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Europe develops the tooling to manufacture powerful ITER magnets

One of the most sophisticated engineering hubs in Europe will be located on the ITER site. The Poloidal Field (PF) coils facility will house the tooling to manufacture some of the most powerful magnets deployed in a fusion device. A range of bespoke equipment, heavy cranes, vacuum chambers and assembly stations will be developed to fabricate the magnetic coils that will maintain the shape and stability of the ITER plasma. Due to their impressive diameter and weight, four out of the six coils will be produced in the facility, and the remaining two will be delivered to the site to be tested.

Fusion for Energy (F4E), the EU organisation managing Europe's contribution to ITER, has signed a contract with a consortium formed by ELYTT ENERGY, ALSYOM and SEIV for the supply of the handling and impregnation tooling required for the production of the PF coil magnets. The works will be completed in eight years and their value will be in the range of 30 million EUR. Johannes Schwemmer, F4E Director, explained that "This contract opens a brand new chapter for the European contribution to ITER magnets. The solid expertise of our contractors in the fields of engineering will be deployed to help us manufacture magnets of unprecedented size and complexity". For Julio Lucas, Technical Director of ELYTT ENERGY, "This contract is a milestone for our company supplying high technology components and services. Together with our collaborators, we feel very proud and honoured that our work is going to contribute to the development of a future inexhaustible energy source for all mankind".

The ITER Poloidal Field coils facility

The construction of the PF coils facility has been financed and delivered by F4E through a contract signed with the consortium of Spie batignolles, Omega Concept and Setec. The facility is approximately 250 metres long, 45 metres wide and 17 metres high. It includes regular services (HVAC, electrical, piping), two large cranes (one standard crane with a capacity of 25 tonnes and another crane especially adapted with a capacity of 40 tonnes), offices, technical rooms and workshop space. Parking and two docking areas for the unloading and temporary placement of coils are also envisaged. The building offers sufficient space to carry out all the steps of coil manufacturing: winding, impregnation, stacking and cold testing. It has the capacity to host around 80 people.

The scope of the contract

Initially through this contract, design and manufacturing studies will be carried out to develop the design. Then, the tooling will be manufactured and tested by the contractors, before being finally shipped, assembled, commissioned and tested at the premises of the PF coils facility. Mechanical equipment will be developed that will lift, insulate and stack the layers of conductor. The impregnation tooling will conclude the electrical insulation of the coils by applying a vacuum, following by injecting and then curing resin in the coil. Last but not least, a gantry crane able to lift a load of 400 tonnes will be installed together with a set of stations for the final assembly of the coils.

How will the ITER Poloidal Field Coils be manufactured?

Once the 1 100 tonnes of the stainless steel clad niobium titanium conductor arrive on the ITER site, in order to manufacture the European coils, they will progressively move from the external storage area to the manufacturing hub, where the winding and vacuum impregnation processes will be carried out. During the moulding stage, epoxy resin will be uniformly applied to help the layers of the conductor to bond tightly in

order to create a coil known as double pancake. Then, a second impregnation process will take place to bond the stack of the double pancakes to form one complete massive coil. The diameter of the largest PF coil is around 25 metres and their weights vary between 200 and 400 tonnes.

Background information

MEMO: Europe develops the tooling to manufacture the powerful ITER magnets

F4E clip: To watch the manufacturing process of PF coils click here

Fusion for Energy

Fusion for Energy (F4E) is the European Union's organisation for Europe's contribution to ITER.
One of the main tasks of F4E is to work together with European industry, SMEs and research organisations to develop and provide a wide range of high technology components together with engineering, maintenance and support services for the ITER project.
F4E supports fusion R&D initiatives through the Broader Approach Agreement signed with Japan and prepares for the construction of demonstration fusion reactors (DEMO).
F4E was created by a decision of the Council of the European Union as an independent legal entity and was established in April 2007 for a period of 35 years.
Its offices are in Barcelona, Spain.

http://www.fusionforenergy.europa.eu

http://www.youtube.com/user/fusionforenergy

http://twitter.com/fusionforenergy

http://www.flickr.com/photos/fusionforenergy

ITER

ITER is a first-of-a-kind global collaboration. It will be the world's largest experimental fusion facility and is designed to demonstrate the scientific and technological feasibility of fusion power. It is expected to produce a significant amount of fusion power (500 MW) for about seven minutes. Fusion is the process which powers the sun and the stars. When light atomic nuclei fuse together form heavier ones, a large amount of energy is released. Fusion research is aimed at developing a safe, limitless and environmentally responsible energy source.
Europe will contribute almost half of the costs of its construction, while the other six parties to this joint international venture (China, Japan, India, the Republic of Korea, the Russian Federation and the USA), will contribute equally to the rest.
The site of the ITER project is in Cadarache, in the South of France.
http://www.iter.org

For F4E media enquiries contact:
Aris Apollonatos
E-mail: aris.apollonatos@f4e.europa.eu
Tel: + 34 93 3201833 + 34 649 179 42