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A RESTORATION STORY**

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# PERFORMANCE TECHNICIAN

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*We begin our review of a two-year restoration and rebuild, told by the pictures we took along the way. Read tips and tricks we learned, with the intention of helping save time, (money?), and yes, possibly some knuckle bruises.*

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# TECHNICAL MINUTE BOLT SEALING AND LOCKING PRODUCTS

-Greg McConiga





I started out on this project with high hopes... I figured I'd gather up a half dozen or so of the popular threadlocker compounds and test them primed and unprimed by setting up an experiment in the shop and then test the results to see what I could determine about how well they set up and what I might expect to see for breakaway torque on similar bolts and nuts. Using a washer as the clamped piece, with all parts cleaned and prepped the same way and with all fasteners made from the same materials with the same plating I set up a few tests using the products I usually stock and began the search to buy a few products that I don't normally use. Then reality set in...

*Opposite Page: Working on an engine, transmission or differential or other oily part means a little more preparation when you're applying a threadlocker. The best solvent I've found is acetone, although I've also used an alcohol based brake cleaner that seems to work well. Bottom line is that all threads have to be clean and dry for the product to work well. I know acetone works... that's why I use it now exclusively.*

## IT MUST BE UNOBTAINIUM

I discovered that for some reason a number of the products I wanted to test are either not available in the United States, or not available in any reasonable time frame. In fact, some products are available only in Europe. I don't know why... yet... but I'll find out. In the meantime, what started out as a feature is going to be reduced to a tech minute while I make a few more calls and research the issue of product availability a bit more so I can get an answer for you. It's not what I intended, but I still got some interesting results that I can share with you and as I'm able to put hands on product I'll write about this again in the future.

## IT'S THE SAME ONLY DIFFERENT

All of the threadlockers I've found so far use very similar chemistry. All are some form of an acrylic and contain Methacrylate or di-methacrylate ester and all are anaerobic, curing in the absence of oxygen. Anaerobic is something that occurs or proceeds or even lives without the presence of oxygen. Yes, even lives without oxygen... there are anaerobic bacteria and they are nasty, smelly little varmints.

I've worked in some shops where as the drains slowly accumulate the dirt and grease off the cars over the period of six months or a year anaerobic bacteria begin to take hold below the muck layer in the drain troughs and when clean out time comes it creates quite a nasty stench in

the shop when you break open the top of their “house” under the muck. Let’s just say having the doors up that day will be to your benefit...

The opposite of anaerobic is aerobic, that that lives or proceeds in the presence of oxygen. There are several ways for glues and adhesives to cure. Some require oxygen to harden, some require water vapor or a certain level of humidity, some are two-part, needing a chemical partner to set up and some cure when no oxygen is present, like virtually all of the anaerobic threadlocker products we’ll review here.

## WHY USE IT AT ALL?

There are a number of real advantages offered by threadlocking compounds. Threaded fasteners are subject to any one of a number of failure modes including mechanical failure due to overload, vibration, tension release or relaxation or a tendency to self-loosen under some operating conditions.

There are a lot of ways to mitigate these failures; we can select much better fasteners, in higher grades or larger sizes for those places where they can be fit and we can safety wire or use locking hardware like split or serrated lock

washers or nylon or distorted body jam nuts to increase the torque needed to back off the fastener but mechanical locking systems don’t perform well in terms of controlling the self-loosening associated with lateral or sliding motion between bolted components.

The use of a threadlocker eliminates the extra length of fastener needed to accommodate a washer or taller locking nut, reduces parts count and costs



*I couldn't get several of the products I wanted to get in time for this feature. I've literally been waiting almost two months for some to arrive. I tried to order Loctite 276 but for reasons that are unclear it seems to only be available in England, so I located an MRO product that is similar. Not sure what the shipping will be, but I'd like to try the 276 because it's actually listed as a medium viscosity threadlocker whereas the MRO product is a retainer product, so I'm not sure how they compare. One product came in expired... one of the activators... and another is due to arrive later this week. My advice is make sure you get your products ordered in the off season because it appears the market dries up pretty quickly once racing season lights off!*



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associated with additional hardware and it has several other benefits as well. Since it has some body to it, it fills the void between threads and increases total contact area between the threads basically creating a chemical/resin bond in 100% of the threaded portions where with mechanical locking controls the contact surface areas can sometimes be as low as 15-20% between bare threaded surfaces.

Threadlockers also seals the interface, keeping corrosion due to moisture, fluids or chemicals out of the threads and all the hardware secured by threadlockers is reusable if cleaned, unlike some lock nuts or lock washers. Acetone or MEK (methyl ethyl ketone) renews the surface and prepares the bolt for reuse. Finally, using a threadlocker provides a lubricating factor that makes achieving repeatable torque values easier on threaded assemblies.

## PRODUCT OVERLOAD

There are far more threadlockers, bearing and sleeve mounting products and other retaining and sealing compounds out there than I ever suspected. For our racing applications the primary concerns are strength and temperature range and there are several options for temperature range within each strength range.

Strengths range from very low to very high and temperature resistance ranges from about 250 degrees to upwards of 400 degrees. The largest and best known maker of these products has got to be Loctite... a name so well known that most

products used to secure or glue fasteners are known generically by that name, even if made by other companies. To my knowledge there are only three companies I can find but that's not to say there aren't a lot more out there. MRO Solutions is one I found at an industrial supply company, and Henkel makes Loctite and Permatex markets threadlockers as well. I'm sure there are others I just am not aware of.

## STRENGTHS, TEMPS AND APPLICATION

From low strength to high the colors of Loctite products run purple, blue, red or red-orange and green. In each color and strength of product there is typically one or more temperature ranges for each color that will be designated by the same color but with a different product number.

As a general rule of thumb the color you use will be partly dependent on the fastener size it's applied to. For fasteners under a quarter of an inch the purple formulation is recommended, for fasteners up to three-quarters of an inch the blue product is your first choice and over three-quarters of an inch the reds are recommended, although these are only recommendations. I have used red 272 on 5-16" and 3/8" fasteners successfully when I wanted to be absolutely sure the fastener wouldn't loosen on some critical applications. I'm equally certain it was overkill.

