

EML4551-2

# Virtual Design Review

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Team 506: Mobile Anechoic Chamber

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FAMU-FSU  
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ENGINEERING



# Team Introductions

## Team 506: Mobile Anechoic Chamber



**Marissa Jackson**  
Project Manager



**Bryce Lankford**  
Systems Engineer



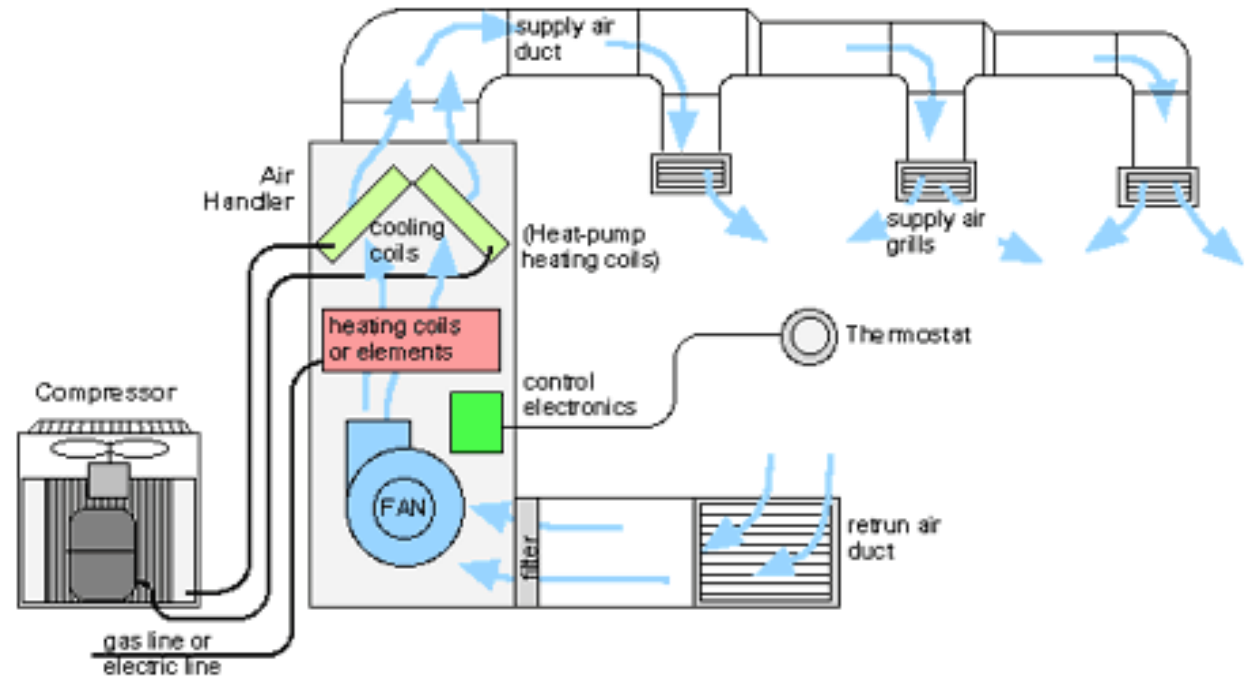
**Nick Ajhar**  
Mechanical Engineer

# Objective

Design a way to efficiently and consistently record sound for centrifugal compressors while managing surrounding noise

# Potential Markets

- Primary
  - Industrial Buildings
  - Danfoss-Turbocor
- Secondary
  - Factories
  - Product R&D



