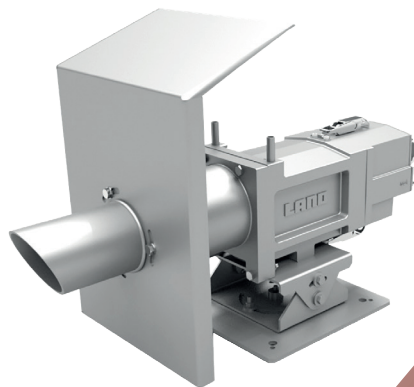


SDS

SLAG DETECTION SYSTEM



800 to 1800 °C / 1472 to 3272 °F



LAND
AMETEK[®]
PROCESS & ANALYTICAL INSTRUMENTS



QUALITY CUSTOMER SOLUTIONS

SDS

SLAG DETECTION SYSTEM

AMETEK LAND HAS BEEN MANUFACTURING PRECISION MEASURING EQUIPMENT SINCE 1947.

WE ARE SPECIALISTS IN NON-CONTACT TEMPERATURE MEASUREMENT AND COMBUSTION MONITORING WITH APPLICATIONS ACROSS DIVERSE INDUSTRIES SUCH AS STEEL AND GLASS MAKING, POWER GENERATION AND CEMENT MANUFACTURE.

As part of AMETEK Process & Analytical Instruments Division since 2006, our customers benefit from the worldwide AMETEK sales and service team.

The AMETEK Land Slag Detection System (SDS) delivers improved yields, higher-quality steel and reduces costly downstream processing. There are additional benefits in reduced ladle refractory wear.

At the end of the tap the levels of slag and steel rapidly reverse. Quick termination of the tap after the alarm has been triggered is necessary to prevent excessive levels of slag in the ladle. SDS uses a high-resolution thermal imaging camera to detect the transition between steel and slag. The dedicated thermal imaging camera has a specific design to survive in the harsh operating conditions and utilizes a particular wavelength to reduce “blackouts” caused by smoke and fume. Data is presented to the operator in real time enabling them to make informed decisions about the tapping process and clear alarm notification.

Suitable for operators of secondary steel making vessels (e.g. EAF, BOF) including stainless steel. Variants of the system are also available for copper, platinum, upon request. The system can also be used to indicate freeboard height if required providing a wide field of view.

IMPROVED PRODUCT QUALITY

Using the SDS has been demonstrated to improve operator response time and consistency at the end of each tap. This results in a typical reduction in slag depths of up to 25% compared to traditional methods of stream monitoring.

