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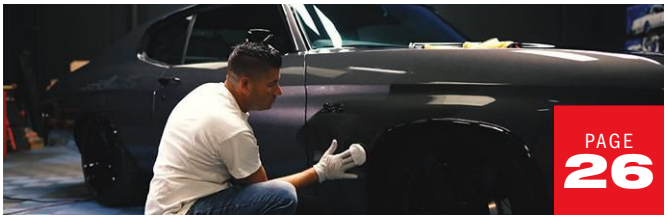
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Whether at the track or on the trail, the proper shock setup provides the stability, control and safety customers seek. Add in specialized tasks such as towing or hauling, and it's no wonder drivers often turn to the pros for advice and installation. *See article on page 58.* (Photo courtesy Rancho Suspension; inset photo courtesy XPEL.)

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Jef White
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Weapons to Fight Catalytic Converter Thefts

The recycled materials industry is tired of being defined by catalytic converter thefts.

In response, the Institute of Scrap Recycling Industry (ISRI) is calling on Congress and state legislatures to pass stronger laws to help curb thefts of the emissions control devices while supporting the legal recycling of catalytic converters as a renewable source of finite critical minerals.

"The recycled materials industry has a history of working with law enforcement and local authorities to help combat metals theft, including catalytic converters," says Robin Wiener, ISRI president. "We are urging lawmakers, at both federal and state levels, to consider taking action to help reduce these crimes, which are impacting consumers and recycling facilities, where thefts are becoming all too frequent. In states where similar legislative principles have been put in effect, we have seen positive results."

The group reports more than 30 million catalytic converters are legally recycled every year—mainly through the recycling of end-of-life automobiles.

Converters contain critical minerals the Department of Interior deems essential to America's national and economic security, ISRI adds. The materials are used in making electronics, new converters, catalysts, medical devices and other consumer products.

ISRI's call to action includes:

- ***Identification & National Registry for Catalytic Converters.*** The group supports the marking and tracking through state and national registries of attached and functioning catalytic converters. This would involve marking the devices with an identifying number in a permanent manner at the time of initial sale of the vehicle.
- ***Proof of Legitimacy.*** The group requests rules that restrict possession of detached catalytic converters or catalytic converter substrates to those who should reasonably be in possession through their normal course of business, or individuals who can provide proof of legitimate ownership.
- ***Recordkeeping.*** The group encourages recordkeeping for all purchases of detached catalytic converters. Records would be required for individual and business-to-business transactions, to include the date of sale, the entities involved in the sale and the volume of converters sold.

The policy recommendations came from member volunteers working in ISRI's Catalytic Converter Theft Working Group, which was established in 2020 when America began seeing a sharp increase in converter thefts. The group believes its suggested action items would help reduce or eliminate the black-market points of entry for the stolen goods.

"Metal recyclers want to stop these crimes, which are impacting not just consumers but also recycled metals companies falling victim to these thieves," says Steve Levetan, executive vice president of Atlanta-based Pull-A-Part LLC and chairman of the working group. "Second, we wanted to leverage the industry expertise to craft solutions that have been proven to bring real results to stopping this type of crime. We owe it to our communities to take action, and that's exactly what we are doing in state after state."

More information is available at scraptheftalert.com. ***TS***

THE SHOP

EDITORIAL

EXECUTIVE EDITOR: Jennifer King
jdking@cahabamedia.com

EDITOR: Jef White
jwhite@cahabamedia.com

MANAGING EDITOR: A.J. Hecht
ahecht@cahabamedia.com

CONTRIBUTING WRITERS:
John Carollo, Lukas Kinigadner, Mike Mavrigian, Phillip M. Perry, Tony Thacker

CREATIVE SERVICES

ART DIRECTOR: Elizabeth Chick

DIGITAL PROJECT MANAGER: Greg Ragsdale

WEB DEVELOPER: Greg Caudle

CIRCULATION

SUBSCRIPTION CHANGES & INQUIRIES:
theshopmag@omeda.com

ADVERTISING

ASSOCIATE PUBLISHER: Stacy Marshall
smarshall@cahabamedia.com

SENIOR ACCOUNT EXECUTIVE: Wendy Miles
wmiles@cahabamedia.com

CLIENT SERVICES COORDINATOR:
Presley Dean
pdean@cahabamedia.com

CAHABA MEDIA GROUP

PUBLISHER: Matthew G. Conroy
VP OF SALES: Greg Meineke
DIRECTOR OF FINANCE: Brandon Whittemore
DIRECTOR OF OPERATIONS: Laurie Tisdale

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HOW TO RECESSION-PROOF YOUR BUSINESS

Take steps now to stay strong.

By Phillip M. Perry

The business world is teetering on the edge of a recession.

"We are seeing evidence that the economy is slowing down," says Anirban Basu, chairman and CEO of Sage Policy Group. "Retail sales and industrial production are falling. Layoffs are occurring at companies such as Microsoft, Peloton, Twitter and Amazon."

Moody's Analytics estimates an increase of only 1.7% in Gross Domestic Product (GDP) when 2022 numbers are finally tallied. That represents a noticeable deceleration from the 5.9% post-pandemic rebound of the previous year.

If 2023 brings an actual decline in GDP—the total of all goods and services transacted in the nation—that will represent the first U.S. recession since 2008.

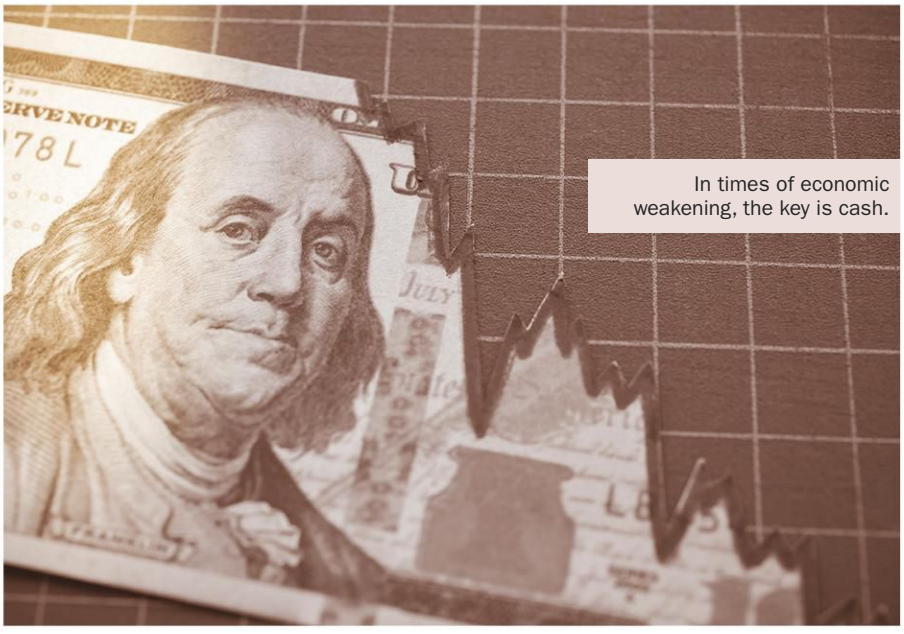
The not-so-secret force driving the economic crisis is the Federal Reserve's moves to raise interest rates—a proven cure for inflation that, unfortunately, also dampens business growth.

Recessions tend to gain force quickly once they begin, as commercial enterprises shift from chasing demand to cutting costs. History shows that organizations taking swift remedial actions rebound faster once hard times recede.

TAKE STOCK

What are the best managerial moves in the face of a recession? The answers can be tricky.

The current recession is more complex than usual, with businesses getting



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QUIZ: ARE YOU PREPARED FOR A RECESSION?

Is your business well-positioned to handle a recession? Find out by scoring 10 points for every "yes" answer to the following questions. Total your score and check your rating at the bottom of the sidebar.

- Have you examined internal operations and shored up underperforming business segments?
- Have you taken a fresh look at accounts receivable and contacted late-paying customers?
- Have you ranked your customers in terms of qualities such as sales volume, term flexibility and loyalty?
- Have you re-bundled goods and services to better meet the needs of customer segments?
- Have you identified "lazy capital" in underperforming assets such as inventory, vehicles and property?
- Have you identified fixed assets that can be converted to variable ones?
- Have you looked at each variable cost with the idea of reducing its impact on the bottom line?
- Have you invited your employees to contribute ideas for increasing profits in recessionary times?
- Have you reached out to your banker to explore more favorable financing terms?
- Are you monitoring the activity of competitors to spot new market opportunities?

What's your score? 80 or more: Congratulations. You have gone a long way toward buffering your business against the ravages of a recession. Between 60 and 80: It's time to retool your operations to prepare for a downturn. Below 60: Your business is at risk. Take action on the suggestions in the accompanying article.

squeezed from two directions:

- On the revenue side, a decline in receipts means less cash to cover expenses
- On the cost side, increasing prices are punching up operating expenses

"Over the past six months or so we have seen a rise in the cost of materials and delays in construction and customer payments," says Josef Roberts, founder of E Squared Consulting in Atlanta. "Distributors and dealers are buying materials that are much more expensive than before. And delayed receipts are exerting their own pressures. The result is a cash squeeze."

For businesses, this unusual dynamic has created a treacherous operating terrain.

"A recession is much more dangerous when it is combined with inflation, since prices are going up at the same time that revenues are coming down," says Oded Koenigsberg, deputy dean at the London Business School.

TURN INWARD

Consultants advise one course of action that will likely pay off—casting a bright light on internal operations.

"Now is the time to get under the hood and examine the individual components of a business," says Travis W. Harms, president of Mercer Capital. "Inefficiencies have almost certainly arisen during the post-pandemic boom. When times are good, managers tend to focus externally on generating revenues and delivering on obligations. It's all too easy to let operations get a little bit flabby. Then, when the tide goes out, problems are exposed."

No matter what the current condition of a business, a sharp eye will spot one or two internal segments clouding the overall picture. While the knee-jerk reaction to this is to cut costs, that too often dampens future profits.

"When the economy turns down and companies lack sufficient cash, they all of a sudden are tempted to let go of core assets they really should hold onto for the long run," says Basu. "The temptation is to cut too deeply."

A better course is to analyze the dynamics of any problem segments, then adjust to enhance profitability. Only if they seem unsavable should they be eliminated.

COLLECT RECEIVABLES

Another important step is to raise operating revenue. "In a time of economic weakening, the key is cash," says Basu. "Cash can get you through anything."

While there are many ways to raise cash, the balance sheet can offer some especially fertile ground. Accelerating the sale of stale inventory and extending accounts



The business world is teetering on the edge of a recession.

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Recessions tend to gain force quickly once they begin.

payable are proven tactics.

The most effective step is to accelerate the collection of accounts receivable, notes Harms. "Start calling folks who are past due."

Reaching out to customers can bring a side benefit, adds Sam Brownell, founder of Stratus Wealth Advisors. It helps build better relationships.

"You get to know people a little bit better, and maybe you can work something out with them that strengthens your relationship going forward."

One proven tactic is to repackage goods and services into bundles more closely aligned with customer needs.

"There are very few products and services that come as-is, without being part of a bundle," says Koenigsberg. "When we buy an airline ticket, we get not just transportation but also food, baggage handling, and service on the plane and in the terminal."

The same goes for aftermarket products and services. Can longer lead times be exchanged for lower prices for customers in need of discounts? Or free delivery for long-term purchase agreements?

Not all customers are created equal. Now is the time to assess the profitability of each one individually.

"Especially when heading into a recession, it's important to rank your customers in terms of quality factors," says Brownell. "We suggest making a list of customers in an Excel spreadsheet. Then start asking questions about each and rating them in columns."

Brownell suggests asking questions like these:

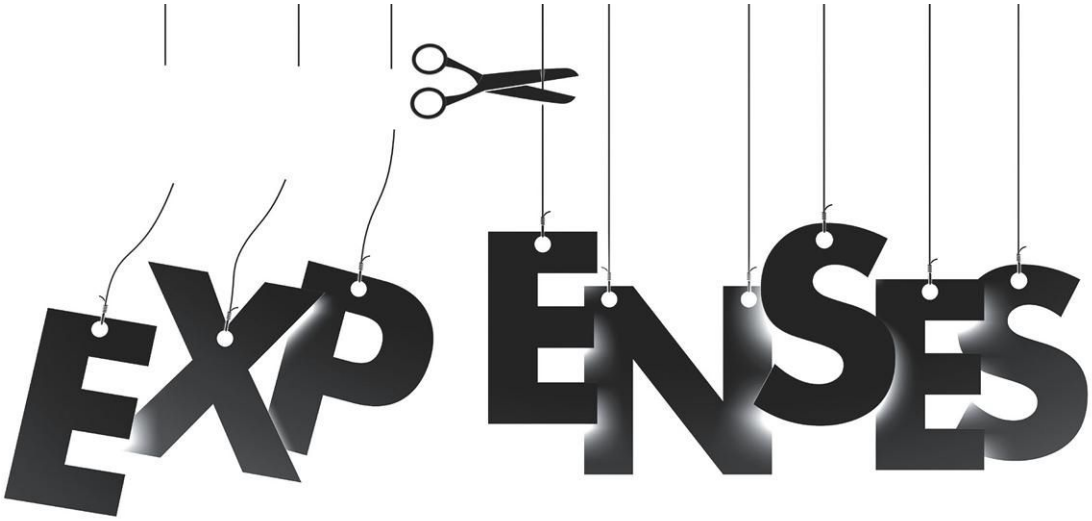
- Which tie up the least number of resources?
- Which are willing to be flexible if, for example, supply chain disruptions mean they can't get exactly what they need?
- Which are the most loyal and pay on time?
- Which are the most price-sensitive?

Rate each customer from 1-to-10 on each factor. Then figure out how to do more business with the customers who get the highest scores.

CUT EXPENSES

Underperforming fixed assets can be another source of funds.

"It's not uncommon for a business to





A recession is much more dangerous when it is combined with inflation since prices are going up while revenues are coming down.

accumulate non-operating assets during good times," says Harms.

Examples include vehicles, inventory, property and equipment such as forklifts.

"See if you have some stuff sitting in the back tying up capital, along with requiring payments for licensing and insurance and fuel," says Harms. "Maybe it's time to sell it."

While cutting too deeply can harm a company, some attention must be paid to reducing expenses that have been allowed to grow too high during good times.

"It's good to focus not just on the amount of expenses, but also the structure of your





Take a holistic look at your employees to make sure you've got the right people in the right places.

expense base," says Harms. "Are your costs primarily fixed or variable? If it's the former, that is supportable when things are going well, but a recession is an opportunity to reconsider. Can you convert some fixed costs into variable ones, reducing your expense base accordingly?"

One example, says Harms, is real estate.

"Do you have long-term leases you may not need? Is there a way for you to adapt a more flexible approach where you're not being locked so much into long-term payments?"

Renegotiating may mean more expense in the short run, but more management flexibility later.

RETAIN TOP PERFORMERS

Brownell suggests taking a holistic look at your employees to make sure you've got the right people in the right places, and identify which ones are critical to your business operations.

"Who are your vital cogs? Who could you not get along without? Who are the people who can perform cross-discipline tasks in the event of a reduction in force?" he asks.

"Those are the people you want to shore up now. Make sure they feel valued and know that you're going to stick with them."

It's more important than ever to retain your A players in this tight labor market, experts agree.

> Now is the time to examine the individual components of your business.

"Given the talent crunch and the changing demographics, it's really important to secure your talent base," says Palisin. "Retention has been an ongoing issue for the last couple of years. You need to make sure you have a stable workforce, and that your company culture helps to retain your best people."

Your top employees can be a source of innovation, of new ways of doing things and even of cost savings.

"People on the front lines see things that those in the front office don't," Palisin continues. "So it's important to solicit their ideas, empower them and make sure they have the opportunity to contribute."

Companies can also increase employee loyalty by being very clear on career paths. Provide opportunities for people to find more value in their work and to move forward.

Also, be honest with the challenges the company now faces. Acknowledge that there may be headwinds, and that there may be the need for some sacrifices, including foregoing bonuses or reining in the company credit cards.

"That kind of forward planning will make you feel more in control of the situation, as opposed to just sitting there and getting buffeted by these exogenous economic factors," says Harms.

Prudent companies will also identify underperformers who might be let go when revenues decline.

"During the post-pandemic recovery

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period, many firms staffed up massively in their efforts to chase demand," says Basu. "But some of those workers have not been performing as well as one might have wanted. That's the kind of worker that probably could be let go to help raise cash flow today to preserve fiscal health tomorrow."

CONSULT BANKERS

Tough times can require a fresh outreach to primary lenders.

"Now would be a great time for any business using any type of financing, whether it's longer-term debt or a line of credit, to reach out to their bankers and have a conversation about what can be done in the event of a downturn," says Brownell.

Some questions to explore:

- Can interest rates be locked in?
- Can lines of credit be extended?
- Can monthly payments be reduced?

"The whole idea is to ensure continuing access to capital. You don't want to be surprised by your bank reducing your line of credit because of changes in your P&L," Brownell explains.

Take special care that your changing profit picture does not inadvertently violate the terms of any outstanding loan agreements.

"Maintaining a dialog with existing lenders is critically important in a recession, because some loan document ratios may be affected," warns Palisin. "Bankers need to know where you stand financially and what's going on with your company."

Prudent companies also create a Plan B for funding sources.

"Having alternative sources of financing in place can be helpful to facilitate mergers," says Palisin. "But companies need to do their homework. Some of the alternative financing sources can be expensive, especially in a high interest rate environment."

SPOT OPPORTUNITY

Successful enterprises see economic downturns as opportunities to solidify and increase their market presence.

"Businesses need to focus not only on how to get through a recession, but also on how to be stronger coming out of it," says Harms.

A close look at the competition can uncover opportunities that will strengthen a company over the long term, he adds. Is a competing enterprise abandoning a sector of your market?

Finally, strong shops can take advantage of opportunities to absorb weaker ones, says Palisin.

"For companies with strong cash flows and healthy financial ratios, it can be financially feasible to look into potential mergers and acquisitions."

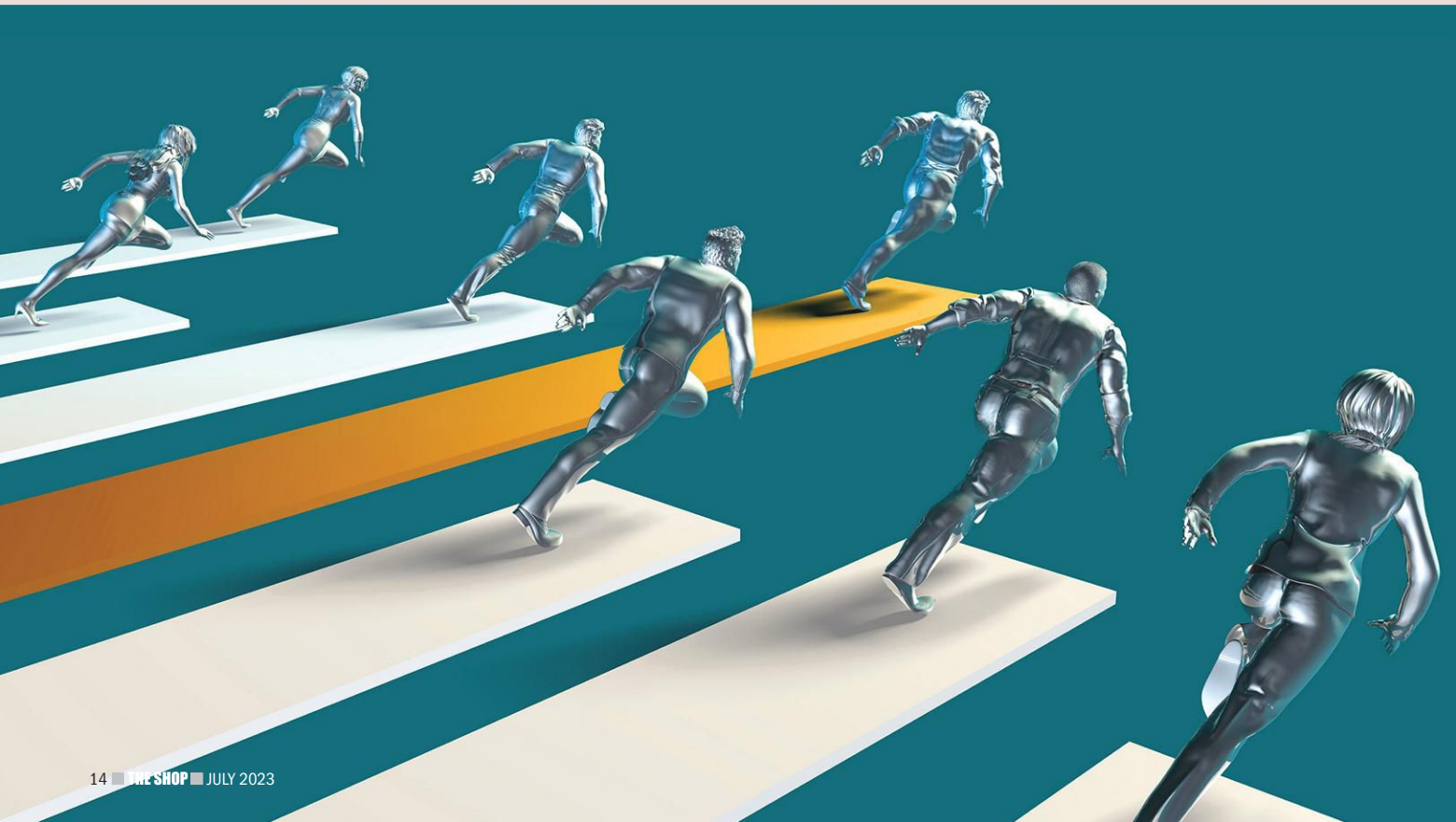
The key to success is to remain healthy during a recession so you can take advantage of the opportunities that arise when the economy recovers, says Roberts.