Bryce Lankford

# Danfoss Turbocor Compressors

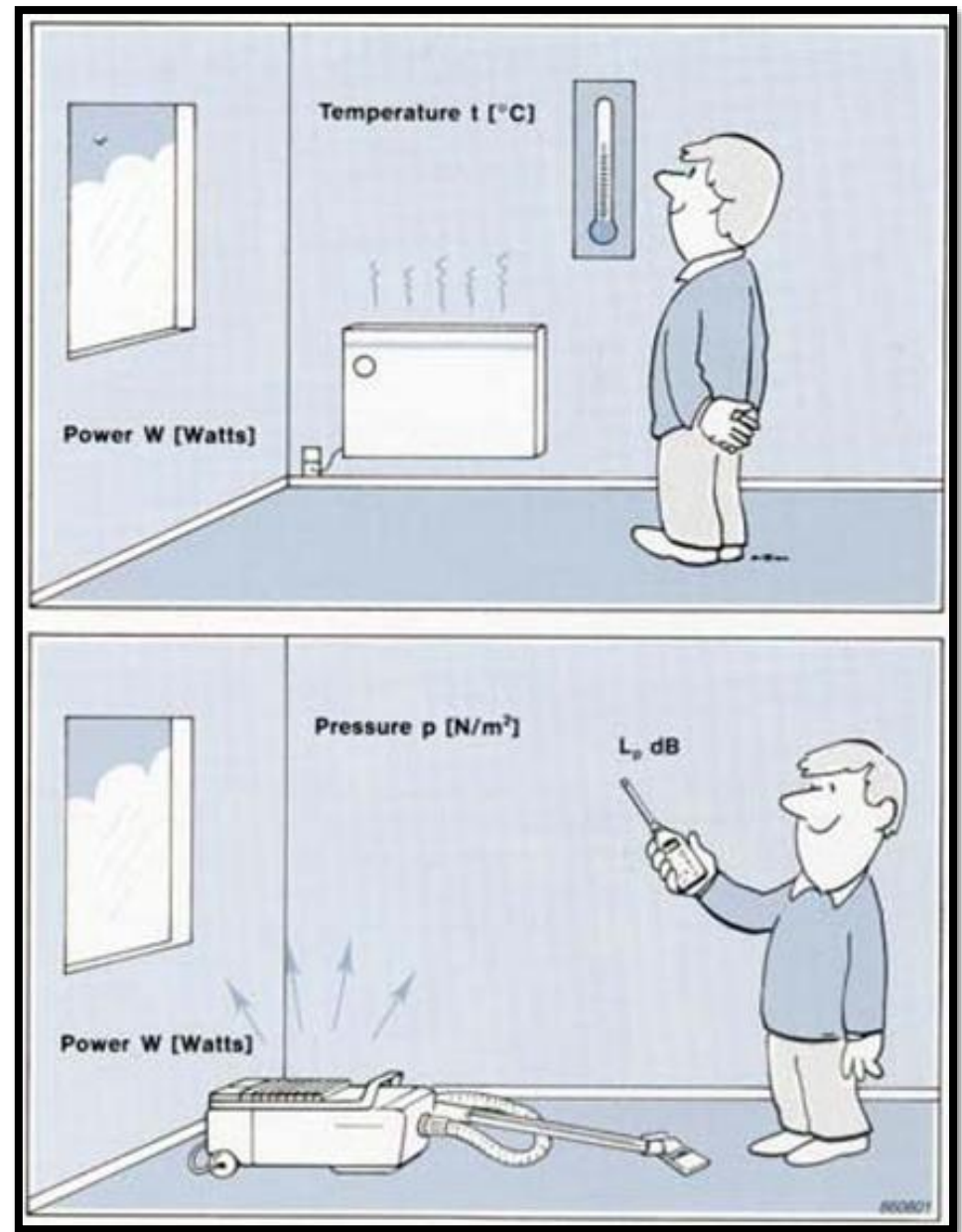
- Centrifugal Compressors
  - TT Series
    - 4 Different Models: 300, 350, 400, 500
  - R134a refrigerant
  - Quiet operation (70dB)
- Applied in chillers
  - HVAC applications
  - Air and water-cooled
  - 60-200 ton/211-702 kW capacity
  - Low, medium, and standard temperature applications



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# Sound Power

- Rate at which sound energy is emitted
- Measured in Watts (W)
- Found by sound intensity ( $W/m^2$ ) or sound pressure (Pa or dB)
- Indicator for how intense the sound of a machine will be
  - More sound power = Higher intensity over testing area



