

Automation of sawing and drilling operations for aluminium profiles

Frederick Grosemans and Kaan Tas

Electromechanical Engineering Technology

Situation

The Bachelor thesis will be made within the company LASE in Herk-de-Stad. LASE is an intermediary in automation projects within the automotive industry. Since 2001, the company has been providing full-service automation projects to automobile manufacturers [1]. To realize the projects, LASE uses aluminum profiles. These profiles are first machined to meet the requested dimensions. Figure 1 shows an overview of this process. The assignment for this Bachelor thesis is to automate this process.

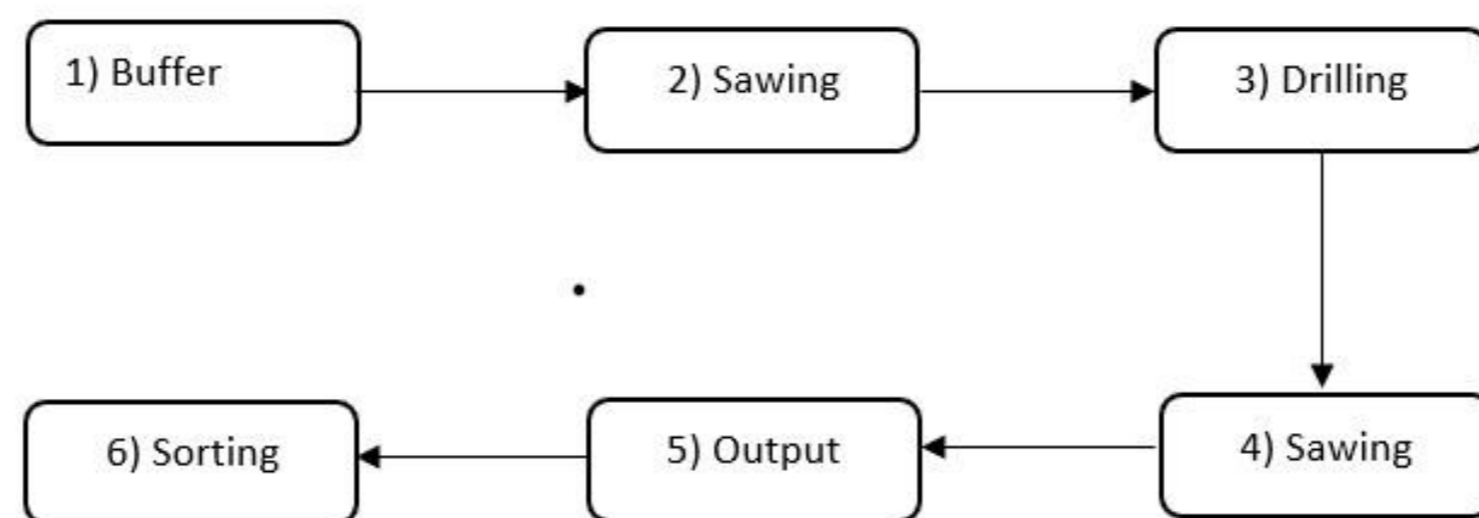


Figure 1: Schedule working principle

Problem

With the method of work in figure 1, four problems arise :

- The **loss of time**. If a worker performs all the steps as explained in the situating, he quickly loses five to 10 minutes.
- **Human error** can occur in manual operations.
- **Insufficient buffer capacity**. As shown in figure 2, there is only room for one profile.
- **The lack of entrapment**. In the sawing process, trapping is only provided in the vertical direction, as shown in figure 3. In addition, the drilling process contains no entrapment.

