ALUMINIUM INTERNATIONAL TODAY Newspaper

The journal of aluminium production and processing

www.aluminiumtoday.com

ALUMINIUM 2026

One visit to meet the industry and find your answers



Patrick Herman, Event Director at ALUMINIUM

A welcome from Patrick Herman, Event Director at ALUMINIUM*

It is my great pleasure to welcome you to ALUMINIUM 2026 – the world's leading event for the aluminium sector, returning to Messe Düsseldorf from 6 to 8 October. Every two years, our show brings together the entire industry for a dedicated exhibition and conference, driving meaningful conversations, innovation and business ventures. This year, that mission feels more relevant than ever.

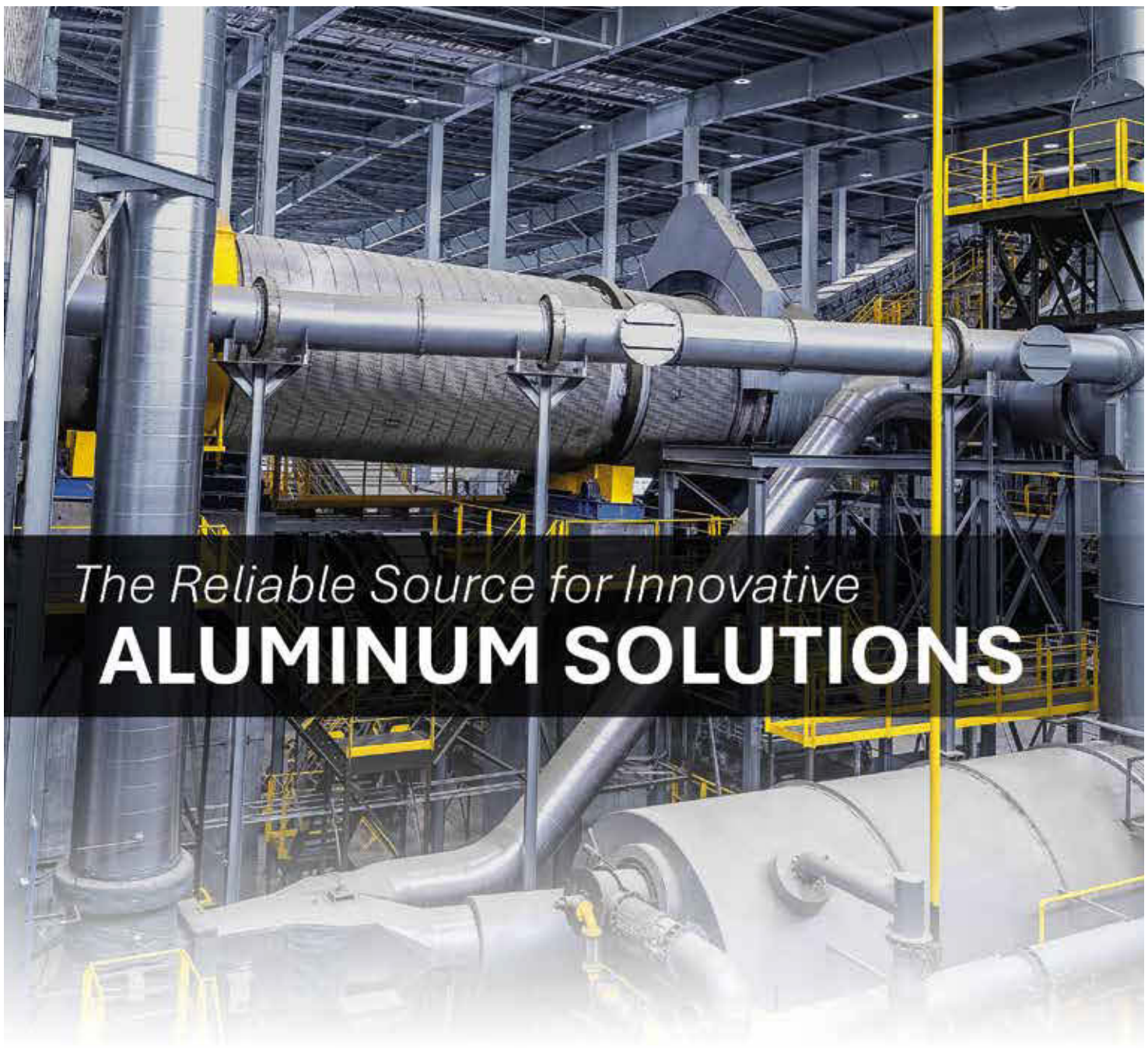
In recent years, our industry has made impressive progress on innovation and sustainability – much of it already proving itself at industrial scale. The task now is to turn this ambition into long-term results that hold up under real and challenging market conditions.

