

# SURFACE VISION

The background of the page is a composite image. The top right portion shows a blue industrial robotic arm with a flexible blue hose, with the text 'AMETEK SURFACE VISION' visible on its side. The bottom left portion shows a large roll of metallized paper, appearing as a series of curved, overlapping layers. The rest of the background is a gradient of yellow and orange.

**SURFACE  
INSPECTION  
SOLUTIONS FOR  
METALLIZED PAPER**

**APPLICATION NOTE**

**AMETEK<sup>®</sup>**  
**SURFACE VISION**

# SURFACEVISION

Metallized paper is produced by coating paper with a thin layer of vaporized aluminum, giving it a finish that adds decorative and protective properties to the product. It is primarily used in packaging, for example in labels, inner liners, gift wrap and other consumer product applications.

The sustainability of paper, and the superior appearance of a metallic surface, promotes this application in the packaging market.

The production process consists of several steps, during which different layers of coatings and a layer of metal are applied to the surface. A thin protective layer supports and safeguards the metallic surface appearance of the paper.

## THE ROLE OF SURFACE INSPECTION

Beginning with the surface quality of the base material – the coated paper – all subsequently applied processes may introduce various defects that could affect either the visual aspect of the metallized surface, or the further processing of the final product (for example, printing). Any of these defects may seriously affect the quality of the final product.

Manual inspection within this process is costly and can only be performed periodically. Depending on the process type, it may not be possible to visually check the material until several hours after production.

This delay means that severe defects and their causes are identified too late, with several rolls of defective metallized paper potentially produced in the meantime.

A continuous, automated surface inspection system will monitor the material for defects including scratches, contamination or coating imperfections, providing effective quality control for all production stages. This continuous inspection can protect manufacturers from claims and reduce costs throughout the production process.

AMETEK Surface Vision's SmartView® system provides an effective solution for this application. It overcomes the difficulties of the metallizing paper process to deliver reliable, highly sensitive defect inspection in real time, always providing visibility over the quality status of the value adding process chain.

## THE METALLIZING PROCESS

Basic paper is unsuitable for metallization as it is naturally porous, representing a rough base for the thin metallic layer that makes a continuous, even coverage impossible.

For this reason, metallizing-grade paper is either given a calendered or supercalendered finish to compress the fibers and smooth the finish, or given a clay coating that improves smoothness and reduces porosity.

It is then treated with a “pre-metallization” coating, an organic layer that further improves the paper smoothness and seal any remaining pores.

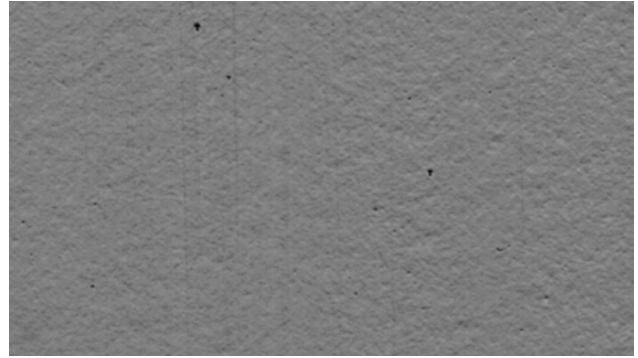
The metallization of this high-quality paper is performed over several stages. Initially, the coated base paper is prepared with a thin layer of primer. This is key to obtaining the desired smoothness and appearance of the metallized surface.

Next, a thin layer of metal, usually aluminum, is applied to the surface, either by lamination or by vacuum deposition. The thickness of this layer is typically as little as 15-30nm.

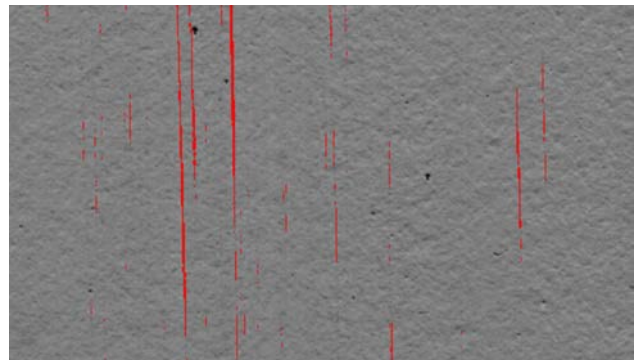
This is followed by one or more lacquering layers which protect the surface and prepares it for further processes, such as printing.

