

## Optimizing Palletizing Processes with Integrated Cobot Solutions

A complete overview of how Collaborative Robots can enhance efficiency, safety, and cost-effectiveness in Palletizing and Depalletizing operations.

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## Optimize palletizing processes and improve overall operational efficiency

This document provides an overview of palletizing and depalletizing processes and their significance in various industries. It explores the needs and challenges faced by manufacturers in manual palletizing operations and highlights the benefits of automated solutions. The document focuses on the use of collaborative robots (cobots) in palletizing systems and discusses the advantages of integrated solutions using cobots and machine automation controllers.

It emphasizes the increased efficiency, flexibility, safety, cost-effectiveness, and data-driven insights offered by these integrated palletizing solutions. The document serves as a comprehensive guide for manufacturers seeking to optimize their palletizing processes and improve overall operational efficiency.







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# What is Palletizing and Depalletizing?

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## Two complementary processes that involve the handling of goods on pallets, but they have distinct purposes and functions.

Palletizing and depalletizing are two complementary processes that involve the handling of goods on pallets, but they have distinct purposes and functions.

Palletizing refers to the process of arranging and stacking products or goods onto pallets in a specific pattern or configuration. It involves placing items onto a pallet in a structured manner, typically following a predetermined pattern or arrangement. Palletizing is commonly used in manufacturing, warehousing, and distribution operations to efficiently organize and transport goods. Palletizing

can be done manually by workers or automated using robots or other machinery.

Depalletizing, on the other hand, is the process of unloading or removing items from pallets. It involves taking products or goods off a pallet, often in a specific order or sequence. Depalletizing is typically done to feed products into downstream processes, such as packaging, sorting, or assembly lines. Similar to palletizing, depalletizing can be performed manually or automated using various technologies, including robots, conveyors, or specialized depalletizing equipment



## In which types of industries are Palletizing and Depalletizing most used?



Palletizing solutions find wide application across various industries, including logistics and distribution, food and commodities, pharmaceuticals, and automotive. In logistics and distribution centers, palletizing is instrumental in optimizing the loading and unloading of goods onto pallets, resulting in improved efficiency, reduced manual labor, and secure shipments. The food and beverage industry relies on palletizing for the packaging and distribution of products, encompassing items like bottles, cans, cartons, bags, and packaged food products. In the

pharmaceutical sector, palletizing is indispensable for handling and palletizing medications, medical supplies, and healthcare products, ensuring efficient and accurate packaging for distribution and storage. Moreover, in the automotive industry, palletizing solutions integrated with sequencing systems enable the arrangement of automotive components in the correct order for assembly, streamlining the production process. These diverse industries highlight the versatility and benefits of palletizing solutions across various sectors.





Systems capable of handling high volumes of products swiftly and accurately, reduce the reliance on manual labor, minimizing downtime.

### Common needs in palletizing and depalletizing operations

In the realm of palletizing operations, several needs arise from the labor-intensive nature of manual palletizing. This operation demands significant physical effort from workers, leading to fatigue and potential injuries. Additionally, finding and retaining skilled workers for these tasks can be a struggle for businesses. Furthermore, manual palletizing requires proper training and skill development to ensure safe and effective performance, posing challenges for consistent workforce training. To address these issues, manufacturers seek automated

palletizing solutions that offer improved efficiency and productivity. They require systems capable of handling high volumes of products swiftly and accurately, reducing the reliance on manual labor and minimizing downtime. Moreover, they often encounter a diverse range of product types, sizes, and packaging configurations, necessitating flexible and adaptable palletizing solutions that can accommodate varying requirements without extensive reconfiguration or downtime.



# Most usual systems for automatic Palletizing and Depalletizing

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### Cartesian robot

A Cartesian robot consists of a three-axis or multi-axis mechanism that operates on a Cartesian coordinate system (X, Y, and Z axes) to handle and stack products onto pallets. The Cartesian mechanism utilizes linear actuators or motors to move along each axis. These actuators can be driven by various mechanisms, such as belts, gears, or lead screws. To achieve higher accuracy and speed, most Machine Builders utilize servo systems and machine automation controllers (MAC) to enhance motion performance.

### Six-axis Robots

Robotic palletizing and depalletizing systems use industrial robots or collaborative robots (cobots) equipped with six-axis and specialized end-of-arm tools (EOAT) to handle and stack products onto pallets. These robots can be programmed to handle various product types and configurations, offering flexibility, adaptability, and a higher degree of freedom for movement. Robotic palletizing systems are versatile and can handle high-speed operations with precision. The EOAT can be customized based on the specific requirements of the palletizing application, such as vacuum grippers, mechanical grippers, or other specialized tools.

## What are the challenges that manufacturers encounter when implementing an automatic palletizing system?

When considering automated palletizing solutions, manufacturers must prioritize various factors to ensure a successful implementation. One crucial

aspect is safety, as palletizing systems involve heavy loads and moving parts that can pose risks to workers. To mitigate these risks, manufacturers need to implement appropriate safety measures, such as safety barriers, sensors, or interlocks, to protect workers and prevent accidents.

Another key consideration is space optimization. Many companies face limitations in floor space within their warehouses or production facilities. Therefore, they require palletizing solutions that can optimize space utilization, allowing them to maximize storage capacity or accommodate other equipment and processes efficiently.

Integration with existing systems is also a significant concern. Factories often have established equipment or systems in place, such as conveyor belts, packaging machines, or warehouse management systems. To ensure smooth material flow and data exchange, they need palletizing solutions that can seamlessly integrate with these existing systems, minimizing disruptions and maximizing operational efficiency.

