



“How to jump-start the shift to electric heating in the aluminium industry”

GEARING UP TO GO GREEN

A clean, green and low-cost future is on the doorstep in the aluminium industry as electric heating systems become a force to be reckoned with. New, landmark testing by Kanthal reveals trailblazing performance results – putting the goal of achieving zero CO₂ and NO_x emissions within easy reach.

THE ROAD TO ZERO EMISSIONS

The green revolution is accelerating in aluminium production as the next generation of electric heating systems become readily available as a replacement for gas burners. The impact of “going electric” is expected to be transformational as CO₂ and NO_x emissions are eliminated from the workplace which unlocks a myriad of benefits.

Take for example our recent electric innovation, the Kanthal® Flow Heater system. It not only provides heating temperatures of up to 1100 °C (2012 °F) with ± 1°C-controllability and zero carbon output, our testing shows that net efficiency is typically as high as 90 percent. This means that electric heating achieves a performance that is equal to gas burners.

Industries like aluminium are at a crossroads in the evolution of practices to ensure compliance with modern standards for health and safety and environmental sustainability. Kanthal, the leading electric heating specialist, is pushing the boundaries in the design of advanced heating elements for low-carbon aluminium products– and we have just set a new milestone.

ELECTRIC HEATING VS GAS BURNERS: THE RESULTS ARE IN!

As each process in aluminium production presents specific challenges, Kanthal offers electric heating systems that cover five main areas:

- Anode pre-heating station
- Anode stub drying station
- Cathode pre-heating station
- Ladle heating and drying systems
- Holding furnaces

WITHIN PRIMARY ALUMINIUM OPERATIONS, OUR TWO MAIN FOCUS AREAS ARE:

Rodding Shop:

A plant within the plant for Anode and Cathode pre-heaters, Anode Stub dryers and Ladle Heaters for holding of cast iron.

Cast House:

For drying and heating of Transport Crucibles including Tapping Tube smelters, Holding Furnaces, Launder Heating, Ingot and Sow Caster Preheater, Filter Heating and Air Heating for Scrap and Homogenization furnaces.

Through feasibility studies carried out together with customers, including the German casthouse specialist Drache, we have established that electric heating systems not only meet the performance of gas burners, but go the extra mile in terms of heating times.

Using an aluminium filter box as the basis for testing, the 40 kW Kanthal® Flow Heater was used to simulate two scenarios: A) initial heating at room temperature (from 20 °C) and B) heating during standard filter change (from 300 °C). The electric heating system was connected to the frame of the filter box and fed with air by a side channel blower driven with 88 mN³/h air flow.

The Kanthal® Flow Heater was then ramped up and measured at intervals up to 700 °C at the filter. The test

results for preheating of aluminium showed a heating time of 40 minutes for the first scenario and, starting at 300 °C, 18 minutes for the second scenario.

Frank Reusch, Technical Manager, Drache, comments on the results:

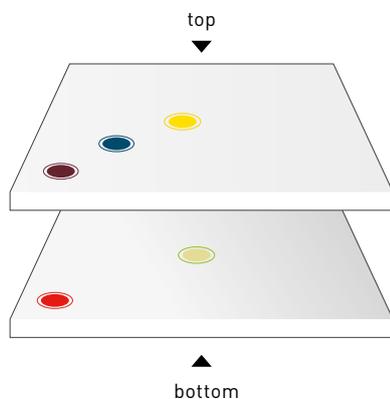
“The testing has proved that electric heating meets both our prerequisites of providing an efficient alternative to gas burners and total reliability. This opens the door to increased safety and a cleaner, healthier working environment which is a strategic goal for Drache.”

