

Design Task for ITER Long-Term Tritium Storage System

C. S. Kim, K. H. Im, S. Y. Cho, B. G. Hong, G. S. Lee, D. I. Choi

ITER Project Task Force Team, 52, Yeo-eun-Dong, Yusung-Gu, Daejeon, 305-333, Korea, kimkim@kbsi.re.kr

1. Introduction

The allocation of components and systems to be delivered to ITER on an in-kind basis, was agreed between the ITER Parties in autumn 2003. Among others, Korea agreed to supply to ITER the Storage and Delivery System (SDS), which is a subsystem of the ITER tritium plant [1]. Part of the SDS is the long-term storage system (LTS). The design of this system is as yet only developed in a conceptual form and hence it is proposed that the present task should concentrate on this subsystem. Detailed design of the SDS, which may need to update to comply with design changes in the plasma fuelling requirements, can be performed in the second stage of this design task.

2. The Work Scope

The objective of this task is to develop the detailed design of the SDS in preparation for the procurement of this system, i.e. this task shall develop detailed design of system configuration, equipment and layout, and detailed definition of the interfaces with the associated subsystems for an industrial manufacturing contract, on-site installation, as well as for the testing (factory and on-site) and commissioning phase of the tritium plant. The design shall take into account (a) on-site tritium measurement (receiving tritium, and solid waste residual tritium), (b) consistency with the facility specifications of tritium loading and delivery sites (c) compliance with IAEA shipping regulations of radioactive materials, (d) minimization of shipping cost, and (e) minimization of residual tritium in the waste at a realistic level. The proposed task has to be seen as the first step in the overall effort.

The subsystems for LTS to be studied in detail are as follows:

- i) unpacking box;
- ii) Inner capsule temporary storage chamber;
- iii) T₂ gas off-loading and baking glovebox;
- iv) Calorimetry;
- v) Long -Term Tritium Storage System and Glovebox;
- vi) Waste packing chamber.

For each subsystem, the task will comprise the following items of work:

- a) review of the design concepts, development of alternative concepts if advantageous;

- b) detailed design (system and equipment design, layout design) of shipping container unpacking box;

- c) detailed design (system and equipment design, layout design) of inner capsule temporary storage chamber;

- d) detailed design (system and equipment design, layout design) of T₂ gas off-loading and baking glovebox including off-loading and baking furnace;

- e) calorimeter laboratory including two dedicated calorimeters and room air local air cooling system;

- f) detailed design (system and equipment design, layout design) of long-term tritium storage system and glovebox;

- g) detailed design (system and equipment design, layout design) of waste packing chamber;

- h) glovebox standardization;

- i) material selection for fire protection and tritium compatibility;

- j) comprehensive integration of the piping interfaces among other subsystems such as SDS, ANS, glovebox atmosphere detritiation system (GDS), N₂ purge supply and discharge, vent detritiation (N-VDS 1), electric power distribution and control cubicles, utilities, etc;

- k) detailed design of electric power distribution cubicles, and control cubicles for process control and monitoring, and for glovebox atmosphere control and monitoring;

- l) detailed design of glovebox supports including joints for connection with embedded anchors;

- m) detailed layout design of cabling inside and outside of glovebox;

- n) detailed layout design of utility piping and instrument tubing inside and outside of glovebox;

- o) development of the technical specifications documents for the entire LTS including associated interfaces (piping and cabling);

- p) development of the technical specification documents for installation and testing.

3. Conclusion

The detail design of the above system will be carried out for the next one year in accordance with the agreement between ITER IT and Korea as a one member of ITER negotiation country. And, cost estimation and planning will be done for the SDS system allocated to Korea.

REFERENCES

- [1] ITER Final Design Report, 2001.