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An Approach to Wire-Wound Hall-Effect Based Current Sensor for Offset Reduction

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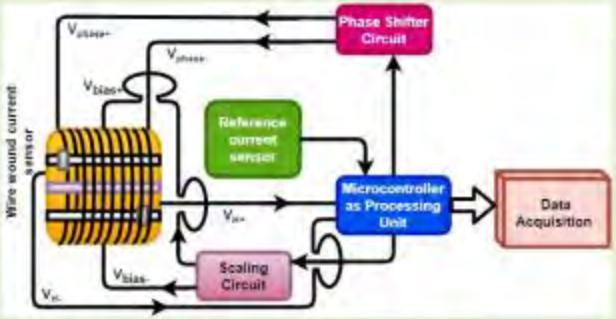
***Abstract*—The advancement of technological innovation in the smart grid demands a reliable and economical solution that could optimize the benefits to the end-user. The presence of unwanted offset and lower sensitivity in available sensors cannot be a reliable solution from the application perspective. This paper proposes a novel current measurement technique that works on the Hall-effect principle to measure current in medium voltage distribution systems. Parameters that affect the output of a Hall-effect sensor like the height, width, thickness, magnetic field, and applied bias voltage are discussed with necessary mathematical proof and electrical equivalent models. Apart from eliminating the conventional biasing, the concerned measurement technology allows the user to achieve considerable sensitivity by varying the biasing voltage and the phase of the applied magnetic field. Experimental validation and simulation of the proposed three-dimensional current sensor with advanced materials like graphene and zinc oxide are carried out, showing a sensitivity of 230.03 ± 2.1 mV/VT and theoretically zero offsets. The feedback feature and controlling ability help the sensor achieve a broad range with minimum nonlinearity and noise. The simulation and laboratory experimentation results confirmed that the offset of the Hall-effect-based sensor is reduced to zero with minimum noise and higher sensitivities for the current measurement.**



***Index Terms*—Current measurement, graphene, Hall-effect sensor, sensitivity, zinc oxide.**