UHLIG ROHRBOGEN

Standard of cladding process in the biomass and waste combustion

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Uhlig Rohrbogen GmbH
16th February 2010
Oslo

Agenda

- Uhlig production range und technical skills
- Cladding with nickel-based super alloy
  - Basics
  - Conforming-standards of membrane walls; Quality trouble
  - Production requirements for a high-grade cladding surface
  - Practical application
- Forecast

Uhlig product range and technical skills

	UHLIG ROHRBOGEN	Main product	▪ Elbow

Elbow

Uhlig product range and technical skills

	UHLIG ROHRBOGEN	Main product	▪ Elbows
	UHLIG TEES	Fittings	▪ Tees ▪ Reducers ▪ Specials

Tees

Uhlig product range and technical skills

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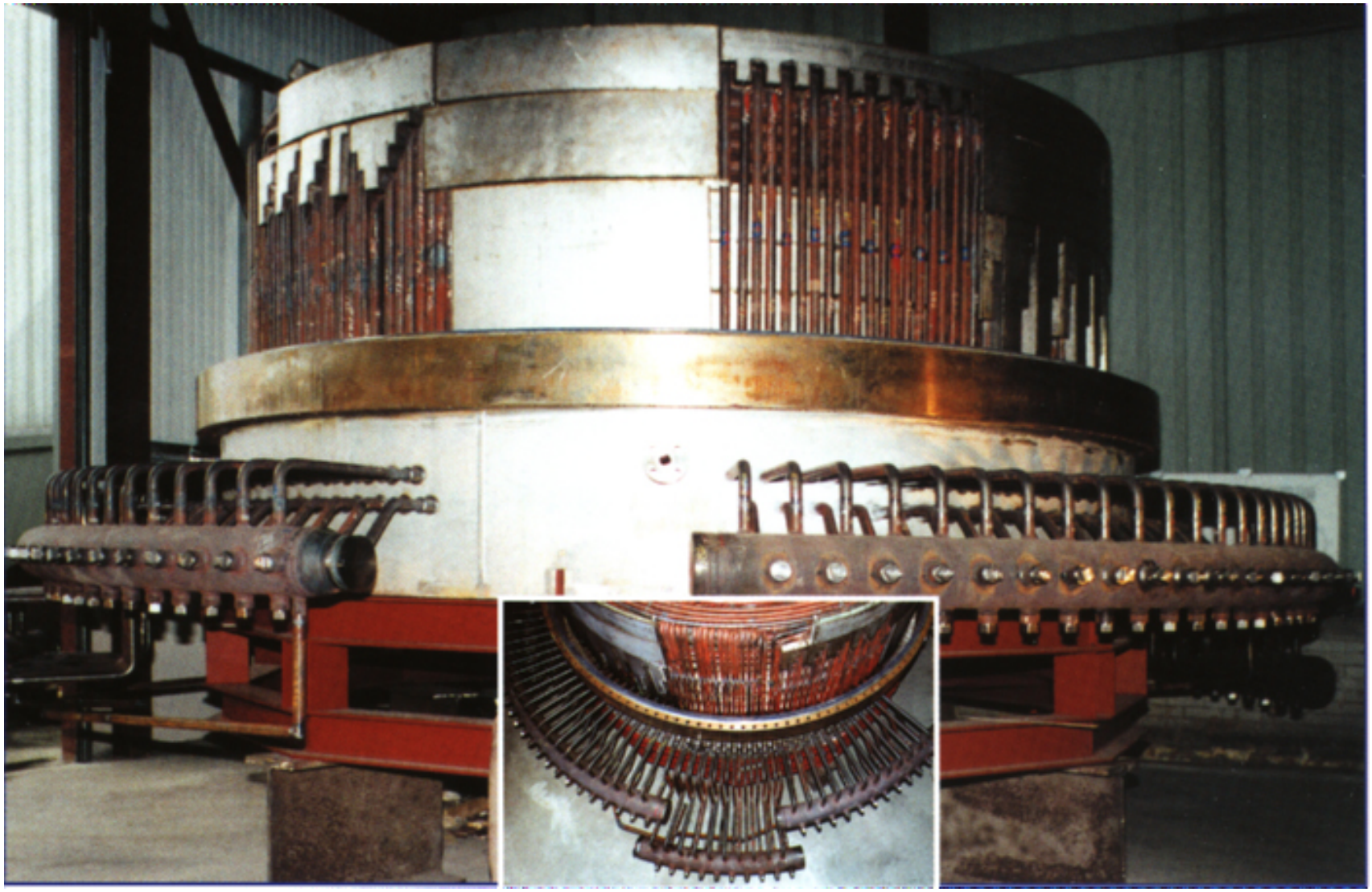
	UHLIG TEES	Fittings	▪ Tees ▪ Reducers ▪ Specials
	UHLIG SERVICE	Specials	▪ Welded constructions ▪ Pressure parts for Boilers ▪ Machining of boiler parts

Service

Service



Specials

Uhlig product range and technical skills

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	UHLIG SERVICE	Specials	▪ Welded constructions ▪ Pressure parts for Boilers ▪ Machining of boiler parts
	UHLIG WEL-COR	Cladding	▪ Cladding of Membrane walls and single tubes
		Corrugated fire-tubes	▪ Corrugated fire-tubes ▪ Longitudinal welded tubes

Cladding at Uhlig since 12 / 1997

So far:

- 50.000 m² proj. surface cladded
- 1.600.000 kg filler metal
- 45.000 gas bottles Cronigon Ni 10