"The most successful companies in a downturn will be those that execute the best." ***TS***



New York City-based journalist ***PHILLIP M. PERRY*** *publishes widely in the fields of business management and law.*

Successful enterprises see economic downturns as opportunities to solidify and increase their market presence.





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Restyling AFTERMARKET ACCESSORIES

Ceramic Coating p.26 / Adventure Motor Cars p.34 / Tire Maintenance p. 40

APPROACH ANGLES PART II

Aim high with aftermarket bumper sales.

By Jef White

MORE ON THESHOPMAG.COM
Overland Expo's Lindsay Hubley joins the podcast:
bit.ly/in-gear-with-hubley

Editor's note: This is the second in a two-part article highlighting trends and sales techniques related to aftermarket bumpers. Part I appeared in the May 2023 issue of THE SHOP magazine.

When selling aftermarket bumpers, the approach is simple—the products work better, look better and offer a touch of personalization over stock options.

Available for the front and rear of a wide variety of off-road, 4x4 and daily-driver trucks and SUVs, aftermarket bumpers can be further customized with winches, LEDs, shackles and other accessories to keep drivers safe and secure at the jobsite or on the trail.

MAKE ROOM

Aftermarket bumpers are currently very popular, as shown by the number of manufacturers found in the market. Appearance and function are key differentiators.

"This category continues to be overpopulated, so we do our best to combat this by emphasizing key competitive advantages through style, winch and recovery point locations, and built-in accessory mounts," says Fred Brayton, sales manager for ICON Impact Armor.

Competition has resulted in "better designs with more complex curves," says Howard Fullerton, category manager for Quadratec, adding that "every bumper now comes pretty standard with recovery points included."

They are also created to work with today's new vehicle designs and systems, says Ryan Wood, director of marketing for Warrior Products.

"Manufacturers have had to use their



Ensure the fit and function of every bumper you sell. (Photo courtesy Westin Automotive Products)

GROW YOUR BUSINESS

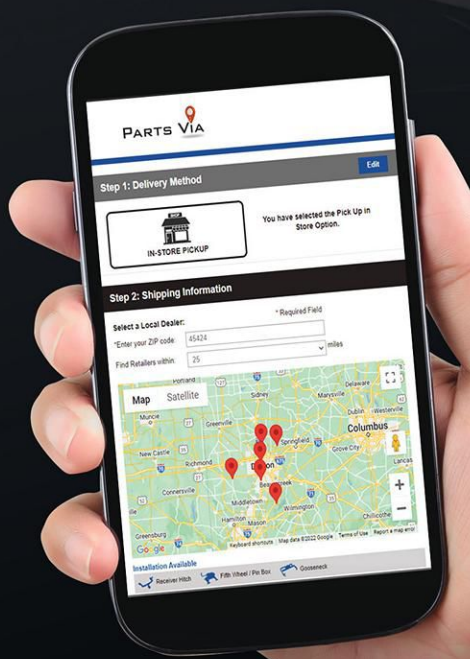
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AFTERMARKET BUMPERS

HOT PRODUCT:
Summit MKII Front Bumper
FEATURES & BENEFITS:
Coming this summer for the new Toyota Tacoma; ultramodern design; strength and quality; integrated styling and fitment; updated fog light design includes a plug-and-play indicator, clearance light, daytime running light and fog light; easy installation.

ARB 4x4 Accessories
Moea Theroux
Marketing Manager

HOT PRODUCTS: BR Series Bumper Replacements & Element Bumpers
FEATURES & BENEFITS:
Offer two different styles of front and rear protection for light- and heavy-duty truck models; OE-approved finish coatings; compatibility with factory ADAS systems; strength and value; Element bumpers ship UPS.

Go Rhino
Dave Williams
Sales Director

HOT PRODUCTS:
Jeep Pro & Comp Series Bumper Lines
FEATURES & BENEFITS:
Front and rear bumpers available for mid- and full-sized trucks and SUVs including 2016-up Toyota Tacoma Sport models and new Ford Broncos; complement factory styling without compromising function; high-clearance; durable steel construction.

ICON Impact Armor
Fred Brayton
Sales Manager

HOT PRODUCT:
QRC JL Bumper
FEATURES & BENEFITS:
Available for Jeep JL models; one-piece construction for durability; two sizes available for stubby or full-width applications.

Quadratec
Howard Fullerton
Category Manager

HOT PRODUCTS:
Midnight Bumper Series
FEATURES & BENEFITS:
Customizable, form-fitted, lightweight designs with modern, futuristic styling, resulting in a sleek, sporty look that's tailored to the truck; fit tightly to the body and deliver a bold stance.

Ranch Hand
Jonathon Matranga
Copywriter

HOT PRODUCT:
Jeep Gladiator MOD Series Rear Bumper
FEATURES & BENEFITS:
Extended tube step provides a stable step surface, an additional layer of protection from trail hazards and added coverage for tailgate-mounted spare tires; built-in off-road jack lift points double as bottle openers for your favorite beverage.

Warrior Products
Ryan Wood
Director of Marketing

HOT PRODUCTS:
Pro-Series Bumper Line
FEATURES & BENEFITS:
Winch-capable upgrade replacements for factory bumpers; accommodate most winch models up to 12,000 pounds; constructed from 10-gauge steel for style and durability; winch mount section made from 4-gauge steel; provisions for factory sensors.

Westin Automotive
Mike Stickney
Director of Sales & Marketing



Suppliers will have answers to your common bumper questions. (Photo courtesy Westin Automotive Products)



Inspiring confidence in a purchase will help close the deal. (Photo courtesy ICON Impact Armor)

expertise to customize and adapt additional modifications to the bumpers to accept the OE sensors," he explains.

Today's products are ready for the latest factory offerings, agrees Mike Stickney, director of sales and marketing for Westin Automotive.

"The addition of sensors, cameras and radar systems has made it increasingly harder to produce bumpers for new vehicles, but staying up to date on the current technologies has made it possible for us to achieve our goal to provide the best bumpers that not only look great but function great as well."

Dave Williams, sales director for Go Rhino, believes the bumper market has made big leaps in the last decade, both in function and design.

"In the beginning, the bulky 'Mad Max' look was the popular style, but those did not work with some OE features, meaning you'd lose functions such as parking sensors," he says.

The trend is now toward more streamlined models that complement the vehicle's bodylines.

"Adding more light mount options and our patented Rhino Hook shackles, as well as incorporating the use of OE sensors and lights was the natural evolution

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APPROACH ANGLES PART II



The latest aftermarket bumpers check all the boxes. (Photo courtesy ARB 4x4 Accessories)

for us," Williams continues. "Now, consumers shouldn't lose any of the features they received with their new truck or Jeep, and they get more functions in a custom-looking package versus OE offerings."

The latest models check all the boxes, agrees Moea Theroux, marketing manager for ARB 4x4 Accessories.

"There's no doubt that sensor technology changed the game and, beyond such advancements, styling integration that makes bumpers fit seamlessly into OE designs has become prevalent."

Versatility is an attractive feature of today's aftermarket bumper designs, notes Jonathon Matranga, copywriter for Ranch Hand, citing the company's Midnight series bumper as an example.

"There have been numerous changes in the aftermarket bumper world in the last decade, from an increase in customization options to improved manufacturing processes and technology," he says. "For this reason, we've increased the customization options on our bumpers to meet the demands of what our customers are requesting, and we've also improved our manufacturing processes."

USEFUL TOOLS

Sometimes shops and staff can be hesitant about offering higher-line products for fear of causing customers sticker shock. However, most buyers do their research in advance and understand the value of getting a product with the features they seek.

"A common mistake is being too focused on price," says Brayton. "A lot of customers have already done their homework and know what they want. Providing product options while speaking to the competitive advantages will help make the sale."

Matranga reveals a common mistake he sees is shops selling bumpers that don't fit the customer's needs.

"Providing excellent customer service and helping the customer through the process—from choosing a bumper to installing it—is the most important part," he says. "A bumper is an investment, and you want the customer to be pleased with their purchase."

But, before you can fit their needs, you must fit their vehicle first, Stickney notes.

"The most common mistake shops make is confirming whether the vehicle has factory sensors or not," he says. "However, we always like to stress double- and triple-checking the make and model of the vehicle receiving the bumper before presenting the product to the customer to ensure it will fit and function properly once installed."

It's a matter of delivering what's required







Aftermarket bumpers are sturdy, stylish additions to any off-road rig. (Photos courtesy Quadratec)

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APPROACH ANGLES PART II







Know the top features and benefits of the aftermarket bumpers you offer. (Photos courtesy ICON Impact Armor)





Versatility is an attractive feature of today's aftermarket bumper designs. (Photos courtesy Ranch Hand)

for the specific application, agrees Wood.

"Consult with the customer to make sure it meets or exceeds their expectations and is a solution for their bumper inquiry," he says.

Options include accessorization opportunities, adds Fullerton.

"Winches and recovery gear are common add-on sales," he notes.

And time on the trail will bring its own necessities, says Theroux.

"Upgrades to protection equipment should go hand in hand with improving suspension," she recommends. "Focus the discussion on the intended vehicle use and take the time to talk through options, making provisions for future accessories such as lighting or a winch."

Back at the shop, understanding the unique installation requirements of individual bumper models can keep work flowing smoothly, Williams says.

"Labor costs are not cheap and a little homework before you throw a new product at an installer could avoid rebellion and unrest in your shop," he reports, noting suppliers are usually available to offer support in different forms. "Many manufacturers have their installation instructions online, so if you



Bumpers should meet or exceed consumer expectations. (Photo courtesy Warrior Products)

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APPROACH ANGLES PART II



Understanding the unique installation requirements of individual bumper models can keep work at the shop flowing smoothly. (Photos courtesy Go Rhino)

know a customer is set on a certain brand of bumper, go to the website and download the installation instructions ahead of time for a dry run. You could save some time on the initial install."

TALK IT UP

Aftermarket bumpers are fun, in-demand products that change a vehicle's appearance and functionality. Be sure to convey that message as part of every sale.

"Learn the products' features and benefits and share them with your consumers," suggests ICON's Brayton. "If a salesperson doesn't know why it's great, then how will the customer? Inspiring confidence in a purchase will help close the deal."

The latest models really do offer practical benefits, says Theroux from ARB 4x4.

"Make sure customers understand that investing in a bumper not only assures occupant safety but prolongs the life of the vehicle itself," she says.

When it comes to promoting the products, nothing beats showroom visibility, says Matranga from Ranch Hand.

"Be sure to put a display in your storefront in clear sight. This lets the customer know that you are a reputable dealer and a source of knowledge. By having a display with helpful pamphlets and information, the customer can get information and then ask you questions when they have them, putting you in the position to help," he says. "If you sell Ranch Hand bumpers, it's also good to have information on your website and social media accounts."

Don't forget available accessories as part of that information transfer, says Warrior's Wood.

"Include the possibility of additional related products that can be added and mounted to bumpers, such as lights, brackets, winches and other recovery equipment."

There's proven power in combining in-demand products in a single transaction, agrees Quadratec's Fullerton.

"Sell packages with winches, lights, recovery gear, etc.," he says.

And if you have questions, seek out suppliers with answers, Stickney advises.

"Lean on quality brands like Westin that will be there throughout the customer experience," he says. "In addition, it's a good practice to make the customer aware of the accessories and other products that are available to them, no matter what vehicle they have."

Building a strong reputation requires consistently meeting customers' individual needs, says Go Rhino's Williams.

"Quality and integrity equal great word of mouth. Truck and Jeep owners talk, post and share online in clubs, reviews, forums, videos and more," he says. "Sell them a good product at a great price and they will bring you more business from family, friends and other club cats and rats they hang with."

He also suggests having products on display for popular off-road models.

"It may seem like a big investment at first, but when word gets out that a shop is educated on a product line and has samples in-house to see and feel, that investment will pay off, time and time again." ***TS***

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DYNAMIC CERAMICS

Enjoy the shine that comes with offering coating services. //////// **By Jef White**



A climate-controlled environment and correct surface preparation are the keys to success when installing ceramic coating. (Photos courtesy Malco Automotive Products)

Customers who view their accessorized vehicles as shining stars will want to keep them looking their best year after year. Enter ceramic coating, a long-term way to preserve and enhance paint finishes that can be offered as a professional service.

Attractive to everyone from race car owners to off-roaders to the Cars & Coffee crowd, the product maintains and highlights the sparkle of custom paint jobs and the sleek sheen of luxury rides while adding an extra layer of protection against the elements.

Whether pitching it to your dealership clients or retail customers, there are some basics to know before you get started. Ceramic coating suppliers are happy to facilitate the introduction.

LAYER OF PROTECTION

To understand what ceramic coating can do for your customers, it may be best to start by defining what it can't do.

Chris Hardy, director of sales, North America, for XPEL, has seen some shops liken the service to the benefits provided by paint protection film. The comparison is not accurate, he explains.

"The greatest tip I can offer is to not oversell it as something it is not," he says. "When you sell coating the way it was intended, you end up with very happy clients. When you claim it will do as much as PPF for a fraction of the price, you are misleading the client, potentially leading to customer concerns."

Ceramic coating will not protect against stone chips or stop scratches or swirl marks from occurring, he notes. But it does provide plenty of attractive benefits.

"It will make the vehicle's paint depth and color pop like a freshly waxed car, only it lasts for years versus days," he says, "and it will allow the vehicle to be cleaned far easier than without ceramic coating."

Shops, of course, will want to set pricing that achieves an acceptable margin. But, even if the target market is affluent dealers or consumers, it's important not to overcharge.

"Be reasonable with your price structure. Ceramic coatings are a luxury, but if you want to tap into the higher-end



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DYNAMIC CERAMICS

CERAMIC COATINGS

HOT PRODUCT:
3M Ceramic Coating
FEATURES & BENEFITS:
Simple coating process; fast-cure formula cures at room temperatures in four hours; 100% active ingredients—no carrier solvent and no strong vapors or odors; low-VOC formula; one formula for multiple surfaces—paint, trim, wheels, PPF and vinyl.

3M
Tim Boxeth
Sr. Marketing Manager

HOT PRODUCT:
EPIC PRO Ceramic Coating System
FEATURES & BENEFITS:
Two coating options specially formulated to offer a superior high-gloss finish, abrasion resistance, ease of cleaning and enhanced UV protection; bonds with the clear coat to create a high level of hydrophobicity; provides a lasting "wet" look.

Malco Automotive Products
Jennifer Bowman
Director of Marketing

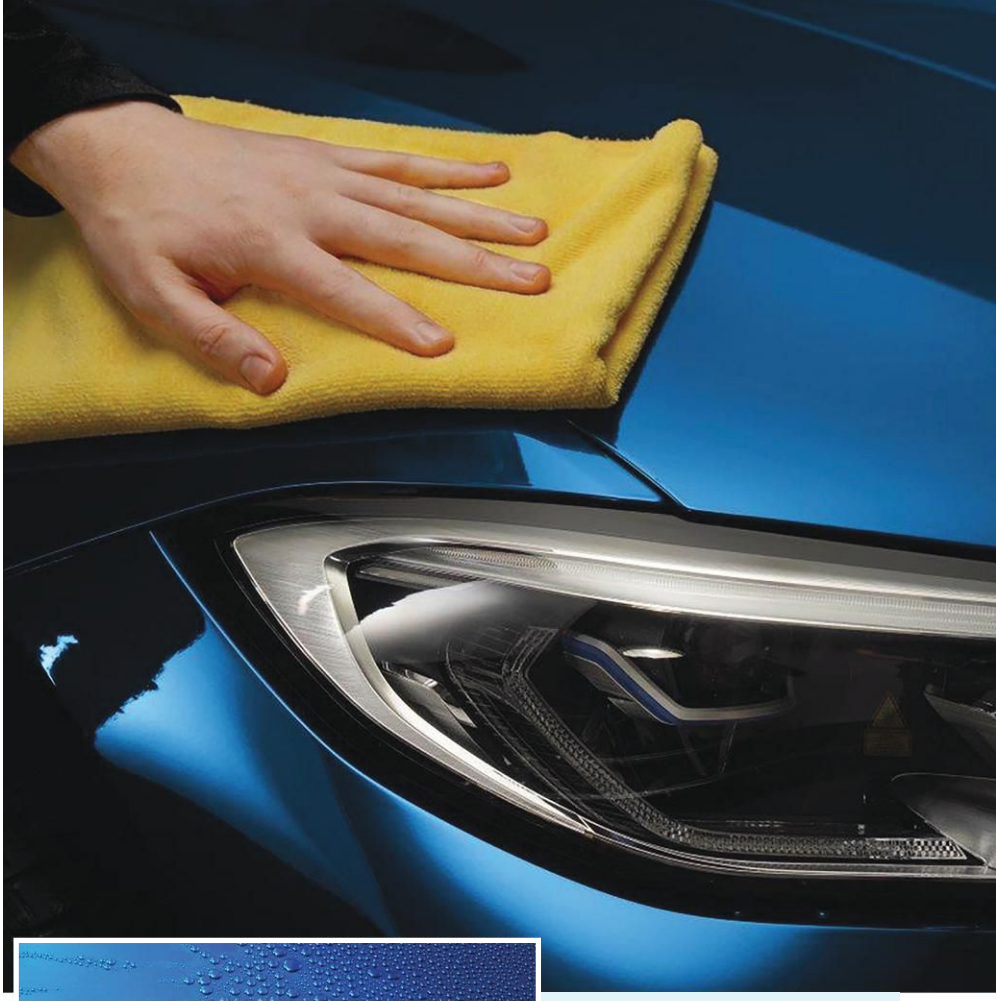
HOT PRODUCT:
System X Max
FEATURES & BENEFITS:
Durable; environmentally resistant; features a stronger, tougher shell up to four-times thicker, two-times stronger and two-times more durable than previous coatings; resists harmful water spotting; super-slick; extremely glossy.

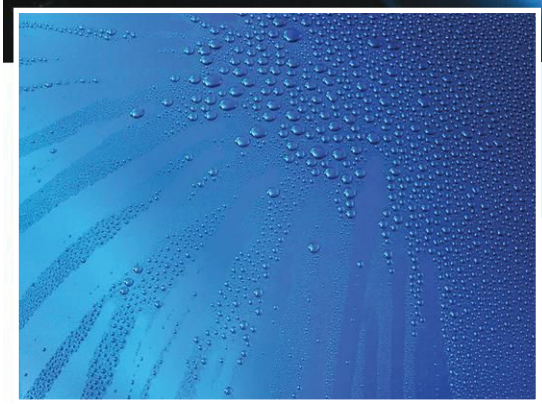
System X
Ryan Jaworski
Marketing Manager

HOT PRODUCT:
XPEL FUSION PLUS PREMIUM
FEATURES & BENEFITS:
Stronger, more durable and longer lasting coating than some of our other offerings; 8-year transferable warranty.

XPEL
Chris Hardy
Director of Sales, North America







It works best to have a clean environment and to apply the coating in temperatures of 60 degrees or above.
(Photos courtesy 3M)

daily driver market, you can't charge luxury prices or customers will be hesitant to make the purchase," warns Jennifer Bowman, director of marketing for Malco Automotive Products.

