



Niobium Experience

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Agenda

- EB capacity and size
- Experience with single/large grain melting
- Sheet capabilities
- Tubing capabilities



Equipment Capability

- Three production and one R&D furnace
- Newest furnace is S10
- Three Von Ardenne EH 750 guns for a total applied power of ~ 2.25 MW
- Melting RRR Nb to 250-480 mm diameter



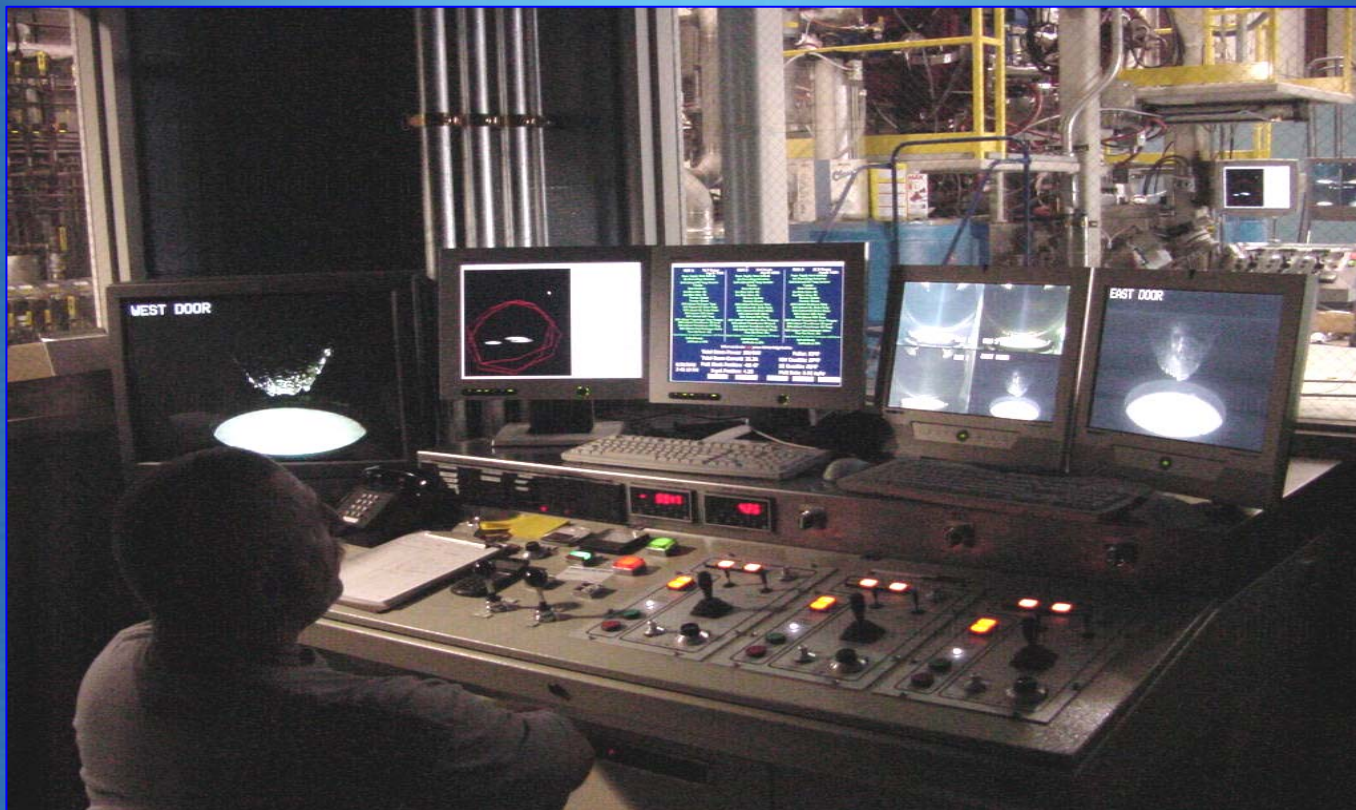
S10 EB Refining Furnace

- Four 900 mm diffusion pumps
- 200,000 l/sec
- 10^{-4} Torr



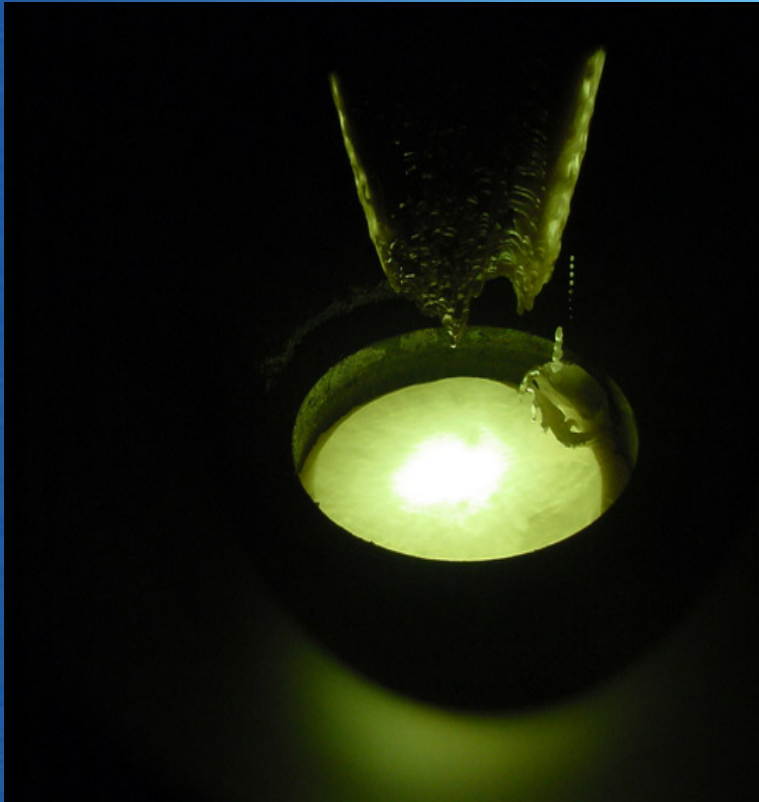


S10 Control Room



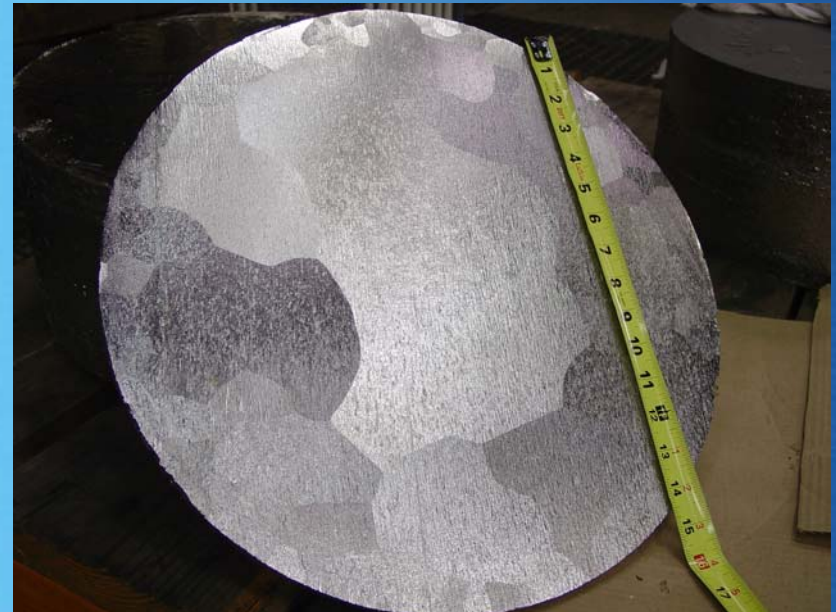
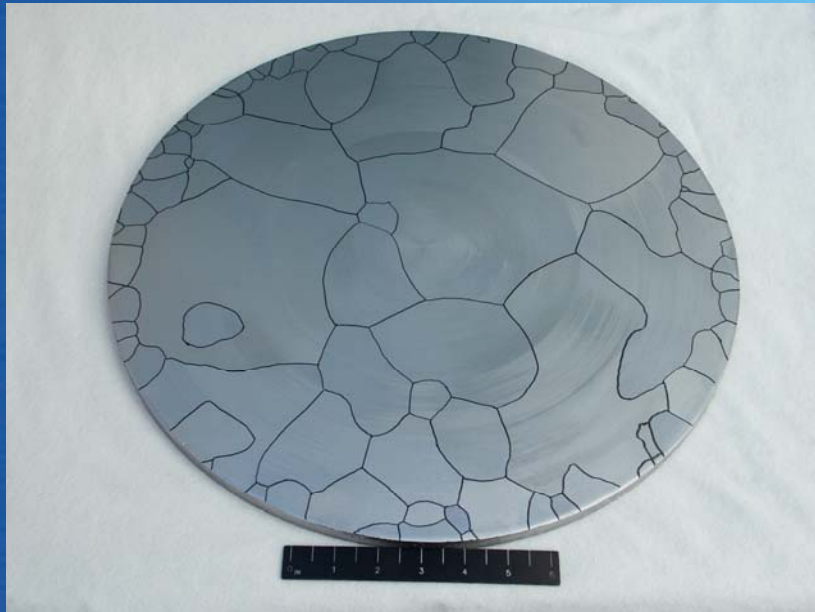


