



Design Review IV

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Team 4: Visual Monitoring System for Danfoss Turbocor Compressor IGVs



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Danfoss IGV Monitoring System

Team 4



Travis Carter
Operations
Officer



Peter House
Thermal Fluids
Engineer



Brandon Klenck
Lead Mechanical
Engineer

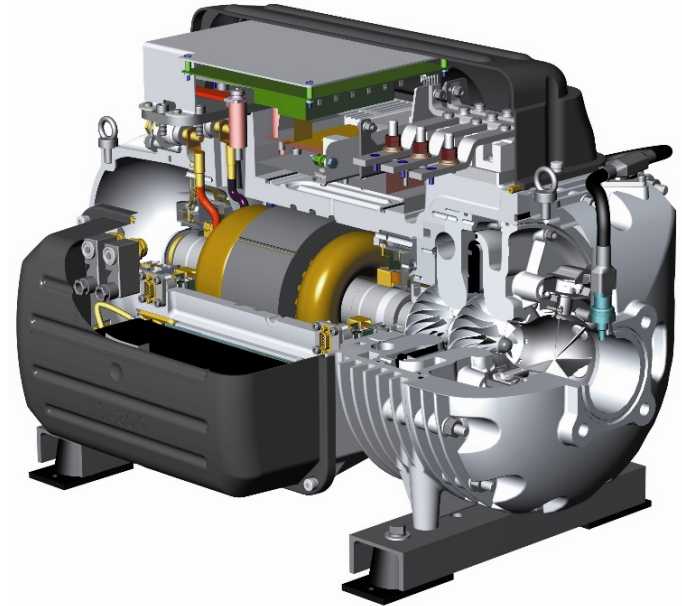


Arnold Schaefer
Team Leader



Project Overview

- Currently No Visual for Inlet Guide Vanes (IGVs)
- Limited Angle Measurement
 - Stepper Motor is Used for Angle Control
 - No Feedback
- Problems with IGVs
 - IGVs Might Flutter or Vibrate
 - Possible IGV Breakdown



Inside Cutout of Turbocor Compressor

Presenter: Travis Carter



Project Goals

- Danfoss Turbocor Inlet Guide Vane (IGV) Monitoring System Goals:
- Provide detailed visual monitoring of vane failure
 - Produce a system to detect position of individual IGVs
 - Minimize impact on the fluid flow



