



High Speed Motor Test Stand

Design Review 5



David Balbuena and Emily Simmons



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MECHANICAL ENGINEERING

Emily Simmons

INTRODUCTION OF TEAM MEMBERS



Team Members



David Balbuena
Lead ME



McLaren Beckwith
Financial Planner



Charles Daher
Web Designer



Jacob Quigley
Communication Liaison



Emily Simmons
Project Manager

Emily Simmons



Emily Simmons

PROJECT SUMMARY



Project Summary



- Sponsor: Danfoss
 - Danfoss primarily designs and builds commercial compressors.
- This is a continuation of a previous senior design project.
- Danfoss needs a testing apparatus to determine motor efficiency of their compressors.

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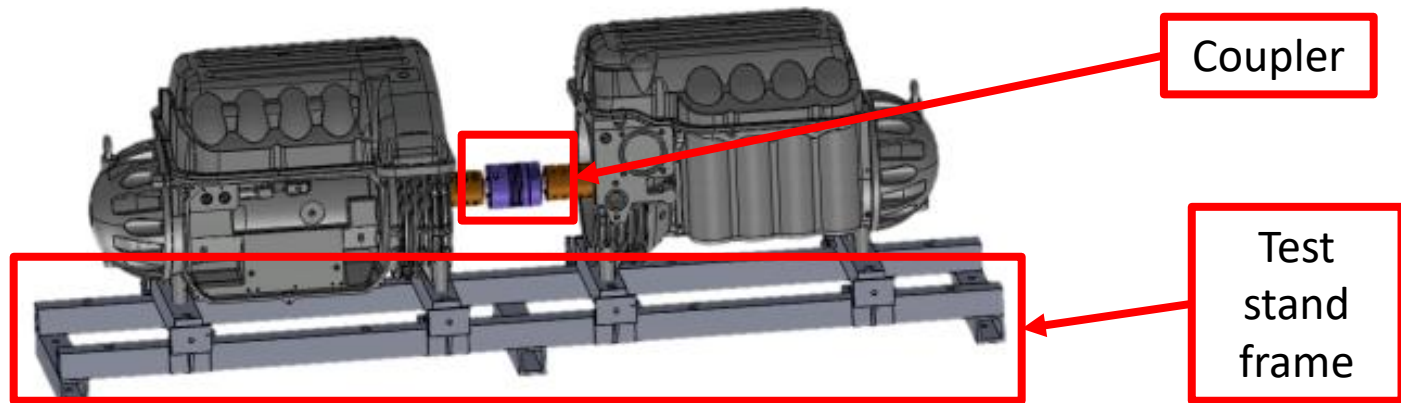


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Project Summary

➤ 2016 Design Team

- Chose to use second compressor as load
- Focused on shaft alignment and frame design
- Built the Test Stand frame
- Bought a coupler for the motor shafts

