FIRST QUALIFICATION OF ITER TOROIDAL FIELD COIL CONDUCTOR JACKETING

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Japan Atomic Energy Agency has a responsibility for procurement of the ITER Toroidal Field Coil conductors as Japanese Domestic Agency (JADA) of the ITER project. The TF conductor is a circular shaped cable-in-conduit conductor, which is composed of cable and stainless steel conduit (jacket). The outer diameter and wall thickness of jacket are 43.7mm and 2mm, respectively. The cable consists of 900 Nb₃Sn superconducting strands and 522 Cu strands. The length of TF conductor is 780m in maximum. JADA started to produce strands, cables, jacket sections and to construct a jacketing facility from 2008. Preparation of conductor fabrication was completed in December 2009. And then, to demonstrate a conductor manufacturing procedure, JADA fabricated 780m-long Cu dummy conductor as a process qualification. The conductor manufacturing steps are as follows;

- 1) Jacket section (outer diameter: 48mm, wall thickness: 1.9mm, unit length:13m) assembly by using gas tungsten arc welding to make 780m-long tube
- 2) Radiographic test, dye penetrant test, local helium leak test at 3MPa, and visual inspection for each weld
- 3) Cable insertion into long jacket tube
- 4) Compaction from outer diameter of 48mm to 43.7mm and spooling on a mandrel with a diameter of 4m
- 5) Global helium leak test at 3MPa, dye penetrant test, pressure proof test at 3MPa, flow test and dimensional measurement

In the 780m-long Cu dummy conductor jacketing, JADA succeeded to perform cable insertion with maximum force of 32kN. Ovalization of cross section of spooled conductor was measured to be 43.7mm+/-0.15mm, which satisfies the ITER target requirement of 43.7mm+/-0.3mm. Finally, the 780m-long Cu dummy conductor has been successfully completed, ahead of other domestic agencies that are in charge of TF conductor procurement. Since all of manufacturing processes have been qualified, JADA started to fabricate superconducting conductors for TF coils.

In the symposium, detail of jacketing facility and results of process qualification will be introduced.