourcing brand-new motor cores for our own motor designs, as well as inverters, DC-to-DC converters, and onboard chargers. We manufacture our own battery packs, called HyperPacks. Our goal is to have robust inventories of products that we have vetted and make them available to ship within one to three days. We're also doing development on expanding battery pack offerings and other products for those packages to cover a wider range of applications.

PRI: Are you involved with cooperation with OEMs or their suppliers?

Miller: OEMs are focused on volume in the tens or hundreds of thousands, or even millions. Their suppliers, though, have aftermarket-facing divisions that can handle smaller quantities, in the hundreds or thousands. BorgWarner, Cascadia, and Dana have been great to work with, and they're as excited about the EV conversion market as we are. When I say conversion, I'm talking about two parts. Conversion for existing or new fleets, where there's volume, and for the performance market, where people want to convert classic cars or build EV hot rods or even race cars.

PRI: With new EVs, buyers think about 'range anxiety.' Does that apply to the performance aftermarket as well?

Miller: I think range anxiety is something that we put on ourselves to some degree. A range of 80–100 miles, even on something as small as a 35-kilowatt-hour pack, is good range for a typical cruise. And nowadays, battery packs run as large as 100 kWh, so range can go up dramatically. I should also note, as with an ICE-powered vehicle, if you're heavy on the accelerator, your EV range will fall.

PRI: Is there a critical mistake you've learned from in your professional career?

Miller: I started my first company when I was 22. I was building race cars and could work on European cars, which was lucrative. My biggest mistake was that I ran it almost like a hobby, rather than a business, and that cost me in profits and time.

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

Miller: I would have a hard time living my life without motorcycles. I've got a bunch of bikes, and I absolutely love them. PRI

INDUSTRY INSIGHTS

MICHAEL RIGSBY

With the goal to be the "essential destination for motorsports in North America," Michael Rigsby has transformed his upstart DirtOnDirt.com live-streaming service to cover more than 2,000 live motorsports events annually. Now with FloRacing, he explains why he believes live-streaming actually benefits the sport overall.

By Jeff Zurschmeide

The ability to see potential in the early stages of something is a gift given to very few people. Michael Rigsby is one of those lucky few. Rigsby got his start in media as a local TV station sports anchorman in Madison, Wisconsin, but his passion for dirt track racing started much earlier, in his youth growing up in central Illinois.

When Rigsby saw the potential of the Internet for racing fans in the early 2000s, he was still working in broadcast TV, while his future wife Amber was working as an on-air DJ and marketing director in radio. Together, the two hatched a plan to create a website that would cover everything to do with dirt track racing. Both of them quit their jobs and devoted themselves full-time to DirtOnDirt.com. The rest, as they say, is history. DirtOnDirt became part of FloRacing in 2019, which is itself part of FloSports, a major online broadcaster of racing and sporting events. Rigsby serves as vice president of motorsports. We caught up with Rigsby to see how it started, how it's going, and where he thinks it's headed in the future.

"WE'RE COVERING MORE THAN 2,000 LIVE MOTORSPORTS EVENTS A YEAR."

PRI: So, how did you end up where you are?
Rigsby: I was born and raised in central Illinois, so I've been a motorsports fan all my life. Central Illinois is one of the great short-track hotbeds of North America. Fairbury Speedway is my home race track. My grandfather was a racer at Fairbury way back in the day, so I've always had a motorsports background. At the same time, I've known since I was five or six years old that I wanted to be a sports broadcaster. I graduated from Illinois State with a journalism degree. I got a job up in Wisconsin, but I was still attending a ton of races. We would go to races with anywhere from 5,000 to 20,000 people at them, but with no media coverage. So I had the idea that there needs to be an all-encompassing news outlet for my particular passion. We called it DirtOnDirt, and we wanted to be the site for dirt late model racing. My wife would do all the marketing and on-site activation, and I would be the one handling all the editing, the shooting, the on-air stuff. We both quit our jobs in 2007 and started this company.
PRI: DirtOnDirt.com became successful, but how did you end up at FloRacing?
Rigsby: FloSports acquired the company in 2019. We had started DirtOnDirt from virtually nothing and built it up to more than 30 employees. I became the vice president of motorsports at FloSports. We cover everything. It's sprint cars, it's pavement late models, it's drag racing, it's snowcross. Our goal for FloRacing was, is, and always will be to be the essential destination for motorsports in North America. All of the NASCAR grassroots stuff belongs to us. We cover more than 2,000 live motorsports events a year.
PRI: What is your relationship to the series that you cover?
Rigsby: It is absolutely a benefit to the partners that we have, whether that be the Lucas Oil Late Model Dirt Series, or Tony Stewart's All Star Sprint Car series, or the Duck X Productions that we do at drag racing or NASCAR grassroots. It is elevating our partners. We have multi-year partnerships with all these people, and it's not just an exposure thing. I think short-track racing and grassroots motorsports have always been the next big sport in America, just bubbling under the surface.

"BRINGING THAT BIGGER AUDIENCE ALLOWS ALL THESE DIFFERENT DISCIPLINES OF MOTORSPORTS TO LEAN ON EACH OTHER AND BE A COLLECTIVE FOR THE FIRST TIME EVER."

Listen, it's never going to be the NFL or college football, but collectively, the number of short-track racing fans in America is enormous. But it's always been sort of a cultish niche following because the distribution was never easy. It was always hard to find, it was always splintered. So that's the really beautiful thing that FloSports has done. My mission is to house it all in one place where sprint car fans are watching Late Model racing, and Late Model fans are watching drag racing, and drag fans are watching snowcross, maybe for the first time. For example, we had this incredible 500-mile snowcross race earlier this year. We had all these sprint car and late model and drag racing fans tweeting about it, because for the first time it's all being distributed from one location.

Bringing that bigger audience allows all these different disciplines of motorsports to lean on each other and be a collective for the first time ever. That has absolutely elevated not only short-track racing, but particularly our partners. The exposure that Lucas Oil now gets as a sponsor of a tour is bigger because the audience is so much bigger. It's crazy, this general awareness that has exploded in the last two or three years because of everybody having access to all of this through one affordable subscription.
PRI: What are some of the logistical challenges that you face trying to cover all these different events?
Rigsby: Scale is the hardest thing. No one has ever attempted to broadcast motorsports at a grassroots level at this scale. It's a challenge to be able to put 2,000 events on the air from facilities that are not "built for television" or for broadcasting. So being able to scale this to the level we're doing comes with an enormous number of challenges from crewing to logistics, to shipping to equipment to the talent. We are constantly cultivating new talent, new camera people, new producers, new everything. So that is the hardest thing.
PRI: How do you negotiate with tracks and series and promoters to cover a racing event?
Rigsby: You asked if we're talking to the track or the series, and the answer is yes to both. We have partnerships that exist with both. For example, somebody like USAC—the United States Auto Club—comes to us and says, "We want you to broadcast all of our sprint car races." So we do a deal, and that is the only entity we deal with. However, there will be tracks that say, "Hey, we would like to have you broadcast all of our events." Or there are tracks out there that won't have a series and they just run an independent big event. In those cases, we deal with the race track. Now, obviously we can't support every track that calls, but if a track is interested in broadcasting their season schedule, they should reach out.
PRI: What does a successful relationship with a series or track look like? Do they pay you to broadcast their events?
Rigsby: It's typically the other way around. We would offer them a rights fee to broadcast their event or series. We have an awesome data team and an awesome rights acquisition and advertising team that figures out what we think it could be worth, working in our model. Then we offer them a rights fee. That's how it would go.

FloRacing's Michael Rigsby, right, interviewing Tony Stewart. FloRacing's extensive motorsports coverage "elevates all our partners," Rigsby said, including Stewart's All Star Sprint Car series. "And it's not just an exposure thing. I think short-track racing and grassroots motorsports have always been the next big sport in America."

Now, there are some tracks out there that just want to be on Flo so much that they do offer to pay us. Those deals are rare because every time we do a production, it's not just flipping a camera on. It's a logistics team that has to have the equipment there. The scheduling team has to get the crew there, so it has a certain amount of work. So we have to limit the number of events we can do. They're not all going to be the same in value, but the principle of the deal would remain the same.

PRI: What goals do you have for FloRacing in the next few years, and then over a longer term?

Rigsby: My mission right now is to make FloRacing the essential destination for motorsports in North America. We have work to do on that. That goes from schedules to breaking news to a little bit more of an editorial presence. I built DirtOnDirt.com on that model of being able to find a team schedule, find the results, and find data integration. Those are all ingredients that go into the soup to make us the essential destination for the events we're broadcasting.

Data is very important to us. We recently acquired Race Monitor, which streams live timing to mobile devices. Then I want to have a driver profile on every driver in North America and every race they run. I want you to be able to click on a driver's name and see every result of every race he's run in his career. All of those things go into making us the essential destination. We have an awesome films team, starting to put short films together. We did a short film with Jonathan Davenport called "Dirty Dollars." I'd very much recommend watching it. I want our fans to know the stories of who these guys are, not just the number on the car.

PRI: Are there people or organizations that you try to emulate?

Rigsby: This will probably sound the wrong way, but truly the thing is, you can't point to another company in North America or the world that is attempting to tackle motorsports like we are.

I would give a nod to some of our competitors in the space like DIRTVision and Speed Sport Network. I have a tremendous amount of respect for both Brian Dunlap at DIRTVision and Chris Graner at Speed Sport Network. They are competitors, but I have so much respect for them because of the way they do business and how they carry themselves. The only difference is the scale at which we're doing it. Those guys do 400 to 500 races a year, and we're doing 2,000. I think we're in a new frontier that we're blazing on our own.

PRI: Do you think that live streaming discourages people from going out and buying a ticket, or does it just create new fans? I know this argument occurred decades ago around baseball and football, but do you think the principle holds true?

Rigsby: I think it's important to note that I'm part of the ownership group of Fairbury Speedway. So I exist on both sides of this.

Michael Rigsby became a part of FloRacing when it purchased DirtOnDirt.com in 2019, which Rigsby started with his wife, Amber, in 2007.

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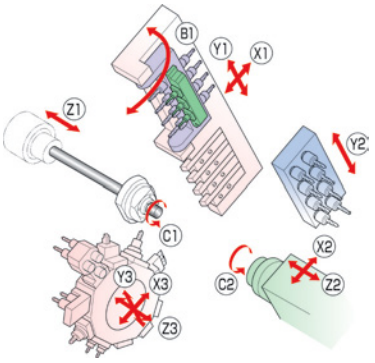

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For Michael Rigsby, seen here on right at the Lucas Oil Late Model Dirt Series opener at Golden Isles Speedway, "scale is the hardest thing" about FloRacing's ambitious broadcast schedule. "It's a challenge to be able to put 2,000 events on the air from facilities that are not 'built for television' or for broadcasting."

We broadcast most of our races, so I work in the broadcasting side and in the promotional side. By and large, the promoters and race tracks we work with have never cited live broadcasting as a hindrance to at-track attendance for them. Most of them have said the exact opposite. They felt like our presence at the event has made it bigger, has offered more legitimacy to it, and has exposed it to a wider audience.

I had a race track promoter tell me one time, let's say you cost me 10 tickets. I know that there were 10,000 people watching that who are future ticket buyers. So our philosophy is no, it does not in any way harm live attendance. For anyone who may fall into that category, it's absolutely worth it from the perspective of exposing it to such a larger audience. We know people walk through gates, and they do it at my race track, and say, "I saw you on Flo. I saw you on DIRTVision, and I came because of that." We believe it certainly is way more positive than negative.

PRI: What are you going to do to keep things fresh and provide the "wow factor" at FloRacing?

Rigsby: Most of our high-level shows use drones now. But it's most important to me, when you're broadcasting as many events as we can, to make sure the delivery is right. That each event has solid camera work, solid live timing and scoring, and that there are no disruptions in service. When I tune into a basketball game and I see them trying some bizarre angles on the Final Four, I think no, this is not how we watched basketball for 60 years. We will continue to evolve with tech, and we will continue to provide new and cool features and user experiences, particularly around data with our customers. But it is important to me that we offer steady streaming, live timing and scoring, and solid camera work. If you told me that I accomplished that over the next three years, I would be happy.

PRI: Let's talk about the future. What do you think we can do as an industry to promote motorsports and sustain its popularity through a period of profound change?

Rigsby: I think we all have to reevaluate what it means to be a promoter. The world is changing, and short-track promoters have got to change with it. Flo can be a part of that solution, to work with them to understand the different ways that the world is evolving. We work with a lot of promoters whose methods and formulas have been successful for a long time. But if you ask anybody, whether it's Major League Baseball, the NFL, anybody, they'll say the audience and audience habits are changing so much that just because methods were successful for many years, that doesn't mean they're going to work anymore.

Collectively, our industry has got to take a look in the mirror to understand that and not be scared of it. We have great products. We just have to tweak, evolve, and change a little bit with it. I want FloSports to be part of that solution. I want a race track promoter to come to me and say, "We're struggling. What do you think?" I want them to come to us and ask us questions. We've got a great set of minds inside our building and inside our office, and we can help them with that. You can no longer just do what you've always done and expect the same results, because the world is a totally different place now than it was even 10 years ago. Our mission when we got involved in racing was to grow motorsports. I think we're doing that, and we are just getting started. PRI

Michael Rigsby with Tim McCreadie talking about the Lucas Oil Late Model championship format. Awareness of short-track racing has "exploded" in the last two or three years "because of everybody having access to all of this through one affordable subscription," Rigsby said. "The exposure that Lucas Oil now gets as a sponsor of a tour is bigger because the audience is so much bigger."


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SPECIAL REPORT:

SUCCESSFUL SPONSOR RELATIONSHIPS

Uncovering the secrets to prosperous partnerships between race teams and sponsors.

By Steve Statham

It's no secret in the motorsports world that sponsorship money keeps race cars on the track and lights on at the shop, but it's also no secret that cultivating successful sponsor relationships is often easier said than done. There are a lot of moving parts, and getting everyone rowing in the same direction takes considerable planning and effort.

After all, there's a lot more to a sponsor partnership than simply a monetary transaction and decals on a race car. At least, there's a lot more to a good sponsor partnership than those basics.

For this article we spoke with sources who have established enduring and mutually beneficial sponsor relationships. We wanted to hear from both sides of the partnership on what success looked like, and how teams and sponsors navigate their way to winning both on track and in the race for consumer attention. What we heard is that success is measured in different ways, but there are some fundamental benchmarks that any good partnership will meet.

Former IndyCar driver Bryan Herta fields Hyundai Elantra N TCRs in the IMSA Michelin Pilot Challenge series as part of his Bryan Herta Autosport racing stable, based in Speedway, Indiana. "I think good communication really has got to be at the top of the list," Herta said. "With good communication you

can really get aligned. Your partner is going to have goals and objectives, and obviously as a team you have goals and objectives, and trying to align those things through good communication is the basis for a good partnership so everybody is aware of what they're hoping to achieve, and everybody is clear on what the goals are for the program."

Other paths to good sponsor relations include finding natural alliances that match the right racer with the ideal brand. Three-time NHRA Top Fuel Champion Antron Brown has a long relationship with primary sponsor Matco Tools, starting with when the company was an associate sponsor during his Pro Stock motorcycle years earlier in his career.

"What makes for a successful partnership is when you're representing a company that you're passionate about, plain and simple," said Brown, who owns AB Motorsports, Brownsburg, Indiana. "For me, I was a mechanic since I was a little kid, so by partnering with Matco Tools, that was like a match made in heaven because I use every single one of their tools. That's what makes the partner relationship deep, is when you become a part of the brand, not just representing the brand. It makes everything easy. I could never represent a tobacco company because I never smoked a cigarette a day in my life. So the main thing is making sure both sides are a perfect fit, like a puzzle."

Three-time NHRA Funny Car champion and now team owner Ron Capps of Ron Capps Motorsports in Brownsburg, Indiana, was influenced by the legendary racers he drove for earlier in his career, such as Don "The Snake" Prudhomme and Don Schumacher. For Capps, one attribute that stood out from the best sponsor partnerships was attention to detail.

"Snake would talk about even small things, like our team scooters lined up in front of the pit area. He hated it if they weren't lined up perfect," Capps said. "I noticed when I went to my first IndyCar race and saw Mr. Penske's pit area, that's the way things were. It was attention to detail with everything. On my end, from representing the sponsors all these years waiting for a chance to be an owner, like with NAPA, who I've been with since 2008, I've always kind of gone to bed and woke up in the morning thinking about 'How can I make them better?'"

Alex Striler is the former director of sales and marketing for Team Lucas Motorsports Program and is the author of the book Motorsports Marketing and Sponsorships: How to Raise Money to Race and Give Sponsors What They Really Want. He is currently hosting online summits educating racers and teams as to what sponsors want from representation.

"We're always looking to listen to Hyundai and understand what their goals are," said Bryan Herta, who fields Hyundai Elantra N TCRs in the IMSA Michelin Pilot Challenge series. "We try to basically be a one-stop solution for them in everything they need as it pertains to motorsports."

"When a property, team, or an athlete can reach a market that the sponsor or brand or company does not already reach with their traditional marketing, then typically that could become a success," Striler said. "The goal of sponsorship is to become a marketing extension of a brand, and to open up that market whether it's relationships through sales, or branding through increasing equity like Red Bull does, into new markets where that company doesn't yet already market. To market to the same old people in the same old series, the same old races, the same old demographic, that does nothing. A successful relationship opens new markets."

BEYOND THE TRACK

Brightly colored race cars flashing by on the race track are the foundation of everything in motorsports, but race teams with solid partnerships spread the sponsor's brand message far beyond the confines of the race track.

"We exist to go motor racing. We exist to go win races. That's our end objective always," Herta said. "But there's a whole lot of other sub-objectives that have to happen along the way, and you need partners that are aligned, not just where you're trying to get to, but the reasons for getting there. In Hyundai we're just really fortunate that we found a brand that was relatively new to motorsports, certainly in the US, was relatively new to performance vehicles, and so we were able to grow this from what started seven years ago as two TCR cars to a program now where we are the sales, and parts, and service representative for all Hyundai vehicles throughout North and South America. That includes parts distribution, working with other customers' teams within those markets. We build and sell TCR race cars completely in-house.

"We run a number of activations for Hyundai, including their at-track activations at the IMSA races," Herta continued. "We run a fairly unique to North America Hyundai driver camp every year where we train all the Hyundai drivers from North and South America on physical training, data, social media, you name it. It's a pretty intensive program. We capture, edit, and post, and provide Hyundai with a large amount of their social media content as it pertains to motorsports. With their support, we helped them launch a STEM engineering program for female engineering interns.

"We also run an at-track hospitality program, called the N Lounge, at all the IMSA races," he added. "Basically, we invite anyone with a Hyundai. Anyone with the key to a Hyundai can come into our tent at the races and have a drink, experience some team hospitality, meet a driver. All these facets to our partnership really grew out of a conversation that started eight years ago: 'Hey, if we got you guys a couple cars and a little bit of money, could you run in the TCR class for us?' I think showing where it's gone in that period of time really exemplifies why we embrace the term 'partnership.' We're always looking to listen to Hyundai and understand what their goals are. We try to basically be a one-stop solution for them in everything they need as it pertains to motorsports."

"We win on the race track, but we don't like just winning on the race track, we like winning off the race track," said Top Fuel champion Antron Brown. "That's helping our partners be successful at their business."

Good sponsor partnerships will also open up new opportunities and relationships for both sponsors and race teams. "The most successful sponsorships are those that really don't focus on exposure, but focus on growth," Striler said. "And growth not just with the brand and the team, but the growth of the entire sponsorship. That includes other sponsors as well. If there's a tire company that sponsors a racer, that tire company also promotes the wheel company and the oil company and the filter company, and they all cross-promote and they all grow. Successful sponsorships package together the marketing of different companies to all grow to a common consumer."

AB Motorsports has put that philosophy into action with its sponsors. "What we like to say is, we win on the race track, but we don't like just winning on the race track, we like winning off the race track," Brown said. "That's helping our partners be successful at their business. And also, tying our other partners into B2B relationships and bringing them together.

"We have Lucas Oil, and then we have Hangsterfer's, which is a metal cutting solutions company that does coolants and Way lubes for CNC machines and manual machines. Hangsterfer's does a lot of private labeling for other companies," Brown explained. "We're able to put them on the car, but then we can tie them into our performance side of where we buy our race products—our pistons, our cranks, our valves. Well, they all use CNC machines, they're all some kind of machining operation. We're able to take Hangsterfer's to all of our vendors where we buy parts and pieces

and bring them a higher quality product. We don't tell them it's higher quality, we'll give them some to try. Once they try, they tell us, 'We love this stuff. We've got to have it.' Then we slowly started converting all of our vendors over to Hangsterfer's, and they got a better price on a better product, so that turned into more business for Hangsterfer's, and at the same time, we get better pricing from our vendors from them getting better pricing with the products we sell to them from our sponsors. It's all in relationships and true B2B business. It's turned from not just being great on the race track, but you've got to be great in the office, too."

Pleasing corporate executives is one thing, but large companies that sponsor race teams have many employees, franchisees, and vendors, and making connections with them can be as important as outreach to the general public. "The pitside hospitality is probably one of the biggest things that we have in our sport, compared to NASCAR and IndyCar," Capps said. "Every fan, when they buy a ticket, they get a pit pass. So they go everywhere. Bigger than that is, when NAPA or any of our other sponsors wants to send customers or employees, our pit area is adjacent to our hospitality. Literally, we have a four-star meal served to our customers, and they're 10 feet away from watching our guys tear the car apart, put it back together, and fire it up. That's the access that I think really turns a lot of these sponsors on. I always say it's like a backstage pass. That has been huge with our sponsors. We push really hard on making that the best experience possible."

"We run a number of activations for Hyundai, including their at-track activations at the IMSA races," said Bryan Herta. Among them is the N Lounge, a hospitality program where "anyone with the key to a Hyundai can come into our tent, have a drink, experience some team hospitality, meet a driver."

That outreach to employees and individual store owners is the kind of street-level marketing that pays big dividends for a company. "It's critical to NAPA's success that we be aligned with drivers and teams that act as positive brand ambassadors on behalf of NAPA and help us to celebrate the thousands of individual NAPA store owners and auto care center owners that make up the broader NAPA organization," said Katherine Wooten, director of partnership strategy and activation for NAPA Auto Parts, Atlanta, Georgia. "So while we have national branding and national-level partnerships, the teams and races themselves are a way for us to show up locally and regionally for our organization.

Racing is a great fit for us because teams visit every region that we operate in as a company, and we can engage with our customers and consumers across the country on a week-in, week-out basis. Whereas more traditional sports sponsorships might be tied to one geographic area or marketing territory, our motorsports partners give us connectivity across the organization, and can do it in an authentic way.

"Success for us is knowing that a driver meet-and-greet at a store grand opening is boosting sales and visibility for that NAPA owner, or being able to reward NAPA customers with a VIP day at the track," Wooten said. "At the end of the day, it's all about the people and the relationships. Ron Capps, in particular, is one of the best in the business in that regard. He's as much a part of the NAPA organization as anyone, and people see that in the way that he represents the NAPA brand. You can't ask for more than that as a company in this business."

BEYOND THE MONEY

Race teams can do plenty to raise the profile of sponsors, but sponsors also do much more than simply sign checks.

"Good sponsorships also are when teams can utilize a company's marketing, when the company uses that team in the marketing it's going to do anyway," Striler said. "Companies are going to create product catalogs, marketing brochures, flyers, coupons, point-of-sale displays, all kinds of things. If a team is used in that media or in any type of marketing, then that team's other sponsors benefit. There's that compounding value."

Striler recalled how when energy drink companies arrived in motorsports, they aided teams in improving the graphics on the cars, building a cooler image. "They really gave teams a new look. Sometimes the appearance that a sponsor can give, the image that a sponsor can give a driver, can enhance that driver's value significantly."

Herta has witnessed that image building capability that a sponsor can provide in his own racing program. "The Performance Blue has been a consistent feature in Hyundai's motorsport programs," he said. "It's that light blue color that our race cars are generally seen in. They've done a really great job of keeping that look and graphics

"To be successful at what you do, you always have to over-deliver," said Antron Brown. "When you do that, the contracts keep getting re-signed. They want you to keep doing it because they see the value in what you do." Brown's relationship with Matco Tools goes back years, to his Pro Stock Motorcycle days.

fresh, always tweaking and updating along the way. I think it gets better every year, and that is something that, as a large auto manufacturer, they have capabilities in those areas and others that we don't. We're able to lean on them and their expertise as much as the other way around."

Sponsors that can provide technical assistance are invaluable to race teams. Ron Capps drives the NAPA Auto Parts Toyota GR Supra in Funny Car competition, and Toyota's resources as a global automaker enhance the team's capabilities significantly.

"Toyota has been huge at the track behind the scenes," Capps said. "They have people that pretty much show us every bump on every lane of every track. That kind of support has been huge with Toyota. I joke about it, but not really. To us, in drag racing, it's been like F1 stuff. They have this full-on trailer that comes to every race, and they have these guys out on the track and they're telling us for every part of the track exactly what the temperature is. The technical support is crazy good."

Ideally, a sponsorship will help a team grow in every aspect of its operation. "They elevate our core capabilities," Herta said of Hyundai. "As we've grown the team, there's a large number of things besides running race cars that we can do. We've been able to grow in size and skill to a point where I've bragged on my guys and girls there at the shop before, and said, 'Our team is structured as a top-line race team, and the fact that we're running Elantra N TCR cars in the shop right now, I really believe we could roll any type of vehicle that races in North America into one of those work bays and, given a little bit of time and ability to get on top of it, could effectively run a car in any class of North American motorsports.' That's been as a result of the partnership that we've had with Hyundai. We've been able to expand our own capabilities in ways that we would never have been able to do on our own."

"NAPA views our racing teams as true partnerships. We don't ever want to be the company that just writes checks and walks away," Wooten said. "We want to know what's working, what isn't, and how we can mutually benefit each other's business at the end of the day. Some of that means knowing what's going on in their worlds that we can maybe help with as an organization. During the pandemic, auto parts and supply chains were really constricted, so there were a couple of times that we needed to source hard-to-find auto parts.

"Other times it's about providing resources to the teams and supporting them in a way that allows them to be successful in their current endeavors, but always with an eye toward what's next," she continued. "If our partners are engaged with charitable organizations or doing something off the race track that's meaningful, we want to show up there and help out, too. Even something small like taking the team to lunch after a big win keeps us connected. We love to celebrate successes throughout the season, in addition to the championships. When teams are supported and working well behind-the-scenes, that translates to success on the track and in the results they put up. It's a win-win for us."

MEETING EXPECTATIONS

Every sponsor partnership comes with expectations on both sides, but it pays to be realistic about expectations, and even more realistic about capabilities.

"What often happens is, a new racer seeking sponsorship will attempt to impress a new brand by overstating what they can do," Striler said. "And then they actually

underperform. When the brand comes in and looks at the expectations, they weren't met, so those sponsorships are often not renewed. I see that a lot. It happens more than I'd like to see. I would prefer to see drivers and teams lower the expectations by starting out small and then over-delivering every year and exceeding those expectations."

"Contracts never have goals, they have deliverables," Brown said. "You always follow deliverables, but to be successful at what you do, you always have to come in and over-deliver what they expect you to deliver. When you do that, the contracts keep getting re-signed because you over-deliver on what you were supposed to, and they want you to keep doing it because they see the value in what you do."

Expectations and goals between team and sponsor often evolve as the capabilities of each side expand. "I feel like we're so lucky to have found each other. Because not only is the partnership, I think, successful, but the people involved we genuinely like and enjoy working with," Herta said. "That's an added bonus when you can find a company that shares common values. A lot of the things they do involve actively promoting young female interns and engineers through the program. They made additional investment for hand-control systems. We've had in Michael Johnson and Robert Wickens, two drivers in North America who've run at the very front of the field operating cars completely on hand controls. Those are the extra things that Hyundai does and the kind of things that they allow us to do that we're really proud of.

"To my knowledge, we've had the only female back-to-back road course driving champion in North America in Taylor Hagler. Those are important milestones and things that I know Hyundai loves to celebrate. But we're also equally proud to be a part of it with them. I think what's amazing about our partnership with Hyundai is it's a lot more than just going racing. We get to go racing in ways that are interesting and are difference makers in ways that we can be proud of what we're achieving."

Ultimately, successful sponsor relations can be defined as a partnership where both sides come out as winners. "We've mutually benefitted. That's really important," Herta said. "It won't continue if only one side is getting what they want or need. Everybody has to benefit." PRI

SOURCES

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Bryan Herta Autosport
bryanhertaautosport.com

NAPA Auto Parts
knowhow.napaonline.com

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Alex Striler
alexstriler.com

PRI SHOW 2023 MACHINERY ROW PREVIEW

CONNECT & DISCOVER

Machinery Row at the PRI Show offers an invaluable opportunity to see ground-breaking innovations that help engine builders, racers, fabricators, and manufacturers complete their jobs faster and easier.