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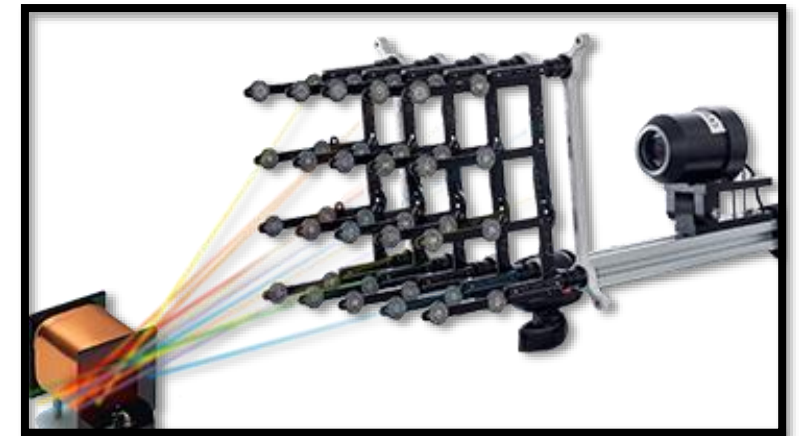
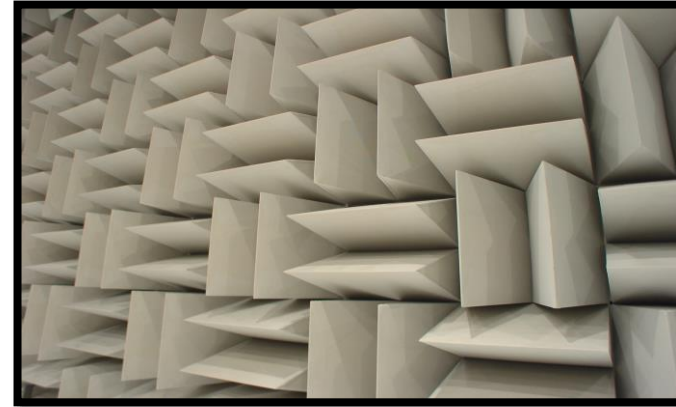
# Project Summary

- Measure the sound power of the TT series compressors
- Sound power is the energy emitted by the source and is measured in Watts
- Reduce the surrounding sound to get a consistent reading from the compressors
- Must be able to be easily assembled and portable

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# Project Scope- Goals

- Consistently measure the sound power across TT series compressors
- Determine best solution- Anechoic Chamber vs. Sound Transducers
- Chosen design will complete our task with high efficiency for the budget



Marissa Jackson



# Customer Needs

Customer Statements	Interpreted Needs
Danfoss wants to measure the sound power and consistency across the compressors.	Need to measure the amount of sound being emitted by each compressor.
Danfoss wants a mobile anechoic chamber.	System needs to be easily constructed to transfer between test stations.
System does not have to be a chamber.	System needs to be able to record the sound power while reducing the amount of surrounding sound.

