

GLASS PERFORMANCE DAYS 2025

AUTOMATIC LOADING OF FLAT TEMPERING FURNACE – POSSIBILITIES WITH TODAY'S SOFTWARE SOLUTIONS AND AI- BASED ALGORITHM



Drivers of Added Automation / Tempering

Labor

- Cost
- Availability
- Stability
- Product quality
- Absences

Idling / missed loadings

- No loading despite the furnace is ready
- Production control
 - Lunch, bio brake
 - Cigarette, chat
 - “No hurry”

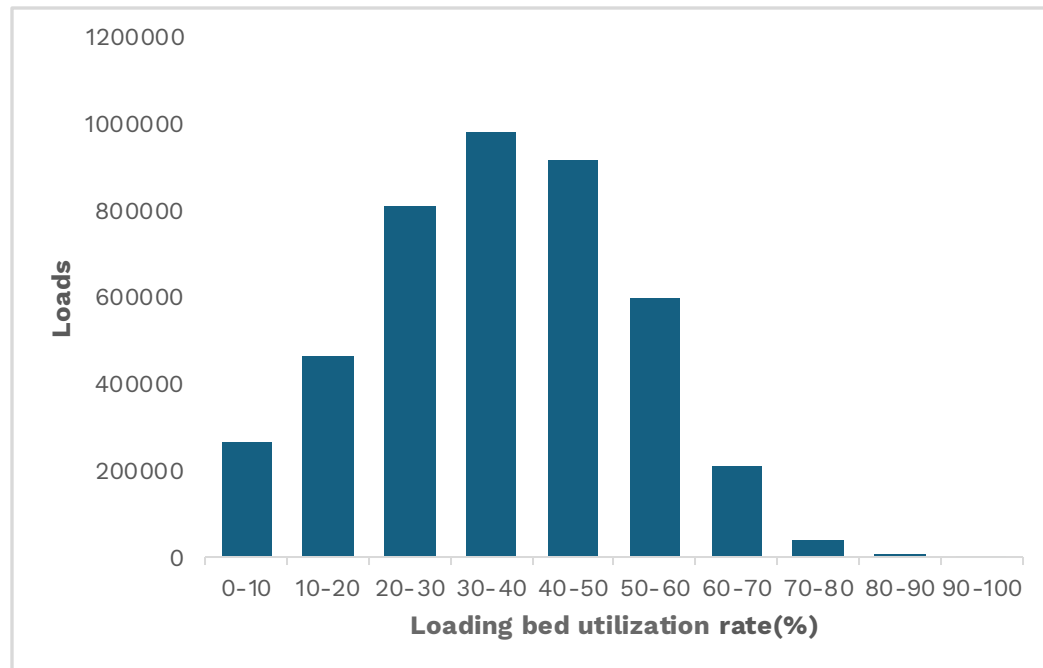
Bed Utilization

- Utilization rate
- Heating process rules

Production is Wasted More than Realised.



