MODINE

ShopTalk

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TECHTOPICS

Let's Look at Epoxy Repair

This "Tech Topics" segment is the fourth authored by Larry LePrevost, national sales manager for the Johnson Manufacturing Company. Larry has 20 years of experience with the Johnson organization, which produces a wide range of products and supplies for radiator shops nationwide. The appearance of Larry's observations on these pages does not necessarily imply Modine's endorsement of same. Questions relative to subject matter can be directed to Larry at the Johnson Manufacturing Company, 114 Lost Grove Road, Princeton, Iowa 52768. Or, telephone 319-289-5123.

In past *Tech Topics* installments focusing on plastic tank repair, we've noted the expanding nature of the marketplace. Consider, for example, that for more than two years, 95% of Ford's automotive radiator production has been supplied with plastic tanks. GM currently equips 65% of its radiators with plastic tanks and has plans to be at 100% by 1996 or '97. Chrysler, long a supporter of copper/brass radiators, has increased its use of plastic tanks, as have other leading automakers around the world. In short, plastic tanks are here to stay, and the aftermarket replacement and repair of these products will surely continue to grow.

We also previously emphasized the importance of knowing when to replace vs when to repair a plastic tank. As discussed in the January **ShopTalk**, some tanks look pretty good on the outside, but may be badly eroded by steam on the inside. Others may appear to be strong while crimped in place, but their weakness is quickly revealed when you remove them from the header. Do not attempt plastic surgery on tanks with broken flanges, or try to reconstruct one that has suffered major damage.

Evaluate the Job

Many of the tanks that you remove will be in good enough condition for repair, but then you must also decide whether the repair will be cost-effective. Obviously, you wouldn't spend an hour and a half fixing up an old Escort tank if you could buy a new one for twenty dollars. On the other hand, you may be able to put one of your customers back

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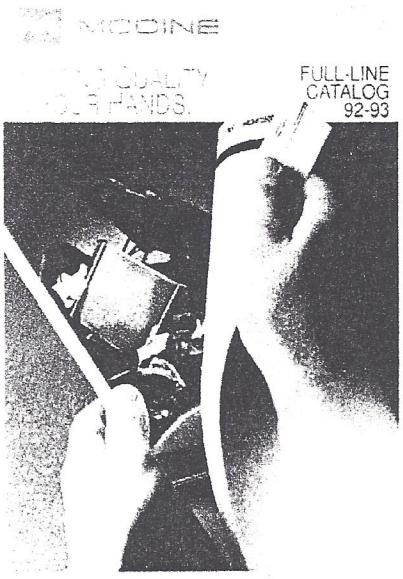
New Catalog Even Better

The Modine Aftermarket Division has announced the availability of its new 1992/93 full-line catalog of heat-transfer products, which includes 125 new models.

Product categories covered include complete replacement radiators for domestic and foreign passenger cars, light trucks, and medium and heavy-duty trucks. Also listed are air-conditioning condensers, heaters, heavy-duty Beta-Weld® radiators and Beta-Weld® low-flow cores, Ad-Tech cores, transmission oil coolers, and accessory parts.

In this year's edition of the industry's most popular catalog, the pages of major product line sections are color-coded to help users find items more quickly and easily. Among other improvements are the use of detailed footnotes on application pages for faster reference, and expanded competitive part-number cross referencing.

Copies of the new catalog can be obtained from local Modine product sources or by contacting the Modine Aftermarket Division, 1500 DeKoven Avenue, Racine, Wisconsin 53403.



Modine's new 1992/93 full-line catalog contains 125 new model numbers.

10-Step Guide Provided for Epox

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on the road within hours, save him or her fifty dollars, and make that much for yourself by repairing a BMW or Volvo tank.

It should also be remembered that saving pre-owned tanks with the header intact (even if they are slightly damaged) makes good sense, especially the more expensive hard-to-find models. They can subsequently be inspected and repaired as you need them using the "JITR" approach (Just-In-Time-Repair). For additional efficiency, you also might consider fixing several tanks at a time (the "batch" method).

