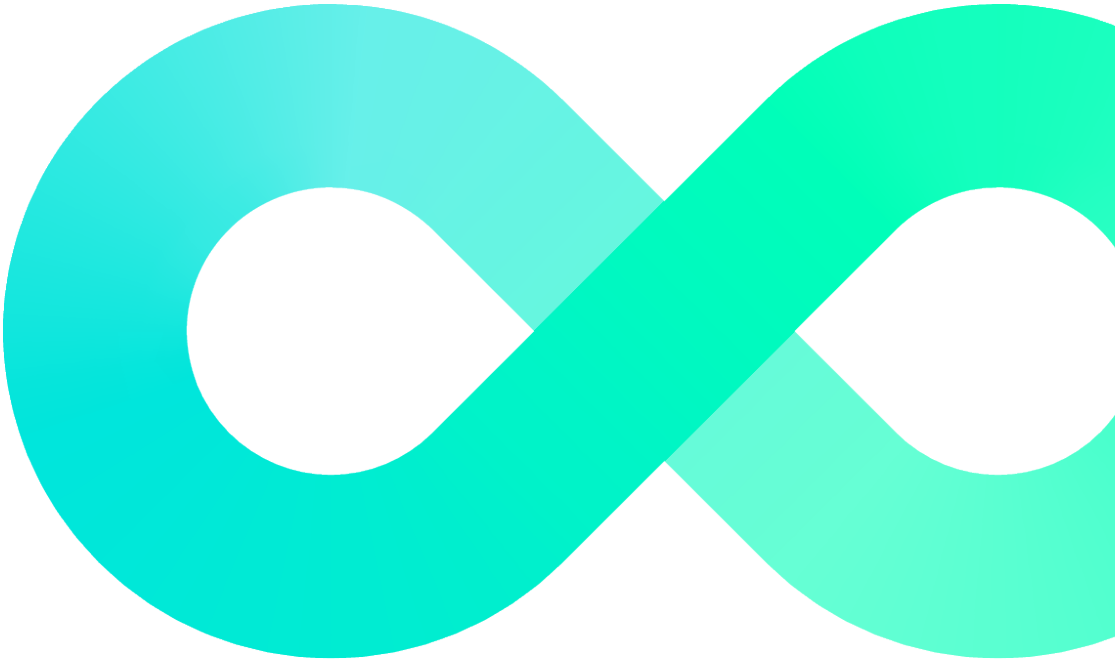
PRODUCT QUALITY ASSURANCE

Improve manufacturing quality with the help of AI

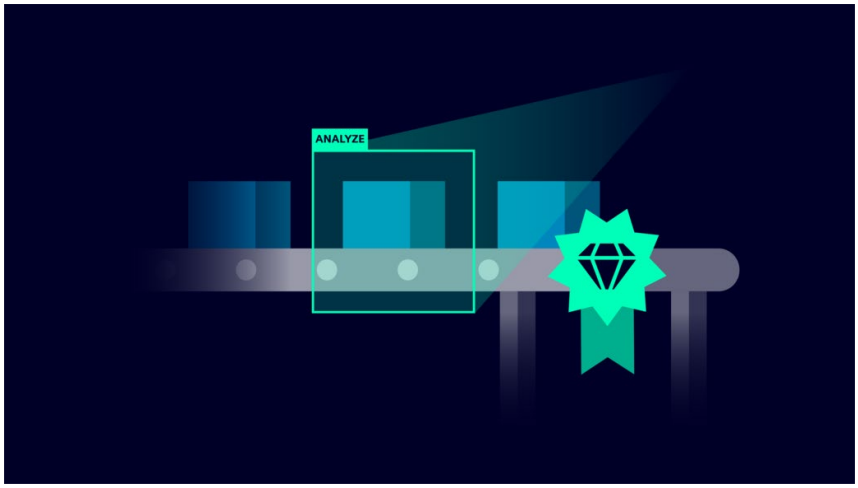
In today's fast-paced, data-driven world, manufacturing companies face many challenges: Where can they find skilled workers? How can they cope with rising raw material prices? And all this with production that needs to become more flexible and efficient in order to compete? Data is the foundation for meeting all these challenges. Only with data can confident decisions be made that ultimately contribute to improved product and production quality.



