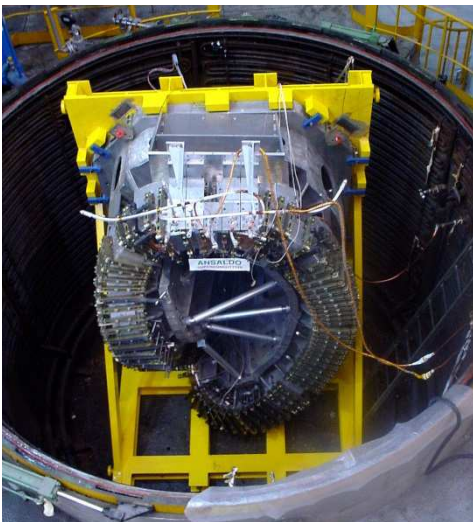
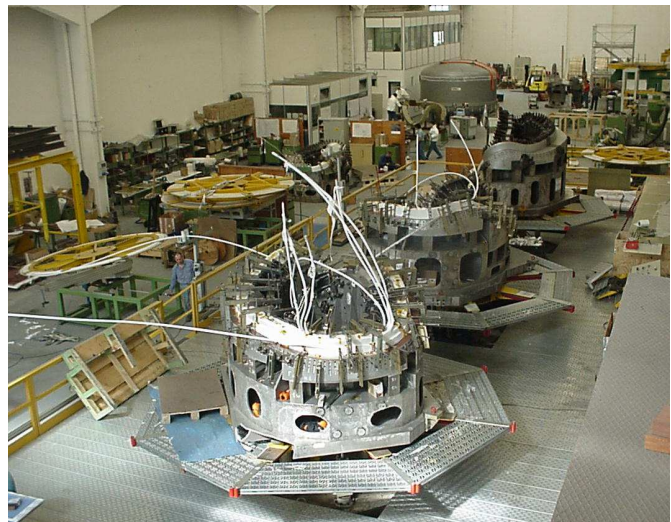


Non Planar Coils for the Wendelstein 7-X Stellarator

In 2006 ASG Superconductors has delivered 30 (of the 50) non-planar superconducting coils of Wendelstein 7-X magnetic system, which has the main purpose to demonstrate the stellarator properties vs. continuous operations. The systems main parameters are the following: its major radius measures 5.5 m, the magnetic field generated reaches the value of 3 T for an overall stored magnetic energy of 600 MJ. The coils are wound using an internally cooled Cable-In-Conduit Conductor with copper stabilised NbTi strands co-extruded in a jacket of hardenable Al alloy (nominal current 17.6 kA at $B = 6$ T, 3.8 K). Each winding, of typical overall dimensions 3.5 m x 2.5 m x 1.5 m, consists in a pack of 6 double layers, impregnated with epoxy resin using a Vacuum Pressure Impregnation technique and then inserted in a thick stainless steel case, TIG welded, for a total weight of 4.5 t. The gap between coil and case is filled with sand-loaded resin; fine machining is performed to guarantee the tight assembly tolerances. X-ray testing has been executed for the welding in the He hydraulic circuit, that was also checked for a leak rate of $2\div5 \cdot 10^{-8}$ mbar·l/s. Geometric dimensions were measured using a laser tracker, over about 800 points on each coil, to match tolerances below a ± 3 mm. The coils have been individually cryogenically tested in Saclay (F) and are now being installed in Greifswald.



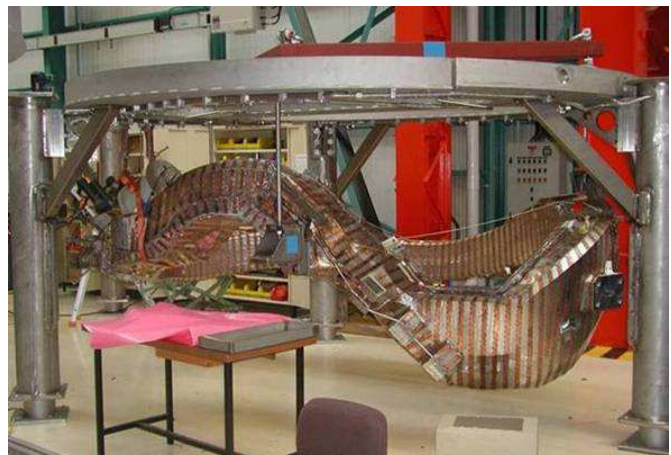
VPI impregnation of coil



A view of the workshop hosting the manufacturing line of W7-X



Completed coil



A W7-X superconducting coil ready to be tested at CEA Saclay