

Sampling Design for Defluorination of D-UF₆

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1. Introduction

In 1986, as part of securing resources for the PWR fuel localization project, KAERI imported about 200 tons of D-UF₆ (a byproduct of fuel production) after concentrating as free of charge. Some of them were used for research activities

Currently, The D-UF₆ being stored in large cylindrical steel cylinders 48 inches in diameter (48Y type) each holding up to 12.5 tons, totally, 185 tons of D-UF₆ are being stored and managed in the storage building.

KAERI has a plan to deconvert D-UF₆ into a stable compound like U₃O₈ to improve storage safety [1-3]. In domestic, there are no facility that can handle the D-UF₆ in 48Y cylinders and deconvert it. Therefore, the D-UF₆ have to be transported to other countries which have suitable facilities and skills.

In order to transport the D-UF₆ to other countries, and to load the facilities, it is necessary that precious information about chemical composition, enrichments and purity. That is, the sampling process is necessary and it should be performed before transportation to other country.

In this study, the draft design of the sampling equipment and sampling process will be discussed.

2. Design and procedure of D-UF₆ sampling

The sampling equipment will be manufactured at ORANO Cycle which has great technique and

knowhow about the deconversion of UF₆

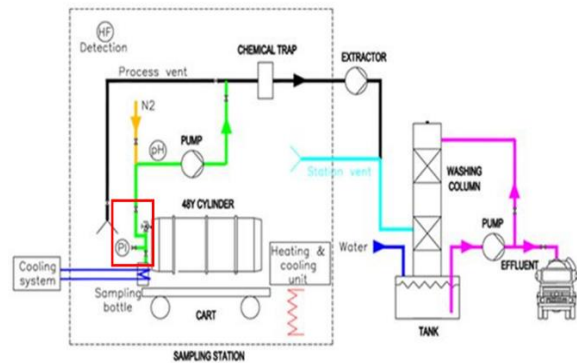


Fig. 1. Schematics of the sampling equipment.

Figure 1. shows the schematics of the sampling equipment consists with chemical traps, heat and cooling system for the cylinder, ventilation system, carts for the cylinder loading/unloading and big shield to protect the UF₆ release.

Figure 2 shows the magnified images of the valves parts (red box in Figure 1.)

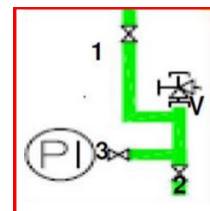


Fig. 2. Magnified images of valves part (red box in Figure 1.).

The sampling procedure is followings.

First, start with all valve is closed. For the valve mechanical test, open V and close V. in order to remove of non-condensable gas, open valve V & 1.

Pumping out until reaching below P_{atm} pressure during limited time to be defined, then close V & 1. Heat the cylinder to make gas condition of UF_6 , around $50^\circ C$, the temperature to be define considering safety issues. Then, Open V and 2 to sampling. During the sampling, the sample bottle will be cool down by cooling system in order to UF_6 crystallization. Several time will be needed for the right quantities.

All equipment and relevant works will be set up and be performed inside of current storage building at KAERI. The storage building is designated as a radioactive controlled area, however, it has a license for the nuclear materials to storage and management only. The evaluation of the environmental effects of these radioactive works and accident analysis will be performed in order to acquire relevant license from Nuclear Safety and Security Commission.

3. Summary

KAERI has about 185 tons of D- UF_6 from 1986 and it being stored 16 48Y type cylinders inside of storage building. The D- UF_6 cylinders should be transported to other countries for the deconversion into stable materials such as U_3O_8 in order to enhance the storage safety and disposal.

For the transportation to other country and loading the cylinders to the deconversion facility, the sampling process is essential. The design and procedure for the sampling are now developing, and environmental effect evaluation and risk evaluation works will be performed to acquire license for the sampling.

REFERENCES

- [1] <http://www.world-nuclear.org>.
- [2] <http://www.avevgroup.com>.

- [3] P.D. Wilson (Ed). The Nuclear Fuel Cycle – From Ore to Wastes, Oxford University Press. Oxford. UK, 1996.