By Mike Magda

When Anthony Usher was selling valve-seat-and-guide machines more than 35 years ago, he literally put one in the back of his truck and drove around to different engine builders.

"I had trouble trying to explain these machines to people over the phone," recalled Usher, who now runs MEC CNC—an American company that distributes Robins cylinder head machining equipment. "So I took this machine to their shops and told them to give me some heads to work on. Then they wouldn't let me leave without selling them a machine."

That kind of personal one-on-one connection helps draw hundreds of manufacturers and thousands of potential customers to Machinery Row at the PRI Show, which takes place this year December 7–9, at the Indiana Convention Center and Lucas Oil Stadium in Indianapolis, Indiana.

"I love the PRI Show," added Usher, who will be showing off the new Robins GH8 SMART valve-guide honing machine that is featured on this month's cover. "I wish we had one every month. People really get excited at these Shows. You can send them brochures, videos, emails, and it doesn't mean much until they actually see the machines in action."

Machinery Row typically corrals around 100 exhibitors at the PRI Show into one area of the Indiana Convention Center, making it easy for engine builders, fabricators, welders, race teams, and manufacturers to view the latest in equipment that serves their needs.

"When you go to PRI, it gives you the ability to look at tons of products at one time and really get a feel for the build quality and whether it's going to work for your needs," said Brian Springmeier of Mittler Bros. Machine & Tool, Wright City, Missouri. "The PRI Show is always really good for us because we can talk to people about the equipment and the individual pieces, whereas that's difficult to do over the phone."

New CNC machines are often the big draw at Machinery Row because most are in action—showing off new tooling and software upgrades by cutting billet cylinder heads or other engine products. The benefits of CNC machines are well known, but it still takes a strong sales pitch to convince some Show goers.

"The machining center systems put the customer in control of their shop," explained John Cowher of Centroid, Howard, Pennsylvania. "There's no more outsourcing of work, saving valuable turnaround time for parts. It allows for in-house R&D with part prototyping. Additionally, since the machine is a CNC machine, it is like another employee. While it is making the parts, the shop guys can go onto doing other things."

Automation versus manual is often a difficult choice for some customers who want personal control over the machine's operation. So, many of today's machines have computer controls as well as manual operation.

"A machine will perform a lot better if a computer helps it," said Usher, adding that the GH8 honing machine will be offered in both manual and automated versions because "there's still a demand for manual machines. Sometimes we call them manual, but inside they have electronics that help do a better job."

The following is a preview sampling of companies that will exhibit on Machinery Row along with new or updated products they'll showcase.

SOURCES

Centroid
centroidcnc.com

Fanuc America
fanucamerica.com

Magido USA
magidousa.com

Miller Electric
millerwelds.com

Mittler Bros. Machine & Tool
mittlerbros.com

Robins Machines (through MEC CNC)
meccnc.com

Safety-Kleen
safety-kleen.com

Serdi
serdimachines.com

Sunnen Products
sunnen.com

THG Automation
thgautomation.com

Trick Tools
trick-tools.com

UltraSonic LLC
ultrasonicllc.com

CENTROID

The popular A560 CNC machine from Centroid now has a new tall column that allows 37 inches of Z travel and 51 inches of spindle-to-table distance like the A560 XL. Also, Centroid upped the standard spindle to 36 hp, and XL is now up to 42 hp. One myth about the A560 is that it only handles blocks and cylinder heads, but it does more.

"We are selling a full-featured five-axis turnkey system," said Cowher. "It allows for in-house R&D with part prototyping, which means you manufacture the part and test it."

The A560 also has options like 1,000-psi coolant through the spindle to assist in deep-hole drilling and chip removal, which is necessary for billet heads and blocks.

FANUC

Fanuc America in Rochester Hills, Michigan, offers an extensive line of collaborative robot, or cobot, models, including those designed for assembly, inspection, palletizing, sanding, welding, and more.

"Our collaborative robots are easy to use and flexible solutions for companies looking to enhance productivity and solve labor issues," said Eric Potter. "We've seen substantial growth in the cobot space, particularly from companies who are new to robotic automation."

This year PRI Show attendees will see the CRX-10iA and be able to try the cobot's intuitive hand guidance and easy-to-use tablet TP programming. They'll also learn that the CRX and CR cobot line now boast increased payload capacities from 4 to 50 kg.

Also at the Show, Fanuc will demonstrate its RoboDrill vertical machining center that's available in three sizes.

MAGIDO

If you think a manual parts washer is too slow or not powerful enough, the Magido HP25 washer offers 870 psi and heated aqueous solution to clean parts faster.

"The number-one question people ask is: What are the benefits of a Magido parts washer?" said Scott Morin of Magido USA, Peachtree City, Georgia. "The answer is simple: Saves time, reduces operating costs, increases shop productivity, improves cleaning quality, and reduces environmental hazards."

Operation is easy. Just load the parts into the washer, reach into the flexible gloves, and activate the on-off foot pedal. The spray pressure and detergent can be directed into the hard-to-clean areas of the parts. Solution heating is controlled by a thermostat, and there is a low-water-level shut off.

MILLER ELECTRIC

The Dynasty 210, 300, and 300 Multiprocess machines from Miller Electric in Appleton, Wisconsin, will help welders tackle complex projects with an LCD interface that offers easy controls, reduced training time, and the ability to save custom weld settings.

The graphics on the Dynasty display can show how parameter selections will affect the weld, so the user can make adjustments before striking an arc—a feature that will help reduce errors and wasted materials. The system is so intuitive that a quick reference guide isn't needed.

"Anything we looked for we found directions on the screen. You don't need the owner's manual," reported Luke Robinson of Robinson Iron, Alexander City, Alabama, adding that the on-screen text explanations enable the users to access and adjust the weld parameters correctly.

MITTLER BROS.

The B1, B2, and B3 Beverly Shears from Mittler Bros. can be used to cut or trim sheetmetal panels, whether a straight line or arcs are needed. These shears can cut stainless steel, copper, aluminum, and other metals much faster than snips, air saws, or plasma cutters while leaving a clean, burr-free edge.

"There are a few knock-off products out there that attempted to copy the Beverly Shear," said Springmeier. "However, these copies are usually manufactured overseas with inferior materials and craftsmanship. Beverly Shear only uses quality made-in-USA castings and tool steel, and they are machined on a state-of-the-art five-axis CNC machining center."

The 58-pound B3 can cut up to seven-gauge mild steel and 10-gauge stainless steel with its 5 5/58-inch blade.

ROBINS

The Robins' SMART control software is designed for the RubiSurf SMART series of machines to help increase productivity by up to 50%. All buttons and switches are eliminated to save operator time in setups, and up/down operations are built into the software.

The RubiSurf surfacing machines also have the option of supporting both a cylinder block and head at once. One can be moved to the side while the other component is machined. This reduces setup complexity by keeping both fixtures on at the same time.

"In the past, users used to have to get cranes or cherry pickers to switch between fixtures," said Usher. "Now both fixtures are in place, and you simply float between the one you need."

SAFETY-KLEEN

While the HP25 aqueous spray washer is not new for Safety-Kleen, the Norwell, Massachusetts-based company will be introducing a new bundled lease offer that will interest engine and race shops. The program includes rental of the washer, exterior cleaning, removal and replacement of used solution, flexible service intervals, and more.

"Customers can purchase the machine outright," said Kyle Bates, "but the rental/lease offer is fairly unique." Safety-Kleen offers its "bundled service program," which allows "customers to rent the machine from us and includes replenishment of their aqueous cleaning solution and disposal of their waste solution."

The HP25 utilizes a spray wand inside the cleaning chamber that delivers up to 870 psi of cleaning solution. The high cleaning force allows users to focus the spray on different surfaces to fully clean the part in one pass. Standard features include foot-pedal activation, large viewing window, door safety switch, and stainless-steel construction.

SERDI

Prestige Motorsports in Concord, North Carolina, recently added a Serdi Profile seat-and-guide machine to its shop.

"The ability to develop valve jobs on the fly was a crucial feature," said Doug Aitken. "The machine's CNC single-point machining allows us to design and modify profiles directly on the touchscreen, eliminating the need for dedicated profile cutting bits."

The single-point technology also eliminates any form of chatter during the cutting process, which improves precision by removing small amounts of material in successive passes. Basically, the process is akin to a CNC lathe.

Aitken said other factors such as customer support and the ability to troubleshoot issues remotely played a role in choosing the Profile from Serdi in Mooresville, North Carolina. And he said the shop can now expand into marine applications.

SUNNEN

One of the hottest tickets on Machinery Row will be the new Sunnen SV-35 cylinder hone. The number-one reason is that cylinder surface finish has become so crucial in today's high-horsepower engines with the new piston ring packages.

"Bore geometry is key to proper ring sealing and increased engine performance," explained Bob Davis of Sunnen, Saint Louis, Missouri. "Sunnen offers multiple stone hone-heads that work hand-in-hand with the SV-35 to optimize ring sealing and engine performance. This includes 16-stone superabrasive heads for larger bores and 12-stone superabrasive heads for high-end performance engines."

The SV-35 also allows the user to set the crosshatch angle, and the system will automatically adjust the spindle and stroke speeds to achieve maximum consistency from bore to bore. Paired with the SV-35 is the Sunnen2 control that makes setup easier.

THG AUTOMATION

The job of welding round or odd-shaped parts that need turning during the procedure is made much easier with the URW-2R25 positioner from THG Automation in Indianapolis, Indiana. This product can be used alongside a THG automated welding system and works with all E-series robot controllers.

"The positioner can be programmed to rotate the workpiece at specific speeds and angles, guaranteeing that the welding torch consistently maintains the ideal position for high-quality welds," said Zenobia Weigel. "Combine it with any THG Automation solution to improve your cutting or welding capabilities."

This positioner features a 13.75-inch diameter table and is capable of 0–5.5 rpm rotational speed. It also has manual tilt adjustment from 0–90 degrees and can support 250 pounds. Other models can support up to 1,100 pounds.

TRICK TOOLS

Welding can be back-breaking work, but the Powerlift adjustable-height welding tables available from Trick Tools in Pella, Iowa, will help ease some of those pains.

"These are designed for the comfort and ergonomics of fabricators so they can work at a height that suits them, depending on the part size," said Bruce Van Sant. "This table uses a 16-mm hole pattern and will accept any manufacturer's clamps meant for that hole size."

The table measures 36x84 inches, and the height is adjustable from 33 to 48 inches. There are two available capacities: 400 or 2,100 pounds. The top is 3/8-inch thick steel. Should the table lose power, it will maintain the height and holding capacity. Slotted holes at each corner can be used to mount a vise.

ULTRASONIC LLC

Nicknamed the "block buster," this Ultra 3200FA 65-gallon ultrasonic cleaning machine features automatic cycles, seven-day heat timer, and dual filtration.

"If we save you one hour a day in cleaning at $75 per hour, that's more than $19,000 a year," said Phil Esz of Ultrasonic LLC, Amelia, Ohio, adding that shop employees have told him there have been big improvements in how the cylinder walls of the blocks are cleaned, and they are shaving two hours of labor in cleaning time for a complete engine rebuild.

In addition to major metallic components, the Ultra 3200FA can also clean rubber and plastic parts. The process uses cavitation bubbles induced by high-frequency pressure waves to agitate the liquid, which then penetrates holes, cracks, and recesses to thoroughly remove all traces of contamination.

PRI SHOW

PRI 2023: MACHINERY ROW EXHIBITORS

Machinery Row is a top destination spot at the annual PRI Show in December for machinists, engine builders, fabricators, race team members, and anyone who wants to inspect the latest in machining and fabricating equipment. Live demonstrations await, along with helpful and knowledgeable representatives from more than 100 exhibiting companies. For booth details and a final list of suppliers exhibiting on Machinery Row, visit pri2023.com/floorplan.

Exhibitor List as of July 5, 2023

ABRO BALANCING MACHINES INC.
abrobalancing.com
Balancing Machine, Laser Welding, Cleaning Machines

ABS PRODUCTS
abs-products.com
Media Cabinet, Balancing Equipment & Tools

ACCELERATED SURFACE FINISHING
asfmotorsport.com
Superfinishing Equipment & Components

ACU-RITE
heidenhain.com
ACU-RITE, DRO's Controls

AERA ENGINE BUILDERS ASSOCIATION
aera.org
Membership, Engine Specification Software

AVL
avl.com/avl-north-america
AVL Brake Torque Sensor & AVL IndiMicro

AXE EQUIPMENT
axeequipment.com
Wet Cleaning Systems

BAD DOG TOOLS
baddogtools.com
Tools

BEND-TECH
bend-tech.com
Dragon A250, Dragon A400 Machinery

BLACKSTONE - NEY ULTRASONICS
ctgclean.com
Ultrasonic Cleaning Systems

BLUE DEMON WELDING PRODUCTS
bluedemonwelding.com
Welding Machines and Welding Accessories

BOSS TABLES
bosstables.com
CNC Plasma Tables and Parts, Tumblers

BURR KING MANUFACTURING CO. INC.
burrking.com
Abrasive Belt Grinders, Polishing Equipment

CENTROID PERFORMANCE RACING
centroidperformanceracing.com
CNC Machining Centers

CLINTON ALUMINUM
clintonaluminum.com
Engine Blocks, Cylinder Heads, Wheels

COBRA - DETROIT TORCH
detroittorch.com
Restoration and Service Welding Torch

COMEC INC.
comecus.com
Engine Rebuilding Machinery

CORGHI
corghiusa.us
Tire Changers, Wheel Balancers

CWT INDUSTRIES LLC
cwtindustries.com
Balancing Machines

CYLINDER HEAD ABRASIVES
ruffstuff.com
Machine Shop Supplies

DAYTON ROGERS MFG. CO.
daytonrogers.com
Short- to Medium-Run Stampings, Fabrications

DEFIANT METAL
defiantmetal.com
Premium Welding Gloves and Fab Accessories

DELTA CUSTOM TOOLS
deltacustomtools.com
Cap Grinder, Cylinder Head Pressure Tester

DYNABRADE INC.
dynabrade.com
Demonstrating American Made Power Tools

DYNOCOM INDUSTRIES
dynocom.net
Hub, Chassis Dynos and Injector Test Benches

DYNOJET RESEARCH
dynojet.com
Automotive Dynamometer, Potential UTV

FANUC AMERICA CORPORATION
fanucamerica.com
CNC Systems, Robotics and Factory Automation

FARRIS EQUIPMENT SALES
farrisequipment.com
Engine Rebuilding Equipment - New & Used

FIRMAN POWER EQUIPMENT
firmanpowerequipment.com
Portable Generators

FYTRON SOFTWARE
fytronsoftware.com
Automotive Machine Shop Software - Fytron

GARAGE GUYS
dalrada.com/ignite-industrial-technologies/
Bug/Tar/Floor Cleaner and Degreaser Parts Wash

GIANT FINISHING
giantfinishing.com
Vibratory Deburring and Finishing Equipment

GOODSON TOOLS & SUPPLIES
goodson.com
Tools and Supplies for Engine Builders

GRAYMILLS CORPORATION
graymills.com
Parts Washers: Manual, Spray, Sonic, Dip

GREX AIRBRUSH
grexusa.com
Professional Airbrushes, Spray Guns and Accessories

GUSHER PUMPS - A RUTHMAN COMPANY
gusher.com
Pumps and Valves-Dyno, Washer, Transfer/Fill

HAAS AUTOMATION INC.
hfochicago.com
CNC Machine Tools, Automation and Tooling

HANGSTERFER'S METALWORKING LUBRICANTS
hangsterfers.com
Full Line of Metalworking Lubricants

HEM INC. - HE&M SAW INC.
hemsaw.com
FEMI Utility Bandsaws

HERITAGE-CRYSTAL CLEAN
crystal-clean.com
Ultrasonic Parts & Aqueous Parts Washer

HUNTER ENGINEERING COMPANY
hunter.com
Wheel Alignment, Balancing, Tire Changers

HUTH BEN PEARSON INTERNATIONAL
huthbenders.com
HB10 Bender, 1674 Expander Collectors

IPG PHOTONICS
ipgphotonics.com
LightWELD Handheld Laser Welding & Cleaning

IRONTITE PRODUCTS
irontite.com
Kwik-Way Valve Refacer, Irontite Diesel Tool

JD SQUARED INC.
jd2.com
Benders, Notchers, and CNC Cutting Machines

JPW - JOBBERS WAREHOUSE SUPPLY INC.
enginepartspro.com
Private Label Engine Parts

KNKUT DRILL BITS & CUTTING TOOLS
knkut.com
KnKut Drill Bits and Cutting Tools

KYOWA EIDEMILLER
kyowa-industrial.com
Precision Machining for Automotive Products

LASER MARKING TECHNOLOGIES
lmtgrp.com
Laser Marking Machines

LINCOLN ELECTRIC COMPANY
lincolnelectric.com
Fabrication Equipment, Welding Equipment

LINDE GAS & EQUIPMENT INC.
linde.com
Welding and Automation Machines

LOCK-N-STITCH INC.
locknstitch.com
Permanent Thread and Crack Repair Supplier

LONGHORN FAB SHOP
longhornfabshop.com
Engine Rotators, HD Rolling Carts

MAGIDO USA
magidousa.com
Automatic Parts Washing Equipment

MAINLINE DYNO
mainlinedyno.com.au
Hub Dyno

MASTERCAM
mastercam.com
Mastercam

MAXIFORCE DIESEL ENGINE PARTS
maxiforce.com
Diesel Engine Parts

MAZAK CORP.
mazakusa.com
Machinery for the Automotive Industry

MB METAL TECHNOLOGIES
mbmetaltech.com
Part and Tag Marking Products

MEC CNC MACHINES
meccnc.com
Sales and Service of Engine Machines

MILLER ELECTRIC MANUFACTURING LLC
millerwelds.com
Multimatic 220 AC/DC, Dynasty 300

MILLNER-HAUFEN TOOL CO.
millnertools.com
Tools - Cutting, Grinding, Drilling and Fab

MUSTANG DYNAMOMETER
mustangdyne.com
Chassis Dynamometers

NEWAY MANUFACTURING
newaymfg.com
Valve Seat Cutters and Valve Refacing Tools

NEXGENSOLUTIONS
nexgensolutions.com
Autodesk CAD/CAM Software

NITRO MANUFACTURING INC.
nitromfg.com
Pit Equip Templates Surface Plates Prototypes

NU-ICE DRY ICE BLASTING
nuiceblasting.com
Dry Ice Blasting Equipment

OHIO BRUSH WORKS
ohiobrushworks.com
Parts Washing and Flow-Through Brushes

ONLINE RESOURCES INC.
onlineresourcesinc.com
3D Scanning, Inspection, Reverse Engineering

PALMGREN
chhanson.com
Band Saws, Drill Presses, Finishing Machines

PERFORMANCE CBN
performancecbn.com
Ultrahard Cutting Tools For Engine Machining

PERFORMANCE PLUS THE LEADING EDGE
perfplustle.com
CBN PCD Inserts and Abrasives

POWERBUILT TOOLS
alltradetools.com
Hand and Specialty Tools, Garage Accessories

PRO ULTRASONICS
proultrasonics.com
"PRO" Ultrasonic Cleaning Equipment

QMP RACING
qmpracing.com
MC-1 is Used for Measuring Engine Parts

QUALCAST LLC
qualcast.com
Engine Valves, Cylinder Heads, Components

QUANTUM MACHINERY GROUP
quantummachinery.com
Welding Tables, Cold Saws, Band Saws, Fab Equipment

QUICKJACK
bendpak.com
QuickJack All Models

REGIS MANUFACTURING
regismanufacturing.com
Machine Shop Supplies, Abrasives, Lubricants

REICH TOOL
reichtool.com
Manufacturing

RESOLUTE PRECISION MANUFACTURING
resoluteprecision.com
Machined Shocks, Suspension Forgings, Swiss

RMC ENGINE REBUILDING EQUIPMENT INC.
rmcengine.com
CNC Machine, ETS Machine, Belt Resurfacer

ROBINS MACHINES
robinsmachines.com
Seat Guides, Guide Honing, Surfacing

ROTTLER MANUFACTURING
rottlermfg.com
Engine Reconditioning Equipment

RT SALES
rtsalesinc.com
Engine Rebuilding Equipment & Supplies

SAFETY-KLEEN
safety-kleen.com
Parts Washers, Oil & Lubricants, Absorbents

SAWBLADE.COM
sawblade.com
Bandsaws, Blades, and Accessories

SBI VALVETRAIN COMPONENTS
sbintl.com
Valvetrain Components

SERDI CORP.
serdi.com
Valve Seat Machines and Tooling

SERVICE PRECISION GRINDING INC.
drill-grinder.com
Drill Sharpener/Grinder and Point Splitter

SHAVIV USA
shaviv.com
Hand Deburring Tools from SHAVIV by VARGUS

SHOP CRANE BY GORBEL
shopcrane.com
Overhead Crane for Shops and Garages

SHOPSABRE - LANGMUIR SYSTEMS
shopsabre.com
CNC Plasma, CNC Mill, CNC Routers

SILVER SEAL PRODUCTS
silver-seal.com
Shop Tools, LS Engine Parts

SMW AUTOBLOK CORP.
smwautoblok.com
Workholding Product for Metal Cutting

SSP WELD
ssp.com
Welding Supplies

STAR CNC MACHINE TOOL CORP.
starcnc.com
Star SR-20JIIB CNC Swiss Type Lathe

STRATUS AUTO EQUIPMENT
stratusautoequip.com
Scissor Lifts

STRONG HAND TOOLS
stronghandtools.com
Welding Tables and Clamps, Work Holding Tools

SUNNEN
sunnen.com
Honing Machines, Gauging Equipment

SUPERFLOW DYNAMOMETERS & FLOWBENCHES
superflow.com
Dynamometers-Engine and Chassis Test Equipment

T&S MACHINES - PROBAL DYNAMIC BALANCING
tnsmachines.com
CNC Boring Milling Machines and Balancers

TEMCO PARTS WASHER
washparts.com
Parts Washers and Related Chemicals

THE ARMAKLEEN COMPANY
armakleen.com
Aqueous Cleaning Products

THG AUTOMATION LLC
thgautomation.com
UR & Fronius Welding Solutions

TIERRA TECH USA INC.
tierratech.com
Ultrasonic Cleaning Systems

TRICK-TOOLS
trick-tools.com
Metal Fabrication Equipment

TRUMPF
trumpf.com
TruArc Weld 1000

TSUGAMI AMERICA
tsugamiamerica.com
Tsugami America CNC Lathes

TUCKER VALVE SEAT COMPANY
tuckervalveseat.com
Auto & Industrial Engine Valve Seat Inserts

ULTRASONIC LLC
ultrasonicllc.com
Ultrasonic Cleaning Machines and Detergents

ULTRASONIC POWER CORP.
upcorp.com
Ultrasonic Cleaning Equipment

WALTER US
melintool.com
Milling, Drilling, Threading, and Turning

WHITNEY TOOL CO. INC.
whitneytool.com
Cutting Tools Used in the Machining Industry

WINONA VAN NORMAN
winonavannorman.com
Performance Racing Equipment

WOODWARD-FAB
woodwardfab.com
Fabricating Equipment for Sheet Metal

YOURDYNO.COM
yourdyno.com
Dynamometer Instrumentation

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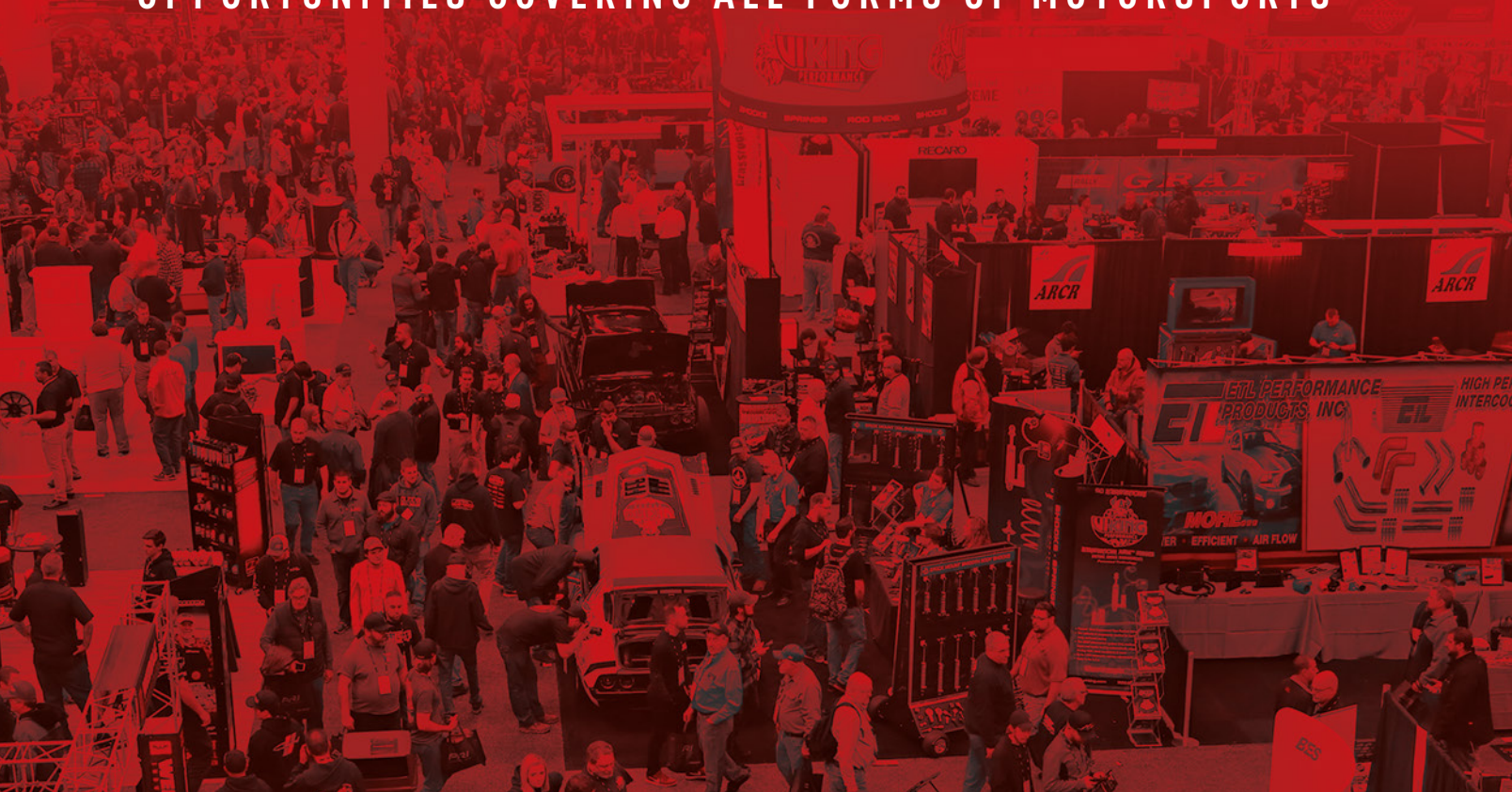



PRI SHOW

THURSDAY, DECEMBER 7 | 9:00 AM - 5:00 PM
FRIDAY, DECEMBER 8 | 9:00 AM - 5:00 PM
SATURDAY, DECEMBER 9 | 9:00 AM - 4:00 PM

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GRAND OPENING BREAKFAST
Live talk show-style program with special guest and complimentary breakfast.

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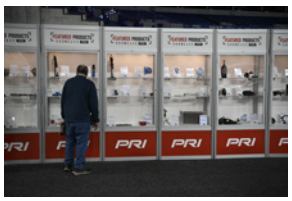
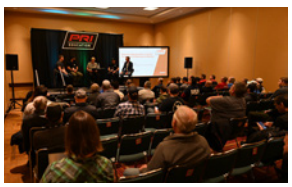
Network with industry colleagues and enjoy complimentary drinks and appetizers.



FEATURED PRODUCTS SHOWCASE
Check out the latest new products from PRI exhibitors.



PRI EDUCATION
Visit the PRI website at performanceracing.com for schedule and sessions.

T.O.P.S. HEADQUARTERS
Dedicated area for track operators, promoters, and sanctioning body reps to connect.

PRI PADDOCK
New for 2023, watch and listen to leading podcasters interview key industry personalities.

EV & ALTERNATIVE FUEL
Discover the latest in EV, hydrogen, and alternative fuel vehicle technology.