Continuous surface inspection is essential at each of these stages to ensure that the paper surface meets the required quality at all times. This process will detect any defects that may not emerge during the prior coating process, and allows action to be taken to remedy any issues at an early stage.

This prevents defective paper going through costly processing and then having to be discarded and recycled. So, in addition to maintaining quality, waste is reduced and production costs lowered.



The paper surface with scratches



Scratch detection through SmartView



A metallized wine label

## SURFACE INSPECTION

Even though the coated paper has been inspected prior to metallizing, defects may be present which are not visible to the human eye and may not even show up under high-resolution inspection. These micro-scratches (for example, blade scratches) may only be a few microns wide.

Nevertheless, such scratches negatively affect the quality of the metallized or printed surface, and may result in obvious, clearly visible streaks on a highly reflective metallized surface.

The reflective surface at the end of the process chain amplifies any imperfections of the base substrate layer. So, even if these defects are initially invisible after the first coating layer, they will become visible to high-resolution cameras, installed at the correct angle, after subsequent coating applications.

At this stage, operators will be able to take the decision to send the material for further processing, or to improve the current process to cover such imperfections.

In addition, the coating and metallizing processes themselves might cause imperfections which are detectable with high-resolution linescan cameras.

Any contamination, splashes, streaks or coating voids of the final protection layer can be observed and reported in real time.

This quality control helps to reduce scrap or downgraded product, improve productivity and reduce costs by avoiding the further processing of substandard material.

# SURFACEVISION

## THE AMETEK SURFACE VISION SOLUTION

AMETEK Surface Vision provides a customizable, modular inspection system for the paper metallizing process.

Based around the SmartView® platform, this system is equipped with advanced LED illumination, highly sensitive linescan cameras, data capture computers and associated process control equipment, with powerful algorithms for detection and classification.

The compact LED lighting illuminates the material for inspection and its optical setup is designed to cope with the different appearance of the various steps while coating or metallizing, since the different layers can have different reflectivity.

The AMETEK Surface Vision **Synchronized View** technology looks onto the surface from different angles, using brightfield and darkfield cameras, and therefore allows a reliable detection of a huge range of defects.

This, combined with our advanced **SmartLearn** classification, delivers excellent detection results in real time.

Furthermore, SmartView's adaptive detection tools like adaptive thresholding, automatic light control and automatic edge detection support the administrator's job in maintaining the different detection parameters for different surfaces.

