On-Line Corrosion and Thermal Mapping Scanners

Multi-Enclosure Systems for up to 500 Sensor Locations and Multiple Monitoring Areas.

Non-Intrusive Monitoring and Mapping of Internal Plant Conditions using External Sensor Arrays

Specifically Tailored for Monitoring Fireside Conditions of Boiler Tube Walls, Internal Surfaces of Pipelines, Storage Vessels etc.

On-Line Monitoring of Surface Corrosion, Erosion and Thermal Behaviour (Heat Flux and Surface Temperatures)

Monitor at Multiple Locations: for example all Four Walls of a Power Plant Boiler

Provides Greater Awareness of Internal Conditions for Smoother, More Efficient Operations and Reduced Downtime.

Use as an Integral Part of Boiler Wall Cleaning Systems

Can be Used to Help Understanding of Crack Growth

Established Technology - in Use since 1999 with >15 Installations now in Europe, Asia and N. America

www.rowantechnologies.co.uk
Principle Scanner Benefits and Features

- Direct, online monitoring and mapping of corrosion/erosion, remaining thickness etc. in high or low temperature environments.

- Online monitoring/mapping of heat flux and internal/external surface temperatures. Provides information on slagging behaviour, effectiveness of wall cleaning or damaging tube wall conditions such as flame impingement and excessive tube temperatures.

- Sensors welded to external surfaces – no requirement for probe entry ports and maintenance-free at sensor locations.

- Increased confidence in plant operation and efficiency over extended time periods.

- Systems can be integrated with plant information systems.

- Dedicated software allows data analysis and presentation in a multitude of ways - historical, real-time, linear traces and 2-D plots.

- Systems adaptable and expandable with designs tailored to individual customer requirements.

- Our corrosion probes and HFC monitors can be integrated with the scanner systems and controlled from a central control unit.
Corrosion and Erosion Monitoring

Corrosion/erosion measurements are based on well-established electrical resistance principles where thinning of a metal increases its measured electrical resistance. However, this measured resistance is also temperature-dependent and the scanners have the ability to simultaneously measure both temperatures and resistances to a high precision, allowing this temperature dependency to be effectively nulled out.

Arrays of sensors are welded to external (cold-side) surfaces. Resistance measurements between adjacent sensor locations provide an average rate of 'uniform' metal loss between those locations. Measurements are performed in a pre-defined sequence (i.e. sensors are scanned) across the whole array, enabling 2D maps to be produced. Metal loss can be readily translated into corrosion rates, remaining thickness and time-to-replacement using the scanner’s analysis software.

The figures below describe monitoring of boiler membrane wall fireside corrosion:
Thermal Scanning - Heat Flux and Surface Temperatures

The scanner’s thermal monitoring capabilities can be used independently of corrosion/erosion measurements to provide thermal mapping on a real-time basis, either as surface temperatures or heat flux.

Fast thermal scanning allows capture of rapid thermal transients resulting from operational changes or slag removal. Data can be sent directly to plant information systems, office or control room for immediate data processing and presentation in the form of maps or time-dependant linear traces.

Depending on system configuration, scanners are able to produce thermal maps (i.e. heat flux and surface temperatures) from all four wall of a large power station boiler at around two-minute intervals. This enables, for example, the effects of wall cleaning to be examined and monitored. Systems can be configured for even faster data capture if required.

Dedicated thermal monitoring scanners are also available, where corrosion monitoring is not required. Further details can be found in our dedicated thermal monitoring system (NTScan) brochure.
Example Installation - Large Power Generation Boiler

The schematic below shows an example scanner configuration for monitoring the walls of a large power generation boiler.

Multi-enclosure systems have a main control unit located near the monitoring areas. The control unit may also house the scanner data logger but this can be located some distance away if fibre-based serial communications to the control unit is used. The control unit and logger communicate with electronics PCB enclosures positioned local to the monitoring areas. Field cables run directly from these enclosures to the wall sensors.

Additional hardware can be added to existing scanner installations to expand existing monitoring areas or to create new ones. It’s also possible to integrate both our corrosion probes and HFC (Heat Flux and Corrosion) monitors to create a single multi-purpose system.

Using an Ethernet link, the scanner data logger can connect to plant servers and/or data analysis and presentation PCs located in a control room or office. This allows the latest scanner data to be processed and displayed in the form of maps or time-dependant traces using the scanner’s data analysis software. The scanner’s thermal monitoring capabilities can also be used as an integral part of wall cleaning feedback control systems.
Scanner Configurations and Installation

The scanner hardware is extremely flexible by design, allowing systems to be configured for a variety of sensor layouts and to adapt to possible site restrictions such as high ambient temperatures and boiler exclusion zones.

Sensors are welded to external surfaces and do not require specialist welding skills. System design is also sensitive to the need to temporarily remove hardware for possible maintenance.

Specifications

CORROSION/EROSION MONITORING

The figures below assume roughly 'uniform' metal loss between adjacent sensors, as compared to highly-localised pitting:

*Sensitivity to Metal Loss - typical values based on a sensor spacing of roughly 1-1.5m:*

- Thermally-stable conditions: 200 ppm (1 part in 5000)
- Furnace wall tube (hot central zone), thermally-dynamic conditions: 2000 ppm (1 part in 500)

*Quantification Time – typical figures. Note that quantification is achieved more quickly for higher corrosion rates, thinner walls and thermally less-dynamic conditions.*

- 10 mm pipe wall: +/- 0.5°C uncertainty (long term), 1mm/year metal loss: 15 days
- 6 mm bare furnace wall tube: +/- 5°C uncertainty (long term), 0.5mm/year metal loss: 40 days

THERMAL MONITORING:

- Approx. 150 msec per sensor measurement - a matrix of 100 sensor locations scanned in about 30 seconds. Data acquisition speeds can be increased with additional hardware.
- Temperature differences accurate to approx 0.2°C - systems are specifically designed for accurate and stable temperature differences between adjacent sensors.
- Absolute measurements: stability approx. +/- 1°C, accuracy within approx. +/-2°C.
- Accuracy of estimated fireside temperature and heat flux depends on system application but typical figures estimated to be within approx. +/-15%.

Above figures are a guide and may be subject to change.