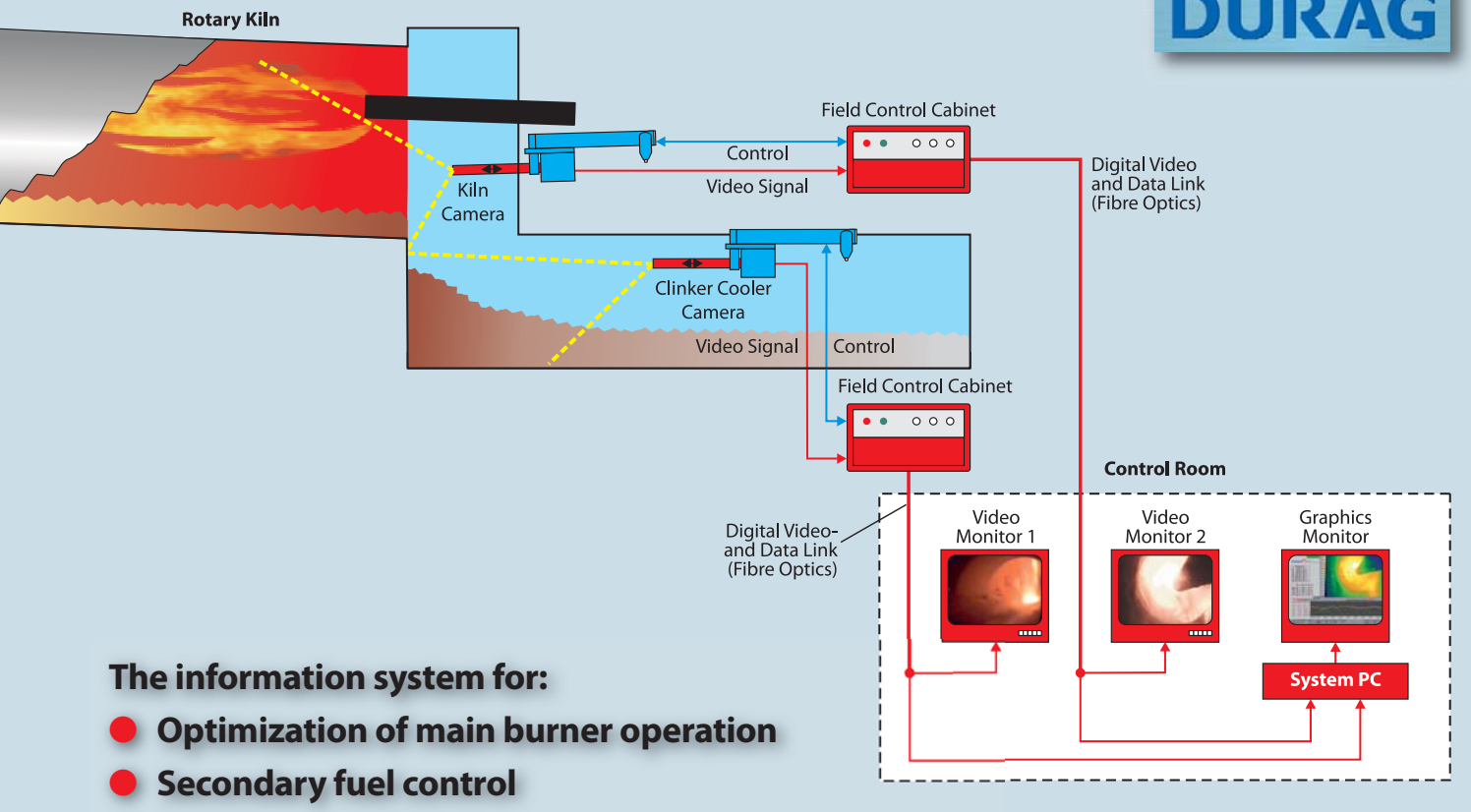
DURAG process & systems technology

D-VTA 100-20

Video and thermography analyzing system for cement plants

1948-2008 60 years DURAG



The information system for:

- Optimization of main burner operation
- Secondary fuel control
- Free lime prediction
- Stabilization of product quality
- Detection of "snowman" and "red river"
- Optimization of maintenance and repair cycles

D-VTA 100-20

Video monitoring

The D-VTA 100-20 video and thermography system

is a modular system specially developed for use in the cement industry, to monitor the clinker manufacturing process. Intelligent sensors allow contactless, optical and thermal online analysis of processes in the sinter zone in rotary kilns and in clinker coolers.