The greens are used for large assemblies where disassembly is rarely required and remember than any of the high strength formulas in either red or green may require

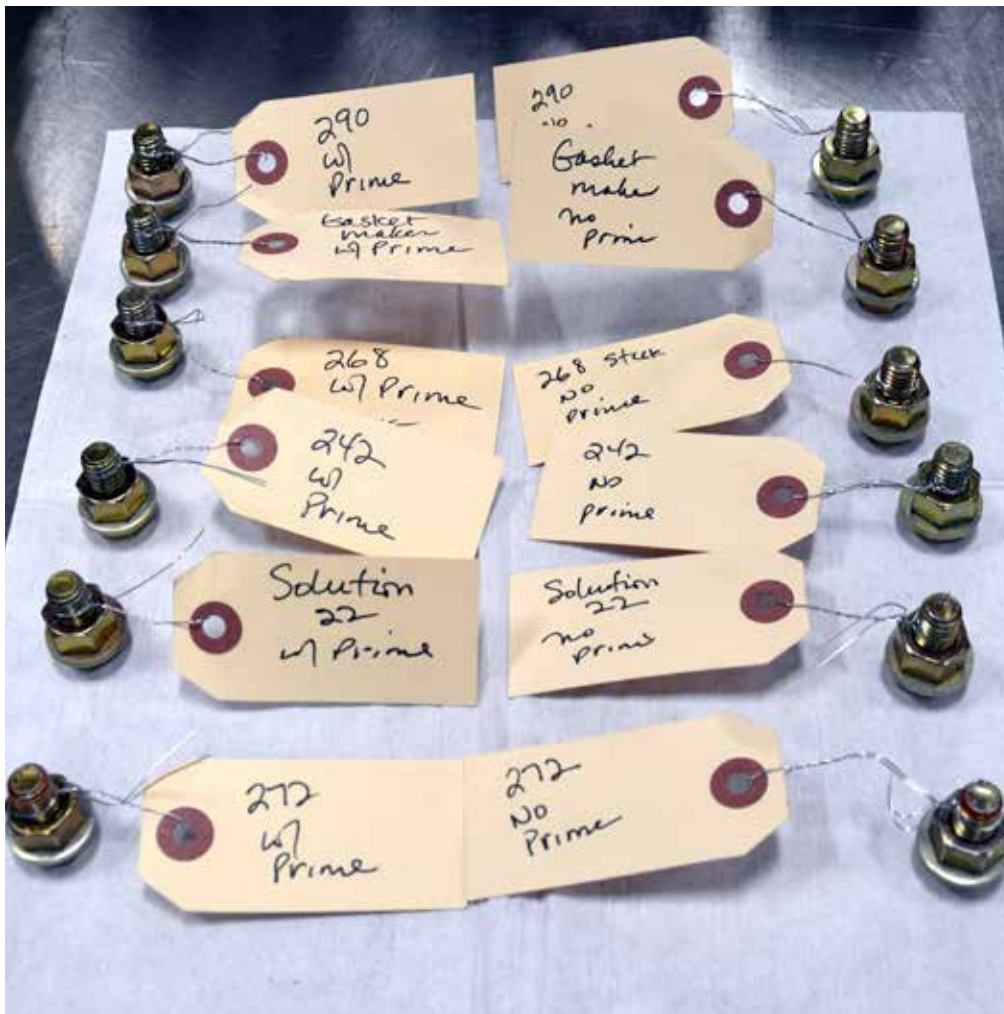


heat to facilitate disassembly. Heating a thread locked joint to over 300 degrees or so with a heat gun will greatly ease disassembly if you need to get the nut off or the bolt back out.

Under each color there are different temperature ranges of products with different holding characteristics formulated to specifically combat things like vibration or contamination. There are even specific formulas for oiled or re-oiled fasteners or fasteners subject to extreme vibration or lateral force. There are several online publications and application guides for you to access and review and I strongly suggest that you do a little reading on the

subject... there's a lot to learn that will help you in your racing program.

The type of metal and the plating used affects threadlocker performance. Inactive metals like titanium, stainless steel, zinc plating, magnesium, black oxide or anodized aluminum may require the use of a primer and activator... especially if BOTH bolt and threaded hole are made from an inactive material. If only one of two surfaces is inactive you can get away with not using a primer and activator, but when in doubt use the appropriate cleaner-primer and activator to make sure the joint is secured as designed.



*This is how I laid out the first test and I was pretty disappointed and confused by the results. There appeared to be no benefit to using the Loctite primer over just using acetone only. Reading the product label on the primer can suggest that it's mostly acetone anyway, so you might be able to save yourself the money of buying it. The most disturbing aspect of this first test was that I literally had no product work correctly other than the green wicking 290. I didn't know what to expect with the gasket maker, but it really didn't act like it provided any extra resistance to removal, which also confused me because I've used it on block drains and oil gallery plugs and it seemed like it locked those tapered pipe fittings in pretty tightly. Maybe I'm just tightening them more than I think. As it turns out the reason that I got such sketchy results is because I just didn't apply the product correctly!*

## YOU CAN'T JUST SLAP IT ON

How you install a threadlocker is critical to making it work correctly for you. If the product is only applied to the bolt air pressure below the bolt may force the product out of the threads as the bolt is run in and the joint will fail. The entire area between the nut and bolt or bolt and hole must be wetted for the product to work as designed. Any excess threadlocker can be wiped away after installation so more is better.

I found this out the hard way... and in learning this lesson I discovered that I have been using the product wrong for years! Using a small amount of product doesn't create the anaerobic environment you need to make the product cure... as you will soon see.

You can't just have one bottle of product and use less of it on a fastener to achieve a lower level of adhesion. I've often used red 272 on most of the fasteners I was chemically securing... putting just a drop in place on the smaller fasteners and more on the larger ones thinking that using a small amount would result in less breakaway torque on the smaller fastener while still providing sufficient holding power. Silly me! I was wrong and the testing I've gotten done to this point proves it. The correct way to apply a threadlocker is to make sure that all the engaged threads, male and female, are fully wetted with the product. If you need less hold, pick a product with less hold, but always wet the threads the same way.

