Insulator Condition Monitoring

High Voltage (HV) insulators made out of non-conducting materials are mainly used in overhead transmission and distribution to insulate the live conductors from the transmission towers. Contamination on the insulator surface causes the conductivity of the surface to accumulate resulting in flashover. These unintended high voltage electric discharges could result in insulator failure interrupting the transmission/distribution networks. According to prior investigations, it has been discovered Salt, Algae, Dust and Industrial pollutants are the commonly found contaminants. Contemporary methods of inspection on the condition of insulators highly depend on the human sense and have associated drawbacks depending on the geographical limitations. Accurate and refined algorithms are being developed and improved, for the detection of contaminants on HV insulators employing Multi-Spectral Images. The utilization of Multi-Spectral Imaging reveals more intelligence on the subject allowing more rigorous analysis of the research. As salt and algae are the most regularly found contaminants on insulators in tropical countries such as Sri Lanka, algorithms are being developed for the identification and condition evaluation of the aforementioned contaminants.

- Algae: Algal contaminated insulator surfaces show low conductivity with hydrophilic surface properties resulting in relatively high surface leakage currents (LC) in comparison with the clean surfaces. Through this, an MSI based algorithm that utilizes the essence of Bhattacharyya Distance is proposed to identify the algae contamination.

- Salt: Salt contamination can be found in the insulators of coastal regions and dry zones in Sri Lanka. An algorithm to discriminate among the contamination conditions and their discrete contamination level are being developed.

Key results :

- Bhattacharyya distance was successfully used in identifying algae contamination on HV insulators.
- From the implemented algorithm, it was identified that wavelengths 405nm and 740nm can be used in assessing algae contamination levels (algae patch length).
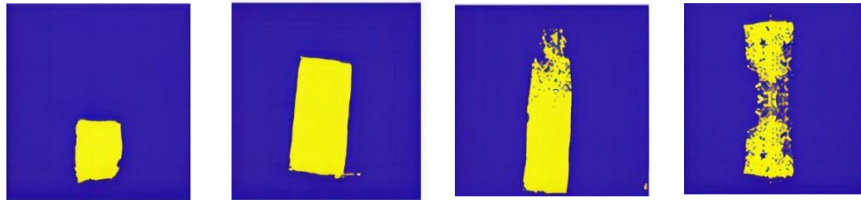
Fig. Identified algae patches on insulator plate

Beneficiaries :

- The electric utility of the country in assessing the condition of HV insulators to ensure uninterrupted service with minimum effort

Outcomes :

- Reflectance Multispectral Imaging for Identification of Algae Contamination in High Voltage Insulators",in OSA Imaging and Applied Optics Congress, OSA Virtual Meeting, July, 2021, L. Ramanayake; N. Senerath; D. Jayasundara; K. Prabath; H.M.H.K. Weerasooriya; M. Fernando; S. Kumara; V. Herath; R. Godaliyadda; P. Ekanayake and S. Athukorala.

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Acknowledgement :

- The Algal Biology and Biotechnology Research group of the Department of Botany, University of Peradeniya for assisting in the preparation of algae samples.

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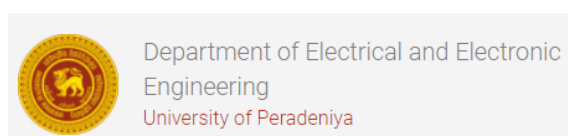
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