KANTHAL APMT™ material presentation

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Sandvik Materials Technology

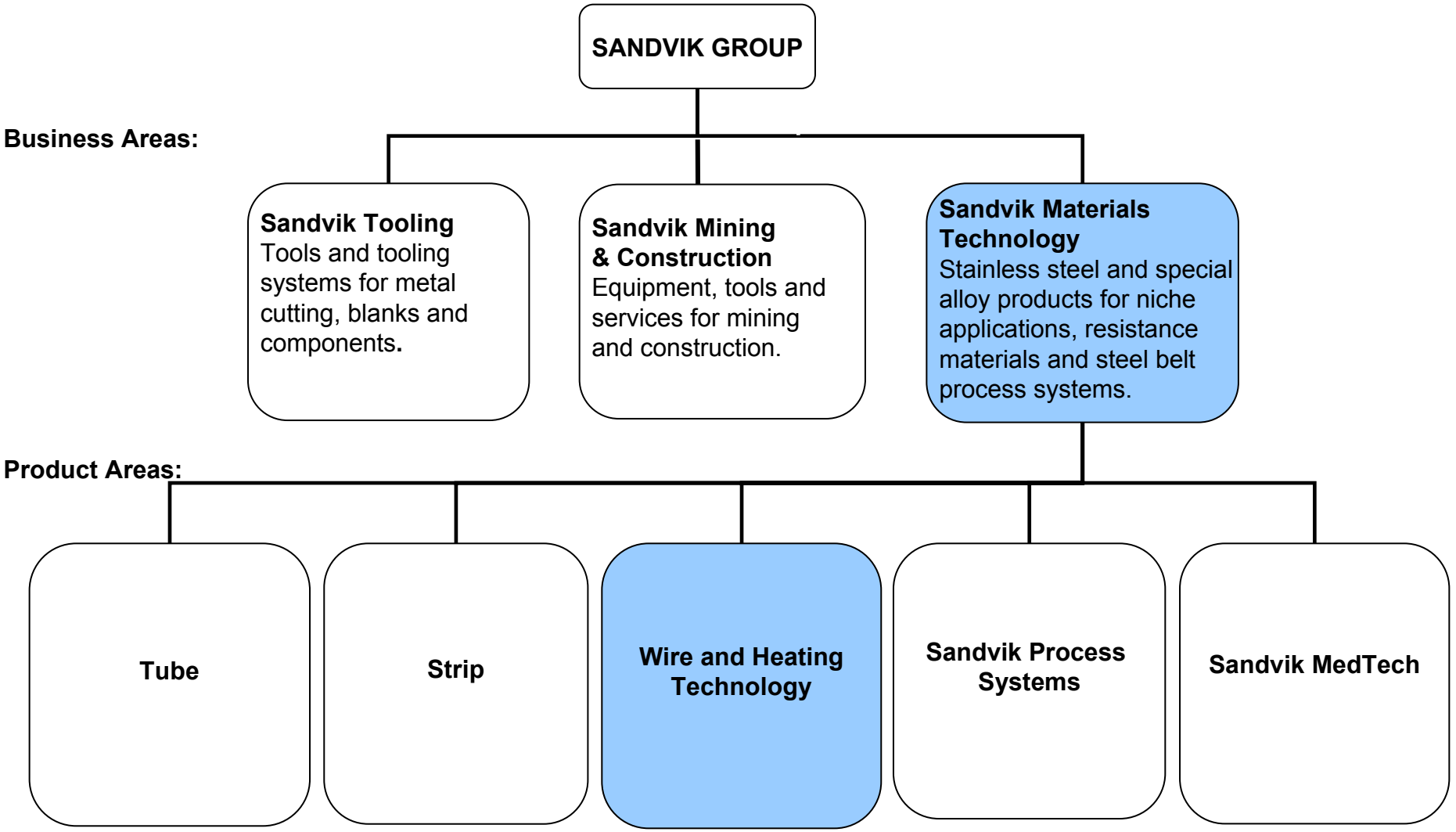
Sandvik Group – a global leader

Three business areas

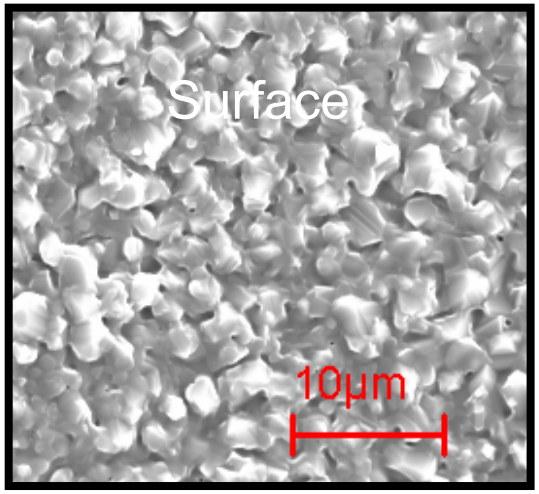
	Sandvik Tooling	Sandvik Mining and Construction	Sandvik Materials Technology
			
