R&D Activities on the Tritium Storage and Delivery System in Korea

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The tritium storage and delivery system, one of the major components of the tritium fuel cycle, is designed to store and deliver the tritium and deuterium in the tritium plant. It comprises several metal-hydride getter beds capable of in-bed calorimetry, a PVT-c loop for an accurate measurement of tritium inventory, a ^{3}He recovery system, overpressure protection headers, etc.

R&D activities on the tritium storage and delivery system include the development of getter beds to increase tritium recovery and delivery performance, the investigation of the tritium reaction characteristics with ZrCo metal-hydride, the tritium measurement techniques including in-bed calrorimetry, and the development of technologies for the optimal process integration of the system.

The key technology for the getter bed development is to find the design driving mechanisms affecting fast delivery and recovery performance. Recently, in order to investigate the design parameters, several mockups were fabricated and tested with hydrogen. Also, to investigate the getter material behaviors in the storage bed, such as repeatability, disproportionation, hydriding and dehydriding phenomena, several experiments have been performed with ZrCo hydride samples. Physical and thermal properties and reaction rate are measured to obtain the information of the stability and reliability of the getter material for the optimal bed design.

In order to develop the technologies for process integration, several unit process experiments are performed. Investigated are the performance of delivering and recovering hydrogen isotopes, accuracy in determining hydrogen inventory, He-3 collections, as well as the pump performance. A reference bed, called as bed simulator, is prepared to simulate the various bed operation scenarios under normal and accident conditions to help design and test the system process independently. It will also be used for the unit process experiments and for on-site tests before tritium employment. The current status of the R&D activities is introduced in this paper.