

# SMART FACTORY, REAL WORLD

Automation Strategies for  
Glass Fabricators

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AI Specialist for Glazing  
thinkivity AI  
*moderator*

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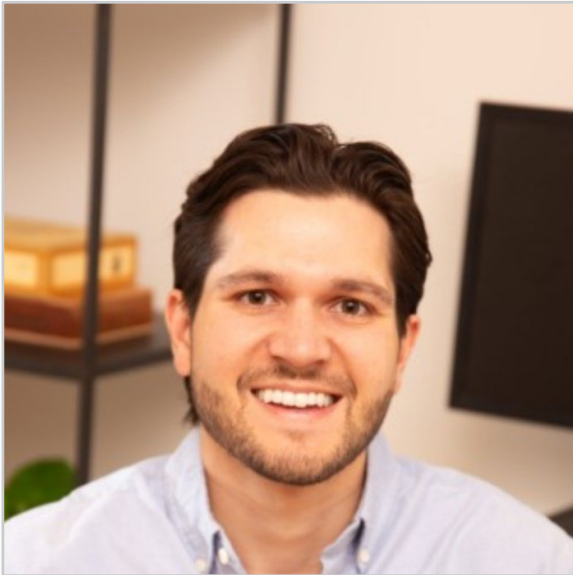
# Built for the floor. Designed for the business.

The modern, AI foundation that every machine, plant, and team runs on — turning power data into action on the P&L.

Maxwell Garrow · Solutions Engineering Manager

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# Maxwell Garrow

**Solutions Engineering Manager**

Guidewheel

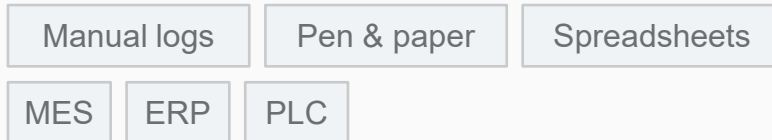
[maxwell@guidewheel.com](mailto:maxwell@guidewheel.com)



# Today's Data Is a Patchwork

## BEFORE

**Sources, spreadsheets, guesswork,  
and gut feel.**



Inconsistent, stale data means leaking margin  
and missed targets.

## WITH GUIDEWHEEL

### **One unified source of truth**

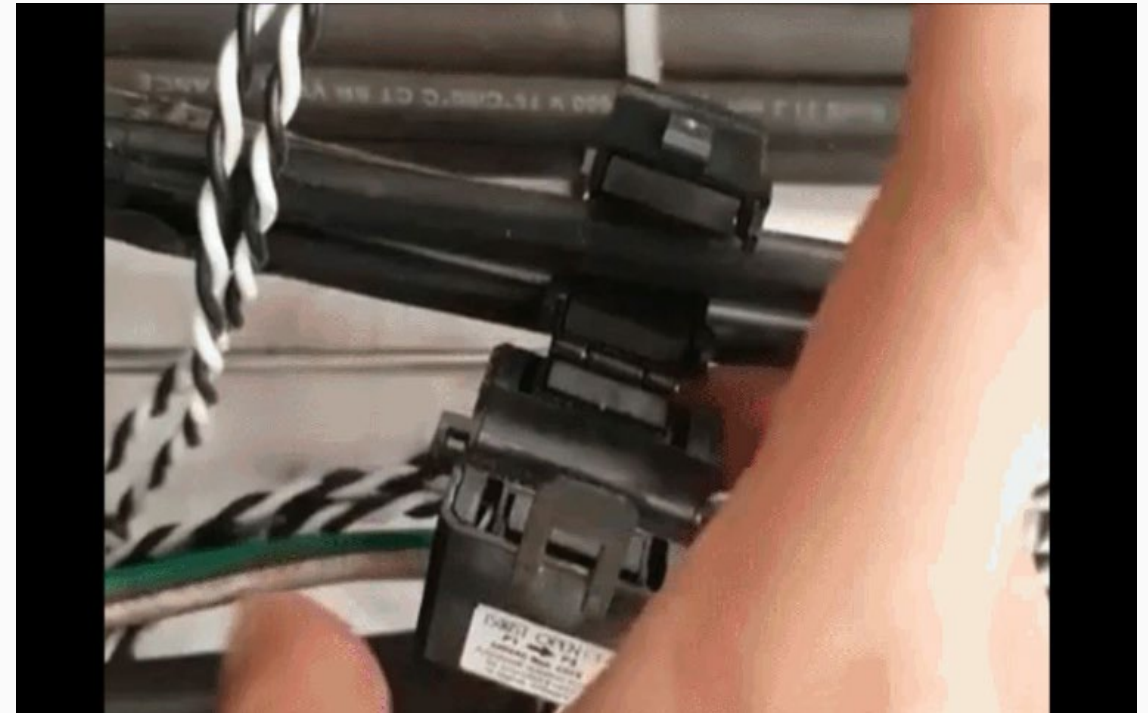
The modern, AI foundation that every machine, plant, and your whole team runs on.

**It doesn't just surface data — it guides your team to actions that move the P&L.**

# Real-Time Visibility on Every Machine

## Read any machine's power 'heartbeat' on day one — with simple, clip-on sensors.

- Improve efficiency and pinpoint downtime across all of your operations.
- Works on any machine — layer on any other sensors or data you want.
- Air-gapped. No PLC, OT network, or cyber risk.



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# One Platform: Machines + Teams

Guidewheel brings together machine-level data and team workflows to drive **fast, scalable ROI**.

## MACHINES

### The common denominator

Power data from any machine on day one  
— clip-on, air-gapped, no IT project  
required.

+

## TEAMS

### See value quickly

Connected teams drive actions from the  
floor up — every shift, in real time.

→

## AI SCALES OUTCOMES

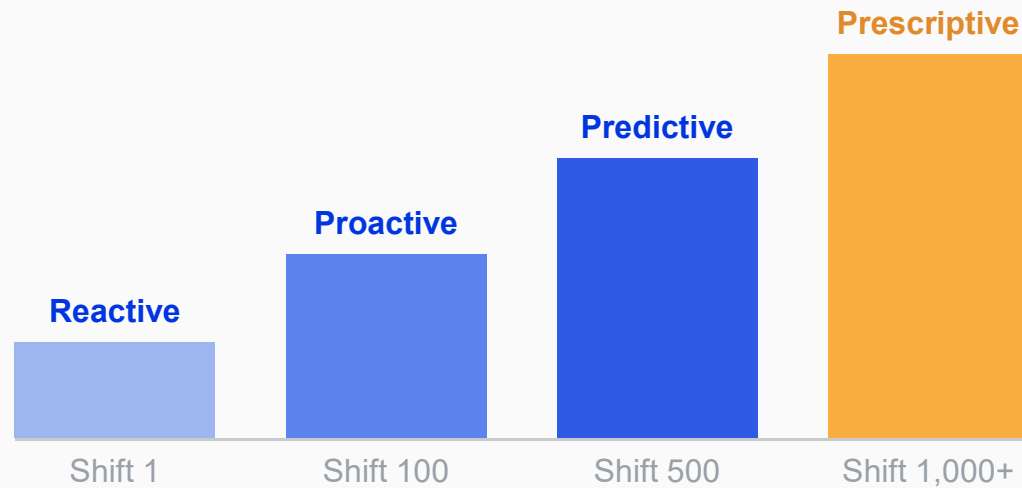
### Get smarter every shift

Customize and build on a foundation with  
AI that learns and grows with your team.