Repair Techniques

During the past few years, several repair methods have been offered to the radiator industry. These have included both hot-air and electric welders which use plastic rods, as well as several brands of epoxy and at least one "super glue" approach.

Not all of these methods have met with success, primarily due to the fact that plastic tanks are not really plastic. They are made from nylon compounds that are reinforced with fiberglass fibers for greater strength. Bonding to nylon and its compounds can be difficult, especially since tanks from individual manufacturers differ in their composition and include varying percentages of fibers.

Many shops confirm the difficulty of plastic welding (particularly if the repairman is only an occasional welder). One spokesperson for a manufacturer of plastic welding equipment pointed out that compounds such as Noryl, Nylon 6/6, Zytel and others which are used by tank manufacturers are tough to weld because they give off moisture during the welding process. Also, each compound requires a welding rod that is compatible with the parent material, and it's not always easy to select the right rod, except through the trial and error method.

Using Nylobond

There's something to be said for using products that are designed for a specific purpose. Nylobond, produced by Johnson Manufacturing, is such a product. (It's not my intention—and it certainly isn't Modine's—to use the pages of **ShopTalk** to promote brand-name repair products. I'm focusing on Nylobond here because I'm intimately familiar with its properties, repair characteristics and effectiveness. If readers know of other epoxies they feel are equally effective for plastic tanks, please let me know via letter or telephone and perhaps we can discuss them in future *Tech Topics*).

Nylobond was formulated to provide a lasting repair for all types of plastic radiator tanks. When cured, it becomes hard enough to sand, or it can be whittled with a knife. It withstands under-the hood temperatures, resists attack from coolants, additives and other chemicals, and remains flexible enough to expand and contract with the tank. Nylobond is easy to use, but as with many products, if you don't read and follow the directions provided, you can lose valuable time and perhaps even ruin the job at hand.

Ten Basic Steps

I would offer the following ten basic steps for properly using Nylobond (with references made to materials that are provided with each Nylobond kit):

1. Scrub the tank inside and out, using warm water, detergent and brushing action, followed by a thorough rinsing and complete drying. This will remove coolants, fluids, oils, road grime and other contaminates, and will allow you to inspect the overall condition of the tank as well as the damaged area. Utilize good lighting in your work area.

2. Inspect the repair area and decide where to apply the epoxy material. In certain cases you will want to apply the heaviest epoxy coating and the woven fiberglass reinforcement cloth (if the reinforcement is necessary) on the inside of the tank, where it's not visible. A thinner coat of Nylobond may be applied on the outside where it can be smoothed out.

3. Apply "pretreat solution" to all areas to be repaired. This solution, included with Nylobond kits, is formulated to clean and etch the surface. Allow it to work for approximately 60 seconds then rinse off, pat dry and observe the difference in the surface condition. The surface should look duller than before, or turn gray or white due to the etching (see Figure 1). If there is no visible change, scrape part of the tank to see if it was painted by the manufacturer. All paint must be removed from the repair area, then re-apply the pretreat solution until at least some etching of the nylon has occurred before applying Nylobond.

