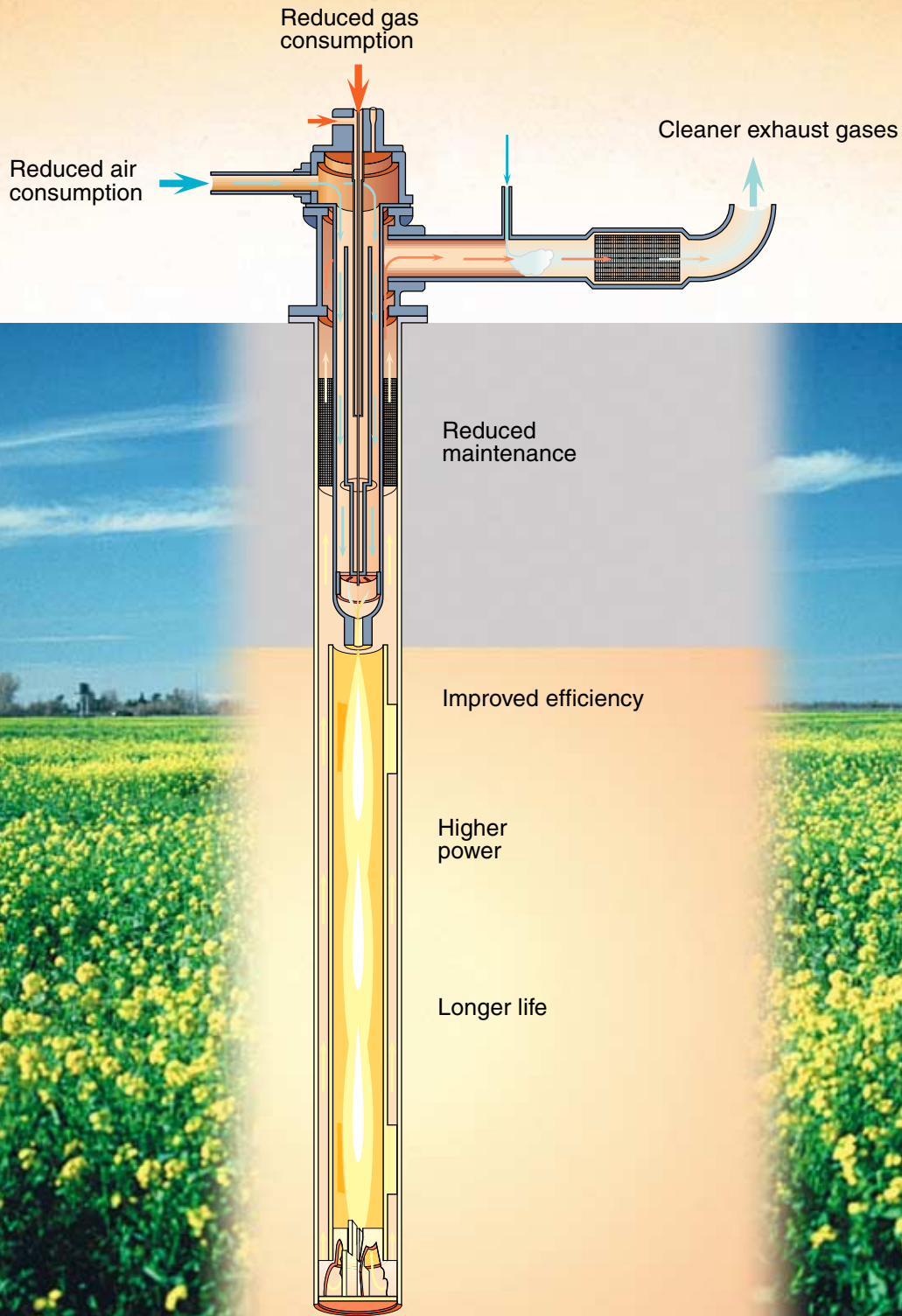


ECOTHAL[®]

Gas Fired Radiant Heaters with Catalytic Exhaust Cleaning



ECOTHAL[®] improves both economy and ecology

ECOTHAL is the world's cleanest recuperative radiant heater. With electronically-controlled gas/air supply and double catalytic converters, nitrogen oxide emissions can be reduced by around 75%!

