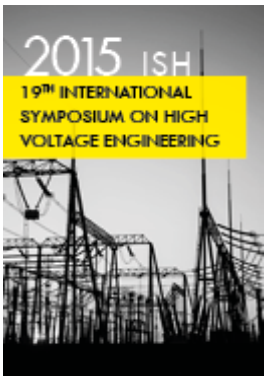
Reference: **ISH2015_115**



Type:
ISH Collection

Title:
Model to indicate the breakdown voltage of mineral oils

File Size:393,5 KB **Year:** 2015

Abstracts

Today it becomes more and more important to predict the actual status of the critical components installed in the electrical grid in order to increase reliability, availability and to reduce life cycle costs. Up to now the dielectric strength of transformer oil is one of the decisive parameters in order to determine the quality. Therefore future online monitoring systems should be expended, such that they are capable of evaluating the dielectric strength of the oil. In general a breakdown test is suitable for this purpose. But this test generates decomposition products. Hence, a model to calculate the breakdown strength or an alternative test method has to be developed. Thus, first of all experimental studies in this context examine the dielectric properties of mineral oil using breakdown voltage tests as well as measuring tests for the dissipation factor, the specific resistance, the conductivity, the permittivity and the moisture in oil. Furthermore the oil colour is classified. For each parameter a correlation analysis related to the breakdown voltage is conducted considering the influence of aging products and moisture. Within the studies on aged oil samples of power transformers and on-load tap-changers, three basic effects can be observed: - A strong dependency of the breakdown voltage on moisture can be identified. - If the absolute amount of water is constant, aging products do not affect the breakdown strength of mineral oil using the standard test set up. - The dielectric properties show a dependency on aging products. For oil samples with constant absolute water content chemical aging happens combined with a reduction of the relative oil humidity, leading to a rise of breakdown strength. However, this strength increasing effect is superimposed by a strength decreasing effect which is attributed to the degradation of the insulation oil. A correlation between the dielectric properties of the insulating oil and the breakdown voltage is not possible due to the different behaviour regarding the aging products. Therefore, a model for the approximation of the breakdown voltage is developed as a function of moisture. The deviations between measured data and model function are analysed and yield to a normal distribution with an average standard deviation of 4 kV for power transformers and 8 kV for tap changers.