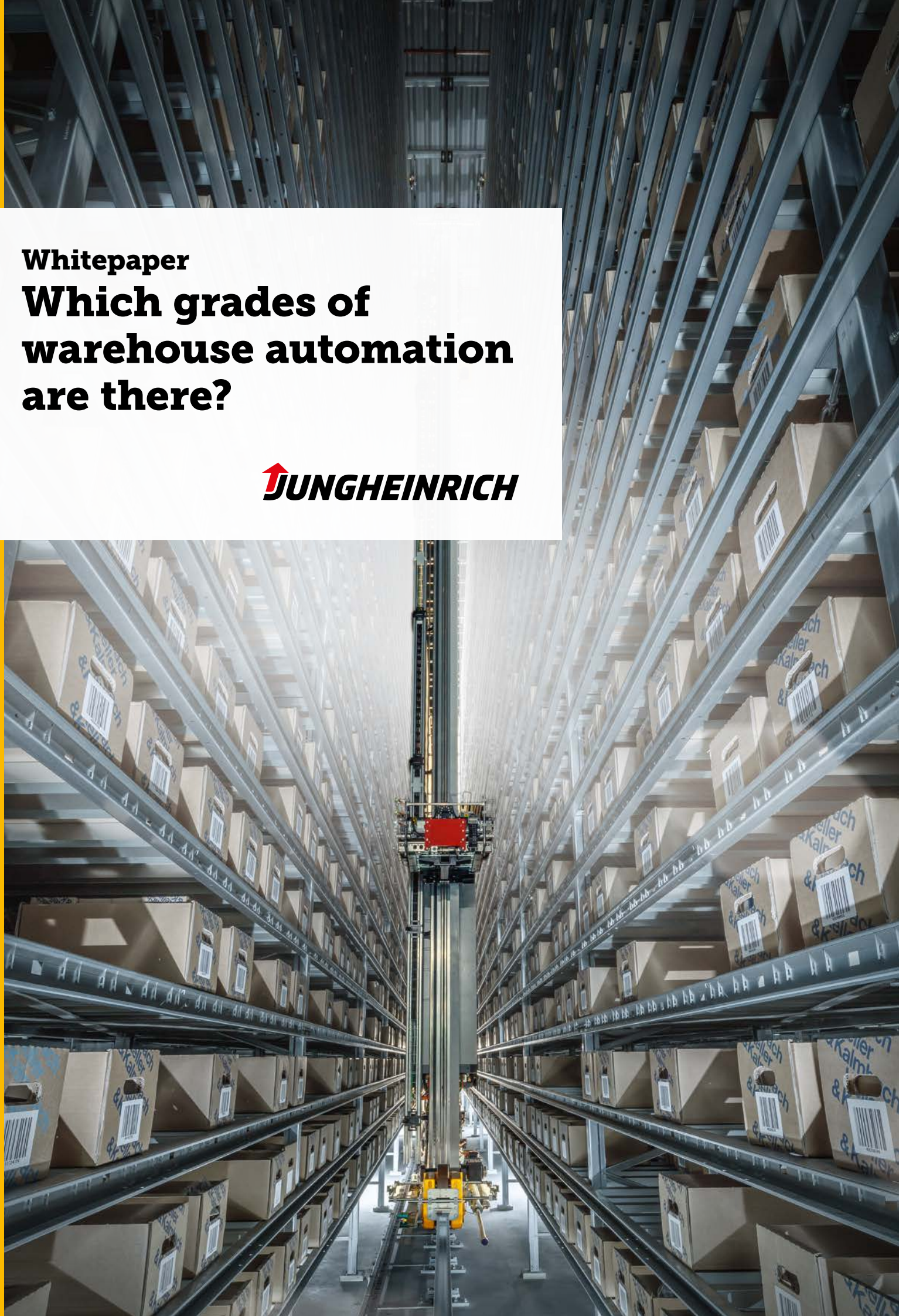
Whitepaper

Which grades of warehouse automation are there?

JUNGHEINRICH



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What are the levels of warehouse automation?

Warehouse automation means replacing manual labour with machines and/or computers in the warehouse. This affects both physical work – such as internal transportation of goods – and mental work.

