Tech 101 – patching a radial tire

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Tire failure can have disastrous, and expensive, consequences. Photo by The Tire Zoo.

Using a tire plug or patch on a radial tire can be a volatile subject; especially dependent on where the injury to the tire has occurred. Because of the flexibility of the sidewall on a radial tire, no original tire manufacturers recommend using any kind of repair system on a tire's sidewall. Virtually every tire manufacturer states that a radial tire with a sidewall leak should be replaced, without exception.

In the case of steel-belted radials, manufacturers, such as Goodyear, further state that the injury must be at least one-inch away from the outside of the tread to be deemed safe for a repair and that the hole size be less than ¼-inch on passenger tires and less than 3/8-inch on commercial tires. They also state that the injury must be thoroughly checked to ensure that the steel belt has not been exposed by the hole because this can cause the steel to rust and deteriorate.

A consumer-grade radial tire plug kit, for temporary repairs. Photo courtesy Princess Auto.

This applies to non-steel belt tires as well; the same continuous cord pattern within the tire carcass is used in a regular radial tire and these cords can, like the steel cords, deteriorate when exposed to outside elements. The fact that the same tire has been patched before is another consideration. If the second hole occurs on the same cord or on opposite sides, the cord has been weakened to the point where it could let loose inside the carcass, leading to blowouts or a severe tire imbalance. Passenger car and light truck tires must also have the minimum 2/32-inch of useable tread left to be considered for repair according to tire industry experts.

Recommendations vary depending on the type of vehicle as well; for instance, most motorcycle repair facilities will not patch a tire leak, even though many motorcycle tool kits are equipped with a tire patch kit. This seems reasonable, given the width of a motorcycle tire places it firmly within one-inch from the tread edge on most injuries. Heavy duty truck and trailer tires are judged under a different set of criteria and it is common to see huge interior patches inside commercial-use tires, however, repairing of large holes in truck tires is often done when they are being re-capped, because the process involves adding new rubber with heat to the outside of the carcass, making inside patch repairs easier during the same process. That being said, the manufacturers that do permit patching of a radial tire all recommend that the injury be repaired from both the outside and the inside as soon as possible, to prevent further deterioration of the tire carcass.

An inside-the-tire consumer repair kit. Photo courtesy Plews & Edelman.

The rope-type or plug-type repair kits you can purchase at most retail stores are for temporary repair and typically include several plugs, some rubber cement, a probe and an inserting tool. Tube or inner tire patch kits typically include a few patches of varying sizes, cement and a stitching tool, used to push the patch over the injury evenly and prevent it from curling before the adhesive can cure. Any of these consumer-grade repair kits should be sufficient to allow you make a side-of-the-road repair to add some air and get you to somewhere that can fix the tire properly. More elaborate tire plug kits use a mushroom-shaped plug that is coated with glue and then installed into a trigger-operated gun that pushes the plug into the repair until the mushroom head opens inside the tire. Many consumers neglect to have proper repairs performed after such temporary fixes, leading to potential tire safety issues down the line.

The tire repair kits found at your typical garage or tire shop will have a much more sophisticated system used to fully seal the tire. Service station, tire store or truck stop garage kits will have an air buffer with hardened steel reaming tips and a buffing wheel to remove all semblance of the original hole and roughen the inner patch surface. These professional patch kits can also include a clamping device that holds the inner tire patch in place while it cures.

A pull-through radial tire plug. Photo courtesy Plews & Edelman

Clearly, the only effective way to repair a radial tire and make it safe again is also the method recommended by both the Rubber Manufacturer's Association and the Tire Industry Association; install a plug in the hole through the tread, but also patch the inner surface of the tire with a radial-specific flat patch. As a consumer, who doesn't fix more than a tire or two in a year, buying the right patch kit to do the job yourself would be prohibitive.

There is however, another type of patch that can be used effectively. It does still require that the tire be demounted, but the patch is a combination plug and patch that can be installed, from the inside, through the hole, using an attached metal point that is removed once the plug pulls through. The pre-attached patch is prepared in the same manner as a flat patch; the carcass must be reamed and buffed, then adhesive is applied to begin curing. Once the glue starts to set, the injury repair patch is pulled through and the patch portion on the inside of the tire is stitched. On the outside, the plug has been pulled through far enough that the metal tip can be removed and the excess length of the plug can be trimmed. The repaired tire should be set aside until the cement curing process is finished and it can then be remounted to the rim and inflated to check for leaks, usually by the use of dish soap or a tire bead mounting lubricant that will bubble around any air leaks.

In summary, the only way to properly repair a tire with a hole is to demount the tire and apply two types of patch, an inner flat patch as well as a tread plug, or by using one of the

combination patches that does the job of both. These procedures are not as cheap as the consumer-grade plug kits, however, the proper repair is money well spent when it comes to yours and your family's safety. A complete wall chart, showing the proper repair procedures is available for $2.00 from the Rubber Manufacturer's Association in the publications section of their website RMA.org.