ENGINEERING
TOMORROW

Bi-directional Offset Lifting Bar

Danfoss Turbocor

Instructor - Dr. Gupta
Advisor - Dr. Hollis

Team 5
Yoel Bugin
Gabriel Omoniyi
Luke Leelum
Devin Stubbs
Coert Maraist

Outline

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- Project Description
- Fall Recap
- Fabrication + Assembly
- Load Testing Results
- Challenges
- Future Work
- Summary

Existing gantry and hoist system in the Chiller 3 Testing Room

Project Description

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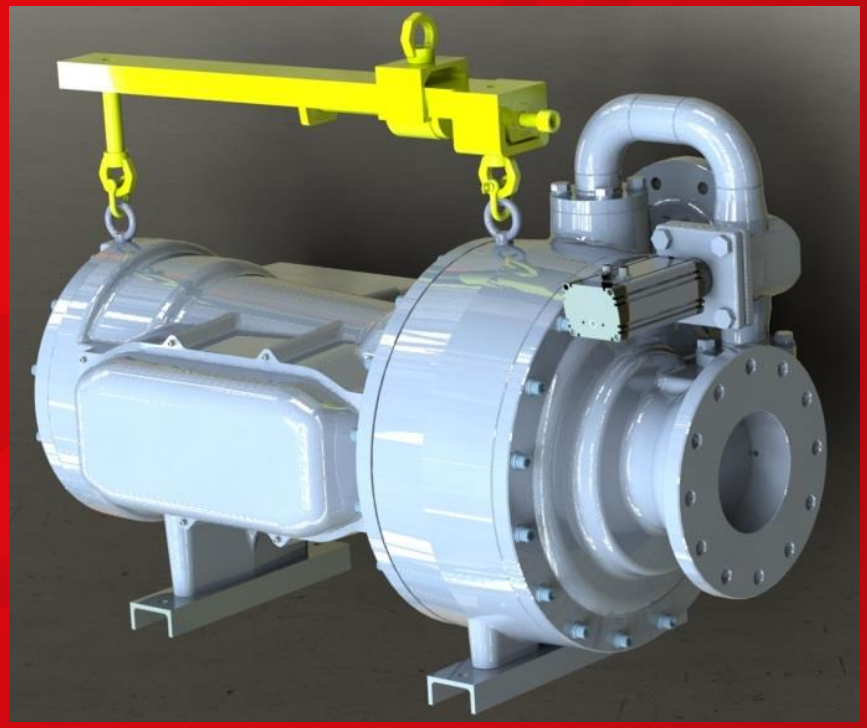
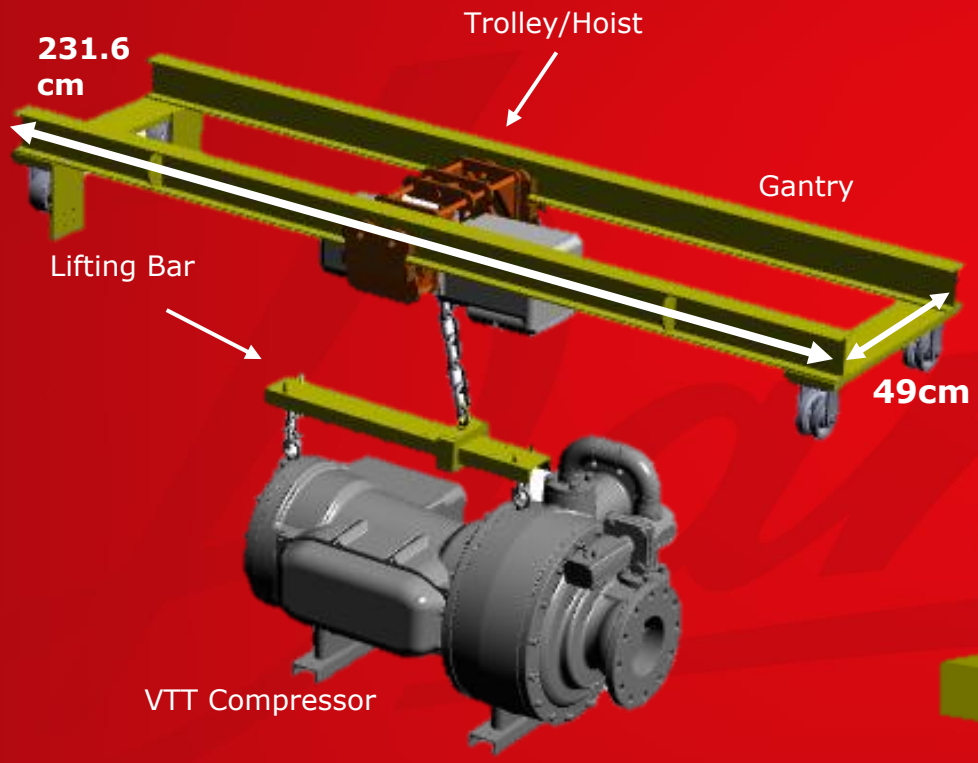
- A better lifting system must be designed and implemented in order to conveniently install the compressor for testing