You will certainly recognise the terms 'mechanisation' and 'robotisation' alongside the term 'automation'. When machines take physical processes away from humans, we call it mechanisation. This often also encompasses software that assumes part of the thinking work, such as planning the sequence of tasks or determining the quickest route through the warehouse. Robotisation refers to a situation when humans are no longer needed for carrying out work – neither in the warehouse, nor in the office. Machines and systems will then process the entire workload autonomously.

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Why are we replacing manual labour in the warehouse?

Physical work

Working in the warehouse is a demanding task, despite the usage of helpful equipment such as forklift trucks, reach trucks and pedestrian pallet trucks. Your employees must constantly bend over, turn, stretch and lift goods in order to move them from one place to another. They must frequently step in and off their forklift trucks on the way to the next position in the warehouse. Moreover, they are constantly moving, not just on board their forklift truck, but also on foot. In the logistics sector, distances that need to be covered are often great.

Mental work

The work of your warehouse staff is not only physically, but also mentally demanding. They must search for products and storage places, frequently with paper lists they must constantly read, make notes and tick off. They have a lot to think about, for example, the most practical route through your warehouse or the most practical approach or sequence to carry out their tasks. Finally, they must also consider your customers' requirements, which are becoming more and more demanding. One customer cannot use pallets with a height of more than 1.2 metres, another only accepts pallets if the barcode label is placed on the right spot.

Less efficient

Not all warehouse tasks are of similar worth. Order picking, for example, can make up almost 60 % of all warehouse operations. More than half of the work often involves going from one picking place to the next. A job your employees have not actually been hired to do, but which is nevertheless necessary in order to process orders.

All kinds of problems and complaints

Human beings are not infallible. They make poor judgements, forget things, get distracted and then end up taking the wrong products. After several hours of hard work, tiredness sets in, concentration drops and the number of errors rises. This usually happens when the pressure is at its highest.
Your employees also have physical limitations. When your staff become tired, their work slows down, productivity drops and the likelihood of accidents increases. The more physical work they have to carry out, the higher the risk of physical problems. Absences due to sickness in warehouses are a well-known problem.

Automation replaces work with machines.

Be it partially or completely, automation alters warehouse operations. Physical work is minimised, which in turn lowers labour costs. Productivity and warehouse capacity often increase, as machines and systems can manage certain tasks more efficiently than people. It also improves workplace ergonomics, as your employees are left with less heavy tasks. Tiredness as well as joint and muscle pains will become less frequent and your staff will rarely be on sick leave. What is just as important: the quality of work in your business will rise. Because computers cannot be distracted, do not get tired or make mistakes.

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Levels of automation in warehouse processes.

There are three distinct levels of automation for primary warehouse processes, such as storage and order picking. In each case, there is an IT system which controls warehousing processes. The main distinction is the level of mechanisation.

1. Manual/traditional warehouses
2. Partially automated warehouses
3. Fully automated warehouse

1. Manual or traditional warehouses

In a manual or traditional warehouse, all tasks are carried out by people – with or without the help of forklift trucks or lifting and transportation devices. In this case, automation means that you manage staff by using software – usually with a warehouse management system. A warehouse management system assumes the tasks of planning, optimising and controlling all manual processes. Your staff will receive instructions via the screens of portable or vehicle terminals, via hands-free modules with voice recognition, or via data glasses.

The warehouse management system, not your staff, determines the optimal sequence for order picking and calculates the most efficient route for doing this. The warehouse management system ensures that your forklift trucks will move around without pallets as rarely as possible, for example, when the operator gets a new order for the return route after delivering a pallet ('double journeys'). The warehouse management system takes departure times of cargo trucks into account. It plans order-picking work in a manner that ensures that the right goods are ready for pick-up at the right time and the right loading ramp.

The warehouse management system does not only take over a large part of the mental work, it also lessens the physical workload of your warehouse staff by planning and optimising all tasks so specifically that your employees only have to cover shorter distances.

In terms of batch order picking, for example, the warehouse management system compiles your customer orders into a batch in an intelligent manner. The operator can collect the entire batch and no longer needs to keep searching the racks for each order. The warehouse management system also minimises mistakes, as it integrates intelligent monitoring during order picking. This includes scanning the barcode at the order-picking site or speaking a control number into the hands-free module.

2. Partially automated warehouses

The advantage of a partially automated warehouse is that you gain plenty of time, while saving labour costs with a relatively low investment. A control system for your narrow aisle trucks, for example, enables automatic travel to the next order-picking site, so that the operator no longer needs to search, drive and manoeuvre simultaneously. In addition, as this navigation function enables a narrow aisle truck to always choose the optimal curve, you can save up to 25 %.