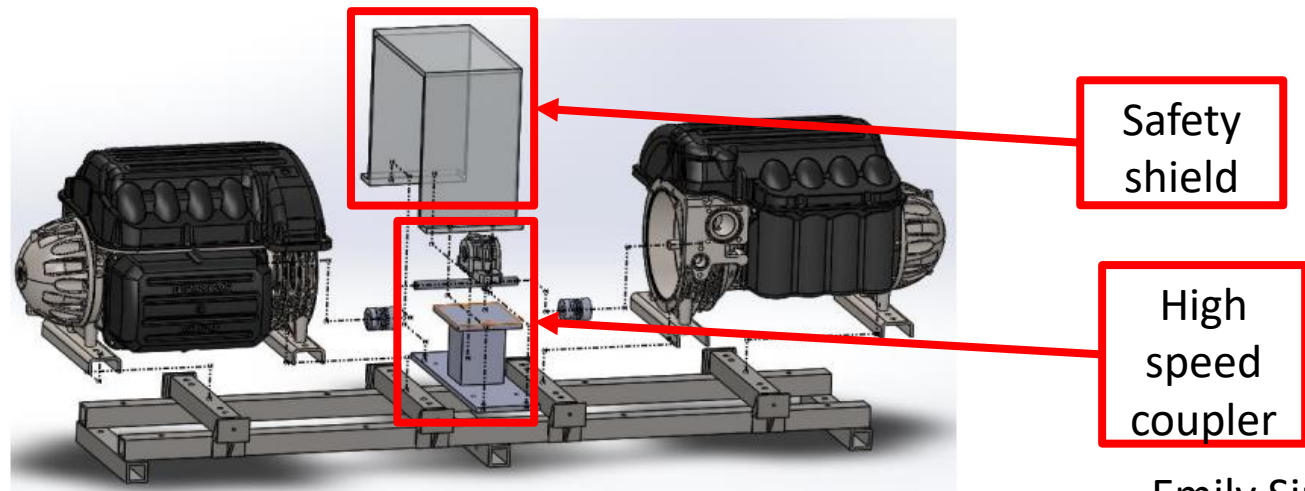


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Project Summary

➤ 2017 Design Team

- Implemented laser alignment system
- Bought a high speed flexible coupler
- Designed a safety shield
- Maximum operating speed of 5,000 rpm



Emily Simmons

Emily Simmons

PROJECT SCOPE



Description

- Improve the motor test stand so that it is able to reach an operating speed of 10,000 rpm

Goals

- Redesign coupler connection
- Ensure safe operating conditions during testing
- Create a system that can be operated efficiently

Market

- Danfoss research and development team

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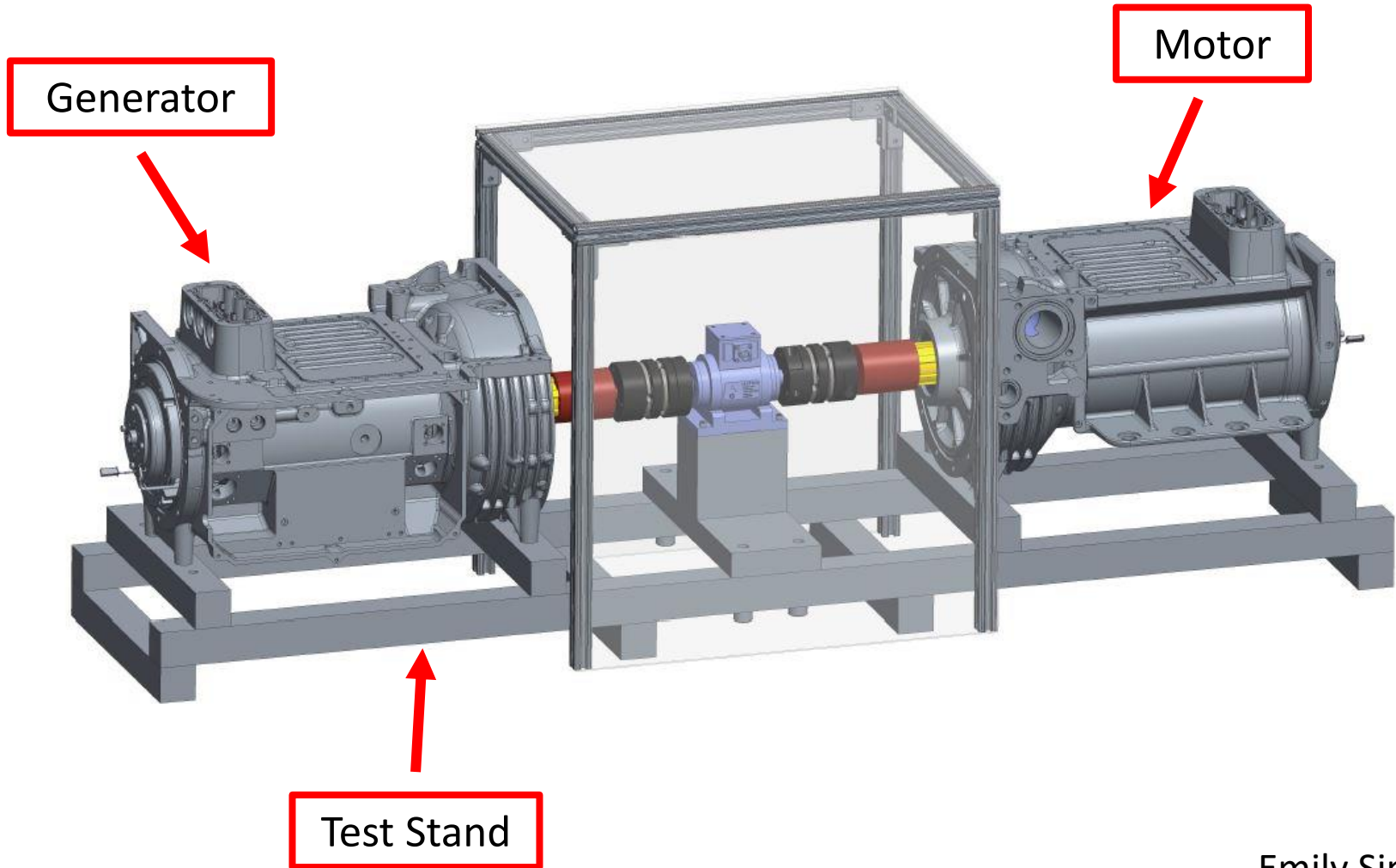


