

Form 2

Technology Information	
Area	3 – Removal of radioactive materials from the seawater in the harbor 3. 港湾内の海水の浄化 (1) 海水中の放射性Cs, Sr除去
Title	CESIUM REMOVAL USING NYMPHEA TECHNOLOGY “NYMPHEA”水中イオン交換体によるセシウムの除去 (AREVA 3-2)
Submitted by	AREVA / CEA / ATOX

1. Overview of Technologies

Functions

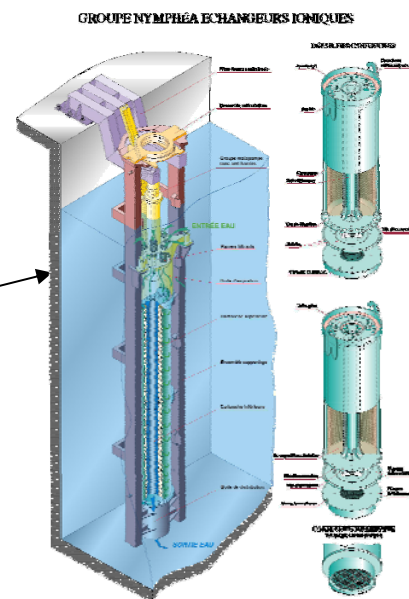
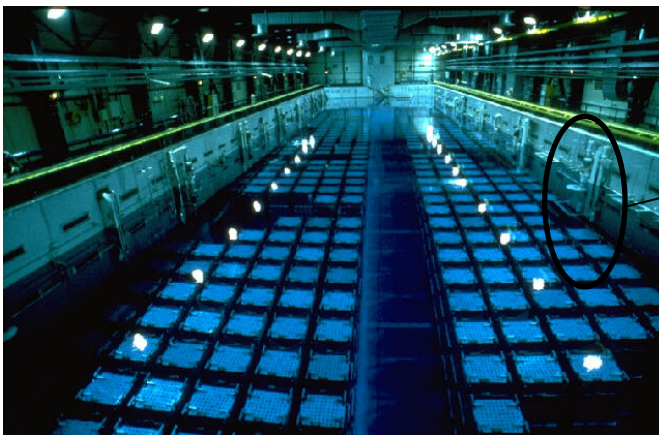
The Nymphaea technology is intended to purify the water of fuel elements and is based on immersed cartridge of mineral adsorbent used in La Hague plant for water treatment in spent fuel pool for 20 years.

Mineral adsorbent could be used in Nymphaea technology for the removal of Cs from the seawater in the harbor instead of ion exchanger resins.

Summary Descriptive

The Nymphaea technology is easy to install and composed of:

1. A set of vertical cartridges and a supporting assembly,
2. A motor-driven pump with a propeller,
3. Inside the cartridges, the water circulates through the mineral adsorbent (i.e.: zeolite or ferro cyanide, the choice will be based on a technological and economic feasibility study).





Possible locations
for Nympha ions
exchangers

Features & Specifications

The equipment is composed of the following parts:

- Support structure unit
- Motor – pump
- Sucking up box with filters
- Set of cartridge ionic
- Distribution box
- Supporting system
- Process control system

The main dimensions of Nympha Ions Exchangers are (could be adapted to Fukushima's topic):

- Diameter: ~900 mm
- Depth: ~2500 mm

Advantage of our technology

- Nympha cesium ionic exchangers used in front of the inlet channel for unit 1 to 4 (representing 160.000m³) will:
 - Treat an average water flow of 250m³/h,
 - Allow to decrease the activity by 10 in approx 3 months with only two set of Nympha cartridge

- Generate between 200 and 2.000kg of mineral sorbent (depending of their performance) for a decrease of the activity by 10,
- Allow to decrease the activity by 100 in approx 6 months,
- The ionic exchangers are immersed. The water is acting as a biological shield.
- The pumping equipment is standard and easy to change.
- The quantity of ion exchanger can be easily adapted depending on:
 - the sea water target activity,
 - the solid waste activity.
- Tests can easily be performed on resins to monitor their activity.
- This technology allows a radial circulation of the water to limits the risks of clogging compared to column treatment.

Owner

AREVA owns the technology.

ATOX would be a partner for technology adaptation to use in Fukushima NPP site and tests of different potential adsorbent.

2. Notes

Technology readiness level

Proven technology already in operation for nuclear spent fuel pool water treatment for more than 20 years.

Challenges

- The main challenge is to adapt the technology to the sea water.
- Tests will be performed to choose the appropriate adsorbent between existing mineral adsorbent and a new one under development with the CEA (i.e.: Porous glass beads).

Others

- The Nymphaea technology is patented by AREVA.
- The new adsorbent is patented by ICSM: Common laboratory of CEA & CNRS.

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