THE NEXT STEP: FINE-TUNING THE APPLICATIONS

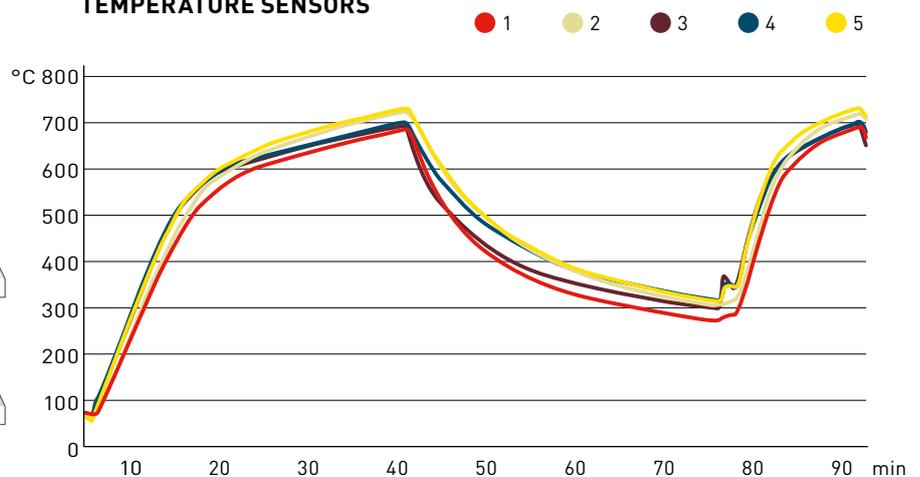
Adopting new alternative technologies in complex aluminium operations is understandably not a step taken lightly. That is why Kanthal works continuously to facilitate the green transition by optimizing electric heating solutions for a wide array of our customers' heating requirements.

For example, at primary aluminium plants we reach agreements to review existing processes and develop alternative solutions starting with preliminary design and testing. Pre-heating is often the desirable option before any casting operation is undertaken in the rodding shop to overcome humidity – which is crucial to avoid cracked surfaces and to ensure safety.

TEMPERATURE SENSORS LOCATIONS ON THE FILTER



TEMPERATURE SENSORS



Putting electric heating to the test: Kanthal® Flow Heater was ramped up and tested at intervals up to 700 °C at the filter. The results showed 90% net efficiency and the fastest heating times on the market for electric elements – matching the performance of conventional gas heaters.

HEATING MODULES AND ELEMENTS

In this process, we use Superthal™ high power reflectors to minimize the risk of failure and provide rapid, clean, silent and efficient heat into the mould chain prior to casting. The same proven technology is applied for anode preheating, where short wave radiation is absorbed, and electric ladle heating for crucibles where Superthal™ reflectors can provide multipurpose heating for drying and preheating.

But it doesn't end there. To speed up the process of bringing ladles back into service after periods of inactivity, our Kanthal APM™ tubes and Tubothal® heating elements enable rapid preheating.

MODERNIZING FURNACES, SAVING COSTS

Electric heating systems from Kanthal can be introduced in the vast majority of aluminium operations to modernize furnaces. Our expertise in reverberatory furnaces used for mixing, for example, has shown significant operational life improvements using Globar® SDA elements, extending the service life by at least 25 percent.

Similarly, Globar® SDA elements have scored high performance results in small holding furnaces used in secondary aluminium plants, in the 5–25 tonne capacity range.

For large holding furnaces in primary aluminium plants (40–100 tonnes), our Tubothal heating elements are an ideal choice and cut operating costs significantly thanks to improved energy efficiency and 0.5–1 % less dross formation – enabling reduced metal loss. Last but not least, carbon emissions are reduced to zero.

The electrification of holding furnaces has proved successful in Russia, Iceland, France, Australia, India and Brazil, where Kanthal has supplied electric heating solutions for more than 70 furnaces in the capacity range of 40–100 tonnes.

In all cases, the use of Kanthal glazed elements increased the service life from 3 to 6 months, leading to major costs savings in both heating elements and maintenance. When operating temperatures for holding are relatively low, typically 980 °C, the heating elements can last for years.



Prior to casting operations, crucibles, anodes and yokes must be preheated to overcome humidity. The electric-powered Kanthal® Ladle Heater provides a multipurpose solution for drying and preheating.



The Kanthal® Flow Heater is available in the power range 3.5 to 40 kW and lays the foundation for a clean working environment at aluminium plants.



GOING GREEN: ON-SITE EVALUATION

With each new installation of Kanthal heating solutions, our analysis of performance data supports and bolsters the underlying trend toward electric heating as a cost-efficient alternative to gas burners.

More fundamentally, this step-change toward clean energy enables aluminium producers to leave a not so clean history behind and make sweeping improvements.

Kanthal takes a leadership role in helping companies lay the foundation for operations that:

- Improve workplace health and safety
- Eliminate CO₂ and NO_x emissions
- Boost productivity
- Reduce operational costs
- Establish future-proof, environmental compliance.

To help our customers start this process, our service portfolio includes a customized, on-site evaluation service called "Go Green" which provides calculation models, reports and recommendations.

This evaluation service from Kanthal has enabled companies to meet their own sustainability and workplace targets, comply with regional emissions rules and has even facilitated government support for expansion projects.

For more information on the global transition to electric heating, please contact your local Kanthal sales office listed at kanthal.com.