Welcome!

Vision Inspection Solutions for the Food and Beverage Industry

BROUGHT TO YOU BY:

Presenter

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Vision Systems DESIGN
THE MACHINE VISION AND IMAGING RESOURCE
FOR ENGINEERS AND INTEGRATORS WORLDWIDE

A Strategy that Supports Efficiency, Variety, and Sustainability

The food and beverage packaging industry is facing innumerable pressures at the moment. Packaging companies are required to do more with fewer resources in addition to offering greater product variety and demonstrating environmental sustainability to an increasingly discriminating consumer base. Fortunately, flexible packaging can help companies meet these demands without incurring significant productivity losses.

By using less material per package and expanding the options for colorful and creative visual presentations, this strategy promotes environmental health and helps different products stand out on retailer shelves.

Factors Driving Automation Solutions

Common Issues Faced by Manufacturers

- Labor Shortage
- Increased Labor Cost
- High-Mix, Low-Volume Production
- Acceptable Product Variation

Factors Driving Automation Solutions

Acceptable Product Variation

- Shape / Size
- Color
- Gaps or Holes
- Location of differently colored ingredients (raisins, chocolate chips, etc.)
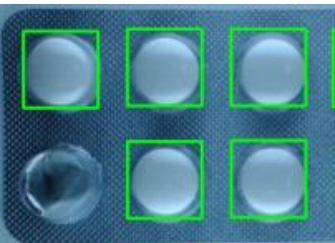- Edge Variations

Factors Driving Automation Solutions

High-Speed Applications

- Different Colored Products and Packaging
- Bottle / Packaging Inspections
- Liquid / Product Level
- Cap / Seal Inspections

Machine Vision – Most Common Applications

- Inspection & Measurement: inspect, measure and judge the quality and/or presence/absence of parts

- Identification, Recognition & Validation: recognize and judge characters (OCR/OCV) and codes (1D/2D), including quality verification

- Guidance & Positioning: locate and output parts coordinates to guide machines (including robots) or tools to precise locations
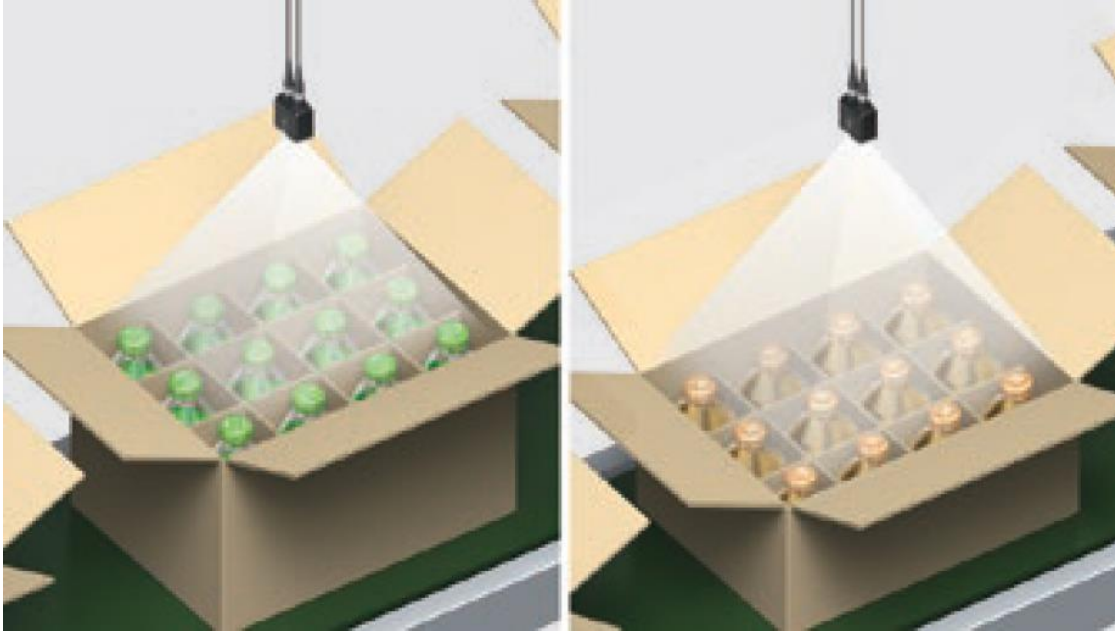
Multi-color Lighting

Inspection of a High Mix of Workpieces Requiring Character/Code Recognition

- Multi-color lighting enables high-contrast, stable inspection and character/code recognition by providing optimal lighting color for each workpiece type

