



G R E N Z E B A C H

W E L C O M E >>>

Sophisticated Glass Handling and Processing in the era of Industry 4.0

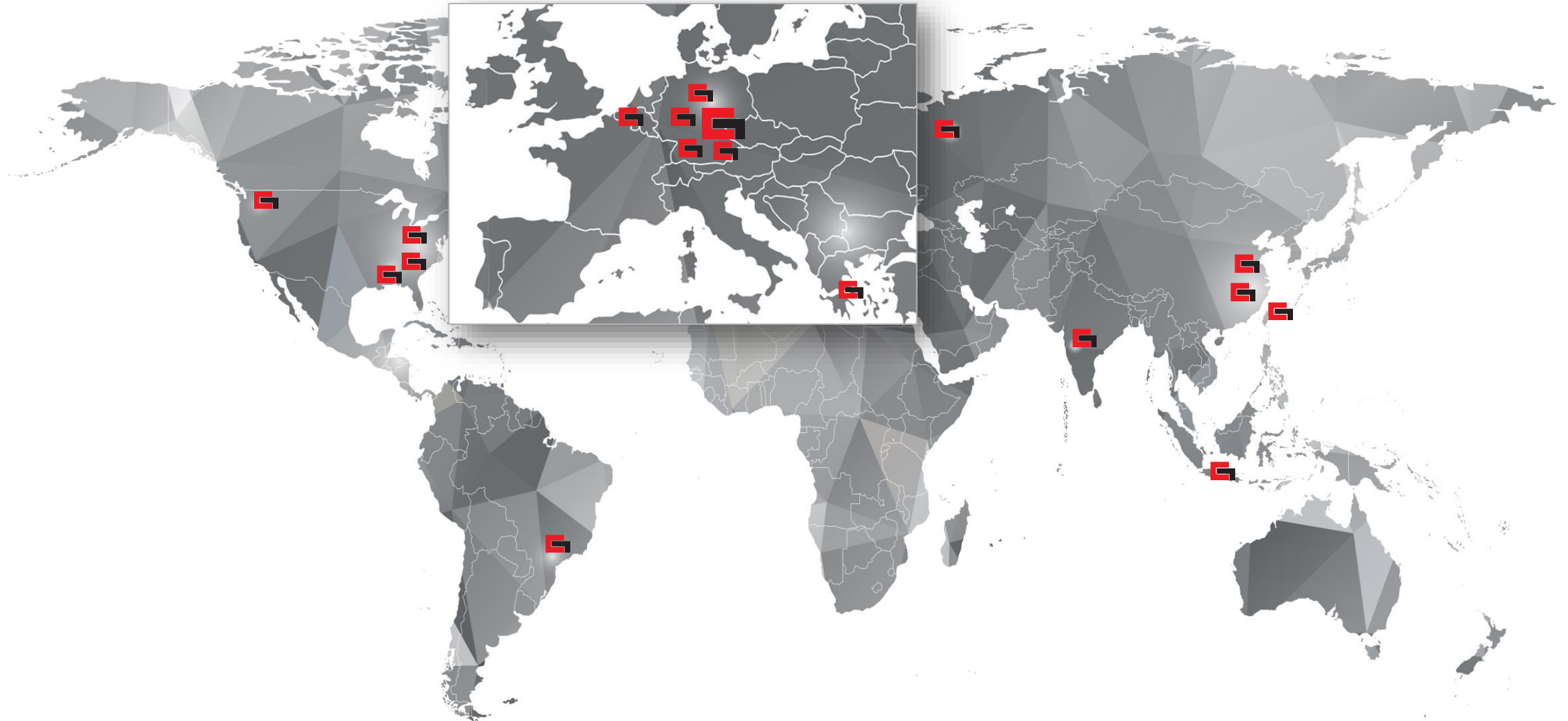
Jan Lukassek, Area Sales Manager Glass Technology
glasspex Exhibition in Mumbai, October 10, 2019

- 1 | Grenzebach Data and Facts
- 2 | Glass Production Technology
- 3 | Grenzebach Digitalization / SERICY
- 4 | SERICY Applications



Expanding over the decades, Grenzebach now supplies international production technology for a variety of industries.

