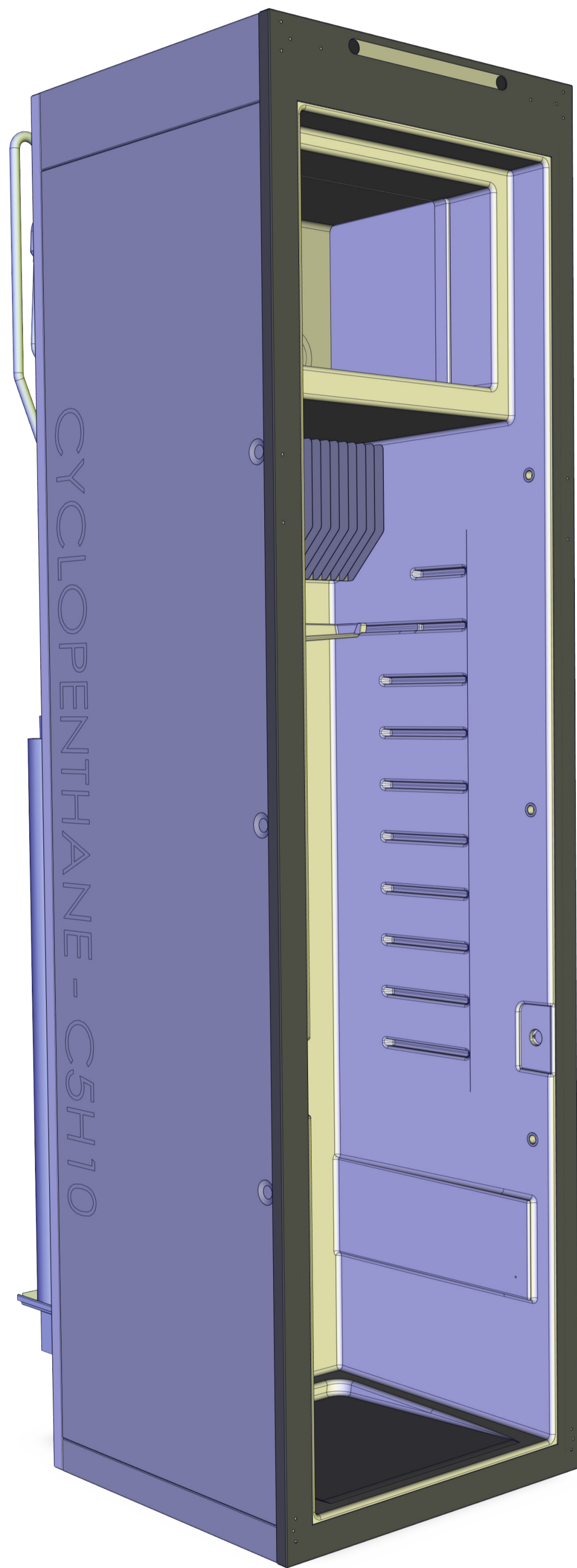


Improved production value through organised DFMA

allowing for one big manufacturing step less through redesigning a recreational vehicle fridge



Thetford needs to improve their efficiency to generate more output, make space on their full factory floor for new products and decrease their human dependency at their absorption refrigerator plant in Etten-Leur. The market becomes more competitive and that is why Thetford choose to change its strategy from customer intimacy towards product leadership. This strategy is focused on generating new revolutionary products like iNDUS. The existing product portfolio does not alter much though while the output increased the past year and is not going to decline the coming years while new products are introduced. So how is Thetford going to generate more output with less people on reduced floor space?

In 2018 a feasibility study was done to explore the possibility of eliminating one big manufacturing step. The project was called 'one-step foaming' because the manufacturing route was designed to contain two foaming steps for isolating the fridge and could be shortened to just one foaming step. One-step foaming could fulfill the strategic needs of Thetford because of the necessary changes in the manufacturing route and design: one big foaming machine less and less assembly steps. The study was successful, but the design was not feasible for mass-production yet. A next step should be taken to further improve the manufacturing route and design.

