

## Controlling fluid leaks in damaged fluid filled cables

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Self-contained fluid filled cables (SCFFs) utilise a low-viscosity dielectric fluid as part of the primary electrical insulation system, and such cables have historically been a vital part of most European electrical distribution networks. Although these systems are steadily being replaced by XLPE cables, a sizeable amount (7,800km in the UK alone [1]) is still in active service. As with other undergrounded cables, including extruded polymeric, maintenance is either difficult or impracticable so having a system that can be self-repairing would be advantageous.

One of the key disadvantages of SCFFs is that cable breaches (through mechanical damage or sheath degradation) will result in the loss of fluid to the surrounding environment. Due to the low viscosity of the fluid in low pressure FFCs, leaks can occur through holes only microns across, a problem which is compounded by the need to maintain a positive pressure within the fluid hydraulic circuit. Locating and fixing leaks is a time-consuming and expensive process, and companies operating leaking circuits will also suffer penalties, associated with the environmental damage and groundwater contamination caused by escaped oil, or by unplanned cable outages if their permit to operate is withdrawn.

Here, we present a potential solution to fluid leakage that does not require modification to the cable structure. Through the introduction of unsaturated additives to the cable fluid, it has been demonstrated that defects in the region up to 0.2mm in size can be sealed in under an hour, without jeopardising the essential properties of the cable fluid. As it is believed that most non-catastrophic cable leaks start at very small defects and grow with time, preventing a leak at this point should dramatically reduce the frequency of fluid leaks and reduce the associated operating and maintenance costs. With the volume of fluids lost being estimated as ~16% of total volume, annually [2], mitigating damage to the environment and avoiding the issues of unplanned outage make potential solutions highly attractive.

- 1 M. Dixon, Investment strategy for decommissioning fluid-filled cables, 19<sup>th</sup> International Conference on Electricity Distribution, Paper 0040 (May 2007)
- 2 F. Khanzada, Asset Stewardship report 2014, Document 3 Asset Category – Cables. Document available from:  
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