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# AI That Compounds Every Shift

Our AI amplifies and scales the expert knowledge of your people — and makes sure it's never lost. The more data it has, the smarter it gets.



## StateSense

AI-powered machine state detection and downtime tagging.

## Cycle Counting

Keeps setup and calibration simple — counts automatically.

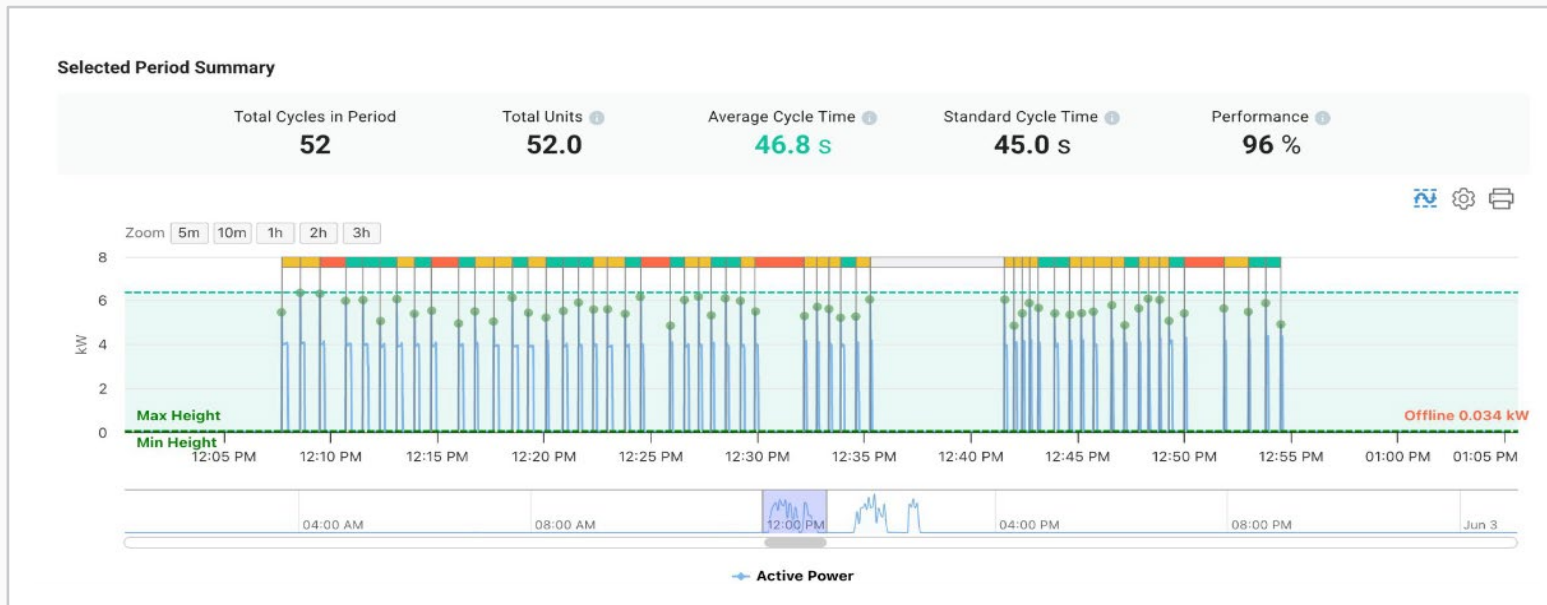
## Throughput Forecasting

Make timely decisions and course-corrections.

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# Power Data Reveals Cycle Time — Automatically

Guidewheel's AI reads every machine's power signature to detect cycles, flag deviations, and track throughput in real time.



**52**  
cycles detected in period

**46.8s**  
avg cycle time · vs 45.0s  
standard

**96%**  
AI-scored performance vs target

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# One Truth, From HQ to the Floor

## One common language driving decisions and actions from headquarters to plant floors.

Always at your fingertips — instantly know exactly what's happening, on every machine and at every plant.

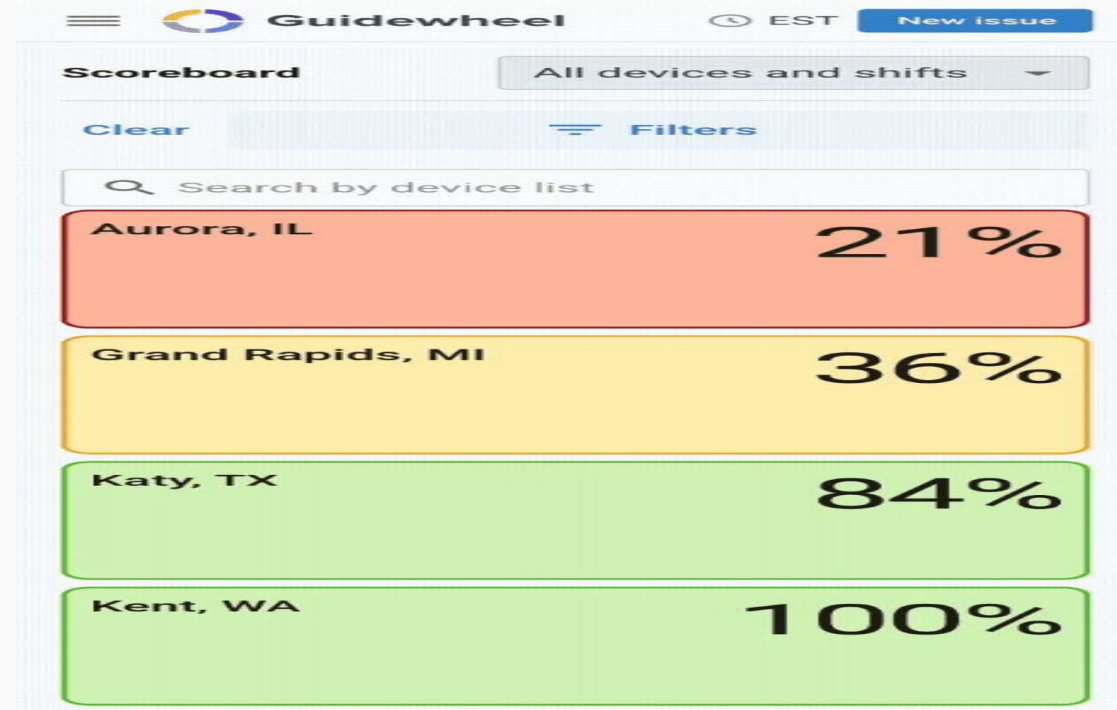
**HQ**

Executives & analysts



**Floor**

Operators & team leads



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## Move from data to driving revenue and margin.