- Lifting bar to include:
  - Auto-leveling
  - Adjustable lifting positions
  - 1 Ton load capacity
  - Less than 500lb operating weight
  - OSHA Compliant



VTT Compressor with Team 5 Lift Bar

Fall Recap: Final Design



- Approved by Turbocor
- Increase vertical height of hoist 7” (Approx. 177mm)
- Meets design requirements and OSHA standards

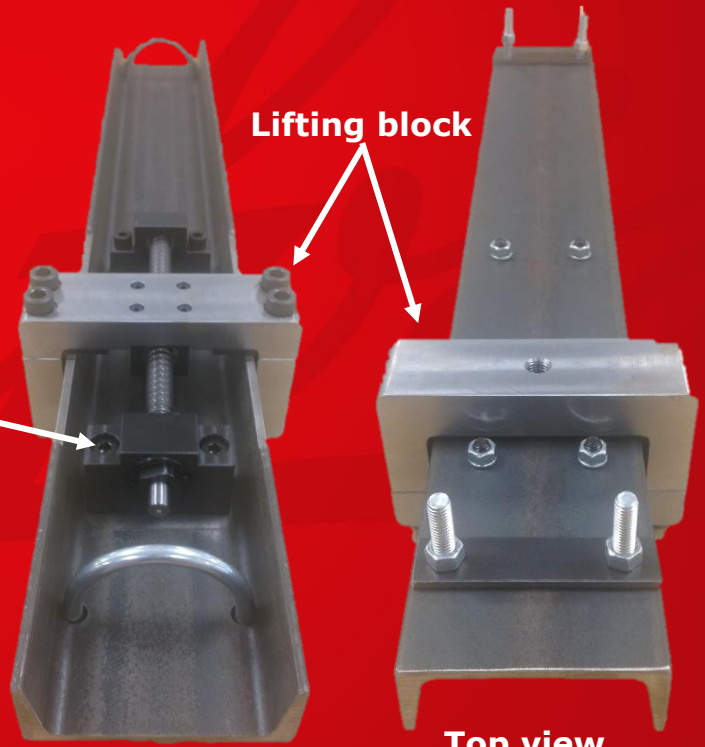
Gantry & Trolley

- Assembly of Gantry and Trolley 90% complete
- Following OSHA Standards
  - Individual components load tested at 1.25 load rating

