



FOOD PRODUCTION SOLUTIONS ASSOCIATION

*Leading Innovation in Food Production*



MARKETSANDMARKETS™

# FROM DATA TO DIRECTION MAKING SENSE OF FP&SA'S 2030 MARKET OUTLOOK

## WEBINAR FOR FP&SA MEMBERS

JUNE 2025





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01

# GLOBAL FOOD & BEVERAGE INDUSTRY TRENDS

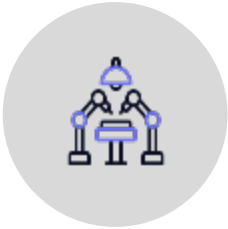


# MEGATRENDS IN THE DYNAMIC LANDSCAPE OF FOOD AND BEVERAGE INDUSTRY (1/2)



## FUNCTIONAL, CLEAN-LABEL, AND HEALTHY INGREDIENTS:

- Shift to natural, plant-based, and minimally processed ingredients.
- Transparent, short ingredient lists meet wellness and ethical demands.
- Focus on gut health, immunity, and mental well-being via functional components.



## FOOD AUTOMATION AND INDUSTRY 5.0:

- Integration of AI, robotics, and IoT for smart, efficient production.
- Blockchain enhances traceability; automation improves quality control.
- Aligns with sustainability and demand for high-quality food.



## FOOD SAFETY AND SECURITY:

- Blockchain and AI boost traceability and contamination response.
- Smart sensors detect pathogens and reduce quality risks.
- Emphasis on resilient, secure supply chains amid global disruptions.



### ADVANCED FOOD PROCESSING TECHNOLOGIES:

- Non-thermal methods like HPP, PEF, and Cold Plasma improve safety, shelf life, and nutrient retention.
- Emerging tools (e.g., 3D printing, Fermentation 2.0, AI automation) enable new textures, personalized nutrition, and better quality control.
- Innovations meet demand for healthier, safer, and more sustainable food processing.



### PERSONALIZED NUTRITION:

- Leverages genetics, microbiome data, and AI to tailor diets to individual health needs.
- Enables customized meals, fortified foods, and supplements targeting allergies, deficiencies, and preferences.
- Supports rising consumer demand for functional, health-optimized food solutions.



### SUSTAINABILITY AND ETHICAL SOURCING:

- Emphasizes eco-friendly practices (e.g., regenerative farming, water use reduction) to lower environmental impact.
- Ensures transparency in supply chains through ethical sourcing, fair wages, and humane practices.
- Certifications (e.g., Fair Trade) and sustainable packaging respond to consumer demand for responsible food systems.

02

# IMPACT ON FOOD PROCESSING AND PACKAGING EQUIPMENT INDUSTRY



# IMPACT OF FOOD & BEVERAGE TRENDS ON PROCESSING & PACKAGING EQUIPMENT INDUSTRY

The value chain is evolving with increased digitalization, direct-to-consumer models, and a focus on traceability and sustainability. Key segments fueling growth include plant-based proteins, functional foods, and advanced food technologies like robotics and 3D printing.

*Safety and AI/blockchain demand hygienic equipment; AI/robotics boost efficiency with smart systems. Regulations require traceable, sustainable designs, while automation eases labor issues despite training needs.*

## 1 FOOD SAFETY

*Food safety trends drive demand for advanced, compliant equipment with integrated safety and traceability features.*

- **Advanced Safety Technologies:** AI, IoT, and blockchain enhance food safety through real-time monitoring and traceability.
- **Regulatory Compliance:** Equipment must meet stringent safety standards, particularly for new food categories like plant-based proteins.
- **Key Equipment Features:** Hygienic designs, contaminant detection, and traceability systems are critical for modern food processing.

## 2 AUTOMATION & AI

*Automation and AI transform equipment into smart, efficient systems, boosting productivity and safety.*

- **Smart Manufacturing:** AI and robotics optimize processes, reduce downtime, and enhance quality control in food production.
- **Connected Equipment:** IoT-enabled machines provide real-time data for predictive maintenance and operational efficiency.
- **Workforce Support:** Automation handles repetitive tasks, freeing workers for higher-value roles.