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DESIGN CONCEPT



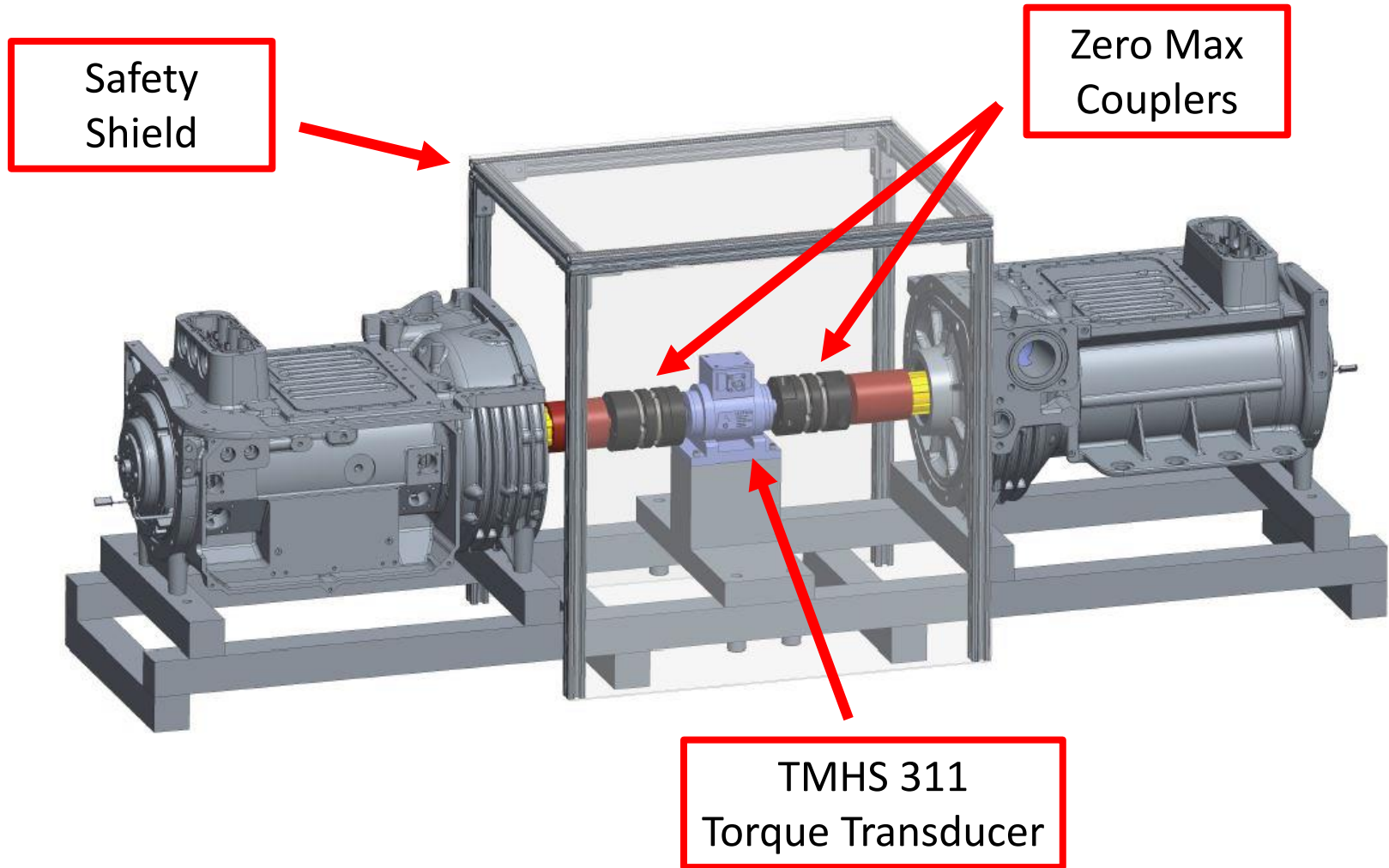
Design Concept



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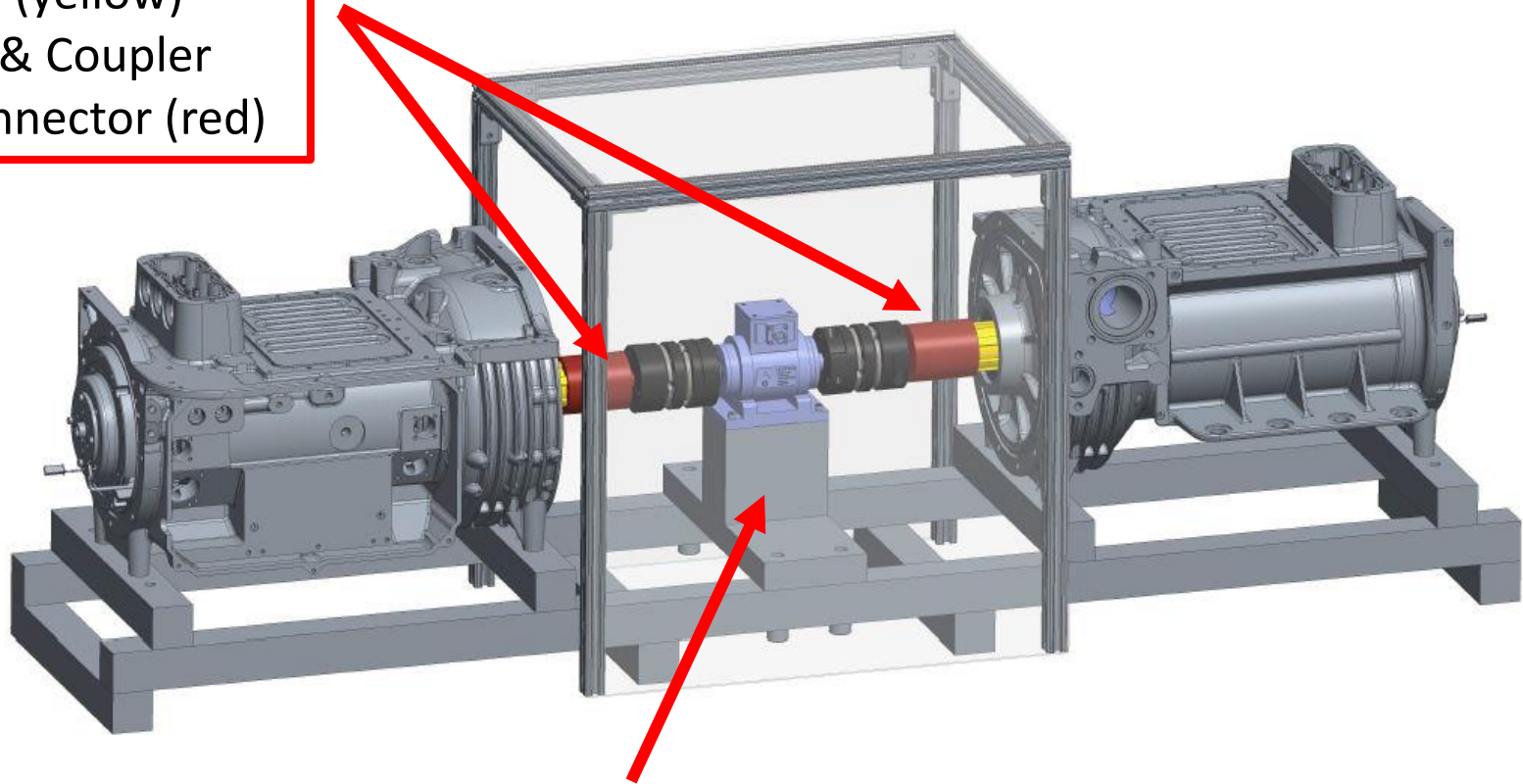
Design Concept



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Design Concept

Shaft extender
(yellow)
& Coupler
Connector (red)



Transducer Mount

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Limitations



- The carbon fiber Zero Max couplers that were specked out by last year's team were not available.
- Due to the expensive cost of the torque transducer, Danfoss decided that the team should design a mock torque transducer instead for proof of concept.

