

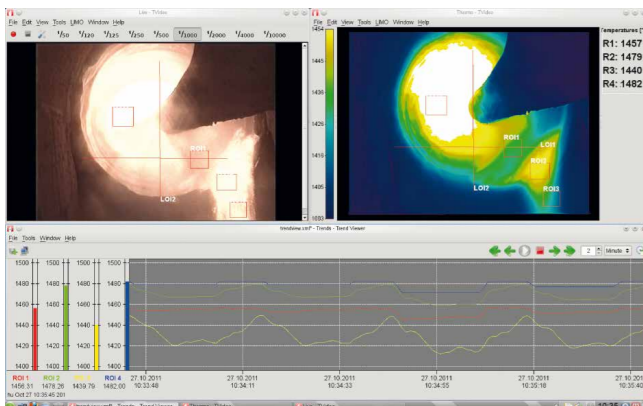
Products for the Cement Industry

- **Combustion Technology**
- **Video-based Thermography**
- **Environmental Monitoring**
- **Environmental Data Management**



DURAG GROUP

Products for the Cement Industry



Video based Thermography

D-VTA 200

Video-based Thermography System

- determine flame and clinker temperature
- analyze temperature distribution
- validate alternative fuel influences
- performs online Free Lime Prognosis
- enhance product quality
- reduce maintenance costs
- optimize kiln availability
- detect snowmen & red rivers

DURAG process & systems technology

Particulate Monitor F-701-20

- Safe, stable C-14 source with low activity
- Measurement results unaffected by lack of homogeneity of the dust particles



F-701-20



Ambient Monitoring

Filter Monitor D-FW 231

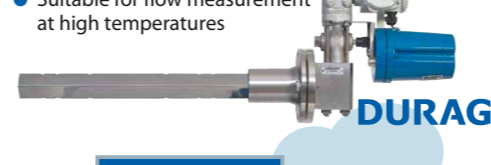
- Triboelectric broken bag detector, easy installation
- Low plant maintenance cost by preventive / selective bag replacement



D-FW 231

Volume Flow Measuring System D-FL 100

- Flow rate measurement according to the principle of differential pressure
- Suitable for flow measurement at high temperatures



D-FL 100

Dust Concentration Monitor D-R 290

- Double pass method (optical transmission)
- LC Display in opacity, optical density or mg/m³
- Suitable for medium to high dust concentrations and medium to large duct diameters



D-R 290

Dust Concentration Meter D-R 320

- Scattered light method for smallest to medium concentrations



D-R 320

Volume Flow Measuring System D-FL 220

- Flow rate measurement according to the ultrasonic principle
- Suitable for low velocities, wet and aggressive waste gas

