A SKINNED KNUCKLES Reprint

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Skinned Knuckles is a monthly publication dedicated to the authentic restoration of classic, vintage and antique cars. Their mission is to restore cars to the condition that they were when they originally left the factory. ***Skinned Knuckles*** is available by subscription $24 per year (12 issues). Contact *Skinned Knuckles* at P.O. Box 6983, Huntington Beach, CA 92615, by telephone at (714) 963-1558, or by e-mail at sk_publishing@yahoo.com Visit their website at **www.skinnedknuckles.net**

Selecting the Correct Instant Gasket Product

Permatex Has the Answer

If you are looking to be totally confused, baffled and mystified, all you need to do is take a walk through your favorite auto parts store to their wall of gasket materials. Besides a myriad of products, you will be visually bombarded with a number of unfamiliar phrases: "sensor-safe', "anaerobic". "RTV", "hardening", "non-hardening", "oil safe", "Install and Go" and so many more. What do they mean? What do they do? Do you have to understand all of the labels to select the correct product? We are going to try and clear up a great deal of the confusion and point you in the right direction in choosing and using the best product for the job.

The one fact that you have to note as you look at the vast array of product be it in a chain parts store, or your friendly neighborhood independent, is that virtually every product that they stock is made by Permatex. Over the years the parent company of Permatex, Illinois Tool Works (ITW) has acquired a tremendous number of smaller subsidiaries - more than 650 - each with special expertise and product lines. Brand names like Devcon, Fibre Glass-Evercoat, Magnaflux, DeVilbiss, Hobart Welding, Southland and, of course, Permatex.

If Permatex has a fault, perhaps it's that they do too much. Their product line is so extensive that it is daunting. Their response to this criticism is that they are keeping up with the most advanced needs, while not eliminating the traditional products that have become standbys for the old-time mechanic. End result? Well, you see it as it stretches from one end of the display to the other; there is something for just about every need.

If you are doing auto and engine repair, you have used instant gasket-maker or gasket-sealer materials. But to do a complete job is it necessary to have all of these products on the shelf? Absolutely not! There are a couple that, if you have them accessible, will replace virtually all other products. How's that for simplifying your life?

Because Permatex is the industry leader in instant gasket-makers and gasket-sealers, we have relied heavily on their expertise to guide us through this maze of confusion. Does that mean that there aren't better or just other products out there? Of course not. There are hundreds of smaller companies that produce lines of products or specialty products to do a certain job. Many of these are fine companies with fine products, but chances are, when you need a gasket maker or sealer, your local auto parts store will offer you a selection of Permatex. So let's look at their products to decide what each does and when each is needed. (And, oh yes, when they shouldn't be used.)

We will look at three separate product lines in this article: gasket makers, gasket sealers and threadlockers. Perhaps in a future *Skinned Knuckles* article we'll explore some of the various adhesives and their specialty uses too. Gasket makers are designed to replace traditional cut-to-size gaskets of paper, cork or rubber. Gasket sealers are used to assist adhesion and help leak-proof traditional cut gaskets, and threadlockers are used to keep nuts and bolts from loosening in use.

GASKET MAKERS

Permatex groups its gasket makers as good, better and best. Starting with the 'Best', they have a relatively new product called, "The Right Stuff®". Basically, with a can or cartridge of The Right Stuff in your tool box, you can throw out everything else. It does the job. The Right Stuff has become the choice as many OEM gaskets. In many cases, in new cars cut-to-fit gaskets have been completely eliminated and a product such as this has replaced them.

The Right Stuff falls into a special category known as "Install and Go". Traditional cure time is virtually eliminated. Apply the product, torque the fasteners and drive off. It has become a favorite because the car or truck can be used immediately. It forms an elastomeric rubber gasket which is oil, coolant and automatic transmission fluid resistant and it is even safe in modern cars with computer sensors. What then, are its liabilities? First is cost. It is more expensive than most other materials, but it goes a l-o-n-g way. Initially the Right Stuff was available in cartridges and in a 'Cheez-Whiz' aerosol can. The flow of material could be controlled by cutting off a small tip of the plastic end to form a bead of the right size, but the 'Cheez-Whiz' gave one size bead, often more than was needed. A new applicator called a PowerBead tip gives an adjustable-sized bead, saving a great deal of product.