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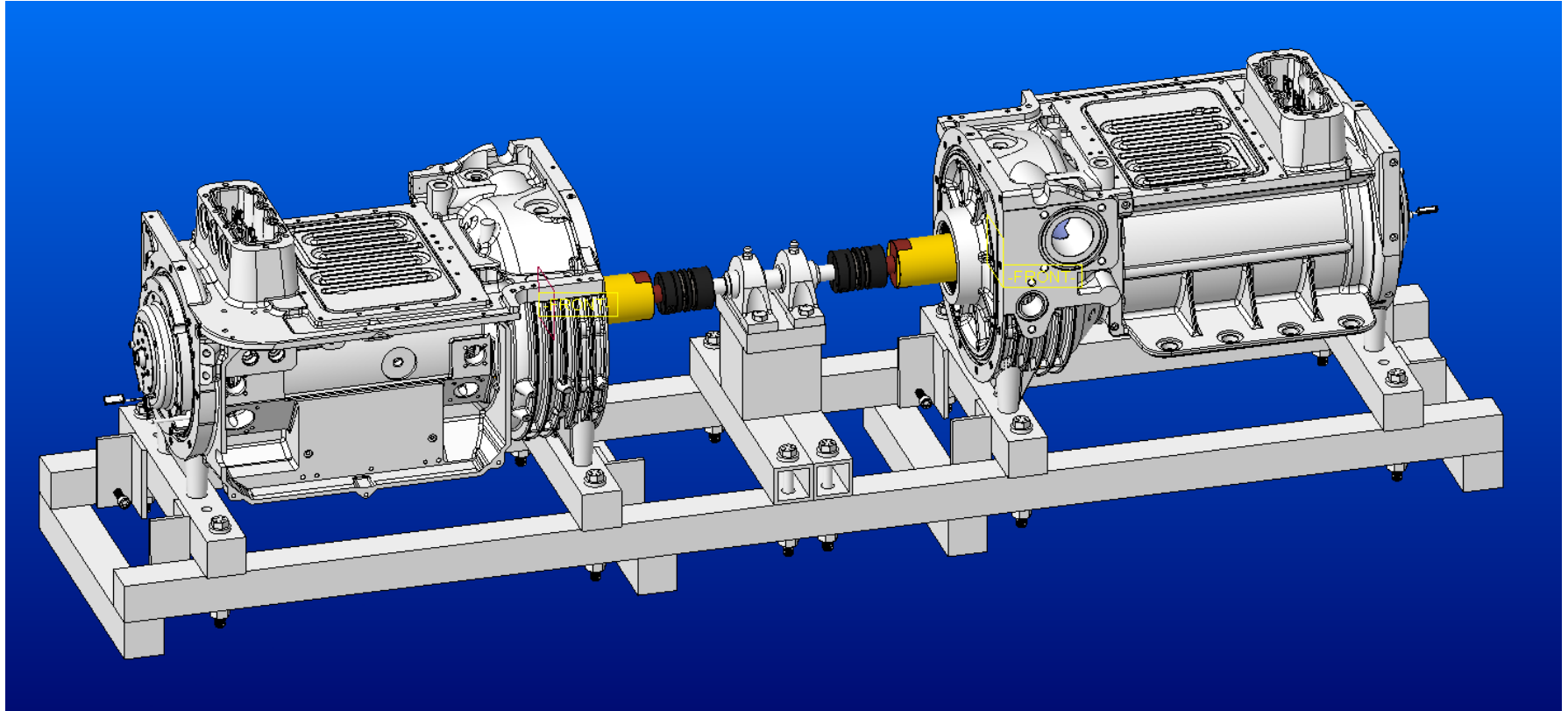
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CURRENT DESIGN