Long-life Liquid Autofocus Lens

Quantity Inspection of Mixed Group of Products

- For quantity inspections of products with varying heights, users can set focus for each product so that inspections can be conducted simply and smoothly with a single device

- The long-life liquid autofocus lens frees you from worrying about the defect

High-resolution Camera Plus Autofocus Lens

Depalletizing Parts Packed in Stacking Pallets

- A high-resolution camera with autofocus lens allows parts packed in stacked pallets to be picked and placed with high accuracy
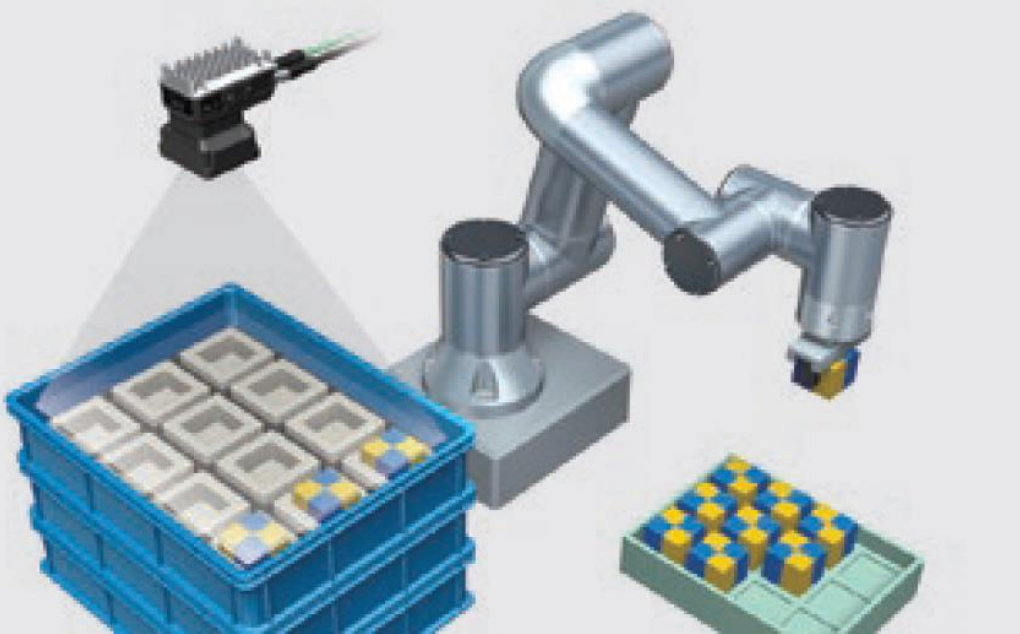
Simple Discrimination and Code Recognition

Code reading

Cap presence/
absence inspection

Cap present OK   Cap absent NG

Inspecting the Caps and Reading the Codes on Bottles

- With its code/character recognition feature, a single camera can perform both inspection and cod recognition

- Allows for simpler solution configurations and fewer cameras

Label Presence Inspection

Food Processing Line Label Inspection

- Cameras can easily verify the presence or absence of a label
- Higher-end solutions can actually verify that the label is correct
  - Label Coloring
  - Product Name
  - Ingredient and Allergy Information
  - Nutritional Information
  - "Best By" or "Use By" Date
 - Factory and Batch Codes
  - 1D and 2D Codes
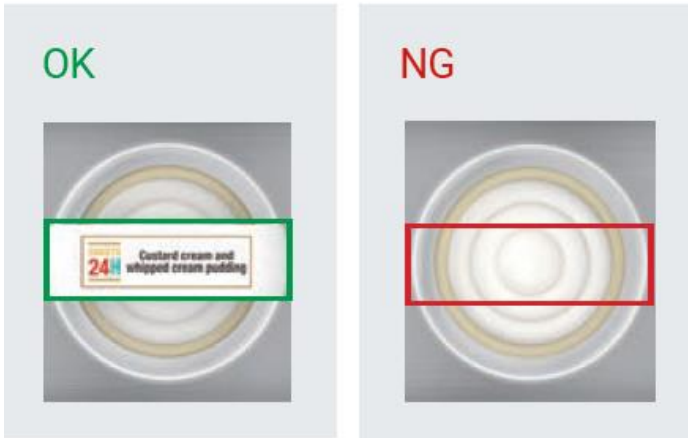
Capping and Label Presence Inspection of Beverage Bottles

Beverage Processing Vision Inspections

- Caps can be checked for

    - Presence / Absence

    - Missing Tamper Bands

    - High Caps, Cocked Caps, Tilted Caps, etc.