Invoicing MSEK	19 078	32 621	**15 328**
Employees	15 296	14 429	**8 246**

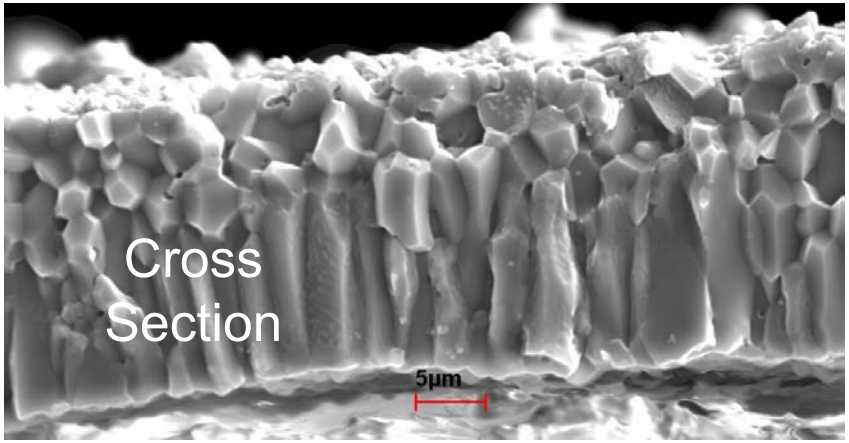
31 Dec. 2009

Sandvik Group – organizational structure



Alumina scale on FeCrAl Alloys





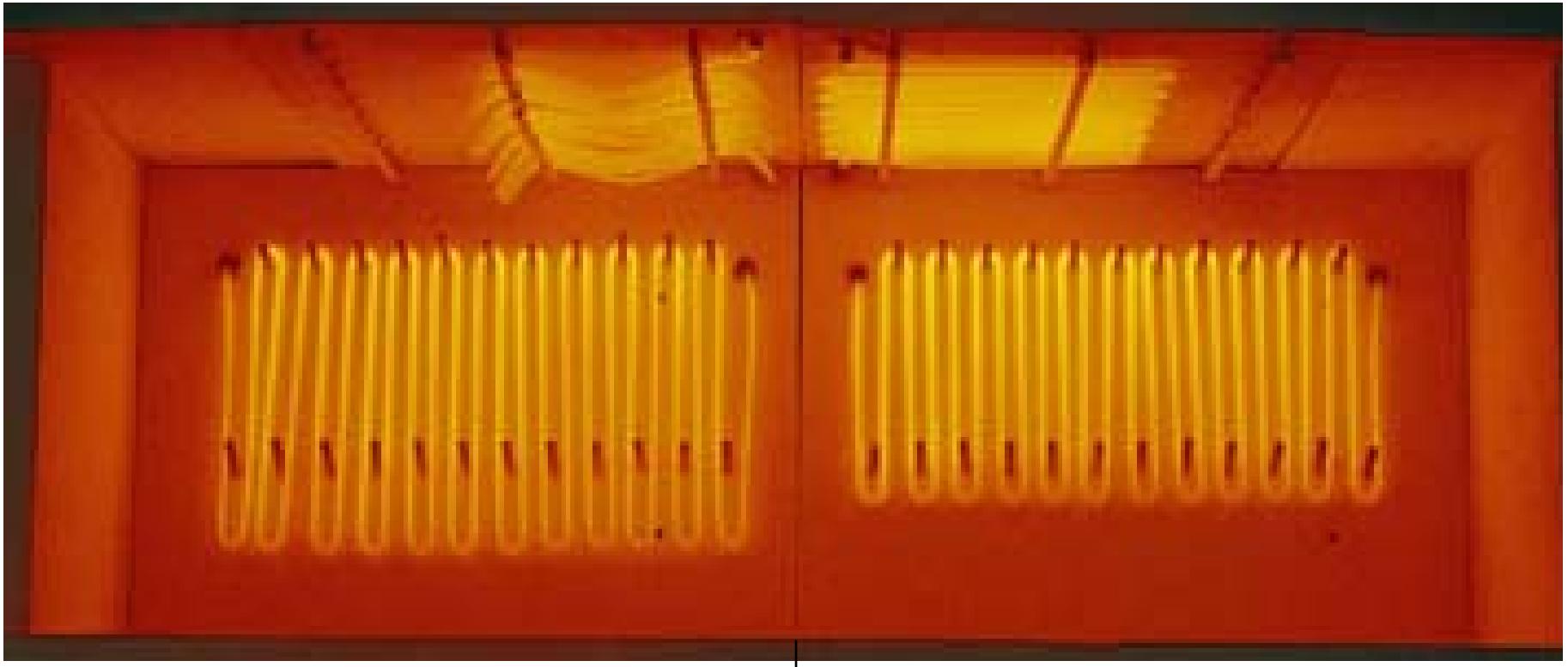
α-alumina Al_2O_3

- ✓ Thermodynamically stable
- ✓ Non-volatile
- ✓ Inert
- ✓ Dense
- ✓ Thin
- ✓ Slow growth
- ✓ Adherent

Reactive Element (RE) effect!

Conventional vs RSP FeCrAl

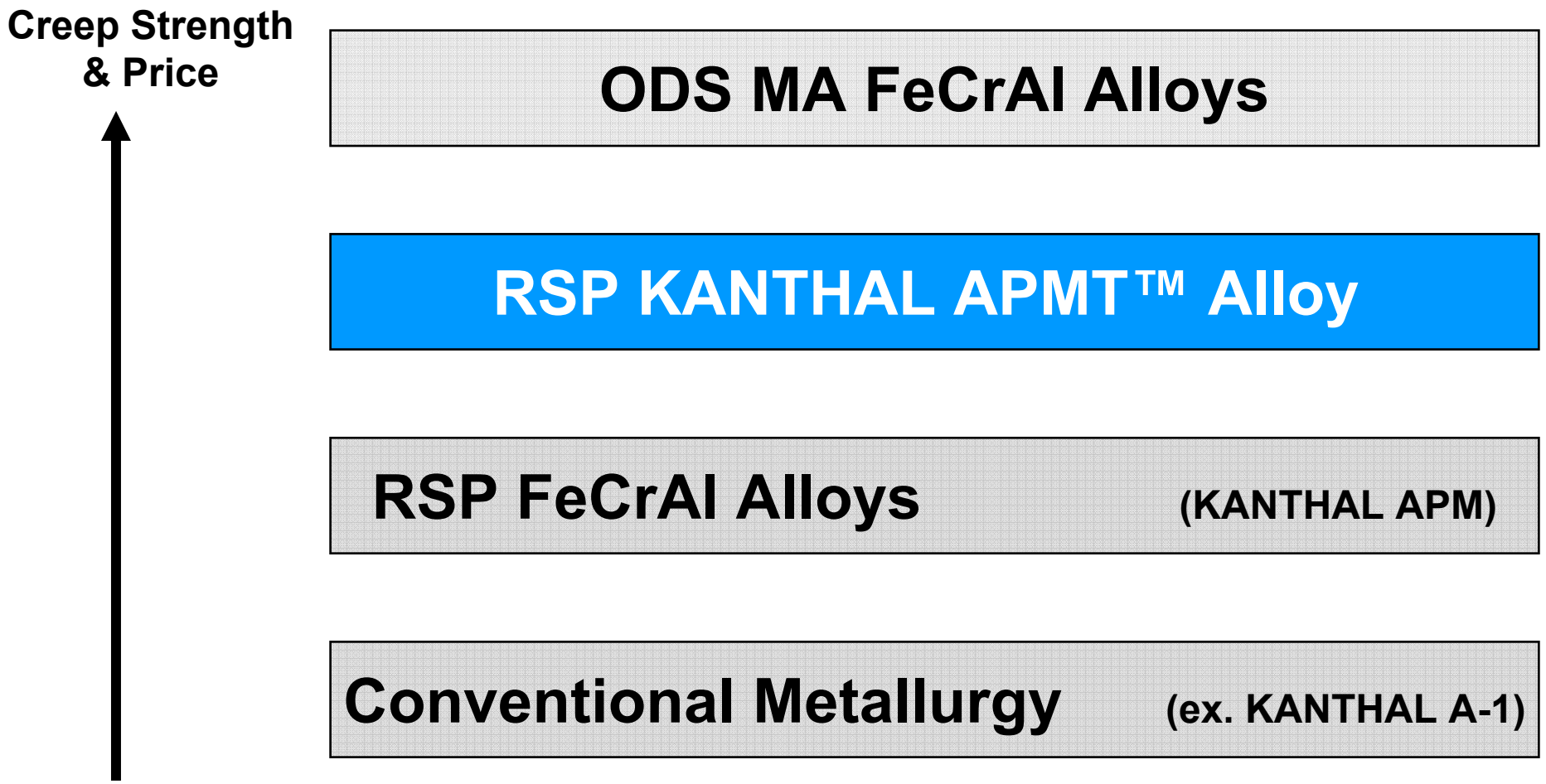
Ø9,5 mm wire heaters after 500 h at 1300-1400°C (2372-2552°F)