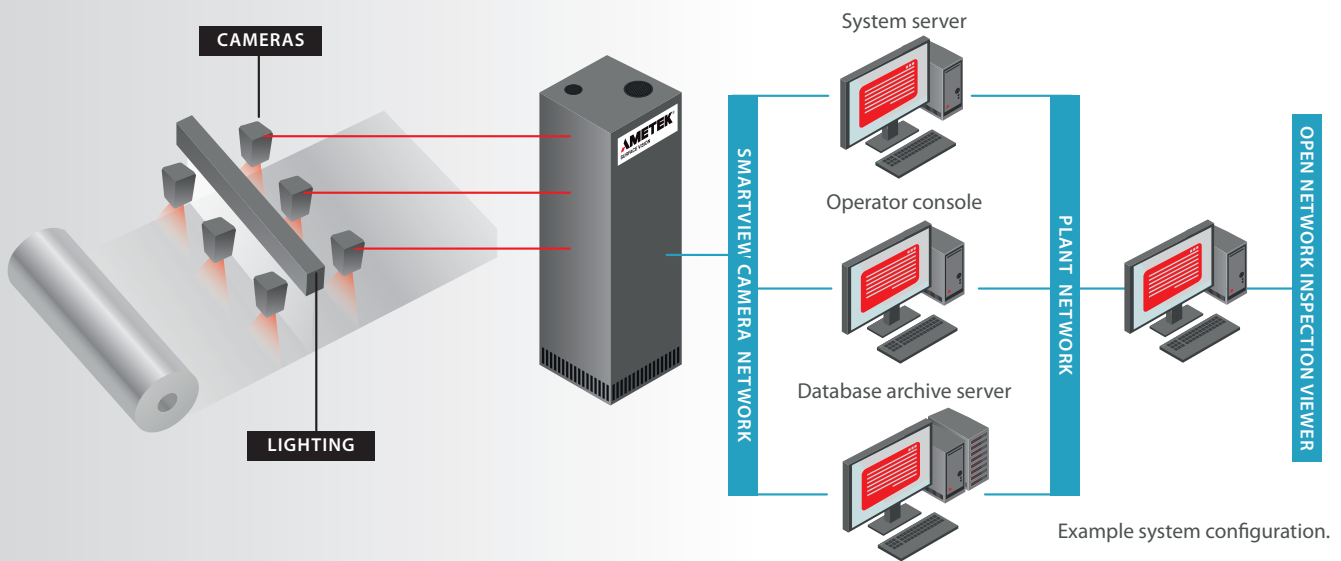
AMETEK Surface Vision has acquired significant experience in inspection of paper, plastics, metals and nonwovens for several decades, developing a wide range of software features and optical setups to serve the requirements of these markets.

The SmartView system is fully modular and expandable. AMETEK Surface Vision can supply a solution that scans both sides of the material, but the metallizing process is applied to one surface only.

SmartView also allows customers to manage their data in an open SQL database. This information can be analyzed using the SmartView onboard reporting package, SmartView Production Quality Advisor, to identify trends in defect appearance and in surface quality.

In addition, customers can easily access the data for use in their own process control and quality control management systems.





## KEY COMPONENTS OF THE SMARTVIEW SYSTEM

### LINESCAN CAMERAS

Provide ultra-high-resolution images of surface features and defects, which allows for excellent detection.

### ADVANCED CLED (COMPACT LED) LIGHTS

Illuminate the material for inspection.

### OPEN SQL DATABASE

For data integration with customers' quality management system for full coil history from hot rolling, through cold rolling and coating to the slitting process.

### SMARTLEARN CLASSIFICATION MANAGER

Multi-step classification software for product quality assessment. SmartLearn delivers unsurpassed accuracy in filtering out non-critical defects and classifying easily distinguishable defects in real time.

### STREAMING VIDEO CONSOLE

Allows process engineers to review or re-run the coil in high resolution using the data stored on a 48-224-hour buffer.

# SURFACE VISION

## ABOUT AMETEK SURFACE VISION

AMETEK Surface Vision is the world leader in automated online surface inspection and monitoring solutions. Our broad product range is optimized for the monitoring and inspection of webs and surfaces, and for process surveillance applications.

The SmartView and SmartAdvisor® product lines deliver robust, flexible solutions to continuous production processes across a number of industries, with hundreds of customers and more than 2,500 installations worldwide.

Our systems have become vital to increasing efficiency, streamlining operations, improving product quality and reducing costs and waste in industrial processes. Manufacturers in the metals, paper, plastics and nonwovens industries rely on our solutions to detect surface flaws or defects, and optimize process efficiency, at their production facilities across the globe.

We continue to innovate, providing cutting-edge technologies and world-class technical support that delivers highly accurate defect data, high-definition video, intelligent grading, archiving and detailed reporting. Customers who use AMETEK Surface Vision's services get the benefits of:

- **Reduced operational costs**
- **Process optimization**
- **Reduced process upsets (breaks, wash-ups, etc.)**
- **Improved product quality**
- **Maximized yield**
- **More thorough and objective grading of material**
- **Detection, classification and visualization of defects**
- **Minimized need for manual inspections**
- **Inspection reports you need, in a form you can use**

Based in Hayward, California, AMETEK Surface Vision has offices and sales representatives around the world. We are part of the Process and Analytical Instruments Division of AMETEK Inc., a leading global manufacturer of electronic instruments and electromechanical devices.

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