Integrated project Engineering Technology

2023-2024

Production of high-speed roller doors

Tim Flipkens & Ferre Fiddelaers

Master of Electromechanical Engineering Technology

01 Situation

This Bachelor's thesis is in collaboration with ADK NV, a Manufacturer of industrial and residential sectional doors. ADK consists of two branches, one located in Kinrooi and one in Maaseik. ADK produces high-quality conventional doors, industrial doors and high-speed doors all over Belgium. This project focuses on the production of canvases for high-speed roll-up doors. These canvases are made of strong Polyamide which are fixed between rails where the curtain can be rolled quickly. By welding zippers to the canvas, the canvas can be attached between rails. Different high-speed roller doors can have different sizes of canvases to suit each customer's application. In doing so, some applications have transparent canvases, while others consist of a single canvas. A third possible modification to the canvases is that for wide canvases, a reinforcing border is attached in the middle of the canvas. When the complete canvas is made, it can be delivered to the customer along with the rails and motor.

02 Problem

The entire production of canvases is currently done manually, which presents some noteworthy problems.

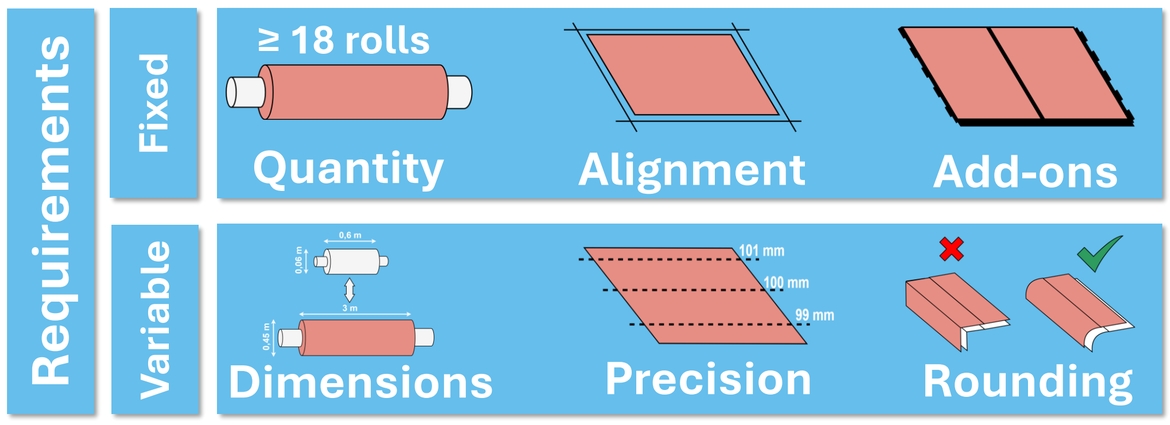
- The storage of the canvases is done on different buffers, which causes unnecessary time loss and labor-intensive work.
- The dimensional cutting is done manually, which creates inaccuracies and is again labor-intensive.
- Moving the cut canvas is labor-intensive, time-consuming and can cause damage to the canvases

Therefore, a new, automated solution needs to be devised to tackle these problems. This automation requires the steps of the production process to be the same.

Storage → Alignment → Welding & Cutting → Storage

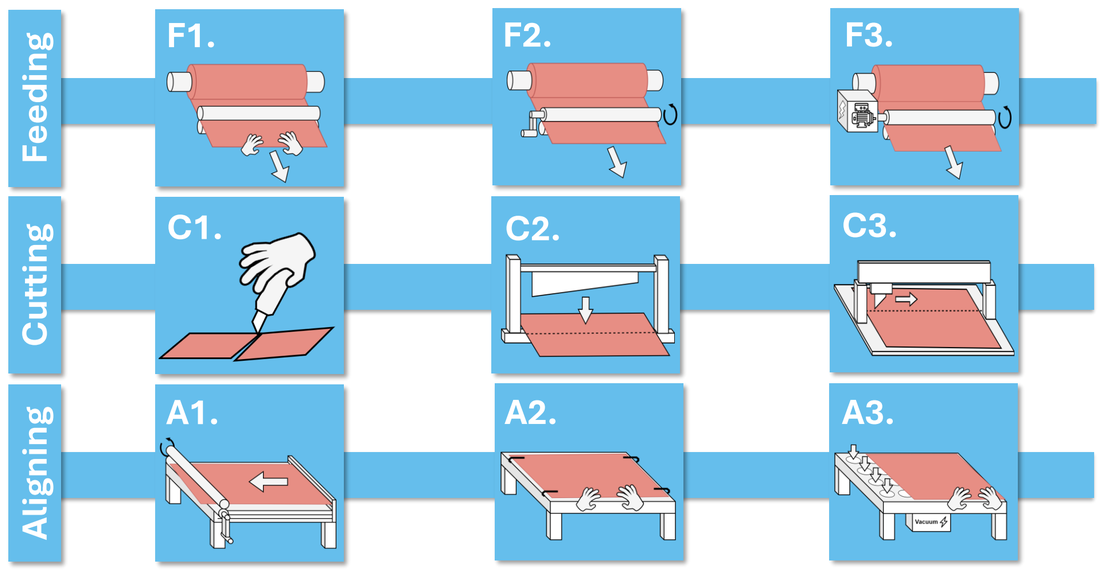
03 Requirements

To obtain a functional design, there are several phases during which an optimized design is probed. Starting with listing the imposed requirements of ADK to proceed structurally. These requirements must occur in the project to achieve a successful design. The requirements are divided into fixed and variable requirements. The fixed ones need to be fulfilled to the fullest extend, whilst the variable requirements are strong guidelines.