Current Design



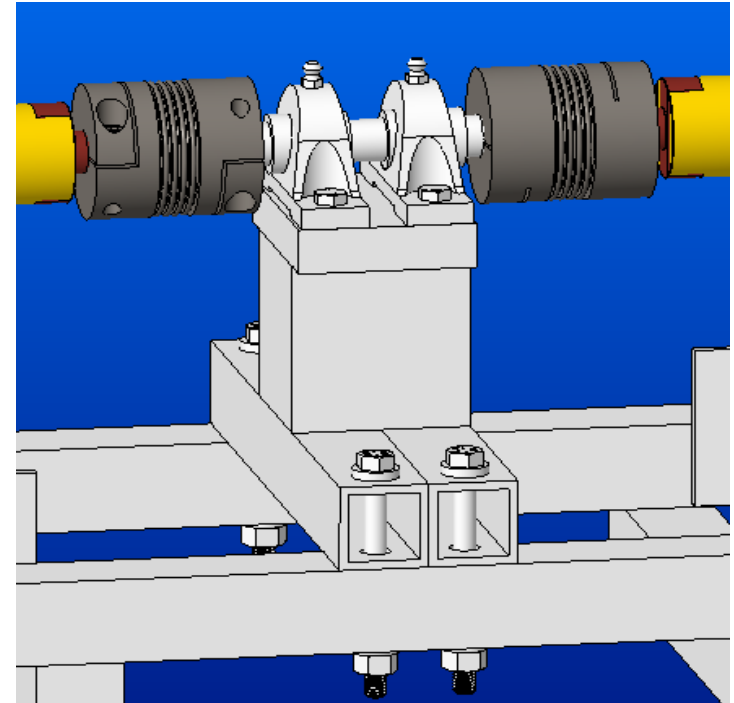
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Mock Torque Transducer

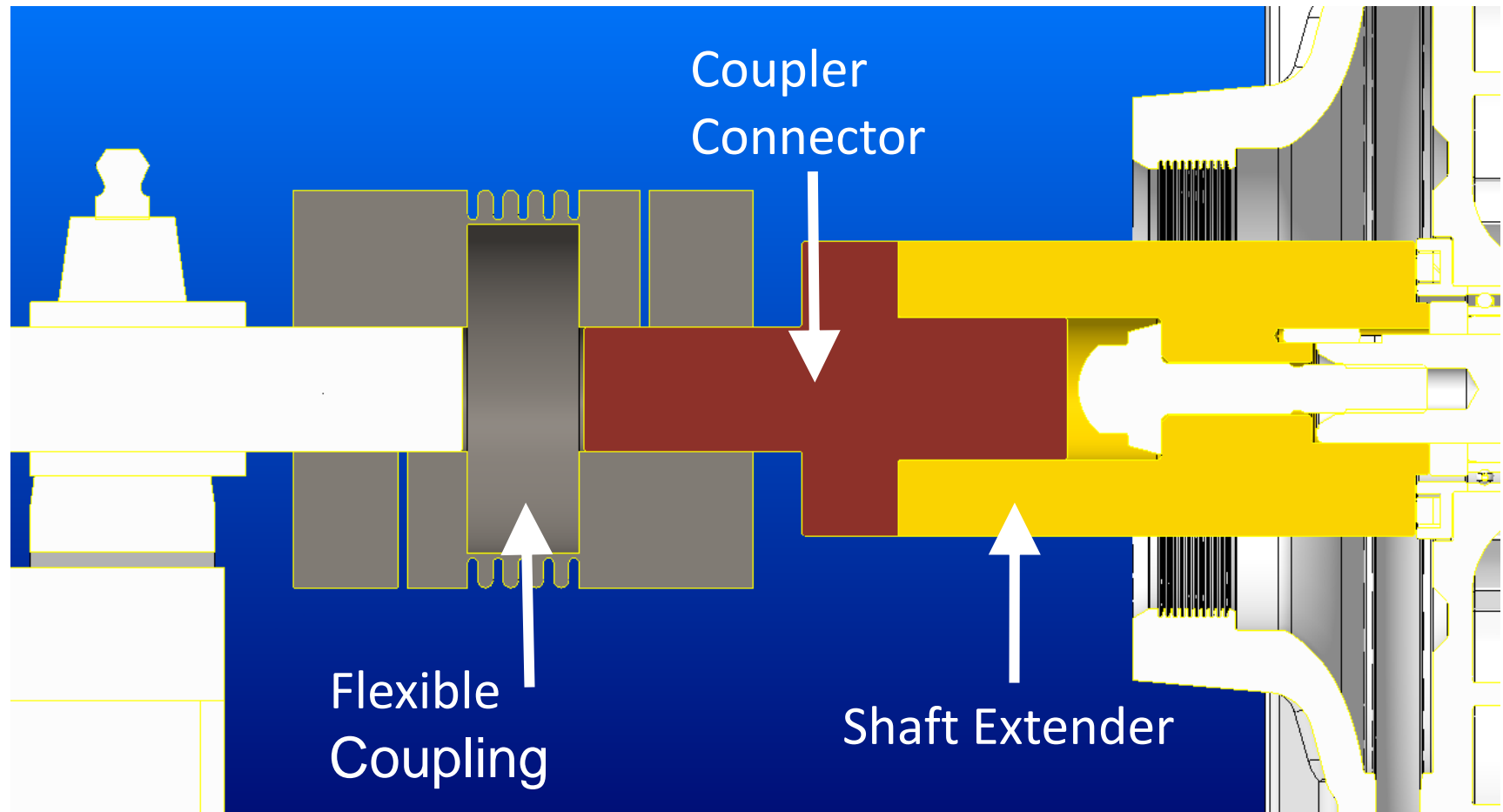
- Two high speed bearings will act as the mock torque transducer
- Center height and length simulate the TMHS 311 torque transducer
- Bearings come with set screw to lock onto and prevent axial movement of shaft