Wasted Loading Bed Utilization

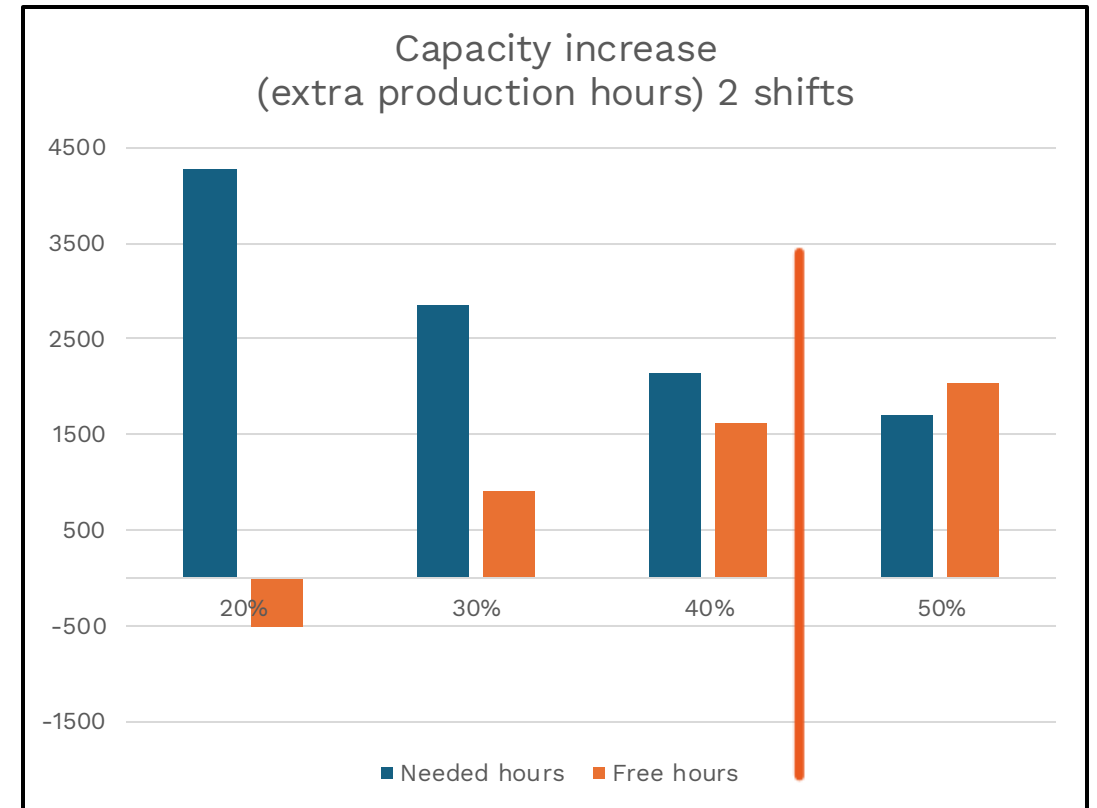


- 98 furnaces monitored since 2016
- 6,3M loadings and 38M glasses
- Average loading bed **utilization rate is 37%**

Wasted Production

- 200.000 m2 annual production
- Equal amount 4, 6, 8mm glass
- Furnace size 2800 x 6000
- 2 shifts

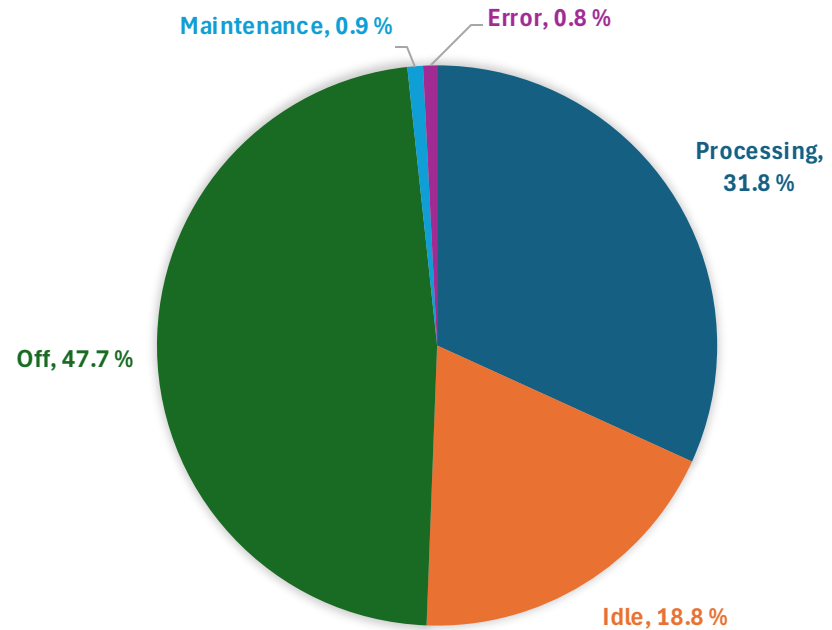
If loading bed utilization is 46,5%
=> Second shift not needed