Conventional FeCrAl alloys
Severe elongation and deformation

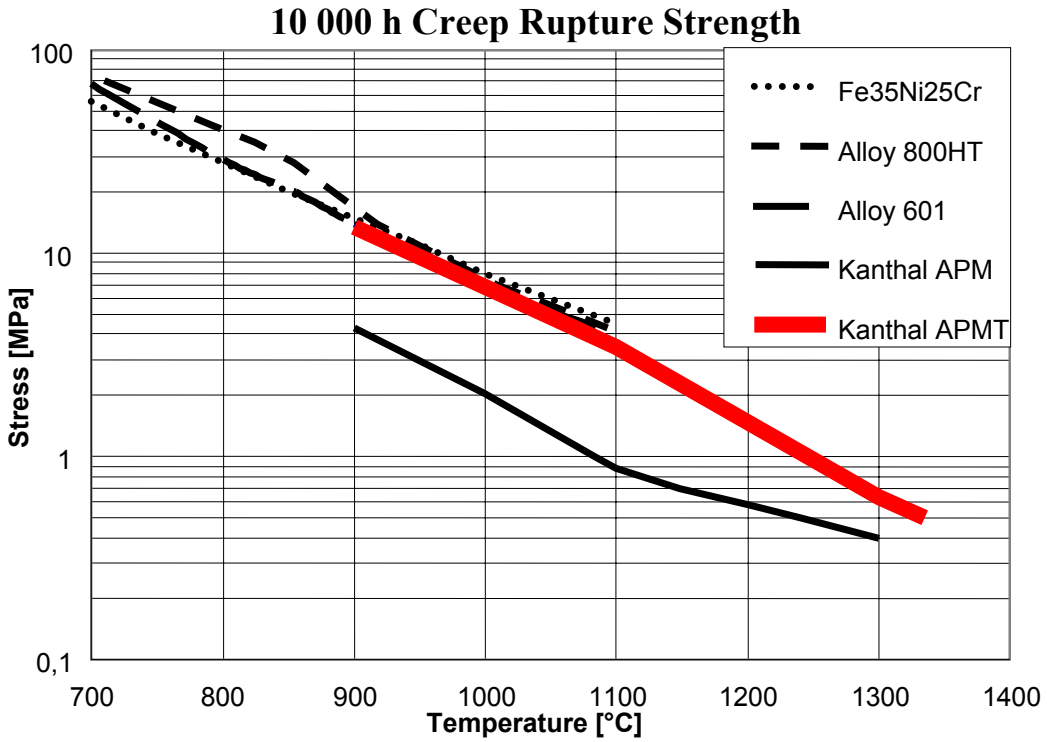
RSP FeCrAl (KANTHAL APM)
Form stability and low elongation

