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Decision support for condition assessment of power cables

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Abstract: This contribution discusses the practical description and implementation of a database for power cables. By application of intelligent filters, relevant partial discharge measurement data can be selected from all data, which is profoundly analysed for characteristic behaviours. As a result of these analyses, knowledge rules are generated to support the asset management decisions.

Keywords: CBM, power cables, partial discharges

Résumé: Cette contribution présente la mise en œuvre d'une base de données pour les câbles d'énergie. Par l'application de filtres « intelligents », les données de mesure de décharges partielles peuvent être extraites de l'ensemble des données et analysées en terme de comportements caractéristiques. Les résultats de ces analyses donnent des règles pour aider à la décision dans la gestion des infrastructures.

Mots clés : CBM, câbles d'énergie, décharges partielles.

1. Introduction

Based on the fact that insulation condition assessment belongs to one of basic maintenance accountabilities of asset management, the development of interpretation tools for practical experiences to support the decision processes in condition assessment of HV equipment e.g. power cables plays a key-roll in the final acceptance of PD diagnostic by electrical engineers. To support their expectations and above all to evaluate critically the possibilities in getting support from PD diagnosis there is a need to systematic evaluation of actual experiences in this field. Moreover the use of data-mining as a tool to support decision processes in condition assessment opens the possibility in implementing results of PD diagnosis. With regard to the definition of data-mining in general the following characteristics can be given, see figure 1:

In this contribution, an example is given illustrating

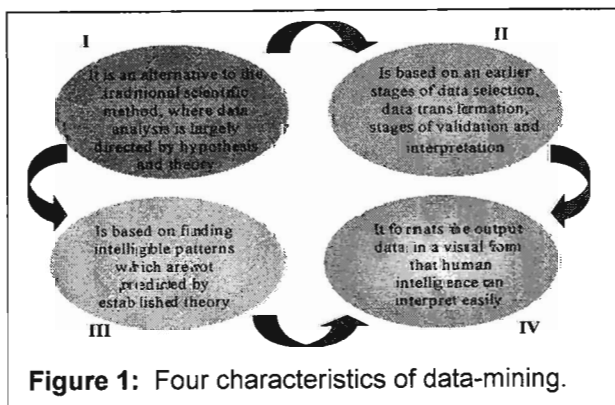


Figure 1: Four characteristics of data-mining.

the potential for data mining to produce useful information from comprehensive modern diagnostic monitoring of distribution power cables.

2. Insulation Condition Assessment

Due to its large population (in the Netherlands 90.000km) is the distribution power cable network an important asset. To enable predictive maintenance the need arises for structured condition assessment of the assets e.g. power cables by the use of powerful non-destructive diagnostics. An excellent example of such techniques for power cables is the PD diagnosis [2,3].

Partial discharges (PD) are sensitive symptoms of possible discharging weak spots (insulation defects, degradation products) in the HV insulation (table 1).

Table 1: Typical insulation degradation processes of the cable insulation.

Accessories	interface problems → PD → tracking; bad hardening → cracking → PD; conductors problems → overheating → cracking → PD; local field concentrations → PD;
Extruded Insulation	insulation voids → delamination → electrical trees → PD; local field concentrations → PD;
Paper/Oil Insulation	oil leaks → dry regions → overheating → PD; water ingress → load effects → overheating → PD; local field concentrations → PD;