BILFINGER BERGER
Power Services

Babcock Borsig Steinmüller

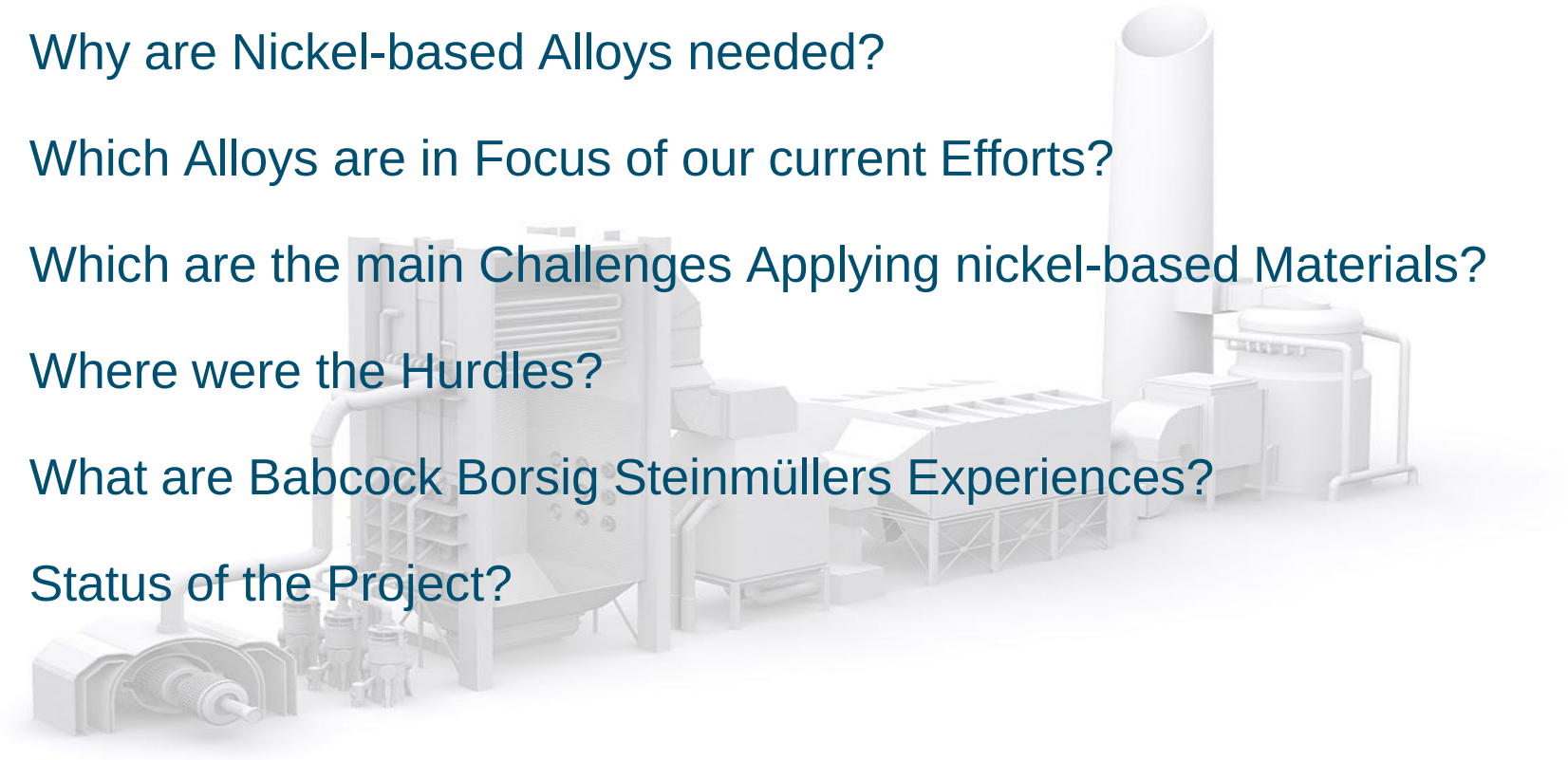
Advanced Manufacturing and Assembly Strategies for Nickel-based Alloys applied at USC Power Plants