Drive decisions and financial impact through behavior change — putting one real-time source of truth in front of every role.

Analysts

Operators

Team leads

Managers

REAL-TIME INTELLIGENCE



BEHAVIOR CHANGE ON THE FLOOR



**Revenue & Margin**

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# Proven on the Floor

## 8.4%

year-over-year efficiency  
increase

## 50%

faster response to downtime  
events

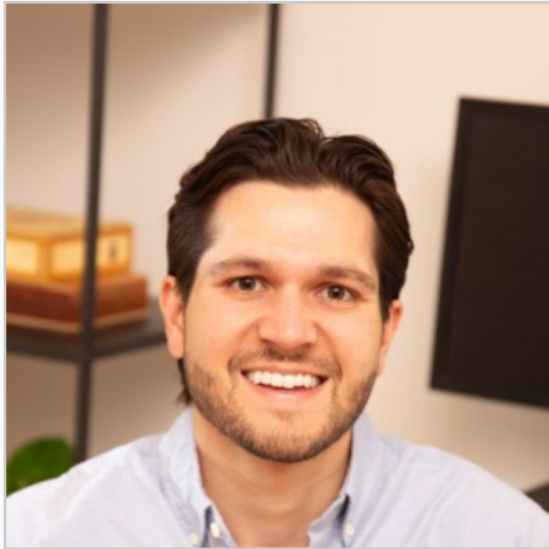
- Moved off pen & paper to a Guidewheel “control room”
- Scoreboard on monitors across the plant floor
- Reliable, actionable data driving decisions

“The team is getting the taste of winning and they like it. It gives them the scoreboard each day to keep up on — who's ahead — and they have a little competition. It's a big motivator.”

**Plant Manager**

Guidewheel customer

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# Thank you.

Built for the floor. Designed for the business.

**Maxwell Garrow**

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# AUTOMATION BEYOND THE MACHINE

Key Factors for Successful  
Integration in Glass Fabrication

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## EVOLUTION OF AUTOMATION IN FLAT GLASS PROCESSING

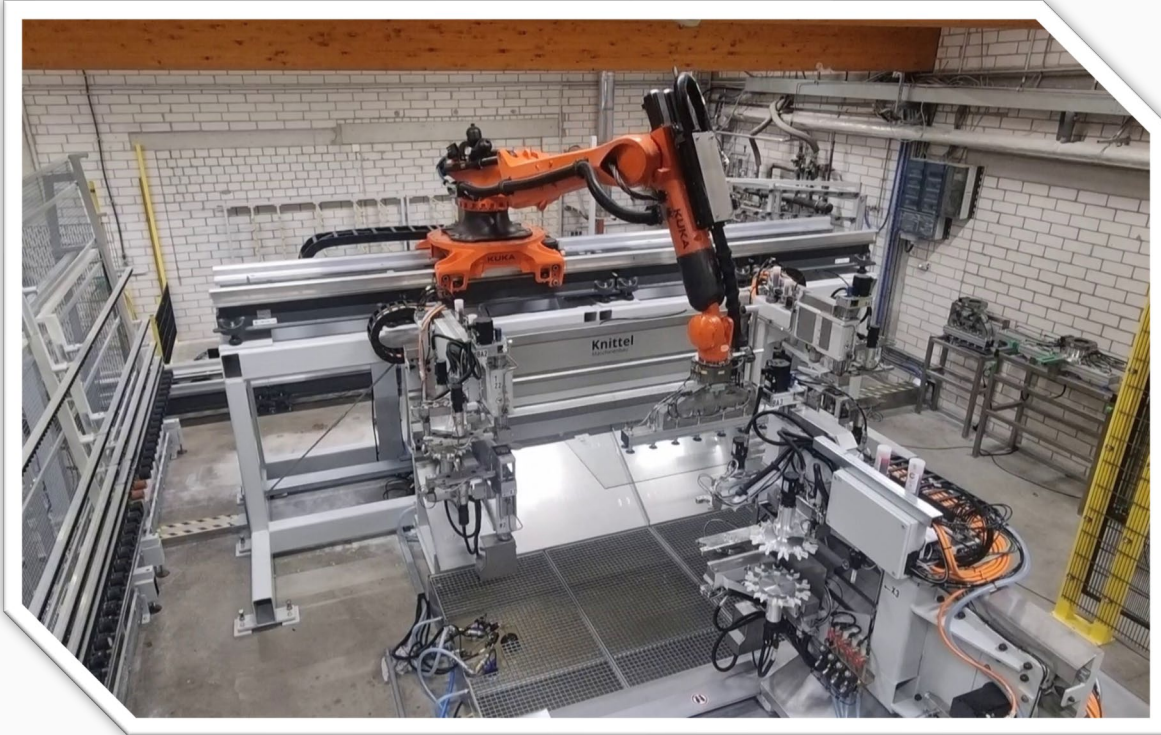
### Flexible Manufacturing

- Market demand shifted toward **customized and smaller production batches.**
- Automation evolved to support both **high productivity and production flexibility.**
- Modern systems integrate robotics, MES/software, tracking, and smart material handling.



## Today's Manufacturing Challenges

- Shorter and reliable lead times,
- higher product customization,
- smaller batch sizes,
- labor shortage and high turnover,
- labor cost,
- faster response to market changes,
- quality consistencies, reduce mistakes, rejects and redoes
- reduced margins,
- calculate ROI and understand real production data.



## The Importance of “Lot Size One”

- Efficient production of single pieces or **very small batches** has become a **key competitive advantage**.
- The industry is moving from mass production to mass customization.
- Modern automation must optimize:
  - productivity,
  - **flexibility**,
  - quality,
  - and real-time data integration.

## Turning AUTOMATION into:

- Productivity, quality, and **competitive advantage**,
- Real performance and measurable business **improvement**.