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Custom Parts



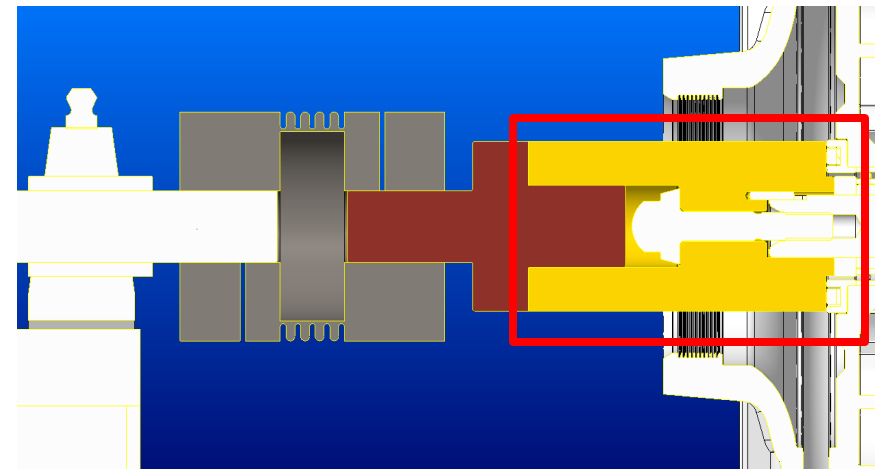
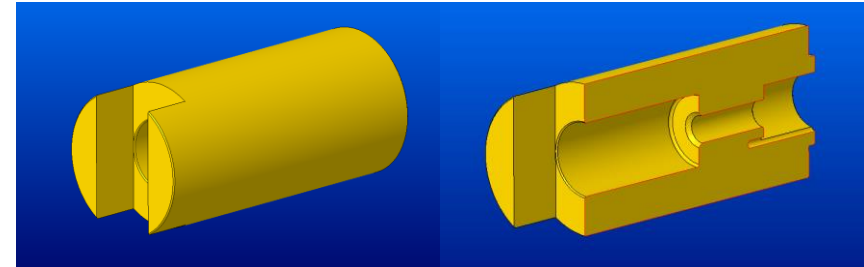
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Shaft Extender