The sensors

have been specially developed for the harsh working conditions of the cement industry.
The sensor housing contains the special boroscope as optical system, the industrial CCD camera and the spectroscopy components. In this design all electronic components are operated outside the kiln area, in the cooled camera housing.
The slim, water-cooled sensor shaft (Ø 43mm) minimises the mechanical stress (abrasive dust) and the thermal influence on the sensor parts in the combustion chamber.
2 autarkic, optically aligned quartz glass systems are integrated into the boroscope for the emission spectroscopy. The optical system is protected against mechanical and thermal damage by sapphire glass at the sensor tip, in addition to air flushing. As no moving parts (no mirrors, prisms or motors) are located in the process-oriented area, the sensors achieve a high availability with minimum service requirement.

The field components

- pneumatically operated retraction system with monitoring units for the cooling and flushing media, including integrated air accumulator
- Field control cabinet for control of the sensors, operation of the optional spectrometers and the signal processing for the data and video transmission via fibre-optic cable to the control room.

The control room equipment

- System computer for temperature calculation, thermography presentation and spectroscopy data processing for free lime prediction
- Video monitor for online colour display of the process.

The video system

The basic system comprises the above-mentioned system components, without system computer.
It enables real-time colour video display, visual monitoring of the process sequence in the sinter zone in the kiln outlet/clinker cooler and provides information with regard to:

- Flame form and position
- Main burner position and state
- Clinker formation: Consistency, thickness, caking; ring formation, "snowman" and "red river".

Thermography

The thermography analyzing system

The thermography system comprises the components of the video system plus the system computer with software modules.
It operates as a spatial optical pyrometer on the basis of image data processing and offers, in addition to the video system:

- Temperature determination of each visible image point of the video sensor
- Thermal analysis of the local temperature distribution
- Temperature definition within freely definable measuring window and lines (ROI = Region of Interest / LOI = Line Of Interest).
- Analysis of thermal samples to identify anomalies in the burning and cooler process

All data of the thermography system can be transmitted to the process control system via a standardized data interface.

The spectroscopy system with free lime prediction

In addition to the components of the thermography system, spectrometers are required in the field PC of the field control cabinet, as well as quartz glass fibre-optics for connection to the sensor. The spectroscopy system analyses the radiation from the combustion and sinter process in the rotary kiln. It expands the scope of performance of the video and thermography system by the following functions:

Video image from the rotary kiln

Combustion chamber sensor with retraction unit (water-cooled)