The questions our visitors bring to Düsseldorf reflect this: Which partners can I rely on for critical supply? Who meets compliance requirements at a competitive cost? Which technologies deliver in daily operations, not just on paper?

ALUMINIUM 2026 remains the industry's stage for technology and innovation – but deliberately goes further, creating room for the strategic discussions behind every investment decision. It is built to make those conversations efficient, focused, and commercially meaningful – which is why our guiding message this year is a simple but powerful promise: one visit, multiple business-critical conversations.

Continued on page 4





DESIGN · SUPPLY · INSTALLATION

INDUSTRIAL FURNACES
ENGINEERING
REFRACTORY SERVICES

314-423-9460 | St. Louis, Missouri

www.gillespiepowers.com

GPX

Achieving a perfect aluminium slab reheat

Dr Steve Offley* introduces the technique of the thru-process temperature monitoring of aluminium slab core temperatures within the reheat homogenisation furnace.



In the hot working of aluminium stock, the initial cast slab is passed through continuous pusher furnaces to reheat and homogenise at temperatures up to typically 550°C (1022°F).

The actual set-point temperature and soak time employed in the process is obviously influenced by the stock characteristics including type of alloy and the physical dimensions of the slab, thickness, and overall thermal mass.

Although modern furnaces incorporate sophisticated temperature control methods, often based on intelligent mathematical models, the success of the heat treat programmes requires independent validation.

The process engineer needs to understand how the furnace programme characteristics, unique to each furnace (temperature and time) effect the temperature of the aluminium slab throughout the complete production heat treatment cycle (passage through the furnace) at different locations within the slab structure (length, width and depth).

Other techniques used for product temperature measurement in process, including furnace contact thermocouples and IR temperature measurement (spot, scanner or camera) limit temperature to the surface slab and often are restricted to one face of the slab only. To achieve efficient hot rolling it is critical the correct slab drop out temperature is achieved through the entire slab core.

Validating furnace control programmes

To validate the performance of the heat treat process, a temperature profile of the slab temperature at different locations within the slab through the heat treat furnace is needed.

To eliminate the inherent problems of the trailing thermocouple approach, the alternative method of thru-process temperature profiling is recommended.

As its name suggests, the measurement system (data logger) passes through the process attached to the test slab during normal production conditions, measuring the temperature of the test slab using short thermocouples at up to 20 critical points.

The data logger is protected from the heat of the furnace by a highly efficient thermal barrier which keeps it at a safe operating temperature.

As the monitoring system is self-contained within the test slab, the system is free to travel safely through the furnace, without any of the inherent challenges of long trailing thermocouples as part of the standard production cycle within a fully loaded furnace.

PhoenixTM data logger range

At the heart of the monitoring system is the data logger designed specifically for use in the hostile heat treat environment.

Data loggers can be provided in a variety of configurations to suit the specific demands of the process being monitored. Models ranging from 6 to 20 channels can be provided with a variety of thermocouple options (types K, N, R, S, B) to suit measurement temperature and accuracy demands (AMS2750 & CQI-9).

Although thermally protected by the thermal barrier the operating temperature of the data logger during transfer through the furnace will increase up to the safe maximum operating conditions (100°C (212°F) in evaporative water barrier).

The data logger temperature change, which would normally affect the thermocouple reading, is automatically compensated for using an accurate internal temperature compensation feature protecting the measurement accuracy in process.

Built to cope with hostile industrial environments the IP67 logger is capable of managing even the most demanding processes where water spray quenching may be necessary.

An optional unique two-way RF telemetry package offers live real time logger control and process monitoring. Slab core temperature readings recorded by the data logger, in-process, are transmitted directly from the furnace back to the monitoring PC via a network of RF repeater units.

Thermal barrier design

Heat treating a 30 tonne, 600 mm (24 inch) thick aluminium slab requires considerable heat to achieve homogeneity. Processes are typically therefore up to 20 hours at 500°C (932°F) and as such the thermal barrier used to protect the data logger needs to be very efficient but at the same time be compact enough to allow safe installation within the slab.

For such process the recommended thermal barrier design is based on a dual phased evaporation technology. The high temperature data logger operating safely at temperatures up to 110°C (230°F) is housed within the dry cavity of a water tank.

Data logger sealing options within the thermal barrier are available including IP67 compression fittings, recommended if water spray quench steps are employed in process.

During transfer through the furnace the water heats up to its boiling point at 100°C

Fig 1 - Aluminium slab thermal barrier showing (1 & 2) dual data logger tray within water tank and (3) filler and exhaust pipes and (4) slab mounting points.



