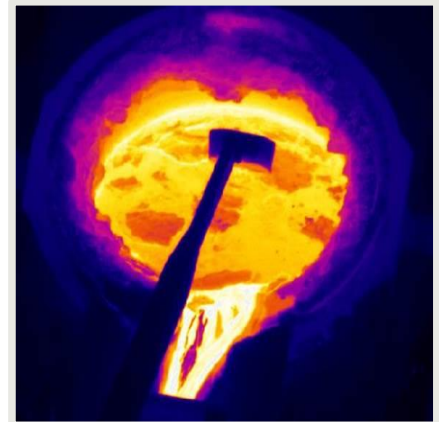


## LadleSlag System

### Ladle deslagging control system

LadleSlag infrared monitoring and evaluation of your deslagging process helps you get in control of your operations and minimize slag carry over.



The LadleSlag system is designed to monitor the ladle deslagging operations using slag rake in order to quantify the slag covered area percentage. Thus a consistent and minimal slag carry-over between the different processing steps is obtained.

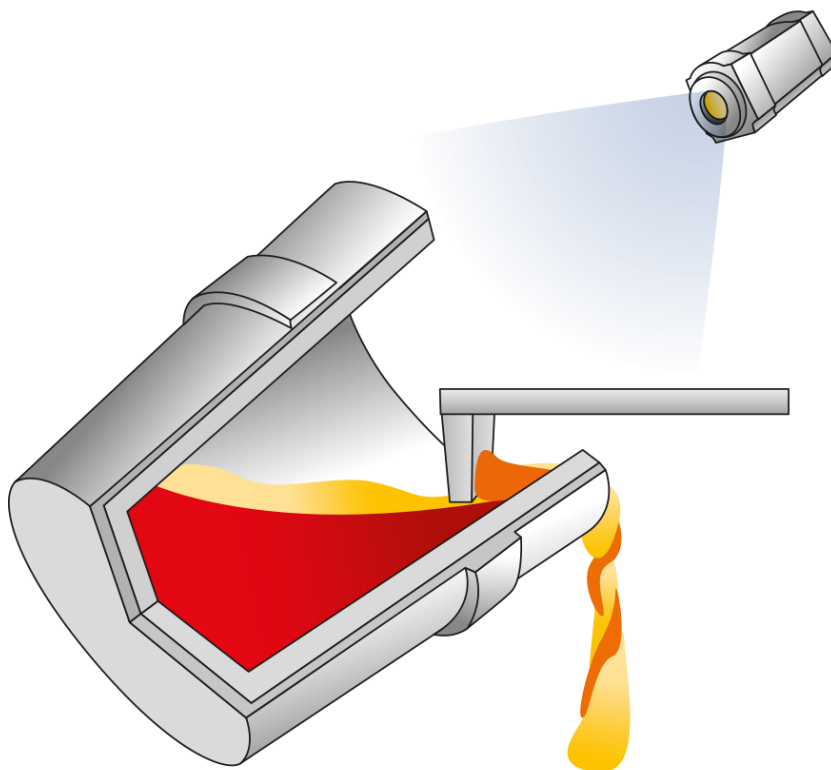
LadleSlag uses thermal cameras and vision technology in order to monitor the deslagging operations in real time.

By using the LadleSlag system you will be able to get in control of your BOF sulphur amounts and re-oxidation during ladle treatments.

By narrowing down the process variations and ensuring that the deslagging process gets more consistent, you will get rid of the unknowns and associated quality variations.

Uneven deslagging processes are well known to create process variations leading to variations in the quality of the final product.

The LadleSlag system will automatically track and store vital information for each heat and make sure your quality assurance program is met every time.



Agellis follows a policy of continual improvement of design and we must therefore reserve the right to supply equipment differing in detail from that described herein.

## Key Features

### Carry-over slag control

Processing of image data performed in order to estimate remaining amount of slag.

### Measurement and image analysis

Thermal camera vision module for evaluation of the fraction of slag covering the steel surface.

### Process stability

Sufficient and consistent slag removal – every time. No more unexpected process variations.

### Increased product quality

Decreased re-oxidation from slag carry-over eliminates non-metallic inclusion formation during ladle operations.

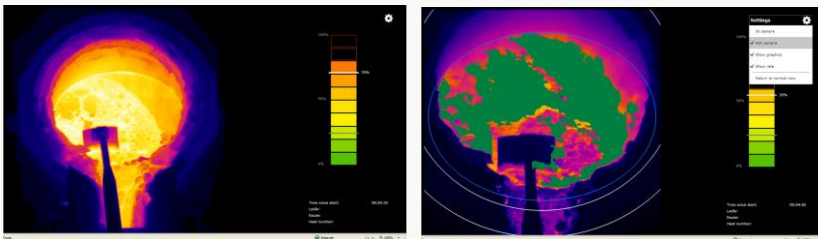
### Operator support

LadleSlag guides your operator in order to obtain consistent handling.

### Production follow-up

Full traceability for production follow-up, data mining and report generation purposes.

## User Friendly Interface



LadleSlag automatically presents the operator with a clear view of the operation. The slag free areas are coloured in green and the slag covered areas are coloured in red, yellow and purple depending on slag amount/severity. This shows the operator very clearly where the slag is to be removed. A clear indicator on the right shows the ladle surface percentage still covered by slag. A settable threshold is visible to the operator as the target to reach for every heat. Once the target is reached a traffic light flips over to green and the ladle is good to go.

## Principles of Operation

### Technical Overview

LadleSlag is based on the thermal imaging technique, using infrared cameras to feed data to the analysis. A Windows based server hosts the LadleSlag analysis models, vision system and databases. The server communicates with plant systems (Level 1/2/3), operator clients, and peripherals using TCP/IP and industry-standard protocols for data exchange.

The LadleSlag technological package is built as a web-application for easy installation and maintenance. The user has access to the system by using the standard web-browser and a local Ethernet – no client installation required.

A typical LadleSlag set-up consists of one or several operator panels controlled by using a touch screen client mounted at the work station pulpit or on the shop floor.



### Thermal cameras

LadleSlag uses Thermovision thermal cameras from Flir Systems, the world's leading supplier of infrared imaging equipment. The Thermovision A-series cameras are designed for continuous 24/7 operation and is a highly accurate temperature measurement system, offering tens of thousands of individual measurement points per image.

## Technical Information

### Thermal camera

**Typ:** Flir system A-series

**Thermal sensitivity:** 70 mK at 30°C

**Temperature range:** -20°C up to +2000°C

**Detector type:** Focal Plane Array (FPA), uncooled microbolometer

**Spectral range:** 7.5 to 13 µm

### Near-infrared camera

**Type:** Basler Ace-series

**Resolution:** High density resolution



### Camera protection housing

**Type:** Different options depending on local condition

**IP Rating:** 67 and above



### Others

A number of standard lenses are available to adapt to different measurement scenarios.

NIR (Near Infra-Red) cameras are used to enhance the vision quality and overlay the image analysis.

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