5 cladding plants for 6 m membrane walls with normal pulsation welding process

4 cladding plants for 6 m membrane walls with CMT – welding process

4 cladding plants for 10 m membrane walls with CMT – welding process

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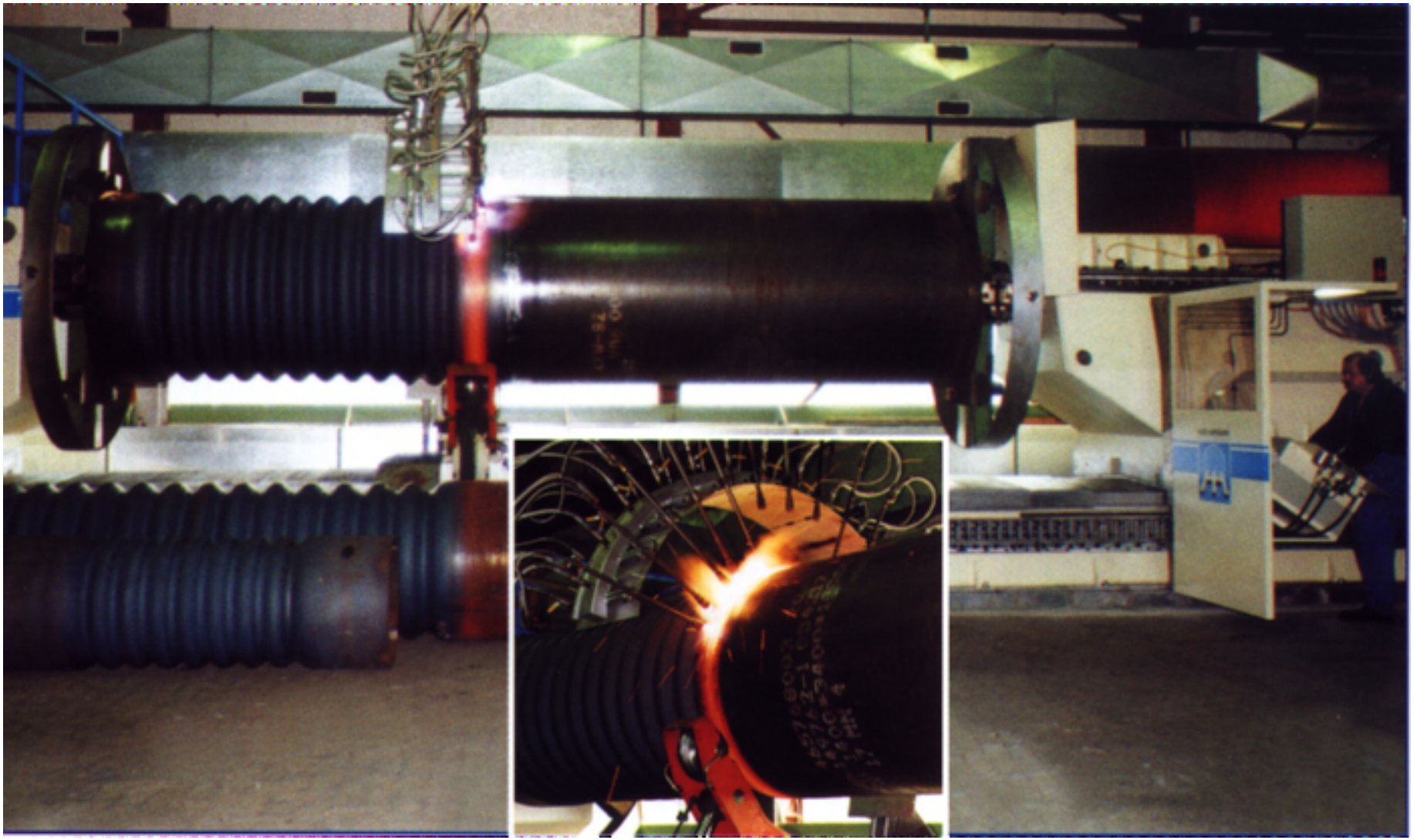
- 4 cladding plants for 10 m membrane walls with CMT – welding process
- All cladding plants are fitted with two parallel welding burners
  Cladding capacity: 150 m² projected surface per week for membrane walls

Corrugated fire-tubes



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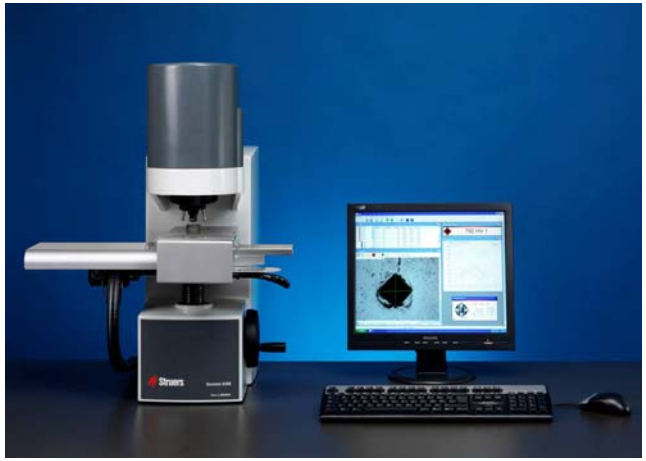
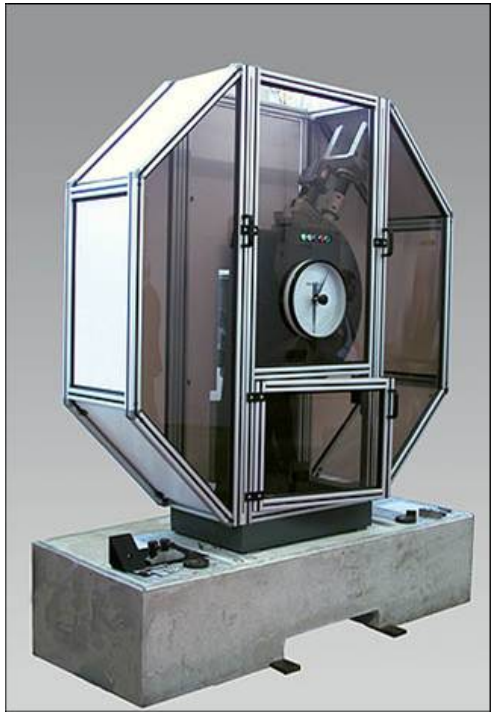
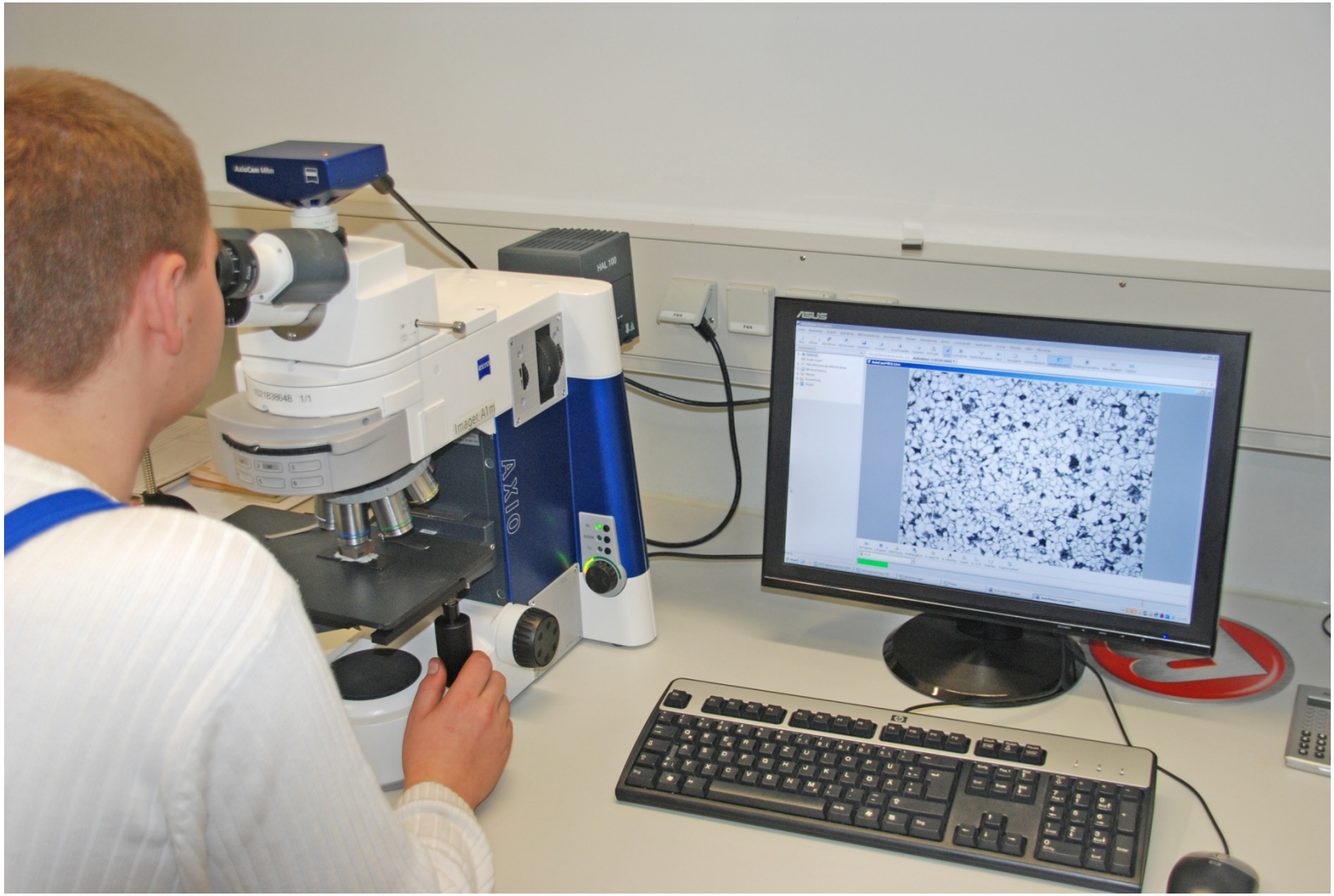
	UHLIG Z(f)P	Accredited test laboratory	▪ Impact test ▪ Tensile test ▪ Micro / Macro ▪ Hardness test ▪ Special test

