Actuator Research

The University of Texas at Austin Center for Electromechanics (CEM) has provided ground-breaking actuator research and design work to various industries since the early 1990's. CEM designs leverage energy storage to provide high power actuation with low overall energy consumption. CEM has participated in actuator designs across a large breadth of performance criteria. The current business environment does not reward large corporate investment in research and development. Companies that prosper in this environment tend to import technology effectively and quickly convert technical advances to profits. In the U.S., the source of this technology is increasingly research universities like the University of Texas at Austin. Moreover, the Center for Electromechanics is well positioned to help develop needed technology, as it is the largest and most comprehensive university-based electromechanics research and development facility in the U.S.

Multi-disciplinary Modeling Approach

CEM engineers have access to a full suite of industry standard software and hardware including LMS Virtual.Lab, MATLAB, Solidworks, Maxwell 3D, Patran, ABAQUS, and many more. Initial system verification is typically done through simulation and the resulting control algorithm is then transferred into the lab and directly integrated into the testing environment. When warranted, CEM engineers develop custom algorithms or testing techniques appropriate to a unique application.

Facilities

The Center for Electromechanics, located at The University's J. J. Pickle Research Campus, houses extensive fabrication, assembly, and testing facilities in a 140,000 square ft air conditioned high bay laboratory. The 70 ft tall high bay features two 25 ton cranes with an additional 25 ton crane servicing a machine shop area. In addition to the main high bay laboratory, an additional 10,000 square ft of air conditioned space is available in 8 satellite labs, along with a 1,200 square ft welding/fabrication shop.

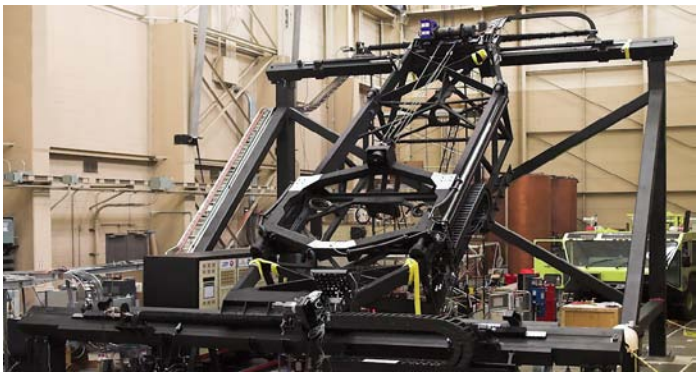
Mechanical Advantage Actuators

Planetary Gear

Fluid-Coupled

- Regenerative
- High Force
- Low Average Power Consumption

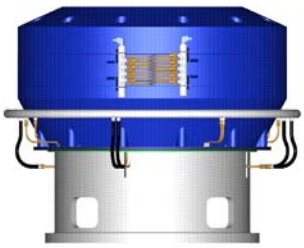
Rack & Pinion



12 Ton High-Precision Robot (Roller Screw Actuators)

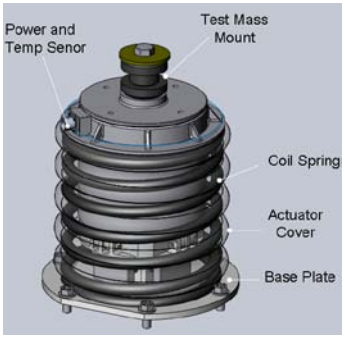
- Long stroke actuation
- Precision accuracy (2-5 microns)
- Low thermal signature
- Multiple layers of safety protection
- Custom control system

Voice Coil Actuators

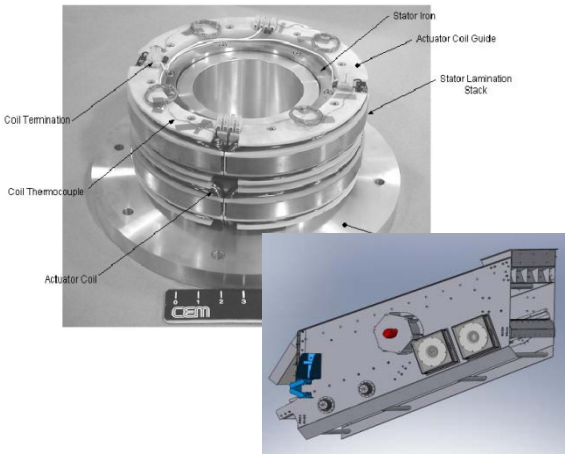


- 60,000 lbf shaker
- 6 – 150 Hz frequency range
- Shaken mass 16,000 lbm
- Base Plate 3,000 lbm
- Capacitor energy storage and PFN

- Designed to isolate electronics racks from rocket launch vibrations
- Successful demonstration isolating 5,000 lb instrument rack.
- Low Losses
- Simple Power Electronics and Controls
- Direct Drive Voice Coil Design (no mechanical components)
- Incorporates passive spring to support static weight



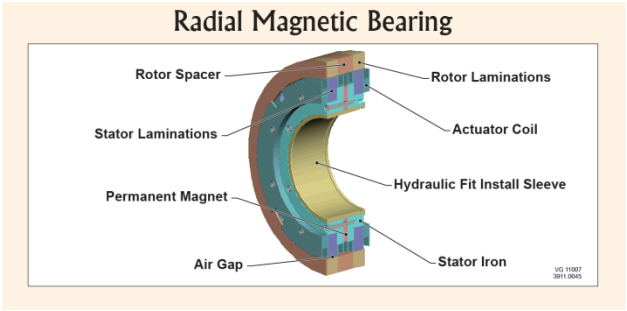
Variable Reluctance



Mechanical Separator

- 3250 lb peak force in X and Y axis
- Operational design to 100 Hz
- Resistance 0.53 ohms/coil
- Inductance 0.082 Henries/coil
- 0.1” peak to peak radial displacement
- User-controlled variable force, frequency, and amplitude

- Very low and predictable friction
- No Lubrication
- Ability to run in a vacuum
- Capable of running at very high speeds



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