

One Source

# Kiln Shell Monitoring System



ECS/CemScanner®

# ECS/CemScanner®

**Experience from 40 years of supplying installations worldwide is reflected in the reliability, quality and performance of the ECS/CemScanner® solution.**

## Application

Correct measurement of the temperature on a kiln shell is essential for efficient operation of the kiln. The ECS/CemScanner system represents the state-of-the-art in kiln shell infrared scanning. It combines a robust design with advanced software features, making it an indispensable aid to the operation and optimization of kilns.

The use of the ECS/CemScanner solution will result in:

- Increased kiln availability
- Lower refractory consumption
- Fewer stops
- Reduced thermal consumption
- Ability to plan overhauls

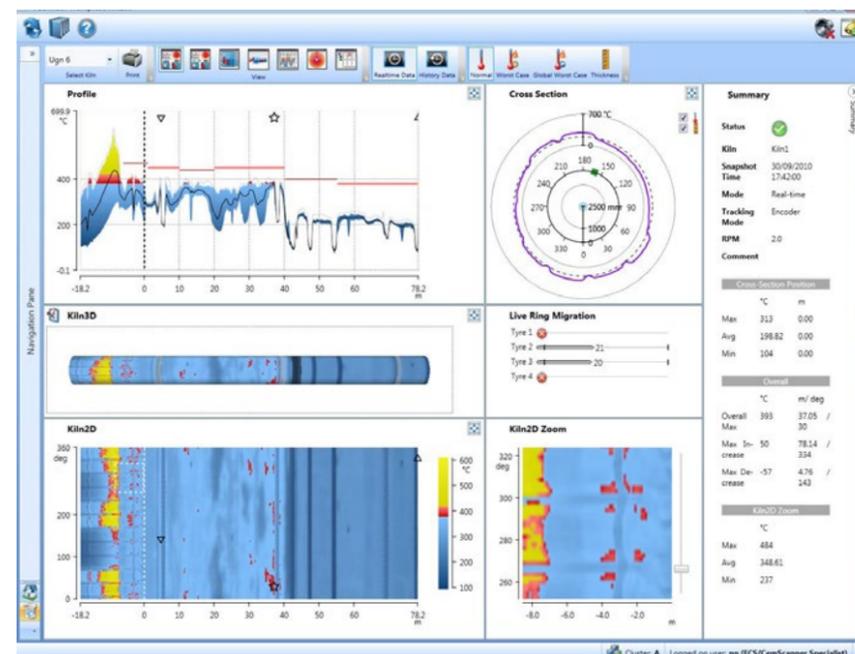
The thermal image represents the entire flattened shell surface, user-defined color codes giving an indication of the temperature scale. The thermal profile consists of 4 superimposed curves showing the minimum, maximum, average and worst case temperatures measured around the shell. It may also display the alarm levels assigned to several kiln sections.

## Components

The ECS/CemScanner system consists of three main components: Infrared scanner head, data processing unit, and the software for the user.

The high-speed infrared scanner used in the ECS/CemScanner solution uses leading scanners offering high reliability, and long-term stability and accuracy.

An advanced processing unit, the CemMicro-III, with Ethernet Interface constitutes the heart of the system. The CemMicro-III receives the measurements from the scanner head and the Kiln Position Encoder (KPE) as well as kiln and tyre rotation pulses, which is processed and transmitted to the computer system through a fibre optic interface or industrial wireless Ethernet solutions.



The ECS/CemScanner software provides a detailed overview of the kiln shell condition

# Protecting the kiln

## Tyre slip monitoring

To ensure lining durability and to avoid kiln deformation and lining damage, the kiln ovality must be kept within certain limits. The kiln shell ovality is greatly affected by the degree of clearance between the tyres and the kiln shell.

The simplest and most accurate procedure is to measure the kiln shell rotation in relation to the tyre rotation. The derived result is termed tyre slip or live ring migration. The Live Ring Migration (LRM) system is an automatic and continuous online computer based measurement and registration system designed to monitor the tyre slip and to anticipate and predict kiln constriction.

