ON-LINE PARTIAL DISCHARGE MONITORING FOR MV CABLES WITH SCG – PRACTICAL EXPERIENCES IN THE PERIOD 2007 TO 2010

Fred **STEENNIS**, Ad **KERSTENS,** KEMA (the Netherlands), fred.steennis@kema.com, ad.kerstens@kema.com
Theo **VAN RIJN**, Jan **MOSTERD**, Alliander (the Netherlands), theo.van.rijn@alliander.com, jan.mosterd@alliander.com
Leon **BOKMA**, Westland Infra (the Netherlands), leon.bokma@westlandinfra.nl
Piet **SOEPBOER**, Alfred **ARTS**, Enexis (the Netherlands), piet.soepboer@enexis.nl, alfred.arts@enexis.nl
Nico **VAN DONK**, Branko **CARLI**, Stedin (the Netherlands), nico.vandonk@stedin.net, branko.carli@joulz.nl

ABSTRACT

SCG is an on-line partial discharge (PD) based monitoring device for mv power cable systems up to 8 km. With SCG, PD sources can be and are being monitored (days to years) and located. PD results are visible via internet with an hourly update. This paper shows the results of the use of SCG by monitoring 158 circuit km of mv power cable with more than 90 SCG's up to March 2011.

It will be shown that the proven average effectiveness in preventing failures so far is better 83%, and for XLPE cable systems this is even above 90 %. It is also shown that if PD's are seen indeed, there is enough time to perform a repair action. A further interesting finding is that certain defects (and in fact most seen with SCG) only show PD activity for a couple of days before resulting into a breakdown. This is an argument to perform on-line monitoring over longer periods indeed.

KEYWORDS

partial discharges, on-line, monitoring, mv cables, medium voltage cables, SCG, experiences, defects, XLPE, PILC, paper insulated

INTRODUCTION

Grid owners are showing interest in on-line PD monitoring for their medium voltage cables already for many years. It would enable them to see PD activity also when a defect is created at an unexpected future moment. Moreover, in on-line monitoring systems work with inductive PD sensors and such sensors can be installed while the circuit is in service, avoiding switching activities. This is clearly a cost saving issue but also a safety issue when compared to off-line testing. A further advantage of on-line monitoring is the fact that real life PD activity is seen.

An on-line PD monitoring system for mv power cables, that can monitor such cables over hours, weeks or years has been used since 2007 and has become commercially available in 2009. The system is called SCG, which stands for Smart Cable Guard (formally called PD-OL).

The way SCG is measuring is shortly explained in the Section "SCG MEASURING PRINCIPLES" of this paper.

The main part of this paper discusses the experiences obtained so far with SMG and these will be summarized in the Section "FIELD RESULTS" of this paper.

The last Section of this paper summarizes the knowledge rules that can be derived from these experiences, showing that there is a wide range of possible behaviours of PD's until the actual failure (if this failure is not avoided by a repair of the discharging component of course). This Section is called "KNOWLEDGE RULES / CONCLUSIONS".

Several other papers on SCG (or PD-OL) from the same authors were published at various conferences in the past, among others [4], [5], [6], [7] and [9]. These papers treat similar items as in this paper. One can consider this paper at hand as a further update, now with less focus on the measuring principles and with more focus on field results and conclusions that can be drawn from this.

The SCG system was born after a lot of research work has been done until 2005 [2] and [3], later followed by new research work finished in 2010 [8]. The research results were converted into a patent [1] and a practical measuring system called SCG in a combined task force of KEMA (project management and service provider for PD results), Locamation (a Dutch company producing the SCG systems) and most of the network owners in the Netherlands (see the authors affiliations). These network owners together represent about 90 % of the total Dutch MV cable network length of 100.000 km.

SCG SYSTEM PRINCIPLES

Measuring setup

A SCG system consists of two separate measurement units, each of these to be installed at one of the cable circuit ends in either a substation or an RMU (Ring Main Units). See for an illustration Figure 1.

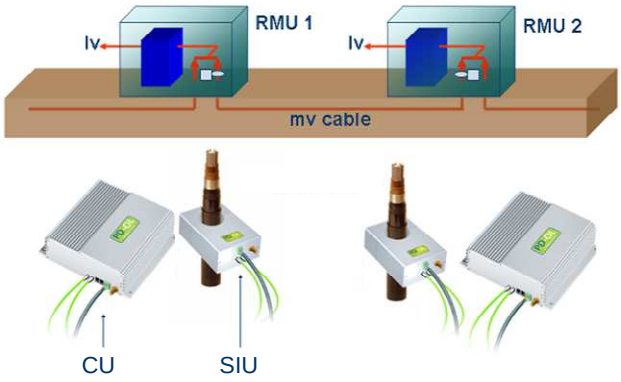

Fig. 1: SCG system set-up

Each measurement unit consists of a Sensor Injector Unit (SIU) and a Control Unit (CU).

The measured PD data and control data is communicated via internet with a server.