

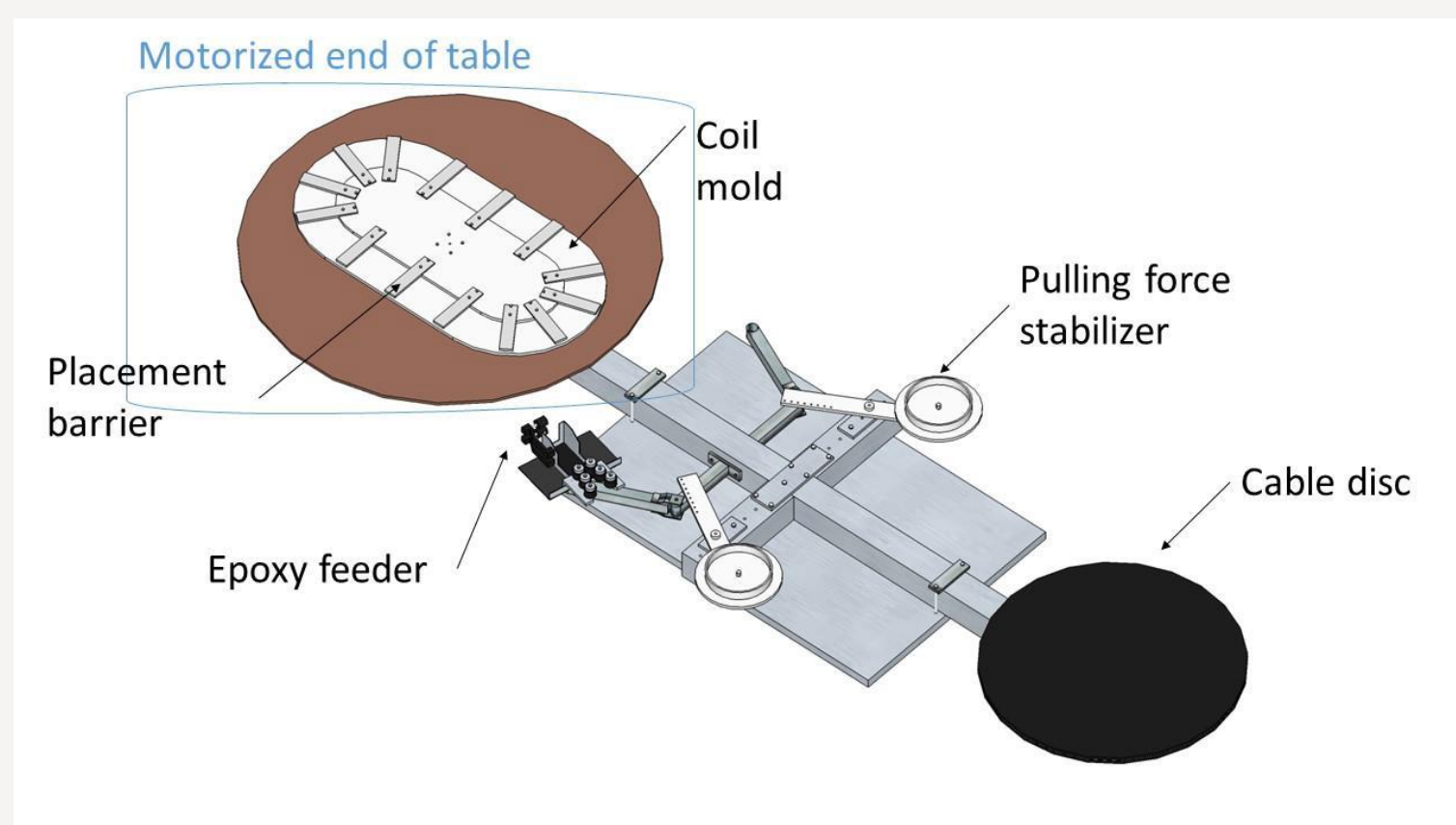
Fabrication of a Scaled MgB_2 Racetrack Demonstrator Pole for a 10 MW Direct Drive Wind Turbine Generator

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0.5 m wide and 1 m long racetrack coil