IEA - Workshop on Advanced USC coal-fired Power Plants

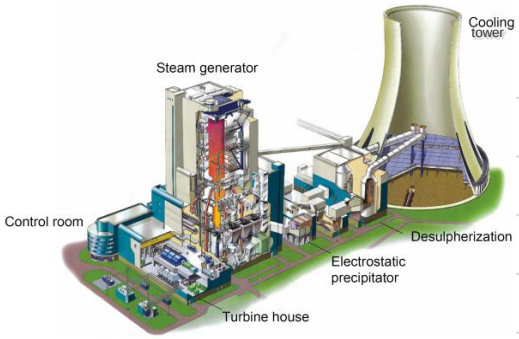
Vienna, 19-20 September 2012

Overview

- Why are Nickel-based Alloys needed?
- Which Alloys are in Focus of our current Efforts?
- Which are the main Challenges Applying nickel-based Materials?
- Where were the Hurdles?
- What are Babcock Borsig Steinmüllers Experiences?
- Status of the Project?



Why are nickel-based Alloys needed?
A short History and Outlook



- Power output (gross)
- Efficiency (net)
- Live-/Reheatsteam

150 300 600 800 900 950 1100 MWel

> 50 > 48 %

30,8 31,4 35,8 36,6 40,6 42,3 >43

375/700/720 285/600/605 bar/°C/°C

180/530/530 200/530/530 262/547/565 267/554/583 275/580/600

Cycle optimization

Once-through boiler | SO_2, NO_x, Reduction | Flue gas heat recovery | Lignite pre-drying

Material evaluation (SH)