PRI ESPORTS ARENA
New for 2023, the latest in eSports and SIM technology on display and ready to play in Lucas Oil Stadium.

PRI EKARTING CLASSIC
Also new for 2023, don't miss live eKart racing action inside Lucas Oil Stadium.

FEATURED VEHICLES
Get up close to some of the most unique and renowned race vehicles in the industry.

2023 PRI SHOW EXHIBITORS (AS OF 7/10/23)

#GRIDLIFE
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3030 Autosport Forged Racing Wheels
3pConnect
4 Piston Racing
A&A Manufacturing
ABRO Balancing Machines Inc
Abruzzi Racing Transmissions
ABS Products
Accelerated Surface Finishing
Accelo Racewear
Aces EFI
ACF-50 - Lear Chemical
ACL Distribution Inc
Acumatica Cloud ERP
ACU-RITE
Advanced Clutch Technology
Advanced Composite Products Inc - ACP - Stahl Headers
Advanced Product Design
Advanced Racing Suspensions
Advanced SimRacing
Advanced Sleeve
Advantage Lifts
AED Metal Products
AED Performance
AERA Engine Builders Association
Aero Exhaust
AERO Race Wheels
Aeromotive - PerTronix
AFCO Performance Group
Affordable Fuel Injection
AFR - Procar - RaceTec - Scat - Vortech
African American Automotive Association
AiM Sports LLC
Air Lift Company
AJE Suspension
Alcom LLC
Alcon Brakes - Pro-System
Aldan American
ALITRAX
All Harley Drag Racing Association
All Pro Cylinder Heads Inc
Allstar Performance
Allstate Carburetor
Alpinestars
Alto Products Corp
Altronics Inc
Aluminum Cabinet Company
American Electronics
American Racer
Amick Associates Inc
AMSOIL Inc
Anderson Composites
Andrews Products Inc
Antigravity Lithium Batteries
AP Racing
ApexTurbo LLC
ARE Dry Sumps - Spintric Technologies
Argo Manufacturing Co
Arias Pistons
Arizona Sport Shirts - Gotta Race
ARP Inc
Arrow Components Corp
Arrow Precision Engineering Ltd
Artec Performance
ASA STARS National Tour
Asetek SimSports
Ashcroft
ASNU Corporation Europe Ltd
ATC
Atech Motorsports
ATI Performance Products Inc
ATL Racing Fuel Cells
ATM Innovation
Aurora Bearing Company
AUS Injection Inc
Auto Verdi AB
Automatic Transmission Design
Automotive Machine Shop Software - Fytron Software
AutoRod Corporation
Autotech Driveline
Autotuner
AVIAID Oil Systems
AVIORACE USA
AVL
AWA Forged Composites
Axe Equipment
B&J Racing Transmissions
Bad Dog Tools
Baker Engineering LLC - Pro-Cam
Bassett Racing Wheel
Be Cool
Behrent's Performance Warehouse
Bell Racing - Racing Force USA Inc
Bend-Tech
Bert Transmission
Beyea Headers
Bill Mitchell Hardcore Racing Products
Billet Specialties Inc
Blackstone - NEY Ultrasonics
Blower Drive Service
Blue Demon Welding Products
BluePrint Engines
BMR Suspension Inc
Boker's Inc
BoltsandNuts.com
Boninfante Friction
BorgWarner
Borla Performance Industries Inc
Borowski Race Engines Inc
Bosch Motorsport
BOSS HOG Torque Converters
Boss One Media LLC
Boss Tables
Boundary Racing Pumps
Braille Battery
Bravo Trailers
Brembo
Brian Crower Inc
Brian Tooley Racing
Briggs & Stratton Racing Engines
Brodix Inc
Browell Bellhousing Inc
Brown & Miller Racing Solutions
Buckeye Carbide
Bullet Racing Cams
Bully Dog - SCT Performance
Burnyzz
Burr King Manufacturing Co Inc
Burromax
ButlerBuilt Professional Seat Systems
Buzze Racing - Buzze Axles
C&S Specialties Inc
Calico Coatings
Callies Performance Products - Energy Manufacturing
Cam Motion Inc
Canton Racing Products
Capital Core Inc
Capitol Custom Trailers and Coaches
Centerforce Clutches a Division of Midway Industries
Centroid Performance Racing
Champ Pans
ChassisSim
CHE Precision Inc
Chevrolet Performance
Chicane Racing LLC
Chico Custom Trailers
Chillout Motorsports
Circle D Specialties
CIRCO Brakes
ClampTite Tools
Clarendon Specialty Fasteners Inc
Clark Copper Head Gaskets Inc
Classy Llama
Clay Smith Cams
Clear View Filtration
Clinton Aluminum
Cloyes Gear & Products
Coan Engineering
Cobra - Detroit Torch
Coker Tire Company
Coleman Machine Inc
Comec Inc
Cometic Gasket Inc
Comp Turbo
Competition Eliminator D4 Bonus Fund
Composite Fabrics of America
Concept Performance
Corghi
Corrosion Technologies
Cortex Racing
Cp-Carrillo
Creative Racing
Crower Cams & Equipment Co Inc
CSF Cooling
CSI Shocks
CTECH Manufacturing
CTEK
CTW Automation
Cunningham Precision
Curto-Ligonier Foundries Co
CVF Racing
CWT Industries LLC
Cylinder Head Abrasives
D&J Precision Machine
D.O.A. Dragsleds
D3 Performance
Daido Metal USA
Dailey Engineering
Dakota Ultrasonics
Dan Olson Racing Products
Darana Performance
DARTON Sleeves
Davis Technologies LLC
Dayco Products Inc
DayStar Machine & Cycle Concepts
Dayton Lamina - DAYtube
Dayton Rogers Mfg Co
DeatschWerks
Decal Shop - Racer Walsh Co
Defiant Metal
Delta Custom Tools
Delta Performance Automotive Group LLC
Derale Performance
Design Engineering Inc
DIESEL Motorsports
DieselCore
Digital Racing Cards LLC
Dino-Lite Scopes
Dirt Empire Magazine
DMI Racing Components - Bulldog Quick Change Rears
DMP Awnings LLC
DMPE Inc
Dodson Motorsport
Dontyne Gears
Double "O" Green
Drag Illustrated Media
Drag-N-Drive Addiction
DRC Race Products
Driven Racing Oil
DRP Performance Products
DSCsport
DSS Racing Pistons
DTS Drivetrain Specialists
Duco Performance
Dura-Bond
Dyer's Top Rods LLC
Dylans RV Center
Dynabrade Inc
Dynamic Drivelines
Dynocom Industries
Dynojet Research
E3 Spark Plugs
Eagle Specialty Products
Earnhardt Technologies Group
EAT SLEEP RACE
Eaton
eBay Motors
EC Carburetors
Ed Tillrock Art
Edelbrock Group
EDRO Engineering & Specialty Steels LLC
Eibach Springs
Eide Industries Inc - RaceCanopies.com
Eldorado Trailer Sales
Electric Drag Racing Association
Elgin Industries
Eliminator Products
Elite Tuned School
Elliotts Custom Trailers and Carts
Ellwood City Forge
EMJ
Emtron Australia Pty Ltd
Engine Builder
Engine Ice - Kost USA
Engine Pro
EngineQuest LLC
Engler Machine & Tool
EPARTRADE
EPT Group - Auto Meter
EQ Systems
ETL Performance Products Inc
Evolution Measurement
EXEDY Globalparts
Exergy Performance
Exhaust Gas Technologies Inc
EZSipe
Factory Kahne
FANUC America Corporation
Farris Equipment Sales
FASS Diesel Fuel Systems
FAST Cooling - Fresh Air Systems Technologies
Featherlite Trailers
Federal New Power - FI performance
Ferrea Racing Components
Fidanza Performance
Fifth Third Bank Motorsports Group
FIREBOTTLE
FIRMAN Power Equipment
FiTech Fuel Injection
Five Star Bodies
Flagtronics by Ballenger Motorsports
Flaming River Industries Inc
Flatout Gaskets and Fabrication
Flatrock Motorsports Park
Fleece Performance Engineering
Flex-A-Lite
Flis Performance LLC
Flitz International Ltd
Fluid Film
Fluidampr - Buffalo Turbine
FluidLogic
FLUIDYNE High Performance
Flying A Motorsports Inc
FMB Machine
Foggit
Ford Performance Parts
Forgeline Motorsports
Formula Trailers by Novae LLC
Fortin Racing Inc
Fragola Performance Systems - FK Rod Ends
Frankenstein Engine Dynamics LLC
FTI Performance - McLeod Racing - Silver Sport Transmissions
Fuel Factory
Fuel Injector Clinic
FUELAB Fuel Systems
FuelTech ECU
Full Race Motorsports
Full Spectrum Power
FURICK CUPS
Gandrud Performance Parts
Garage Guys
Garmin USA Inc
Garrett Advancing Motion
GB Remanufacturing Inc
Gear Vendors Inc
Gearstar Performance Transmissions
GET'M Performance
GFB Go Fast Bits
GForce Performance Engineering
G-FORCE Racing Gear
G-Force Transmissions
GFX Inc
Giant Finishing
Gibson Performance Exhaust
GingerMan Raceway
GNS Auto Parts
Goodridge
Goodson Tools & Supplies
Goodyear Racing - Mickey Thompson Race Tire
Graf Gearboxes
Grand National Super Series
Grassroots Motorsports Magazine
Graymills Corporation
Green Filter
Grex Airbrush
GST Racing Seals
Guiyang Talfri Brakes Co Ltd
Gusher Pumps - A Ruthman Company
Haas Automation Inc
Hammer Concepts and Designs
Hangsterfer's Metalworking Lubricants
Harrop Engineering USA
Hart's Turbo
Hastings Piston Rings
Haulmark Racing Trailers
Hawk Performance
Headershield
Heatshield Products Inc
Hedman Performance Group
HEM Inc - HE&M SAW Inc
Heritage-Crystal Clean
HKS
HMS Motorsport
Holley
Hondata Inc
Hooker Harness
Hoosier Pattern Inc
Hoosier Racing Tire
Hostile Industries
Hot Shoe Racewear
Hot Shot's Secret
HotRods by Havliks
Howards Cams
Howe Racing Enterprises
HP Tuners
HPL Oil - HPT Turbo - AFIS Injectors
HRP - Hepfner Racing Products - Streeter Super Stands
Hughes Performance
Hunter Engineering Company
Hussey Performance
Huth Ben Pearson International
Hylift Johnson Lifters by Topline Automotive
Hypercraft
ICI Metals
IDIDIT
Ignite Racing Fuel
IMCA
Impact RaceGear
Impact Racing Inc
Indianapolis Speedrome
Industrial Hard Carbon LLC
Indy Cylinder Head
Indy Power Products
InEarz Sport
Inferno USA Eyewear
Inline Tube Inc
Innovators West Inc
inTech Trailers
Intercomp
Intercooler Chiller
International Precision Machining Inc
IPG Photonics
Irontite Products
ISC Racers Tape
ISKY Racing Cams
ISSPRO Inc
Italian Trade Agency - ANFIA - AICA
ItalianRP SRL
Jamison Equipment Inc
Jamo Performance Exhaust LLC
Jase Composites
Jason Dietsch Trailer Sales
JD Squared Inc
Jegs
Jerry Bickel Race Cars Inc
Jesel Inc
JET Performance Products
Jet-Hot Coatings
JGS Precision TCP
JMS Chip Inc
Johnston Research & Performance
Jones Cam Designs
Jones Racing Products
Jones Transmisson Cooling Systems
Jongbloed Racing Wheels
JPW - Jobbers Warehouse Supply Inc
JR1 Racing Oil
JRZ Suspension Engineering
K&K Insurance Group Inc
K&N Engineering Inc
K1 RaceGear
Katech Performance
KB Cores
KB Trailer Sales
KBS Coatings
KD Kanopy Inc
Keizer Aluminum Wheels
Kelford Cams
Ken Perry's Xtreme Arias LLC
Kenny's Components
Kill Devil Diesel LLC
King Engine Bearings
King Racing Products - BR Motorsports Ignitioneering
Kinsler Fuel Injection
Kirkey Racing Fabrication Inc
Klotz Synthetic Lubricants LLC
KnKut Drill Bits & Cutting Tools
Kooks Headers & Exhaust
Koolbox Products
KRJ Race Products
KSE Racing Products
Kustom Komponents LLC
Kyowa Eidemitler
L.A.SLEEVE
Label Co, The
Lafrance Performance
Laris Motorsports Insurance
Larry Jeffers Race Cars
Laser Marking Technologies
LAT Racing Oils
Late Model Engines
Lazer Chassis - Bernheisel
League - Legacy
Liberty Engine Parts
Liberty's Gears
Lifeline Fire and Safety Systems
Lincoln Electric Company
Linde Gas & Equipment Inc
Line2Line Coatings
Link Engine Management USA Inc
LIQUI MOLY
Liste Corporation
Litemax Batteries
Livernois Motorsports & Engineering LLC
Lizard Lit Pit Lights
LOCK-N-STITCH Inc
Long Tube Headers
Longhorn Fab Shop
Lotse Steering Wheels
LSM Racing Products - Logan Smith Machine Co Inc
Lubelocker
M&M Competition Engines
M.O.M.S. Place
M1 Concourse
Mac's Custom Tiedowns
Magicmotorsport
MAGIDO USA
Magnafuel Products Inc
Magnus Motorsports
Magnuson Superchargers
MAHLE Motorsport
Mainline Dyno
Mantic Clutch USA
Manton Pushrods - Manton Rockerarms
Maradyne High Performance Fans
Martin Generators
Marwin Sports
Mast Motorsports
Masta Performance Inc
Mastercam
Masters Entertainment Group Inc
MAVTV
Max Track Time

Maxiforce Diesel Engine Parts
Maxima Racing Oils
Maxwell Industries
MAXX-D Trailers
Mazak Corp
MB Metal Technologies
ME Racing Service AB
MEC CNC Machines
MEGA-Line RACING ELECTRONIC
Mel Hambelton Racing
Melling Performance
Meyer Distributing
Meziere Enterprises
Micro-Armor Lubricants
Mile High Crankshafts Inc
Milestone Marketing
Millennium Technologies
Miller Electric Manufacturing LLC
Millner-Haufen Tool Co
Milodon
Mittler Bros Machine & Tool
MME Motorsport
Moduline Cabinets
Molecule
Molnar Technologies LLC
Monit Motorsport
Moroso Performance Products
Moser Engineering
Motec USA Inc
Motion Control Suspension
Motive Components Ltd
Motor State Distributing
Motorsports Fuel and Equipment
MOTORVAULT
MPD Racing - Ti22 Performance
MPI USA Inc
MR RACE OIL
Mullins Race Engines
Mustang Dynamometer
MY WER
MYLAPS Sports Timing
MyRacePass
Nankang Motorsport Tire
NASCAR
National Auto Sport Association
National Sprint Car Hall of Fame & Museum
National Tractor Pulling Championships
NDRL
Neal Chance Racing
NecksGen
Neo Synthetic Oil
New England Gear Polishing LLC
Neway Manufacturing
NexGenSolutions
NHRA
Nickels Performance Distributors
Niterra North America Inc
Nitro Manufacturing Inc
Nitrous Express - Snow Performance
Nitrous Outlet
Noonan Race Engineering
Northern Radiator
Nostrum High Performance Inc
NPW Companies
Nu-Ice Dry Ice Blasting
Oasis Scientific Inc
Offroad Anonymous
Offroad Motorsports Youth Foundation
Ohio Brush Works
Ohio Crankshaft
Omni Powertrain Technologies
Online Resources Inc
OpenFender
Optic Armor Performance
OPTIMA Batteries
OptiMate High Performance Battery Chargers
OptiTorque Technologies
OTR Filters
Outerwears Inc
Outlaw Diesel Super Series
P1 Manufacturing
PAGID Racing
Painless Performance
Palmgren
Patterson Enterprise
PBM Performance Products
PDRA - Professional Drag Racers Association
PE Racing
peel 3d
PennGrade 1
PENNZOIL
Penske Racing Shocks
Performance CBN
Performance Data Systems
Performance Design
Performance Driveline Engineering
Performance Electronics
Performance Engineering & Manufacturing LLC
Performance Plus Global Logistics
Performance Plus The Leading Edge
Performance Tube Bending
Peterson Fluid Systems - Specialty Products Company
Peuphratica Precision Technology Co Ltd
PFC Brakes
Philadelphia Racing Products
Pit Pal Products
Pit-Pro Custom Carts
PJH BRANDS
Platinum Racing Products
Plazmaman Racing
Plymouth Tube Co
PMAS Technologies
PML Inc
PolyDyn Performance Coatings
Poppe-Potthoff
POR-15 - American Icon
Power Automedia
Powerbuilt Tools
Powerhouse Racing
Powermaster Performance
PowerMist Racing LLC
PRC - Precision Racing Components LLC
Precision Products Performance Center
Precision Turbo & Engine - Turbonetics
Pro Spot International
Pro Ultrasonics
ProCharger Supercharger Systems
Professional MotorSports Solutions - PMSS
Pro-Filer Performance Products
Promaxx Performance Products
ProMedia LLC
Prosub USA
ProThings Apparel
Pro-Tint Inc
PRW Industries Inc
PSI Power Inc
PTP Turbo Blankets
Pulsar Turbo Systems
Pure Drivetrain Solutions
PureForge
PWR Advanced Cooling Technology
Pyrotect
QA1
Qingdao Lakesea Tyre Co Ltd
QMP Racing
QTP Quick Time Performance
QualCast LLC
Quantum Machinery Group
Quartz Engine Oil
Quda Auto Parts
Quick Performance
QuickCar
QuickJack
R&M Race Trailers
Race Engine Technology
Race Monitor
Race Parts Liquidators - Drop The Hammer Auctions LLC
Race Ramps
Race Star Industries
RACE TECH Magazine
Race Tools Direct
Race Winning Brands
RaceCals
Racecar Engineering Magazine
RACEceiver - Flagger
Racers For Christ
Racetech USA
Racetronics
Racing Electronics
Racing Optics
RacingJunk.com
Racingrivets.com
Radical Race Gear
Radium Engineering
Randy's Racing Filters
Raybestos Powertrain
Rayfast USA
RC Components
RCI-Racer's Choice Inc
RCV Performance
RECARO Automotive
Red Camel Racing
Red Line Synthetic Oil
Red Wood Enterprise Co Ltd
Redhorse Performance
Redline Ace
RedTide Canopies
Redwood Rally - Motorfab
Regis Manufacturing
Reich Tool
Reid Racing Inc
Reid Rockerarms
REM Surface Engineering
Remflex Exhaust Gaskets
Renegade Performance Fuels & Lubricants
Resolute Precision Manufacturing
Retrofit USA LLC
Revchem Composites Inc
Rhino Tuff Tanks
Richmond - Motive Gear
Ricky Sanders Racing
Right Trailers Inc
RJ Race Cars - Quarter-Max
RMC Engine Rebuilding Equipment Inc
Roadrunner Performance
Robert & Sons Aluminum LLC
ROBINS Machines
Rocket Track Products
Rockett Brand Racing Fuel
Rod End Supply
Roltek Transmissions
Ross Racing Pistons
Rottler Manufacturing
Rowe Electronics Inc
Royal Purple Synthetic Oil
RPC
RPM Trailer Sales
RT Sales
RYNO.co
S&S Diesel Motorsport
Sabelt
SADEV Racing Transmissions
Safecraft Inc
Safety-Kleen
Saldana Racing Products
Samsonas Motorsport
Sander Engineering
Sawblade.com
SBI Valvetrain Components
SCE Gaskets - Athena-SCE
Schaeffer's Specialized Lubricants
Scheid Diesel
School of Automotive Machinists & Technology
Schultz Racing Fuel Cells
Schumann's Sales & Service
Scoggin Dickey Parts Center
Scorpion Racing Products
Scott Performance Wire
Scribner Plastics
SCS Gearbox - Probell Racing Products
Seals-it
SEMA Data
Sentinel Video Systems
Serck Motorsport
SERDI Corp
Service Precision Grinding Inc
Service Steel Aerospace
Setrab USA
SHAVIV USA
Shepherd Insurance
SHIELDS Windshields
Shirt Works Racewear
Shocker Hitch
Shop Crane by Gorbel
Shopmonkey
ShopSabre - Langmuir Systems
Sikky Manufacturing
Silver Seal Products
SimCraft
SimGear Motion Simulators
Simpson Performance Products
SIRUDA Performance Gaskets
SIS Motorsports
Skyview Race Cars
Slade Precision Shocks
Smeding Diesel LLC
Smith Brothers Pushrods
Smith Systems Inc
SMW Autoblok Corp
Sonnax
SoundGear
Southern Adrenaline
Southern Drag Boat Association
SP Tools USA
SPA Performance USA
SPA Technique Inc
SPAL USA
Specialty Auto Parts - Proform
SPEED SPORT
Speedbear Fasteners
Speedmaster
Speedtek Transmission Components
SpeedTour
Speedway Illustrated
Speedway Motors Inc
Spring Mountain Motor Resort and Country Club
SpringRithm by B4 Unlimited
SpringTools
SRI - Stock Car Steel and Aluminum
SRO Motorsports America
SSP Weld
Stainless Headers Mfg Inc
Stainless Works
Stanadyne
Stand 21 North America
Star CNC Machine Tool Corp
Steinjager Inc
Stellar Automotive Group - Lubegard
Stifflers
Stilo
Strange Engineering - Strange Oval
Strapworks Automotive
Stratus Auto Equipment
Straub Tech
Street Outlaws
Strong Hand Tools
Stroud Safety
Summit Racing Equipment
Suncoast Performance
Sunnen
Sunoco Race Fuels
Sunoco Racing Oils
Sunshine Metals
Supercharger Systems Inc
SuperFlow Dynamometers & Flowbenches
Superior Bearing & Supply
Supertech
Surf & Turf Instant Shelters Inc
Swain Tech Coatings Inc
Sweet Manufacturing
Swift Filters Inc
Swift Springs USA Inc
System1 Filtration
T&D Machine Products
T&D Tungsten Products Manufacturing Inc
T&E Ent Auto Haulers
T&S Machines - PROBAL Dynamic Balancing
Taiwan Racing Products Co Ltd
Taylor Motorsports Products
TEAMTECH Inc
Tech Line Coatings Industries Inc
Tech-1
Technocraft Cabinets LLC
Tekton Inc
Temco Parts Washer
Temprel Inc
Texas Speed & Performance
TEXYS Sensors
The ArmaKleen Company
The Bangshift Billy
The DriveShaft Shop
The FOD Control Corporation
The Joie of Seating
The Mental Agility Coaching Center
The Original Slidelite
THE SHOP Magazine
The Tuning School
Thermo Tec Automotive Inc
THG Automation LLC
Thitek
Thyssenkrupp Bilstein of America
TI Automotive - Walbro
Ticon Industries Inc
Tierra Tech USA Inc
Tillett Racing Seats Limited
Tillotson Racing
TILTON
Titan 7 Forged Wheels
Titus Performance Products
TLN Engineering
TMS Titanium
Top Kart USA
Top Street Performance
TOPDON USA Inc
Toro Tents Banners and Displays Corp
Torqued Distribution
Total Power
Total Seal Piston Rings
Total Transmissions Chicago
Total Venue Concepts
TotalSim US
Toyo Tire U.S.A. Corp
Track Systems North America
Trackside Systems
TracTive Suspension
Trailer Alarms
Trensor - 3FP
Trick Titanium
Trickflow
Trick-Tools
TRUMPF
Tsugami America
Tucker Valve Seat Company
Turbo Time Performance
Turbosmart
Turbostart Batteries
Turn 14 Distribution
Turn One Steering
Turnkey Trailers
TW Metals
UCoat It
Ultimate Awning
Ultimate Headers
Ultra Shield Race Products
Ultrasonic LLC
Ultrasonic Power Corp
UMI Performance
Uni Saf
UniSteer
United Engine & Machine
United Race Parts
United States Auto Club
United States Postal Service
United Trailers
USA East Sled Pulling
VAC Motorsports
Vahlco Racing Wheels
Van-K Wheels
Vanson Leathers Inc
VBOX Motorsport
Velocita USA
Verge Quick Outlaw Series
Vibrant Performance
Victory Custom Trailers
Viking Performance Inc
Vision Wheel
VMP Performance
VP Racing
Vyper Industrial
WABAM
Wagler Competition Products
Wagner Tuning Inc
Walker Performance Filtration
Walter US
Weddle Industries
Wegner Automotive
Wehrli Custom Fabrication - WCFab
Westhold Corporation
Westwood Cylinder Liners Ltd
Wheel Chill
Whelen Engineering Co Inc
Whitney Tool Co Inc
Wholesale Horsepower LLC
Wieland
WIKD Motorsports
Williams Engineering LLC
Willy's Carb & Dyno Shop LLC
Wilwood Disc Brakes
Winnebago
Winona Van Norman
Winters Trailer Sales LLC
Wirecare.com
WISSOTA Promoters Association
Wizard Cooling Performance Radiators
Woodward-Fab
Woolf Aircraft Products Inc
World Products
World Racing Group
Worldwide Bearings
Wossner Pistons
WPC Treatment
XCLUTCH
XDP
XS Power
Xtrac
Xtreme-DI
Yarde Metals
Yella Terra
YourDyno.com
Zamp
Zeitronix
ZF Race Engineering North America
zMAX
ZyCoat High Performance Coatings

CHANGING THE GAME

By Jason Sands

INNOVATION AND INCREASED LEVELS OF AFTERMARKET SUPPORT HAVE BEEN KEY TO MAKING DIESEL DRAG RACERS NOT ONLY QUICKER AND FASTER BUT ALSO COMPETITIVE IN CLASSES TYPICALLY DOMINATED BY TRADITIONALLY FUELED VEHICLES.

Diesel drag racing has come a long way in a short period of time.

Consider these benchmarks: In 2004, Scott Bentz made the first 7-second pass in a diesel dragster he built himself when the torque from his Cummins engine twisted the frame he had purchased.

Not quite 20 years later, at Duck X Productions' Lights Out 14 in February, Ryan Milliken's Cummins-powered 1969 Nova ran a best of 4.17 seconds at 181 mph and made it to the semi-finals of the highly competitive X275 class. His speed through the traps was faster in the eighth-mile than Bentz's dragster went in the quarter. How did that rapid evolution happen?

One of the first vehicles to go seriously fast was the Scheid Diesel dragster. As owner Dan Scheid of Scheid Diesel Service Company in Effingham, Illinois, was working on dominating the world of sled pulling, he was concurrently developing a drag racing effort using a Spitzer chassis dragster. After more than two years of development, Scheid took the dragster record away from Bentz in 2006 with a 7.55-second pass at 183 mph. This was accomplished with a traditional hardtail chassis setup and Lenco transmission, much like the other gas- and alcohol-powered dragsters it would run against in the Top Dragster class.

Another person familiar to the diesel scene in the "old days" was John Robinson, who started his diesel drag racing career with a Cummins-powered Altered, its engine backed by a Dodge-based four-speed transmission. After a few seasons, Robinson whittled his elapsed times down into the 8-second range, which was respectable considering the dragster's massive weight.

For several years, the National Hot Rod Diesel Association (NHRDA) in Arlington, Washington, had some of the most rapid development of any diesel drag racing in its Pro Street and Super Street classes. Pro Street trucks had to weigh 4,500 pounds and had a basically open rulebook, while Super Street trucks were more street-based and had to weigh 6,000 pounds. Still, some of the speeds these trucks were seeing were impressive. Pro Street trucks started running 10s, then 9s, then finally 8s, while Super Street trucks were breaking into the 9s even with the class's high weight minimum. All

around the country, diesels were making an impression at local bracket races, their high levels of boost making them less sensitive to weather conditions and, therefore, more consistent.

The quickest diesel at press time is the featherweight Hollyrock Customs dragster powered by a nitrous-assisted twin-turbo Duramax and driven by Mattie Graves, who has run an astounding 3.96 at 187 mph in the eighth-mile, and is one of only two diesel-powered vehicles to run a 3-second pass in the eighth. She set the record during a test session at Maryland International Raceway in November 2022.

THE COMMON-RAIL AND NITROUS REVOLUTION

The joining of common-rail technology and nitrous injection has made huge strides in turning diesels into competitive drag racers. The first company to prove this was Banks Power in Azusa, California, which debuted a high-rpm, parallel-turbo, nitrous-injected Duramax-powered S10 tube-chassis drag truck, which was built to set records in the (diesel) Pro Mod category. The Banks drag truck was one of the first that proved that gas-style technology would work on diesels, and that 2,000 lbs.-ft. of torque wasn't necessary to get moving when the truck was light. The Banks truck was the first non-dragster in the 7s, eventually running a best of 7.72 seconds in the quarter-mile in 2008. For the rest of the diesel drag racing community, this would be a harbinger of things to come.

