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C1Or2B-01: Conservation of Helium while Maintaining High System Purity

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Recent helium shortages and helium price increases have lead to an increased emphasis being placed on conserving helium. The need to conserve helium must be balanced with need to maintain the high levels of purity necessary to prevent operational problems caused by contamination. Helium losses and contamination control are especially important for test stands that have cryogenic distribution systems operating continuously with frequent changeover of cryogenic temperature components that are being tested. This paper describes a mathematical model to estimate the quantity of helium lost and the purity of the helium after the pump and backfill procedure is complete. The process to determine the optimal time during pump down to cut off pumping and start backfilling is described. There is a tradeoff between trying to achieve the lowest possible pressure during pumping and the quantity of air leaking into the volume while pumping is occurring. An additional benefit of careful selection of pump and backfill parameters in conjunction with real-time pressure monitoring can reduce the labor and time required to complete a successful pump and backfill procedure. This paper is intended to be a tool for engineers to review their pump and backfill procedures and measured data to optimize helium losses, system purity, and labor required.

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