Robot or Layer Palletiser?

What are the pros and cons of stacking products with a robot versus a ‘convential’ layer palletiser?

palletising

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Conventional palletising has existed since the 1950's. Robotic palletising since the 1980's. But on what grounds should you implement the one technology or the other?

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Introduction

Many FMCG/CPG manufacturing companies have implemented automatic palletising at the end of the production line and even more others are considering it. If you want to move away from manual palletising, two technologies are available: machine layer palletising and palletising with robots (industrial or collaborative). Because most suppliers of palletising solutions only have one technology available, they try to convince their customers of the benefits of that type of technology. In this White Paper we look at the pros and cons of each technology to enable an objective choice. Different variables, such as the specifics of the situation, equipment footprint, type and capacity of products and others, influence the decision and lead to different choices in different situations.

At low capacities (< 7 cases a minute), a collaborative robot may be the better suited/cheaper solution. For all regular and high capacity levels, there is not much difference between the industrial robot solution and the collaborative robot. Therefore, these platforms have been treated as one generic platform.

Gantry robots have not been taken into account, as they are less efficient in end-of-line solutions and more suitable in warehousing environments.

Relevant variables

What variables should you look at when preparing a decision on automatic palletising technology?

The **footprint** is an important factor. On brownfield sites there is often little space to install a palletising solution. Locating the solution in a different area will result in higher costs for transporting the product. Conveyors can be attached to the floor or to the ceiling, a palletising solution usually cannot.

Capacity of the lines (cases per minute; cpm) in combination with the number of lines is crucial for the choice. Both robotic and layer palletisers can handle the entire range, from very low to very high capacities. The difference is mainly in the volume of equipment needed to handle the high capacities.

But don't just think about today's capacity, **future growth** may also be a factor. The costs and complexity of major capacity extensions can certainly play a role. Depending on the technology platform, the consequences will be quite different.

Stacking accuracy can be important when full pallets need to be automatically stacked in a warehouse or have to be shipped in very tight loading units.

Reliability can be achieved through the use of very robust equipment designed to maintain a very high reliability. As an alternative, or in combination with the previous measure, parts of the equipment can be equipped with overcapacity (redundancy).

If the product is very **vulnerable to damage**, this must be taken into account when designing the system. The solutions with robots or layer palletisers are quite different.

Maintenance cost are an OPEX-factor that returns year after year and must therefore be taken into account in the total life cycle costs of the installation.

All the above variables influence the **overall installed cost of the system** (CAPEX/initial investment). Since palletising can be done with layer palletisers in most situations, as well as with robotic palletisers, the cost factor may ultimately prove to be the deciding factor.

Irrelevant variables

Several variables are important for designing of the right palletising solution, but do not really influence the choice between robotic and layer palletising.

State-of-the-art technology: don't be misled by the term 'conventional layer palletiser': the modern layer palletiser is, from a technology viewpoint, more sophisticated than the average robot.

Safety also is not a distinguishing factor. Robust and safe solutions are available or can be designed for both layer palletisers and robot palletisers.

Delivery time may play a role, but it mainly depends on the capacity of the supplier. A robot can be made available with relatively short delivery times. The design and engineering of the total solution, the construction and testing of the palletising cell and installation and commissioning on site determine the total time needed for a palletising project.

The **operational capacity required** to run a robot palletising system or a layer palletising system is approximately the same if it is properly designed. It must be able to run continuously 24/7 with a quick and easy response option in case something goes wrong (short MTBF and short MTTR).

A very high level of **system reliability** is reached by designing robust palletising systems. The systems continue to perform at a very high reliability level for a very long time. In robotic systems, reliability is usually increased by introducing redundancy, either in extra robot cells or in switching possibilities of lines to other palletising cells.