4. Dry the tank thoroughly, even in

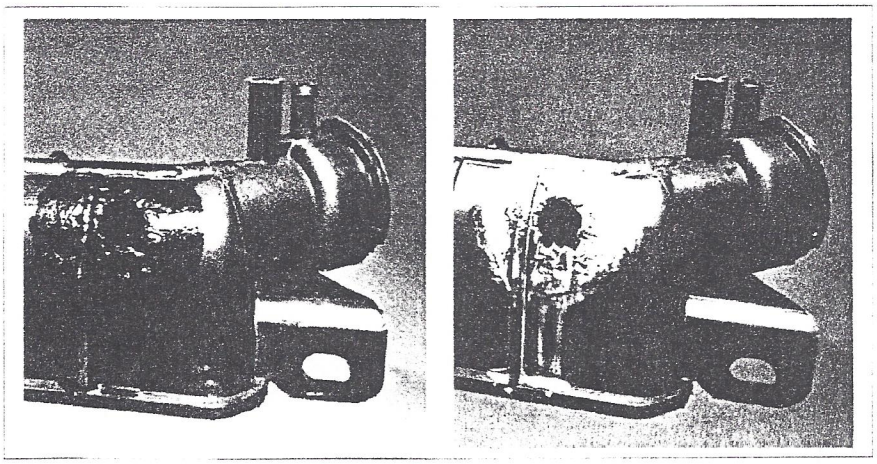


Figure 1

The pretreat solution supplied with the Nylobond kit should be applied to all surfaces that are to be repaired. Above left, we see the tank properly wetted around the target repair area. After 60 seconds, the solution should be washed off and the surface should be checked to ensure it has been etched. Some tanks may merely have a dull look, while others may turn grey or white, as shown in the right-hand photo above.

Repair

the cracks. Do not blow dry with shop air because it may add contamination from moisture and/or oil in your line. A hot-air blow dryer may prove useful.

5. Pour the entire amount of the catalyst hardener into the Nylobond resin jar and mix as directed. Stir carefully by mashing the resin against the inside of the jar for about one minute, or until the glossy look disappears. Stir slowly to minimize air entrapment. Stirring too vigorously, or too long, can trap extra air in the mixture, which might increase porosity in the final repair.

6. Apply a thin coat (1/8" of Nylobond to the repair, first on the inside of the tank.

If fiberglass reinforcement cloth is needed for strength, mash Nylobond epoxy into the weave from both sides until the cloth is completely impregnated. Then, trim out a patch with an old pair of scissors. Press the patch into the Nylobond which you've applied to the repair area and cover it completely with an additional layer (1/4") of Nylobond resin (see Figure 2), smoothing it into place and feathering the edges. **Do not** use brass to reinforce a Nylobond epoxy repair.

7. Apply a thin coat of Nylobond epoxy to the outside of the repair. Then, using the wooden applicator supplied with each kit, or a small metal spatula, smooth the epoxy over the contour of the tank while feathering out the edges (see. Figure 3).

8. Cure the Nylobond in one of several ways. Shops in southwestern states may be able to place tanks in the sun to accelerate the curing time. In Alaska, they can be put on top of a boilout tank. But in either place, it takes approximately 24 hours to cure Nylobond at room temperature (72 degrees F.) Perhaps the most practical way to cure this epoxy is to position tanks under a 375-watt heat lamp, 15 inches away from the heat source, for about 20 minutes. Don't attempt to speed the process by placing the lamp closer than 15 inches, because curing too rapidly can cause outgassing (bubbles or blisters may appear) or charring that may permanently damage the tank.

Use Lamp Carefully

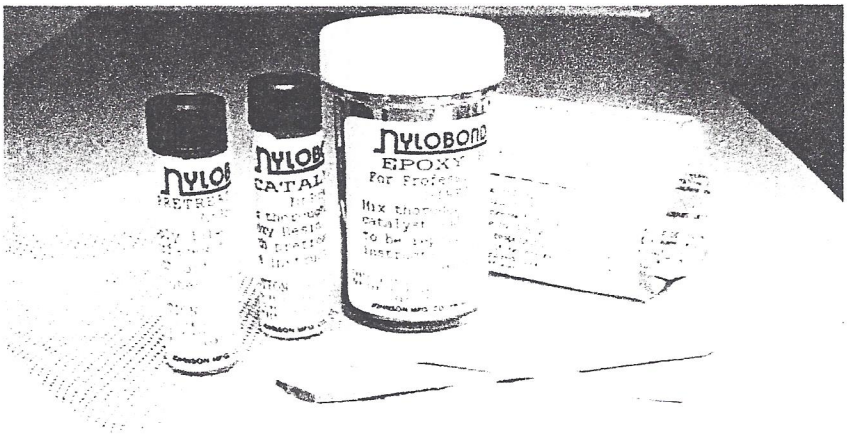
When using a heat lamp, each area of the tank where Nylobond was applied should be cured independently. For example, start by curing the inside of the tank, or wherever Nylobond is thickest. Cure for 20 minutes and then check. Next, move to the opposite side of the repair, where the Nylobond coat may be the thinnest. Readjust the lamp to 15" from the top of the tank and continue heating for 5 to 10 minutes and check. After repairing several tanks, you'll get a good reading of how long the curing process takes.