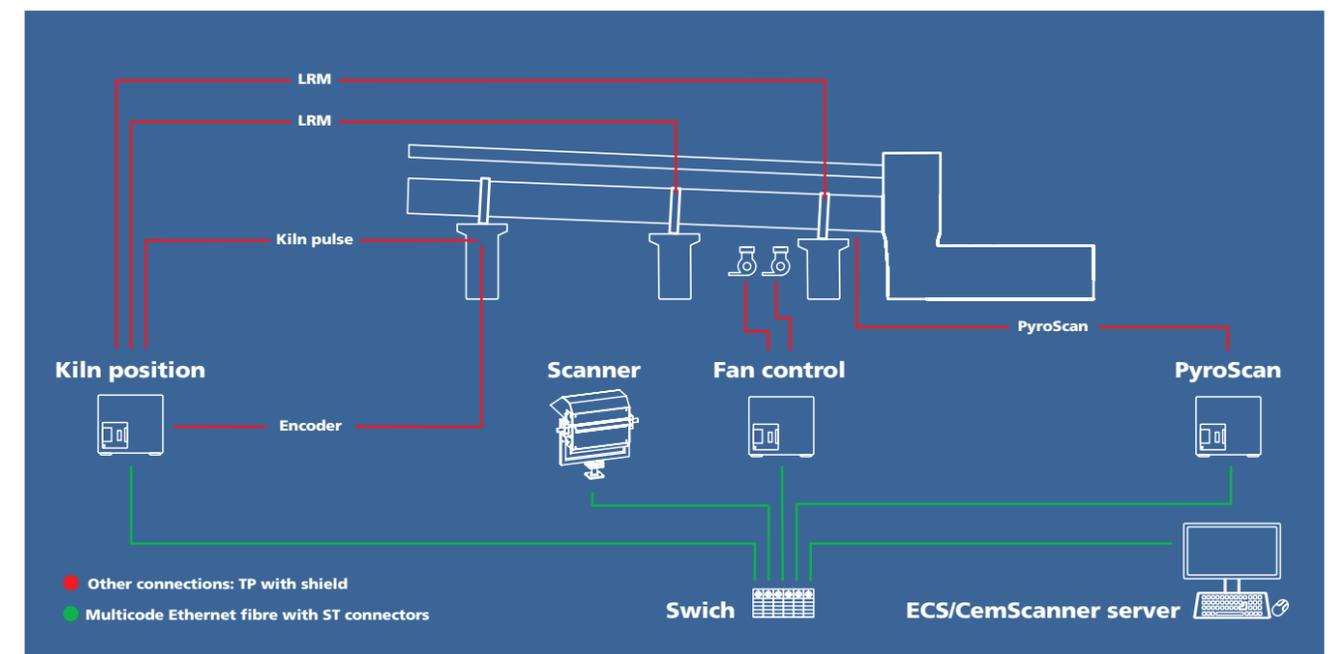
It monitors the tyre slip by constantly measuring the relative positions of the kiln and tyres or the rotation time of the kiln and tyres. The slips are computed with the help of statistical calculations to obtain reliable values.

The tyre slip for each tyre is shown on a bar chart. It can also be displayed as trend curves, ie. together with the shell temperatures on both sides of the tyre. Slip alarm levels are indicated on the bar chart and alarms for slip trend can also be generated.

## Fan control

When using cooling fans to control the burning zone section, the ECS/CemScanner system can optionally be equipped with automatic control of the fans through the plant PLC system.

Fans are started when and where it is required by continuous temperature monitoring of the kiln sections. This option enables an optimized use of the fans to prevent uneconomical continuous operation of the fans, thereby increasing their service life.



An overview of the ECS/CemScanner components

## "Walk inside" ...

### Brick thickness

The ECS/CemScanner software is able to calculate brick and coating thickness. The results are displayed as a profile or 3-dimensional image updated in real time or based on historical data. Allowance is made for different conductivities of the bricks, internal temperatures and conditions causing abnormally high shell temperatures, not necessarily as a result of thin bricks.

