Facing Blown Regulators and Other Rebuilding Experiences

COLUMN BY NATHAN UNGER

A customer brought in a Mitsubishi alternator no. A7TA3377, pic no. 203-143, from a Nissan forklift. The job seemed straightforward enough at first. Everything seemed OK except the regulator was blown.

I called a number of suppliers but no one had a replacement regulator. Finally, I called technical assistance at Transpo/WAI and they suggested a circuit insert chip that would work—the TRI350, a fairly new release.

Having installed the chip according to the instructions that came with it, I replaced the bearings and brushes, etc., and reassembled the alternator. I then tested it. After the indicator light blinked once or twice the alternator began to charge normally. This blinking effect concerned me. It was not consistent either.

I tested the rotor. The current draw was normal, at about 3A. On a whim, I dragged one lead sideways off of the copper ring onto the plastic part of the slip ring, expecting to see the current drop to zero. It didn't. It kind of wandered down to 2A, then 1.5A, and stayed there. Glancing more closely at the slip ring plastic, I noticed it was glowing as if there was a carbonized path back to the copper.

It seems that when I drew the one lead off of the copper ring onto the plastic, the high voltage kickback spike I would normally see was strong enough to carbonize the plastic—up to a distance of one-eighth of an inch! To further verify this, I put the rotor in the glass bead cabinet and cleaned the slip ring all around.

When I had re-inspected the slip ring, I noticed that the original plastic was intact, but the carbon layer had all been removed. I could plainly see that the circumference between the slip rings had been largely carbonized, causing a partial short. I surmised that this is what blew the original regulator.

I wondered if the forklift had been used in an environment with conductive or chemically reactive dust that settled on the parts. It seems strange that the plastic would break down like that. (Anyone who has encountered this, e-mail me on the ERA forum sometime.)

I changed the slip rings and the regulator (again), and that solved the problem. Another interesting note about this alternator; the flat rectangular Mitsubishi diodes were actually the avalanche type.

Things to consider when substituting regulators

- Of course, check the pinouts, functions and connections to make sure they are identical.
- Being able to successfully substitute regulators helps where you cannot get the one you need, or where you don't have enough time to get one in, or where you want to reduce inventory while still maintaining coverage.
- A regulator with soft start can usually supercede one without.
- A regulator with the "L" that drives the choke can replace one where the "L" doesn't. For example, IN436 nicely replaces IN438 on those 140A John Deere alternators.
- A regulator with a longer LRC time can usually replace one with a shorter or no LRC time.
- Note whether the rectifier of that alternator has a trio or not. If not, then the regulator will be stator-activated.
- If you want to substitute stator-activated for trio-activated, then simply clip out the trio diodes and run a jumper across where any one of the trio diodes used to be. I have read somewhere that someone had a problem with this one time because a vehicle alarm signal turned the regulator on when the engine was not running, causing the battery to go dead. Other than that, I have not heard of any problems in these conversions.

Method for finding cracks and pits

I was rebuilding a Lester no. 4093 starter and had put the parts into my vibratory degreaser. I took the drive end housing out and blew it dry, then commenced glass beading it. A thin wet line appeared where I had just blasted.

It seems that solvent from the degreasing was oozing out and the contrast of wet and dry surfaces made it highly visible. This crack would have been invisible otherwise.

This method for finding cracks and/or pits works best I think, if there is some dust mixed in with the glass bead or sand.

Lessons from the flood restoration people

To reclaim soaked windings such as armatures, stators, rotors, solenoids, or fields, one has to first determine if the windings are actually shorted or if they only have leakage due to the conductance of water. This procedure assumes that the insulation was intact before the water damage occurred.

Clean the part thoroughly first. I would also glass bead off the rust. I have seen commutators that appeared shorted but there was dirt bridging the mica or plastic from the copper to the steel.

The glass bead can often clean nicely behind the commutator as well because it sprays through the hairpins. You may have to remove the banding and replace it later.

Most importantly, do *not* use a high voltage insulation tester or megger until the very end. This can actually damage the wet insulation permanently, by causing the weakest points to flash over, thus creating conduction paths to ground.

Just use a simple volt-ohmmeter to find out if the insulation resistance is more than about 20,000 ohms. If so, it may be possible to reclaim it using the following steps.

Dry the unit in a warming oven at just below the boiling point of water. You don't want steam pressure to build up inside.

When fully dry, test it again with your volt-ohmmeter. If the resistance is now above about 100,000 ohms, then while still hot, dip the unit into a varnish such as Dolph's AC43 or CC105. The heat tends to draw the varnish into the voids.

Then bake according to the instructions on the side of the can, and retest with the volt-ohmmeter to make sure that it is still above 100,000 ohms. If so, then test in the usual manner with your high voltage insulation tester or megger.

I have been able to reclaim over half of my soaked armatures and stators this way.

Nathan Unger is owner of ASI Rebuilders, Abottsford, B.C., Canada.