



Coppenrath & Wiese produces up to 4.5 million bread rolls daily across eight production lines, with further expansion planned

AI-POWERED QUALITY CONTROL

Coppenrath & Wiese relies on **Siemens Visual Inspection Cockpit**

Who could say no to fresh bread rolls for breakfast, straight from the oven? Thanks to ready-baked frozen rolls from Coppenrath & Wiese, you can enjoy bread fresh from the oven without even having to leave your home. To ensure that every single roll meets the highest quality standards at the breakfast table, Coppenrath & Wiese relies on an innovative Siemens solution that checks the rolls in real time for perfect quality.

The goal: Free employees for higher-value tasks

Founded in 1975 and based in Mettingen, Germany, Coppenrath & Wiese is now part of the Dr. Oetker Group, although it still operates independently. The company is highly innovative, driven by a team of young, dedicated engineers. Whether in the product areas of cakes, tortes, desserts, or bread rolls, the team is highly committed to finding digital solutions throughout the entire production process. Quality control is just one, but certainly a representative example.

Coppenrath & Wiese stands for the highest quality in everything it does, especially in the important bread roll sector. Up to 4.5 million rolls are produced daily on eight production lines, with further expansion planned.



The goal is to produce perfect bread rolls

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Until now, visual quality control has been performed manually. Employees are trained and have images of quality standards and possible defects at their workstations. Nevertheless, the final decision is always subjective. Manual inspection is monotonous and tiring for the employees, despite two hourly rotations. The idea of achieving more consistent real-time quality checks and freeing staff up for more value-adding tasks, was a logical next step. An automated quality control system does not tire and consistently makes decisions based on established quality criteria.



Coppenrath & Wiese is right on trend with this transition. Many companies from a wide range of sectors are currently automating their quality controls, precisely because the human component naturally leads to fluctuations. Automatic inspection clearly has the advantage with its unparalleled precision in real time. In addition, employees can take on more meaningful roles. It's a win-win for both the company and its staff.

Moreover, the data collected during inspection can serve as a basis for expanding production into closed-loop manufacturing.



In this forward-looking approach, production results are continuously measured, checked, and evaluated. The insights gained flow directly and automatically back into production control to independently initiate necessary corrections, enabling self-optimizing manufacturing for maximum efficiency and quality.

The start of a new project

The project began about two years ago with a two day design thinking workshop. Initially, a different use case was planned, but the focus quickly shifted to AI-powered quality control. Coppenrath & Wiese had already tested various camera and image processing systems. "With the solutions we tested, something was always missing. The results didn't satisfy us. That's why we were open to an AI solution from Siemens," recalls Christian Struck, Automation and Robotics Engineer at Coppenrath & Wiese.

Siemens was chosen as a partner due to positive experiences from earlier collaborations, as well as its global expertise in industrial edge computing, AI, computer vision, and automation. The workshop led to a pilot project for quality control on a production line for white bread rolls.

left: Manual inspection proved monotonous and tiring for employees. Automated quality control frees them from this task and gives them time and space for other responsibilities

right: Christian Struck from Coppenrath & Wiese and Astrid Penner from Siemens: A partnership built on many good experiences from previous joint projects



Image capture on the conveyor belt

The Siemens solution is based on the company's Visual Inspection Cockpit (VIC), which combines deep learning with classic computer vision. Images are captured by an industrial camera with special lighting directly on the conveyor belt. Multiple frames per roll and position tracking with IDs ensure robust results. Image processing is performed locally on the industrial edge device SIMATIC BX-59A with NVIDIA GPU. The operational technology (OT) networks for the VIC are physically separated from IT, and for security reasons, external access (such as via the cloud) is not permitted. However, the installed quality control system is seamlessly integrated into the existing Siemens automation and OT landscape. Updates and scaling are managed centrally via the Industrial Edge Platform and Edge Hub. The VIC's graphical user interface is accessible from both the production area and offices in a clear step toward OT/IT convergence. Furthermore, Coppenrath & Wiese's IT department was involved throughout installation and integration.

The VIC was developed for production and quality control of non-standardized parts – a real market gap, since most solutions in this area are specialized for rigid and always-identical products, such as gears. The VIC, on the other hand, is predestined for quality control of shape-variable products such as rolls, where size, cut, and surface structure always differ slightly within certain parameters. Only a few images are needed for training,

left: An industrial camera with special lighting inspects the rolls directly on the conveyor belt

right: Everything at a glance: The graphical user interface is accessible from both production and office areas

Benefits at a glance

The solution provides Coppenrath & Wiese with automated real-time quality control, which not only relieves employees from monotonous visual inspections, but also creates a reliable data basis for process optimization.