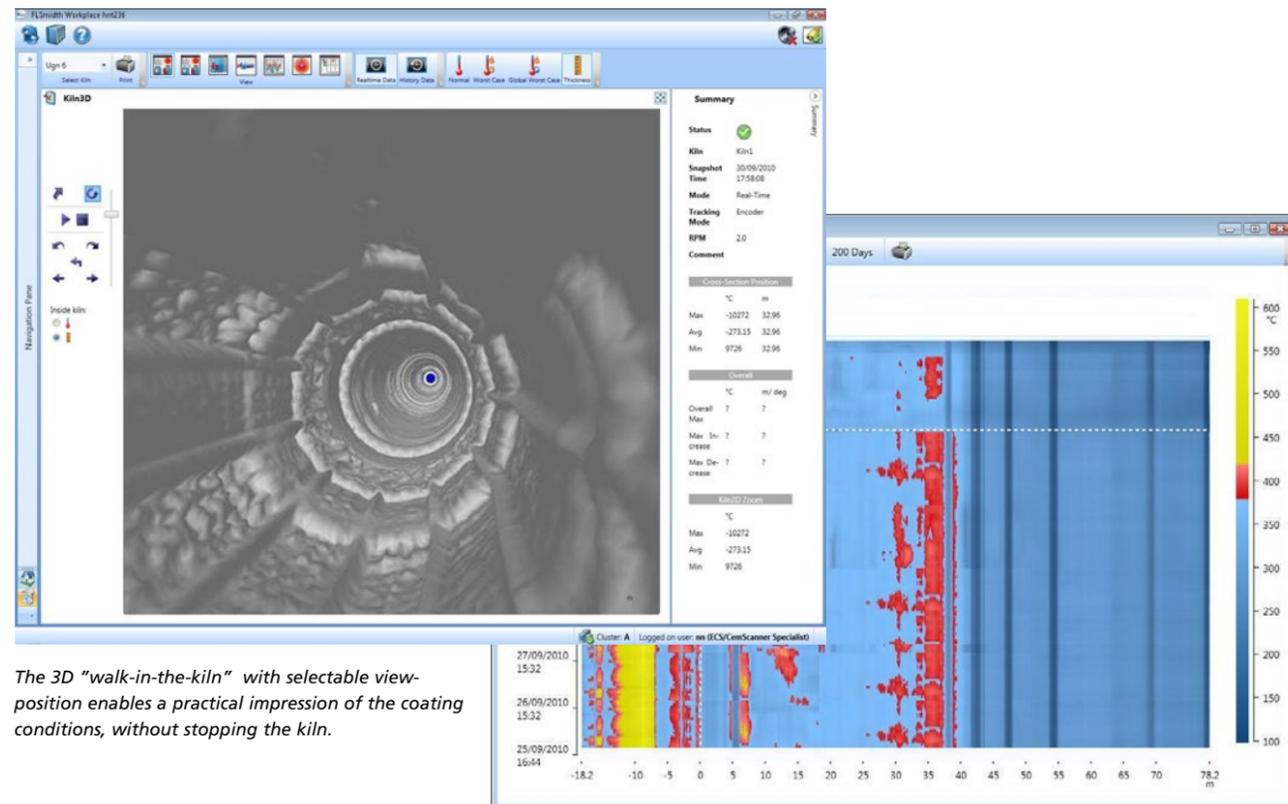
The calculation of brick and coating thicknesses is not an estimate, but is based on solid theoretical grounds.

Skilled users attain accuracy results better than 10% i.e. within a few millimeters. To make sure that historical thickness calculations can be compared, the system requires the use of an encoder to ensure a precise kiln position indication.

The "walk-in-the-kiln" view enables advanced monitoring of the coating conditions by plant operators. In the below screen shots, blockages in two satellite cooler knees are clearly seen.

### Historical data

With storage of data for several years, it is possible to easily analyse the kiln. Using the "play" button, operators can search for a kiln temperature profile forward and backward in time. The "Max temperature trend image" will not only give a concentrated summary of the kiln surface temperatures during the latest days or months, it is also a visual browser to search for critical or interesting situations in the past to be opened up for detailed analysis. Users can also manually save a snap shot of the profile for easy later retrieval.



The 3D "walk-in-the-kiln" with selectable view-position enables a practical impression of the coating conditions, without stopping the kiln.

The max temperature trend image provides snap shot information of kiln coating over time.

