

## Triple flat-type inductive-based oil palm fruit maturity sensor

### ABSTRACT

This paper aims to study a triple flat-type air coil inductive sensor that can identify two maturity stages of oil palm fruits, ripe and unripe, based on the resonance frequency and fruitlet capacitance changes. There are two types of triple structure that have been tested, namely Triple I and II. Triple I is a triple series coil with a fixed number of turns ( $n = 200$ ) with different length, and Triple II is a coil with fixed length ( $l = 5$  mm) and a different number of turns. The peak comparison between Triple I and II is using the coefficient of variation  $cv$ , which is defined as the ratio of the standard deviation to the mean to express the precision and repeatability of data. As the fruit ripens, the resonance frequency peaks from an inductance–frequency curve and shifts closer to the peak curve of the air, and the fruitlet capacitance decreases. The coefficient of the variation of the inductive oil palm fruit sensor shows that Triple I is smaller and more consistent in comparison with Triple II, for both resonance frequency and fruitlet capacitance. The development of this sensor proves the capability of an inductive element such as a coil, to be used as a sensor so as to determine the ripeness of the oil palm fresh fruit bunch sample.

**Keyword:** Inductive concept; Air coil; Resonance frequency; Oil palm; Maturity classification; Moisture content