Uhlig Z(f)P





Uhlig Z(f)P



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Basics

- Cladding with Thermanit 625 is the best and high effective option for corrosion protection in biomass and waste combusters
- Cladding with Thermanit 625 is also a high priced option
- Based on middle- and long-term consideration the cost-effective option!
- The filler metal is the biggest cost factor. Costs of 35 € / kg and 28 kg / m^2 projected area offers 980 € / m^2 !
- If operators of combustors decides to use the best and high effective option for corrosion protection, it has to be ensured that the Cladding is done with due diligence and best technology.

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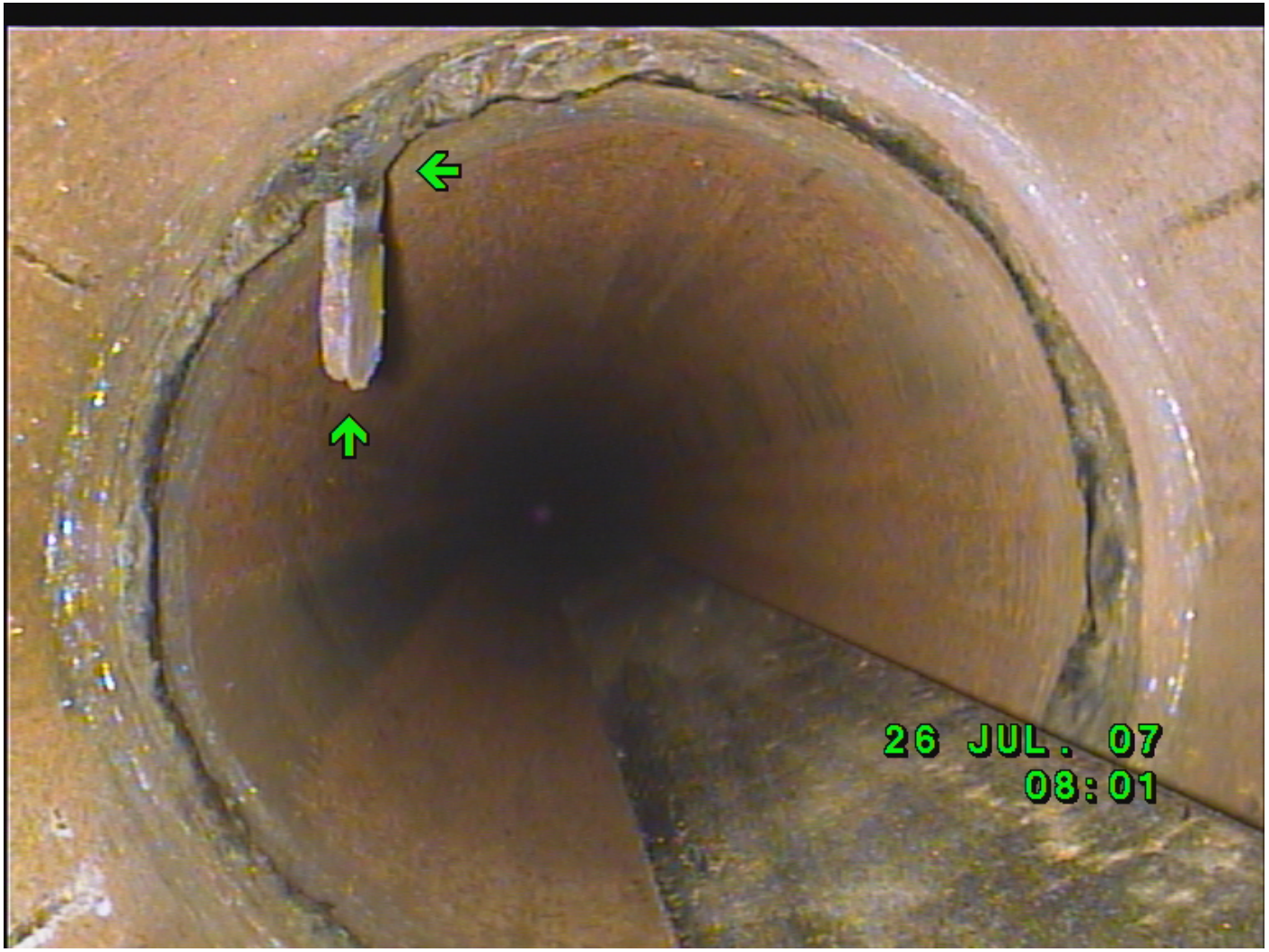
Conforming-standards of membrane walls

