The Impact of Air gap of Toroid Core on Magnetic Flux Density in Electromagnetic Energy Harvester

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Depending on the development of technology and industry, monitoring and inspection of energy transmission lines is important for the sustainability of energy. The information gathered from the sensors employed in power transmission lines allows for prompt intervention in potential fault situations. The amount of energy required for the sensors to work can be provided by various energy harvesting methods. One of the easiest ways to provide energy to the aforementioned sensors is the electromagnetic energy harvesting method. This method provides an important advantage as the harvesting process is done directly from the line itself. Electromagnetic energy harvesters consist of a core that can be composed of different geometric shapes and different magnetic materials, and the windings on the core. One of the biggest problems in harvesting energy from the electromagnetic field is the saturation of the magnetic material. To overcome this problem, some solution methods such as an air gap in the core and switching are used. In this study, a toroidal electromagnetic energy harvester was designed to obtain energy from the lines. In order to prevent saturation of the core material, it was analyzed by Finite Element Method (FEM) using air gap at variable distances. The toroid core is made of M15 material and has dimensions of 30x10x15 mm. Magnetic flux density distributions were obtained by adjusting the air gap in the range of 0 - 1 mm with an accuracy of 0.1 mm. The flux density value decreased as the air gap increased. After the air gap value was 0.6 mm, the magnetic flux density approached zero.

Keywords: *Air-gap, Electromagnetic energy harvesters, Flux density, Transmission line.*