A clean production line for conductors insulation preparation

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Introduction

ICAS, set up a production line to process copper conductors to be used in magnets for fusion reactors, in order to prepare, apply and cure a cyanate ester based primer, aimed to improve the adhesion of epoxy resin insulation to copper.

With this semi-automatic line, a total of about 1.5 km of conductors have been already treated successfully in a complete temperature and moisture controlled clean environment.

Key parameters: cleanliness

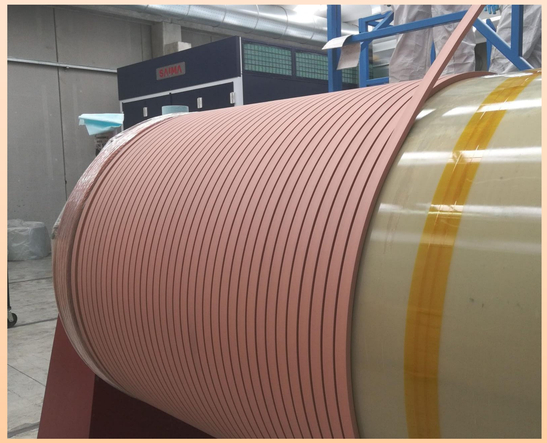
The entire workshop was under temperature and moisture control, and constantly kept in overpressure in order to mitigate the risk of external contamination prior to curing.

The whole unspooling and sandblasting line was designed to employ online non-contaminating materials.

The priming process was held in a separate and even cleaner, still temperature and moisture-controlled, spray booth.

The sandblasting line

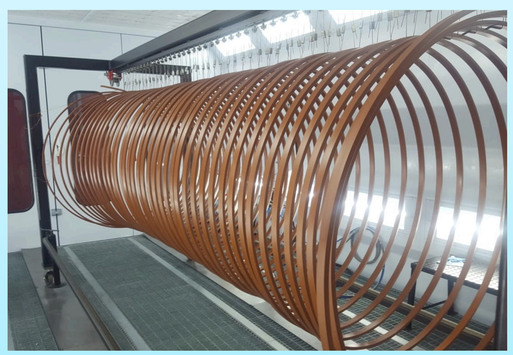
ICAS used its experience in unspooling, straightening and preparing copper from previous magnets and superconductors production to design an integrated line to sand, thoroughly wash, degrease and respool on a perfect cylinder the whole conductor.



Key parameters: spray booth and curing oven

In the spray booth, highly trained operators took care of distributing a very thin film of primer on the hang conductor, with the aid of an electrostatic spray gun and special non-contaminating wipes to remove the excess, as needed.

The booth was equipped with lighting that helped for Visual Inspection and thickness measurements after curing (target vs actual value was ± 6 µm).



Key parameters: surface roughness

During the R&D phase, it was clear that one of the key parameters to take into account for a successful priming was the surface roughness of the copper. The correct roughness was achieved with very tight tolerances with a combination of a fine tuned in-line sandblasting unit and proper blasting media (target vs actual value was ± 1 µm).

Quality Assurance and Quality Controls

The whole process was designed to minimize risks, and then monitored by ICAS' Quality Management System. The team and operators in charge of Quality Controls were highly trained for the special tasks the project required and followed closely by the QA supervisor.