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Invited Speaker

Partial Discharge Detection & Location Techniques for Covered-Conductor Overhead or Underground Distribution Lines.

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Abstract: Covered-conductor (CC) overhead lines are commonly used in medium voltage (MV) networks because the loads are widely distributed in the forested terrain. Such parts of the network are exposed to leaning trees which produce partial discharges (PDs) in CC lines. PD measurement provide a valuable information for assessing the insulation health in high voltage (HV) equipment. Nowadays, many PD detection devices had been invented to detect PD on CC overhead line or underground cable. A novel wireless Rogowski coil (RC) sensor based on PD detection in the MV line will be presented. The research is divided into three sections which are RC sensor development, pre-filtering technique and wireless integration. A series of investigations on sensitivity and bandwidth for four types of RC sensors will be demonstrated.

New technology has enable PD estimation evolve from offline PD estimation to online PD estimation. However PD location algorithm still has many ways to improve its effectiveness and accuracy in PD location. Advanced signal processing technique shall be implemented into those devices in order to estimate PD location accurately. This work presents a technique to locate the PD source on CC overhead distribution line networks. The algorithm is developed and tested using a simulated study and experimental measurements. The Electromagnetic Transient Program-Alternative Transient Program (EMTP-ATP) is used to simulate and analyze a three-phase PD monitoring system, while MATLAB is used for post-processing of the high frequency signals which were measured. A RC is used as the measuring sensor. A multi-end correlation-based technique for PD location is implemented using the theory of maximum correlation factor in order to find the time difference of arrival (TDOA) between signal arrivals at three synchronized measuring points. The three stages of signal analysis used are: 1) denoising by applying discrete wavelet transform (DWT); 2) extracting the PD features using the absolute or windowed standard deviation (STD) and; 3) locating the PD point. The advantage of this technique is the ability to locate the PD source without the need to know the first arrival time and the propagation velocity of the signals. In addition, the faulty section of the CC line between three measuring points can also be identified based on the degrees of correlation.

An experimental analysis is performed to evaluate the PD measurement system performance for PD location on CC overhead lines. The measuring set-up is arranged in a HV laboratory. A multi-end measuring method is chosen as a technique to locate the PD source point on the line. A power transformer 110/20 kV was used to energize the AC voltage up to 11.5 kV/phase (20 kV system). The tests were designed to cover different conditions such as offline and online measurements.

Keywords Correlation, wavelet transforms, partial discharge, Rogowski coil, EMTP-ATP, overhead covered-conductor, distribution systems

Biography: Dr Muzamir Isa was born in Perlis, Malaysia in1979. He received the B. Eng. (Hons) in electrical engineering from the Universiti Teknologi Malaysia (UTM), Skudai, Johor, Malaysia in 2001, the M. Eng. in electrical engineering from the Universiti Tun Hussein Onn Malaysia (UTHM), Johor, Malaysia in 2004 and Doctorate (Ph.D) degree from Aalto University, Finland in 2012. His research interests are partial discharge measurement, detection and location technique, and power system transient studies including EMTP-ATP simulation. Currently, he is Associate Professor and actively supervises postgraduate students at Universiti Malaysia Perlis (UniMAP), Malaysia. He has published more than 120 research articles and conference papers. The link of these articles is as follows:

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