Instead, she recommends creating package deals that include ceramic coating and related maintenance services.

"Use high-quality products, take the time to prep and install the coating well, and educate your customer on the benefits and performance of ceramic coating," she says.

SETTING UP SHOP

There are a few steps to take before shops can begin delivering professional ceramic coating services to their clients.

"Many providers that offer a professional-grade coating such as XPEL require proper training in both coating and also paint correction," says Hardy. "It is wise to have a dedicated area to do the application, as well as to allow the vehicle to remain in the same spot during the initial cure time."

The job begins by prepping the vehicle, which includes, but is not limited to, washing, using an iron remover, clay-barring, possibly polishing and/or wet-sanding, washing it again and then using a specialized solvent right before application to ensure a better bond to the surface, Hardy outlines.

The process, he explains, can't be rushed.

"You can use IR lamps to speed up the cure time by about 75%, but it still means the vehicle will need that floor time," Hardy says. "Most of the better shops will require a vehicle to stay inside overnight to ensure the customer's best experience with the coating."

Tim Boxeth, senior marketing manager for 3M, says there are formulas that allow



same-day delivery of ceramic coating if desired, and agrees that the work area should be closely regulated.

"It works best to have a clean environment and to apply at 60 degrees or above," he says.

And, while 3M does not require technician training, "it is good to follow the instructions and practice some first."

Ryan Jaworski, marketing manager for System X, also suggests gaining some experience before bringing the service to the public.

"To become a certified System X installation shop, the client must have a registered business and have sufficient knowledge of paint correction," he says. "Certification with System X is free and does not require in-person training."

Once comfortable with the product, Bowman agrees that a climate-controlled environment and correct surface preparation are the keys to success when installing the product.

"Ceramic coating is a solvent, and solvents will flash and cure at different rates based on the environment. To allow for appropriate open time during installation and for superior curing, we recommend that you install ceramic coating indoors in a humidity-controlled environment (approximately 40%-50% relative humidity) between 50 and 75 degrees," she says.

That includes ensuring the vehicle surface itself is between 50 and 75 degrees as well, Bowman adds.

"Good airflow, a clean working environment and limited exposure to dust will ensure a smooth, glass-like finish of the installed coating," she continues. "Once the coating is installed, the car must remain indoors for a minimum of 12 hours, and preferably 24 hours."

When it comes to surface prep, Bowman explains that ceramic coating will magnify any imperfections in the paint that are not addressed before installation.

"A shop should have all the appropriate detailing tools to wash and perform paint correction and final-prep decontamination of the vehicle before ceramic installation," she says. "Taking the time to com-



DYNAMIC CERAMICS



Suppliers can help shops spread the word about the features and benefits of ceramic coating. (Photos courtesy System X)





System X is the official coating partner of West Coast Customs. (Photos courtesy System X)

plete a thorough paint correction of the car with a high-quality compound and finishing polish, then giving it a final wipedown with a ceramic prep wipe will ensure a smooth, contaminant-free application surface."

GIVE IT A TRY

Ceramic coating can greatly increase a customer's satisfaction level when sold and maintained properly, says Hardy from XPEL, partly because it has a built-in automatic return process.

"Shops will see the clients more often than through other products such as window tint or PPF, as there is usually a yearly inspection required to maintain coating warranties," he explains. "This touch point leads to a more friendly relationship, in turn leading to more revenue and more referrals."

Malco's Bowman also cautions against selling it as a "one-and-done service."

"Yes, ceramic coating will extend the life of the vehicle's exterior, but it must be maintained properly to maximize its performance and maintain its warranty," she explains. "Proper maintenance of a ceramic-coated vehicle includes either regular hand-washing or





CERAMIC COATING: THE PRODUCT & THE PROCESS

Strong demand is driving the ceramic coating market as consumers come to know and love the service for its dual benefits of enhanced appearance and added protection.

For aftermarket shops unfamiliar with ceramic coating, Michael Stoops, senior global product and training specialist for Meguiar's, helps outline the product and the process.

For starters, he suggests viewing ceramic coatings as an advanced form of paint protection.

"Boiled down to their basic function, they do essentially what any old-school carnauba wax does—act as a sacrificial barrier to the paint on a vehicle," Stoops says. "Ceramic coatings last far longer than traditional waxes and offer a much higher level of protection as well."

Application is a bit more involved than with a traditional wax, however.

"It is critical that the paint be extremely clean prior to application of a coating. This means at the very least the vehicle needs to be washed, clayed and perhaps iron-decontaminated as well," he says. "Claying and iron-decon are specialty processes designed to remove any bonded contaminants from the paint surface, making it feel very smooth to the touch, and allowing for waxes, sealants and especially ceramic coatings to better adhere to the paint and therefore perform to their maximum potential."

Applications are often performed after the vehicle has gone through an extensive paint correction process so that swirl marks, fine scratches and other defects have been removed.

"This usually involves machine-applied compounds and polishes and then use of a specialty product to ensure that all traces of the compound and polish are removed," Stoops explains. "Only then can a ceramic coating be properly installed."

Then it's time to cover the vehicle.

"The actual application of the coating can be a bit tedious," he admits. "Usually, a specialty applicator pad is used, often wrapped in a unique type of microfiber cloth for proper distribution of the coating onto the paint. Application is done in a meticulous crosshatch pattern, covering only small areas of the vehicle at a time before wiping off or 'leveling' the excess product."

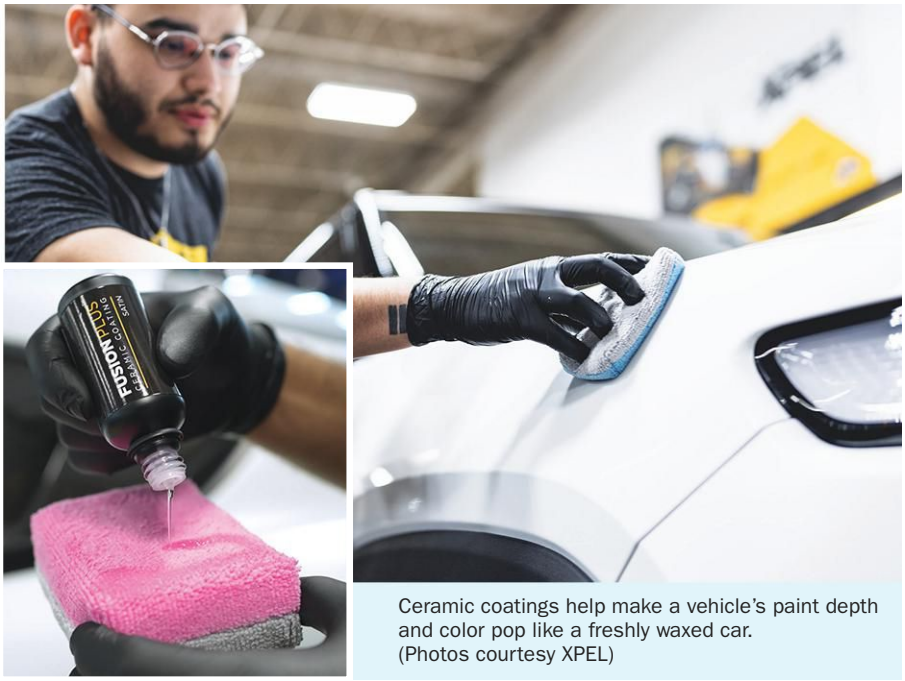
In many cases, removing it at the right time is as important as, if not more so, than the initial application.

"Wipe it off too soon and you may wipe off almost all of the applied product," he explains. "Wipe it off too late and the product may have already started to cure, meaning high spots will be left behind. These high spots must then be removed with a machine compounding or polishing process, and the coating application must be redone."

Timing specifics can vary from coating to coating, he notes, and also change with temperature and humidity, meaning there's no substitute for knowledge and experience.

—Jef White

View ceramic coatings as an advanced form of paint protection. (Background photo courtesy Meguiar's)



Ceramic coatings help make a vehicle's paint depth and color pop like a freshly waxed car. (Photos courtesy XPEL)



using a touch-free car wash to clean the car using a high-quality ceramic-compatible soap. You should also protect the coated vehicle with a ceramic spray topper or refresher at least once every six months."

If shops want to generate additional revenue from ceramic coating customers, offering a monthly ceramic maintenance package is an option.

"Then upsell additional services like engine cleaning, interior detailing, wheel cleaning and dressing the tires," recommends Bowman.

Meanwhile, Boxeth from 3M provides a list of ceramic coating selling points:

- Enrich/sustain high paint gloss and shine
- Seal-in and help maintain the "wet" look of a new polish
- Smooth surface finish you can feel
- Easier care and maintenance
- Slick finish allows dirt and contaminants to release with less effort
- Wash durability
- Keep cars cleaner longer
- Durable, long-lasting water beading effect
- Extreme hydrophobicity and water shedding
- Chemical resistance
- Protection against road salts, harsh cleaning agents, acid rain, tree sap, bird droppings, bug remains and environmental fallout

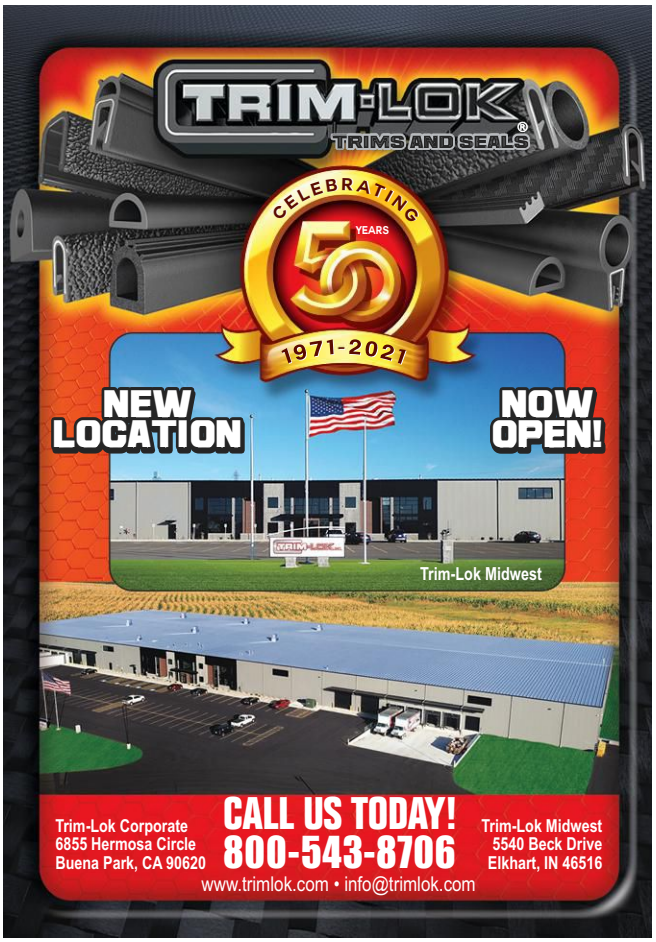
The results, he reports, are extremely positive.

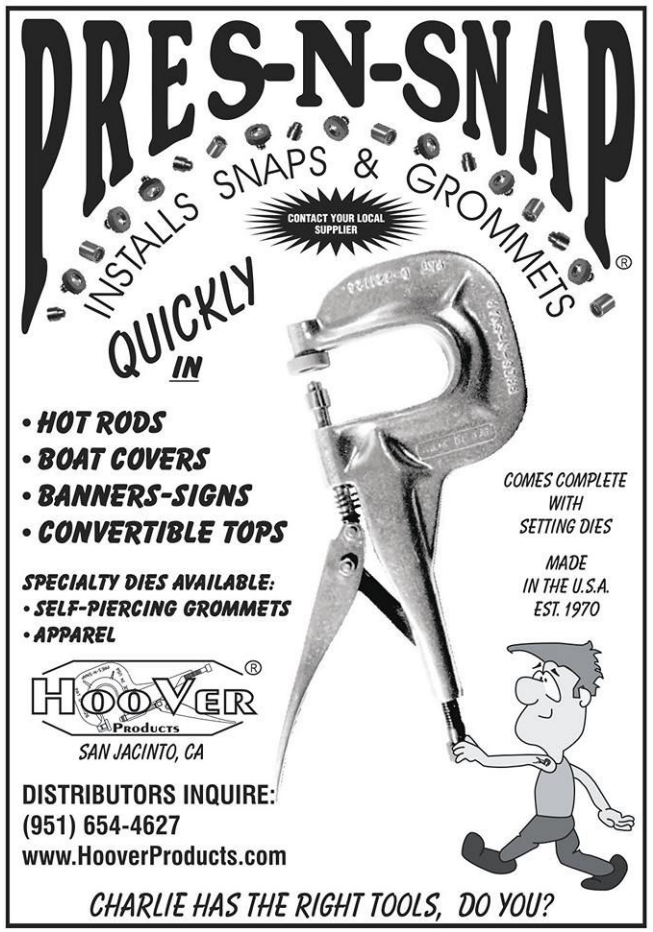
"The feedback we get is that shops can be more profitable with it than they expected."

The only thing holding back many potential ceramic coating customers is a lack of familiarity with the product and its benefits, says Jaworski—a challenge shops can easily overcome through supplier partnerships and simple online practices.

"System X runs large-scale marketing campaigns for consumer installation leads, which get automatically dispersed to our installer network free of charge. In some cases, installers can net more income from referred jobs than they have spent overall on product," he reveals.

Lastly, to capture the attention of consumers searching for more information about ceramic coating on the internet, he recommends taking advantage of basic search engine optimization (SEO) methods, including keyword optimization in your shop's Google business name. **TS**







In 2004, Stephen Ogletree stepped away from his day job in construction and founded Adventure Motor Cars in Birmingham, Alabama.

In the early 1990s, having already conquered Europe, Land Rover decided to bring its distinctive Defender SUVs stateside. Between 1993-97, the company sold approximately 7,000 NAS (North American Specification) Defenders complete with lefthand drive, fuel-injected gasoline engines and other amenities designed to appeal to an American audience.

When they arrived, no one had to tell high school sophomore Stephen Ogletree how special they were. He spotted one at a basketball game in Alabama in 1993 and was immediately hooked.

"It was a '93 Defender 110," he recalls. "I walked around it and saw the numbered badge and it affected me. From that point on I was like, 'I want that car.'"

He took a direct approach trying to convince his parents to buy one.

"Land Rovers were heavily advertised in National Geographic at the time. Their ads were everywhere," he says. "We looked at National Geographics for book reports and things like that in high school, so I ripped those ads out and I'd put them in my dad's briefcase or under his pillow as subtle hints. But we couldn't afford it."



By Jef White

DEFENDING THE SPECIES

Adventure Motor Cars keeps NAS Land Rovers on the road.

Stymied but not defeated, Ogletree later earned a degree from Auburn University and took a job in Miami. He scrimped and saved and triumphantly returned to the Birmingham area a little over a year later to purchase his first Land Rover.

But then something unexpected happened. A stranger saw his Defender and asked to buy it for more than Ogletree had paid. He said yes.

"I sold it, bought another one, the same thing happened, and then eventually it was like, 'What if I could play with house money?'"

As one became two became three, Ogletree's father-in-law, who had recently retired, recognized a pattern and a business opportunity. He agreed to front the money if Ogletree would go in 50/50 on a new business.

So, at nights and on weekends for the next few years they would buy, clean up and sell Defenders at a pace of about 20 per year.

In 2004, Ogletree stepped away from his day job in construction to become the founder of Adventure Motor Cars.

Fast-forward to 2015, when Ogletree bought out his father-in-law and stepped out on his own. In June 2022, the company opened a new Birmingham facility that spans 30,000 square feet and accommodates close to 30 vehicles.

BUSINESS ADVICE

Stephen Ogletree, founder of Adventure Motor Cars in Birmingham, Alabama, shares the business advice he's picked up over 20-plus years in the industry:

1 ***Know your numbers.*** "If you don't know your numbers, you don't know your business. You have to know where you're making money and where you're losing money, and generally it's in different areas than you may think."

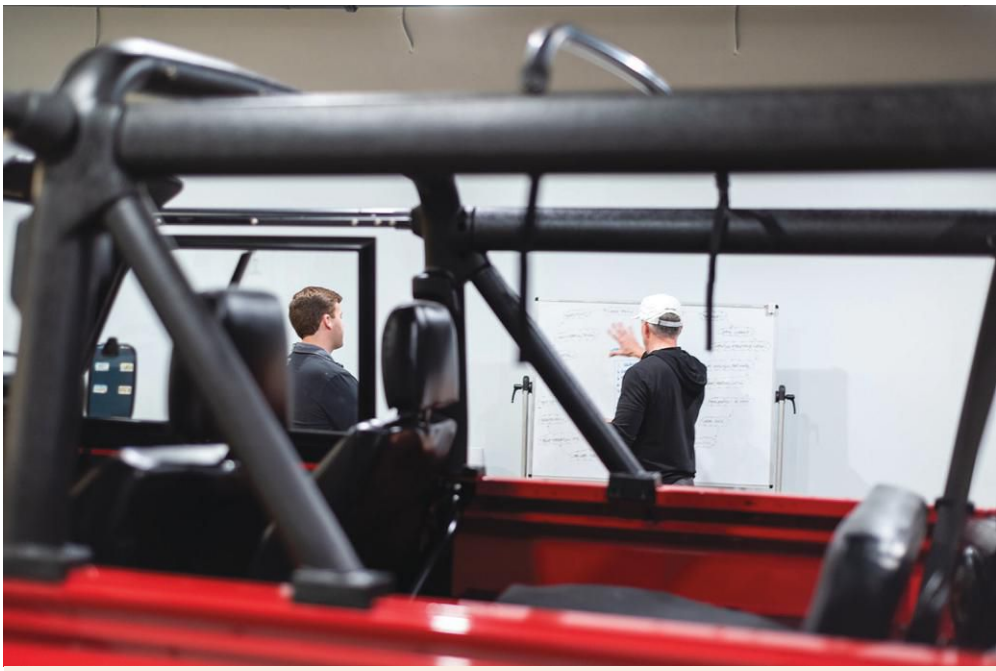
2 ***Always do the right thing.*** "Don't be afraid to lose money or break even if it's the right thing to do. If you have to redo something on a customer's car, do it. There aren't enough people who do that. A lot of what we do at our shop is undo what other people have done."

3 ***Have a system in place.*** "Systems are a big part of controlling workflow and remaining profitable."

4 ***Set goals.*** "Have daily, weekly and monthly goals for your technicians. If you can create those little goals, it's amazing what can be accomplished."

5 ***Give technicians input.*** "They are on the floor and know what's going on. You definitely need their input."

6 ***Maintain a constant dialogue.*** "Let technicians know why you're doing what you're doing. You're not bothering them; you're making sense of what they're doing."



The talented AMC crew can make most Defender dreams come true.

SAVING THE SPECIES

With only 7,000 NAS Defenders in existence—minus those that have been totaled, parted out or otherwise removed from the market—Adventure Motor Cars plays in a very small sandbox.

"I have 21 years of my life in these NAS Defenders, and I still get excited about them. They are still awesome," says Ogletree. "The thought of a car getting parted out and there being one fewer in the world, that drives me crazy. We say we are saving the species."

To keep his predominantly high-end clients happy—think buyers in Martha's Vineyard, Nantucket or Aspen—Ogletree strives to make dealing with Adventure Motor Cars "ridiculously easy." One of the company's core values is treating people the way they would want to be treated.

"Character is more important than making a profit," says Ogletree. "Don't misunderstand, you can't make it over 20 years in business without making money, but that is not our primary objective. We aim to do the right thing and let the chips fall where they may, even if that means going the extra mile at our expense."

Adventure Motor Cars searches for Defenders throughout the U.S. and Canada, bringing them back to the shop for a teardown and cleanup before listing. In other cases, clients will bring in their vehicles for a refresh. The company also offers a consignment program.

"If I find a Defender that I think is worth the money, I'll buy it," Ogletree says. "We're pickier on the projects we take in, because if we control the project, we can make any Defender nice."

He points to a shiny black Defender on his showroom floor.

"It was terrible," he notes. "But, after $100,000 it was back on the road. The more of these we can save, the better."

Crisscrossing the country in search of Defenders, Ogletree will sometimes post about a vehicle he's picking up on Instagram (@AdventureMotorCars) and have it sold before it even gets back to the shop.

"In that case we say, 'OK, what would you like to do with it?' It's now a blank slate. And they'll say, 'I know it's white, but can you make it blue?' Or 'I've got three kids, can you put the four seats in the back?' They get to design it the way they want it."

