FUNDAMENTAL WELDING R&D RESULTS FOR MANUFACTURING VACUUM VESSEL OF JT-60SA

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The real vacuum vessel (VV) manufacturing of JT-60SA has started since Nov. 2009 at Toshiba. As shown in Fig.1, the height and outer diameter of the torus are 6.6m and 9.95m respectively. The VV has double shell strructure and its cross section is D-shaped. Poloidal ribs are welded between inner and outer shell. Prior to start manufacturing, lots of fundamental R&Ds, especially on welding had been carried out.

R&D was carried out by three stages. In the first stage, primary tests for screening welding method were performed. As shown in Fig.2, plasma arc welding for the butt joint between shells, twin MAG welding for rib and inner shell, and the combination of TIG and plug MAG welding for rib and outer shell were respectively chosen as the most appropriate welding methods. In the second stage, the trial welding for 1m-long straight and curved double shell samples were conducted shown in Fig.3. The dependences of welding quality and distortion on the welding conditions, such as arc voltage and current, setting accuracy, welding sequence, the shape of grooves, etc. were measured. In addition, welding condition with low heat input was explored. In the last stage, fabrication sequence was confirmed and established by the trial manufacturing of the 20-degree upper half mockup. This paper presents the R&D results obtained in the first and second stages.

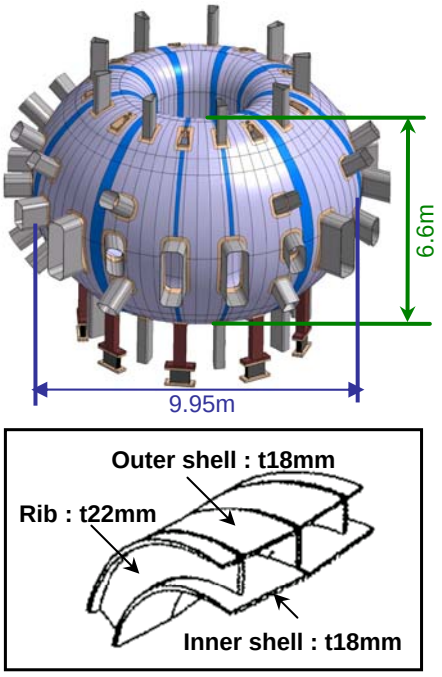

Figure 1: VV of JT-60SA and its cross section

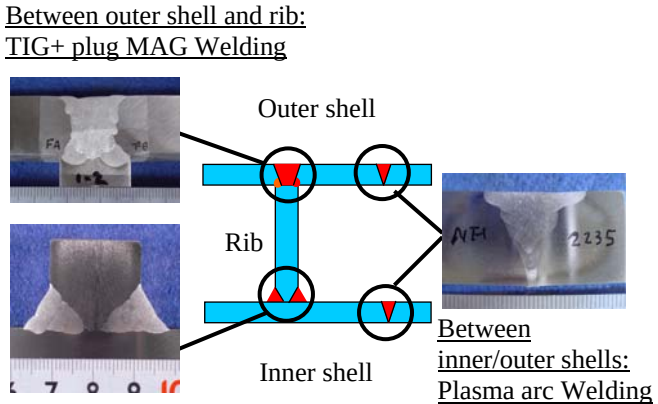

Figure 2: Macroscopic cross section of each weld

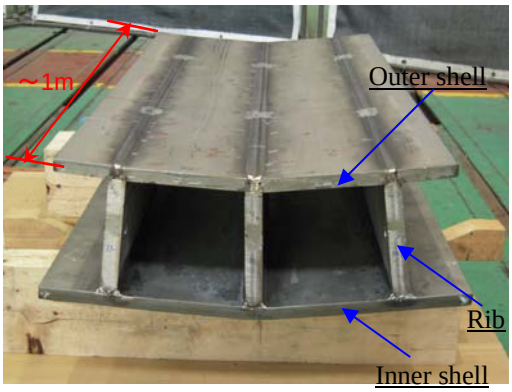

Figure 3: Trial welding of 1m long double shell construction (inboard straight part)