Development of Creep Resistant FeCrAl-alloys



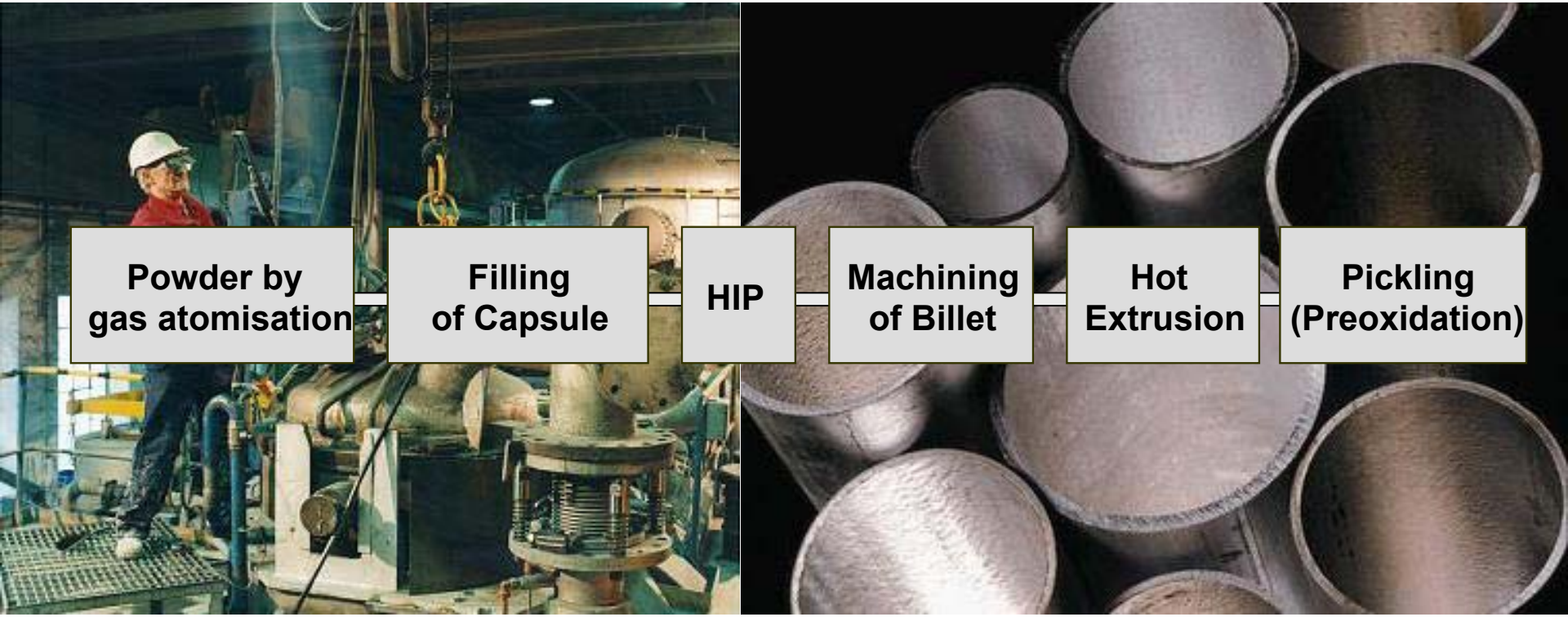
PM based KANTHAL alloys

Composition (wt%)	Fe	Cr	Al	Mo	Si	Mn	C	Minor additions
KANTHAL APM	Bal.	22	5.8		<0.7	<0.4	<0.05	Present
KANTHAL APMT	Bal.	22	5.0	3.0	<0.7	<0.4	<0.05	Present



