EVALUATION OF PD MEASUREMENTS ON MV CABLE SYSTEMS BY MEANS OF A WEB DATABASE

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ABSTRACT

The use of onsite PD measuring systems is more and more common to detect and locate PD faults to prevent service failures and loss of power supply. To perform a PD measurement is today quite easy, but the interpretation of the results rise often more questions and makes the decision for replace or repair difficult. The paper describes a WEB database for documentation of the most important PD parameter of field measurements and the results of visual inspections of the located PD faults.

KEYWORDS

Offline partial discharge measurement; interpretation of pd parameter; severity estimation of pd defects

INTRODUCTION

It has to be pointed out that this paper is published on behalf of a VDE working group (Germany), which has discussed the content and structure of the data base in several meetings. The intention of this paper is to make us much as possible international experts aware about this database and motivate them to use it as a source of information for the evaluation of their own partial discharge measurements and hopefully to convince a big community to contribute active for this open knowledge source.

The physics and causes for PD defects in XLPE and PILC cable systems is mainly well known and described in detail in several publications. [1 - 8]

From the view of the network owner it is in the first line important to know, if the cable system is operating with permanent PD activity under normal service conditions or not. The second important issue is the behaviour of the insulating system in case of over voltages due to earth faults or switching. In networks with resonance grounding a voltage of 1.7 Uo could be applied over some hours to the cables. If a cable system has during normal operation at Uo continuous PD the question about the risk of these PD is raised.

Basically, three PD parameter are important for the judgement of the PD behaviour of a cable system.

PD Inception Voltage PDIV : The PD inception voltage is determined by a stepwise or continuous increase of the voltage applied to the test object. PDIV is the voltage, where measurable PD start, i.e., the sensitivity of the measuring system and the existing ground noise during the measurement influence the recording of the inception voltage.

PD Extinction Voltage PDEV : Since PD sources often show a hysteresis response regarding the inception and extinction voltage, i.e., the PD in ignited locations are often only extinguished below the PD inception voltage, the value of the extinction voltage is also important for the judgment of the risk factor.

PD Level : Normally, the average impulse charge at Uo is used as assessment criterion. There are some global experiences in order to evaluate the risk factor for the reliability of operation depending on the location of the PD (cable, joint, termination), the type of insulation of the cable and the design of the accessories.

The phase-resolved display of the PD offers for typical types of PD sources the possibility of comparison with so-called “fingerprints“. For GIS systems, there are already relatively exact characterizations. For cable systems, however, fingerprints depend on a number of influencing factors like the type of excitation voltage and nature of defect so that presently significant correlations are only possible in a limited value, but a useful additional information can nevertheless be derived.

For the network operator, the following requirements are important for the assessment of cable systems.

- The cable system should be free from PD at the rated voltage Uo.
- In networks with resonance earthed starpoint , there should not be any PD up to 1.7 Uo. Should this nevertheless be the case, the PD must extinguish again above Uo.
- For the PD diagnosis, a voltage shape should be used, which creates comparable PD parameter (inception and extinction voltage and PD level), such as the 50 Hz service voltage.
- The voltage stress during the PD diagnosis must incite the existing PD faults in order to detect them, determine the intensity and locate the position of the PD.
- The PD diagnosis must to take place non-destructively, i.e., no additional fault locations in the form of electrical trees should be initiated.
- When using power-frequency or similar voltage shapes, the gradual increase in voltage may be limited to levels up to max. 1.7 Uo during the diagnosis. This way, the risk of damage to the insulation is minimized.
- When using distinct different voltage shapes (e.g. 0.1Hz Sinus), there should be knowledge for interpretation how the obtained test readings can be transferred to 50 Hz service conditions.