- Labels can be checked for

    - Presence / Absence

    - Tilted or Misaligned Labels

    - Label Colors

    - Product Names

    - "Best By" or "Use By" Date

    - Factory and Batch Codes

OK   NG
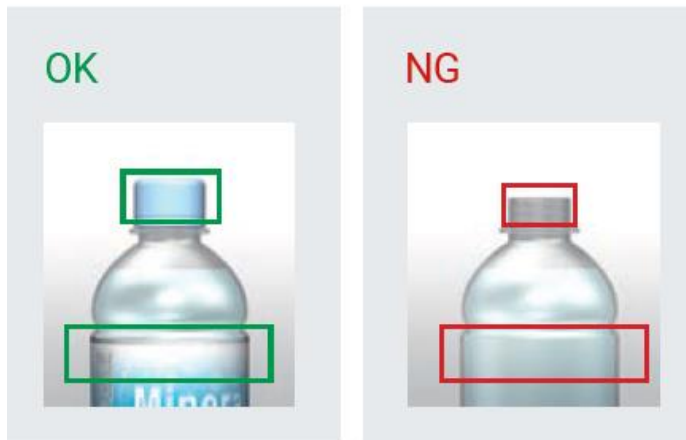
Vision Inspections with Artificial Intelligence Accept Good Products with the Precision of an Experienced Inspector

1 Prepare images

Although standard AI processing requires a huge number of images for learning, the FH Series requires only 100 to 200 images.

Good product image

Defective product image

2 Create model

The system suggests images to learn, helping to complete the good product model.

AI

AI model

3 Check results

Test is automatically performed using images prepared in Step 1. You don't need to adjust parameters for differential inspections.

AI

Water

Correlation score

Image A:10

Image B:150

When a good product is judged as defective, AI gives each image a correlation score to visualize the degree of overdetection. This facilitates selecting images that need to be learned to reduce overdetection.

- 3 quick steps on the settings screen guide the user through the process of creating the good product model with the minimum number of images

- Learns from the image data of non-defective products to quickly acquire the expertise

- The system can be tested afterwards using new test images or live images

High-Speed Multi-Core Vision Systems with Multiple Cameras

Contamination checks of beverage containers

- High-speed controllers with multi-core CPUs allow users to reduce the number of controllers from 4 to 1 without compromising takt time

- Each core is able to simultaneously process another camera image

- Enables significant cost savings in procedures that involve many lines

Beverage Industry Solution Example

Vision Inspection Application to check PET bottles

- Pin and larger holes in bottle prior to Filling

- Off-center Gates on the bottom which indicate a thinning of the bottle wall on one side reducing burst pressure and limiting stackability

