

What are the different degrees of warehouse automation?



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Warehouse automation = replacing human labour with machines and/or computers in a warehouse. This means replacing both physical labour, i.e. the internal transport of goods, and mental labour, i.e. the thinking.

You might also be familiar with the terms mechanisation and robotisation. Mechanisation is the process of machines taking over the physical work of people. Mechanisation also tends to involve a software component that carries out some of the thinking, such as planning the order of tasks or determining the fastest route through the warehouse. We talk about robotisation when humans are no longer needed at all - neither on the floor nor in the office. In such instances, machines or systems work fully autonomously.

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Why replace human labour in the warehouse?



Physical labour

Warehouse work is intensive and physical, even with the use of tools such as forklift trucks, reach forklift trucks or pallet trucks. Your employees have to constantly bend, twist, reach and lift to move goods. They get on and off their trucks as they move from one location to the next. They're on the move an awful lot, not just driving, but walking too. In logistics, distances are often long.

Mental labour

The work undertaken by warehouse employees can be mentally laborious. They search for items and storage locations, constantly reading and marking off their documents. They spend a lot of time thinking about the ideal route through your warehouse, the most convenient way of working or the order in which to work. Finally, they have to think about the needs of customers, whose demands are ever increasing. Some, for example, will not accept pallets higher than 1.2m, while others will not accept pallets unless the barcode label is in exactly the prescribed position.

Less efficient

Not all of the work undertaken by warehouse employees is equally valuable. The order-picking process accounts for as much as 60 percent of all work carried out, which itself is made up of at least 50 percent walking from one location to the next. This is not the task you hired your employees for, but one that's needed to ensure that orders leave the warehouse.

Range of problems and complaints

People are far from flawless. They make misjudgements, forget things and become distracted, causing them to pick the wrong items. After many hours of hard work, there are fatigue issues, poor concentration and an uptick in mistakes. These often occur at times when the workload is at its highest. Physically too, your employees are not without flaws. When your employees become tired, they work more slowly, productivity falls and the risk of accidents increases. If they undertake a lot of physical work, the risk of physical problems increases too. Absence due to illness in warehouses is a common problem.

Automation replaces labour with machines

Partially or completely, automation changes the work in the warehouse. The amount of physical labour reduces, which also reduces labour costs. Typically, productivity and capacity increase as machines and systems do more work than people. Ergonomics are improved as employees undertake less heavy work. They become less tired and are absent less frequently. Most importantly, the quality of your overall operation increases. After all, computers do not become distracted, tired or make mistakes.

2.

Degrees of automation in warehouse processes.

We distinguish three degrees of automation in primary warehouse processes such as storage and order picking. Each process involves an IT system that controls processes on the warehouse floor. It's primarily the degree of mechanisation that makes the difference.

1. Manual/conventional warehouse
2. Semi-automated warehouse
3. Fully-automated warehouse

1. Manual warehouse/conventional warehouse

In a manual or conventional warehouse, people still undertake all operations, albeit with the aid of forklift trucks or warehouse trucks. Here, automation means that your people are steered by software – usually a WMS. A WMS takes care of planning, optimisation and control of all manual processes. Your employees receive instructions via a screen on a handheld or truck terminal, via headsets with voice recognition or via smart glasses.

It's the WMS, not your employees, that optimises order picking tasks and calculates the most efficient route through the warehouse. The WMS ensures that your forklift trucks travel around the warehouse without pallets as infrequently as possible. This may mean giving drivers another assignment on the way back from storing a pallet (double play). The WMS takes truck departure times into consideration and schedules order picking tasks so that the right goods are at the right dock at the right time.

The WMS not only takes over a lot of the mental labour, but also reduces the physical effort needed in your warehouse. As it plans and optimises all tasks with great precision, employees are required to cover shorter distances.

Take batch picking as an example - the WMS merges orders for your customers into a single batch. Your employees can collect that batch in one go so that they don't need to walk past the racks again for each order. The WMS also reduces mistakes by integrating smart controls during the order picking process. Examples include scanning the barcode at the picking location or requiring the employee to say a control number into the headset microphone.



