26th National Symposium on Cryogenics and Superconductivity

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EFFECT OF THE COMPRESSOR DELIVERY PRESSURE ON THE COOLING CAPACITY OF THE HELIUM PLANT WITH MODIFIED CLAUDE CYCLE

Content :

The main components of a helium liquefier which determines the performance of the HRL for a given compressor flow rate are Turbine, Heat exchanger and JT valve. Turbine and JT valve produces cooling effect of helium gas by isentropic and isenthalpic expansion process respectively. Different components can be arranged to have different thermodynamic cycle configuration. For each configuration main components can have different operating process parameters leading to different performance of HRL. This involves the analysis and optimization of the compressor delivery pressure for a configuration in which 2 turbines are in series between temperature of about 40 to 10 K and 3rd turbine is placed just upstream of the JT expansion valve. This analysis and optimization work will also involve finding effects of different practical inefficiencies of main components. This configuration, including a liquid nitrogen pre-cooled heat exchanger has eight heat exchangers which produces liquid helium at 4.5 K and can operate as liquefier and refrigerator simultaneously. This optimization work is done for a helium plant of equivalent cooling capacity ~2 kW at 4.5 K. It shows that for more than a certain compressor delivery pressure of about 18 bar, the cooling capacity of the plant does not improve. This paper will present the details of this analysis and results.

Summary :

This abstract is related to large scale helium plant development. Poster presentation is preferred.

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