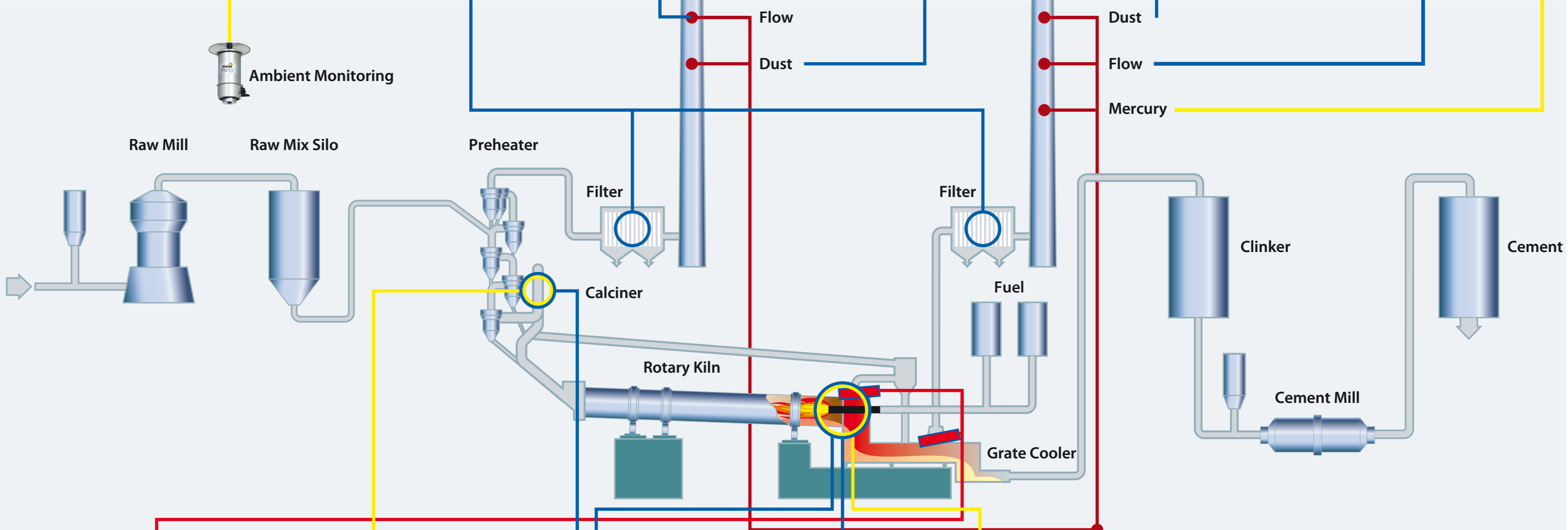


D-FL 220

Total Mercury Analyser HM-1400 TRX

- Thermocatalytic reduction method, no wet chemicals necessary
- Measuring range 0...45 µg/Nm³

HM-1400 TRX



Gas Burner

BR.../BD...



- Gas Burners BR... or BD...
- Heat release ranges from 35 kW - 4,000 kW
 - For natural gas, propane, cleaned coke oven gas or process gas

Hegweln

Flame Monitoring

D-LX 720 D-LL...



- Compact Flame Monitor with Fibre Optic System
- Wide sensitivity range
 - For ambient temperatures from -40°C up to +85°C
 - Dual channel design throughout
 - Measurement of flame flicker frequency
 - Selective to individual burners and fuels

Igniters

D-HG 400



- High Energy Ignition Device
- Ignition of liquid or gaseous fuels with large power ratings
 - Compact design: control unit and ignition lance form one unit
 - Special designs for hazardous areas are available

Ignition Burner

ZA.../ZDA...



- Igniters ZA... or ZDA...
- Heat release ranges from 100 - 4,000 kW (Gas) 30 - 300 kW (Diesel)

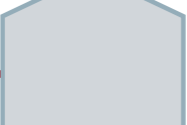
Hegweln

Process- and Environmental Data Management

D-EMS 2000



D-EFUE.www



Authority

Control Room

Environmental Data Management System D-EMS 2000

- Capturing, storing and evaluating of environmental data according to European Directives and national regulations in compliance with EN 14181
- Emission data, immission data, waste water data, meteorological data, process conditions, time diagrams, correlation diagrams
- Including QAL3 CUSUM-card
- Internet representation

DURAG data systems

DURAG GROUP Products in Cement Plants

Combustion Technology

Compared to other industries, the energy costs for cement production constitute a very high percentage of the total product costs. The reason for this is the requirement to pre-heat and heat the raw materials strongly in order to dehydrate them as well as dissociate the calcium carbonate they contain. The quick and reliable ignition of the combustion and the safe monitoring of it ensure a high availability of the production process.

Ignition and monitoring equipment is used for the rotary kiln burner and, depending on the design of the plant, also for the calcination burners or additional hot gas generators. The hot and dusty environment typical for the combustion in a cement plant puts especially high demands on good protection, ruggedness, and large ambient temperature range of the instruments. And a long lifetime of the equipment supports cost efficiency and high uptime of the plant.

A quick start-on-demand of the burners is given by the right choice between either a DURAG high energy spark igniter D-HG 400 for direct electrical ignition of the flame or a Hegwein ignition burner if the higher power of the main burner so requires. The compact and highly integrated design of the DURAG GROUP ignition systems allows for reduced installation time and cost. Spark igniters with high energy and high spark rate as the D-HG 400 require only an electrical connection and can ignite all gaseous fuels as well as liquid fuels up to heavy oil Class 6. While ignition burners require an additional fuel train, the Hegwein igniters can also be run continuously as pilot burners to stabilise the combustion in case of fuels with highly varying composition or calorific value.

