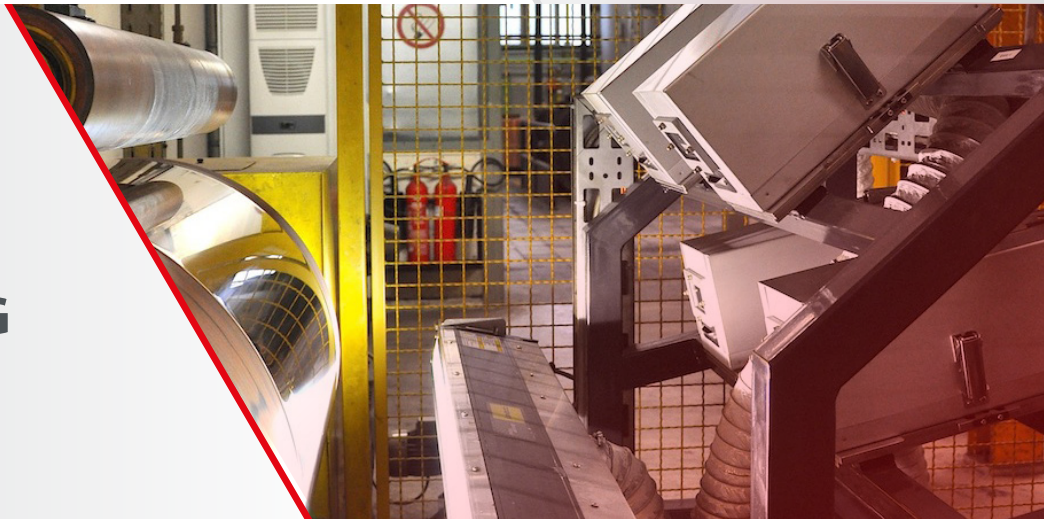


SmartView® from AMETEK Surface Vision optimizes quality control at Wieland-Werke AG

Surface inspection of copper strips



wieland

The diversity and miniaturization of electronic components is only possible thanks to small copper components known as lead frames. The production of these precision-stamped parts places high demands on the raw material. In addition, these delicate component carriers require copper strip with a virtually perfect surface. Wieland-Werke AG, one of the global leaders in the manufacture of these rolled copper products, relies on SmartView Surface Inspection Systems from AMETEK Surface Vision throughout its manufacturing locations.

DEFECT DETECTION & IDENTIFICATION

If steel is the backbone of the modern world, then its lifeblood, electric current, flows through billions of miles of copper cables. Many of the items that we take for granted – smartphones, photovoltaics, internet communication and mobility – are only possible thanks to copper lead frames. The continued trend of these devices towards miniaturization requires increasingly high-grade materials. These materials, made from miles of copper strips, must be defect-free, even down to the micron

level. It's for this reason that Wieland-Werke AG puts its trust in AMETEK Surface Vision's SmartView range of surface inspection systems. These systems not only ensure outstanding product quality, but also accelerate and optimize the manufacturing processes.

As an industry visionary, Wieland introduced its first automated surface inspection systems as far back as 1994. Today, a total of 25 SmartView systems are installed at Wieland plants around

the world, including 10 at its main production plant in Vöhringen. This case study reviews the installation on the DO50 continuous furnace, focusing on the practical operation and capabilities of the system.

**SMART
VIEW®**
DEFECT DETECTION & IDENTIFICATION

SmartView® surface inspection systems
for continuous annealing furnaces

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AMETEK®
SURFACE VISION

IDENTIFY AND SYSTEMATIZE DEFECTS

Copper is not just copper. Today, almost every one of Wieland's customers requires bespoke solutions to meet the demands of their products. Hence, the plants must be incredibly flexible, producing copper strips with a wide range of technological, physical and geometric properties. This means that several hundred different recipes are processed in the DO50 continuous furnace, often on the same day. They possess a multitude of customer-specific characteristics, such as strip thickness, bendability, tensile strength and surface finish. The finished product – 800 mm

wide strips, up to 12 km in length – are used by Wieland's customers to produce stamped products with the finest structures.

With line speeds of up to 100 meters per minute, effective quality control is only possible with an automated surface inspection system. Using SmartView, any irregularities that occur in the manufacturing process can be systematically and reliably detected and classified. Typically, two types of defect are detected:

- Systematic, repeating defects, e.g. roller imprints arising from surface damage or dirt on the rollers
- Sporadic defects, such as breakdowns caused by impurities from the casting process, emulsion residues, dirt or even insects that are caught in the rollers.

To achieve this, a custom recipe for each product type, with dedicated inspection parameters, is stored and reloaded each time the product is manufactured.

