Dresser-Rand Eddy Current Damper

Overview
Dresser-Rand manufactures compressors that are used below sea level. Currently, a rotor is mounted on oil based bearings that have high maintenance costs. A design using magnetic bearings is being implemented to avoid high maintenance costs. In the event of an electrical failure, the magnetic bearings will fail. The eddy current dampers will act as a backup safety mechanisms that will utilize an magnetic flux generated by a coil to be sent through an aluminium disk. The flux will generate eddy currents that will in turn produce an opposing magnetic field and act as a damper.

Objectives
The teams objectives included modifications of the provided testing rig to maximize rotor RPMs. The team had to measure and correct all vibrations outside of a specified tolerance. Furthermore, electromagnetic cores were machined and complex analysis was done in order to determine the specifications relevant to the electromagnets. Finally, testing was conducted to show the effects of the eddy current damping system.

Approach
- The team travelled to Olean, NY to meet with the sponsors
- Outlined problem and objectives
- Met with previous team to make for a smooth transition
- Began motor testing and rig modification to meet design requirements
- Calculate design specifications of electromagnets
- Heat shrink balanced aluminium disk onto shaft
- Add weights to shaft and calculate shaft balance
- Add small counterweights to balance shaft
- Machine electromagnet cores using water jet
- Wind wire coils around the cores
- Wire to power supply and control unit
- Test using proximeters and calculate vibration/ and G force produced at bearing failure

Outcomes
- Further testing is needed to determine if the damping system will be effective
- The damping system slowed the system faster, however created more vibrations and overall forces on the system.
- More practical power supply was needed
- Proof of concept has not been verified
- Experiment was a success in that system response with implementation of eddy current damping was acquired