

ABSTRACT

Magnetic field induction planar system has been developed by using single transceiver. The existence of an input of alternating current (AC) in the transmitter coil cause magnetic field changing, it causing emf at the receiver coil. The magnitude of the magnetic field induction is also influenced by the permeability of the medium between the transmitter and receiver coil. COMSOL system of this system is used to preliminary study of coil sensor geometry design, value of coil inductance, and pattern of magnetic flux density distribution. Referring to the results of this simulation, then made prototypes of the system. System prototypes were tested to recognize differences in ferromagnetic and non-ferromagnetic materials. Then, after obtaining a type of material that is more sensitive to the system, then the type of material is tested with thickness and anomaly variations. The average inductance value of the measurement result is 0.06959 mH, while the COMSOL simulation is 0.05162 mH. In system test, the input is given by function generator is 10,2 Volt and with working frequency on range 2 MHz - 8 MHz, then the result is displayed on oscilloscope. The planar induced magnetic field system is capable of distinguishing types of ferromagnetic and non-ferromagnetic materials such as solids (paraffin, iron in paraffin, iron) and powdered objects (quartz and Fe₃O₄ or magnetite). Fe₃O₄ powder which is included in ferromagnetic material there is a shift of the frequency of the optimum working frequency. When the object is quartz, the peak of working frequency at 5 MHz, whereas powder the peak of working frequency in the Fe₃O₄ at 4 MHz. The result of the measurement data of planar induction system of magnetic field to the object that tested more sensitive on ferromagnetic object compared with non-ferromagnetic object, indicated by the value of induced voltage on receiving coil higher on ferroagnetic material than non-ferromagnetic aterial. However, this system has not been able to distinguish the thickness and anomaly of steel materials significantly.

Keywords: coil, sensor, induction, magnetic field, planar