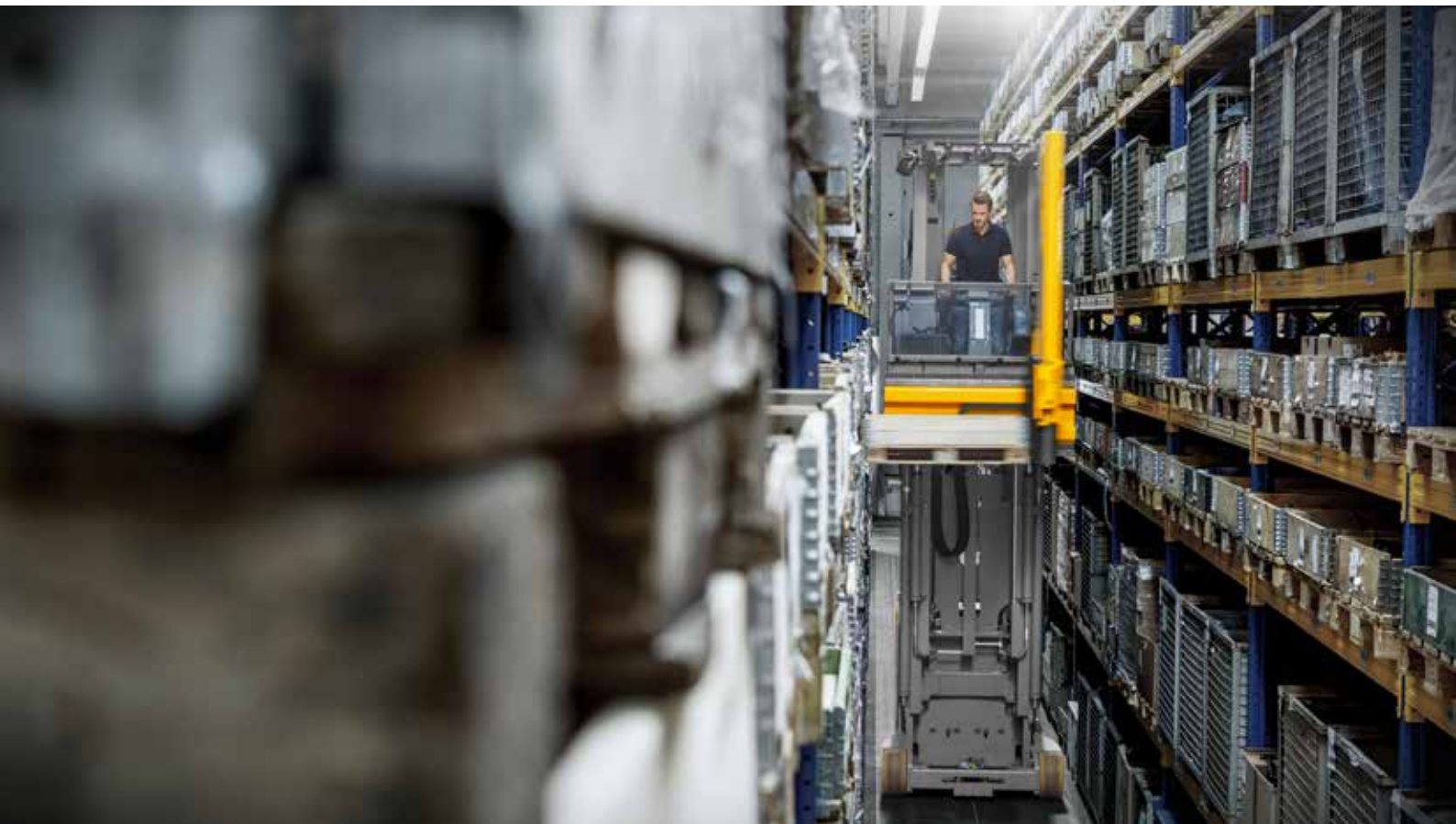
2. Semi-automated warehouse

The benefit of a semi-automated warehouse is that you can still save a considerable amount of time and reduce labour costs with a relatively limited investment. Consider linking your narrow aisle trucks to automatically search for the next picking location so drivers don't have to search, drive and manoeuvre themselves. A narrow aisle truck has a navigation function that always seeks out the optimal curve, which means that savings can run to 25 percent.