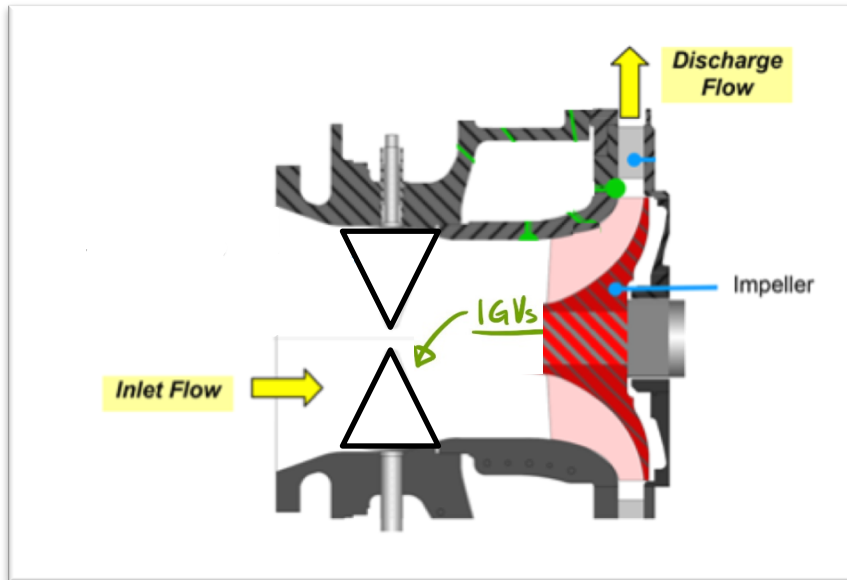
Compressor Inlet Cross-Section

Presenter: Travis Carter



Project Subsystems

- IGV Visual Monitoring
- IGV Angle Monitoring
- IGV Lighting



Compressor Inlet Details

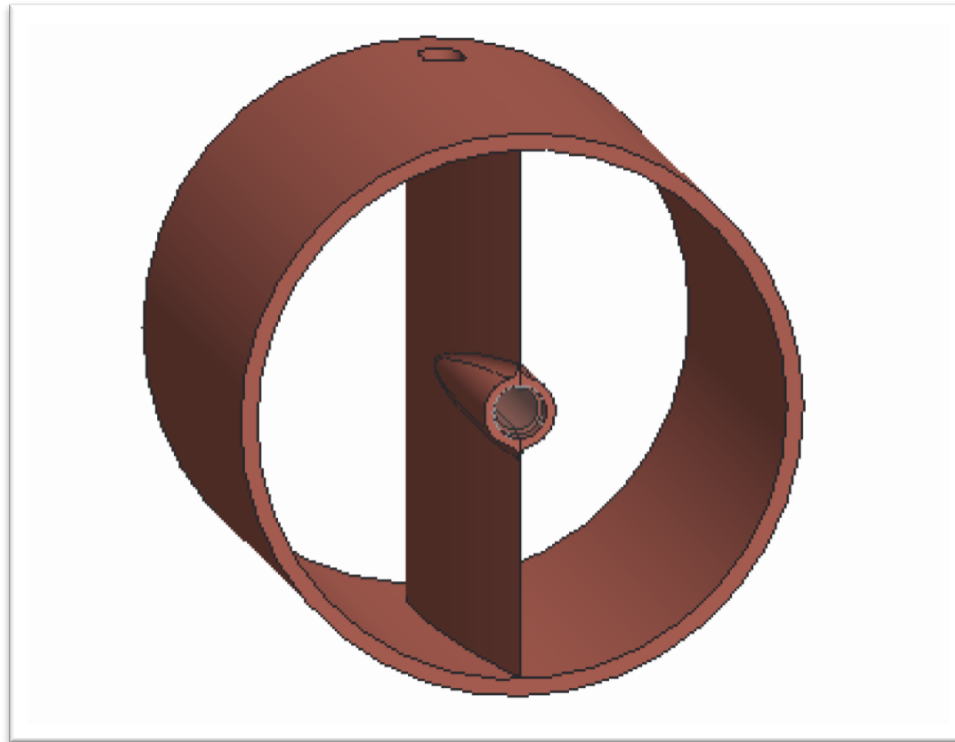


Compressor Inlet Cutout

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Selected Subsystem Design



Finalized Design

Camera in rake
spanning pipe
diameter

Camera with April
Tags for angle
detection

Lighting provided by ring light or
additional lights upstream in pipe

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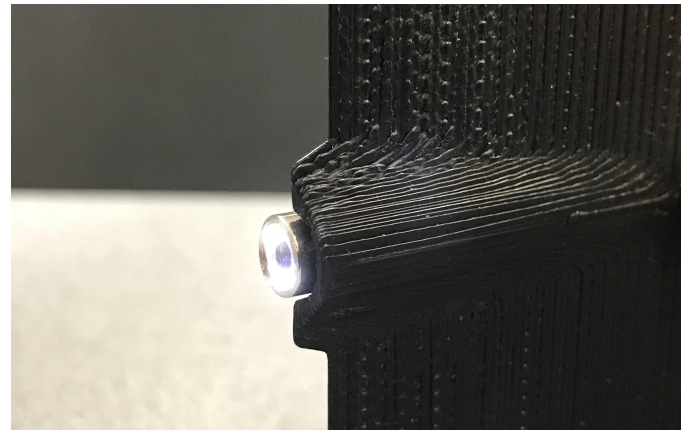
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Current Progress

- Camera Purchased & Delivered
- Airfoil Prototypes Completed
- Detailed Design Completed
- Design review scheduled with Danfoss this week