REDUCED DOWNSTREAM PROCESSING COSTS

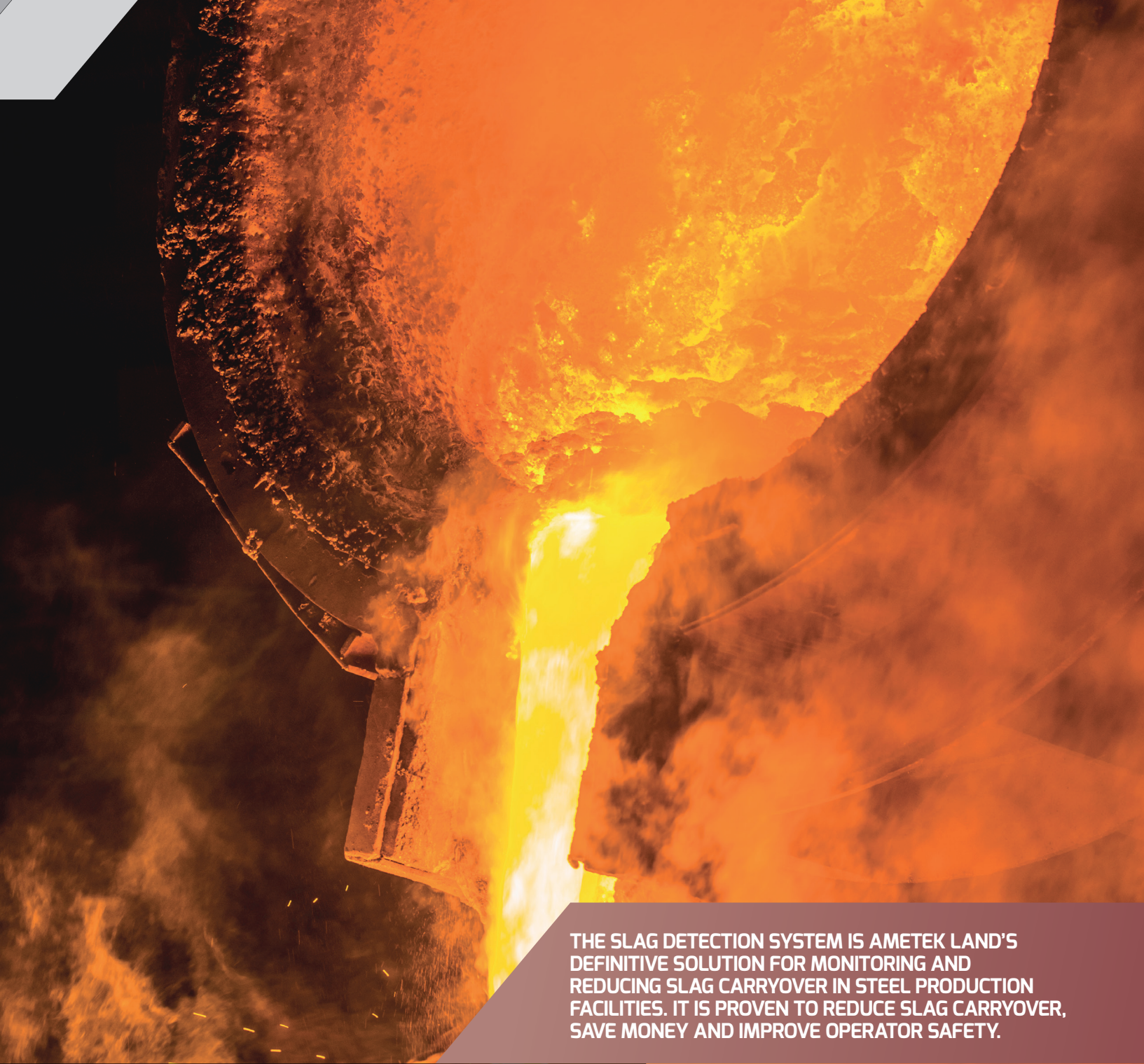
The cost of additional downstream processing time and materials can be a significant burden on an operating plant. By controlling slag carry-over this costly downstream processing can be reduced or eliminated, improving plant throughput and operating margins.

AUTOMATIC OPERATION

As the tap commences, the application dedicated software records it, using a stream identification algorithm, producing a data log and graph for quality control. A stream tracking mechanism is included to ensure reliable operation in typical installation conditions. When slag appears, and exceeds an operator defined amount, an alarm is automatically triggered. The system is designed to ensure accurate detection of steel/slag independent of charge weight and without operator intervention.

KEY FEATURES AND BENEFITS

- Improved production yields
- Lower slag content improves steel quality
- Lower maintenance on BOF / EAF vessel
- Reduced energy costs
- Automatic stream identification and tracking accurately identifies the stream and reduces background interference
- Clear alarm notification sent to the operator
- Alarms generated by the system directly stop the tap before the slag is carried over
- Fully automatic operation
- Accurate detection independent of charge weight
- Reliable alarm independent of the operator
- Improved connectivity through the use of Open Data Interface



THE SLAG DETECTION SYSTEM IS AMETEK LAND'S DEFINITIVE SOLUTION FOR MONITORING AND REDUCING SLAG CARRYOVER IN STEEL PRODUCTION FACILITIES. IT IS PROVEN TO REDUCE SLAG CARRYOVER, SAVE MONEY AND IMPROVE OPERATOR SAFETY.



SPECIFICATION & DESIGN

POWERFUL DETECTION SYSTEM PREVENTS SLAG CARRY-OVER

This comprehensive, fully featured system has been developed to provide the steel plant engineers and managers with the tools to develop and improve the transfer of steel from one process to another.

SDS offers the steel plant a number of inter-connectivity methods for on-line control and, more importantly, it automatically records the tap data in three forms for post analysis and future process improvement.

In addition to this, the image processing system has been pre-installed and configured to work straight out of the box – minimum set-up is required. Once the system hardware is installed onto the steel plant, the moment the system is turned on, the steel plant can immediately begin to reduce slag carryover. No other thermal slag detection system currently available offers these features.