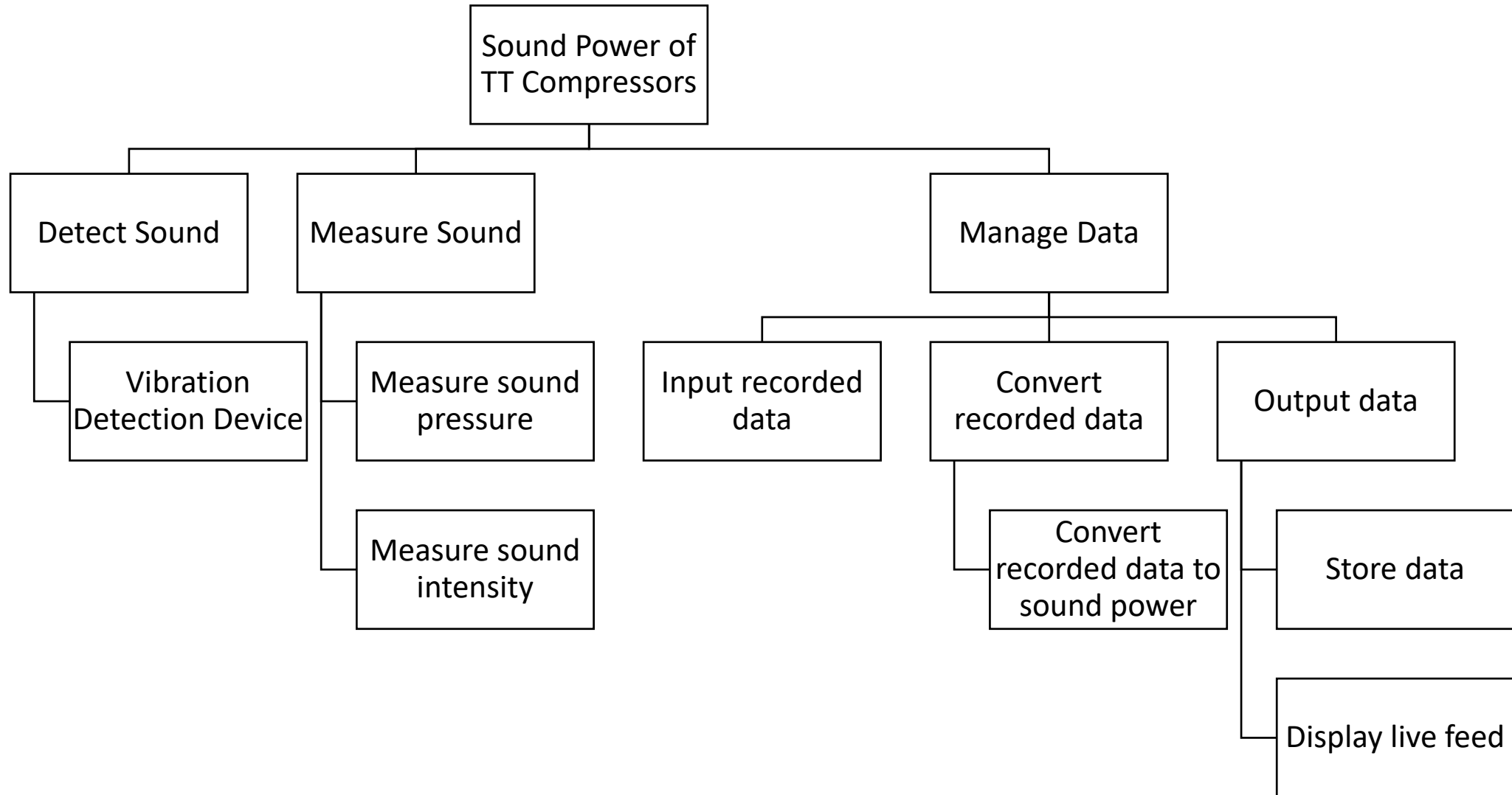
Marissa Jackson

# Customer Needs

Customer Statements	Interpreted Needs
Customers have requested the consistency of sound across the chambers.	Produce a system that will reduce the surrounding noise and measure the consistency of sound power from the compressors.
Customer needs of a way to display or store this sound power data.	Either procure a way to store/display the data or integrate into their current system.
Danfoss will provide all necessary power sources and test stations.	System needs to be compatible with the supplied testing station.
The compressors will be the same and measured at the same point.	Do not have to account for a variance in kind of compressor.

Marissa Jackson

# Functional Decomposition



Marissa Jackson

# References

Danfoss Turbocor - TT. (n.d.). Retrieved from <https://www.danfoss.com/en/products/compressors/dcs/turbocor/turbocor-tt/#tab-overview>

Brüel & Kjær. (1993). Sound Intensity. Retrieved from <https://www.bksv.com/media/doc/br0476.pdf>

# Questions?



# Preliminary Data

From a test Danfoss previously conducted, the level of sound from the compressors was measured and averaged.

- Ambient Sound Level – 78 dB(A)
- Compressor Sound Level – 92 dB(A)

# Next Steps

- Targets and Metrics
  - Consistency of sound power range
  - Display the data collected
- Concept Generation and Selection
  - Design of various systems
  - Selection of design using house of quality