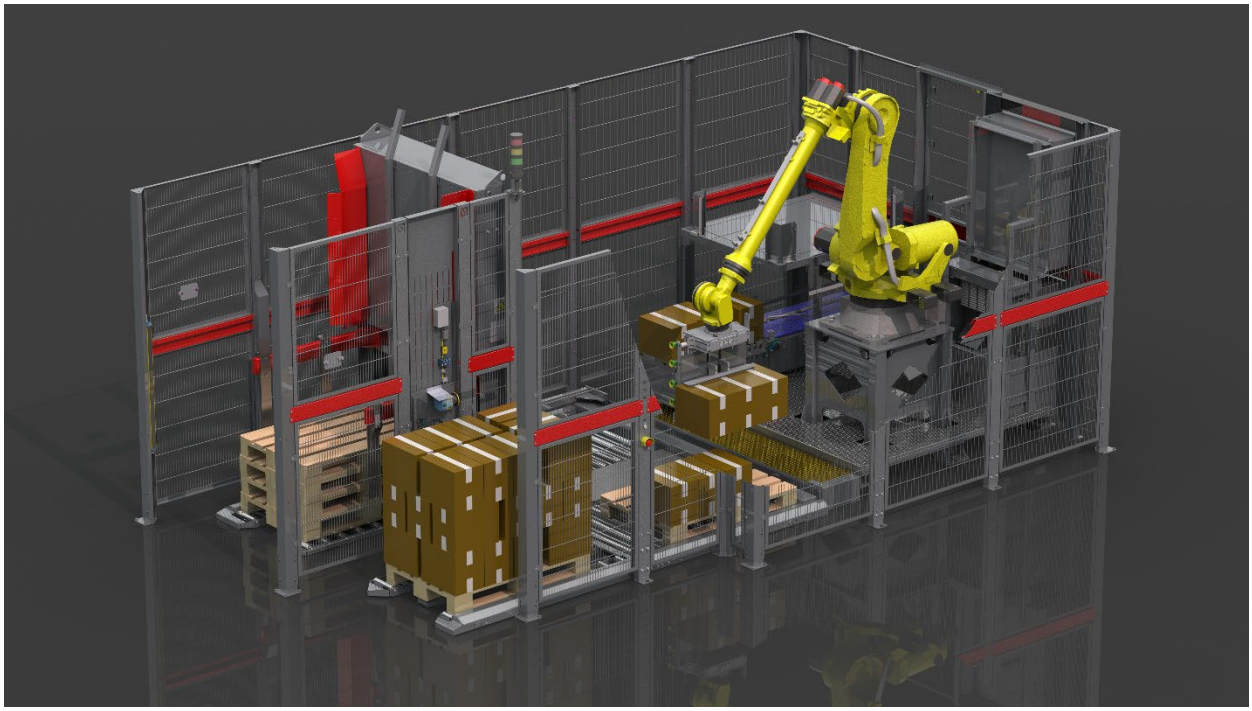
Training needs and level are comparable. Technology is different, but it doesn't take more time to master the one or the other.

Monitoring operational status of the equipment can be made visible, both at a local level and at a central, operational management, point. With the currently available software tools, even remote monitoring and intervention can be realised.

Both technologies allow systems to be designed that are very **energy efficient/sustainable**. Normally power and compressed air are necessary to run the system.

Although robotic systems have the image of being more **flexible**, this is only the case as long as they are not integrated into a total system. Major changes in capacity/product mix, type of cases, footprint etc. require major adjustments to the system in both technologies.

The **connection with other systems** (ERP, WMS, labelling equipment etc.) is also part of the total system design and is not dependent on the type of technology chosen.



Comparison

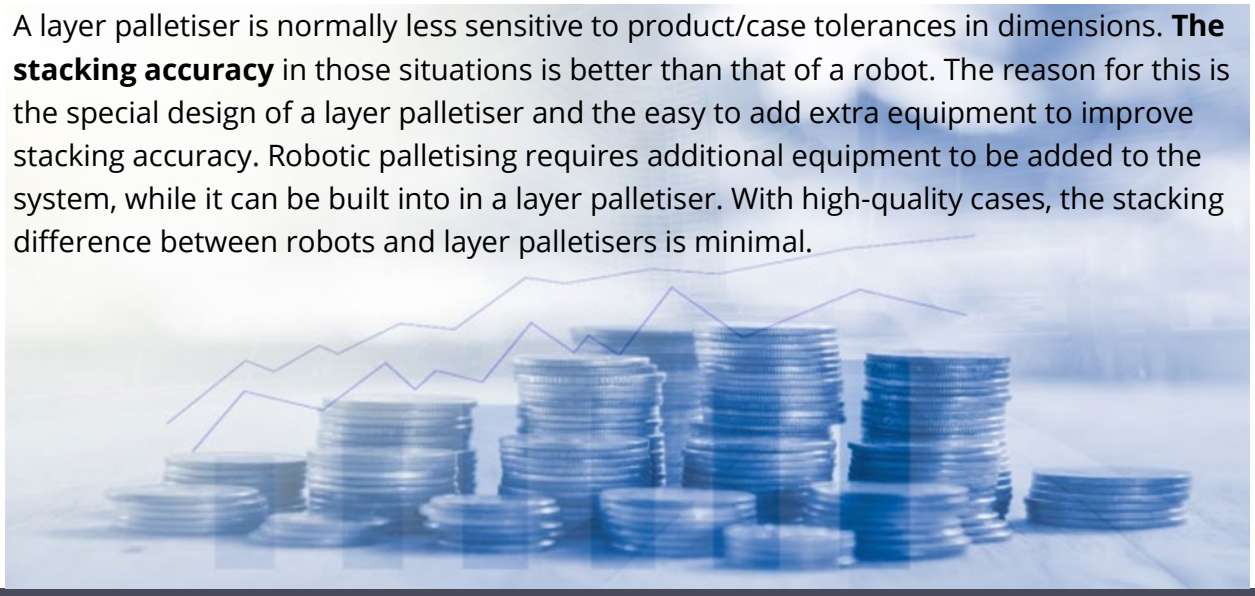
Based on the variables mentioned above under ‘relevant variables’, a comparison is made between robotic and layer palletising.

