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Team 506: Mobile Anechoic Test Chamber

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Abstract



Disclaimer



Acknowledgement



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Chapter One: EML 4551C

1.1 Project Scope

Danfoss Turbocor seeks an efficient and consistent way to record sound for their “TT” series compressors while reducing surrounding noise. Customers of Danfoss have requested testing the sound power as a specification for their compressors. A mobile anechoic chamber was requested as an idea from the initial problem statement, but we are also able to come up with various options to perform this task. The chosen mechanism would provide a more efficient way of gathering the consistency of sound data. The mobility of the chamber allows for testing to be easily transferable between testing stations. The compressors are tested for 40 minutes and each test consists of ramping the power to the compressor, holding speed, then powering down. The design will need to be easily and quickly disassembled, as well as easily storable.

Goals:

- Find a solution to measure whether the sound power of Danfoss compressors are consistent before shipping out to customers.
- Determine a more specific type of solution, as there are multiple options available to us to solve the current problem.
- Prove the viability of ideas and show a firm plan of action before selecting materials and assembling the design.
- Choose a design that will complete our task with high efficiency on the floor of an active plant.

Primary Market:

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Graduation year: 2019



- Danfoss-Turbocor personnel use
- Air-conditioning companies

Secondary Market:

- Tool companies to measure different sound characteristics of products
- Companies which employ compressors who want to find out the sound characteristics of their compressors inside buildings or outdoors
- Wildlife organizations to test sound characteristics of their vehicles and tools to see impact on environments that may be sensitive

Assumptions:

- Dimensions of compressors used are the same.
- Our design will need to be implemented in the compressor testing station supplied by Danfoss.
- Power is supplied to the testing rig by Danfoss.
- Refrigerant closed loop system is supplied to the testing stations.
- Danfoss Turbocor will provide all machining services.

Stakeholders:

- Danfoss Turbocor- Sponsor and customer
- Dr. Shayne McConomy- Facilitator



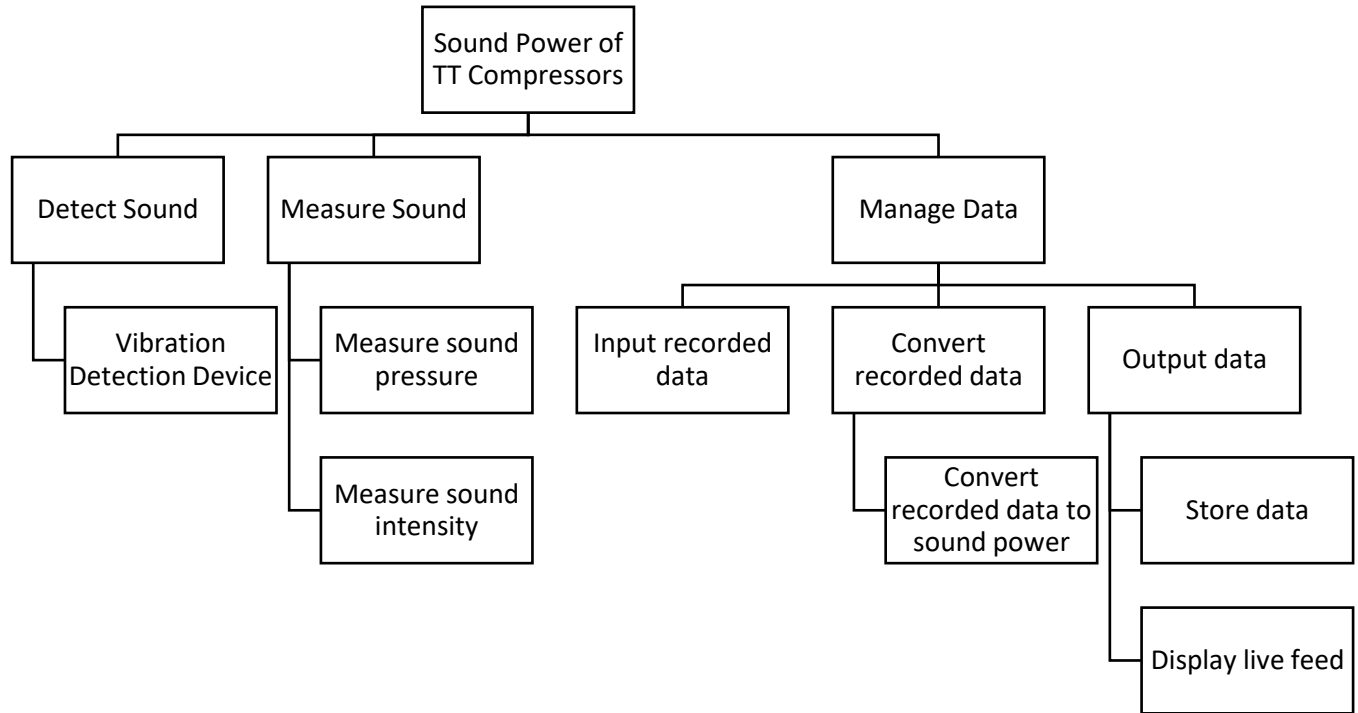
1.2 Customer Needs

The initial meeting with Danfoss Turbocor concluded that our project will consist of designing an anechoic chamber, or similar system, that will measure the sound power across the “TT” series compressors. The recorded sound power will be used to determine the consistency across the compressors, which has been requested by their customers. Below are statements from our customer concerning different components of the project and what we interpreted those statements as. These statements allow us to narrow down the scope of our project.

