



PROPERTYMON

INLINE MEASUREMENT OF STEEL STRIP PROPERTIES

With increasing quality requirements, higher productivity, increased competition and cost pressure, process measurement and control are more important than ever. Good process control is essential to stable and consistent production, particularly for higher strength grades that are more process critical. End users also require greater levels of documentation and certification of quality and properties.

Primetals Technologies' in-line PropertyMon system provides enhanced product quality data by non-destructive assessment of the product properties along the entire length of the strip. This quality data is calibrated against conventional laboratory destructive test data providing comprehensive and reliable quality assurance information along the full strip length. This enables the consistency and stability of production to be monitored and any deviation in process and properties to be quickly identified so that remedial action can be taken.

YOUR CHALLENGE

It is impossible to continuously monitor and guarantee material properties and specifications with conventional laboratory-based destructive tests of samples taken, typically, at the beginning and end of a coil. Laboratory tests, whilst a reliable method of determining the steel properties, are slow and provide no immediate feedback to the process. In addition, the results are only valid for the sample position and not truly representative of the properties along the strip length. It is important for both process control and quality assurance to identify any variations in properties from the target values along the full strip length.

Conventionally this monitoring has been achieved by combining recorded process parameters, such as surface temperature, with empirical modelling simulation of microstructure development. Clearly measurements directly related to the microstructure are more accurate and therefore preferable. The challenge is to find a better method for monitoring material properties in line without destructive testing.

OUR SOLUTION

PropertyMon is a quality monitoring system for the online detection of mechanical or magnetic properties in the steel strip using an electromagnetic principle. The system performs a continuous, inline and contactless inspection along the strip length. The results are immediately available, visualized for the benefit of the operator and stored in PropertyMons' internal database.

The relationship between microstructure, magnetic response and steel properties enables the assessment of the steel properties by calibrating the magnetic response of the microstructure to laboratory sample data.

Non-contact sensor heads mounted above and below the strip inspect the entire strip at full plant speed applying a magnetic field to the strip and measuring the responding signal. The sensors have a fixed position, for example for centerline measurement or can be traversed to measure at different transverse positions. It is also possible to take measurements in either the rolling or transverse direction. The compact sensor geometry means that the measurement is independent of strip speed. Measurements can be taken close to the edge of the strip if required.

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

All hot- and cold-rolled ferromagnetic steel grades including micro-alloyed steel, IF steel, dual-phase steel and TRIP steel can be measured.

FIELDS OF APPLICATION

- Annealing, Galvanising and other process lines
- Skin pass mills, etc.
- Electrical steel production
- Automotive component applications



Plant integration example during commissioning



Data visualization for analysis and documentation

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 same range as laboratory destructive tests are calculated by applying multiple linear regression. The calibration is obtained from PropertyMon measurements and corresponding laboratory samples, the use of online process parameters from the plant is not necessary but can be used to enhance the results.

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 with synchronization to the measurement position.

MAIN FEATURES

- Simultaneous detection of mechanical and magnetic properties
- Reliable differentiation between different steel grades
- Directional measurements for anisotropic properties
- Compact industrial sensor heads provide localized measurements independently of strip speed
- Tracking of sensor stand-off height from strip to ensure accuracy of results
- Sensor traversing function for measurement at different transverse positions
- Automatic or manual operation and control from local cabinet, remote access from operator pulpit also possible
- 4-Step safety features to avoid strip contact and ensure operational safety

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)
- Up to 100°C strip temperature
- Accuracy (one sigma standard deviation):
 - tensile strength $<\pm 5\%$
 - yield strength $<\pm 7\%$
 - magnetic losses or polarization $<\pm 5\%$



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