ENGINEERING

Project 3 – Independent Research Summary

Inductive Proximity Sensor

ENGINEER 1P13 – Integrated Cornerstone Design Projects

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Executive Summary

The main function of inductive proximity sensors is to detect metal targets approaching the sensor without contacting the target physically. There are three main classifications for these sensors corresponding to operating principles, high-frequency oscillation type, capacitance type, and magnetic type [1]. The high-frequency oscillating type uses electromagnetic induction, the others are named appropriately as they use magnets and capacitance. These sensors are based on Faraday's Law of Induction [2]. The main working principle that allows the device to perform its function is done by a coil in the oscillation circuit, which generates a high frequency magnetic field. As a metallic target approaches the sensor, electromagnetic induction causes an induction current to flow into it. The current flow increases as the target gets closer, increasing the load on the oscillation circuit until it attenuates [1]. The sensor detects the change in oscillation, and outputs a detection signal as a result.

One of the crucial material components of an inductive sensor is the induction coil. The induction coil is important for the function of the sensor because it creates the oscillating magnetic field that detects incoming metallic targets. Brass is a common material that is commonly used for these coils [3]. The first material property of brass that makes it a good choice is its high conductivity. A higher conductivity of the material in the coil will allow for more of an inductance shift when a target comes near. In other words, a higher conductivity will allow for more current to flow through and a greater oscillation [3]. The sensor can then more easily detect change in oscillation which results in better performance. Brass also has a lower thermal coefficient compared to materials such as copper. The resistivity of brass changes less and performs more consistently in various temperatures [4].

References

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