World Academy of Science, Engineering and Technology
International Journal of Electrical and Information Engineering
Vol:18, No:04, 2024

Defect Identification in Partial Discharge Patterns of Gas Insulated Switchgear and Straight Cable Joint

Authors : Chien-Kuo Chang, Yu-Hsiang Lin, Yi-Yun Tang, Min-Chiu Wu

Abstract : With the trend of technological advancement, the harm caused by power outages is substantial, mostly due to problems in the power grid. This highlights the necessity for further improvement in the reliability of the power system. In the power system, gas-insulated switches (GIS) and power cables play a crucial role. Long-term operation under high voltage can cause insulation materials in the equipment to crack, potentially leading to partial discharges. If these partial discharges (PD) can be analyzed, preventative maintenance and replacement of equipment can be carried out, there by improving the reliability of the power grid. This research will diagnose defects by identifying three different defects in GIS and three different defects in straight cable joints, for a total of six types of defects. The partial discharge data measured will be converted through phase analysis diagrams and pulse sequence analysis. Discharge features will be extracted using convolutional image processing, and three different deep learning models, CNN, ResNet18, and MobileNet, will be used for training and evaluation. Class Activation Mapping will be utilized to interpret the black-box problem of deep learning models, with each model achieving an accuracy rate of over 95%. Lastly, the overall model performance will be enhanced through an ensemble learning voting method.

Keywords : partial discharge, gas-insulated switches, straight cable joint, defect identification, deep learning, ensemble learning
Conference Title : ICHVE 2024 : International Conference on High Voltage Engineering
Conference Location : Tokyo, Japan
Conference Dates : April 22-23, 2024