- Cap and Liquid Level inspections after Filling

Beverage Industry Solution Example

Vision Inspections can be used to check each PET bottle for

- Pin and larger holes
- Off-center Gates on the bottom
- Damaged / Improper Caps
- Liquid Level
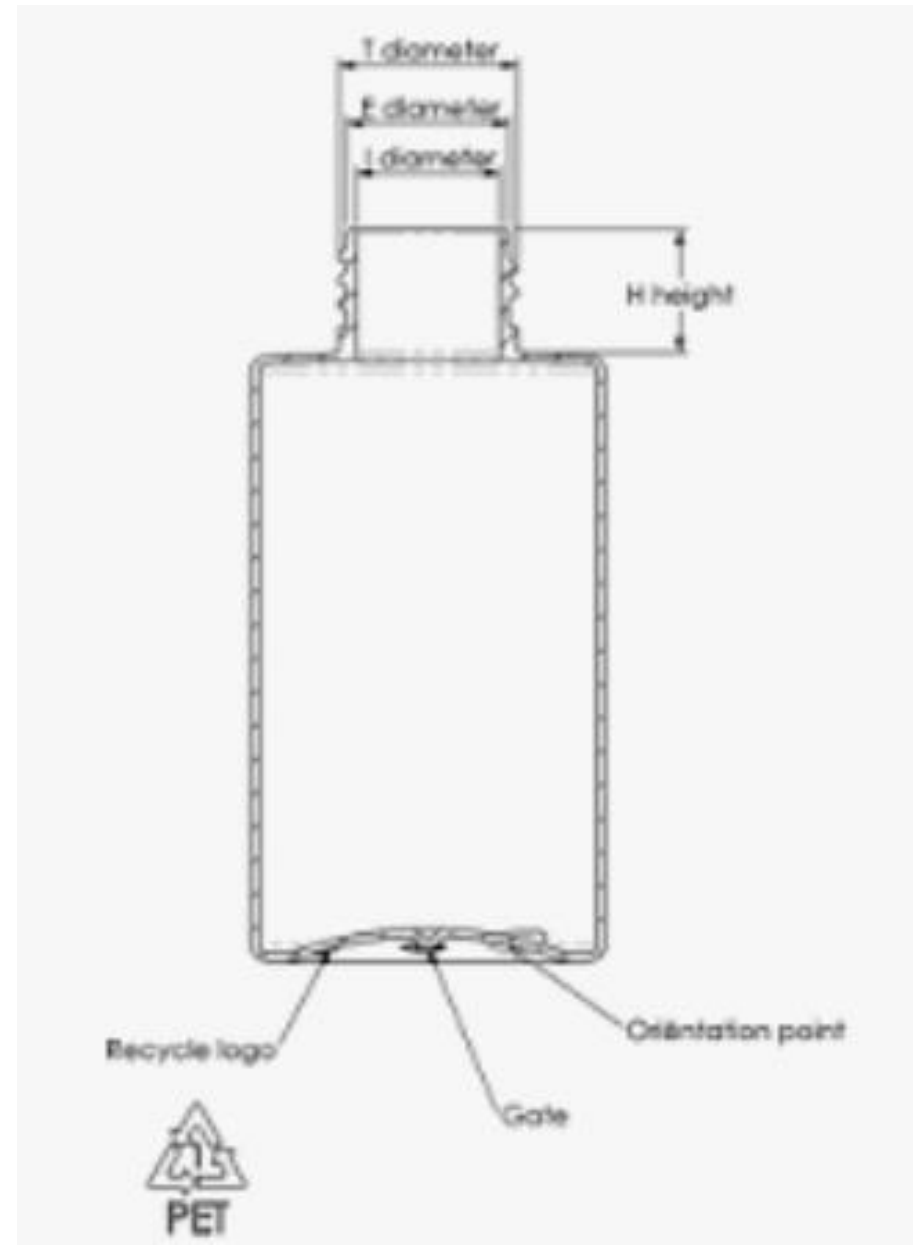
SWIR Vision Inspection for Packaging Seals

- SWIR is Short Wave Infrared Camera technology that allows a Vision System to see in a spectrum which inspectors cannot see with the human eye

- As manufacturers use less and less plastic in their packaging, the sealing films get thinner and thinner

- Thin films are easy to burn through if the assembly line is not running correctly – this includes temperature settings for the heating elements, servos that move the product at the proper speed and pressure/tension, etc.

SWIR Vision Inspection for Packaging Seals

Vision Inspections Include

- Objects Under Seal
- Foreign Matter in Objects
- Incorrect Materials
- Wrinkled Materials
- Process Failure
- Folded Corners
- Double Seal
- Misaligned Materials

Product Types

- Meal Kits
- Frozen Meals
- Dehydrated Meals
- Heat Sealed Containers
- Film Sealed Containers
- Cap Seals
- Film Sealed Cups
- Food Trays

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SWIR Vision Inspection for Packaging Seals

- The integrity of the seal at the edge of the tray is critical to prevent contamination

- SWIR cameras can see where the seal is properly heated and melted to the tray

- Gaps in the continuity of this sealing line indicate an improper seal and a possible entry point for bacteria and foreign material

