Compensating for environmental effects with embedded sensors

Anthony Croxford[1], Chenghuan Zhong[2]

[1]Mechanical Engineering, University of Bristol, United Kingdom, [1]R and D, Inductosense, United Kingdom

Monitoring the state of structures is the primary goal of NDT. Classical measurements using manually placed ultrasonic sensors typically suffer from significant variability over time as a result of coupling variations and location inaccuracy. Permanently installed sensors can mitigate these issues recording data consistently from the same location. A recent development in the area has been inductively coupled sensors. Here the sensors are coupled to inspection hardware inductively. This enables sensors to be battery free with no electronics and connected wirelessly to the inspection hardware. While this eliminates the variability inherent in manual measurements it means that small changes in state due to environmental variation are resolvable and can mask changes. The classical way to calibrate these out is to measure the temperature with additional equipment. This paper reports on an alternative whereby the inductive coupling is used to determine the temperature on a part, thus needing no extra equipment. This relies on electrical property changes in the sensor which manifest as changes in the response of the system. When the temperature on the part is known the effects of temperature can be compensated for. In this paper we give an overview of inductively coupled sensors, show how temperature is measured and how accounting for temperature affects the resulting measurements.