Eventually some other serious common-rail Duramaxes would surface and become hard runners, with Wade Moody campaigning a Pro Mod truck, and then later a dragster, and even Nitrous Express' Mike Wood getting onboard and running his own Duramax dragster. Racers started spraying 400, 500, or even 600 hp worth of nitrous on top of boost to go even quicker and faster. It was clear it wasn't just a Cummins world anymore.

THE 2,000-HORSEPOWER PLATEAU

It's important to remember that racers were pushing diesel engines that were originally rated at 160–300 hp past the 2,000-hp mark. But not much further. For a few years, whether in sled pulling or drag racing, Cummins or Duramax (or the rare Power Stroke) injection technology, cylinder heads (or lack thereof), and reliability issues kept diesel engines around the 2,000-hp level. Drivetrain components were a limiting factor too, as 2,000 hp also meant more than 3,000 lbs-ft. of torque, often around a parts-shattering 3,000–4,000 rpm. To push past this plateau, a whole new industry would emerge.

Transmission technology struggled to keep up as well. In most pickups, the Dodge-based 47RH and 48RE four-speed transmissions were faced with the herculean task of propelling diesel drag racers down the quarter- and eighth-mile, all while dealing with nearly 10 times the torque they were designed for. Allisons weren't considered by serious drag racers because they were too heavy and didn't shift quick enough, and traditional TH350 and TH400 automatics weren't strong enough and lacked lock-up torque converters.

A NEW AGE OF COMPETITION DIESELS

As diesel drag racing grew in popularity, the engines started to receive aftermarket support more in line with what was available for gas engines.

"We've always been into V8s, so we started with a Duramax block," noted diesel engine builder Jeremy Wagler of Wagler Competition Products, Odon, Indiana.

Dan Scheid (far lane) has been a pioneer in diesel drag racing, as his Top Dragster was one of the first in the 7s. He was a long-time proponent of making power with a lot of boost and no nitrous until just last year, when he added a modest (200–300 hp) nitrous system.

"Strength-wise, it could be compared to a Top Fuel engine; we just have to deal with a lot of torque. The heads were also a major development. We started out with heavily ported stock versions, but eventually made our way to completely custom solid [no water] heads."

Wagler also noted that long blocks (depending on options) come in at around $50,000, about the same as a comparable 3,000-hp gas engine, with less maintenance.

On the inline-six side, at around 2,000 hp, and especially with a lot of timing, Cummins engine blocks would split right down the middle. Now a number of companies, including Wagler, LSM Systems Engineering, and Scheid Diesel, offer Cummins aluminum blocks, which allow diesel drag vehicles to make more reliable power.

"Not only will an aluminum block shave nearly 140 pounds from the engine, it will be a lot stronger," noted Scheid. "This, combined with the fact that performance aluminum cylinder heads came into the picture around the same time, meant huge power increases."

Progress was made with injection systems as well. "When it comes to what we know now versus five to seven years ago, it's been leaps and bounds," explained Justin Norris of S&S Diesel Motorsport, Seymour, Indiana. "We initially just tried big nozzles and multiple pumps. Sled pullers were running three, even four CP3 pumps at one point. Where we ended up [now] is a greater understanding of how the entire injection system works. Just throwing the biggest parts out there on your vehicle won't always work.

"With injectors and pumps it's about flow and refinement," he continued. "We can run two CP3 pumps and injectors that flow 400% more than stock and make a controlled 3,000-plus hp and spin the engines past 5,000 rpm."

Norris also noted that MoTeC and Bosch controllers are an immense help in tuning the engines. "With the factory ECU, there are some things you just can't do, but with these race ECUs, the tuning tables are wide open."

Milliken, who runs Hardway Performance in Mary Esther, Florida, agreed. "The MoTeC is going to be big, and I think you'll see a lot of people turning to it."

More and more diesel racers are switching to radial classes, as the rise of factory-appearing bullet cars combined with highly prepped tracks has led to high-torque, high-horsepower radial cars that have practically infinite grip. These levels of torque and traction have led to a revolution in transmissions as well, and now one can buy a Turbo 400 with lockup that has virtually no original parts left.

"Our Supermax TH400-based diesel transmission has even more options than our regular max-effort gas transmission," said Carl Rossler of Rossler Transmissions, Girard, Ohio. "Spooling and applying lock-up is always a challenge with diesels, so we've incorporated a multi-stage soft lockup as well as an adjustable dump valve, so spooling isn't an issue. These transmissions have been tested in two-wheel drives, four-wheel drives, Cummins, Duramax, and Power Strokes."

TODAY'S DIESEL DRAG RACERS

Following is a brief look at some of today's top diesel racers and the classes they compete in.

CLASS: NHRA TOP DRAGSTER

John Robinson is one of the racers who has been around since the beginning. "I remember they used to have us park way out in the weeds," he said, laughing.

His diesel dragster always gets a lot of cheers from the crowd and interest in the pits, Robinson said. "Everyone loves an underdog, and even with all the shiny parts it's still just a sub-400-inch truck engine to a lot of people. So far in this incredibly competitive category we've gone two or three rounds, but never made it to the finals. But we've definitely faced our share of issues to have success with a diesel."

Scheid is another diesel heavy hitter in the Top Dragster class and is responsible for the injection pump, cylinder head, and a lot of the other hard parts that make these 2,500-hp mechanically injected monsters go down track. "We started to see hairline cracks in spots in the crankshaft, so we built a crank support for the engine," said Scheid. "That helped, but in the end, it just moved the cracks to a different spot. Oddly enough, we don't have this issue in pulling engines."

Scheid is also one of the few racers who stuck with a big boost, no nitrous combination for years. "We were within a tenth of the eighth-mile record, and that was at 160 psi of boost and without any nitrous." Begrudgingly though, he put a small (200–300 hp) shot on just this last year. "I decided that I was about the only one who still cared, and if nobody else did, I suppose I shouldn't either," he added.

The Lenco transmissions both Scheid and Robinson run have been in and out of both dragsters dozens of times, as weak points are found. "We run more than twice

the amount of shift pressure than even the alcohol dragsters do," noted Robinson. "We ended up actually having to make our own internal parts to get the trans to live with 4,000 lbs.-ft. at 4,000 rpm."

Scheid agreed. "We ended up having to make our own 2.73-ratio gears to run the quarter-mile, as no one else made a set that was that tall, and that's what we needed."

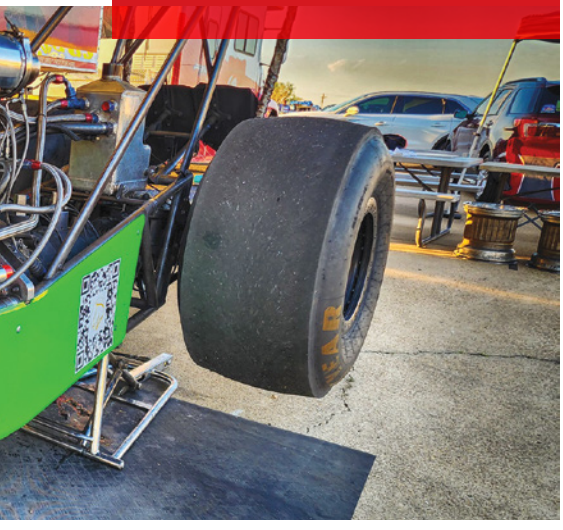
The Scheid dragster, driven by Jared Jones, just set a new quarter-mile record with a 6.17-second pass at 229 mph, while Robinson has run 6.30s in the quarter-mile and holds the eighth-mile speed record at 4.10 seconds at 192 mph.

CLASS: X275 DRAG RADIAL

"It may sound strange to say, but running a diesel engine doesn't make you all that special," said Milliken, who has been making waves in the X275 class. "There's a lot more to racing than just the engine. You have to stage right, drive right, and have your mind right. There's suspension tuning, power management, and a host of other factors."

He also is quick to admit that for a long time, diesel racers were doing things completely backward. "You'd have a racer spool like crap, leave the line anyways, and

A number of companies offer aluminum Cummins blocks to improve reliability. "Not only will an aluminum block shave nearly 140 pounds from the engine, it will be a lot stronger," said Dan Scheid.



While Cummins and Duramax engines tend to dominate diesel drag racing, Rudy's Performance Parts fields two seriously competitive pickups with Ford Power Strokes, a Pro Mod and a 4x4. The 4x4 has gone as quick as 4.62 in the eighth-mile.

run something like a 10-second ET at 150 mph," he said. "If we can't spool within 2–3 seconds and cut a 1.1–1.2 60-foot, we're not even testing past that. You have to spool, and you have to leave the line."

Milliken may not feel "special," but running 180-plus mph in the eighth-mile in a door car still takes some doing. "Right now, we're the heaviest car in the class at 3,350 pounds. Since we use two power adders to keep things clean, we've been saddled with a bunch of weight. That makes everything else a lot harder. The math said we're more than 3,000 hp, but what I'd really like is for them to take some power away and make us lighter so it's easier on parts.

"One of the advantages of racing a diesel is the lack of maintenance," he added. "There are no spark plugs to check or pistons to swap because of a nitrous mishap. Sometimes all we do is change out a nitrous bottle and put more fuel in it."

As much success as he's had in the X275 class, Milliken admitted that it's also been quite the effort. "Going this quick in a diesel, especially a big door car, is interesting for everybody, but we've been able to show that it can work." Looking at it from a spectator standpoint, it's also good for the sport. "Nowadays everyone loves different, and running heads-up with these all-out [gas] race cars is about as different as you can get," he added.

CLASS: RWYB (RUN WHAT YA BRUNG) NO PREP

No prep racing has made a significant impact on the industry. Cars are being built specifically for it; it has helped the LS market skyrocket; and it's good for tracks, airports, and spectators when done right. This type of tire-limited racing has attracted a large number of street-type cars, but there's also been some controversy about where to put AWD vehicles, namely Skylines. Diesel trucks have entered too but have been put out fairly quickly, as it usually takes 5-second eighth-miles to keep up with the crowd, even on an unprepped surface.

That changed when Ethan Patterson from Wilson Patterson Diesel in West Lafayette, Indiana, brought out his 4,400-pound 2006 Dodge Ram to the 2021 Thaw Out No Prep race at Darlington Dragway. The truck was light enough and had enough power (1,500 hp) to run with even the big-tire Pro Mods, as the surface was particularly rough, and he had the advantage of four 29.5-inch tires hooking. In the end he walked away with the $8,000 class purse, the first diesel to win such a race.

"You have to always keep improving though, because everyone else is doing the same," said Patterson. "The truck has gone through a ton of upgrades, including a 6.7-liter deck plate engine built by WP Developments and machined by Scheid Diesel, a Freedom Racing Engines head, and 88-mm Garrett GTX55 turbo. We also have three stages of nitrous through a Hammertech Racecars Nitrous Cannon."

In a bit of a separation from the norm, Patterson chose to stay with the 48RE-based Dodge transmission, but it's been highly modified. "The trans has a custom valve body specifically for this truck, all three shafts are aftermarket, and it was built by us with top-of-the-line Raybestos GPZ clutches," he noted. It seems to be getting the job done so far, and that's with the truck making nearly 1,000 hp more now. "Our diesel will definitely be a threat in no prep," he said.

"It seems like we say this every year, but

The Banks Power Sidewinder S10 demonstrated the power-making potential of mating nitrous oxide injection with a diesel's common-rail technology. The Banks truck was the first non-dragster in the 7s, eventually running 7.72 seconds in the quarter-mile.

Getting diesel pickups down track has always been a challenge, but the performance aftermarket is responding to racers' needs. For example, aftermarket GM-based transmissions from companies like Rossler Transmissions can stand up to a diesel's immense power and torque from spooling to lock-up.

we're still nowhere near the limit of diesel performance," said Scheid.

Milliken agreed. "Right now we're partnering with PPEI and building a Corvette Pro Mod that will have even more nitrous, and weigh 1,000 pounds less than the Nova," he said. "That is going to be fun."

Firepunk Diesel, whose Cummins-powered S10 was the first diesel of any type to break into the 3s, will also debut a new Pro Mod Duster that is lighter and will make more power than its old ride, proving diesel drag racing is a force to be reckoned with. PRI

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SEPARATING FACT

THANKS TO ADVANCES IN AREAS LIKE ENGINE MANAGEMENT CONTROLLERS AND FUEL DELIVERY, TODAY'S DIESEL SETUPS DON'T NEED TO OPERATE LIKE SMOKE STACKS ON WHEELS IN ORDER TO MAKE BIG POWER.

By Bradley Iger

Diesel technology has been fighting a long, uphill battle to establish its place in the realm of high performance. While diesel's inherent benefits in commercial and heavy-duty applications have been well understood for some time, these oil-burning powerplants have largely been overshadowed by their gasoline counterparts in hot rodding and racing circles due to their narrower operating range, comparatively limited aftermarket support, and, to a tangible degree, public perception.

"Outside of diesel's competition origins in sled pulling and tractor pulling, there's been a handful of teams over the years who were brazen enough to put one in a drag car, and for a long time these were kind of rat rod-style builds that were basically put together because they told us we couldn't do it," explained Jared Alderson of Kill Devil Diesel in Poplar Branch, North Carolina. "That essentially relegated these builds to sort of 'side show' status—a novelty kind of thing. It was like, 'Hey guys, watch the smokey truck go down the track and then we'll get back to real racing.'"

That perception wasn't aided by the popularization of diesel street trucks being tuned to "roll coal" so that their exhaust systems would belch out massive plumes of thick, dark smoke. "Rolling coal produces incredible amounts of smoke and soot that blocks out the sun," explained Gale Banks of Banks Power, Azusa, California. "That's horsepower that you can see, but not feel or use. It's wasted fuel. That never really struck me as a manly thing to do. I'd rather be out there setting records."

Nick Priegnitz of Calibrated Power in Woodstock, Illinois, said that while emissions-compliant vehicles currently comprise a niche of the diesel motorsports segment, there's been a larger shift toward a cleaner approach. "There are a growing number of events in the country that currently have a clean diesel category—classes that mandate factory-style emissions controls. But in general, the attitude in the industry now is to use as little smoke as possible to make the power you need to make. It's kind of the unspoken tuner's rule now. It used to be a 'more smoke is better' mentality, but that has changed."

FROM FICTION

COMBATTING MISCONCEPTIONS

It's no secret that efficiency is key to extracting all the performance potential of a given setup. As diesel tuning has become more sophisticated over recent years, improved efficiency has helped to push diesel performance to new heights.

"SOME OF THESE GUYS ARE NOW NIPPING AT THE HEELS OF THE FASTEST GAS CARS IN THE WORLD."

"Look at what the Firepunk guys and people like Ryan Milliken are doing today," Alderson said. "Some of these guys are now nipping at the heels of the fastest gas cars in the world. It has reached a point where diesel is a viable option for folks who are serious about being competitive."

Thanks to these strides in diesel technology, segment-leading diesel setups are operating virtually smoke-free.

"I think there's this general misunderstanding that if it's not smoking a lot, the power isn't there," observed Brian Jelich of JeliBuilt Performance, Moyock, North Carolina. "But it's actually the other

"THE ATTITUDE IN THE INDUSTRY NOW IS TO USE AS LITTLE SMOKE AS POSSIBLE TO MAKE THE POWER YOU NEED TO MAKE."

way around. When it's clean, you know that thing is making power. You look at Derek Rose or Ryan Milliken—their setups are making more than 3,000 hp and they're running clean. There's not even a haze coming out of the exhaust."

Alderson said that those who roll coal at the track these days typically do so for the sake of the visual spectacle, but there are drawbacks that go beyond any environmental concerns. "At the track there's a showmanship element to it, but ultimately, we'd rather just burn all that fuel. One thing we see a lot from gas guys who are coming into the diesel world is this concern about running too lean and blowing the motor up. But in the diesel world, it's really quite the opposite: Lean is actually what we want. The smoke might look cool, but it's not efficient, and it's not good for the engine."

"Engine controls we're using today are light years ahead of what folks were using not so long ago, and there's really no reason to leave the engine with an excess of fuel anymore," said Nick Priegnitz of Calibrated Power. "A sooty truck is just performing under its potential."

He also told us that recent efficiency improvements have come in part due to teams and builders looking for ways to improve durability. "We obviously want to go as fast as we can while keeping parts alive," Alderson continued. "Running cleaner is better for the engine. You're not sooting the oil, and you're not dealing with fuel wash on the rings as much. So, to some degree, running cleaner is really a byproduct of trying to get these combinations to live."

Priegnitz said that modern rich-running setups also quickly run into the law of diminishing returns from a performance standpoint. "A diesel typically makes its best power around an air/fuel ratio of 15:1, and the line for 'clean' is somewhere around 16.5:1 or so, if you're using a well-designed piston and injector. In the past, folks would run down to in the 12:1 or 13:1 range mainly just because they could, and engine controls weren't great at keeping the engine out of that space during transient operation, like during turbo spool-up, for instance. But the engine controls we're using today are light years ahead of what folks were using not so long ago, and there's really no reason to leave the engine with an excess of fuel like that anymore. A sooty truck is just performing under its potential."

CHANGING THE GAME

Banks said that OE-backed development of technologies like Bosch's common-rail injection system have also played an important role in improving diesel engine efficiency across the board, but maintaining that efficiency when launching off the line is perhaps the biggest challenge facing tuners.

"Say you're at sustained wide-open throttle, like at Bonneville," Banks explained. "In that situation the turbocharger is at full song, so all you've really got to have is a good match of parts. But coming out of the hole is a different story. Because the turbocharging usually lags behind the fuel—you've got to have exhaust energy to spool it up and get the air to come to the party—people put a huge shot of fuel in to minimize that lag. But it isn't always turbo lag that's the problem. It can sometimes be air system lag. And that comes down to understanding the volume of air that you're compressing, and how long it takes to get to the intake valves.

Gale Banks described a "wonderful sweet spot" in turbine response when a tuner does "the most you can with camshafts, turbine housing, and turbine wheel specifications. That's also where variable valve timing comes in."

"You also have to consider where you open the intake valves and where you close them," he continued. "On the exhaust side, you want to blow down the cylinder and get all the pressure out of there by bottom dead center, if possible. You don't want to open the exhaust valves too early, but you want it to be early enough to let the energy out and kick the turbine in the ass. So you do the most you can with camshafts, turbine housing, and turbine wheel specifications, and that's also where variable valve timing comes in. There's a wonderful sweet spot to be found that really helps the turbine response."

Jelich pointed out that advancements in tuning have made finding that sweet spot a much easier task. "The tuning methods have evolved quite a bit over the past five to 10 years, and now we have standalone systems available that take it to the next level. You can tune directly to an air/fuel ratio. That's a big deal because the goal is to keep your EGTs low, and the more you lean it out, the lower the EGTs are. We try to shoot for about 30:1, and at that point there's no visible exhaust coming out of the pipe. It's actually

cleaner than a lot of the gas vehicles that are going down the drag strip. And it's making really good power without creating a lot of heat in the engine, so it's putting the heads, pistons, and other components through less abuse."

Tuning to an air/fuel ratio is possible without a standalone, but the capabilities of these systems can yield better, more consistent results. "For example, there isn't a standalone system available for my 7.3-liter Power Stroke because the injectors use very high voltage and there's nothing that supports it," Jelich pointed out. "With that it's just about adjusting the fuel quantity and pairing it up with a nitrous system to balance everything out and keep the AFR where we want it. Monitoring EGTs can be helpful with that, too. When you're at 18:1, for instance, you're making a lot of heat, and EGTs are probably at more than 2,000 degrees. When you start to lean it out with a lot of nitrous, you can bring that down to 1,400 or 1,500 degrees. But with a MoTeC system, or some of the Bosch stuff, those adjustments are basically automated because the systems can self-adjust."

"There's this general misunderstanding that if it's not smoking a lot, the power isn't there," said Brian Jelich of JeliBuilt Performance. "But it's actually the other way around. When it's clean, you know that thing is making power."

The situation is aided by stronger aftermarket support in other areas as well,

Priegnitz said. "We have a broad spectrum of available turbochargers now, and that's made a big difference. Ten or 15 years ago, it was common to see a turbo thrown on a truck that was just grossly oversized for the application simply because the options were limited. Now we're able to match parts much more precisely to the desired output and use-case of the vehicle, and that has helped improve that transient engine response, which inherently makes them run cleaner."

This more dialed-in approach also offers the added benefit of improved parts longevity. "When the engine is running more efficiently, you're not washing the cylinder walls, burning piston rings as badly, you're not killing turbos, and you're not putting valves and seats through as much abuse," explained Alderson. "That's another huge advantage."

Nick Priegnitz of Calibrated Power said diesel engine builders now have "a broad spectrum of available turbochargers. We're able to match parts much more precisely to the desired output and use-case of the vehicle. That has helped improve that transient engine response, which inherently makes them run cleaner."

BUILDING MOMENTUM

Regardless of the trajectory that the emissions-compliant diesel racing takes down the road, ongoing development in the high-performance diesel realm is expected to continue to improve efficiency in the coming years.

"The real key here is having enough oxygen in-cylinder to burn all of the fuel in-cylinder," Banks said. "We're still at a point where a lot of folks still haven't maximized the efficiency of their charge-air cooling systems. They don't flow enough coolant, or they might have insufficient airflow; there's still a lot of mistakes being made in this area, especially when it comes to sizing. That's an important consideration because, in a really serious race engine, the charge-air cooling system has a huge impact on horsepower. What you need is an instrument across the charge-air cooler that measures pressure in, pressure out, temperature in, and temperature out to ensure that you're getting the lowest pressure drop, and the highest temperature that you can get. We're

in the process of developing that type of an instrument right now."

Meanwhile, Priegnitz looks to the expanded range of turbocharger options in the aftermarket as a means of improving both competitiveness and efficiency. But he also noted that, in the diesel realm, some of the biggest innovations being made today are occurring at the OEM level.

"I think the variable geometry stuff could be a neat addition to class racing. But what's interesting is that we're used to motorsports existing as a way to help drive innovation that will trickle down to street-driven vehicles. Right now, in the diesel racing world, I feel like the development is kind of flowing the other way: The innovations are coming from the street to the track. We keep seeing higher and higher fuel pressures from the OEMs with better pumps, better injectors, and better atomization. I think that racers will definitely benefit from that through things like more precise cylinder pressure control."

As this segment continues to mature, Alderson expects high-performance diesel setups to become less of an anomaly in the racing world. "It's continuing to get more and more competitive with the mainstream options. We're breaking records every year, and not by small amounts. I think that's going to continue to bring increased interest and support, which in turn will draw more people into the diesel industry." PRI

Tuning methods "have evolved quite a bit over the past five to 10 years," Brian Jelich of JeliBuilt Performance said. "You can tune directly to an air/fuel ratio. The goal is to keep EGTs low, and the more you lean it out, the lower the EGTs are." Done right, diesel trucks can be "cleaner than a lot of the gas vehicles going down the drag strip."

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DIESEL POWER

DIESEL RACERS SEEKING PERFORMANCE UPGRADES SHOULD LOOK BEYOND THE ORDINARY.

By Steve Statham

Diesel racing is growing on all fronts, and the flood of parts to service the market is growing right along with it. To get the best performance from a diesel engine, though, it helps to look beyond the obvious intake/exhaust parts and investigate the possibilities from every angle. There are plenty of parts that can make a big difference when replacing OEM parts and systems, even if these aren't the first components that spring to mind.

The products highlighted in this article are designed to improve on-track performance, but some are also primarily aimed at improving durability and are equally effective whether used in a race truck or a diesel tow vehicle. Large numbers of racers bring their daily-driver trucks to the track to compete, so ensuring durability is as important as gaining that last little bit of power.

It's a great time to be fielding a diesel engine in racing, and this sample of recent products may very well include that final piece of the puzzle a diesel racer needs to smoke the competition.

CUMMINS HYDRAULIC LIFTER CONVERSION KIT

Factory diesel engines have a reputation for toughness, but in a constantly changing marketplace, even that can't be taken for granted.

Regarding the latest Ram truck model, "In 2019, they came out with a hydraulic roller," said Austin Myers of Wagler Competition Products, Odon, Indiana. "In the past years, from 1989–2019, the Cummins used a flat-tappet style. Now they've updated it to this hydraulic, and the hydraulic portion starts to fail, and you'll get a tapping sound. It lets the lifter bounce on the cam, and if it's not fixed soon, it will beat the roller down out of the lifter. Then all chaos breaks loose, and you've ruined everything.

"If you catch it soon enough, our kit allows you to use your own lifter bodies and roller, and simply dump out the hydraulic portion of the lifter," he continued. "We have a spacer that takes up the slack, basically, and then we have our own custom-length pushrods that come to the top. And we use an OEM 2018-style rocker that has the adjustment back up top, because the newer style rockers, being hydraulic, don't have adjustment. So we have to put adjustable rockers back on top."

Although straightforward, the hydraulic lifter conversion kit does require a specialized tool for installation and some skill. "It's a simple kit, although it's kind of difficult to install. Mopar actually made a tool to do it in the truck. It's like a little slide tool that goes through the cam tunnel to get the lifters in and out. Without that tool, you're looking at taking the engine out and flipping it upside down. So the install is quite in-depth," Myers concluded.

EVERYDAY DIESEL TREATMENT

Racers at the early stages of building a diesel truck for competition can sometimes get distracted by the countless speed parts choices available in the aftermarket. But before installing those power-making bolt-ons, it's smart to address the basics—like what goes into the fuel tank. Hot Shot's Secret's Everyday Diesel Treatment can be thought of as "step 1" for anyone interested in elevated diesel performance.

"It's designed to solve the issues with low-quality diesel fuel that we find at the pump, typically," said Josh Steinmetz of Lubrication Specialties, maker of Hot Shot's

Wagler's hydraulic lifter conversion kit for 2019 and newer Cummins engines includes the lifter conversions, custom-length pushrods, and OEM 2018-style rocker arms.

Hot Shot's Secret's Everyday Diesel Treatment treats pump diesel fuel with cetane and lubricity to improve engine performance and durability.

Secret products in Mount Gilead, Ohio. "Diesel is less refined than gasoline and some of the other fuels that we use in racing, so we need to treat it to bring it to more of a premium-style spec. Everyday Diesel adds cetane to the fuel, which helps it burn more completely. It's kind of like octane for gas, except because of the way it works in a diesel we measure it as a cetane rating.

Also, we add lubricity to the fuel as well. Ultra-low sulfur diesel that's now available everywhere is really low in lubricity. That can lead to fuel pump failures and injector failures."

Besides improving diesel engine durability, there are definite performance gains to be had from the Everyday Diesel Treatment. "They'll notice faster start-up times, faster turbo spooling, and they'll also notice a horsepower gain. We can actually see some horsepower gains because of the cetane and the lubricity in the Everyday Diesel Treatment," Steinmetz said. "Even if you're not trying to get performance gains, the protection you add with the lubricity is really peace of mind to make sure you're not going to grenade that couple-thousand-dollar injector pump."

CAST FORD POWER STROKE POWERPAK PISTON SETS FOR 6.0L AND 6.4L

Diving into the engine to replace the factory pistons is no casual upgrade, but eventually the serious racer will reach that decision point. High-level racers will select forged pistons, but for the intermediate Ford Power Stroke 6.0L and 6.4L racers, MAHLE's new PowerPak piston sets allow them to step up to the next level of performance and durability.

"We take the base replacement piston that's manufactured by MAHLE Aftermarket,

MAHLE's new PowerPak piston set for Ford Power Stroke engines features modifications to the pistons to make them stronger and increase their power potential.

and we de-lip the bowls, we add the pockets, we can do crown coatings, just to increase the strength. It's really for a hot street truck or a mild sled-puller, or mild drag truck," said Justin Dossett of MAHLE Motorsport, Fletcher, North Carolina. "By de-lipping the bowls, anytime you can increase the radius dimensions in the bowls it adds strength to the crown. So it makes the piston stronger. Also, we do fly-cut for valve reliefs for guys who are running larger cams. It's going to allow the person to make more power with our part than the stock piston would."

MAHLE offers its PowerPak cast performance piston sets for Cummins and Duramax applications as well, but the Ford applications are its newest offering, having been introduced at the 2022 PRI Show.

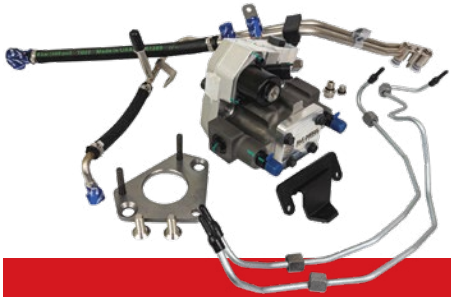
FORD 6.7L CP4 TO DCR PUMP CONVERSION KIT

Reliability is crucial for anyone competing regularly on track, and especially for those whose truck is doing double duty as a race vehicle and go-to-work truck. For Ford drivers, one OEM weak spot has been the 6.7L Power Stroke CP4 high-pressure fuel pump, which is prone to sudden failure, often followed by catastrophic collateral damage.

