Active Thermal and Corrosion (ATC™) Monitoring Systems

Designed for Single or Multiple-Point, Focused Monitoring of Boiler Membrane Walls.

Part of a Range of Monitoring Systems supplied by Rowan Technologies

A New Monitoring Approach using ‘Active’ Signals and Tailored for Point Locations

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

Real-Time Monitoring of Thermal Behaviour: Heat Flux, Surface Temperatures, Slagging, Fouling and Wall Cleaning

Can be used in Place of Intrusive Heat Flux Sensors

Continuous Monitoring of Fireside Tube Wall Corrosion and Erosion

Compact Fully-Autonomous Technology: Multiple configurations with Low Installation Costs

Multiple Interface Options with Plant Information Systems

Patented Technology

ROWAN
TECHNOLOGIES LTD

www.rowantechnologies.co.uk

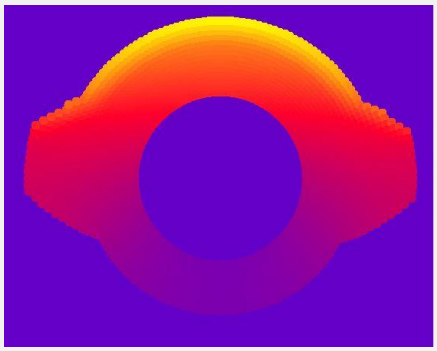
SYSTEM OVERVIEW

ATC systems are dual-purpose systems capable of monitoring both tube wall heat flux and/or fireside tube wall corrosion and erosion of boiler membrane walls. The systems are ‘active’ because they apply signals through the tube wall cross-section during the measurement process.

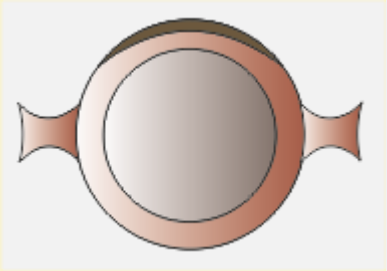
These recently-developed systems have evolved from RTL’s scanner technology: included within the ATC systems are refinements of techniques used within the scanners, as well as incorporating new measurement methods. ATC systems use a ‘focused’ approach: measurements typically taken across 1 or 2 tubes as compared to the ‘whole wall’ approach, using rectangular arrays of sensors, normally used by the scanners.

Like the scanner sensors, the ATC sensors are non-intrusive - no access through the boiler wall is required. The sensors are welded directly to the cold-side wall surfaces.

The ATC base unit comprises compact, fully autonomous electronics with on-board computing power, all housed within one small double-sealed enclosure that can be interfaced to plant information systems using a variety of methods. Additional multiplexing creates multi-point monitoring capability.

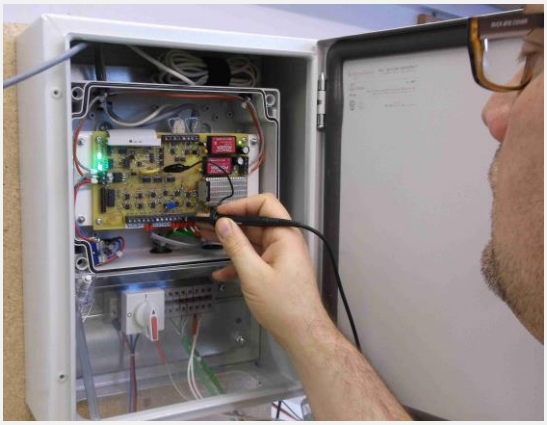


Finite Element Heat Flux Simulation:
Weld-Overlaid Superheater Tube



Fireside Corrosion:
Subcritical Boiler

Sensor Configuration



Sealed Dual-Enclosure Design

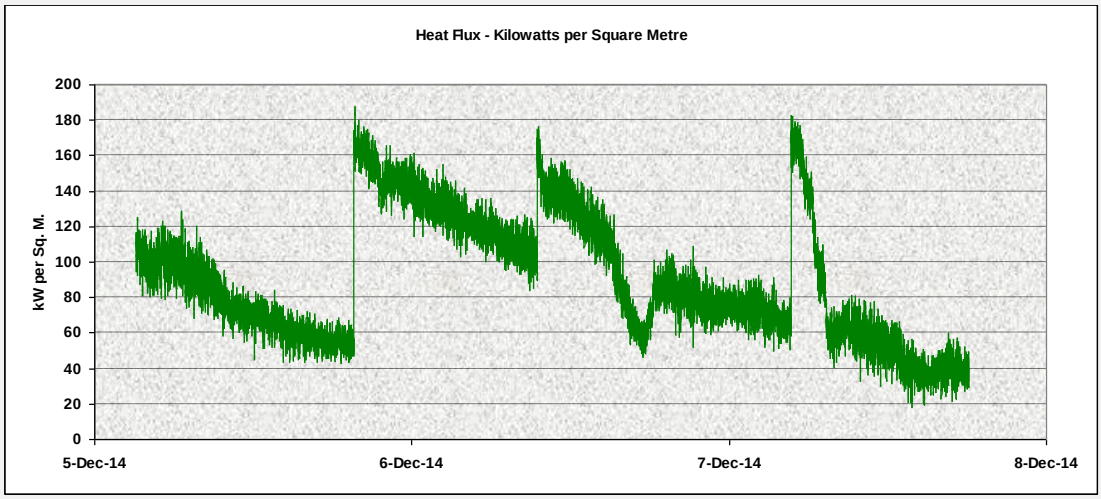
THERMAL MONITORING

For heat flux monitoring, ATC systems combine finite element modelling information with a dual measurement approach: the first method (a refinement of the scanner's technique) uses passive measurement of tube surface conditions, whilst the second method actively passes signals through the whole wall cross-section, including the fireside tube wall. Results from both methods reinforce each other and are combined to provide enhanced-quality heat flux data.