Lifting Bar

- Lifting bar assembly 90% complete
- Power screw handle
- Adjustable hook

Lifting bar final design



Lifting bar – bottom view

Top view

Load Testing

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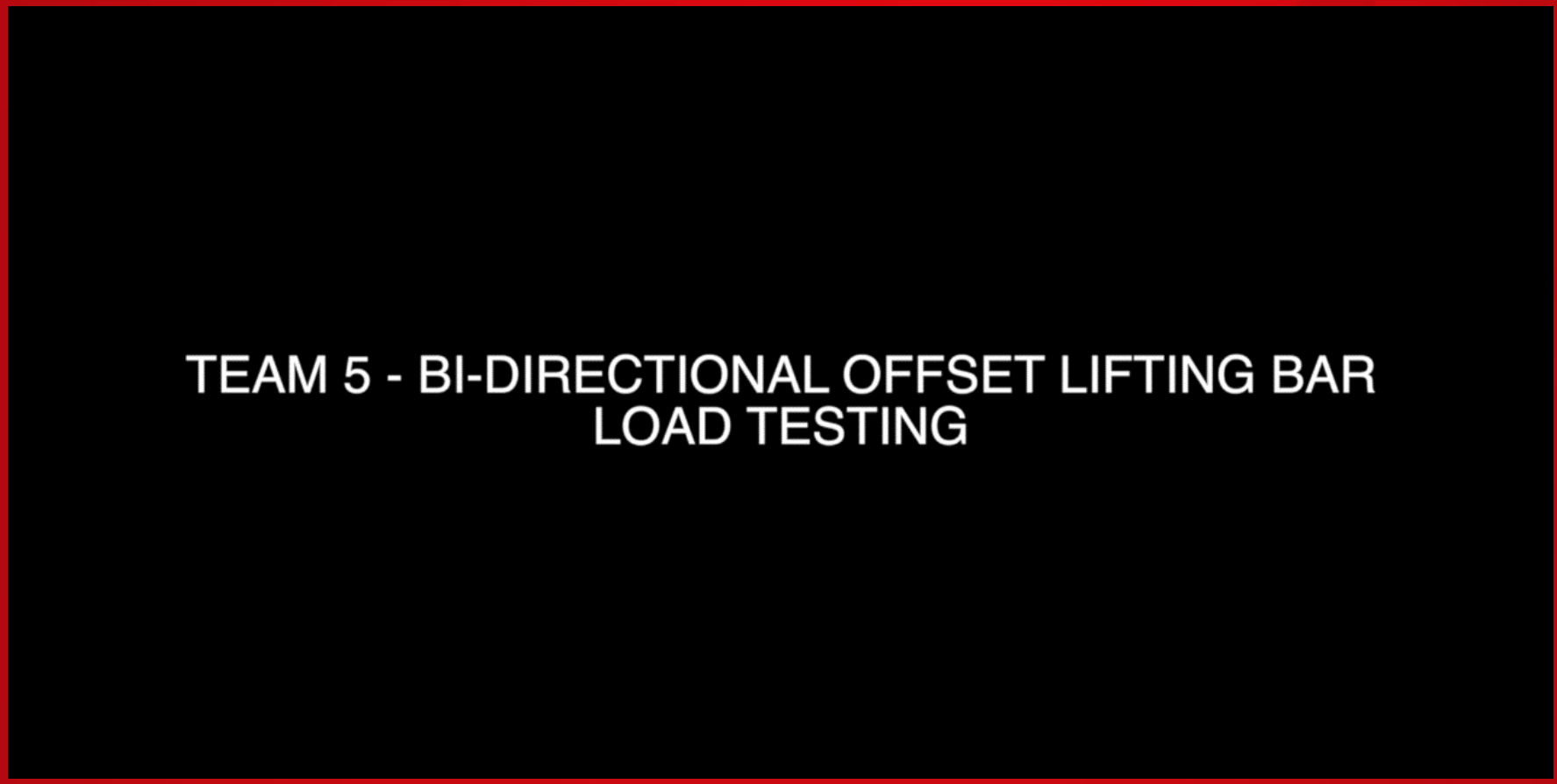

