

Design of an automatic folding system for small shipping boxes

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Context

NSI is a Bilzen-Hoeselt (BE) based manufacturer of keyboards and pointing devices in the industrial, military, maritime and medical sectors. They also have a shipment preparation room where their main goal is to reduce labor costs and improve employee comfort.

Problem

- Shipping boxes are folded manually
- Employee spends every second Friday restocking folded boxes
 - Employee must leave primary workstation, interrupting regular workflow.

→ Automatization



Figure 1: Shipping box

Objectives

- Input buffer 100 box templates
- Output buffer is waiting line on packaging table
- > 8 boxes/min
- Adjustable for different box lengths
- Table height equal to 72 cm

Input buffer

The adjustable magazine can hold up to 160 templates with sizes ranging from 30 to 100 cm in length in increments of 10 cm. Gravity and holder tabs position the templates for grabbing.

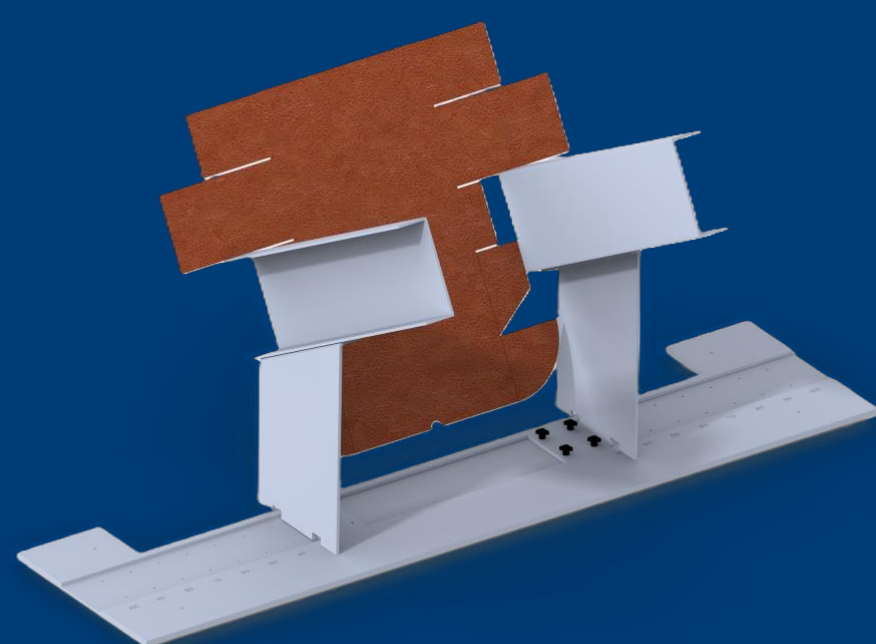


Figure 3: 3D-design adjustable magazine

Sequential press basket

The press basket performs all folding steps in chronological order as the arm pushes the templates into position. The securing flaps of the templates are bent over by the two fingers. Which ensures a sturdy box with smooth insides for packaging. During the last step, the front basket side moves down and allows the back side, connected to an ejection piston, to push the box out to a packaging table.

