

LPCE Process Design of Wolsung and Cernavoda Tritium Removal Facility

Hojun Lee, Yeonduck Han, Inhoon Lee, Kyumin Song

Korea Hydro & Nuclear Power Co., LTD(KHNP)
Hojun.lee@khnp.co.kr

1. Introduction

The Cernavoda TRF(Tritium Removal Facility) is currently under construction with an planned completion date of 2027 and will be the third facility in the world after Canada's Darlington TRF (1990) and South Korea's Wolsong TRF(2007).

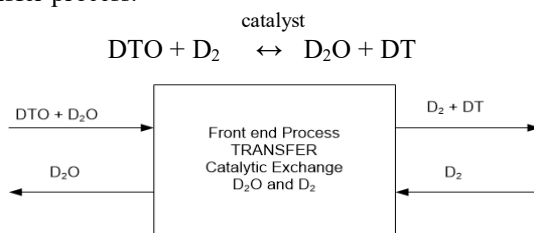
Each of these facilities has installed the LPCE(Liquid Phase Catalytic Exchange). The purpose is to remove tritium, but the structure and removal method of facility is different.

LPCE(Liquid Phase Catalytic Exchange) of Wolsong Tritium Removal Facility(WTRF) and Cernavoda Tritium Removal Facility(CTRF) is introduced.

2. Process Design Description

The LPCE system has reduced the tritium content of moderator heavy water feed to the catalytic exchange column.

The first part, or front-end of process is to remove the tritium from the heavy water using catalytic exchange reaction. The detritiated heavy water is returned back to the reactor after being treated in this transfer process.



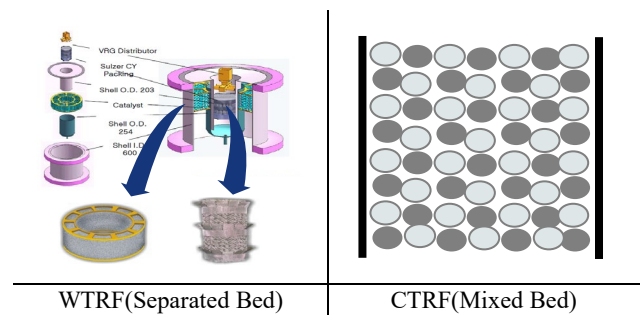
< Fig 1. Transfer Catalytic Exchange >

Tritium is transferred from a heavy water molecule to a deuterium molecule under the wet proofed platinum catalyst. This process is termed Liquid Phase Catalytic Exchange (LPCE).

3. Comparison of WTRF and CTRF

In WTRF, Catalytic and packing reactions occur in different parts of LPCE column. On the other hand, in CTRF has catalytic and packing reactions occur the

same part of LPCE column. Therefore, catalyst components and equipment structures are different.



< Fig 2. The structure of WTRF, CTRF >

CTRF LPCE system is designed using 3 columns taking into consideration. New hydrophobic catalyst and a stainless-steel packing mixture recently developed. The typical design differences in the LPCE process are as follows.

	WTRF	CTRF
LPCE Type	Separated Bed	Mixed Bed
Number of Catalyst Column	2	3
D2O Isotopic feed	>99.8 mole%	>99.7 mole%
D2O Processing rate	100 kg/hr	40 kg/hr
Catalyst Type	Pt., Hydrophobic	Pt., Hydrophobic

< Table 1. Comparison of WTRF, CTRF >

4. Conclusion

The conceptual LPCE design of CTRF and WTRF was different. Both facility systems have their advantages. When CTRF has constructed, the worker dose and environmental emissions of Tritium will be significantly reduced.

REFERENCES

- [1] Potential Collaboration Between NFRI and Kinectrics, WTRF-Kinectrics OPEX Meeting, 2014
- [2] Cernavoda Tritium Removal Facility, WTRF-Kinectrics OPEX Meeting, 2014
- [3] Cernavoda Removal Facility-Evolution in TRF Design, Fusion and Science Technology, 2016