OBSERVE CRITICAL TAP INFORMATION

Pre-installed on the powerful image processing system, the display allows users to observe critical tap information such as the live thermal image, steel and slag percentages, time versus percentage graph, alarm level and alarm status.

Secondary information such as tap number, sensor temperature, communications status, tap duration, steel / slag ratio and record status are less prominent so as to not distract the user during the tap. External inputs are also present for monitoring and capturing.

VIEW THE TAP INFORMATION THROUGHOUT THE PLANT

Multiple users can view remotely a condensed view of the live tap anywhere on the plant network by using the remote viewer option (min. IMAGEPro-SDS 1.1 required).

At the end of the tap the video, text data and graph are saved by tap number for later analysis and can be automatically deleted after a user defined number of days.

Inputs and outputs from the steel plant and slag detection system include: digital and analogue outputs, Ethernet. These are controlled by the Open Data Interface (Modbus TCP and I/O options).

STRAIGHTFORWARD FIBRE-OPTIC CONNECTIVITY

Connecting the image processing system to the plant network via the Open Data Interface allows live data transfer to and from the slag detection system to improve the steel transfer process.

Data to the SDS includes tap number, alarm level and five unique variables specified by the steel plant such as charge-number, heat-number, steel grade and tap temperature. When used, these data are recorded in the saved text data file.

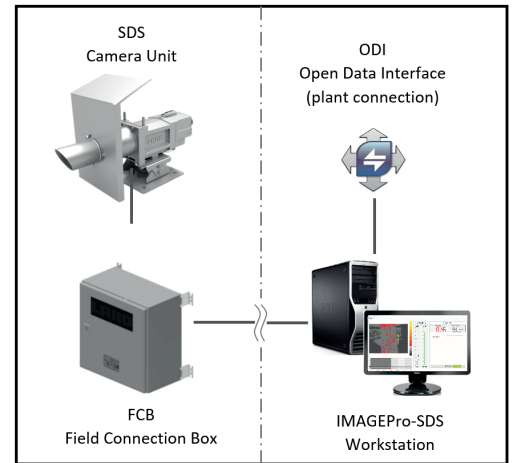
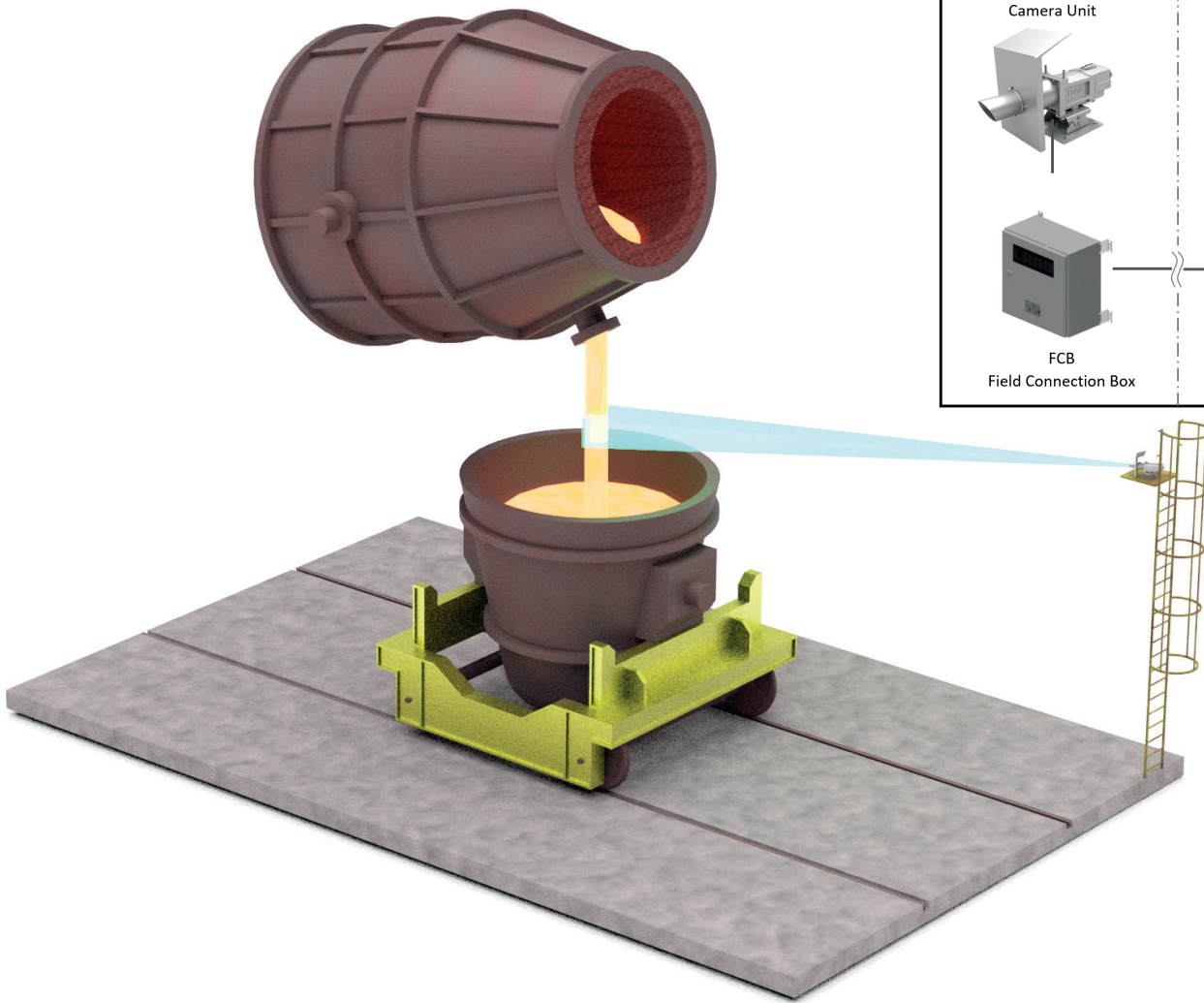
Data output from the system can be transmitted up to 50 frames per second. This information includes steel slag percentage, alarm status, sensor temp and communications status.