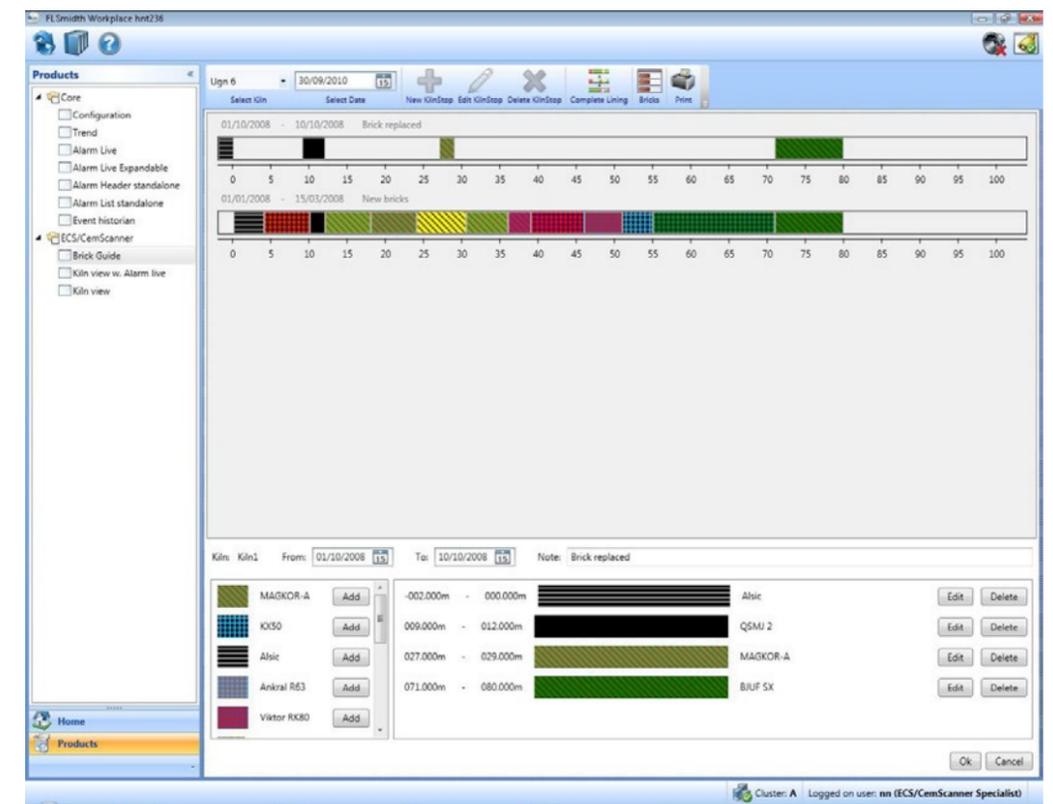
## Reduce refractory costs

### Refractory management

Usually, plant personnel in charge of refractory maintenance gain valuable experience and know-how on the performance and useful life of the refractory in the plant. Unless this information is centralised and systematically recorded, new planning of refractory lining becomes inefficient because of insufficient information on refractory track record.

Correct use and installation of refractories not only reduces refractory costs, but also results in significant increase of kiln availability and productivity.

The optional package, BrickGuide, is a unique tool for management of all the relevant information on refractory track-record, consumption and past installations. The software package includes graphical presentation of the history of the installations, lining arrangement, consumption and performance reports for each installed brick type in the kiln.



BrickGuide for brick lining management.

# Customize to your needs

## Stereo scanner

If it is not possible to obtain a clear view of the kiln shell with one scanner head because of obstacles, one or more additional scanner heads can be installed. The stereo scanner ensures that every portion of the kiln shell is fully covered. The software functions as if there were one scanner head only.

## Pyrometers

If obstacles prevent the scanner from viewing parts of the kiln shell, up to 16 infrared pyrometers can be installed to measure temperatures in these specific areas. With the PyroScan option, temperatures of a particular section are scanned and integrated into the thermal image and profile displays of the ECS/CemScanner software.

## Integrated scanner camera

Through the scanner window, an integrated camera visually discloses problems with dust on the window or whether the scanner head is out of alignment.