X20 | T91 | Austenitc Materials | Nickel-Based Alloys

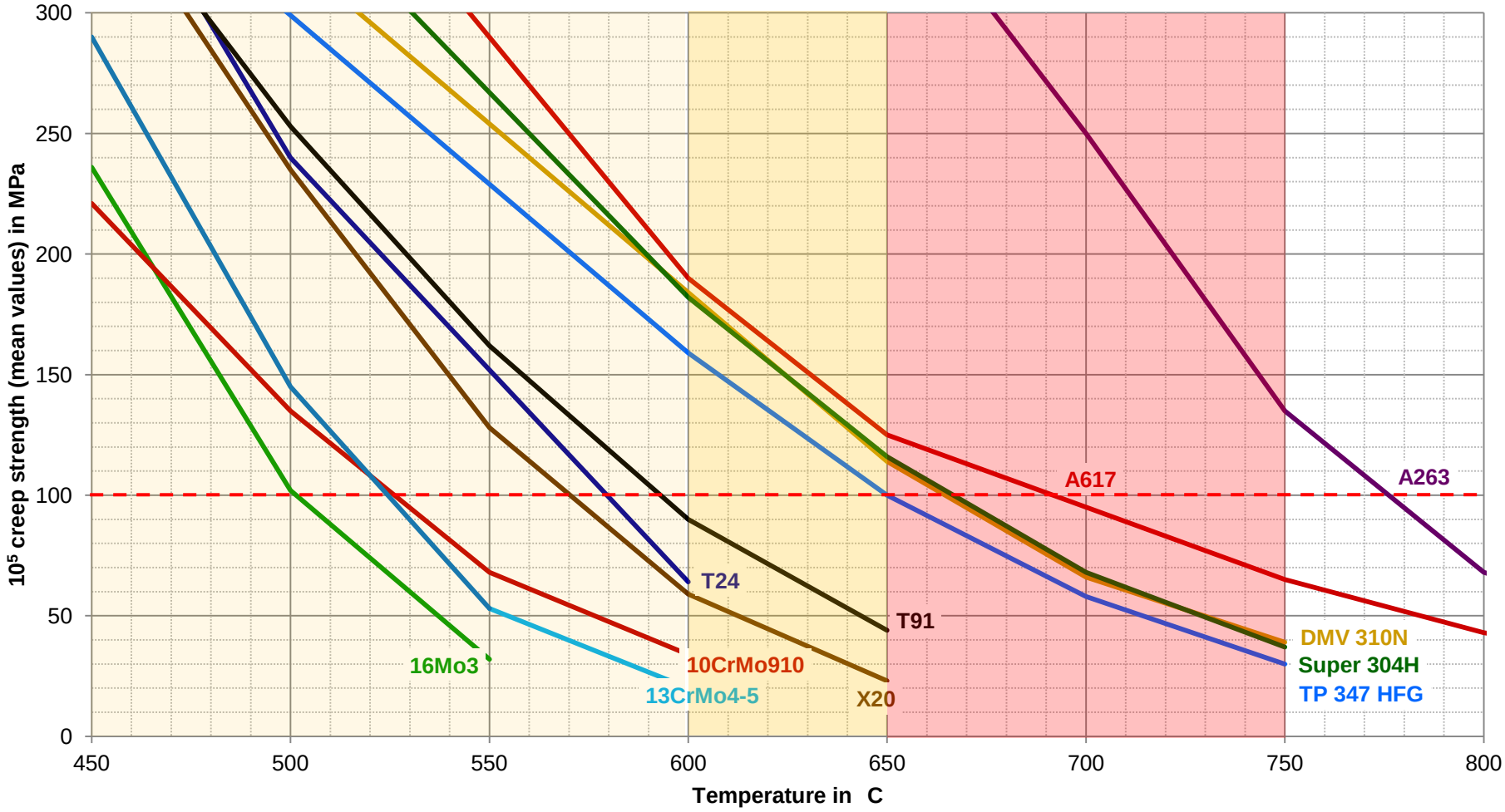
◇ Process advances

1960 1980 2000 2020

Source: RWE AG BBS

Which materials are in Focus of our current Efforts?
COORETEC – HWT II

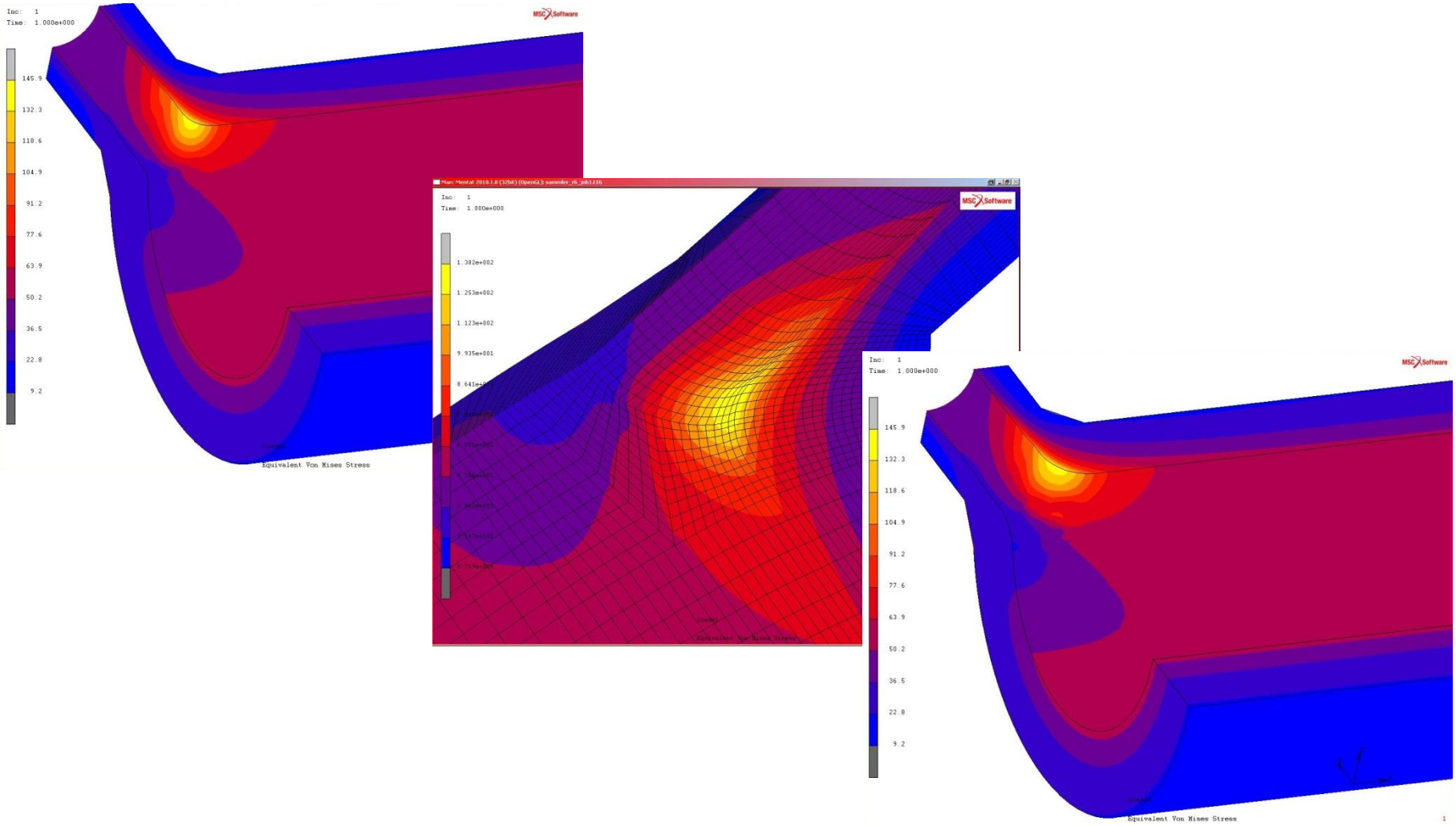
Which Materials are in Focus of our current Efforts?
Material Comparison



