

26th National Symposium on Cryogenics and Superconductivity

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Cryocooler based helium liquefier development- A practical usage

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Content :

Inter-University Accelerator Centre has undertaken research to develop cryocooler based liquefiers for commonly used cryogenics like liquid nitrogen (LN₂) and liquid helium (LHe) because of its modular nature and ease of operation for diverse experimental systems requiring liquid cryogenics. As a first step one LN₂ liquefier was built which has been producing LN₂ at the rate of 64 litres per day (lpd) using a Gifford Macmohan (GM) cryocooler having cooling capacity of 250 watt at 80K. Another laboratory scale helium liquefier has been developed which produces LHe at the rate of 17 lpd by using a 1.5 watt at 4.2K GM cryocooler. The setup works in a perpetual manner. Helium gas at room temperature is injected at the top of the cryostat near cryocooler top flange (either from external source or evaporated gas from the cryostat where it is stationed) and liquid helium is produced in the 2nd stage heat exchanger area which flows down the cryostat by gravity. The first LHe liquefier setup by itself cannot be practically used for any other standalone experimental facility and so a portable helium liquefier with the cryocooler was designed and fabricated. This setup can practically be used for any liquid helium cryostat facility. It can be hooked up to the liquid delivery port of the device. In the present demonstration setup the cryocooler liquefier has been hooked up to a commercial 100 lts helium dewar. The dewar was cooled starting from room temperature with the cryocooler liquefier in situ and 50 lts liquid helium was collected inside the dewar. The details of the cryostat, cooldown procedure of the dewar, rate of LHe collection inside dewar by dewar level rise and external heater evaporation method will be discussed. Heat loss mechanisms from different components and instruments connected to the cryostat will be elaborated during the presentation.

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