## THE EXPERIMENTS

I started out using exactly the same bolt, nut and washer for each mockup... an inch long anodized grade eight 7/16 coarse bolt and nut and I put an 1/8" grade eight extra thick washer between the nut and bolt and torqued the assembly up to 40 foot-pounds. This was done after washing the new hardware up in acetone. The first go-around I just did my normal routine and put about two heavy drops inside the nut and a single stripe of the solid adhesive on the bolt, as you can see in the photos accompanying this article. I set them out on my workbench and went back to work.

The next day, twenty five hours later, I grabbed my Snap-On Torque-meter with tell-tale and loosened them all back up. My control part, assembled clean and dry and torqued to 40 foot-pounds broke away at 34 foot pounds. And so did every other assembled bolt in the test with the exception of the one secured with green 290 wicking Loctite, which took about 52 foot pounds to loosen. All the rest came loose somewhere around 33-37 foot pounds. To say I was confused was an understatement. I walked away from the mess and gave it a little thought and did a little more reading, and lo and behold I stumbled on the answer. The only product that I applied properly was the 290! In every other case I used too little and failed to create an airless environment over a large enough area to allow the adhesive to cure properly.



I washed up the hardware, removed all of the adhesive previously applied and repeated my experiment, this time making sure that I had sufficient product applied to fully wet all the male and the female threads that were engaged with the nut fully torqued.

This time, the MRO Solution 22 green retaining compound, which previously released at 37 foot-pounds, took 77 foot-pounds to break away. The Loctite 272 which released at 34 foot pounds in my failed experiment took 66 foot-pounds and the Loctite red stick number 268 went from 33 to 53 foot-pounds in the second test.

I've ordered (and have yet to receive) a couple of different types of primers along with another type of threadlocker, but I'm out of time to get this out, so I'll have to do a little more work and follow up with another short piece on what else I'll learn once the products arrive. I've always discounted the medium strength blue 242 but I think I'll experiment with that formula a bit more and see if perhaps it's been me creating the problem and not the product. I might even order up some purple and see how that does... you never know!

## THINGS TO REMEMBER AND TAKEAWAYS

Here's what you need to remember about using threadlockers. One, make sure you get all your hardware cleaned up with acetone or MEK before application unless you've got a product designed to work with oily surfaces in your tool kit (Loctite 266 is

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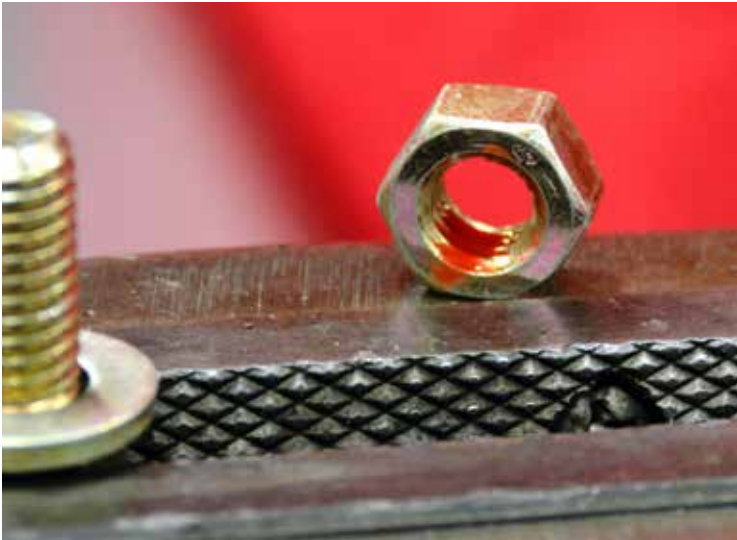
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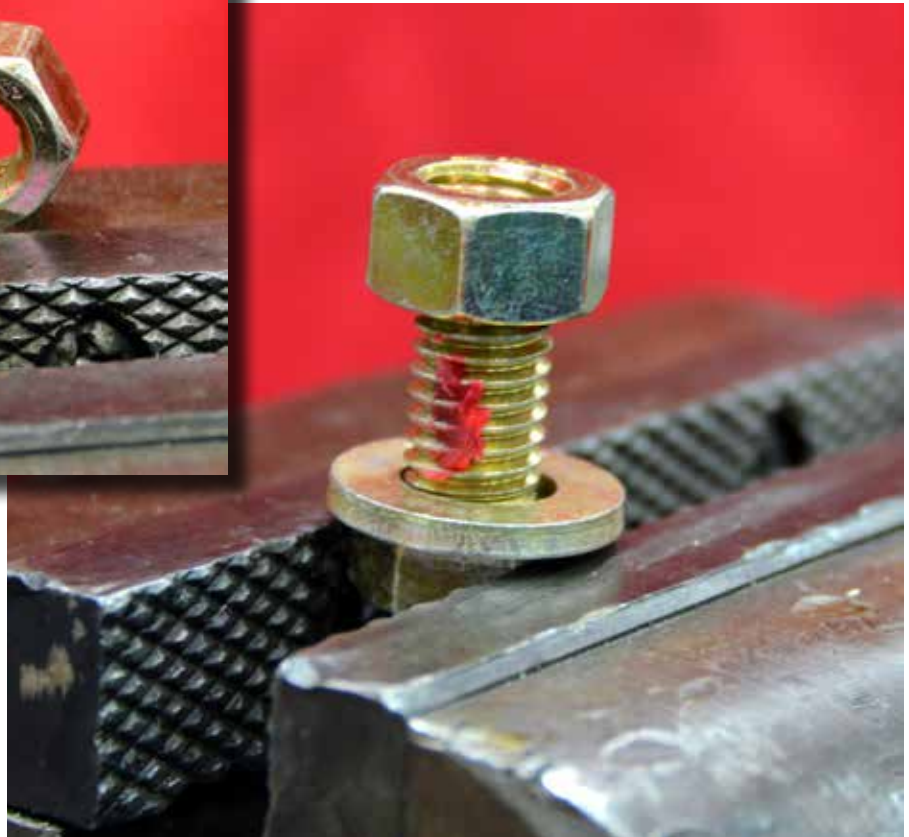
just one out there.) Two, check your dates on your products, some have expiration dates and they may not work well if they are too old. Three, use enough... too little doesn't work at all and you're wasting time and money... and potentially putting your assembly at risk by doing it wrong. Four, if you are applying the products to inactive materials the application technique changes. You must use an activator... which is different than a cleaner-primer... to have it secure the fastener. The product works by grabbing hold of the tiny peaks and valley of the threads and some plating's

or materials are slick at the microscopic level. Five, use the right product for the right application. There are thread lockers, gap filling, retaining products and glues and adhesives out there under the Loctite and Permatex brand names and it's easy to mismatch the product to the application. Application guides are online... find them and read them, there's no point in having a failure over not taking the time to learn how to use the materials.

