Distributed Automation System Based Remote Monitoring of Power Quality Disturbance on LV Network

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Abstract : Electrical distribution networks are prone to power quality disturbances originating from the complexity of the distribution network, mode of distribution (overhead or underground) and types of loads used by customers. Data on the types of disturbances present and frequency of occurrence is needed for economic evaluation and hence finding solution to the problem. Utility companies have resorted to using secondary power quality devices such as smart meters to help gather the required data. Even though this approach is easier to adopt, data gathered from these devices may not serve the required purpose, since the installation of these devices in the electrical network usually does not conform to available PQM placement methods. This paper presents a design of a PQM that is capable of integrating into an existing DAS infrastructure to take advantage of available placement methodologies. The monitoring component of the design is implemented and installed to monitor an existing LV network. Data from the monitor is analyzed and presented. A portion of the LV network of the Electricity Company of Ghana is modeled in MATLAB-Simulink and analyzed under various earth fault conditions. The results presented show the ability of the PQM to detect and analyze PQ disturbance such as voltage sag and overvoltage. By adopting a placement methodology and installing these nodes, utilities are assured of accurate and reliable information with respect to the quality of power delivered to consumers.