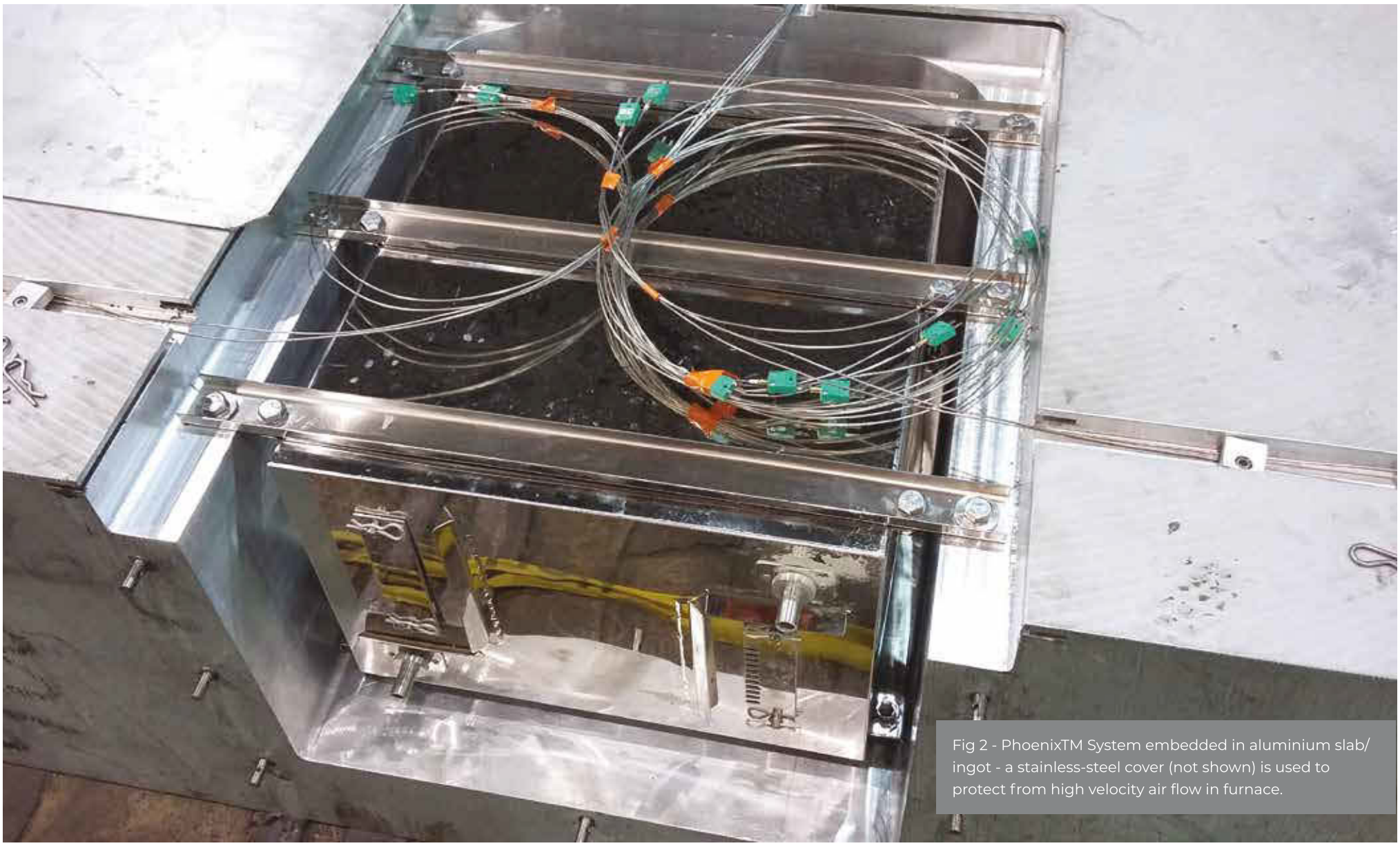


Fig 2 - PhoenixTM System embedded in aluminium slab/ ingot - a stainless-steel cover (not shown) is used to protect from high velocity air flow in furnace.

(212°F) and then maintains the temperature as water phase changes from liquid to gas (steam). The rate by which the water temperature in the tank rises is further controlled by an outer skin of microporous insulation which helps reduce rapid temperature changes and associated risk of distortion problems for the thermal barrier structure.

The exact thermal barrier protection is governed by the capacity of the water tank. When specifying the correct thermal barrier design often there is a fine balance between maximising the size of the water tank and volume of water available to the outer dimensions of the thermal barrier suiting the size of the slab being monitored.

