

## PIREF – process diagnostics and integrated closed loop control for increasing the efficiency of hot rolling lines for steel bars and wire

Despite the fact that the performance of the bar and wire manufacturing plants has increased over the decades, the manufacturers, engineers, and operators are still struggling through various challenges (e.g. productivity, product quality, production tolerances, costs, etc.). This is due to the complexity of the forming process in profile rolling. In addition, alternating materials have different influences on the forming process and accordingly lead to cross-sectional variations, which deteriorates end products tolerances.

Overcoming those challenges requires a holistic view of the entire plant. Hence, the aim of the project PIREF is to achieve a significant increase in the efficiency of the hot rolling process for steel bars and wire by means of new measurement and control technology by using forming process models. A real time in-situ diagnosis of the entire process demands the introduction of new sensor technology to get more information about the material speed, roll gap, friction, cobble detection, and several material parameters. Moreover, the development of innovative process forming models along with the application of new optimal control strategies for an exact and robust volume flow rate control will attain the desired efficiency increase.

These optimization approaches demand interdisciplinary cooperation in different scientific fields. Therefore, under the Leitmark EFRE project and the European Regional Development Fund sponsorship a collaboration between University Duisburg-Essen – Institute of Metal Forming, University of Applied Science Ruhr West – institute of Measuring and Sensor Technology,

University Siegen – Institute of Automatic Control Engineering and two partner companies working in steel processing industry: SMS Meer GmbH and EMG Automation GmbH. To validate the results and get deeper insight into real plant behavior, three manufacturers are associated partners.

The main focus of the institute of Automatic Control Engineering is on process dynamics modeling, validation and the development of new control strategies for an optimized output. Therefore, different data analysis techniques and state-of-the art toolchains for rapid control prototyping are used.

### I Project Management and Execution

Management:  
Univ.-Prof. Dr.-Ing. R. Deike  
(University Duisburg-Essen)

Contact project leader at Siegen University:  
Univ.-Prof. Dr.-Ing. Dr. h. c. Hubert Roth  
Universität Siegen

Naturwissenschaftlich-Technische Fakultät  
Lehrstuhl für Regelungs- und Steuerungstechnik  
Hölderlinstr. 3  
D-57076 Siegen

E-Mail: [hubert.roth@uni-siegen.de](mailto:hubert.roth@uni-siegen.de)  
Web: [www.uni-siegen.de/rst](http://www.uni-siegen.de/rst)

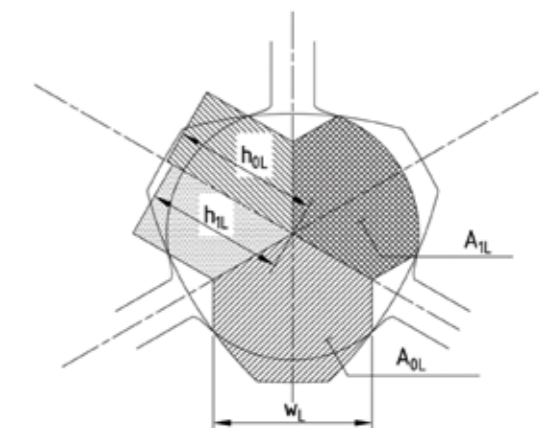
Telefon: +49 (0) 271 740 4439  
Fax: +49 (0) 271 740 4382



Ring conveyor belt in hot rolling mill (SMS Meer GmbH)



QFM-Sensor for measuring the rod diameter  
(EMG Automation GmbH)



Geometric representation of three-roll-model  
pass used for roll force calculation

