



Automating a Palletizing Cell

Basics, Essentials, and Decision-Making Approaches



In an effort made to democratize automated palletizing cells in industrial, manufacturing and material handling environments, this eBook aims to explore the concepts of palletizer efficiency, deployment, features & benefits, and impact on the workforce. Steps will be taken to address return on investment, workplace, and application-specific factors that will weigh in at the decision-making stage.

Table of Contents

Goals.....	2
The Workforce Buy-In.....	4
Getting Started: Justify the Project and Gather Information	4
Choosing the Right Palletizer.....	6
Additional Solution Costs.....	7
Making the Cut: Summarizing the Final Palletizing Solution	7

START
PRODUCTION
FASTER

The worldwide pandemic that started in 2020 has forced companies to re-examine how they utilize their workforces throughout their organizations. The days of an overabundance of labour are over. The workforce is aging. Today's youth are accustomed to a fast-paced world provided by social media and personal communication devices and expect their careers to adapt and reflect this technology. Today, companies are all vying for a portion of a diminished labour pool.

Historically palletization has involved manual labour placing goods or materials, onto pallets or bins that were usually positioned close to conveyor belts discharging the packaged or bulk products, or at the very least, in a convenient location to accept the items.

Palletizing is a tertiary process that is the step before warehousing and final shipping. There are two system types: centralized and decentralized. Centralized palletizing means the factory layout will consolidate all goods produced in a single point where palletizing is done, usually with a system of conveyors. Decentralized palletizing means the produced goods are in multiple locations across the factory floor, each location having an independent station where palletizing is done.

Although automated palletization may seem like a panacea to solve all labour shortages or to increase production with less manual labour involvement, it is important to understand both the benefits and shortcomings of any manufacturing process upgrades.

Goals

One cannot address a possible production change (i.e., the implementation of an automated palletization cell) without first listing goals, and which of these goals ensure success. If targets are identified (i.e., employee safety, increased productivity, efficiency), then systems can be designed to achieve them without relying on hit-and-miss approaches that lead to disappointment. Always remember the physics concept that for every action there is a counteracting action. Production concept success is in no way different.

Greater palletization efficiency at the production end is a given. Efficiency does not automatically mean an increase in speed. Human hands are faster but the human body is also more fragile.

Robots are not affected by:



Fatigue.

Cobots work consistently over long periods of time.



Ergonomics.

Twisting motions and other limiting physical maneuvers present a risk for humans, and not for robots.



Payload.

There is a robot for virtually any application.

Even though humans generally respond well to change, manual workers may find it difficult to adapt to process changes that put a strain on their physical health, namely task-related actions that induce injuries due to poor ergonomics and repetitive movements. Robots can be adapted to all production challenges. Manual labour is restricted to what they can lift safely. Robots, by changing the type of gripper, such as pads, fingers or suction pads, can lift pretty much anything without fear of dropping it.

Automating palletization translates to:

- Not relying on an aging and possibly shrinking manual workforce. **Manual repetitive labour is being shunned by all ages** in our society.
- Not shutting down palletizing system due to employee injury because of back strain. A simple sprain can lead to **unexpected long-term medical issues** for both the employees themselves and also for company insurance premiums.
- If applicable, reassigning humans to value-added tasks in the organization.
- A cohesive production line. The successful integration of an automated cell at the palletizing step of the process will minimize bottlenecks, provided cycle time reduction was a target in the first place.
- **Employees do not like dull and repetitive steps.** Utilize their skills elsewhere. Long-term employees already have a vested interest in company success.
- End product consistency and quality. Intactness of packages and boxes. Satisfied customers as to **what they find on their incoming pallets.**

Features of Automated Palletization
Different box/item surfaces can be handled
Adapts to all object configurations
Adapts to product size changes
Easily deployed in as little as a few hours
Can be redeployed
May fit in smaller spaces
Quick set-up time
Reduces employee hours at the end of the line
Reduces employee numbers at the end of the line
Removes human injury at the end of the line
Removes human repetitive tasks at the end of the line

The Workforce Buy-In

Very few workers find job satisfaction in doing repetitive, drone-like labour. Enlightening any management and labour team about the benefits of palletization is simply about stressing the positive aspects of it such as:

- ✓ Promoting bodily safety and good ergonomics to protect their health.
- ✓ Guaranteeing employment by moving them to other job functions even if extra training is required.
- ✓ Helping to improve everyone's job stability by reducing slowdowns or downtimes due to absenteeism because of workplace disability issues.
- ✓ If job guarantees are not given to the pallet crew, the morale of others may suffer as they start to worry about their ability to earn a living. Overall production may even decrease as a result.
- ✓ Putting forth the option of enhanced training to do other important manufacturing tasks in the system is often a dealmaker for sites that are unionized.

It is a win-win situation if a company can make its workforce accept that changes are about them first.



Getting Started: Justify the Project and Gather Information

There are a number of factors that need to be considered to maximize the return on investment (ROI).