Results

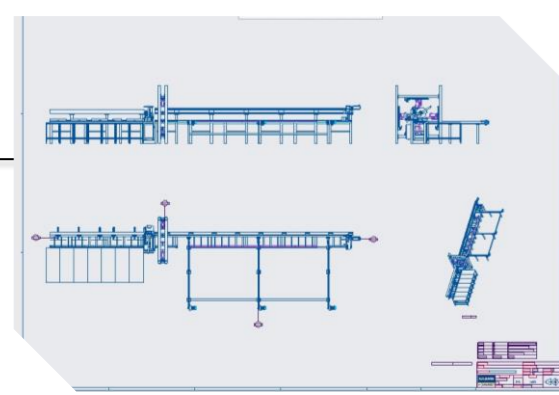


Figure 7: Drawing assembly

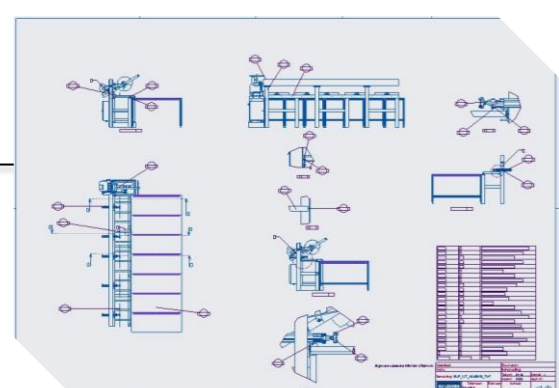


Figure 6: Drawing buffer

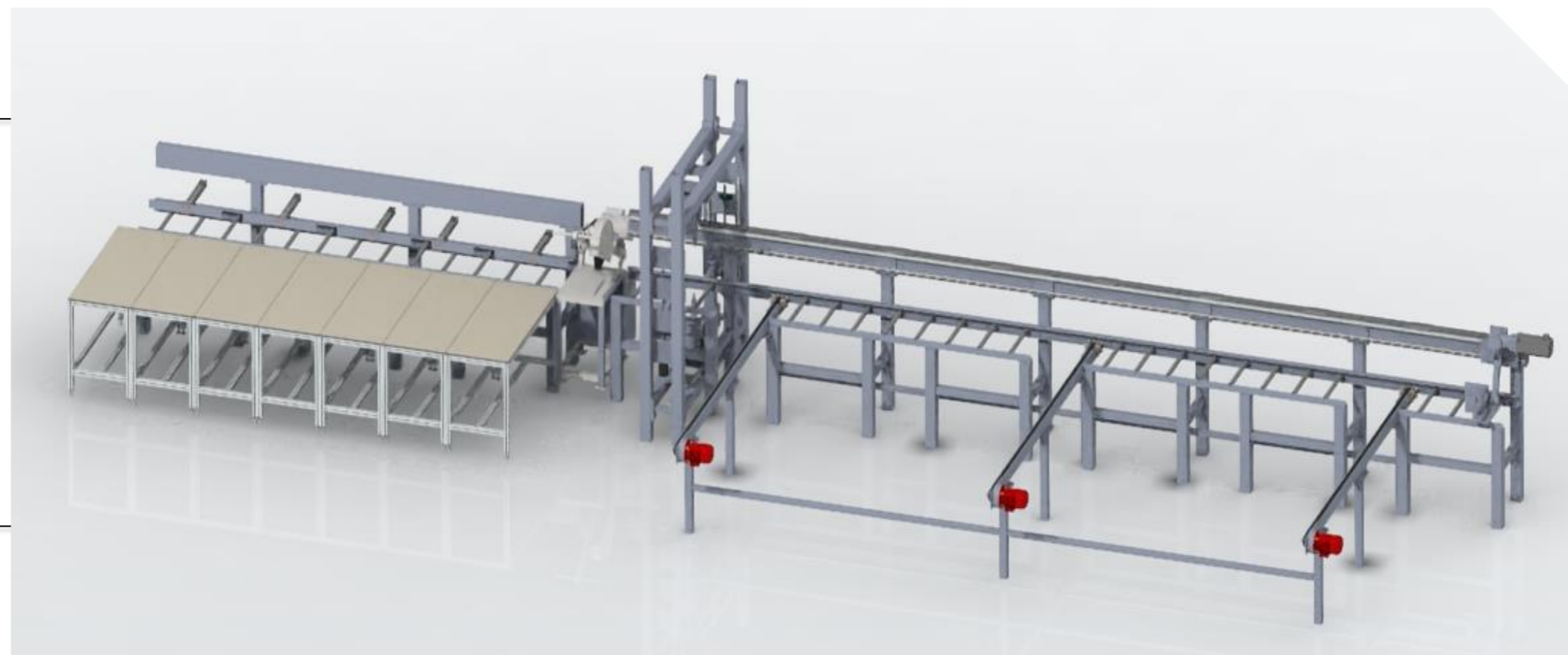


Figure 8: Final Result



Figure 2: Buffer



Figure 3: Trapping vertical direction

Method

The order of the method is explained chronologically below.