This project tended to improve one-step foaming up to a level that would increase the output by at least 20% while reducing the necessary floor space by at least 20%. The method chosen to achieve this was by applying a DFMA study on both the present product and a product of a competitor. The lessons learnt would generate a design where the value of the work of production workers would be highest. Meaning: no use of materials or handling that would not add any value to the external customer. The customer is not going to pay more for this internal manufacturing

change and that is why the project should result in a cost neutral business case while also generating the same customer experience.

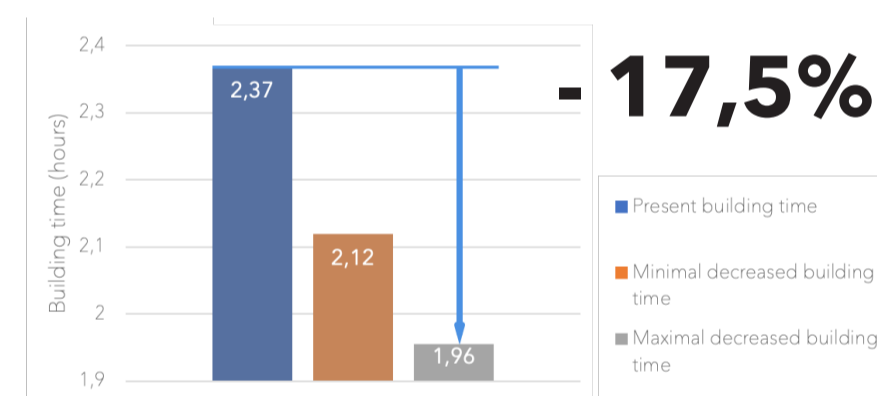
The result is one concept, chosen from 3, that has an output increase of probably 57% with the same amount of workers, floor space reduction of 42% and cost price reduction compared to the new expected encasement of €11,83 with an investment of €250.000. These numbers are calculated only for the implementation of one-step foaming on the 140L fridge line (the beaker or N4140) and not the tabletop or the larger fridges. The assumption made is that new encasement regulation will be introduced

resulting in a big change Thetford. The encasement regulation means that Thetford needs to change their cheap and lightweight cardboard encasement with heavy sheet metal encasement. When one-step foaming will be introduced on the 140L fridge line it will allow for usage of the automatic line 2nd step machine to foam other fridges as well.