- 1.** Determine the output of the palletizing cell. What is the target pace and production rate? How many pallets can be loaded, and how many boxes or packages can be placed in a given time window?
- 2.** Determine the arrangement or configuration of the pallet. This information can come in a variety of formats such as layer pattern, layer sequence, and package layout.
- 3.** Determine the weight of boxes and/or packages.
- 4.** Determine how the boxes are stacked. Are they to be interlocking or placed directly on top of the lower item? Interlocking has been found to result in damage cost savings since it makes for more stable pallets that are less likely to collapse.
- 5.** Determine pallet moving requirements. Different equipment may be needed to best utilize the benefits of better loaded and even bigger final pallet loads.
- 6.** Determine the floor space required. Palletizers take up more room than a manual labourer. They also cannot move out of the way when lift trucks manoeuvre around the pallet.
- 7.** Evaluate the ROI of centralized vs. decentralized palletizing. Would you need to reconfigure your work floor for centralized palletizing? Should you keep your production line as it is with a decentralized palletizer?



Reasons Justifying Palletizer Deployment
Changing labour force
Government safety regulations changing
Handles fragile packaging better with less damage
Increase in throughput
Consistency in throughput
Worker insurance premiums increasing

The solution provider and/or integrator should be considered a full member of your production team, ensuring the successful deployment of a palletizer, and flawlessly merging with company employees of all levels, from engineering to production to floor people.

Traditional Palletizer Deployment Method

- Calculate correct centre of mass for products
- Calculate correct payloads
- Calculate robot arm reach to maintain centre of gravity
- Reduce changes in pallet configuration

Smart Cobot Solution

- Software-managed centre of mass values
- Software-managed payload values, based on end effector capacity
- Software-managed reach and limitations.
- Use of an online simulator for layout and test purposes
- Copy/Paste cells and change configurations relatively easily

Choosing the Right Palletizer

In the best-case scenario, **a vendor will help determine what system best fits the anticipated goals.** This is done both in-office meetings and on the floor watching how what is there now works, from the front end to the final shipping system. Discussion with actual floor employees that do the physical work is often missed. This may be a result of various factors such as how the company's hierarchical structure is designed and even the cultural background of the location.

A top-down management system can easily miss important details that can waylay any expenditures. Likewise, a less structured chain of command may assume that someone else will identify any outages. The type of management system will influence how much the vendor can make suggestions. Management lead time may be different from what the vendor can accommodate.

A vendor should have input on how capacity requirements of palletization may fluctuate week to week. Suggestions as to the **type of gripper system**, such as foam pads or suction cups on the end effector, **need to be determined** and even if they can be modified if the conveyor production changes. If pallet dimensions and weight are going to change from what is currently the norm, a vendor will need to know if this is for the long term.



Centralized vs. Decentralized Palletization

Centralized	Decentralized
One main robot	Multiple smaller robots
Multiple conveyors feeding one robot	One or two conveyors feeding one robot
More conveyors is not an issue	Used when wanting fewer conveyors
Product lines do not change	Product lines are changeable
One program changes for varying products	Program can be changed for one robot leaving the others the same
Production stops if robot goes down	All production does not stop if one robot goes down.

If multiple conveyor feed lines exist or in future more may be expanded, the vendor may recommend the use of not just one industrial robot or custom solution, but multiple smaller ones. These are known as end-of-line palletizers. The programming code will need to be considered to make sure that there is easy and enough flexibility to handle even minor production problems so that the palletizer can respond to them (i.e., change in the variety of packages, program steps before and after the actual palletizing stage, intuitive script functions for out-of-the-box processes, etc.).

Since barcodes and QR codes are the norm on boxes and final pallets, does the palletizer have to orientate them in a certain way to make them readable by the company warehouse and shipping department? The transport company such as truck, train or sea vessel? And by the final customer.

Additional Solution Costs

The initial purchase price of any unit is not the final cost. **All costs need to be added to calculate a correct ROI.**



There are maintenance costs and spare parts costs.



Safety features such as fencing also need to be factored in.



Delivery of critical parts may have a long lead time if not warehoused at the site.



Software will need to be updated on a regular basis as vendors tighten up the operating code and this will need to be beta-tested to ensure updates work as designed for the system.



The initial purchase price should clearly state that all necessary programs are in the package and not add-ins.



Additional cost for conveyor line sensors that shut down the system will need to be factored in as the palletizer location may have no human interface nearby if the palletizer malfunctions.

Making the Cut: Summarizing the Final Palletizing Solution

Automated palletizing is extremely reliable and is used in countless industries. Computer programs are getting extremely focused but easily transferable from unit to unit. For instance, some solutions such as **Robotiq's can be deployed and programmed within a day.** It may come as a surprise that the “wheel” does not need to be reinvented to make palletization work anywhere and at. Similar computer operating codes are found in CNC machines (computer numerical control) that may already be in use in the maintenance departments of many companies and so company IT specialists may be able to do the normal program maintenance and computer upgrades without calling in the vendor specialists, but this option should always be included in the final contract.

Palletizing is no longer in the realm of rocket science. Applications are no longer a specialist job. It is easy to think that palletizers are only suitable for very high-volume systems and ignore them. **Decentralized cobot systems open a whole new world of applications where traditional industrial centralized systems were simply not an option.** The collaborative smaller systems make them affordable for both bigger companies that would use a “cobot fleet” of some extent to reach their KPIs, and businesses outputting smaller product volumes.

Think big or think small, there is a palletizer just right for any application.





START PRODUCTION FASTER



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share their **know-how**, and **get answers**.

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