VALIDATION OF WELDING TECHNOLOGY FOR ITER TF COIL STRUCTURES

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The ITER superconducting magnet system consists of 18 Troidal Field (TF) coils, 6 Central Solenoid (CS) modules, 6 Poloidal Field (PF) coils and 18 Correction coils. The Japan Atomic Energy Agency (JAEA), acting as the Japan Domestic Energy Agency (JADA) in the ITER project, is responsible for the procurement of 9 TF coil winding packs (WP), structures for 19 TF coils, (including one spare), and assembly of the WP and the coil structures for 9TF coils.

TF coil structures, which support large electromagnetic force generated in TF coils under the cryogenic temperature (about 4K), are the mega welding structures composed of coil case and support structures made of high strength and high toughness stainless steel.

JAEA started the study on welding trials for heavy thickness materials since 2008 and is planning of full scale mock-up model fabrication for main sub-components (1 set of inboard side and 1set of outboard side) in 2010 in order to investigate the technical issues for manufacturing of TF coil structures.

This paper introduces the results on welding trials and status of full scale mock-up model fabrication to confirm the validity of welding technology and manufacturing design before fabricating actual products.

Enough weld joint performance was obtained with the base metal of JJ1 (FMJJ1 specified by JSME Code and is high strength and high toughness stainless steel developed in Japan) and SS316LN (FM316LN specified by JSME Code), and also their combination using JJ1 filler wire (FMYJJ1 specified by JSME Code and is developed in Japan) by narrow gap GTAW process.

Welding deformation such as angular distortion between outer plate and side plate of U-shape segment could be controlled and minimized by using effective restraint jig and no defects was observed in the welds by radiographic testing (RT) in trial manufacturing of 1m long straight leg.

Validity of welding technology and manufacturing design such as fabrication sequence, welding procedure specification (WPS), quality control plan is confirmed during full scale mock-up model fabrication.