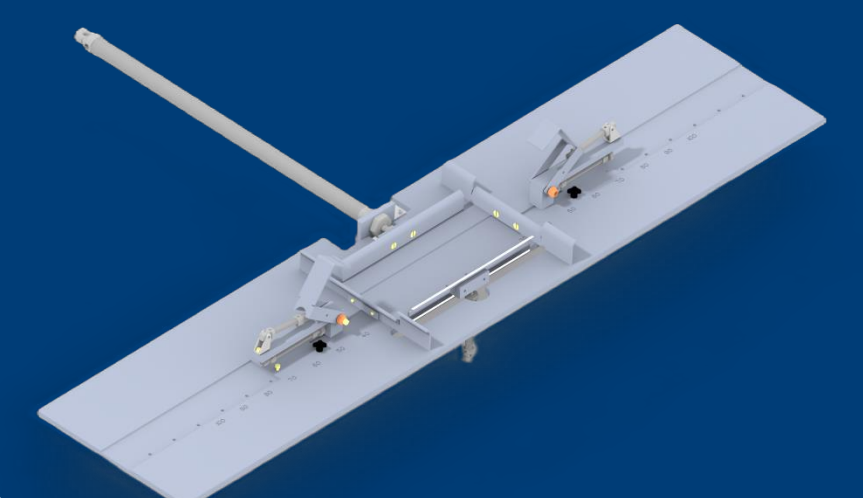


Figure 4: 3D-design press basket

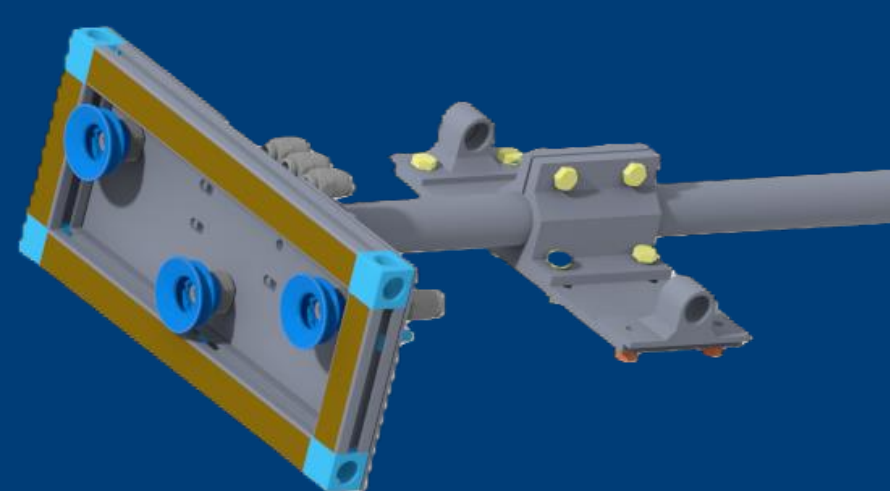


Figure 5: 3D-design grabbing arm

Grabbing arm

The pneumatically actuated swing arm grabs the templates out of the input buffer using suction cups fit for cardboard. These suction cups are attached to the press head which pushes the templates through the folding steps in the sequential press basket.

