Achieving the highest quality, optimizing processes and delivering savings in production costs are among the biggest challenges facing the world’s steel producers today. The inline measurement of mechanical and/or magnetic properties of the steel strip in a processing line using contactless, non-destructive techniques offers considerable potential for further technological optimization and steel grade development.

This is where the PropertyMon system comes in, using state-of-the-art methods based on electro-magnetic signals. It is a system that delivers reliable values for properties such as tensile strength, yield strength, specific magnetic losses and magnetic polarization.

**YOUR CHALLENGE**

The steel producing industry is driven by ever increasing quality requirements. It is impossible to continuously monitor and guarantee material properties and specifications with standardized laboratory-based destructive tests (e.g. single-axis tensile or Epstein frame tests) of samples taken, for example, at the beginning and end of a coil.

Destructive testing needs to be reduced and irregularities identified immediately and throughout the entire production process in order to increase output quality and ensure process optimization and, consequently, reduce costs. Producers also need to have comprehensive strip length-based data records of property values for documentation and analysis.

Laboratory tests are a reliable method of determining mechanical or magnetic steel properties, but delivering the results is a slow process and there is no margin for quick process adaptations. Furthermore, the results are only valid for the sampled position, and properties can vary greatly over the entire strip length.

**OUR SOLUTION**

PropertyMon is a quality monitoring system for the online detection of mechanical or magnetic properties of the steel strip. The system performs a continuous, inline and contactless inspection over the whole strip length based on an electromagnetic measurement principle. The results are immediately available, visualized for the benefit of the operator and stored in PropertyMon’s internal database.

The main system components are the sensor heads, a traversing unit, distance control, and an electrical cabinet. The material is inspected at full plant speed by distance-controlled sensor heads above and below the strip. The horizontal traversing unit can vary the measurement position across the strip width and transfer the sensor heads to the test sample desk or park position beside the line.

All electrical components required for the power supply, signal processing and control of the measurement device are integrated within a single electrical cabinet located near the traversing unit. An integrated HMI visualizes measurement and system status and allows for full manual control of the measurement device.

Measurable steel grades are hot- and cold-rolled ferromagnetic steel strips including micro-alloyed steel, IF steel, dual-phase steel and TRIP steel.

**FIELDS OF APPLICATION**

- Annealing lines
- Galvanizing lines
- Various processing lines (pickling, etc.)
- Skin pass mills, etc.
FUNCTION
The PropertyMon system measures electromagnetic values (hysteresis curve) of ferromagnetic materials and exploits the interrelationship between mechanical, material and magnetic properties. Output values with an accuracy in the range of corresponding destructive tests are calculated by applying multiple linear regression. The calibration can be obtained from test measurements and corresponding laboratory samples without the use of online process parameters from the plant.

The system is directly connected to the Level 1/2 automation system of the processing line via TCP/IP so that all relevant information, such as strip identification, grade, thickness, strip position, etc., can be obtained and the results sent back and stored in the PropertyMon database synchronized to the measurement position.

MAIN FEATURES
- Simultaneous detection of mechanical and magnetic properties
- Reliable differentiation between related materials even with similar remanence
- Directional measurements for anisotropic properties
- Compact industrial sensor heads for local measurements and width-traversing
- Test sample desk beside line for offline measurements
- Automatic or manual operation from local cabinet
- Long-term data storage in internal database
- Easy-to-use software with GUIs for offline data visualization and analysis and simple calibration of steel grade classes

MAIN BENEFITS
- Advanced inline measurement
- Detection of mechanical and magnetic properties
- Material properties evaluation and documentation over whole strip length
- Reduction of customer claims
- Process optimization with respect to quality, capacity, output, energy
- Reduction in number of destructive laboratory tests
- No special plant parameters required

TECHNICAL DATA
- 0.25 mm - 5 mm strip thickness
- 0 - 800 m/min strip speed
- Up to 1600 MPa (tensile strength and yield strength)
- Working distance 6 - 12 mm (application-dependent)
- Up to 100°C strip temperature
- Accuracy (one sigma standard deviation):
  - tensile strength < ± 5%
  - yield strength < ± 7%
  - magnetic losses or polarization < ± 5%

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