



Contribution ID: 497

Type: **not specified**

P4.162 Evaluation of conservative and innovative manufacturing routes for gas cooled Test Blanket Module and Breeder Blanket First Walls

Thursday, 20 September 2018 11:00 (2 hours)

Several manufacturing routines were developed in KIT for First Wall components of the Helium Cooled Pebble Bed concept: for the Test Blanket Module of ITER in 2010-2015 and the Breeder Blanket for DEMO since 2014. The overall fabrication strategy consists of two main steps: 1) the manufacturing of a semi-finished plate penetrated by channels, and 2) the forming of the plate with channels into the U-shaped final geometry; the forming procedure of a plate with an internal channel structure was demonstrated in full scale in 2017, the results will be documented in this paper. However, step 1) which comprises the manufacturing of the semi-finished plate with the internal channel structure remains an issue. The plate shall be fully penetrated by parallel channels (30 channels for the TBM, 120 channels for the DEMO BB). The void due to integrated channels amounts to about 1/3 of the plate volume. The hydrodynamic channel diameter is in the order of 15 mm, e.g. square shaped. Length-to-diameter-ratios are about 2500/10. Additionally, channel surfaces shall be shaped according to thermal-hydraulic aspects, a certain surface roughness or macro structures (V-shaped patterns) are desirable. The routine shall be compatible to applied codes and industrial mass production. Also high cost efficiency is required. The paper compares different approaches for manufacturing step 1): a) Electrical Discharge Machining, b) Hot Isostatic Pressing and c) Additive manufacturing applied as innovative continuous process. The approaches are analyzed with regard to aspects like maximum feasible length, precision, suitability for application of heat transfer enhancement structures, effort for code implementation and technology readiness level. Finally, cost and mass production related aspects are addressed. The results are an important contribution for a general blanket technology assessment, e.g. in connection with the Test Blanket Modules in ITER as well as with the DEMO Breeder Blanket.

Presenter: Dr NEUBERGER, Heiko (Institut für Neutronenphysik und Reaktortechnik (INR) Karlsruher Institut für Technologie (KIT))

Session Classification: P4