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Non-contact laser measurement in the railway industry

OPTImess laser sensors are a universal measuring instrument for railways due to their small size, high measuring frequency and accuracy as well as their ability to measure under almost any ambient conditions.
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Research & development
Production
Contact wire measurement
Rail profile measurement
Rail cross section measurement
Wheel profile measurement
Wheel set measuring stands

Application examples

Deutsche Bahn AG, Australian Railway, Berliner Verkehrsbetriebe BVG, Hörmann Industrietechnik, Knorr Technik, Korean HighSpeed Railway Co., Matisa, Österreichische Bundesbahnen ÖBB, Plasser & Theurer, Schweizer Eisenbahn SBB, Speno, Thyssen, TNO, TU Berlin, VOEST Schienen AG, Weichenwerk Brandenburg, Windhoff ... are already satisfied customers of Dr. D. Wehrhahn Measuring Systems.

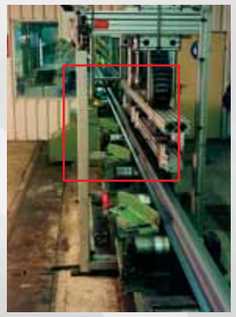
The laser — a universal measuring instrument for wheel and rail

Research & development

The defined positioning of the OPTImess sensors at the side of the rails allows the positions of the wheel sets inside the rail to be measured at high speeds. With several sensors in a line near to points, information about the running behaviour of wheel sets in points can be gathered and used to optimise guiding within the points. The behaviour of the wheel set during travel can be recorded by simultaneous measurement of the rail and wheel position. Other applications in R&D are the measurements of rail movements, approach measurements when coupling carriages, side inclination measurements of carriages and detection of the contact wire position.

Production

Unevenness in the rolling surface requires regrinding of the rails. This grinding result in removal of the hardened areas in the rail head not to mention the high costs incurred. One large rail manufacturer has been using a non-contact measuring system for years. The rolling surface is measured online by laser sensors during production. With a ruler generated in the software the min and max values are determined analogously with manual measurement. Comparative measurements over a longer period have shown that maximum deviations of 0.05 mm occur between both measurements. In addition the rail unevenness is measured at 90° to the rolling surface. The measuring system has been tested and approved by renowned railway companies.



Contact wire measurement

It is important to know the exact position and height of the contact wire for overhead assembly monitoring and overhead assembly installation. Appropriate non-contact contact wire measuring systems have been developed for the Korean High Speed Railway Corporation (KHRC) and the English OLE Alliance. A laser triangulation scanner measures the height and lateral position of the contact wire during travel. Another five laser sensors are installed on the vehicle to measure the inclination of the carriage, the lateral movement of the carriage and the track width.
All these data are displayed graphically and logged. The measuring system operates under almost all ambient conditions (rain, extreme heat or frost).

Rail profile measurement

For classification of the state of wear of the rail head and evaluation of the necessary maintenance work, measuring vehicles are equipped with laser sensors in which 5 to 7 sensors per rail side are positioned around the rail head. Measured values are recorded every 20 cm at these points at about 80 mph and compared with the nominal profile in the computer. The computer classifies the deviations according to given tolerance values. The movements of the measuring vehicle superposed on the measured values are compensated mathematically in the computer.

Rail cross section measurement

For the necessary regrinding of the rail profile, the profile is monitored before, during and after grinding. To do this, either a point measuring OPTImess sensor is moved transversely to the direction of travel by a linear unit or laser scanners are used. With the laser scanner the measuring point is scanned along a line over the rail profile and a profile cut along the measuring line is obtained. This «rail section» is compared in the computer with the nominal profile to be produced and the grinding parameters are adjusted accordingly.

Wheel profile measurement

The non-contact measurement of the wheel profile enables, fast, contactless measurement of the parameters for the downstream wheel set processing. A laser sensor is moved along the profile by a linear unit to record the profile. The computer picks up the profile by simultaneous recording of the travel distance and the laser distance values and then the characteristic variables such as wheel flange thickness, wheel flange height, wheel flange width, qr dimension and wheel gauge are measured. The systems which are also used on tramways and underground railways were developed in co-operation with German Railways and integrated directly in wheel set processing machines so that pre-dimensioning, machining and post-dimensioning is possible with one machine. In addition a mobile laser-wheel profile measuring system for the workshop is available.

Wheel set measuring stands

If only the characteristic variables of the wheel profile are determined in the application described above, the use of several sensors on a 2 or 3-axle drive unit allows almost all parameters of the wheel set such as profile, impact, brake disks, flattening etc. to be measured. All parameters to be measured are determined, measured automatically and logged by entering the wheel set identification. The flexibility of the laser sensor in terms of dimensions, measuring distance and measuring range also allows the conversion or retrofitting of existing tactile measuring stands.

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