O.E.N. ENTERPRISES (PTY) LTD.

SMART SOLUTIONS FOR OPTIMAL PERFORMANCE

Products for Fossil Fuel Power Plants

Dust and Opacity Monitor D-R 290
- Double pass method (optical transmission) for medium to high dust concentrations and medium to large duct diameters.
- Used with D-ISC 100

Dust Concentration Monitor D-R 320
- Scattered light method for smallest to medium concentrations.
- Used with D-ISC 100

Dust Concentration Monitor D-R 800
- Forward scattering method for small to medium concentrations.
- Used with D-ISC 100

Combined Probe Sensor D-RX 250
- Dust concentration, volume flow, Temperature, Absolute pressure
- Used with D-ISC 100

Filter Monitor D-FW 231
- Triboelectric broken bag detector, easy installation
- Detects the efficiency and function of filters and filtration systems
- Used with D-ISC 100

Dust and Opacity Monitor D-R 220
- Optical transmission analyser
- Monitor in combustion and filter systems, ducts and warehouses
- Used with D-ISC 100

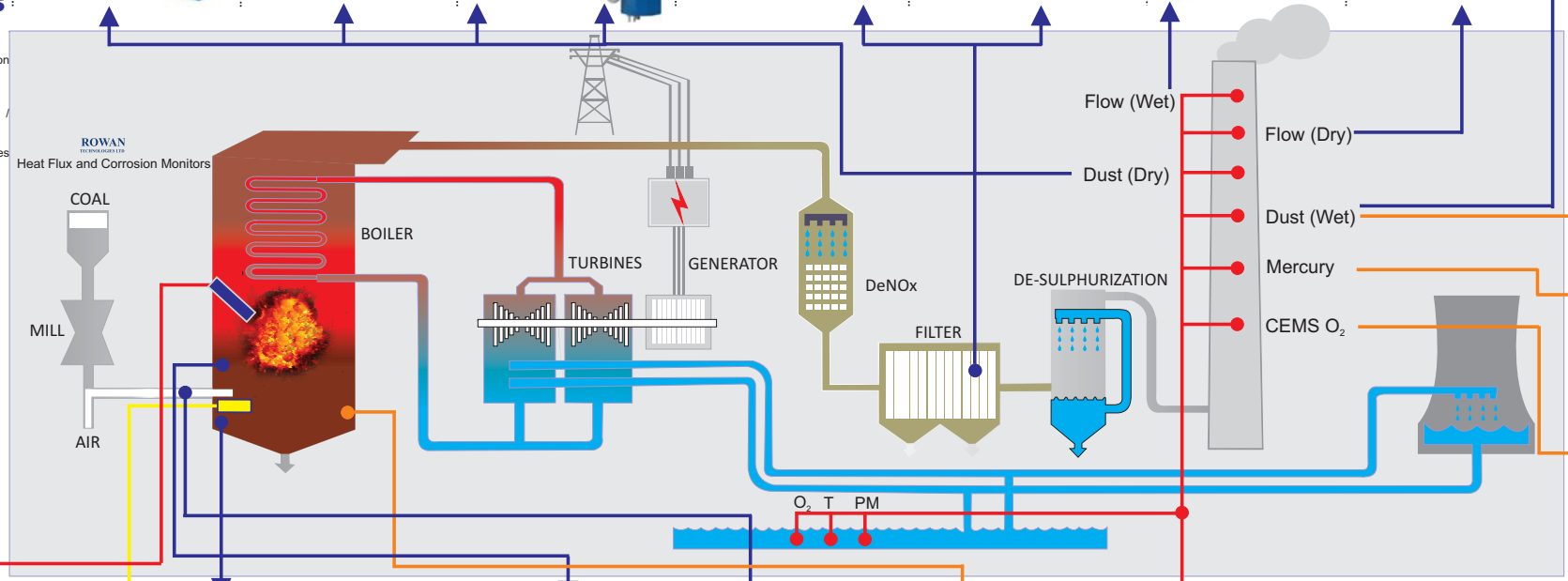
Volume Flow Measuring System D-FL 220
- Ultrasonic principle
- Suitable for low velocities, wet and aggressive waste gasses
- Used with D-ISC 100

