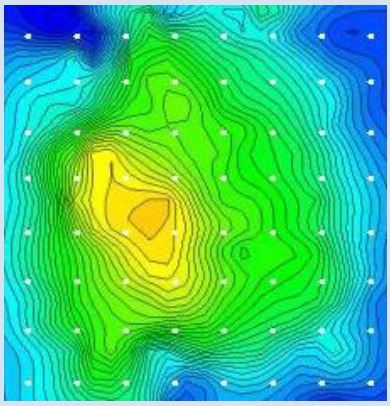
Mini-TC (Thermal and Corrosion) Scanners

Compact, Stand-Alone Scanner Systems for Small Monitoring Areas

Part of a Range of Monitoring Systems supplied by Rowan Technologies



Non-Intrusive, On-Line Monitoring of Boiler Fireside Conditions using External Sensors

Established Scanner Technology in a Single, Stand-Alone Enclosure

Real-Time Monitoring of Thermal Behaviour: Heat Flux and Surface Temperatures.

Continuous Monitoring of Fireside Tube Wall Corrosion and Erosion

Compact Fully-Independent Systems with On-Board Computing Power

Multiple Configurations and Low Installation Costs

Multiple Data Communication Options

Patented Technology

ROWAN
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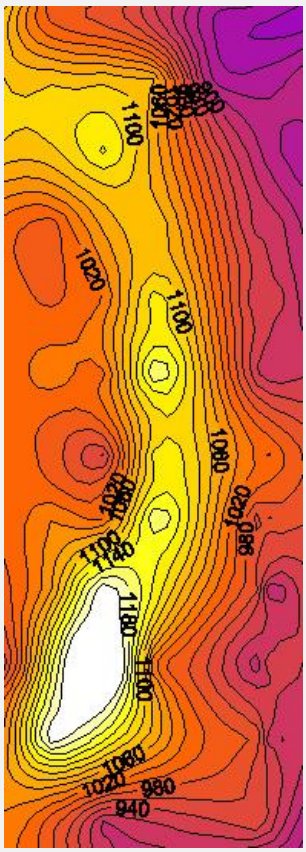
www.rowantechnologies.co.uk

SYSTEM OVERVIEW

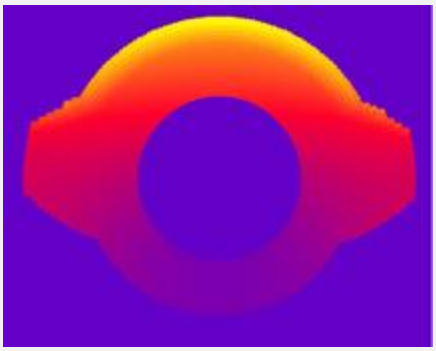
RTL's new mini-TC scanner systems are compact versions of our established scanner technology. They are housed in single, stand-alone enclosures and powered by a single low-voltage DC supply. They have on-board computing power and a range of data communication options for plant information systems, office or control room.

Just like our larger scanners, mini-scanners monitor fireside tube wall corrosion/erosion and thermal behaviour using arrays of sensors that are welded to external (cold-side tube surfaces).

They are designed for smaller monitoring areas: catering for up to 50 or more sensor locations, (as compared to up to 500 or more for our larger scanners) and their single-enclosure design allows for straight-forward, low-cost installation.

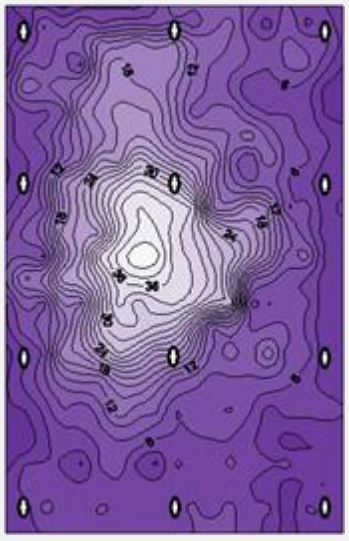


Scanner Flame Impingement Map: Supercritical Boiler



Finite Element Heat Flux Simulation: Weld-Overlaid Superheater Tube

Rugged Control Modules, Housed in Double-Sealed Enclosures: Core Electronics in Mini-Scanner Systems.