- Non conforming quality of membrane walls of east europe
- Big difference in pitches
- Fins are not coplanar
- Welding defects (porosities, lack of fusion)
- Inner defects in the tubes

Result:

Intensive income control of delivered panels

Conforming-standards of membrane walls



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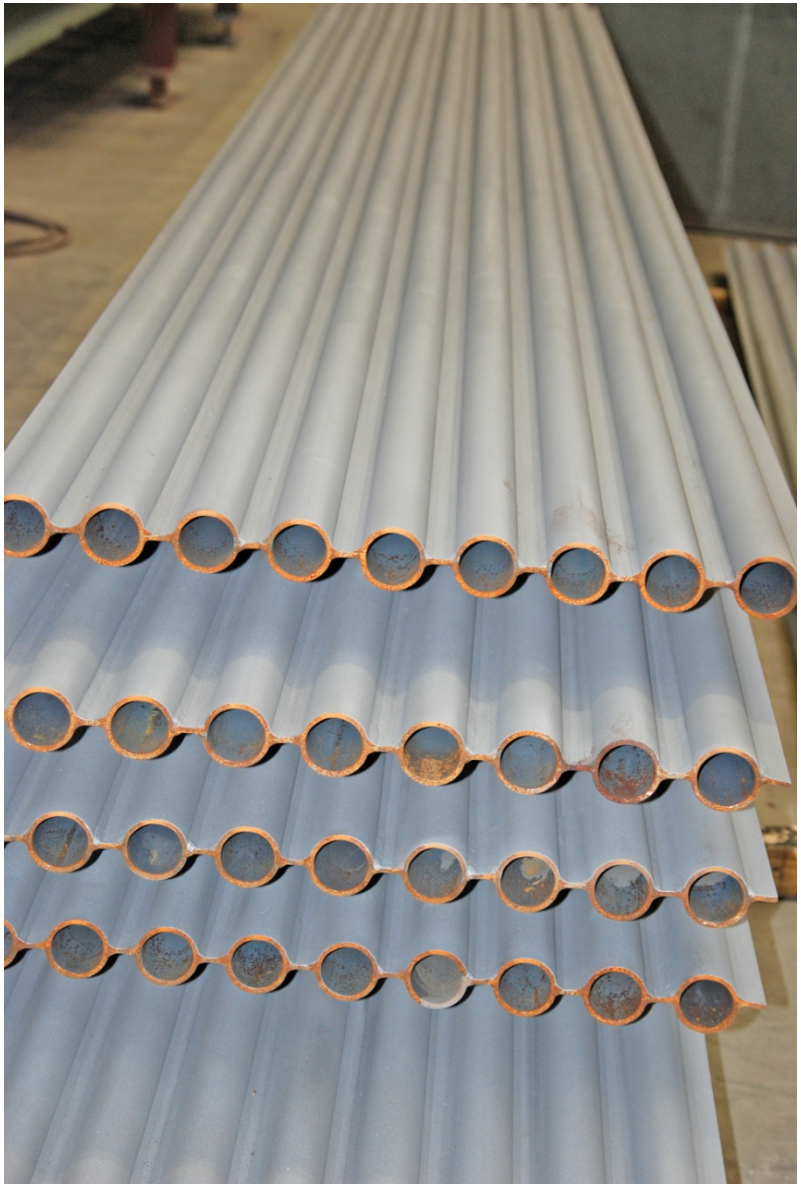
Requirements to an optimal overlay welding

- Comprehensive Quality system, already incoming control of delivered Membrane walls and single tubes.
- Accurate cleaning of surface before cladding
  - 2 times blasting (1. blasting step with granules, 2. step with glass granules). Surface finish < 35 µm offers best conditions for overlay welding and a constant iron content on cladding surface.

Requirements to an optimal overlay welding



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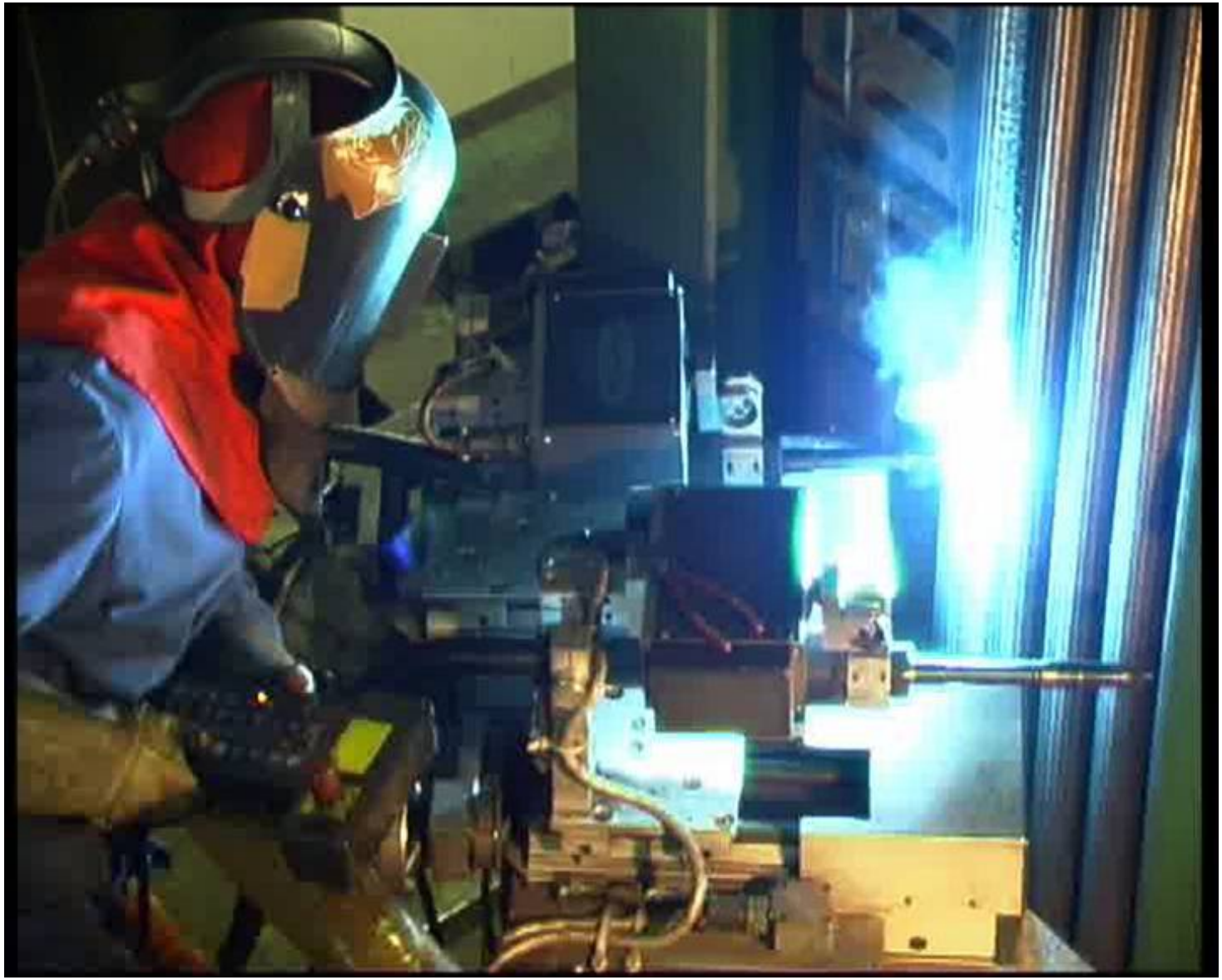