Until next time, may every pass be your best pass... ■



*The testing failed because I didn't use enough product; the threads must be fully wet on both the male and female threads to the depth of thread engagement to create the oxygen free atmosphere that an anaerobic product needs to cure properly. After cleaning up from this debacle I repeated the experiment with the 272, the 268 stick and the Solution 22 fully wetting every joint and the products exceeded my expectations. Breakaway torque for those bolts properly prepped and with the correct amount of product applied was significantly higher than my control bolt that was simply cleaned up and torqued up dry.*





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# A RESTORATION STORY IN PHOTOS

-Greg McConiga





*Restoration services offer a great opportunity for those possessing the patience to oversee such large projects. It's not as easy as they make it look on TV... in fact, those TV shows do more harm than good to the real practitioners of the art.*

*It takes more time, more money and more skill that can be demonstrated in an hour or half hour TV show, and real shops don't have a team of ten working on the car with a support team of ten working in the background to gather up parts, do research, find rare and hard to find NOS parts and coordinate shipping and receiving. I'm sure there are a few such shops around,*

*but for the most part those shops are more fantasy than reality, and they are financially rewarded for their TV show far more than what is made from the work itself as can be seen in all those shows where they started out in some dump with few tools and ratty equipment and now are surrounded by multi-million dollar buildings and assets.*

*This car came to us from an east coast rust belt state and had suffered from mid-eighties resto-mod build, complete with an updated 440 engine in place of the original 383, a fiberglass snorkel hood and murdered out chrome and body colors. For the day it might have been fine, but by today's standards it was dated and poorly done, with little thought given to the overall value or preservation of the original car.*



*It's just my opinion, of course, but I think the 1969 Plymouth Roadrunner and Super Bee were some of the most beautiful cars ever built. I just love the lines of these cars! They have sexy hips and waists and long contoured panels with just enough detail in them to draw the eye. Of course, there were a lot of really beautiful cars back then... but this is a favorite. Even with the line-destroying snorkel hood and strange accent line it's a work of art. These cars were light and fast for their times, although it's fair to say that they were nearly all traction limited, so the real as-built potential is pretty hard to determine. The real problem is that they were an early unibody design and they were lightly built to compete in the horsepower and performance wars of the*

*late sixties, so exposure to salt and weather did a number on them. In fact, finding a pristine example in the salt regions is all but impossible. It's so bad around here that even the heavy K-members rotted away!*

*Our predecessors drilling holes through the floor pan to mount the "roll bar" and "racing seats" didn't help matters and neither did the quick "spray and pray" paint work done that left a fair amount of corrosion around the window openings and lower lip of the trunk lid. This is an original one-owner car... purchased new in 1969 and still owned today by that purchaser... so it was a real honor to be chosen to put this old beauty back to right. As you'll soon see... it wasn't without its challenges!!*







*There are a multitude of opportunities in restoration and resto-mod work. You have the engine to refurbish or replace... along with the electrical, wiring harnesses, possibly 6 to 12 volt conversion work, transmission, clutch and differential work... brake work or brake upgrade from original to disc or upfitted disc... steering repair or replacement or upfitting from recirculating ball to rack and pinion or manual to power... as well as body work, paint work, frame work, trim and interior work and chrome and stainless work. The best part of doing this kind of work is that unlike the commercial side where the car is seen as an appliance, in the restoration and resto-mod world it's seen as a passion... or, like this Roadrunner, as a part of the family. People will cheerfully spend their money on the things they want, while resenting spending money on those things that are seen as just another necessary evil of modern life.*

*The first lesson for anyone getting into this end of the business is that you absolutely must be brutally efficient at organization and storage. These projects can take a year or two or more depending on the year, make and model of the vehicle involved because you can*

*literally spend a month running down some rare part! Even on old cars there are an absolute TON of parts! The very first time I did one of these projects I nearly ended up in a state of high anxiety thinking about how in the hell I was going to get all this put back together into something resembling a car. It's amazing what you can get used to if you just refuse to give up. Nuts, bolts, brackets, fasteners, clips and trim bits take up a lot of room. Rolling shelving is a must, and we use "S" hooks for hanging big parts, a bunch of restaurant bus tubs for mid-sized parts and cooking sheets in full sheet, half sheet and quarter sheet along with cheap garbage bags to bag up all the pieces on a tray or in a tub once they are all cleaned, painted and*





*prepped for reassembly. We have fixtures for subassemblies and everything has to be labeled. The rest of the story; no matter what you do you will lose something... don't ask me how, but invariably some little part or piece gets away no matter*

*how careful we are. It just drives me crazy and every time it happens we add to our storage and organization systems. If this keeps going it won't be long and we won't have any room for cars in the shop....*



Once the car is brought in we always start with an “as-arrived” evaluation to see what we think we have to work with. In addition to a physical inspection of the sheet metal and mechanicals I recommend a road test if it will run and a compression test, a cylinder leak down test and a hot and cold engine oil pressure test. This is a good and reasonable first step, but you should be fully aware of the fact that this is merely the “first approximation”... and you should let your customer know that as well.

Our initial talk about this car involved just removing the mechanicals and fixing the body and returning it to its original color and interior, but as this job progressed we uncovered a greater the number of problems than expected and the job grew legs. Not uncommon... and it's a conversation you have to have early on.