## 3 REGULATIONS

*Regulatory pressures necessitate equipment that ensures compliance, sustainability, and allergen safety.*

- **Stringent Standards:** Global regulations require compliant equipment designs to ensure safety and sustainability.
- **Sustainable Practices:** Equipment must support eco-friendly packaging, like bioplastics, to reduce environmental impact.
- **Allergen Management:** Dedicated lines and traceability features are essential for allergen control and consumer trust.

## 4 WORKFORCE ISSUES

*Automation enhances efficiency and safety but demands training to address workforce skill gaps.*

- **Automation Adoption:** Robots address labor shortages but require workforce retraining for advanced systems.
- **Safety Enhancements:** Automated systems improve workplace safety by reducing manual handling risks.
- **Talent Attraction:** User-friendly equipment and training programs help attract and retain skilled workers.

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03

# FOOD SAFETY – A UNIVERSAL PRIORITY



# WHAT IS THE **IMPACT** OF **FOOD SAFETY** ON THE EQUIPMENT INDUSTRY ?



*Food safety trends drive demand for advanced, compliant equipment with integrated safety and traceability features.*

- **Advanced Safety Technologies:** AI, IoT, and blockchain enhance food safety through real-time monitoring and traceability.
- **Regulatory Compliance:** Equipment must meet stringent safety standards, particularly for new food categories like plant-based proteins.
- **Key Equipment Features:** Hygienic designs, contaminant detection, and traceability systems are critical for modern food processing.

## ***How is it affecting the food and beverage processing and packaging equipment manufacturers?***

### *Advanced Equipment Demand:*

- ✓ **Manufacturers** must develop **IoT- and AI-enabled** equipment to enable **predictive maintenance** and **real-time process optimization**.

### *Regulatory Compliance*

- ✓ **Manufacturers** need to design machines with **standardized interfaces** to support **robotic integration** for **modular, flexible lines**.

### *Traceability Features:*

- ✓ **Manufacturers** must ensure equipment delivers **actionable data** for **yield optimization, forecasting, and cost efficiency**.

# WHAT ARE THOSE KEY DRIVERS OF CHANGE AND CHALLENGES?

## DRIVERS OF CHANGE

### AI AND AUTOMATION

- AI-driven systems predict contamination risks by analyzing supply chain data in real time, while IoT sensors monitor parameters like temperature and humidity to ensure product safety.
- These technologies are critical for maintaining high safety standards.

### SMART PACKAGING AND IOT

- Smart packaging with embedded sensors and blockchain enhances traceability, enabling rapid identification of contamination sources, which is vital for recalls and consumer trust
- This trend is driven by consumer demand for transparency.

### FOOD-SAFE MATERIALS:

- The use of food-safe epoxies for equipment coatings and packaging adhesives is growing, driven by demand for non-toxic, durable surfaces.
- The market for these materials is projected to grow at an 8% CAGR over the next five years

## KEY CHALLENGES FACED BY MANUFACTURER

### Technology Integration

Retrofitting legacy equipment with AI, IoT, and blockchain is costly and complex, requiring significant investment in system upgrades, particularly for smaller manufacturers.

### Workforce Training

Operators need specialized training to manage advanced safety systems, posing a challenge for firms with limited resources.

### Regulatory Navigation

Varying regulations for new food categories (e.g., plant-based meats under USDA vs. FDA) complicate equipment design and compliance, increasing development costs.

## HOW ARE PLAYERS ADOPTING THESE TRENDS ?

### KEY PLAYERS

- **Technology Integration:**
  - GEA Group: Upgrades legacy systems with IoT-enabled sensors for real-time contamination monitoring.
  - Krones AG: Retrofits packaging lines with AI-driven quality control modules at reduced costs.
  - Alfa Laval: Introduces modular heat exchangers with integrated blockchain for traceability upgrades.
- **Workforce Training:**
  - Krones AG: Offers virtual reality training for operators on advanced packaging systems.
  - Alfa Laval: Provides hands-on workshops for staff managing IoT-integrated processing equipment.
  - SPX Flow: Delivers online certification courses for operating safety-enhanced machinery.
- **Regulatory Navigation:**
  - Alfa Laval: Designs adaptable processing units to meet EU and FDA regulations for plant-based products.
  - SPX Flow: Configures equipment to comply with varying global standards for new food safety rules.
  - Hosokawa Micron: Develops flexible systems to navigate USDA vs. FDA requirements for innovative foods.