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- Special shielding gas for cladding process e.g. Cronigon Ni 10

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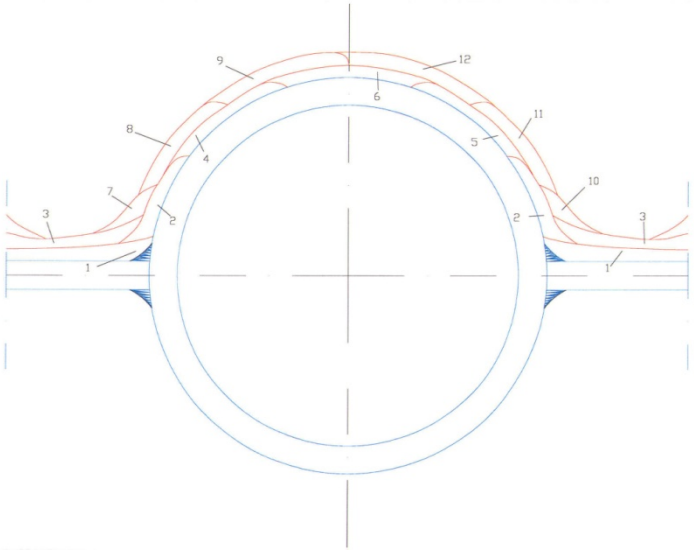
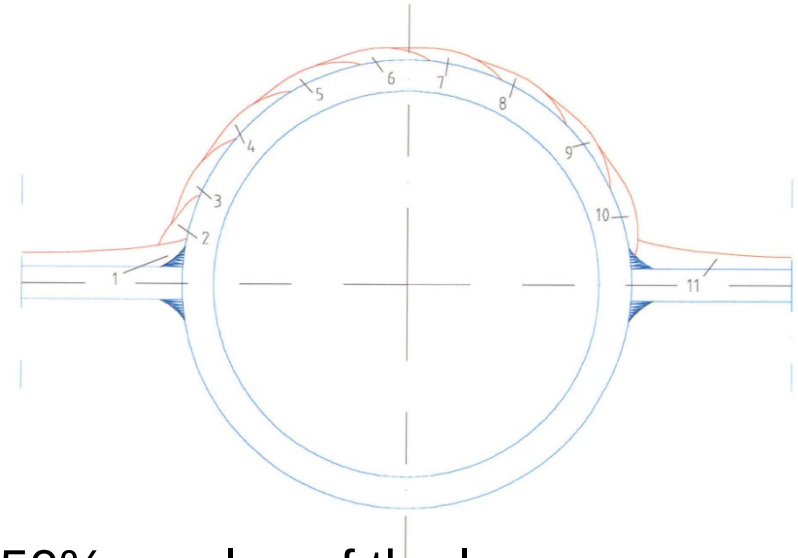
- 2 layer technology – first layer black / white, 2. layer white / white

The practice of cladding: Two – layer structure



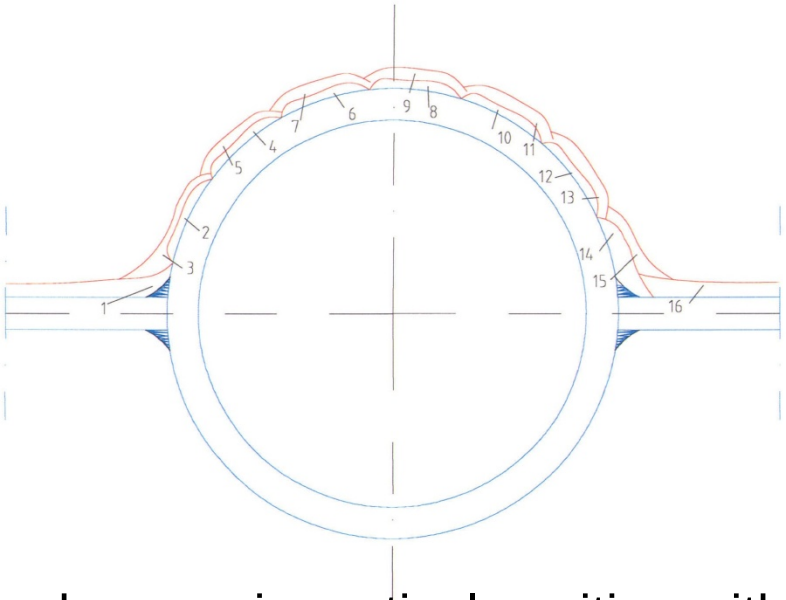
- 1. layer black / white connection - Fe content appr. 12% at 0,9 mm layer thickness
- 2. layer white / white connection - Fe content < 5%, with CMT lower
- Both layers with optimal, different welding parameter
- Low heat stress
- Smooth layer thickness and smooth Fe-content

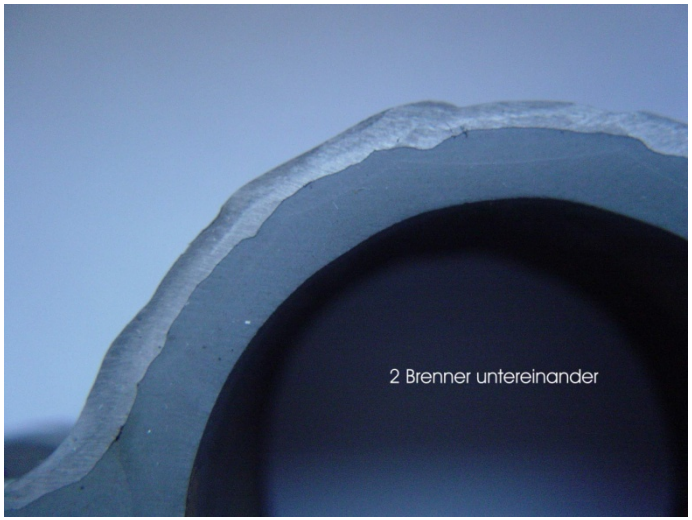
The practice of cladding: Single – layer structure



- 50% overlap of the layers
- 50% black / white, 50% white / white welding in one welding process; no different weld parameter possible
- Trouble to reach layer thickness
- Trouble to reach low Fe-content on the surface
- Partially craggy change-over of layer