S&S Diesel Motorsport in Seymour, Indiana, teamed with PurePower, a Stanadyne company, to produce a drop-in DCR pump conversion. "It is a more robust pump design," said S&S Diesel's Justin Norris. "We've been validating it for more than a year in 20-plus different trucks, trying to rack up as many miles as we can to make sure it's spot-on." Unveiled in February, the DCR Conversion was scheduled for release in summer 2023.

"Where I see the DCR being a benefit to racers is improved reliability out of their tow rigs," Norris said. "There are a lot of 6.7 Power Stroke-powered trucks out there pulling trailers with race cars on them. The whole intention of the DCR was to be a reliability improvement product. There are some performance advantages to be had, but you're not going to get any extra performance out of the DCR without tuning."

Those racers who do take the time for proper tuning can take advantage of



S&S Diesel Motorsport's drop-in DCR fuel pump conversion kit for 6.7L Power Stroke engines solves the reliability issues inherent with OEM CP4 pumps.

Snow Performance water methanol systems are designed to reduce exhaust gas and intake air temperatures, which will improve fuel economy and performance.

significant potential. "We have a DCR in one of our sponsored trucks, purely a race truck that doesn't see any street use," Norris said. "The DCR pump conversion has roughly 25% more displacement than the CP4, so it has the potential for 25% more output if the calibration would call for it. In a race vehicle that's not seeing any street use, you can tell the pump to make whatever output you want it to."

BOOST COOLER WATER-METHANOL INJECTION KIT

Excessive heat is an enemy of just about any competition vehicle. Snow Performance in Wichita Falls, Texas, attacks that problem with its Boost Cooler Water-Methanol Injection Kit.

"Snow Performance Water Methanol Systems were designed to greatly reduce exhaust gas temperatures (EGT) and intake air temperatures (IAT), increase air charge density, improve fuel economy, and add low-cost horsepower with gains commonly above 100 hp," said Cody Sprague of Nitrous Express and Snow Performance.

Cooler temperatures translate to greater air density and greater power output. "Diesel drag racers should expect to see an EGT drop of 200–300 degrees and an IAT drop of 100-plus degrees, resulting in more power safely and efficiently," Sprague said.

The Snow Performance boost coolers are available in four different stages for different levels of competition. "The stages differ by complexity and tunability of the system," Sprague explained. "Stage 1 is an on/off system based on boost. Stage 2 is a progressive system based on boost (1–30 psi). Stage 2.5 is progressive based on boost (1–50 psi) and can activate a second stage of water-methanol injection. Stage 3 is a 2D progressive based on boost (1–100 psi) and EGT and is also capable of activating a second stage."

FASS COMPETITION SERIES

As diesel racers move up the ladder into faster and more competitive series, reliable fuel delivery and protection from fuel contamination are crucial. FASS Diesel Fuel Systems of Marthasville, Missouri, took

The Competition Series Fuel Air Separation System from FASS Diesel Fuel Systems ensures continuous fuel flow from the tank to the engine by eliminating air bubbles and water from the fuel system.

aim at racers' needs with the release of its Competition Series Fuel Air Separation System late in 2022.

Racing diesels can require extremely high flow rates, and eliminating air bubbles and water that can harm the injection system is key for longevity. "The FASS system ensures the continuous flow of fuel from the tank to the engine," said Mike Fischer. "While maintaining the high horsepower, the Competition Series will clean and polish the fuel, which is what you really want when you're dealing with diesel in those high-horsepower applications."

Racers have always had the option of installing two or more FASS signature series kits for high-powered applications, which works fine, but the Competition Series delivers those benefits while increasing simplicity, with a single filter base, one set of filters, and the plumbing required for only a single set. The Competition Series comes with a new high-flow fuel pressure regulator, adjustable up to 100 psi, and a competition filter base that accommodates AN braided lines.

FASS Diesel Fuel Systems offers the Competition Series in three different stages to accommodate a wide range of horsepower outputs. PRI

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BUSINESS PROFILE

D&J PRECISION MACHINE

By Bradley Iger

WHAT BEGAN AS A SIDE PROJECT IN A CORNER OF A FRIEND'S SHOP HAS EVOLVED INTO A FIXTURE OF THE HIGH-PERFORMANCE CUMMINS DIESEL SEGMENT WITH 20 EMPLOYEES AND A 24,000-SQUARE-FOOT FACILITY.

Over the past decade, D&J Precision Machine has gone from a one-off build for a friend to a high-performance Cummins diesel outfit that ships out one engine and three cylinder heads per day. But as CEO Drew Pumphrey explained, the company almost stalled out at the conceptual phase.

"At that time, the plan was to move to Utah and run Wendy's stores for my dad. I had worked for a company called Enterprise Engine Performance for a few years and had eventually gotten to the point where I was running day-to-day operations there. In 2012, during the transitional phase between Enterprise and the expected move to Utah, I went to work for a directional boring company, and the owner was also a truck pulling customer. He asked me to build an engine for him, but since I'd left Enterprise Engines, I didn't have a place to do that."

The owner offered a corner of the company's shop for the build so that Pumphrey could work on what he assumed would be a one-off project. But soon after its completion, others began asking Pumphrey if he could build engines for them as well.

"I didn't have any money at the time, and basically no equipment," he said. "The owner of that directional boring company actually loaned me $10,000 so I could build the next engine after his. I paid him back out of the proceeds from that engine build, and D&J Precision Machine basically grew out of that."

For about a year, Pumphrey worked for the directional boring company and fit in engine builds when he could. Then, in 2013, he moved his operation into a 2,400-square-foot facility in Zanesville, Ohio. "That was the first time we were truly off on our own," he said. "And that's when I hired my first employee."

D&J Precision Machine moved into a new 5,000-square-foot shop the following year, but thanks to the company's rapid development, it quickly outgrew that facility as well. By 2016, the company had moved into its current 26,000-square-foot Cambridge, Ohio-based facility.

FINDING A NICHE

D&J Precision Machine works specifically on high-performance Cummins diesel engine builds, many of which are used in diesel drag racing series as well as pulling competitions. Pumphrey said that his company's focus on this family of engines can ultimately be traced back to his teenage years.

"In high school I got a diesel Dodge pickup truck and started doing some sled pulling. Working on that truck is what led me to the job at Enterprise Engines. D&J's niche has always been the B-Series platform—the Dodge Cummins stuff. We haven't really branched out of that because it has always kept us busy."

He said that by early 2020 the company was rarely working on anything under 1,000 horsepower, but the pandemic lockdowns convinced him to re-evaluate things.

"Up to that point, we just didn't have the time to get into anything below that. But things slowed down when COVID-19 hit. While that dip ended up really only lasting about a month or so, it made us look at branching out a bit, so we added more of the lower horsepower stuff and stock-style remanufacturing to the mix as well. Going forward, we'd like to turn that kind of work into about 50% of what we do because it's more sustainable, and more recession-proof. We didn't want to slow the performance stuff down, though. We wanted to build the company by adding more people and increasing our capacity so we could also take care of the everyday guy."

SETTING A STANDARD

One of the characteristics that sets D&J Precision Machine apart from most other diesel engine outfits is that almost everything that goes into its high-performance engine builds is manufactured in-house.

"We're a machine shop as much as we're an engine builder," Pumphrey said. "We do all of our own block and cylinder head work, and we manufacture our own pistons, connecting rods, intake manifolds, valve covers, and everything that ties into that stuff. We also sell out the door to other engine builders as well as customers who're doing their own engine builds."

Pumphrey explained that he decided to bring a significant amount of the manufacturing in-house because he wanted more control over the quality of the components used in the engine builds. "We couldn't get what we wanted. Even with connecting rods and pistons we kept having failures and other issues with the high-end stuff. We also had other people doing block work for us early on, and they were just unreliable. We knew we could solve these problems ourselves if we brought it in-house."

D&J Precision Machine's full-billet Cummins powerplants are capable of more than 3,500 hp and 4,000 lbs.-ft. of torque, a level of power that factory blocks simply can't handle. "These engines are going into trucks in the Outlaw Diesel Super Series, along with some of the No Prep Kings events. And some are starting to play with Pro Mods. There's going to be a couple of really, really good cars coming out in the next year. What we've always lacked in the diesel community is really good chassis. Some of our best customers have been running S10 Pro Mod chassis from the 1990s. But we've got a couple of guys who've built some stuff for this year that have the potential to run at the top of the Radial vs. the World classes."

D&J Precision Machine "is a machine shop as much as we're an engine builder," said Drew Pumphrey. "We couldn't get what we wanted. Even with connecting rods and pistons we kept having failures and other issues. We knew we could solve these problems ourselves if we brought it in-house."

IN FOR THE LONG HAUL

The company currently has 20 employees working at the shop, which boasts specialized equipment that includes several vertical CNC machines for parts manufacturing and block work, a Rottler CNC cylinder hone for high-quality bore surface finishes, and an advanced seat-and-guide machine that allows them to do whatever profile they want for valve jobs. Cylinder head porting is done with a Centroid five-axis CNC machine, while a DMG Mori horizontal handles what Pumphrey describes as the grunt work. "It does a lot of billet valve covers and a lot of our billet connecting rods." A SuperFlow

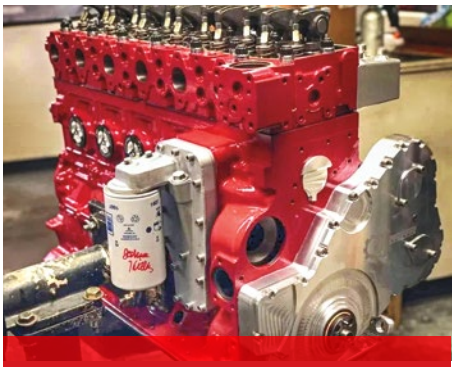
"D&J'S NICHE HAS ALWAYS BEEN THE B-SERIES PLATFORM—THE DODGE CUMMINS STUFF. WE HAVEN'T REALLY BRANCHED OUT OF THAT BECAUSE IT HAS ALWAYS KEPT US BUSY."

Black Widow engine dynamometer is installed onsite as well.

While D&J Precision Machine is always looking for good people, Pumphrey said that it has put together a strong team in part by adopting a policy of internal promotion. "We've brought a lot of young folks in, and that's worked really well for us. The guy running our cylinder head department is 20 years old, and he was originally hired as a part-time employee right out of high school. For us it's about training these folks on the job. The guy assembling engines for us now started off cleaning parts in the core department. We try to work people upward by teaching them along the way and putting them in the best places where they fit. That's been the most successful method for us."

Considering the company's current output, that tactic seems to be working. "Aside from engine builds, we do full long blocks, full fuel systems, and dyno-proven turbocharger setups," he said. "And we do a lot of cylinder heads. We're shipping out three cylinder heads and one engine every day when we're on schedule."

Pumphrey said that campaigning a D&J race truck isn't a priority for the company right now, not only due to time constraints, but also because of some concerns he has



Though D&J concentrated on high-powered (1,000 horsepower and up) builds until 2020, a slight business slowdown during the pandemic caused Drew Pumphrey to re-evaluate. "We added more of the lower horsepower stuff and stock-style remanufacturing to the mix. Going forward, we'd like to turn that kind of work into about 50% of what we do because it's more sustainable, and more recession-proof."

D&J's customers, like Austin Doidge, seen here, "keep us at the forefront of what's going on," said Drew Pumphrey. "We have several customers who're always pushing the envelope. And every time we identify a failure point, we solve the problem by making improvements."

about the dynamic it creates between shops and their customers.

"I've seen a lot of shops who compete with their customers, and it seems like their customers are always in second place and the shop is in first," he observed. "I never wanted to be that guy. I want to make sure whoever wants to chase it can do that. Our customers keep us at the forefront of what's going on. When someone has a failure, we can identify it right away and address those problems. We have several customers who're always pushing the envelope. And every time we identify a failure point, we solve the problem by making improvements. That's really how the development of all of our products began."

From an organization standpoint, Pumphrey said a properly built-out management system is crucial to the long-term success of a company like D&J Precision Machine.

"For a while, we didn't have enough management," he explained. "We just didn't realize how much management we needed in order to keep things moving well. Before we figured that out, we would constantly get engines to the clean room and discover that they were missing parts, or things weren't lined up for them. It's a bigger challenge than it seems; when you're shipping out one engine a day, you have to have everything in order when it hits the clean room so it doesn't get stalled in there because something's missing."

Last year the company incorporated enterprise resource planning software to help with inventory management and workflow optimization, a move Pumphrey said has been a tremendous help with inter-

office communication. “Now everyone knows what they need to do and how to stay on schedule. Scheduling is huge. For a long time, we didn’t operate on a schedule, and sticking to a schedule is the hardest part. We had to learn how to tell customers ‘No’ because you can’t just jump on their stuff when they have to have it. They have to get in line.”

Focusing on inventory management also put D&J Precision Machine in a strong position once demand came roaring back in the second half of 2020. “We invested heavily in inventory right as COVID hit. We basically looked ahead six months with our top four vendors and purchased as much as we possibly could,” Pumphrey noted. “We actually had to finance that effort, but it gave us an advantage because we had parts on the shelf when a lot of other people didn’t. That allowed us to move forward when others were completely stuck. What was six months’ worth of product back then is about two months’ worth today.”

D&J currently has 20 employees working in the shop, including Josh Wengerd, seen here. Drew Pumphrey has put together a strong team in part by adopting a policy of internal promotion. “We’ve brought a lot of young folks in, and that’s worked really well. For us it’s about training these folks on the job.”

That kind of forward thinking is what brings racers like Patrick Puskarich to D&J Precision Machine. Puskarich currently campaigns a 1997 Dodge 3/4-ton pickup with a D&J 6.4-liter Predator long block in 2.6 Smooth Bore-class truck pulling competitions. Puskarich originally got his start in the discipline with gas-powered trucks, so when he decided to make the switch to the diesel side about six years ago, he knew he was going to need an engine builder who really understood how to put together a bulletproof Cummins combination.

“We’re also located in eastern Ohio, and a friend had suggested that we track Drew down,” Puskarich explained. “I really liked that he was doing his own thing—designing his own parts and coming up with his own solutions. Working with him has definitely improved our durability. If Drew doesn’t like the way something is made, he makes a better one.” PRI

THE NEXT

Easily accessible horsepower has taken land speed racing to unprecedented levels of performance in recent years, but it takes more than brute force to break records.

By Bradley Iger

Technological innovation has allowed racers across various motorsports disciplines to push the established boundaries to new heights in recent years, and land speed racing is no exception. These advances have not only created new targets for teams that are competing in the upper echelons of the sport, they've also raised the bar for those seeking to reach traditional milestones.

"For Bonneville, the '300 Club' of today—that is, the group of racers who've broken the 300-mph barrier—is what the '200 Club' used to be," said Steve Strupp of ECTA Motorsports, Wadesville, Indiana. "Today you can buy a 200-mph car off of the showroom floor, so the new challenge is to get to 300 at Bonneville, or 250 mph on a mile-long pavement track. A lot of it has to do with the advancements in forced induction, both with blowers and turbos. It has allowed racers to get controllable, dependable increases in horsepower. But it's not really about the amount of boost people are using, it's more about having the ability to keep the engine alive for more than one pass. It's much easier to manage now."

This progress has made the sport more accessible to a greater number of would-be competitors, and it has also allowed teams that are on the hunt for a class record to devote more of their attention to design aspects outside of their engine program. Yet as we have so often seen when racers attempt to break into new territory, Mother Nature also plays a crucial role in determining what's ultimately possible.

THE SCIENCE OF GOING FAST

"Electronics have become a big part of these cars," said Steve Watt of Maxwell Industries, Ventura, California. Watt is also on the team that developed and races the Speed Demon, a streamliner-class land speed car, which currently holds the title of the fastest piston engine, wheel-driven vehicle in the world at 481.576 mph. "You're basically trying to utilize 3,000 hp on 2 1/2 inches of tire tread in a five-mile drag race. In the past, a lot of the teams used weight to try and get some traction—the original Speed Demon, for instance, was more than 5,800 pounds. We designed a whole new car after an incident in 2014, and the new car is closer to 4,000 pounds. Our MoTeC electronics allow us to use a sophisticated traction control system. Once we've gotten a few runs in and we know the salt conditions, we can use that system to feed in the power at just the right rate for the available grip. That equates to faster acceleration without the need for additional weight to create the traction."

Aaron Brown of The Garage Shop in Denver, North Carolina, told us that while the new tech has ushered in a new era of car development for land speed racing, some still prefer to do things the old-school way.

"Our team has two Roadster-class cars. One of them has MoTeC everything, and the other one—the one I drive—basically has a carburetor and a tachometer. What's interesting is that the driver of the other car is only in his second season racing at El Mirage and events like that now, and his car is just as fast as mine. The data is really helping to level the playing field in terms of performance and repeatability."

Dennis Sullivan of the Utah Salt Flats Racing Association said that this technology is also bolstering durability, which is a constant concern due to the format of land speed racing. "At Bonneville you're running flat out for five miles. If you qualify, then you go to impound, and you've got to do it again the next day with the same motor. So you're basically doing 10 miles at wide open throttle. The salt is a little bit like running on snow, and what kills motors is the loss of traction, because that causes the rpm's to spike, and when it catches traction again, it puts a big shock load on the motor. Anything you can do to minimize that will help the engine live."

FRONTIER

As expected, aerodynamics play a crucial role in both speed and safety. "There's a lot of wind tunnel testing involved at the upper end of the sport," Sullivan added. "There are now companies that can simulate aerodynamic behavior at speed using computational fluid dynamics and using data from wind tunnel sessions to improve it further. Wind tunnels can be hard to find, and they can get pretty expensive, especially if you're going to make changes while you're there. But it's generally more desirable than simulation because you can use smoke wands and things like that to see with your own eyes how changes are affecting the aerodynamics. Most of them have 'tables' that the car sits on, which allow you to adjust the angle of the car and so on. That can provide some insight into how altering the attitude of the vehicle not only affects the aerodynamics, but also its stability at speed."

The Speed Demon currently holds the piston-engine, wheel-driven speed record at 481.576 mph. Power comes from a Ken Duttweiler-built, twin-turbocharged, big block Chevrolet-based V8. "It's like a drag build in a lot of ways, but there's more of a focus on longevity because you're going wide-open for five miles," said Steve Watt.

RUN WHATCHA BRUNG

A production-based chassis won't put a team in the running for a new overall speed record, but these types of vehicles comprise the majority of the entries at events like Bonneville Speed Week. "They've got everything from antique-bodied cars to full sedans—you name it," said Rick Vesco of Team Vesco Racing, Rockville, Utah. "There's a class for everything. Typically, cars are classified by fuel, engine displacement, aspiration, and things like that. It's broken down to the point where just about anybody can find a class to run in and be pretty competitive within that class."

Sullivan said that the rule sets vary from class to class, but there are some stipulations that tend to have an effect on vehicle designs. "Depending on which class you're looking at, there can be quite a few rules that affect what you can and can't do, especially as you move up the ranks. Beyond the safety requirements, there are limits on wings, air dams, and other aero elements. Even in the Roadster classes, which are the oldest classes, there have been some changes in recent years. In Modified Roadster, for instance, they're now allowed to use wings on the back, which wasn't always the case. And to revive some of the older cars that might've been parked in garages because they weren't competitive anymore, a class called American Iron Roadsters was created to bring out the cars with old Dodge Hemis and old Pontiac motors, etc. Of course, due to the nature of competition, that has inspired some people to build 'new' old cars and build out those old motors with new hardware. Classes that used to run 140 or 150 mph are now starting to exceed 200."

He also noted that, due to engine displacement being a key factor in car classification, some competitors have been taking big block motors that would normally be put in B-class racing and purposely reducing their displacement in order to make them eligible for C-class competition. That trend resulted in some racers petitioning for a new class for small block V8s in the 300 cubic-inch range, a displacement that's harder to achieve when starting out with a big block, and the D-class was created as a result. But in other elements of the car, many classes offer teams quite a bit of freedom when it comes to innovation.

"Our Roadster cars actually use dirt late model rear suspensions, with a torque arm and a fifth coil," Brown said. "When we built these cars last year, we really wanted to give a lot of consideration to the suspension stuff. Our first thought was, 'OK, what type of race cars need the most traction and have the most power?' So we got two right-side bird cages and designed all of our own brackets, and we looked to drag racing for a wishbone lower link. We chose that over a track bar and panhard bar because we wanted the rearend to be able to rotate freely. The data has helped us dial that setup in—we were pretty good right off of the trailer in testing last year—but having that data also allowed us to make some informed choices over the winter, so we were even better when we came back earlier this year."

The Garage Shop fields two Roadster-class cars. Aaron Brown prefers the old-fashioned approach in this car—"it basically has a carburetor and a tachometer"—while the other one "has MoTeC everything. The driver of the other car, only in his second season racing, is just as fast as mine. The data is really helping level the playing field."

GOING ALL OUT

Even though the production-based classes are faster than ever, the streamliner class is the current top tier of land speed racing in the United States. Outside of safety requirements, basically anything goes in terms of body shape, chassis design, and wheel-driven propulsion. For Team Vesco

ECTA Motorsports is the first sanctioning body for paved land speed racing. Steve Strupp likened the powertrains used on ECTA's paved mile as resembling slightly detuned versions of Top Fuel or Funny Car engines. "The combinations are a blend between drag racing technology and something like NASCAR in order to get that durability."

Racing, whose Turbinator II car has been as fast as 503.3 mph during a qualifying run in 2018 (though they were unfortunately unable to certify the results the following day due to rain), it's about achieving a balance between horsepower, reliability, and minimal wind resistance in a package that's controllable at speeds where sonic pressure waves start to become a concern.

"When we built the original version back in 1981, we had two small block Chevrolet V8s in it, and we ran it with two-wheel drive," Vesco recalled. "We got up to about 350 mph, and at that point we knew we needed some more horsepower, along with four-wheel drive, so we got ahold of two 159-cubic-inch Indy car motors. They put out 1,000 horsepower apiece because, despite the displacement, they would accept 50 to 60 pounds of blower pressure. That got us to 397 mph, and the record at the time was 409, so we thought we were on our way. But one of the motors dropped an exhaust valve, and the parts went through both engines. They were ruined, and we couldn't find the parts to put them both back together. But my brother was invited to an unlimited hydroplane race, and those boats were running T-53 turbine engines. He called me from the race and said, 'We've got to get one of these engines!'"

After making a few calls, the team acquired a T-55 turbine engine from a Chinook helicopter, a powerplant that Vesco said is good for about 5,300 hp at sea level.

While the unconventional mill required quite a bit of engineering to adapt it to the team's streamliner (part of which included designing a custom-built transmission), the engine's original use-case, which often sees it at wide-open throttle for extended periods of time, made it ideal for a land speed race car.

The body shape of the Turbinator II eschews the wings and splitters seen on the faster cars in the production-based classes as well. "The bigger the hole you punch, the more power it takes to get through the air," Vesco said. "We've never done any of the simulation stuff; we've mainly focused on making the smallest and skinniest streamliner that we possibly could. The basic principles for aeronautics are pretty much the same for land speed cars, although we still have to get traction, and they don't have to contend with ground effects like we do. A lot of teams build ground effects into their streamliners to get traction, but whenever you do something like that, it takes more horsepower to get you down the track."

Watt and the Speed Demon team take a different tactic with their streamliner, which is motivated by a Ken Duttweiler-built twin-turbocharged, big block Chevrolet-based V8. "It's like a drag build in a lot of ways, but there's more of a focus on longevity because you're going wide-open for five miles," Watt explained. "You've got to use steel rods rather than aluminum ones, for example, and you can't run as hard with as much boost as you would if it were in a drag car. With our car, the boost is fed in gradually—we don't get to full

With passenger vehicles capable of more than 300 mph, and streamliners cresting 400 mph, land speed racing has some of the strictest safety rules of any form of racing. This includes complex roll cages, Lexan windows, fire suppression systems, and more.

power until we're about three miles down the track because we don't have enough traction. We need the aero to start really pushing down on the car."

Strupp said the combinations at this level of land speed racing often resemble a slightly detuned version of an engine found in Top Fuel or Funny Car competition. "There are a lot of adjustments made in fuel mixture, timing, and the engine controls, but the fundamentals are the same. They're turbocharged, blown, or they use some form of compound induction, and it's typically V8-based billet stuff. Many of these engine builders come from the drag racing world, but the combinations end up being more of a blend between drag racing technology and something like NASCAR in order to get that durability."

Also in contrast to Team Vesco's approach, the Speed Demon team isn't shy about leveraging technology to develop their aerodynamic strategy. "We're fortunate because we were able to run our old car through the Ferrari F1 team's simulator, which is one of the most sophisticated in the world, thanks to a mutual friend," Watt said. "That provided a whole list of things that we needed to do for our new car to improve downforce while also reducing drag, which in turn enabled us to go a lot faster."

THE ROAD AHEAD

Although streamliners are the fastest land speed race cars currently competing, they aren't the fastest land speed cars ever developed. That distinction goes to vehicles like the Aussie Invader and Bloodhound LSR, which use jet thrust to propel the car forward rather than wheel-driven torque. The Bloodhound has recorded speeds as fast 628 mph, but the runs were conducted on a dry lakebed in Hakskeen Pan, South Africa, rather than at Bonneville, due to an issue that

"The bigger the hole you punch, the more power it takes to get through the air," said Rick Vesco. For the Turbinator II, "we've mainly focused on making the smallest and skinniest streamliner that we possibly could." That strategy resulted in a 503.3-mph qualifying run in 2018.

has affected Speed Week racers at all levels of the sport.

"Bonneville is getting smaller and smaller," Brown pointed out, "and I think there needs to be a larger conservation effort because the problem has been getting worse over recent years. When we got flooded out last year, I wasn't upset at all because the lakebed needed to sit like that for six or eight months in order to heal."

Along with concerns about the consistency of the surface, the reduced amount of usable lakebed has made speed attempts with jet cars impossible due to the amount of space they need to build up speed and shut down. And, to a tangible degree, it also has put a cap on the performance potential of top-tier streamliners. "I think someone could go 550, 570 before they'd start to run into any trouble with sonic pressure waves, but it's going to have to be at a longer race course," Vesco said. "For us it's not so much about horsepower or aero at this point as it is the track length. This thing is still accelerating like crazy at the end of that five-mile run, so if we had more room, I'm sure we could take it further." PRI

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FUELING SUSTAINABILITY

By David Bellm

Being an imitation usually isn't a badge of honor. Knockoffs of original items often carry the connotation of sacrifice, of making do with less and just getting by—like being forced to eat a patty made from vegetables while craving a giant, juicy cheeseburger.

When it comes to racing fuels, imitations can sometimes be better than the original. In farms, laboratories, and production facilities around the world, forward-thinking individuals are reinventing the precious liquids that fuel our race cars. In the process, they're creating fuels that burn cleaner and make more power, with less impact on the environment.

Race sanctions are noticing. Along with electric vehicles (EVs) and other sustainability programs, renewable fuels have become a vital element in the pursuit of greater environmental responsibility throughout the sport. Many of the world's largest sanctions have introduced fuel blends with significant amounts of renewable content:

- Formula 1 cars currently use hybrid internal combustion/electric powerplants that run a fuel blend consisting of 10% ethanol. In 2026, F1 will switch to a new hybrid engine that will use 100% renewable fuels.
- All FIA Endurance Championship and World Rally Championship cars now run 100% renewable fuel.
- IndyCar introduced ethanol blends to the series in 2006 and ran E85 from 2012 through 2022. Beginning in 2023, the sanction switched to 100% renewable fuel, consisting largely of ethanol.
- NASCAR has run 15% ethanol fuel since the 2011 season, and in late 2022 reached the milestone of 20 million miles driven on-track with the fuel. The series is likely to move to a 100% renewable fuel at some point.
- Starting with the 2023 season, IMSA GTP cars are running exclusively on an R80 fuel blend, which consists of 64% biofuel.

The future of renewable fuels in racing is

A WIDE ARRAY OF NEWLY DEVELOPED RACING FUELS IS HELPING REDUCE THE OVERALL ENVIRONMENTAL IMPACTS OF MOTORSPORTS, WHILE ALSO BRINGING POTENT BENEFITS TO RACERS. BUT CREATING THESE FUELS COMES WITH A COMPLEX SET OF UNIQUE CHALLENGES.

promising. But like so many other aspects of technical progress in motorsports, getting to the ultimate goal can be difficult. Breakthroughs in renewable fuels are typically won through hard work, determination, and unwavering commitment.