Like most caulking-consistency gasket-makers, the Right Stuff not only adheres to the metal surfaces, but also fills the small irregularities and pits that could result in leaking. It is slightly heavier-bodied than most materials and has considerably better 'blow-out' resistance. It is a long lasting product. (Now it is even available in a special formulation for foreign cars as well.) More than likely, once applied, it will last for as long as you need it to do the job.

Next down the line are the 'Better' products - the line of 'Ultra' gasket-makers. These products do not require the longer cure time of the older-style silicones, and like all of the silicon-products they are room temperature vulcanizing (RTV) meaning that they require no special

ambient conditions to cure. They are low-odor and non-corrosive to metals. The newest and most advanced of these is Ultra-Grey. It is impervious to oils, coolants and automatic transmission fluids (ATF) and extremely vibration resistant.

The Ultra line has a variety of specialty products for specific applications. Ultra-Copper is designed for use at high temperatures; it is rated for up to 700° F intermittent and is often used at exhaust systems - exhaust manifolds are a perfect example. The material tends to fill the pits and voids prevalent on the block and exhaust manifold from heat and prior corrosion. Ultra Black provides maximum oil resistance, as well as being resistant to the other powertrain fluids. Ultra Blue is similar but not quite a viscous as the Ultra Black; it tends to flow a little better.

Now we come to the basic 'Good' products. These consist of the older style silicone materials. They have that strong, vinegar odor until completely cured which generally requires 24 hours. (All silicon products require seven days for a 'full' cure, but they reach about 94% of their strength in 24 hours). Although sensor-safe for newer cars, these older products do have corrosive tendencies toward metals. They cure from the outside in. The proper use of all silicon gasket makers (with the exception of the 'Install and Go' products) is to apply them and finger-tighten the fasteners within fifteen to twenty minutes, but not quite all of the way. Allow the gasket maker to set up for about one hour, and then torque to specification. This will help prevent the product from being squeezed out from between the two surfaces.

All of the products noted above are designed to be used on clean, bare metal, forming their own gaskets, without the need for cut-to-size gaskets. There are a couple of caveats though

for satisfactory use. First, and foremost, ALL the old gasket or gasket material or sealer must be removed from both surfaces. A single-edged razor blade or a special gasket-remover tool should be carefully used. Then a special gasket remover, brake or parts cleaner or just alcohol should be used to wash all residue off both surfaces. Be sure that both surfaces are flat and smooth, especially with stamped steel parts like oil and transmission pans or valve covers. If they are not perfectly flat, make necessary repairs (see *Skinned Knuckles*, Issues #356 March 2006 and #357 April 2006 - 'Gasket Lore' Parts I & II). Apply a small, even bead of the material to one surface - about 1/8" to 1/4" is adequate for a metal surface about 5/8" wide. Be sure to surround each bolt hole with the material. Follow the instructions on the package regarding set-up and cure times. If possible, do not use the silicon products immediately without allowing adequate cure time. To get full advantage allow them to cure.

Finally tighten the fasteners in the sequence and to the torque specified in the service manual. Beginning at one end and just tightening the life out of the bolts is likely to squeeze the gasket material out from between the surfaces. By the way, the same goes for cut-to-size gaskets. These too, must be tightened in sequence and torqued to spec or they can distort or even squeeze out from between the two surfaces. Do not use too much gasket maker. That 1/8" to 1/4" bead will be adequate. Too much could allow the sealer to be squeezed out from between the surfaces (both to the outside and the inside). If used in excess, large amounts of material could break off and clog oil galleries, radiator tubes or other orifices necessary for the proper flow of internal fluids.

Most of these products are not resistant to fuels. The gasoline or diesel fuel can act as a solvent and dissolve the seal formed by the gasket material. A special product known as MotoSeal-1 is specifically formulated to withstand the solvent action of fuels. It was designed for motorcycles, lawnmowers and other small and two-cycle engines often using a gasoline/oil mixture. It is a solvent-based bond and is ready to use in about twenty minutes.

GASKET SEALERS

There are many applications where it is desirable or even necessary to use cut-to-size gaskets. Spin-on oil filters, heads, exhaust manifolds and transmissions are just a couple of examples. Sometimes you do not want to use a gasket sealer. Spin-on oil filters require just a film of clean oil to provide an adequate seal. A head gasket or an exhaust manifold gasket may be used in an area where corrosion has pitted the surfaces. A sealer is advisable in these cases. All of the gasket-makers noted above can be used as sealers. They serve three purposes: they fill the small irregularities in surfaces, they bond the gasket to the metal, and they keep the gasket in place during installation.

