

Automating the packing process of rolled mattresses

Bikkembergs Jochen & De Vloo Marnick

Electromechanical Engineering Technology - design and production

Situation

The Bachelor's thesis was carried out at the company Velda. Velda is a subsidiary of the large Belgian company Veldeman Bedding. Since the start of the company, the core activity has been the development and production of high-quality sleeping systems. The production of mattresses, box springs, slatted bases and sofa beds takes place in their production facility in Oudsbergen. Some of the produced mattresses are rolled up and packed in cardboard boxes. These come in two sizes. However, this process encounters several issues, prompting Velda to engage us in identifying an automated solution for this task.



Figure 1: packed mattress

Problem definition

The current packaging process for folded mattresses at Velda's production site necessitates the involvement of two employees. First, they have to unfold the box and seal it on one side. After this, they place this box on a stand where a piston slides the rolled-up mattress into the box. The employees then seal the other side and label the box. Finally, the box containing the rolled-up mattress is taken off the stand and stacked on its corresponding pallet. However, this process poses ergonomic challenges for the workers and is not cost-effective for the company. Moreover, there are difficulties in recruiting new personnel to fulfill the packaging process. Therefore, there is an urgent need to optimize the packaging process to address these concerns effectively.



Figure 2: cardboard packing boxes

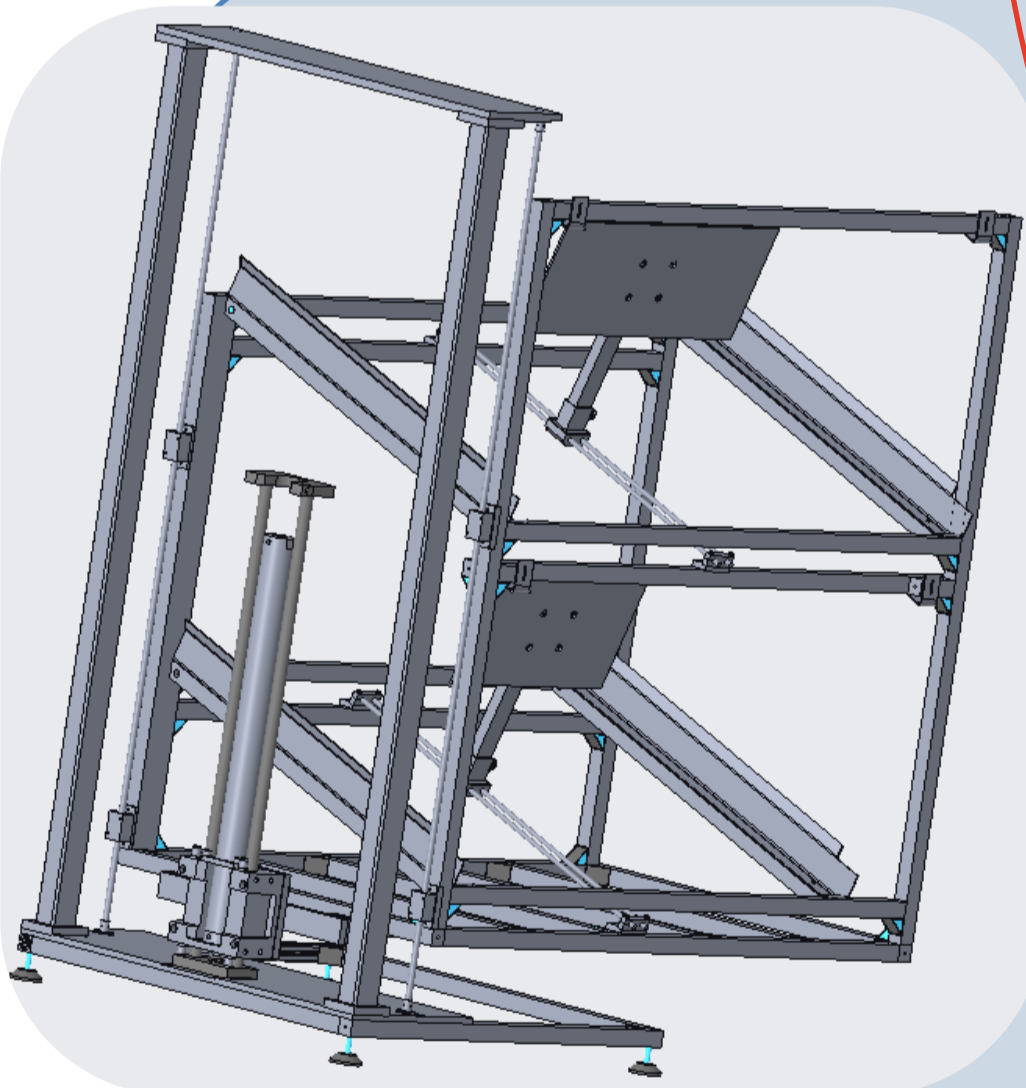
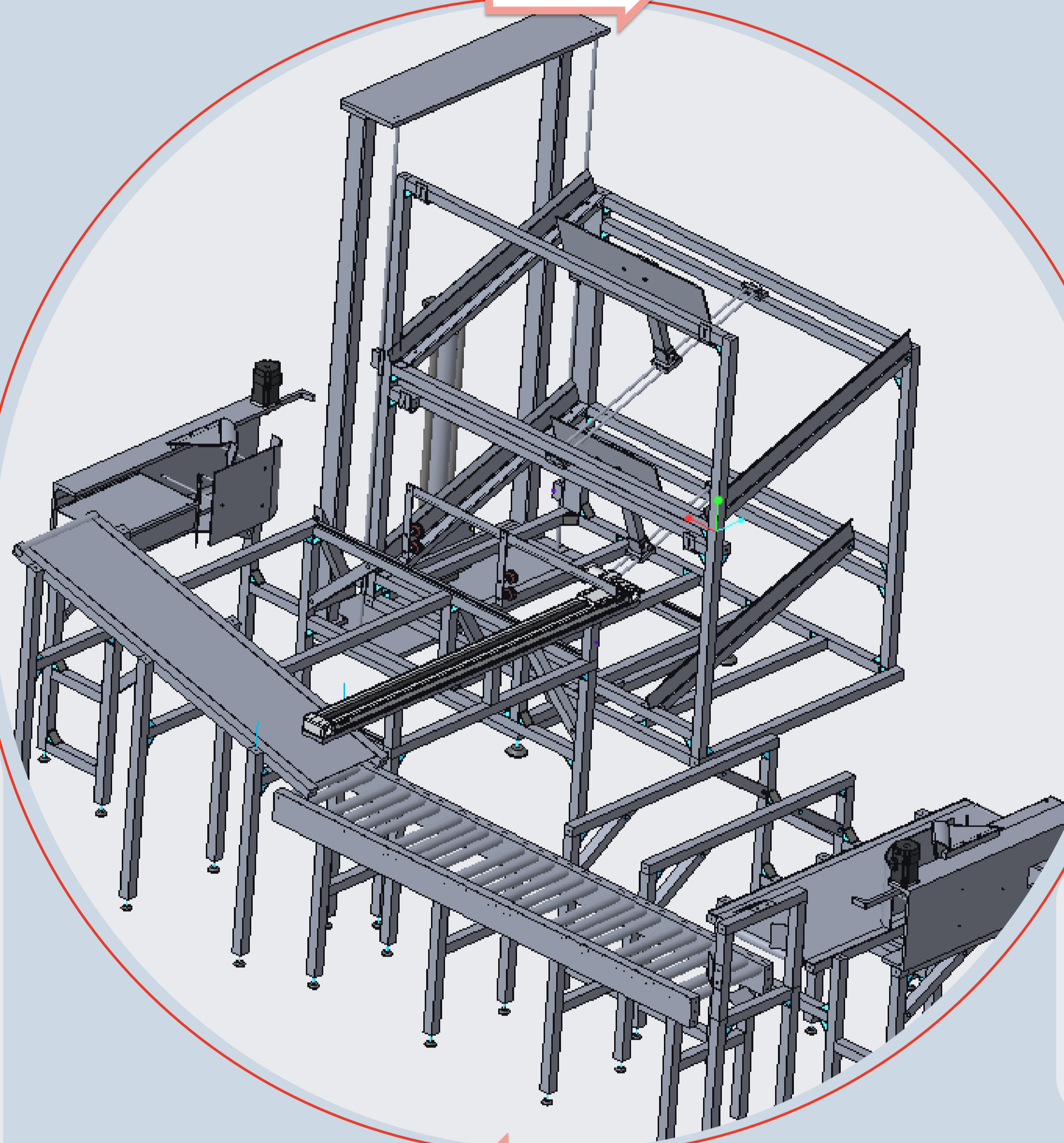


