

## **Prosjektoppgave 2013**

**Tittel:** Dannelse av vanntrær i polymere mellomspenningskabler

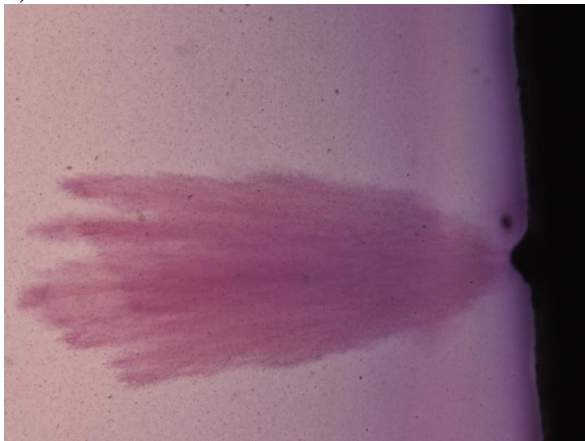
**Title:** (eng): Initiation of Vented Water Trees in Polymeric Cables

### **Prosjektbeskrivelse (eng):**

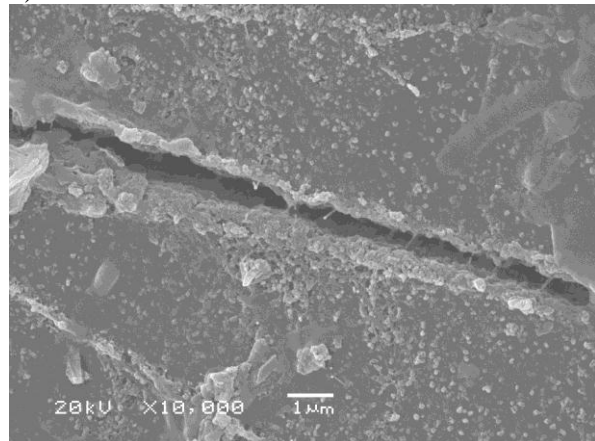
Water treeing is considered the most important failure mechanism for medium voltage cables in service. Water trees grow in the electrically stressed (3-5 MV/m) polymeric insulation at a high relative humidity and from contaminants. The degradation is essentially a network of water-filled voids and micro-channels in the polymeric insulation. In Norway only, there are more than 20 000 km of such cables that are potential at risk of service failure due to the water trees. Lately it has been discovered that corrosion of the aluminium conductor in the cables cause severe environmental stress cracking of the conductor screen and further void/channel growth to the insulation where vented water trees then can start to grow.

In this project work, further study of this mechanism will be examined, such as the effect of mechanical stress and temperature (uniform/gradient). The aged cables are planned to be characterised by partial discharge measurements for localisation of any water trees and microscopy (e.g. Scanning Electron Microscopy - SEM) analysis of the insulation. Training in SEM will be offered in the beginning of the study.

a)



b)



a) Vented water tree growing from the conductor screen in a 12 kV XLPE cable. b) SEM micrographs showing the surface of a conductor screen that has been in contact with a corroded section of the surface of an aluminium conductor strand.

It is feasible to continue the study within a Master Thesis work by e.g. examining the effect of super-absorbents between the strands. Also summer job at SINTEF Energy Research is possible. The work will be supported by a running SINTEF project financed by Norwegian industry and the Norwegian Research Council.

### **SINTEF Energi:**

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