DEVELOPMENT OF HIGH TEMPERATURE AND UNDERWATER SENSOR FOR PERMANENT MAGNET CORROSION MONITORING SYSTEM

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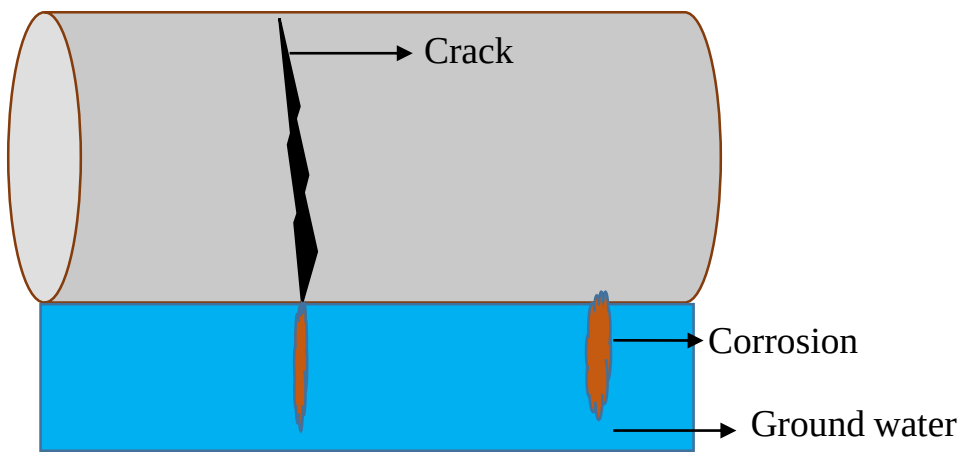
1 Introduction

Non-destructive testing (NDT) provides an excellent balance between quality control and cost effectiveness. Magnetic Flux Leakage (MFL) testing is a powerful and highly efficient method that has been widely used for ferromagnetic objects, such as oil-gas pipelines, rail tracks, steel wires, oil storage tank bottoms and bridge cables.



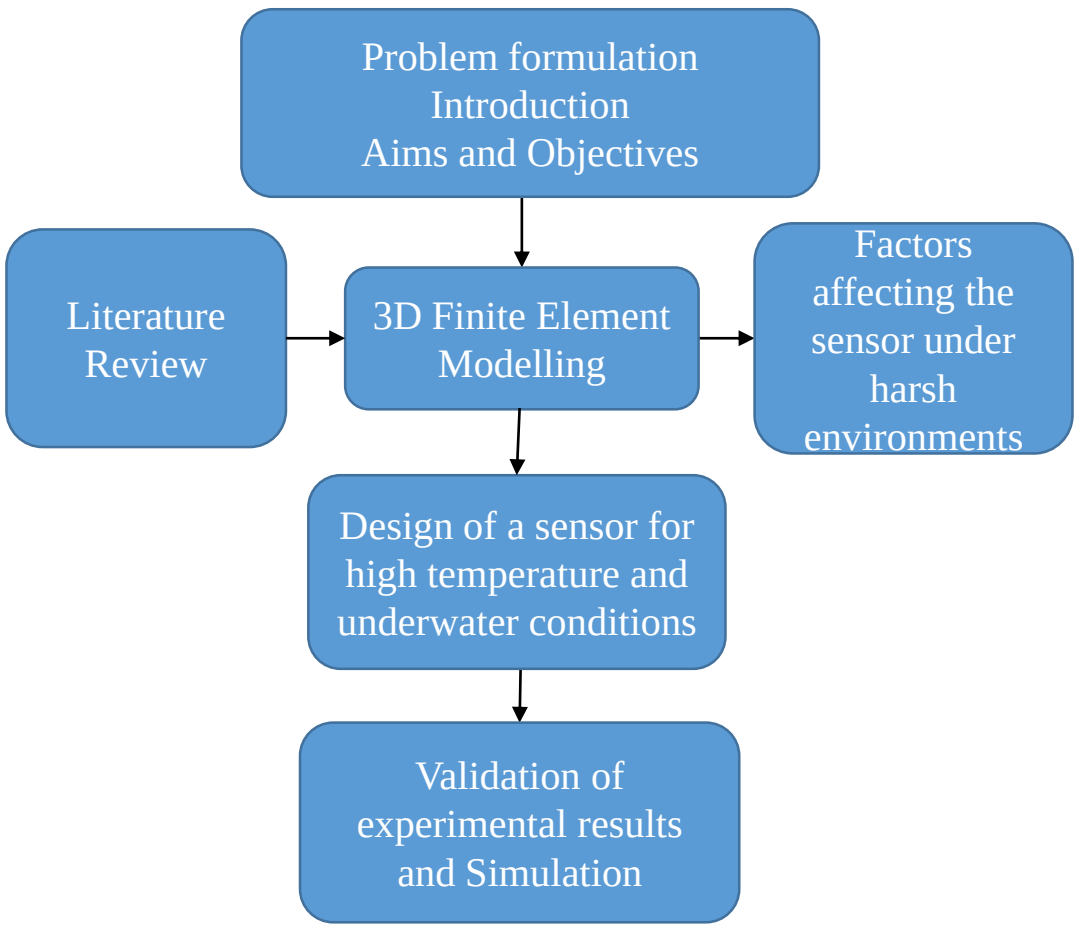
Types of damage in pipeline

The research is to investigate and focus on the parameters that affects the probe and magnet at elevated and underwater temperatures, in detecting corrosion using MFL technique and proposing a solution to make it work efficiently.