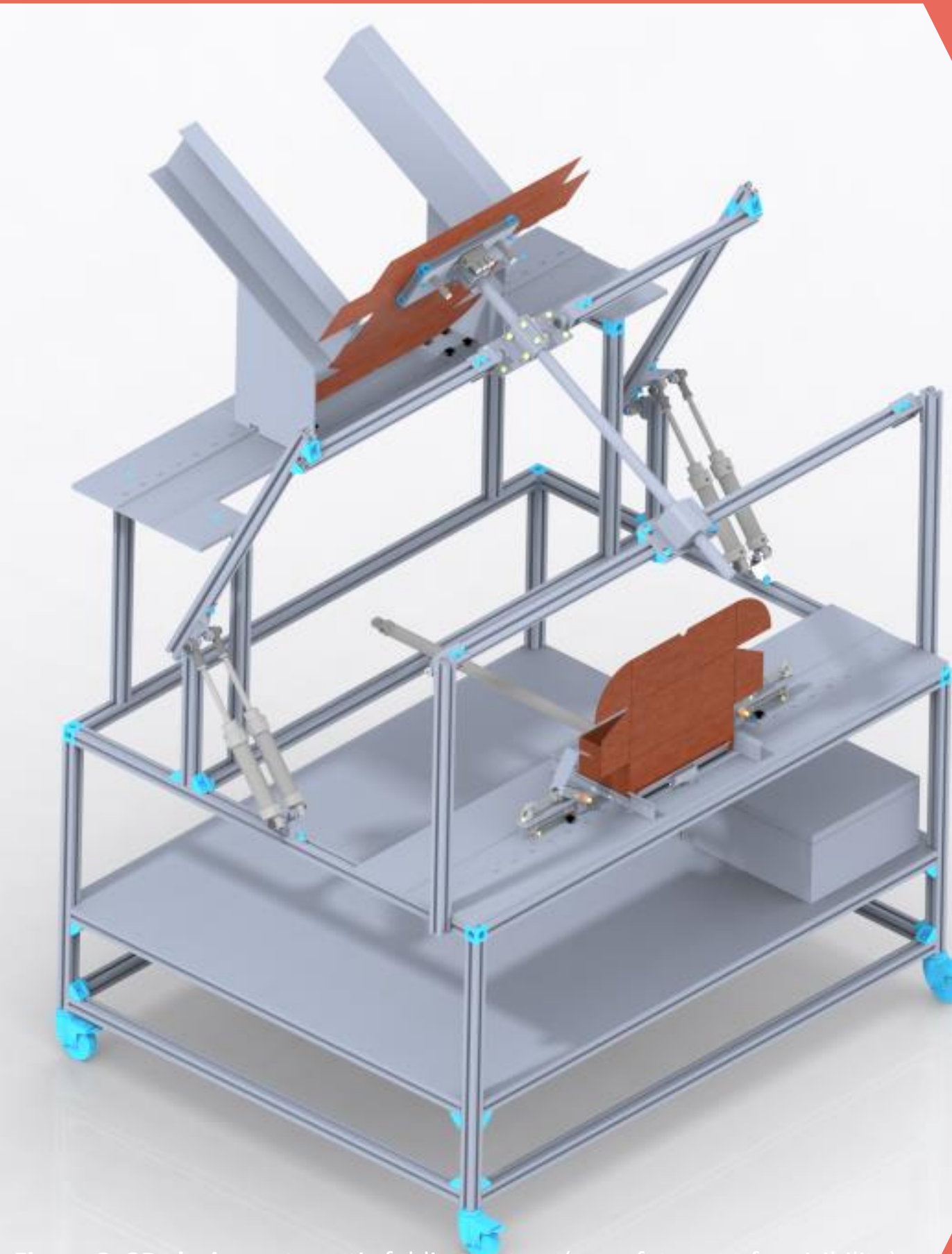


Figure 2: 3D-design automatic folding system (no safety cage for visibility)

Output buffer

Once ejected out of the press basket, the boxes sit in a waiting line on the packaging table. The ejection piston is responsible for pushing the line forwards. The waiting line is equipped with sensor feedback to signal when the line is full.

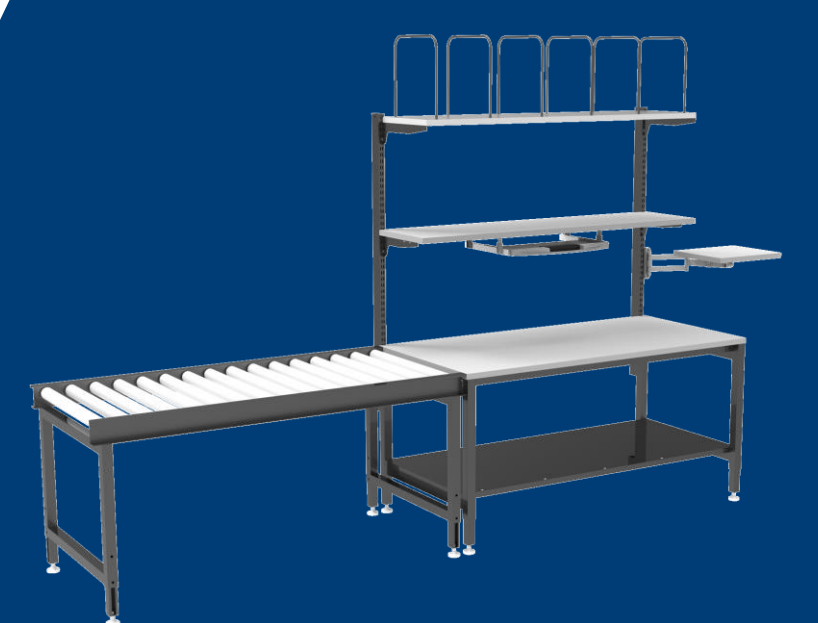


Figure 6: packaging table

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