## PARTNER SELECTION PROCESS

### Why decisions have changed

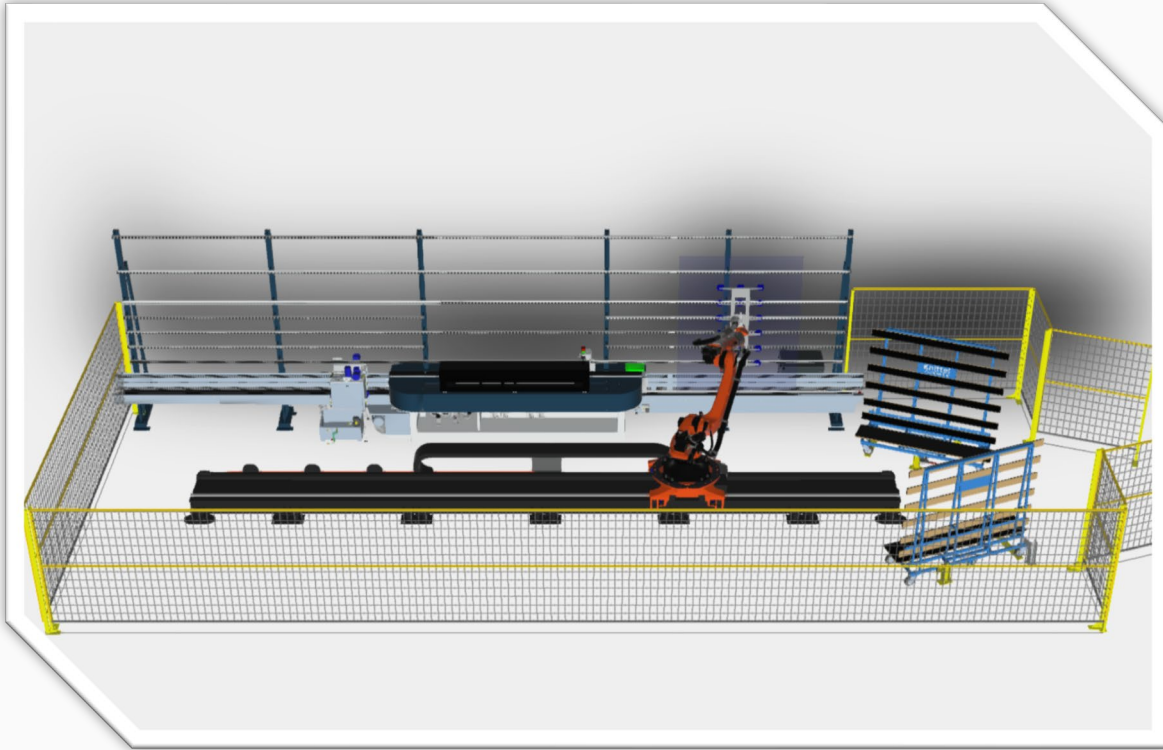
- From price & speed → to integration & data
- Automation = end-to-end production system
- Focus on flexibility, scalability, and control
- Goal: sustainable performance, not just output

### What really matters today

- System integration (lines, ERP, software)
- Operational flexibility (products, volumes, future needs)
- Process stability (reduced human error & variability)
- Data transparency (real-time KPIs & traceability)
- True ROI (OEE, hidden losses, real productivity)
- Partner value (know-how, support, long-term vision)

### Key message

👉 Don't choose a machine — choose a partner that can scale your production system.



## HOW TO SELECT THE RIGHT PARTNER

When evaluating a commercial or technology partner, it is essential to verify the presence of key competencies and operational capabilities

- **Consulting** capabilities.
- **Simulations** based on real production data.
- **Digital Twin** expertise.
- Dedicated **robot engineers**.
- Dedicated **mechanical engineering** team.
- Dedicated **software engineering** team.
- Proven **portfolio** and case studies.
- After-Sales and technical **service** and support.

**BE CAREFUL**

**THINK BEFORE  
YOU ACT**

## WHAT TO AVOID / BE CAREFUL OF

- **Standard or “Copy & Paste” solutions**  
Be cautious of partners proposing the same solution for every customer without properly analyzing the specific production process, requirements, and operational constraints.
- **Focus only on machine speed**  
High speed alone does not guarantee efficiency or a higher throughput.
- **Productivity measured only in panels/hour**  
Real productivity depends on product mix and panel sizes.
- **Lack of safety controls to prevent possible operators/labels mistakes**
- **Over-reliance on operators**  
Statements such as “operators should not make mistakes” can indicate weak process engineering. Strong automation should reduce human error through built-in controls.
- **Insufficient level of automation**  
Excessive manual intervention can cause bottlenecks, inconsistency, and higher labor costs.
- **Complex and expensive maintenance**
- **Solutions too complicated to learn and operate**
- **Lack of after-sales service and support**

## HOW TO AVOID OPERATORS' MISTAKES – OUR SOLUTION

To ensure process reliability and reduce the risk of human error, advanced validation and control systems should be integrated throughout the production flow.

- **Automatic glass sheet dimension measurement**  
The system automatically verifies glass dimensions after loading to ensure compliance with production requirements.
- **Plausibility check between nominal and measured data**  
The system compares production data with actual measured dimensions to detect inconsistencies before processing.
  - Continue production with a warning notification
  - Automatically stop the line and generate an alarm
- **Glass sheet lower-edge detection sensor**  
Sensors ensure accurate positioning, alignment, and handling during automated operations
- **Glass sheet size and position validation on loading rack**  
The system checks both dimensions and the correct positioning before pick-up and processing
- **Automatic error recovery procedure**  
if a validation error or positioning mismatch is detected, the robot automatically returns the glass sheet to the rack, preventing incorrect processing, potential damage, or downstream production issues.



Availability: 100%

Number of edging machines	Numer of robots	working method	Produktivty [m] oder ["] per h	Produktivty 1x8h => 8h	Produktivty 2x8h => 16h	Produktivty 3x8h => 24h	
1	1 on track (7th axis)	unload on rack	105 4.134	840 33.071	1.680 66.142	2.520 99.213	[m] ["]
1	1 on track (7th axis)	unload via washingmachine	120 4.724	960 37.795	1.920 75.591	2.880 113.386	[m] ["]
2	1	1x employee	150 5.906	1.200 47.244	2.400 94.488	3.600 141.732	[m] ["]
2	1	2x employee	280 11.024	2.240 88.189	4.480 176.378	6.720 264.567	[m] ["]
2	2		280 11.024	2.240 88.189	4.480 176.378	6.720 264.567	[m] ["]

### SIMULATIONS AND REAL RESULTS

Accurate simulations and real production data are essential to properly evaluate the actual benefits of an automation investment.

- Advanced simulation software
- Simulations based on real production data
- Data-driven configuration optimization
- Real performance improvements

**Example:**

production capacity increased from approximately **65,000 linear inches per day** (8-hour shift) before automation implementation to nearly **125,000 linear inches per day** after installation — almost doubling overall productivity.

- From simulation to measurable ROI
- See the chart below for the related performance results.

