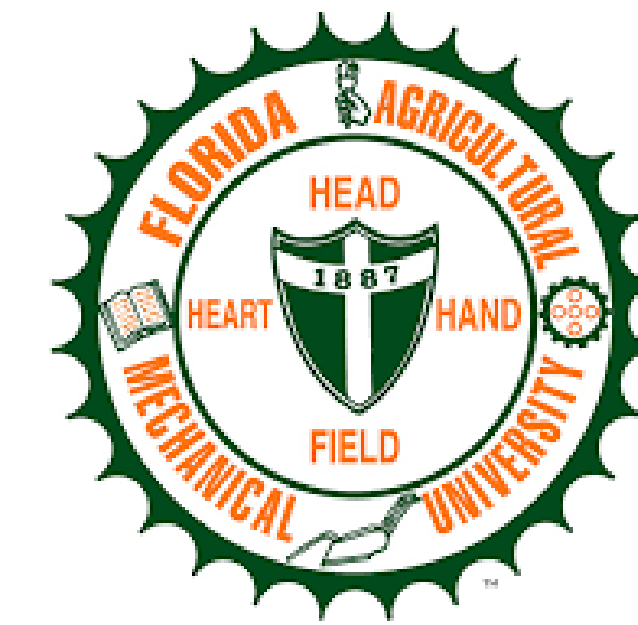




# Motor Test Rig: Improving Alignment and Incorporating Transducer



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## Background

- Motor test rig needed by Danfoss Turbocor to test performance of their various compressors.
- A second compressor will be used in this system to act as a generator, while the first will be treated as a motor powering the system.
- Magnetic bearings provide contact-free levitation – one axial and two radial.
- TT500 compressor will be used in experimental procedures
  - Natural Frequency: 904 Hz
  - 9 Sensors that adjust the shaft to maintain levitation.
  - 200N\*m Force applied on the shaft will shut down the compressor .

## Goals

- Achieve 10,000 rpm, but design for up to the maximum speed of 40,000 rpm in mind.
- Introduce a transducer to the system.
- Reduce/eliminate as much vibration as possible.

