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Non-contact laser measurement in the aluminium and steel industry

Laser sensors have become an increasingly universal measuring instrument for the steel industry in the areas of casting, rolling, welding, robotics and quality inspection due to their small size, high measuring frequency and their ability to measure without contact under almost all ambient conditions.

Application examples

Casting level control
Thickness measurement
Geometry measurement
Levelness measurement
Overlap and welding seam measurement
Diameter measurement
Bending radius determination

Afflerbach, Allegheny Ludlum, Alusuisse, AMAG, Blohm + Voss, Dillinger Hütte, Haeussler, HOESCH Stahl AG, Mannesmann Rohr, Ilsenburger Grobblech, Oxytechnik, Saarstahl, Salzgitter AG, Sascilor, Sollac, Stahlwerk Trinec, Striko, Sumitomo, Thyssen, Unimetal, Veitsche Magnesit, VOEST ALPINE, VOEST SCHIENEN AG ... are already satisfied customers of Dr. D. Wehrhahn Measuring Systems.

The laser — universal measuring instrument in casting and rolling mills

Casting level control

The increasing automation of casting processes demands a more and more accurate control of the casting level. The filling level is measured largely by float systems of various kinds. Since these systems are in direct contact with the smelt, they are prone to faults, e.g. due to adhering material. Non-contact laser systems are the perfect solution because in addition to their freedom of contact from the smelt they offer other advantages such as a large measuring range at a great basic distance from the metal surface. The main areas of application are casting level control in smelting furnaces, continuous casting shells, casting gutters, band casting systems and in moulding.

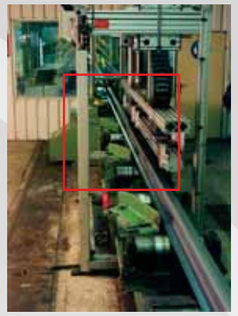
Thickness measurement

Two sensor layouts are available basically for the thickness measurement. One sensor is used for the reference measurement on a roller. The product runs over a roller which is used as a basis for the zero point. The subsequent measurement on the product is set off against the zero point and output as a thickness. In the thickness measurement with two sensors the product runs between two sensors, one above, one below the material. The difference between the two sensor values gives the thickness. The advantage of this measuring set-up is that the product can move vertically to the direction of travel without causing measuring errors. Air-cooled OPTImess sensors are available for measuring warm and hot materials. Traversing thickness measuring systems are available in addition to the stationary thickness measurement with separate measuring tracks.

Geometry measurement

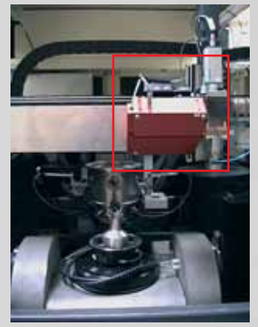
If other dimensions of steel products such as width, length and edge form are to be measured in addition to the mere thickness, this is made possible by combined use of point measuring OPTImess and scanning OPTIscan laser sensors. Length-dependent measurement of the entire slab geometry is performed in combination with a non-contact length measurement. Two scanners each above and below the material pick up the thickness and contour, two point measuring OPTImess sensors mounted at the sides determine the width. The profile is measured along the slab by permanent measurement during the passage of the slab.

Levelness measurement



Levelness is an important quality feature of plates. Automatic measuring and control systems are integrated in rolling mills to optimise levelness. Highly accurate axial measurements are necessary to monitor these plants. Such axial measurements can be made during production with non-contact lasers. The height profile can be measured even at high production speeds thanks to the high bandwidth of the OPTImess sensors up to 10 kHz. In real plants three OPTImess laser sensors measure the levelness (edge-centre-edge) of the red hot band or in the cold area the levelness of high speed rails in two levels. In both cases the surface profile measured by the laser sensors is evaluated and displayed by a special software (Fourier analysis).

Overlap and welding seam measurement



When welding high-tensile aluminium parts in the aerospace industry the size of the welding seam is also significant in addition to picking up the geometrical position. Using two OPTIscan sensors adapted to the laser welding system the welding seam volume is calculated and documented in addition to the dimensional accuracy of the welded components. This enables online inspection of the welded parts. Another large field of application is in the overlap or gap measurement when welding automobile plates. Individual plates are joined either by soldering or laser welding. In both cases it is crucial to the joining process to observe the very narrow component tolerances. Therefore suitable sensors must be used to scan the welding line. Here too OPTImess sensors or OPTIscan laser scanners are used. The welding position is transferred by an advance sensor to the welding control which then adjusts the welding head.

Diameter measurement / Bending radius determination

Laser measuring systems which operate according to the shadow method are normally used for the diameter range up to about 300 mm. Special OPTImess sensors have been developed for larger diameters. An OPTImess with two integrated receivers allows diameter measurement of steel floors with a radius difference of 2 m. The accuracy of the measurement can be doubled by using two receivers. A measurement up to a diameter of 8 m is possible using four OPTImess sensors installed in a cooled housing. Three sensors measure the distance from the tube — starting from a fixed base. The distance values are picked up by OPTIcontrol and the diameter is determined. The measurement is also possible on red hot surfaces.

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