



BÖHLER

BLECHE

BÖHLER NEUTRONIT®

SHIELDING MATERIALS
FOR NUCLEAR INDUSTRY

NRC Meeting - NAMs

Aude Prestl

March 14th, 2013

Key figures FY 2011/2012

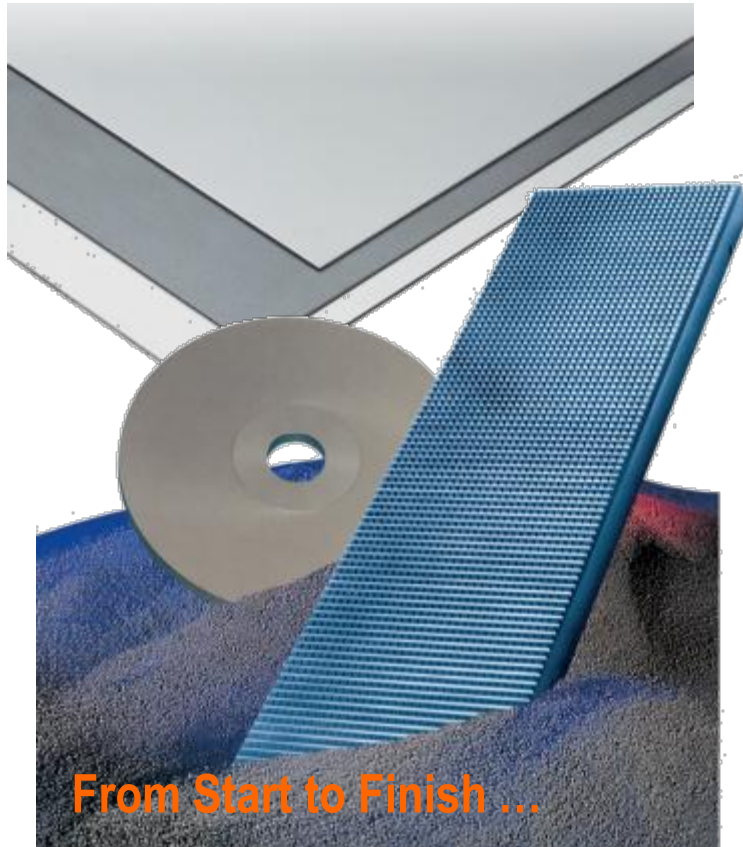


Turnover*:	146 m€
Employees**:	550
Production*:	24.115 to
Export rate*:	98 %

*excl. other earnings

** incl. apprentices

Integrated steel production



BÖHLER cover all technical melting and re-melting processes with state of the art equipment, e.g.

- EAF/AOD-Converter
- VID, VIM
- ESR, P-ESR, VAR
- POWDER METALLURGICAL PROCESS
(for tool steels and high speed steels)

