

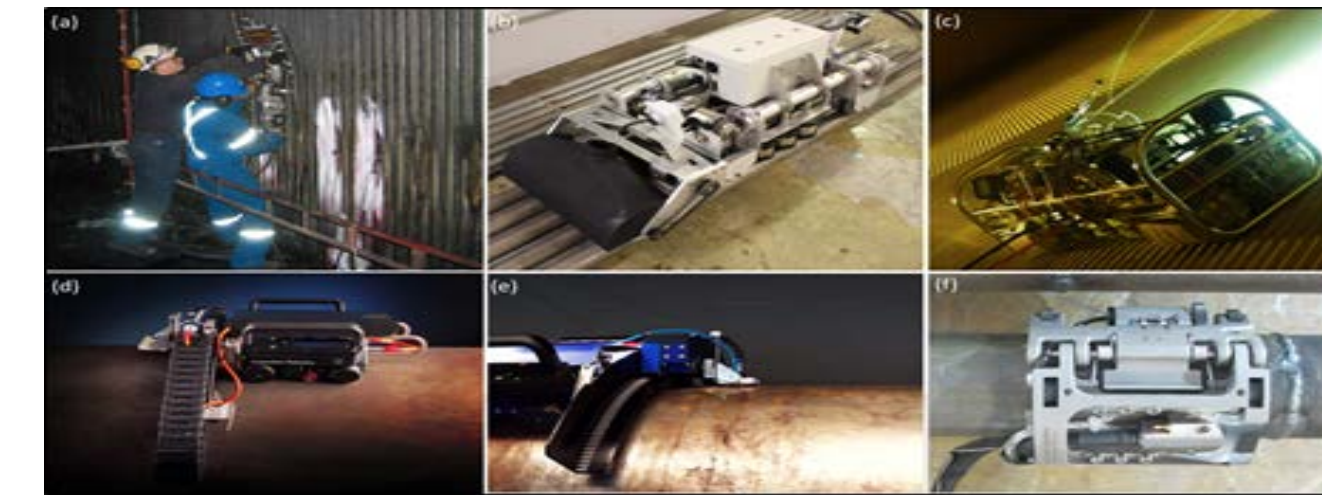
INTRODUCTION



- Tubes are the main component of several units in power plants
- Aging power plants is a major concern in the US.
- limited accessibility requires overhaul of unit for routine inspection (time consuming and costly)

CURRENT ROBOTIC METHODS

- Current Robots:
- Cannot be used for complex geometry
 - Requires smooth surfaces
 - Mostly requires ferromagnetic materials
 - Scanning has to be performed point-by-point
 - Testing requires couplant



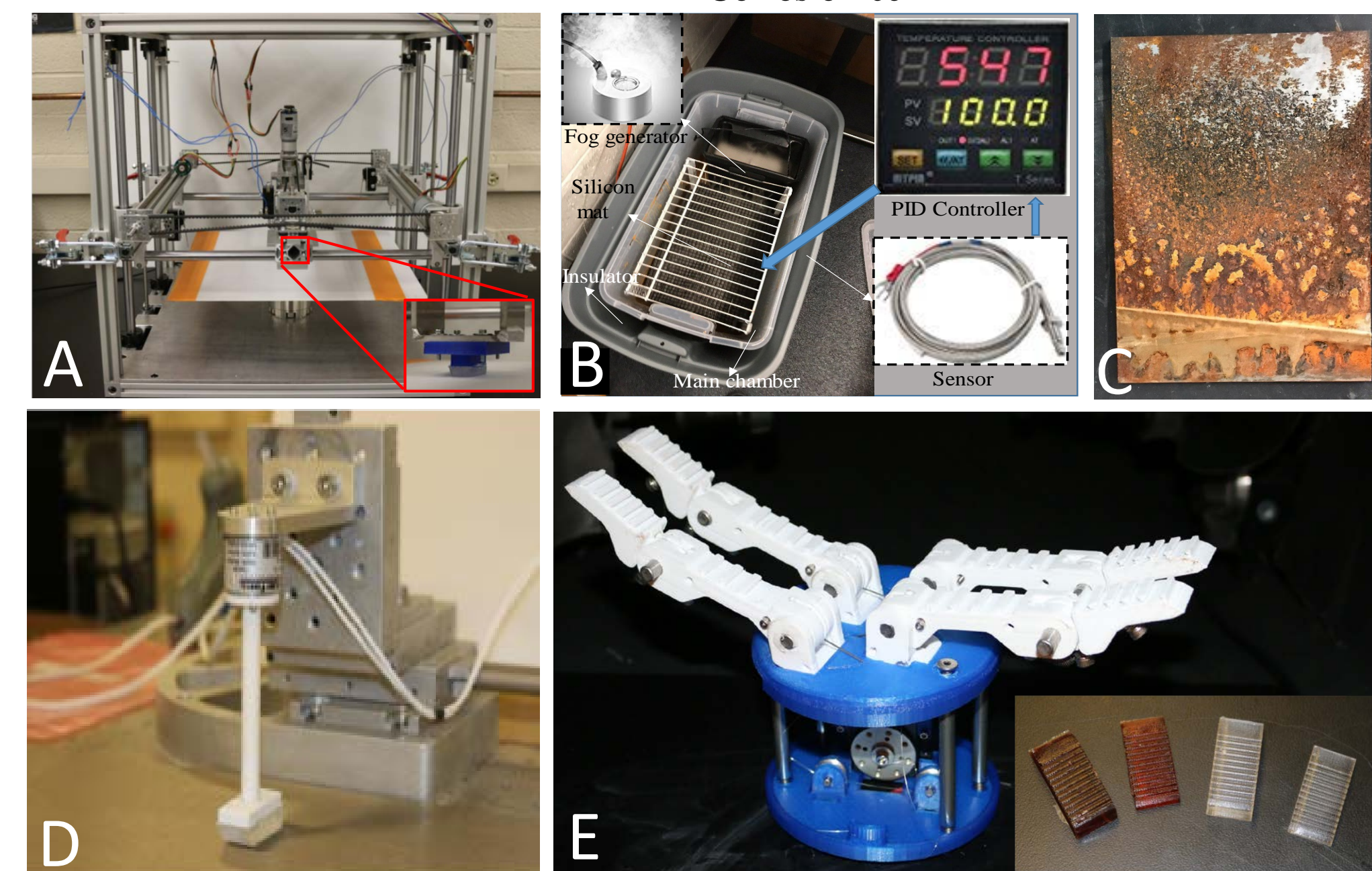
Tube inspection robots. (a) Vertiscan system, (b) ICM climbing robot, (c) boiler wall cleaning and inspection robot, (d) inspection robotics system, (e) FAST UT system, and (f) PALM scanner.

