Contribution ID: **496** Type: **Poster**

Design and Analysis of SST-2 Vacuum Vessel

Thursday, 20 October 2016 08:30 (4 hours)

SST-2 is under design as an intermediate step before the Indian demo. The design provides a low fusion gain (Q=5) for realizing the reactor technologies and serve as the test bed for qualifying reactor components and D-T fuel cycle. The design is based on RCC-MR code. The Vacuum Vessel (VV) will be constructed out of SS316LN with control over cobalt content (in the range of 0.03%). The design incorporates provisions of fusion power output in the range of 100 –300 MW with appropriate up-gradation of in-vessel components.

In this design bulk thickness of the vessel takes into account the neutronic shielding requirements for the Toroidal Field Coil. Optimum bulk thickness is taken into account by structural loads like dead weight, seismic events, off-normal events, coolant pressure and vacuum pressure loads and further electro-magnetic loads takes into account the magnetic discharge force. The parametric finite element model in ANSYS is used to arrive at the optimum shell thickness, rib thickness, rib spacing taking into account regular port size and special port size for Neutral Beam Injectors. This design forms the basis to initiate the process of feasibility assessment for complex manufacturing aspects, the feedback from which in turn, would be incorporated in establishing a manufacturable engineering configuration. This paper gives an insight into the engineering requirements and design basis with the identified electromagnetic and structural loads on the double walled 'D'shaped vacuum vessel for SST-2.

Paper Number

FNS/P5-9

Country or International Organization

INDIA

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Session Classification: Poster 5

Track Classification: FNS - Fusion Nuclear Physics and Technology