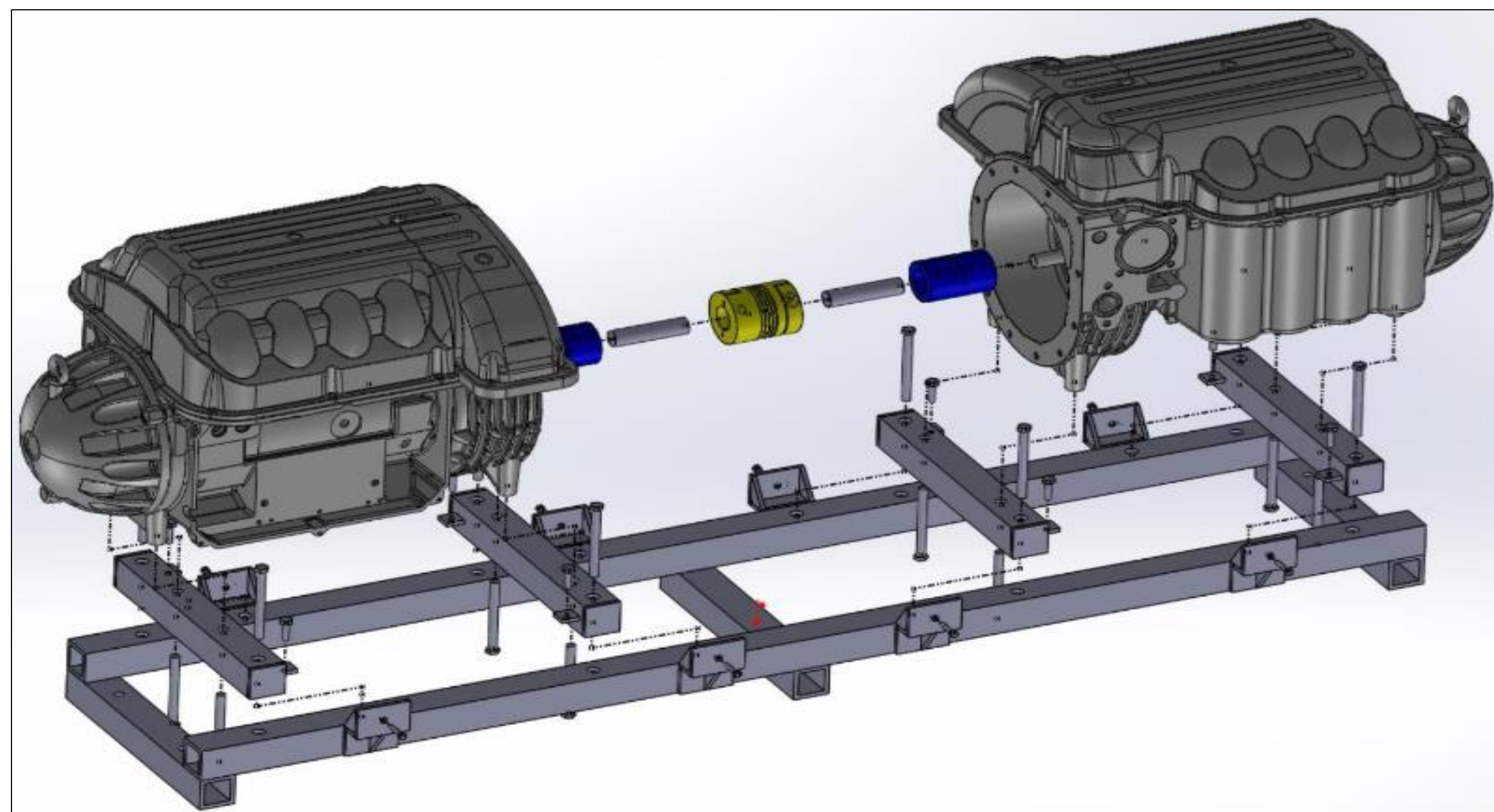
## Improving Alignment

- We plan on replacing the dial alignment tool with a high precision laser alignment tool.
- Reducing the number of parts required in the system.
- Eliminating the flexible coupling and 2 shafts and replacing them with a torque transducer.

## Incorporating Transducer

- Transducer (Subject to change)
  - Magtrol Series TM 308
  - 50,000 rpm
  - 20N\*m Nominal Torque Rating
- Mounting the transducer to the base will prevent the two free-floating (levitating) shafts from fighting each other

## Last Year's Design



### Components

- Flexible Bellow Coupling (**Gold**): R&W BKC 150
  - 150 Nm rated torque
  - 10,000 rpm standard speed
- 2 Rigid Couplings (**Blue**)
- Shims: 304 Stainless Steel Standard
  - Thickness of 10, 25, and 250 um