Load Testing Results

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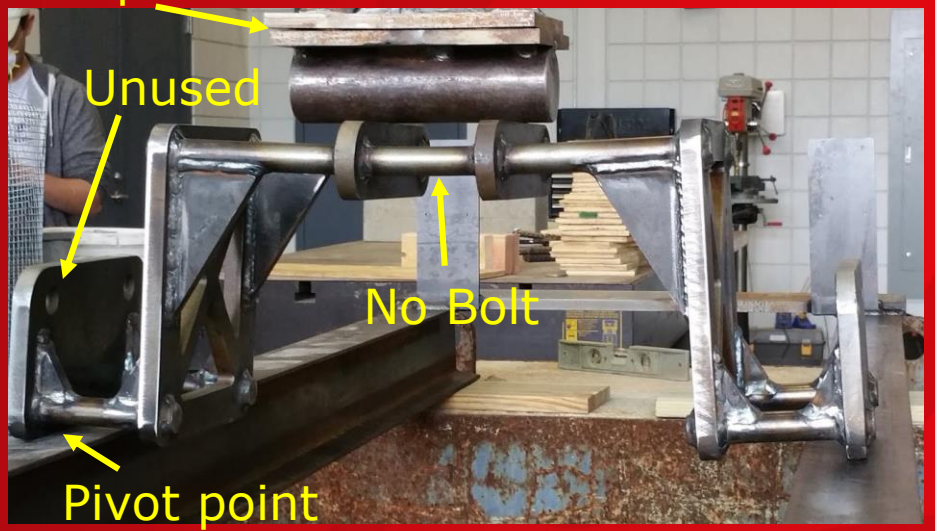
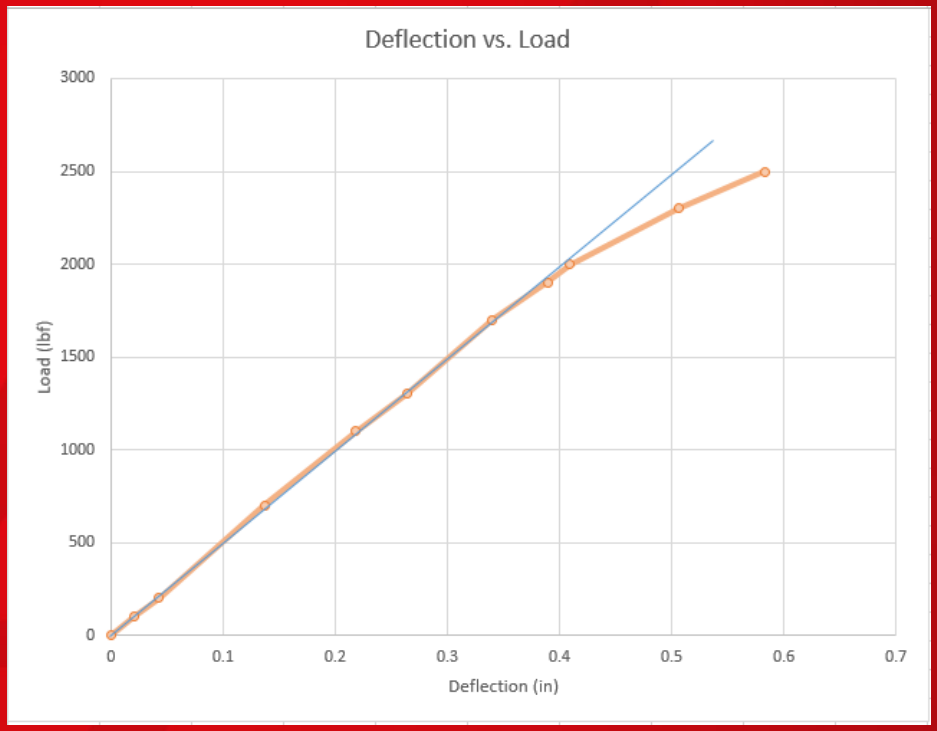


