

Gasket Repair made Quick and Easy

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Transformers and switchgear in substations and switchyards need to operate efficiently for the grid to supply the power needed by industry, commercial establishments and households. Important to access and affordability of electrical power is the reliable operation of the many power transformers in the power grid. The leakage of dielectric oil from transformers impacts the continuity and quality of the electrical service supplied by power transformers during their operation. Quick and cost-effective infield repair of oil leaks using the innovative sealant technology from Polywater, PowerPatch® is often used to minimize such performance degradation.

Compared to traditional repair processes, the use of Polywater® PowerPatch has proven to be a faster and more cost-effective oil leak remediation method in many cases.

Oil leaks are generated in a variety of ways, through pinholes, welding defects, worn gaskets and radiator cooling fin corrosion or rust. The loss of dielectric fluids from a power transformer can have many deleterious effects. High temperatures due to oil loss, affect the quality and dependability of the supply of power. High heat also contributes to accelerated decomposition of the solid

Photo: Polywater

insulation which leads to accelerated aging of the transformer. Leaks also provide a gateway for atmospheric gases, such as oxygen and nitrogen, into the transformer. They degrade oil quality and further accelerate de-polymerization.

Oil leaks also create open pathways for moisture to enter the transformer. Moisture contributes to the natural aging processes within the transformer to reduce its useful life. The effective sealing of these pathways with PowerPatch helps to reduce the effects of moisture critical to improved grid performance and power quality.

Correcting problems caused by oil leaks can be complicated, costly, and time-consuming. Often, conventional leak remediation processes require long shutdowns of power to the transformer while repairs are being made. The use of in-field leak sealing processes that minimize

the time to repair/replace can lower the opportunity costs of lost service.

To better understand the time and financial impact of different corrective actions in the repair of transformer leaks, we will compare traditional gasket replacement to gasket leak repair using Polywater's PowerPatch leak repair system. We assess the time and cost needed for each process to stop an oil leak in the bell tank gasket. It will be assumed that the transformer is in proper functioning condition, but the nitrile gasket has failed. The Table 1 (next page) compares these two processes to stop a main gasket oil leak: Conventional Gasket Replacement and the use of the PowerPatch Leak Repair System. First a description of the transformer leak and resources required for replacement. In this particular instance we will use the example of a 22 MVA – 60 / 13.8 kV – 192 5/ 920 4. A transformer that weighs 37,100 kg in total, of which 18,600 kg fall to active parts, 8,900 kg to the oil, and 4,000 kg to the tank. In this example, the transformer in question has developed a defect: An oil leak from the main gasket between the tank and the tank cover.



Gasket Replacement (The traditional method)

Work required: Replacement of gasket between the main tank and tank cover. See Table 1 (next page).

Traditionally, gasket replacement procedures require a lot of equipment: A 30-ton telescopic crane, a holding tank with a minimum capacity of 3,000 l (2,600 kg), an oil treatment system with a minimum oil treatment capacity of 5,000 l/h, a power unit of 80 to 100 kW (in the event there is no energy source), a tool kit, measuring instruments, safety equipment, service materials, (gloves,

insulated blankets, grounding cables), and auxiliary equipment (chain blocks, hoists). On top of this long list of material requirements, the other most crucial resource is human labor in the form of 3 to 4 electro-mechanical technicians and 1 crane operator.

Table 1

Work Steps	Gasket Replacement	Gasket Repair
Shut-Down Energy & Verify	X	X
Raise Tank Top with Crane	X	--
Remove Original Gasket Material	X	--
Prepare and clean gasket perimeter	--	X
Lower Active Part back into tank	X	--
Place & Adjust Bolts	X	--
Apply quick cure putty over leaking areas	--	X
Abrade area around active leaks	--	X
Apply PowerPatch on perimeter & bolts	--	X
Transfer Oil to Oil Treatment Tank	X	--
Treat oil over two cycles-RH of 5 ppm	X	--
Monitor oil treatment over 24 hours	X	--
Final Oil Test Sample	X	--
Remove Earthing Cables	X	--
Reenergize Transformer	X	X

In short, oil tank gasket leaks are time-consuming and costly to rectify with conventional methods. Heavy equipment is required to lift the top and active part of the transformer to gain access to the gasket. Opening the tank exposes the transformer oil to moisture and atmospheric gases, which require oil treatment to reduce their deleterious effects.

Gasket Repair with PowerPatch

Work to seal the gasket: See Table 1.

With Polywater's method, the only equipment required to make immediate repairs to the gasket is a PowerPatch Kit and a team of 5 - 6 electro-mechanical technicians.

PowerPatch Features

The PowerPatch Leak Repair System offers a safe and effective alternative to conventional gasket replacement.



The PowerPatch system is used to seal the perimeter of the tank cover to stop active oil leakage. There is no need to lift the top of the tank, which limits exposure of the oil to the harmful effects of moisture and gases. The costs and time required for oil treatment are eliminated when PowerPatch is used.

Among the many features of PowerPatch, is its high-pressure resistance of 13.7 bar (199 psi) when adhered to steel. High pressure resistance pressure allows its use on large oil-filled power transformers and in sealing leaks in SF₆ insulated switchgear. Another valuable feature of

The two-part resin cartridges ensure accurate mixing of Parts A and B for maximum adhesion and consistent working times.



Other PowerPatch packages are available for other types of transformer repairs. The EP package consists of two small containers of resin Parts A and B. They are mixed manually, after which the combined resin can be applied with a wooden spatula to irregularly shaped areas needing repair. Both EPCT and EP packages include a quick-setting putty stick for the repair of active oil leaks, as described in the leak repair process above. PowerPatch Slow-Cure (EPSC) comes with 290-ml of Parts A and B and is used for large-area repairs. Its use is recommended for large, high-voltage transformers where the slower cure time of EPSC ensures sufficient working time for applying resin to the repair area.



Summary

The proper functioning of oil and SF₆ insulated equipment, essential components of electrical grids around the world, is critical. The quick and cost-effective repair of power transformer leaks ensures reliable and high-quality electrical services to homes, businesses, and industries. Using versatile and innovative sealant technology from Polywater for on-site repair of oil leaks has been shown to lower both the cost and time required. The costs of lifting- cranes, oil treatment systems, and other equipment needed for on-site gasket replacement were over \$10,000 higher than using the PowerPatch Leak Repair System. The use of Polywater PowerPatch leak repair products reduces transformer shutdown time from 24 hours to 8 to 10 hours and results in much lower costs.



PowerPatch is its high dielectric breakdown voltage to minimize the potential for partial discharge in the transformer.

The multi-use PowerPatch cartridges (EPCT) are designed for repairs as small as pinholes in cooling radiator fins and valves and as large as oil tank main gasket repair. The application of the permanent resin described above can be applied with either 50-ml or 250-ml PowerPatch cartridges. The 50-ml cartridge is ideal for smaller repairs, while the 250-ml cartridge can be used for medium or larger repairs such as those found around flanges and bushings. The cartridges are multiuse to minimize resin waste, to reduce repair costs.

Photo: Polywater



For more information on Polywater PowerPatch, scan the QR code or contact us at global@polywater.com