Hot rolling technology



Three high mill

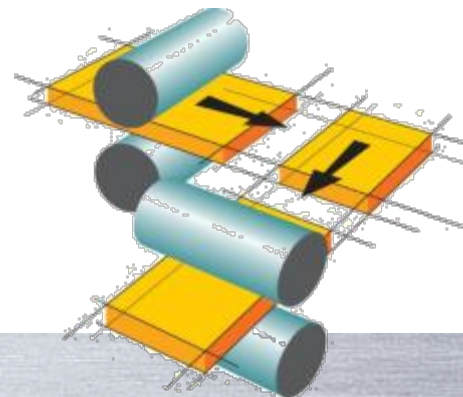


Two high mill

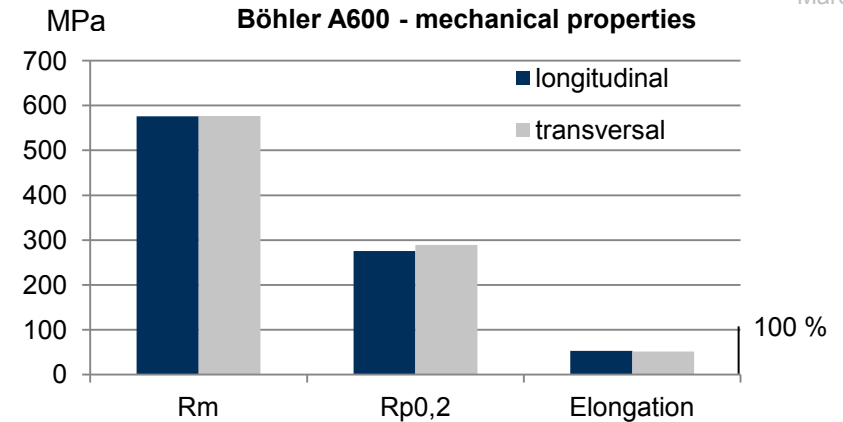


Fine steel mill

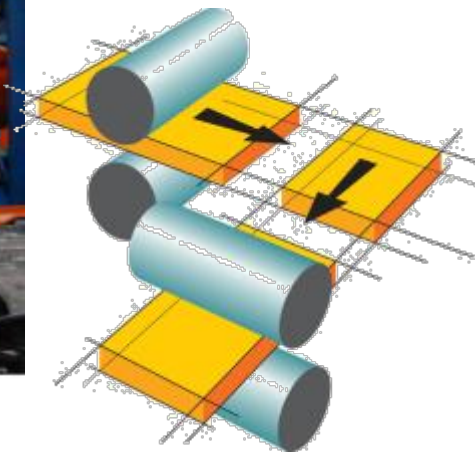
BÖHLER BLECHE is specialized in the production of cross-rolled sheets and plates.



Cross-rolling technology



A special cross-rolling technology creates uniform properties on all our products concerning



- mechanical
- technological and
- physical characteristics

General information to Böhler Neutronit®

- Böhler Bleche produces shielding material since more than 30 years
- Böhler Bleche is one of the world's leading producers of boron alloyed stainless steels with natural or enriched boron
- Highest criteria is the equal and homogeneous distribution of borides
- Böhler Bleche developed a unique non destructive testing method for boron distribution (JEN3)

Production program

Neutron absorber materials

- Dimensions:
 - max. width: 59 inch (1500 mm)
 - max. length: 237 inch (6000 mm)
 - thickness: 0.06 inch (1.5 mm)
up to 3.55 inch (90 mm)
- Edge finish:
 - Shear cut
 - Cold sawn
 - Lasercut
- Surface finish:
 - Shot blasted
 - Pickled
 - Ground



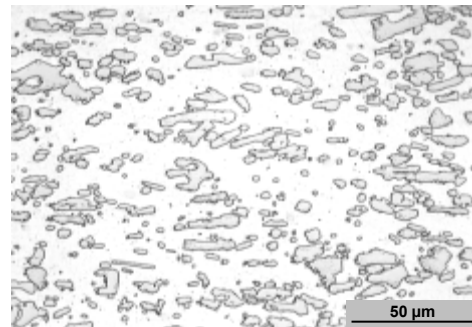
Technical specification

Boron alloyed stainless steel

- Average chemical composition [wt.%]

BOHLER NEUTRONIT®	Standard ASTM A887	C	Cr	Ni	Co	B
A976	304 B Grade B	0.03	19.1	12.7	Max. 0.05	0.6 - 1.9

or tailor made chemical composition according to customer specification



A976SD 1.2 wt% B



A976SF 1.8 wt% B

(Fe, Cr, Ni, Mn, Mo)₂
(B,C)

austenitic matrix

Technical specification

Boron alloyed stainless steel

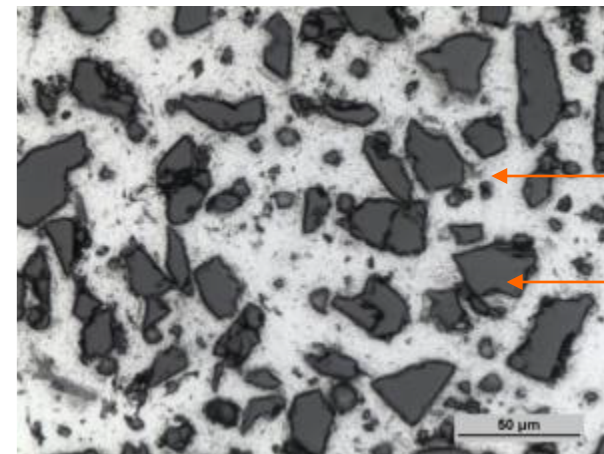
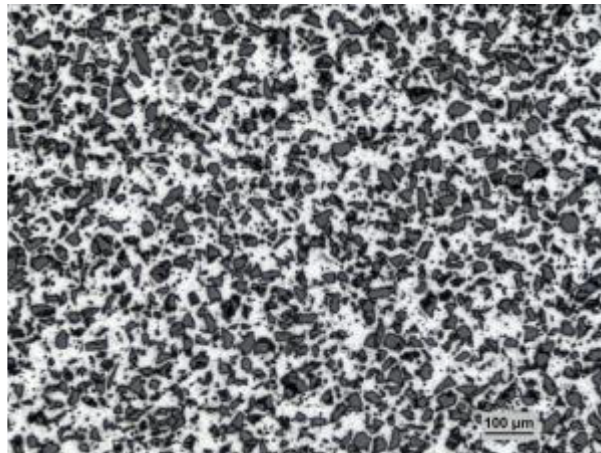
BOHLER NEUTRONIT®		Standard according to ASTM A887-89 Grade B	Average chemical composition	Average mechanical properties		
			B (wt.%)	Rm (MPa)	Rp0.2 (MPa)	A (%)
natural FeB	A976SA	304 B3	0.8	581	325	30
	A976SD	304 B4	1.1	590	329	21
	A976SG	304 B5	1.3	593	348	19
	A976SE	304 B6	1.6	605	365	13
	A976SF	304 B7	1.8	619	397	11