Wasted Loadings

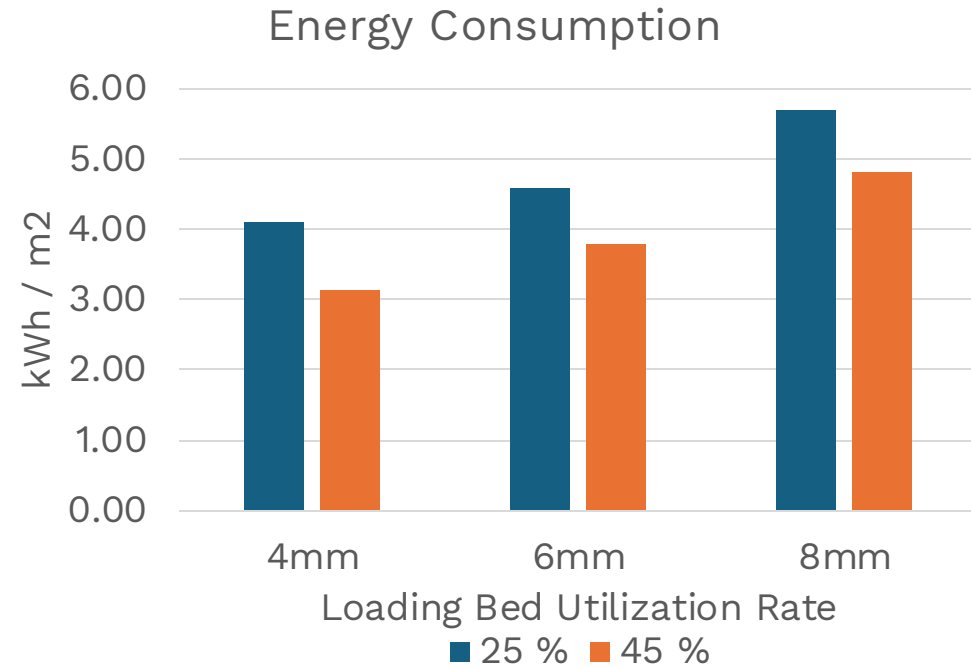
Furnace idling

- 106 tempering furnaces
- 2023 – 2025
- Idling varies a lot, being typically 10-45%