The talented AMC crew can make most Defender dreams come true, but Ogletree often cautions clients looking to take their projects a bit too far.

"We have a self-imposed moral responsibility to ensure our customers are wisely investing their Defender dollars," Ogletree explains. "It would be easy to add a lot of expensive modern options in line

with current trends, but those never leave a good return on investment. We want to guide our customers to spend money in a way that will lead to a positive financial experience."

On average, the vehicles appreciate between 3% and 5% annually, he says.

"My favorite scenario is when we can buy a Defender back for more than the customer paid years prior. Inversely, my least favorite scenario is when a customer has invested tens of thousands of dollars in the wrong places and ends up losing big."

'WHAT I DO MATTERS'

The search for new workers with mechanical aptitude and a positive attitude is never-ending. The shop's five full-time employees all came via word-of-mouth-referrals.

New hires start with what Ogletree calls a "two-week paid interview."

"Hop in. I might love you, I might hate you; you might love me, you might hate me," he says. "It's a two-week paid interview. Just hop in and let's see how you do."

Particularly proud of his crew, Ogletree lists the three things his workers all have in common:

1. **Jack-of-all-trades.** "You have to be good in multiple roles."
2. **Willing to learn.** "Always be willing to learn and seek new ways to get better at your craft."
3. **Works well with others.** "The synergy of two people working closely together can be more productive than three people working separately."

Shop workflow is handled through Apple notes, text chains and checklists, and everyone is constantly on the lookout for ways to improve processes and save time. Ogletree enjoys rewarding employees for jobs well done.

"I love presents. If I see the guys doing something above and beyond, I love to reward instantly with knives, flashlights or cash," he says. "We give Christmas bonuses, and we have a nice Christmas dinner at a



The company searches for NAS Defenders throughout the U.S. and Canada, bringing them back to the shop for a teardown and cleanup before listing.



DEFENDING THE SPECIES



Adventure Motor Cars deals solely with the approximately 7,000 NAS (North American Specification) Defenders that Land Rover sold between 1993-97.



The company opened a new facility in June 2022 that encompasses 30,000 square feet, including work, storage and office spaces.

steakhouse. We'll also work a little longer on Monday, Tuesday, Wednesday and Thursday, and then Friday you're off at 2 p.m. to get the weekend started early."

Ogletree also studies the work areas of companies he partners with, including painters, powder-coaters and parts suppliers, in search of good ideas he can incorporate into his own facility.

"One place that does our undercarriages, they have racks at every single bay, and I said, 'I like that.' And they have trashcans everywhere," he says. "So, now we have trashcans everywhere and rolling racks at every bay."

Every year the whole crew attends the annual 30A Sand Rover Rally in Santa Rosa Beach, Florida, where visitors can get an up-close look at the company's vehicles and employees can enjoy some outside attention.

"It's a time when strangers get to walk up to every technician and say, 'Wow, y'all built this?'" Ogletree says. "They're not hearing it from me; they're hearing it from strangers. For the technicians, it's a reset. They think, 'What I do matters. Other people can't believe what I do, and we take it for granted.' (Employees) get to see that and it makes a big difference."

THE UNSELFISH SPORTS CAR

Aside from some significant price increases on tires (BFGoodrich was the original OE supplier) and other rubber products, Adventure Motor Cars has managed to navigate recent supply chain challenges without many issues.

Business remains strong, as Ogletree says NAS Defenders have natural charm.

"I don't have to spend a great deal of time on sales, because our finished product sells itself," he reveals. "If I have to explain to somebody why they're awesome, they are the wrong person. Our customers see themselves doing something outdoorsy in these cars—going camping or mountain biking or to the beach. It's like an unselfish sports car, because there are backseats, and they can take their families. Kids and dogs love these cars."

They also appeal to low-key executives.

"They can drive it to the office and their employees will say, 'Cool Jeep, boss.' It's

not like buying a $150,000 Ferrari."

While not flashy, classic Defenders certainly attract their fair share of attention.

"I think it's cool that they are understated," says Ogletree. "If you take one to a country club, they are going to park it up front. If you go to a valet, they are going to park it up front. They may say, 'I don't even know what that is, but that's really cool, I'm going to park it where people can see it.'"

And sometimes that attention comes from people who are kind of a big deal in their own right.

"We're close to Nashville. I grew up in Alabama. Country music in the '90s was Alan (Jackson) and Garth (Brooks)," Ogletree recalls.

So, in 2014 when he received a call from someone claiming to be Jackson's secretary, he was skeptical, yet excited.

"I was thinking 'no way,' but I said, 'Sure, put him on.' And sure enough, he came on and his voice is very distinctive, and I was like, 'Oh my gosh, this is really him!'"

It turns out the country star had seen a Defender in Wilmington, North Carolina, that he wanted to buy, but Ogletree had beaten him to it.

They soon negotiated a deal on the vehicle that included some upgrades, prompting Ogletree to request Jackson visit his facility in advance of the sale to make sure everything was to his liking.

"I was just nervous. I didn't want to mess it up," Ogletree laughs.

Jackson, who announced in 2021 that he has a degenerative nerve disease, ended up buying about half-dozen cars from AMC over the years.

"That was very cool," says Ogletree. "From about 2014 to 2020, you'd get that call with no caller ID. That was fun."

Another memorable project involved a customer who called one April and said, "I need this car done by Memorial Day." When Ogletree started to explain why it couldn't happen, the customer said two more words:

"Open checkbook."

"There were certain things we couldn't do—we couldn't get him a full paint job, there just wasn't enough time—but it was our 'shut down the shop' rate, because we couldn't get it done unless we shut down the shop. So we had to tell every other customer 'I'm sorry,'" Ogletree remembers. "What we learned was that, when you shut it down and just work on one thing, it's amazing what you can do in six weeks."

WORLDWIDE APPEAL

Ogletree spends about two hours a day, and a little more on weekends, posting on Instagram to get the word out about the Defenders he currently has available.

"For years we've made great vehicles, but I haven't always done the best job showing the world what we can do," he admits. "People like looking at Defenders, so you can't really mess it up."

As technology progresses, he's working hard to keep pace.

"Social media constantly changes, and we have to change with it. You have to show your followers what you do with a picture, or maybe a short video (Reels). We want our followers to feel like they have been to our shop and seen our Defenders after viewing our content."

Whatever he's doing seems to be working. From about 10,000 followers in 2021, Adventure Motor Cars had grown to 34,500-plus as of March.

The work is important to keep the company moving forward.

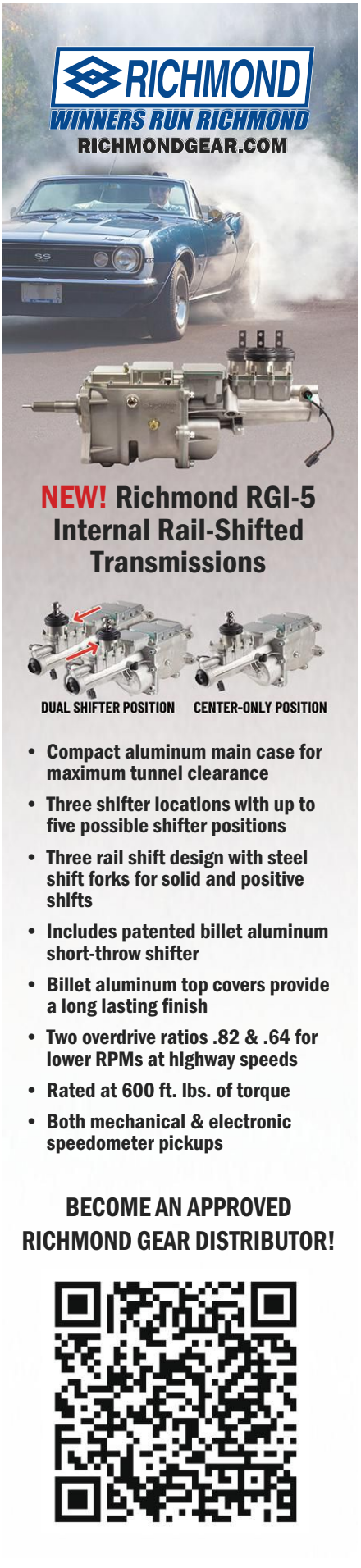
"With only 7,000 cars, the question is, 'Where can you grow?'" he asks. "But there are people that this is their dream car. Probably once a week I hear from someone who says, 'Man, I had one in the '90s and I wish I had never sold it.'"

He also plans to introduce them to an international audience.

"The next thing to happen will be for these NAS Defenders to become recognized internationally," he predicts. "Once the world comes to appreciate the fact that Land Rover made 7,000 hand-numbered vehicles in the '90s that were different than any other Defenders worldwide (soft tops, V-8s, automatic transmissions, numbered badges, etc.) prices will explode. Right now, NAS Defenders are only special to U.S. buyers, but if the international market takes note of these rare vehicles, it will open up a completely new buyer and they will be more popular than ever."

It all harkens back to that first high school encounter.

"We talk about it all the time: 'We have to save these things.' To get one out of a garage that was rotting and make it nice is a very rewarding feeling." ***TS***





Drivers often rely on professionals to know when it is time to change their tires.

WHERE THE RUBBER MEETS THE ROAD

Why tire maintenance data is a must-have for customer loyalty.

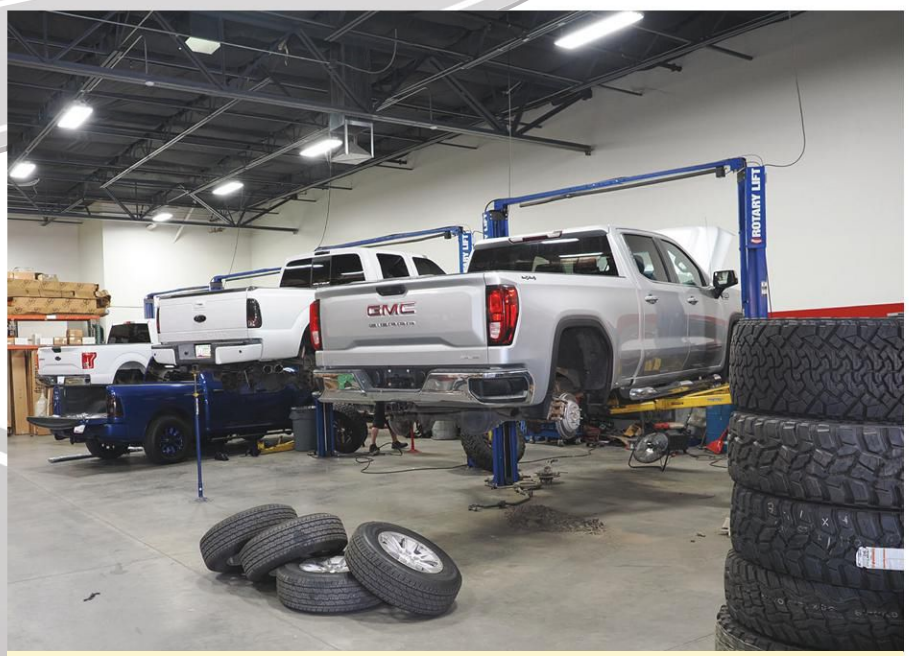
By Lukas Kinigadner

Nearly 4-in-10 U.S. drivers replace their tires once every three years or more, and about that same number rely on their mechanics to tell them when to do so.

With this in mind, it's no surprise that establishing trust between customer and technician is a top priority, as specialty tire shops must be prepared to offer transparency and meet consumer needs.

If your shop offers tire replacement or any type of repair service, there's an opportunity to increase customer engagement at every step, from maintenance checks to tire upgrades. Using Optical Character Recognition (OCR) and AI-enabled technology, mobile data capture allows technicians to pull information directly from the tire sidewall, efficiently and instantly digitizing maintenance data.

With mobile data capture, specialty tire shops can build customer trust and loyalty.



Specialty shops must be prepared to offer transparency and meet consumer needs when it comes to tire sales and installation. (Photo by Mark Bach)

SAVE THEM TIME & MONEY

Manually recording and sharing tire sidewall information with local tire suppliers leaves plenty of room for human error. With 74% of respondents in a recent survey stating that typos on smartphones are a frequent pain point in manual data entry, it is essential for tire shops to ensure that all collected tire data is 100% accurate.

Manual data entry may not only lead to errors but is also a time-consuming process. This, along with recent labor shortages, have caused some tire shops to have longer wait times, as they may not have enough staff allocated to inspect tires.

Additionally, the average time to manually record tire sidewall data such as DOT numbers and tire size from a vehicle is 2 minutes and 43 seconds, compared to 30 seconds with mobile data capture. Mobile data capture reduces the time it takes for technicians to perform vehicle maintenance checks while also improving accuracy, allowing customers to save more time when getting their vehicles checked.

Mobile data capture technology also allows customers to save money in the long run by ensuring checkups are precise and the data measured is accurate. Implementing technology into everyday processes not only makes it easier for customers to get in and out of maintenance checkups quickly, but it also boosts customer satisfaction and peace of mind.

Discount Tire, the world's largest independent retailer of tires and wheels, sought a way to ensure its technicians had the latest technology to deliver an unrivaled tire inspection process. The company wanted to automate tire maintenance processes to create a better customer experience.

With mobile data capture, Discount Tire was able to complete a tire assessment in about 5 seconds per tire, helping technicians assist more customers and thereby reducing wait times.

REACH CUSTOMERS WHEN IT MATTERS

Almost half of Americans knowingly admit to driving on bad tires, and 46% report having experienced a tire blowout while driving. This data reveals that many customers do not know how to consistently care for or monitor their tires.

With mobile data capture, tire shops can collect and manage vehicle data in a way



It is essential for specialty shops to give customers specific, reliable tire recommendations for their distinct vehicles.



Many customers do not know how to consistently care for or monitor their tires.

that not only provides real business value, but also helps keep customers safe.

With mobile DOT scanning assistance, specialty tire shops can improve road safety for drivers and ensure timely connections with customers through preventative tire care. Many drivers rely on professionals to know when it is time to change their tires, so it is essential for specialty tire shops to give customers specific, reliable recommendations about their distinct vehicles.

Using connected, digital vehicle information, mobile data capture allows tire technicians to know exactly when to replace tires, which tire models are the best fit and when to return for a maintenance visit.

Customers also rely on the pros when it comes to purchasing tires. In fact, 39% of respondents in a recent survey stated that they trust their mechanic to tell them when to replace their tires.

This gives specialty tire shops vital upselling opportunities through mobile scanning technology. Having connected, scanned data integrated into a customer relationship management (CRM) platform or dealer management system (DMS) allows tire shops to recommend products to customers right when they need them most.

If a customer has been using the same tires for a certain number of years or has had consistent issues with their current tires, the technician can use that history to make a valuable recommendation, boosting revenue and customer trust.

BENEFITS FOR MULTI-LOCATION SHOPS

Specialty tire shops can easily and accurately scan all needed vehicle data—such as DOT and VIN numbers, tread and depth, tire size and license plate number—with mobile data capture. The technology allows technicians at multi-location shops to have consistent information and vehicle history for a customer as soon as they arrive, no matter which location they visit.

When tire shops do not have vehicle maintenance history readily available, technicians don't have information on when the tires were last rotated or installed, or if the wear and tear is old or new.

For specialty tire shops, using mobile scanning technology helps connect that data, saving the customer time and money and empowering the technician to make more informed decisions and recommendations.

Mobile data capture is especially helpful when it comes to DOT recall procedures. This allows tire shops to track tires and know instantly if a tire that has been recalled is in use.

STREAMLINING THE TIRE BUYING PROCESS

A recent consumer study found that while the number of U.S. drivers willing to buy tires over the internet increased from 10% in 2017 to 29% in 2022, the majority of drivers still hesitate to buy tires online.

Meanwhile, the top pain points for in-store purchases include being bothered by upselling salespeople (37%), waiting too long in the store to get new tires (37%), or being unsure of what they were buying (30%).

To address these issues, specialty tire shops can invest in tire eCommerce, mobile data capture and scanning technologies. Not only does mobile data capture help customers make educated decisions about their tires and vehicles, it also saves the customer time while building trust with the tire shop.

Since 43% of drivers would consider purchasing tires online if they had more knowledge about what they were buying, specialty tire shops have an opportunity to boost sales by creating more chances for customers to learn about tires their web-



Mobile data capture allows tire shops to pull information directly from the tire sidewall, efficiently and instantly digitizing maintenance data.

site. Also, 30% of drivers consider cost and instant access to exclusive pricing as key factors in the decision-making process—another area where online service shines.

With online tire buying, tire shops can easily provide customers with all the needed information, allowing them to do adequate research and therefore feel confident in their purchase.

CONNECTED TIRE MAINTENANCE DATA

To keep up with larger commercial dealers, specialty tire shops have an opportunity to build customer relationships and improve engagement by implementing the latest technologies.

To counter competition and labor shortages, smaller tire shops can use mobile data capture and AI-enabled systems to enhance their entire organization. Incorporating real-time data can strengthen all processes, from planning and sales to post-purchase services.

To increase customer value, tire shops must ensure that data collection is not only secure, but also accurate and timely. Businesses that invest in key technologies will not only facilitate repairs and ensure preventative maintenance, but also keep drivers safe on the road.

Creating a regular touch point with the customer also allows tire shops to build a long-term relationship and enjoy repeat sales. ***TS***



LUKAS KINIGADNER *is CEO and founder of Anyline, a data capture and enterprise-grade mobile scanning solutions business. Visit anyline.com.*

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MADE IN USA

The benefits of producing products close to home.

In a world where global sourcing is now commonplace, are there still benefits to domestic manufacturing for the automotive aftermarket?

The Warn Group—which offers made-in-the-USA truck, Jeep and off-road products through its Fab Fours, Fabtech, Factor 55 and Warn Industries brands—can actually name three.

"Top of the list is quality control," says Corby Phillips, VP of aftermarket sales for The Warn Group. "If we find an issue with any product, our engineers are steps away to view the problem and take corrective action."

Agility is next on the list.

The Warn Group enjoys real-world benefits from offering products made in the USA. (Photo courtesy The Warn Group)

"We can adjust production to the needs of the market quickly," Phillips notes, "as filling customers' needs is a top priority here at Warn."

Finally, there's creating jobs for American workers.

"Keeping a strong workforce employed here in the States is important. We have sub-suppliers, and they have sub-suppliers—the trickle-down of what it takes to produce products in the U.S. has a positive impact on our economy."

Some of your customers may feel the same way, which is why THE SHOP is highlighting products that manufacturers market as Made in the USA on the following pages. Check them out to find the parts and accessories produced close to home.

Silverado Bumper



Fab Fours, Lancaster, South Carolina, presents its Matrix Series Bumper for 2022 Chevrolet Silverado 1500 applications, the latest in its line of stylish, functional bumpers and accessories for late-model trucks and SUVs. The slim-fitting Matrix Series is made in the USA and equipped to hold a 30-inch light bar, four LED cube lights and a **WARN** ZEON 12 or VR EVO 12 winch (or smaller). Available with or without a pre-runner-style guard option, the bumpers include integrated D-rings.

Vehicle Recovery Kit

Factor 55, Boise, Idaho, presents Borah, the latest in its line of vehicle recovery kits. The kit features made-in-the-USA components including soft shackles and straps, Crosby screw-pin shackles and a HitchLink 2.0 hitch receiver shackle mount, all in a handy carrying bag. A variety of related winch recovery and kinetic recovery kits are also available for off-road truck, SUV and powersports applications.



Jeep Molle Rack



Fabtech, Chino, California, presents its Overhead Molle Rack for Jeep Wrangler JL and Gladiator applications. Offering a one-piece design that bolts to the windshield frame and rear sport bar, the rack adds storage space and is made in the USA. Designed to stay in place with the factory hardtop removed, the system enables easy fastening of compatible storage accessories like bags and boxes, while the ball stud pattern allows for the installation of electronics such as mobile phones, radios, GPS devices and more.



Silverado Exhaust System

BORLA Performance Industries, Oxnard, California, offers a Cat-Back Exhaust System for 2022-23 Chevrolet Silverado 1500 ZR2/ GMC Sierra 1500 AT4X 6.2L V-8 models that improves horsepower and torque. Featuring the company's True Dual design and S-Type sound, the system includes brushed T304 stainless steel turn-down tips.

