

Introduction

For any manufacturing facility, the use of cataloging and organizing parts is essential for efficient operation. Danfoss is revamping their aftermarket production process and are looking for a solution to address their current cataloging system. Our group was first introduced to Stephen Seymore, the Operations Engineering Director. He was prompted with questions about the aftermarket process, the current system in place for cataloging, and expectations from our team. From the questions, we were able to generate a chart that shows our customers' questions, customers needs and the interpreted needs.

Background

Aftermarket production at Danfoss deals with repairing clients' malfunctioning compressors. The current method that Danfoss uses to implement aftermarket production consists of three main departments: aftermarket testing, material handling, and production. The job of a material handler is to assess the data received from aftermarket testing and determine what components are malfunctioning on a compressor. The material handler is then to determine what parts need to be replaced and then create a bill of materials to be sent to production. The material handlers at Danfoss are currently using a material requirement planning program (MRP) to catalog data. The MRP program is currently supplied by Systems Applications and Products in Data Processing (SAP).

Customer Needs and Interpretations

Customer Needs and Interpretation:

Question/Prompt	Customer Statement	Interpreted Need
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Interview		
What kind of project is this: mechanical engineering or logistics?	This project will be mostly a logistical problem. There is a possibility of a mechanical component being added to the project. But as of now it is entirely logistical.	A system that does not involve mechanical components or moving parts.
What is the current system Danfoss has in place for aftermarket production?	Danfoss is currently using an MRP supplied by SAP as well as Cool inspector. Cataloging is done mainly by experienced material handlers.	A system that an inexperienced material handler is capable of operating
Is there a specific kind of program you would like us to use in order to do the record keeping?	Danfoss uses Creo, Matlab, SAP, and Cool Inspector, but are open to all programs and solutions.	Danfoss is open to all possible solutions
How in depth are we going to need to understand which parts need to be replaced for a given aftermarket compressor?	Ordinarily, supervisors make those decisions, so I don't believe you will need to make those decisions yourself. We simply need a more formal method of making those decisions based on cataloged data .	An organized solution that reflects all the decision making of the supervisors.

<p>If a part breaks, do we need to come up with a solution to which parts need to be fixed or will that information be given to us?</p>	<p>That information will be provided. Getting access to these reports shouldn't be an issue.</p> <p>Reports are recorded in a system called CoolingInspector. Your system will make decisions based on the information we supply.</p>	<p>Able to identify replacements based on prior data from material handlers.</p>
<p>Does our solution need to be robust enough to include any possible compressor model from any possible year?</p>	<p>Ideally, at some point Danfoss wishes to include all potential models from any potential year. However, it is likely that this is outside the scope of what can be accomplished within the timeframe allotted for the project.</p>	<p>Danfoss needs a system that can be replicated for any possible compressor model.</p>
<p>Is it possible for us to limit the scope of the project to a single compressor model until we arrive at a solution which meets the project goals.</p>	<p>Do work on the MiniTT compressor as we have the most cataloged data for this model.</p> <p>If the project is fully operational with the MiniTT compressor then it should be easy to replicate for other models of compressors.</p>	<p>The scope can be limited to the MiniTT compressor</p>
<p>What improvements would you make to the technology you use currently?</p>	<p>I want any Joe Schmo off the street to be able to look at this process and be able to follow it to the T.</p>	<p>Easily understood by people with no formal knowledge of manufacturing engineering.</p>

<p>Do all compressors need to be upgraded or can the compressor efficiency remain the same?</p>	<p>The goal is to have the same level of performance. The two goals are to give a list of mandatory replacements in the form of a bill of materials, and the replaced parts need to be functional so as to fix the issues within the compressor. It is always favorable if the efficiency is greater.</p>	<p>Outputs parts that maintain the same level of performance or higher for the compressor.</p>
<p>Are there known parts that frequently break or does this solution need to be general enough to encapsulate all the part failures within a compressor?</p>	<p>It needs to be able to handle all possible part failures and list the failed parts in a formal bill of materials.</p>	<p>Solution is general enough to include all possible part failures.</p>
<p>Is there a specific format needed to be given to the material handlers?</p>	<p>No, SAP is an enterprise resource system used by the material handling department for MRP, but it is not imperative that the solution outputs to SAP's specific format.</p>	<p>An output naming convention that is understood by the material handlers.</p>
<p>Are there well known solutions to this problem used in industry that you propose we use to solve the problem at hand?</p>	<p>There is no one specific way to solve the problem at hand, however solutions in the past have included scripts, MRP software, and catalogs to organize the data.</p>	<p>Software, scripts and catalogs may be used.</p>

<p>Would you like to have a system that is easily updatable?</p>	<p>Yes it would be beneficial for employees at Danfoss to input new data that comes from aftermarket testing.</p>	<p>Updates with ease and complies with future products.</p>
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Analysis

Based on the meeting with Mr. Seymore, we’ve concluded that the solution that Danfoss is looking for is a “compendium system that is far more automated and robust” The current process has the material handlers and technicians making decisions based on experience. Danfoss would rather have a system in place that expedites the decision making process and does not rely on the potential human error of material handlers.

In addition to being accurate and faster, our system will also be compatible and easily integrated with their preexisting aftermarket compressor repair process shown below.

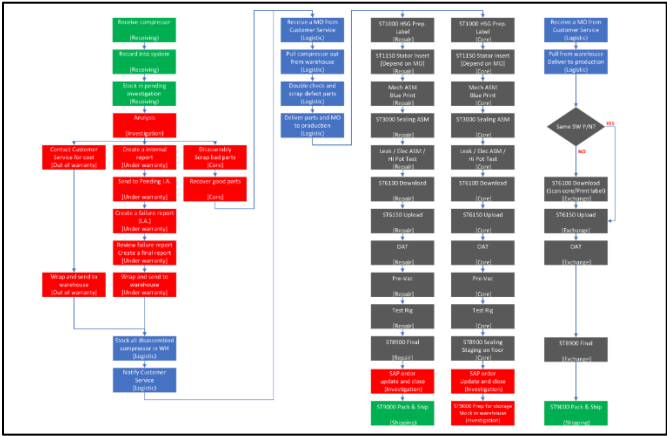


Figure 1: Compressor Aftermarket Process Flow Chart

The interpreted need for Danfoss is a system that can transition the analysis and investigation phase (red blocks), to the portion of the process responsible for repair (grey blocks). The current blue blocks (logistics) are what our system will replace. For this to happen our design will need to be compatible with the data collected in the analysis phase. Being

compatible with the analysis phase includes, having a naming convention that can be understood by the material handlers.

As well as being compatible, our design will be updatable and replicable for any compressor model. Compressor models and versions are always updating, so our design will also need change accordingly.

Being that Danfoss has many versions and types of compressors, there was discussion during the meeting to limit the scope of the project to just the MiniTT compressor model. This compressor has the most cataloged data out of all compressors. Completing the project with this model first will make translating to other compressors models easier.

Conclusion

In conclusion, the meeting with Stephen Seymore highlighted the demands that our design needs to meet. He pointed out that the aftermarket process has current issues that our design should counter. Now that we have the interpreted and customer needs we can proceed to look at the functionality of our design.