- » 1,500 employees worldwide
- » 3,000 plants installed in 55 countries
- » Production facilities in Germany, the US and China
- » Rudolf Grenzebach founded the company in 1960 and still today, the international high-tech company is owned by the family





GLASS PRODUCTION TECHNOLOGY



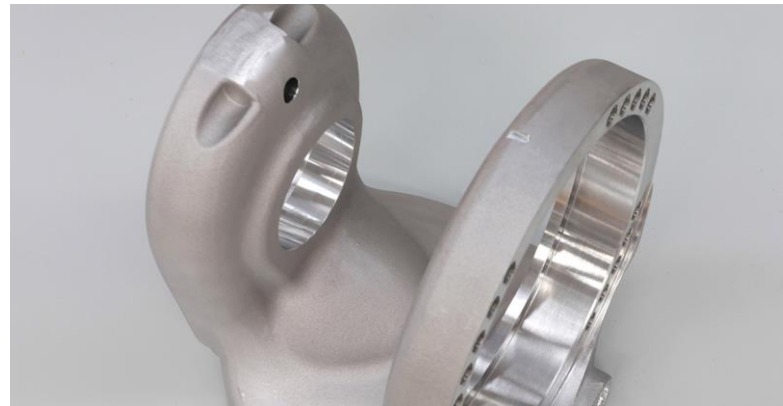
BUILDING MATERIALS PRODUCTION TECHNOLOGY



INTRALOGISTICS



 **GRENZEBACH**
FRICTION STIR WELDING SYSTEMS
FRICTION STIR WELDING



CASTING PARTS



PROCESS TECHNOLOGY



Float Glass:

- » From endless glass ribbons to stacked individual sheets to the glass warehouse



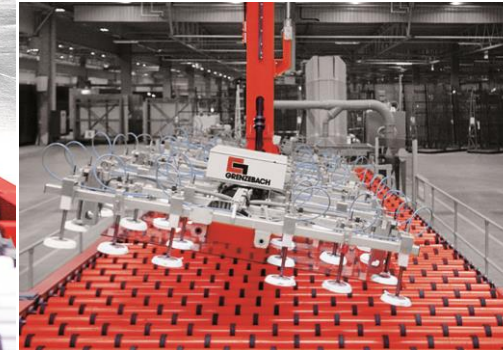
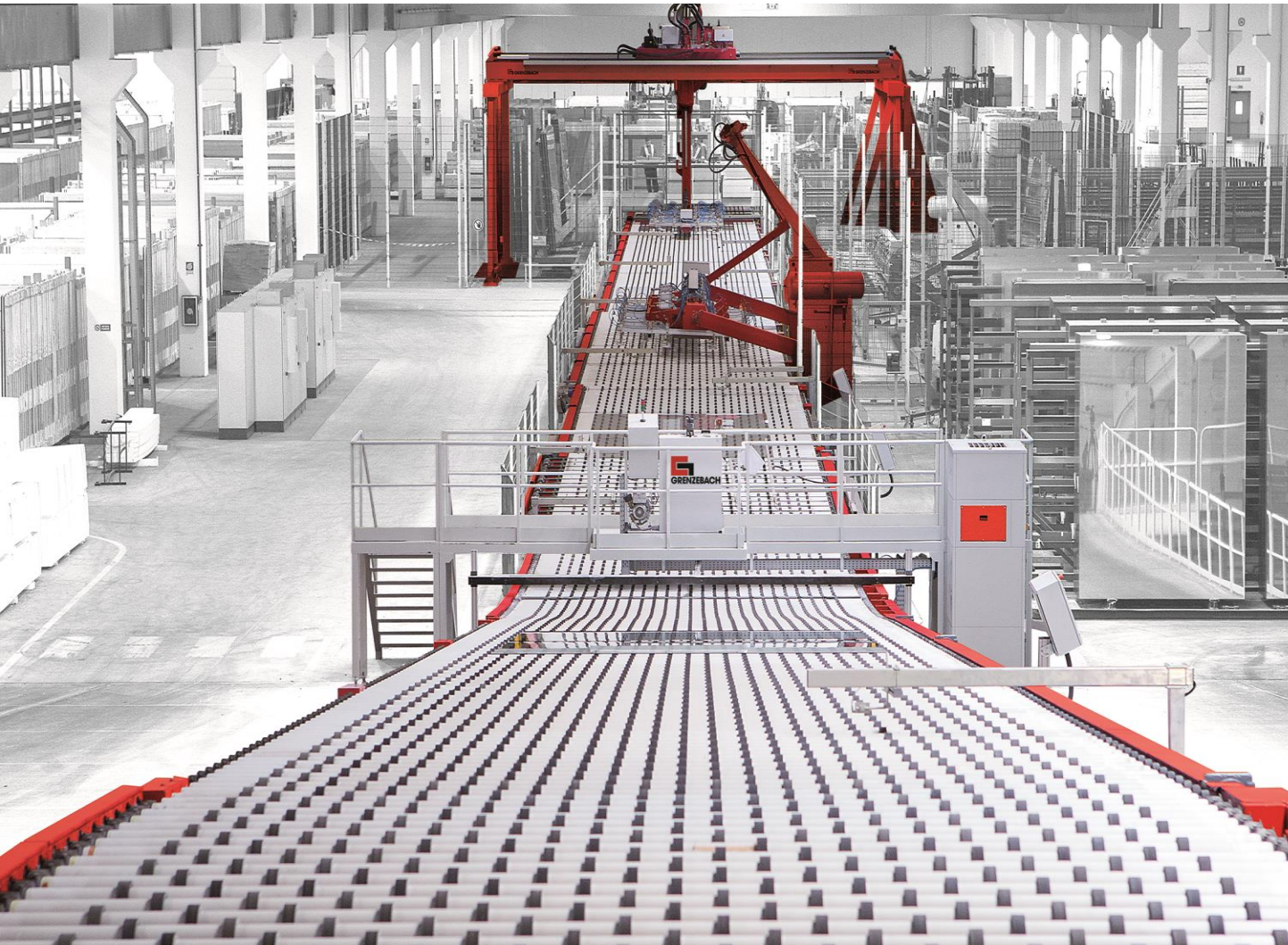
PVD Coating Technology:

- » From raw material to an energy efficient building element



Solar:

- » Planning and overall automation of Thin-Film solar manufacturing equipment



Equipment for the processing and handling of flat glass:

- » Transport, cutting, snapping and stacking
- » Thin and thick sheets: from 0.3 - 25 mm
- » Sheet lengths: up to 24 m
- » Daily output: up to 1,200 t
- » More than 300 Grenzbach lines installed worldwide

GRENZEBACH | Float Glass



Over 40 years experience:
From the glass ribbon (Cold End) via the stacked single sheet to the glass warehouse - Grenzbach sets standards for the flat glass industry.

Float glass, pattern and wire glass, thin glass, coated glass, laminated glass, mirror glass and other special-purpose glass are manufactured on Grenzbach lines.



- » Snapping of glass
- » Main snap roll snaps the cross scores
- » The edge trim conveyors snap the edge by knock-off rolls
- » The longitudinal scores are snapped on the roller conveyor and separates by chevron roller



Handling of glass sheets by:

- » Direct stacker (tin-air side mode)
- » Under-table stacker (tin side mode)
- » Pick on the Fly Robot (air side mode)
- » Swinging stacker (air side mode)

GRENZEBACH | Float Cutting Optimization Systems

History and Installed base

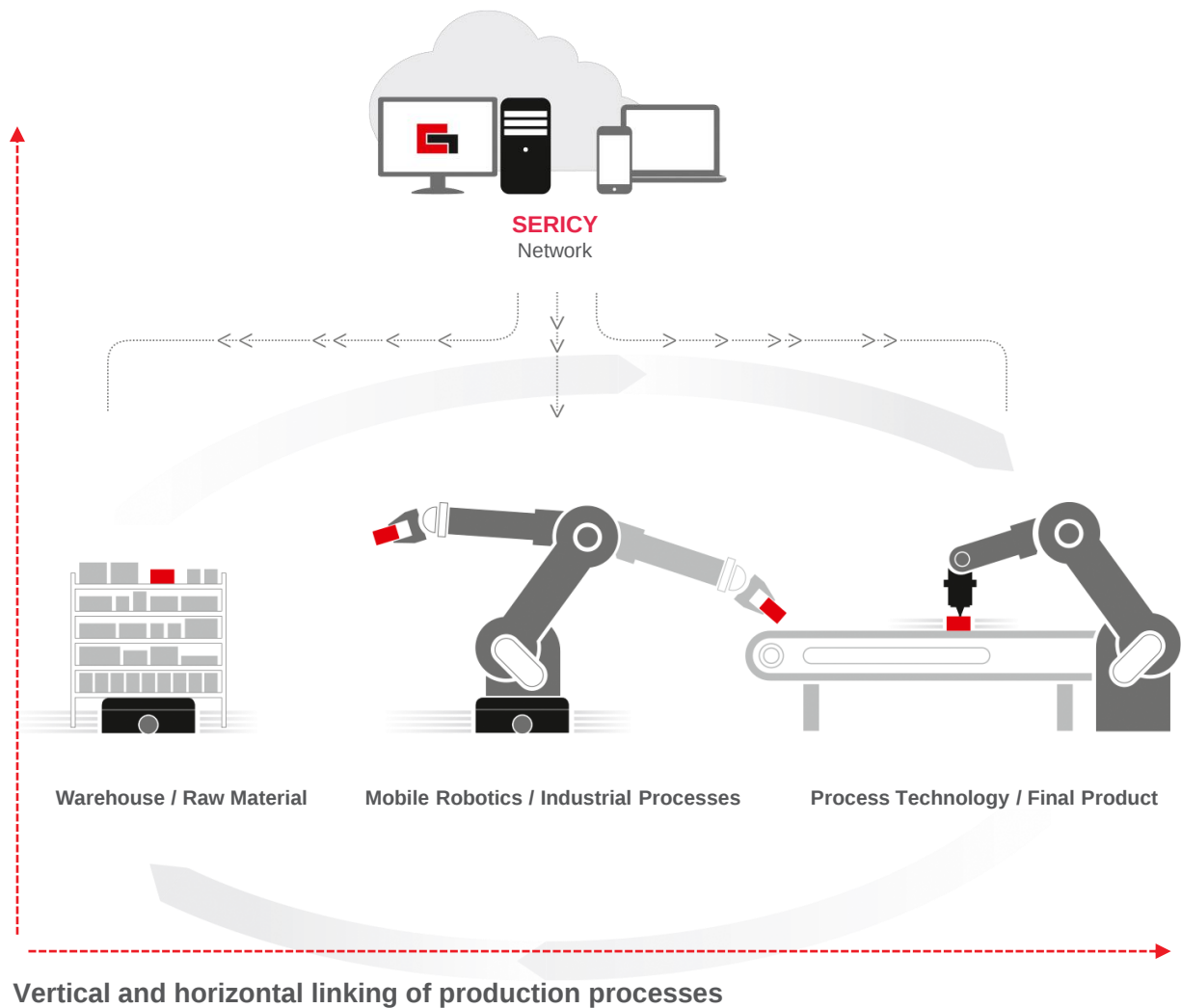


- » 30 years of cut optimization systems – first applications in year 1990
- » More than 200 system installations worldwide
- » High reliability and availability by redundant system and data storage concept
- » Designed to last long by taking furnace lifetimes / cold tank repairs into account
- » Server based redundant architecture