Off-Road Bumpers

Warn Industries, Clackamas, Oregon, presents its Elite Bumpers for Jeep Wrangler, Gladiator and Ford Bronco applications. Designed, engineered and made in the USA, the front bumpers combine style and maximum trail protection and accommodate WARN mid-frame winches up to 12,000 pounds. Features include integrated ports for lights, optional grille guard tubes and welded tabs for eyelets. The steel bumpers have a low-profile look and include a state-of-the-art powder-coat finish. Full-width and stubby models are available for Jeep models.





Digital Overlaminate Line

Avery Dennison, Mentor, Ohio, presents its expanded Digital Overlaminate (DOL) product line that now includes the advanced DOL Max Series—DOL 1060 Max and DOL 1360 Max—along with DOL 6470, a new PVC-free, luster-finish overlaminate. The pressure-sensitive films provide durability and longevity of printed vinyl, especially in exterior applications such as fleet graphics, vehicle wraps, marine and outdoor signage. Overlaminates protect the graphic from environmental conditions including harsh weather, UV exposure, chemicals and abrasion.



Jeep Lift Kits

AccuAir Suspension, Merritt Island, Florida, offers custom Jeep Dynamic Lift Kits with Crawl and Tow Control. The kits lower to stock level for garage entry and then automatically adjust to ride height. While off-roading under 25 mph, the Jeep can be adjusted using Crawl Control. Features of the fully bolt-on systems include new control arms, sway bar links and front track bar, as well as **JRi** shocks and the AccuAir e-Level Plus control system, which can be controlled via a hardwired Touchpad+ or Bluetooth.

Camaro Climate Control

Vintage Air, San Antonio, presents its all-new Gen 5 SureFit Climate Control System for 1982-92 Chevrolet Camaro and Pontiac Firebird models. The kits showcase the all-new Gen 5 electronically controlled climate control system featuring OEM-quality injection-molded cases and block-type expansion valves. Designed for cars originally equipped with factory A/C, they are available as either a complete kit or an evaporator kit. Manufactured in the USA, the kits install with minimal modifications to the firewall and include high-torque actuator motors.





GMC Truck Column

Flaming River Industries, Berea, Ohio, presents the 1973-87 GMC Truck Column, designed to provide a modern, comfortable driving experience. Made from high-quality materials to ensure durability and longevity, the FR30106BK column features a 2-inch-diameter tube and a 3/4-inch, 36-spline shaft, making it compatible with most aftermarket steering wheels. It also includes a self-canceling turn signal switch and hazard switch for added convenience and safety. Available finishes include black powder-coat, mill-finish stainless or polished.



Rooftop Cargo Carriers

ProMaxx, Jasper, Indiana, presents new Rooftop Cargo Carriers. Made in the USA, the no-tool-assembly roof cargo carriers with convenient two-sided access are designed to offer an affordable, effective storage solution. The carriers are available in 10- and 18-foot models and fit most vehicles. Features include a sleek, aerodynamic appearance and non-skid texture. They come complete with all locks and keys.



Universal Steel Leaf Spring Shims

Warrior Products, Tualatin, Oregon, presents its heavy-duty Universal Machined Steel Leaf Spring Shims (8 degrees) for 2-inch-wide leaf springs. Made in the USA, the shims can correct the pinion and/or caster angles in leaf-sprung Jeeps and trucks. They are designed to be permanently attached to the leaf spring pack using the leaf's center-pin. Cross-holes are counter-bored against the angled surface to ensure the center-pin gets even clamping force across the spread of the pin's top surface. Shims are available in 2-, 2.25-, 2.5- and 3-inch widths.

Catalytic Converter Theft Deterrent System

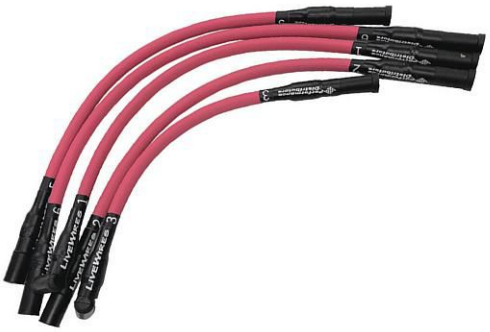


Pop & Lock, Green Bay, Wisconsin, presents the CAT-RAP Catalytic Converter Theft Deterrent System. Created to protect catalytic converters with a patent pending steel plate and cable wrap, the system's universal design allows easy installation in less than 30 minutes on a wide variety of vehicles including trucks, vans, buses and SUVs. It is made in America with stainless steel components to help it withstand the harshest environments.



Oil Filter Adapters

Aviaid Oil Systems, Chatsworth, California, presents its expanded line of Remote Oil Filter Adapters that now includes CNC-machined billet aluminum units for three popular sizes of OEM and aftermarket spin-on-type filters with 3-, 3-5/8- or 4-1/2-inch-diameter canisters. For vintage applications, Aviaid offers the original Traco cast aluminum adapters for standard Chevrolet (3-5/8-inch) filters. Additionally, the company manufactures billet aluminum remote pressure regulators with mounts to accommodate 3-5/8- or 4-1/2-inch diameter filters.



Spark Plug Wires

Performance Distributors, Memphis, offers its Live Wire Plug Wires, now available in a new Performance Pink color. Measuring approximately 1/2-inch in diameter, the low-resistance wires deliver maximum spark energy to the plugs and include heat-resistant sleeving for protection from headers and manifold heat. The wires are custom-fit for each engine with no assembly required and are numbered for the correct cylinder. Live Wires are also available in red, silver, blue, black, yellow, green and purple.

Jeep Floor Liners

Quadratec, West Chester, Pennsylvania, presents its Ultimate Floor Liners for Jeep Wrangler, Cherokee XJ, Grand Cherokee and Gladiator models. Offering affordable, made-in-the-USA interior floor protection, the all-weather liners are easy to install and easy to clean. They are engineered to follow the exact contours of the floor pan, providing total protection against water, snow and mud with extra-tall sides and a 5/16-inch-deep tire tread pattern.



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GM Truck Lowering System

Ridetech, Jasper, Indiana, presents its Coilover Lowering System, including applications for 2019-newer GM 1500 pickups, two- and four-wheel drive models. Offering a 1- to 3-inch adjustable front drop and a 2- to 4-inch adjustable rear drop, the systems enhance the truck's stance, handling and ride quality. Made in the USA, the kit features front adjustable coil-overs, upper control arms, rear leaf spring hangers and shackles, along with adjustable rear **FOX** shocks.



GM Coil-Over System



BDS Suspension, Coldwater, Michigan, presents a 6.5-inch Coilover Conversion Lift System for 2020-newer GM 2500HD/3500HD pickup models. Based on the company's high-clearance design, the system was developed to improve ride quality, handling and performance on any terrain, and includes **FOX** 2.5 Performance Elite (PE) coil-overs and shocks. All products are designed, tested and manufactured in the USA.

Electric Fan

Flex-A-Lite, Burlington, Washington, presents its patented Flex-Wave Electric Fan. Created to increase airflow and efficiency while being quieter than traditional S-blade and straight-blade fans, the Flex-Wave fan moves up to 3,000 cfm of air. A sine-wave design offers aerodynamic advantages.



Jeep Wrangler 392 Exhaust

AWE, Horsham, Pennsylvania, offers its Jeep Wrangler 392 Quad Tip SwitchPath (Valved) Exhaust. Manufactured in-house, the dual, 3-inch, cat-back system is designed and engineered specifically for aggressive off-road use. A bespoke resonated H-pipe is configured to enhance and amplify the exhaust note while keeping the inherent rasp in check. Tucked high, the system transitions smoothly to the rear, where it splits off into a tailored SwitchPath muffler complete with OEM Tier 1 valves that ensure 100% factory valve operation.



Catalytic Converters

ACAT Global, Charlevoix, Michigan, offers its complete line of Catalytic Converters proven to reduce greenhouse gas emissions in a wide range of on- and off-road internal combustion engine applications while increasing horsepower and improving mpg. Proprietary Herringbone Pattern Metallic substrate technology is used in the American-made converters for universal or direct-fit installation.



Toolbox & Roll Cover



Truck Covers USA, San Diego, presents the American Work Cover, a toolbox and roll cover combination. Available for a variety of truck models and made in the USA, the system marries two essential products—an American Roll Cover tonneau cover and a heavy-duty aluminum toolbox—and is ideal for work truck applications. Features include OEM-grade locking mechanisms, two sliding removable trays, LED cargo lighting and remote locking options.



Active Cargo Systems

Leitner Designs, Corona, California, presents its Active Cargo Systems, available for a wide variety of off-road vehicles. Designed, engineered and manufactured in the U.S., the racks feature one-piece aluminum alloy uprights and grade 10.9 Zi-Ni-coated fasteners. The systems stand 23 inches tall atop the bed rails and weigh 81 pounds. A patented sliding load bar accommodates motorcycles, bikes and large items by twisting a knob, while the quad-rail load beam design accommodates accessories from most industry manufacturers.



Inline Fuel Filters

System 1 Filtration Products, Tulare, California, offers a wide selection of Inline Fuel Filters for competition and street applications. Made in the USA, the units range in size from the large-diameter long filter at 9-by-2-1/2-inches to the compact Pro Street model that measures 4-1/2-by-2-inches. All are CNC-machined from 6061-T6 aluminum billet and black anodized. Designed to be easily integrated into a variety of fuel systems, most are available with a choice of AN-06, AN-08, AN-10, AN-12 or 3/8-inch barbed inlet/outlet fittings.

Adjustable J-Link Control Arms

JKS Mfg., Coldwater, Michigan, presents its Adjustable J-Link Control Arms for Jeep TJ, XJ, JK, JL and JT applications. Designed to enhance the vehicle's off-road prowess and reliability, the control arms are engineered specifically to reduce NVH characteristics (noise, vibration, harshness) and include factory-style, maintenance-free rubber bushings pre-installed at both ends. CNC-bent in the USA from stout DOM tubing with a forged end, the fully adjustable setup allows fine-tuning of the suspension geometry and alignment.





Bronco Bumpers

Crawltek Revolution, Coldwater, Michigan, presents its Blaze Series Front and Rear Bumpers for 2021-newer Ford Bronco applications. Developed to add protection and styling, the bumpers are built in the USA using 3/16-inch heavy-duty steel. The Blaze series was engineered with a high-clearance design for improved approach/departure angles. Features include robust recovery points and customizable inserts for auxiliary lighting, parking sensors and adaptive cruise control radar configurations.



[ADVERTISEMENT]



The Warn Group: Four Top-Tier U.S. Brands Under One Company

Fab Fours, Fabtech, Factor 55, and Warn Industries now form The Warn Group: Four premium, American-based brands all with U.S. manufacturing and engineering, and all as one entity.

Each of these top-tier companies brings something special to the table and has its own manufacturing facilities, some with industry-leading ISO and IATF quality certifications. Fab Fours, located in Lancaster, SC, creates a variety of rugged steel bumpers for trucks, SUVs, and powersports vehicles on the cutting edge of style, but don't sacrifice functionality. Born of motorsports heritage, Chino, CA-based Fabtech, has a heritage steeped in the high-performance truck suspension arena. For nearly 35 years, they've made top-notch shocks, springs, and components for creating off-road-ready rigs. In Boise, ID, Factor 55 pioneered the revolutionary technique of closed-system winching and continues to lead the pack in rigging equipment and vehicle-recovery accessories. Finally, Warn Industries is one of the most recognized brands in the off-road segment and is located in Clackamas, Oregon. It is still the most trusted name in winches, 4WD hubs, and off-road accessories for 4x4s of all sorts, not to mention industrial, commercial, and OEM segments.

Warn Industries alone has been in business 75 years. However, combined with the other brands, the companies of The Warn Group have nearly 140 years of collective experience designing, engineering, manufacturing, and selling products buyers want—and WDs and jobbers want to sell.

The Warn Group's brands offer multiple advantages as an entity—from operating efficiencies to enhanced sales opportunities. These U.S.-based companies employ hundreds of workers across the country designing, engineering, building, testing, marketing, and selling products that produce profits. These are products consumers want. They allow them to customize their truck, SUV, and powersports vehicles in a way that not only looks great but also adds innovative functionality, durability, and capability.

Reach out to your sales rep today to learn how your business can prosper by partnering with The Warn Group to meet your customers' needs. Four premium brands, one trade name: The Warn Group.




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And there's more to come, with efficiencies in ordering and freight that lower your costs while raising your profits. But that's just the start. Reach out to your sales rep today to learn how your business can prosper by partnering with The Warn Group to meet your customers' needs.



GM Upper Control Arm Kit

Zone Offroad, Coldwater, Michigan, offers an HD Cast Upper Control Arm Kit for 2019-newer GM 1500 2WD/4WD pickup models. The direct-replacement Adventure Series Pro upper control arms are made in the USA from cast ductile iron with CNC-machined ball joint and bushing mounts. Designed to increase travel range, they come equipped with stock-style rubber mount bushings to provide a smooth, quiet ride, along with a preinstalled serviceable ball joint.



Steering Columns

IDIDIT, Tecumseh, Michigan, presents its complete line of Steering Columns and Accessories, including lightweight options, for street rods, muscle cars and classic cars, trucks and Jeeps. Designed and manufactured in the U.S., the columns are available in high-quality paintable steel, triple-plated nickel chrome and black powder-coat finishes. Retrofit columns are offered to fit specific makes, models and years, while Universal Columns come in straight, tilt, shorty, tile and telescoping setups. Options include cruise control, quick-release hubs and more.

GM Coil-Overs

FOX, El Cajon, California, presents its 3.0 Factory Race Series Internal Bypass Coilovers with Remote DSC Reservoir for 2019-newer GM 1500 2WD/4WD truck models. Designed to deliver the feel of near-endless suspension travel, the system includes exclusive internal bypass technology that allows oil to flow around the piston at some points of the stroke while creating strong pressure at other points to support the vehicle. The shocks feature cactus cooler reservoirs and 7/8-inch shafts with redundant seals and are made in the USA.





4-Door Bronco Retractable Top

Bestop, Louisville, Colorado, introduces its all-new Skyrider Retractable Top that supports the four-door Ford Bronco hardtop. The top has a large, dual-row opening that gives both front and backseat passengers access to open air when folded back. A factory top replacement, it features a three-panel design that unlatches from the front. Once the two folding front panels are removed, the top slides back easily from outside the Bronco to create an expanded open-air experience. The Skyrider is made in the USA from premium black twill fabric.



Interior Protectant



Malco Products, Barberton, Ohio, presents Malco Automotive Clean & Shine vehicle interior protectant. Designed to power away grease, grime and dirt from leather, vinyl and plastic while restoring a rich, satin finish with no oily or greasy residue, the one-step, ready-to-use formula cleans, beautifies and protects vehicle interiors. Made in the USA, the protectant penetrates pores and is VOC compliant. It is available in 22-ounce spray bottles, 1- and 5-gallon containers and 55-gallon drums.

Shocks

RADFLO Suspension Technology, Fountain Valley, California, offers a complete line of high-performance, custom, OE and universal-length Shock Absorbers. Specializing in OE replacement shock absorbers and dampers for Jeeps, trucks, SUVs, motorsports and commercial vehicle applications, the products are made in the USA.

All-Season Tire

Yokohama Tire, Santa Ana, California, presents the AVID Ascend LX Premium Touring Tire, available in 39 T-, H- and V-rated sizes. The Ascend LX offers improved tread life, superior wet traction, dependable winter traction and a quiet, smooth ride. Produced at Yokohama's plant in Salem, Virginia, the Ascend LX is designed for passenger cars, minivans and crossovers in sizes ranging from 15 to 18 inches.





Bumper, Grille & Mirror Covers

Ecoological, Rocklin, California, presents easy-to-install Shellz Bumper, Grille and Mirror Covers. A cost-saving alternative to complete replacements, painting or vinyl wrapping for custom trucks, the covers are available in finishes including gloss black, matte black, gloss white, textured TPO or Armor-Coated.

Expanded Gauge Line

Dakota Digital Inc., Sioux Falls, South Dakota, presents its expanded RTX Series Gauges, now with two new systems for 1987-89 and 1990-93 Fox Body Mustangs. Designed to appear nearly identical to the factory cluster, the gauges include LED backlighting and high-tech features such as high-definition TFT message centers that can be fully configured to display information as desired. The RTX series utilizes a central control box for easy installation and setup and is made in the USA.







Rear Axle/Flange Locking Bolt Kit

Stage 8, San Rafael, California, presents its GM Corporate 14-Bolt Kit for Rear Axle/Flange. The 20-piece, full-floating rear axle retaining bolt kit includes eight 1/2–13-by-1-1/2-inch, 12-point Grade 8 grooved locking bolts, four two-hole, laser-cut stainless steel locking bridge retainers and eight snap rings. The kit is designed to prevent bolt loosening in off-road applications.



Gladiator Bed Rack

Adventure Rack Systems by MetalCloak, Rancho Cordova, California, introduces the new Bak-Pak Bed Rack System for Jeep Gladiator JT models. The American-made, fully customizable bed rack system is designed to deliver versatility and style during off-road adventures. Constructed from high-quality, powder-coated, 2-inch steel tubing, the system offers a payload capacity of 600 pounds and works directly with the optional OverCab rack.

Adhesive-Backed Heat Barrier

Thermo-Tec Automotive, Greenwich, Ohio, presents its Adhesive-Backed Heat Barrier, a specialized protective solution designed to shield parts and components from the harmful effects of radiant heat. The barrier is constructed from woven silica with a flexible aluminized finish to defend painted surfaces, plastic parts and various components. Its surface has high reflectivity to withstand radiant temperatures of up to 2,000 degrees, while the adhesive-backed side is engineered to handle direct and continuous temperatures of up to 300 degrees.





Floor Liners

Husky Liners, Winfield, Kansas, presents X-Act Contour Floor Liners that combine a laser-scanned design with a no-slip DuraGrip surface and a softer feel. The liners use the vehicle's factory retention posts and the company's own Stay-Put Nibs for a no-slip, no-slide fit. Resistant to chemicals including battery acid and oil, the liners include a FormFit Edge to keep spills contained. They are made in the USA and available in black.



Body Side Armor

MEK Magnet, San Diego, presents its Vehicle Armor. Made in the USA, products include redesigned flexible magnetic Removable Trail Armor for aluminum vehicles. Magnets have been replaced with lightweight ballistic resin and nano-hold technology, allowing the Armor to stick to any smooth surface. The new material is reusable and washable and rated for all speeds.

TRX Front & Rear Sway Bars

Hellwig Suspension Products, Visalia, California, introduces new Front and Rear Sway Bar options for Ram TRX pickup models. Designed to improve stability and comfort for daily driving and while under load without sacrificing the maneuverability desired by off-road adventurers, both sway bars are made in the USA from solid heat-treated chromoly steel and offer increased stiffness over factory sway bars for improved handling, comfort and safety. Kits include all hardware needed for installation.





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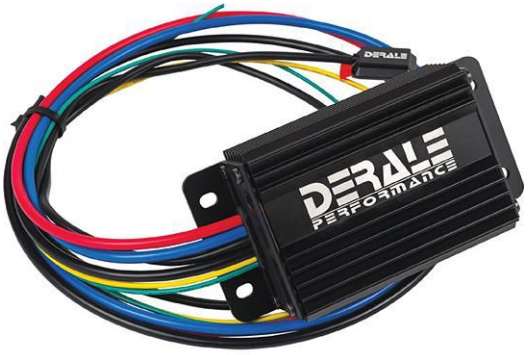


Hedman Hedders, Whittier, California, part of the **Hedman Performance Group**, presents its new Mid-Length Tube Headers for 1967-74 4WD Chevrolet Blazers/GMC Jimmys, as well as 1/2- to 3/4-ton Chevy/GMC pickups and Suburbans with small-block Chevy engines. The smooth 1-5/8-inch tube design improves exhaust flow to increase horsepower and torque. The mid-length design keeps the header connection up tighter to the body, helping keep the entire exhaust above the frame rails. The headers are made in the USA.

Shifter Handles

Silver Sport Transmissions (SST), Rockford, Tennessee, part of the **Wharton Automotive Group**, presents its new line of Billet Aluminum Shifter Handles. Made in the USA, the handles are available in a variety of lengths, angled back or straight, and with black anodized or natural brushed aluminum finishes.