The practice of cladding: Single / two – layer structure





Two burners in vertical position with appr. 100 mm distance

- Directly over welding of the first layer (no control of 1. layer possible)
- Partially craggy change-over of layer
- Different layer thickness, different Fe-content
- High heat stress (high shrinking)

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- Professional straighten of the panels

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- 100 % visual control, small flaws will be fixed, cladding ends welded around

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- Machining of outer fins for high accurately fitting

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- Professional straighten of the panels
- 100 % visual control, small flaws will be fixed, cladding ends welded around
- Machining of outer fins for high accurately fitting
- Finish with glass granules blasting of the cladded surface

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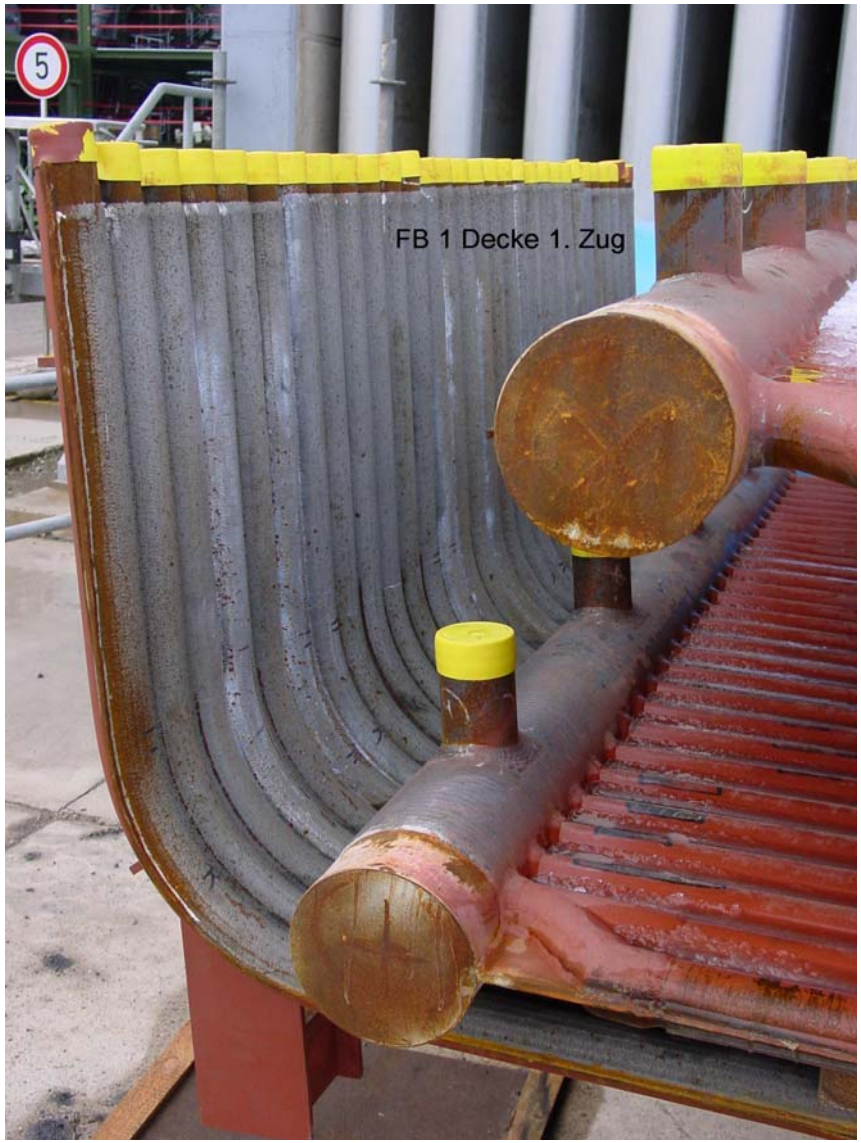

