MEASURING AND CLEANING SYSTEMS
FOR METAL STRIPS
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UVB TECHNIK s.r.o. has been engaged in the development and production of measuring and cleaning systems, while the production of continuous contact thickness gauges is the core activity of the company. The gauges are mainly used for measurement of metal, non-ferrous strips and flat wires in the cold rolling mills and also by the strip processors.

The company was founded in Ostrava in December 1991 with the intention to exploit the experience in production technologies in the area of mechanical engineering in view of high demand for the precision continuous contact gauges.

In 1993 the development of new continuous metal strip thickness gauge types with micrometer resolution was launched. The efforts invested was rewarded with the patent for Metal Strip Thickness Gauge on 22 September, 1993. By the end of this year the findings were transferred to the production.

The rising demand at the domestic market allowed dynamic development of the company which succeeded in establishing at the measuring instrument market. It is the only manufacturer of this instrument type in the Czech Republic and one of a few major international companies producing continuous contact gauges.

In 1998 UVB TECHNIK was transformed into UVB TECHNIK s.r.o., a joint-stock company with registered offices in Ostrava owned by Mr. Tomáš Barták, and Mr. Pavel Vitoslavský. From the next year the continuous contact metal strip thickness gauges have been exported, with the largest amount directed to Spain.

At late 1999 / early 2000 the company moved to new premises including the production hall in Hlučín.

The essential objective of the company for the near future is to penetrate more foreign markets and strengthen the positions at the domestic market. The high quality of products and long-terms relations with the clients will still be the basic tools to succeed this effort.

Increasing demands on the quality of production at the cold rolling mills are reflected in the strong demand for measuring instruments. These devices are nowadays absolutely necessary. They allow to prevent operational problems and subsequent loss of customer by increasing the quality of final products. Mainly by scrap reducing all costs incurred for the acquisition of these devices return in a short time back.
Functional principle
Contact measuring by means of two opposite sensors with diamond contacts.

Process of measuring
The gauge is lead onto the strip by the operator manually or automatically. Then the measurement proceeds automatically, the measured data are displayed on the evaluation unit. As an option, the gauge can include the PP Visual system which is a PC equipped with software for data processing and reports printing. The gauge can also be used for calibration of non-contact gauges. Its function does not depend on composition of the measured material. The automatic version of the gauge is furnished with a system which enables fast pull-out off the line in cases the strip gets sideways of the track, suddenly breaks or excessively corrugates.

Outputs of the equipment
- digital image of absolute value of the measured thickness
- analog representation of the measured thickness deviation
- analog outputs of deviation, or of nominal thickness for AGC
- digital communication interface

Features of the equipment
- single measuring range 0 – 9 mm
- measuring sensors do not have to be mechanically set up to nominal thickness
- the equipment accuracy is not influenced by composition nor surface of the measured material
- soft pressure of contacts means that also soft materials can be measured
- 5-years warranty for the service life of measuring contacts

Optional accessories
- module of analog outputs 0 – 20mA
- digital communication module
- visual display and control unit fitted in the operator console
- PP Visual - industrial PC with software for data processing and report printing
# Technical data:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>Automatic or manual</td>
<td>Automatic</td>
</tr>
<tr>
<td><strong>Resolution</strong></td>
<td>0,001 mm</td>
<td>0,0001 mm</td>
</tr>
<tr>
<td><strong>Strip thickness range</strong></td>
<td>0,03-9 mm (20 mm)</td>
<td>0,02 (1)-2 mm</td>
</tr>
<tr>
<td><strong>Max. thickness measurement error</strong></td>
<td>±1 µm, ±2 µm (&gt; 2 mm)</td>
<td>±0,5 µm</td>
</tr>
<tr>
<td><strong>Max. measurement depth from the strip edge</strong></td>
<td>150 mm (210 mm, 310 mm)</td>
<td>900 m/min</td>
</tr>
</tbody>
</table>

SOTYL, Argentina, copper, reversing rolling mill

Enersys, UK, lead, reversing rolling mill
MTP references

- ArcelorMittal Ostrava a.s., Czech Republic
- KWW, a.s. (Bilstein Gruppe), Czech Republic
- MĚĎ Povrly, a.s., Czech Republic
- Wickeder Westfalenstahl GmbH, Germany
- Walcownia Metali Nieżelaznych „ŁABĘDY” S.A., Poland
- ZM SILESIA SA, Poland
- S.C. GALFINBAND S.A., Romania
- FGUP “MZSS”, Russia
- OOO Konserv - Trade, Russia
- TSNiChermet I.P. Bardin, Russia
- MAHLE Engine Components Slovakia s.r.o., Slovakia
- CINKARNA, Metalurško-kemična Industrija Celje, d.d., Slovenia
- U.S. STEEL Smederevo, Serbia
- Compañía Valenciana de Aluminio Baux, Spain
- Laminados Especiales S.A., Spain
- JSC AZOTSM, Ukraine
- EnerSys Ltd., UK

