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Advanced Process and Quality Control in Hot Rolling Mills Using Eddy Current Inspection

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Abstract

Typical product temperatures in hot rolling mills for wire and bar are up to 1200 °C at product speeds up to 120 m/s. The non-contacting and couplant free eddy current inspection method is ideally suitable for the inspection of products under such demanding conditions. A multi purpose eddy current unit of the standard product range of PRÜFTECHNIK NDT has been enhanced with the capability of signal evaluation for periodic signals, i.e. repetitive eddy current signals at regular intervals. Together with proven water cooled encircling coils the system is installed in the harsh environment of hot rolling mills. The quality of the rolled product is influenced by both the material quality of the raw material as well as the rolling process. Especially the work rolls for the mechanical transformation of the dimension of the product are often subject to cracking during rolling. Such damaged rolls induce repetitive defects on the product. Widely applied statistical process control (SPC) by destructive testing of production samples has quite long reaction time to reveal such damage on the product. Inspection of the hot material during rolling gives immediate feedback about process stability and product quality. Eddy current signal traces detected to contain repetitive signals are shown together with metallographic pictures of the damaged products. The detected frequency of the repetitive signal is compared with the calculated frequency based on the geometric dimensions of the rolls and production speeds.