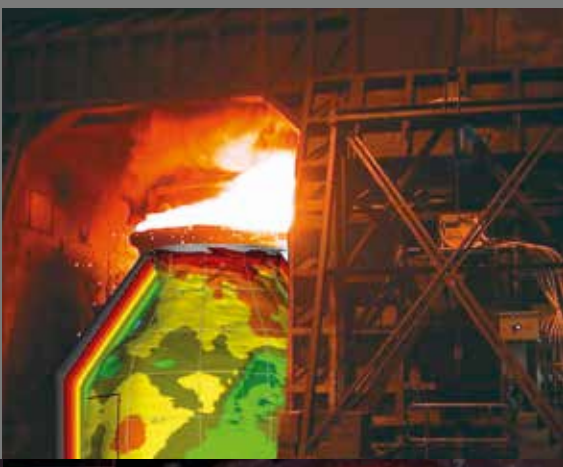
MINERALS TECHNOLOGIES

MINTEQ

FERROTRON
A MINTEQ DIVISION

LaCam®

FAST, ACCURATE, RELIABLE LASER SCANNER FOR HOT SURFACE APPLICATIONS



3D Laser Profile Measurement in Hot Vessels and Transport Ladles.

- Increases Safety
- Reduces Cost
- Extends Refractory Life
- Optimizes Processes

The LaCam®-System – Measuring principle and general functions

Since 1985 Ferrotron has been successfully developing advanced laser technology for non-contact measurement of refractory linings in metallurgical reaction and transport vessels (converters, ladles, torpedo ladles or EAFs).

Today a 3D Laser profile measurement system is a standard tool for reliable inspection in most steel making facilities.

Due to this experience, high quality service, and implementation of the latest laser technology, Ferrotron has become a leader in the world steel market.

The LaCam®-System enables the shortest duration of measurements and by this an improvement of the production processes in steel plants. If requested, a measurement can be made within a few seconds after each tapping.

This is achieved by rapid scanning of the object via a pulsed laser beam (class 1 laser - eye safe), which is deflected by a rotating mirror system. Thus, a three dimensional frame of the vessel's inner surface is obtained within a few seconds – almost like a photo from a **La**ser **Cam**era.

By comparison with previous reference measurements, the residual brick thickness of the refractory is evaluated by the built-in industrial PC.

All LaCam® computers run Windows operating system and can be integrated into the customer´s network, which enables external data storage for documentation, remote service and diagnostics as well as detailed data analysis over a period of years.

The extremely simple handling of the LaCam®-System with the graphical user interface via a touchscreen allows usage without any computer knowledge. With the pre-installed software LaCam®-3D Reader, detailed evaluations of the residual brick thickness and automatically produced documentation of measurements can be done.

Optionally the LaCam®-3D Reader can be used on external computers providing an alternate means of evaluating the measuring values.

LaCam®-Benefits:

- Safe vessel operation
- Minimize dangerous and expensive break-throughs
- Accurate measurement of refractory lining
- Visualization of high wear areas
- Optimization of vessel life
- Improved control of slag splashing practice
- Bath level measurement for optimal lance positioning
- Optimization of tapping angle
- Trend analysis and forecast of vessel lining life
- Remote control available
- Integrated cooling system
- Control of sand filling (well filler setting for ladle)
- Gap and crack detection

LaCam®-Fixed Installed – additional Benefits:

- **FASTER**
  - Measurement ready at all times
  - No set-up time prior to measurement
  - Fast measurement due to optimized scanning angle and high laser repetition rate
  - Elimination of positioning tolerances by patented structure finding analysis
- **EASIER**
  - One push button from the control room and fully automatic operation is possible
- **MORE SAFETY**
  - Operation complete out of dangerous area
- **ADAPTION**
  - Implementation to the steel plant process

The LaCam®-Family:

M – mobile version
For converter and ladle

Remote control from a safe distance
by means of tablet PC possible

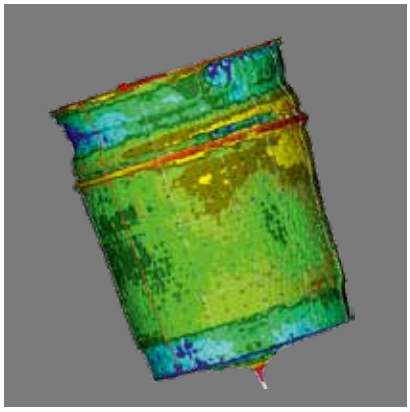
C I – fixed installation
For converter

E A F – fixed installation
For electric arc furnace

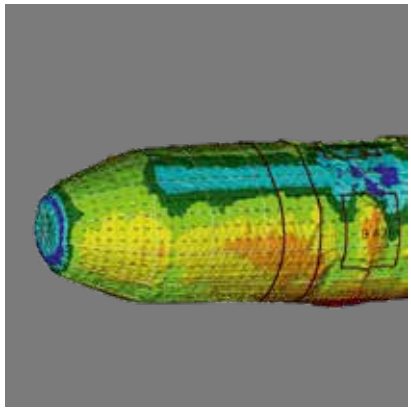
L I – fixed installation
For ladle

LaCam® LI Explorer – fixed installation
With advanced technology for immersion of
laser head, so gap and crack detection possible

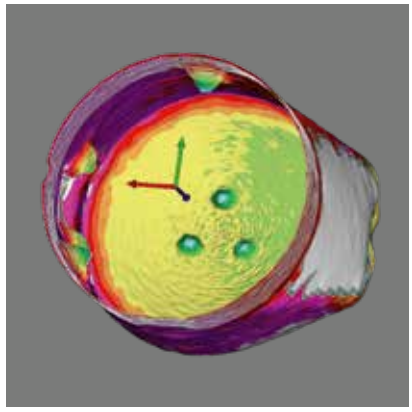
Examples of evaluation



Ladle



Torpedo ladle



Electric arc furnace

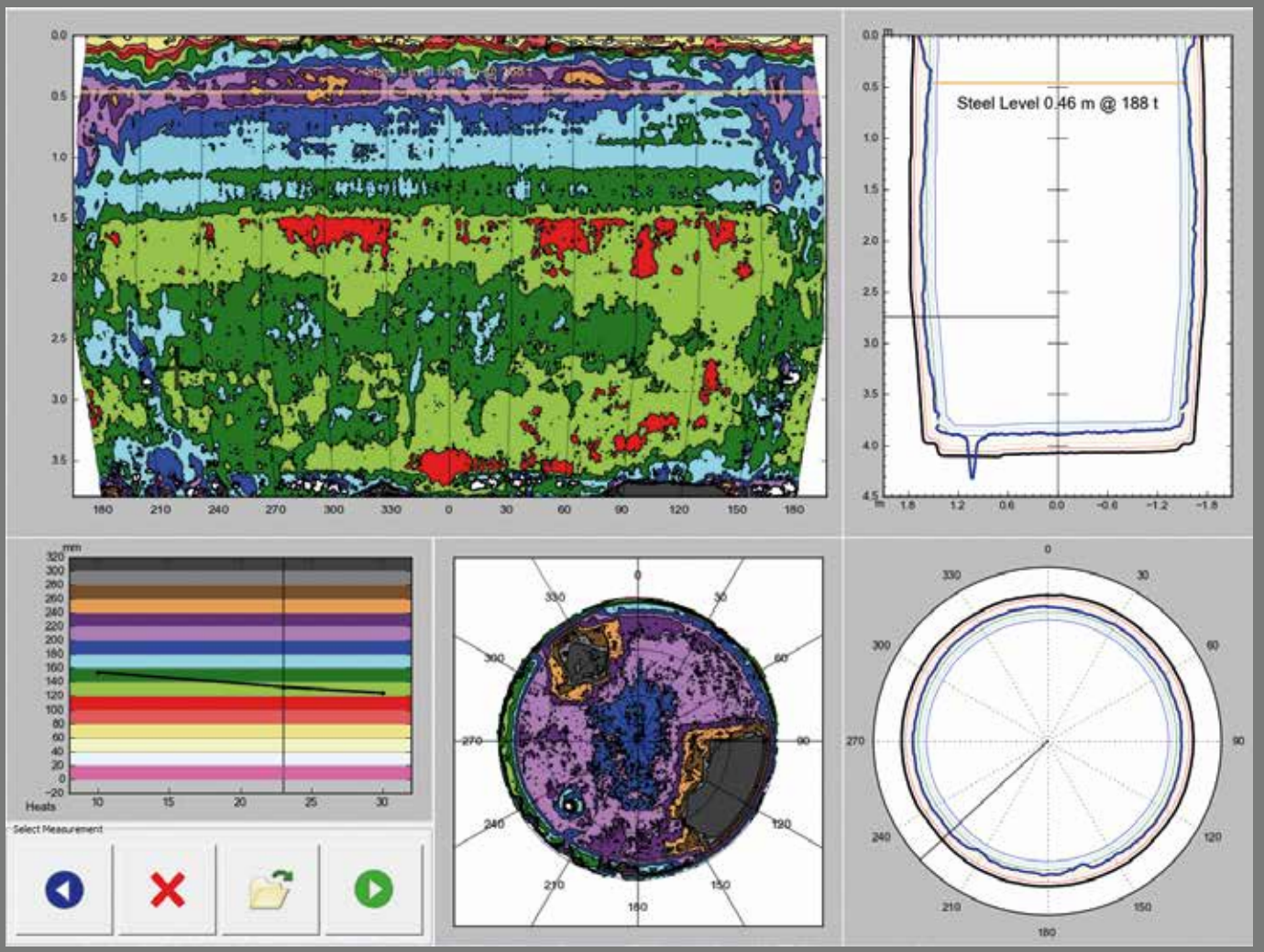
LaCam®-3D Reader Software – Graphical User Interface