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04

# AUTOMATION & AI – TRANSFORMING OPERATIONS



# WHAT IS THE **IMPACT** OF **AUTOMATION & AI** ON THE EQUIPMENT INDUSTRY ?



*Automation and AI transform equipment into smart, efficient systems, boosting productivity and safety.*

- **Smart Manufacturing:** AI and robotics optimize processes, reduce downtime, and enhance quality control in food production.
- **Connected Equipment:** IoT-enabled machines provide real-time data for predictive maintenance and operational efficiency.
- **Workforce Support:** Automation handles repetitive tasks, freeing workers for higher-value roles.

## ***How is it affecting the food and beverage processing and packaging equipment manufacturers?***

### *Smart Equipment Demand:*

- ✓ *Manufacturers must integrate **AI, IoT, blockchain, X-ray, and metal detection** into equipment to meet rising **safety and traceability** expectations.*

### *Robotics Compatibility*

- ✓ *They are required to design equipment that complies with **strict food safety laws** (e.g., **FDA's Traceability Rule**), especially for **sensitive categories like plant-based meats**.*

### *Data-Driven Operations::*

- ✓ *There's growing pressure to incorporate **blockchain and RFID** for **end-to-end visibility**, driving innovation in **track-and-trace enabled machines**.*

# WHAT ARE THOSE KEY DRIVERS OF CHANGE AND CHALLENGES?

## DRIVERS OF CHANGE

### AI and Machine Learning

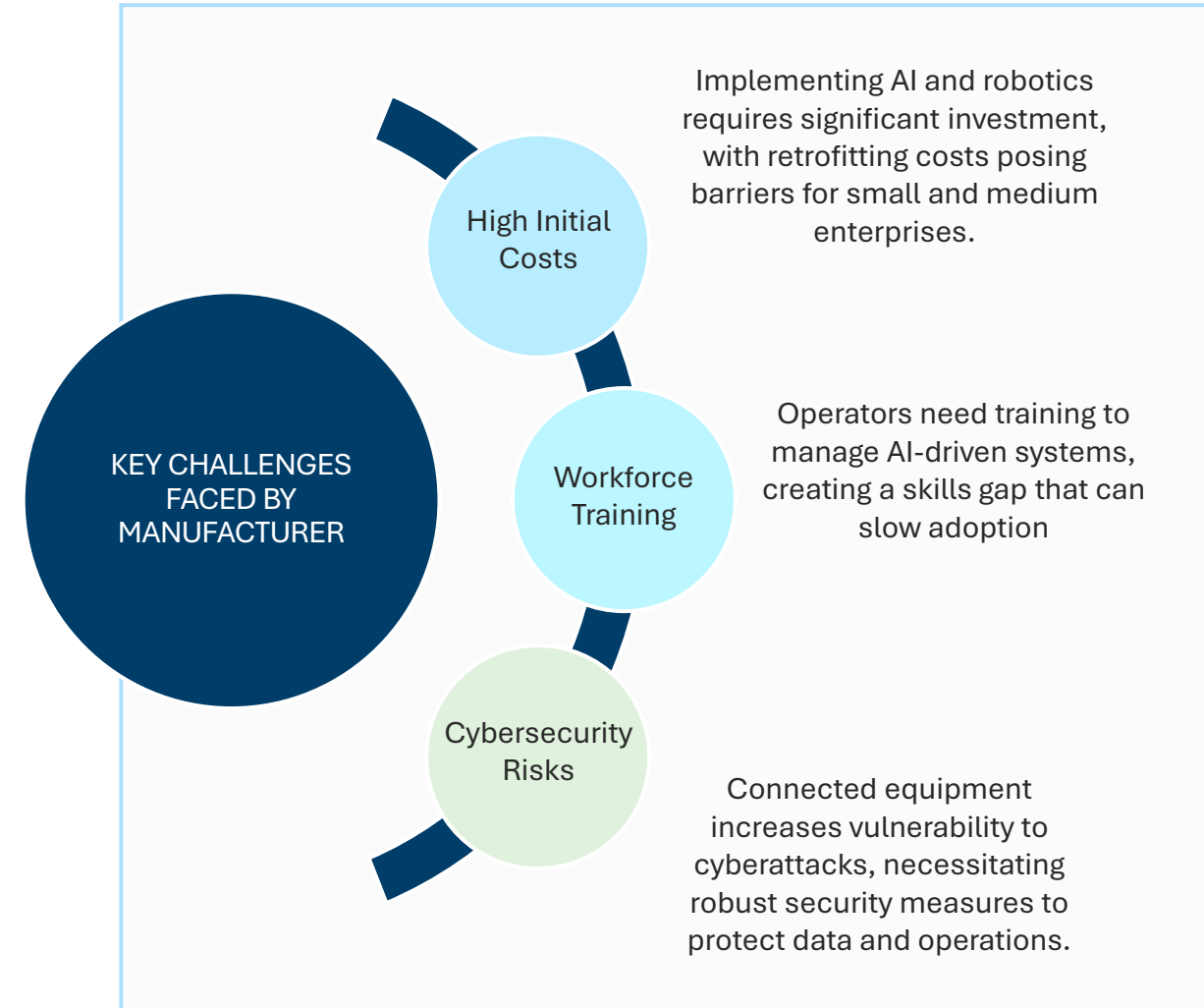
- AI optimizes processes by predicting equipment failures and improving quality control, with algorithms analyzing data to enhance production efficiency
- This is critical for smart manufacturing.

