Demonstration Project for Technologies for Capturing Radioactive Substance from Soil
Summary Report for Public ＜ATOX, AREVA NC, AREVA ATOX D&D SOLUTIONS＞

Scope

PRB is verified capture performance of radioactive strontium (Sr) by some capture tests, applicability to the Fukushima Daiichi Nuclear Power Station (1F) were evaluated.

Overview and Features

1. Overview and features of the PRB

◆PRB have been used worldwide for more than twenty years to treat organics solvents and heavy metals pollutions.
◆Reactant injected into the ground to adsorb radioactive material, diffusion of contamination is prevented. (Fig 1)。
◆The number of injection points can adjust the size barrier, be constructed to 80m depth.

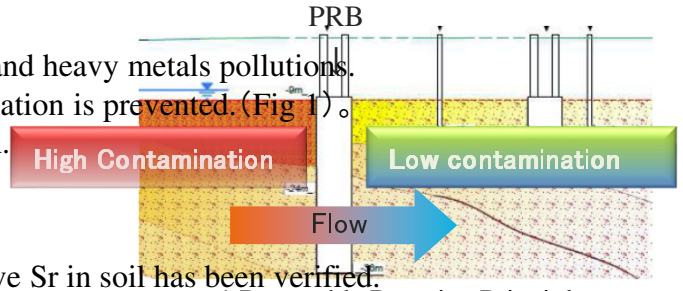

Fig.1 Permeable Reactive Principle

2. Project Summary

2.1 Adsorption tests

The capture tests of (1)-(3) shown in Table 1, the capture performance of the radioactive Sr in soil has been verified.

Table 1 Comparison of adsorption tests

	(1) Inactive Tests	(2) Active Tests	(3) Confirmation Tests
Purpose	Evaluation on adsorption capacity of each reactant	Evaluation on Sr-85 decontamination factor	Soil and groundwater similar to 1F site, and confirmation of the capture performance
Method	Batch and column tests	Column tests	Column tests
Reactants	Zeolite A(2 type) Apatite (4 type) Bone powder, Iron Powder, etc.	Zeolite A(2 type) Apatite (1 type)	Zeolite A(2 type) Apatite (1 type)
Soil	Test sand	Test sand	Iwaki sand
Synthetic groundwater	Sea water and groundwater	Sea water and groundwater	Groundwater from 2F site and sea water
Sr	Inactive Sr (Initial concentration1300μg/L)	Active Sr(Sr-85) (Initial concentration100kBq/L)	Inactive Sr (Initial concentration 1300μg/L)


Fig.2 Example of reactant(Zeolite A)

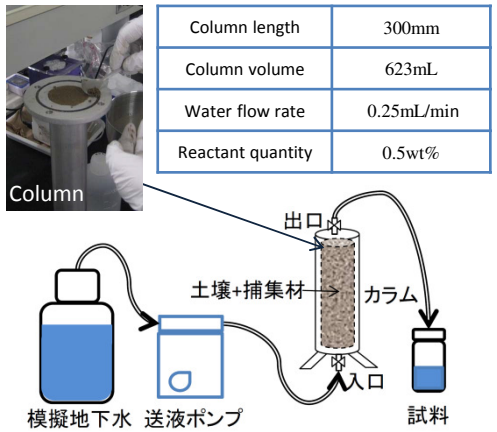

Fig.3 Column test rig

2.2 Applicability evaluation of the Fukushima Daiichi Nuclear Power Station

Based on the results of the capture tests described above, applicability to the Fukushima Daiichi nuclear power Station was evaluated.

Result

3. Result for the project

3.1 Result for Adsorption test

①Inactive Tests(Table 2)

- ◆Both zeolites are the most efficient reactants for Sr capture.
- ◆Apatite don't show great selectivity for Sr.

②Active Tests(Table 2)

- ◆Both zeolites are the most efficient reactants for Sr-85.
- ◆The double PRB test (Apatite and Zeolite) indicate a way for on-site optimization on the lifetime and the cost of the PRB.

③Confirmation Tests

- ◆ Confirmation test using a similar soil and groundwater to 1F site was the equivalent results to test described above.

Table 2 Sr Adsorption capacity and Sr-85 DF

Reactants	Sr Capacity	Sr-85DF*1)			
		0.2L/g*2)	0.5L/g	1.0L/g	1.5L/g
Zeolite A-1	Most efficient	1×10^5	1×10^5	1×10^4	7×10^2
Zeolite A-2	Most efficient	1×10^5	1×10^5	4×10^3	1×10^2
Apatite	Efficient	2×10^4	1×10^1	2×10^0	1×10^0
Apatite +Zeolite A	–	1×10^5	1×10^5	1×10^5	1×10^5

*1) Sr-85 DF＝Sr-85 initial concentration(100kBq/L)÷column outlet Sr-85 concentration
*2) Unit L / g is percolated synthetic groundwater volume per reactant 1g

Applicability to 1F site and Future Tasks

3.2 Applicability evaluation of the Fukushima Daiichi Nuclear Power Station(Fig.4)

Stratum structure, soil property and groundwater flow was studied, applicability of the PRB was evaluated.

①Construction of PRB

- ◆Reactants are used in construction with apatite and zeolite A.
- ◆PRB is constructed from well No.2-6 in radial 15m-20m, and to 14m depth.

②Adsorption of radioactive Sr

- ◆Groundwater is pumped from well No.2-6, radioactive Sr of groundwater is captured to the PRB.
- ◆Capture effect of PRB lasts up to 25 years.

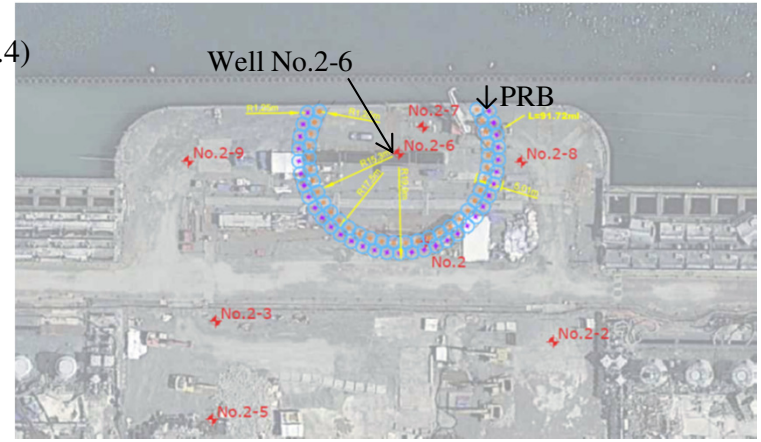

Fig.4 Application of the PRB to 1F site
(Vicinity of the unit 3,4 intake)

5. Future Tasks

①Confirmation lab tests with actual soil and groundwater samples in 1F site.
②Cost estimation.
③Realize a site scale pilot on the site, and 3-6 months monitoring for site decision execution.

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