Up to around ten measurements per minute are processed in real-time, stored locally at the electronics and made available to the plant information systems via a number of methods:

- 0-10V or 4-20 mA analogue signals.
- Digitally via serial or Ethernet links.

These methods provide a range of options for real-time data acquisition and display using an office or control room computer.



ACT Heat Flux Data – Subcritical Boiler

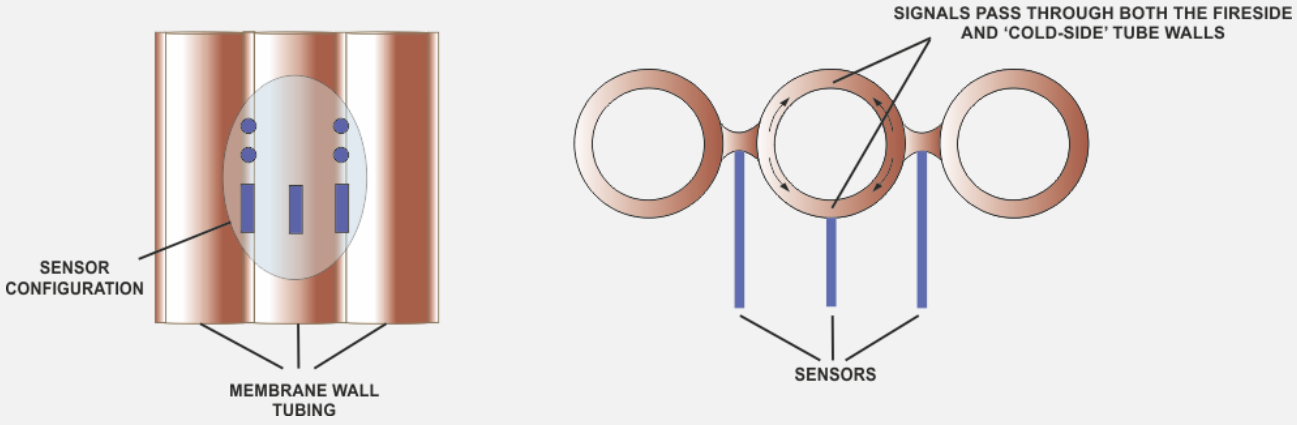
CORROSION MONITORING

ATC systems use a refined version of the scanner's electrical resistance corrosion monitoring methods. The highly-focused monitoring approach i.e. typically across a single tube, helps to minimize sources of measurement noise (mainly caused by the dynamics of the boiler wall), resulting in improved response times when detecting metal loss. Corrosion data is stored locally at the electronics and is also delivered to plant information systems in the same way as thermal data.

Superheater Tube Wall Corrosion

HARDWARE OVERVIEW

The schematic below shows the electrode/sensor arrangement. A total of seven robust sensors are welded directly to the cold-side of the tube wall, typically around a single tube. During the measurement sequence, signals pass around both cold-side and fireside tube walls, enabling the cold-side sensors to detect fireside tube wall conditions.



ATC enclosures are usually positioned in readily-accessible locations within about 15 metres of the ATC sensor locations. Signal cables, pre-connected to the enclosure, run to the sensors in suitable conduit. Enclosures are powered from a single low-voltage DC supply.

As well as operating as single stand-alone units, ATC systems can be:

- Configured as multiple-units, covering a wide area, with central computer e.g. office or control room.
- Configured, with additional multiplexing, for multiple-point monitoring close to the ATC base unit.
- Configured to create small fully-autonomous scanner systems.
- Integrated with normal scanner hardware and systems.
- Used for alternative corrosion and thermal monitoring applications where the inherent measurement techniques are suitable.

SPECIFICATIONS

THERMAL MONITORING

- Maximum approx.10 heat flux measurements per minute.
- Heat flux accuracy within ~ +/-10%.
- Sensor difference accuracy <0.2^0 C (most critical for heat flux measurements).
- Cold-side surface temperature stability approx. +/- 1^0 C and accuracy approx. +/-2^0 C.

CORROSION/EROSION MONITORING

Sensitivity to metal loss - typical values:

- Boiler wall (dynamic central zone) 2000 ppm (1 part in 500).
- 6 mm tube wall @ ~0.5mm/year metal loss ~30 days response time.

Quantification is achieved more quickly for higher corrosion rates, thinner walls and thermally less-dynamic conditions. Above figures assume normal ‘uniform’ corrosion, as compared to highly localized pitting.

OUTPUTS, DATA COMMUNICATION OPTIONS AND DATA STORAGE

- 2 x 4-20 mA.
- 2 x 0-10V.
- Bespoke serial data link to (optional) data logger.
- Ethernet.
- Minimum 10 GBytes on-board storage.

POWER REQUIREMENTS

Single 24 or 48V DC supply. Max. 3A.

HARDWARE CONFIGURATIONS

- Single base unit will serve up to two sensor locations.
- Multiple base units can be configured with central data logger.
- Optional multiplexing electronics for increased sensor capacity with scanner capability.
- Can be integrated with standard scanner electronics.

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

Rowan Technologies Ltd
Manchester UK
mail@rowantechnologies.co.uk
www.rowantechnologies.co.uk