### Robotics and Cobots

- Collaborative robots (cobots) handle repetitive tasks like sorting and packaging, increasing throughput and maintaining hygiene standards
- This aligns with Industry 5.0 principles.

### IoT for Real-Time Monitoring

- IoT sensors enable real-time tracking of food safety and quality, optimizing supply chain logistics and reducing waste
- This supports predictive maintenance and efficiency.



# HOW ARE PLAYERS ADOPTING THESE TRENDS AND CHALLENGES ?

## KEY PLAYERS

- **High Initial Costs:**
  - Marel: Offers scalable robotic and AI solutions for gradual integration, easing financial burdens.
  - JBT Corporation: Provides cost-effective AI upgrades for predictive maintenance.
  - Bühler Group: Delivers affordable AI-driven optical sorting systems to reduce retrofitting costs.
  - Tetra Pak: Supplies cost-efficient packaging upgrades with AI optimization.
- **Workforce Training:**
  - JBT Corporation: Develops user-friendly interfaces and training programs for operators.
  - GEA Group: Offers training to bridge the skills gap for AI-driven systems.
  - Marel: Supports staff with the Marel Academy's online training resources.
- **Cybersecurity Risks:**
  - Tetra Pak: Implements robust security protocols in IoT-enabled equipment.
  - GEA Group: Ensures data integrity with secure IoT integration.
  - Bühler Group: Focuses on secure data handling in AI systems.

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05

## REGULATIONS – NAVIGATING A COMPLEX LANDSCAPE



# WHAT IS THE **IMPACT** OF **REGULATIONS** ON THE EQUIPMENT INDUSTRY ?



*Regulatory pressures necessitate equipment that ensures compliance, sustainability, and allergen safety.*

- **Stringent Standards:** Global regulations require compliant equipment designs to ensure safety and sustainability.
- **Sustainable Practices:** Equipment must support eco-friendly packaging, like bioplastics, to reduce environmental impact.
- **Allergen Management:** Dedicated lines and traceability features are essential for allergen control and consumer trust.

## ***How is it affecting the food and beverage processing and packaging equipment manufacturers?***

### *Compliance-Driven Design*

- ✓ **Manufacturers** must integrate **traceability systems** and **hygienic designs** to meet **global safety standards** (e.g., **FDA**, **EU**).

### *Sustainable Material Compatibility*

- ✓ **Manufacturers** need machines that handle **bioplastics** and **compostable films**, requiring **new sealing and forming tech**.

### *Regional Regulatory Adaptation*

- ✓ **Manufacturers** must design **versatile equipment** to meet **varied regional regulations**, increasing **design complexity**.

