11-13 September / Eylül 2014
TÜYAP Fair, Convention & Congress Center, İstanbul
7th International Ankiros Foundry Congress
7. Uluslararası Ankiros Döküm Kongresi

«Next Generation Of Electrical Ladle Heaters»

«Yeni Jenerasyon Elektrikli Pota Isıtıcılar»

Marcus Andersson
(SAN Malz. Tek.)

5.Oturum: Döküm Teknolojileri Demir Dışı

5th Session: Casting Technologies Non Ferrous

Oturum Başkanı/Session Chairman: Can Demir (Componenta Döküm. Tic. San. A.Ş.- Alüminyum)

Oturumlarda yer alan sunumlar 15 Eylül 2014 Pazartesi tarihinde kongre web sayfasına **(kongre.tudoksad.org.tr)** yüklenecektir.

Kanthal® Global Services

Next generation Electrical ladle heaters

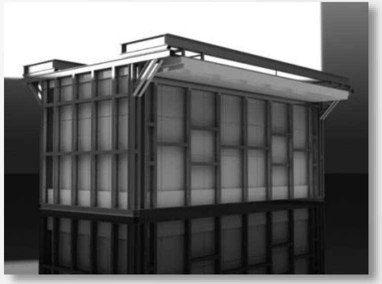
Marcus Andersson, Sandvik Heating Technology

Kanthal Global Services

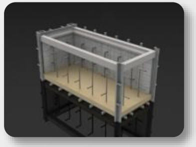
Electrical Heating Systems, Engineering services & Technical services

Electrical Heating Systems

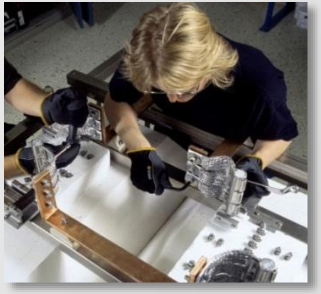
- Concept solutions
- Ladle heaters
- Ladle dryers
- Mold heaters
- Stub dryers
- Anode heaters
- Cathode heaters



Engineering Service



- Furnace re-engineering
- Commissioning
- Complete furnace refurbishment projects
- “Taylor made” heating systems
- Product trainings



Technical Service

- System Installations
- Service contracts
- Spare parts
- Refurbishments
- Repairs

Ladle heater

- Heater
- Controls
- Accessories
- Commissioning & Installation
- Service

Ladle dryers & Ladle pre-heaters

Kanthal electrical heating systems

- Suitable for both pre-heating and holding of liquid metal in primary and secondary aluminium processing and steel foundries
- Long life refractory lining by optimized processes

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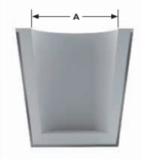
Ladle heaters

Product portfolio



Model	Ladle size A [mm] (inch)	Phases	Power [kW] (BTU/h)	Supply voltage [V]	Heater Dimensions	
					OD [mm] (inch)	H [mm] (inch)
5–7	500-700 (20"-28")	1-phase	30 (102 400)	230	1150 (45,3")	700 (27,5")
	500-700 (20"-28")	1-phase	45 (153 500)	230		
	500-700 (20"-28")	1-phase	66 (225 200)	400		
7–9	700-900 (28"-35")	1-phase	66 (225 200)	400	1350 (53,1")	700 (27,5")
	700-900 (28"-35")	3-phase	90 (307 000)	400		
9–11	900-1100 (35"-43")	3-phase	90 (307 000)	400	1550 (61")	700 (27,5")
	900-1100 (35"-43")	3-phase	135 (460 600)	400		
11–13	1100-1300 (43"-51")	3-phase	90 (307 000)	400	1750 (68,9")	700 (27,5")
	1100-1300 (43"-51")	3-phase	135 (460 600)	400		
13–15	1300-1500 (51"-59")	3-phase	90 (307 000)	400	1950 (76,8")	700 (27,5")
	1300-1500 (51"-59")	3-phase	135 (460 600)	400		
	1300-1500 (51"-59")	3-phase	200 (682 400)	400		
15–17	1500-1700 (59"-67")	3-phase	135 (460 600)	400	2150 (84,6")	700 (27,5")
	1500-1700 (59"-67")	3-phase	200 (682 400)	400		
17–19	1700-1900 (67"-75")	3-phase	135 (460 600)	400	2350 (92,5")	700 (27,5")
	1700-1900 (67"-75")	3-phase	200 (682 400)	400		
19–21	1900-2100 (75"-83")	3-phase	135 (460 600)	400	2500 (98,4")	700 (27,5")
	1900-2100 (75"-83")	3-phase	200 (682 400)	400		
	1900-2100 (75"-83")	3-phase	270 (921 300)	400		

Click to find out more!