- » Since 2000 two main product families → PPC Production Process Control and CTS Cut to size system
- » Numerous interfaces to ERP and other enterprise systems, e.g. for automated job download and production data feedback for reports, statistics, labels, etc...
- » Highly developed system | Improved to the best over the years | Covering almost every situation and demand
- » But ... if you now want to further improve yield, quality, cost situation → **a new approach is needed**



SERICY.

fast,
reliable,
cost-efficient



Grenzebach presents a clear vision showcasing tomorrow's human-machine collaboration.

SERICY | Why Grenzebach Digital? The foundation



- » Independence from the four Business Units
- » Developing software technology leadership
- » Increasing flexibility & accelerating decision making
- » Establishment of an independent partnership network with other software and service companies
- » Implementation of best practices for the development process



Quality

Improve product quality

Quantity

Increase output & yield

Resources

Reduction of costs

Key to success:

- » Generate customer value
- » Data generation, collection, comprehension
- » Additional features, like analytics, error patterns, artificial intelligence, virtual reality, preventive and predictive, smart machinery (e.g. by load collective counter)
- » Product tracking and traceability will play a main roll as well
- » Usability and user assistance by smart systems (settings manager, thickness monitor assistant, messaging to mobile devices)
- » Benefit from new technologies (video tutorials, trainings, mobile documentation, ...)

