



Oxford Superconducting Technology

An overview....

Oxford Instruments History



The Business of Science®

1959

1960s

1970s

1980s

1990s

2000s

Today



Oxford Instruments develops the world's first superconducting magnet

Founded by Sir Martin and Lady Audrey Wood, Oxford Instruments is the first commercial spinout from Oxford University



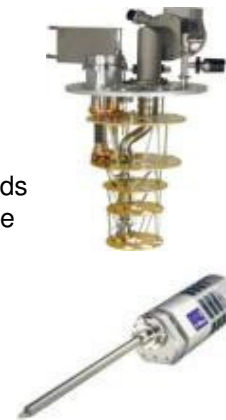
Oxford Instruments delivers world's first MRI system



Floated on London Stock Exchange



The Group expands its global presence opening offices in Japan and China



Continuing the heritage of innovative technologies, the Group develops unique cryogen free and silicon drift detector technologies

The Group continues to expand its high tech tools portfolio both organically and through acquisitions

ANDOR
an Oxford Instruments company



IRMG

ASYLUM RESEARCH
an Oxford Instruments company

mniprobe®
An Oxford Instruments Company

Omicron
An Oxford Instruments Company

Platinum
Medical Imaging



Oxford Superconducting Technology



Leaders of Science®

200+ employees

Manufacturing - Carteret, NJ – 110 000 ft²

ISO 9000-2008 certified

OHSAS 18000 certified



Commercial Superconducting Wire & Cable

- Comprehensive manufacturing of broad range of superconductor
- Most sales generated outside of the Oxford Instruments group
- Leading volume producer of low temperature product (“LTS”) in the world

Product & Technology Development

- LTS (primarily Nb₃Sn)
- HTS (Bi-2212 round wire)



A history of development and growth



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- 1965 Superconductor R&D at Airco
- 1979 'Airco Superconductors' moved to Carteret, NJ
- 1982 'Oxford-Airco' joint venture formed to exploit MRI
- magnets produced in Carteret through 1989
- 1986 Oxford Instruments buys out Airco - 'OST' formed
- 1991 Contract from BNL for RHIC conductor
- 1993 Ranked as #1 supplier to SSC for outer cable
- 1995 ISO9001 certification achieved
- 1996 Solidified position as world's largest s/c producer
- 1997 Introduced internal tin product line
- 1999 2212 HTS insert coil reached record magnetic field
- 2000 900 MHz NMR magnet with OST conductor
- 2002 Rod process internal tin product introduction
- 2003 25T with HTS insert coil, 16T in Nb₃Sn dipole
- 2004 950 MHz (22.3T) NMR magnet produced
- 2007/8 Strong commercialization of internal tin products
- 2009 ITER orders (67 tons) received
- 2013 ITER shipments completed
- 2014 MRI production expansion completed

MRI
conductor
development
focus

5x increase in
MRI conductor
throughput



Nb₃Sn ITER
conductor
development

20x increase in
Nb₃Sn
conductor
throughput



Quality Summary

- Mature Quality Management System
 - ISO certified since 1995
- Workforce committed to Quality
 - Internal Process Audits
 - Greater process control
 - Continuous improvement
- 100% Quality Inspection
 - In process inspections
 - Final inspections
- Product Testing/Validation
 - OST labs
 - External labs
- OHSAS 18001 Safety Certification achieved in 2013