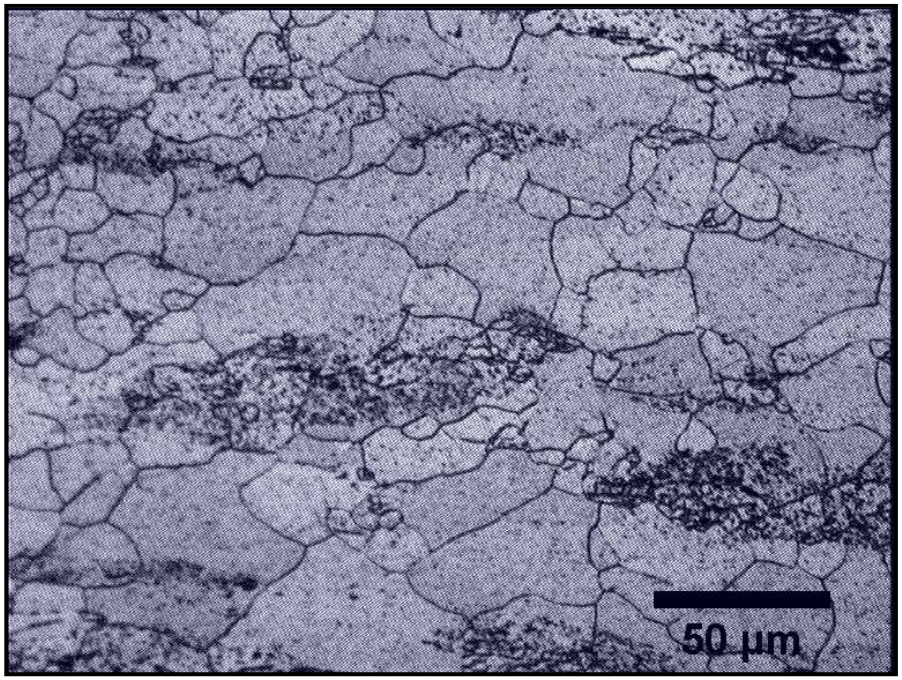
Production of PM HIP:ed materials

Process Route for Tubes

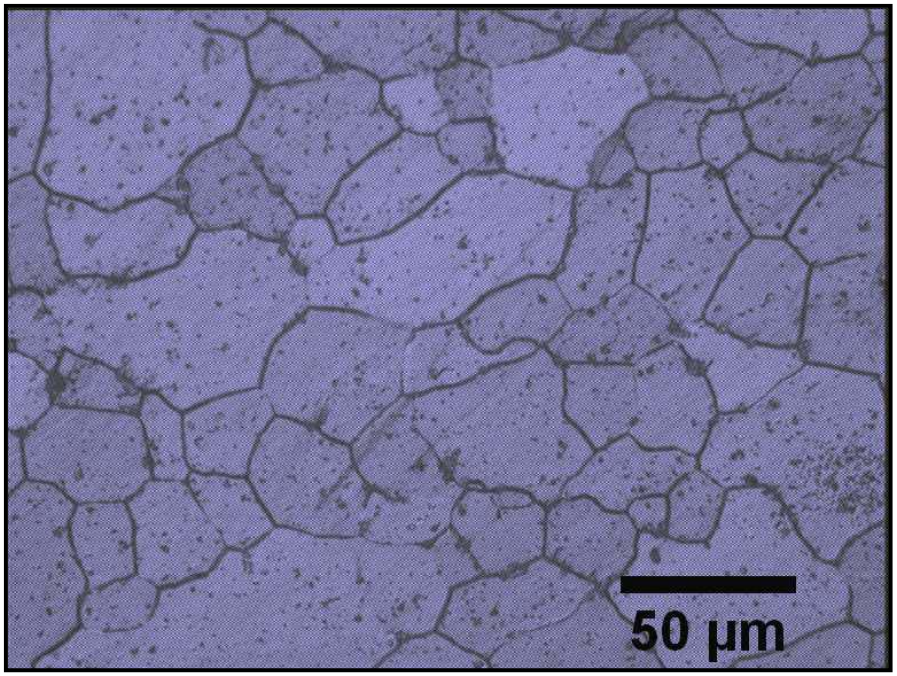


Grain Structure Kanthal APMT tubes

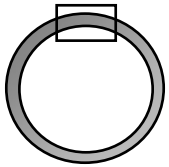
Grain Stability



Delivery State



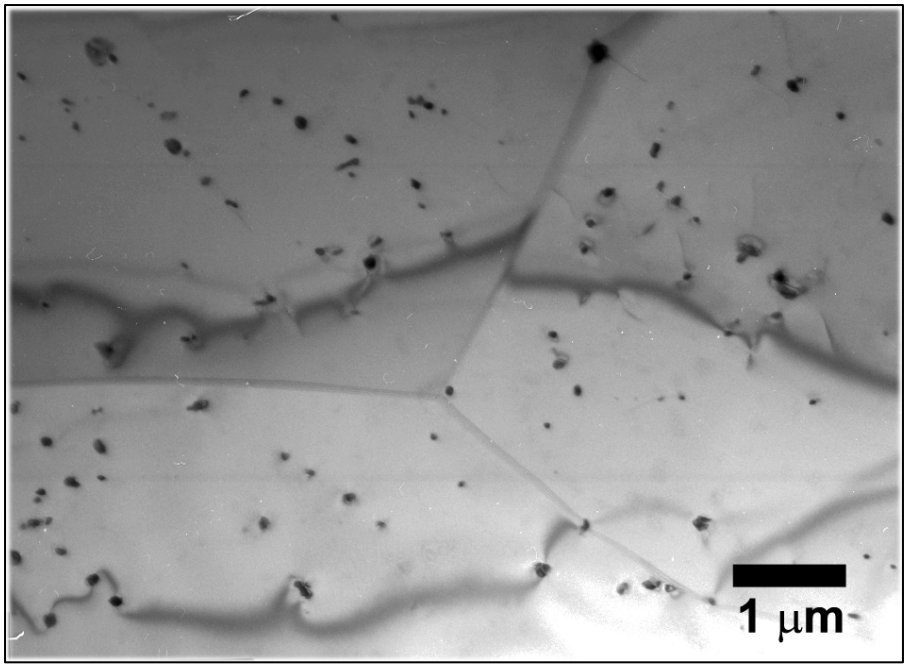
Creep tested at 1200ºC, 2000h

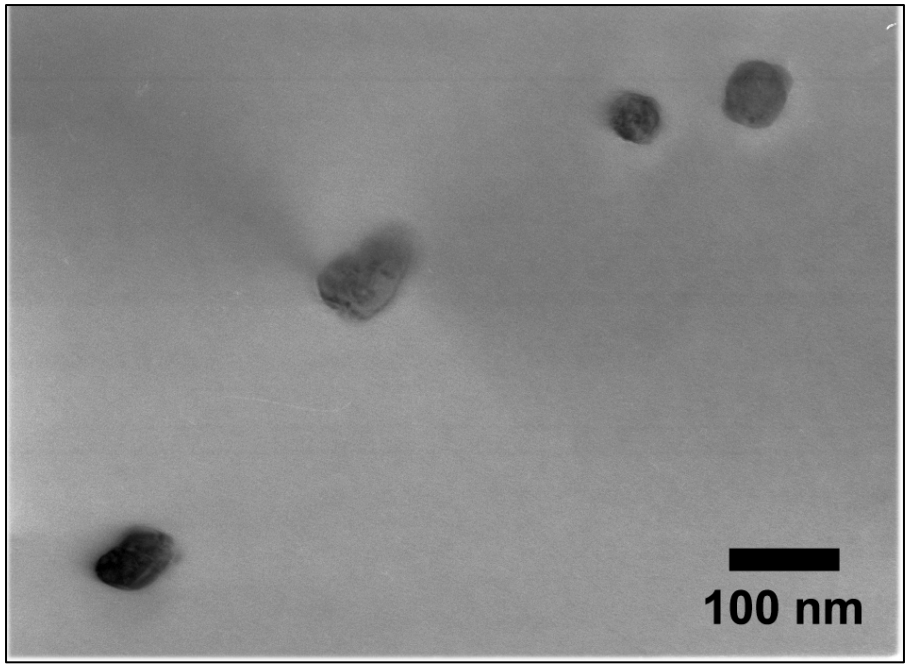