BRIGHT FIELD AND DARK FIELD CAMERAS COMBINED

The SmartView system installed on the DO50 line has a specific optical and mechanical configuration to enable installation within very tight space constraints. The system is installed at a space-saving deflection unit, using an S-Roller to enable two bright field and two dark field cameras to monitor the top and bottom surfaces of the strip. The cameras and lighting modules are mounted in dedicated, robust housings to protect them from the environmental conditions. An 8 mm light strip is projected directly onto the copper strip and then cameras are aligned to view this area from different angles, to provide both bright field and dark field views from the same mounting. As with

all SmartView systems, the system relies on industry-proven line scan cameras, these ensure that even the most minor defect on the 800 mm-wide strip does not escape the automatic eyes! The synchronization of the bright field and dark field cameras results in the best possible detection of standard surface irregularities. The combination of the results from the inspection of the upper and lower surfaces provides additional classification characteristics.

Thanks to high-performance line scan camera technology, the use of synchronized camera views for each application provides the optimum combination. This allows the flexible use

of a number of different configuration and inspection angles. The configuration of Wieland's DO50 is described by image processing experts as synchronized view processing. As outlined above, two lines of bright field and dark field cameras are also installed. This means that even the most diverse of reflection properties of individual defects can be reliably identified. Because SmartView combines the bright field and dark field defect patterns in real time, defect types can be accurately classified.

SPLIT-SECOND CLASSIFICATION

SmartView's advanced processing enables automatic detection and classification of defects based on pre-determined parameters. This also ensures that acceptable surface features are not falsely detected as defects. Once the defect has been detected and classified by the combination of intelligent cameras and processing units, it is presented to an

experienced operator to assess the defect pattern in detail. The entire process of image capture, image analysis and data exchange takes a split second. In this way, positional data, the grayscale value, orientation axes and segmentations are combined as a defect-specific data packet. Overall, SmartView determines a unique set of characteristics for each defect

pattern. The data is transmitted once the final process step has been completed.

INTELLIGENTLY STANDARDIZED, EFFICIENTLY ADAPTED

Unlike the first surface inspection systems at Wieland, which was a completely customised solution, costly designs, today's standardized SmartView systems from AMETEK Surface Vision provide effective, cost-efficient defect detection across the entire company. The flexible system is the result of more than 20 years' research and development and experience in selecting the right combination of industrial cameras, variable lighting and high-performance

image processing software. Wieland uses a total of 25 SmartView surface inspection systems worldwide. These are identical in terms of structure but are individually optimized to the specific application.

This combination of standardization and customization reduces both the upfront purchase costs (compared with a bespoke solution) and reduces the cost of start-up, maintenance and

worldwide data exchange. Wieland can therefore put its trust in a reliable and fast surface inspection at all production sites throughout the world. With AMETEK Surface Vision's SmartView, Wieland's rolled products meet the highest quality standards, regardless of whether they are produced in Vöhringen, Villingen, Langenberg, Birmingham, Wheeling or Singapore.

QUICK TO SET UP, EASY TO USE

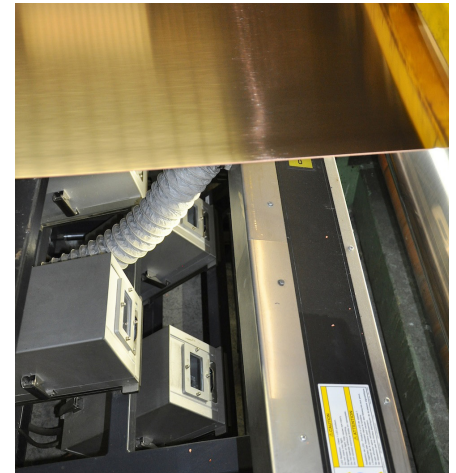
Not only does SmartView identify and classify defects in the process quickly and thoroughly, it is also easy to set up, thanks to its sophisticated, intuitive configuration tools. By utilizing these tools, the Project Manager from AMETEK Surface Vision can have the system up and running a short time after the mechanical installation is complete. From there, the operators from Wieland can easily maintain the system and adjust it to many different operating conditions.

Despite the underlying complexity of the system, the operator interacts with it via a user-friendly operator interface, with a variety of displays providing the information required by production operatives. These include defect listings, defect trend profiles, full camera width display with grayscale image, and manual or automatic defect visualization.

More information about SmartView's features can be accessed online at www.ameteksurfacevision.com/products/smartview-systems



The combination of bright field and dark field cameras enables the SmartView system from AMETEK Surface Vision to identify even the smallest defect on the surface of the copper strip.



For reliable defect classification, the SmartView system uses synchronized view processing to combine data from the top and bottom surfaces of the strip.



High performance in a small space – the two sets of cameras on Wieland-Werke AG's DO50 line were installed on either side of the space-saving S-roller.



In the production of copper strips, the so-called slabs are subject to extremely high temperatures and large forces.

ABOUT AMETEK SURFACE VISION

AMETEK Surface Vision is a world leader in automated online surface inspection solutions with a broad product portfolio optimized for surface inspection, monitoring and process surveillance applications.

Surface Vision's product portfolio includes three distinct product lines: SmartView® systems, SmartAdvisor® systems and Slit Inspection. Each product line uniquely enables customers to inspect the surfaces of materials processed in a continuous fashion across the metals, paper, plastics, non-wovens and glass industries.

Surface Vision is unit of AMETEK Process and Analytical Instruments, a division of AMETEK, Inc., a global manufacturer of electronic instruments and electromechanical devices.

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