PROVEN METHODOLOGY SPEEDS REPAIR OF OIL, NITROGEN OR SF6 GAS LEAKS

By Gary Lee Brown and Jim Hackett

Dielectric fluid, nitrogen and SF-6 gas leaks have plagued the electric industry for years. In the past, it was common practice to take leaking equipment out of service, drain the oil, re-gasket all potential leak points, re-fill the unit and hope that the problems were corrected. In some cases a leak would re-occur and the whole process was then repeated.

Today these leaks can be repaired without draining or de-pressurizing the equipment by means of hydraulically injecting compatible sealants to stop the leak. Colt Atlantic Services, Inc. has been providing on-line leak sealing services to a wide range of industries for over twenty years. Their Power Services Division has a highly experienced staff that is dedicated to repairing oil and gas leaks on electrical equipment.

Figure 1

Figure 2

Figure 3

The repair process varies depending on the type of leak, but a typical leak is found around the stem area of the radiator flapper valve. If the leak is located low enough on the transformer, the repair is completed with the unit in service, and in all cases the repairs are completed without draining the transformer. To repair a stem leak, the technician will drill and tap a 1/16" blind hole into the side of the valve at a point that will intersect the internal O-rings or rope packing. Next, they will install an injector into the tapped hole. This injector allows the technician to control any oil flow that may occur during the next step. Using a 1/8" drill bit he will then insert the drill into the injector and drill a hole into the seal area. The bit is then removed and the injector is turned to the closed position. A proprietary, two-part compound is then hydraulically injected into the seal area. The material is allowed to cure, typically for one hour. The injector is then removed and a Teflon coated pipe plug is installed. An independent lab has tested our S-22 Sealant for dielectric properties and dissolved gas analysis. This material is not an epoxy and will not bond to the equipment. This allows for easy disassembly of the repaired component at a later time. The sealant also has a memory that will allow it to expand and contract without cracking, during temperature changes and vibration.

The following are case studies of different leak sealing jobs and/or devices and their uses:

Figure 1 and 2 show a type of clamp used frequently on radiator drain plugs. It is designed to close on the half coupling OD. The crunch teeth (see Figure 2) are designed to have a .005 to .010 interference fit. The teeth wipe out around the half coupling OD creating a barrier for our sealant to bridge up against during the injection process. The aluminum clamps are just tapped on with

Figure 4

Figure 5

a hammer. There are two setscrew holes located 180 degrees from one another that are used to hold the clamp on during the injection process. These remain in place after the repair is complete. However, these clamps are easily removed if needed.

Another common leak is the Flapper Flange [see Figure 3]. These flanges typically have a grooved area for a gasket or O-ring to lie in. Colt's repair procedure is to drill and tap several 1/16" NPT injection ports into the failed gasket/O-ring. The S-22 sealant is then injected into the gasket area, the groove acts as a mold and a new gasket is formed during the injection process. After injecting, the material is allowed to cure (1-2 hours) and the injectors are removed and Teflon coated pipe plugs installed.

The Flapper Valve Packing is a notorious source of leaks we deal with all the time. This repair technique [see Figure 4] is done by drilling and taping a 1/16" NPT injection port into the packing area. We raise the follower during the injection process to allow for sealant penetration and filling of the packing gland area. When completed there will be a leak free and fully operating packing assembly. (see above completed packing repair) (Teflon coated pipe plug installed).

Figure 5 shows a cover plate that is ready to be sealed. 1/16" injectors have been installed into the gasket area of this cover plate. Our S-22 dielectrically tested sealant will be hydraulically injected. The 1/16" injectors will be removed and Teflon coated pipe plugs will be installed.

Figure 6 illustrates a Bushing Repair. Our drill and tap technique is used to penetrate the gasket/O-ring area and our special sealant (S-22) is injected, creating a seal. After the sealant is cured, the injectors are removed and Teflon coated pipe plugs are installed.

Figure 6

CONCLUSION

Our methodology for repairing oil, nitrogen or SF6 gas leaks is a time-proven technology: On the repairs that have a grooved or recessed area where the O-ring or gasket lies, is a perfect spot to penetrate using our drill and tap technique. By intersecting this grooved area, we have a channel where our sealant can travel around and create a seal.

On other repairs, we create a barrier (fabricate a clamp) around the leaking component and inject the cavity of that piece of hardware to obtain a seal. This special hardware allows us to inject our sealant under pressure. Compression of the sealant under pressure successfully seals the leaks.

Orange & Rockland Utilities Inc., a wholly owned subsidiary of Con Edison, has been conducting a study using this method. This study began approximately 14 months ago and involves repairing various types of leaks and then monitoring the results. To date, the utility has been happy with the repairs and plans to continue to use this method.

Gary Lee Brown and Jim Hackett are with COLT Power Services. **ET**