



Laser Contouring System (LCS)

Fixed Position Contouring
Fast, Accurate, Reliable Refractory Profiling

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In 2014 Process Metrix was purchased by Vesuvius and is now a wholly-owned subsidiary of Vesuvius. This partnership leverages the world-wide presence of Vesuvius with the technical capabilities of Process Metrix to bring world-class measurement solutions to the steel industry.

The mobile Laser Contouring System (LCS) by Process Metrix rapidly measures lining thickness in the BOF, EAF, AOD, Q-BOP, or ladle environment. The LCS combines high-speed, laser scanning technology with a robust mechanical platform and easy-to-use software. Using Process Metrix new 300 kHz Anteris* laser scanner, millions of contour points comprise each measurement, providing incredibly detailed surface and feature resolution in less than six minutes.

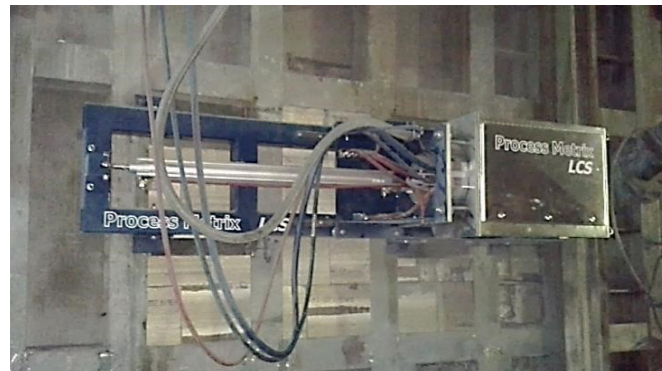
The Fixed Platform

When measurements of a specific vessel (or ladle fleet) are needed, PMC's fixed position LCS configuration enables dedicated, always-on measurement capability.

This proven, mill-ready system consists of the following components:

Process Metrix Anteris 3-D laser scanner,
A water-cooled housing with pneumatic door to protect the scanner,

- Process Metrix electronic control unit,
- An inclinometer for measuring vessel tilt (BOF typical),
- A water-to-water heat exchanger for cooling/heating the housing,
- A remote PC for system control, connected by either copper-, fiber-Ethernet



Fixed System installed on BOF dog-house doors

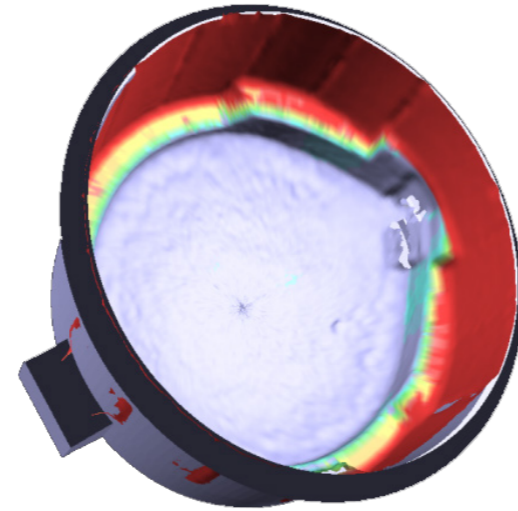
Measurements

Measurements can be made manually, in semi-automatic, or fully automatic mode. Automation is implemented through a MODBUS/TCP interface, though Process Metrix will incorporate any interface protocol required. The MODBUS interface includes provisions for automatic entry of critical information such as heat number, vessel number, campaign number, etc., ensuring that all pertinent measurement information is included in the data set. In fully automatic mode, the LCS system can be controlled by the customer's automation system, completely removing the need for a local operator. The LCS software also includes a complete campaign manager, a critical component for ladle applications.

Communication

Some applications, such as EAF's, also require communication with a robotic controller to ensure that measurements are initiated only when the robot has positioned the LCS system at the correct position with respect to the vessel. This communication link is also completed using the MODBUS interface.