SIEMENS

How to create an AI-driven manufacturing setup

Companies often have to rely on subjective human assessments of production quality, which leads to certain obstacles. Technical and technological experts are often scarce, manufacturing is complex, making it difficult to account for all relevant interdependencies in processes, and quality issues can arise due to human error. AI-driven solutions can overcome some of these obstacles.



Vision-based applications help improve efficiency, safety, and manufacturing quality in a wide range of industries.

To stay ahead of the technology curve and be more competitive, manufacturing companies must rely on data as a trusted foundation for making confident decisions.

How to improve manufacturing quality

Vision-based applications are critical to ensuring product quality. When supported by AI, they are able to use data from sensors and cameras to predict quality issues, detect deviations, and make immediate corrections, even during production. The result is minimized waste and maximized efficiency. Best of all, the underlying infrastructure is scalable, ensuring a high return on investment. Three use cases show what an AI-driven manufacturing setup can look like and which solutions are available in each case.

In the food and beverage industry, a lot of liquid products with different ingredients are made by flowing them through a pipe system into a storage tank. Depending on the flow rate of the ingredients, certain process parameters must be continuously monitored to ensure the quality of the final product. The problem is that physical sensors aren't accurate enough to measure the process parameters because of the highly viscous liquid. If a value changes for the worse, there is also the challenge of responding. In addition, manual supervision of the process

parameters at fixed intervals and reacting to deviations from the setpoints is very time-consuming and expensive. The solution: AI-based virtual sensors can substitute physical sensors. Industrial AI and Industrial Edge form the basis for these smart, virtual soft sensors to be able to continuously predict key process parameters, adjust process setpoints, or improve existing physical sensor measurements to optimize overall process quality. Making use of the AI-based soft sensor as a part of the Industrial AI suite, the company benefits from not having to share its process knowledge with third parties. It can run and train its own AI model based on the collected time series data on an infrastructure provided by Siemens that consists of the Industrial AI and Industrial Edge portfolio (from the field to the cloud level). This use case is particularly relevant for companies with a strong IT department and corresponding expertise in the field of AI.

Production transparency is not an end in itself, but the basis for continuous improvement.

The second use case involves visual inspection with AI for electronics manufacturing. Today, solder joint inspection is still performed by operators at the electronics line, which can lead to variations in the quality of printed circuit boards. The solution in this case can be similar to that in the food and beverage industry: a comprehensive Industrial AI and Industrial Edge portfolio architecture provides companies in the electronics industry with the foundation to train their own AI model using image data. This gives companies an automated AI vision inspection system that is available 24/7, easily scalable, reliable, and minimizes manual effort and human error.

Relying on subjective judgments about production and quality creates certain obstacles. With an AI-driven manufacturing setup, companies can overcome them.

The third use case also comes from the electronics industry, but is tailored for companies with small IT departments that do not have comprehensive AI capabilities. PCB assembly involves the inspection of numerous small components, which is still often done by hand. Not only is this prone to error, but it also ties up employee capacity that could be better spent elsewhere in the manufacturing process. Even for companies without large IT departments, there is a easy-to-use, out-of-the-box AI solution that help eliminating the

errors associated with manual inspection. Inspekto enables visual quality inspection by combining a electro-optical system with AI technology and requires no expertise in vision solutions or AI. Training Inspekto's AI is easy: it just takes a few clicks to mark the inspection regions and 20 to 30 good samples. Then the AI can accurately detect the smallest defects, distinguish defects from acceptable variation, and identify small defects that would be missed by the human eye.

Solutions for IT beginners and professionals

There are many ways to improve the quality of products and production - but in every case it makes sense to rely on AI-driven solutions. On the one hand, this is important for incorporating all relevant dependencies in complex production processes. On the other hand, it is important not to be dependent on error-prone human quality control. The right path for an organization depends on its structure. Does it have a large IT department with data scientists or data engineers? If so, an AI model for image processing may already exist or can be built by the company. In this case, a comprehensive infrastructure from the field to the cloud in form of the Industrial AI Suite can support the use case, and the AI and process knowledge stays within the company. But even companies without large IT departments can benefit from AI solutions for quality control. Ready-made, out-of-the-box AI solutions which are easy to install help them do this - the only effort the company has to make in this case is to cluster the samples into good and bad quality to train the AI.

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