In addition to narrow aisle trucks, you can also link order pickers and reach trucks to your WMS. When your WMS transmits the storage location to the reach truck, the truck automatically looks for the correct height and avoids your order pickers having to get on and off to ready the truck for the next pick just a few metres away. This can yield savings of 25 percent or more.

It can be a wise idea to mechanise some physical work, but you may not want to do all of it. An example is zone picking, where you divide picking locations into different zones. Each employee collects items in their own area only, which means they don't have to cover the entire warehouse and will walk less as a result. The containers or boxes into which items are placed can then be transported automatically from one zone to another and ultimately to the packing station via roller conveyors.

Another example of semi-automation is the combination of batch picking and sorting. The WMS merges a large number of orders to form a batch, which several order pickers can pick at the same time. The order pickers then place all items on a sorting system which ensures all items are sorted by customer. The items still need to be picked manually, but the sorting process is fully mechanised.





3. Fully-automated warehouse

Another term for a fully-automated warehouse is goods-to-man, where employees no longer have to walk or drive to goods because the goods come to them. A fully-automated warehouse is often a combination of racking and rack control devices, such as cranes or small load carriers, that automatically store and remove pallets, containers or boxes. If you only have pallets entering and leaving the warehouse, there are no human operations at all. The most you'll need is someone to place the pallets on or remove them from a conveyor at the start and end of the process.

A warehouse in which there is order picking cannot have a fully-automated operation as you will still need someone to be responsible for the final activity, which is picking the correct quantity of items. That employee only needs to be ready at the order picking stations, where conveyors supply the right pallet, container or box, to remove the correct quantity. Further innovation is aimed at automating this final activity too.

There are already automated systems for case picking, i.e. picking at box level, but these are only really of interest to larger retailers. Full automation of item picking, i.e. the picking of individual items, remains too complex due to the large differences in shapes and sizes of items.

Other forms of automation

In addition to the storage and order picking process, there are other warehouse processes that can be automated.

- Transport of finished products from the production lines to the warehouse. You can use Automated Guided Vehicles (AGVs) for this stable, continuous flow, e.g. in the form of autonomous warehouse trucks..
- Loading and unloading of trucks. Systems are available that can slide a complete truck load into the cargo hold of a truck on a chain conveyor in just a few minutes. This requires a truck with an adapted loading bay.

3

Factors that play a key role in warehouse automation.

There is no stock answer for whether and to what extent you should automate. In addition to the different degrees of automation, there are other important factors to consider, such as your range and order pattern. Companies that are considering full automation should pay close attention to these factors.

Range diversity

For many companies, a single storage system isn't enough and they need different storage systems for different product groups. When looking for a fully-automated storage and order picking system, you will encounter solutions for pallets and for plastic containers or boxes. If your range includes large, bulky items, they will often fit onto pallets perfectly. If your range consists of small items such as fasteners, electrical components or office supplies, you will benefit more from a system of containers. In practice, most companies have a mixture of bulky items and small items. Companies that sell furniture, bathroom fittings or building materials, for example, will often have items in their range for which even a pallet is too small.

The question is whether the size of each product group is large enough for storage to be automated. It doesn't have to be. There are plenty of warehouses that operate fully-automated storage systems in conjunction with manual processes for goods that are too big for pallets.

Turnover rate

In addition to item dimensions, the turnover rate is also an important factor when deciding on a system. The turnover rate is a measure of the number of times your customers order a specific item. If your range contains smaller items with a low turnover rate (slow-moving items), a small load carrier might be an appropriate solution. In a system of this nature, a single crane operates in each working aisle to handle the storage and removal of containers with slow-moving items.