Besides narrow aisle trucks, you can also connect order pickers and reach trucks to your warehouse management system. As soon as your warehouse management system transmits the storage position to the reach truck, it automatically moves to the right height. At the same time, an order picker automatically stops in front of the next order-picking site after each removal. This means that the operator of the order picker is no longer required to constantly get on and off the truck in order to move it a few metres to the next position. This will also give you savings of 25 % or more.

Frequently, it is advisable not to automate all physical processes, only some of them. One such example is zone order picking, meaning that the area is divided into different zones with order picking sites. Each employee only gathers products in their own zone. As a result, they are not moving around the entire warehouse, which in turn reduces the distances they need to cover. You can then mechanise the transportation of products through the zones. The containers or cases in which all products are placed are transported automatically from zone to zone by runway and finally to the packing station. A further example of semi-automation is the combination of batch order picking and sorting. The warehouse management system compiles a large number of orders into one batch, which several order pickers can compile simultaneously. The operator then places all products into a sorting system. The system ensures that all products are picked and sorted per customer. The products must still be picked by hand, the sorting process, however, is fully mechanised.

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Levels of automation in warehouse processes.

3. Fully automated warehouse

A different term for a fully automated warehouse is ‘goods-to-person’. Your staff will no longer have to walk or drive to the goods. On the contrary: the goods will come to them. A fully automated warehouse often consists of a combination of racking and rack operating devices such as stacker or miniload cranes, which deposit or remove pallets, containers or cases with goods entirely automatically. If only full pallets enter and leave the warehouse, no human interaction will be required. If at all, someone is required to put the pallets on or remove them from a conveyor system at the beginning and end of the process.

Fully automated operation is not entirely possible in a warehouse that includes order picking. You will still need employees for the final process: compiling the right number of products. They must stand at the order-picking site – where conveyor systems retrieve the correct pallets, containers and cases – and take out the right number. Further innovations also aim to automate the latter process. There are already automated systems of this kind for case picking – order picking on a case level – but so far, these have only been of interest to major retailers. The full automation of product picking, i.e. collecting loose products, is still too complex due to the major differences in the shapes and dimensions of products.

Other forms of automation

As well as the processes of storage and retrieval and order picking, you can automate other processes in the warehouse.

- Transportation of ready-made products from the production line into the warehouse. You can use Automated Guided Vehicles in the form of autonomously functioning lifting and storage vehicles for the stable, continual flow of material.
- Loading and unloading trucks: Some systems can complete an entire loading process of a cargo truck within a couple of minutes via a chain conveyor in the cargo hold. This, however, requires a cargo truck with an adjusted loading area. The question is whether your freight forwarders and your customers are willing to get involved.

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Important aspects of warehouse automation.