Electrical ladle pre-heating

Case story

Existing gas burner system

In aluminum foundry

- From room temperature to 850°C in one hour
  (Retained three hours – 4 hours in total for preheating)
- Gas type: 13A (City gas)
  Power: 41.7 MJ/m^3
- Average gas consumption 6 m^3/h
  (24 Nm / 4 hours)

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Electrical ladle heating system

- Heating elements made of Kanthal® Super RA (12/24) with 3D configuration
- Heater unit is automatically raised and lowered hydraulically
- Heater specification 54kW/600A
- Attachments on both sides to minimize heat loss from the spouts

Heater unit

System

When preheating

Visual comparison

Gas burner system vs electrical heating system

- There is a small gap between the gas burner and the ladle for exhaust gas, whereas there is no clear gap on the electric heater
- The electrical heating system is equipped with a shielding cover for safety. When the heater unit is lifted, residual radiation could harm an operator

Gas burner system

Electrical Heating system

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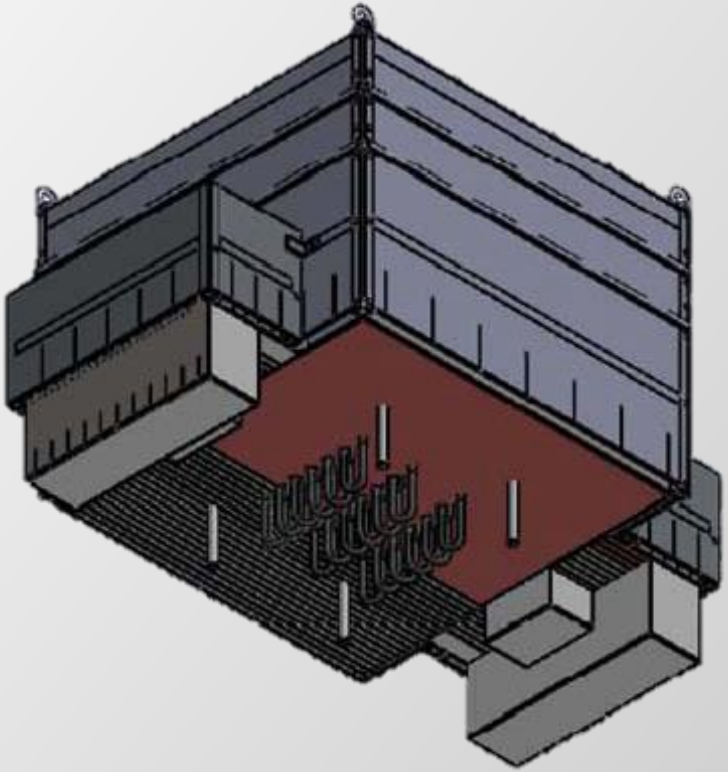
Comparison

With gas burner system

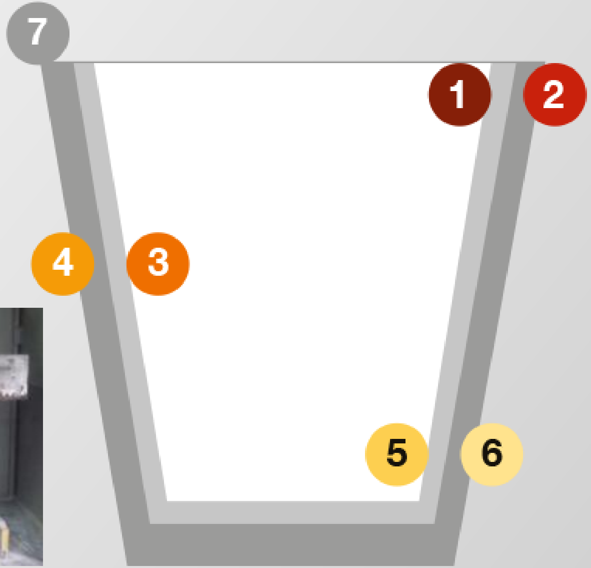
- Target temperature is fixed to achieve the same temperature in the outer wall, then a comparison is made in power consumption between the electrical heating system and the gas burner system
- Both primary and secondary electricity consumption are measured (to include power loss in controller, cable, etc)
- Target temperature: 920℃ (thermocouple)
- Temperature monitoring is always active (by Programmable Logic Controller, PLC) and controlling upper limit



Temperature measurements

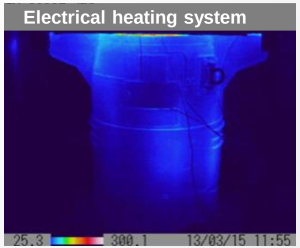
In aluminum foundry

- There are thermocouples at 7 points on the heater to measure temperature when preheating
- A data logger records each temperature every 30 seconds
- Thermocouple number 7 measures the temperature of the exhaust gas