If your range includes a large number of fast-moving items, the capacity of a small load carrier may be insufficient, and the crane will not be fast enough to meet the high demand for these popular items. A sensible alternative would be a pallet carrier system, with several pallet carriers in each working aisle taking care of storage and removal.



Ordering pattern

A fully automated storage and order picking system only works optimally if capacity is large enough to process all orders at peak times. This can be difficult if the order pattern has high peaks, such as in the weeks leading up to Christmas. If you purchase a system that is calculated for this peak, it will be as good as stationary for much of the rest of the year. This makes automation relatively expensive, in part because a significant chunk of your investment cannot be offset by reduced labour costs. In that case, you would derive greater benefit from a semi-automated system based on zone picking. This kind of system often allows you to expand capacity by increasing the number of order pickers in each zone. Many e-commerce companies prefer this option, although their product range and turnover rate may justify greater automation.

Collaboration via WMS

It is obvious that one type of system is seldom sufficient for the entire warehouse. In most cases, the optimal warehouse setup involves a combination of different, (more or less) automated storage and order picking systems. Whichever you choose, you need a good WMS to ensure that your systems are coordinated and work smoothly together. For example, the WMS will split orders into part orders for different systems. It will also ensure that part orders are put back together again after the order picking process. This turns your warehouse into a well-oiled machine.



4.

Service life of warehouse automation.

The service life of automated storage and order picking systems warrants additional attention. A fully automated system will run for five or ten years (and frequently longer) without any problems. If you conduct an interim overhaul, replace worn parts and update the control system, you can extend this time. That means you can almost always amortise your investment costs, but you need to give yourself the time in which to do so. If you adhere to a three-year amortisation period, you will probably come up short – a service life of five or ten years requires some foresight. To justify an investment in an automated system, you need to think hard about what your operation will look like in five, ten or fifteen years. What capacity will the system be expected to cope with then? How likely is it that the range will still be able to fit into the storage system?

Flexible and scalable

Many companies find it difficult to look that far into the future. Changes follow one another in rapid succession, which means that the future is uncertain and forecasts are difficult to make. With that in mind, who has the courage to say whether a system will still be sufficient in five years' time, let alone ten? The key is to work out how far into the future you can look. Then adjust the amortisation period accordingly.

Designers of automated storage and order picking systems respond to this by making their solutions flexible and scalable. You start with a system that is calculated for the capacity that you expect to need over the next few years. If your range then grows or the number of orders increases, these systems enable you to expand warehouse capacity or throughput with relative ease and at minimal expense. In a nutshell, these systems grow as your business grows.



Making decisions in warehouse automation.

5.

As you have seen, there are various different ways to automate a warehouse, and different degrees to which you can do it. It is clear that one storage and order picking system is seldom enough for the entire operation. Most companies opt for a combination of manual, semi-automated and/or fully automated systems. That's why it's essential that you have a WMS that can plan and control the entire operation so that the systems work together like a well-oiled machine.

A particular point for attention is the service life and desired amortisation period of the systems. For many companies, the moment at which an automated storage and order picking system is amortised is beyond their viewable horizon. If that's true for your company, you may need to opt for systems with a shorter amortisation period or choose something more flexible and scalable.