In general, the **footprint** of a layer palletising system is (much) smaller than the footprint of a robotic system on floor level. On the one hand because of higher-level equipment (e.g. buffer decks or lanes) and on the other hand because a layer palletiser has fewer parts that can move in all directions, so less space is needed for it to function safely. If multiple production lines are connected to a central palletising area, the situation may be different, because one robot can also handle multiple lines.

The speed of the robotic arm in combination with the end-of-arm gripper determines the capacity of the robot cell. The **maximum capacity** can be achieved if an entire layer is picked up and placed in one movement. The capacity of a typical layer palletiser is normally a lot higher, because layer formation and layer placement are split and work in parallel. The entire machine is designed to maximize throughput, while a robot arm used for palletising is just one of many possible applications. Both in situations where the capacity of a single line is high, and in situations where many production lines are running simultaneously, the layer palletiser is most likely the preferred solution.

The influence of **future capacity extensions** depends entirely on the specific situation. In some cases, one extra robot can significantly increase the capacity of the factory. In other cases, an extra conveyor can increase the capacity of a layer palletising solution. The cost differences can be huge, so it is wise to research this before making the initial investment.

A layer palletiser is normally less sensitive to product/case tolerances in dimensions. **The stacking accuracy** in those situations is better than that of a robot. The reason for this is the special design of a layer palletiser and the easy to add extra equipment to improve stacking accuracy. Robotic palletising requires additional equipment to be added to the system, while it can be built into in a layer palletiser. With high-quality cases, the stacking difference between robots and layer palletisers is minimal.



An additional advantage of extremely reliable palletising systems is the low **maintenance cost**. Machines tend to require more maintenance than robots because they consist of more parts. However, maintenance of the robotic arm must be carried out by specialists and is relatively expensive. The level of use of robots is palletising cases is very low, so robotic systems also have very acceptable maintenance costs over the lifetime.

A system must be easy to operate and maintain. This means that all relevant parts of the machine must have **good (ergonomics) and safe access**. The accessibility of a (high infeed) layer palletiser is achieved by building a platform, which requires people to climb stairs. In addition, extra lighting and safety measures are required. Robots are directly accessible at ground level, which requires a stricter access policy (and toolset).

Robots pick and place products and thereby exert force on the product. Products that require very **gentle handling** should generally not be handled with robots unless a gripper can be designed that prevents product damage. With layer palletisers the handling of cases is much smoother, they are always supported from below and only pushed to change direction.

At the end of one medium capacity production line, a robotic solution will in most cases be the preferred solution from a cost perspective. At higher speeds or multiple lines at low/medium speeds, the layer palletiser generally becomes more attractive, but does not necessarily have to be the lowest investment solution in all cases. In any case, careful analysis and comparison is needed.

Conclusion

Both robot palletisers and layer palletisers can replace the human who palletises manually in almost all cases. However, depending on the situation in the factory or warehouse, one technology may be more suitable than the other. The variables that play a role are known, how to interpret them is a job that the automation specialist must do together with the company that wants to purchase an automatic palletiser.

The available space in the factory or warehouse, the capacity of the lines, the possibility of large capacity expansions in the future, the necessary stacking accuracy, the desired system reliability, the gentle handling needs and the annual maintenance costs play the most important roles. However, sometimes the initial level of investment forces the decision in a certain direction because budgets are limited and both platforms can do the job.

A careful analysis of the variables that lead to a specific solution will reveal what the best possible solution is in any given situation.

How can we help you?

CSi has almost 60 years of experience in realising all kinds of projects involving palletising and conveying equipment. Based on that history, CSi is very capable of carrying out all kinds of palletising projects. By gaining experience with both robotic palletising and layer palletising since the early 1980s, CSi has truly become a specialist in this field. We are happy to share this wealth of knowledge and experience with customers who are thinking about automatic palletising.

If you would like to receive more information, don't hesitate to contact us.

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