Technical specification

Aluminum B4C based Material Matrix Composites

- Böhler Neutronit[®] MMC with up to 25% B4C
- Matrix based on A1XXX and/or A6XXX
- Development of MMC with higher B4C content in progress

Böhler Neutronit[®]
with 23% B4C
17 wt% boron



AA1100 Matrix

B4C

Technical specification

Aluminum B4C based Material Matrix Composites

BOHLER NEUTRONIT®		Average chemical composition	Average mechanical properties (as rolled)			
		B (wt.%)	Rm (MPa)	Rp0,2 (MPa)	A (%)	Density (g/cm ³)
enriched B4C (min. 50 at.% B10)	MMC15 AA6061	11.9	264	205	6.6	2.67
natural B4C	MMC20 AA1100	17.0	166	151	2.8	2.66
	MMC25 AA6061	19.2	283	180	2.6	2.66

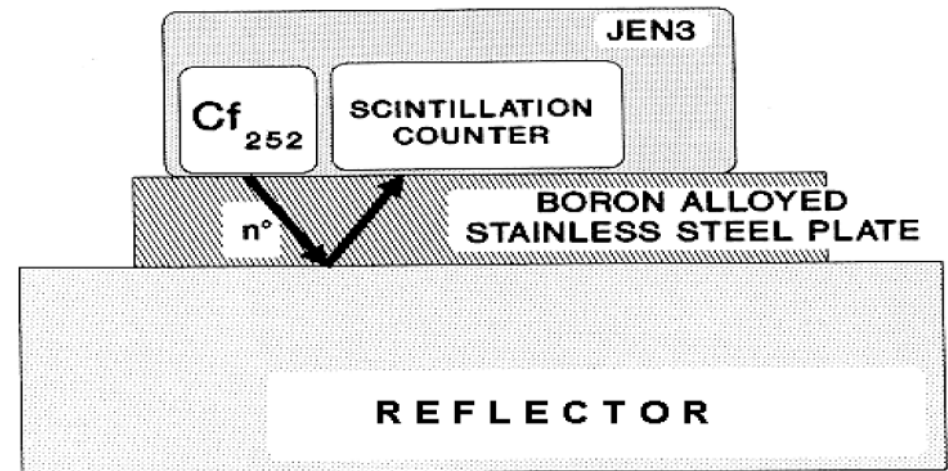
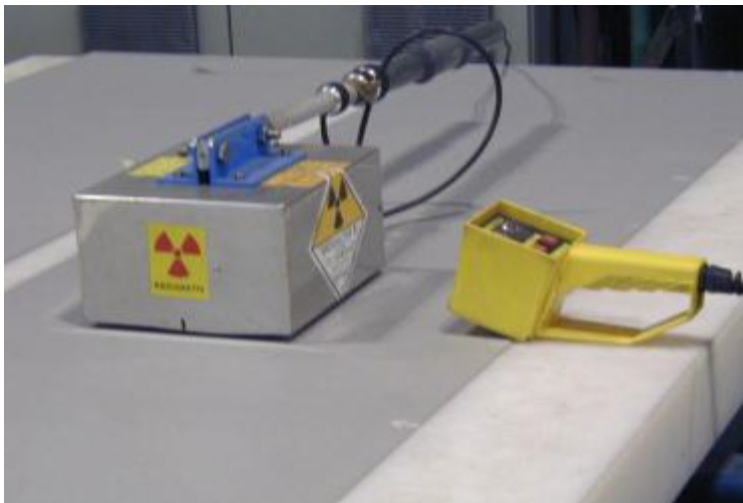
Quality control and testing

- ISO 9001 certified
- ÖVE/ÖNORM EN ISO/IEC 17025:2007 accredited testing laboratory
- Inspections through quality inspectors at various stages of production
- Customer approvals
- Non destructive testing for boron distribution through JEN3 device.