There is simply no way to know how deep the rabbit hole goes! You must establish how you'll communicate and how and when you'll know to stop work. We bill monthly and instruct our customers to call us and put a stop work order on the car if they become uncomfortable with anything we are doing or suggesting or if the project becomes too expensive.

We suggest that you start out measuring the gaps around all the openings, doors, hood and trunk and record them. This will tell you if the body is damaged or sagged or if prior repairs were poorly done. Running a good filler detector over the car is a good plan if you suspect that there's been a prior body repair. You're battling time, miles, the history of the car and the hands that have been over the car before you saw it and in some cases the prior work is quite good





and in some cases it's not as good as we can do with today's improved technology and paint products. On this car there was considerable rot in the windshield frame openings (typical for older cars... it's one area that seems to show up rusted more often than not on sixties era cars) and the quarter panels had been replaced but were still in reasonable condition. The gaps and body lines were good, but we had a lot of dents to iron out and there was some older body work to fix and the inner lip of the rear wheel openings were cut away at some point to accommodate larger tires. Since both the inner and outer rear wheel houses were in bad shape fixing the missing lip only required a bit of fabrication and repair to the previously replaced quarter panels, which we cut off the car and reinstalled once the floors and wheel houses were replaced.



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help preserve those exciting stories for all time.



This is more of the kind of thing you just don't want to see. Cutting up the stock seats (or in the case of the front seat, tossing them out in the trash) created one hell of a problem because finding decent donors for this car wasn't easy. We found some really nasty old stuff out there, but it took a lot of time, money and effort to bring them back from the dead and get them recovered. You can see the asking price for that old used bench front... and believe me, it was just as nasty on the bottom side as on the top. Mickey and all his friends had made it their home and outhouse for a few years and after peeling off the old seat materials there was considerable time and effort put into blasting, powder coating and recovering the seat with period correct seat covers. If you're put off by mouse poop, urine or their rotting mortal remains you might want to stay away from restoration work! The little varmints love old cars as much as we do. Which reminds me... always wear a mask when dealing with their former domiciles until you can get to the



scrub and bleach phases because they can carry and leave behind some nasty things like hantavirus in their feces and urine and that is not something you want to have to deal with... it's serious.

On the plus side, we did find the original build ticket stuffed into the springs of the rear seat base! We gently removed and preserved it for the customer so they now have documentation showing exactly how the car was born.





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*Here's a few before pictures so you can see where we started from and what it took to get it back to what you'll see later on in this feature series.*

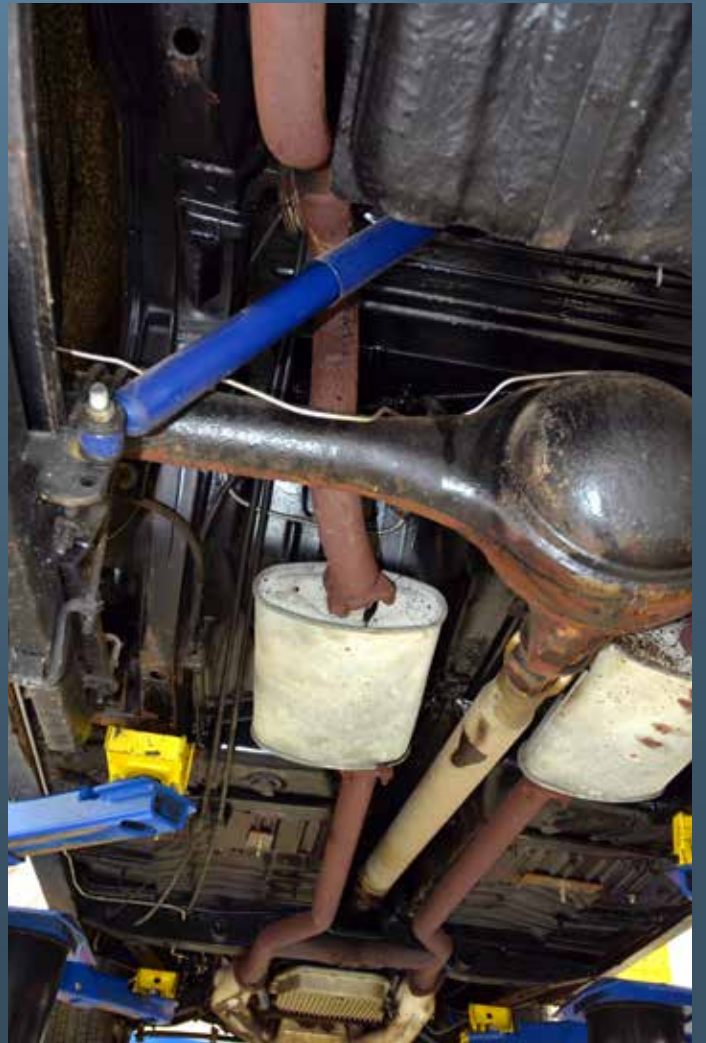
*The car only had a few hundred miles put on it since the last build. Like a lot of folks who hold onto original cars, raising a family and work took precedence over driving the old girl every Sunday to get an ice cream cone. The car arrived with a 4.10 gear in it and that's what we put back in it, but truthfully with all that brute torque produced by the 440 engine that's in it now it doesn't need that kind of gear and the gas mileage is atrocious. On the plus side it will dig a rut if you jump on the fuel! I'm sure that's what contributed to the car sitting around so much and being driven so little over the last 30 years.*

*The engine driven fuel pump was removed and an electric installed back in the trunk and the batter was relocated to the left rear, presumably for left rear preload like one would expect on a racecar. I think this is overkill given the power level of this car. You can clearly see where they took some cut off scrap pieces and slapped them against the bottom of the floor pan to mount the roll bar... and while they installed the Oberg filter they didn't wire in the warning switch for it. The exhaust isn't done real well either.*

*The use of an engine oil cooler seems over the top for a car that's not an endurance racer, and the transmission cooler appears to be smaller than what I'd like to see since the aftermarket aluminum radiator has not transmission oil cooler provisions in it.*