The SDS Power Supply Unit (PSU) is supplied with fibre-optic 1 GB Ethernet connectivity (fibre optic on demand) for easy installation and integration into existing plant systems.

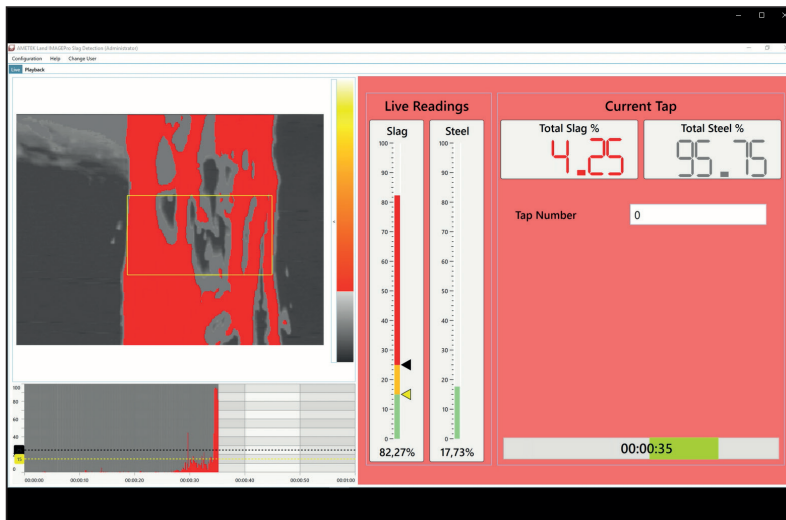
AUTOMATIC STREAM TRACKING

Another new feature of the SDS is automatic stream tracking. The dedicated slag detection image processing software has the option to track the width and position of the stream regardless of the position of the sensor unit.

When viewing the stream from an acute angle, its position will change during the different phases of the tap - the software accurately tracks any movement that may occur as the pour takes place, only measuring from the area identified as the stream. This reduces any errors caused by background heat sources in the field of view.