#	CUSTOMER STATEMENTS	INTERPRETED NEED
1	Danfoss wants to measure the sound power and consistency across the compressors.	Need to measure the amount of sound being emitted by each compressor.
2	Danfoss wants a mobile anechoic chamber.	System needs to be easily constructed to transfer between test stations.
3	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.
4	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.
5	Danfoss will provide all necessary power sources and test stations.	System needs to be compatible with the supplied testing station.
6	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.
7	The compressors will be the same and measured at the same point.	Do not have to account for a variance in kind of compressor.



1.3 Functional Decomposition



The main function for our project is measuring the sound power of the TT compressors. To accomplish this, there are three objectives that must be completed: detect sound, measure sound emitted, and manage data. To detect the sound, a type of vibration detection device must be implemented. Measuring the sound can be done two different ways: measure the sound pressure (recorded in decibels) or the sound power (recorded in Watts per square meter). Once the sound is measured, the data acquired must be managed appropriately. To manage the data, the data found from measuring the sound must be inputted. The data will then be converted from the units recorded into Watts. Once the data is converted it will display a live feed of the data OR store the data based on customer requirements.



1.4 Target Summary

1.5 Concept Generation

Concept 1.

Concept 2.

Concept 3.

Concept 4.

Concept n+1.

1.6 Concept Selection

1.8 Spring Project Plan



Chapter Two: EML 4552C

2.1 Spring Plan

Project Plan.

Build Plan.

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Graduation year: 2019



Appendices



Appendix A: Code of Conduct

Mission Statement

Team 506 is committed to contribute their full effort to create and maintain a positive environment where we will perform our tasks to the best of our ability. We will ensure that our team will be professional and act with integrity.

Roles

Each team member is assigned the following roles based on their past experiences. Each member will be held to a certain standard and contribute their respective parts.

Marissa Jackson- Project Manager

Responsible for managing the team, creating a timeline and plan for the project, and delegating the work amongst the other members. Responsible for final editing and submission of documents. The project manager will maintain contact with the sponsors and arrange and organize meetings. The project manager will act in the best interest of the project and will keep track of the progress. The project manager will manage the budget and be responsible for meeting all deadlines.

Bryce Lankford- Mechanical Engineer

Responsible for research and designing of concepts, as well as assist in editing documents and maintaining the budget. The mechanical engineer will prepare meetings for the group with updates and questions on the project. Bryce will be responsible for providing the manufacturing engineer with proper documents to assemble the final concept.

Nick Ajhar- Mechanical Engineer



Responsible for implementing final design concept as well as review of designs. The mechanical engineer will assist in editing documents, as well as conduct research for design. Bryce and Nick will work closely together to ensure the designs are clearly documented and up to date. Nick will be responsible for ordering the material and assisting in maintaining the budget.

Communication

The team will communicate via either email or cell phone. Use of cell phone will be for casual conversations, while email will be used for planning, setting up meetings, and contact with advisers. The team will meet every Tuesday and Thursday from 4-5:30 p.m. to discuss progress and review the project actions. Outside of this set meeting time, casual group meetings can be set up through agreement of group members. Such meetings will be set up with enough notification so that all members can be present if possible. The team will meet with the sponsor every other Thursday from 3-4 p.m. at the Danfoss facility. If any questions were to arise for the sponsor, they will be contacted through email.

Attendance Policy

All members must be present at all meetings or must notify the group 24 hours in advance of absence. For casual group meetings attendance is not mandatory but recommended.

Dress Code

For team meetings, casual dress is acceptable. Meetings with sponsors, however, require business casual attire. Business formal attire will be held for all presentations.

Individual work schedule



Other than the required meetings, each individual group member will be required to give at least 10 hours per week for the project. This can be done by either individual work or group work outside of required meeting time.

Statement of Understanding

By signing this document, the following agrees to all statements above as well as any amendments come from a group vote.

Marissa S. Jackson

Sign:  Date: _____

Bryce L. Lankford

Sign:  Date: _____

Nicholas C. Ajhar

Sign:  Date: _____



Appendix B: Functional Decomposition



Appendix C: Target Catalog



References

There are no sources in the current document.