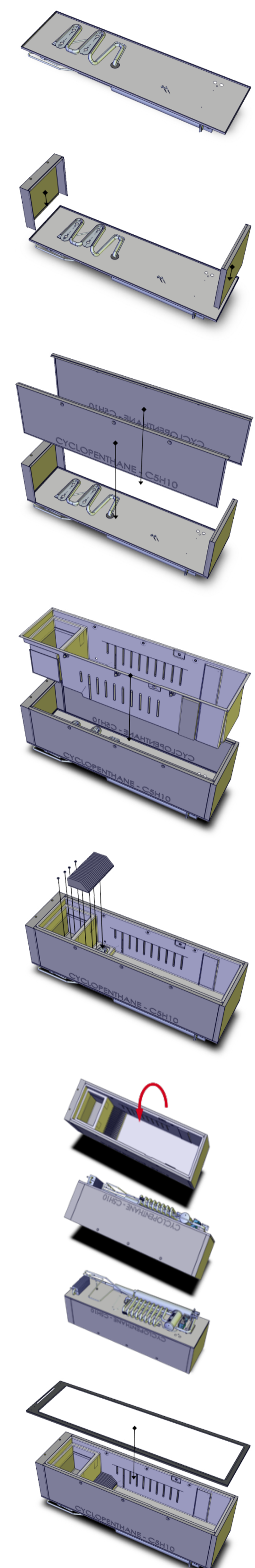
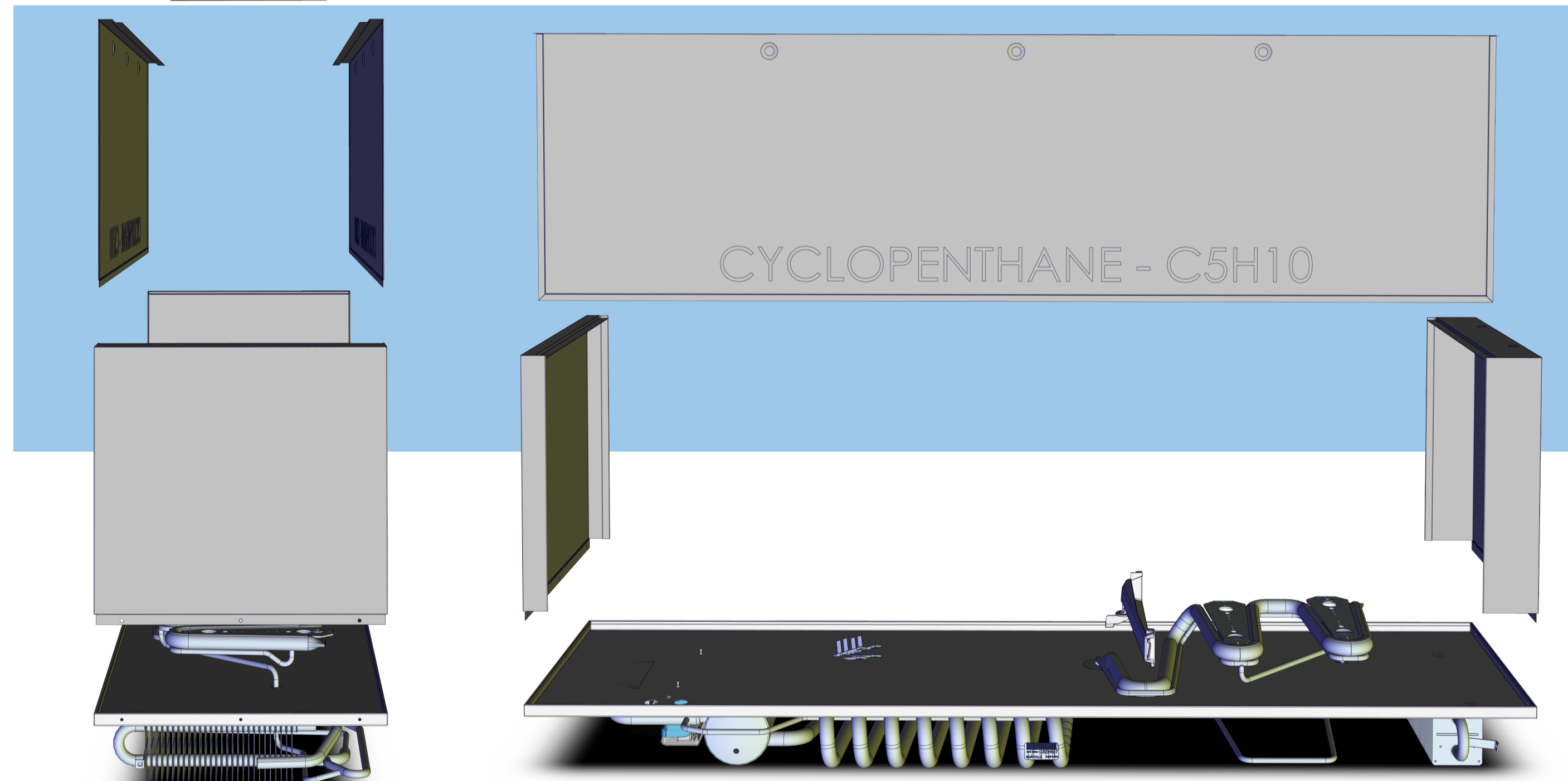
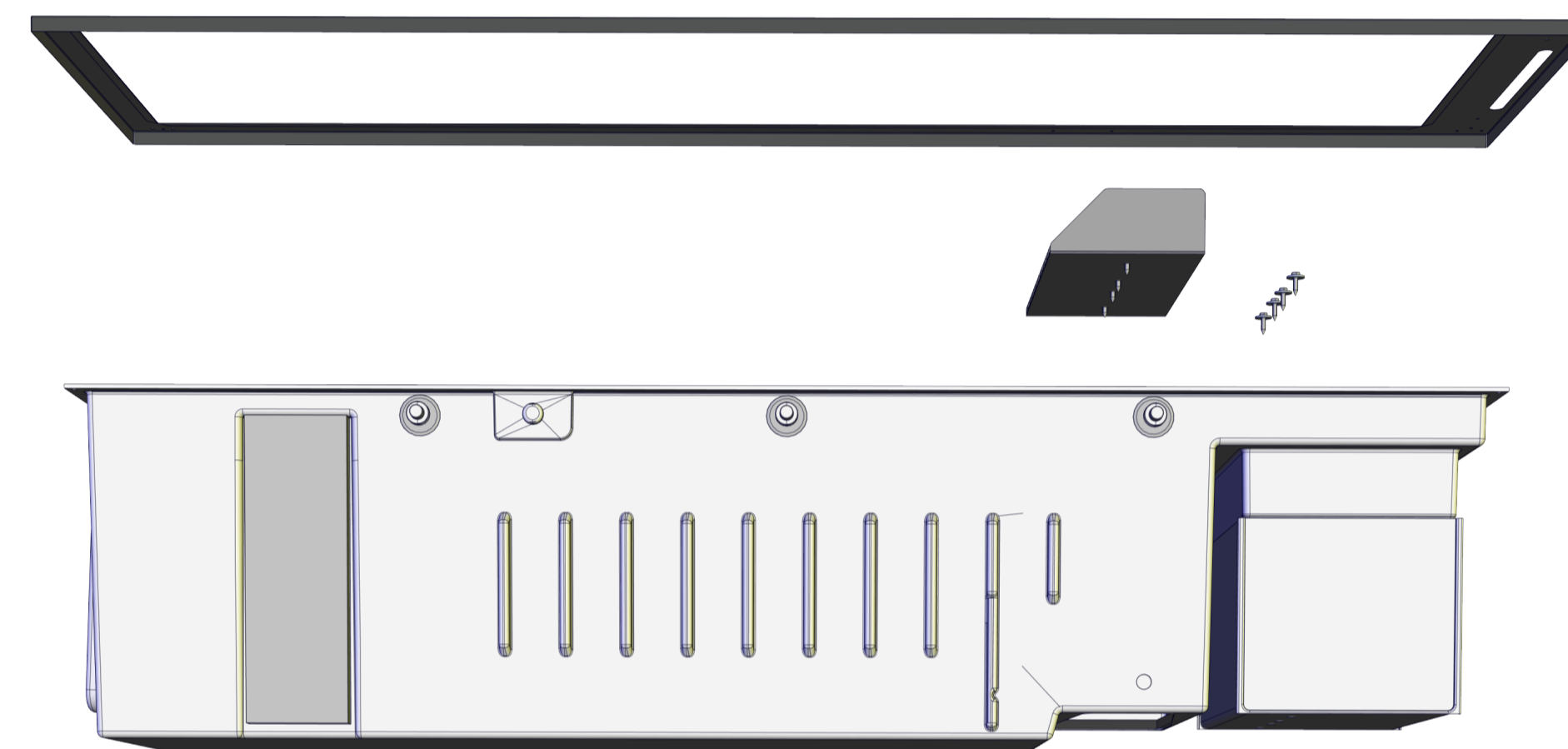
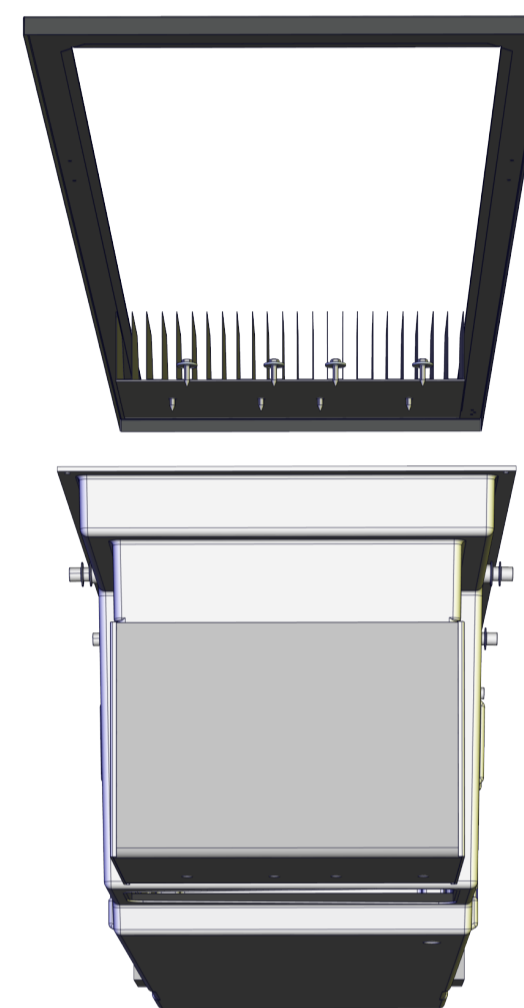
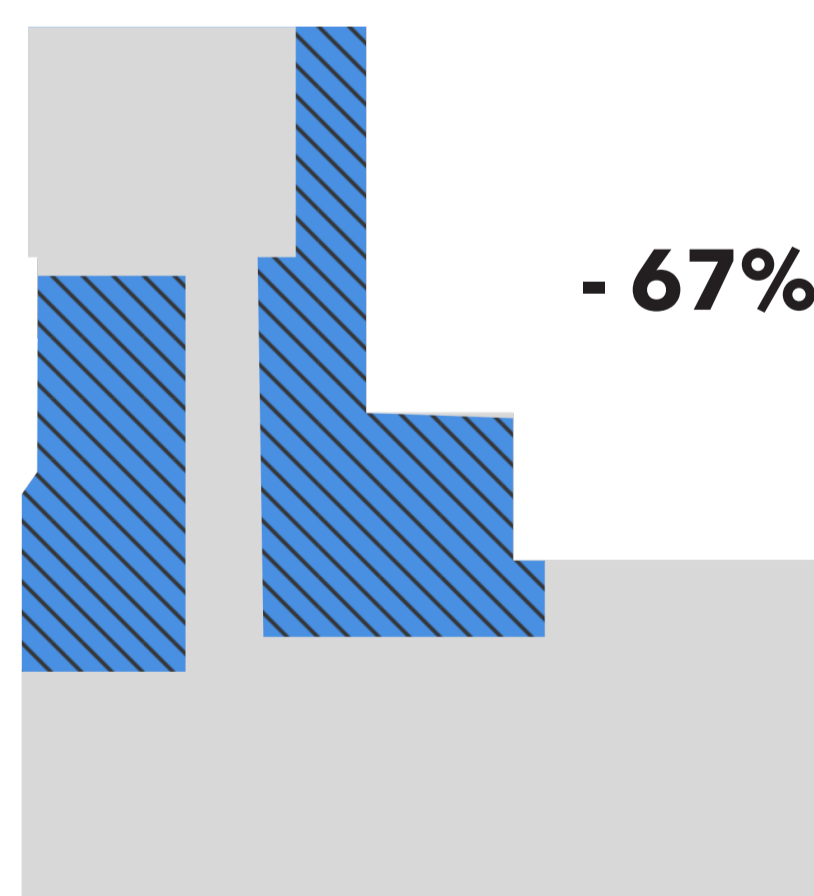
The next step after this project is to validate the concepts by making a prototype. The project shows a high potential for Thetford to remain competitive on both the present and new product portfolio while not needing to move to another plant. Validation makes the promises of one-step foaming more realistic. Another

important lesson for Thetford from this project is to rethink their level of operational excellence. In the past efficient production and high output were not important but they are now. Thetford is already started improving by implementing automation but it could do more in the sense of DFA and active automation. There is still high potential improvement to increase the level of operational excellence for Thetford and one-step foaming shows this.

Building time decrease



Factory floor space reduction



Jonathan Johan Nederend
 Improved production value through organised DFMA
 Graduation date: 8th of February 2022
 Integrated Product Design

Committee: Dr. Erik Tempelman (chair)
 Henk Kuipers (mentor)
 Dennie van Opstal (company mentor)
 Company: Thetford

