

On-Line Transformer Oil Purification

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A common challenge for today's utility engineers is to extend the life of power delivery assets. During the service life of transformers and other electrical equipment, numerous stresses degrade the mechanical and dielectric properties of the oil and paper insulation, and eventually compromise the integrity of the equipment. The degradation is primarily a chemical process that is substantially accelerated by the insulation's exposure to heat, moisture, partial discharge, oxygen, metals, acids and other contaminants and that is also compounded by the degradation products themselves. This exposure promotes the production of aldehydes, organic acids, ketones and polymerization of unsaturated hydrocarbons. All these phenomena are known together as the "ageing" of a transformer's insulation. The heat transfer properties of the insulating fluid are also affected.

This presentation will summarize Powertech's on-line oil purification systems for continuous removal of the aforementioned harmful substances from oil as they are formed and while the transformer is energized without the need for any outages. This approach to reducing and keeping in check the ageing process both extends the life of the transformer and increases its operational reliability. Additionally, it maintains the quality of the assets as well as having the potential to save money by mitigating and/or postponing costly outages that are planned or, much worse, as a result of sudden, catastrophic transformer insulation-breakdown failures.

The systems work in a by-pass mode, are fail safe and can be left unattended. Depending on the contaminant needing to be removed, the purification process uses proprietary cartridges and adsorbent materials to remove targeted sets of the following contaminants:

- moisture
- gases
- particulates
- oil decomposition products
- corrosive sulfur

In addition to oil purification for life extension, a novel method for the specific on-line removal of polychlorinated biphenyls (PCBs) will also be presented. This has particular importance in Canada with Environment Canada's PCB Regulation to substantially reduce PCBs by 2025.