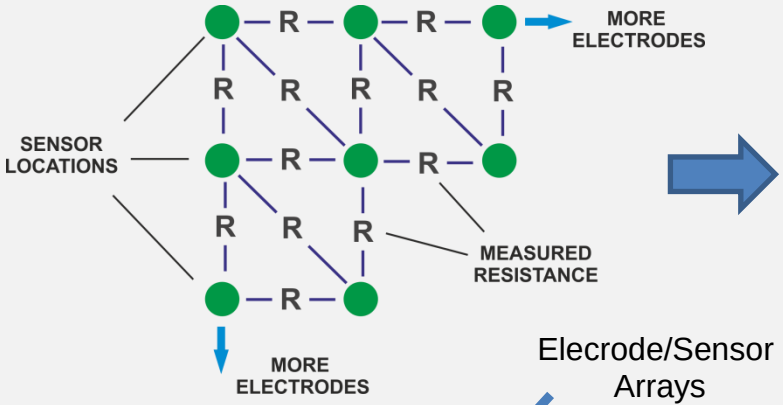


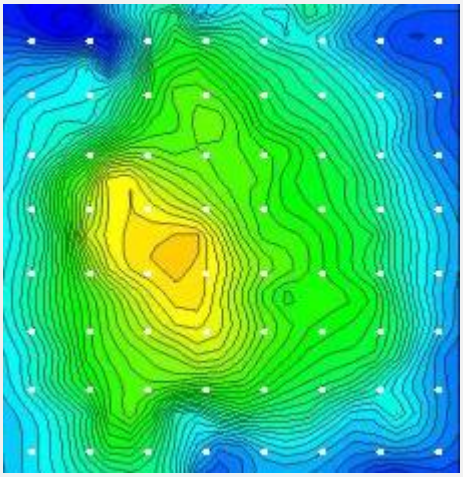
Scanner Fireside Corrosion Map - Subcritical Boiler

CORROSION AND INTEGRITY MONITORING

Electrodes, welded to external (cold-side) surfaces, are used to monitor internal, or fireside, corrosion/erosion or cracking using well-established electrical resistance techniques. Measurements are performed between adjacent electrodes in a pre-defined sequence to build complete 2D maps of wall integrity. As part of the measurement cycle, metal temperatures are measured or predicted to compensate for background 'noise' induced by thermal variations.

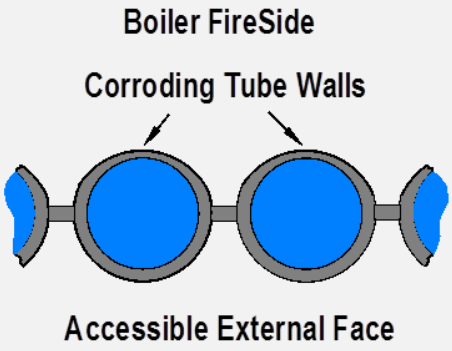
Corrosion monitoring scanners have been operational in coal fired generation plant since 1999; the longest serving system was installed in 2001 and is still in continuous operation.