A feature of the pusher furnace design is that the slab is rotated at the entrance and exit of the furnace to maximise loading capacity. The rotation of the slab and consequently the thermal barrier as well could create problems with water loss and deterioration in thermal capacity. The water tank construction is therefore designed in a unique way to orientate water filler and steam exhaust pipes to minimise water loss during any rotation step (**Fig 1**).

Monitoring system

Generally, a test slab is prepared by machining a portion out to accept the monitoring system with the thermal barrier often positioned centrally and, in a position, where it will not impede any equipment used to load / unload the slab.

The assembled monitoring system fitted within the slab cavity is covered with an external metal shield (**Fig 2**). The shield has two purposes, firstly to protect the thermal barrier from high levels of heat transfer from high velocity hot air convection, and secondly to maintain air flow patterns over the slab itself to maintain normal production heating conditions.

Thermocouple placement

Temperatures within the slab are measured from the tip of the mineral insulated thermocouple. To position the tip at the exact location / depth within the slab pilot holes need to be drilled in the slab.

Depending on the type and diameter of thermocouple to be used, aluminium bushes may need to be used as guides. If a small diameter thermocouple is used, for example a 1.5mm (1/16 inch) diameter mineral insulated type, then it would be impractical to drill a small hole say 300mm (11.8 inches) deep to the measuring point.

In this case, a large diameter hole can be drilled, and bushes used. It is essential that the thermocouples are firmly secured to the slab as they travel from the data logger to the measuring point.

Often the thermocouples are channelled along groves in the slab surface so that the cables are confined within the slab eliminating snagging risks in the furnace, or on charging / discharging the equipment (see product insert image in **Fig 3**).

Handling the data

The result of the thru-process monitoring step is the invaluable temperature profile graph (**Fig 3**). The profile graph represents a thermal fingerprint of what temperatures the aluminium slab achieved through the process at the selected locations over the slab footprint and at specified depths within its core.

The profile data can be interrogated in detail to fully understand the heat treat operation at the critical product level and be used to control, optimise and validate the furnace operation.

Such data is essential to accurately set-up and verify mathematical model predictions used to control the furnace operation and ensure that the process is run efficiently to save energy, improve productivity and reduce carbon emissions.

Conclusion

Thru-process product temperature profiling is an accurate and efficient method to measure aluminium slab internal core temperatures in pusher furnaces prior to hot rolling operations.