Trolley + Gantry under 2500 lb. load



Load vs. Deflection

Challenges

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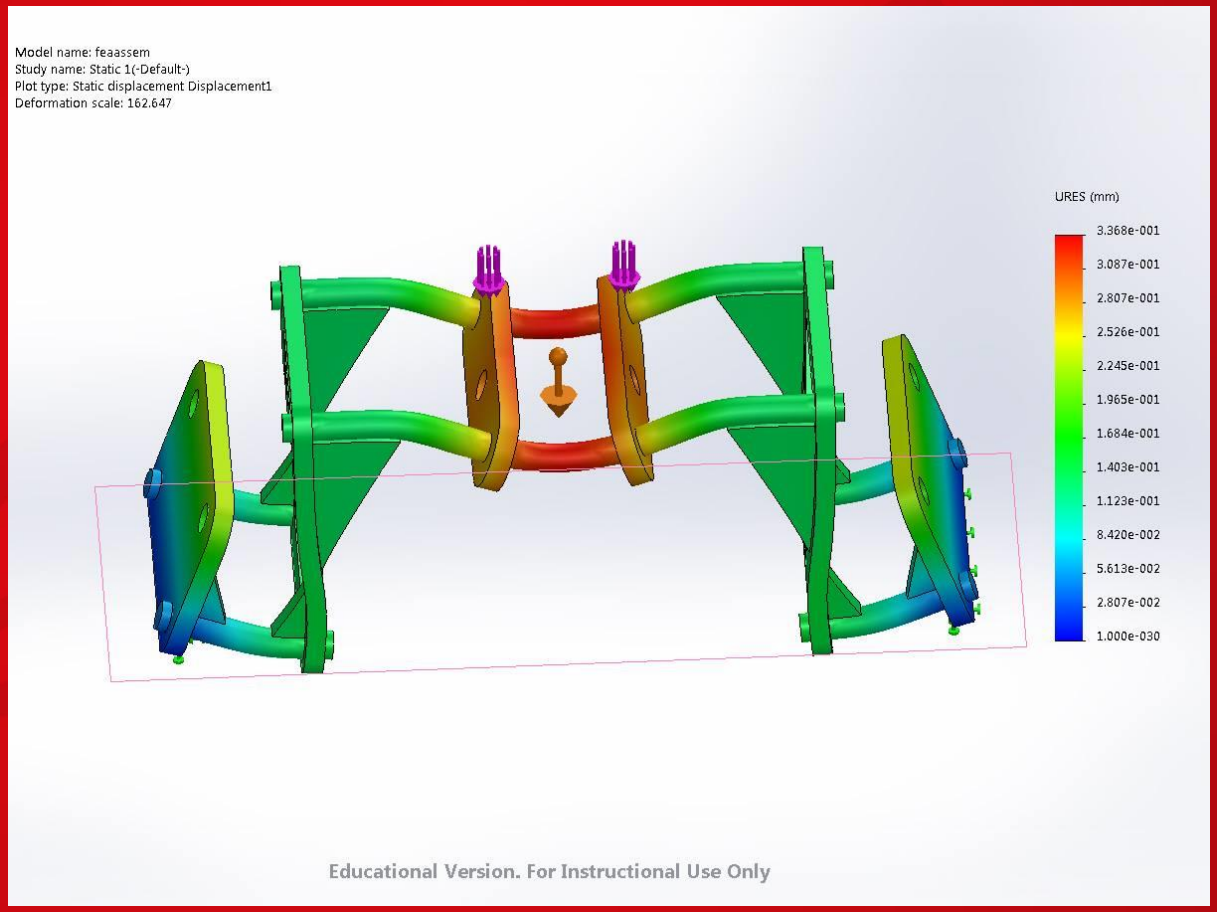
- Deflection
- FEA Assumptions
- Adjust FEA to match results
- Simulating real world conditions
- Materials Lab Supervisor



2500 lb. FEA – original trolley design (Exaggerated Deflection Scale)

Assumptions

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- Homogeneity
- Material Properties
- Torsion & Translational limitations in Solidworks FEA
- Solidworks FEA works on a highly-simplified linearly-based model
- Welds provide full semi-rigid contact and full penetration