Installation date	Operating months (approx.)		Linear [m] - TOTAL	Linear ["] - TOTAL	Linear [m] - MONTH	Linear ["] - MONTH	Linear [m] - WEEK	Linear ["] - WEEK	Linear [m] - DAY	Linear ["] - DAY
08/05/2023	35	MACHINE #1	517.997	20.393.583	14.800	582.674	3.418	134.567	682	26.851
		MACHINE #2	780.895	30.743.898	22.311	878.397	5.153	202.863	1.028	40.479
		<b>TOTAL</b>	<b>1.298.892</b>	<b>51.137.480</b>	<b>37.111</b>	<b>1.461.071</b>	<b>8.571</b>	<b>337.430</b>	<b>1.710</b>	<b>67.330</b>
Installation date	Operating months (approx.)		Linear [m] - TOTAL	Linear ["] - TOTAL	Linear [m] - MONTH	Linear ["] - MONTH	Linear [m] - WEEK	Linear ["] - WEEK	Linear [m] - DAY	Linear ["] - DAY
08/05/2023	35	MACHINE #1	974.970	38.384.646	27.856	1.096.704	6.433	253.280	1.284	50.539
		MACHINE #2	772.547	30.415.236	22.073	869.007	5.098	200.694	1.017	40.046
		<b>TOTAL</b>	<b>1.747.517</b>	<b>68.799.882</b>	<b>49.929</b>	<b>1.965.711</b>	<b>11.531</b>	<b>453.975</b>	<b>2.301</b>	<b>90.586</b>



02/28/2024 (Wed) 16:03:38

MANUAL

DATA TABLE

EDIT

AW-R

AXIS	THICKNESS:	ZONE PRESSURE			
	2.5mm	-	3.5mm		
1 GLASS REMOVAL:	1.0mm	POLISHING 1	2.0Bar	D1 ACTUAL PRESETTING	-1.00mm
2 SPEED	2.0Mt/m	POLISHING 2	2.0Bar	D2 ACTUAL PRESETTING	-0.80mm
3 FRONT ARRIS	0.5mm	CERIUM 1	2.2Bar	D3 ACTUAL PRESETTING	-0.20mm
4 OFFSET	0.0mm	CERIUM 2	1.8Bar	R1 ACTUAL PRESETTING	0.00mm
5 BACK ARRIS	0.5mm	FRONT ARRIS	1.8Bar	R2 ACTUAL PRESETTING	0.10mm
	0.0mm	BACK ARRIS	2.2Bar		

### Working programs and settings

The system is designed to provide maximum production flexibility through automatic program management and adaptive processing parameters.

- **Quality management**
  - Per production batch
  - «on the fly»: per individual glass sheet or per glass side
- **Glass type management**  
Automatic parameter selection based on glass type (float or laminated).
- **Wide range of available programs**  
more than 10 processing programs are available, depending on the line configuration.
- **Special programs for**
  - Narrow glass sheets / stripes
  - Parallelogram-shaped glass sheets
  - Corner dubbing
  - Out-of-square glass management
- **High-flexibility mass production management**
  - Without individual barcodes / predefined production files
- **Flexible rack configuration**  
The rack configuration has been designed to maximize operational flexibility and reduce production constraints (no zero loading points).
  - Mixed glass thicknesses in the same rack
  - Different quality programs and side settings within the same rack
  - Multiple loading positions in the same rack



## AUTOMATIC MACHINES

Transfer your know-how into the system

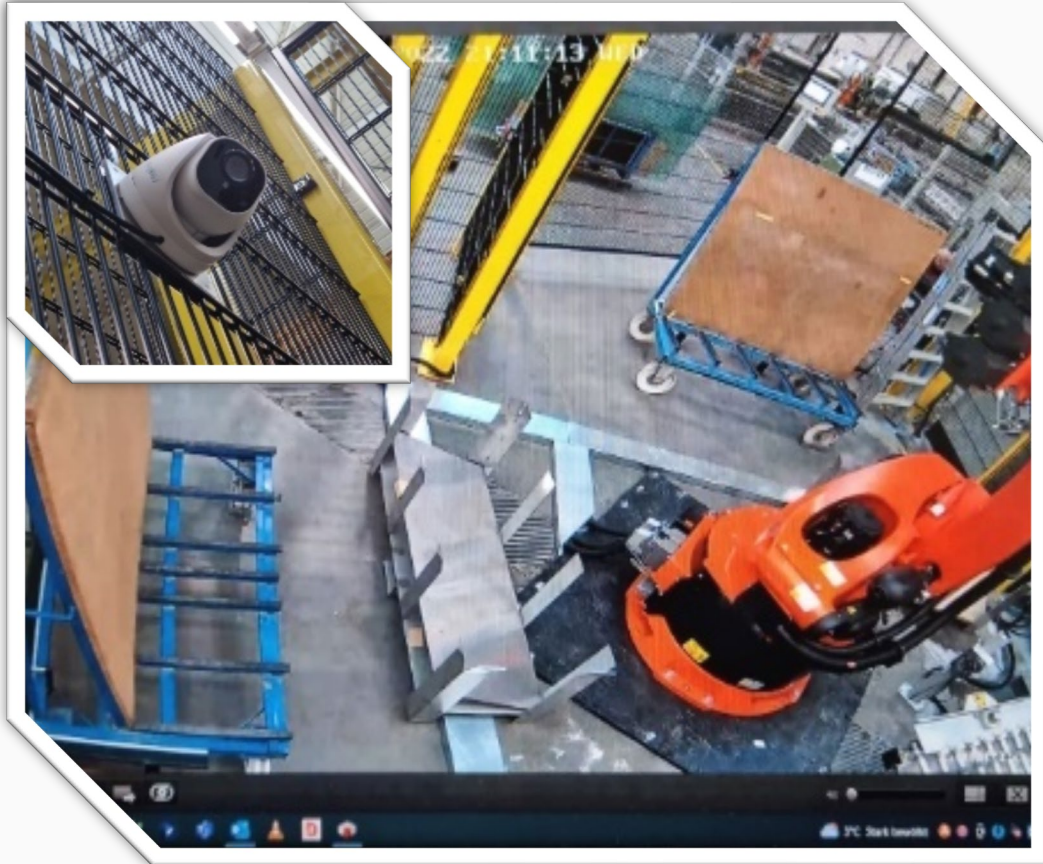
- **A-WR / i-AL (Limited Edition)**
  - Automatic wheels' wear compensation
  - Comprehensive parameter database for float and laminated glass processing
  - Automatic parameter adjustment in case of deviation from the nominal zero line (wear compensation)
- Self-optimizing line performance for maximum efficiency and quality





## AUTOMATIC MAINTENANCE AND CONDITION MONITORING FEATURES

- **Automatic spindle cleaning system**
- **Automatic spindle greasing pump**
- **Teach-in and torque feedback control**  
Advanced torque monitoring functions allow improving process stability and helping detect abnormal operating conditions.
- **Infeed conveyor alignment feature**
- **Main track alignment feature**
- **Automatic compensation for inlet belt wear**
- **Condition monitoring sensors**  
Integrated sensors continuously monitor critical machine components and operating conditions, enabling predictive maintenance and early detection of potential issues.