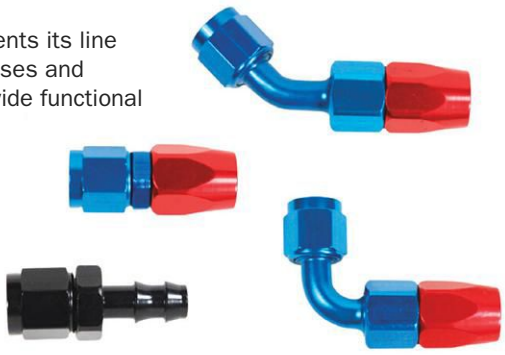




PWM Fan Controller

Derale Performance, Los Angeles, offers its Digital PWM Fan Controller. The controller continuously monitors engine temperatures and operates the fan as needed between 1-100% to increase cooling efficiency. Using Soft Start Technology, fans ramp up slowly, eliminating harmful amp spikes. Benefits include reduced fan noise.

Performance Plumbing



SpeedFX, Exeter, Pennsylvania, presents its line of High-Performance Fluid Control Hoses and Fittings. Precision-engineered to provide functional ease of use and lasting quality, the hoses are independently tested to meet SAE-30R7 standards, while the fittings are manufactured to exacting tolerances in a CNC-controlled ISO 9000 environment. More than 200 popular SKUs are available, and all fittings are made in the USA.

Double-Roller Timing Chain Sets

PRW Industries, Perris, California, presents its Double-Roller Alloy Timing Chain Sets for 2003-10 Dodge 5.7L and 6.1L Hemi V-8 applications. Machined steel alloy gears add longevity and won't stretch or fail prematurely. The sets come with a nine-keyway crank gear for 2-degree adjustments, and offset bushings deliver easy cam indexing for most applications. The systems fit under most stock timing chain covers, with occasional minor machining required.



Bedliners

TrailFX, Exeter, Pennsylvania, offers custom-fit Bedliners. Featuring reinforced corners and an extra-thick, non-skid surface that promotes easy drainage, the liners are resistant to oil, gasoline and other corrosive chemicals. They protect truck beds from high-impact dents and scratches and everyday wear and tear.



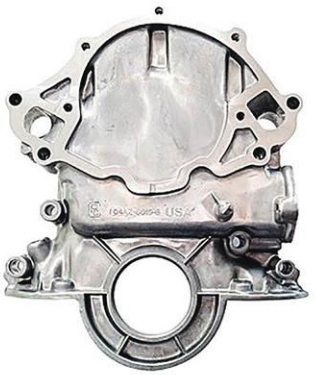


Jeep Skid Plate Systems

MetalCloak, Rancho Cordova, California, offers UnderCloak Skid Plate Systems for a variety of Jeep Models. A 1/4-inch-thick steel oil pan skid plate is tucked up as far as possible while providing access to the oil filter. Transfer case and gas tank skid plates are boat-sided to protect and allow obstacles to slide under the Jeep without concern. "Skidguard washers" are used at all exposed hardware points, and the pieces are finished with gold zinc plating. The systems are made in the USA.

Mustang Timing Chain Cover

California Pony Cars, Ontario, California, offers a Timing Chain Cover with Molded Timing Pointer for 1965-66 Ford Mustang models. The concourse-correct cover is made in the USA of precision cast aluminum and also fits various other 1965-67 vehicles with 289- and 351-ci Ford engines. Features include a machined dipstick tube hole with plug included. The crankshaft seal is installed from the front side (seal not included), and the unit clears the crankshaft-mounted oil slinger used on early engines.





Flex Fuel System

Advanced Fuel Dynamics, Troy, Texas, presents the ProFlex Commander, a true performance Flex Fuel System made in the USA. Designed to address the inconsistency in ethanol content found in E85 at the pump, the flex fuel kit is easy to install and comes with all the components needed for plug-and-play installation. A completely autonomous, post-ECU flex fuel management system, it is compatible will gas tunes, bolt-ons and power-adders. Users can run gas, E85 or any mix of the two fuels and can fill up at either pump anytime.

Open-Style Clutches

McLeod by Powertrain Technology, Anaheim, offers a lightweight line of Open-Style Clutches available in 4.5-, 5.5- and 7.25-inch diameters and in 1-, 2-, 3- or 4-disc configurations. Featuring improved linear engagement and friction life with a positive feel, all PTT products are designed on the latest CAD systems. In-house capabilities allow a wide range of clutch and drivetrain product development. ***TS***



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PERFORMANCE

Performance Shocks p.58 | Makerspaces p.66

SHOCK VALUE

Suit each suspension upgrade to the project at hand.

By John Carollo

Literally and figuratively, these days we could all use a smoother ride, right? When it comes to aftermarket suspension upgrades, performance shocks help soften some bumps in the road.

Whether at the track or on the trail, the proper shock setup provides the stability, control and safety customers seek. Add in specialized tasks such as towing or hauling, and it's no wonder drivers often turn to the pros for advice and recommendations.

To keep your sales of performance shocks headed in the right direction, manufacturers provide updates on the technological developments and buyer preferences that are trending in today's suspension market.

RIDING HIGH

Technology in the performance shocks market has been advancing to keep pace with the latest models and features being rolled out by the OEMs.

"In recent years, auto manufacturers have released a wide range of new vehicles, including the Toyota Tundra, Ford F-150 Raptor and Bronco, and Chevy/GM 1500, to name a few," says Ryan Thompson, brand manager at PVG (Powered Vehicle Group) FOX. "It takes a lot of engineering bandwidth to develop, test and tune each application. When paired with production delays carrying over from COVID, suppliers have yet to be able to keep up with demand."



Offering quality products helps spur repeat business. (Photo courtesy Radflo Suspension Technology)



Shock upgrades offer tangible performance gains. (Photo courtesy Radflo Suspension Technology)

Explore New Heights.

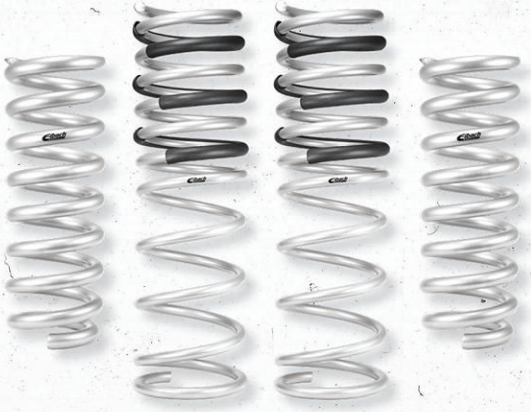


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SHOCK VALUE

SHOCKS

■ **HOT PRODUCTS:**
Factory Race Series Shocks
■ **FEATURES & BENEFITS:** Bolt onto production trucks and Jeeps; bottomless feel for faster driving in demanding and harsh conditions while maintaining street manners; position-sensitive internal bypass damping and DSC adjusters; recirculating remote reservoirs on some models.

FOX
Ryan Thompson
Brand Manager at PVG (Powered Vehicle Group)

■ **HOT PRODUCT:** Compression Damping Electronic Valve (CDEV)
■ **FEATURES & BENEFITS:** Powered by ICON Intelligent Control (IIC) technology; allows for automatic, instantaneous adjustments to the shock's damping; in-cab adjustability and customizability from the IIC iOS app.

ICON Vehicle Dynamics
Dylan Evans
Lead Engineer

■ **HOT PRODUCT:**
KONI Sport Adjustable Dampers
■ **FEATURES & BENEFITS:** Proven technology; wide adjustability range for ride and handling tuning to suit anyone's driving style.

KONI Shock Absorbers
Allen Briere
North America Automotive & RV Sales Manager

■ **HOT PRODUCT:**
KYB MonoMax Light Truck Shock
■ **FEATURES & BENEFITS:** Instantly and automatically adjusts to performance needs; no fade due to aeration; suitable for commercial, off-road, towing and hauling applications; available as an OE upgrade for vehicles that came from the factory with twin-tube or monotube shocks.

KYB Americas
Andy Castleman
Director of Product & Marketing

■ **HOT PRODUCT:**
OE Replacement 2.5 Coil-Overs
■ **FEATURES & BENEFITS:** Remote reservoirs and adjusters for versatility and adaptability to trail conditions; ability to fine-tune suspension; smooth, stable ride in any environment; personalized approach to determining the ideal size, length, valving and spring weight.

Radflo Suspension Technology
AJ Grasso
Sales & Marketing Manager

■ **HOT PRODUCT:**
RS7MT Monotube Shock
■ **FEATURES & BENEFITS:** Patented sintered metal rod guide featuring an integrated dirt wiper and dual closure method for increased tensile loading; application tuning for precision on- and off-road handling; internal rebound bumper for a smoother ride; effectively dissipates heat.

Rancho Suspension
Michael Bender
Engineering Manager

■ **HOT PRODUCTS:**
B8 8112 (ZoneControl CR DSA+)
■ **FEATURES & BENEFITS:** Truck shocks; position-sensitive damping with three compression zones and two rebound zones; triple-piston design for everyday driving comfort and maximum control under large suspension inputs; aluminum components with EVO gray shock bodies.

Thyssenkrupp Bilstein of America Inc.
Steve Von-Seggern
Head of Marketing & Powersports





Study product specs to avoid mix-and-match mistakes. (Photos courtesy ICON Vehicle Dynamics)

Also, and again partly thanks to the pandemic, new markets are growing rapidly.

"Building recreational vehicles that support the outdoor lifestyle has become more commonplace, especially in recent years," observes Dylan Evans, lead engineer at ICON Vehicle Dynamics. "This is causing a great need for performance shocks for a wide range of vehicle platforms. Customer expectations are at a peak for premium components that perform better, and an added layer is that the OEMs are releasing more advanced packages on newer vehicles, forcing aftermarket technology to make great strides forward."

Innovations are making manufacturers better, says Michael Bender, engineering manager for Rancho Suspension.

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Learn more here:

SHOCK VALUE



Manufacturers continue to work on diversifying their lines, including automotive and RV offerings. (Photos courtesy KONI Shock Absorbers)





Performance shock designs are keeping pace with the latest OEM models and features. (Photos courtesy FOX)

"Increased competition in the marketplace is driving all of us to develop and implement new technologies to keep pushing the performance envelope," he says.

The results are shocks that really do offer tangible performance gains, says AJ Grasso, sales and marketing manager for Radflo Suspension Technology.

"Many customers may not be aware of how much of an impact a high-quality shock can have on their vehicle's performance and overall driving experience."

Manufacturers continue to work on diversifying their lines, says Allen Briere, North America automotive and RV sales manager for KONI Shock Absorbers.

"KONI Shocks has a range of product lines to meet every customer's needs, so the better you understand what those needs are, the better you are at offering a superior product," he says. "If you provide a customer with too stiff of a shock or a shock that is too soft and cannot support other modifications on the vehicle, then they will be returning (to complain)."

Current demand is for damping adjustability, notes Steve Von-Seggern, head of marketing and powersports for Thyssenkrupp Bilstein of America Inc.

"More people are using their vehicles for camping, hauling and towing than ever before and they want the ability to adjust the ride for those loads," he reveals. "We're answering that demand with products like our 8112 DSA+ that features dual-speed compression adjusters as well as an integrated internal bump stop that's adjustable. We also offer direct-fit external bypass options with tool-free adjustability."

Add in the well-known challenges of doing business in 2023, and the shocks market is sprinting just to keep pace.

"There are still supply chain issues



Increased competition in the marketplace is pushing the envelope for performance shocks. (Photos courtesy Rancho Suspension)

that are affecting the performance shock market," says Andy Castleman, director of product and marketing for KYB Americas. "Consumer demand is very high, and manufacturers sometimes have trouble meeting that demand. KYB has very focused efforts in place to increase our delivery rates, as well as provide fitments for a wider range of later-model applications."

CUSTOMER COMMUNICATION

Overwhelming demand means extremely thin margins for error, adding an emphasis on shop efficiency.

"A top piece of advice for shops is to ask the customer what their driving preferences are and how they intend to use the vehicle. Is it lifted/stock/lowered? Will it be used off-road or on the track?" Bilstein's Von-Seggern says. "This will help the shop determine what the customer really needs or doesn't need."

Use your knowledge and experience to point drivers in the right direction—even if they initially have ideas for something a little different, says Castleman.

"For example, a customer may state that they want a 3-inch lift for their truck or SUV. Easy, right? Just sell them a shock that provides a 3-inch lift," he says. "But what retailers should really do is ask why they want a 3-inch lift. Is it merely for cosmetics? Do they use the vehicle for off-roading? Is it a work truck used to haul heavy loads or pull a trailer? These factors can influence the brand and type of shock that will perform best for the customer."

It takes knowledge and finesse to hit on the trends consumers want to follow while making the proper recommendations for each application, says Briere.

"With so much confusion out there, it is important for both a shop and the consumer to understand what makes a damper good and then purchase wisely," he says.



There is a current demand for damping adjustability. (Photo courtesy Thyssenkrupp Bilstein of America Inc.)



SHOCK VALUE



Consumer demand for performance shocks is currently very strong. (Photo courtesy KYB Americas)



Use factors help determine the best brand and type of shock for each project. (Photo courtesy KYB Americas)

Professional outlets often have knowledge of factors that customers fail to consider, Grasso agrees.

"Shops can take the initiative to educate their customers by providing detailed information about different types of shocks, their features and the benefits they offer. For example, they can explain how a performance shock can provide better handling, increased stability and improved ride quality both on- and off-road."

With that in mind, it's important that all add-ons work well together, Evans notes.

"Misapplying incompatible components is a huge mistake that some shops make. Avoid the mix-and-match approach led by either the customer or the salesperson simply not knowing any better," he says. "It's important to study product specs and, when in doubt, do due diligence to learn the best-performing configurations."

Ideally, shops won't undersell or oversell, he continues.

"It's important to know a vehicle's capabilities and potential, including the intended use. Configuring a build's suspension is one of the most crucial elements of any project. It can make or break customer satisfaction and poses a safety risk when done improperly."

What's best for the project should always come first, Bender agrees.

"Focus on what the customer wants or needs and don't only push products that grant the highest profit."

After all, trust is what the shop-client relationship is all about.

"For brick-and-mortar shops, realizing the value of their service and expertise is essential," says Thompson. "You don't have to race to the bottom to match a price. At the end of the day, customers ultimately want value and confidence that they've had quality parts installed by experts."

STRONG SALES

When it comes to increasing sales in the performance shocks market, ICON's Evans recommends starting by offering shock services for the parts you're already selling.

"Most performance shocks are fully rebuildable," he explains. "The customer is likely to return to the shop they purchased from to have them serviced, and if



Customers are likely to return for rebuilds and related services. (Photo courtesy ICON Vehicle Dynamics)

the shop does not provide the service, then it's likely to lose the next opportunity and potentially a repeat customer."

That may mean additional training for your technicians.

"Not all shocks are created equal," he continues. "If we hear of an alleged shock failure, we always drill down to see what the issue might be. In most cases, it's because the shock was well past its recommended service time, or it had recently been serviced incorrectly."

Performance shock upgrades are also an easy add-on when selling larger wheel-and-tire combinations, says KYB's Castleman.

"Original equipment shocks are not designed to dampen the additional unsprung weight of larger tires and wheels, making the vehicle harder to control. Packaging a wheel, tire and shock combination can generate additional revenue while providing your customer with better vehicle control and longer tire life," he says.

Thompson offers a formula to follow.

"First, understanding the customer's use is vital to success when upselling shocks. You can then use the various features and benefits to help the customer choose the one that will provide the comfort, control and safety they would expect from a high-quality performance shock," he says.

The next component is education.

"We know customers are willing to spend the money, but they need to understand how the product will benefit them. Once you know the difference between IFP versus emulsion shocks, how body diameter affects ride quality and why you should choose a dual-speed compression adjuster over a single adjuster, your sales opportunities will increase," he continues, noting his company has created a "FOX Academy" video series to help with shock sales.

It always comes back to the unique needs of each customer, says Bender.

"Make shock suggestions based on how the customer uses their vehicle rather than what's the latest trending product," he says. "Rancho recommends different shocks for different applications and use cases."

KONI is among the manufacturers that offer lines with various features and price points, Briere notes.

"Educate customers not only on performance level benefits, but also on the durability, warranty and craftsmanship behind the brand. Some customers may want to improve their lap times while others may want a more refined ride, so understanding product ranges will help increase sales."

Achieving those increased sales may simply require schooling customers on the available products, adds Radflo's Grasso.

"Shops should prioritize offering customers the option to upgrade to superior shocks that not only provide a better ride quality and increased comfort but are also serviceable and customizable to meet the needs of their unique build. By providing high-quality shock options, shops can ensure that their customers are fully satisfied with their purchase and will likely return for future business." ***TS***



A SPACE FOR BUSINESS



Urban Workshop is a successful makerspace in Costa Mesa, California.

Makerspaces offer a chance to get trained & get started. ///// **By Tony Thacker**

There's no doubt the industry desperately needs tradespeople of all stripes—everyone from CNC machinists to welders. We skipped a whole generation as we sent everybody off to college and university to get a degree, and that decision is now coming back to haunt us.

Not that there's anything wrong with getting a degree—there absolutely isn't—but we still need competent people to make and mend things.

Obviously, there are trade schools all over the U.S., but prior to the pandemic there were also a number of so-called "makerspaces" that were very effective incubators for budding engineers and entrepreneurs.

Makerspaces, of which the now defunct TechShop was perhaps the poster child with a much publicized visit from former President Barak Obama, are membership-based, DIY workshops and fabrication facilities. They offer the trained and untrained a cost-effective co-op facility in which to learn a trade or even start and run a business.

It's a great concept, but a business model that is very difficult to sustain.

FIND YOUR SPACE

In a previous life I was actively involved in education, and I visited a lot of makerspaces on the West Coast and in the Detroit region. Most are now gone, but ex-Mazda designer Truman Pollard introduced me to Urban Workshop (UW) in Costa Mesa, California, where he has been a youth program instructor since 2019.



Steve Trindade, left, and Truman Pollard of Urban Workshop.

Founded in 2014 by owner-operator



Youth programs are one of the four pillars of successful makerspaces. Students gain experience using tools, thinking on their feet and solving real-world problems.

Steve Trindade, Urban Workshop is housed in a 28,000-square-foot facility with easy freeway access in Orange County.

With a comprehensive range of tools and equipment—more than $1 million worth, including Solidworks software, 3D printers and a CNC mill—UW enables members to realize projects in a clean, safe environment where there is always professional assistance available to help get the job done. Members can run a business out of the facility, keeping startup costs to a minimum.

"With more than 300 members, we have several that operate small businesses from here, ranging from people making furniture to people restoring cars and converting vans," Trindade says.

Individual memberships start at $199 per month (annual agreement), offering full access to the facility, computers, meeting spaces, tools and equipment, on-site materials, Wi-Fi, experienced staff members, storage, etc. For a startup business, that's very reasonable.

You can also purchase month-to-month memberships for $249 per month. If you had a short-term project, say, three to six months, that program would be ideal. Incidentally, students and military members get a month-to-month price of $195, and there are family and lifetime membership programs viewable on the UW website (urbanworkshop.net).



A SPACE FOR BUSINESS



UW provides training and workspace for tradespeople, including a thriving automotive clientele.



Instavan is an auto-related upfitter that got its start at UW.

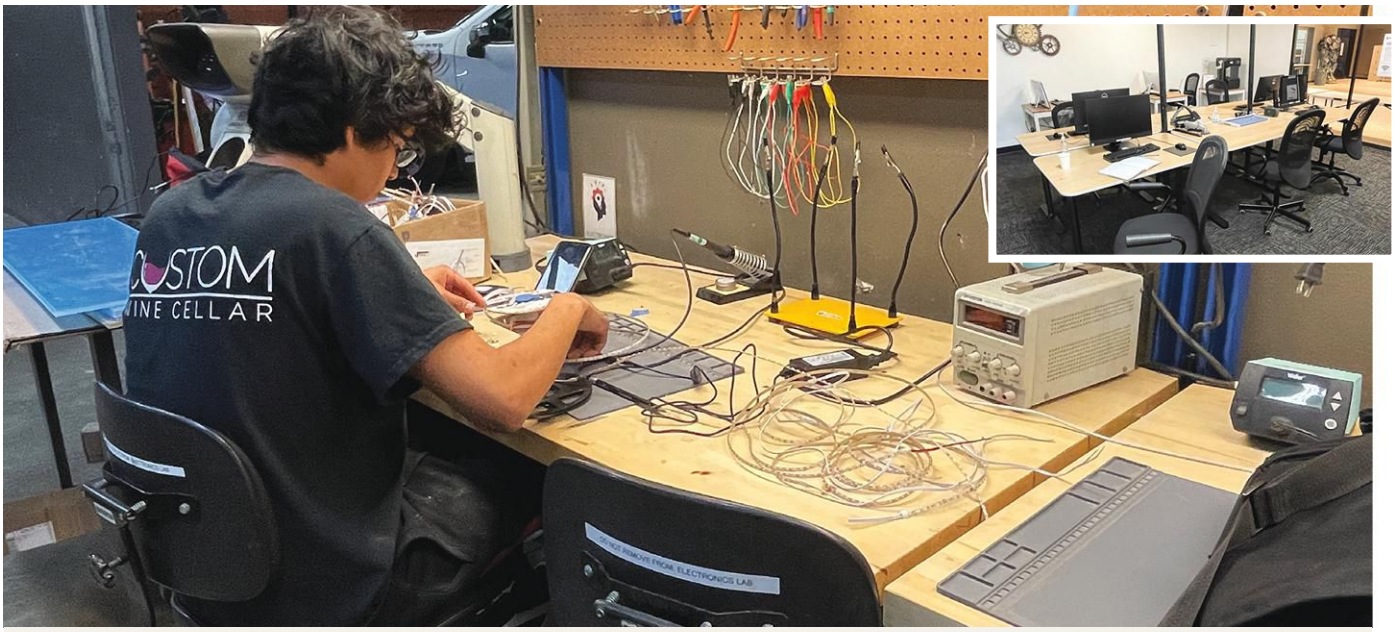
As the site says, the benefits of using a makerspace to kick-start a business are numerous—there are no long-term commitments or leases, no deposits, no personal guarantees, no insurance requirements, no capital equipment expenses and no tenant improvements (TIs) to make. You can start a side hack, using somebody else's space and equipment, and see if it works before quitting your day job.

