# Design of a more space efficient drying rack which improves the workflow within Fokkers paint shop.

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The goal of this assignment was to design a detailed concept of a new paint shop drying rack which would save space within Fokkers paint shop while also improving the workflow. Fokker aerostructures produces parts for the civil and military aviation industry. This bachelor assignment focused on the paint shop where the metal parts coming out of machining are painted and go through quality control. The current drying racks used within this paint shop take up a lot of space while most of the time they are standing around with products waiting for the next step. When this floorspace taken by the drying racks can be reduced there is more space to move around and work more efficiently. The main objective of the assignment was to reduce the floorspace taken by the drying racks by 50% while also trying to improve the workflow.

To better understand the current situation within the paint shop a research was conducted. During this research, the layout and workflow of the paint shop was looked at. Also, the current drying rack was clearly defined and the available floorspace and needed capacity was defined. This was done by both observing the situation and talking to the paint shop employees. This led to a list of requirements were the new design should adhere to. With the main challenge defined, reducing the floorspace while maintaining the capacity, the ideation phase was started. This first ideation phase was performed with the guidance of the TRIZ method to come up with rough ideas that could solve the problem. From all these ideas three were selected to develop into concept directions. These were further divined to be able to compare them to each other. The space saving of each concept was estimated, and each concept was evaluated with the list of requirements. One concept stood out to be the best and most effective solution for this problem and that was the cantilever rack. This concept was discussed with both the client supervisors of the paint shop and the painters themselves to gain feedback and find out what needed further development. This feedback was implemented in the final phase to reveal the final result.

*Figure 1: Final cantilever rack design.*

The result was a cantilever rack which can fold and unfold while keeping the spraying beds level such that the products can stay on the rack. This generates a space saving of around 50% while maintaining the current drying rack capacity. A ratchet locking mechanism keeps the rack from folding and unfolding unwanted and the bearings are protected from paint dust by hiding them inside the beams. By making this rack out of aluminium instead of steel tubing the weight of the rack will stay roughly the same. Vibration dampers are added in between the wheels and the mainframe to reduce vibration when pushing the rack into the spraying cabins which causes problems with moving products within the current situation.

However, not all products are small enough to fit into a folded drying rack. Some products are to long and need the length of an unfolded rack. Therefor this is not a solution in each situation. This was considered when calculating the space saving. Luckily, most products are small enough to still reach the 50% space saving target throughout the whole paint shop. Therefor the main objective of being more space efficient was met. Improving the workflow with this design will be limited to reducing the needed floorspace and decreasing the size of the folded rack which makes it easier to move it around. The workflow within the spraying cabin will not be improved through this design. Also, the designed vibration damping needs to be tested to find out whether this has enough impact to improve the workflow.

To test this and other aspects of the design such as reliability of the pivot points, a prototype should be made which can be tested within the paint shop. This way the painters can also experience further benefits and downsides of the design and give more feedback which can be implemented into a final version of this new drying rack.