Purchased Camera



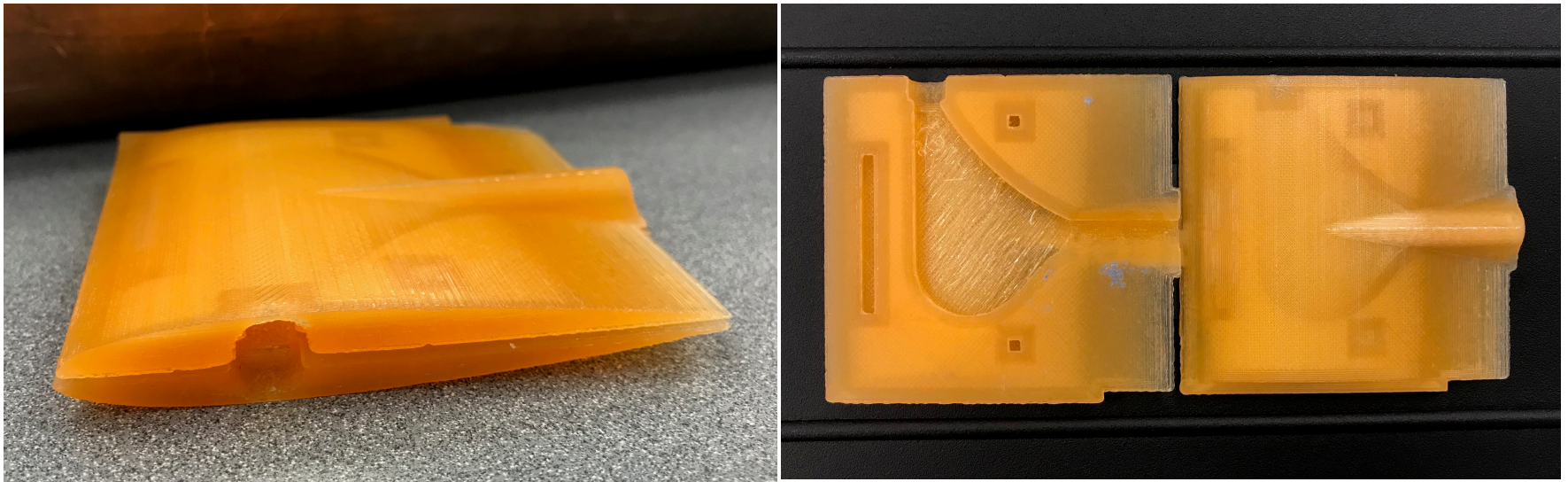
Camera in Prototype

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3D Airfoil Prototypes

- Tested channel size and path for camera fit



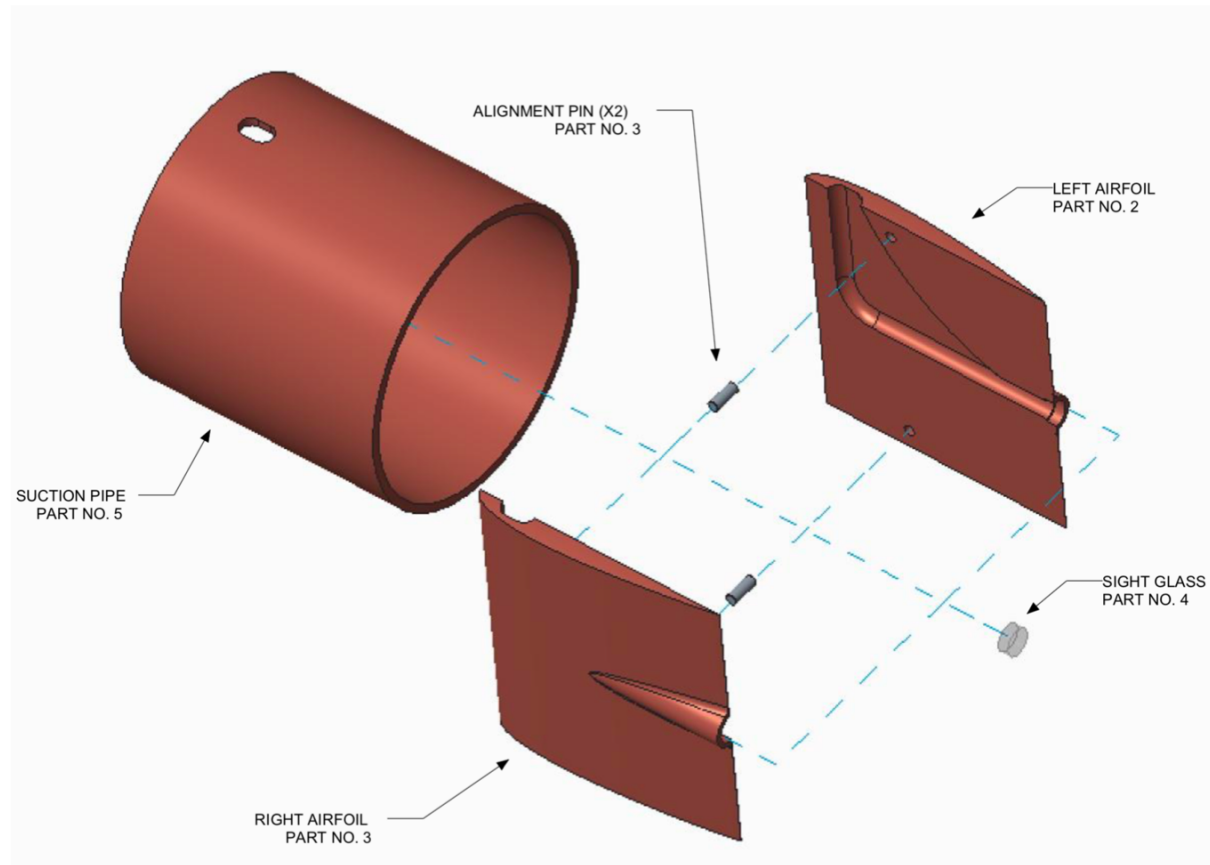
Sample Vane Prototypes

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Detailed Design Overview



Assembly Overview

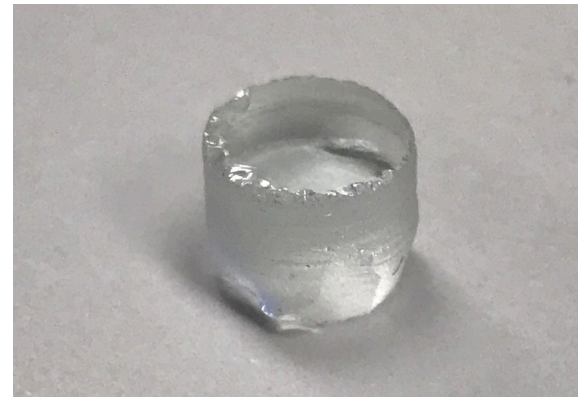
- CAD models and drawings completed
- Awaiting final review from Danfoss
- Parts will be sent to manufacturing this week

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Plans for Refrigerant Proofing

- Brazing two halves of vane together
- Brazing the vane in place in the pipe
- Camera sight glass to be polished and adhered with epoxy in the vane
- Increased quality of seals at the cost of maintainability



Sight glass Prototype

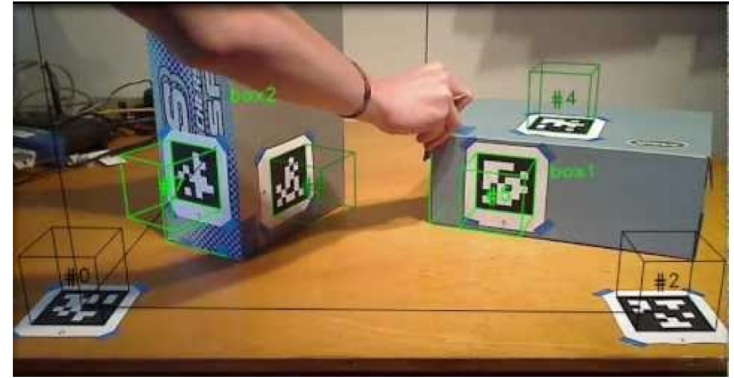
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Future Tasks

