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Advanced measuring system for the analysis of dielectric parameters including PD events

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RESUME

Différentes méthodes de mesure permettant le diagnostic préventif des matériels HT sont utilisées ; parmi celle-ci, on peut citer la détection et l'analyse des décharges partielles ainsi que la mesure de la capacité et de la tangente de l'angle des pertes.

La présente communication présente un système intégré compact des procédés de mesure évoqués précédemment.

Ce système permet pour la première fois de mesurer simultanément les paramètres de l'impédance de l'isolation ainsi que les décharges partielles. Simultanément les décharges partielles peuvent être localisées. Pour l'analyse des caractéristiques des décharges partielles, une base d'information « system expert » est intégrée. Ainsi l'état global de l'isolation peut être évalué d'une manière complexe.

1. INTRODUCTION

Both, the loss factor / impedance measurement and the partial discharge measurement are accepted techniques for investigations on the dielectric properties of high voltage insulation materials. For this purpose, the presented new developed system combines the technology of both proved methods.

Caused by the difference of these methods regarding to the appropriate usage most often are both [1] applied in order to get comprehensive test results. On the one hand the integral overall state of a system and on the other hand the differential local insulation system fault analysis is of interest to estimate the condition of HV systems [2]. Only, when applying both diagnostic methods, a meaningful criterion of the tested insulation system can be found [1]. For obvious reasons, the combination of both measurement techniques into one integrated system gains a high benefit.

2. SYSTEM ARCHITECTURE

The system is characterized by a general modular conception. It is designed to implement most of the functionality in digital components, exclusively. Analog parts are used only on a small indispensable scale.

ABSTRACT

For preventive diagnosis of HV equipment different measuring procedures are in use, such as the detection and analysis of PD phenomena as well as the measurement of the capacitance and loss factor. The submitted paper reports on the integration of such different measuring systems to a common, compact and computer based device. This offers for the first time the possibility of a simultaneous measurement of both, impedance-parameters of HV insulation and partial discharges. Simultaneously PD faults can be located. For analyzing characteristic PD types a database expert system is integrated. So the global insulation condition can be assessed in a complex manner.

The platform of the user interface for both systems is a conventional iX86-based computer system. The signal preprocessing is managed by separate independent DSP units. These units feed the main system bus of the computer. Parallel running real-time NT kernel drivers transport the preprocessed compressed data to a Windows-based user front-end. Different input units with selectable digitizing characteristics are realized. The implementation of different acquisition units is cascable.

2.1. Loss factor / Impedance Measuring Technology

Obligated by many inconveniences of the classical and traditional bridge technology based on the Schering-idea (1919) and it's improvement in the 1960-ies by Kuster-Peterson using the current comparator principle, a new system to measure loss factor and other impedance quantities was developed. The measuring principle [3] is schematically shown in figure 1. The magnitude and phase relation of the two currents flowing in the measurement- and reference branch are continuously measured by two independent potential free, fibre-optical connected and battery supplied active current sensors.