Trolley V2

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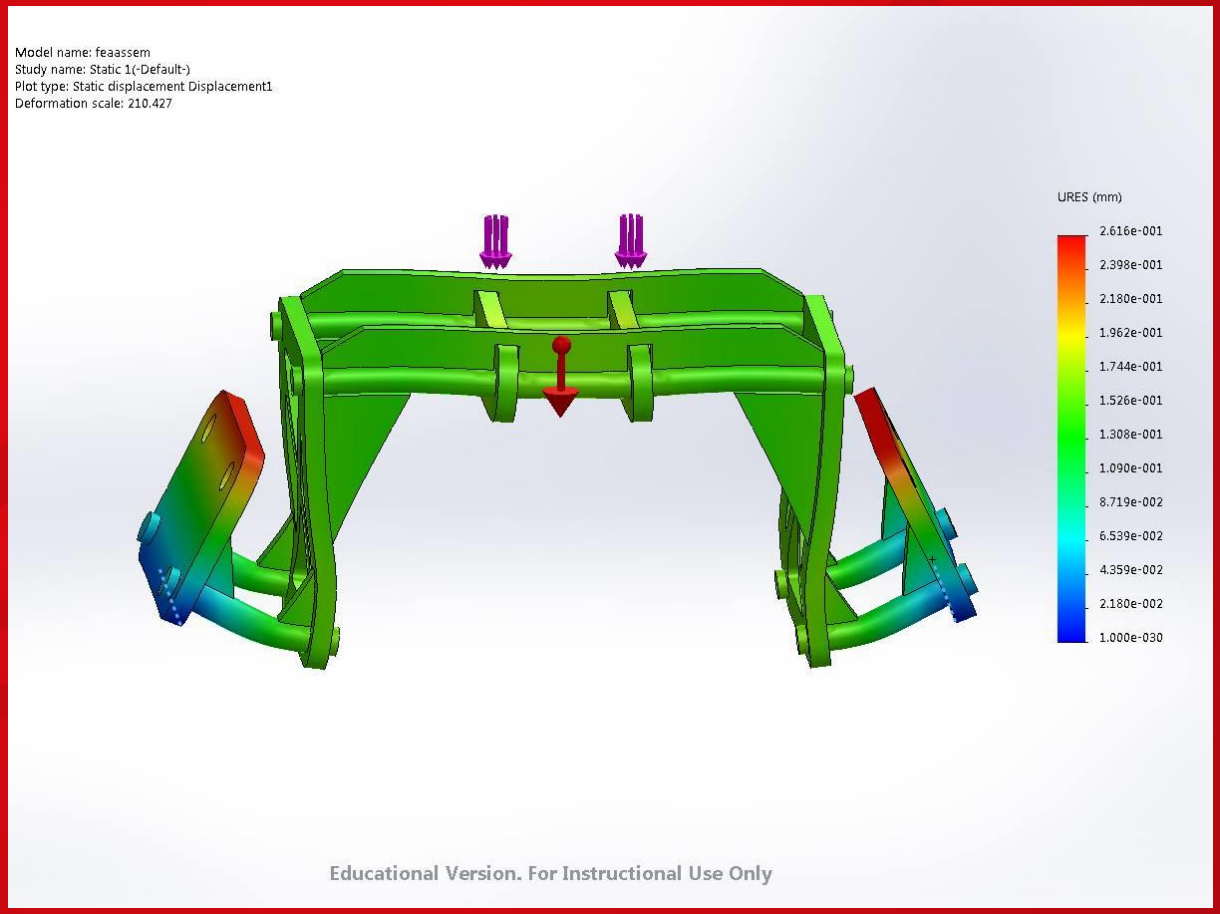
- Additional support material
- Increased height of support bolt location
- ~ 22% decrease in deflection



2500 lb. FEA- new trolley design (Exaggerated Deflection Scale)

Future Work

- Complete final assembly
- Assembled gantry & trolley load test
- Lifting bar load test
- OSHA paint and warning labels
- Turbocor approval
- Onsite implementation