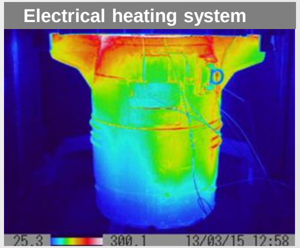
Temperature profile in outer shell

After
1 hour

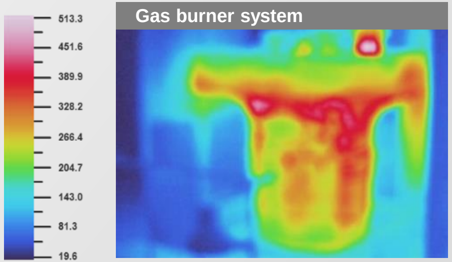


- The burner quickly heats the upper area due to the effect of the exhaust gas

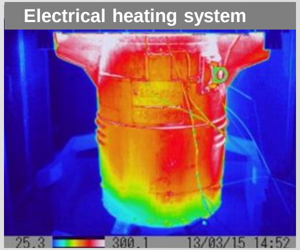
After
2 hours



- Showed almost same temperature profile
- But, only upper part for burner system showed higher temperature



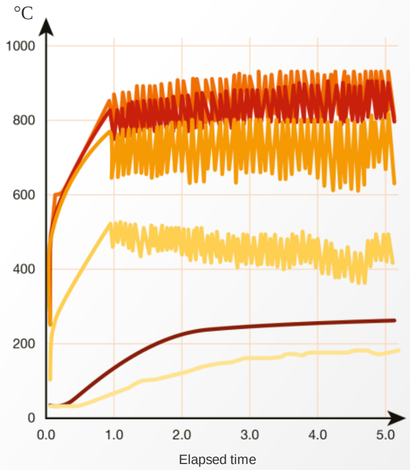
After
4 hours



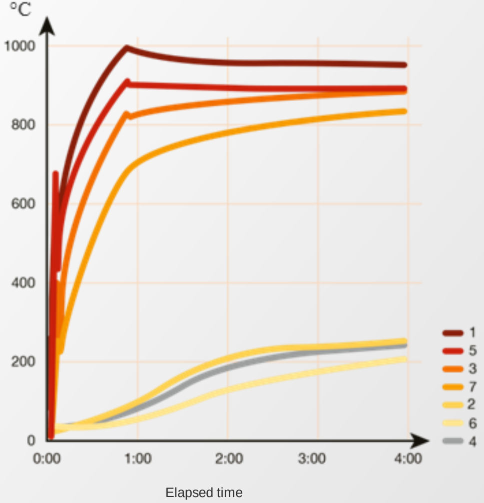
- Same as after 2 hours, but the electrical heating system showed slightly better temperature uniformity

Temperature profile over time

Gas burner system

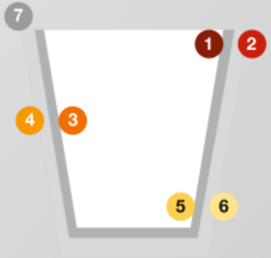


Electrical heating system



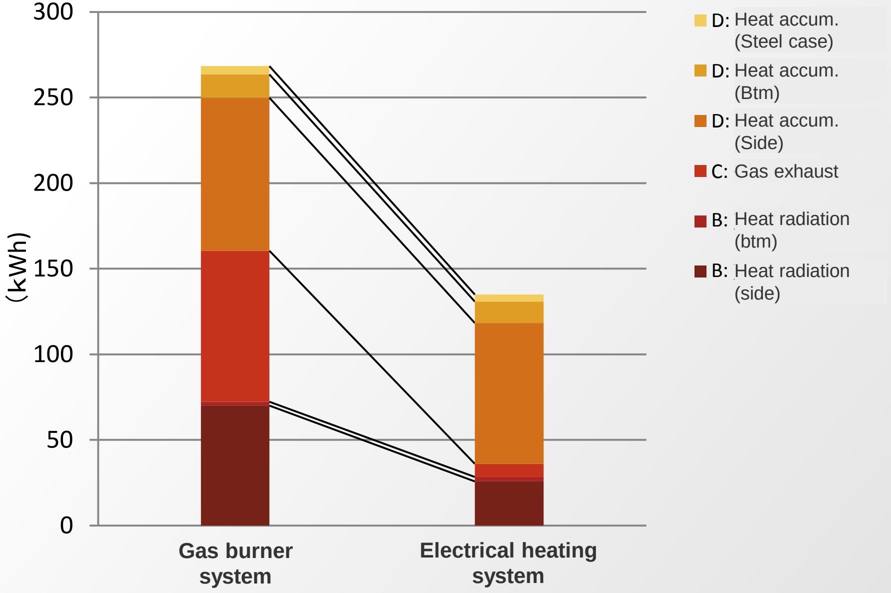
Data summary:

- CH 1 (electrical) shows higher temperature than TC (setting temperature) due to the proximity effect from the heater
- Both tests reached same temperature at CH 4 after 4 hours preheating, 250C
- The electrical heating system showed better temperature uniformity in the outer shell and inner wall



Heat balance summary

Comparison



- In the same preheating conditions, the heat balance is as shown in the graph
- Pure efficiency improvement 50% (268 kWh / 134 kWh)

Advantages

Kanthal electrical ladle heating system

Economy

- Energy consumption reduced by 50 % compared to a gas burner system
- Increased refractory lifetime by 10 – 15 % due to better temperature control compared to a gas burner system
- Unmanned operation gives low labor cost

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Advantages

Kanthal electrical ladle heating system

Quality and functionality

- Lack of combustable gases in the Kanthal ladle system gives a reduced risk of hydrogen in the molten metal which results in higher quality
- Same system can be used for drying / firing simply by changing patterns

Environment

- Reduced greenhouse gas emissions:
  CO_2 emissions for electrical heating systems = 0
- Zero NO_X

Advantages

Kanthal electrical ladle heating system

Employee health

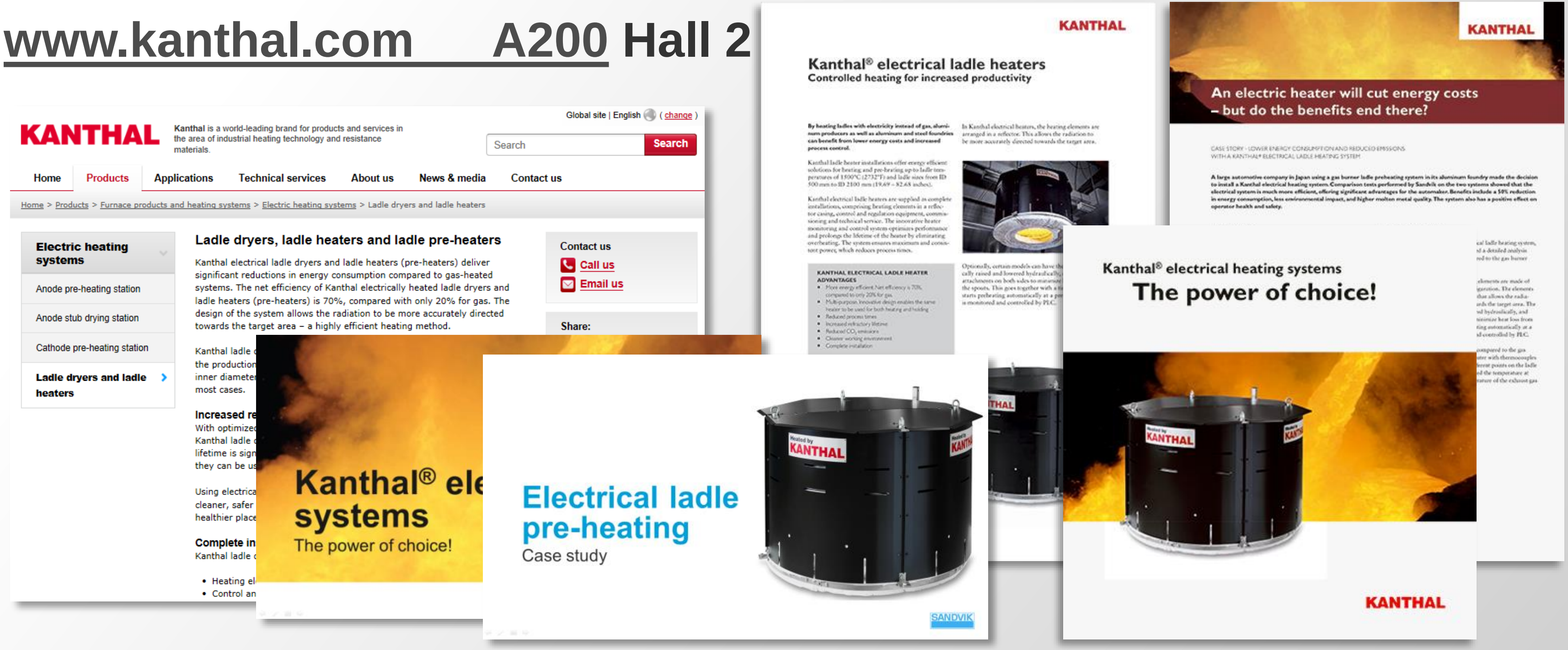
- Quiet in operation
- No harmful gas, such as CO

Employee safety

- When drying, fine tuning is possible, reducing risk of bubbles in the refractory
- No risk of water vapor build-up, low risk of vapor explosion
- No gas pipeline required

Information material

www.kanthal.com   A200 Hall 2



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Thank you for your attention!