## Kiln camera

Spyrometer or kiln TV can optionally be displayed as an integral part of a ECS/CemScanner system.

## Trending

In addition to the built-in historical data, any specific process data such as shell temperatures in the burning zone and other sections of the kiln, tyre slips or maintenance data such as the scanner head temperature can be logged for monitoring, trend and early warning purposes.

## Diagnostics

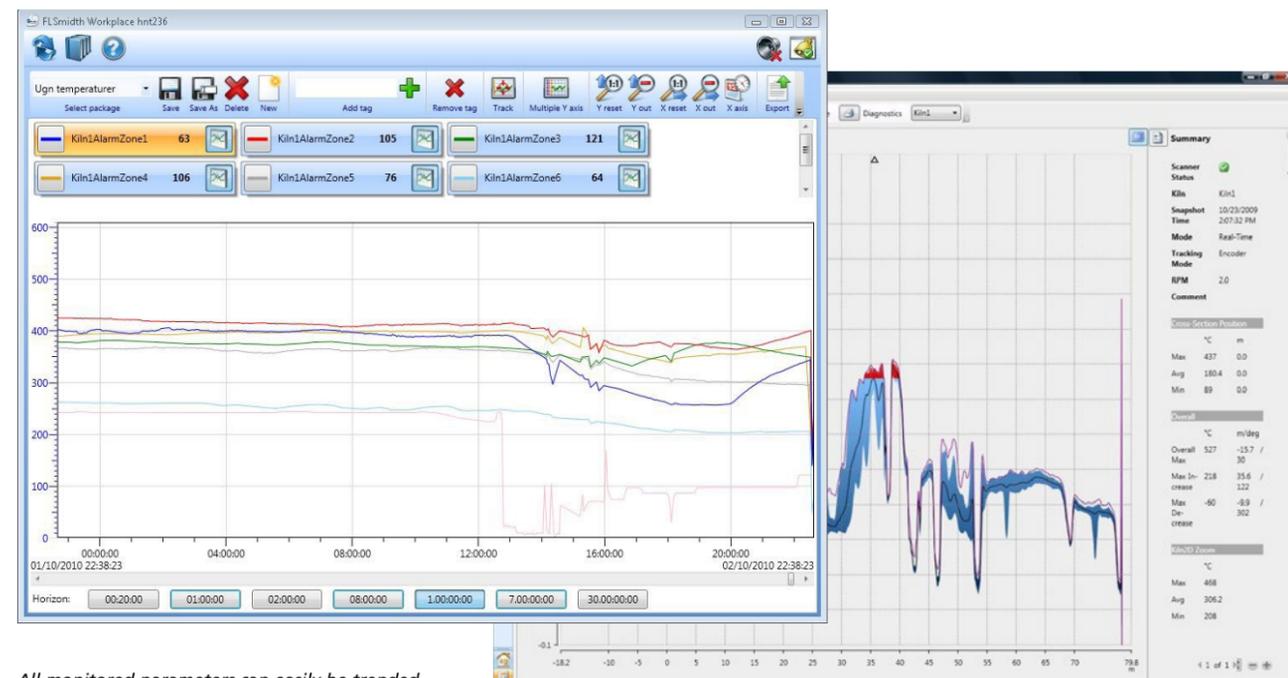
Comprehensive diagnostic information and KPI's on the equipment conditions, scanner raw data, and data communication status are available for monitoring the system and to facilitate maintenance.

## Shell heat loss

Shell heat loss from the whole kiln and/or subsections is calculated and can be displayed as trend curves.

## Retrofit

In order to continuously serve our existing customers FLSmidth offers various upgrade solutions.



All monitored parameters can easily be trended.

# Quality

## Scanner head

The high-speed infrared scanner heads offer market leading specifications, with superior accuracy and high reliability.

## Standard cabinet

The scanner head is installed in a stainless steel rain-cover, with ball head support for easy installation. The cabinet is suitable for installation in areas with temperatures between -20°C and 50°C.

## Rugged cabinet

The rugged cabinet can optionally be provided for installation in environments with temperatures outside -20°C and 50°C.