Volume Flow Measuring System D-FL 100
- Differential pressure principle
- Suitable for flow measurement at high temperatures
- Used with D-ISC 100

Extractive Dust Concentration Monitor D-R 820F
- For wet sample gas to monitor low to medium dust concentrations

Universal Operating Unit D-ISC 100
- Automatic sensor detection allows easy installation and setup
- Convenient operation by keypad and big display
- Quick parametrization of the connected sensors
- Maintenance and monitoring via safe intranet / internet remote access
- Integrated power supply for one DURAG sensor
- Efficient upgrading by internal expansion modules and converters

Lancom - IV
- Up to 9 gas measurements in a single instrument.
- Robust industrial design.
- Meets ASTM D-6522 with Dry Sampler probe.

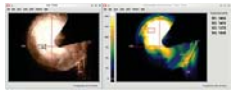


Extractive Dust Concentration Monitor F-904-20
- Especially for wet stack gases and for the blast furnace gas (BFG) monitoring

Total Mercury Analyser HM-1400 TRX
- Thermocatalytic reduction method, no wet chemicals necessary

Thermography / Video

DURAG process & systems technology



Video Based Thermography System
- Detection of temperature distribution inside combustion chambers
- Analysis of unbalanced combustionprocesses
- Optimisation aid in case of middle and low load

Ignition Burner

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

Hegwein

Igniters

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

Combustion Analyzer

WDG-V COMBUSTION ANALYZER SYSTEM
- Sample Flow Verification.
- Cell & Detector Trending
- Stability Indicator during the Calibration Process
- Trend Data Logging & Access by USB Port

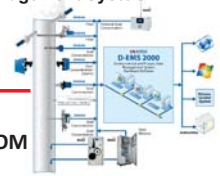
PF Sampler

PFS – Pulverized Fuel Sampler
- Sampling in accordance with standard ISO 9931
- Extracts a pulverized coal for laboratory testing
- Easy connection with a Dustless Connection
- Adjustment of fuel distribution

Flame Monitoring

Compact Flame Monitor
- 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

Data Management System



CONTROL ROOM

AUTHORITY

D-EMS 2000
- Acquisition, evaluation and long-term storage of environmental data according to European directives and National Regulations in compliance with EN 14181
- Monitoring and reporting of diverse data types like emission, immission, waste water, meteorological, process conditions etc.
- QAL 3 Control charts
- Internet Representation

DURAG data systems

Products for Fossil Fuel Power Plants

Flame Monitoring

The monitoring of the flame is a safety engineering element for industrial combustion technology - fuel may only enter the combustion chamber if safe combustion is guaranteed. Therefore high demands are made on the availability and safety of the equipment used. For intermittent operation it is sufficient when the flame monitoring hardware performs a self test during the startup procedure. Continuous operation requires a permanent verification of error free operation.

The monitoring can be performed by the combination of a flame sensor (also flame scanner) with a control unit. Where the flame sensor transforms characteristic properties of the flame into an electrical signal and the control unit provides the flame signal and ensures error free operation. Alternatively these two parts are combined in one compact flame monitor.

Besides the proper selection of the flame monitor also its correct placement and alignment are important prerequisites for the successful monitoring of the flame. The presence of a flame must be correctly detected independently of the obstruction of the furnace or its operational mode.

Ionisation Detection

Flame monitors with ionisation detectors. They are used primarily on smaller gas burners and pilot burners.

Detection of the optical signal

Larger burners are monitored solely by optical flame monitors. Depending on the fuel and combustion technology of the process optical sensors with different spectral sensitivities or combinations of them are used:

Infra-red detectors (IR) react to radiation having a wavelength of 800 nm or higher. It is only the flickering of the flame which is analysed. Constant radiation sources, such as the glowing of the furnace walls, are not detected as a flame.

Flames radiating in the UV range, but whose UV component is absorbed by dust, steam or other substances, can often also be monitored using infra-red detectors.

Ultra-violet detectors (UV) detect the flame radiation below 400 nm. Ultra-violet detectors are well suited for monitoring gas flames, but can also be used for oil flames. Products with the codes UL, US, UH, UA, and UAF use these detectors.

Visible radiation detectors (VIS) are suitable for the monitoring of oil and coal flames between 400 and 800 nm. However, product guidelines in some countries stipulate that gas flames must not be monitored in this spectral range. Products with the codes IS, ISE, and ISO use these detectors.

