SLAG DETECTION SYSTEM
CONTINUOUS THERMAL MONITORING

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600 to 2000°C / 1472 to 3632°F

SPECIFICATIONS

IMAGE PROCESSING SYSTEM (LIPS SDS-E)

Slag Detection: Alarm activation when a pre-set percentage of either slag or steel detected within defined window

User Display: Front page information display, plant, logo and location identifier

Frame Rate: 30 frames/sec

Automatic Functions: Auto tap detection, stream identification, steel/slag ratio, video file, log file of all data, steel/slag percentage graph, all saved as tap number

Language: User defined

Outputs: Digital output card, DDE, OLE, Ethernet and OPC options

SENSOR SUPPLY UNIT

Functions: Local connection interface between imaging sensor and image processing system

Service: Water, air, power input, communications, video, located to the rear of the enclosure

Added Protection: Sacrificial plate protects the main enclosure from direct impact

Sighting Tube: Design significantly reduces the risk of direct impact of liquid steel against the field replaceable sapphire window

Air Blided: Provides positive pressure within the enclosure

Environmental Rating: IP55

THERMAL IMAGING SENSOR (SDS-E)

Measurement Range: 600 to 2000°C / 1472 to 3632°F

Image Resolution: 384 x 288 pixels

Detector: Amorphous Silicon Focal Plane Array

Field of View: 7.5° (horizontal) x 5.5° (vertical)

Motorised Focussing Range: 4 m / 13.1 ft to infinity

Temperature Resolution: 0.5°C (for 600°C blackbody)

Accuracy: ±1 % absolute temperature (K)

Options: Air purge, blower unit, setup monitor, carry case

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

WWW.AMETEK-LAND.COM
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.

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.

**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
- 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 standard Ethernet

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.

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POWERFUL DETECTION SYSTEM PREVENTS SLAG CARRY-OVER
This comprehensive, fully featured software 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-E 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.

VIEW THE TAP INFORMATION THROUGHOUT THE PLANT
Up to four users can also view remotely a condensed view of the live tap anywhere on the plant network by using the remote viewer software.
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 and OPC.

STRAIGHTFORWARD FIBRE-OPTIC CONNECTIVITY
Connecting the image processing system to the plant network via either OPC or Ethernet protocols 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 at the equivalent of 30 frames per second. This information includes steel slag percentage, alarm status, sensor temp and communications status.
The SDS-E Power Supply unit is supplied with fibre-optic 100Base-FX Fast Ethernet connectivity for easy installation and integration into existing plant systems.

AUTOMATIC STREAM TRACKING
Another new feature of the SDS-E System is automatic stream tracking. The dedicated LIPS SDS-E 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 LIPS SDS-E 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.

REMOTE VIEWER
Up to 4 remote connections allow viewing of live tap information anywhere on the plant network.

LANGUAGE
When operating in Full Screen Mode, the software offers local language support.
The following sequence of screens clearly illustrates how the SDS-E tracks the onset of slag, finally activating an alarm to stop the tapping process, preventing slag carry-over.

1: ALARM LEVEL WINDOW
Steel, slag alarm percentage, steel/slag alarm status, available via OPC and Ethernet connection. Values can be transferred to the SDS-E from the steel plant via OPC or Ethernet.

2: USER DEFINED VARIABLES
Any five user defined variables can be chosen with corresponding values as determined by the steel plant. This information is included in the auto record data for each tap.

3: AUTOMATIC STREAM TRACKING
Automatically identifies and tracks the stream position within the thermal scene to reduce the effect of background interference.

4: DISPLAY GRAPHS
A bar or line graph displays the steel and slag percentage versus time. A pie chart illustrates the total steel slag pixels during each tap, this is extremely useful when comparing taps. This screen also shows alarm condition status. This information, along with the thermal video and all text data, is automatically recorded as soon as the tap commences.

5: SYSTEM BAR STATUS
Displaying communication status, imager temperature status, tap duration and Ethernet connections.

The alarm is still showing green. Steel is at 91% (slag at 9%).

The alarm is now showing red. The steel content has fallen to 23% (slag at 77%). The alarm level (set at 35% slag) was triggered, the tap is then stopped.

The SDS-E continues monitoring after the alarm has been triggered, showing the slag content rising to a maximum of 94%.
**SPECIFICATIONS**

**IMAGE PROCESSING SYSTEM (LIPS SDS-E)**

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