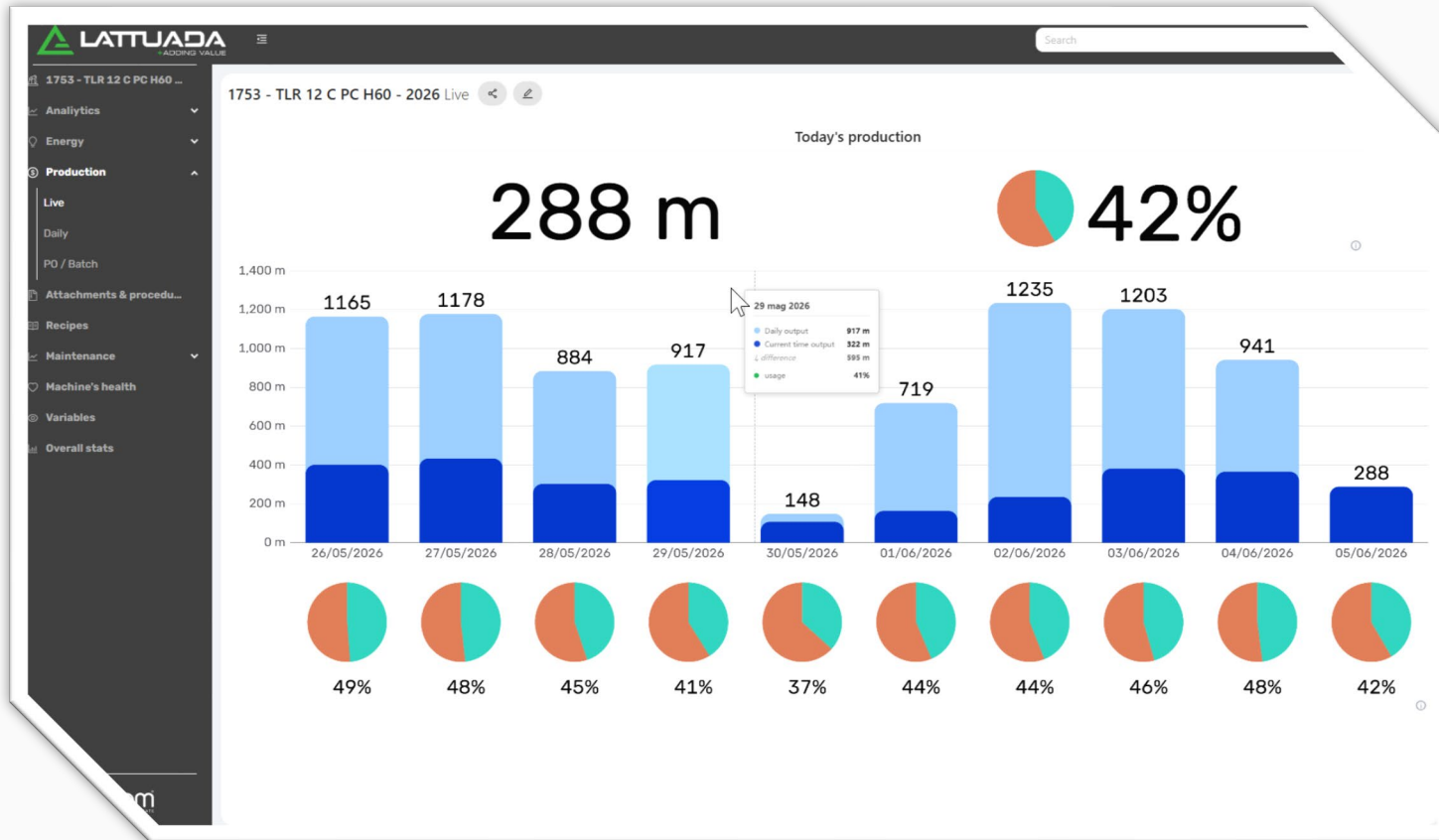
## BEYOND INSTALLATION: MAINTENANCE & TECHNICAL SUPPORT

A reliable service structure is essential to ensure maximum machine availability, fast issue resolution, and long-term production continuity.

- **Remote connectivity**
- **Camera surveillance and remote monitoring**
- **IoT ORQUESTRA Platform**  
Advanced IoT connectivity enables real-time monitoring, diagnostics, data collection, and predictive maintenance management.
- **Dedicated WhatsApp support groups**  
Dedicated communication channels with technical teams located across different time zones ensure faster response times and continuous support availability.

Today, **the quality of service and technical support is as important as the machine itself.**

- **Fast service responsiveness reduces downtime**
- **Predictive and planned maintenance are critical**
- **Easy-to-use systems improve operational consistency**  
User-friendly systems simplify operator training, improve daily usability, and increase process consistency across shifts and production plants.
- **The supplier becomes a long-term technology partner**



## ROI – PRODUCTION DATA ANALYSIS

- **IoT – ORQUESTRA**

Access to live and historical production data enables a deeper analysis of machine performance, process efficiency, and operational trends.

- **More accurate ROI calculation**

By analyzing real operational data, companies can calculate ROI more accurately based on:

- productivity improvements
- downtime reduction
- scrap reduction
- labor optimization
- maintenance cost savings

- **Data-driven decision making**

Advanced production analytics support better strategic and operational decisions, enabling continuous process improvement and higher manufacturing efficiency.

# KEY IDEAS

1. Start from the production bottleneck, requirements and simulations
2. Define measurable operational goals before investing
3. Prioritize integration, usability and scalability
4. The right automation partner impacts ROI as much as the equipment itself



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# ED ROBLES

Vice President of Sales

Salem Fabrication Technologies Group, Inc.

We Are 100% Employee Owned



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# THE FUTURE OF AI IN GLASS FABRICATION

Uncovering the Opportunities &  
Challenges Fabricators Face

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 **EQUIPMENT**  
Resources

**Ed Robles** brings more than 32 years of glass industry experience spanning fabrication, machinery, tooling, automation integration, and production optimization. As Vice President of Sales for Salem Fabrication Technologies Group, Inc., he oversees both HHH Equipment Resources and Salem Fabrication Supplies, working closely with fabricators across North America to improve throughput, enhance process consistency, and identify equipment and tooling strategies that support long-term operational performance.