ECOTHAL is approximately 10% more efficient than other recuperative systems. The high efficiency also reduces emissions of carbon dioxide per energy unit produced.

ECOTHAL is therefore the right choice to reduce both gas consumption and emissions. A good solution for environmentally and cost-conscious companies.

Reduced air consumption

ECOTHAL is approximately 10% more efficient than other comparable SER systems (Single Ended Recuperative). This results in a corresponding reduction in air consumption. Although air does not cost anything, ventilators, tubing, filters etc. are far from free. The available air can be used instead to burn more gas and thus increase capacity.

Electronic control provides great environmental benefits

Well-defined combustion is important to maximise efficiency and reduce pollution.

Too much air reduces the heat output and increase the amount of harmful nitrogen oxides (NO_x) in the exhaust gases.

Too little air results in imperfect combustion which causes unburnt residues in the form of carbon monoxide (CO) and hydrocarbons (C_xH_y) to be expelled with fumes to the environment.

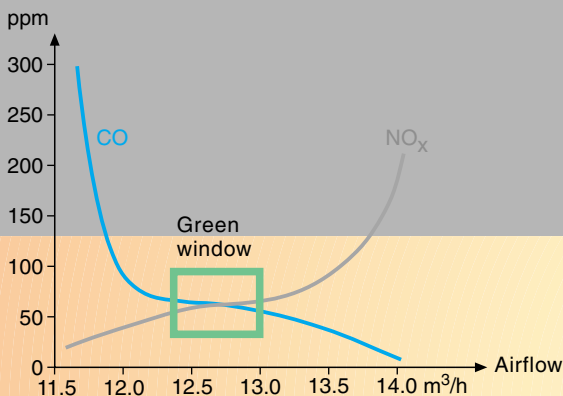
Control equipment ensures that combustion always remains within the "green window" resulting in low emissions of both nitrogen oxides and carbon monoxide.

Approximately 10% more efficient

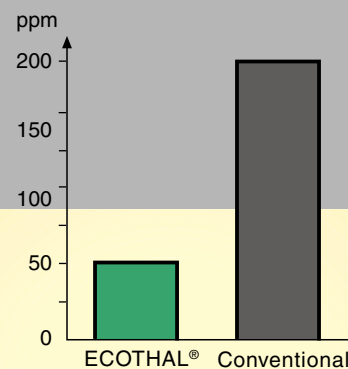
ECOTHAL's degree of efficiency is around 80%. That is approximately 10% more efficient than conventional recuperative systems.

This efficiency is the result of the lambda value and energy content of the exhaust gases. Lower lambda values and thus reduced exhaust volumes result in higher efficiency levels.

It is ECOTHAL's precise two-stage cleaning system that makes it possible to optimise the amount of surplus air and thus reduce the lambda value and the exhaust gas volume, thereby maximising efficiency.



Combustion occurs within the "green window" which results in low emissions of nitrogen oxides and carbon monoxide.