THE DEVIL IN THE DETAILS

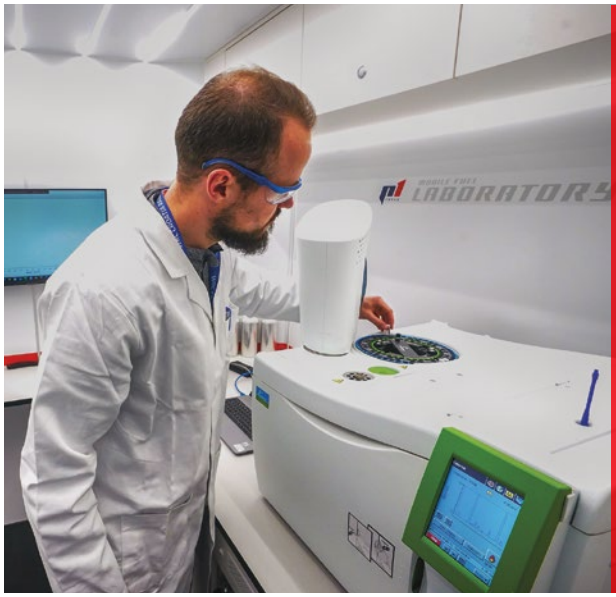
Renewable fuels are nothing new. In the early 19th century, some of the first internal-combustion engines ran on biofuels such as ethanol. Synthetic fuels were developed extensively during World War II to combat fuel shortages among Axis nations in Europe. Now, more than 80 years later, these two technologies make up the primary categories of renewable fuels in use today.

Although many people refer to all renewable fuels as "biofuel," that term refers specifically to methanol or ethanol fuels made from fermentation of plants or plant-based oils. The different types of these raw materials, called biomass, determine what subcategory a biofuel is considered to be.

First-generation biofuels are made from crops, such as corn, barley, or sorghum. Second-generation biofuels are made from agricultural residues such as grasses or sugarcane stalks. Third-generation biofuels are made from algae or other microorganisms. All of these biomasses can be fermented into ethanol or methanol, which can be used straight as fuel, blended with gasoline, or converted into biogasoline, which is functionally equivalent to gasoline.

In contrast, synthetic fuels begin as hydrogen and carbon, the raw ingredients of gasoline. These elements are then fused into the desired molecular structure, typically by using the Fischer-Tropsch process in which heat, pressure, and a catalyst are applied to combine the elements. The resulting reaction yields a hydrocarbon fuel that's functionally the same as gasoline. This too can be used straight or blended with other fuels.

Determining the environmental impact of biofuel and synthetic fuels can be complicated. On one hand, biofuels might



P1 Racing Fuels makes renewable fuels by converting alcohols into synthetic hydrocarbons. "The biggest hurdle we are facing is cost," said Martin Popilka. "We are working on decreasing that by building up our production facilities and introducing less-energy-intense technologies to produce fuels on a large scale."

appear more environmentally sound. But many biofuels are currently first-generation, made from corn. This is a more efficient and therefore more economical method of producing ethanol or methanol, but it has the disadvantage of diverting food stocks from their primary role as human sustenance, which largely offsets any environmental benefits.

On the flipside, synthetic fuels don't use any kinds of crops, and the necessary carbon can be pulled from the air in the form of carbon dioxide—a "win-win" for sustainability, in which raw materials are gathered by reducing carbon in the atmosphere. However, the process of fusing hydrogen and carbon into a liquid fuel consumes massive amounts of electricity. In fact, the amount of power needed is so great that the only way it's considered at all environmentally responsible is if the electricity is generated by renewable sources, such as wind or solar power.

Then there's the cost. Prices of renewable fuels vary wildly. First-generation biofuels, such as ethanol made from corn, can be less expensive per gallon than gasoline. Perhaps counter-intuitively, second-generation biofuels are actually about twice the price of first-generation biofuels, despite using agricultural waste products. This is because first-generation biomasses can more readily be broken down into simple sugars, making the process much more efficient and therefore cheaper.

Synthetic fuels are generally more expensive yet, largely because of the energy required to manufacture them. Also affecting the costs of all renewable fuels are basic factors of supply and demand. Ethanol has been around for quite some time, and there are plenty of suppliers that can provide it, which keeps prices relatively low. On the other extreme, there are relatively few synthetic fuel manufacturers at this point, which limits quantities and drives up prices.

Because of the generally high prices and limited availability of many renewable fuels, they're often mixed with gasoline in various proportions to help offset the cost while still improving their sustainability. This is an everyday reality for Mark Walls, director of research development at VP Racing Fuels, in San Antonio, Texas. The company's R80 renewable fuel now powers the IMSA GTP class, and roughly a third of VP's 70 fuel blends use renewable components in them.

Determining what those blends will be is a complicated jigsaw puzzle in which cost, availability, and overall environmental footprint have to be balanced carefully with the performance these fuels offer racers. "It's only as green as you're willing to pay," explained Walls. "Everybody wants 100%, until they find out it costs 50 bucks a gallon. Then everything's not so green at that point. The biggest hurdle for us is the sourcing and availability of the renewable components that are out there. There just aren't very many options. And if you do find them, they might not be available at the scale you need, or at the price point you need."

Walls' take on the process underscores the vast complexity of developing a market-ready renewable fuel for motorsports. That's besides the fundamental technical questions being answered in development labs. With this array of factors and the interplay between them, it can be difficult to find clear-cut answers on what's best for the environment, motorsports, and racers when it comes to renewable fuels.

Regardless, many in the industry see renewable fuels as the most promising direction for motorsports to survive in today's increasingly environmentally aware era. Although EVs are certainly still on the table as far as "green" directions for the sport, renewable fuels have some definite advantages in real-world applications.

Renewable fuels can be introduced with minimal disruption to racing series and the rules that regulate them. They're generally formulated to be a "drop-in" replacement as much as possible. This means they can be poured into fuel tanks with little or no changes to the rest of the car and its existing setup. At the same time, renewable fuels in many cases make more power, keep engine components cleaner, and emit fewer harmful emissions than gasoline.

The icing on the cake for many in the sport is that renewable fuels allow the cherished visceral elements of racing to continue unfettered. Race cars can go on singing their ground-shaking roar, in contrast to the near silence of EVs.

THE TIGER IN THE TANK

Jay Berry, founder of Ignite Racing Fuel in Marion, Indiana, remembers a time when nobody cared much about renewable fuels. Sanctions didn't require them, racers weren't requesting them, and relatively few suppliers were developing them.

"When I started in 2002, you went to events and nobody knew what ethanol was," recounted Berry. "This was before there was even pump E85. The reason I created

Ignite was because there was nobody out promoting and showing people how great ethanol fuel is on its own merits. We've come a long way in educating not just the racer, but engine builders, and along with that, helping consumers understand that ethanol is not a bad fuel. It's a premium fuel that's actually better."

Now his company is finding healthy demand for its biofuels, all of which have very high concentrations of ethanol. The company's Yellow E98 blend is essentially straight, uncut ethanol. Alongside that are Ignite's Orange E85 and Red 114 (E90), blends. Berry makes these fuels using first-generation ethanol from corn he grows and processes entirely on his own farm, exactly the same as when he started his company more than two decades ago.

While Berry's methods and blends haven't changed much over the years, now racers are warming to the idea of renewable fuels in general, as they're faced with the possibility of environmentalists shutting down their sport or altering it beyond recognition. That said, Wall has observed that younger racers tend to accept renewable fuels more readily, because they're less set in their ways and more willing to adapt to new methods.

Nonetheless, some old attitudes and perceptions linger. This is particularly true regarding the use of ethanol. Fears about ethanol's corrosive effects on engines persist, despite the fact that it's been used in all different ratios and blends for years. It is, however, generally accepted that running ethanol in higher concentrations—most experts say above 10% to 15%—requires changing fuel-system components to avoid risk of damage. Included among these modifications is switching fittings and hoses to PTFE materials, which resist the widest range of fuels.

Synthetic fuels, on the other hand, typically have fewer variables regarding how they run in race engines. Although synthetic gas may not always smell like actual gasoline, it's generally formulated to be a direct drop-in replacement, and therefore it requires no change to fuel systems. This also applies to ethanol that's been converted to biogas.

Berry, however, contends that any damage to fuel system components by ethanol is entirely a result of harmful additives and low-quality gasolines often found in pump E85 blends, rather than by ethanol itself. That said, he conceded that it's much easier to use high ethanol blends with electronic fuel injection than with carburetors.

"It's hard to run an ethanol fuel with a traditional carburetor," he said. "Very few

Porsche has joined forces with other international companies to develop synthetic fuels. The first major result of the consortium is a pilot plant in Punta Arenas, Chile, which was chosen in part for its strong prevailing winds, allowing an on-site wind turbine to provide sustainable electricity for the self-contained operation.

"When I started in 2002, you went to events and nobody knew what ethanol was," said Ignite Racing Fuel's Jay Berry. "The reason I created Ignite was because there was nobody out promoting and showing people how great ethanol fuel is on its own merits." Now his company sees a healthy demand for its biofuels.

guys have really figured out how to make it work. Part of that is because of the variance in pump E85. Ignite's fuel blends have never changed. Nothing varies. But pump E85 can be anything from 51% to 83% ethanol. So that's the frustration for the carb guys. They could build the perfect carb and send it out to 10 different people, and it'll have 10 different fuels running in it."

COMPLEX CHALLENGES FOSTER INNOVATION

For all the advantages renewable fuels offer, significant challenges still need to be solved before they can achieve universal adoption. Cost is the biggest hurdle right now. Many of these fuels are expensive to make and will probably remain so, at least for the near future.

This may change as more suppliers enter the market and the requisite technologies evolve. At the same time, there's a debate going on between proponents of EVs and those who favor internal-combustion vehicles that run on renewable fuels: Does it make sense to channel massive amounts of electricity into making liquid fuel to be burned at relatively low internal-combustion efficiencies, instead of just putting that electricity into a battery and powering the car directly?

It's a tough question that defies simple answers; both sides of the argument have their own unique liabilities. "EVs look great if you draw the box around just the car and you don't look at how the batteries were made, or where the electricity is coming from," noted Walls. "But as long as you're efficient in the way you make your renewable fuels, then it'll make sense all day long. You have to make sure you're not wasting electricity to make a renewable fuel, where you would have been better off putting electricity back into the grid."

Martin Popilka surely understands the debate well. He's the CEO of P1 Racing Fuels in Berlin, Germany. The company makes renewable fuels by converting alcohols into synthetic hydrocarbons. P1 asserts on its website that, even with EVs, there will still be too many internal-combustion cars operating in the decades ahead to meet global environmental targets. Therefore, he believes that eco-friendly renewable fuels will have to play a large part in the overall effort to clean up the planet. This is especially true, Popilka stated in a P1 whitepaper, when the electricity for EVs is generated by fossil-fuel sources such as coal.

Nonetheless, Popilka told PRI that the expense of processing synthetic fuels is a significant challenge that needs to be overcome. "The biggest hurdle we are facing is cost. However, we are working

on decreasing that by building up our production facilities and introducing less-energy-intense technologies to produce fuels on a large scale. As production scales and market conditions become more favorable, costs are expected to drop significantly in the coming years."

In the meantime, P1 fuels are gaining ground in motorsports, having been chosen for the FIA World Rally Championship and Karting World Championship. It's worth noting, too, that among users of the company's products are several successful vintage Bentley race cars. "We're proving that P1 fuels can be used as a sustainable drop-in fuel from prewar racing up to modern car racing such as the WRC, where the fuel is tested to its maximum in all kinds of harsh conditions, from the heat in Mexico to freezing Swedish temperatures."

"WE'VE COME A LONG WAY IN EDUCATING NOT JUST THE RACER, BUT ENGINE BUILDERS, AND ALONG WITH THAT, HELPING CONSUMERS UNDERSTAND THAT ETHANOL IS NOT A BAD FUEL."

Many in the industry echo Popilka's belief that when the infrastructure for synthetic fuel is more mature, the cost disparity will narrow enough to make it a more viable alternative to fossil fuels and EVs. One company that's betting on it is Porsche, which has joined forces with Siemens Energy, ExxonMobil, and other international companies to develop synthetic fuels in conjunction with Highly Innovative Fuels Global (HIF Global), in Houston, Texas.

Rather than choosing one side of the electric versus renewable-fuel debate, Porsche is banking on both approaches to some degree. "Electromobility is a top priority at Porsche," said Porsche CEO Oliver Blume in a press release. "eFuels for cars are a worthwhile complement to that—if

they're produced in parts of the world where a surplus of sustainable energy is available."

The first major result of the Porsche renewable-fuel consortium is a pilot plant in Punta Arenas, Chile, which became operational in late 2022. The site was chosen in part for its copious wind, which typically blows 270 days a year, allowing an on-site wind turbine to provide eco-friendly, sustainable electricity for the self-contained operation. This power is used to split water into hydrogen and oxygen and combine it with carbon dioxide pulled from the atmosphere to make methanol, and then convert that to gasoline.

Although output from this plant will be relatively meager at around 34,000 gallons per year, it's just an initial step. The consortium plans to apply the experience and insight it gains from the project to a much larger HIF Global plant to be built in Texas. Construction on this facility is planned to begin in 2024. When fully operational, it's expected to produce approximately 200 million gallons of fuel per year.

Porsche plans to use the fuel produced at the Chile pilot plant in large part to conduct real-world research in motorsports. The whole annual output of the facility is slated for use in the Porsche Mobil 1 Supercup racing series and in other special projects, such as Porsche Experience Centers.

THE BIG PICTURE

The emergence of viable renewable fuel technologies and their widespread adoption by major sanctions throughout the world is an encouraging step for racers. It could be the key to preserving their right to compete in the cars they want indefinitely, no matter how draconian environmental regulations may eventually become.

At the same time, organizations throughout motorsports are scrutinizing the much bigger question of overall sustainability. When all factors are taken into account, race cars aren't actually the biggest source of carbon emissions in motorsports. Although there may be as many as 60 cars on the track at a major event, that pales in comparison to the thousands of spectators in the stands, many of whom drove more than an hour to get there. Then, behind the scenes are dozens of semi-trucks, racking up thousands of miles hauling equipment from track to track. And blazing through the skies above all that traffic are hundreds of airline flights shuttling

P1 fuels are gaining ground in motorsports, having been chosen for the FIA World Rally Championship as well as being used in vintage race cars. "We're proving that P1 fuels can be used as a sustainable drop-in fuel from prewar racing up to modern car racing such as the WRC, where the fuel is tested to its maximum in all kinds of harsh conditions," said Martin Popilka.

team members about.

Ultimately, it all comes down to carbon footprint—how much carbon is being put into the atmosphere versus how much is being removed. The goal is to be "net zero," meaning carbon is taken out of the atmosphere at the same rate that it's emitted. Carbon footprint takes into account every aspect of how business is conducted. For example, Formula 1's introduction of renewable fuel is part of the sanction's much larger goal of becoming net zero by 2030. Also included in that effort are steps such as phasing out single-use plastics, optimizing logistics, using renewable energy when possible, and even converting to remote broadcast operations.

NASCAR has launched a similar program, with the goal of becoming net zero by 2035. At the same time, other major race sanctions also have comprehensive sustainability initiatives in the works, albeit with somewhat less ambitious goals than the NASCAR and F1 net zero efforts.

Alongside sanctions in these sweeping sustainability initiatives are fuel suppliers as well, many of which are looking at the entire process they're using for developing fuels, manufacturing them, and bringing them to market. "It's not just the fuel we're making," Walls explained about VP's broader sustainability efforts. "From production, to the electricity in the building, to me driving into work every day, we're aiming toward a more carbon-neutral footprint.

"This is where we all have to live. Every little bit helps." PRI

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RODS OF DESTINY

WITH THE EXCEPTION OF UNEXPECTED RAW MATERIAL PRICE HIKES AND OCCASIONAL SUPPLY GLITCHES, THE DOMESTIC CONNECTING ROD MARKET IS QUITE STABLE IN TERMS OF PRODUCT INNOVATION AND DESIGN—BUT THERE MAY BE A QUIET REVOLUTION LOOMING IN THE SHADOWS.

By Mike Magda

Compare a sampling of today's performance-driven connecting rods with a similar cross-section of rods from 10 years ago and there may not be much difference to the untrained eye. Machining will be more precise, critical dimensions more accurate, finishes more impeccable, and certainly the fasteners will be much more robust.

However, to paraphrase Gertrude Stein, "a rod is a rod is a rod." Not much has really changed in design or materials for the majority of popular motorsports applications. Sanctioning body rules often limit innovation by mandating a specific design or imposing minimum weights to reduce the temptation to try uber-expensive materials. So it's safe to say that there's a slow news cycle around the connecting rod industry right now.

"There really hasn't been much that has changed in the rod biz," admitted Tom Molnar of Molnar Technologies, Kentwood, Michigan, who has been involved in designing and manufacturing connecting rods for more than 40 years. "Costs are going up, cost of materials, labor, overhead. Our customer base has grown. People are finding us through word of mouth."

"I really wish I had something to tell you on that particular avenue, but I don't," concurred Danny Cerny of Scat Crankshafts, Redondo Beach, California.

"At this point, Howards has no new rods in the pipeline. We continue to stay committed to grassroots racing and entry-level racers," added Kirk Peters of Howards Cams & Racing Components, Oshkosh, Wisconsin, who added a stunning bit of gossip to the conversation. "As for 3D printing of parts, I've heard rumors that high-end engine builders have played with the idea, but there are no pictures to substantiate the rumors."

Well, we have some pictures, but the innovative rods are not meant for IMSA or NASCAR or even Pro Stock. Instead, those "anadiaplasi" titanium rods (see sidebar on page 100) are designed for an exotic hypercar V10 engine expected to produce more than 3,000 horsepower for the street.

Such a design trend is unlikely to spread to mainstream racing markets. The technology is still in its relative infancy and quite expensive. Instead, connecting rod manufacturers are focused on improving production efficiency, keeping orders filled, and helping customers select and install the correct rod. New or upgraded products will be introduced as power levels continue to increase or new applications are introduced to the market.

FUTURE PLANNING

"There has been a tremendous increase in 'typical' power output, and with that comes increased power-handling capabilities for connecting rods," explained Alan Davis of Eagle Specialty Products, Southaven, Mississippi, noting that the company has been using its current third-generation design for some 20 years. "Eagle's much anticipated

"There has been a tremendous increase in 'typical' power output, and with that comes increased power-handling capabilities for connecting rods," explained Eagle Specialty Products' Alan Davis. "Eagle's much anticipated 4th Generation design will become available this fall in time for the 2024 racing season."

4th Generation design (4D) will become available this fall in time for the 2024 racing season."

This redesign will feature thicker webbing in the beam to improve tensile and compressive strength.

"But the big improvement is realized around the big end of the rod," Davis continued. "Several improvements have been made to strengthen the big end and make the bore more rigid to further prevent distortion under high load."

The rods will be fully CNC machined from Eagle's exclusive two-piece forging of a proprietary steel alloy. ARP 2000 bolts will be standard, and ARP's Custom Age 625+ bolts may be an option. Initial applications will be Chevy small block, LS, Chevy big block, Ford 302 and 351W, along with popular Honda, Subaru, and Toyota engines.

Racers' need for more rod strength is also driving Callies of Fostoria, Ohio, to expand a popular line to include more applications. "We've had a line for small block Chevy and LS called the Compstar Xtreme," explained Brook Piper. "We're now expanding that into big block Chevy and Gen III Mopar. It's for the guys running up to 1,800 hp, so it's going to be a good rod for probably 60% of the market like the average bracket guy and street/strip. They'll retail for around $1,250 per set."

"CHOOSE YOUR ROD THAT WILL FIT YOUR NEED BUT ALLOW FOR GROWTH, BECAUSE WE ALL HAVE THIS ADDICTION TO GO FASTER."

Callies basically put its Compstar H-beam rod on steroids to create the Compstar Xtreme. Engineers added some weight by thickening the web and added an H11 tool-steel fastener. Overall, Callies calls the rod an "H-I" design.

"It's kind of a hybrid between an H- and I-beam," said Piper. "It's made from 4340 steel, and we'll start with 6.385, 6.535, and 6.700 lengths for the big block Chevy. For the Gen III Hemi we'll have a 6.125, which is popular for strokers. We'll also expand the LS with a 6.350 rod for the tall-deck guys."

Over at Crower Cams & Equipment in San Diego, California, material costs make for challenging times, but there are bright spots. "We're holding our own right now. Our titanium rods are big movers, but it's really hard to compete with material costs," said Peter Harris, noting that titanium has doubled in price in recent years and costs for heat-treating have also increased significantly. "People can't always justify spending $800, $900, or $1,000 per rod. But everyone wants a light rod that doesn't break at high horsepower."

A new material and new applications are making headlines at CP-Carrillo in Irvine, California. The company is now offering rods for the Nissan VR30DDTT, and expanding into powersports is also a priority as rods are now available for the Aprilia RS 660 twin, Arctic Cat Z1 Turbo, Can Am X3, and Suzuki GSXR1300 Hayabusa (extreme duty).

"We're also working on a Ford Godzilla rod for high-horsepower applications," said Richard Batchelor. "We have been offering our new high-strength steel called C107. This material is approximately 22% stronger than our standard material, and we can make rods 10–15% lighter while maintaining the same strength. With this material we have been making some Porsche rods for a few of our high-end customers that are actually lighter than the factory titanium rods."

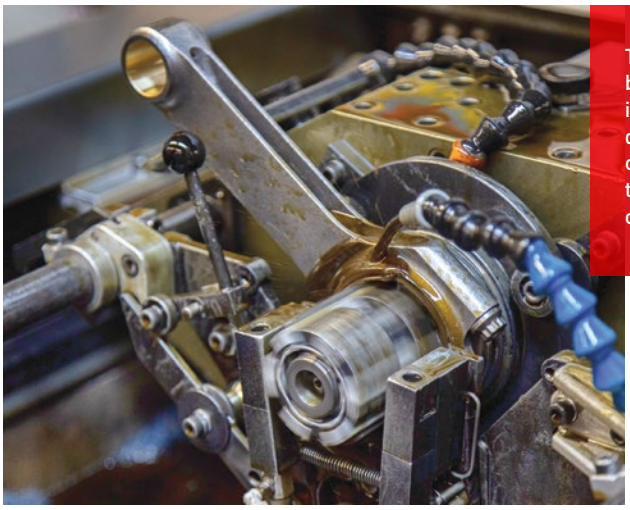
With such a wide variety of connecting-rod styles, weights, and materials available to racers, it's more important than ever to make the right decision when building a competitive engine—especially if more horsepower is in the plans.

"The biggest thing with selection is to buy a rod that you can build off of for years to come," stressed Piper. "If a big block Chevy guy calls in and says he's going to do a little bit of nitrous, we all know that eventually leads to a whole lot of nitrous. So choose your rod that will fit your need but allow for growth, because we all have this addiction to go faster. We all know how quick and easy it is to put on a turbo or a ProCharger. I always impress upon our guys here to ask about plans for the future so we can get the customer the best bang for the buck."

AVOIDING DISTRACTIONS

Most experienced engine builders have already narrowed down their preferences for every type of engine and will order

"Not much has changed in the rod biz," said Tom Molnar. Although he acknowledged increasing costs of materials, labor, and overhead, he added, "our customer base has grown. People are finding us through word of mouth."



To help the DIY engine builder, Scat machines its connecting rods with different-sized chamfers on each side. "We've taken the guesswork out of it," said Danny Cerny.

We recommend they run with our stroker clearance rods. That way you don't worry about getting out a die grinder or spending another $700 on a small base-circle camshaft."

accordingly. However, there remain some misconceptions that can sidetrack even the best builders. One such distraction is the question of rod balance; that is, every rod in a set must be balanced equally and perfectly. That precision isn't always possible because of wear on machine tools during a single run.

"Say there's a run of 96 rods. The first rod will be the lightest and the last will be heaviest," said Roger Friedman of Dyer's Top Rods, Forrest, Illinois. "You're always going to have a little variation, maybe one or two or three grams. But some engine builders are so critical that they want perfect. Well, how do you measure the oil on the rod when it's spinning around?"

The real problem isn't a difference of a couple of grams in a rod or two, it's when the engine builder tries to correct the problem. "They take metal off the wrong places, usually with a belt sander, and they weaken the rod," explained Friedman. "Every engine builder is different, but we see some hack jobs, especially with stroker crankshafts and the rods are cut for the camshaft. We actually put the rods in a fixture with the bolts properly torqued, and we'll mill it with a CNC machine. Then we deburr all the edges and polish it. We're trying to give this rod every chance to survive."

"The most frequently asked question we get is about cam clearance," agreed Cerny. "A lot of people don't know about the different base circles of the camshafts. They try to use a standard cam and throw an H-beam in there with a stroker crankshaft.

INSTALLATION TIPS

Although connecting rods appear quite simple, there is a correct way to install them. To help the DIY engine builder, Scat machines the rod with different-sized chamfers on each side.

"We've taken the guesswork out of it," said Cerny. "On the big end of our rod, one side of it has a very large chamfer where the bearing would sit. The other side has a very small chamfer. Obviously, for us, the large chamfer is what's going to go toward the counterweight or the throw where the radius is on the rod journal. The small chamfer is where the two rods will face each other."

The correct installation also addresses rod offset. Some engines are designed so that the cylinder-bore centerline is slightly offset

Callies has expanded its line of Compstar Xtreme rods to now include big block Chevy and Gen III Mopar engines. Callies calls the rod an "H-I" design. "It's kind of a hybrid between an H- and I-beam," said Brook Piper.

from the rod-bearing radial centerline. That difference is corrected by offsetting the rod slightly so that the little end is centered on the wrist pin.

"Many times customers will use rods that are not correct for their engine, such as running an SBC rod in a small block Ford, which have different offsets," explained Batchelor. "That moves the pin end of the rod 0.025-inch toward the pin boss instead of being centered in the piston. This is a common practice due to availability of SBC rods, and in most cases if the rod is built strong enough it will work, as long as they have additional clearance for the small end of the rod in the pin boss."

Batchelor also had a customer experiencing unusual wear on the pin end of the face and on the opposing big-end face. He asked the engine builder to mock up all the blocks he was using and take some measurements.

"We were able to figure out that making the big-end offset to what it needed to be would have resulted in a weaker design," said Batchelor. "Instead, we corrected the problem with non-standard offsets of both ends and changing the pin-end width slightly so that both ends of the rod could never contact the piston pin boss and the crank at the same time."

One design element of connecting rods that often baffles customers is an oil squirter built into the rod. Users often have the misconception that pistons and cylinder walls won't receive any oil if a squirter isn't designed into the rod.

"First of all, a hole in the big end of the

WHAT IS ANADIAPLASI?

The unique connecting rod that appears to have been modeled after a twisted jungle vine was actually developed by Spyros Panopoulos Automotive (SPA) using its proprietary method of Design for Additive Manufacturing (DfAM) called "anadiaplasi."

A native of Athens, Greece, Panopoulos has been designing his own connecting rods since 1999. He soon started manufacturing other performance engine parts like billet heads, turbo compressor wheels and titanium camshafts. About five years ago, he built a 1,788 cc Mitsubishi Evo engine that pulled 2,880 horsepower at 14,100 rpm and pushed the car to a quarter-mile time of 7.704 seconds in Abu Dhabi. Additional innovations include brake and piston designs for Formula 1 and working with "super alloys" for various racing parts.

Around 2019, Panopoulos developed anadiaplasi to take advantage of advancements in high-tech 3D metal printing. In theory, the component's shape is dictated solely by the forces acting on it. Effective designs multiply and evolve while inefficient designs die off in this AI-driven development. The end result is that material is minimized if performance isn't supported and added where needed to improve performance.

"It's an algorithm created in-house," explained Panopoulos, "and based exclusively on 3D printers. The method is based on the strength and properties of materials in relation to the forces exerted on the forms."

SPA has developed designs for different materials, including carbon, alumina, titanium, and ceramic. Different additive manufacturing methods—including XJet nanoparticle, selective laser melting (SLM), or binder jetting—are used to print the parts. Then any number of surface treatment technologies may follow, including CVD or ALD coatings, ultrasonic nanocrystal surface modification (UNSM), and shot peening.

The unusual shapes of these connecting rods was developed by Spyros Panopoulos Automotive using "anadiaplasi," which is its proprietary method of Design for Additive Manufacturing.