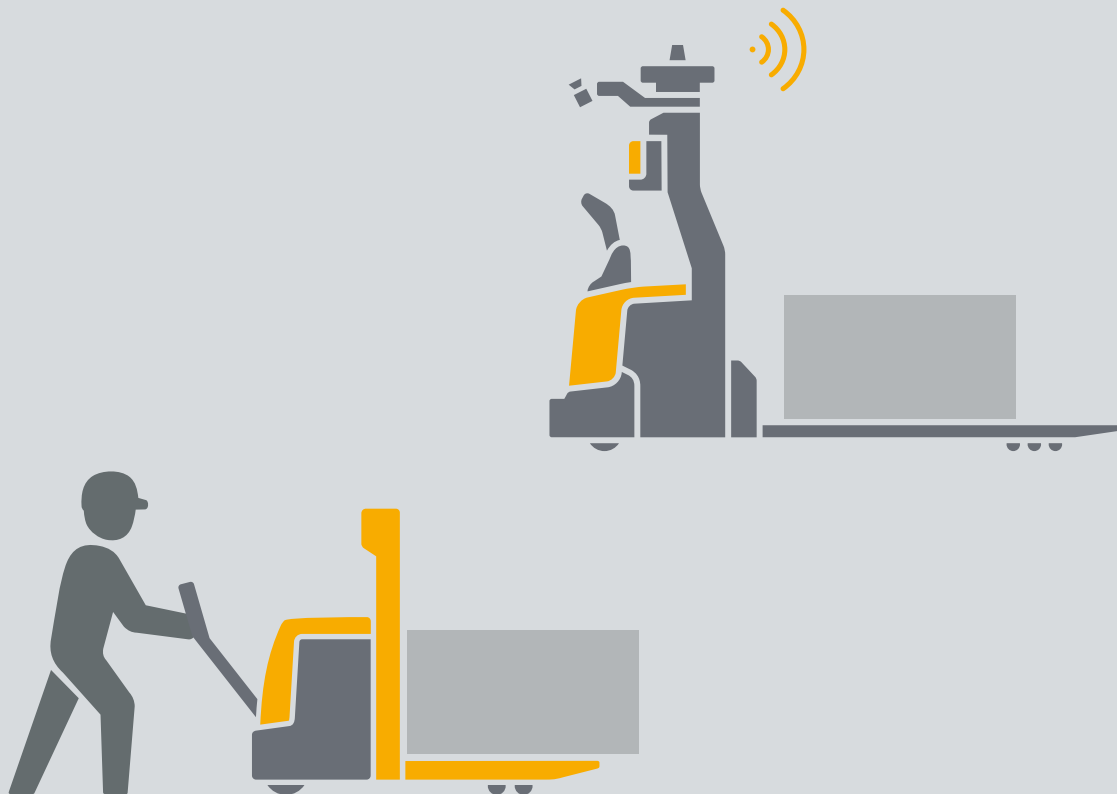
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The key question: does your warehouse need automation?

Are you wondering whether automating, or further automating, your warehouse is a sensible idea? The answer is 'it depends'. If your warehouse is working well, there might still be a good case for automation. If there are bottlenecks, they could, in many cases, be resolved with automation. A well-considered automated system also offers many strategic benefits.

Free white paper – 'Your warehouse - to automate or not?'

In our white paper 'Your warehouse - to automate or not?', you'll read about the benefits that warehouse automation could bring and gain clarity on the potential drawbacks. You'll also receive practical tips and considerations to help guide your decision-making.



Get the answers you need with our automation survey.

7.

Any warehouse automated system study should start by mapping the current situation. How is the warehouse set up? How effective are processes? What are the characteristics of the material flow?

With this inventory list, you can then map much of your operation by yourself. Your answers will give you a clearer picture of how things currently stand. In addition, the list will enable your supplier to give you some initial advice on points for improvement in your operation and on possible automated system solutions.

Take a few minutes to complete our online questionnaire and take the first steps to optimising your operation.

[Start survey >](#)



Jungheinrich Intralogistic Solutions

Jungheinrich Intralogistic Solutions is the division of Jungheinrich that is responsible for the design, sales and realisation of warehouse equipment projects. Jungheinrich is one of the largest suppliers of intralogistics solutions in the world. We are specialists in the equipment and optimisation of warehouse and distribution centre logistics; from installing warehouse racks through to warehouse software, warehouse automation and robotisation.

We not only offer a wide range of warehouse and transport systems, but also retain all expertise in house. We analyse existing processes, identify potential and develop optimised strategies, including for your future requirements. And we do all of this on the basis of your individual needs.

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