Resulting Corrosion Map

Elecrode/Sensor Arrays

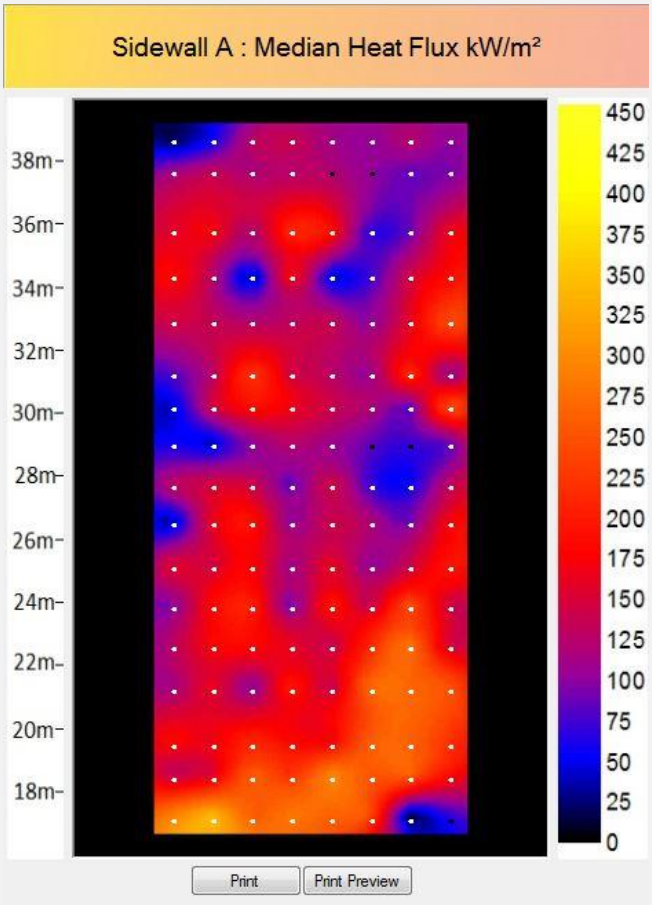


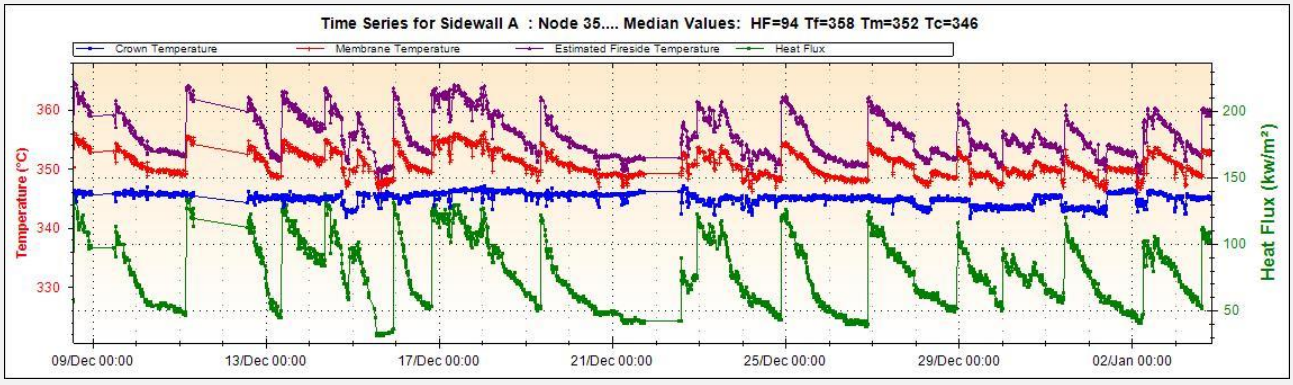
THERMAL MONITORING

Scanner systems are capable of monitoring both boiler tube wall heat flux and fireside temperatures. Also, fast scanning of the sensor array allows capture of rapid thermal transients resulting from operational changes or slag removal.

Data can be sent directly to plant information systems for immediate processing and presentation using our dedicated software: this can take the form of maps or time-dependent linear traces from specific sensor locations. Further details can be found in our dedicated thermal monitoring system (NTScan) brochure.

For optimum data quality, the systems can also be configured to use the same active measurement processes as our Active Heat Flux (AHF) monitors. Our AHF monitor brochure has further details.