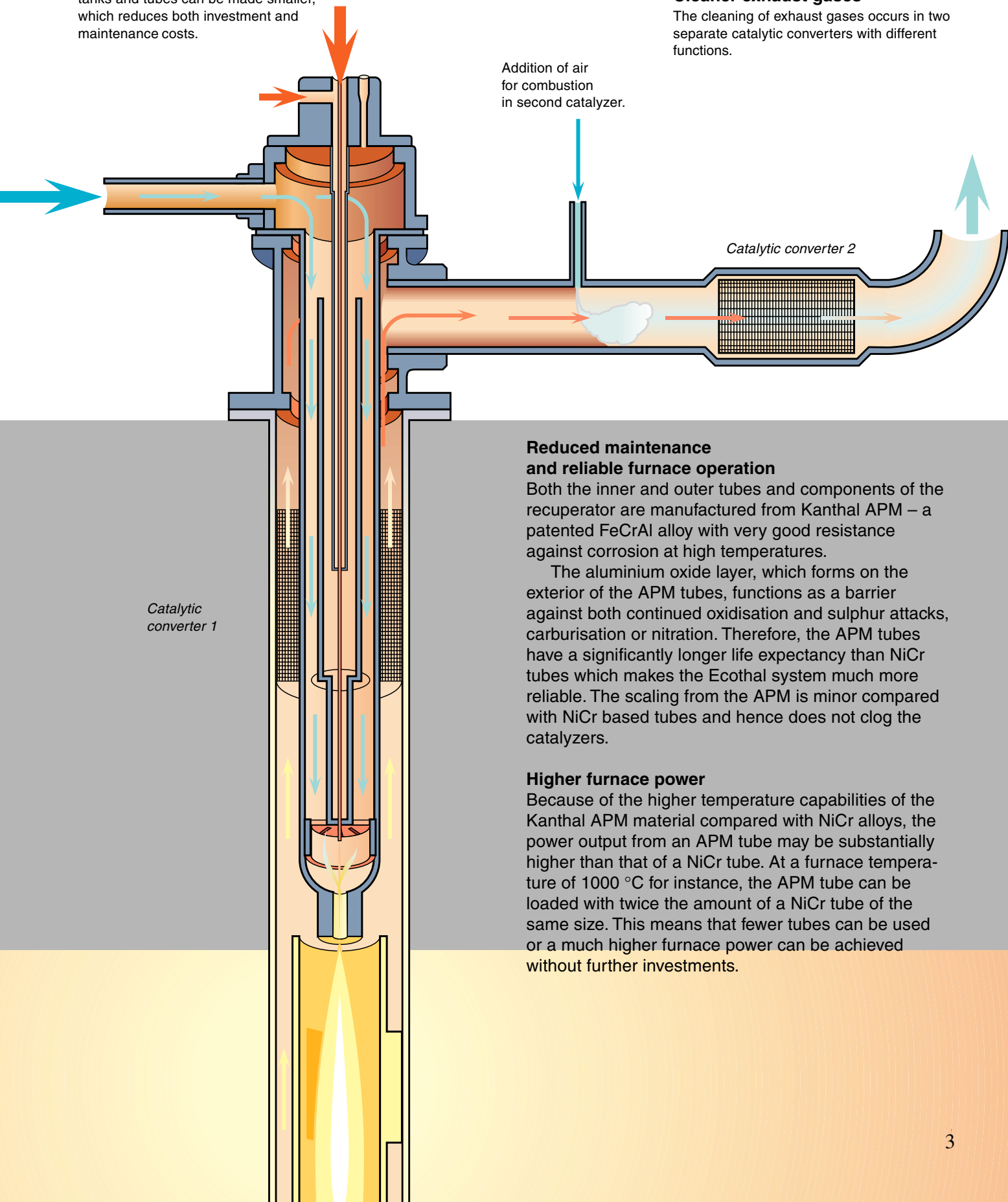
ECOTHAL reduces emission of NO_x by around 75%.

Reduced gas consumption

ECOTHAL's higher degree of efficiency and precise regulation of combustion reduce gas consumption. Compared to furnaces without recuperators, ECOTHAL is more than twice as efficient. Lower gas consumption means lower running costs, but also gas tanks and tubes can be made smaller, which reduces both investment and maintenance costs.

Cleaner exhaust gases

The cleaning of exhaust gases occurs in two separate catalytic converters with different functions.



Addition of air for combustion in second catalyzer.

