The Four Stages of a Smart Factory – in Summary

Smart factories are not created overnight. The process of becoming "smart" takes place in several stages, as explained below.

Stage 1: Transparent Factory

› Standardization begins to take effect and leads to the development of use cases, some of which are implemented.

› Data and processes can be presented retrospectively using systems and analysis (business intelligence tools and process mining).

› Key performance indicators (KPIs) are defined in order to quantify the performance of the organization (value creation, order to cash, operations).

› The first automation solutions or cyber-physical systems are set up in pilot projects.

› Data collection from peripheral processes begins (e.g. building technology or upstream stages in the value and logistics chain).

Stage 2: Responsive Factory

› The degree of standardization and the speed of data availability reach levels that make it possible to intervene and control processes.

› With clearly defined data sets, information can be used efficiently, in near real time, and without data breaks on other systems.

› By using algorithms, data evaluation is no longer just a matter of human interpretation. Data controlling is still the responsibility of those working in the factory.

› There is increasing integration and automation of physical and information processes. This already extends beyond broad but firmly defined sub-areas.

› It is possible to cascade and link data from process and peripheral processes (e.g. building technology and supply chain), and this information can be evaluated.

Stage 3: Predictive Factory

› The availability and stringency of data is at a level that allows extensive data sets to be combined, networked, and analyzed.

› The use of artificial intelligence (AI) and simulations supports human decision-making processes so that action can be taken based on proposed solutions. These suggestions are based on rules specified by people and system optimization is carried out in feedback loops with and by people.

› Such interventions and decisions are carried out vis-à-vis processes and process-related control systems, leading to tangible action. This could range from dispatching orders and capacity leveling to system controls and the control of physical interlinking systems.

› The number of measuring points reaches a new scale at this stage. With a wide range of parameters being processed, simulated scenarios can be carried out. Big data analysis can be used to identify patterns that remain unnoticed by humans. Working on the basis of these patterns, process parameters can be optimized in order to raise the efficiency and quality of products to a significantly higher level.

Stage 4: Smart Factory

› Similar to the predictive factory, data and activities are analyzed and evaluated in real time. However, most of the decision-making power is no longer in human hands. While intervention by employees is possible at any time, it is only mandated and necessary in special circumstances.

› Systems and control loops optimize themselves independently using the same algorithm as in a predictive factory and also make independent decisions within a defined scope of activity.

› Human actions and decisions are supported by digital assistants or robots that suggest measures to achieve optimum efficiency and quality.

› At this stage, in many areas employees can enjoy a high level of flexibility in terms of where they work. Value stream controlling value is autonomous and interventions and decisions can be made remotely.