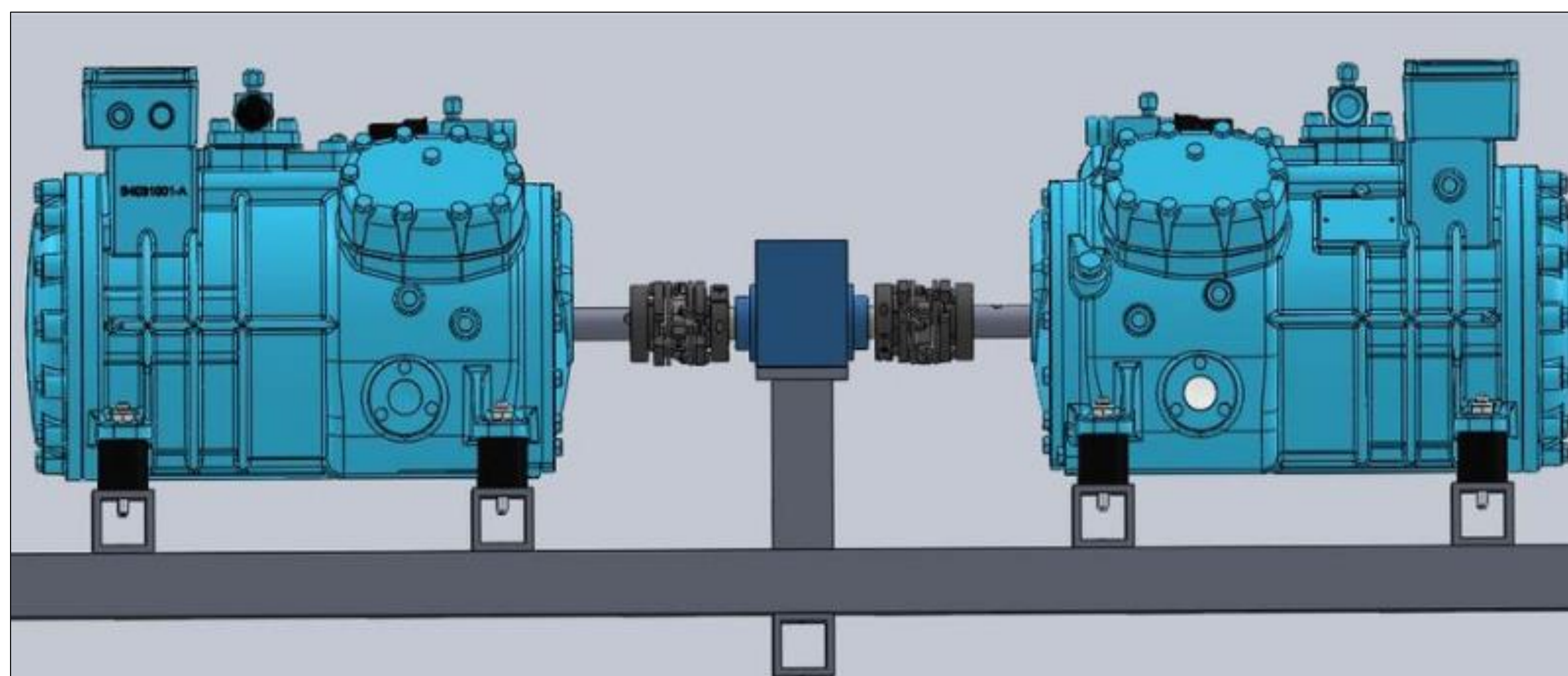
### Alignment

- Adjustable Frame
- Dial Alignment System
- Shims and Set Screws
  - Adjust elevation and lateral position

### Performance

- 700 rpm reached before vibrations occurred and compressor shut down

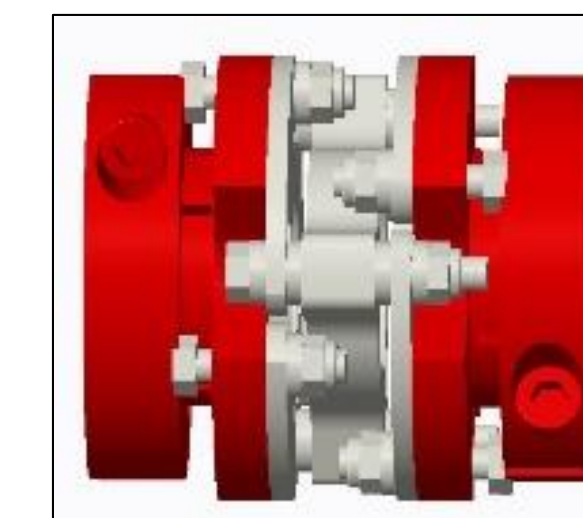
## Our Design



Using Same Base Frame:

### Components

- Torque Transducer (Mounted)
- 2 Double-Flex Disc Couplings
  - Custom Made by Zero-Max
  - Carbon Fiber
  - 40,000 rpm, 100 N\*m Torque Rating



### References

- <http://www.zero-max.com/documents/Zero-Max%20CD%20Series%20A1C%20A4.pdf>
- <http://www.magtrol.com/datasheets/tm301-308.pdf>
- FSU Team 4 Senior Design Report 2015-2016