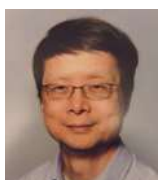


Development of New Camber Gauge to Measure True Bar Shape in Hot Strip Mill



In the hot strip mill, camber is an important quality characteristic of a transfer bar coming out of a roughing mill. Excessive camber negatively impacts subsequent process in a finishing mill. Therefore, it is desirable to measure and control the bar camber during rolling in a roughing mill. Centerline deviation measurements cannot distinguish bar movements from bar shape changes. A new camber gauge system for roughing mill applications allows for characterization of the true bar shape, providing camber/curvature information that can potentially be used by operator/control system to correct the bar shape. Camber sensing and its current application are described.

Introduction

The steel industry is constantly innovating automation technology to improve the productivity of the rolling process. In recent years, the advancement in sensing technology has made it possible to analyze and quantify image data from a vision camera instantly and accurately due to improvements in central processing unit (CPU) and graphics processing unit (GPU) performance and development of new image processing and computer vision algorithms.

In the hot strip mill, there is a requirement to quantify the bar shape in the roughing mill rolling process¹ as a “camber.” Large camber is one of the factors leading to lateral movement of a strip in a finishing mill. This causes a tail pinch issue characterized by a strip touching the sideguides in interstands and damaging mill rolls. As a result, unscheduled shutdowns for roll changes lead

to significant losses in the hot strip mill process.

Vishay Precision Group Canada ULC (KELK) and TMEIC have developed a new camber gauge to solve this problem by measuring the bar camber. This article introduces the features of the new camber gauge system for roughing mill application, provides examples of simulation and application results in a hot strip mill, and proposes camber control solutions.

True Bar Shape Measurement

True Bar Shape vs. Centerline Deviation

Centerline deviation (CLD) characterizes the lateral bar position with respect to the mill centerline. Strip CLD is an important measurement during the hot rolling process. Centerline deviation measurements produced by the camber gauge system for finishing mill applications are successfully used

Authors

Ganna Piatkovska (top left), Vishay Precision Group Canada ULC (KELK), Toronto, Ont., Canada
ganna.piatkovska@vpgsensors.com

Tatsuya Tsukamoto (top center), TMEIC, Tokyo, Japan
tsukamoto.tatsuya@tmeic.co.jp

Lesya Blagova (top right), Vishay Precision Group Canada ULC (KELK), Toronto, Ont., Canada
lesya.blagova@vpgsensors.com

Derek Yu (middle left), Vishay Precision Group Canada ULC (KELK), Toronto, Ont., Canada
derek.yu@vpgsensors.com

Aye Myaing (middle center), Vishay Precision Group Canada ULC (KELK), Toronto, Ont., Canada
aye.myaing@vpgsensors.com

Satoshi Ueno (middle right), TMEIC, Tokyo, Japan
ueno.satoshi@tmeic.co.jp

Rin Nagamine (bottom), TMEIC, Tokyo, Japan
nagamine.rin@tmeic.co.jp