Panopoulos has created connecting rod designs that may be used in future Formula 1 engines, but current efforts are focused on a 4.0-liter 90-degree DOHC V10 developed for the Chaos hypercar, which is made from more than 44,000 3D-printed parts. SPA will use its 3D technology to manufacture the crankshaft, camshaft, intake valves, exhaust system, and even the magnesium engine block. Twin turbos made from carbon and titanium, and fitted with ceramic compound turbine wheels, will boost the engine to a projected 3,000 hp at 12,200 rpm.

"The engine is on the test phase on the chassis dyno," confirmed Panopoulos. "We're testing different materials and designs. But similar parts with the same technology have been tested on the dyno and track since 2018." —*Mike Magda*

rod is a fantastic starting point for a fatigue failure crack. You don't want that," explained Davis. "Have you ever imagined what even 20 psi of oil pressure flowing past the rods and crank journal surfaces might look like in the bottom of an engine? Not to mention what 40, 50, or 60 psi would look like! Oil is spraying everywhere. The only way everything is not completely soaked in oil in the crankcase is if you don't have oil in it at all. Nothing will escape this violent oil spray."

As long as the oil system is working properly, cylinder walls, piston skirts, rings, pins, and other components will receive plenty of oil. The reason many OEM engines, especially imports, have oil squirters and other oil manipulating features is that auto manufacturers have to plan for the worst possible owner when it comes to ignoring routine maintenance, harsh driving conditions and overall misuse of the vehicle.

"It has to be idiot-proof," concluded Davis. "In the racing and performance enthusiast industry, I guess we expect a bit more out of our customers!" PRI

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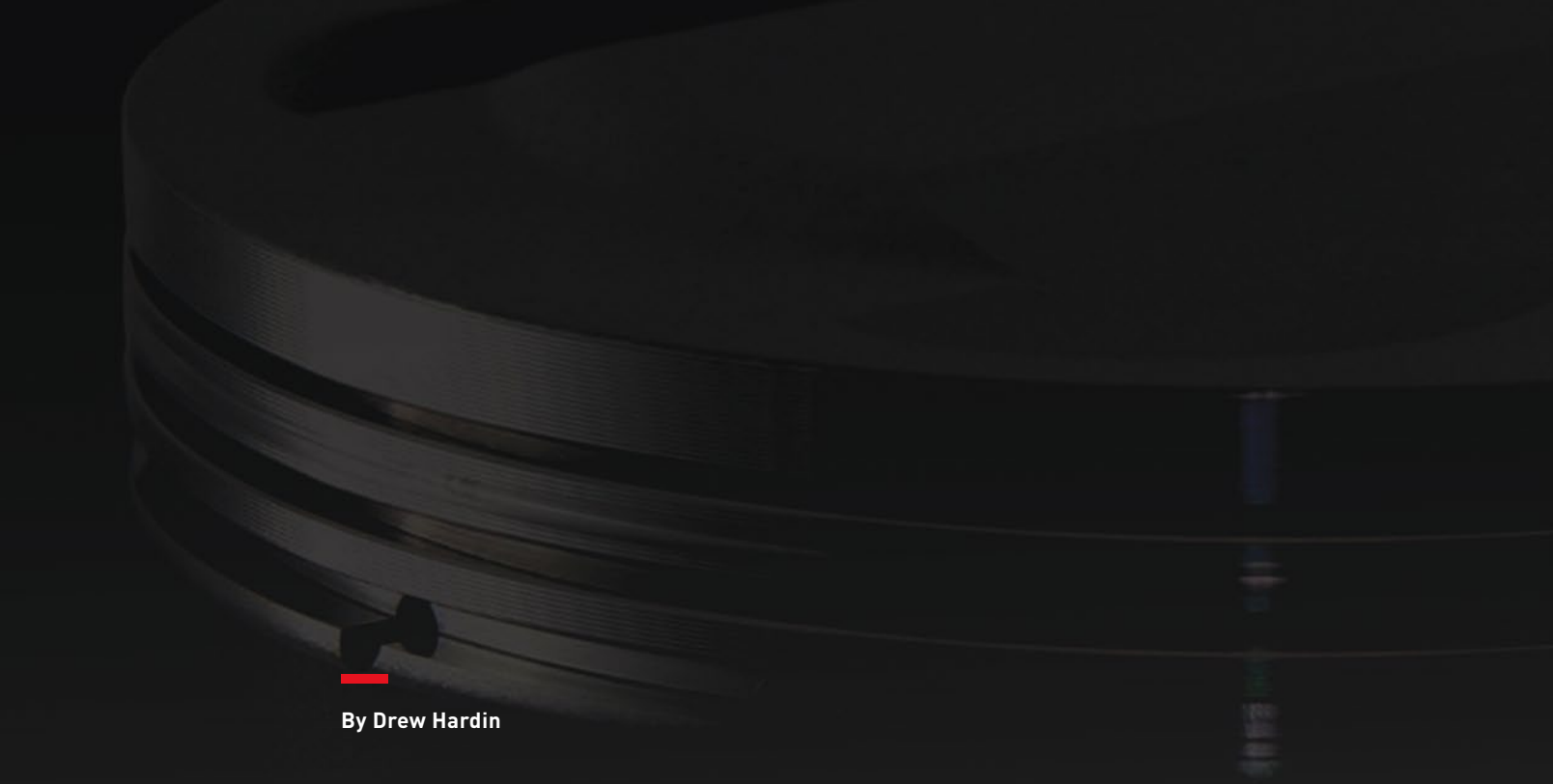
SECRET WEAPON

INCREASED DURABILITY, REDUCED FRICTION, AND ENHANCED THERMAL CONTROL ARE JUST SOME OF THE BENEFITS THAT CAN BE GAINED FROM COATING ENGINE AND DRIVELINE PARTS. OTHER COATING ADVANTAGES, THOUGH, ARE A LITTLE MORE UNEXPECTED.



By Drew Hardin

The coatings used on engine components and driveline parts have evolved to a point where they do very specific—and sometimes contrary—things. One type of coating attracts oil. Another coating sheds oil. There are coatings that act as a heat barrier. Others absorb and transfer heat. Some coatings have the hardness of a diamond. Others are soft enough to scratch with a fingernail. Some cure to a beautiful shine, while one company, Swain Tech Coatings of Scottsville, New York, warns that its White Lightning exhaust coating is downright ugly. "Which is not quite fair," admitted Richard Tucker. The coating is an effective thermal barrier, but it can mar or scratch during shipping or installation, and it can change color when exposed to heat. Said Tucker, "We'd rather be very clear that customers should not consider our exhaust coating if the appearance is important to them."

Parts coating has tangible benefits that can be felt as well as seen. "Roundy-round racers with a coated motor are going to blast off corners quicker and smoother," said Carl Benton of Polymer Dynamics (PolyDyn), Houston, Texas. "And drag race motors accelerate faster." The "heavy motors" used in drag racing and tractor pulling, "the blown alcohol and blown fuel motors, are using our coated rod and main bearings," Benton said, "and they're getting twice or three times the amount of runs because of the way the bearing can hold onto the oil."

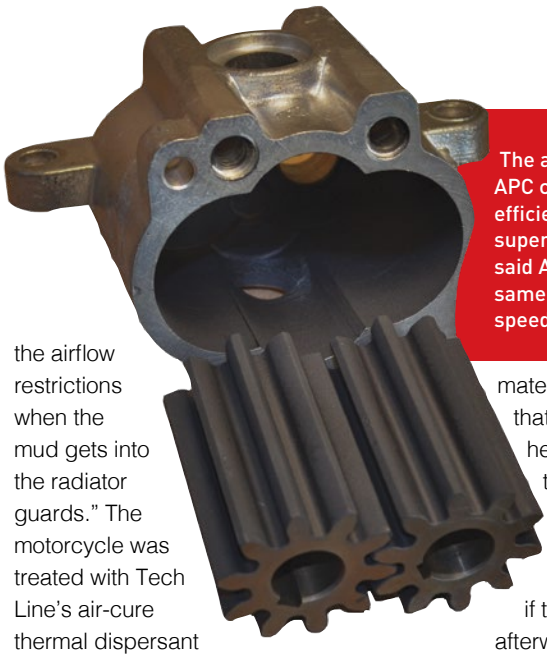
"ONCE SOMEBODY STARTS TO SEE WHAT YOU CAN GAIN IN PERFORMANCE AND DURABILITY, IT'S HARD TO GET AWAY FROM COATINGS."

Line2Line Coatings of Clarkston, Michigan, is best known for its abradable powder coatings (APC) for piston skirts and other components. "That's what sets us apart from everybody else," explained Mark Gelstein. "We can put it on heavy, and it will adjust to fit under temperature and under load."

That adjustment process, added Andy Suman, can actually be felt when racers are breaking in the pistons on track. "Sprint car guys will say, 'Oh, you can feel it. At first the motor's kind of tight, but as you do some laps, you can feel it find its fit," he said. "It gets smooth and nice.'"

Sometimes, though, the benefits of a coating can surprise a racer.

"I was working with a friend of mine as he was putting together an off-road racing bike," said Jason Arbogast of Tech Line Coatings, Rutledge, Tennessee. "He mentioned that they wanted to pull some heat out of the engine, because the race that was coming up was going to be a mud race, and that was known to cause havoc on bikes because of



The abrade-to-fit nature of Line2Line's APC coating has improved the efficiency of "oil pumps, turbochargers, superchargers—they're all pumps," said Andy Suman. "If you can create the same amount of boost with a slower rotor speed, then you're saving energy."

the airflow restrictions when the mud gets into the radiator guards." The motorcycle was treated with Tech Line's air-cure thermal dispersant coating "on the engine, radiator, and any other part that would or could see heat."

After the coatings were applied, the rider went out for some test laps but came back quickly, certain that the bike was running hot. "When we asked why, he said because his feet were warmer than normal," Arbogast said. It turned out the bike was not overheating—far from it. "We checked the engine temp, and it was 20-plus degrees cooler. The coating was pulling heat off the engine so well, it was warming up his boots more than he was used to."

That kind of anecdote got us to thinking, were there other unexpected, surprising, or hidden benefits to coating parts?

PISTON COATINGS

Piston coatings fall into two general types: coatings for the piston top and for the piston skirt. Each has a different role to play.

"Ceramic coatings on the top of the piston can greatly enhance flame propagation, so you're burning fuel more effectively. The flame travel is more complete over the top of the piston," explained Benton. "Because of that, some of our guys will, because the flame propagation has been enhanced, reduce the timing slightly, which makes more horsepower."

Piston top coatings also act as a thermal barrier. PolyDyn's ceramic piston top coating is a "synthetic polymer resin-based system that, as it cures, creates a ceramic matrix," Benton said. "Then we add particles to it to reinforce its heat stability. The gold material in the coating is another pigment that adds resiliency." The coating "reflects heat off the top of the piston, so piston temperatures during operation are much, much less than if it wasn't on there. It'll keep from reducing the Brinell hardness of the piston, which, if that occurs, can cause stress cracking afterwards. The coating enhances that stability and structural integrity."

Tucker said the primary purpose of putting a thermal barrier coating on the piston top "is to provide a margin of protection against a bad tune, lean condition, bad fuel, and so on, where an unusual amount of heat is generated. An uncoated piston top could be destroyed or badly damaged if the top was

not coated."

Yet not only will the coated piston run cooler and retain more strength in normal operating conditions, "less heat passes through the coating and into the piston, wrist pin, and bottom end," Tucker added. "Rarely is this such a dramatic change that you would have to make a clearance adjustment, but it is often noticeable enough that the evidence of heat you see on the bottom of the piston is much less or completely eliminated when compared to a piston that does not have our thermal barrier on top of the piston."

Piston skirt coatings, on the other hand, primarily serve to enhance the lubrication

Tech Line Coatings' Jason Arbogast applied thermal dispersant coatings to an off-road racing motorcycle to help cool the engine if it became covered in mud. After a brief test the rider came in worried that the engine was overheating. "The coating was pulling heat off the engine so well, it was warming up his boots more than he was used to," Arbogast said.

How does a coating become a diagnostic tool? Tech Line Coatings offers a colored Ciloxide exhaust coating that darkens when warm and returns to its original color as it cools. Taking a quick glance at the headers will tell a racer if one cylinder isn't firing properly.

between the piston and the cylinder wall, while also providing some thermal protection.

"We primarily use our PC-9 skirt coating to provide a margin of protection against wear, scuffing, and damage that can occur at cold starts, oil starvation, when clearances are off due to a heat surge, or the integrity of the oil film being compromised," said Tucker. "In these situations, our PC-9 skirt coating can help reduce or eliminate damage."

PolyDyn describes its RP skirt coating as "a ceramic-reinforced dry film lubricant with a low affinity for oil." In other words, said Benton, "oil won't stick to the skirt of the piston, so the skirt will ride on the film of oil on the cylinders."

"CERAMIC COATINGS ON THE TOP OF THE PISTON CAN GREATLY ENHANCE FLAME PROPAGATION, SO YOU'RE BURNING FUEL MORE EFFECTIVELY."

Line2Line's abradable piston skirt coatings add to those traits by their ability to find the proper fit in a cylinder bore. "You can open tolerances up a little bit," said Gelstein. "You don't need to be so precise because the coating will take up any of that extra space and will find the ideal fit and then lock it in."

When a piston finds that "ideal fit," it stabilizes in the bore, which has a number of benefits. "You get less oil coming up into the combustion," Suman said. "Oil takes away from the octane rating, so you're more likely to get pre-ignition if the rings are allowing oil to go by. By getting less oil in your combustion, you can advance the timing a little bit."

Also, "stable pistons with uniform oil film thickness move less, rattle less, and do not pierce oil films with impact events as often as standard, uncoated, loose-fitting pistons," Suman added. "Stable pistons also make the rings' job of sealing and survival much easier because they are not getting pounded on

and/or piercing oil films to cause wear, which also creates high friction events. Stable rings stay in better contact with the piston and the bore and therefore improve heat transfer to the bore for a cooler piston."

Gelstein and Suman said they've seen high-powered race applications "get 1.5–3 times the life of uncoated pistons that have lots of secondary motions from poor fit. We also see circle track engines staying together much longer and running more reliably in intense race conditions. In all these cases, if a set of cylinder kits in a multi-cylinder engine stays together longer, the ability to tune the engine improves because the underlying components are not changing as much between passes or races or nights. This means the racer can refine his strategy around the weather and other conditions with better precision."

PUMP COATINGS

The abrade-to-fit nature of Line2Line's APC coating has improved the efficiency of "oil pumps, turbochargers, superchargers—they're all pumps," Suman explained. "If you can create the same amount of boost with a slower rotor speed, then you're saving energy."

"WHEN A RACER KNOWS HE HAS A COATED MOTOR, HE CAN PUSH THE CAR HARDER AND DO THE WHOLE EVENT WITH MORE CONFIDENCE THAN HE'S EVER HAD."

The APC coating on gerotor oil pump gears, for example, helps tighten the clearances beyond what's possible with standard manufacturing practices.

"When you design an oil pump, it has to pump enough oil at the lowest rpm so the engine won't eat itself," Suman pointed out. "But the efficiency of oil pumps is low at low rpm because the clearances have a greater effect when it's spinning slower. There's more time for the fluids to leak backwards." Tightening the clearances "stops those leaks and maintains high pressure at low rpm. Then you can either spin the oil pump slower to save energy or use a smaller capacity pump." Likewise, "if you want to run lightweight oil to save parasitic loss but can't get enough pressure with the lightweight oil because your pump leaks, if you put our coating on that oil pump you can spin it slower with a bigger pulley on it, and you'll still always have enough pressure."

In regard to superchargers, "a lot of the blowers have Nylatron inserts at the tips," Suman noted. "They'll scrub against the factory anodized coatings on the insides of those cases and will wear out. If you put our coatings inside the blowers, the tips last longer, because our coating doesn't eat the Nylatron. So you might get 20 passes instead of 10, and your blower is more consistent again."

EXHAUST COATINGS

Tucker said the primary purpose of Swain Tech's White Lightning exhaust coating is to "keep the heat in the exhaust to keep heat out of the areas that are next to the exhaust—generally the engine bay or near the driver's feet." Excess heat in those areas "can be detrimental to all kinds of parts in the engine bay."

Beyond the protection factor, reducing heat in the engine bay "can reduce intake temperatures, which is one way you can gain power," Tucker added. "Also, more heat kept in the exhaust moves the heat more efficiently through the pipe, so it breathes or scavenges more effectively." It's common for that increased efficiency to result in a power gain, but he pointed out that the increase may not be significant enough to be felt. "Few will have the time and energy to dyno before and after, so we primarily focus on the heat management aspect" of the coating.

As an additional benefit, "over the years, we've often heard many racers, especially drag racers, will have our coating on their exhaust because it is so effective at managing heat that they can work near the exhaust shortly after finishing a run. They

COATING A FORMULA 1 AIRPLANE ENGINE

These engine parts from a Cassutt Formula 1 racing airplane demonstrate the variety of coatings from PolyDyn. "All of these are used in automotive applications as well, on a lot of diesels and everything under the sun," said Carl Benton.

When we spoke with Carl Benton of Polymer Dynamics in Houston, Texas, his technicians were coating engine components for a Cassutt Formula 1 airplane in preparation for the National Championship Air Races in Reno, Nevada. This is a relatively new race discipline for PolyDyn.

"We got involved a couple years ago, showing them how to pick up the speed of the plane," Benton explained. "I'm a nobody with these racers, but all of a sudden everybody wanted my business card because we picked up the speed of this one particular airplane by almost 9 mph. Even with that itty-bitty motor these planes can go as fast as 250 mph." The coatings used on the Cassutt's engine are the same PolyDyn uses in "automotive applications every day."

The bearings are coated with PolyDyn DL, "which stands for dry lubricant. It can work dry, but it's unique in that it has a polymer that creates an affinity for oil. Oil wants to stick to the bearing like concrete."

The crankshaft is coated with PD14 Silver, "which has PTFE in it, a material similar to what you'd find in a frying pan," he continued. "It is a very resilient coating because it is a nylon composite resin-based system. When we compose this coating, we start off with the base system—the actual name is polyamide-imide—then we add nano-aluminum pigment particles for color and abrasion resistance. The PTFE gives it its slippery, non-stick surface. We use the same coating on connecting rods. Oil does not want to stick to that surface. It's the opposite of what's going on the bearings."

The piston tops are coated with PolyDyn HS, a "synthetic polymetric ceramic" that makes the piston stronger by enhancing the dome's structural integrity. It protects the piston from heat and also distributes the heat through the combustion chamber, allowing for more efficient flame travel.

Piston skirts receive PolyDyn RP, "two unique fluoropolymer coatings. The first one put on is a very tenacious coating, ingraining itself into the metal substrate. Then the bearing coating PolyDyn DL goes on top of it, wet-on-wet, so as it starts to cure, the coatings intermingle. The first coating acts as a primer, but it's a dry film lubricant. The second coating has the ability to retain oil on the piston skirt," Benton concluded. *—Drew Hardin*

would not think of doing that without our coating on their exhaust."

Arbogast recalled a story about how one of Tech Line Coatings' exhaust coatings became a diagnostic tool. The company sells a line of red, orange, purple, and blue Ciloxide exhaust coatings that "darken when they get warm and go back to their original color when they cool off," he explained. A customer who didn't fully understand how the coatings responded to heat called to say the coating wasn't working right. "When

he applied the Ciloxide Orange coating and installed the headers on the vehicle, he told us only one of the tubes was staying bright orange. The other tubes were darkening as the engine was idling. When we talked, he realized that the tube that was not darkening was not firing. This color change has helped some with being able to take a quick glance at the headers, and if they all look the same, the engine is firing on all cylinders."

DRIVETRAIN COATINGS

"Once somebody starts to see what you can gain in performance and durability, it's hard to get away from coatings," Benton said. He recalled being contacted by Tim Cole, who worked for TCI. "I knew him from his drag racing days. We used to coat all his stuff." Cole told Benton TCI was having warranty issues with its Powerglide transmissions and thought PolyDyn coatings might help, particularly on one part: the outer pump gear in the front pump. "After doing tons of tests, we reduced their warranty issues company-wide by 97%," Benton said.

But it didn't stop there. "I started getting 1,000–1,500 pump gears every three months from those guys," Benton recalled. "I called TCI and said, 'There ain't no way you're selling that many transmissions.' They weren't, but what they were doing was selling coated front pumps, and the rebuilders were saying, 'These things are next to bullet-proof.' They found a new avenue of business that they would never have explored if it wasn't for the fact that the coating in the front pumps improves the durability so radically."

A coating's thermal-control properties can have benefits beyond the engine compartment. Arbogast said one of Tech Line Coatings' applicators "was looking for ways to help a customer reduce heat on a side-by-side used for off-road racing. We recommended our Thermal Dispersant coating. It was applied to the drive clutch and secondary clutch, and the temps were reduced by about 100 degrees." That made the customer happy, as did this unexpected benefit: "Not only did it remove the heat from the clutch system, cleaning it was easier as well. The coating has a hydrophobic property to it which, when it would get wet or muddy, would fling off the water and mud faster."

THE SECRET WEAPON

Beyond all these tangible benefits of performance parts coatings, Benton touched on an unexpected advantage he's seen over the years.

"When you tell a racer he has a secret weapon that most likely nobody else at the track has, it makes a psychological difference that shows up at the track. When a racer knows he has a coated motor, he can push the car harder and do the whole event with more confidence than he's ever had." Benton cited drivers he's worked with, including Rusty Wallace during his 1989 NASCAR Winston Cup Championship year and "something like 18 championships" won by Steve Kinser, all due, in part, to PolyDyn coatings. "Steve realized he could push his car harder than anything, and overheating the motor wasn't an issue.

"Short-track guys, and stock and super stock racers, because they have to run steel rods, we put the oil-shedding polymer coating on the rods and cranks, and the rpm is so much smoother and quicker," Benton said. "All of a sudden, you know you've got an edge."

Even Benton's son has benefited from the secret weapon. "My son had a NASCAR late model for about a year, and his first time out, here he is a rookie, and he said, 'Dang, Dad, everybody out there is slow. I can jump on any of them.'

"They do feel it. And they didn't know they could feel something like that." PRI

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MEMBER CHECK-IN

BLUEPRINT ENGINES

With a vast product line, extensive in-house engineering, and a deep commitment to quality, BluePrint Engines enjoys strong present-day success and eyes an even more promising future.

By David Bellm

It might not seem like racing engines and industrial engines have much in common, but BluePrint Engines has turned this combination into a recipe for success that has spanned more than 40 years. Founded in 1982 by second-generation racer Norris Marshall, this Kearney, Nebraska-based company has steadily grown into one of the world's largest builders of performance crate engines.

BluePrint currently offers more than 300 different combinations of GM, Ford, and Chrysler crate engines, with carbureted, fuel-injected, and supercharged versions ranging from 300 to 1,015 horsepower. Alongside this wide assortment of automotive performance engines, the company's Origin Engines division focuses on engines for generators, mobile equipment, agricultural implements, and other industrial applications.

Although both divisions have separate product lines, a recent cross-pollination between the two sides of the company has fired the imagination of racers and enthusiasts, creating a buzz of excitement at the 2022 PRI Show. The project began with Origin Engines' proprietary 3.6-liter four-cylinder engine, which was originally designed for steady low-rpm use in industrial equipment. But then BluePrint refitted it with a single aluminum LS head, along with some other performance tweaks. The result is a tough, compact engine capable of 340 hp and 500 lb.-ft. of torque with a turbocharger.

"WE'RE ALWAYS LOOKING FOR WAYS TO SERVE NEW MARKETS, SPECIFICALLY IN RACING."

It was all in a day's work for BluePrint, which engineers and manufactures many of its crate-engine parts in-house, including a Chrysler Gen III Hemi block currently in development. This self-sufficient mindset contributes to the company's ongoing efficiency, with 220 employees shipping approximately 50 crate engines and 30 industrial powerplants every day from BluePrint/Origin's 230,000-square-foot plant.

In addition, the ability to engineer components within the company helps mitigate supply-chain challenges. Between the two divisions, there are approximately 1,500 key parts the company has engineered or re-engineered, largely freeing it from dependence on outside suppliers for many critical components.

Along the way, Marketing Manager John Chrise has seen BluePrint grow by leaps and bounds, while contributing significantly to the company's good fortunes. Although he's only been with BluePrint as an employee since September 2022, he's been helping the company thrive and expand for decades. "I used to run a small marketing and advertising firm, and BluePrint was one of my clients," recounted Chrise. "Eventually, I sold my partnership in the agency, but I made a stipulation that I took BluePrint with me. As an enthusiast myself, it was the only client that I was interested in servicing. Then, in the summer of 2022, the company asked me to come on inside. So I've been doing work for them for 20 years."

"PRI really helps us take the pulse of what's going on in the professional race industry," said John Chrise of BluePrint Engines, a PRI Founding Member. "It gives us a lot of insight, ideas, and strategies on which to enter into some of these fields."

To build the BluePrint brand and drive sales, Chrise and his team rely on a wide array of contemporary marketing methods. But he said it's all ultimately built on the quality of the products themselves and the satisfaction they bring customers. "One-hundred percent of our success comes from the reputation for dependability that we've achieved over the years."

Throughout Chrise's involvement with the company, PRI has been a vital ingredient in reaching potential customers in motorsports and automotive-performance market segments. It has proven to be an indispensable tool for understanding where the company's customer base is going and what resonates with them the most. "This whole community is so diverse," observed Chrise. "PRI really helps us take the pulse of what's going on in the professional race industry. It gives us a lot of insight, ideas, and strategies on which to enter into some of these fields."

Given the many benefits the company gets from being involved with PRI, it was a natural step to join as a Founding

John Chrise and his team at BluePrint Engines utilize a wide array of contemporary marketing methods, a campaign ultimately built on product quality and customer satisfaction. "One-hundred percent of our success comes from the reputation for dependability that we've achieved over the years," he said.

Member. Further deepening the company's commitment to the organization, CEO Norris Marshall also heads the SEMA Political Action Committee and serves as a member of the SEMA board of directors. "Norris is a true believer in the whole industry and loves it," noted Chrise. "He gets really passionate about anything that he serves on. So he's a great catalyst."

"IT'S AN INDUSTRY CONSTANTLY ON THE RISE, AND THERE REALLY ISN'T ANY END IN SIGHT."

With a relentless approach to quality, an innovative spirit, and the drive to continually excel, BluePrint engines is enjoying the kind of success that characterizes the best in PRI Members. As this is being written, the company is about to build its 400,000th engine and is considering doubling the size of its plant to allow continued expansion of the business.

"We're always looking for ways to serve new markets, specifically in racing," said Chrise. "And we have a lot of market segments we still really haven't touched yet. It's an industry constantly on the rise, and there really isn't any end in sight." PRI

PRI TECH

FUEL SYSTEM STRATEGIES

The determining factors that are most important when putting together a fuel system.

By Brett Clow

The racing and street-performance landscapes are starting to look quite similar these days, especially when considering engine power and fuel-system setups. The same fuel pump or turbo may be used on a restomod Chevelle or an X275 doorslammer. There is a definite blurring of the lines between street and strip performance.

Among the reasons for this is the increased popularity of drag-and-drive events along with the tremendous amounts of horsepower we're seeing in no-prep and small-tire classes at the drag strip. Few rules are holding back engine builders in these events, which means as the power levels increase, more attention must be focused on the fuel system. However, it is becoming more challenging to design a system that works both on the track and the street.

From the calls I get, at least 30–40% have a race car they want to drive on the street. Or they have a street car that they want to race at the track, and they want to run fast, real fast!

When I started with Aeromotive 22 years ago, the A1000 was the creme

"AS THE POWER LEVELS INCREASE, MORE ATTENTION MUST BE FOCUSED ON THE FUEL SYSTEM."

de la creme for an electric EFI fuel pump. There was nothing else out there that could compare. It was a 1,000-hp fuel pump. At that time, that was the dream: to own and drive a 1,000-hp street car.

Today, we're getting to the point where if a person calls in and they're not claiming to make 1,000 hp in a street car, it's almost a surprise. It just seems like everyone is either making 1,000 hp now or planning to in the near future. That has changed everything when it comes to setting up fuel systems in "street cars."

Besides gasoline as a fuel, ethanol/E85 and now even methanol have come into the picture in a big way. That's thrown a big curve at fuel delivery for a multitude of reasons, the least of which is the solvent nature of alcohol fuels (ethanol and methanol). E85 will, in minutes, strip all the shellac from inside of a tank that's held gasoline for years, potentially clogging the first few fuel filters on a new system. Also, the fuel lines and filters become management issues as they must be E85 compatible, and given the strong solvent nature of E85, filters require more frequent service. This is particularly important with big pumps.

Also, E85 requires more volume to make the same power. It's going to take 30% more fuel using E85 to make the same power with gasoline. Methanol requires double the fuel volume of E85 for the same power if that's an option for a particular customer.