Cross Section

Dispersion in Kanthal APMT tube

TEM, Bright Field Image

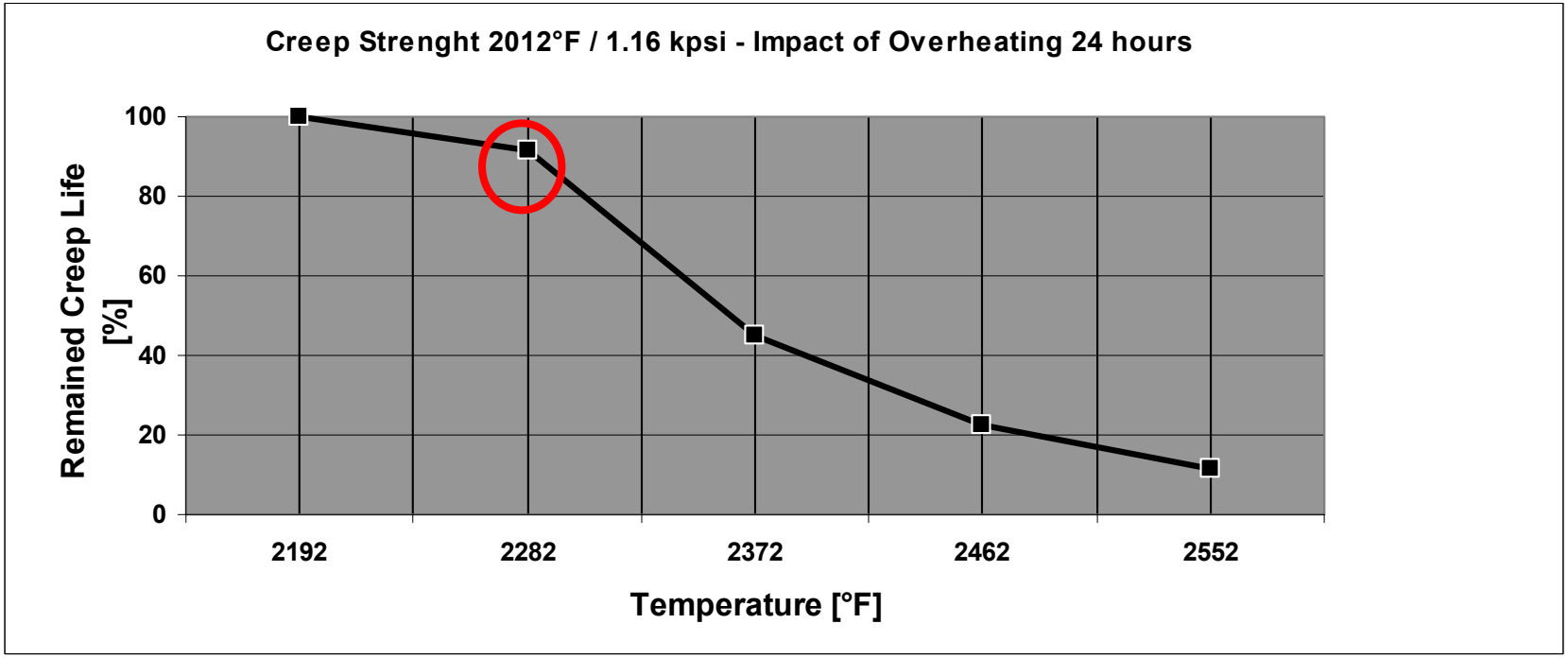




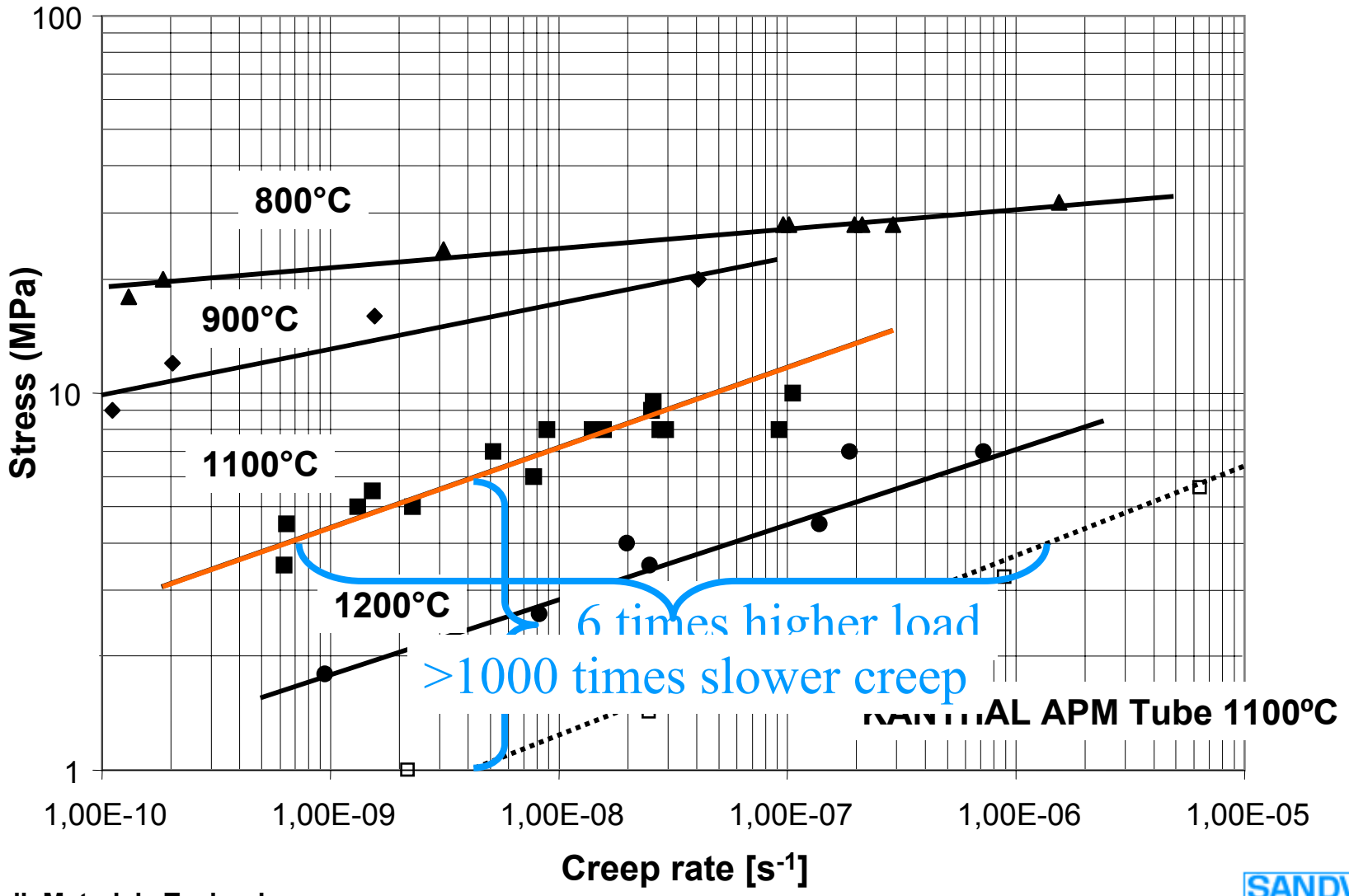
Average Particle Size: 75 nm
Average Particle Density: 12 μm^{-3}

Overheating

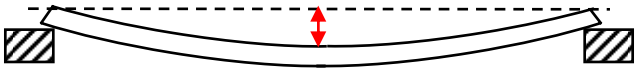
APMT can withstand temperature trips of 24h at 2282°F with Creep Properties maintained !