Figure 4: the buffer

The buffer is equipped with two refill sections specifically dimensioned for the corresponding box sizes. The design choice during the concept phase was to place the sequential machining processes, such as the folding unit, in a non-movable configuration. But because of the two different box sizes, it is necessary to place the buffer in a movable configuration so that the selected box size can be correctly aligned with the folding plant. This is achieved by implementing two linear guides and an actuated pneumatic cylinder.

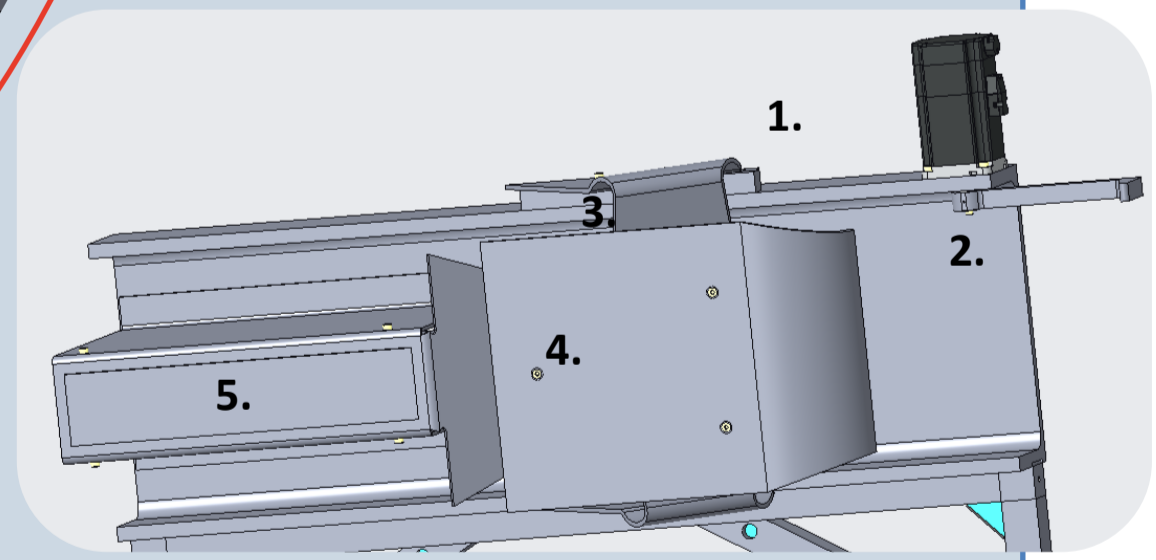


Figure 3: the folding system

Legend folding system;

- 1. Electric step motor
- 2. Stroke arm
- 3. Upper and lower folding obstacle
- 4. Middle folding obstacle
- 5. Small folding obstacle with the tape head

A passive system was chosen for folding the flaps of the box. This system uses only one actuator to fold all the flaps of the box, resulting in an efficient and cost-effective solution. The folding system consists of components shown in figure 3 with its corresponding legend.

Buffer

Folding system

Supervisors / Co-supervisors / Advisors: Bijmens John, Daenen Michael, Kellens Karel, Lievens Jeroen / Moons Jeroen, Soors Joris, Grommen Stijn