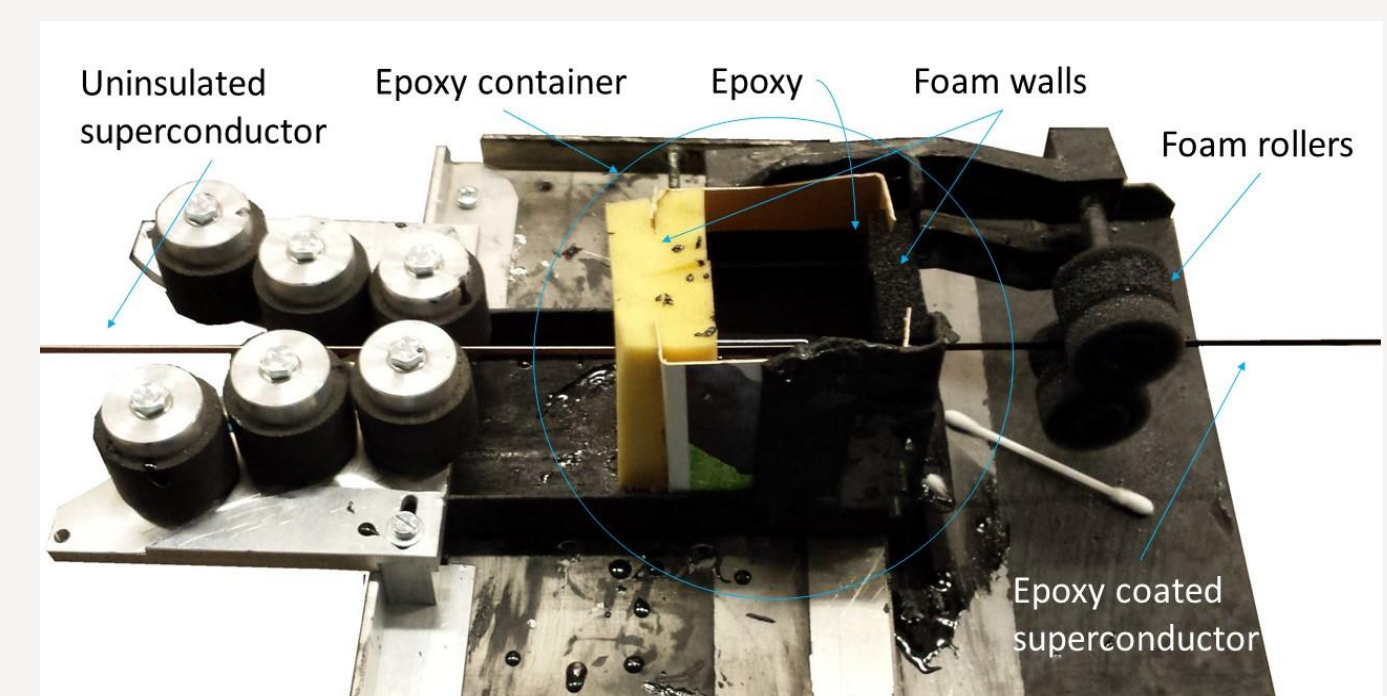
- MgB_2 superconductor:
 $I_c = 373 \text{ A}$ at 1.8 T and 16 K
0.5 mm x 3 mm Ni-matrix wire
0.2 mm copper strip on one side
- Reduced straight section compared to full-scale pole
- Built up of double pancake coils

Quantity	Value
Straight section, length	500 mm
End section, inner diameter	300 mm
Coil height	81 mm
Coil width, straight section	87 mm
Coil width, end section	81 mm
No. of double pan-cake coils	10
No. turns per double pancake	208
Total amount of superconductor	4500 m
Full load current	225 A
Maximum magnetic field at full current	2.8 T
Inductance	5.0 H
Operating temperature	10–20 K



Winding

- Wet-winding: epoxy applied to wire during winding
- Epoxy serves as electrical insulation
- Tuning of epoxy layer thickness important
- One work day to wind a coil
- Straight section tends to be wider than end section

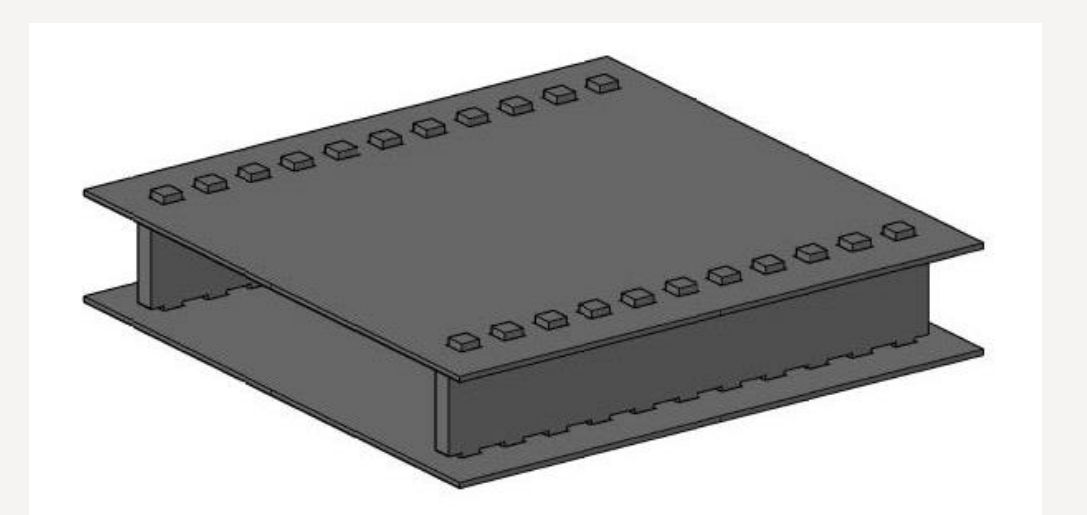


Coil assembly

- Double pancake coils glued one by one to thermal interface
- Soldering performed with a soldering iron with two plates pressing the wires together with a spring system
- 80 μm tin layers yield resistances in the 40 – 50 n Ω range

Mechanical support

- Electromagnetic forces of 110 kN at 225 A
- 5 mm thick stainless steel plates heavily oversize the support
- Detailed analysis at the holes necessary to optimize the support



Conclusions

- Several practical issues solved for wet-winding of racetrack MgB_2 coil
- Subsequent testing necessary to validate the winding method

