

Improved power transformers made by Powertech Transformers

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Power Transformers are an integral part of the electrical network of any establishment. The capital cost of transformers necessitates reliability and maintainability. Powertech Transformers a number of years ago introduced some significant design changes to increase the reliability and maintainability of its transformers.

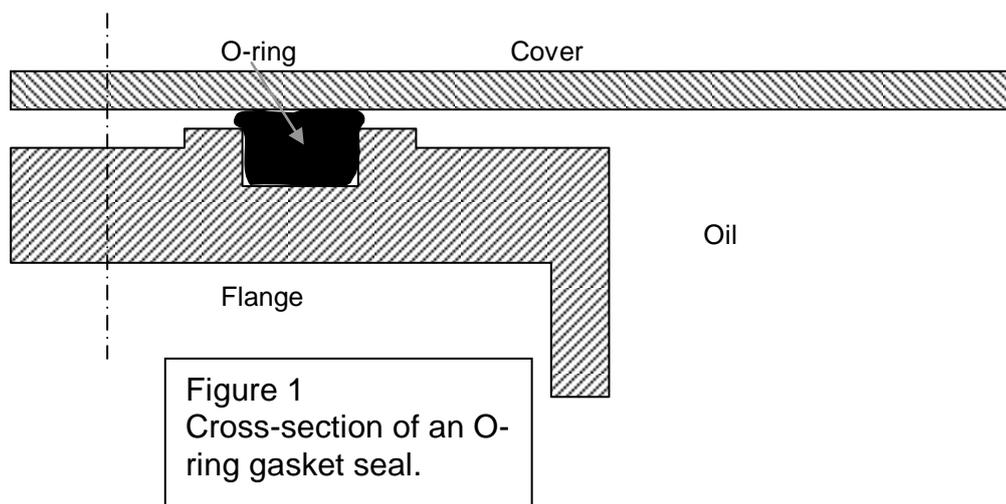
Powertech Transformers together with ESKOM, introduced some design improvements on the range of larger transformers. Due to the fact that the benefits became evident these features were also incorporated on the range of medium and small power transformers where relevant. The changes were O-ring gaskets, welded covers, bagged conservators, improved breathers and maintenance friendly tap-changers.

The different features are all discussed in detail below outlining the difference to what was offered in the past as well as the new benefits.

O-ring gaskets

For many years Powertech Transformers had been successfully using gaskets in grooves for certain critical areas where a leakage would be extremely difficult to repair. We decided to change exclusively to this design for all gasketed joints. The previously used rubber bonded cork gaskets had the disadvantage that they required re-tightening during installation and a further re-tightening after a period in service. However, if these gaskets were tightened too much the elasticity properties of the material was destroyed and they were no longer able to expand and contract thereby not providing an effective seal.

The O-ring and groove type of gasket, as applied by Powertech Transformers, offers a leak free joint. Furthermore there is no need for any in service maintenance of the gasket. When seals are opened for whatever reason, the groove and O-ring lends itself to a clean replacement and resealing, unlike the cork which often bonded to the mating surfaces and required extensive cleaning of the flanges before resealing.

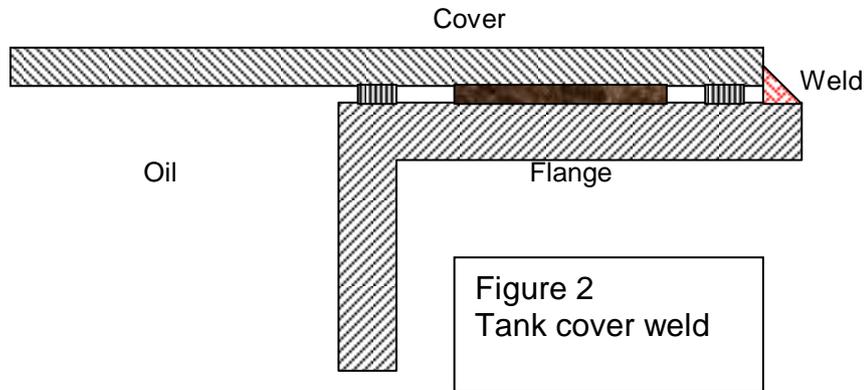


Welded Main Tank Covers

In conjunction with the O-rings our standard is to weld the main tank cover. Previously a main tank cover leak would require a major operation to repair. In most cases it involves draining of the oil, lifting of the cover and exposure of the transformer active part to the atmosphere. This operation often takes several days and the added risk of contamination by moisture or other particles while the unit is open. After replacement of the gasket, the transformer would need to be evacuated before oil filling commenced.

With a welded cover no maintenance is required. The weld is dye penetrated and pressure tested in the factory. Secondly, it is much easier to repair an oil leak at a weld than a gasket that is leaking. Thirdly the outage time is much less and the possibility of contamination is eliminated.

The design of the transformer cover flanges are designed to allow de-welding. Should customers however still require a bolted cover with a gasket that can be offered.