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Practical application

Assembly of cladded panels in the width

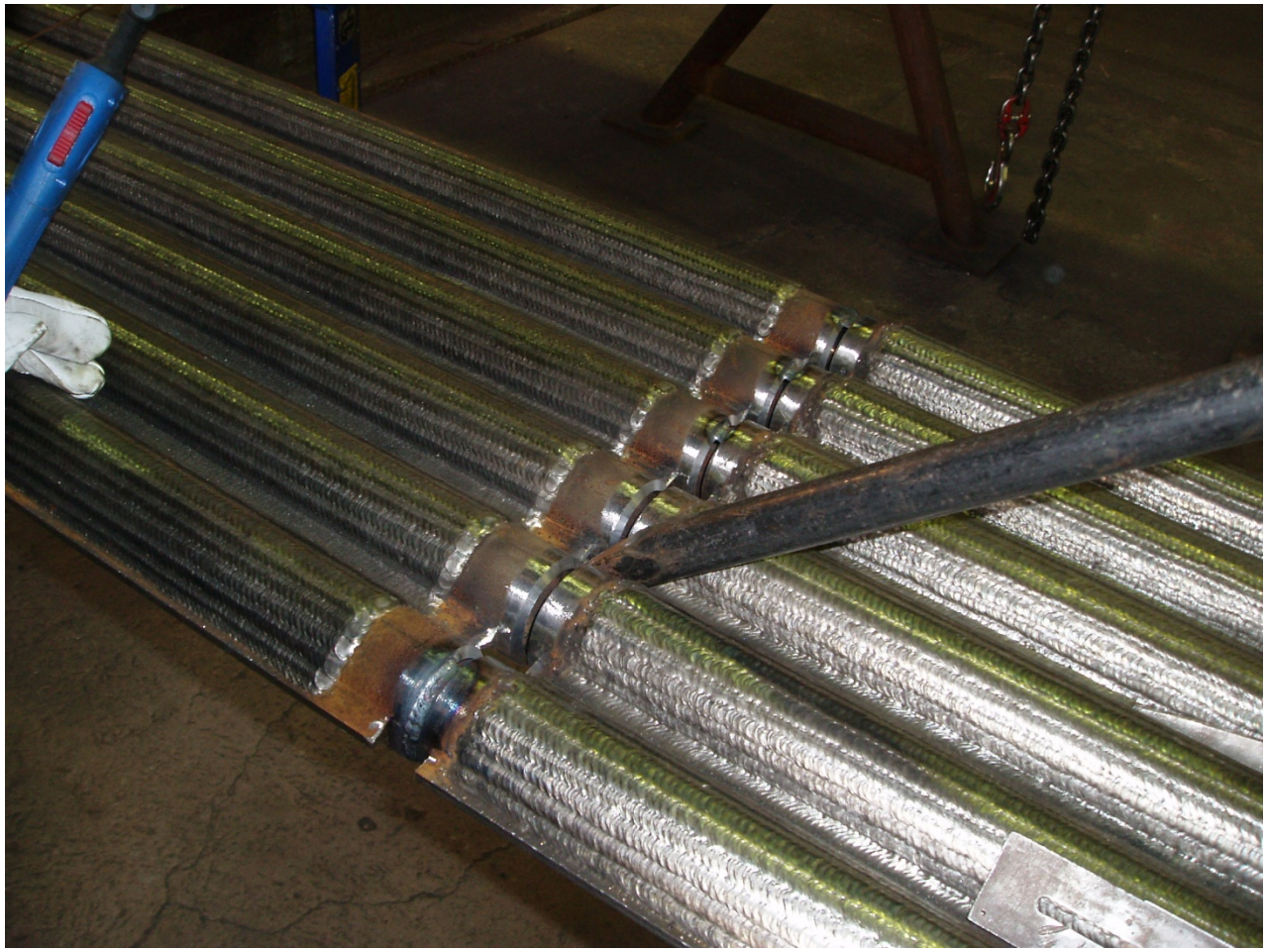
Practical application

Post cladding of shop assembly seams

Practical application

White / white connection of cladded components

Practical application



Black / black connection of cladded panels

Practical application

Chipped refractory in area of bendings

Practical application

Full circumference cladded bendings

Practical application

Cladded header with cladded, bended panel elements

Practical application

Cladded superheater tubes

Practical application

Header – panel connection

Practical application

Cladded panels with 360° cladded, bendings

Practical application

Assembly of cladded parts

Practical application

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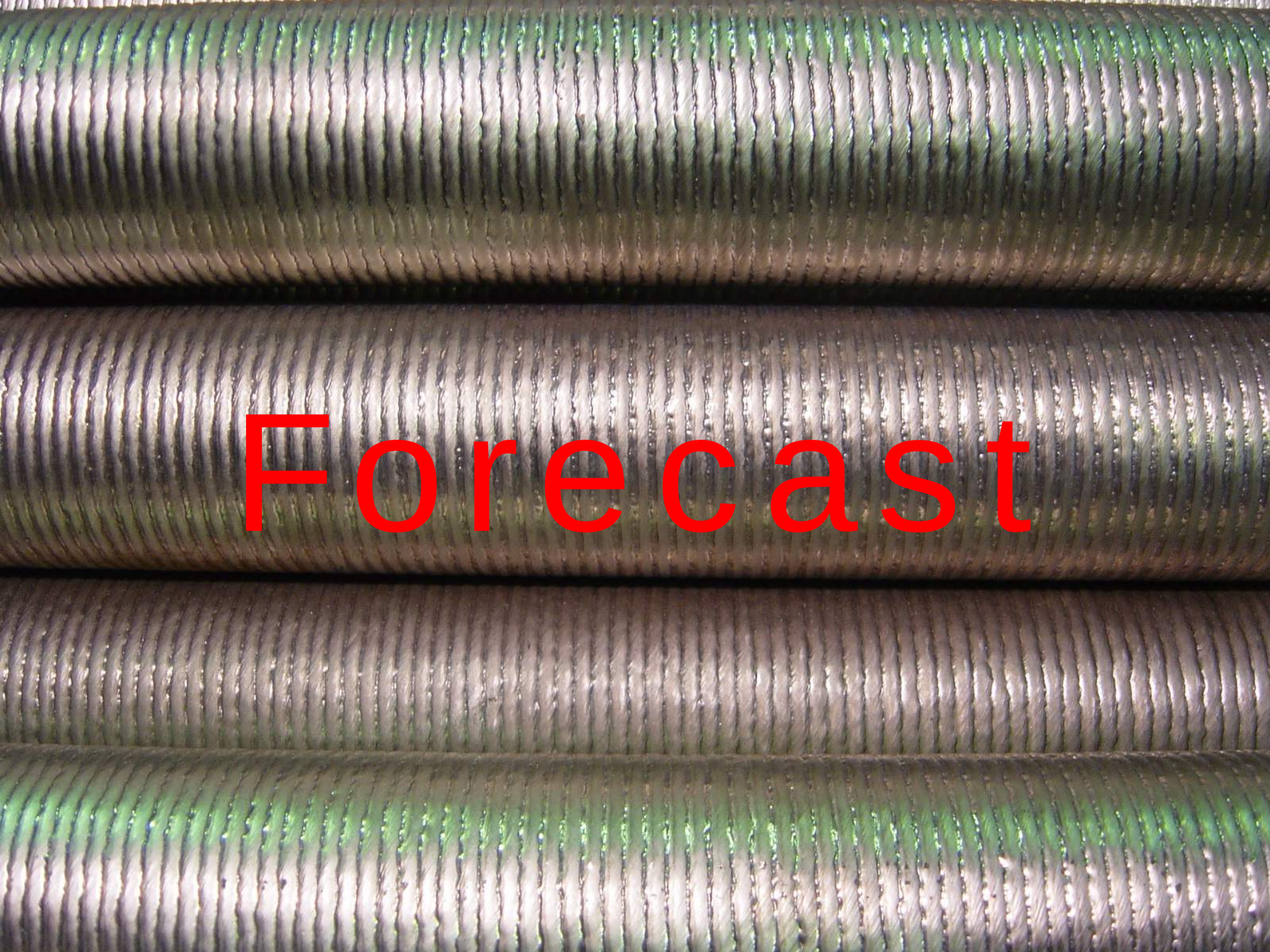
Forecast

Forecast

Trend: In steps from a small service company to a boiler manufacturer

1. Step: Pure cladding of pressure parts
   (Stapelfeld, Hagenholz, Giubiasco)
2. Step: Cladding of panels incl. assembly
   (Brescia, Twence, Traba Germania)
3. Step: Cladding of panels and superheater tubes incl. assembly;
   additional fabrication of a steam drum (Göteborg)
4. Step: Fabrication of complete boiler pressure parts (Winterthur)

How to realize ?