It is imperative to use just a minimum of material - of either gasket maker or gasket sealer - on a cut-to-size gasket. Too much can cause 'oozing' or even worse, provide a lubricity which would cause the gasket to slip out of position when torqued to specs. Just a thin film is adequate.

Be sure to use the right material of cut-to-size gasket and/or gasket maker/sealer. If you are unsure, why not contact Olson's Gaskets (see their ad on page 48 of this issue) at 360-871-1207, or Permatex Technical Service at 1-877-376-2839. Exhaust manifold gaskets must seal as well as be able to withstand some pretty intense heat. Ultra-Copper gasket maker is the ideal product to use on a "Durabla" (the modern version of asbestos) gasket. Copper Spray-A-Gasket is an aerosol gasket sealer designed to be used with head gaskets. Don't be tempted to spray a heavy coating onto the head gasket. Use a light spray, allow it to dry, and then apply a second light coating. If, when it dries, the color is uniform, that's enough. If there are light areas and dark areas on the gasket, use another light spray. Hang the gasket while the spray is drying. Too thick an application could cause problems, and, since it contains copper, the heavier components of the gasket spray are liable to flow toward the bottom, leaving too thin a layer at the top. The copper helps to dissipate heat, while filling minor surface irregularities in the head or block.

The old standby, Permatex Form-a-Gasket (despite the name, a gasket sealer) comes in hardening and non-hardening formulas. The hardening is fine for rigid applications; the non-hardening is used where some flexibility is necessary. There are also a number of high-tack products which, in addition to sealing the gasket to the metal, hold it in place like a 'third hand' to make installation easier. When working on your back, trying to hold a heavy oil pan in place while you get those first two or three bolts started, you don't have to aggravate the problem by having the pan gasket slide around. That's when the high-tack gasket sealers can be a blessing.

For years, many old-time mechanics have relied on shellac as a gasket sealer. I used to have an old can of thick, orange shellac on a shelf for whenever I had to hold a gasket from shifting around. Indian Head gasket shellac has its own brush in the bottle. Shellac-type sealers should be used on paper or cork gaskets because as it dries it becomes rigid. Rubber gaskets should use a more flexible sealer - a specialty rubber sealant will do the job.

Another specialty product is the anaerobic gasket sealer that is a sealer that cures in the absence of air. For absolutely smooth, flat surfaces (not more than about 0.010"-0.015" gap) one of these specialty products can be used. Two types are normally available: one for 'active' metals - iron, steel, copper, etc., and one for non-active metals like aluminum, magnesium, etc. The non-active formula requires an activator - a spray prep - that acts as a catalyst in setting up the sealant, increases gap fill and speeds up cure time.

THREADLOCKERS

The third class of 'gaskets' is the threadlockers. While not a traditional gasket, a threadlocker is an adhesive-type material which fills the gap between a bolt and the threads into which it fits, either the nut or a threaded hole in a second part. Most of the time we use a lock washer to keep a bolt from coming loose due to vibration or parts movement. The lock washer is actually a spring, a split ring that is slightly offset, pressing the washer against the head of the bolt and the nut or other part, or it might be a star-type lock washer with tiny fingers that press against the bolt/nut/part.

In actuality, only about 15% of the threads of a bolt make contact with the nut/threaded hole. The remaining 85% is air gap. A liquid threadlocker eliminates the need of a lock washer and actually fills the air gap with a material that binds the bolt to the nut/hole. As the threadlocker cures, it fills that 85% with a plastic-type material that keeps the bolt from vibrating out, while providing much greater holding power than the bolt alone, or a bolt with a lock washer.

There are generally three strengths of threadlockers: high strength, medium strength and low strength. The Permatex line of threadlockers is color coded by strength: red is high strength, blue is medium and purple is low strength. The red high strength can be used for permanent applications which require extra resistance to coming loose. It can be used on bolts from 3/8" and up. When cured it will require special tools and/or heat to release it. Regular hand tools generally will not be adequate. The red is also available in large bolt formulations, and high temperature formulations. The blue, medium strength can be used on bolts 3/8" and up and will release with regular hand tools, sometimes requiring the judicial direct application of heat to release. The blue is also available in a 'surface insensitive' formula, good for an oily film on the bolt or retaining part. The purple is a low strength product, generally used on bolts 1/4" or smaller or on fine threads. It will release with regular hand tools.