Wasted Energy

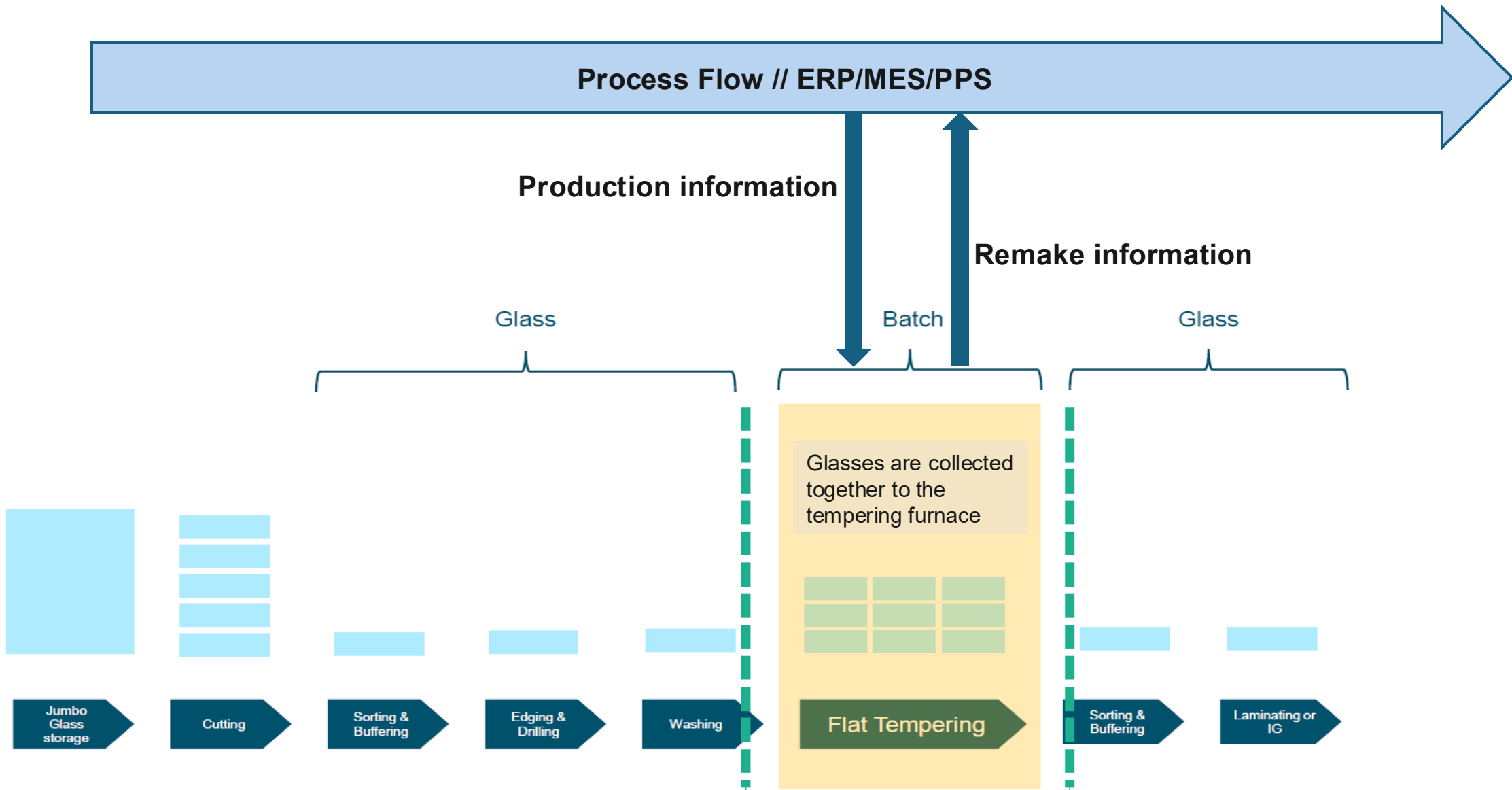
200.000 m² annual production
Equal amount 4, 6, 8mm glass
Furnace size 2800 x 6000
0,15 EUR/kWh



Increasing loading bed utilization from 25% to 45%
=> Annual savings: € 79.000,-

Improving Efficiency is Possible





Parameters of the AI-based Algorithm

Fixed

- Furnace type
- Furnace year model
- Furnace size
- Optional enhancements

Variables

- Type of production
- Variation of the production
- Focus on capacity or quality
- Environmental conditions
- Rules of the tempering process



AI, Algorithm and Tempering Furnace

- Algorithm receives the production information from the production control (ERP/MES/PPS)
- Batch optimization algorithm connected to **furnace automation** forms a communicating interface and **adjusts the process parameters automatically**
- Batch arrangement data can be utilized to operate an automatic loading with robotized solution