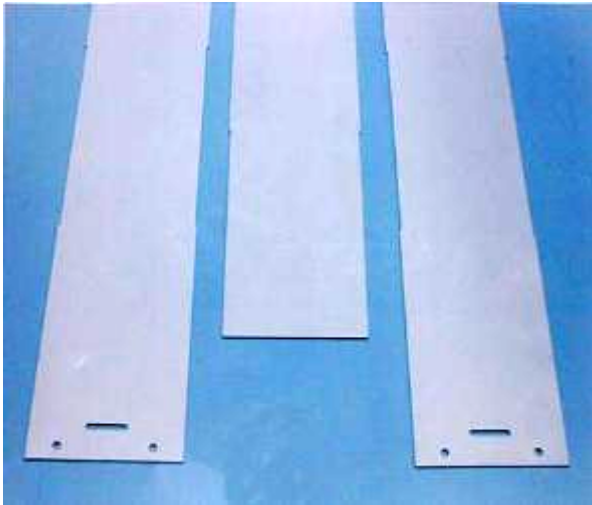


Verification of boron distribution

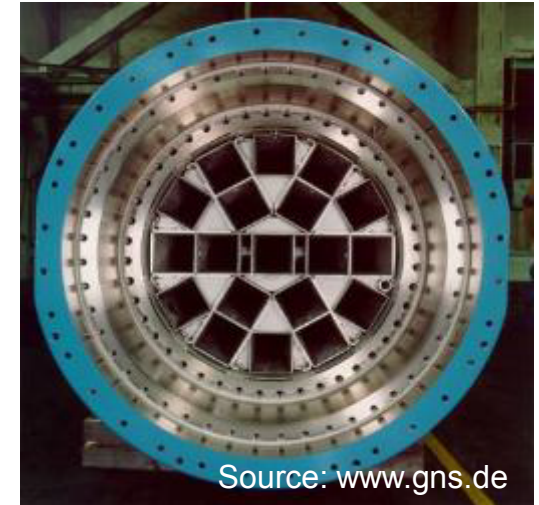
- Neutron absorption testing
- Positive identification test
- Boron uniformity distribution test
- Non destructive testing



Böhler Neutronit[®] – Applications



Source: www.butting.de

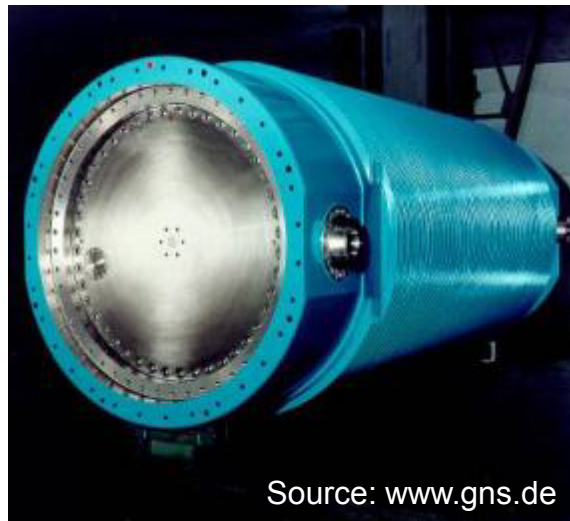


Source: www.gns.de

BÖHLER A976
NEUTRONIT

Up to 2% boron
(incl. enriched boron)

