

26th National Symposium on Cryogenics and Superconductivity

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Invited Talk-IT "SST-1 CRYOGENICS SYSTEM AND RELAVENT CRYO FACILITIES"

Wednesday 22 Feb 2017 at 15:00 (00h30')

Content :

The SST-1 machine is only an operational superconducting tokamak in the country, which uses complex cryogenics system comprises of helium and liquid nitrogen (LN₂) for process, control and distribution. The cryogenics system distributed over wide spread areas e.g. gas area, cryo hall and compressors station with distribution piping over 230 m. 1350 W/4.5 K helium refrigerator/liqefier (HRL) is operational since 2004. It facilitates the custom cooling requirements of SST-1 (either in single-phase or two-phase flow), 650 W/4.5 K of refrigeration power and 7 g-s-1 of liquefaction. LN₂ is used as pre-coolant in HRL heat exchangers and on-line purifier. To prevent direct steady state heat-in leak from ambient, efficient 80 K thermal shields are installed to get temperature within 80K-85K. Other auxiliary cryo sub-systems e.g. current feeders, current leads chamber, integrated flow distribution and control system also use LN₂ in thermal shields. To cater such requirements, LN₂ storage and distribution system is in place. Recently, few systems were upgraded for better performances.

The large-scale cryo test facilities include 80 K booster system, large superconducting coil test, current leads test, and 80 K thermal shields test. IPR cryogenics division follows all the mandatory safety protocols for storage/operation of high-pressure gas vessels as per CCOE norms.

The present team has learnt over years to develop cryo lines, current leads, electrical breaks, HRL plant operation, process control and maintenance. Total nineteen SST-1 cool-down / warm up campaigns have been completed using the cryogenic system. This paper will elaborate the recent updates, developments and experiences.

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