FABRICATION AND INSTALLATION OF KSTAR IN-VESSEL CONTROL COILS

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The in-vessel control coils (IVCC), which have been designed for dedication of various active feedback plasma control functions, successfully fabricated and installed inside the vacuum vessel of the Korea Superconducting Tokamak Advanced Research (KSTAR). The IVCC system consists of sixteen segmented coils that were independently fabricated outside the vacuum vessel and installed without any welding or brazing joints inside [1]. The segmented coil system has several advantages such as eliminating possibility of cooling water leakage at the welded or brazed joints, simplification in fabrication and installation procedure, and easy repair and maintenance of the coil system. Each segment contains eight oxygen-free high conductive coppers, which are grouped as four pairs called section. Consequently, a segmented coil forms four sections for position control, field error correction (FEC), and resistive wall mode (RWM) control according to electrical connection at outside the cryostat. The eight conductors (or four sections) with internal coolant holes are enclosed in a rectangular welded jacket that is made of stainless steel 316LN and electrically insulated from the conductors by epoxy/glass composite layers.

After the meticulous and extensive engineering design to evaluate structural safety against electromagnetic loads, and the feasibility of fabrication and installation [2], the IVCC system has been fabricated and installed as shown in Fig. 1. In the KSTAR 2010 campaign, the IVCC system is to be operated for only vertical position control due to absence of power supplies for the other functions. In addition to key features of the IVCC, this paper will report several important results in the fabrication and installation of the IVCC in detail.

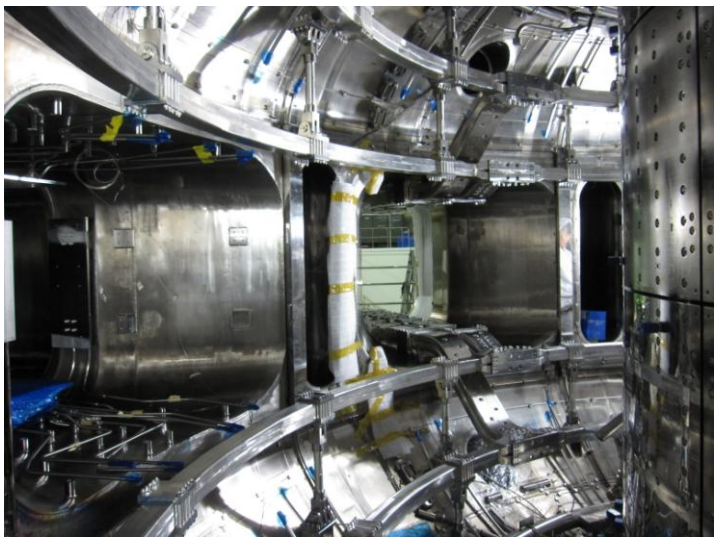

Figure 1: In-vessel control coils installed inside of the vacuum vessel

[1] G. S. Lee et al., ITC2001, 2001
[2] H. K. Kim et al., Fusion Engineering and Design, 84, 2009, 1029-1032