The VIC can be flexibly scaled to new product groups and further developed independently by the internal team. Integration into the existing Siemens automation landscape, as well as the possibility for real-time adjustment in the sense of closed-loop manufacturing, make the system a strategic tool for quality, efficiency, and future security.

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Looking ahead: Data from the Visual Inspection Cockpit could be used for real-time production adjustments as part of closed-loop manufacturing

making precise training and the most accurate parameterization for the AI on which the solution is based, all the more important. The AI must allow dynamic tolerances for seasonal variables like temperature, humidity, and minor raw material changes, ensuring defective products are reliably detected and sorted out. "We had to teach the AI to mimic the experienced eye of our staff – a real challenge with a natural product like rolls. That takes time," explains Christian Struck, engineer for automation and robotics.

Goal achieved – and still more ahead

As intended, automated quality control relieves staff from monotonous visual inspection and frees them up for higher-value tasks. "The Siemens solution is exactly what we envisioned," says Christian Struck. Mission accomplished for the joint Siemens and Coppenrath & Wiese team.

However, this is just the beginning. Data from the VIC enables quantifiable statements about product quality, which can be tracked retrospectively to identify trends, recurring errors, or batch deviations. This data is essen-

tial for process improvements in closed-loop manufacturing. Unlike traditional production methods, where quality checks usually occur at the end of the line, closed-loop manufacturing involves dynamic, real-time adjustments. The goal is to detect deviations early and automatically counteract them at the appropriate point in the manufacturing process, before errors even occur or can propagate.

A concrete example of the system's potential is the quality of the cut on the bread rolls. An unclear cut can indicate dull knives. A detail such as this is something that only experienced bakers with a trained eye can recognize in images from the VIC. However, it is conceivable that the VIC could one day be trained to detect such anomalies, complete with a timestamp and in which product context they occurred. This would allow precise tracking of when and how often quality deviations occurred and whether they correlate with specific production conditions, such as when knives need replacing. The AI can be trained to continuously monitor cut quality. In a closed-loop scenario, this information could be automatically passed on to



Visual Inspection Cockpit is scalable and can be expanded from the pilot line to other lines, for example for cakes, pastries, or desserts

maintenance or control and actioned, for example, to replace knives before they become dull or to adjust cutting parameters. Another potential application relates to browning patterns. These can provide clues to uneven oven profiles. With appropriate training, the AI could soon recognize such patterns and automatically send a message to the technicians to initiate an oven adjustment. In the long term, AI models could not only check and provide feedback, but also actively intervene in process control to automatically adjust parameters. Plans are also underway to use AI to automatically remove defective products via a picker connection. Alternatively, with the help of mechanical alignment, AI could consistently align the rolls coming out of the ovens to the so-called top view with a rate of 99%. In future, the system could also be used for the detection of foreign objects. The already existing, highly precise position tracking is central to these future applications.

Easy expansion

After the positive experiences with the pilot line and thanks to its scalability, the VIC is now being installed and used on all production lines for white bread rolls at Coppenrath & Wiese. Since the production process and the product to be inspected are identical, implementation can be carried out with minimal effort. However, adjustments would be needed for new bread products or even other product groups such as cakes or pastries. Above all, retraining of the AI would be required. Thanks to open interfaces, the in-house team can independently handle scaling, parameterization, and further development using their experience with Python and OpenCV, even when expanding to additional quality features. After the successful pilot phase, Coppenrath & Wiese mastered the system well enough to drive further development independently, both for new quality features and for rollout to additional lines. "Our employees now have

Technical highlights

- Visual Inspection Cockpit Edge Application
- Industrial Edge Device SIMATIC IPC BX-59A with NVIDIA-GPU
- Connection to SIMATIC S7-1500 PLC
- Central updates and management via Industrial Edge Platform/Edge Hub
- Open and programmable interface, customizable by the in-house team

Christian Struck and Astrid Penner successfully implemented the pilot project



a highly effective tool to independently optimize our processes. This not only brings efficiency but also fosters personal responsibility in the team,” says Christian Struck. This ability to scale independently underscores the solution’s practicality and user-friendliness.

Well positioned for the future

The solution at Coppenrath & Wiese demonstrates how AI and industrial image processing, especially when combined, create real value in practice. The created value is not only for quality inspection but also, in a further step, for intelligent data utilization across the entire manufacturing process. The ability to flexibly scale to new product groups and further develop the system independently makes the VIC a strategic tool for quality and efficiency. With increasing automation and real-time adjustment capabilities as part of closed-loop

manufacturing, the VIC will become a key technology, even for variable products. Together with Siemens, Coppenrath & Wiese is setting a strong example for digital innovation in the food industry, impressively demonstrating how technology and craftsmanship can complement each other perfectly.

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