



Contribution ID: 415

Type: Poster

C1Po1F-02: “Keep it simple, stupid”: Redesigning a chaotic low pressure LN₂ delivery system to NMR instrument

Monday 19 May 2025 09:15 (1h 45m)

“Keep it simple, stupid” is an engineering design principle that is, sometimes, silently drifted away from when system modifications are implemented to rectify a problem; where, ironically, complexity is increased to achieve a simple objective. This project introduces a tumultuous low pressure (5psi) liquid nitrogen delivery system feeding an NMR instrumentation lab, with a current system stability analogous to a spinning top in a hailstorm. Over time, additional modifications have been added to this LN₂ delivery system, increasing the complexity, albeit without enhancing stability. Our goal in presenting this system is to ultimately redesign its implementation aiming for improvement in efficiency and stability. Presently, the system requires near daily user input via adjustment of relief valves to maintain a stable flow rate, where its current state has a propensity towards chaos, reaching a point of constant filling and venting to maintain 5psi flow rate. The original system design, located on the roof above the NMR instrumentation lab, utilizes a VJ LN₂ supply line entering a two-phase tank, with upper and lower fluid volume regulated via a pneumatically operated controller fill valve, where 5psi output flows from the bottom of the tank via VJ line to NMR instrumentation. The two-phase tank is equipped with a pressure relief valve set to 22psi. Overhead gas volume is maintained with an outlet vent to atmosphere, regulated with a pressure regulator valve set to 7psi and a solenoid valve set to 14psi. Ineffectual post modifications involved installation of an additional gas phase buffer pot placed above the two-phase tank and connected upstream from the original pressure regulator (7psi) and solenoid valves (14psi) to increase overhead gas volume with an intent for increased stability.

Author: ARLINE, Benjamin (Florida State University - NHMFL)

Co-author: JIANG, Zhiyi (Florida State University - NHMFL)

Presenters: ARLINE, Benjamin (Florida State University - NHMFL); JIANG, Zhiyi (Florida State University - NHMFL)

Session Classification: C1Po1F - Large Scale Refrigeration II