Ed's expertise includes robotic cell applications, AI-enhanced vision systems, material handling optimization, smart factory initiatives, and advanced fabrication equipment integration for both existing and new production environments. He was also involved in bringing one of the first Single Robotic Cell (SRC) installations to North America, helping advance automated fabrication capabilities within the glass industry.

Based in Southern California, Ed is recognized for combining technical knowledge with a practical, customer-focused approach to improving safety, throughput, consistency, and long-term manufacturing efficiency.

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# Automation & Robotics: A Practical Path Forward

**The question is no longer whether to automate.  
The question is how intelligently your automation can adapt,  
optimize, and scale.**

AI Doesn't Replace Automation.

It Makes Automation Smarter.

Traditional automation follows instructions.

AI-enhanced automation interprets, adapts, and continuously improves performance.

# WHAT THIS MEANS FOR GLASS FABRICATORS

- Transform existing equipment into intelligent production assets
- Improve glass recognition, orientation verification, and handling accuracy
- Reduce manual intervention and operator dependency
- Capture real-time production data for measurable process improvement
- Enhance quality, consistency, and throughput across operations
- Improve safety through advanced vision systems and layered protection architectures

# Two Paths to Automation

## Integration Automation

- Phased investment targeting bottlenecks and labor challenges with practical solutions
- Robotic loading, automated material movement, and AI inspection reduce operator dependency
- Ideal for incremental modernization without disrupting operations or redesigns

## Full Smart Factory Automation

- Complete production flow with AI vision, robotics, and real-time data collection
- Higher throughput with remote monitoring and control across all fabrication stages
- Best for greenfield projects or major facility redesigns optimizing entire workflows

# Integration Automation

Most fabricators are not building entirely new facilities. They are modernizing existing operations one process at a time.

- Add Automation to existing equipment
- Ideal for phased investment strategies
- Targets specific bottlenecks and labor challenges
- Includes robot loading/unloading, material movement and inspection
- Reduces operator dependency while improving consistency



Successful automation projects begin with process evaluation and practical implementation planning –not simply adding robots.

# Modernizing Existing Operations

## One Process

at a Time Approach

## ROI Focus

Throughput & Quality Consistency

- Fabricators modernize incrementally, requiring careful evaluation of current processes and constraints
- Process evaluation must consider space, equipment compatibility, and bottleneck areas for maximum value
- Strategic planning ensures automation addresses real challenges while maintaining production flow and delivering measurable returns



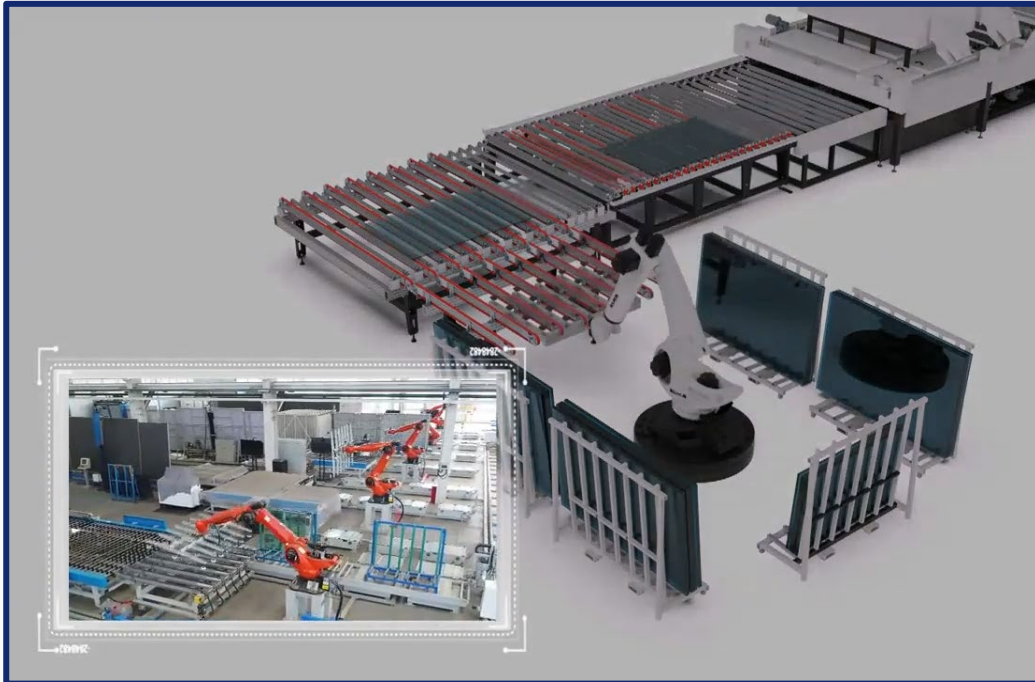
# SMART

Automation Solutions

by  EQUIPMENT  
Resources

Autonomous Mobile Robot  
Material Handling

# Key Considerations



## Floor Space

Available layout area and equipment placement compatibility for automation integration

## Equipment Compatibility

Assessment of existing machinery capabilities and upgrade requirements for automation connectivity

## Production Bottlenecks

Identifying constraint points where automation delivers the highest operational impact

## Labor & Safety

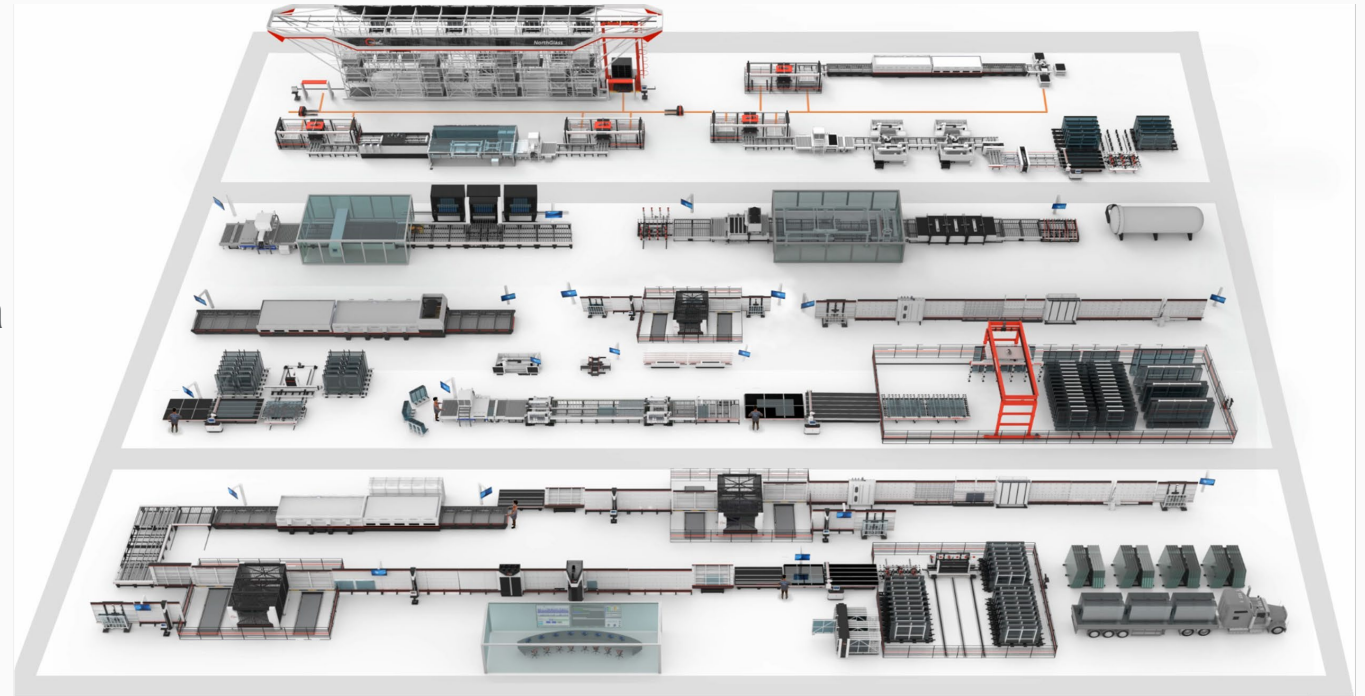
Operator availability challenges and injury risk reduction opportunities through automated handling