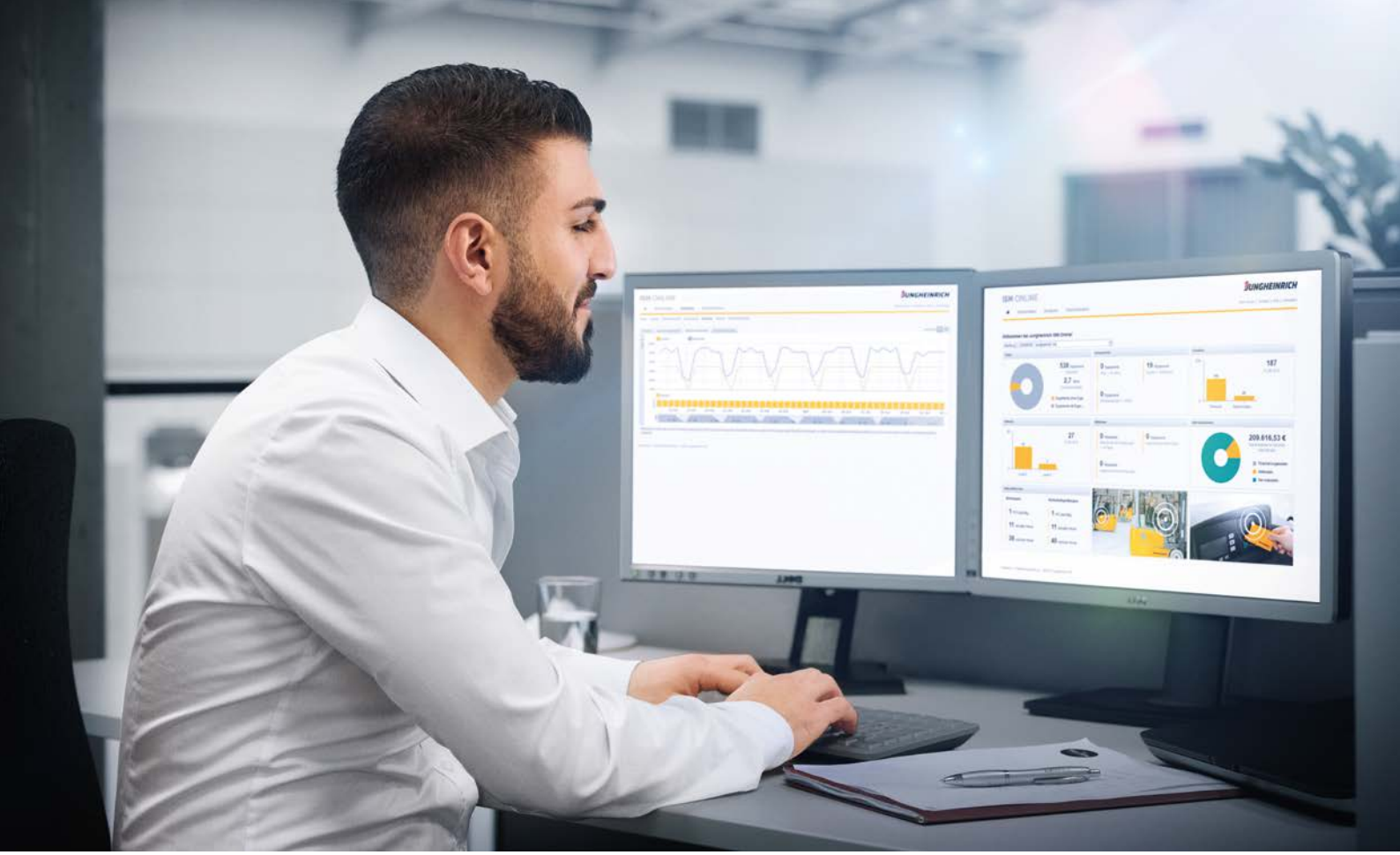
Deciding whether to automate or not is a complicated issue. There are various factors that play a part besides the different levels of automation, such as your product range and order patterns. Businesses that consider full automation must think carefully about these factors.

Portfolio varieties

For many companies, a single storage system is not enough; they need different warehouses for different product groups. If you are looking for fully automated warehouse and order-picking systems, you can find solutions for pallets, plastic containers or cases. If you have large, voluminous products in your product range, these often fit well on pallets. If your portfolio consists of small products such as fasteners, electrical components or stationery, you will get more out of a system with plastic containers. Experience shows that most companies stock both voluminous and small products. Companies which sell products such as furniture, plumbing or construction materials deal with products that are too large for even a pallet. It begs the question whether the volume of one of each product group is large enough for justifying an automated warehouse. Many warehouses combine one or more fully automated warehouse systems with a manual process for goods which, for example, might not fit on a pallet.

Throughput

Besides product dimensions, throughput is also a key factor in choosing the right system. Throughput is a way of gauging the frequency with which your customers order a product. If your portfolio contains small products with low throughput (‚slow movers'), then a miniload system may be a good solution. In this system, a single crane runs each errand and takes over the storage and retrieval of containers with slow movers.
However, if your product range contains several fast movers, the capacity of a miniload system might not be enough. The crane is simply not fast enough to be able to meet the demand for products that are frequently requested. A good alternative is a shuttle system, where several shuttles store and retrieve products during each errand.



Order patterns

A fully automated warehouse and order picking system works best if there is sufficient capacity to process all orders, even during impact hours and peak days. Large peaks in the order patterns can be misleading, for example, when you receive most orders in the weeks leading up to Christmas Eve. If you purchase a system that is designed for these peak periods, it will usually be down during the rest of the year. Automation then becomes relatively expensive. Ultimately, a large part of your investment returns through lower labour costs. In this case, you will have more than one semi-automatic system, for example, based on zone order picking. In most cases, you can increase capacity using a system with several order pickers in each zone. Numerous internet retailers opt for this choice, although their product ranges and throughput may justify a higher level of automation.