- It is also possible to tell if the film is not properly aligned and does not cover the entire tray
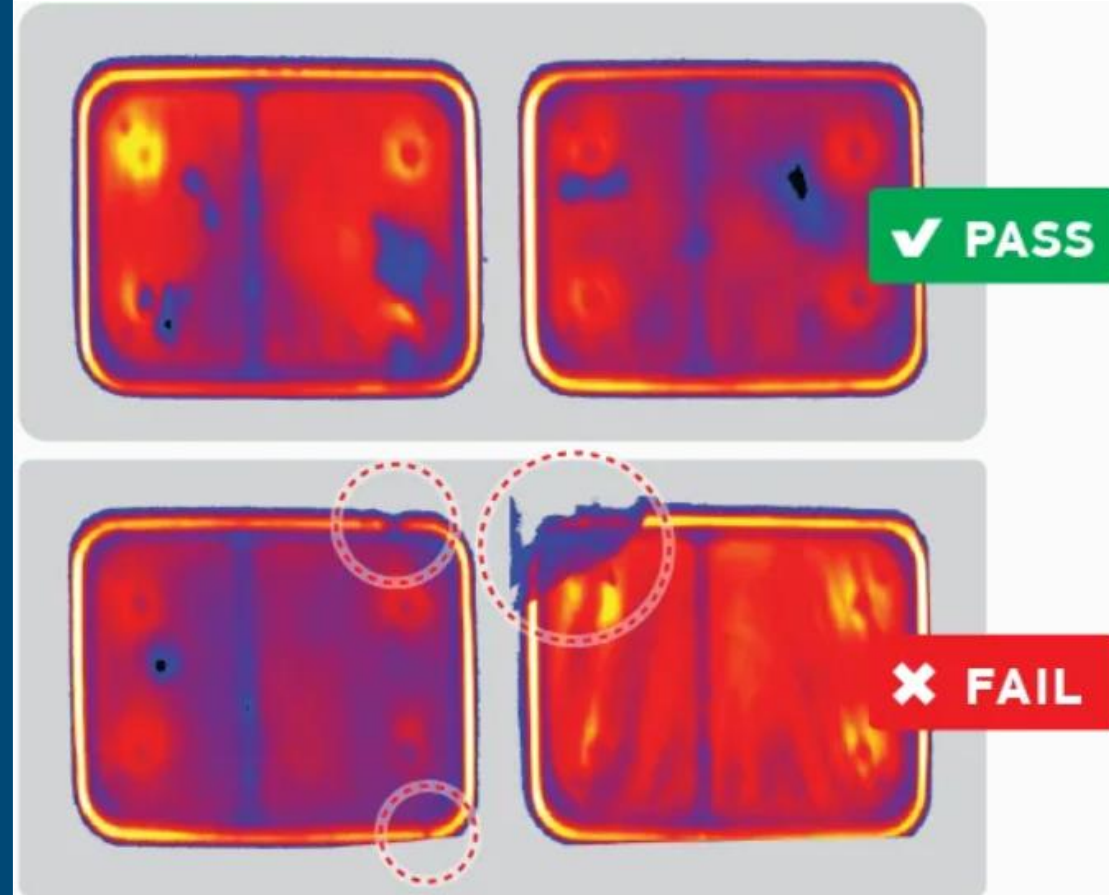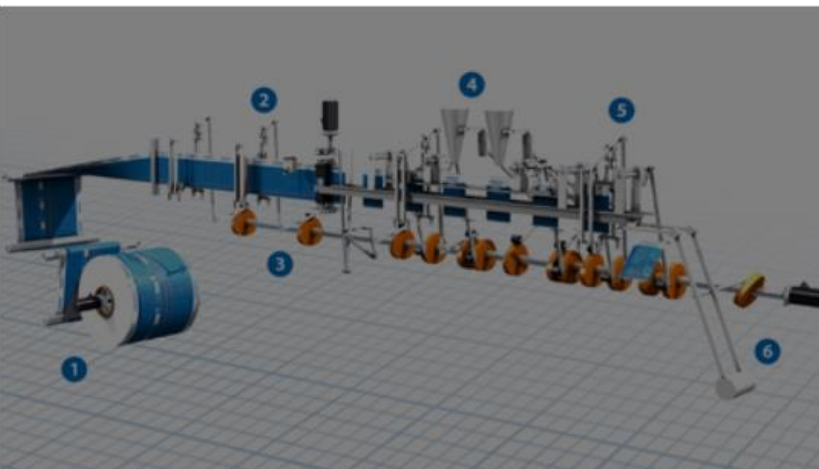
Driving the Factory of the Future

Innovative solutions for the packaging industry from food and beverage to consumer packaged goods
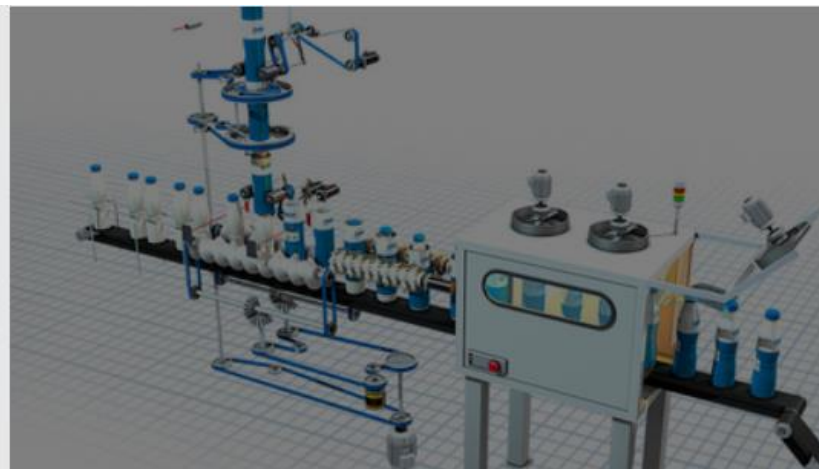
Examples of Packaging Automation

