

How are smart factories changing the face of manufacturing?

There's little doubt that the manufacturing industry is undergoing some seismic changes at the moment.

Technological advances in automation, computing power and communications (the 4th industrial revolution) have made intelligent manufacturing and smart factories a reality.

In a nutshell, smart factories employ advanced technology to optimize planning, production, transportation, and management processes.

A recent report highlighted that 76% of US manufacturers are either planning or in the process of adding smart factory elements to their operations. Despite this, less than 15% are happy with the progress they've made regarding implementation.

This article will take a broad overview of how smart factories are changing the manufacturing industry, the pros and cons of implementing the new technologies and what the future may hold.



Smart factories – intelligent, flexible, and hyper-connected

Over the past 40 to 50 years, the manufacturing industry has been characterized by increasing automation. Modern factories still rely on robotics and automated processes, but smart factories are pushing things even further with AI and data-driven systems and highly connected workflows.

So, what does a smart factory look like?

Let's take a look at a possible application of smart technology in a factory that makes specialist, customized products.

A customer orders several hundred products via the internet. The order data would be fed into management software, such as an enterprise resource planning system. The data is automatically sent to the shop floor to prepare the machinery and, if necessary, to outside suppliers to order the materials.

A design is drawn up using CAD (Computer-Aided Design) or automatically with generative design technology. The design details are automatically converted into machine language.

Smart machinery ensures that everything needed for assembly is sent to the right place and at the right time, using electronic tags attached to the materials and components. When it arrives on the shop floor, robots or a collaboration between human workers and robots (also known as cobots), begin the assembly process.

In some cases, an additive manufacturing process (3D printing) may be used to fabricate the product, especially for small customized orders.

Industrial Internet of Things (IIoT) remote sensors built into the machinery will constantly monitor and record data on the production process and the functioning of the equipment. Fully or semi-autonomous AI systems can adjust operating parameters or change workflows to optimize them for quality and speed.

If the customer has a change of mind and wants something altered mid-order, this can be done quickly and easily with little disruption.

Finally, the finished products are automatically quality-checked with sensors and AI before being loaded and dispatched, with tracking devices fitted to keep the customer fully informed.

The advantages of smart manufacturing

The smart factory approach has many benefits including long-term cost savings, improved efficiency, and increased productivity. In fact, it's estimated that by 2022 factories that adopt smart technology will be up to 7 times more productive.

Productivity is constantly optimized in a smart factory. If something is slowing production down, the data will highlight it, and the AI systems will seek to solve the problem. With these highly adaptable systems comes greater flexibility.

One of the main efficiency savings is the decrease in production downtime. Modern machinery is often equipped with remote sensors and diagnostics to alert operators to problems as they occur. Predictive AI technology can highlight problems before they even occur and take steps to mitigate the productivity and financial costs.

In a well-designed smart factory, everything will flow smoothly and will have features of automation, as well as human-machine collaboration.

The disadvantages of smart manufacturing

The most obvious downside is the initial cost of implementation. The considerable costs of the technology will put off many small to medium-sized companies, especially if they adopt a short-term philosophy or they don't have the capital or investment needed. The long-term savings will certainly outweigh the starting costs, so companies need to plan for the future even if they aren't in a position to implement smart factories straight away.

Another disadvantage is the technological complexity of the systems. If it is well-thought-out and installed initially, this shouldn't be a problem, but systems that are poorly designed or not adequate for the required operations could hurt profits.

Where are smart factories heading?

Nobody can say for certain what factories will look like in ten or twenty years' time. New technology, materials or concepts may come along and completely change the direction of manufacturing.

However, the way things appear to be heading at the moment is towards an increasingly interconnected and flexible manufacturing environment. With adaptable systems and machinery, companies will be able to offer a wider range of products and more opportunity for customization.

It's likely that the price of the technology will come down over the coming years, meaning that smaller companies can get involved. We have seen evidence of this already with Autodesk offering a range of affordable products that make Computer Aided Manufacturing (CAM) and generative design available to more businesses.