JT-60SA Newsletter
No.41, 31 May 2013

Headline

Automated welding and inspection of vacuum vessel sectors

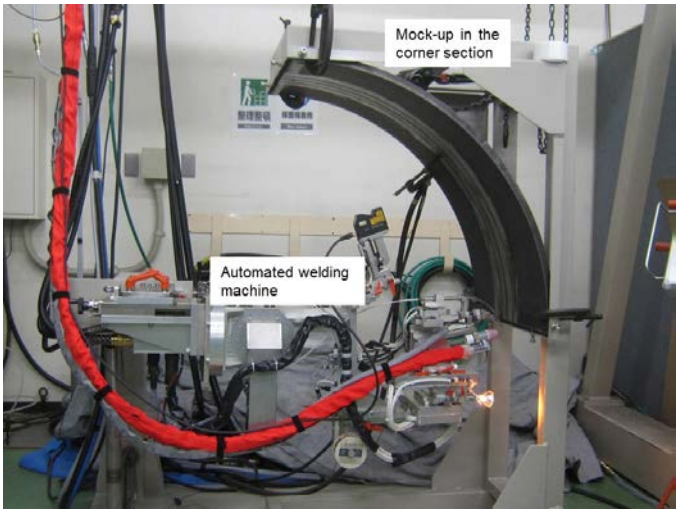

Figure 1: Automated welding and inspection machine

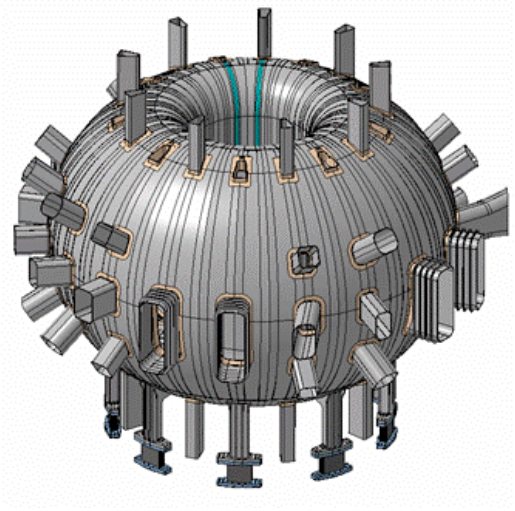

Figure 2: Vacuum vessel with ports and gravity supports

For the vacuum vessel assembly, it is important to weld the vacuum vessel sectors smoothly. In particular, welding of the corner section of the upper inboard is the most difficult because of its small radius (approx. 750 mm) and location overhead. To ensure its feasibility and quality, an automated welding and inspection system was adopted and has been tested now using a mock-up of the corner section of the upper inboard (Figure 1).

Before welding, the positions of the laser-measured groove and the welding head point were made equal. During welding the conditions were recorded using a CCD camera with filter. As a result, the gap between the grooves and the linear misalignment were kept within permissible ranges, and it was confirmed that the welding could be performed normally.

The vacuum vessel sectors (Figure 2) will therefore now be welded using this welding and inspection machine.

News

Manufacture of sixth 40° vacuum vessel sector

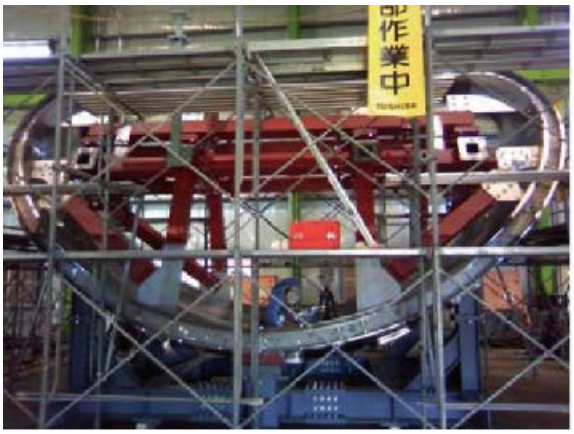

Figure 1: Sixth 40° sector completed

Figure 2: Loading sixth 40° sector onto a truck

After delivery of the inboard and outboard segments of the sixth 40° sector to the Naka site in March, they were welded together and passed all the inspections. Thus 240° of the vessel has now been completed.

Five out of the six completed 40° sectors have been moved from the vacuum vessel sector assembly building to the JT-60 main building and stored temporarily there to prepare for the vacuum vessel assembly, which will be started in early 2014.