Which are the main Challenges Applying nickel-based Alloys?

- **Sensitivity against chemical compounds**
- **Sensitivity against indents**
- **Sensitivity against impurity**
- **Hardness**
- **Heat warping**
- **Possible need for post-weld heat treatment**

Which are the main Challenges Applying nickel-based Alloys?
Load change rate analysis



Where were the Hurdles?
Special strict Working Advices for Nickel-Base

Babcock Borsig Steinmüller Babcock Borsig Steinmüller GmbH	Arbeitsvorschrift	**AV-NiBa-001** Seite 1 von 8

Titel:	Verarbeitung von Ni-Basis-Legierungen
Projekt:	**GKM – Forschungsvorhaben HWT II**
Inhalt:	1. Zweck 2. Geltungsbereich 3. Zuständigkeiten 4. Markierung 5. Mechanische Bearbeitung 6. Reinigung 7. Zerstörungsfreie Prüfung Schweißkante 8. Schweißen 9. Anlage

Where were the Hurdles?
New BPS,WPQs, WPSs and ITPs needed

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Vorläufige Biegeanweisung (pBPS)

pBPS-Nr.: 11/02 | Blatt 1 of 1 | Rev.Nr.: 0

Kennwort:	GKW Mannheim HWT II
Bauteil:	Versuchsschlange Rohr
Geltungsbereich:	DIN EN 12952-5:2011; Vd
Biegequalifikation Nr.:	BBS-11-BQ-02

Biegevorrichtung	
Hersteller	Schwarze-Robitec
Typ	SR 80 DB
Maschinen-Nr.	2009-0230
Matrizen-Nr.	2011-0901
Gleitschiene-Nr.	2011-0901
Biegeverfahren	Biegedruck (ohne Dorn
Schmierung	ohne

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INSPECTION PLAN
Prüfplan

11310-ITP-01

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Project:
Projekt: **GKM Kessel 17**
725℃ Überhitzer: Rohrscheiben mit Tragrohren, Samm ler

