

# Production Optimization due to Real Time Information of Profile and Surface Defects on Rolling Products

## Duplex World Topic: Improving Quality and Avoiding Failures

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### Introduction

The metal industry, especially steel industry, faces challenges regarding delivery time, production costs and product quality driven by high requirements from e.g. the automotive industry [1]. One measure to address these challenges is striving for production automation with comprehensive understanding of material behavior under certain control action in the rolling production line of long products. Contactless inline measuring systems play a key role in production optimization.

Laser-based systems are the solution for sound information about the product geometry and its surface condition with high accuracy. The detection of deviations of profile and surface, as well as the analysis of its source regarding the caliber is crucial for taking the right control actions in the rolling line. Smart evaluation and data processing allow real time detection of product parameters and the supply of significant details for the process control system and the operator, respectively.

### Challenges in Hot Rolling Mills

Hot rolling mills are the last production step to influence the product quality and production costs significantly [2]. Wear, damages, adhesive scale and defects on

the rolling caliber as well as production process condition changes like temperature changes, unforeseen production interruptions or strain variation at the caliber influence the quality of the rolled products. The consequences on the rolling product are profile deviations, breakouts, splitting and bursting, dents, scratches and cracks [3].

Tight tolerance demands require shortest reaction time on production condition changes [4].

### Laser-Based Solutions

Two contactless laser measuring principles are common for inline profile measurement systems, the shadowing and the light-sectioning principle.

LAP offers profile measurement system solutions with both principles (figure 1). The newest application is profile measurement in combination with identification of rolling defects and rolling gap, as well as with surface defect detection on rolling products in one single measurement gauge.

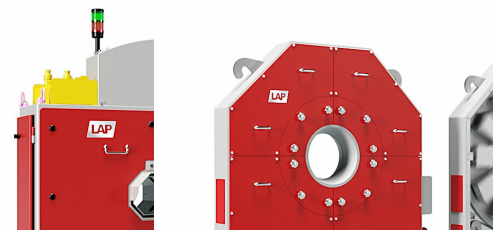


Figure 1: CONTOUR CHECK SHAPE (left), CONTOUR CHECK ROUND (middle), CONTOUR CHECK EDGE (right) system (Picture source: © LAP GmbH Laser Applikationen)

**Benefits in Hot Rolling Mills.** These systems are mainly used in hot rolling mills for long products, rebars and pipes, especially for valuable materials like SBQ.

LAP's light-sectioning system CC SHAPE can identify and visualize rolling defects regarding the position of the caliber to each other and its filling factor.

Especially in wire rod rolling mills with a layer head, the identification of the rolling gap and the relation of the measured information to the gap solves a crucial production challenge.

In productions with high material surface requirements, the CC SHAPE is additionally used for surface defect detection. Surface defects down to 100µm depth or height and 200µm width can be identified over the length of the material.

To fulfil industrial requirements for tight production tolerances, closed loop control systems for rolling mills are becoming more important. LAP provides measuring gauges for both feedback and feedforward control with the same real

time set-up and defined communication architecture.

## References

- [1] A. Rimnac, T. Pfatschbacher, Trend and solutions for future steel grade development, Materials Science Forum, Vol. 949, pp 66-75, TTP, 2019.
- [2] C. Klebba, S. Schwarz, J. Ammerling, F. Strobl, 4D-Eagle: The new measuring gauge of Kocks for long products, SEASI Journal, 09/2016.
- [3] F. Sängler, Was der Walzwerker von seiner Arbeit wissen muss, second ed., Stahleisen, Düsseldorf, 1999.
- [4] M. Liskow, M. Kruse, Automation tool for quality assurance of long products, Materials Science Forum, Vol. 918, pp134-139, TTP, 2018.

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