ArcelorMittal Ostrava a.s., Czech Republic, steel, reversing rolling mill

- JamesTown Industries Ltd., UK
- SOTYL S.A., Argentina
- Envases de Plata S.A., Argentina
- Agrawal Metal Works PVT. Ltd., India
- Jindal Stainless Ltd., India
- KSPG Automotive India Pvt. Ltd., India
- Nippon Cross Rolling, Japan
- Osaka Heat Treatment Co., Ltd., Japan
- Green Industry Co., Ltd., Korea
- WOORI GEC, Korea
- Lucas-Milhaupt, Inc., USA
- Foshan Tongbao Electrical Precision Alloy Co. Ltd., China
- Wah Brass Mills (Pvt) Ltd., Pakistan
- MAHLE METAL LEVE S.A., Brasil
Functional principle
The equipment is designed for downloading measured thickness from one or two continuous MTP gauges. The course of measuring and statistical values are displayed on the screen in real time. The programme measures and enables archiving and printing of the measurement reports.

System characteristics
- communication with the MTP thickness gauge (downloading data and transferring setup to MTP)
- graphic display of distribution of thickness with visualisation of tolerances
- measuring of length during connection to pulse signal
- archiving of the measured data to HDD
- printing of measurement reports in charts and graphic formats
- access to computer network

Basic components of the system
- software in the MS WINDOWS environment
- LCD monitor
- PC in industrial chassis
- keyboard
- DVD R/RW
- hard disc min 320 GB
- input/output card for connection of the technology (e.g. pulses for measuring of length)
- communication interface cards for connection of thickness gauges
- network interface card for connection via Ethernet

Outputs of the system
- continuous evaluation and visualisation of statistical indicators during the measuring process
- data archived in chart format compatible with Microsoft Excel
- option to add further technological values to be measured and archived
SZ/Wiping equipment

Equipment for wiping emulsions from the surface of metal strip

**Functional principle**

Surface cleaning is done by wiping by means of two pairs of flexible blades. In addition, in between the pair of blades, strip is cleaned by compressed air. The blades together with the blast bar are attached to the floating frame. The frame offsets side tilt of the strip and its horizontal and vertical motion. The upper and lower cleaning part of the frame are pressed together by a couple of air cylinders. Pressure of the air blast can be continuously controlled. The equipment is supplied with a spare set of blade holders which enables fast replacement.

**Features of the equipment**

- prevention of oil or emulsion spilling off the line
- elimination of drawing rolls spinning
- shortening of annealing times for clean strip
- prevention of stain formation during annealing
- lifetime extension for degreasing baths
Technical data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strip width</td>
<td>max. 3000 mm</td>
</tr>
<tr>
<td>Strip temperature</td>
<td>max. 160°C</td>
</tr>
<tr>
<td>Strip thickness</td>
<td>max. 10 mm</td>
</tr>
</tbody>
</table>

SZ references

- ArcelorMittal Ostrava, Czech Republic
- BSH Electrodomésticos España, Spain
- Jindal Stainless Ltd., India
- NASTECH Ltd, South Korea
- Supermax Personal Care Pvt. Ltd., India
- ThyssenKrupp Electrical Steel, India
- Tube Products of India, India
- WISCO, China
- KS Gleitlager GmbH, Germany
- Agrawal Metal Works PVT. Ltd., India
- AL Invest Bílíčná a.s., Czech Republic
- CINKARNA, Slovenia
- Copalcor Rolled Metals, South Africa
- Envases de Plata S.A., Argentina
- Gupta Metal Sheets (P) Ltd., India
- JSC “KZOCEM”, Russia
- KWW, a.s. (Bilstein Gruppe), Czech Republic
- LLC “GZOCEM”, Russia
- Meta Copper And Alloys Ltd, India
- MINO S.p.A., Italy
- Özer Metal Sanayi A.Ş., Turkey
- SOTYL S.A., Argentina
- Tower Aluminium Nig Plc., Nigeria
- Walcownia Metali Nieżelaznych , Poland
- ARANIA S.A., Spain
- MKM Mansfelder Kupfer und Messing GmbH, Germany
- Primetals Technologies France SAS, France
- Ashland Aluminium, USA
- Pfarr Stanztechnik GmbH, Germany
- ACIERS COSTE, France
MPP/Strip profile gauge

Equipment for the laboratory measuring of thickness profile on a cut-out strip sample

Functional principle
Contact measuring.