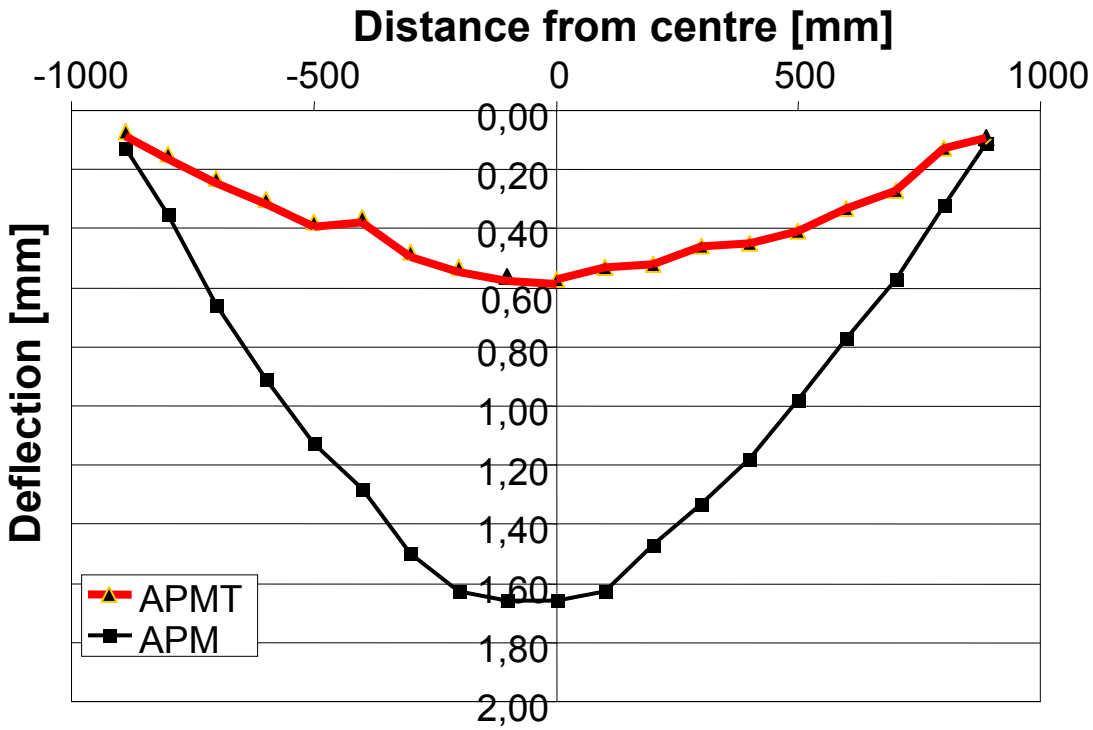


KANTHAL APMT Sec. Creep Rate



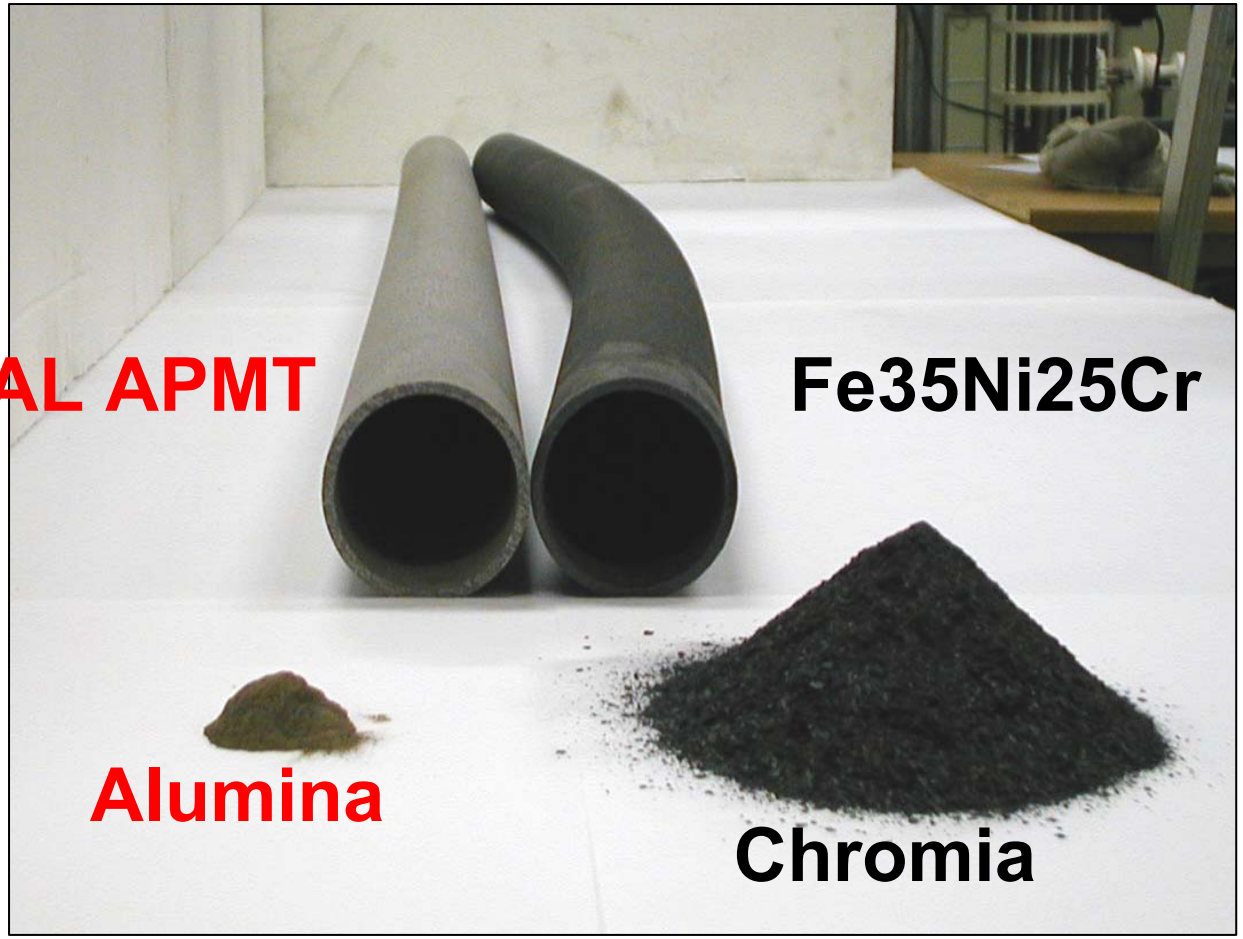
Gravitational deflection of horizontal tubes





KANTHAL APMT **Fe35Ni25Cr**

Oxide spallation.