News

Contract of TFC gravity supports awarded

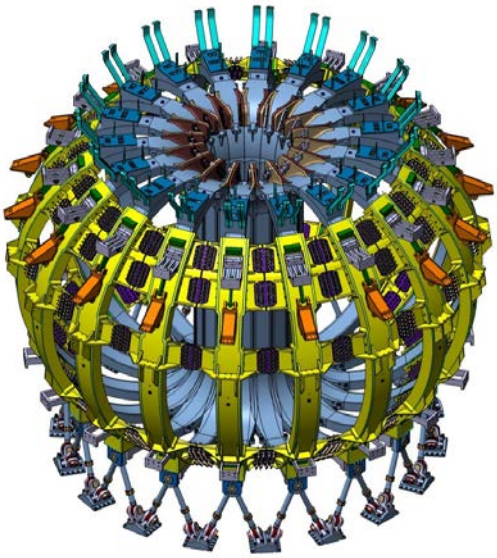

Figure 1: The complete TF magnet assembly, supported by 18 inverted V-shaped gravity supports

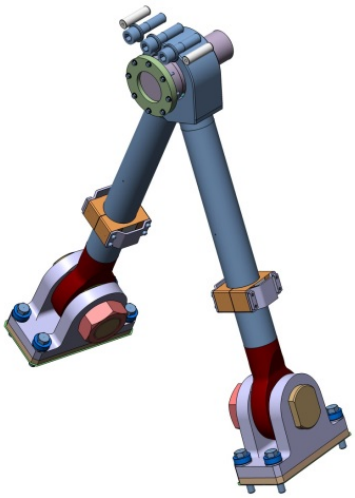

Figure 2: An individual TF coil gravity support, approx. 1.8m tall.

Figure 3: Participants from Alsyom, CEA and F4E at the kick-off meeting on 23 April 2013

The contract for the TF coil gravity supports, which will support the full weight of the magnet assembly for JT-60SA, has been awarded to ALSYOM by the French voluntary contributor CEA. The contract was signed on 17 April 2013 and the kick-off meeting was held on 23 April with representatives from CEA, F4E and ALSYOM.

Besides the mass of the coils, the gravity supports must withstand seismic events and loads due to plasma disruptions. The inverted V-shaped strut pair under the base of each TF coil is pinned to allow the legs to move slightly. This allows the magnet system to contract when it is cooled to 4K to become superconducting. Since the bottom of each leg on the cryostat base will remain near ambient temperature, each leg has a thermal collar attached to the thermal shield to reduce the heat flow into the coils.

Conceptual design was performed by F4E before the detailed design was completed by CEA. ALSYOM has worked with CEA for many years, in particular producing various subsystems for the Laser Megajoule project. ALSYOM will make the structures at their factory in Tarbes in the south-west of France, and the contract is expected to be completed in 2014. The gravity supports will be attached to their TF coils after the coils have been positioned in the torus hall.

News

Operator training for helium refrigeration system

Training at J-PARC Centre

The installation of the ~8kW helium refrigeration system for JT-60SA, which will be contributed by Europe (manufactured by Air Liquide Advanced Technology), will be started in April 2015 and its commissioning will start in the same year.

In preparation for use of the installation, operator training on the latest helium refrigeration system (4K-2kW), developed by the Materials and Life Science Experimental Facility at the J-PARC Centre, has been started in order to transfer skills to JT-60SA staff who will be involved in its operation, and to support the improvement of control systems that may need to be manufactured in the future. In particular, the training has focussed on the cool-down and warm-up periods, which are considered the most difficult and important, in order to learn operation techniques and to gain experience. The J-PARC helium refrigeration system started operating in 2008 and its control system has been renewed, unlike the helium refrigeration system for the ITER central solenoid model coil at the Naka site, whose operation was started in 1995.

Meetings

12th BA Steering Committee Meeting

On 23 April, the Broader Approach (BA) Steering Committee meeting took place. Representatives of Europe and Japan met at Rokkasho (Japan) and approved the 2012 Annual Reports, and updated the Project Plans for the three projects (IFMIF/EVEDA, IFERC and STP(JT-60SA)).

For the Satellite Tokamak Programme (JT-60SA), as the Project Leader (PL), S. Ishida, reported, the project achieved its major milestone of start of tokamak assembly in January 2013 following delivery of the first large component procured by Europe, the cryostat base, from Spain to the Naka site. The procurement and manufacture of other components also made steady progress in Europe and Japan, meeting the schedule of first plasma in March 2019. On 25 March, the "Celebration of the delivery of the first component from EU and start of assembly of the JT-60SA tokamak" was held in the presence of many members of the EU delegations in Tokyo and high level representatives of European voluntary contributors as well as Japanese Diet members and representatives of Japanese Ministries and local government. The PL expressed his deep appreciation to all the members of IAs (Implementing Agencies) and VCs (Voluntary Contributors) for their completion of one of the most important milestones in the project. The SC expressed satisfaction with the progress of the STP in both European and Japanese procurement activities, in particular start of the assembly.

The next BA Steering Committee meeting will be held in Saclay (France) on 17 December 2013.

