

ENSURING STEEL QUALITY

### Surface inspection system helps prevent steel strip breakages



Figure 1: The SmartView system at the end of the pickling line in the Ternium Pesqueria steel plant



### A major steel manufacturer

Ternium S.A. is one of the leading steel manufacturers in the Americas, and operates 17 sites across Argentina, Brazil, Mexico, Guatemala, Colombia, and the United States.

Manufacturing a wide range of flat and long steel products, it has an annual production capacity of 12.4 million tons. Its plants span the entire steel manufacturing process, from iron ore extraction to high-value-added products for the most demanding industries.

### SMARTVIEW DETECTION SYSTEM FOR PREVENTION OF STRIP BREAKAGES

Ternium's Pesqueria steel plant in Monterrey, Mexico, operates a Pickling Line Tandem Cold Mill (PLCTM) with five stands, six high. It is focused mainly on the automotive market, producing a wide range of products with high quality requirements.

This line receives hot rolled coils, sometimes with a previous skin pass process. Once the coil is threaded into the line, it is pickled using hydrochloric acid (HCl). The rolling capacity is 6,000 tons per day.

At the beginning of operations at the plant, AMETEK Surface Vision's SmartView system was installed to monitor surface quality issues and provide traceability for all processed coils. The system uses four cameras, two each side,

installed in bright field mode just after the pickling process.

The inspection system was originally planned as a stand-alone, so it was installed with no direct communication with the line's programmable logic control (PLC) system.

Following the SmartView system, there is a looper, beyond which is a manual inspection station. The steel strip passes in front of the quality inspector at 300 meters per minute, so it is impossible for the human eye to inspect the whole surface.

Once the line was fully operational, the plant began to experience strip breakages, some of which caused significant damage to the mill equipment.

The defects responsible for these breakages were correctly detected and classified by the SmartView system. However, some defects are challenging by their nature and could be misclassified or not classified at all. So, the defect classification task was critical for the results obtained.

**Carlos Gomez, Process Manager at Ternium Pesqueria, said:**

*"Our operational practice dictates that the unclassified defects are not shown to the quality operators or inspectors. They are under the responsibility of the system owner, a process engineer. The most damaging strip breakages happened in a thin gauge."*

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### SWITCHING TO A MORE AUTOMATED SOLUTION

Working in partnership with AMETEK Surface Vision, Ternium took immediate action to safeguard the mechanical integrity of the mill and process continuity.

**Manuel Acevedo, Process Engineer at Ternium Pesquera,** said: *"The first lesson we learned is that the system has to have an owner, someone who understands the architecture, the possible failure modes, how the applications interact, and the reporting possibilities."*

*"This person is responsible for communicating with the AMETEK Surface Vision support team, enabling us to solve any issues quickly and efficiently. Also, understanding what tools to use, based on our particular needs, has been crucial."*

The SmartView inspection system's color-coded classification tool was put to use to identify defects on a gradient of severity, so that operators could be more alert to significant problems.

To prevent a defect passing through the mill unsupervised, SmartView was connected to

the plant's PLC, so that when it detected a severe defect under certain strip thickness conditions, it would trigger a signal via one of its programmable system outputs. The line's PLC was then able to acquire the data and track the defect along the line. Just before the first mill bite, the mill could then reduce speed in order to minimize any damage.

This allowed the mill to operate safely even if the inspector was distracted. A visual and acoustic alarm was also added to alert the operator when SmartView detected a severe defect.

To make automatic inspection even more robust, correct detection levels are essential. The pre-classification stage helps to free the processor from unnecessary task loads, while the post-classification stage allows the detection to be potentialized – that is, the defect severity can be changed depending on its position, contrast or dimensions.

Finally, setting up rules for the defects that are not classified prevented any evasive defect going through. As the line processes material from different hot mills, the features for the same class of defect are different, so this variable can make detection more challenging.



**Figure 2**  
The SmartView system has helped reduce the frequency of strip breakages

### EFFECTIVE RESULTS AND IMPROVED QUALITY

**Oziel Samaniego, Maintenance Engineer at Ternium Pesquera,** said: *"Since making the changes to the PLCTM system, there has been a steady decline in the frequency of strip breakages. If the SmartView system was not in service for any reason, we simply couldn't operate the line for thin gauge or exposed quality steel – the risk would be too high."*

*"As a by-product of the work carried out, we are now in a much better position to locate defects that could mark the mill's work rolls and consequently leave an imprint on the strip surface."*

Ternium and AMETEK Surface Vision are also looking at ways to improve the performance of the system, such as updating and increasing the System inspection capabilities.

AMETEK Surface Vision is pleased to have Ternium as a partner. We were able to achieve these results together thanks to their commitment to quality and continuous improvement, which enabled us to apply our long history of expertise to their evolving process requirements. Through training, on-site visits and system upgrades, we will continue to help solve any issues that arise with their metal strip quality.



**Figure 3** A SmartView system in operation on a pickling line

### ABOUT AMETEK SURFACE VISION

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

Its product portfolio includes two distinct product lines: SmartView® systems and SmartAdvisor® systems. Each product line uniquely enables customers to inspect the surfaces of materials processed in a continuous fashion across the metals, paper, plastics, nonwovens, and glass industries. Learn more by visiting [ameteksurfacevision.com](http://ameteksurfacevision.com).

AMETEK Surface Vision is a unit of AMETEK Process and Analytical Instruments, a division of AMETEK, Inc., a global manufacturer of electronic instruments and electromechanical devices with annual sales of approximately \$5 billion.

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