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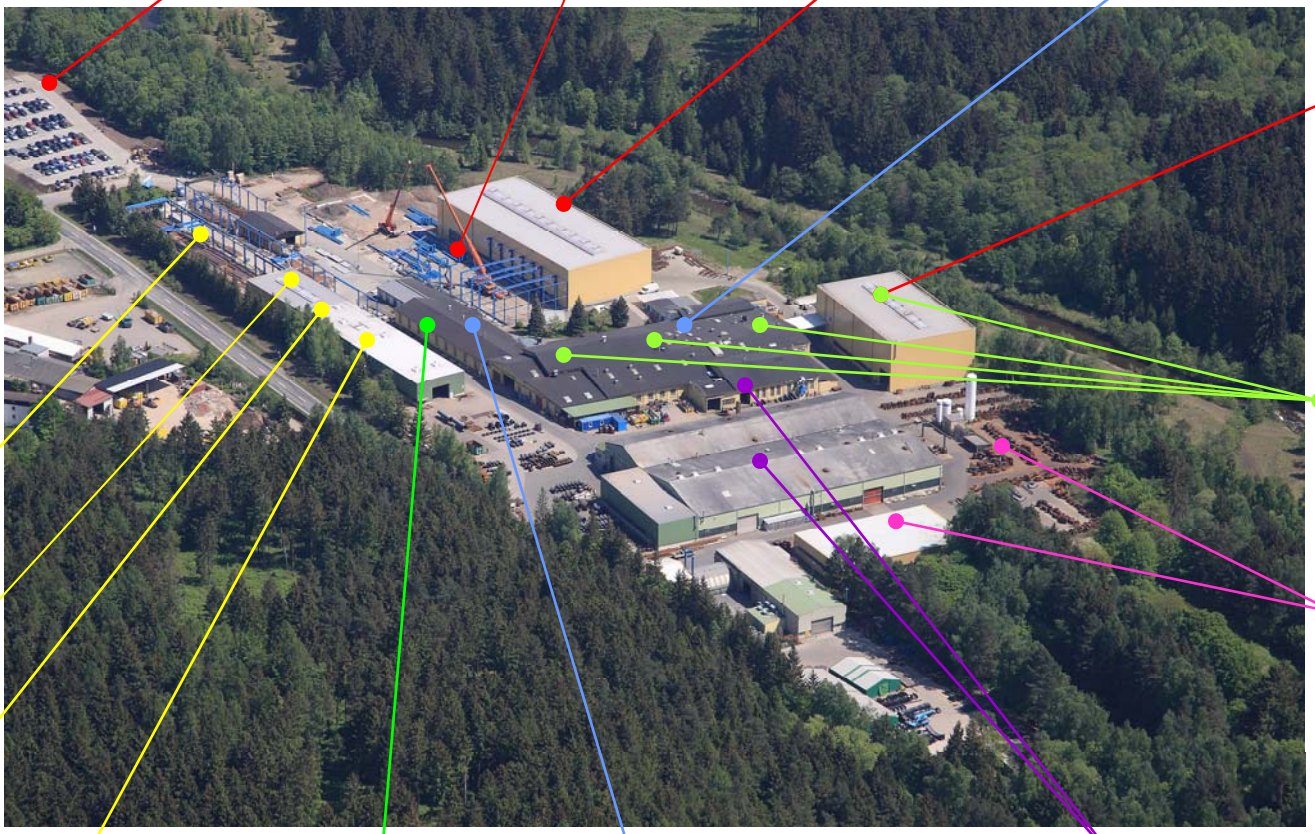
UHLIG Z(f)P

Extension area 4.500m² for 154 cars

Hall 9 fabrication panels

Hall 8 Assembly

Total area 72.500m² - 12.250m² roofed



Hall 7 10m Cladding plants

Cladding panels

Plate stock

Extension cut part

Tool stock

Cutting

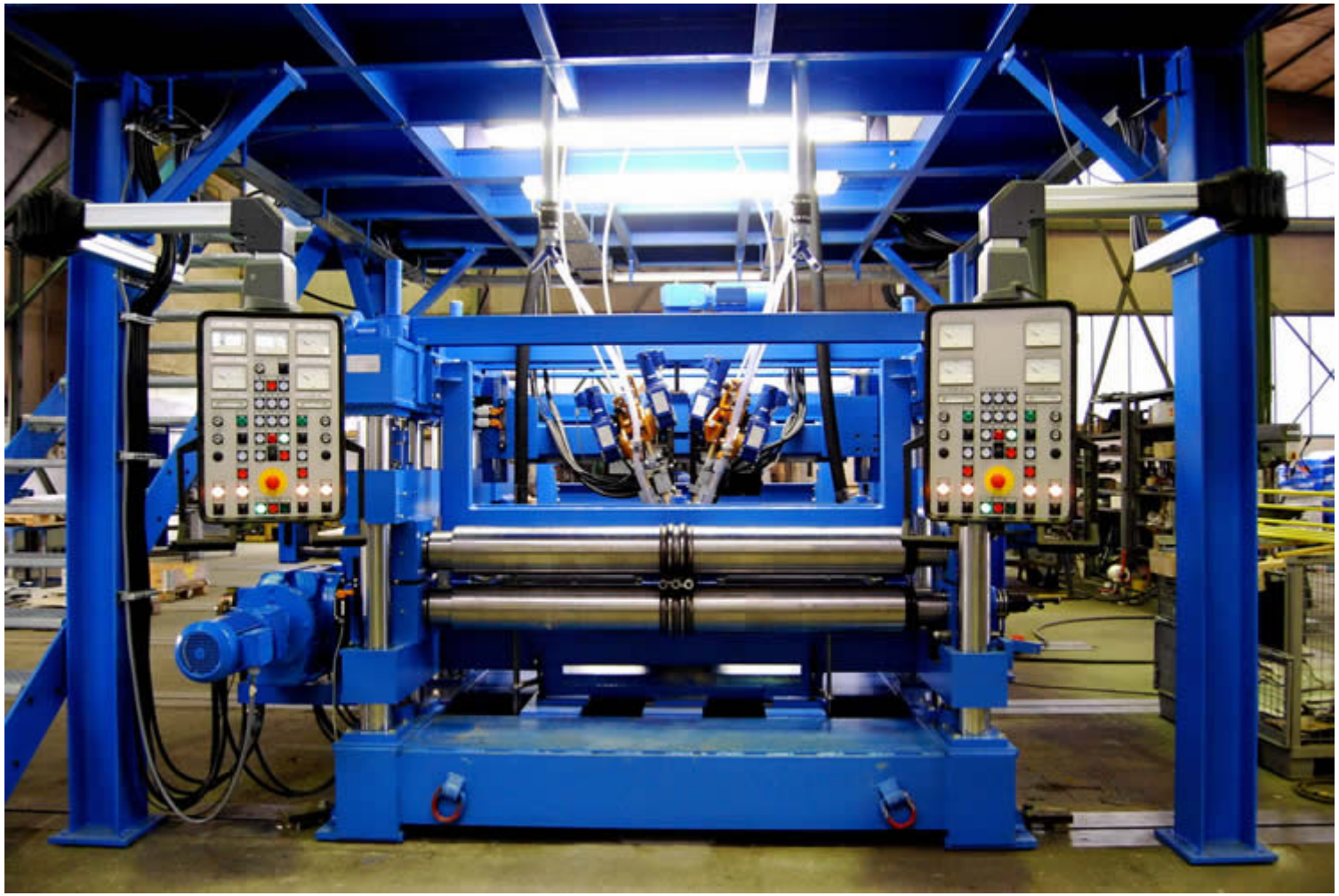
Fabrication fire-tubes

Cladding single tubes

Administration

Fabrication Elbows + fittings

Membrane wall - Fabrication



Membrane wall - Bending

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Thanks for your attention !