2 Aims and Objectives

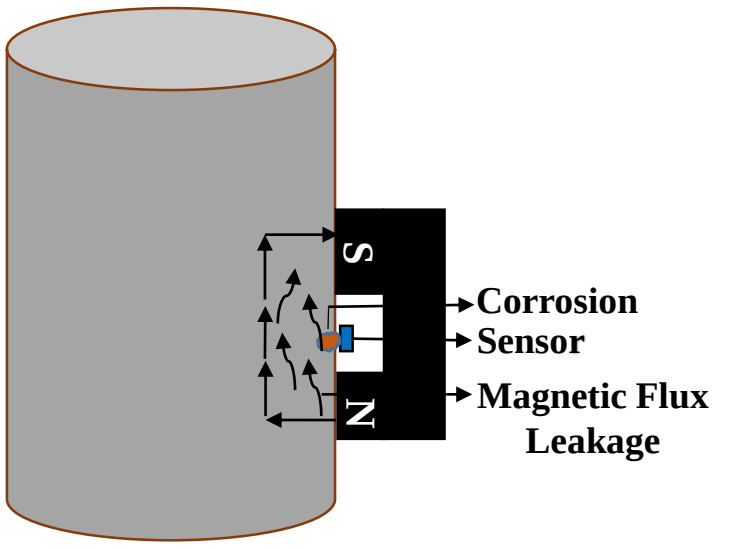
- To design and model a high temperature and an underwater probe that works and testing the effects on magnet .
- Design of an underwater probe with a data transmission system and analysing its durability in seawater environment
- And modelling an alternative energy harvesting for these environments and validating the modelling results with experiments.

3 Methodology

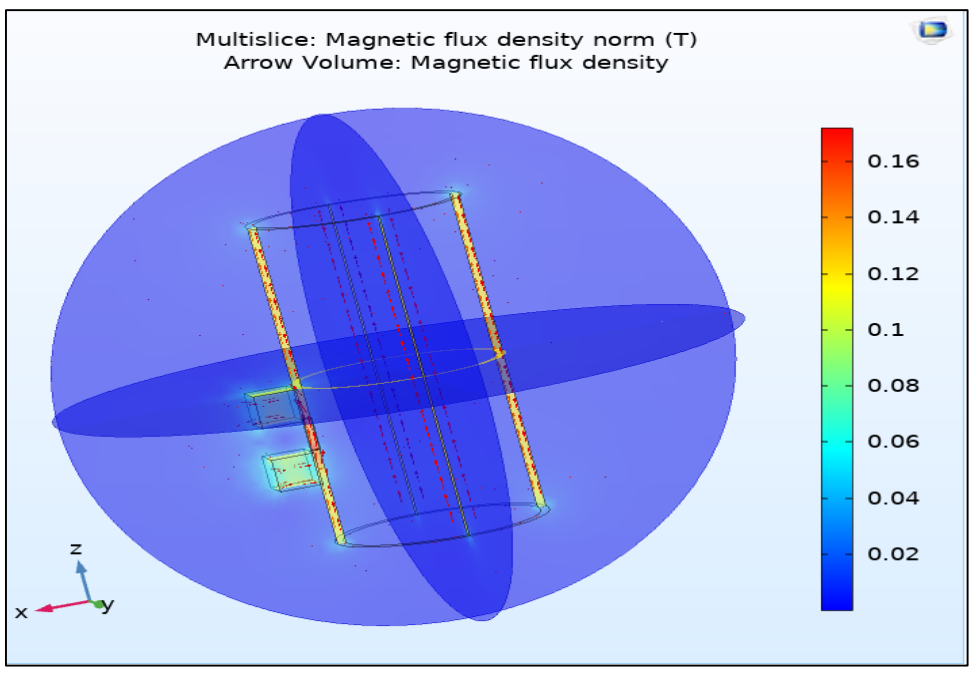


4 FEA Modelling

The finite element method, is a numerical technique for solving boundary value problems of engineering and mathematical physics. The finite element method formulation of the problem results in a system of algebraic equations. Using Comsol Multiphysics 5.4, magnetic flux density of pipe sample with defect is obtained and shown below.



Modelling of a pipe with a defect



Magnetic flux density

5 Conclusion and Future work

- Comsol results shows the magnetic flux leakage within the defect area and it can be concluded that defect exists and analysis of the sensor response at different depth in sea water and validation of results.
- Investigation and implementation of effective data transmission system for underwater applications. Simulation of different defect depths would give a better knowledge of corrosion rate at different conditions.

6 References

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