[Form 2 (to be reported to Committee on Countermeasures for Contaminated Water Treatment and to be disclosed to public)

Technology Information	
Area	2 (Select the number from "Areas of Technologies Requested")
Title	Complex scheme of wastewater treatment to remove tritium
Submitted by	Khlopin Radium Institute

1. Overview of Technologies (features, specification, functions, owners, etc.)

World experience in the hydrogen isotopes separation was used in the development of the unit required. As a result, the complex scheme of the wastewater treatment to remove tritium was developed.

We used the three-step scheme. The first step of the installation is a vacuum distillation, which is used to remove tritium (purification degree ≥ 100) and salt impurities from water wastes and provide formation of the intermediate product with tritium concentration 10 times. The second step operates in accordance with the BHW (Bithermal catalytic exchange in the water-hydrogen system) technology in the water-hydrogen system and involves both cold and hot columns. The intermediate concentrate obtained in the distillation column is fed to the cold column and hot water flow from the hot column is returned to the rectification column. Water with enriched with tritium form the BHW step is supplied to the third stage of the installation, operating by CECE (Combined electrolysis catalytic exchange in the water-hydrogen system) technology. From the third step we obtain the product with tritium concentration of 2 000 times greater than that in the feed. To reduce energy consumption in developed unit we suggest performing heat recovery in the rectification and BHW steps.

Based on the experience of operation of the installation with capacity of 100 L/h we proposed to develop and design a unit for wastewater treatment to remove tritium with a capacity of 20000 L/h and characteristics shown in Table 1.

Table 1. Characteristics of the unit for waste water treatment to remove tritium with a capacity of 20 m^3/h.

Parameter	Unit	Value
Capacity on the initial water	m^3/h m^3/day	20 480

Purification degree	no less than	100
Tritium content in the contaminated water	Bq/l	~$5 \cdot 10^6$
Tritium content in the treated water	Bq/l	<$5 \cdot 10^4$
Equipment performance	Bq/day/m^2	≥$1 \cdot 10^9$
Degree of tritium concentration	no less than	2,000
The volume of solid radioactive waste (solidified tritium concentrate)	m^3/day	no more than 2

The technology used in Russia for the treatment of liquid radioactive waste. Performance operating apparatus 100 l / h.

【Areas of Technologies Requested】

(1) Accumulation of contaminated water (Storage Tanks, etc.)
(2) Treatment of contaminated water (Tritium, etc.)
(3) Removal of radioactive materials from the seawater in the harbor
(4) Management of contaminated water inside the buildings
(5) Management measures to block groundwater from flowing into the site
(6) Understanding the groundwater flow