MTS load tester

Gantt Chart

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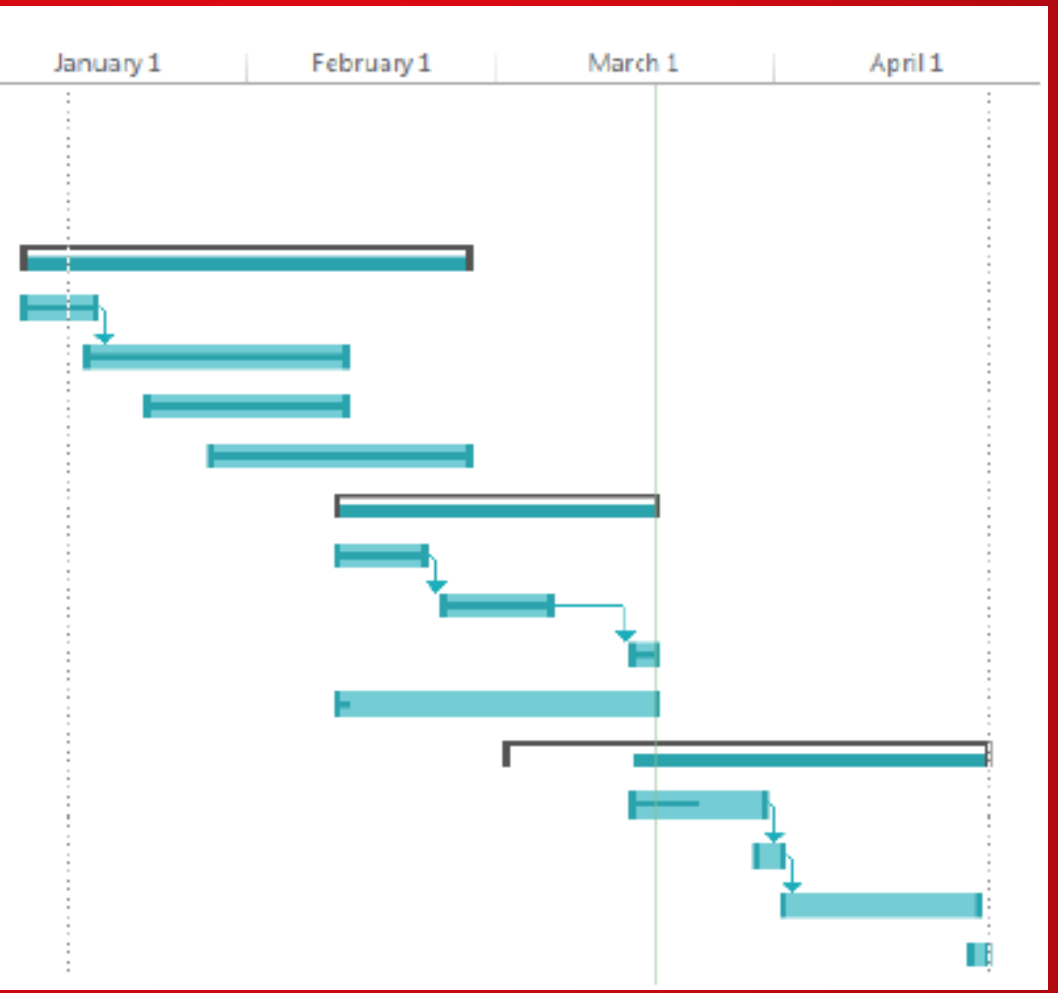
Task Name	% Comp
Planning	**100%**
Concept Creation	**100%**
Design Proposal	**100%**
Procurement and Initial Fabrication	**100%**
Inventory Parts and Complete Procurement	100%
Submit Machinist Approved Drawings	100%
Fabrication of Components by Team 5	100%
Fabrication of Components by Turbocor	100%
Assembly of Components	**45%**
Gantry Assembly	90%
Trolley System Assembly	100%
Lifting Bar Assembly	90%
Paint and Safety Warnings	5%
Testing	**17%**
Load Simulation	50%
Obtain Approval From Turbocor Engineers	0%
Implementation in Chiller 3	0%
Perform VTT Compressor Lift	0%



Summary

- Milestones Met
  - All parts delivered and inventoried
  - Drawings and FEA submitted and approved
  - Machining and fabrication complete
  - Preliminary load testing complete

- Future Work
  - Assembled gantry and lifting bar load test
  - Turbocor authorization on load testing
  - User manual for each component
  - Onsite implementation at Turbocor

Questions?

More information available online at:

http://eng.fsu.edu/me/senior_design/2015/team05