*Under hood it's dated and tired looking. I'm not a fan of leaving wire tie ends long where trimmed... I like them cut flush so you don't end up cutting yourself on them as you work on the engine... and I'm not a fan of just grabbing a handful and locking them on regardless of color. I like to use black ones on black harnesses... otherwise they stick out like a sore thumb. I want them to disappear, not become a focal point when you open the hood.*

*The suspension appeared to be original, with all of the ball joints, rubber bushings, tie rod ends and steering idler and pitman in the kind of condition you'd expect for having been in service for 48 years. This is one of those things that confuses me a little bit; why stuff a giant engine and gear in the car and neglect the steering and suspension? Even in the eighties slapper bars were old school... and with all the original rubber left in place it steered like a worn out old car. The brakes in the*









front were updated with a small version of Wilwood manual hydraulic disc brakes which while a bit small for my tastes worked well but the proportioning valve wasn't adjusted with sufficient forward bias so stopping the car quickly became a rear tire dragging screeching panic attack as the rear end tried to pass the front. Again... slapping parts on the car without thinking it through just leaves me confused and I just don't see the point of it. On the plus side we had a few good bits to work with so other than some time and effort and a few new rubber pieces to install we were able to put a like new 1969 Roadrunner back over the road. As you'll see later, we updated the upper control arm and the steering gear with parts from Firm Feel and this car drives like a new one now. If you've ever driven an original early

Roadrunner you'll remember that it's pretty vague feeling... the steering is like a stick in a bucket of mud... but with some positive caster and a stage two steering gear in it it's really nice to drive now.







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Once the preliminary evaluation is done the mechanical systems start coming out of the car. As mentioned, originally we were going to just reseal the engine and transmission and differential and run all of them again since they only had a few hundred miles on them and most of the leaking was just from sitting so long. As we pulled them out we started noticing a few problems... the differential wasn't built right, preload was gone and backlash was non-existent. The transmission was represented to be a TCI unit but inspection revealed that it was full of swarf and pulling it apart revealed that it was just a stock unit with stock parts and new paint and a sticker, so we contacted Cope Racing Transmissions for a replacement. (If you're a Chrysler guy and need a seriously robust 727, Cope is your man. This thing SHIFTS!)

We pulled the engine pan to begin the reseal process and as a matter of routine I checked the side clearance for each rod pair. Since this was supposed to have been a custom build

done just a only a few hundred miles (but several years ago) I was shocked to discover that the five-six rod pair rattled around pretty badly and that they had over .040" of side clearance! Pulling the bearing caps told the tale... what we had was a badly beaten up used racing crankshaft that showed signs of having been welded up and it was already turned .030" rods-.030" mains under!

This was represented to be built with brand new parts, but it was clear that someone took the new crank and "donated" this old used up race weary crank in its place thinking that no one would find it or know the difference. I'd like to tell you that this isn't commonplace, but I can't. If you









*intend to do this kind of work for people you should start every conversation with every new customer explaining the idea that they may not have what they think they have and that the seller they dealt with may have misrepresented the truth so that when this kind of thing is discovered you won't be the bad guy in the equation.*



*I've seen this to some degree on virtually every build we've been privileged to be a part of so I think we can safely say that the odds of you buying something that's accurately represented are pretty small. If you're buying a car at an auction or online or from a private seller you should ask to see all of the documentation and photos of the build because people are selling "frame off restorations" dirt cheap and they are far from frame off or restored. In fact, more than a few of them are rattle can restorations and poorly done even at that. Buyer beware is the phrase of the day...*







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*The three most common ways to clean paint and rust from a car body and each can be used in the restoration business; sanding, media blasting and chemical dipping. Sanding is labor intensive, can't be used in tight spaces or in the confines of a welded structure and makes a hell of a mess. If you get in a hurry and build a lot of heat during the sanding operation you can warp the sheet metal adding labor to the job when the damage has to be repaired.*

*Media blasting comes in various forms, wet/dustless, dry, CO2, glass, walnut or other organic media, aluminum oxide and baking soda come to mind. Baking soda looks good but it's alkaline and will need to be carefully neutralized to keep it from causing corrosion... glass and aluminum*

*oxide can create the same problem with heat as sanding and it takes a careful and disciplined operator willing to adjust and tune pressure and volume to keep from warping the body panels... something production shops will only do reluctantly, if at all. Dipping is the best solution because it gets into all crevices and cavities and once stripped the body is dipped in a neutralizing solution that stops the chemical activity of the stripper preventing future problems.*

*Because this is a unibody and because we knew that most if not all of the floor pan would have to be removed and replaced we constructed an internal bracing system to keep the body stable during transport and the lifting and dipping processes. We've tried doing this a couple of different ways*









and the way we've landed on is shown. We weld several pieces of plate steel to the body and then tie in the support bars to those plates. The supports have to run front to rear, high and low and on the diagonal to provide the strength to prevent bending, bowing and twisting. The only mistake we made here was we forgot to drill drainage holes in the support bars and stripping solution or neutralizer slowly leaked out for a day or two after we got the car back. We won't make that mistake again.



If you pay attention to how this was done you'll see that we intentionally mounted the support system high enough to allow work access under the bars so we could drill out the pan spot welds, remove the floor pan in sections and weld in the new sections before removing the bars. The dipping process shows the rust, the pitting, the margin around the damaged and removes most plastic body fillers... or at least loosens them enough that they are easily knocked off the body. The lead seam on the sail panel was melted out and the brazed seam on the quarter panel was MIG welded to make the quarter panel whole again. During the entire process you'll see notes stuck on the body reminding us of something left to fix or do, or some critical dimension that was removed with the offending sheet metal.