Catalytic converter 2

Catalytic converter 1

Reduced maintenance and reliable furnace operation

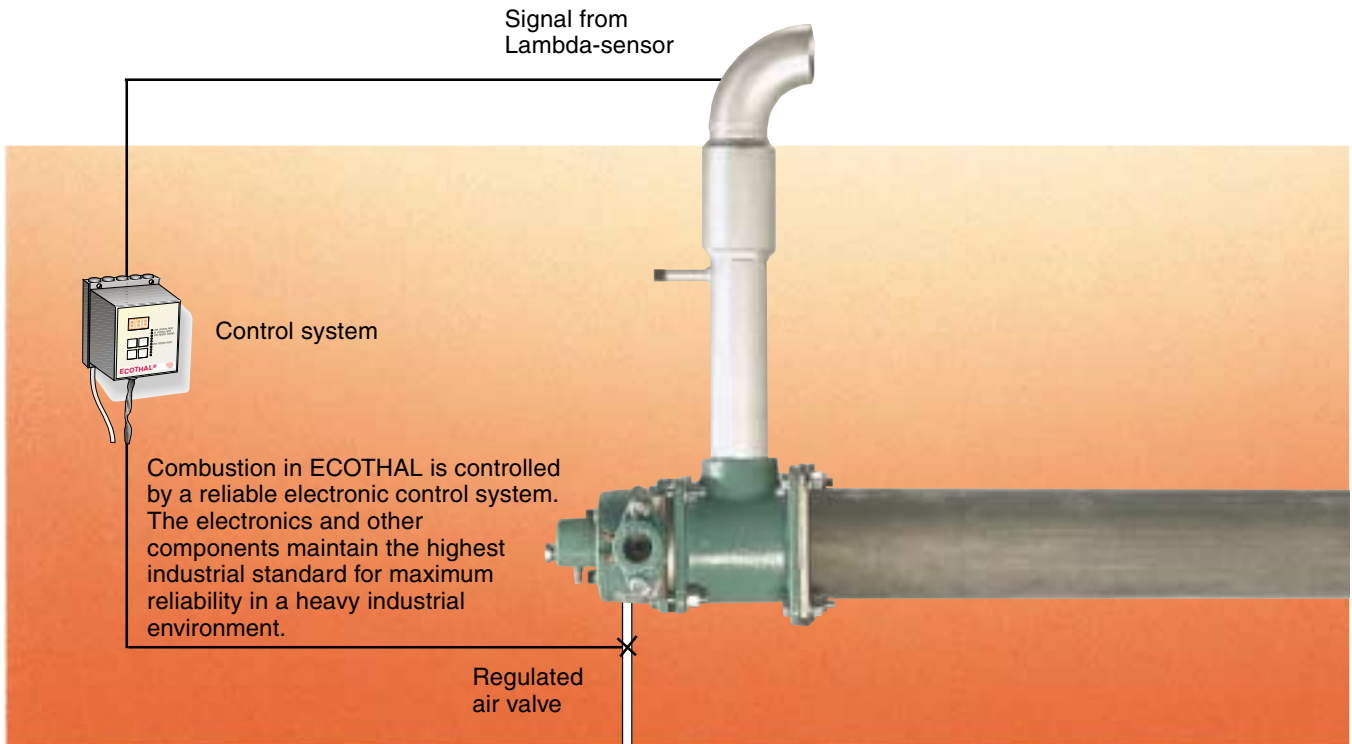
Both the inner and outer tubes and components of the recuperator are manufactured from Kanthal APM – a patented FeCrAl alloy with very good resistance against corrosion at high temperatures.

The aluminium oxide layer, which forms on the exterior of the APM tubes, functions as a barrier against both continued oxidation and sulphur attacks, carburisation or nitration. Therefore, the APM tubes have a significantly longer life expectancy than NiCr tubes which makes the Ecothal system much more reliable. The scaling from the APM is minor compared with NiCr based tubes and hence does not clog the catalyzers.

Higher furnace power

Because of the higher temperature capabilities of the Kanthal APM material compared with NiCr alloys, the power output from an APM tube may be substantially higher than that of a NiCr tube. At a furnace temperature of 1000 °C for instance, the APM tube can be loaded with twice the amount of a NiCr tube of the same size. This means that fewer tubes can be used or a much higher furnace power can be achieved without further investments.