# WHAT ARE THOSE KEY DRIVERS OF CHANGE AND CHALLENGES?

## DRIVERS OF CHANGE

### Stricter Food Safety Standards

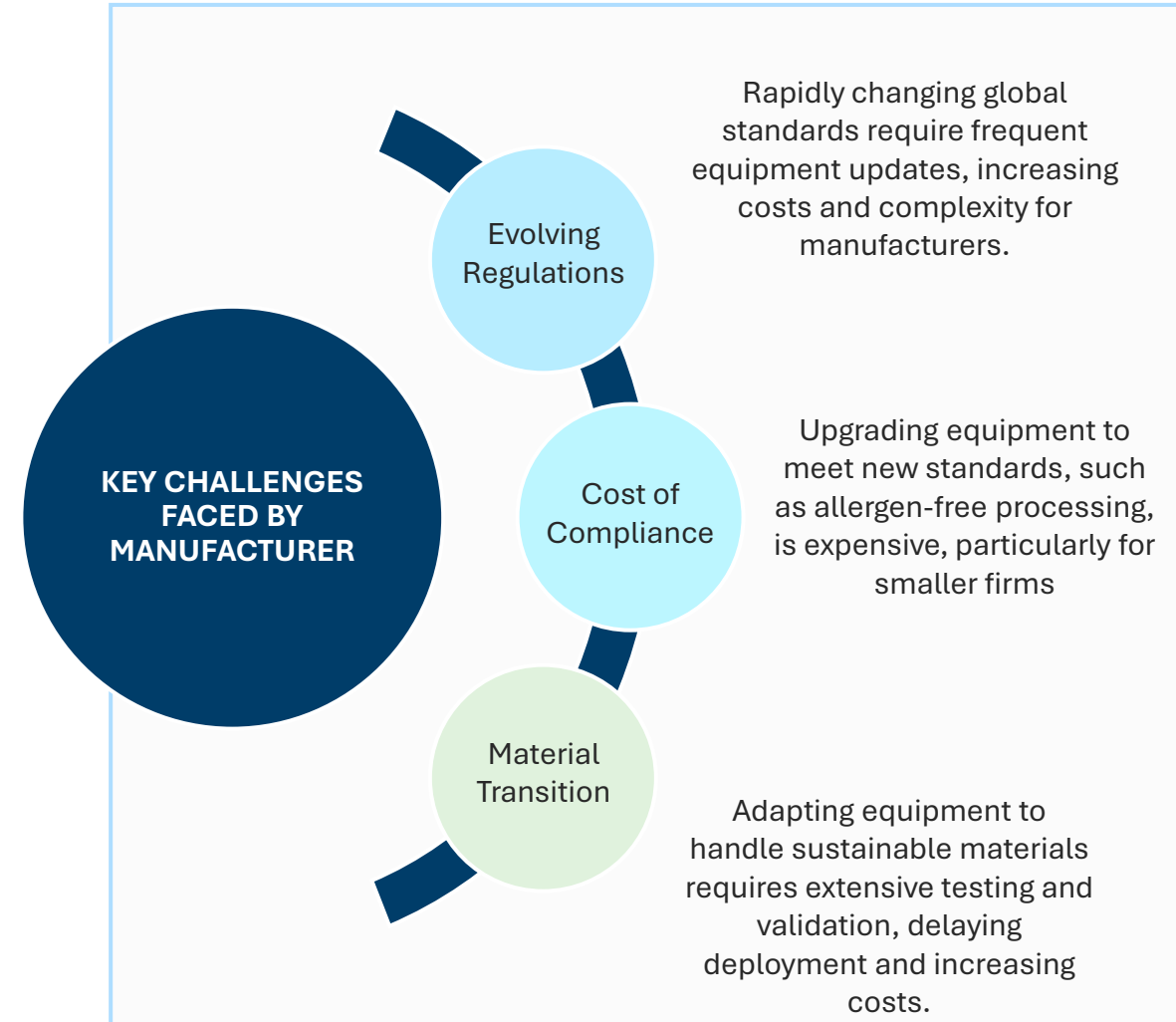
- Regulatory bodies like the FDA and USDA enforce rigorous standards, requiring equipment with hygiene and traceability features
- This ensures consumer safety.

