



Contribution ID: 141

Type: **Poster presentation (105min)**

Developing progress of critical equipment in the CSNS cryogenic hydrogen system

Tuesday 8 July 2014 14:15 (1h 45m)

Construction of the China Spallation Neutron Source (CSNS) started in October 2011 and is expected to last 6.5 years. Supercritical hydrogen is used as moderator for coupled and decoupled moderators of CSNS. Cryogenic system provides ~ 20 K cryogenic hydrogen (at 1.5 MPa) to neutron moderating system, and nuclear heating load is transfer to the helium refrigerator by the circulation of hydrogen.

Cryogenic hydrogen system is a closed circulation, which consists of key equipments including hydrogen-helium heat exchanger, cryogenic hydrogen heater, accumulator, cryogenic hydrogen pump, ortho-para hydrogen convertor and cryogenic valves. Most of these apparatuses are non-standard equipment, and will be developed independently. This study introduces the latest research progress.

Manufacturing of the accumulator has been completed this February. A prototype of the hydrogen-helium heat exchanger has been manufactured and tested for sealing. Engineering design of the cryogenic hydrogen heater and the ortho-para hydrogen convertor have been finished, and the prototypes will be manufactured this April. Besides, cryogenic valves produced by STOHR arrived, and the cryogenic hydrogen pump is under manufacturing at Barber-Nichols Inc, and will be delivered in the middle of 2014. Finally, all these cryogenic devices will be integrated into two cold boxes, i.e. a hydrogen cold box and an accumulator cold box. The engineering design of the cold boxes will be completed soon. Developing these critical equipments will help to accumulate valuable engineering experience for the construction of the CSNS cryogenic system.

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Session Classification: Tue-Af-Posters Session 1.3

Track Classification: C-13: LNG and hydrogen systems