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The helium recovery and purification system of the ADS-inject I

ADS-Injector is one of the important parts in the Accelerator Driven Sub-critical project. In order to reduce the quantity of impurities in the helium and to recover the helium during superconducting cavities tests or maintenance, a helium purification and recovery system is implemented in the ADS-Injector I cryogenic plant. It is composed by two high pressure recovery compressors, a helium booster and a helium cryogenic purifier. An atmospheric gas bag (100 m³), high pressure cylinder for impure gas helium (20 bottles at 20 MPa, 500 N m³ each), high pressure cylinder for pure gas helium (20 bottles at 20 MPa, 500 N m³ each), a liquid nitrogen tank (10,000 l) and dedicated transfer stainless steel pipe lines are provided for the vertical test stand and horizontal test stand.

The recovery and purification system can be operated automatically. The helium to be recovered is collected in the gas bag; if its pressure is too low to enter in the gas bag quickly, the low pressure helium is sent to a booster where its pressure increases to the 1.05 bar before entering the helium gas bag.

The helium coming from the gas bag is sent to the recovery compressor and stored in the high pressure (20 MPa) cylinder from which it is delivered to the impure gas storage. The maximum rate of flow of each recovery compressor is 105 Nm³/h. A cryogenic purifier which is cooled down to 77 K with liquid nitrogen is used to trap impurities from gaseous helium. The output impurity of the helium can be decreased to less than 5 ppm. and then it is stored in high pressure cylinder (up to 20 MPa) which is delivered to the pure gas storage.

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