Process of measuring
The measuring cycle is semi-automatic; operator introduces a sample cutting manually, then enters the sample data and starts the measuring. Within the equipment, the sample is pneumatically gripped by means of spring collets which secure mutual perpendicularity of the measured strip surface and contact sensors. After the sample is gripped, the profile measuring and processing of measuring data follows. The outcome of the measuring process is a chart consisting of graphs and statistical data. The charts can be subsequently printed or electronically archived.

Outputs of the equipment
- overview representation of the processed data and graphic display of the measuring on a PC screen
- data archives on PC hard disc
- printed report
- equipment can be connected to company’s local network and the measured data can be read from a remote PC

Features of the equipment
- the equipment accuracy is not influenced by composition nor surface of the measured material
- gripping of the sample into spring collets eliminates deflection of the sample
- measuring head does not have to be mechanically set up to nominal thickness
- soft pressure of contacts means that also soft materials can be measured

Technical data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness of the strip sample</td>
<td>0.03 - 5 mm (10 mm)</td>
</tr>
<tr>
<td>Resolution</td>
<td>0.001 mm</td>
</tr>
<tr>
<td>Accuracy</td>
<td>± 1 µm</td>
</tr>
<tr>
<td>Max. width of the strip sample</td>
<td>3000 mm</td>
</tr>
<tr>
<td>Number of measurements on the strip width</td>
<td>1 measurement / 1 mm of the sample width</td>
</tr>
</tbody>
</table>
MPP references

- ArcelorMittal, Rumania
- ArcelorMittal, South Africa
- ArcelorMittal Spain
- (previously Aceralia S.A.), Spain
- Böhler-Uddeholm Precision Strip, Austria
- Borcelik Celik Sanaci Ticaret A.S., Turkey
- Compania Valenciana de Aluminio S.L., Spain
- Duferco, South Africa
- El Zinc - Asturiana de Laminados S.A., Spain
- ThyssenKrupp Electrical Steel, India
- Voestalpine Stahl GmbH, Austria
- JSW Steel, India
STM/Shapemeter roll
Sectional strip tension meter

**Functional principle**

The sectional strip tension meter is designed for evaluation of metal strip flatness in cold rolling mills. The principle of the flatness evaluation is based on the measurement of pressure forces of a metal strip in individual zones of the measuring roll. A visual unit displays in real time on a monitor the measured tensions across the strip in the form of columns including required data output for AFC (Automatic Flatness Control) and flat graphical mapping.

**Defects occurring during the rolling process**

- Visage of the strip
- Rolling gap
- Mapping of tensile force across the strip

KOVOHUTÉ ROKYCANY a.s., Czech Republic, nickel and alloys, copper, brass, reversing rolling mill

TS PLZEŇ, a.s., Czech Republic, ZnCuTl, reversing rolling mill
STM references

- Johnson Controls Battery Co. Ltd., China
- Johnson Controls Battery Group, Inc., USA
- Johnson Controls, Inc., Mexico
- KOVOHUTÉ ROKYCANY a.s., Czech Republic
- Steel Equipment Specialists, LLC, USA
- TS PLŽEŇ a.s, Czech Republic
- VIZ-STEEL LTD (NLMK Group), Russia

Technical data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. vertical force</td>
<td>14 000 N/each zone</td>
</tr>
<tr>
<td>Measurement error</td>
<td>&lt; 0,15% from the measuring range</td>
</tr>
<tr>
<td>Measured tension max.</td>
<td>400 N/mm x strip width</td>
</tr>
<tr>
<td>Width of measuring zone</td>
<td>33,3 mm</td>
</tr>
<tr>
<td>Max. strip speed</td>
<td>2 400 m/min</td>
</tr>
<tr>
<td>Data output</td>
<td>Profinet (Profibus)</td>
</tr>
<tr>
<td>Display units</td>
<td>N, I-Units</td>
</tr>
</tbody>
</table>
SURFSCAN/Continuous strip inspection

SURFSCAN is a visual inspection system designed for defect detection on non-woven textiles, plastic foils, paper, metal plates, etc. System can detect defects as small as 0.1 mm² at speeds up to 2000 m/min. Maximum product width is 5 m. System is fully configurable according to customer’s requirements and can be used in various phases of production process.