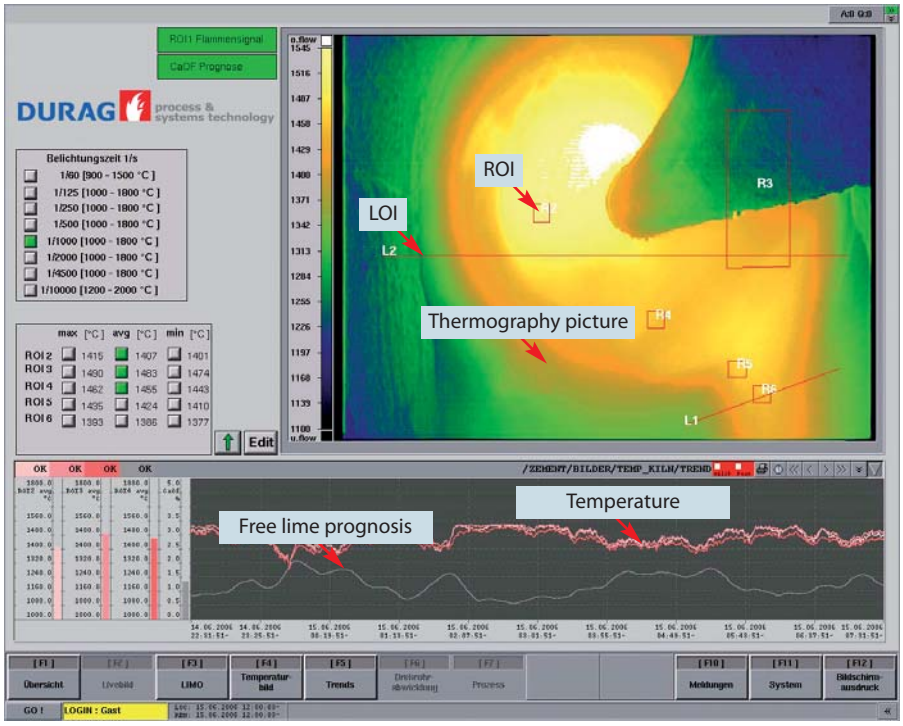
Anneliese Zementwerke Gesecke, Germany

ROMCIF Fieni, Romania

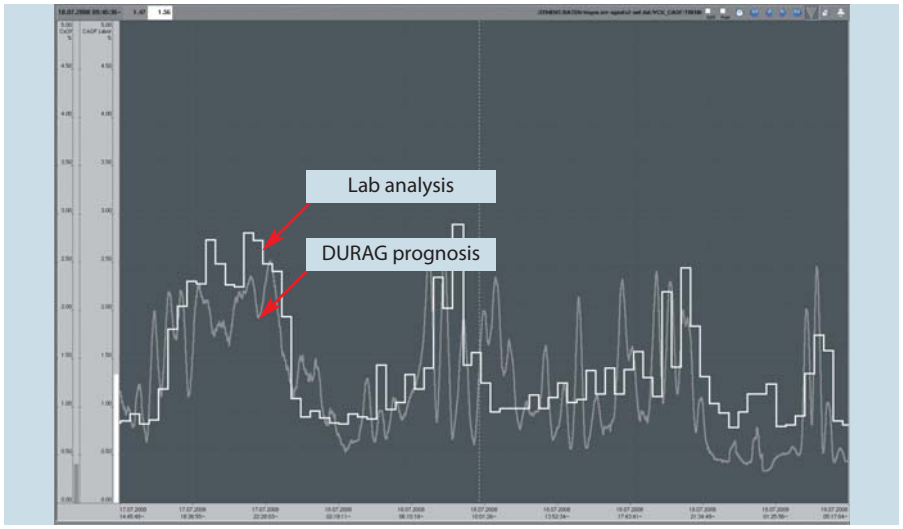
Rohrdorfer Zement Rohrdorf, Germany

analyzing system

- Measurement of the flame and clinker temperatures (reference)
- Assessment of the thermal influence of the main burner flame on the burning process (radiation behaviour and temperature transition).
- Free lime prediction from correlation of spectroscopy data and process data (DURAG patent).
  This prediction indicates the process trend sensitively and at an early stage, providing the possibility of process optimization.



The user interface of the thermography analysis system



Free lime prediction

Technical data

Video system	PAL, picture elements: 752(H) x 582(V), fixed focus
Thermography from total radiation	Temperature range 1000°C – 1800°C
Optical alignment	Sensor 0°: axially-parallel to sensor axis, Sensor45°: angled 45° to sensor axis
Optical field of view	Sensor 0°: horizontal 72°, vertical 54°, diagonal 90°; Sensor 45°: horizontal 48°, vertical 36°, diagonal 60°
Data interfaces on the system PC	RS232, RS422, RS485: ASCII, MODBUS, Siemens RK512; Ethernet: TCP/IP: FTP, MODBUS
Auxiliary energy	230 V / 50 Hz, 500 VA
Gas temperature in combustion chamber	Water-cooled sensor <1800°C
Ambient temperature	Sensor / Retraction: 0°C…60°C, Field control cabinet: 0°C…45°C
Material	Sensor: stainless steel 1.4571 / 1.4301, Field cabinet: steel sheet, painted in RAL 7035
Dimensions / Weights	Diameter of sensor tip: water-cooled 43 mm
Immersion depth in combustion chamber	max. 450 mm from welding plate
Space requirement for sensor / retraction device	1450 x 500 x 800 mm (LxWxH)
Stroke of retraction device	700 mm
Field cabinet	600 x 380 x 210 mm (HxWxD)
Cable length	Sensor/Retraction – Field control cabinet 10 m
System PC	19" industrial housing, 4 HE, depth 450 mm
Weights	Sensor with retraction and carrier 70 kg, field control cabinet 15 kg
Cooling water volume	350 l/h, 1.5…8 barg
Cooling water temperature	Inlet: <45°C, Outlet: Temperature increase <10° C
Cooling water quality	Clean, chemically neutral, non-corrosive, Hardness: <5°dH / <28 mMol/l
Compressed air volume	max. 25 Nm^3/h
Compressed air pressure	5 – 8 barg
Compressed air temperature	5…40°C
Compressed air quality	dry, free from dust, aerosols, oil

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