Current Status of PPC and CTS

Cold End overview



- » Glass Defect Inspection
- » Evaluation area
- » Ribbon inspection FSE

- » Scoring (longitudinal / cross)
- » Snapping (cross)
- » Snapping (edge trims & center)
- » Plate inspection FSP

- » Product distribution
- » Product handling and stacking
- » Product disposal

Opt System
Monitoring Range

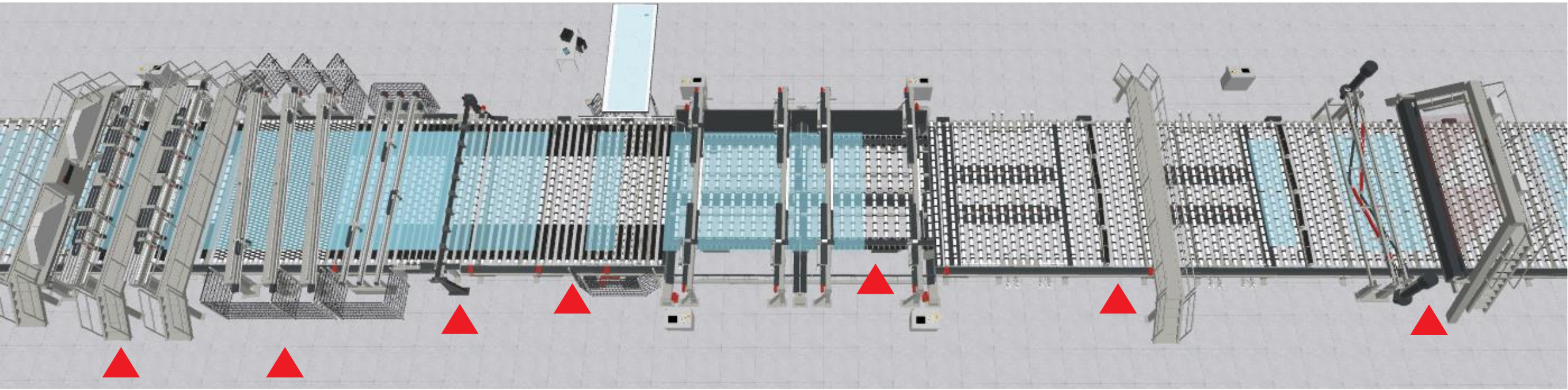
Limited range

Look ahead system CTS

Look ahead- wide range system - Production Process Control | PPC

Smart Plate Inspection

Use case: defect pattern recognition through data analysis



Longitudinal cutters

Cross cutters

Cross snapping
by main snap roller

Acceleration of
individualized plates

Edge trim snap
by knock off rolls

Center snap
and chevron

Camera inspection
FSP Float Scan Plate

- Length & width
- Rectangularity
- Edges
- Corners etc.

Bring existing information into relation and recognize defect patterns

Glass Inspection Systems

Use case: Grenzebach FSE-d: Closed Loop Feedback



Glass ribbon camera system for detection of:

- » Glass ribbon edge position
- » Outer edge position of knurl mark
- » Inner edge position of knurl mark
- » Evaluation of ribbon gross width
- » Evaluation of ribbon net width
- » Evaluation of knurl mark width

Provision of important information for:

- » Production process control system; eg. ribbon drift
- » Cutting control system; eg. cutting head positioning
- » Product and process optimization
- » Product quality control and tracing
- » Yield tracking and reporting

Articulated Tin- / Airside Stacker: TASS

Use case: Grenzebach TASS Information



High Speed Tin-/ Airside Stacker & Loader for small to medium flat glass formats

- » 3-axis stacker
- » Tin-/ airside handling of flat glass
- » Stacking and de-stacking of glass
- » Single stream and dual stream handling of glass
- » Glass width up to 2 meters
- » Payload up to 60 kg
- » Up to 20 cycles/min for stacking in tin & air mode
- » Up to 10 cycles/min for de-stacking in tin & air mode
- » Super flexible for various pick up & drop off heights, rack inclination and stacking depth
- » Serves numerous types of glass racks
- » Indexing functionality by stacker kinematics
- » No indexing on platform required
- » Integrated mechatronics unit

Product Identification & Traceability

Use case: Trace your product from start to finish



Wide range of product traceability solutions covering future demands

- » Track your product through the entire production chain
- » Identification of each and every product
- » Identification by the help of radio transmission
- » Digital fingerprint of product
- » Inline and offline solutions
- » Local or cloud-based data storage
- » Carries and provides important product data such as: product type, production date, status, quality, dimensions, weight, production facility, defects, ...
- » Customized tags

