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#### **Diagnostics and maintenance of high-pressure fluid-filled paper cable**

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This article describes a process for the evaluation of the condition and maintenance of HPFF links.

The principle of the diagnostic method is based on the fact that insulating paper and oils subjected to electrical and thermal stresses break down into gases characteristic of the phenomena that lead to their formation.

Samples of oil are taken from the link at 15 Bars by a method with which any losses of gas and all contact with the atmosphere can be avoided. The dissolved gas contents determined by gas-chromatography make it possible to establish the state of aging of the link

Apart from the interpretations of Dissolved Gas Analysis applicable to transformers, there are few references for cables. The criteria for interpretation have to be adapted to the actual circumstances of the performance of a particular technology. In the absence of numerous correlations between Dissolved Gas Analyses and the level of deterioration of the paper, the reference is constructed on the basis of the experience acquired from the contents observed. The approach consists of considering that a large portion of the links installed has aged without serious deterioration, and that the values deviating from a normal distribution relate to the forms of deterioration causing the most concern.

When the gas contents increase and approach thresholds of solubility, it is necessary to treat the oil to ensure satisfactory performance of the structure. The oil treatment operation is carried out at service pressure (15 Bars) and the link can therefore remain live and on load.

The operation involved pushing treated oil through the tank located at the head of the link. The whole of the oil in the link moves towards the other end where it is recovered and stored in a temporary tank. After treatment it is re-injected into the link.

The method has the advantage of reducing the down time of the structure, reducing the cost of the operation, and in contrast to simply replacing the oil with new oil, it avoids the operations for the disposal of used oil.

Besides the main objective, better evaluation of the condition of the link is achieved. Firstly, analysis of the oil collected provides information on the initial contents along the length of the link. These contents are usually accessible only by taking samples locally at the junctions. In addition, the variation in the contents between successive sampling operations can be more clearly perceived.

The actions presented in this article are intended to keep these structures in service for a long time whilst reducing the costs of maintenance and, if necessary, to schedule partial or complete replacement of a link in a pertinent manner.