Working together via the warehouse management system

This much is true: a single system is rarely enough for the entire warehouse. The ideal warehouse equipment often consists of a combination of different, more or less automated storage and order-picking systems. In any case, you will need a good warehouse management system. This system ensures that your various systems are synchronised and can work together smoothly. For example, the warehouse management system will divide all orders into partial orders for each of the various systems, ensuring that the partial orders can be reassembled after the order-picking process. This will turn your warehouse into a well-oiled machine.

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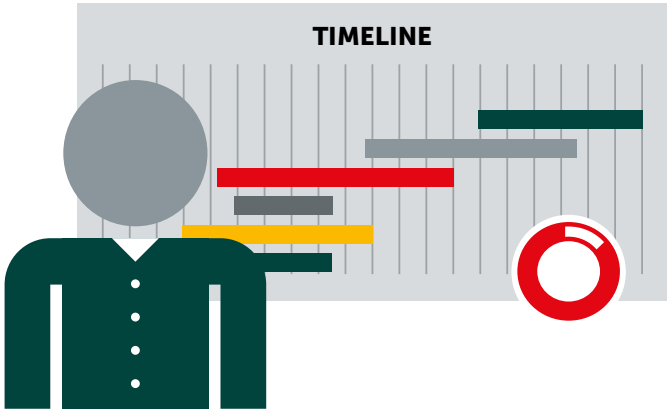
Service life of an automated warehouse.

The service life of automated warehouse and order-picking systems deserves special attention. A fully automated system can function without any problems for five years, ten years or more. You can prolong the service life with an interim overhaul of the system by replacing wearable parts and updating the controls. This means that you can almost always recoup investments if you leave enough time for this. If you have a payback period of three years, you may be underestimating yourself. A service life of five or ten years requires foresight. If you want to justify investing in automation, you need to answer the question of how your firm will look in five, ten or fifteen years. Which capacity will the system have to process? How likely is it that the portfolio will still fit into the warehouse system?

Flexible and expandable

Today, many businesses find it difficult to look so far ahead. They have to adapt to changes in shorter and shorter intervals, which makes the future uncertain and predictions unreliable. Who can confidently guarantee that a system will still be sufficient after five or even ten years? The trick is to discover how far you can look ahead, in spite of everything. Determine the payback period accordingly. Engineers of automated warehouse and order-picking systems prepare themselves for this situation by designing solutions that are flexible and expandable. You will be starting with a system designed to meet the capacity required in the next few years. If your product portfolio grows and the number of orders increases, you can expand warehouse and/or processing capacity relatively easily and cheaply with this system. In short: these systems grow with your company.



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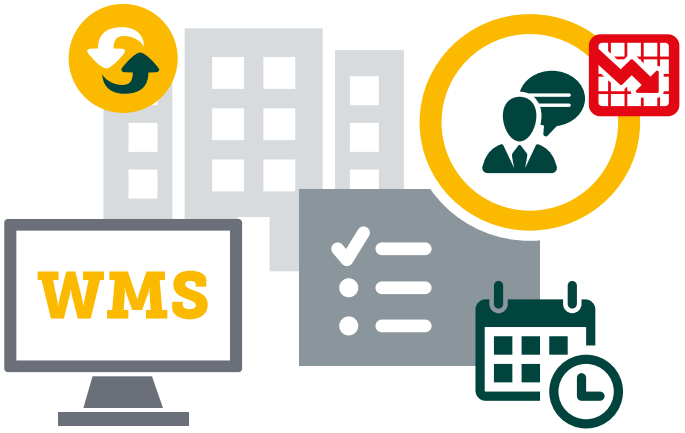
Making decisions regarding warehouse automation.

As you can see, a warehouse can be automated in a variety of ways and to a variety of extents. A single warehouse and order picking system is rarely enough for the whole business. Most companies choose a combination of manual, partially and/or fully automated systems. In this instance, it is crucial that a warehouse management system plans and controls the entire operation, so that the systems work together like a well-oiled machine. The service life and desired payback period of the system should be taken into account. The moment in which an automated warehouse and order-picking system is written off lies far beyond the planning horizons for most companies. If this also applies to your company, you should favour systems with shorter payback periods. Or you can decide on a flexible and expandable system.



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