Horizontal form, fill, seal

Fill a variety of pouch styles including pillow packs and trays

High speed linear shrink sleeve applicator
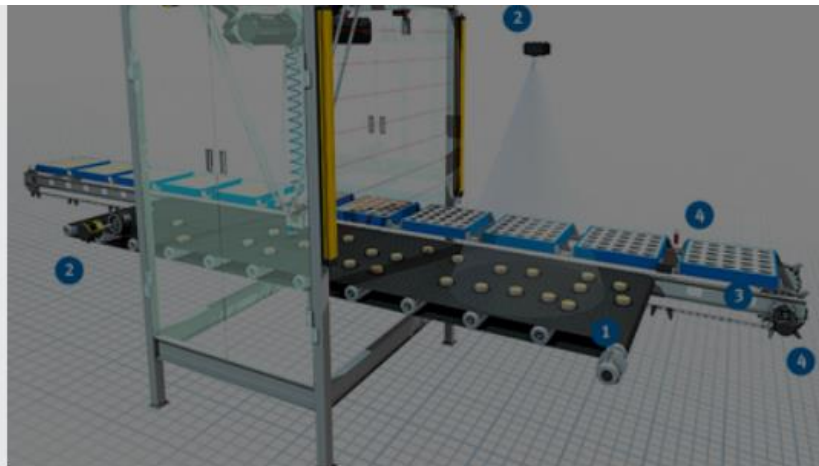
Label inserter and shrink oven

Horizontal flow wrapper

Rotary sealing knifes (servo driven)
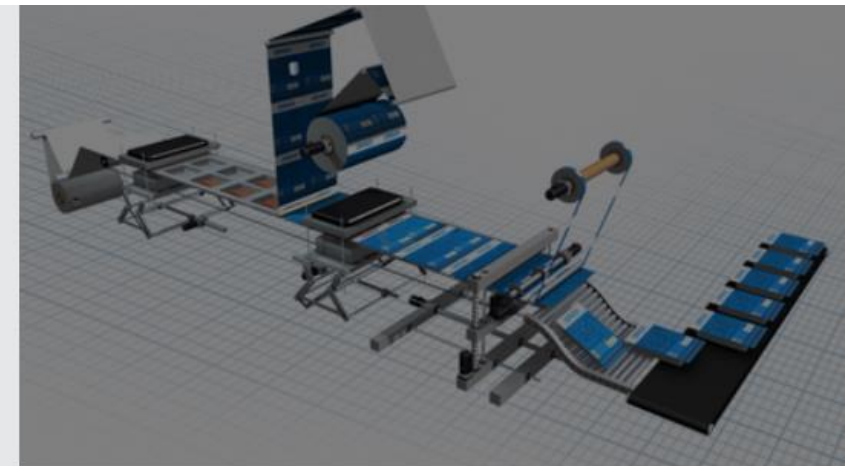
Examples of Packaging Automation

Palletizer gantry robot

Robots for pick and place applications

Robotic loading cell or assortment packer

Robotic control system

Thermoform fill and sealer

Flexible Hygienic moulds

Smart Manufacturing

Intelligently integrate people-to-people, machine-to-people and machine-to-machine throughout the entire production process creating a seamless environment

– Consistency and transparency along the value chain

– Receive accurate real-time data about systems and processes

– Increase yields, improve quality and reduce waste

Flexible Automation

Readily adapt to changes in product design, varying levels of production, variations in components assembly and differences in process sequence