APPROACH

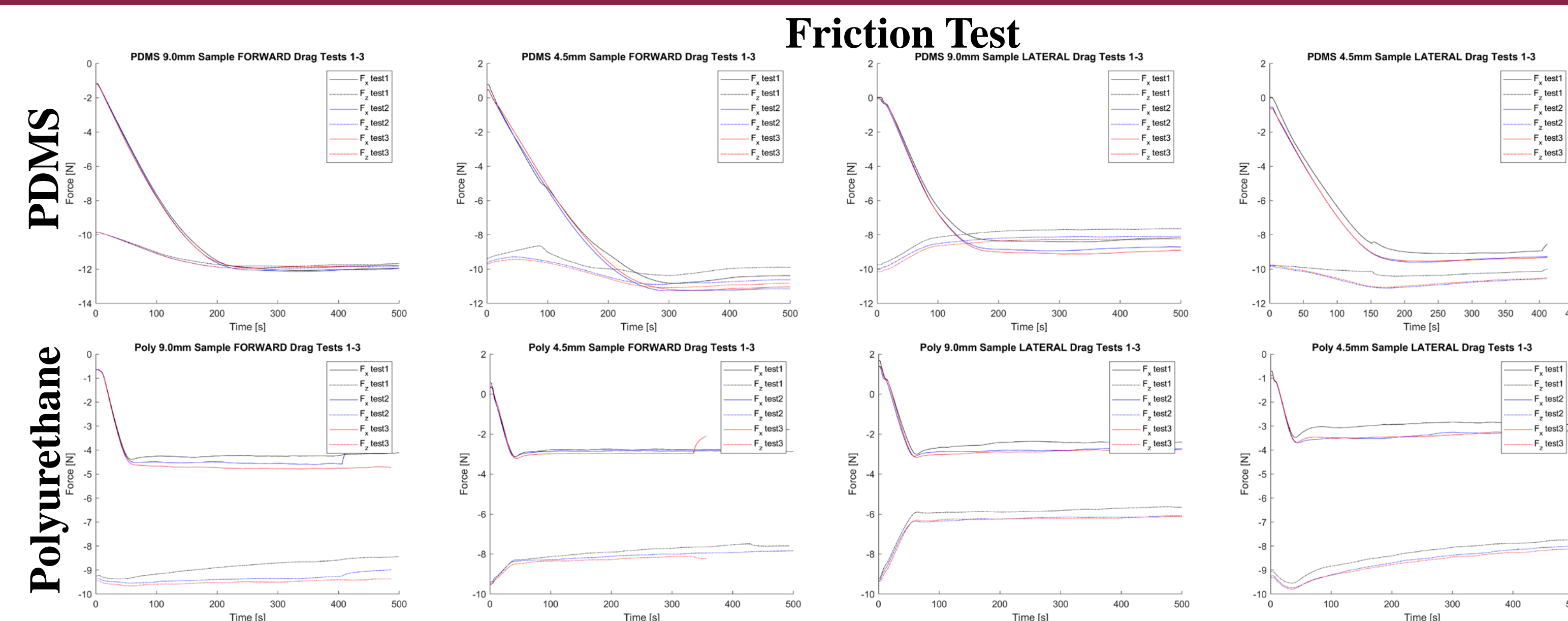


- Lizard-inspired robot:
- Friction based mobility
 - Couplant free UT
 - Advanced UT imaging