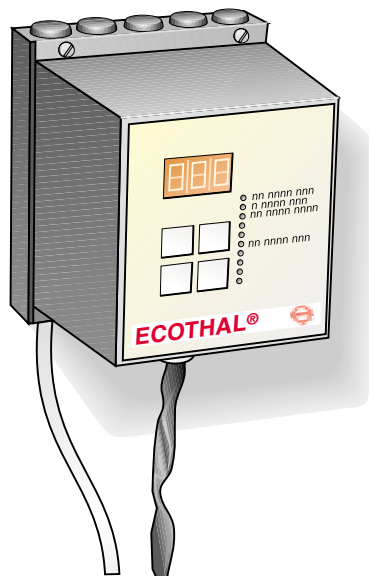
Gas regulation system and catalytic converters



Electronic gas regulation system and 3-way catalytic converters for - cleaner exhaust gases - excellent economy - simpler handling - improved reliability - long life of the catalysts

ECOTHAL's electronic regulation system consists of a control unit that automatically regulates gas and air supply to the burner to create optimal combustion – so-called stoichiometric combustion. This provides the best possible working conditions for the catalytic converters, the cleanest exhaust gases and the highest efficiency.

The control signal is given by a Lambda sensor located in the exhaust tube after the last catalytic converter – a safe and tested technique.

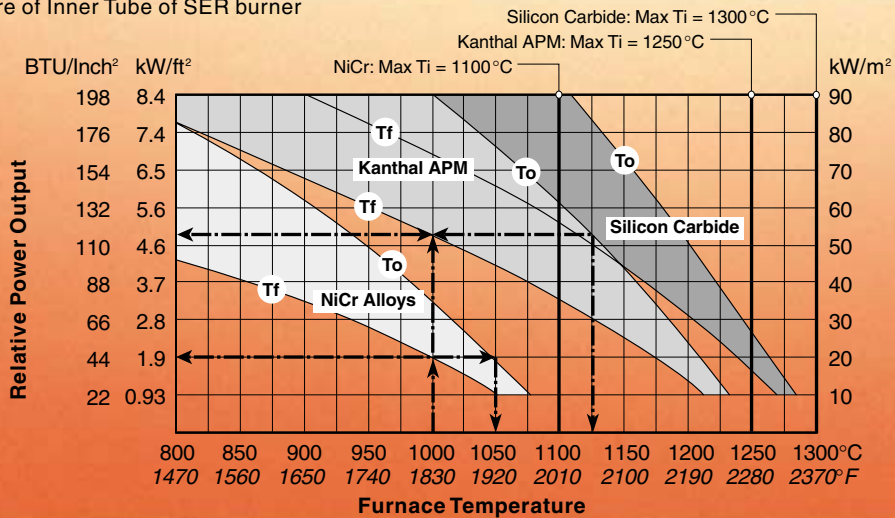


The catalytic converters transform the nitrogen oxides (NO_x) which formed during combustion into safe nitrogen gas (N_2) and carbon dioxide (CO_2).

ECOTHAL is equipped with two catalytic converters. Both are produced by Kanthal and consist of a catalytic material applied to a carrier of Kanthal material.

The catalytic converters are extremely efficient. No reduction in their cleaning effect has been reported after more than one year in operation.

Tf = Furnace Temperature
 To = Temperature of Outer Tube of SER burner
 Ti = Temperature of Inner Tube of SER burner

