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A Scintillator Purification Plant and Fluid Handling System for SNO+

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A large capacity purification plant and fluid handling system has been constructed for the SNO+ neutrino and double-beta decay experiment, located 6800 feet underground at SNOLAB, Canada. SNO+ is a refurbishment of the original SNO detector to fill the acrylic vessel with liquid scintillator based on Linear Alkylbenzene (LAB) and 2 g/L PPO, and also has a phase to load natural tellurium into the scintillator for a double-beta decay experiment with Te-130. The plant includes processes multi-stage dual-stream distillation, column solvent-solvent extraction, steam stripping, and functionalized silica gel adsorption columns. The plant also includes systems for preparing the scintillator and metal-loading the scintillator for double-beta decay exposure. We review the basis of design, the purification principles, specifications for the plant, and the construction and installations. We also discuss the plant helium leak testing, the passivation and high-purity cleaning, and the plant safety systems. Currently the plant is undergoing testing and commissioning with water, with approvals for LAB commissioning to begin early summer 2016.

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