The protective stainless-steel scanner cabinet offers ample space for easy and open access to components. It is air-pressurised and heated to maintain a temperature above -20°C and below 50°C.

## Product features

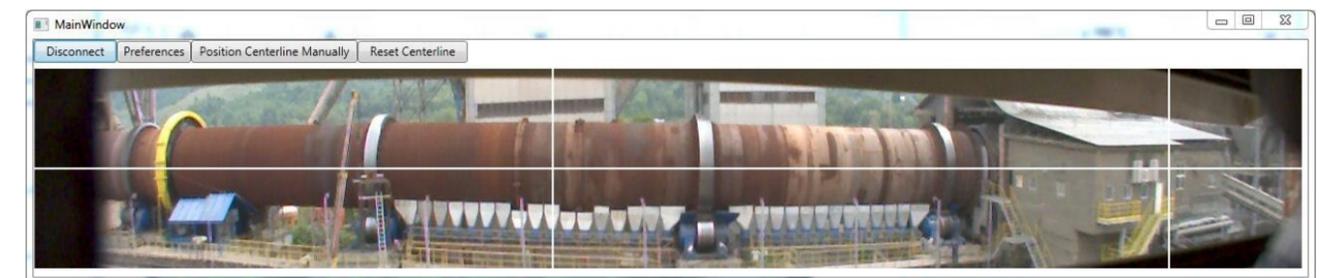
- Thermal profile with various statistical values
- Kiln cross-sectional view
- Zoom 2D and 3D
- 3D-IR kiln thermal view from adjustable view angles
- 3D "walk-in-the-kiln" for on-line coating monitoring
- Review of several month of operation on the max temperature trend image
- Calculated brick and/or coating thickness
- User-defined color palette
- Built in camera for controlling state of the window, obstructions and alignment of the scanner
- Optional OPC and PLC communication drivers for data exchange with plant PLC and SCADA system
- User-interface supporting most major languages



The standard cabinet.



The rugged cabinet.



Positioning the ECS/CemScanner is easy with the integrated camera

## Available scanner heads

### Cement kilns

Scanner Head Type	TMC8-1DH3	TMC5-1DH3	TMC4-1DH3
Typical Application Industry	Cement Kiln	Cement Kiln	Cement, Stereo
Detector type / Temperature range	MCT/75 - 700 °C	MCT/75 - 700 °C	MCT/75 - 700 °C
Scanning frequency	20 (8 - 25) Hz	20 (8 - 25) Hz	20 (8 - 25) Hz
Resolution: (Hot spot detection, 50%)	0,8 mrad	2,2 mRad	2,7 mRad
Resolution: (Temp. measurement, 90%)	2,0 mrad	5,5 mRad	6,7 mRad
Scanning sector (FOV)	120°	120°	120°
Accuracy	±1% or ±3°C Up to 300°C	±1% or ±3°C Up to 300°C	±2% or ±5°C Up to 300°C
Window type	Solid	Solid	Solid
Integrated IP Camera	Yes	Yes	Yes
Operating temperature range	-25 to - 60 °C	-25 to - 60 °C	-25 to - 60 °C
Dimensions/weight	244 x 260 x 147mm / 8 kg	244 x 200 x 147mm / 7 kg	244 x 200 x 147mm / 7 kg

### Pulp & paper / minerals

Scanner Head Type	TMC8-1DL3	TMC6-1DL3
Typical application industry	Pulp & paper / minerals	Pulp & paper / minerals
Detector type / Temperature range	MCT/50 - 500 °C	MCT/50 - 500 °C
Scanning frequency	20 Hz (8 - 25 Hz)	20 Hz (8 - 25 Hz)
Resolution: (Hot spot detection, 50%)	2,0 mRad	3,3 mRad
Resolution: (Temp. measurement, 0%)	5 mRad	8,3 mrad
Scanning sector (FOV)	120°	120°
Accuracy	±1% or ±3°C Up to 100°C	±1% or ±3°C Up to 100°C
Window type	Solid	Solid
Integrated IP Camera	Yes	Yes
Operating temperature range	-25 to + 55 °C	-25 to + 55 °C
Dimensions/weight	244 x 260 x 147mm / 8 kg	244 x 200 x 147mm / 7 kg

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