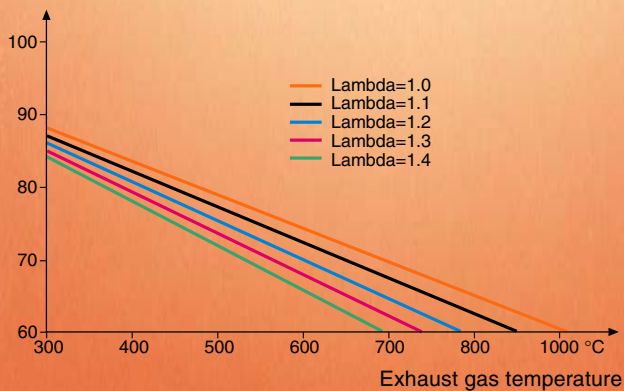


Maximum Surface Loading for Various Types of Radiant Tubes

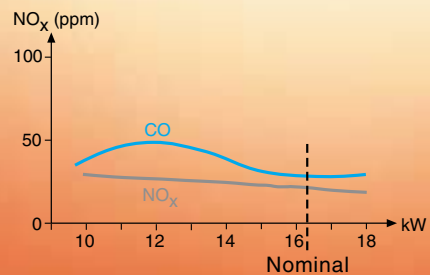
At 1000 °C furnace temperature the NiCr tubes have a dissipation of 20 kW/m² and the outer tube will have a temperature of 1050 °C.

A KANTHAL APM tube at the same furnace temperature can be dissipated at 53 kW/m² (more than twice NiCr-tubes) and the outer temperature will be 1125 °C.

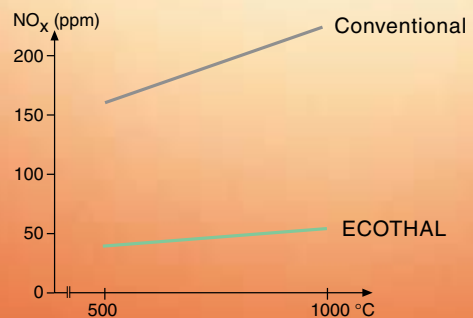
Degree of efficiency, %



The high degree of efficiency of ECOTHAL can be explained by a number of factors, such as the low Lambda value which results in greater efficiency at all exhaust gas temperatures - see diagram.



ECOTHAL produces low nitrogen oxide emissions even when the burners are not running at nominal output.



Compared with a conventional burner, ECOTHAL produces significantly lower nitrogen oxide and carbon monoxide emissions at all furnace temperatures.

Radiant tubes and burners for demanding applications



Comparison between NiCr tubes (left) and Kanthal APM tubes after 1000 hours at 1150 °C (2100 °F). The NiCr tubes are severely contaminated with oxide flakes as result of scaling while the APM tubes are still clean.



The picture shows comparison tests with ECOTHAL mounted next to a conventional 27 kW SER system. The result: ECOTHAL has 48 % greater heat efficiency and emits 68 % less pollution! Note the marginal modification.

Kanthal APM Radiant Tubes

- longer tube life
- reduced maintenance costs

Kanthal APM forms part of the Kanthal family of tube materials that can tolerate high temperatures. Kanthal APM is based on the same FeCrAl alloy which has been the basis for our electrical heating elements for over 70 years.

The Advanced Powder Metallurgy (APM) process helps the material keep all previous advantages while adding several new ones, such as greater high-temperature stability, higher surface load and long life expectancy.

With a combination of extreme heat resistance and superior oxidation characteristics, Kanthal APM has opened up many new areas of application, one of the most interesting being ECOTHAL.

Proven gas burner systems

- many well-known makes
- same dimensions and connections as SER burners

The ECOTHAL system can be used in principle for all burners currently available on the market, but functions best with a burner modified by Kanthal.

The burners are standard burners adapted to function together with tubes and other components. The modifications made are patented or patent pending.

As the ECOTHAL has the same dimensions and connections as normal SER burners, current gas and air supply systems do not, as a rule, need to be modified. An upgrade to ECOTHAL is, therefore, easy to carry out and most of the current system can often be re-used.

ECOTHAL Data

ECOTHAL exemples

System performance with different standard burners at lambda = 1,0 at furnace temperature 950°C (1740°F).