CONTINUOUS MONITORING AND CLEAR VIEWS ▼



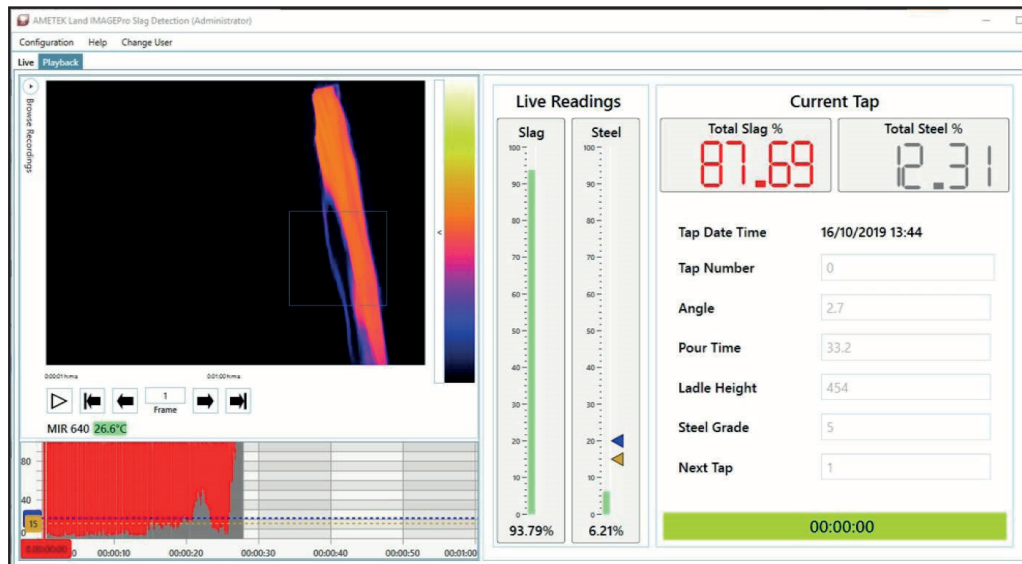
REMOTE VIEWER

Remote connections allow viewing of live tap information anywhere on the plant network.

LANGUAGE

The software offers local language support.

IMAGEPro - SDS APPLICATION SOFTWARE



STEEL / SLAG/ ALARM LEVELS

Steel, slag alarm percentage, steel/slag alarm status, available via Open Data Interface. Values can also be transferred to the SDS from the steel plant.

AUTOMATIC STREAM TRACKING

Automatically identifies and tracks the stream position within the thermal scene to reduce the effect of background interference.

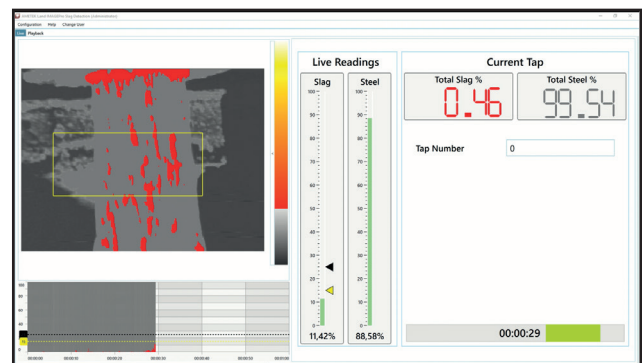
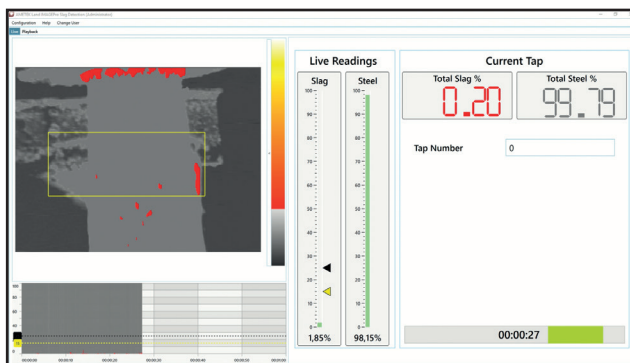
DISPLAY GRAPHS

Bar and line graphs display the steel and slag percentage versus time. The actual and overall steel/slag percentages are shown in bar charts and numbers. This screen also shows alarm condition status and indicates alarms with colour changing. This information, along with the thermal video and all text data, is automatically recorded as soon as the tap commences.