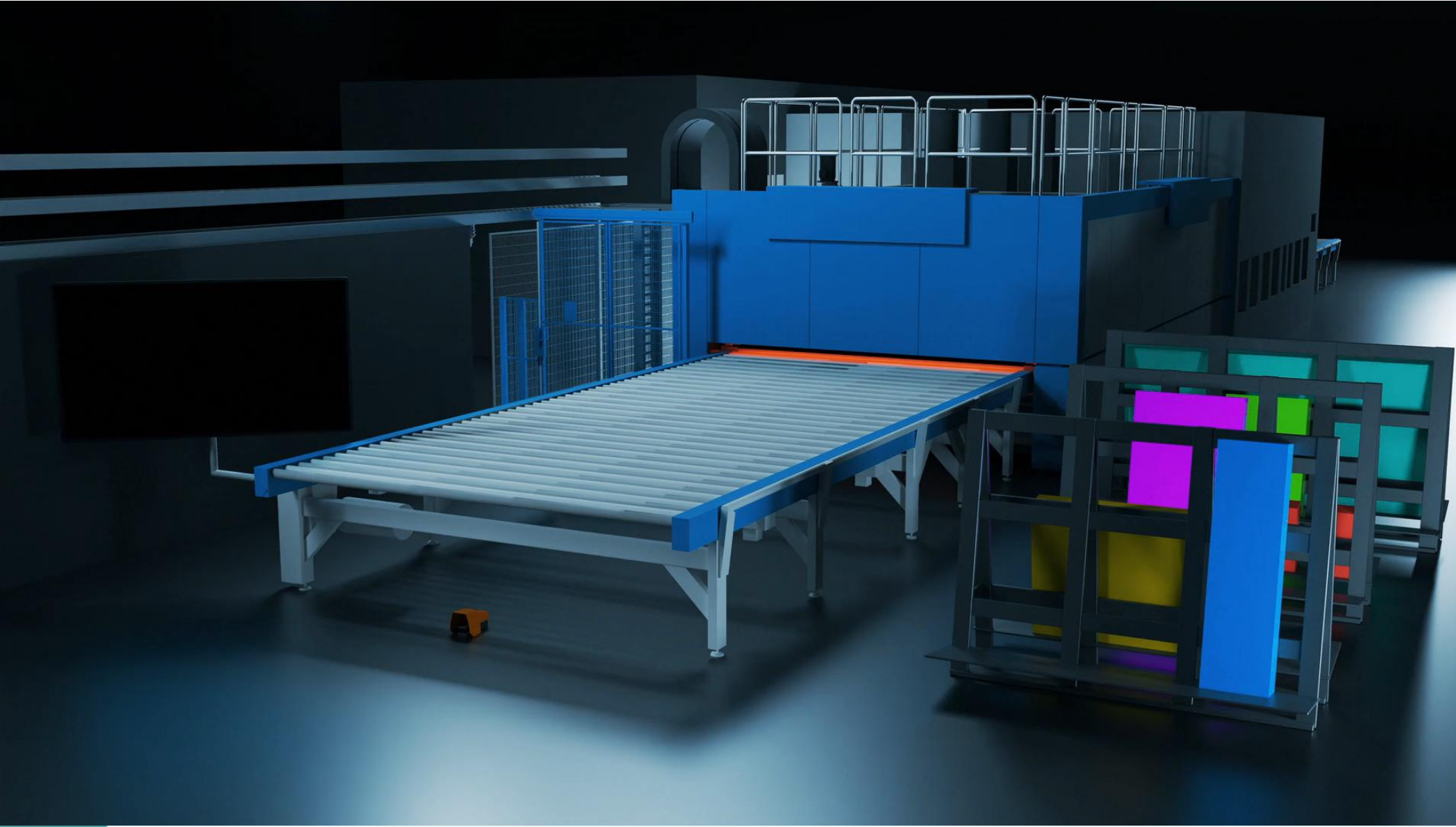
Optimized Loading

Batch 3 / 58 8 mm Clear



1.	116 Rack: Rack3	1045 x 1440 Rack side: B
2.	103 Rack: Rack3	1076 x 1345 Rack side: A
3.	104 Rack: Rack3	1076 x 1345 Rack side: A
4.	47 Rack: Rack2	902 x 1302 Rack side: A
5.	48 Rack: Rack2	902 x 1302 Rack side: A
6.	1 Rack: Rack1	878 x 1239 Rack side: A
7.	132 Rack: Rack3	765 x 1672 Rack side: B
8.	133 Rack: Rack3	765 x 1672 Rack side: B
9.	134 Rack: Rack3	765 x 1672 Rack side: B