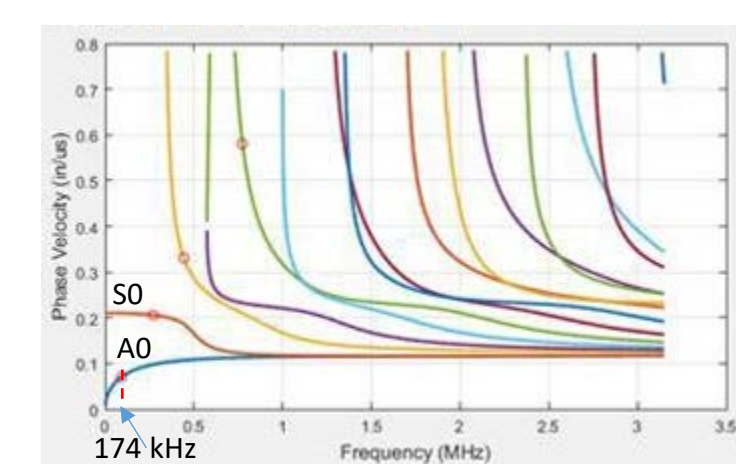
- High-load testing structure
- Accelerated Corrosion Cell
- Corroded Plate
- High-resolution testing system
- Fabricated Gripper and Friction Pads



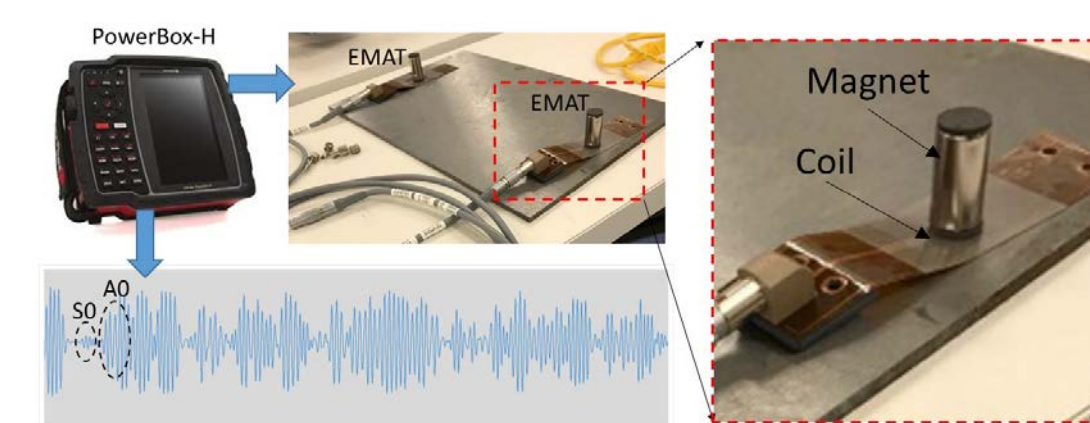
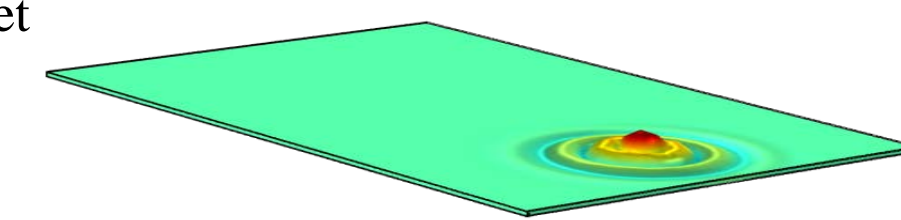
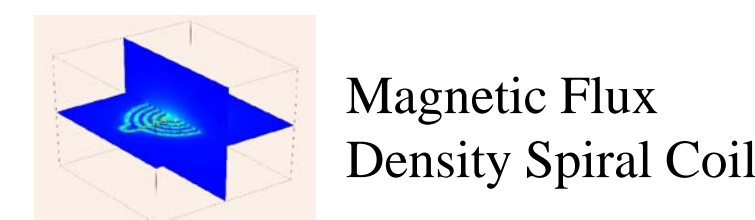
RESULTS



Lamb waves generation



Lamb wave dispersion curvature



Lamb wave generation by EMAT: Experimental Setup and Modeling in COMSOL

FUTURE WORK

- Modeling results with different plate curvatures and EMAT lift-offs
- Experimental results with different corrosion levels and different lift-offs
- Embedding sensors into the friction pads
- Robot fabrication
- Design a robust semi-autonomous controller
- Optimize the pad design to obtain maximum friction

ACKNOWLEDGEMENTS

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