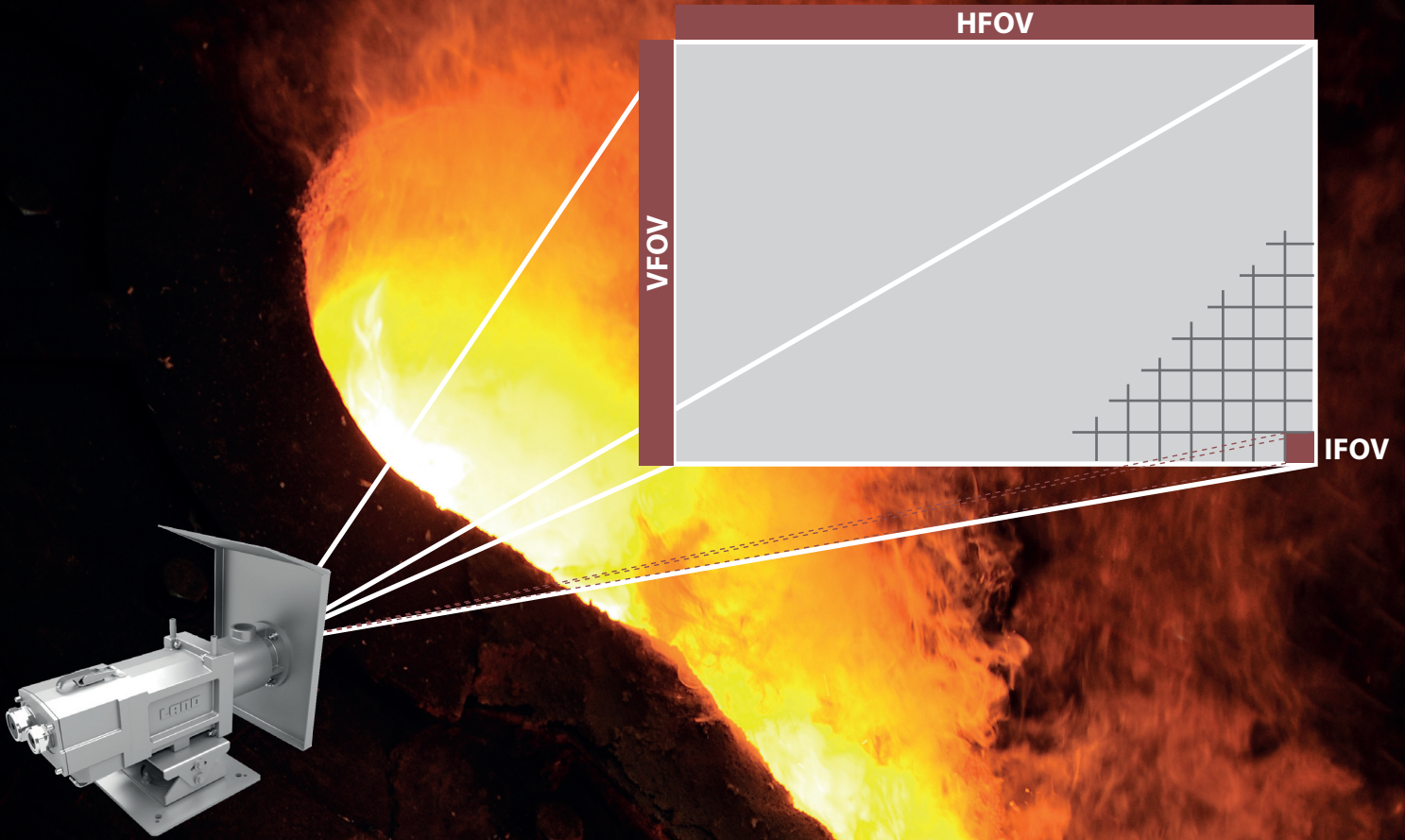
HOW SLAG CARRYOVER IS PREVENTED ▼

The following sequence of screens clearly illustrates how the SDS tracks the onset of slag, finally activating an alarm to stop the tapping process, preventing slag carry-over.

The alarm is still showing green. Actual steel level is 88.6%, slag level at 11.4% (overall steel level 99.5%, overall slag level 0.5%)