	Burner type				
	WS 80	Eclipse	Toho Gas	Eclipse	Pyronics
Burner size (nominal in.)	3 1/4	3 1/4	4	4 1/2	6
Power (kW)	12	14	14-18	16	40
Ecotal system data					
NOx (ppm)	<50	<50	<50	<50	<100
CO (ppm)	<50	<50	<50	<50	<50
Exhaust temp. (°C/°F)	450/840	585/1085	558/1035	500/913	590/1094
Therm. efficiency (%)	81	75	76	79	74
Comparable data for the same burners without Ecotal system					
NOx (ppm)	300	350	350	350	400
Therm. efficiency (%)	73	70	70	70	67

Kanthal APM tubes – standard product range

OD	Wall thickness	Weight	OD	Wall thickness	Weight
mm	mm	kg/m	in	in	lb/ft
26.67	2.87	1.52	1.05	0.11	1.02
33.7	6.0	3.71	1.33	0.24	2.49
33.4	3.38	2.26	1.31	0.13	1.52
40	3.0	2.48	1.57	0.12	1.67
50.8	6.35	6.35	2.00	0.25	4.27
60.33	3.91	4.92	2.38	0.15	3.31
64	4.0	5.35	2.52	0.16	3.60
73	4.5	6.88	2.87	0.18	4.62
75	4.5	7.08	2.95	0.18	4.76
83	5.0	8.70	3.27	0.20	5.85
87	5.0	9.15	3.43	0.20	6.15
88.9	5.49	10.2	3.50	0.22	6.88
100	5.0	10.6	3.94	0.20	7.12
109	5.0	11.6	4.29	0.20	7.79
115	5.5	13.4	4.53	0.22	9.02
128	5.5	15.0	5.04	0.22	10.1
146	6.0	18.7	5.75	0.24	12.6
154	6.0	19.8	6.06	0.24	13.3
164	6.0	21.2	6.46	0.24	14.2
178	8.0	30.3	7.01	0.31	20.4
198	8.0	37.9	7.80	0.35	25.5
220	8.5	40.1	8.66	0.33	26.9
260	12.0	55.8	10.2	0.47	37.5

Systems and Services

Our broad range of resistance materials, finished elements, radiant tubes and other components cover almost any application up to 2000°C. You can get all your requirements from one supplier, as well as qualified technical advice.

We can also supply complete heating systems e.g. radiant tubes with integrated heating elements or inner tubes for gas heating, Fibrothal and Superthal heating units, air heating cassettes, fibrothal complete systems for renovation of furnaces etc. A complete system saves time and resources.

We can assist you

- in choosing suitable element material, element type, support systems and insulation
- with the design and calculation of the elements and heating system
- by supplying complete heating elements or heating systems ready for installation
- with the upgrading of old furnaces or the conversion of gas/oil heated furnaces to electricity



Kanthal Super, Superthal
Complete element assemblies and heating modules for max. element temperature 1850 °C, 3360 °F.



Wire and Strip
KANTHAL and NIKROTHAL(r) highest quality material for max. element temp. 1425 °C, 2590 °F.



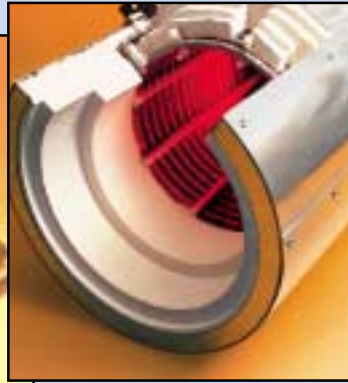
Metallic Elements
Ready-made metallic elements manufactured by Kanthal workshops.



Tubothal
Long-life elements for all types of radiant tubes, ideally KANTHAL APM, up to 1300 °C, 2370 °F, free radiating.



Extruded Tubes
Kanthal extruded radiant tubes for gas or electrically heating furnaces.



Heating elements
Elements and systems for diffusion furnaces in the semiconductor industry.



FIBROTHAL
A complete modular building system for heating and insulation.



Silicon Carbide
Hot Rod, Crusilite, Globar, Silit and multileg silicon carbide heating elements for furnace temp between 700 and 1650 °C, 1290 and 3000 °F.

KANTHAL

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