Application Note *LSV-01*

FIELD OF APPLICATION

- Vibration Measurement by Laser Doppler Vibrometry
- **Speed and Length Measurement by Laser Surface Velocimetry**

Integrating Non-contact Laser Velocimeters into a Rolling Mill C-frame Platform

The processing industry, in particular the automobile industry, sets tight tolerances regarding the dimensional accuracy and quality of the steel and aluminum products used. To reduce the thickness tolerances of rolled strips even further, modern rolling mills are controlled according to the mass flow principle. Laser Surface Velocimeters (LSV) are easily integrated into a mill and allow reliable measurement of the strip velocity necessary to calculate thickness according to the mass flow principle.

Non-contact Strip Thickness and Velocity Measurement

The mass flow relationship makes it possible to calculate the strip thickness in the roll gap by measuring the velocity and thickness before the roll stand and the velocity after the roll stand. The strip thickness measurement in rolling mills is usually done using so-called C-frames. The strip thickness is determined by the absorption of x-rays. The x-ray tube and the detector are situated in the upper and lower arm of the C-frame.

Increasing numbers of Laser Surface Velocimeters (LSV) are being used for non-contact velocity measurement in both rolling and steel mills. In contrast to the traditional velocity measurement with measuring wheels or rollers, the LSV works without slippage or wear eliminating common causes of significant measurement errors.

The new LSV-6200 controller makes fast and reliable measurements possible.

Even though the strip thickness measurement for the mass flow regulation is always combined with the velocity measurement, until now, both measurement systems have always been installed on the rolling mill completely separately.

Integration of the LSV Sensor Heads into the C-frame

Since December 2000, IMS, a manufacturer of C-frames, and Polytec, a manufacturer of Laser Doppler length and velocity measurement systems, have been working closely together. The compact construction of the LSV-065 sensor heads and flexible stand-off distances ranging from 300 mm to 2500 mm persuaded IMS to integrate Polytec LSV systems into their own C-frames.

Polytec GmbH
Laser Measurement Systems
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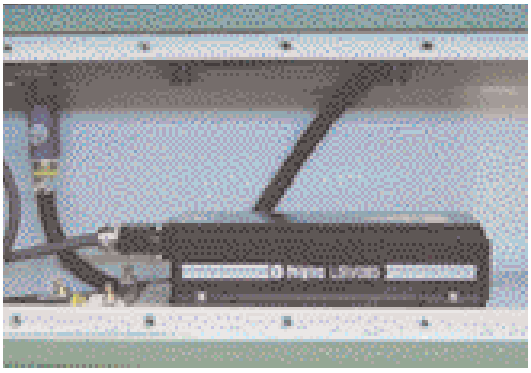

Figure 1:
IMS C-frame with integrated Polytec LSV

Figure 2:
X-ray control devices (top) and LSV controllers (bottom) combined in a switching cabinet

Polytec constructed a custom cooling plate with a turning mirror to integrate the sensor heads into the C-frames. The sensor head sits horizontally in the C-frame, reflects 90° with the turning mirror and views the surface of the strip through a window in the bottom of the upper C-frame (figure 1).

By moving the LSV-065 sensor head relative to the mirror, the system can easily be configured for different production line positions and C-frames gaps. Due to the large depth of field, the sensor heads tolerate production line fluctuations of up to ±30 mm.

Advantages of C-shaped Stays with an Integrated LSV

The rolling mill operator benefits from considerable advantages through IMS integrating the Polytec Laser Surface Velocimeter into the C-frame. The additional expense of separate protective and mounting constructions, switching cabinets (figure 2) and utility supply for the laser velocity measurement are no longer necessary. For service work or when feeding in the strip, the C-frame can be moved into the park position. The C-frame has a large maintenance opening which makes the LSV sensor head easily accessible and means it can be exchanged in a matter of minutes. The interior of the IMS C-frame is under slight positive pressure which actively prevents the LSV optics becoming soiled through penetrating rolling oil fumes.

The process combination is offered as a complete system by an experienced team. Due to the many advantages it provides, many customers in Europe, Asia or the USA (figure 3) have already decided on the IMS C-frame with an integrated Polytec Laser Surface Velocimeter.

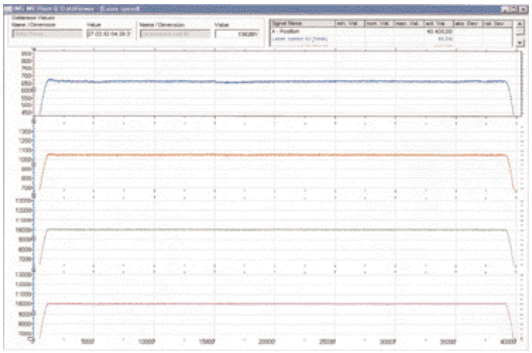

Figure 3:
Strip velocity of four Polytec LSVs integrated in IMS C-frames (in the 5-stand tandem mill at USS-Posco in Pittsburg, California)

Polytec GmbH
Polytec-Platz 1-7
76337 Waldbronn
Germany
Tel. + 49 (0) 7243 604-0
Fax + 49 (0) 7243 69944
info@polytec.de

Polytec-PI, S.A. (France)
32 rue Délizy
93694 Pantin
Tel. + 33 (0) 1 48 10 39 34
Fax + 33 (0) 1 48 10 09 66
info@polytec-pi.fr

Lambda Photometrics Ltd. (Great Britain)
Lambda House, Batford Mill
Harpenden, Herts AL5 5BZ
Tel. + 44 (0) 1582 764334
Fax + 44 (0) 1582 712084
info@lambdaphoto.co.uk

Polytec KK (Japan)
Hakusan High Tech Park
1-18-2 Hakusan, Midori-ku
Yokohama-shi, 226-0006
Kanagawa-ken
Tel. +81 (0) 45 938-4960
Fax +81 (0) 45 938-4961
info@polytec.co.jp

Polytec, Inc. (USA)
North American Headquarters
1342 Bell Avenue, Suite 3-A
Tustin, CA 92780
Tel. +1 714 850 1835
Fax +1 714 850 1831
info@polytec.com

Midwest Office
3915 Research Park Dr., #A12
Ann Arbor, MI 48108
Tel. +1 734 662 4900
Fax +1 734 662 4451

East Coast Office
25 South Street, Suite A
Hopkinton, MA 01748
Tel. +1 508 544 1224
Fax +1 508 544 1225