Job.-No.:
Kom-Nr.: **IA 11310**

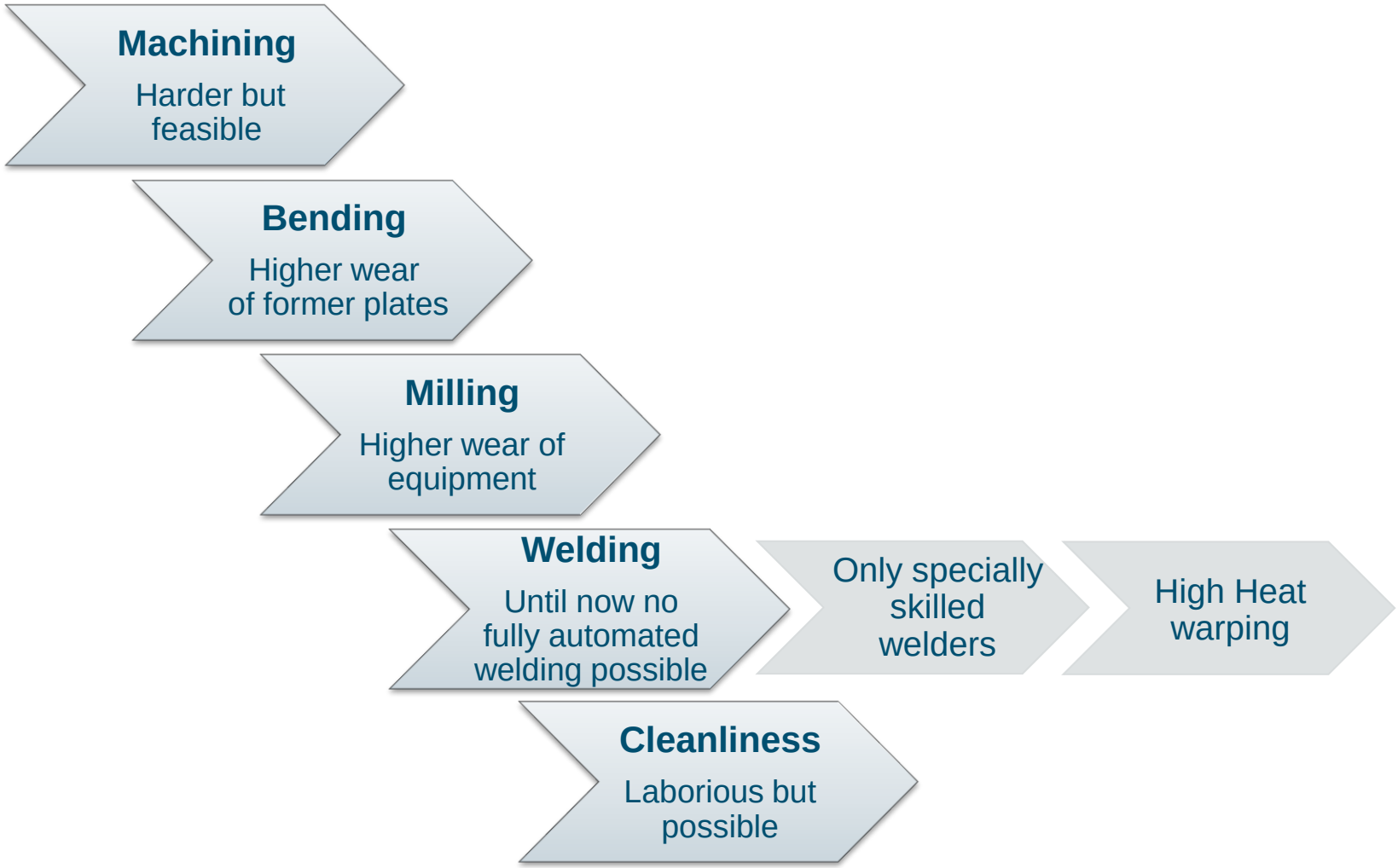
Requirements
Anforderungen: **EN 12952**