Single measurement times are on the order of 5s at high resolution (e.g. BOF's and EAF installations) and 20s for vessels such as ladles that require more detailed scanning



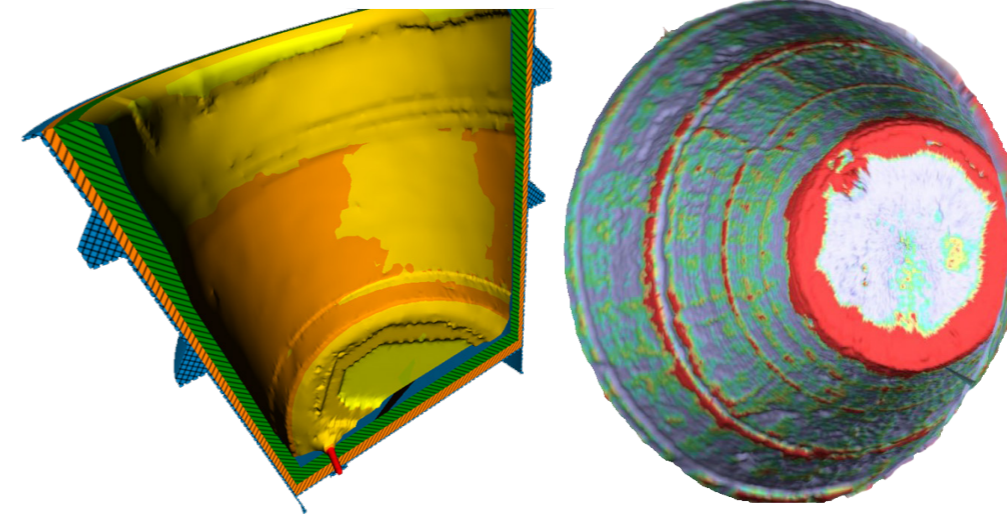
LCS' 3-D output provides quantitative and qualitative assessment of vessel lining thickness, such as this EAF profile.



Anteris System

Feature-Rich System

PMC's fixed position laser system includes features that make the system safe, robust, and user friendly. Our purpose built software automates data acquisition, making the system easy and straightforward to use. All software operations are highly intuitive, with icon definitions implemented pictorially and configuration functions password protected. The vessel profile is displayed automatically within three seconds after acquisition. An overlay function allows comparison of multiple measurements. Bath height, based on input values of charge weight and density, is also overlaid on each data view.



3-D Contour of Ladle Lining Thickness Measured with LCS

Customization

A high degree of output customization is available to tailor the view definitions to the needs and preferences of the customer. Two-dimensional radial slices (as shown at right), horizontal slices, wall and bottom contours (as shown below), and tabular output formats are standard. Zoomed views of problem areas can be pre-defined and automatically applied to every measurement. A wear rate calculator allows immediate assessment of historical lining thickness minimums, as well as identification of areas in the vessel that might need maintenance attention in the future. Or, data can be exported to comma separated value (csv files) tables in Excel for more customized analysis. Automatic data transfer to your refractory gunning robot is also supported. Our report generator automatically prints all of the views and screens to hardcopy, .pdf or .jpg formats.

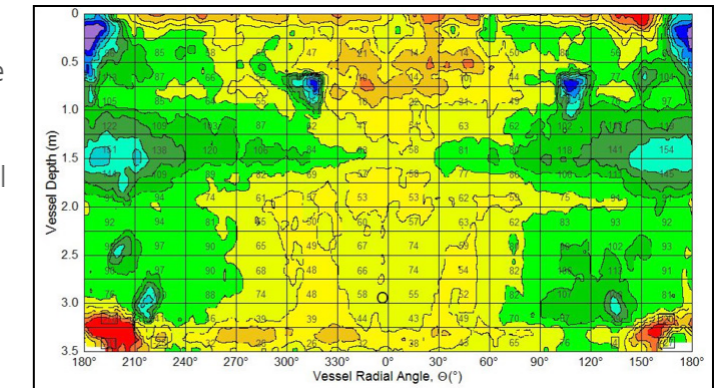
Uncompromising Support

Process Metrix provides a preventive maintenance plan designed to keep your system operating at peak performance. Should a failure occur, a Process Metrix certified technician can always be reached around the clock through our dedicated service/support line. If on-site support is required, a Process Metrix certified technician can normally be on site within 48 hours. Remote support via internet through a cell phone modem (included in our standard service contract) or VPN connection affords fast, seamless parameter changes, data review, and software upgrade from any remote location.



Fixed-Position LCS System Specifications

- Lining thickness Accuracy: 6 mm (average)
- Measurement speed: 120 kHz (TDS-300)
- Measurement time: 5s, single scan
- Optional integrated two-color pyrometer for surface temperature measurement
- Field of View: +65°, -40° vertical, horizontal
- Scanner Safety Class: 1
- Measurement range: 2-25m



Contour plot of lining thickness in a ladle. Areas in red are regions below acceptable limits and should receive attention from the operator.



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