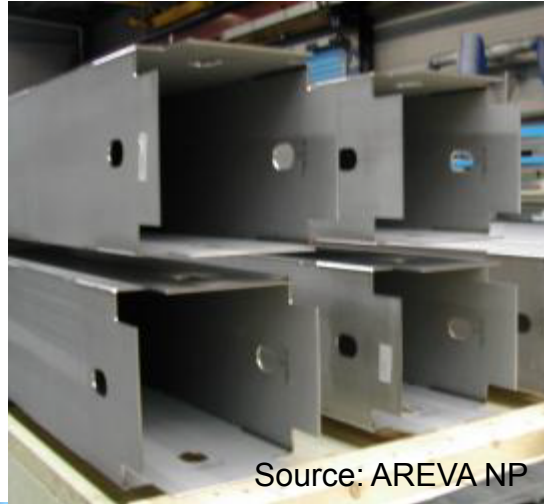
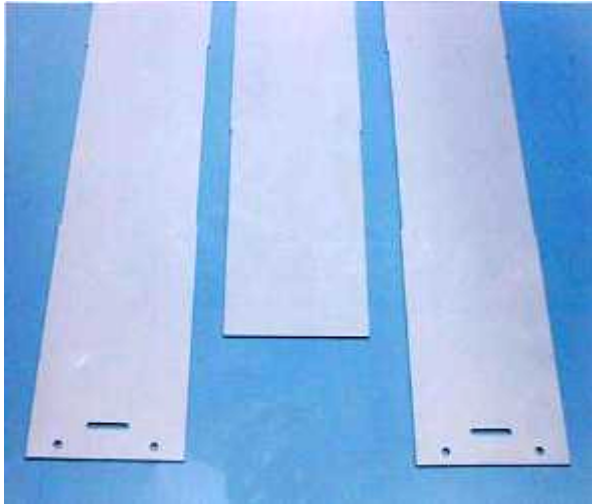
For dry storage racks and
transportation casks



Source: www.gns.de

CASTOR[®] V/19

Böhler Neutronit[®] – Applications



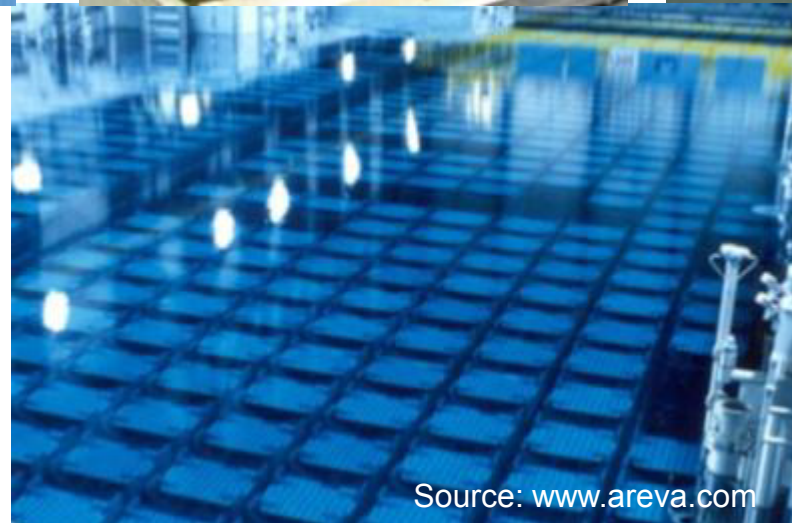
Source: AREVA NP



Source: AREVA NP

BÖHLER A976
NEUTRONIT

Up to 2% boron
(incl. enriched boron)
For wet storage racks



Source: www.aveva.com

La Hague wet storage

Milestones – Material for nuclear industry

- 1970's First trials with boron alloyed stainless steel at Bohler Bleche (B-content 0.8 %)
- 1980's First big project for wet storage in La Hague (B-content max. 1.1 %), development of the JEN-3 Equipment
- 1990's Development of high B-contents up to 2 %
- 1999 First deliveries of plates with enriched boron for special applications
- 2000's First trials with other base materials (mainly aluminum)
First trials with Boron-Gadolinium alloyed Steels
- 2009 First order for borated aluminum (MMC)

Major projects

- Plates for fuel reprocessing plant in La Hague
- Plates for fuel reprocessing plant in Sellafield
- Plates for wet storage rack for EPR in Flamanville (first project with high B-content)
- Plates for wet storage rack for EPR in Olkiluoto
- Plates for ITER project - 1.57 inch (40 mm) with B-content 1.8 %
- Plates for wet storage rack in China
- Continuous supplies for transportation casks
- Project Reracking in France

Market size

- Production volume of 500 to 1000 tons of Böhler Neutronit® per year
- Since more than 30 years
- For over 50 satisfied customers
- In around 20 countries distributed over Europe, Asia and the USA

Thank you!

Aude Prestl

Business Area Special Materials and Pressplates

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