Product Tracking & Traceability – Data on Glass

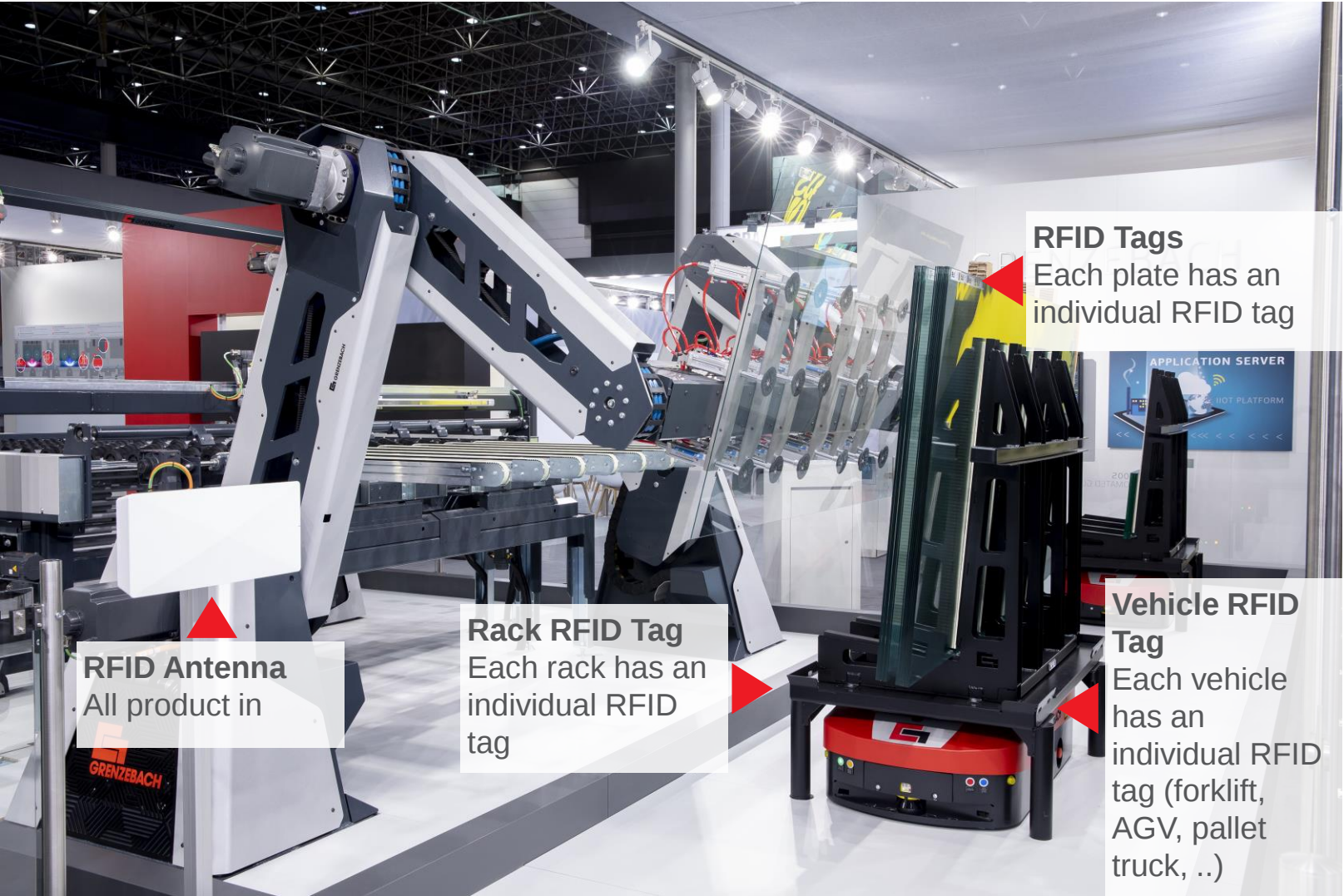
Use case



RFID Technology

- » Complete readout of vehicle, rack and all individual glass plates by passing the antenna
- » Stationary or handheld units
- » All data stored in central database
- » Access to individual plate information (type, size, date, defects, defect positions, defect class, powder, coatings,
- » Access by either scanning of RFID, QR code or ID editing.
- » Automated scan and information download for downstream machinery (eg. Cutting table, tempering line, coater line)
- » Clear identification by shipping department
- » Ability to detect, if shifts operate in different way
- » Constant improvement by trained database
- » Monitoring of deviations to recommend setting

SERICY | Product Tracking & Traceability (2/2)
Use case



5 Reasons why Grenzebach is your perfect partner





GRENZEBACH

THANK YOU >>>

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