FUSION FOR ENERGY

TECHNOLOGY OFFER

High perfomance superconducting wire technology for strong magnetic field applications

F4E and ASG Superconductors have been working together on the ITER magnetic field coils made of superconducting alloys. These innovative materials can run very high currents leading to powerful magnetic fields for demanding applications. ASG masters the manufacturing of such materials and can deliver them in complex shapes, depending on the end-use: MRI, energy storage, transport or particle accelerator.

The Technology

The confinment of the plasma in ITER requires very high magnetic fields (>10 T). Such magnetic field intensity cannot be obtained with regular metallic coils, as the electric current needed is too strong (>65 kA). That is why superconducting coils were made of niobium-titanium (NbTi) and niobium-tin (Nb_3Sn) alloys, the wires are designed to be internally cooled using supercritical helium (-269°C) to enable the alloys superconducting transition and allow high currents to be driven in the coils for long duration pulses (300-500 seconds).

Outstanding performances within complex shape conductors in a demanding environment

The ITER magnetic coils are outstanding in many ways. While the poloidal field coils are circularily shaped (the largest one being 24 m in diameter), the toroidal field coils are D-shaped (9 x 17 m), both being the largest ever built to date. Moreover, the coils must withstand collossal electromagnetic forces that occur during the tokamak operation. Manufacturing such devices was an exceptionnal challenge, as the alloys do not have very good mechanical properties. Thanks to its decades-long know-how, ASG, as the Engineering Integrator, succeeded and delivered top-quality field coils.

A unique know-how in manufacturing superconducting devices available for various purposes

ASG Superconductors can manufacture superconducting devices using different alloys (Nb_3Sn, NbTi, but also MgB_2, a high temperature superconductor (-234°C)) in many shapes, as it did not only for ITER but also for previous fusion devices. ASG can manufacture wire, coils and magnets for large magnetic field applications such as MRI, fault current limiters, superconducting magnetic energy storage, field coils for particle accelerators or detector magnets. The company also takes care of installation and on-site commissioning.

Collaboration opportunities

The know-how and technology are available for direct use, technical adaptation for new applications and tailor-made devices.

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