## Quality & Throughput

Consistency improvement targets and production capacity goals with measurable ROI expectations

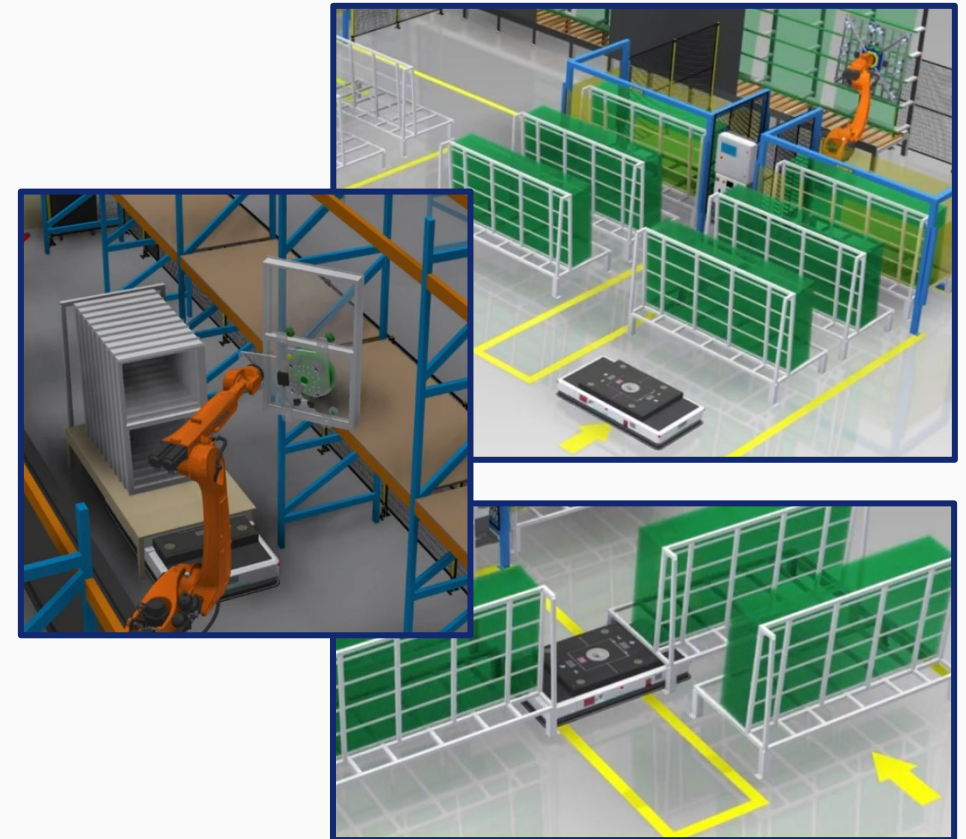
# Full Smart Factory Automation

- Integrated cutting, edging, washing, tempering, transfer and storage systems
- Designed around complete production flow
- Uses AI-enhanced vision, robotics and data collection
- Higher throughput and process visibility
- Best suited for greenfield or major facility redesign



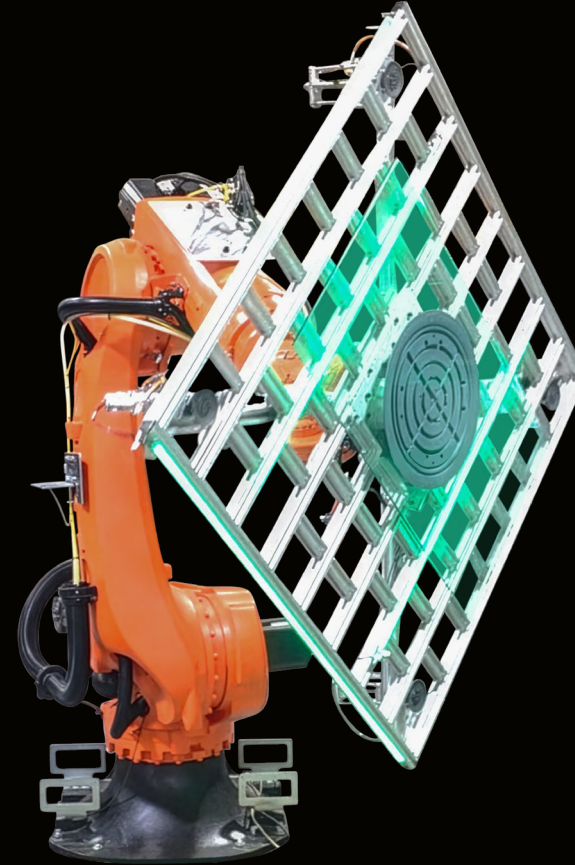
# AI, Robotics & Visualization

- AI-enhanced vision systems for glass recognition and positioning
- Robotic cells for loading, unloading and material transfer
- Autonomous mobile robotics (AMRs) for plant flow optimization
- VR-based layout planning to visualize automation within customer facilities
- Predictive maintenance and operational training opportunities



# Key Takeaways

- Automation should fit the fabricator's process –not force process changes
- Integration projects often provide the most practical path forward. Start where the bottleneck exists.
- AI and robotics can improve consistency, safety and throughput
- Visualization and planning tools reduce implementation risk
- The right automation partner brings application knowledge, engineering support and long-term service



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