Meetings

2nd Research Coordination Meeting

Figure 1: Discussion at the meeting

Figure 2: Group photo in the torus hall

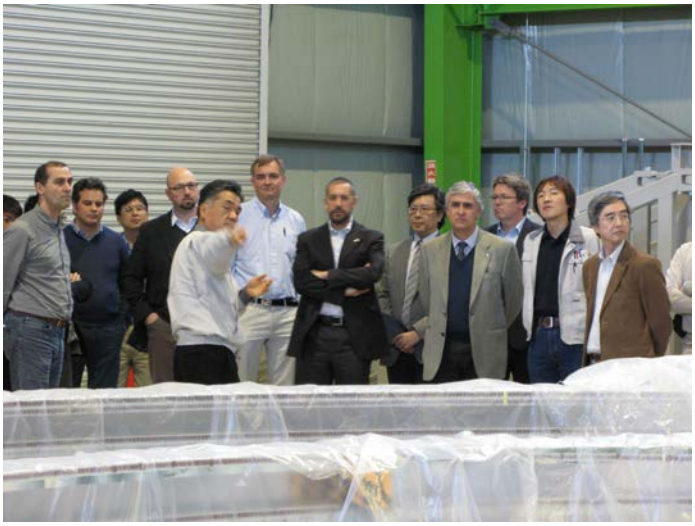

Figure 3: Learning about EF6

The 2nd Research Coordination Meeting (RCM) was held at the JAEA Naka site on 8-10 May. 40 experts in total (28 from Japan, 12 from Europe, and 1 expert and the Project Leader from the Project Team), participated in the meeting, including 4 experts via video-conference. The participants contributed actively to the constructive discussion on (i) the revisions needed in the JT-60SA Research Plan considering the recent results of collaborative activities, (ii) the results of tungsten plasma-facing components in JET and ASDEX-U experiments, (iii) concepts of "JT-60SA data management" related to the collaboration with the Remote Experimentation Centre (REC) in the IFERC project, and shared in considering DEMO design issues as a part of the collaboration with DEMO Deign Activities (DDA) for the IFERC project. The REC and DDA sub-projects in IFERC are implemented at the Rokkasho site (see the Local article of this newsletter).

During the meeting, the participants visited the cryostat base installed in the torus hall (Figure 2) and the superconducting coil winding building, to see the equilibrium field coils to be installed in the torus hall soon (Figure 3), and were informed about the progress with JT-60SA assembly.

The participants agreed with proposals for each chapter revision, and subjects of possible collaborative work, and to complete the revision of "JT-60SA Research Plan Ver. 3.1" by the end of December 2013.

Local

IFERC in Rokkasho

Figure 1: Aerial photo of Rokkasho Village

Rokkasho village is located at the base of the Shimokita Peninsula and faces onto the Pacific Ocean in the eastern part of Aomori Prefecture at the northern end of the Japanese main island. This is a predominantly natural environment with characteristic scenery such as varied seashores, lakes and ponds, and hilly districts. Agriculture and fishing are the main activities being undertaken in this natural environment, but the energy industry is also active there.

Rokkasho village is implementing a number of local measures to resolve energy issues along with its participation in national development projects, having invited advanced large-scale industry into the area such as the national oil reserve, reactor fuel cycle facility, and wind farms.

For the Broader Approach (BA) activities, JAEA established a new site - the “International Fusion Energy Research Centre (IFERC)” - in Rokkasho village. At this site, the IFERC project and IFMIF/EVEDA project, two of the three BA projects, are progressing. The accelerator building for the IFMIF/EVEDA project, and the DEMO R&D building and the CSC & REC (Computer Simulation Centre and ITER Remote Experimentation Centre) building for the IFERC project, have already been established.

The IFMIF/EVEDA Accelerator building will accommodate an accelerator able to generate the highest level of beam currents (125 mA of deuterons at 9 MeV) for long periods. This IFMIF prototype accelerator, manufactured in Europe, has already been delivered to the site, and its assembly and operation will be started in the second half of this year. In the DEMO R&D building, research and development is being undertaken on neutron-irradiated specimens in a controlled area, and experience in the handling of tritium fuel for a fusion reactor is being obtained. In addition, it is also possible to perform various material (mechanical property) tests and ultrastructure research in the building. In the CSC & REC building, the “Helios” supercomputer (with Intel Sandy Bridge Xeon (E5) processors), which ranks 2nd in Japan and 15th in the world (LINPAC 1.237 Pflops), has been in operation since January 2012. 58 simulation projects for Europe and Japan have been carried out in the first cycle (from 9 April to 14 November 2012) and further 82 simulation projects are being carried out in the second cycle (from 15 November 2012 to 14 November 2013). As far as the ITER Remote Experimentation Centre (REC) is concerned, remote experimentation techniques are being developed in cooperation with the STP (JT-60SA) project being implemented at the Naka site, to facilitate the broad participation of scientists in the ITER experiment.

Figure 2: International Fusion Energy Research Centre

Calendar

June 10-14, 2013
25th Symposium on Fusion Engineering (SOFE-25)
San Francisco, USA

July 1-5, 2013
40th European Physical Society Conference on Plasma Physics (EPS-CPP-40)
Espoo, Finland

July 14-19, 2013
23th International Conference on Magnet Technology (MT-23)
Boston, USA

September 16-20, 2013
11th International Symposium on Fusion Nuclear Technology (ISFNT-11)
Barcelona, Spain

October 9, 2013
13th Meeting of the STP Project Committee (PC-13)
Naka, Japan

October 23-24, 2013
18th Technical Coordination Meeting (TCM-18)
Naka, Japan

Contact Us

The JT-60SA Newsletter is released monthly by the JT-60SA Project Team.
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For more information please visit the website: http://www.jt60sa.org/