Optimized Loading



UNLOADING INSTRUCTOR glaston

Batch 10 mm clear Next batch: 300s

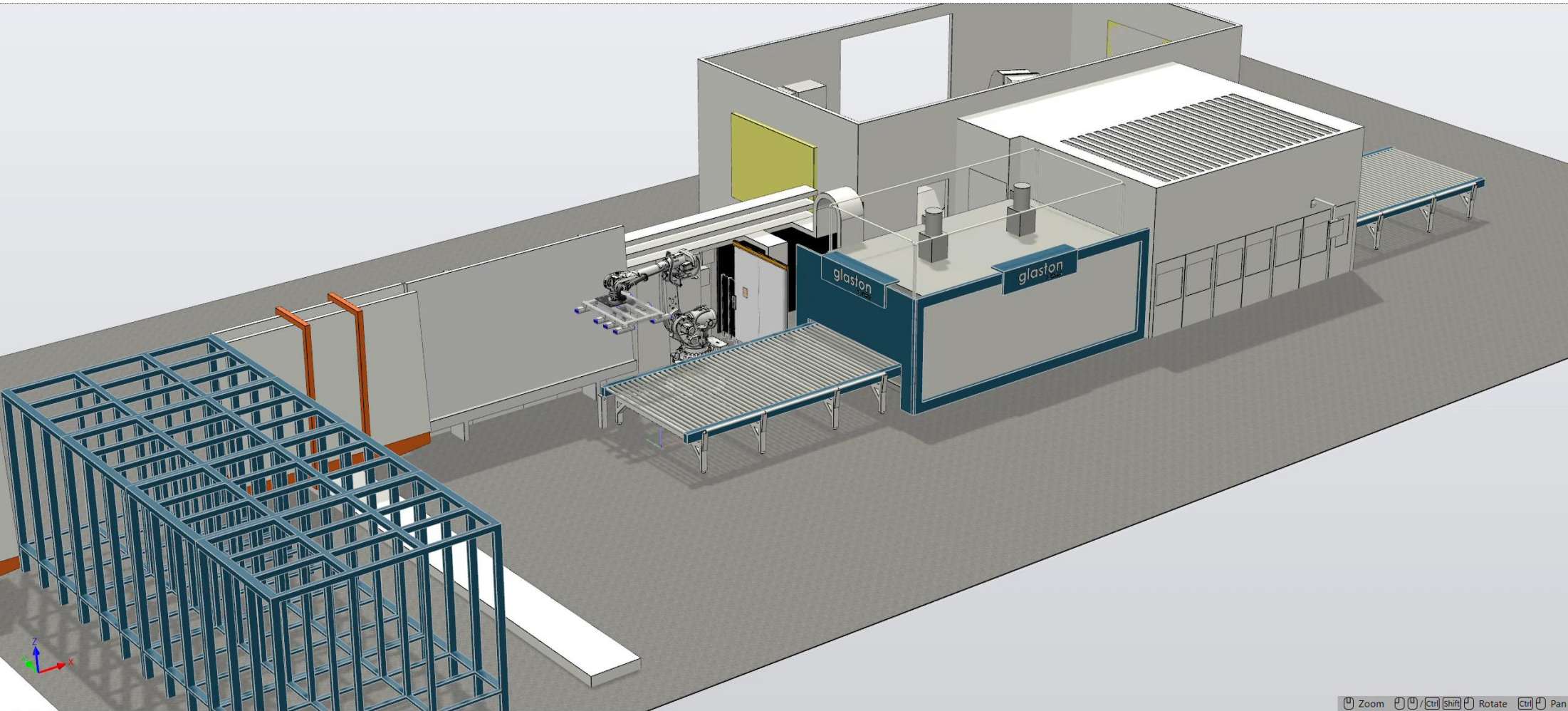
7	8	1 T.RACKID pos/pos Order ID 1800x2200 mm	5 T.RACKID pos/pos Order ID 1800x2200 mm
5	6	2 T.RACKID pos/pos Order ID 1800x2200 mm	6 T.RACKID pos/pos Order ID 1800x2200 mm
3	4	3 T.RACKID pos/pos Order ID 1800x2200 mm	7 T.RACKID pos/pos Order ID 1800x2200 mm
1	2	4 T.RACKID pos/pos Order ID 1800x2200 mm	8 T.RACKID pos/pos Order ID 1800x2200 mm

Unloading; Mixing Orders is Possible

Automated Loading



Automatic Loading



Zoom Rotate Pan

Automatic Loading




Wasted Production?



Improving the Efficiency is Possible

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