Based on customer´s needs, questions and inspirations, we created our user friendly 3D Reader Software.

The result, calculated with millions of data points, provides a reliable way of inspecting a converter, ladle, EAF or torpedo ladle with minimal time.

The advanced possibilities of evaluation allow for a wide range of presentations, from simple tabular reporting up to a virtual walk-through of configurable 3D images.

Discover more about the processes in your vessels!



Main Features and Characteristics:

Depending on application up to 4 million measuring points are achievable with a scan in less than 30 seconds due to a laser repetition rate of 300 KHz and an extended vertical viewing angle of 110°. The smallest laser beam size of 3 mm is offering the highest resolution and best accuracy. This allows improved joint and edge detection in ladles and other vessels.

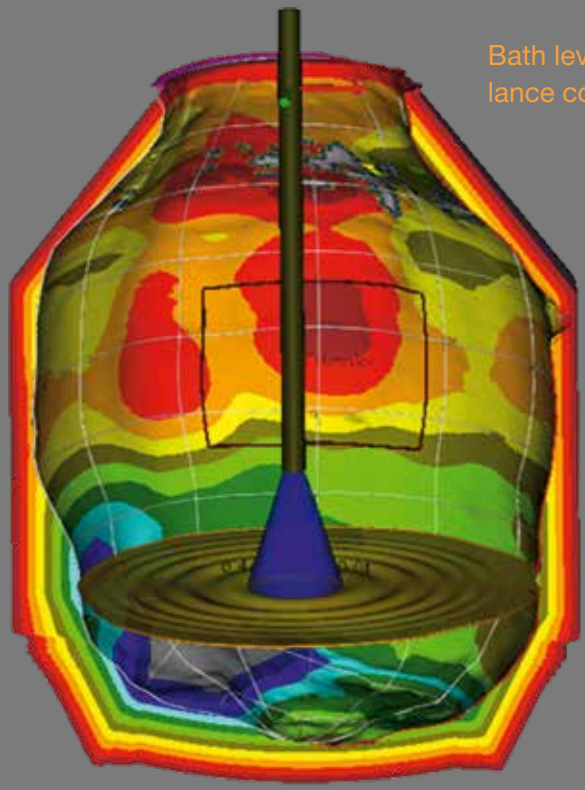
The LaCam®-System offers a built-in pyrometer for measuring the surface temperature simultaneously to thickness measurement of the lining. This allows the user to see a thermographic image of the inner surface of the vessel. The results of the pyrometric measurements can be displayed as wall, bottom and 3D images.

The LaCam®-System is equipped with a guided system which allows to measure the whole vessel with multiple scans in a minimum of time. A typical measurement of a vessel provides an evaluation in less than 3 minutes with all relevant information on one page. The operator is able to inspect the evaluated data simultaneously in different plots on this page. With the powerful 3D graphics it is possible to view the refractory lining from all perspectives.

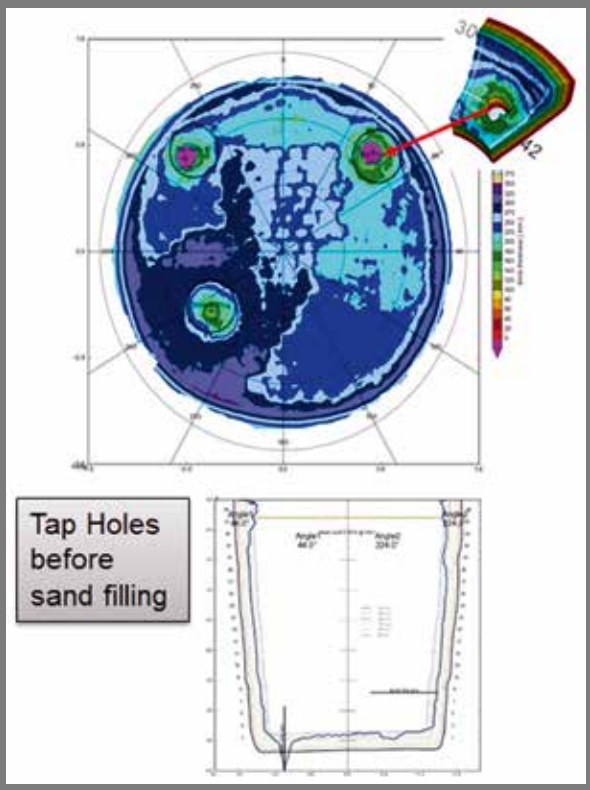
Presentation of Measurement Results:

- 3D presentation of the measured lining surface
- Lining thickness indicated by colour
- Calculated bath level displayed as a surface

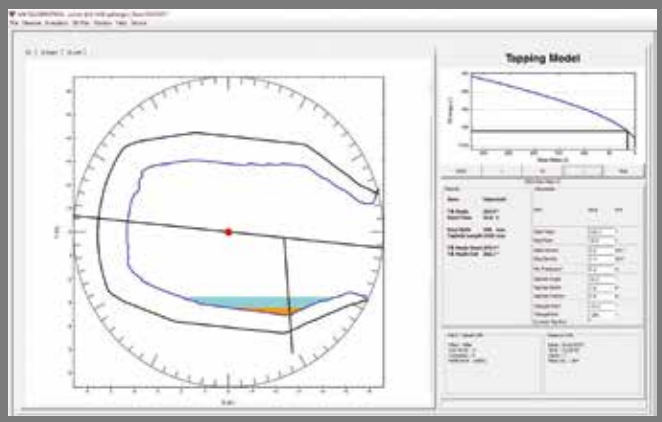
Bath level
lance control



Tap hole inspection for ladles



Tap model for automatic tapping of converter

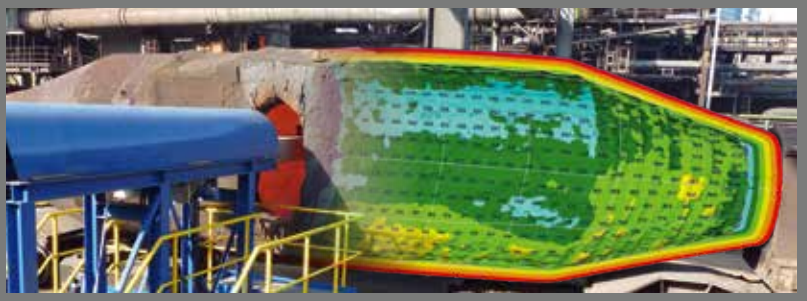


System Highlights:

- Compact coaxial laser scanner
- Integrated cooling system for extreme heat protection of laser head for long-lasting life time
- Easy to use operation (single button operation with touchscreen)
- Significant 3D evaluation software
- Industrial PC for data storage and data processing
- Possible link to customer's level 2 system
- High precision inclinometer with wireless data communication
- Fully automated positioning methods

Additional LaCam®-Applications for:

Torpedo ladle



3D-Laser profile measurement for refractory lining thickness in hot torpedo ladles

- Immersed laserhead
- Increased safety
- Extended refractory life
- Cost savings in energy, maintenance and materials
- Optimized ladle fleet

Open die forging press

3D-Laser profile measurement for hot forging pieces

1. Final dimension control:
   Get dimensions in final workpiece for internal and external quality

2. Straightness control:
   Optimized straightening during the forging operation

3. Online measurement for computer added forging:
   Savings of production time, energy, forge and furnace capacity and raw materials

scantrol

Scantrol® is MINTEQ's world leading fully automatic measurement and maintenance system for EAF's, BOF's and ladles.
Scantrol® applies the correct repair material to the correct place at the required amount, taking into consideration the high priority areas. In addition, the maintenance process can be flexibly adjusted by an operator if this is required by the current furnace situation. This option allows the operator to easily and quickly control the automatic maintenance process.

FERROTRON
A MINTEQ DIVISION

*MIN*TEQ International GmbH
FERROTRON DIVISION
Dr.-Alfred-Herrhausen-Allee 24
47228 Duisburg
Germany

Telefon +49 (0) 20 65-42 36-500
Telefax +49 (0) 20 65-42 36-501
E-Mail ferrotron@mineralstech.com
Internet www.ferrotron.com

QUALITY SYSTEM CERTIFICATION
DNV·GL
ISO 9001