A quick look at the pile of scrap tells the tale... there's most of a car sitting there and that doesn't include all the various



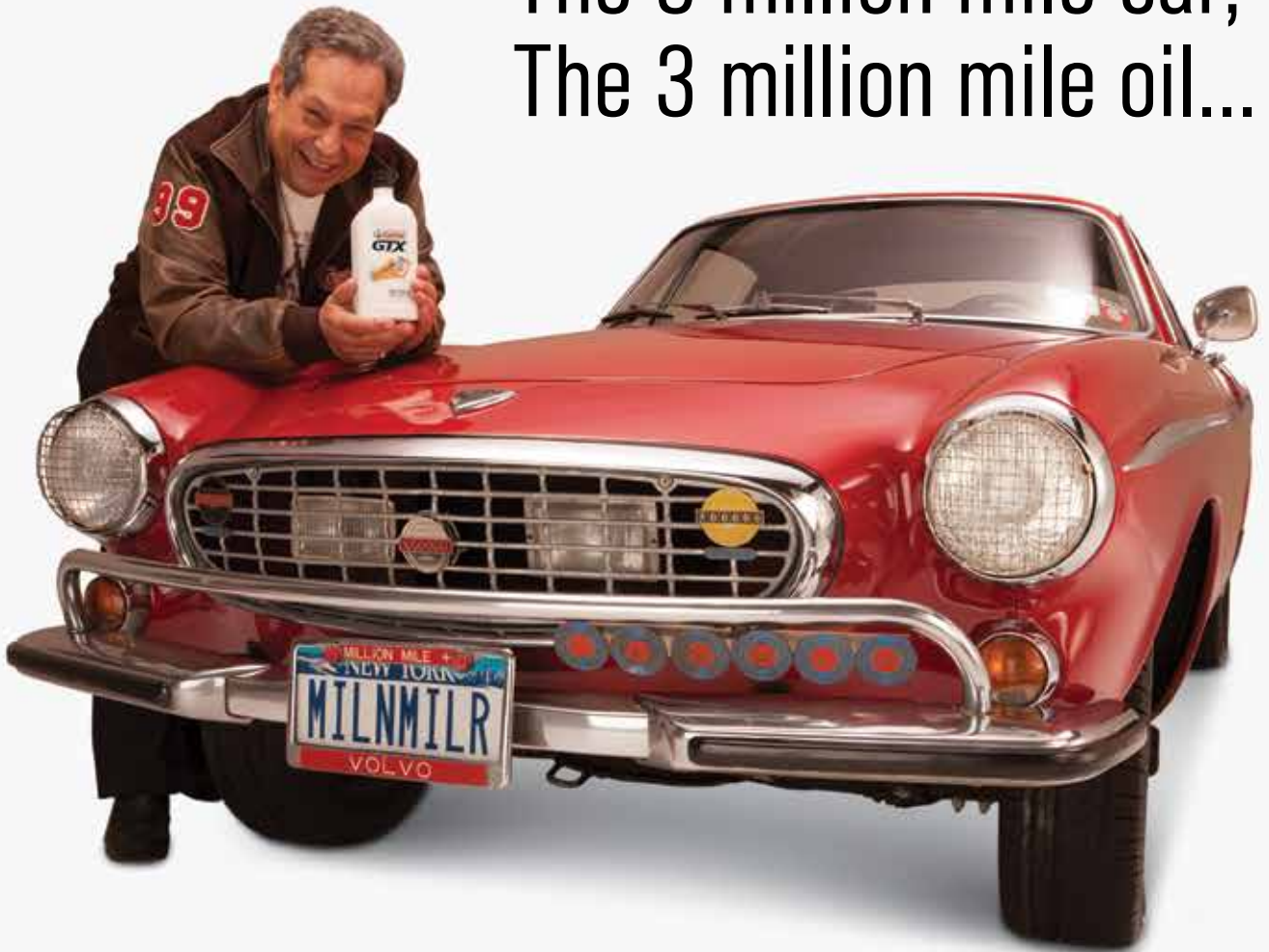
small patch panels that were custom cut and fit around the window openings, lower truck deck and other areas where total replacement wasn't called for but bits were in bad enough shape that they needed to be replaced. Stay tuned, there's more coming next issue!





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WANDERING FULMINATIONS ON HIGH-PERFORMANCE

# A LITTLE HELP HERE....



If you like what we're doing here and learn a little from it... Please, share it, help spread the word... and help us get bigger and better!

We are working diligently to produce the kind of material that someone who is either new or improving in the racing community will find practical and helpful when it comes to the actual hands on portion of engine and car building. It's not written to provide all the answers, because in our opinion there's no such thing... both the question and the answer are changing every minute of every day... you never really reach the end, you just continue to chase the right combination.

It looks easy from the outside... and God help us, every television show out there makes it look easy, but as any real racer knows it's far from easy and often breathtakingly expensive, particularly if you are still on the front end of any learning curve for a new part or system you're putting on your

car. The reality of TV is that it's not real and cramming a month of work into a half hour or hour show just contributes to unrealistic expectations for the armchair experts who never make it to the track. You know the type... they've all got thousand horsepower cars (at the rear wheels, of course!) and no time slips to support the claim. I remember when five hundred horsepower was the number... now it's a thousand... and it's pretty hard to hit a thousand without nitrous, blowers or turbos... and it's really hard to make that kind of power and keep the engine alive.

If you're a racer, here's the problem; you don't have enough power, so you improve your engine program. You buy better heads and a better cam and suddenly the valve train isn't stable. You improve the valve train and now the engine operating range increases by a couple of thousand RPM and the power is good up there so you need better rods, pistons and pins. Then you figure out the oiling system



needs a major upgrade and a dry sump won't fit so you send the chassis out to modify it to fit all the dry sump hardware. All this newfound power creates a traction issue so you step up the suspension and increase tire size to get the power to the ground... and toss the transmission and differential out on the ground. After grabbing the oil dry and the aluminum grain shovel and shoveling up the scrap you upgrade both to meet your new found power and traction capabilities and now you're back in the hunt... until your competitors find more power and once again you're off looking for more power!

Each lesson you learn can potentially set you back thousands of dollars and hundreds of hours... and how many can really afford to buy a carb-to-pan engine from a professional builder? Even if you've got the money, your "warranty" reads like "if you start it, you own it and if it blows up I know it wasn't anything I did." The rest of the story is that this learning curve has no end... at least not one that I've identified so far. The faster you go the less you know and the closer to the ragged edge of making scrap from

expensive parts you get! A weekend warrior running in the tens or elevens doesn't need a Racepak, unless it's just for giggles... but once you step up to the semi-pro and pro classes things happen so quickly that if you don't have data you don't know what's going on, if it's driver, tire, engine or chassis related and have no way to figure it out if you aren't looking at the pertinent data, so now you've got that to install, learn and interpret. I'm telling you, there's no end to this and if you're a racer you'd better be an industrious son-of-a-gun who can live on bread and beans because there's not a lot of time off or a lot of money left over if the racing gets serious.