Crucible & Finished Ingot



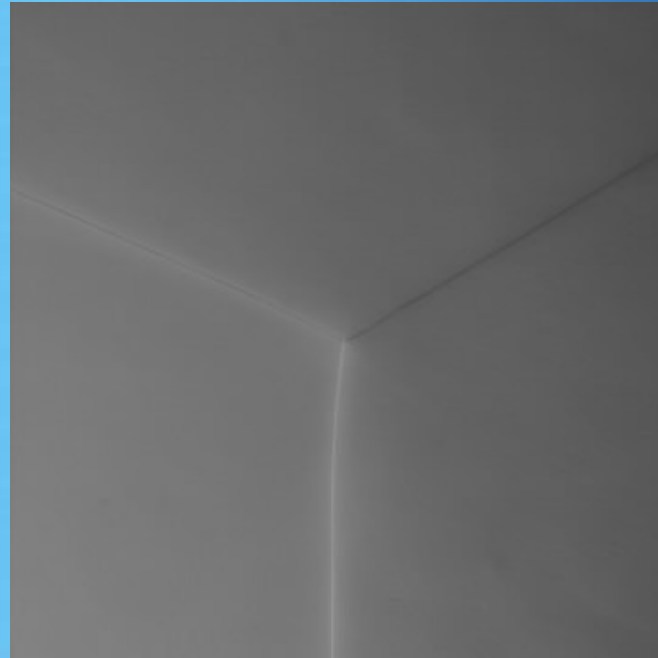


Examples of Large Grain Ingot Slices





True Single Crystal Grains



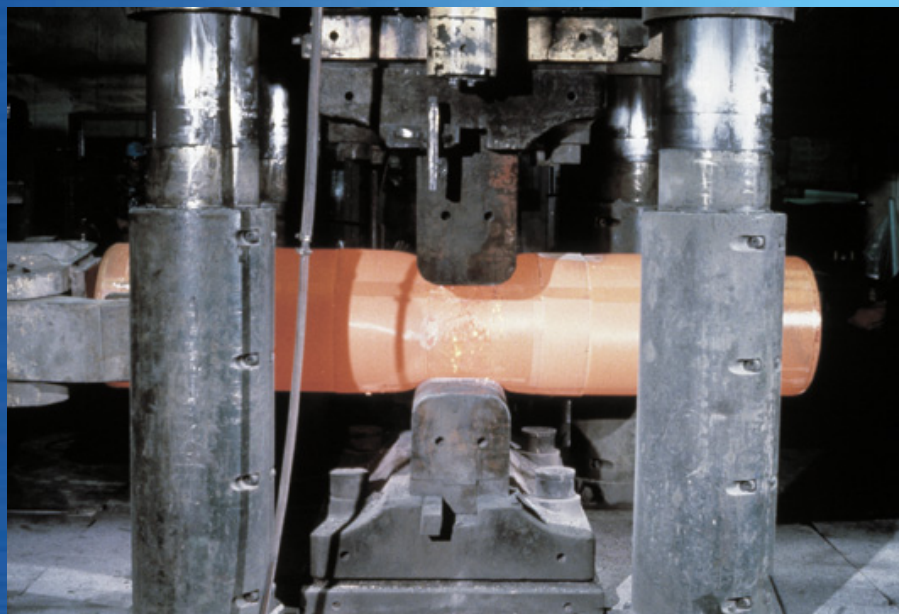


EB Production Furnaces

Furnace Designator	Power kW	Crucible Diameter mm	Ingot Length mm	EB Guns Von Ardenne
S8	1,200	250-400	2900	3
S9	700	250-400	2900	3
S10	2,250	250-480	2900	3



Sheet Manufacturing





Cold Rolling



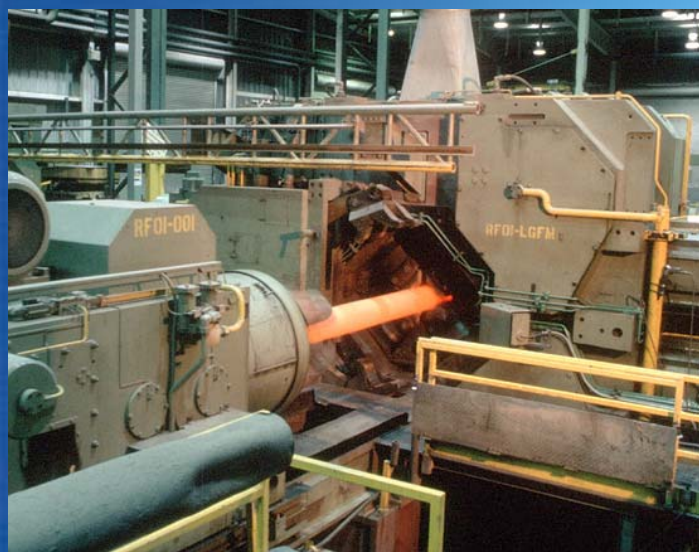


Sheet Manufacturing

- 2000 ton open die forge
- Air atmosphere furnaces
- 800 mm wide hot mill
- 700 mm wide cold mill
- 300 mm wide Sendzimir “Z”-mill for foil to 20 μm
- Conditioning – roller leveling, shearing, slitting, pickling, microgrinding, hydrobuffing



Tubing Manufacturing





Tubing Manufacturing

- 650 ton rotary forge, 350 - 65 mm ϕ
- Fully automated extrusion billet manufacturing
- 3,500 ton extrusion press, 150 mm OD
- Vacuum annealing to 1300°C
- Conditioning – rotary straightening, belt polishing, pickling, cut-to-length, chamfer



Questions?