9. After curing, allow at least 5 minutes for the repair to cool naturally before installing the tank or putting any pressure on it. During this time, however, you can use a pocket knife to shave off any swirls or ridges which might remain.

10. Cleanup is easy if you don't wait too long. Each kit is designed for one-time use (although you can normally repair two tanks with each kit). When finished with your job(s), just place the two small jars that held the catalyst and pretreatment solution, respectively, inside of the larger Nylobond jar and tighten the cap. Then, as you stand there wiping off your tools, take a minute to admire your work. It's important for every craftsman to feel good about what he does for a living.

While the foregoing describes the use of Nylobond in fairly broad terms, more detailed instructions and safety information is contained in a brochure that accompanies every Nylobond kit. For a free copy, write to Johnson Manufacturing at 114 Lost Grove Road in Princeton, Iowa 52768.

Larry LePrevost



Nylobond kits contain enough pre-measured epoxy resin and catalyst to make two typical repairs at the same time. "Pot life" (working time) is approximately 45 to 60 minutes after mixing.

Figure 2
Here we see the inside of a repaired tank, where about 1/4" of Nylobond coating provides much of the strength.

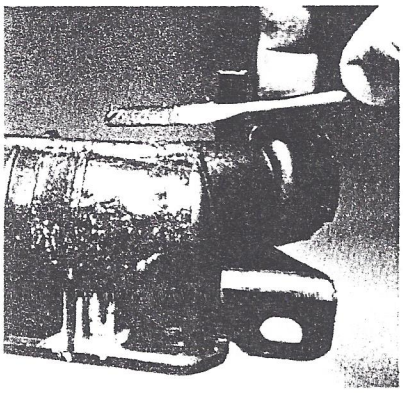


Figure 3
Smoothing out the Nylobond helps to make a professional-looking repair.

Tips Offered on Alumabond

(continued from page 1)

Hot-Melt Epoxies

Hot-melt epoxies are available in coils or in stick forms. They are easy to use, and repairs hold up relatively well when proper procedures are followed. GM hot-melt epoxies (coils) should be kept in their sealed container when not in use to provide maximum shelf life. Pre-cleaning of the area to be repaired is essential.

Do not allow the direct flame from your torch, or excess heat, to scorch the epoxy when you are applying it. Allow five minutes for the repair to cool naturally before testing.

Using Superglues

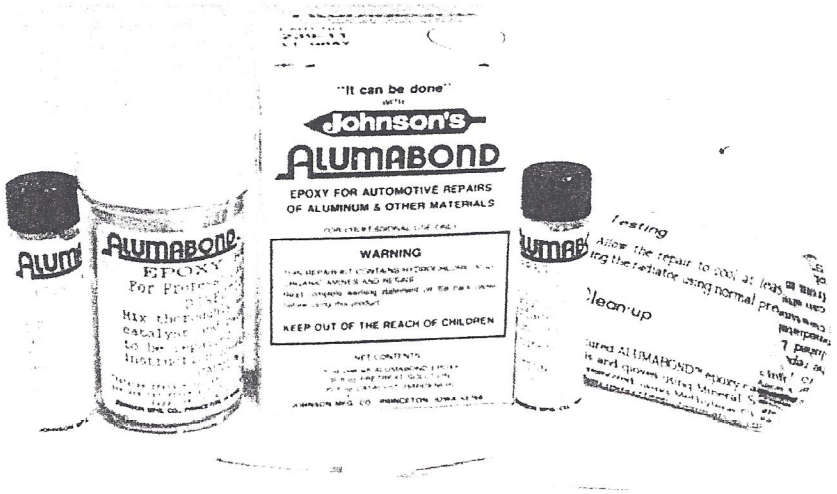
Superglues are often used to form or splice O-ring gaskets, and RTV silicones (blue, black, and clear) are used to help lubricate and/or seal PTR gaskets. However, **do not** use these products to patch holes in aluminum radiators. They simply are not designed to withstand the combination of pressure and temperature that is generated.