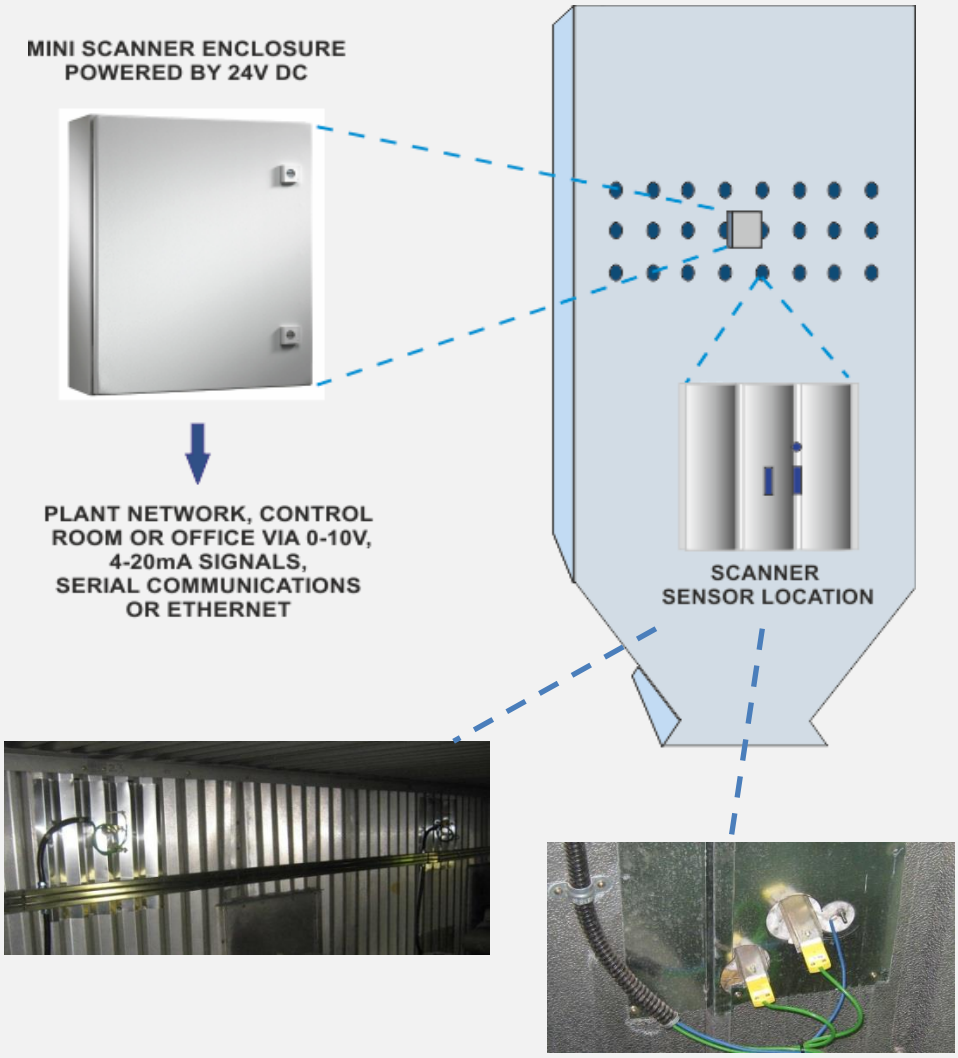




Images from RTL's dedicated Thermal Analysis Software

HARDWARE OVERVIEW

The schematic below shows a typical application for a large boiler. All scanner electronics are housed in a single wall or rail-mounting enclosure and powered by a single 24V DC supply. Cable runs from the enclosure to the sensor locations are typically no more than about 25 metres.



Features of the system include:

- Single-enclosure design with low installation costs.
- On-board computing capability – data processing, communications and storage.
- Optional Ethernet and serial communications – linking to control room or office.
- Optional 0-10V, 4-20 mA analogue outputs.
- Multiple systems can be linked to central computer for data storage and analysis.

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)
Boiler wall (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^{o}C uncertainty (long term), 1mm/year metal loss	15 days
6 mm furnace wall tube: +/- 5^{o}C uncertainty (long term), 0.5mm/year metal loss	40 days

THERMAL MONITORING:

- Approx. 300 msec per sensor measurement - a matrix of 50 sensor pairs scanned in about 30 seconds. Speed can be increased for dedicated thermal scanners.
- Temperature differences accurate to approx 0.2^{o}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% (or +/- 10% for Active Heat Flux sensor configurations).

Above figures are a guide may be subject to change.

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