Cost-effectiveness is another critical factor driving companies' decision-making process. They seek palletizing solutions that offer a favorable return on investment (ROI). By reducing labor costs, minimizing product damage, optimizing space utilization, and improving overall operational efficiency, these solutions can deliver long-term cost savings for companies.



# Additional considerations for choosing an automatic palletizing system

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When implementing an automated palletizing system, it is important to consider factors such as payload capacity, end-of-arm tooling (EOAT), footprint, and the ability to handle mixed pallets. The system should have the capacity to handle the weight and size of the products being palletized, with appropriate EOAT for secure stacking. The system should also fit within the available space and be able to handle mixed pallet configurations if necessary. Additionally, ease of programming and compatibility with existing equipment and systems should be considered. By carefully considering these factors, a successful implementation of an automated palletizing system can be achieved.

## Why are manufacturers choosing Cobots?

While industrial robots have their own advantages in terms of payload capacity, speed, and advanced capabilities, cobots offer unique benefits in terms of safety, flexibility, space efficiency, cost-effectiveness, and ease of use.

Cobots ensure safety by working alongside humans without safety barriers, equipped with features like force sensing and collision detection. They offer flexibility and adaptability, easily reconfiguring for different product types. Cobots are space-efficient, fitting well in limited spaces. They are cost-effective with lower upfront costs, requiring less infrastructure and consuming less power. Cobots are user-friendly, requiring minimal programming knowledge, making them accessible

to engineers with limited robotics experience.

## Architecture options for Cobot Palletizing

### Stand-alone

A stand-alone palletizing solution refers to a palletizing system that operates independently and does not require integration with other equipment or systems. It is a self-contained unit that handles the entire palletizing process from start to finish.

The stand-alone palletizing solution can be programmed to handle various product types, sizes, and configurations. It can stack products onto pallets according to predefined patterns or specifications. The programming can be done in the robot's own software or in external software that provides specific tools for palletization and compatibility with the robot.

The system may also include features such as pallet dispensers, product conveyors, and pallet conveyors to facilitate the smooth flow of products and pallets. Also, external mechanisms with lifts or horizontal axis (commonly known as seventh axis) can be integrated to extend the cobot reach in case of larger height or width of pallets.

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## Integrated Palletizing

An integrated palletizing solution refers to a palletizing system that is fully integrated with other equipment or systems within a production line or workflow. It involves the seamless coordination and communication between different components and processes to automate the palletizing process.

In an integrated palletizing solution, the palletizing system is connected and synchronized with upstream processes such as product handling, sorting, and packaging. It may also be integrated with downstream processes such as labeling, wrapping, or shipping.

The integration of the palletizing system with other equipment or systems allows for a continuous and efficient flow of products throughout the entire production process. It enables automated transfer of products from one process to another, eliminating the need for manual intervention or additional handling.

The integrated palletizing solution may involve the use of conveyors, robotic arms, safety sensors, vision systems, Machine Automation Controller (MAC), and Human-Machine Interface (HMI) to facilitate the smooth operation and coordination of the palletizing process. These components work together to ensure accurate product placement, proper stacking, and efficient palletizing.


The Machine Automation Controller plays a crucial role in communicating with external equipment, being able to control multiple processes simultaneously. Like the stand-alone solution,

external lifting mechanisms and servo drivers can also be integrated and controlled by the Machine Automation Controller to extend the robot's reach. In terms of connectivity and IIoT capabilities, it brings flexibility and easy integration with the main systems utilized in the manufacturing process, such as MES, SCADA, ERP, and other cloud-based interfaces. When combined with code readers and vision systems, these capabilities bring great benefits to traceability control, especially in the life sciences, food and beverage, and automotive industries.

The HMI is another important component for integration. It provides a user-friendly interface for operators to easily interact with the system, monitor the process in real-time, and make necessary adjustments. The HMI simplifies system configuration and setup, offers diagnostic and troubleshooting capabilities, and can be integrated with other systems for seamless data exchange. It enables data visualization, reporting, and remote monitoring and control.

Depending on the complexity of the machine layout and the interaction between the cobot and operators, external safety components such as emergency stop switches, safety laser scanners, and enabling switches can be integrated into the system to minimize risks and create a safer environment. These components are designed to detect potential hazards, collisions, limit speed and force, allow for safe manual interaction, and provide emergency stop functionality.





# What benefits do collaborative robots bring to palletizing operations?

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# The flexibility of cobots enables easy adaptation to different product types and configurations, accommodating changing production requirements.

The use of collaborative robots in palletizing systems increases efficiency by allowing cobots to work alongside human operators, handling repetitive tasks and freeing up humans for more complex activities. The flexibility of cobots enables easy adaptation to different product types and configurations, accommodating changing production requirements. Safety is enhanced as cobots are designed to work safely alongside humans, equipped with advanced sensors and safety features. The combination of cobots and machine automation controllers optimizes

resource allocation, ensuring accurate and precise palletizing. The integration streamlines system setup and operation, while advanced safety features ensure a secure working environment. The cost-effectiveness of cobots is evident through lower initial investment, maintenance, and operating costs. Additionally, cobots improve ergonomics by reducing strain on human workers and provide data collection and analysis capabilities for process optimization. Data-driven insights enable continuous improvement, and the solution is scalable for future needs.



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## Learn more about Omron Solutions

Automated palletizing solutions, particularly cobots, revolutionize palletizing operations by improving efficiency, productivity, and worker safety. They offer flexibility, adaptability, and seamless integration with existing systems. By embracing automation, manufacturers can overcome the challenges of manual palletizing and unlock the full potential of their operations.

Click and check how Autonomous Mobile Robots can extend the Palletizing and Material Handling solution.





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