Rubber bag in conservator

The concept used is one where there is a balloon-like bag filled with air inside the conservator. The transformer oil surrounds the bag and is isolated from the atmospheric air by the bag membrane. The rubber bag provides several advantages. Moisture take-up from outside is minimised. This is important for high dielectric strength of the insulation system. Secondly a low oxygen content of the oil can be maintained. This leads to a considerable reduced ageing of the cellulose and therefore a low production of internal moisture. Such transformers offer increased loading at a lesser insulation-ageing rate. Thirdly, degassed oil has a better dielectric strength in large-scale gaps and can better suppress partial discharges. For a similar reason as above a degassed insulation system has a far better capability to sustain loading beyond nameplate rating under limited time compared with gas saturated system.

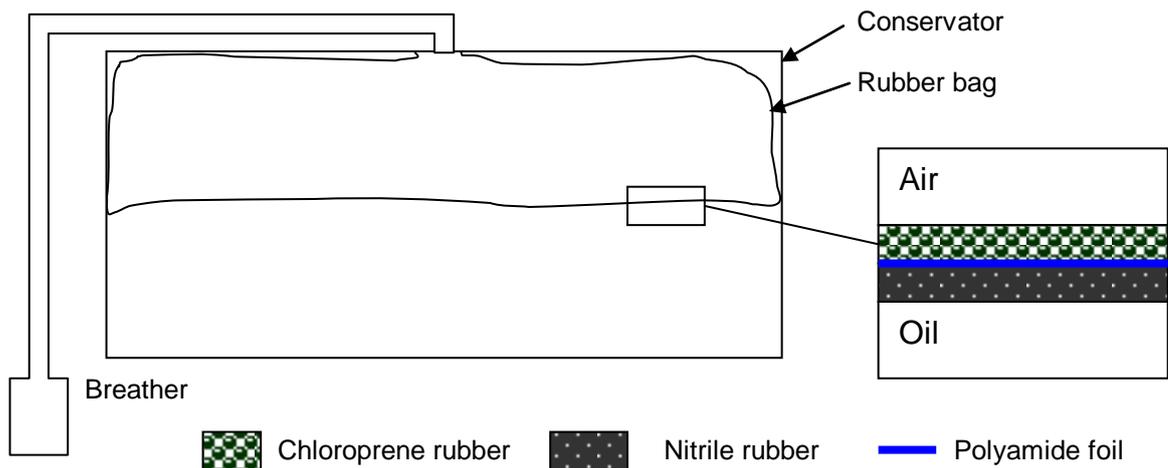


Figure 3. Conservator with air cell

Maintenance friendly breathers

Silica gel breathers of transformers are amongst the items that require the most frequent maintenance; are of utmost importance, however often neglected. The reasons for neglect are multiple, but one important one is

that breathers are often not maintenance friendly. Easy replacement of the desiccant, good visibility of the charge, robustness and simplicity are but a few of the customer's requirements.

These improvements that have been incorporated are outlined below. Depending on the total mass of the desiccant the containers are arranged and connected in series to separate the charge so that only one container needs to be recharged at a time when it has been discoloured completely. This reduces maintenance time and desiccant wastage. To improve the visibility the container housing is made of a transparent and durable material. The smaller range of breathers has a bayonet type of connection that allows easy removal of the desiccant container. Where the charge requirement is above the small unit range, combinations have been developed that have the bayonet type at the end for ease of maintenance.

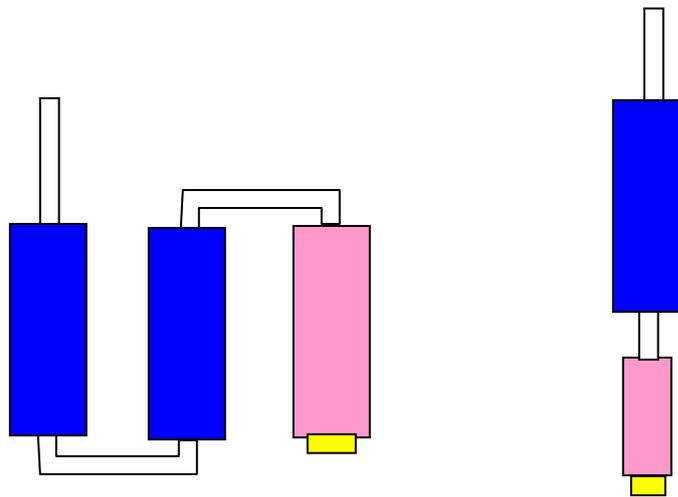


Figure 4 Series breather combinations

Maintenance friendly tap changers

Tap changers are also items that require regular maintenance. The maintenance intervals depend primarily on the number of operations, but there are also time-related intervals. These time intervals are in the order of five years depending on the model. There are two types of tap changers used by Powertech Transformers that offer high maintainability. The one is a bolt-on type or known as the UZ range or the in-tank type known as the UC range.

The UZ range is simple, allows ground level access, has excellent overall visibility and requires short outage times. The UC range requires no shaft disconnection, has a plug-in diverter switch and also requires short outage times.

Powertech Transformers is constantly striving to satisfy the customer by designing and building power transformers the way customers prefer.