➤ April Tag software

- Detect stickers
- Compute angles
- User interface
- Error alarm



Sample April Tag Processing

➤ Machine Components and Assemble

- Machining at Danfoss
- Brazing through Danfoss

➤ Dry Test Runs

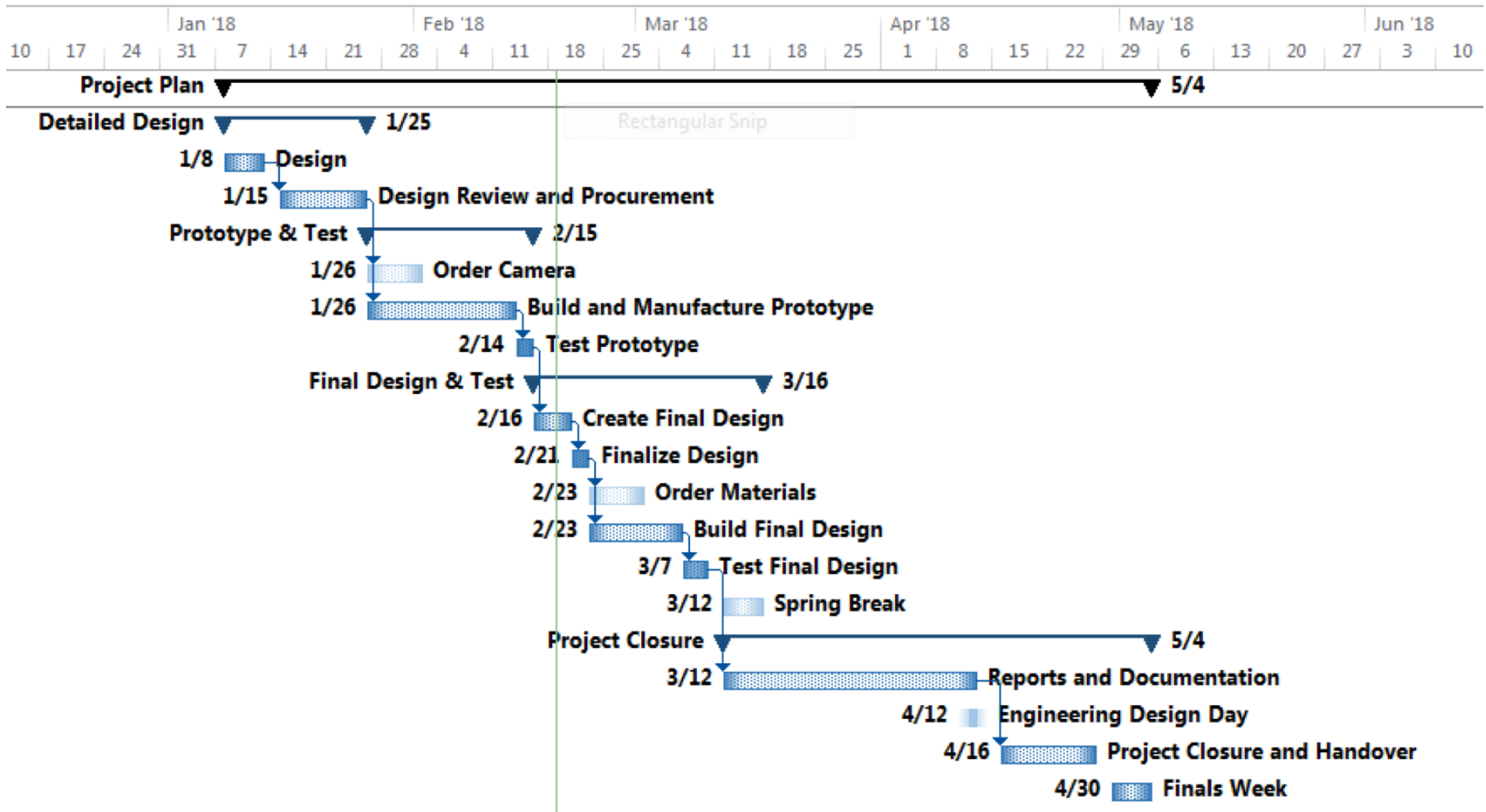
- Testing Lights & April Tags

➤ Full Test Run

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Project Timeline