- Scalable machines, production lines and factories
- Reduce delays and bottlenecks
- Coordinate work processes with suppliers and customers
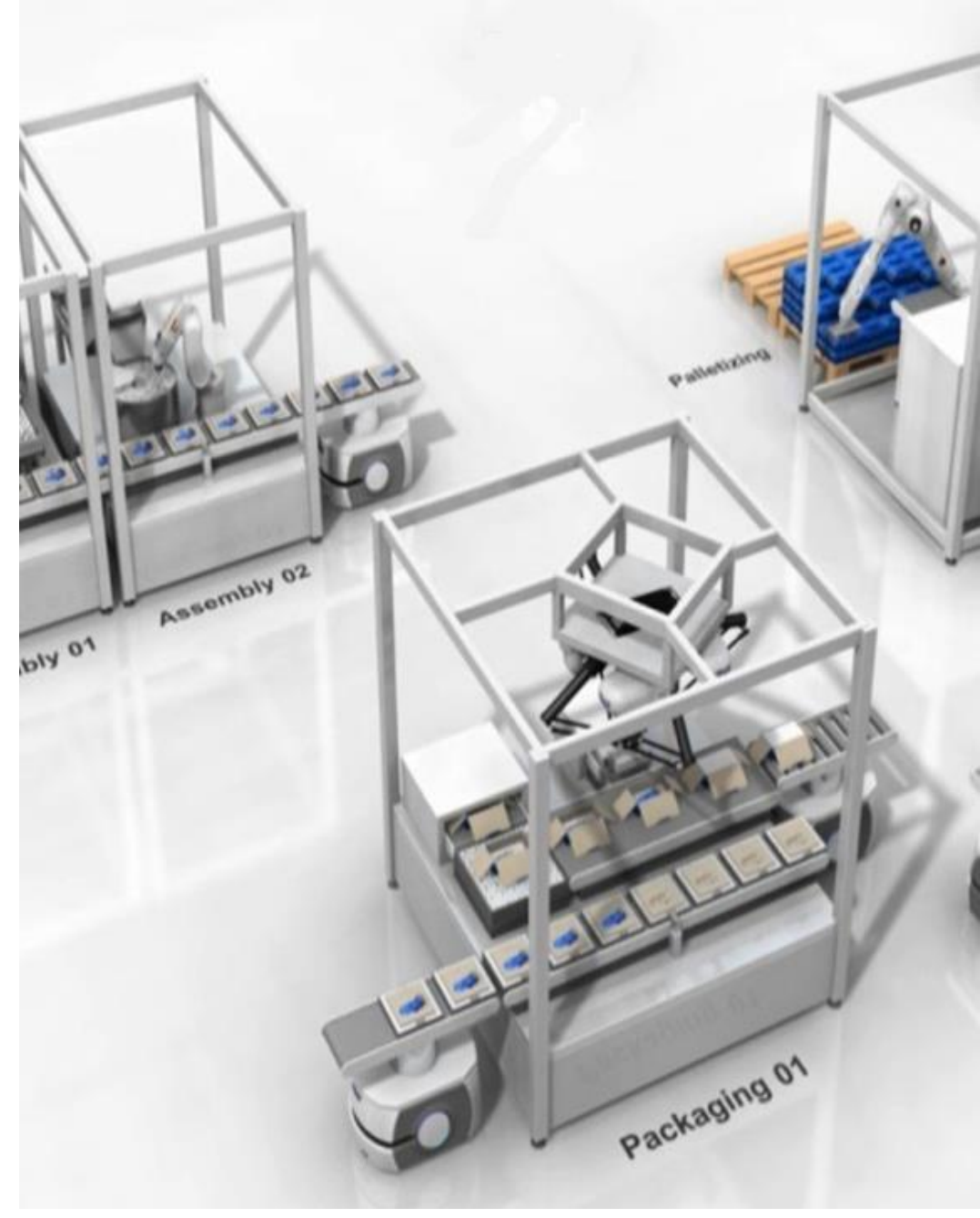
Traceability

The ability to trace the history, application or location of a product(s) by means of recorded identification

– Assure compliance with industry regulations

– Identify non-conforming products before they reach the market

– Recall specific batches instead of entire lots

Serialization

The ability to trace individual items from manufacturing, through distribution and retail to the end-user

– Visibility at a granular level; eliminate product shrinkage

– Protect against counterfeit products

– Respond rapidly to product holds or recalls

Product Inspection

Verify the product is not compromised and there are no missing pieces, components or deformities

– Deliver more complex products at higher levels of precision

– Reduce end-of-line defects and non-conformities

– Maximize inspection coverage with measured feedback throughout the production process

Label/Marking Quality

Verify the quality and integrity of labels and other package markings

- Ensure readability and durability of critical product information

- Verify non-human readable information is understood by a quality management system

- Maintain brand image by checking for label integrity

Intelligent Packaging

Pick and sort components or products and place them in the appropriate location with the correct orientation