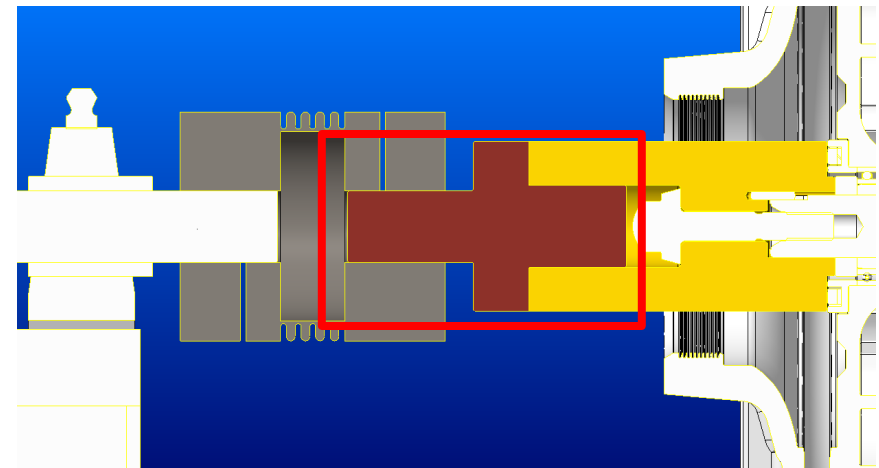
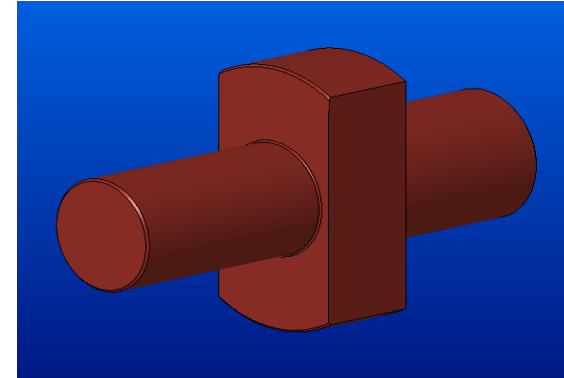
- Acts as modified 1st stage impeller
- Allows for shaft to be in proper stack tolerance and balanced with the rest of the assembly
- Allows for laser alignment tool to be used properly



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Coupler Connector

- Connects Shaft Extender to flexible coupling
- Slip fits into shaft extender
- Two different coupler connectors will be machined for the two different couplings



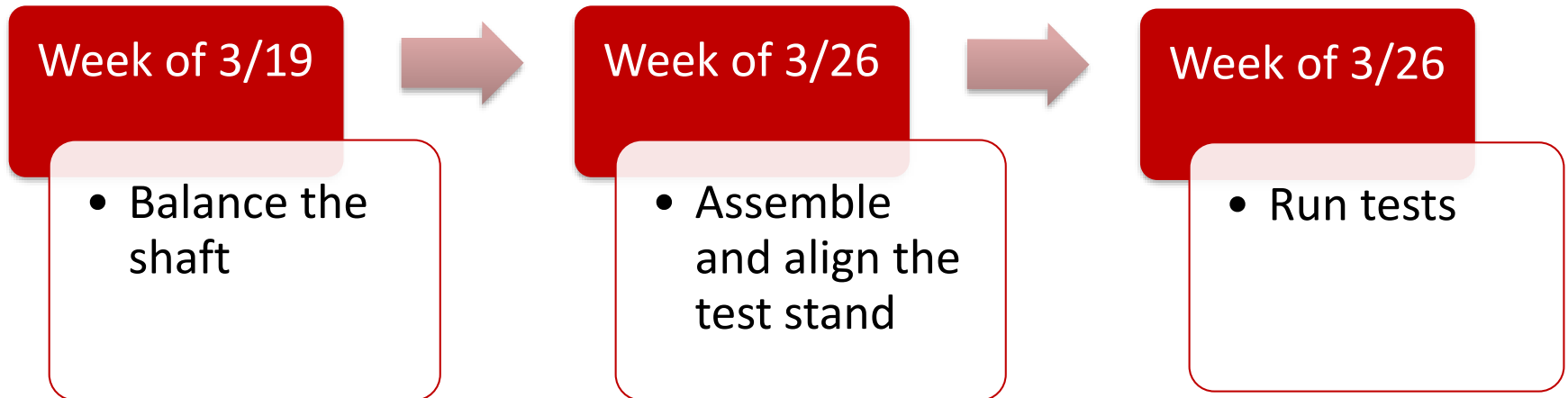
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FINAL STEPS



Results



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Future Work

- Purchase and implement torque transducer
- Purchase high speed couplings
- Refine test stand for continuous use
- Address cooling issues for continuous operation

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Questions?