**Features**
- 100% inspection 24/7
- Detection of periodic defects
- Automatic detection of edges and width of material
- Possible integration of alarms and marking systems
- Slitting quality control
- Real-time visualization of defects on several distributed stations
- Export of statistics, print of output protocol
- Easy integration due to modular design
- Suitable for in-line systems and rewinders
- Online support 24/7 non-woven fabrics

**Purpose**
- Production efficiency improvement
- Number of reclamations from customers decrease
- Long-term overview of production quality due to simple export of statistics

**Suitable for**
- metal plates
- paper
- foil
- polycarbonate plates
- products on conveyor belt
System overview

System can detect many different kinds of defects, e.g., holes, spots, foreign objects, changes of pattern, homogeneity of material, etc. These defects are then automatically classified using neural network algorithms into categories according to training samples in database. To achieve best detection results system uses adjustable high-power LED illumination, high-speed linescan cameras and sophisticated lens control. It’s applicable to wide range of thickness, colors and patterns of produced material.

Every part is designed as modular as possible, so it can be adapted to individual customer’s requirements and limitations of given production line. System can be installed in different stages of production, i.e., from primary material to final product for end customer.

- Bright field illumination
  - Defects: holes, scratches, embedded contamination, thickness changes, fibers

- Transmitted illumination
  - Defects: holes, gels, fibers, spots, thickness changes

- Specular illumination
  - Defects: scratches, surface contaminations, 3D defects (bubbles, pits), operating fluid spots (oil)

- Slitting inspection
  - Defects: changes of width between rolls, misfiring knife

Central server
- Server handles mainly control of a whole measuring process and communication with particular subsystems. Furthermore it processes image data and archive results of inspection

Operator console
- According to needs it’s possible to use several remote administrator consoles and multiple offline stations for reviewing of archived reports

Connection to other systems
- Connection to other systems of production line (PLC, encoder, database, printer, etc.) via standard industrial interfaces is a commonplace

Output devices
- It’s possible to signal (acoustic or optical alarm, marking system) not only actual state of system, but also occurrence of selected types of defects
Components

Camera unit
System SURFSCAN uses state-of-the-art linescan cameras with high resolution sensors (up to 16 kpixl), outstanding signal/noise ratio and line frequency up to 200 kHz. Lens is mounted to camera using specially developed adapter, which allows remote control of lens aperture and focus.

Illumination unit
To achieve best results of detection system uses adjustable high-power LED illumination. To highlight particular type of defects there are also variants with different wavelengths of light, eventually with special angle illumination.

Rack unit
Core of the system is a rack unit containing computational units for data processing. It also provides a power supply for all subsystems. Using standard industrial interfaces (Ethernet, RS232/485, etc.) it can communicate with other systems. In case of operation under more demanding conditions, it can be equipped with air-conditioning or ventilation unit.

I/O module
Expansion I/O module PULSIO allows connection of output signals to other systems (signalling, marking, etc.) and also custom input signals (start/stop, material break, etc.). Programmable logic inside can also act as a state machine of production line and share this information with central server which controls whole inspection accordingly.

Other features
- Customization of SW according to customer needs
- Control of detection sensitivity
- Setting of minimum defect’s size
- Self-learning classifier
- Automatic compensation of illumination intensity
- Classification of defects to categories
- Communication with systems on production line
- Possible integration of other sensors
- Automatic system diagnostic
- Users’ rights management
- Low operating costs

Examples of defects

Foil

Non-woven fabric

Paper

Metal
System outputs

Graphical distribution of defects in reel

Detail of slitting defect

Production overview

High-power linear LED illumination

Diagnostical output of system (report of windings, cuts, speeds, temperatures, sensitivities, etc.)

Specification

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply</td>
<td>230 V AC</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>5 – 60 °C</td>
</tr>
<tr>
<td>Production speed (max.)</td>
<td>2000 m/min</td>
</tr>
<tr>
<td>Material width (max.)</td>
<td>5 m</td>
</tr>
<tr>
<td>Defect size (min.)</td>
<td>0.1 mm²</td>
</tr>
<tr>
<td>Image resolution (typ.)</td>
<td>0.1 mm/pxl</td>
</tr>
</tbody>
</table>

Installations

Inspection system implemented to production line

References

- Fatra, a.s.
- PEGAS NONWOVENS s.r.o.
- JIP – Papírny Větřní, a.s.
- Balsac papermill s.r.o
- OP papirna, s.r.o.
- TRIBOMETAL (now MAHLE s.r.o., Slovakia)
UVB TECHNIK in the world