- Avoid workplace safety hazards
- Perform routine functions to fine tolerance limits
- Increased throughput with true around-the-clock production
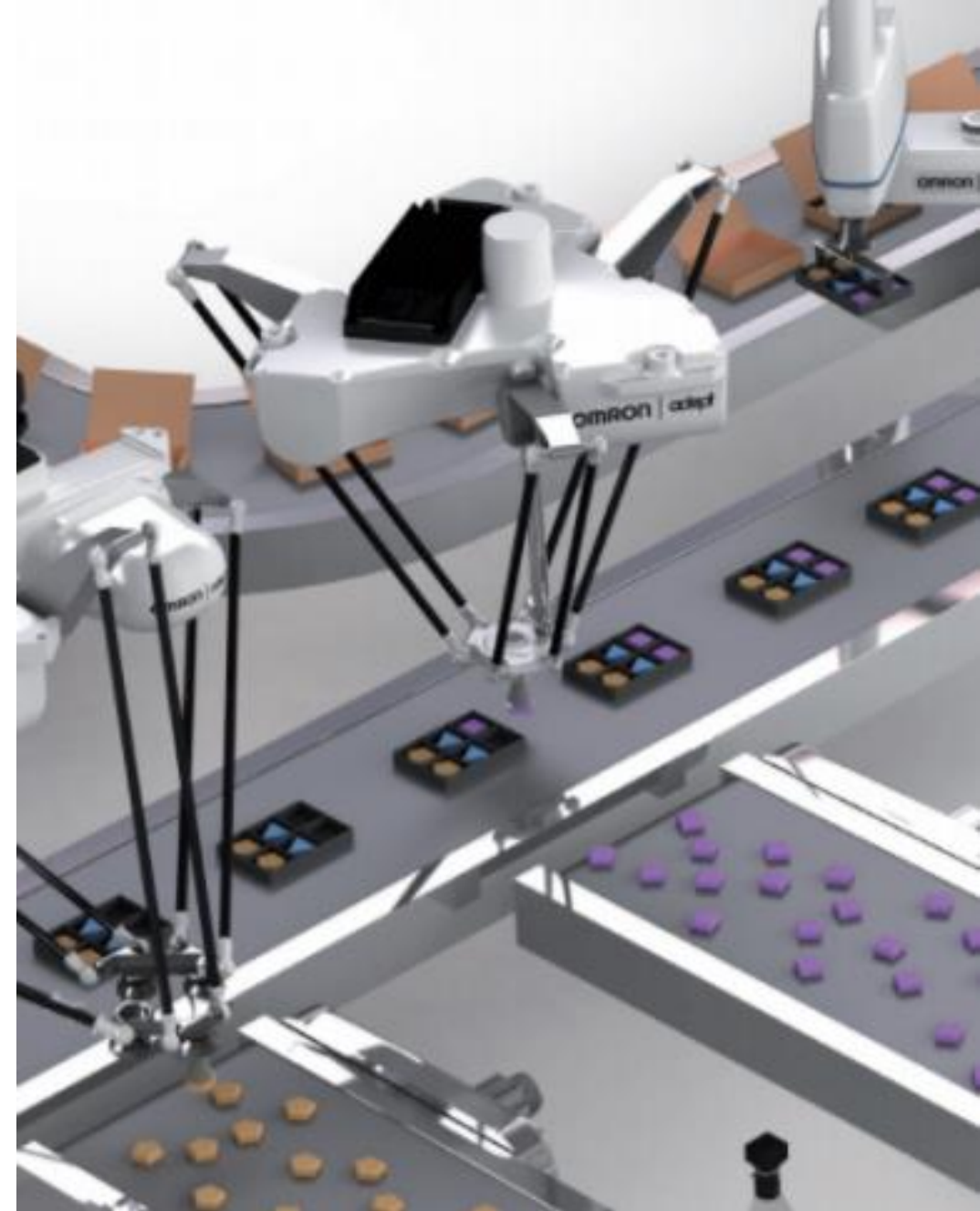
Data Security

Machine-to-machine and production floor data is optimally protected against unauthorized access

– Mitigate the effects of an attack on machines and systems

– Isolate the plant floor from the enterprise network

– Minimize the need for maintenance from IT

Machine Safety

Improve uptime and productivity by protecting operators and operating machines

- Maintain compliance with safety standards
- Allow people and machinery to collaborate safely
- Protect capital investments

Predictive Maintenance

Increase reliability of machines and components as well as the stability of the overall system by accurately predicting early indicators of potential failures

– Predict where, when and why component failures are likely to occur

– Provide cost savings by minimizing unplanned downtime

– Acquire and monitor data trends for decision making at critical control points

Component Lifespan

Continuity of components over time to allow replication of existing, or legacy, machines on production lines

- Negate the necessity for redesigning machinery due to end-of-life components
- Maximize availability and uptime of machinery
- Minimize the need for revalidation due to component changes

Equipment Effectiveness

Evaluate how effectively a single piece of machinery or an entire production line is utilized – *also known as OEE*

– Increase productivity by gaining visibility into operations

– Provide insight on the location of production bottlenecks

– Reduce machine downtime and maintenance costs through better management of the life cycle

Edge Intelligence

Connect disparate machines to gather data that is actionable and intelligent

- Facilitate secure communications with machines that are currently unable to communicate or transmit data
- Zero impact on the validation state of the original machine
- Quantify a machine's productivity without the need for a PC on the machine or the production line

Q&A Session

Use the Ask a Question box to ask a question to our speakers and click on the Send button

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