- A function block diagram was made of the objectives.
- A morphological overview was made of the various possible solutions to these problems.
- One solution was chosen and further developed to concept level. Figure 5 shows a concept drawing.
- Drawings were made using the CAD program PTC Creo. Figure 6 and 7 show these drawings. Figure 8 gives the final result.

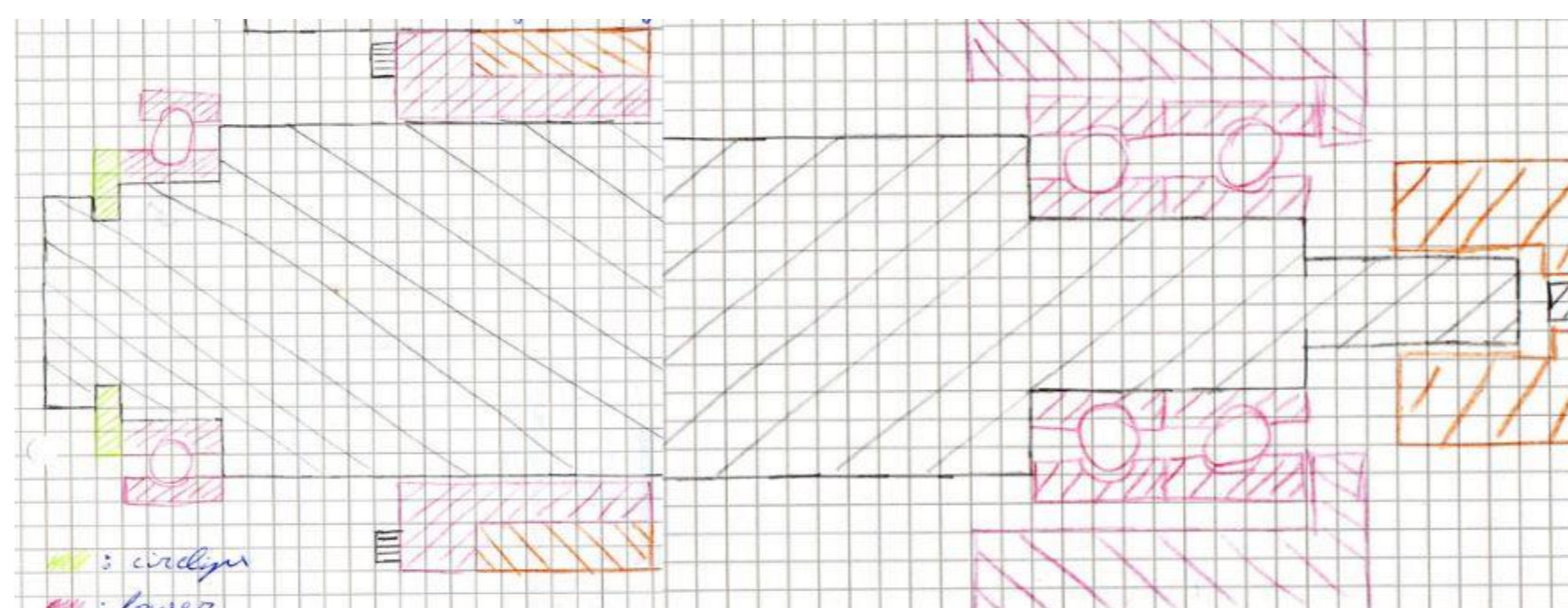


Figure 4: Concept drawing

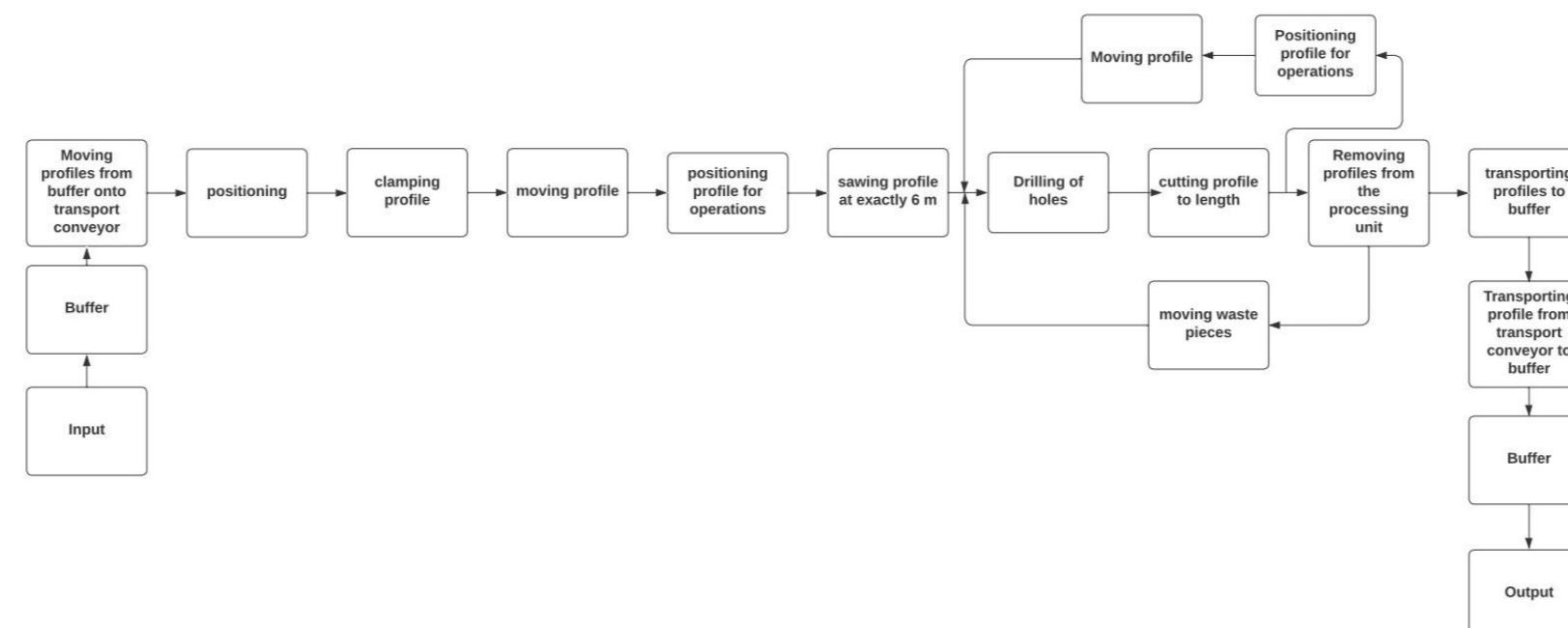


Figure 5: Function block diagram

Objectives

The objectives for this thesis are:

- A maximum price of 50 000 euros.
- Machine may be maximum 14 meters long and 3 meters wide
- Machine must work with aluminum profiles varying between 20 x 20 and 200 x 100 mm²
- Profiles must not be damaged
- In one minute, there must be saw actions or one drill and one saw action.
- Machine must be able to drill in 4 planes
- A buffer of at least five profiles
- Tolerance for cutting is 0.1 mm
- Position tolerance for drilling is 0.5 mm

Supervisors / Co-supervisors / Advisors: Prof.dr.ing. Karel Kellens
 Prof.dr.ing. Michael Daenen
 ing. John Bijmens

[1] Lase, „Join our team” 2022.[Online].Available: <https://www.lase.be> [Opened 28 oktober 2022]
 [2] LASE group, „LASEgroup machinebouwer,” 2018. [Online]. Available: <https://www.lase.be/> [Opened 2 may 2023].