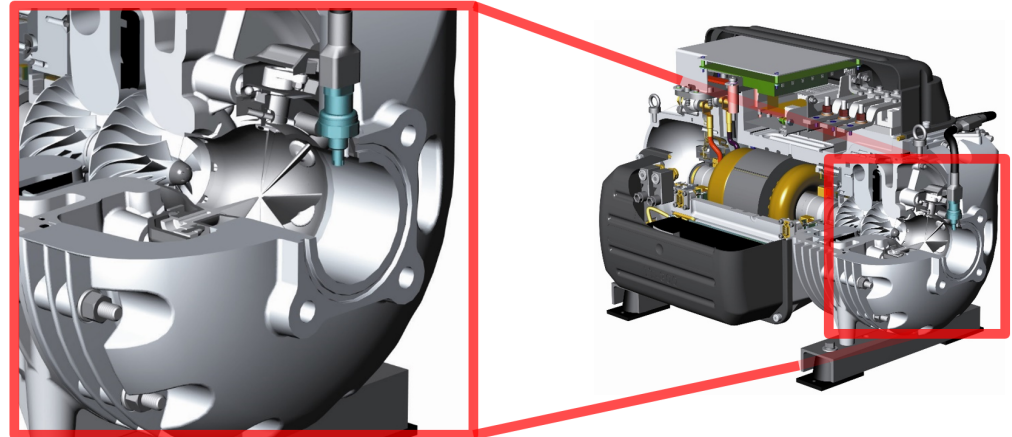
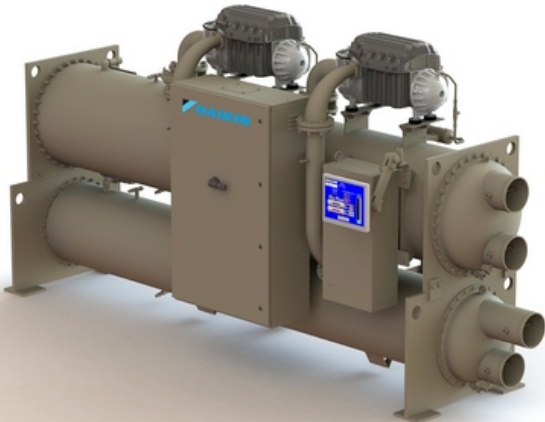
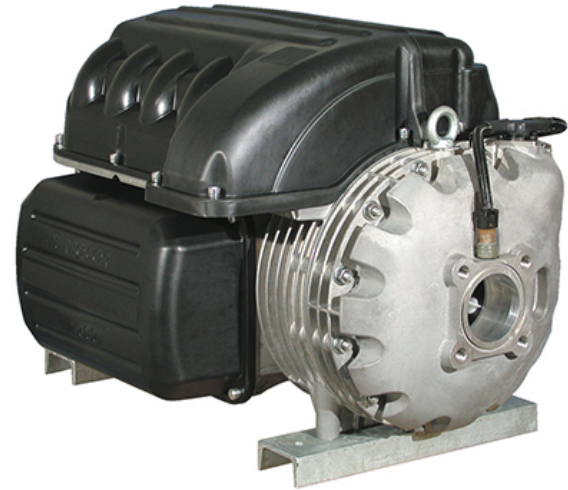
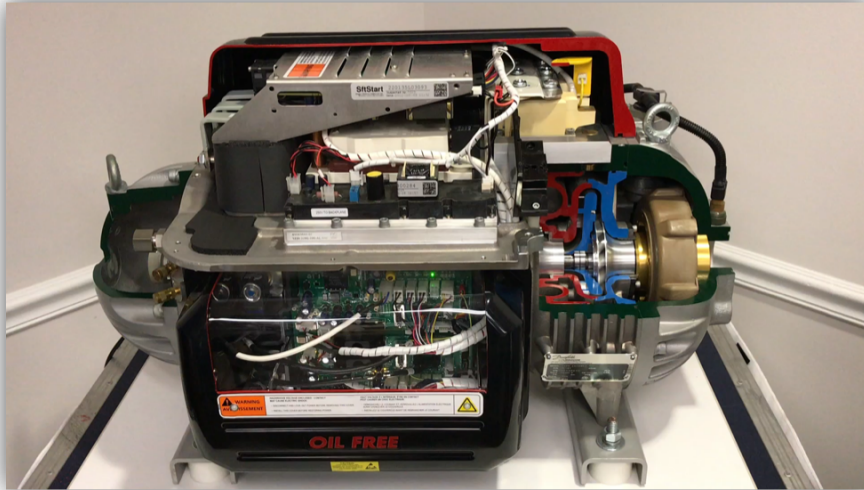


Currently on time and under budget!

Presenter: Arnold Schaefer



Thank You for Your Time. Questions?



Work Cited

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