And there's a track record. Some of the businesses that got their start at UW include vehicle upfitter Aiden James Customs, robot company Brikeda, Herst Coffee Roasters and SZK Metals, which specializes in architectural metal fabrication.

TIME IN THE GARAGE

Along with the "crafty" areas where people are making furniture, performing 3D printing and assembling electronics, there's an area of UW dedicated to automotive, including Instavan and American Corvair Service operated by Barry Sparks,

"I have a close affinity to the auto side," Trindade notes. "Until I started Urban Workshop, I was heavily involved with racing as president and CEO of Automotive Technology Group Inc., and after that as owner/COO/CFO and technical director of Socii Racing LLC, doing business as Truspeed Autosport. When the racing came to an end, I started Urban and in less than 10 months turned it into the third largest DIY workshop and makerspace in North America."



Members can take advantage of computer and electronics labs, a machine shop, meeting and outdoor workspaces, and hands-on instruction.



Makerspaces like UW are much more than a rental garage.

To be successful, most makerspaces require four revenue streams: membership, on-site storage, adult educational classes (for which you don't have to be a member) and youth programs.

"I was initially reluctant to embrace youth programs," Trindade admits. "Having children around equipment can be challenging, but youth programs now account for 30% of our business. And, I have to say, it's very rewarding to see children ages 10-16 enter the program with absolutely no knowledge or experience and emerge as enthusiastic and competent budding craftspeople."

UW's goal is to help students become curious about how the world works while introducing them to modern and traditional tools and techniques.

"We believe that everyone should be self-sufficient and have the skills and confidence to be able to fix and invent things," says Trindade. "This leads to young people who know how to think on their feet, solve real-world problems, are aware of the tools available to them and know how to use those tools."

ROOM TO GROW

Urban Workshop surviving the pandemic is a testament to the management skills of Trindade and his team. So, now that the acute shortage of technicians of all kinds is obvious, what does the future hold?

Growing the makerspace community, for one.

"We know from experience that starting, operating and maintaining a profitable makerspace is expensive and tough," Trindade says. "Consequently, we offer a Makerspace Blueprint licensing program for individuals and institutions that wish to start, operate or scale a makerspace of their own. By implementing our blueprint, somebody can shortcut the time and investment that we made to become sustainable, even in the toughest economy."

It starts with initiating the four revenue streams necessary for success.

"You can use the proven documents we developed to quickly establish both adult and youth course curriculums," he says. "You can use the time and money saved to develop impactful programs, and our licensing program provides valuable ongoing support by our experienced team to guide you through the process."

Kre8Now Makerspace in Lexington, Kentucky, recently took UW up on its offer.

"We were able to double their monthly revenue, increase profitability, add a new revenue stream, rework the existing adult education programs and hire two additional staff members in just the first six weeks," Trindade reveals.

During my tenure as an educator, it was obvious that there were a lot of students who were not necessarily destined for an academic career, and that's perfectly OK—it's not for everybody.

What we don't have, especially in the auto industry, are skilled workers. Practically every shop I know is desperate to find fabricators, body shapers, welders, painters and technicians.

If makerspaces provide an environment where people can get started on those skills and help build our workforce, then I believe we should do what we can to help support them. ***TS***



Born in England, ***TONY THACKER*** *is an accredited automotive journalist, author and book publisher, and served as marketing director at the famed SO-CAL Speed Shop.*

Engine Build p. 70 / Engine Products p. 77

Building a Big-Block Chevy, Part I

Starting with the block, crank, rods & more.

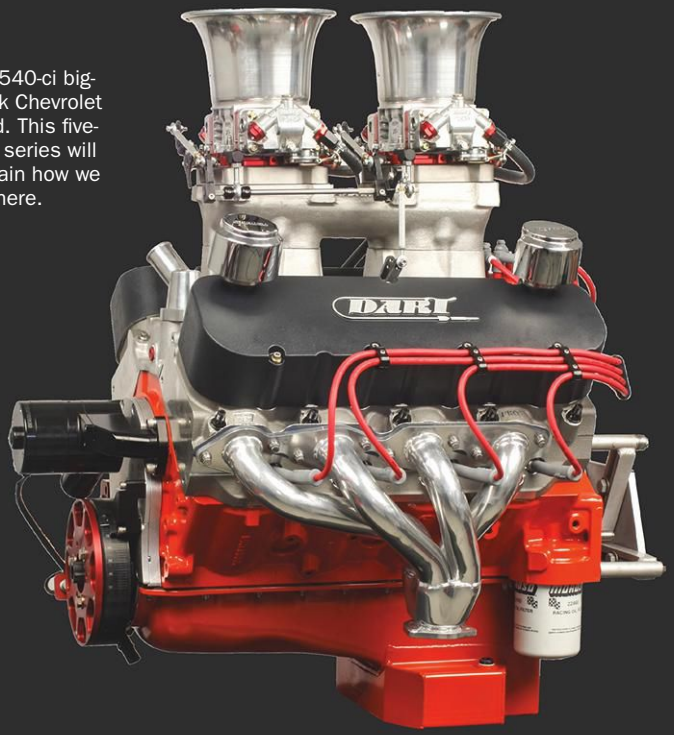
Build, text and photos by Mike Mavrigian

EDITOR'S NOTE: *This is the first installment of a five-part series highlighting the steps to building an old-school Chevrolet big-block performance engine.*

In this engine project, we decided to go "old school" and build one of the performance aftermarket's all-time favorites—a big-block Chevrolet. After all, who doesn't have a soft spot in their heart for a big-breathing Rat motor?

Our build features a 4.500-inch bore and 4.250-inch stroke, for a final displacement of 540 cubic inches. After all, more displacement equals more fun!

The build starts with a super-strong, new Dart Big M block and is adorned with a selection of cherrypicked, high-quality aftermarket components. It was done at the request of AERA (Automotive Engine Rebuilders Association).



Our 540-ci big-block Chevrolet build. This five-part series will explain how we got here.



The foundation of our BBC build is a Dart Big M block. We opted for the standard 9.800-inch deck height and standard cam bore location.

STARTING WITH THE BLOCK

Rather than messing around with an old OE core, we opted for the cream of the crop—a brand-spanking-new Dart Mark IV Big M iron block.

The Big M offers a number of significant improvements over a GM block, including priority main oiling, lifter bores lengthened by 0.350-inch for increased support, blind head bolt holes, superior iron alloy with high nickel content, thicker decks, priority main oil circuit, and a 0.300-inch minimum cylinder wall thickness (even with a max bore of 4.625 inches).

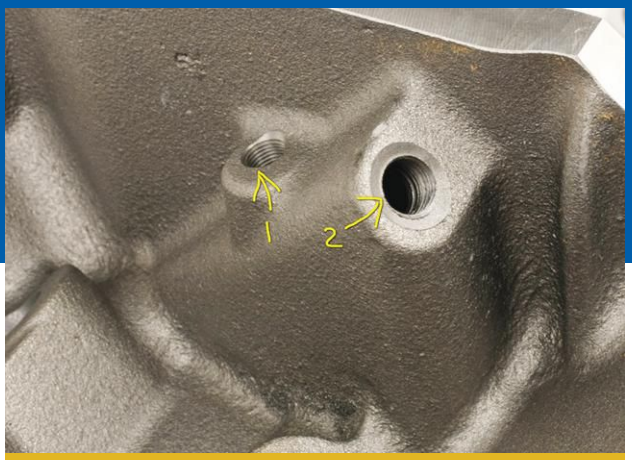
Options include bore sizes of 4.250, 4.500, 4.560 or 4.600 inches. There's also the choice of a standard or 0.400-inch raised cam bore. Deck height options include 9.800 or 10.200 inches.

To make life easier, the block readily accepts traditional/standard components and fitment, including all freeze and cam plugs, distributor, head bolt pattern, oil filter, standard cam bearing O.D., standard two-piece rear seal, mechanical fuel pump, Gen IV timing cover, starter and more. Oil pan bolt holes are provided to accept either a standard or a stroker pan.

Arguably the most significant selling point of this block is its beefiness and strength (plenty of metal to play with) and superior oiling circuit. A choice of steel billet or ductile iron main caps is also available (all four-bolt). This iron block weighs 280 pounds with a 4.250-inch bore, and drops down to 250 pounds with a 4.600-inch bore.



The front of the block is machined for both main and lifter galleys to accept 1/2-inch AN O-ring plugs. Lifter galleys are labeled here 1 and 2. The main is 3.



The front of the lifter valley features two ports—1/8-inch NPT and 1/4-inch NPT.

The Big M provides a stout foundation for any naturally aspirated or forced induction build.

BLOCK PREP

After performing an initial dressing by grinding off minor casting flashings in the lifter valley drain holes and removing the sharp edges from the cam bore entries and freeze plug holes using a bearing scraper followed by 220-grit sandpaper, I delivered the block to Ross Racing Engines in Niles, Ohio.

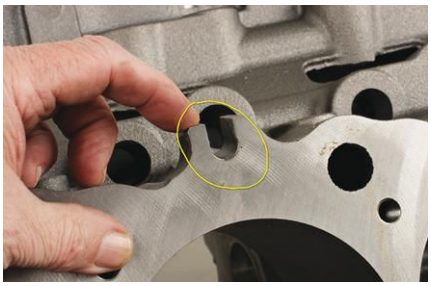
Owner Tony Lombardi decked the block to a height of 9.794 inches, which left our pistons 0.014-inch below deck. We could have gone with a standard deck of 9.800 inches, but having pistons 0.020-inch below deck seemed wasteful. Granted, we could have gone tighter, but our final deck height provides a bit of extra valve clearance for any "just in case" scenarios.

Cylinders were bored by removing 0.006-inch to obtain an initial 4.497-inch bore diameter, followed by CNC honing on Lombardi's new Rottler H85AX CNC honing station, where a final bore size of 4.500 inches was obtained by removing a final 0.003-inch using diamond stones followed by plateau honing.

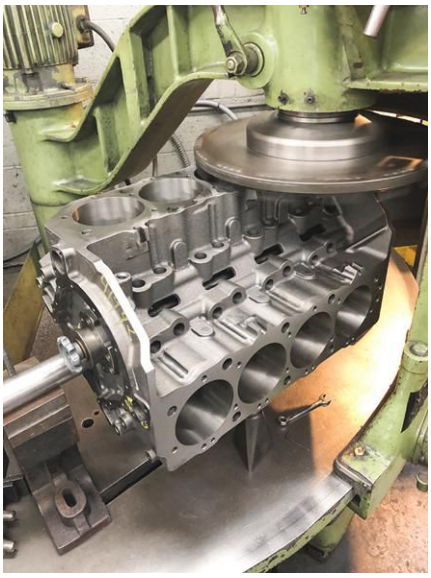
Lombardi noted that his new Rottler machine cuts his block honing time in half as compared to his traditional honing machine. Honing and brush finishing were done with deck plates in place. The result provided a 0.0045-inch piston-to-wall clearance.

Lombardi then fitted our lifter bores, removing 0.0005-inch to obtain a 0.0017-





The block will accommodate "extra" head studs (studs that screw into the deck of the heads, captured under the extension seen here with nuts). This feature aids in handling extreme pressures encountered in forced induction applications.



Tony Lombardi at Ross Racing Engines decked our block to achieve a height of 9.794 inches. Our combination of a 4.250-inch stroke, 6.385-inch rods and a 1.270-inch piston compression distance (CD) places our pistons 0.014-inch below deck.



Lombardi removed 0.006-inch from the cylinders to obtain our desired 4.500-inch bore size. (Photo courtesy Ross Racing Engines)

inch oil clearance for our Morel Black Mamba solid roller lifters (Morel's lifter guru, John Callies, recommends a lifter clearance of 0.0015- to 0.0017-inch).

All head deck threaded holes were cleaned and checked using a Goodson 7/16-14 thread chaser and then rinsed.

With the crank positioned on the upper main bearings, a rod and piston assembly (with rod bearings) was mocked up at each cylinder, carefully rotating the crank to check for rod-big-end-to-block clearance. All rod big end bolt-heads-to-block-pan-rail-area clearances were verified at 0.285- to 0.300-inch, providing more than enough room. I generally regard 0.050- to 0.060-inch as a bare minimum.

With a rod and piston assembly test installed, crank-counterweight-to-piston-pin-boss clearance was also checked. The tightest I found (at counterweights 1, 5 and 6) was 0.100-inch, again more than adequate as I consider 0.060-inch as a minimum.

As Dart had already notched rod bolt clearance, no extra block clearancing was required.

THOROUGH CLEANING

With all crank/rod-related clearances verified, it was time to have the block jet-washed and meticulously cleaned by Jody Holtrey of Medina Mountain Motors in Creston, Ohio.

For added security, I then scrubbed the oil galleys using Goodson's high-pressure cleaning tool kit, which is way cool. It features a billet machined handle with both air and water control, a stainless wand (18- or 36-inch length) and three cleaning rifle brushes (3/8-, 1/2- and 5/8-inch).

You can run the tool dry, with water or with compressed air, as well as with both air and water together. The tip of the wand features spiral-oriented holes to create a strong swirling action.



The Rottler CNC honing machine allows easy setup and provides real-time graphing of cylinder wall profiles. (Photo courtesy Ross Racing Engines)



The Goodson cleaning tool features a billet aluminum body and separate activation buttons for air and water, to be used individually or simultaneously.



The Goodson cleaning tool kit includes brushes in diameters of 3/8-, 1/2- and 5/8-inch. A spiral layout of the water/air orifices creates a swirling action.



After the block was jet-washed, we ran Goodson's oil galley cleaning tool through the main and lifter galleys.

Once the block was "clean," I cleaned it again using extremely hot water and Dawn dishwashing liquid (my go-to soap that I use on all of my blocks). This solution was routed through all holes and passages using an assortment of Goodson bore brushes, along with scrubbing the block exterior using a nylon bristle brush.

It was followed by a hot rinse, immediately followed by a cold rinse in an effort to



Each piston weighed 590.4 grams, with no variances throughout the entire set.



Craig Haslem of RPM Engine & Machine notes results from the initial spin. It took Haslem just six spins to read and correct for imbalances.





Weight removal was required at the front and rear counterweights, with no need to add heavy metal.

prevent quick surface oxidation and blown dry with compressed air. Once absolutely dry, bores and decks were lightly coated with WD-40.

The block was then masked and lightly primed with SEM self-etching primer. This was followed by a coat of gray primer and three coats of old-school Chevy Orange.

BLOCK PLUGS

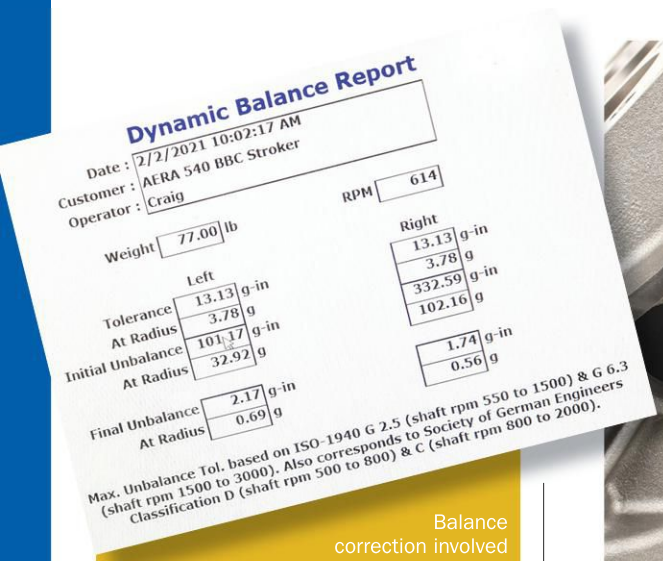
The front and rear of our block's main feed and lifter galley ports feature straight AN threads, not NPT. The front requires three 1/2-inch O-ring AN plugs, and the rear takes two 1/2-inch O-ring AN plugs and one 3/4-inch O-ring AN plug (all were supplied with the block).

These plugs are available from Dart. Don't assume that NPT plugs are used in these locations.

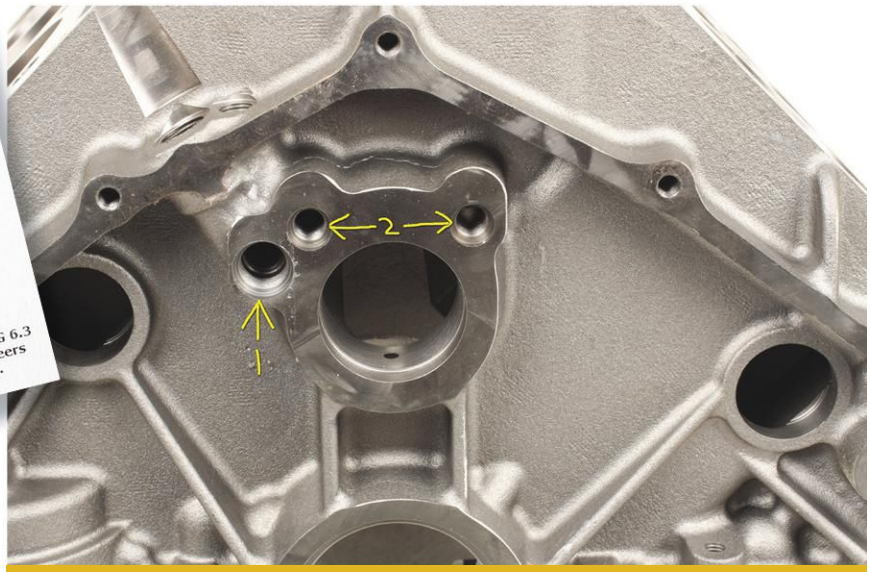
The forward end of the lifter valley features two NPT threaded holes that intersect with the lifter galleys. The larger hole requires a 1/4-inch NPT plug and the smaller one takes an 1/8-inch NPT plug. The restrictor location is accessed by removing the 1/4-inch plug.

The block is tapped for 1/8-inch NPT between the main oil feed





Balance correction involved material removal from the front and rear counterweights to achieve a balance between 0.69- and 0.56-gram.



The block rear oil ports required a 3/4-inch AN O-ring plug for the main (1) and 1/2-inch AN O-ring plugs for both lifter galleys (2).



Haslem's balancing machine monitor shows the location, diameter and depth required for weight removal drilling.



The front oil plugs (1/2-inch AN O-ring) sit flush with the block, avoiding any cam gear clearance issues.



Our SCAT forged crank features a stroke of 4.250 inches. Rod pins are 2.100 inches. Balancing this crank was easy.



Our SCAT H-beam forged steel rods measure 6.385 inches. Big end weights are 550.4 grams. A few of the small ends were lightly kissed (removing perhaps 0.3-gram or so) to achieve an equal weight of 246.60 grams, with total weights at 797 grams.

and the lifter galley if restriction is needed. Since we're running a solid roller cam, we opted not to restrict.

The top rear left side of the block features a 1/2-inch NPT port, to be used if running a remote oil filter, and a 1/4-inch NPT port for oil pressure gauge installation.