Both the bolt and the mating hole (nut or fixed hole) should be as clean as possible from water, oil, grease or gasoline. A special cleaner, or a brake and parts cleaner can be used. On an open hole, such as a nut or a through hole, a few drops of the correct formulation should be put onto the threads and then the bolt tightened to

specifications. It should be allowed to cure for between two and four hours before being subjected to use. On a blind hole, a few drops of the threadlocker should be put into the hole. The bolt, as it is tightened, will hydrostatically force the product up and around the threads where it will cure (in the same two to four hours) and bind.

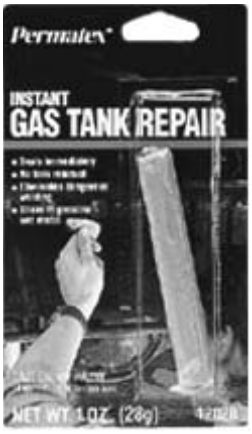
A special threadlocker is available in a 'green' color. This is a special penetrating or 'wicking' formulation. It is a much more fluid product designed to be used on post-assembly applications. After the nut is on the bolt, or the bolt is in the hole, the green threadlocker will flow between the male threads and the female locking the two together. After curing, localized heat and hand tools are required for disassembly.

Disassembly of the red threadlocker, and sometimes the blue or green, requires directed heat. A propane torch aimed at the locked joint, and heating it to about 400° F. will make the threadlocker soft enough to allow disassembly.

Finally, a specialty threadlocker: one used for a bolt hole leading into a water jacket. This is often the case in a headbolt hole that is tapped into a cooling port within the engine. A special material has to seal out the water as well as lock the bolt into place against vibration. Permatex High Performance Thread Sealant replaces Teflon tape or dope while providing extra-high holding power. When cured (after 24 hours) this product will develop a resistance of up to 10,000 pounds per square inch against internal pressures while acting as a mild threadlocker. It will seal the water out of the bolt hole* while providing resistance to loosening. It is available in a high-temperature formula as well.

**** NOTE**: Neither this product, nor any chemical product is designed to replace or fill worn or stripped thread holes. If the threads are stripped to the point that the bolt will not torque to specification, either Heli-coils or another mechanical method of 'replacing' the bad threads is necessary. Actually, this caveat is applicable to all gaskets, gasket makers, gasket sealers and threadlockers. These products are designed to enhance the seal between two parts in good condition. They are not designed to fill large gouges, bends, warps or other damage to one or both mating surfaces. These problems will have to be addressed as separate mechanical problems and rectified prior to the installation of one of these products, or a satisfactory bond might not be possible. .*

Two last products to look at before we quit this subject. They really aren't gasket makers or sealers or threadlockers. They are patches, and I only mention them because of the special needs of our older cars. Gas Tank and Radiator Repair and Instant Gas Tank Repair are both two part epoxies in 'tootsie roll' form. One part is the inner core and the second is the outer. Break off what you require, knead them together until the color is completely uniform and the product begins to get warm. Place it over the leak. Either product can be used over a 'wet' leak, and both are fuel and water resistant. Try to clean as much crud from around the actual leak - rust, scale, oil, grease, etc. before applying the mixed paste. Once it has cured (about 20 minutes) knead up a second blob and place it over the first, extending the second layer beyond the first onto the metal. THIS IS A TEMPORARY FIX designed to get you home. It is not to be used as a permanent repair because one rusted-out spot in a gas tank or fuel line is indicative of problems elsewhere in the system. Fix it all. This product, like most of the products discussed in this article, have a shelf life of about two years. They are not suitable for long-term storage in an emergency kit in the car. Take a look at the Permatex product: there is a product number stamped onto it. The first position is a digit; that is the year of manufacture. The second position is a letter; that is the month of manufacture. The balance is tracking information as to where and when the product was made. For example, the stamp of 6CZ2378A would indicate that the product was made in '6' - 2006, and 'C' the third letter, the third month, March. It is fresh until two years after that date, that is, until March of 2008.



<u>Skinned Knuckles</u> thanks Permatex for their assistance in writing this article, and getting the right information out to you, our readers. Call on them (Permatex Technical Service 1-877-376-2839) for help with gasket makers, sealers and threadlockers and call on Sandy Olson of Olson's Gaskets (360-871-1207) for help in locating and selecting the right cut-to-size gasket or gasket material.

Technical Data Sheets (TDS) and Material Safety Data Sheets (MSDS) are available on-line from Permatex by going to their website at www.permatex.com and clicking on MSDS or TDS at the top left of the screen. You will first need the five-digit product number which can be obtained directly from the product container or by typing the product name in the 'Search' box on their website.