04 Methodology

In order to accommodate these requirements and the necessary functionality of the production process, the right mechanisms and design choices need to be made. First, every possible solution is taken into consideration. Then, the best ideas are further expanded upon and visualised. After this, an overview is created that visually represents and compares these ideas. Using this method, a visual consideration can be made between the different possible mechanisms to determine the most applicable one.



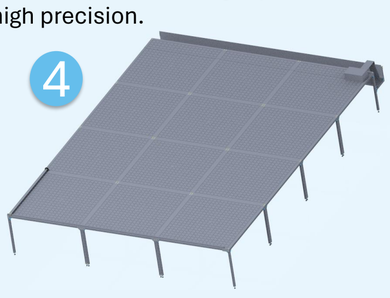
05 Final concept

The final concept is realised when all possible solutions are considered, compared and finally the best solution is chosen. After this, the iterative process of combining these mechanisms into a whole structure starts. In this case, the final design consists of 4 large components.

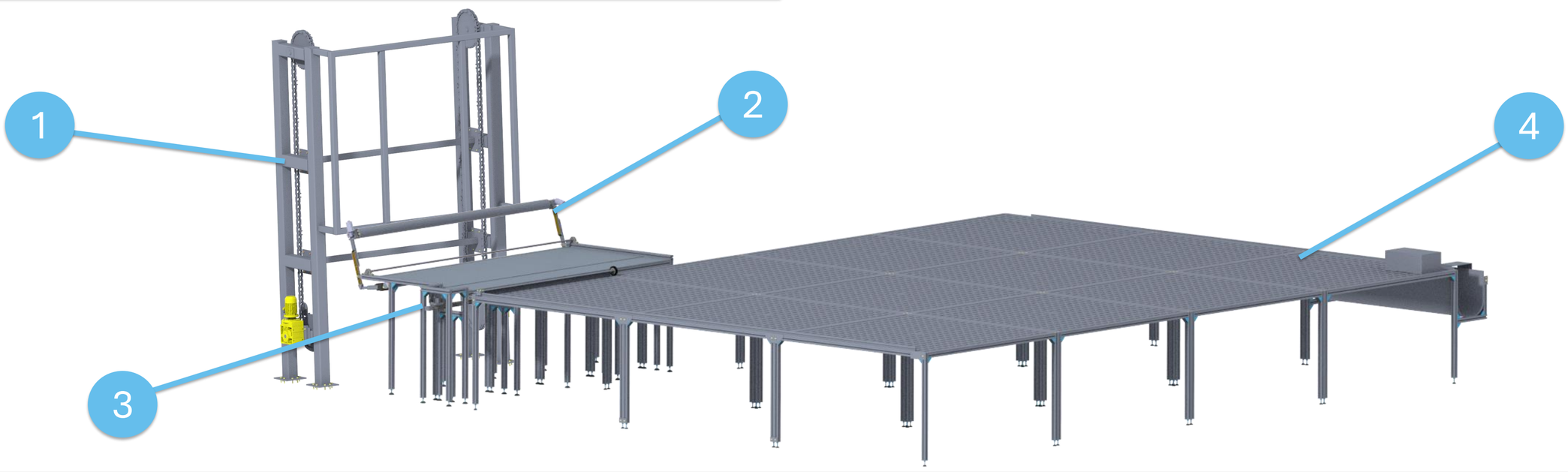
1 To solve the problem of storing the cloths, a buffer was created that can automatically rotate the total of 19 rolls. This allows quick selection of the right roll to cut the required cloth size. The buffer is capable of carrying and rotating 19 rolls, each weighing 435 kg. In addition, the buffer can easily load new rolls and unload empty rolls from the rear. To ultimately ensure safety for the operators and the environment, fall protection and sturdy materials are used.

2 In order to feed the cloth to the production line, a motorized roll is mounted to a table via two arms. This circumvents the need for constant manual labor. The arms ensure that the roll can move out of the way when the buffer starts rotating.

3 Also present on this table is a motorized rail, which holds a carriage. Mounted on this carriage is a cutting disc attached to a motor. The disc protrudes slightly from the table surface to be able to cut the cloths with high precision.



4 To complete the final machine, a worktable must be added. This is fully equipped with a pressing and vacuum system. The pressing system allows the fabric to be moved easily and quickly across the table for welding in various positions. The vacuum system can hold the fabric in the correct position so that it cannot move when the welder attaches different canvases. A measuring stop is also attached to cut the cloth to the correct length. This makes it easier for the operator to achieve proper accuracy.



Supervisors / Co-supervisors / Advisors: Prof. dr. ir. Michael Daenen, Prof. dr. ir. Karel Kellens, Prof. dr. ir. Lievens Jeroen, Ing. John Bijnens, Extern: Erwin Doumen

De opleiding industrieel ingenieur is een gezamenlijke opleiding van UHasselt en KU Leuven