Ignition

Ignition of oil and gas burners by high energy spark igniters, gas fired igniters, oil fired igniters (diesel) or dual fuel fired igniters (gas and oil).

Video-based Thermography

Disturbances of the local fuel-/air ratio of boiler plants and steam generators result in the following operational conditions:

- Localized combustion areas with high combustion temperatures and high formation of thermal Nox
- Localized combustion areas with incomplete combustion and high formation of CO
- High flue gas losses and high amounts of unburned carbon (UBC) or loss of ignition (LOI)
- Local displacement of the main combustion zone compared to the design position
- Local overheating of boiler construction material
- High temperature corrosion and thermal stresses combined with boiler tube ruptures

Measures

Control of the combustion process through derived variations of firing parameters like:

- Uniform distribution of fuel
- Control of the combustion air distribution over the entire combustion zone

To achieve these targets, the online analysis of the actual firing situation has to deliver the following information:

- Detection of the local position of the main combustion zone
- Flame temperature distribution Local flame propagation
- Ignition point of flame
- Local fouling

Video System: Presentation of the Flame Picture

The furnace camera sensor of the DURAG Video System supplies online visual information directly from the combustion chamber to assist the operator in adjusting the complete combustion process optimally.

Thermographic System: Analysis of the Flame Temperature Distribution

The DURAG Thermographic System provides methods for:

- The thermal analysis of the spatial temperature distribution out of the combustion chamber
- Temperature determination within freely definable areas and lines (ROI-Region Of Interest and LOI- Line Of Interest)
- Detection of actual position of the combustion zone.

For automatic closed loop control measures all data of the thermographic systems can be transferred to the main process control system (DCS) at the customer site through standardized data interface.

Emission Monitoring

Within the O.E.N. Enterprises portfolio, we supply a range of products suitable for emission monitoring including:

- dust concentration and opacity
- total mercury concentration
- flue gas volume flow
- CEMS

as well as evaluation systems for the calculation of emissions.

The products are used worldwide in power generation plants and the process industry, such as e.g. fossil fuel power stations, waste incineration plants, refineries, chemical processing plants, cement works, the lime industry, the steel industry, filter and dust extraction plants as well as for monitoring ambient air.

The following are taken into account:

- VDI 2066/VDI 3950-German dust measurement standards
- EN 14181 - European quality assurance standard for automated measuring systems
- EN 15267 - European standard for type approval & certification ofAMS/CEMS
- EN 13284-European standard for determining small dust concentrations
- EN 14884 - European standard for determining total mercury concentration
- ISO 10473 - International standard for beta absorption method
- ASTM D-6216-12-American standard practice for opacity monitors.

DIN EN 14181

DIN EN 14181 defines three quality assurance levels (QAL) and an annual functional test (AST) for automated measuring systems AMS:

- **QAL 1:** Requirement for suitability evaluation of automated measuring equipment (the test complies with EN ISO 14956, EN 15267)
- **QAL 2:** Installation of automated measuring system (AMS), calibration of AMS using the standard reference method (SRM), determination of measuring uncertainty / variability of AMS and check for observance of preset measuring uncertainties
- **QAL 3:** Continuous quality assurance by the operator (monitoring drift and precision of the AMS, verification on control charts)
- **AST:** Annual surveillance test including SRM measurements to control the performance and function of the AMS and evaluate the validity of the calibration function.

DURAG — Combustion and emission monitoring.

Hegwein — Ignitor, pilot and burner monitoring

SMITSVONK — Flare ignition systems

MW — Process monitoring systems for coal fired power plants

AMETEK PROCESS INSTRUMENTS — Process analysers and control Instrumentation

Thermo SCIENTIFIC — Radiation monitoring

electron tubes — Photomultipliers for environmental radiation

ROWAN TECHNOLOGIES LTD — On-line thermal and corrosion monitoring of boilers

LAND AMETEK PROCESS & ANALYTICAL INSTRUMENTS — Combustion and environmental monitoring

HYDROCLIMAPONICS Feed the world — Hydroponic solutions and systems

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Products for Fossil Fuel Plants

- Combustion Technology
- Thermography and Video Systems
- Emission Monitoring
- Emission Data Management

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