CASE STUDY ALUNORF: **ALUMINIUM INGOT SCALPING OPTIMIZATION WITH GOCATOR® 3D LINE PROFILERS**

ALUNORF

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Aluminium Norf (Alunorf) GmbH was founded in April 1965 and is today the largest aluminium rolling and remelt plant in the world, setting new standards for the processing of aluminium to sheet and plate for a wide range of applications.

Alunorf employs more than 2,200 people, with production running around the clock, 7 days a week. Rolling and remelt volume has continuously increased and now totals approximately 1,500,000 tons per year.

The Application

This project was triggered by the necessity to improve geometry and topography measurement of raw aluminium ingots (8.6 m x 2.2 m x 0.6 m). The rolling surface of each ingot has a variable amount of excess material that must be scalped off in order to remove the metallurgical shell from the casting process.

The Challenge

The plant's existing system of moving point laser scanners was not capable of covering the whole ingot in length and width. The system only covered the cross profile at certain positions along the ingot's surface. Characterization of the ingot surface in between these positions could not be measured using this method, and had to be compensated for with several additions in the scalping depth (called "safety" additions). Such "safety" additions led to unnecessary extra scrap material for each ingot that was scalped.

In addition, the use of a measurement system with moving sensor heads led to mechanical wear, which in turn caused maintenance downtimes and even production outages. Finally, the technology of a traversing laser made it necessary to interrupt the ingot transport over roller tables when measurement was in progress.

The Solution

Given the numerous disadvantages of the old system, it became clear that the application requirements would be best fulfilled by implementing a system of multiple fixed-mount laser line sensors that could cover both sides of the ingot simultaneously. Such a system, which is now called AIT (Alunorf Ingot Topography System), would be able to cover the variations in ingot widths (between 900 mm and 2200 mm). Finally, an open and well documented data interface became obligatory in order to implement the measured data into an existing infrastructure of ibaPDA-systems.

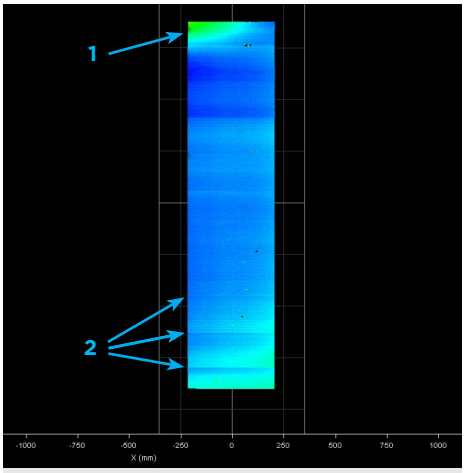
Custom bracket with 2 Gocator senors for a simultaneous inline top and bottom surface scan

Gocator® 2100 series sensors were chosen for their large scan width (field of view), which minimized the number of required sensors and made the system affordable (10 Gocator sensors total - 5 sensors per side). In addition, the lack of moving sensor parts made mechanical maintenance due to wear obsolete. And, the installation at Alunorf marked the first system that was able to measure ingots on both sides while traveling inline.

The Gocator® Advantage

- Multi-sensor networking capability captures 360° scans of each ingot
- Easy to calibrate all sensors in the network to world coordinates and return highly accurate measurements
- Easy system integration with the ability to seamlessly connect one or many Gocator sensors to Alunorf's proprietary interface (ibaPDA-system)
- Easy to develop custom algorithms for on-sensor measurement tools (e.g., vibration correction) and off-sensor data analysis using GDK/SDK
- Ability to ensure 100% inline quality of ingot shape between different casthouses and molds
- High-quality 3D data even on dark scan areas/targets
- Built-in robot calibration makes system integration easy

> *"The use of a Gocator sensor for our AIT-System made the process of implementation and calibration as easy as possible. Simultaneous to this the Gocator delivers a high grade of detail in measurement, covering a wide measurement area at a relatively low price. Finally, the possibilities of configuring measurements based on our own requirements are infinite. Both minor and larger topography effects are measurable with this system while transport movements do not affect the measurement itself."*
>
> **– Stefan Schulz, M.Sc., Process Engineer, Alunorf**



1. *Part of the thick ingot foot*
2. *Vibration-induced height variance due to roller conveyor travel (before vibration reduction filter)*

The Result

With the introduction of the new AIT-System, Alunorf is now able to measure the geometry of each individual ingot in full detail. Engineers can immediately detect the thinnest point of the ingot, rather than having to add "safety" factors that increase scalping depth and therefore scrap. Even a reduction of 1 mm per side leads to enormous amounts of scalping chips that do not have to be remolten again.

Alunorf is also able to generate KPIs on their central ibaPDA-System using the measured data from Gocator, which accurately describes Good or Bad ingot shape (i.e., deformation factor). This data helps determine individual or systematic problems in the casting process. For the scalping process itself, the measured data is used to correctly position the ingot in the scalper and to position the scalper heads for optimal operation.

Next Steps

The old scalping recipe system, which required certain "safety" factors built into the scalping depth, is now undergoing a factory-wide upgrade. With this new system in place Alunorf is focusing on achieving a reduction of scalping depth to the absolute minimum.

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