Expansion plugs for the block sides and rear are the standard 1-5/8-inch. The rear cam bore plug is also stock BBC size, 27/32-inch.

NOTE: OIL FILTER ADAPTER

When installing a spin-on oil filter adapter to the block, Dart notes that the 5/16-18 mounting bolts must be 1-1/4-inch overall length. Note that this actually refers to threaded shank length.

Dart emphasizes the importance of paying attention in order to provide a half-inch of thread length to engage into the block. Regardless of bolt head height, the objective is to allow a half-inch of thread depth into the block.

Be aware of this. The under-head length I used for the Melling adapter was 1.25 inches with lock washers.

CRANK, RODS & PISTONS

Our stroker crank is a forged unit from SCAT featuring a 4.250-inch stroke, 2.200-inch rod journals and 2.749-inch main journals, with a snout diameter of exactly 1.600 inches.

Our H-beam forged steel rods are also from SCAT, with a center-to-center length of 6.385 inches. I measured each rod, and their lengths were spot-on.

The floating pin diameter is 0.990-inch. Note that this crank requires "narrow" rod bearings to clear the generous rod journal fillets (Clevite CB743HN is an example).

During clearance checking, I measured our SCAT crank's main journals at 2.749 inches, noting zero taper. With main bearings and main caps installed, I set our bore gauge at zero at each bearing location and individually measured oil clearance with



Our solid roller steel COMP bumpstick features intake and exhaust lift (with 1.7:1 rockers) of 0.715-inch, duration @ 0.050 of 276 degrees intake and 282 degrees exhaust, with lobe separation angle (LSA) at 111 degrees. The cam includes a 4/7 firing order swap.



Our pistons are UEM's Icon forged premium slugs, sized for 4.500-inch bores and featuring a 10cc dome.



The Icon IC516 piston skirts are coated for added lubricity. Note the ring groove oil ports.



Our pistons feature a compression height of 1.270 inches, which places the 0.927-inch pin bores into the oil groove, requiring the use of spacer rings (included).

the bore gauge checking our micrometer, obtaining a pleasing 0.003-inch oil clearance at each main bearing location, (0.0025- to 0.003-inch is an acceptable standard for a BBC).

I also measured all rod journals at 2.200 inches. Again, each rod journal was exact, with no taper. SCAT did a nice job. All fillets were precision-radiused, and all oil holes were edge-free with smooth chamfers and lead-in paths.

Our pistons are forged aluminum slugs from United Engine & Machine's Icon line, featuring 10cc domes and anti-friction-coated skirts, with oil holes at the oil ring lands and full-float, 0.990-inch Trend wrist pins.

- Crank stroke – 4.250 inches
- Connecting rod length – 6.385 inches
- Piston compression distance (CD) – 1.270 inches (0.990-inch floating pins)

The piston design allows the wrist pin to be secured with a single Trend spiral lock (supplied) at both ends of each pin.

CHECKING CRANK THRUST

Once main bearing oil clearance was verified, I applied CMD 3 lube to all bolt threads and under-heads. I installed and fully seated all main caps, then backed off the bolts and re-snugged to about 10 pound-feet.

I knocked the crank fore and aft to obtain main cap register and checked crank thrust at 0.007-inch. All bearings were coated with Royal Purple Max Tuff synthetic assembly lube.

I cocked the rear main upper and lower seal halves offset, adding a dot of RTV on each exposed seal end. With all caps hand-snug, the crank was knocked fore and aft again. All caps were then torqued to 15 pound-feet and thrust was again verified at 0.007-inch.

All cap bolts were then torqued to 30, then 50, then 65, and then to a final 100 pound-feet, with thrust verified after each step.

ROD BEARING CLEARANCE

As noted, all SCAT crank rod journals measured exactly 2.200 inches with no variations. The Goodson micrometer was locked in at 2.200 inches and secured to my Goodson micrometer stand.

With a pair of MAHLE Clevite CB743 HN standard bearings fitted to a rod and the ARP 2000 7/16x1.6-inch rod bolts torqued to 70 pound-feet, I used my Goodson bore gauge to establish a zero reading on the installed bearings. Placing the bore gauge onto the micrometer, an oil clearance of 0.002-inch was observed.

I then swapped out the lower rod bearing shell for a CB 743HXN, and observed an oil clearance of 0.0025-inch, which I decided to incorporate. All rods will be fitted with a standard upper bearing and 1X lower bearing.

During final assembly, all rod bolts will be tightened while monitoring stretch (SCAT recommends a max stretch of 0.0062-inch for the 7/16x1.6-inch ARP 2000 rod bolts). And yes, it is perfectly acceptable to mix upper and lower bearing thicknesses within these ranges.

Note: Take the time to read the instructions supplied with aftermarket rods. Torque recommendations and max rod bolt stretch specs will differ depending on the size and type of rod bolts.

Bolt diameter, type of material and length all factor into required tightening specs. Bolt heads are marked with series type, and thread diameter and length are easily checked, so pay attention.

CAMSHAFT INSTALL

Once the block was absolutely clean and painted, we installed a set of Dart's coated cam bearings. A test fit of the cam revealed an easy finger spin.

During cam installation, I coated the journals with Royal Purple Max Tuff. A roller cam must be positioned to minimize endplay, since roller cam lobes do not feature a taper (flat-tappet cam lobes feature a slight taper to force the cam rearward, preventing it from walking forward).



We used standard MAHLE Clevite MS829H main bearings. Rod bearings are CB743 with a mix of standard and 1X.

If the roller cam features a step in the nose, a retainer plate may be installed to prevent excess forward walk. If the cam nose does not feature a step, a thrust button is required that installs into the cam gear center hole and contacts the cam nose, providing a forward thrust limit at the rear of the top timing cover.

Since our cam is non-stepped, we used a roller thrust button included in the COMP three-piece timing cover set. Per the instructions with COMP's timing cover kit, cam endplay/thrust should be in the 0.005- to 0.010-inch range.

Shims are used to adjust the thrust button placement. With the cam installed, insert the thrust button and the timing cover. The lower cover section features a 1/8-inch NPT hole for dial indicator access to the bottom of the cam gear face.

Using a long flat-blade screwdriver, gently walk the cam rearward via one of the lifter bores, zero the indicator, and walk the cam forward to observe play. If play is excessive, remove the thrust bearing, insert a spacer shim and try again.

Shim thicknesses include 0.005-, 0.010- and 0.020-inch. Fine-tune until you gain acceptable endplay. We set ours at 0.007-inch.

Once thrust was set, the three 1/4-20 socket head cap screws (SHCs) were removed and a retainer plate that captures the thrust button was installed. SHCs are provided in order to clear the thrust button, since hex head screws prevent access with a socket wrench.

Because our Cloyes Hex-A-Just timing set features an eccentric bushing at the cam nose dowel location that allows cam advance/retard adjustment, I had to drill a hole in the retainer plate to clear the hex adjuster. I then opened that hole fully at the outside to reveal the timing reference dots on the cam gear.

The Cloyes set also features a thrust bearing (Torrington) that seats into a recess at the rear of the cam gear. If cam timing adjustment is needed, simply loosen the three gear-to-cam mounting screws, adjust the eccentric and retighten the screws to 25 pound-feet, adding medium-strength threadlocker.

COMP CAM SPECS

Billet steel mechanical roller Grind 4028B/4032B	
ADVERTISED DURATION	312 degrees intake; 318 degrees exhaust
DURATION @ 0.050-INCH	276 degrees intake; 282 degrees exhaust
LOBE SEPARATION ANGLE (LSA)	111 degrees
VALVE LIFT (WITH 1.7:1 ROCKERS)	0.715-inch intake; 0.715-inch exhaust
LOBE LIFT	0.4210-inch intake; 0.4210-inch exhaust
JOURNALS	1.950 inches
4/7 SWAP FIRING ORDER	1-8-7-3-6-5-4-2

FIRING ORDER SWAP

In combination with our 1.7:1 Harland Sharp roller rockers, our solid roller billet COMP cam features an effective 0.715-inch lift at both intake and exhaust, with duration (@0.050-inch) of 276 degrees intake and 282 degrees exhaust.

The cam's firing order features a 4/7 timing swap. Changing the firing order offers several benefits.

With a common pin V-8 crankshaft, it is impossible to eliminate having adjacent cylinders fire one after another in the sequence. A 4/7 firing order moves the hot spot from the 5/7 cylinders up to the more-forward 4/2 cylinders. This aids in cooling in an engine that features a front-mounted water pump.

Also, there are main bearing benefits in terms of reducing harmonics and improving oiling. Theoretically, you'll see better bearing life and less scuffing when swapping to a 4/7.

Again, we are trying to change firing pairs. The focus is on pairs that fire on the same pin, thereby focusing the force on the adjacent crank main bearings. Moving this to the back of the engine seems like a good idea because, even with a crank damper, the drive train is much better at damping these forces than a small mass on the end of the crank.

When we consider the power that can be gained with lighter-weight, lower-viscosity oils, bearing life becomes not only a durability concern, but also a power consideration.

Finally, changing the firing order is one of the best ways to change the cylinder-to-cylinder fuel and air distribution in the engine. Just like throws on the crank and cylinders next to each other in the block or head, we have to deal with ports next to each other and across from each other asking the manifold for air one after another.

This creates a dynamic system in the manifold plenum where pressure waves of air (and also fuel in a wet manifold) are moving from front to back and side to side. Changing the firing order definitely changes how the ports interact.

Next time we'll take a look at the lifters, heads, rockers and more. ***TS***



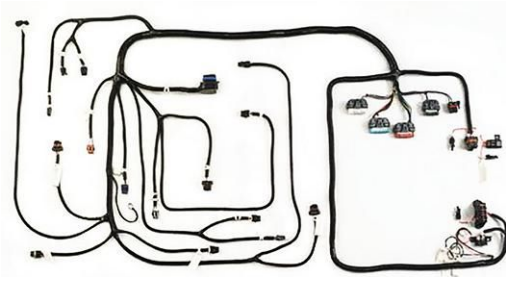
MIKE MAVRIGIAN *owns and operates Birchwood Automotive in Creston, Ohio, where he builds custom engines and street rods and performs vehicle restorations. He has written thousands of technical articles as well as nine books on automotive technology during the past 30 years. Mike can be reached at (330) 435-6347 or birchwdag@frontier.com. Visit Birchwood's website at birchwoodautomotive.com.*



Line Sleeves

Design Engineering Inc. (DEI), Avon Lake, Ohio, presents Heat Shroud Line Sleeves for –20, –16 and –12 AN sizes. Designed to reduce heat strain and abrasions on lines, hoses and wires, the sleeves offer an easy wraparound installation. They are constructed from a high-temperature-rated glass-fiber fabric with an insulating inner layer and a heat-reflective outer surface. The pliable sleeves can be used on tight bends with no need to disconnect lines. They are available in 3-feet and 10-feet lengths and can be trimmed to fit.

Vortec Wiring Harnesses



Howell EFI, Marine City, Michigan, offers Wiring Harnesses for a variety of GM Vortec pre-LS engines (1996-2007) including 4.3L, 5.7L, 7.4L and 8.1L applications. The 4.3L wiring harnesses for small-block Chevy engines are available for manual and electronic transmissions. They allow for sequential fuel injection (SFI) and operate with all stock sensors. The 5.0L and 5.7L Vortec harnesses allow for SFI for 4L60E or 4L80E transmissions and can be sold with or without emissions connections.



Honda/Acura PowerPak Piston Set

MAHLE Motorsport, Fletcher, North Carolina, presents its Honda/Acura K24 2.4L PowerPak Piston Set. Manufactured with high-strength 2618 aluminum alloy in a slipper skirt forging, the forged pistons are designed for reliability in extreme-duty applications. The set features heavy-duty, 0.250-inch wall thickness H13 tool steel wrist pins and comes complete with a nitrided steel 1.2mm top, 1.2mm second and 2.8mm oil ring set. The pistons are forged with valve pockets to accommodate K20 and K24 heads and fit OEM-length connecting rods and wrist pins.

Pro Series Rocker Arms



PRW Industries, Perris, California, introduces PQX Platinum Pro Series Rocker Arms. Made from 2024 extruded billet aluminum, the CNC-machined rockers are precision-finished with ground needle and cage bearings for improved performance and quiet operation. Heat-treated GCr15/52100 steel nose rollers with axles and trunnions minimize normal wear, and the surface finish is shot-peened and anodized to increase strength and reduce stress. The rocker arms are rated at 750 pounds of open spring pressure to withstand rigorous racing conditions.



Flex Fuel Sensor Adapter

Aeromotive Inc., Lenexa, Kansas, introduces a Flex Fuel Sensor Adapter to accommodate high flow demands while still allowing the OEM flex fuel sensor to accurately read the ethanol/gasoline ratio at all times. The adapter features ORB –10 inlet and outlet ports that can be fitted to any size fuel line with a dual O-ring seal for the OEM flex fuel sensor's 3/8-inch tube. The adapter's body is constructed from 6061-T6 aluminum alloy with a bright-dip anodized finish and is sold preassembled as a body without the OEM sensor.



LS Valve Springs

Elgin Industries, Elgin, Illinois, introduces a new line of PRO-STOCK Performance Valve Springs engineered for GM LS-based engines. The valve springs are optimized for use with Elgin PRO-STOCK performance camshafts, including the Sloppy Stage 2 hydraulic roller lift cam. The heat-treated springs include a micro-engineered surface finish for maximum durability, multilayer fatigue enhancement to eliminate potential surface defects and prolong spring life, and beehive and conical geometries to reduce dynamic surges. ***TS***

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Hot Wheels Seeks Customs for Garage of Legends

The 2023 Hot Wheels Legends Tour presented by Mobil 1 kicked off May 13 in Miami, resuming an annual search for customized vehicles worthy of being recreated in 1:64 scale.

With interactive shows planned for 17 countries, custom car builders around the world can enter for a chance to have their unique projects chosen as the next Hot Wheels Garage of Legends inductees.

Now in its sixth year, the Hot Wheels Legends Tour offers shops and enthusiasts the opportunity to have their custom vehicle creations immortalized and celebrated by fans around the world, including stops at the SEMA Show in years past.

"More than 10,000 incredible cars were entered in last year's Hot Wheels Legends Tour and this year we're expecting even more as the tour continues to grow," says Ted Wu, vice president and global head of design for vehicles, Mattel. "Not only are there more countries participating, but we expect each city to bring even more custom builds this year, making 2023 the most competitive Legends Tour yet."

Stops have been added in France and Italy, making this year's tour the largest in Hot Wheels history. The U.S. will host nine regional events across the country, culminating Oct. 7 at the Mobil 1 Rally and Legends Fest at the brand's headquarters in El Segundo, California.

As in years past, both the Global Semi Final on Nov. 2 and the Global Grand Finale on Nov. 11 will be presented virtually, so fans around the world can tune in to watch as the 2023 champion is crowned.

The U.S.-based regional events will again be held at Walmart stores and feature interactive analysis and coverage from onsite hosts, according to tour organizers.

Each stop will include activities for fans of all ages including a Power Wheels racing track, RC races, a preview of the new Hot Wheels Rift Rally and play spaces where kids can interact with the latest Hot Wheels toys.

The Hot Wheels Legends Tour seeks custom vehicles to immortalize in 1:64 scale.



The regional events, Global Semi Final and Global Grand Finale will be streamed on Hot Wheels' social media channels.

"We are thrilled to continue our partnership with Hot Wheels on the Legends Tour, bringing auto enthusiasts together across the globe to share their passion projects," says Ryan Allen, brand & partnerships manager of North America, on behalf of Mobil 1. "The introduction of the Mobil 1 Rally will be an incredible addition to the tour, as we're driven by the love of driving and aim to inspire drivers to get behind the wheel and connect with the world around them. We believe that these one-of-a-kind builds are at their best on the open road and are excited to help bring that to life."

Upcoming North American Tour dates include:

- June 10: Walmart in-person event, Detroit
- June 24: Walmart in-person event, Chicago
- July 8: Walmart in-person event, Houston
- Sept. 9: Walmart in-person event, Dallas
- Sept. 23: Walmart in-person event, Phoenix
- Oct. 7: In-person event at Hot Wheels headquarters, El Segundo, California
- Nov. 2: Global Semi Final (virtual)
- Nov. 11: Global Grand Finale (virtual)

Since its launch in 2018 to commemorate the toy company's 50th anniversary, the Hot Wheels Legends Tour has grown from a series of local Walmart events across the U.S. to the world's largest traveling car show, the company says, bringing in builders and automotive fans through both virtual and live events.

Previous champions include the "2JetZ" in 2018, "The Nash" in 2019, a 1970 Pontiac Firebird in 2020, a 1969 Volvo P1800 gasser in 2021, and last year's champion "Texas Toot," an ultra-custom 1992 Autozam Scrum micro-truck.

For registration information or to learn more about the Hot Wheels Legends Tour, visit hotwheels.com/legends. **TS**

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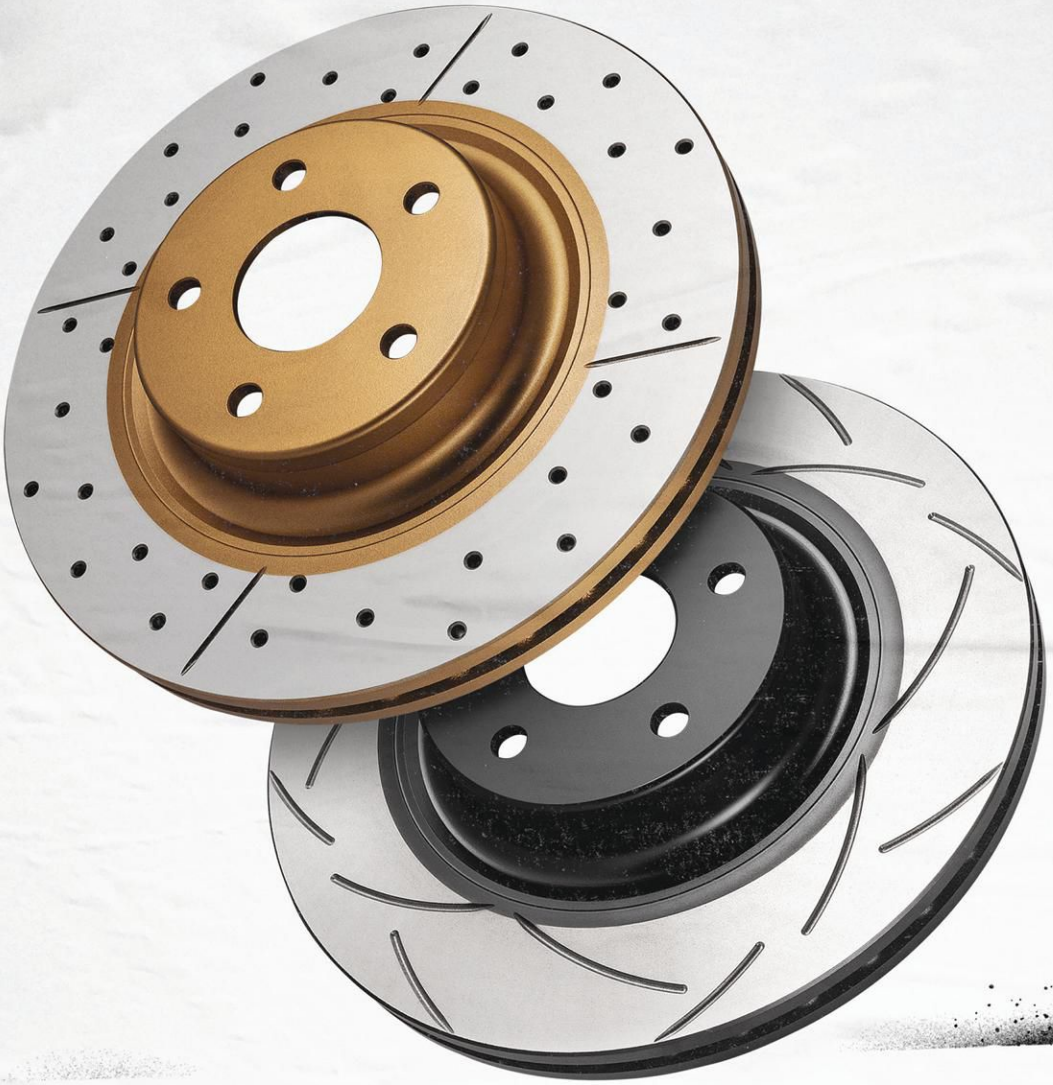
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