Two-part epoxies (like Alumabond) that you mix together, apply and then cure, provide your best alternative for repairing aluminum radiators in situations where using a torch is questionable. This is particularly true for aluminum headers, especially if they have epoxy on the air side. **Do not** use a torch where header epoxies are involved, because it may cause them to char, or even burn.

Proper Steps Noted

Depending on their age and condition, not all radiators are candidates for extensive repair. If, however, repair makes sense, then doing the job right not only saves time but also greatly increases your chance for success. Following are ten basic steps for making tube-to-header repairs using Johnson's Alumabond epoxy:

1. Remove the tank(s) from the radiator and clean the header(s) thoroughly, using a mild detergent, scrub brush and hot water. Inspect in a well lighted area, using magnification if available.
2. Determine the exact cause for leakage (usually pinholes in the brazed joint around one or more tubes on the water side). Trace the hole's pathway under the epoxy, on the air side of the header, to the point of exit (usually a corner).
3. Being careful not to damage the tubes, carve out the header epoxy from around the base (air side) of all tubes that are leaking, or are suspected of leaking.



Alumabond kits contain enough epoxy to repair both the air and water side of a radiator. In fact, there is normally sufficient material to repair two radiators at the same time. As with the Nylobond product discussed in the last Shoptalk, the "pot life" (working time) of the epoxy is about 45 to 60 minutes after mixing.

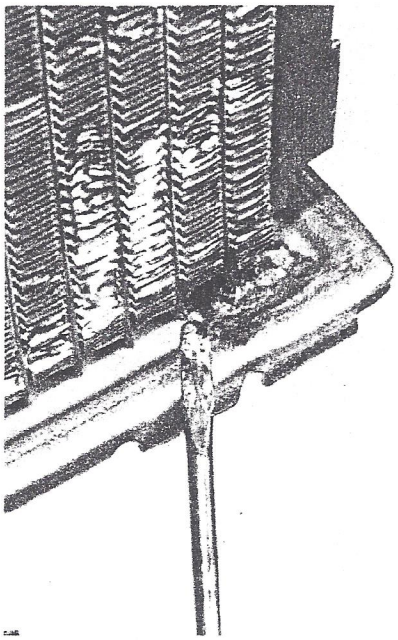


Figure 1

Exercise care not to damage the tubes when carving out old header epoxy, using a heated screwdriver. Allow the heat to do most of the work.

This can be done with the narrow blade of a screwdriver that is heated with a torch (see Figure 1). It is best to work in an area with good ventilation.

4. Next, using a small stainless steel brush, clean up the tube ends and header (water side), covering an area about two inches all around. Brush until the metal has a clean, shiny look (see Figure 2). According to some shops, the careful use of a sandblaster is also an accepted practice for this purpose. When doing this prior to brazing, however, be sure to select the proper blast medium to avoid contaminating the joint area. It is for the same reason that only stainless steel brushes should be used when preparing aluminum surfaces for brazing.
5. Apply Alumabond Pre-treat solution to both sides of the repair and allow to set for one to three minutes. Some foaming may occur due to a reaction between this acidic solution and the aluminum. Rinse with water