Engine builders have few restrictions in drag-and-drive events as well as no-prep and small-tire classes. This blurring of the lines between street and strip performance translates to increased power levels, which requires greater attention to the fuel system.

Brushless fuel pumps are becoming more popular for racers who sometimes drive on the street, as the pump speed can be adjusted by the throttle-position sensor on the EFI system. This Aeromotive in-tank brushless pump can deliver up to 7 gallons of fuel per minute.

NEW TECHNOLOGICAL DEVELOPMENTS

Given the challenge of chemical compatibility, and the additional volume requirements to change to alcohol-based fuels, compounded with the rapid increase in the raw horsepower potential of modern-day engines, we've had to aggressively develop new motor and pumping mechanism technologies, along with special fuel lines and filter media to keep up.

Today, some street/strip or drag-and-drive racers want flex-fuel capability; that is, the option to run any mixture of gasoline and ethanol in the fuel tank. A couple of important points must be acknowledged. First, you need a flex-fuel sensor, and Aeromotive offers a high-flow flex-fuel sensor adapter with a built-in bypass so an OEM-style sensor can be used that would otherwise be too restrictive for the higher flow fuel pumps required to do the job.

Talking about big pumps on street/strip cars, for those who decide to make a significant upgrade in power, and then change to E85 for example, Aeromotive offers inline and in-tank brushless gear pumps rated for crazy flow numbers from 3.5 and 10 GPM (1,250–3,400 flywheel hp). Further, these brushless pumps can include our TVS (True Variable Speed) Brushless Motor Controller technology for continuous duty with reduced recycling and fuel heating in the tank.

We also have mechanical fuel pumps that can deliver from 2–120 GPM, used in almost all forms of motorsports from nitro-burning drag cars to offshore marine, from Indy cars to NASCAR, and everything in between.

But there's more to setting up a complete fuel system than just stepping up to a more powerful pump. The biggest mistake we see people make when upgrading a fuel system for a big increase in power is that they'll change the pump but fail to upgrade the rest of the fuel system to match. That is, they don't understand they'll need bigger fuel lines, bigger filters with more surface area (higher flow capacity and appropriate service life), and a fuel pressure regulator that can handle the big jump in flow volume while keeping pressure under control.

Aeromotive is an engineering company, with a "pump-centric" approach to fuel system design. This means we seek a flow problem to solve, then engineer, design, and test a fuel pump to do the job. That done, we then engineer the ancillary components needed to support that pump, everything from port fittings to fuel filters, fuel lines and hose ends, pressure regulators, and fuel rails or fuel logs. From that we generate the appropriate system diagrams for each pump, showing the correct fuel line sizes, supporting components, and plumbing diagrams, depending on the application. This is a tremendous resource available to anyone on our website, aeromotiveinc.com.

Now, there is a risk of building a fuel system that's too big for an application, so some caution is advised. For example, someone making 1,500 hp on methanol today requires a little more than 7 GPM into the engine. Say sometime in the future the plan is for a new engine combination making 3,000 hp, which would take double that, or 14 GPM. Can you put a 20-gallon-per-minute pump on it now, knowing it will be a year or two before going to a bigger engine? Unfortunately, the answer is no, because it will just run the regulator over trying to bypass the extra 13 GPM the engine isn't able to use today at the lower power level. As a rule, we try to limit the bypass fuel to 7–8 GPM max to install the biggest possible pump for the future but avoid false high fuel pressure under load down-track today.

Excess fuel bypass is also a problem for those who are spending time on the street with a big engine that needs a lot of fuel at WOT, which can easily overheat the fuel in the tank when the engine is at low load on a longer drive. You really have to deal with just how much extra fuel will be recycled and how hot the fuel is going to get in the tank over time.

Here's an example: If there's a 15-gallon tank in a car with a 5.0-GPM pump at full speed, every three minutes all the fuel in the tank goes through the chassis and the engine bay if the tank is full. If the tank is down to half full, every minute-and-a-half all that fuel goes through the chassis and the engine bay. The less fuel in the tank, the higher the frequency of recycle, and the faster the fuel in the tank gains temperature.

Depending on altitude and time of year, the maximum fuel temperature in the tank varies before cavitation and vapor-lock can start. This generally falls between 130 and 145 degrees F. When you cross that threshold, you can easily see hot fuel handling problems occur, including poor drivability and vapor-lock.

The key to avoiding such problems when using large, high-flow pumps is to vary pump speed with engine demand in order to minimize excessive recycling. Aeromotive offers a fuel pump speed controller suitable for use with all of our standard, brush-style fuel pumps, and we offer all of our brushless fuel pumps with an optional TVS, or True Variable Speed controller. This gives the user the flexibility to run a bigger pump for higher horsepower combinations and avoid creating a hot fuel problem.

Our standard pump speed controller uses engine RPM as a reference, whereas our brushless TVS controllers use an analog voltage reference between 0- and 5-volt DC. Typically, a reference off the TPS (throttle-position sensor) is a simple, intuitive way to control pump speed. The input range is technically from .5 to 3.8 volts, so as you move the throttle, the pump speeds up or slows down automatically. Full speed is typically achieved by roughly three-quarter throttle opening.

For maximum fuel-delivery needs, Aeromotive builds mechanical fuel pumps rated at more than 30 GPM. They are used in alcohol and nitro applications, such as Pro Mod, Top Fuel, and Nostalgia Funny Car.

Some engine builders and tuners prefer to control the pump on a load-based strategy. Here we can take a 2- or 3-bar MAP sensor and dedicate that to the fuel pump, and then the pump speed is controlled by manifold pressure.

Another big benefit of using an Aeromotive brushless fuel pump with TVS control is less amperage draw on the electrical system at lower pump speed. As an example, a 10-GPM pump at full speed and 60 psi is drawing 48 to 50 amps. Using a TVS controller, at full slow the current draw drops to 13 amps, while the regulator adapts to the reduced flow, and fuel pressure is unaffected, remaining at 60 psi.

If you're in the pits warming the engine up, or you're driving it in the pits to warm up the driveline, you don't need that pump running at 10 gallons a minute and drawing 50 amps. You're just draining the battery or heating the tank up.

Using our True Variable Speed brushless pumps provides all the flow needed at WOT while being able to reduce the recycle rate and reduce the current draw at idle and low load. PRI

A lifelong hot rodder, Brett Clow has been the Director of Technology at Aeromotive for more than 20 years. He's been tuning fuel injection systems for more than 27 years, and he heads up all of Aeromotive's technical training programs and workshops.

ADVOCACY CORNER

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 several initiatives this month, including a successful and productive gathering of automotive professionals and state lawmakers in California, increased support for internal combustion engine (ICE) technology and sales, and a new tax incentive package that would support aftermarket businesses.

PRI, SEMA HOST SUCCESSFUL CALIFORNIA RALLY

Industry members gathered in Sacramento, California, in early June for the SEMA California Rally, allowing them to network with key lawmakers and advocate for the motorsports and automotive aftermarket industry.

Topics covered during the full-day event included new vehicle technologies, manufacturing tax incentives, and the California Air Resources Board (CARB) executive order process. Attendees also discussed Proposition 65 compliance and the upcoming closure of the Oceano Dunes State Vehicular Recreation Area.

"The motorsports and automotive aftermarket industries face significant challenges, and our voices must be heard. The SEMA California Rally was the perfect place to make your concerns known and advocate for policies supporting our industry's growth and innovation," said Christian Robinson, Senior Director of State Government Affairs and Grassroots for SEMA and PRI.

California Senator Josh Newman (center) visits with attendees of the California Rally.

Assemblywoman Marie Waldron addresses the California Rally.

California Senator Bob Archuleta speaks at the California Rally.

HOUSE COMMITTEE PASSES TAX INCENTIVE PACKAGE TO BENEFIT AFTERMARKET BUSINESSES

The U.S. House of Representatives Ways and Means Committee has passed the PRI-supported American Families and Jobs Act, a legislative package comprised of three bills from Committee Chairman Jason Smith (R-MO): the Tax Cuts for Working Families Act (H.R. 3936), the Small Business Jobs Act (H.R. 3937), and the Build It in America Act (H.R. 3938). The bill includes key provisions that will benefit automotive aftermarket businesses, including a 100% bonus depreciation for qualified property, expanded small business expensing to $2.5 million, and the restoration of immediate expensing for Research and Development (R&D) for tax years 2021 through 2025. The bill would also create full expensing for machines and equipment.

"These policies will provide relief for working families, strengthen small businesses, grow jobs, and protect American innovation and competitiveness," said Committee Chairman Smith.

The American Families and Jobs Act now awaits consideration on the floor of the U.S. House of Representatives.

For more information, including key provisions of the American Families and Jobs Act, contact Tiffany Cipoletti at **tiffanyc@sema.org**.

MORE THAN 175 MEMBERS OF CONGRESS OPPOSE EPA'S PROPOSED EMISSIONS STANDARDS

A total of 177 U.S. Senators and U.S. Representatives signed letters directed to U.S. Environmental Protection Agency (EPA) Administrator Michael Regan urging him to rescind the agency's proposed emissions standards for light- and medium-duty vehicles and heavy-duty trucks. U.S. House Energy and Commerce Committee Chairwoman Cathy McMorris Rodgers (R-WA) and U.S. Senate Environment and Public Works Committee Ranking Member Shelley Moore Capito (R-WV) sent letters pushing back on the EPA's tailpipe emissions rule that would essentially put an end to the internal combustion engine (ICE) through this proposal. PRI and SEMA thank Chairwoman McMorris Rodgers and Ranking Member Capito for their leadership in opposing the EPA's draft multipollutant rulemaking for model years 2027–2032 vehicles. If finalized, the EPA estimates the rule would lead to electric vehicles (EVs) making up two-thirds of new passenger vehicles sold in the United States by 2032.

Congressional Republican members have come out in strong opposition to the EPA's proposed rulemaking, as a supermajority of both the House and Senate Republican Caucus signed on Rep. McMorris Rodgers' and Senator Capito's letters opposing the EPA's effort to transition the U.S. motor vehicle fleet away from ICE technology.

"There are many options on the road to zero emissions; it is crucial for government policy to remain technology neutral. The motorsports industry has been built around the internal combustion engine (ICE), although the industry is leading the way in fuel innovations and conversions of old vehicles into new and cleaner technologies," said Eric Snyder, Senior Director of Federal Government Affairs for SEMA and PRI. "Hydrogen and other renewable fuels, including synthetic eFuels, will allow legacy vehicles to operate in a carbon-neutral manner and should have an equal seat at the table."

For more information, visit **sema.org/EPA-Proposed-Greenhouse-Gas-Rules** or contact Tiffany Cipoletti at **tiffanyc@sema.org**. PRI

INDUSTRY NEWS

PRI, SEMA THANK BILL MILLER FOR 16 YEARS OF SERVICE

Bill Miller

The staff, Board of Directors, and volunteer leadership of the Specialty Equipment Market Association (SEMA) and Performance Racing Industry (PRI) would like to thank William "Bill" G. Miller for nearly 16 years of service.

Miller, who moved on from the association as of July 7, has served as senior vice president of operations since 2007, and will provide consulting services through December 2023.

Mike Spagnola, SEMA and PRI president and CEO, stated, "I was fortunate to introduce Bill to SEMA back in 1996, and work with him on a daily basis for the last decade. It is always bittersweet to have someone like Bill leave our team to pursue new opportunities, but we wish him and his family nothing but the best."

During Miller's tenure as senior vice president, the association evolved to meet the challenges and needs of its membership. Working with the SEMA staff and Board, he was integral in helping navigate the association through several challenges and opportunities.

A permanent replacement has not yet been named.

INDUSTRY LEGEND NANCY EDELBROCK, 86

Nancy Edelbrock

Nancy Edelbrock, the wife of Vic Edelbrock Jr., has passed away. She was 86.

Along with raising their three daughters—Camee, Christi, and Carey—Nancy Edelbrock would join Vic at the SEMA Show and at races to promote the company. She was an integral part of Edelbrock, even if she didn't have an official title. Referred to as "the Real Boss" by Vic, she played an essential role in the growth of the iconic Edelbrock brand.

SFI FOUNDATION FOUNDER, SAFETY PIONEER ARNIE KUHNS, 83

Arnie Kuhns

Arnold "Arnie" Kuhns—the motorsports safety pioneer and founder of SFI Foundation—has passed away at age 83. Kuhns was inducted into the SEMA Hall of Fame and the SEMA Motorsports Parts Manufacturers Council (MPMC) Hall of Fame.

During his career, Kuhns served as president of the International Council of Motorsports Sciences (ICMS), and was an active member of the NFPA 610 Committee for Safety at Motorsports Venues and the Association for the Advancement of Automotive Medicine.

NHRA TEAM OWNER CATHI MAYNARD, 65

Cathi Maynard

NHRA team owner Cathi Maynard, 65, has passed away. She was the driving force behind the Maynard family becoming involved in drag racing, first as sponsors in 2021 before forming JCM Racing during the 2022 season, and fans of Tony Schumacher can credit Maynard for his return to full-time competition after a multi-year racing hiatus.

JOHN CONCIALDI, CO-FOUNDER OF AEM, 67

John "JC" Peter Concialdi has passed away at his home in Murrieta, California. He was 67 years old.

Concialdi founded Advanced Engine Management (AEM) in 1987, after his time working at Weber, where he received the first-ever California Air Resources Board (CARB) Executive Order for a performance carburetor. He created the air bypass valve, which received a patent, to solve the potential danger of hydrolock from the increased intake length common with cold air induction piping.

Concialdi was instrumental in the co-development of the first plug-and-play engine management system for race cars, and he designed and developed the first oil-free high-flow air filtration media for the automotive aftermarket (DryFlow).

FORD UNVEILS MUSTANG GT3

Ford has unveiled the Mustang GT3 race car, based on the all-new 2024 Mustang Dark Horse, during a special ceremony as part of this year's 24 Hours of Le Mans.

The automaker also announced plans to enter the GT3 into the iconic endurance race's FIA GT3 category in 2024, along with an entry in the 2024 World Endurance Championship season under Proton Competition.

Multimatic will build and support the GT3s, while M-Sport will assemble the Ford Performance-developed 5.4 L Coyote-based V8 engines.

POWER AUTOMEDIA LAUNCHES 'ELECTRIFIED,' A DIGITAL BRAND FOR ELECTRIC VEHICLES

Power Automedia—the media and automotive digital publishing company in Temecula, California—has announced the official launch of "Electrified," a digital brand focused on electric vehicles (EVs).

"Electrified," available at electrifiedmag.com, is designed to deliver entertaining and informative content to EV enthusiasts worldwide.

NEW MINORITY OWNER AT JOE GIBBS RACING

Joe Gibbs Racing (JGR)—the NASCAR organization with four Cup Series teams, three Xfinity Series teams and an ARCA Series team—has announced a new minority owner. JGR has received a significant investment from Harris Blitzer Sports & Entertainment (HBSE) and Arctos Partners.

Through the investment, Joe Gibbs will also become a limited partner in Harris Blitzer Sports & Entertainment, pending approval by the NBA and the NHL.

INAUGURAL ELECTRIC POWERBOAT RACING SEASON ANNOUNCED

UIM E1 World Championship—the world's first all-electric powerboat racing championship—has unveiled the venues that will host the first-ever racing season beginning in January 2024.

The season will launch in Jeddah, Saudi Arabia, followed by a to-be-determined location in the Middle East, with two events in Venice, Italy. Then, competitors will visit Monaco, followed by Rotterdam, Netherlands.

Teams will race RaceBirds boats near the shore, so fans can view the action from land.

ROBIN MILLER INDUCTED INTO INDIANA BROADCAST PIONEERS HALL OF FAME

Robin Miller

Six Hoosier broadcasters—including the late motorsports journalist Robin Miller—will be inducted into the Indiana Broadcast Pioneers Hall of Fame this fall.

Known nationally to viewers of ESPN, SPEED, and NBC, Miller's career covered more than 50 years, including 30 plus at the Indianapolis Star.

OFF-ROAD MOTORSPORTS HALL OF FAME ANNOUNCES CLASS OF 2023

Officials with the Off-Road Motorsports Hall of Fame (ORMHOF)—based in Reno, Nevada—have announced its class of 2023 includes Jeff Cummings, Scott Douglas, Evan Evans, Helen Fields, Scot Harden, Mary McGee, Tommy Morris, Lee Sieck, and Russ Wernimont.

The class will be celebrated on September 9, at the South Point Hotel Casino & Spa in Las Vegas, Nevada.

DARLINGTON RACEWAY PRESIDENT KERRY THARP TO RETIRE AFTER 2023

Officials with NASCAR and Darlington Raceway—the NASCAR "Track Too Tough to Tame" in Darlington, South Carolina—have announced track president Kerry Tharp will retire at the end of the 2023 season following the Cook Out Southern 500 during Labor Day weekend.

MARK GRAIN APPOINTED AS EXTREME E TECHNICAL DIRECTOR

Officials with Extreme E—the off-road racing series featuring electric SUVs and founded by the same team behind Formula E—have announced the appointment of Mark Grain in the newly created role of technical director.

Grain's arrival coincides with the upcoming launch of Extreme H, set to be the world's first hydrogen motorsports championship.

AAM GROUP BOOSTS ENGINE PRO TEAM

The AAM Group—the automotive aftermarket program distribution group and specialty marketing firm based in Piney Flats, Tennessee—has announced the hiring of Alan Stevenson to the position of product manager and the promotion of Steven Perrotta to the position of marketing leader.

ROB MARSHALL TO JOIN MCLAREN FORMULA 1 TEAM

McLaren Racing—the British organization with teams in Formula 1, IndyCar, Formula E, Extreme E, and esports teams—has announced the appointment of Rob Marshall as technical director, Engineering & Design, for its Formula 1 team. He joins after 17 years with Red Bull Racing, most notably as CEO.

Supporting Marshall will be Neil Houldey in the newly created role of deputy technical director, Engineering & Design. The pair will collaborate to assess and establish the highest technical standards required to design winning F1 cars.

Marshall will officially join the team in 2024.

RADFORD RACING SCHOOL ADDS KIM WOLFKILL

Radford Racing School—the premier driving and racing school based in Chandler, Arizona—has named Kim Wolfkill as vice president of sales and marketing.

Wolfkill will manage the sales and marketing functions, and play an active role in creative campaigns, strategic partnerships, special events, group sales, and expanding the school's industry presence.

IHRA ANNOUNCES HOT ROD RACING CLASSIC FOR 2024

The International Hot Rod Association (IHRA)—based in House Springs, Missouri—will debut the IHRA Hot Rod Classic in 2024.

Similar to the Pro-Am races from previous years, teams will compete in Quick Rod, Super Rod, and Hot Rod classics to earn special black and chrome IHRA Ironman trophies.

In addition, a heads-up Real Steel, No-Time class will require an OEM steel shell, steel doors and steel fenders (except those originally fiberglass, which must be factory-original parts). Billet heads and engine blocks are not allowed.

WYOTECH ANNOUNCES IHALL OF FAME CLASS

WyoTech—the US automotive, diesel, and collision trade school based in Laramie, Wyoming—has announced its inaugural Hall of Fame class.

The inaugural WyoTech Hall of Fame Class is (in alphabetical order): John Alonzo, Jessi Combs, Dave Gilley, Levi Green, Zeth Key, and Randy Svalina. PRI

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

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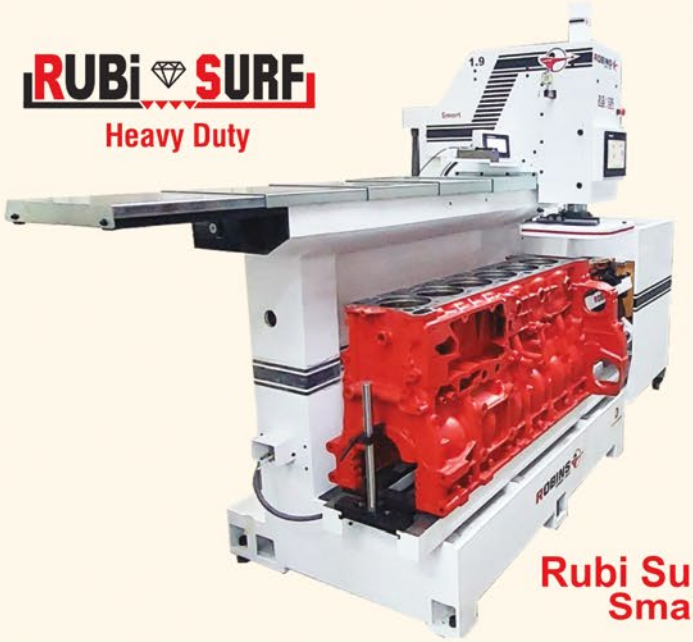
Heavy Duty



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Caterpillar C15
Cylinder Head

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RUBI SURF 1.9 SPECIFICATIONS

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

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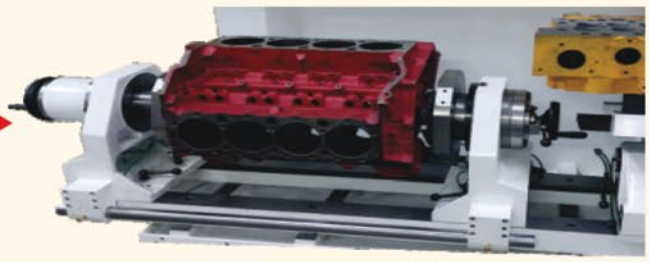

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ATI PERFORMANCE PRODUCTS

atiracing.com

ATI's American-made, OEM-style pressure regulator valve for Powerglide valve bodies are designed to work with OEM mating parts with no modifications. This part will help save users from having to reuse or look for commonly worn-out parts in their performance Powerglide builds.

Contact: 866-203-5094

ERSON CAMS

pbm-erson.com

New Erson valves are designed for high-performance diesel applications. Intake valves are made from 21-4N stainless alloy and exhaust valves are Inconel alloy with a stellite facing for maximum durability under the extreme heat and stress produced by turbocharged and supercharged diesel engines. All valves feature full machined heads with swirl polished stems for increased flow and consistency and are fully nitrided to increase strength.

Contact: 800-641-7920

KC HILITES

kchilites.com

The Roof Mounted Gravity LED Pro6 Light Bar Kit is specifically designed for the Polaris RZR Turbo R and Polaris RZR Pro XP vehicles. This bolt-on kit delivers output of 13,800 raw lumens, providing long-distance visibility and safety for off-road racing. It's constructed with aircraft-grade aluminum housings and shatterproof polycarbonate lenses. Additionally, the IP68-rated seals protect the system from dust, dirt, and water.

Contact: 888-689-5955

NEW VINTAGE USA

newvintageusa.com

New Vintage USA has rolled out a line of aftermarket gauge kits for 1972–2001 Dodge trucks. Builders can choose from a wide range of styles to fit the theme of their build while updating the functions to modern OE electronics. LED lighting, performance timers, and built-in indicators are a few features. This direct-drive system not only reduces wiring by 75%, but also can be incorporated with any engine/trans/PCM combination including diesel.

Contact: 248-850-5482

PACIFIC PERFORMANCE ENGINEERING

ppepower.com

PPE's cast iron cylinder heads are an upgrade for the Duramax engine. Cast from high-quality alloyed grey iron, these heads offer elevated fatigue strength, heat, and creep resistance. The denser and stiffer material properties from the cast-iron construction also reduce engine clatter. PPE valves are made of superior materials and are fully nitrided

Contact: 725-238-2002

WEIGH SAFE

weigh-safe.com

The 180 Hitch offers users the ability to quickly change from a 2-inch tow ball to a 2 5/16-inch by removing the dual-pin lock, sliding the head off the drawbar, rotating it 180 degrees, and locking it back into place at the desired height.

Contact: 801-820-7020

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 engagement.

Turn 14 Distribution's approach to social media is to "generate mutually beneficial content for T14 and its partners," noted Kyle Crawford, digital media manager, of the Horsham, Pennsylvania, distribution powerhouse. This month, we're going to take a deeper look at how the company implements its strategy.

The platforms utilized by T14 include Facebook, Instagram, YouTube, and TikTok. "Before we start a page for our brand, we analyze the potential benefit of having a presence on that social media platform. If there is a perceived or untapped benefit to us and our partners, we'll shape how we generate material for said platform," Crawford explained.

T14 has a team of industry insiders with varying segment focuses, backgrounds, and years of experience to help develop campaigns. "We each bring something unique to the table and follow two base objectives to shape each message we share," he said.

When it comes to content, the company focuses on two main avenues of material. "Promoting employee life at Turn 14 Distribution: This content highlights T14 as an aspirational brand with specialized automotive knowledge while ensuring it's still viewed as a regular business filled with real people and non-automotive-based career opportunities.

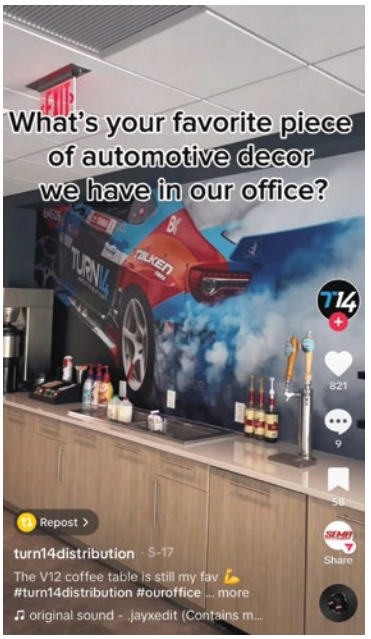
"Partner showcases: These posts include any news involving vendor brands or products we distribute, an activation that Turn 14 Distribution created or exhibited within, and notable general items from the automotive industry we all enjoy," Crawford explained.

He pointed out that "while the first avenue targets talent acquisition and prospective applicants, the second is intended to be digested by our six market segments (Domestic Performance, European Performance, Truck Accessories, Modern Performance, Truck & Off-Road Performance, and Hybrid & EV Performance). With a vast product range and customer base, we prioritize consistent posts that appeal to as many segments as possible without lacking in others."

One social media tip from the talented T14 team is to post with a purpose. Crawford noted, "Considering the influx of content at anyone's fingertips, standing out is a challenge. Couple that with the notion that humans are inherently lazy, and conversion from social media to a website becomes much more difficult. To battle this, be direct, make your message as clear and concise as possible, and focus on why you're posting in the first place."

Additionally, details matter. "Whether that's the media you choose for a particular post or carefully crafting the first line of your caption to attract a second glance, don't overlook the importance of details," he added.

Different brands have different social media objectives. Once you've established your goals, get creative, build a strategy, be consistent, and post with intention. PRI



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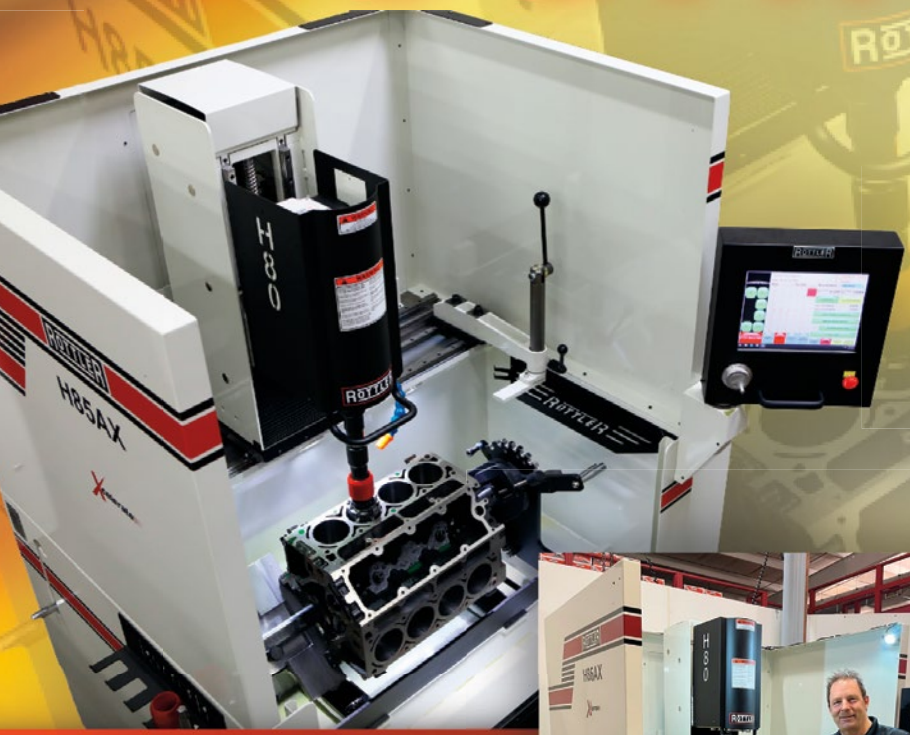

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