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Mechanical Testing and Design of the Magnetic Linear Test Apparatus

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MECHANICAL TESTING AND DESIGN OF THE MAGNETIC LINEAR TEST APPARATUS

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PURPOSE

The Magnetic Linear Test Apparatus (MLTA) is used to test and study the fatigue and electrical characteristics of magnetic shape memory alloys (MSMA).

EXISTING DEVICE

- Design has functioned well and produced usable data
- Magnets must be removed to access the sample stage
- Sample mounting takes place in a difficult to access area
- Limited to fixed magnetic field strength
- Stability issues caused by vibration

DESIGN BUILD

Design completed using Dassault Systemes Solidworks Modeling software

- Parts fabricated in COEN Student Machine Shop by undergraduate researchers
- Electromagnet characterized and prepared in COEN Magnetic Materials Lab
- Electromagnet wired with temperature sensitive switches to prevent overheating
- Electromagnet plumbed for process cooling water to sustain large magnetic fields

FINAL DESIGN

1. Linear actuation motor
2. Heavy MIC6 aluminum base plate with rubber feet
3. Variable field electromagnet
4. Linear compression stage with micrometer compression adjustment

Design completed entirely by COEN undergraduate students

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FUTURE WORK

- Complete fabrication/assembly
- Mechanical integrity/data acquisition testing
- Sound level safety testing
- Conduct tests on MSMA samples
- Data analysis
- Design and installation of sound proofing cabinet