

9/27/2019



Team 510: Climatic Camera

Customer Needs

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Questions, Answers, and Interpretations

To accurately find the customer's needs, a series of questions were formed. We asked our customer (Vinayak Hedge) a series of questions in order to find what was important in the products design. Below are the questions that were asked to the customer. The full table of customer needs with their interpretations can be found in Appendix C.

Questions:

- How do you currently monitor the environmental test?
- How long does the test last?
- How would you like to control the test monitoring?
- Would you like to be able to put away or move around this product?
- How would you like to power this product?
- What size would you like the monitoring device (camera) to be?
- What conditions will the monitoring device be subjected to?
- Do you have any size constraints for this product?
- Is anything else inside the chamber other than the test subject?
- What would you like this product to do? Time of failure or...? What kind of feedback do you want? Only visuals?
 - Does the device need audio?
- Is there lighting inside the chamber?
- Is there a desired angle for the recording device?
- Do you want us to use a standard recording device or develop a new one?
- What does the vibrational test consist of?
 - Do floor and/or walls vibrate?
- Is the chamber operated from a computer or the chamber itself?
- At what height are the test subjects tested?
- How big/How much space are we allowed to use in the wire opening space?
- How do you currently isolate the wire opening in the chamber?
- Is there only one subject tested at a time?
- Is there access to Wi-Fi on laptop for remote access?
- Is the inside of the chamber magnetic?

By analyzing the customer's needs, the team determined that each question has unique characteristics for the desired product. Vinayak Hedge, reliability engineer manager for Danfoss, desires a monitoring device that sustains the climatic chamber conditions. The device needs to

have video recording capabilities. The video recordings need to be accessible live and stored for future access. The model numbers for the two climatic chambers that are used were recorded to have the recommended manufacturers specifications. Also, the vibrational chamber model number was taken to understand how the device works and what specifications it has.

Overall the needs that the team were able to interpret from the customer data were directly related to one another. The final product will be able to accommodate the primary and secondary markets as much as capable.

Appendix C

Table 1 Questions, Customer Statements, and Interpretations

Question/Prompt	Customer Statement	Interpreted Need
How do you currently monitor the environmental test?	As of now, someone has to physically go and look in from the window of the chamber and see if there is any failure or any LED off	The device can be remotely accessed
How long does the test last?	The test goes on 24/7 until failure	The device provides continuous monitoring
How would you like to control the test monitoring?	I would like a camera that can be connected to a computer	The device can be connected to a computer
Would you like to be able to put away or move around this product?	I would like a rigid fixture and mobility of the camera	The device can be movable or fixed
How would you like to power this product?	USB connection preferably	The device can be powered by an external source (outside the chamber)
What size would you like the monitoring device (camera) to be?	I want something small, like a USB Borescope camera	The device is compact in size
What conditions will the monitoring device be subjected to?	The climatic chamber test has oscillating temperatures that go from -40 to 160 degrees Celsius. We also do 10 to 90 % Relative Humidity and vibrational tests	The device operates within the parameters of the test
Do you have any size constraints for this product?	Compact device, cannot drill inside the chamber to fix camera because it would affect liability and guarantee of chamber	The device is compact and does not affect integrity of the chamber
Is anything else inside the chamber other than the test subject?	Vibrational chamber and various test subjects depending on what part we are testing	The device needs to be easily moveable
What would you like this product to do? Time of failure or...? What kind of feedback do you want, only visuals?	If possible, I would like the product to have a temperature indicator to see time and temperature at failure	The camera should know the current time and/or temperature
Is there lighting inside the chamber?	There are two bulbs inside the chamber but would like to have operational camera without bulbs, like an infrared camera	The customer would like the camera to see in the dark
Is there a desired angle for the recording device?	No, but would like the device to be movable and adjusted to desired angle	Orientation of device should not be permanent

Do you want us to use a standard recording device or develop a new one?	I want you to use an existing camera and make it work under the test conditions	The recording device is isolated from the environment
What does the vibrational test consist of?	Vibrational test is done with a smaller chamber were the surface of the chamber is the only part that vibrates	The device can avoid vibrations with proper positioning
Does the device need audio?	Don't make a difference	The device has visual capabilities
Is the chamber operated from a computer or the chamber itself?	The chamber has a control system on the chamber that regulates temperature and humidity, the computer is used to record feedback	The device provides with visual feedback
At what height are the test subjects tested?	Various heights depending on the test, there are racks to mount test subjects but on vibrational test we take them out and have the vibrational chamber inside	The device can be placed at adjustable heights and angles
How big/how much room are we allowed to use in the wire opening space?	The space available is about a fist in diameter, not much room	The device connection to the computer fit through the wire opening space
Do the floor and/or walls vibrate? More info on vibrational test	Surface vibrates, walls do not	The device can be fixed on the wall or external surfaces without vibration
How do you currently isolate the wire opening in the chamber?	We use a cork that is flexible for cables to go in and keep isolation	The device does not affect the integrity of the wire opening
Do you test the entire compressor in the climatic chamber?	We test at a sub-assembly level	The device can record smaller pieces of the test subjects
Is there only one subject tested at a time?	We test various components at a time	The device can be adjusted to video record a few test subjects or one in particular
Is there access to Wi-Fi on laptop for remote access?	Yes, we have Wi-Fi available in the room	The device can be Wi-Fi enabled
Is the inside of the chamber magnetic?	The inside is not magnetic, the outside is	The device does not rely on magnetism inside the chamber for support