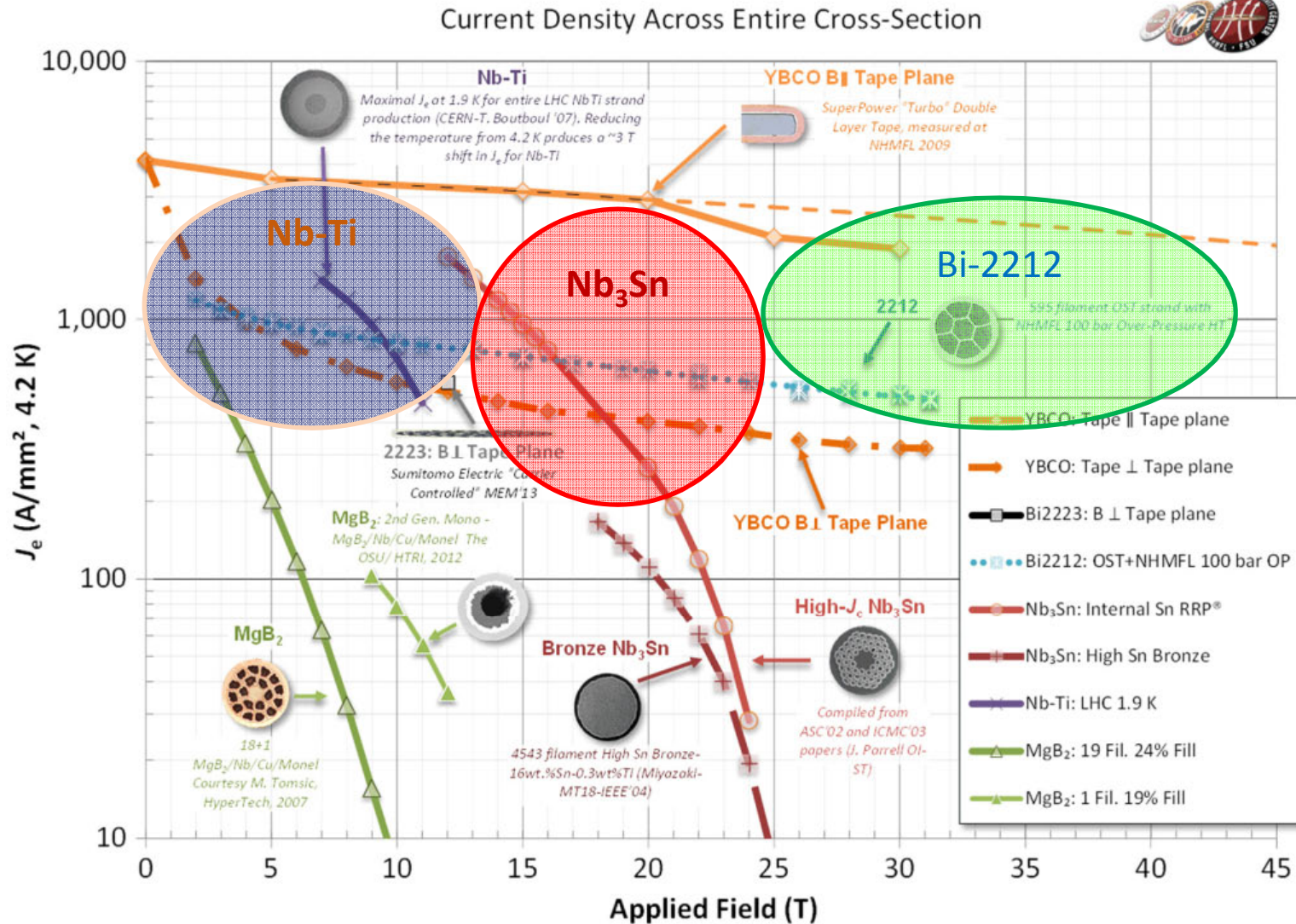
Key Product Families



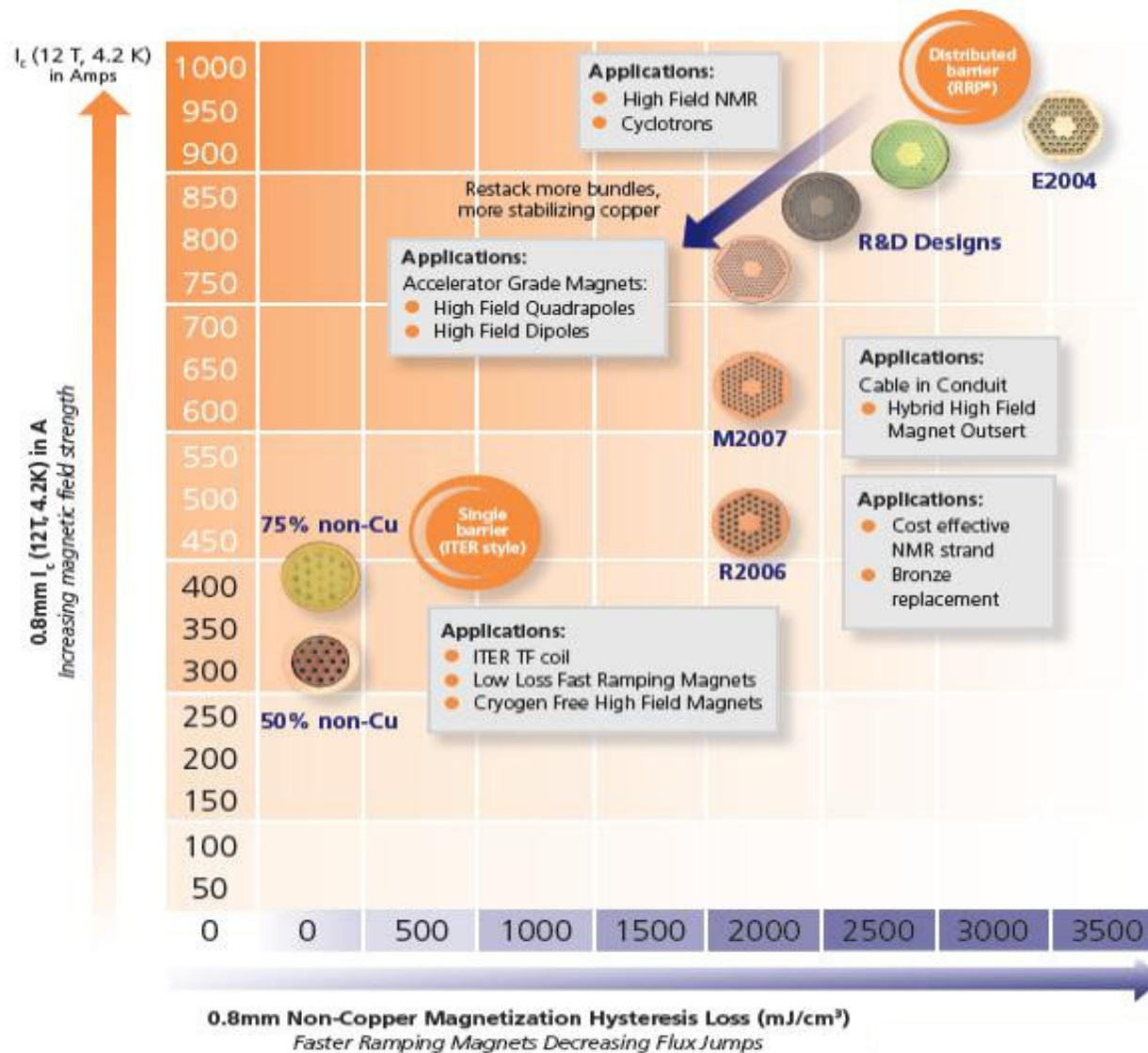
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- Nb-Ti wire for MRI, NMR, etc.
 - Monolith wire with Cu or Cu-Ni matrix (Switch, Probe)
 - Wire-in-channel
 - Fine filament (accelerator grade)
- Nb₃Sn wire for Accelerator, ITER, NMR, etc.
 - Single barrier internal tin
 - Distributed barrier internal tin (RRP®)
- Bi-2212 round wire for advanced Accelerator & Ultra High Field Magnets

Nb-Ti, Nb₃Sn and Bi-2212 Wire Performance



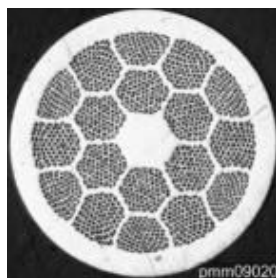
Nb₃Sn Wire Properties



Bi-2212 Wire for High Field and Low Temperature Applications



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Rutherford cable by LBNL

High field application special requirement	Bi-2212	Bi-2223	RBCO
• An isotropic conductor form	√	x	x
• High connectivity and high vortex pinning	√	√	√
• Ability to twist, cable and transpose	√	?	?
• Operation in domains of T and H inaccessible to 1 GHz magnet maximum for Nb ₃ Sn	√	√	√
• Strength, resistance to quench, compatible insulation and materials utilization technology	√	√	?
• Easy to scale up (low equipment investment cost) and adapt well developed Nb ₃ Sn technology	√	?	x

Unique material for Ultra High Field magnet applications



OST is continuing to invest in Nb₃Sn and Bi-2212 conductors

- Based on our distributed barrier internal tin (RRP®) product for identified HEP applications and needs.
- Cooperative efforts with public and private users

Future collaboration is welcomed

- Direct contact with R&D team
- Technical conferences and workshops
- On- site seminars

THANK YOU