PERMANENT ON-LINE MONITORING OF MV POWER CABLES BASED ON PARTIAL DISCHARGE DETECTION AND LOCALISATION – AN UPDATE

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ABSTRACT

A new on-line measuring system that is able to measure and locate partial discharges (PD's) in MV cables was presented at Cired 2005 [1]. This system is called PD-OL, which stands for PD testing on-line with localisation. Since 2007, this system is commercially available. First experience with PD data is presented in this paper. Apart from the first experience, for people who are not familiar with this new way of PD measurements, a summary of the ins and outs of PD-OL is given.

KEYWORDS

power cable, medium voltage, partial discharge, PD-OL, on-line, defect, localisation, noise, monitoring, degradation

INTRODUCTION

Because of the large impact of cable failures in the MV network on outages as experienced by customers, network owners show much interest in diagnostic tools for their network. For this reason, off-line PD testing has become popular and is being applied since the early 1990-s. After a couple of years of Dutch research activities [3], [4], a prototype of a measuring system became available in 2005 that was able to measure and locate on-line PD's in a MV power cable. At Cired 2005, the basics of the PD measuring system called PD-OL, was fully presented for the first time [1]. PD-OL stands for Partial Discharge testing On-line with Localisation. This paper also includes references to further details. The measuring system is protected with a patent [2]. Since 2005, energy was spend in realising commercial equipment which has become available recently (2007). PD-OL systems based on this got in operation. The first results are shown in this paper.

Compared to off-line PD diagnostics (performed once per couple of years for a certain cable circuit), PD-OL is seen as a step forward in diagnosing MV power cables for the following reasons:

1. PD trends can be seen. This may give a better estimation of risk on failure and maybe also of the actual the remaining life.
2. Since PD-OL is based on inductive sensors clamped around the earth lead just below the termination, no galvanic connection with the MV is needed. From a safety point of view this is an advantage.
3. PD-OL units can easily be removed and installed on another cable circuit. This is because the sensors that can be clamped around the cable consist of two parts.
4. In many cases (depending on the actual termination type and safety regulations) no MV switching operation is needed to install the PD-OL sensors. This is both a safety and cost advantage.
5. In case that PD's from a specific defect are only measurable during a short period of time (hours, days, weeks, or months) before breakdown, PD-OL has a far better chance of interception these PD's.
6. In case that PD's from a specific defect are only measurable during short intervals, also here PD-OL has better chance to intercept PD's.

Background information for arguments 5 and 6 is given in Figure 1. Here, an example (measured in the KEMA laboratories) is given of PD activity form a joint that showed PD activity in intervals over a period of a couple of days only before breakdown. Overheating of the joint due to a bad connector caused this breakdown.

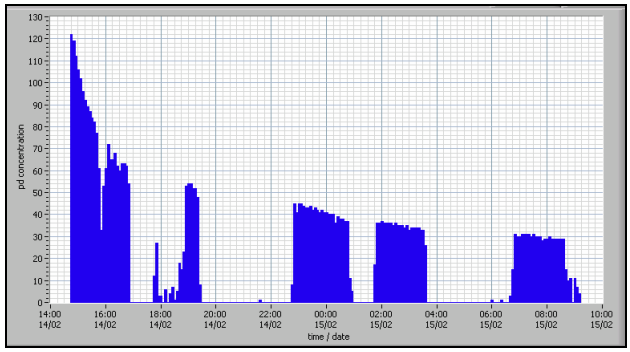

Figure 1: PD concentration form a failing joint as a function of time. The x-axes represents almost 1 day, until the moment of breakdown.

PD-OL – HOW IT WORKS

Lay-out

One PD-OL system consists of two separate PD-OL units, each of these to be installed at one of the cable circuit ends in either substation of RMU(s) (Ring Main Units).See for an illustration Figure 2. In Figure 4 a real life situation at one cable end is shown with

a) sensor/injector unit (PD-OL - SIU). Such an SIU has two parts which are bolted together and in this way is clamped around the cable earth lead The