### Sustainable Packaging Regulations

- Bans on synthetic chemicals and single-use plastics drive demand for equipment that handles biodegradable materials
- This aligns with sustainability goals.

### Allergen Management

- Stricter allergen labeling and cross-contamination prevention rules necessitate dedicated equipment lines
- This protects consumers with allergies.



# HOW ARE PLAYERS ADOPTING THESE TRENDS AND CHALLENGES ?

## KEY PLAYERS

- **Evolving Regulations:**
  - Tetra Pak: Updates equipment for new EU sustainability directives on packaging waste reduction.
  - GEA Group: Adapts to FDA's updated hygiene standards for dairy processing equipment.
  - Krones AG: Modifies systems to comply with China's latest food safety labeling laws.
- **Cost of Compliance:**
  - Tetra Pak: Offers modular upgrades for allergen-free packaging at reduced costs.
  - GEA Group: Provides subsidized retrofits for traceability features in small-scale plants.
  - Marel: Supplies affordable allergen control kits for existing processing lines.
- **Material Transition:**
  - Tetra Pak: Tests equipment for compatibility with plant-based bioplastic films.
  - Krones AG: Validates sealing technology for compostable beverage containers.
  - Bühler Group: Ensures processing lines handle biodegradable grain packaging materials.

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## WORKFORCE ISSUES – ADDRESSING THE TALENT GAP



# WHAT IS THE **IMPACT** OF **WORKFORCE ISSUES** ON THE EQUIPMENT INDUSTRY ?



- **Automation Adoption:** Robots address labor shortages but require workforce retraining for advanced systems.
- **Safety Enhancements:** Automated systems improve workplace safety by reducing manual handling risks.
- **Talent Attraction:** User-friendly equipment and training programs help attract and retain skilled workers.

## *How is it affecting the food and beverage processing and packaging equipment manufacturers?*

### *User-Friendly Design*

- ✓ **Manufacturers** must create *intuitive interfaces like touchscreens* to support **less-skilled operators** and shorten the **learning curve**.

### *Training Integration*

- ✓ **Manufacturers** are expected to embed **training tools like VR simulators** to accelerate **skill development and system familiarity**.

### *Safety Enhancements*

- ✓ **Manufacturers** need to integrate **advanced safety features** (e.g., **emergency stops, collision detection**) to protect workers and meet **regulatory standards**..