Title:
Titel: Inspection plan for prefabrication
Prüfplan für die Vorfertigung

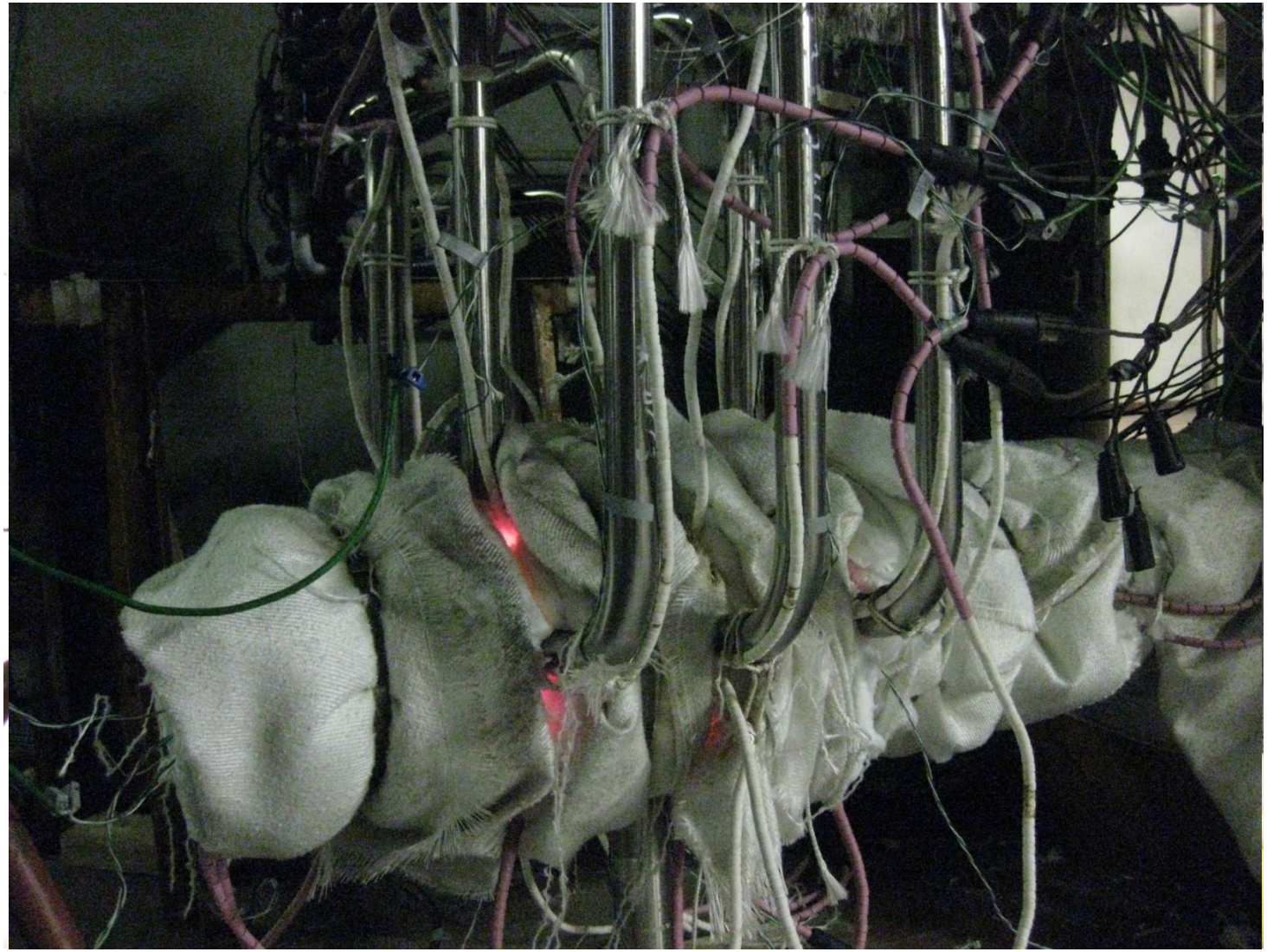
System:
System: 725℃ Superheater
725℃ Überhitzer

Material:
Werkstoff: **NiCr23Co12Mo (2.4663) mod., NiCo20Cr20MoTi (2.4650)**
X6CrNiNbN25-20 (1.4952),
X10CrMoVNb9-1 (1.4903), 16Mo3 (1.5415)
X15CrNiSi25-21 (1.4841)

What are Babcock Borsig Steinmüllers Experiences?



Status of the Project?



Thanks for your attention!

Dipl. Ing. Philipp Schiffer
Wärme- und Feuerungsverfahrenstechnik

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