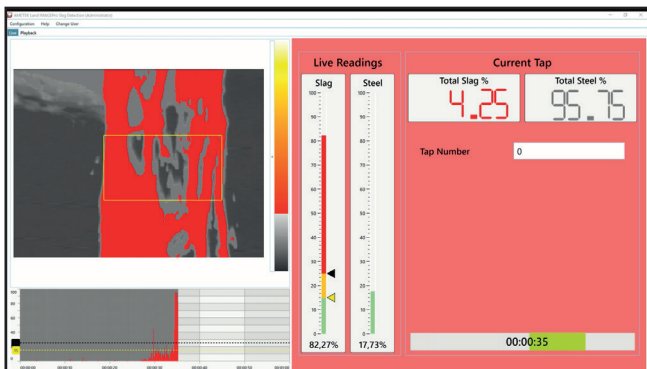


FIELD OF VIEW

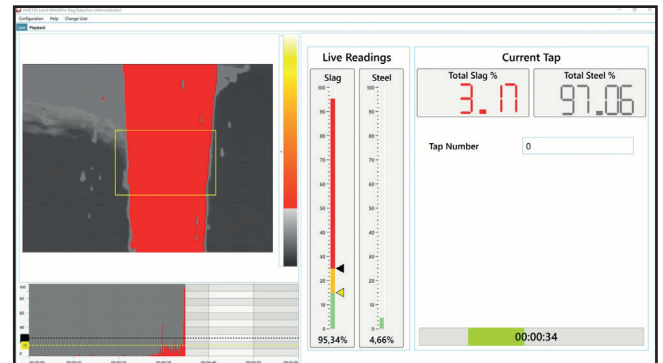


Distance	4m			5m			7.5m			10m			15m		
	Width	Height	IFOV	Width	Height	IFOV	Width	Height	IFOV	Width	Height	IFOV	Width	Height	IFOV
12° x 9°	0.84m	0.63m	1.3mm	1.05m	0.78m	1.6mm	1.57m	1.18m	2.4mm	2.1m	1.57m	3.2mm	3.15m	2.36m	4.9mm

The alarm is now showing red. The steel content has fallen to 17.7% (slag at 82.3%). The alarm level (set at 35 % slag) was triggered, the tap is then stopped.



The SDS continues monitoring after the alarm has been triggered, showing the slag content rising to a maximum of 95%.



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SPECIFICATIONS

SDS CAMERA UNIT

Measurement Range:	800 to 1800 °C / 1472 to 3272°F
Image Resolution:	640 x 480 pixels
Spectral Response:	3.9 µm (centre)
Frame Rate:	50 frames/sec
Detector:	Microbolometer Focal Plane Array
Optics:	Standard - 12° (horizontal) x 9° (vertical)
Focus Range:	4 m / 13.1 ft to infinity
Protection Window:	Sapphire (available as a spare part)
Accuracy:	±2% of measured value
Temperature Resolution:	0.5 °C / 32.9 °F (800 °C / 1472 °F blackbody temperature)
Enclosure:	Water cooling and air purged enclosure with heat protection shield
Sighting Tube:	Design significantly reduces the risk of direct impact of liquid steel/metal against the field (sapphire protection window included)
Dimensions:	560 x 215 x 235 mm / 22 x 8.5 x 9.3 in.
Weight:	10 kg / 22.05 lbs.
Environmental Rating:	IP65

SDS CAMERA SUPPLY

Connection:	Local connection interface between camera unit and image processing system
Services:	Water, instrument air, power input, located to the rear of the enclosure

POWER SUPPLY UNIT (PSU)

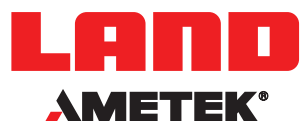
Components:	Power supply, Ethernet communications (switch)
PSU - Environmental Rating:	NEMA Type 4
Size:	380 x 380 x 211 mm / 15 x 15 x 8.3 in.
Weight:	15kg / 33.07 lbs.
Connections:	Light fiber data connection as an option

IMAGE PROCESSING UNIT

Slag/Steel Detection:	Alarm activation when a pre-set percentage of either slag or steel/metal detected within defined window
User Display:	Front page information display and location identifier. External data displayed via interface input.
Automatic Functions:	Auto tap detection, stream tracking, steel/slag ratio, thermal video and video file recording, log file of all data including tap number, clear display of steel/slag percentage (bars, numbers and graphs), alarm colours, etc.)
Software:	IMAGEPro-SDS - Advanced Image Processing and Application Software
Interfacing:	Open Data Interface, Modbus TCP, Moxa I/O unit

DISCOVER HOW OUR BROAD RANGE OF
NON-CONTACT TEMPERATURE MEASUREMENT
AND COMBUSTION & EMISSIONS PRODUCTS
OFFER A SOLUTION FOR YOUR PROCESS

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