# WHAT ARE THOSE KEY DRIVERS OF CHANGE AND CHALLENGES?

## DRIVERS OF CHANGE

### Automation for Labor Shortages

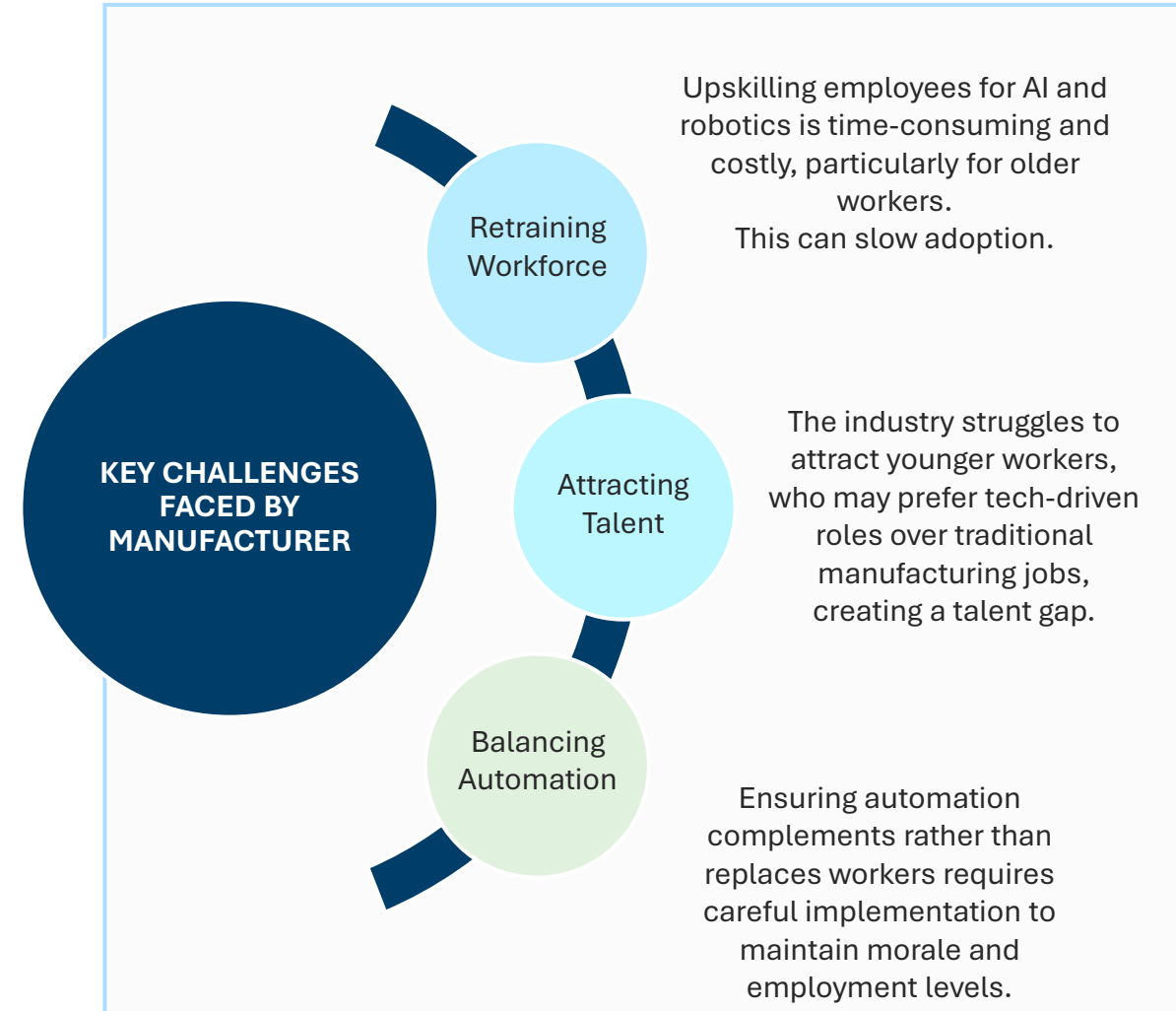
- Robots and automation address labor shortages by handling repetitive tasks like sorting and packaging, reducing reliance on manual labor
- This is critical in a tight labor market.

### Skill Development

- Adoption of AI and robotics requires a workforce skilled in operating advanced systems, driving demand for training programs
- This ensures operational efficiency.

### Workforce Safety

- Automation minimizes exposure to hazardous tasks, improving safety through features like robotic handling of sharp tools
- This enhances workplace conditions.



# HOW ARE PLAYERS ADOPTING THESE TRENDS AND CHALLENGES ?

## KEY PLAYERS

- **Retraining Workforce:**
  - Marel: Provides tailored training sessions to upskill operators on robotic sorting systems.
  - Bühler Group: Offers online courses alongside equipment to train workers on advanced processing technologies.
  - JBT Corporation: Supplies VR simulators with equipment to accelerate learning for AI-driven systems.
- **Attracting Talent:**
  - Tetra Pak: Designs intuitive touch-screen interfaces to appeal to tech-savvy younger workers.
  - GEA Group: Promotes user-friendly equipment in career fairs to attract new talent to manufacturing.
  - Bühler Group: Highlights training programs to showcase growth opportunities for young professionals.
- **Balancing Automation:**
  - Marel: Implements collaborative robots that work alongside workers to maintain employment balance.
  - JBT Corporation: Designs hybrid systems where automation supports, rather than replaces, manual roles.
  - GEA Group: Integrates automation with feedback mechanisms to ensure worker involvement in decision-making.

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# INDUSTRY REPORTS BY MNM FOR FPSA MEMBERS



## LIST OF RESEARCH STUDIES FOR FPSA MEMBERS AVAILABLE

### KEY REPORTS PUBLISHED FOR FPSA MEMBERS



Beverage Processing &  
Packaging Equipment Market



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Processing & Packaging  
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