26th National Symposium on Cryogenics and Superconductivity

Contribution ID : 2

Optimization of the Performance of Injection Cooling System Using Genetic Algorithm

Content :

Injection cooling is a method to reduce the boil-off loss of cryogenic liquids, and has been applied in space launch vehicles. In this method, a pure insoluble gas, whose boiling point is less than that of the liquid, is bubbled into the liquid. Subcooling due to liquid-evaporation into the gas bubble, causes a reduction in the liquid boil-off. A difference between the saturation pressure of the liquid and partial pressure of the liquid component inside the gas bubble drives the liquid into the (rising) gas bubbles. Extent of evaporation depends on the interfacial area between the liquid and the gas bubbles, and heat and mass transfer coefficients. All these parameters in turn are dictated by the bubble hydrodynamics and various two phase interactions. Hence, gas flow rate, gas injection temperature and system configuration have profound effect on liquid subcooling. Optimum values of process variables are needed to maximize the process performance. There has been no study reported on the optimal selection of process variables. The present study involves the development of an optimization strategy to minimize the evaporative loss of cryogenic liquid in injection cooling. Genetic Algorithm has been applied for this purpose as it enables the determination of global optimum values of various process variables. An in-house code is being developed to carry out optimization studies on the injection cooling.

Primary authors : Mr. SAHA, Pritam (Indian Institute of Technology Kharagpur)

Co-authors : Mr. B, Nitin (Indian Institute of Technology Kharagpur) ; Prof. SANDILYA, Pavitra (Indian Institute of Technology Kharagpur)

Presenter : Mr. SAHA, Pritam (Indian Institute of Technology Kharagpur)

Session classification : Poster Session 1: Abstract ID 1,2,3,8,9,15,16,21,23,25,27,28,29,30,42,44,46,47,49,50,51,58,61,65,79,81,82,87,96,97,98, 106,126,130,189

Track classification : Cryogenic Systems: Refrigeration / Liquefaction

Type : --not specified--