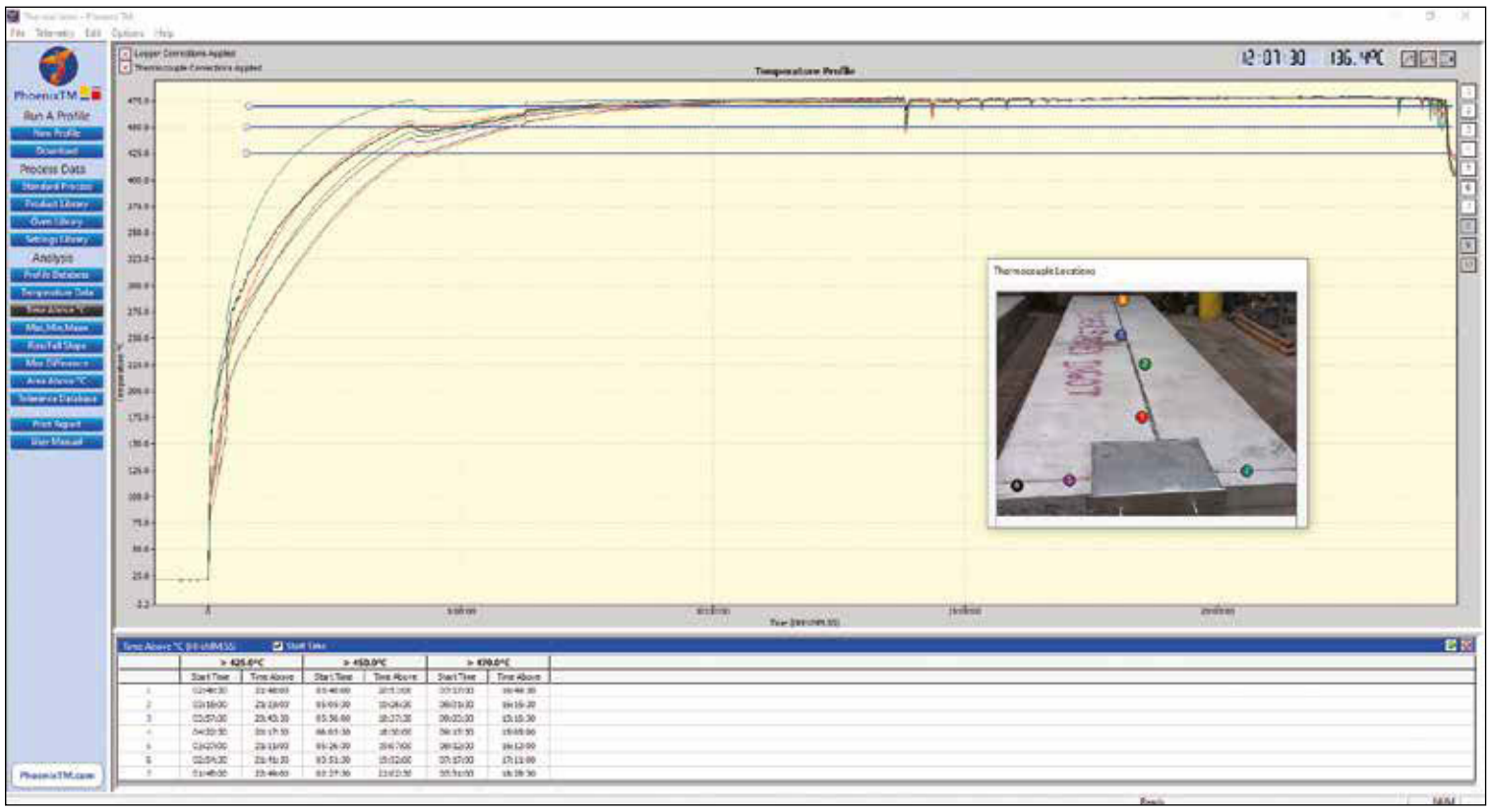


Fig 3 - Temperature profile graph showing the temperature variations within the aluminium slab core over the entire heat treat process. Soak times at critical temperatures can be accurately calculated to ensure that drop out temperatures and rolling operations are performed correctly.

Non-homogeneous temperature conditions can be prevented that would potentially cause variation in downstream processing and compromised final product quality, ultimately leading to energy wastage, higher costs, and rejections.

***Product Marketing Manager, PhoenixTM, Cambridgeshire, UK**
www.phoenixtm.com

PhoenixTM

Phoenix Temperature Measurement

... where experience counts !

Temperature Profiling and Surveying solutions for Aluminium T6 Heat Treat Processes

Measure, Control, Improve .....and Certify!



Comprehensive

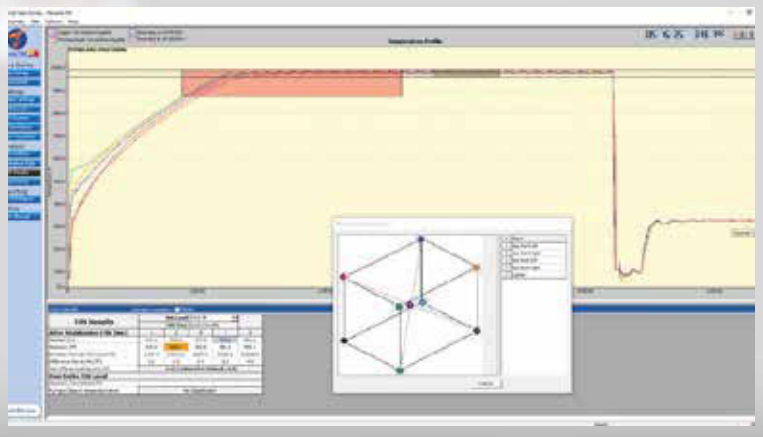
A complete product temperature profile

- Accurate product temperature through the solution furnace, water quench and ageing furnace.
- Measurement with up to 20 thermocouples giving detail over whole product or product basket.
- Real time live data with 2-way RF Telemetry option.



Easy

- No Trailing Thermocouples. Passes safely through furnaces and quench without production delays. Measure true production conditions.
- New rubber gasket seal design offering IP67 protection in water quench.
- 10 or 20 channel data Logger operation.
- Quick easy repeat thermocouple fitting and lower consumable costs compared to traditional compression fittings.



Compliant

- Product temperature profiling and TUS capability.
- Fully compliant efficient analysis and reporting to AMS2750/ AMS2770R or CQI-9.

Other aluminium application monitoring solutions from PhoenixTM
Homogenising, Ageing, T5, Brazing & Power Coating
Contact PhoenixTM today!

www.phoenixtm.com

PhoenixTM Ltd UK
sales@phoenixtm.com

PhoenixTM GmbH Germany
info@phoenixtm.de

PhoenixTM LLC USA
info@phoenixtm.com