The problem we are all dealing with is an explosive growth in technology, driven in part by the engineering that's producing the Hellcat, Demon, Shelby and Corvette from the OE side, combined with equal parts vastly improved machining operations and the racer guys tapping into both while doing what racer guys do best, which is think way, way outside the box. At the OE level we have the traditional engineering path and on the racer level

we have the cut-and-try engineering path... and where those two coincide is where a lot of new parts, processes and technology is being developed and installed on racing vehicles and on OE vehicles. We've had engine and chassis dyno's available for years, but as the software improved the ability to produce repeatable and consistent results has made them the go-to for engine development programs... at a price that while still expensive, is now within the grasp of smaller engine development operations.

We are only just now seeing the tip of the iceberg. Moore's law states that technology doubles every two years, and the unspoken corollary to that is that as participants in a technologically advancing sport our levels of education and training must also advance at the same pace. If we are to remain competitive we must investigate every advance and review every new technology to see if it's applicable to our racing program, because you can bet that your competitors are out there looking for every advantage they can get for next season.

By the way, our fight to keep our right to race is far from over. Our kind, benevolent, government that knows more about what is right for us than we

do is still trying to find ways to restrict or reduce participation in all forms of auto racing, and I predict that that will continue until they figure out how to tax it to death, after which it will be considered the biggest boon to mankind since the beginning of time (not that I'm cynical...) God knows our few cars in the few hundred venues around the country are causing all kinds of problems...unless it becomes profitable to those that tax, levy, fine and license.

If you've not been over to SEMA and linked in to let your legislators know that you support racing and oppose government interference in our traditions head over to <https://www.sema.org/rpm-bill-summary> and click the link to contact your representatives. Maybe just once they'll act to advance personal freedom rather than restrict it.

Now the disclaimer... I'm a grouchy old man who's not smart enough to avoid running his mouth inappropriately and these opinions are not those of the staff or management of the publishing company. In the meantime I'll try to work on my attitude, but at my advanced years and in my advanced state of deterioration I'm not sure change is forthcoming, so don't expect much.

Until next month, keep it shiny side up...



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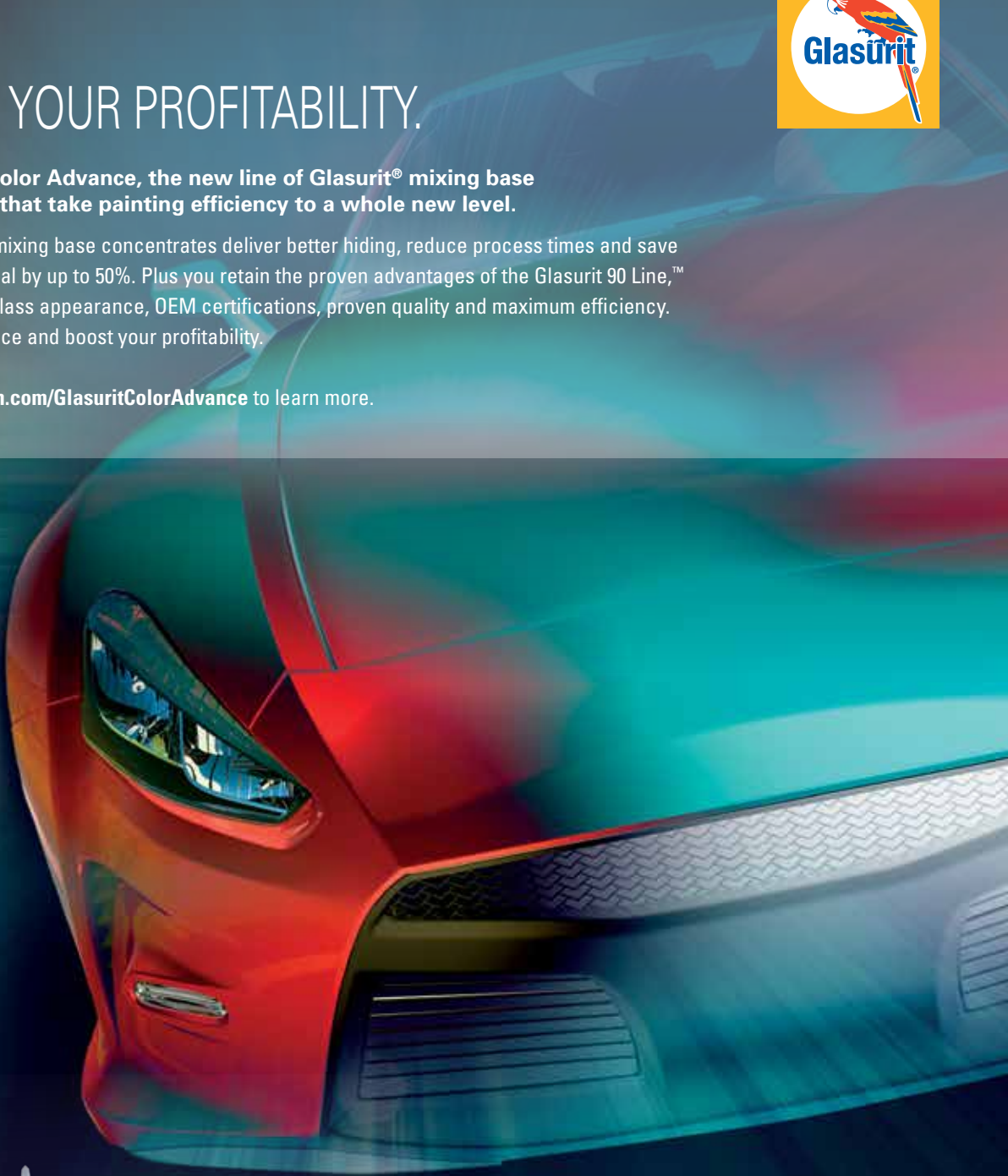


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