Joining techniques

- KANTHAL APMT is weldable if WPS is followed.
- Recommended methods TIG (GTAW), laser welding
- Preheating and PWHT is necessary.
- APMT filler is recommended.

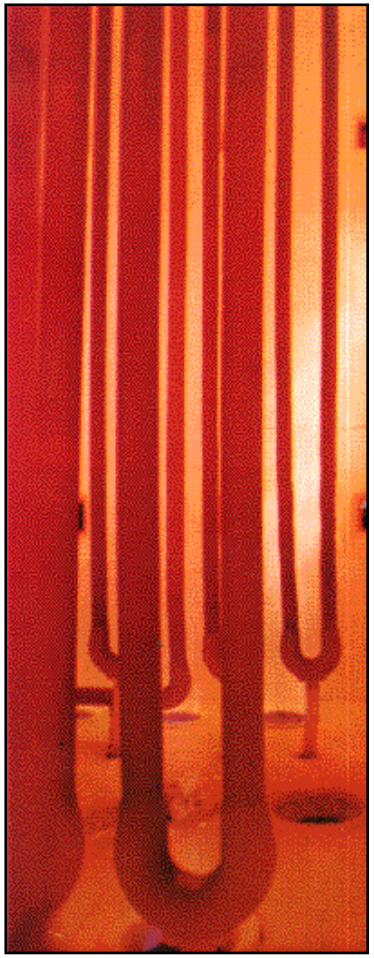
- However a loss of creep strength is unaviodable due to remelting of RSP structure.

- Solid state welding techniques are being evaluated.
- Vacuum brazing also possible.

Applications for KANTHAL APMT

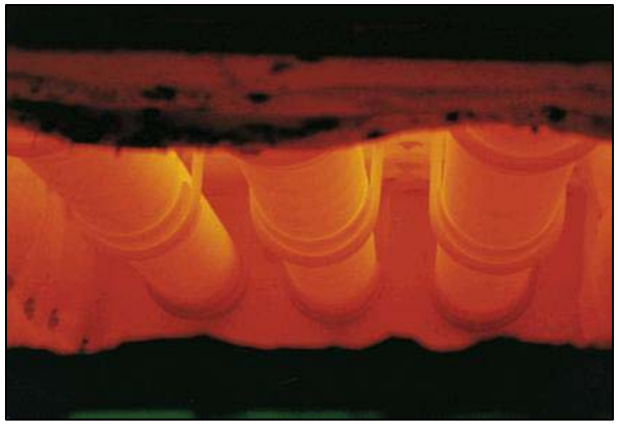
Wire mesh belts

Furnace rollers



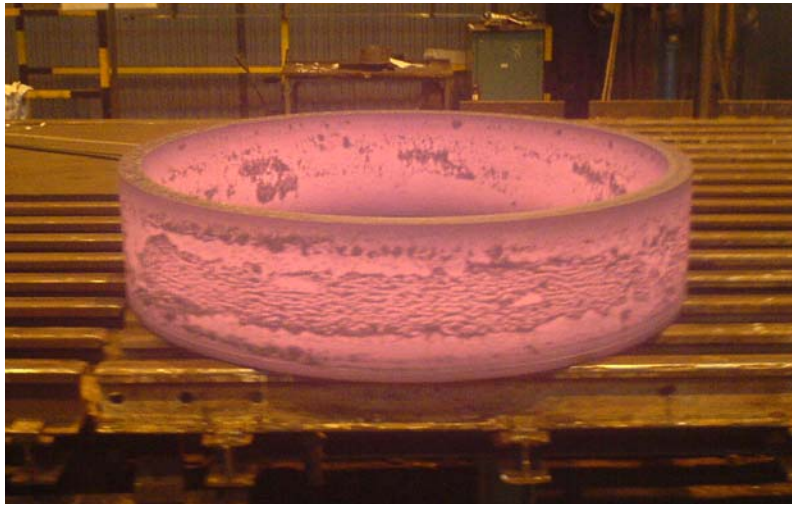
Ethylene tubes

Furnace furniture



Radiant tubes

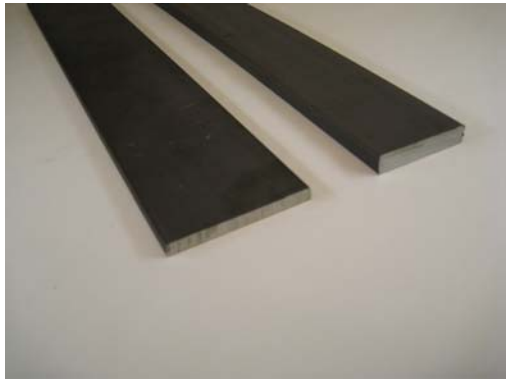
KANTHAL APMT applications

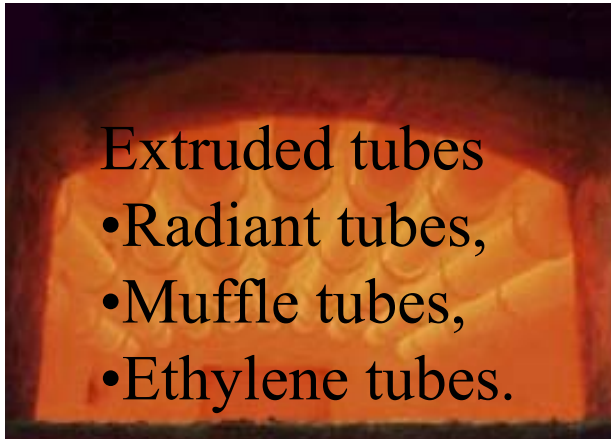


Loading cage rings for HIP presses.

KANTHAL APMT product forms

Hot rolled
- Billets,
- Bars,
- Rod,
- Profiles
- Rings





Fabricated components/products

NNS HIP components

Fore more information

www.kanthal.com

THANK YOU FOR LISTENING!