



Superconducting Cable (CICC) Technology

Mark D. Bird, Series Connected Hybrid Construction

DMR-Award 0603042

National High Magnetic Field Laboratory



The Outer Superconducting Coils for the Magnet Lab's new Series-Connected Hybrid (SCH) magnet use Nb₃Sn cable-in-conduit conductor (CICC) technology, which is state-of-the-art for large-diameter, fast-ramping superconducting magnets such as those required in

- high-field research magnets
- superconducting magnetic energy storage (SMES) devices, and
- magnetic fusion energy tokamaks.

This year, the Nb₃Sn wire was delivered to specification and ahead of schedule and cabling has been initiated.

The production of the SCH CICC is not only a major milestone in the SCH project, it also serves to demonstrate much of the equipment that will be used to fabricate similar Nb₃Sn CICC's for the International Superconducting Experimental Reactor (ITER) project.



Full-Scale SCH Cable-in-Conduit Conductor Prototypes.

The largest CICC is

28.7 mm x 14.9 mm in size.



SCH Production Cables fabricated at NEWT, Inc. in Lisbon, NH



Superconducting Magnet Workforce Development

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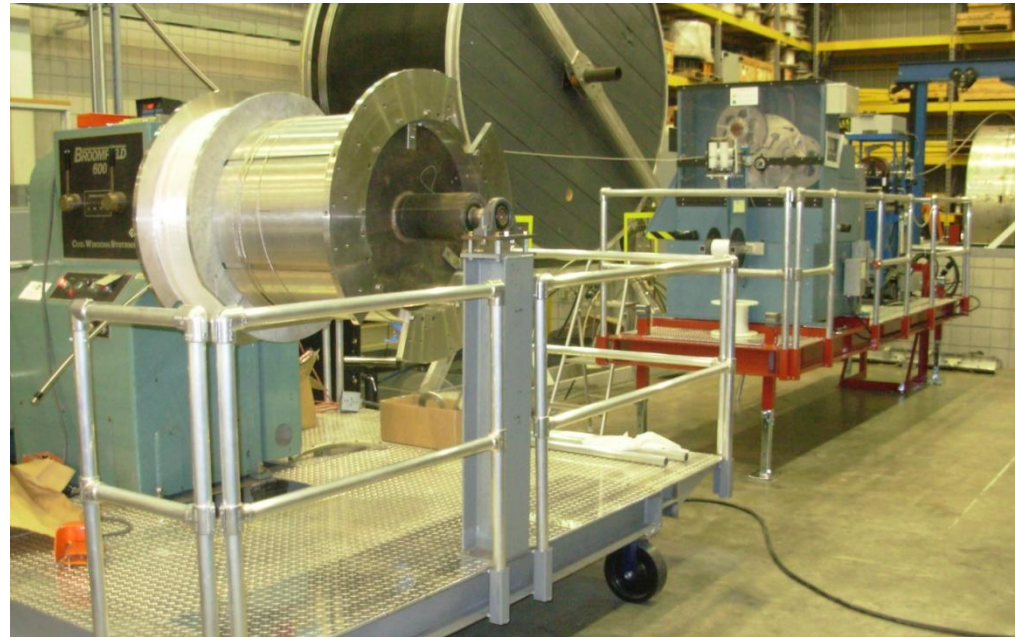


The coils for the Series-Connected Hybrid Outsert Magnet use high-performance Nb₃Sn cable-in-conduit conductors (CICC) to provide dc magnets using one-third the electric power of a conventional all-resistive magnet. Nb₃Sn superconductors require a technically challenging wind-and-react fabrication process.

In 2009-2010, two electrical engineering graduate students contributed to improving the homogeneity and stability of the SCH magnet design.

In addition, two Magnet Lab interns were involved in the SCH Coil construction:

- ✓ Mayan Hight, a high-school student, was involved in R&D qualifying electrical insulation schemes for service at liquid nitrogen temperatures.
- ✓ Kyle Orangio, an undergraduate, has been involved in developing and documenting the technical procedures for the SCH Outsert coil winding and heat treatment processes.



Completed SCH Outsert Winding Line Setup (above). Model Coil 2 winding is completed and Model Coil 3 winding is under way.



Kyle Orangio