Flame monitoring in cement production often requires the use of flame monitors together with fibre optic systems. This is due to the typically long length of the rotary kiln burner, and the fact that the rotation of the kiln does not allow for mounting the monitors to the walls of the combustion chamber. The DURAG D-LL fibre optic systems are routinely delivered with lengths between 10 and 20 m. Purge air is used to keep the fibre optics clean in spite of the dusty environment, it also serves to cool the fibre optics. The versatile compact flame monitor D-LX 720 with a wide sensitivity range allows for stable flame monitoring of flames from a wide variety of fuels. The two channel design throughout effectively combines high safety with high availability.

Environmental Monitoring

The emission of dust, particularly from kiln stacks, has been one of the main environmental concerns in relation to cement manufacture. Since secondary fuels are increasingly being used in especially the cement industry, the demands placed on flue gas purification systems are inevitably growing. Due to technological progress in filter technology the environmental pollution could be reduced effectively during the last decades. Typical clean gas dust contents attained by rotary kiln systems equipped with an ESP range between 10–20 mg/Nm³ as daily average.

The emission limit of the daily mean value depends on the amount of derived fuels and ranges typically between 10–30 mg/Nm³.

TA Luft 86	TA Luft 2002	17. BlmSchV	2000/76/EC	2010/75/EC
50 mg/Nm ³	20 mg/Nm ³	10 or 20 mg/Nm ³	30 mg/Nm ³	30 mg/Nm ³

Emission limits for daily mean values of dust concentration

In cement plants the use of continuously operating analyzers for emission monitoring is necessary in accordance with the local authority.

The DURAG GROUP offers a wide range of equipment for emission monitoring for all kind of measurement tasks.

- Dust concentration monitors with a measuring range of 1 mg/m³ to 1000 mg/m³
- Ambient TSP, PM10 and PM2.5 fine dust monitor, typically 0-50 µg/m³ up to 0–10 mg/m³
- Velocity/flow monitors with a measuring range of 0 to 50 m/s
- Total Mercury monitor with a measuring range of 0–45 µg/Nm³ / 0–75 µg/Nm³

All emission monitors of the DURAG GROUP are suitability tested according to national, European and international standards.

Another important measuring task for continuously measuring analysers is the control of the product quality by monitoring the process conditions. With the help of DURAG filter monitors for bag house filters and DURAG dust concentration monitors in the stacks early leakage detection and saving of cement material is possible. By identifying leakages dust monitors pay for their initial cost relatively quickly.

Video and Temperature Monitoring in Rotary Kilns and Coolers

This sintering process is critical to the quality of the cement and requires accurate control of the energy input.

Insufficient heat will cause the clinker to contain unconverted limestone whereas excess heat will shorten the life of the refractory bricks in the kiln which may damage the kiln shell. Both conditions diminish product quality or increase process costs.

The DURAG Intelligent Sensor System gathers reliable online information out of the high temperature burning process which is not measurable with the standard process instrumentation:

- Real time and colour video presentation of the sintering zone at kiln outlet
- Clinker bed formation and condition on the initial third of the clinker cooler's grate
- Detection of flame form, flame position and irregularities of the main burner
- Detection of burner nozzle position and condition
- Temperature measurement from the sintering zone, flame and clinker bed
- Temperature distribution with spatial resolution
- Evaluation of radiation energy of the flame

Video System

The real-time visual information of the sintering zone or of the clinker cooler is permanently displayed in colour on the video monitors in the control room. It presents the flame form and position, burner nozzle position and condition, clinker bed situation with thickness, condition, caking and formation of rings. Conditions like "snowman" and "red river" in the cooler can be detected.

Thermographic System

The DURAG Thermography System is an optical pyrometer based on video data processing. In addition to the Video System using false colour imaging it provides methods for:

- Determining the spatial temperature distribution out of the field of view of the sensors video system (thermal image)
- Measuring the temperature inside freely definable objects (ROI = Region of Interest) and on user definable lines (LOI = Line of Interest)
- Analyzing of thermal patterns to reveal anomalies.

All data gathered out of the high temperature process such as analytical data and temperature measurements are available for the control systems via standard interfaces.



Water and Air Cooled Sensor with Retraction Unit



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