R&D Back-ups for Operation of the Highly Contaminated Water Treatment System in Fukushima Daiichi Nuclear Power Station

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CRIEPI
Central Research Institute of Electric Power Industry

Overview of Water Treatment System in Fukushima Daiichi

Since 6/24

Since6/27

Desalination

HITACHI-GE, AREVA

Cs Precipitation

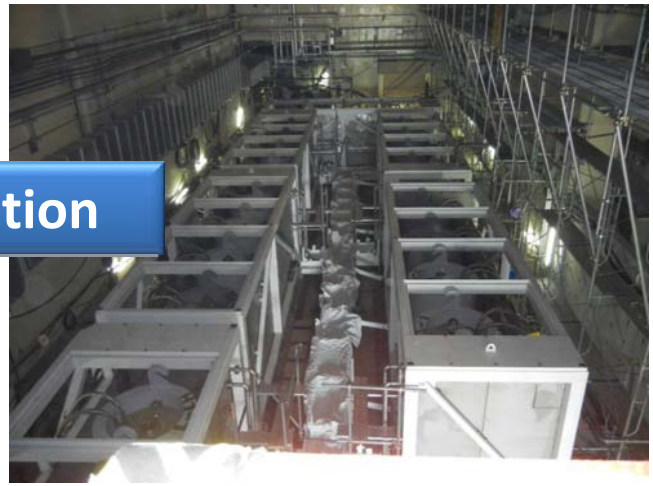
AREVA

Since 9/14

2nd Cs Adsorption

TOSHIBA/Shaw

Cs Adsorption



KURION

Since 8/18

Reactor Unit #1

WATER RECYCLE

Oil Separation

TOSHIBA

Since 6/17

1200 ton/day

Over flow ?

Contaminated Water

Radioactivity > 10^6 Bq/ml

Impurity= sea water, oil

Amount= 100,000m^3 => **250,000m^3**

TMI Experience and Fukushima Challenges

Difficulties compared with TMI water treatment system

Composition: -Radioactive elements similar to TMI
-Impurities of sea salt & mechanical oil
Throughput: 250,000ton/year (6,000ton/year for TMI)
Environment: Need to use existing building
-Limitation in weight and function of crane
-Water pool: not available => Individual shielding
Lead time : About 2 months (2 years for TMI)

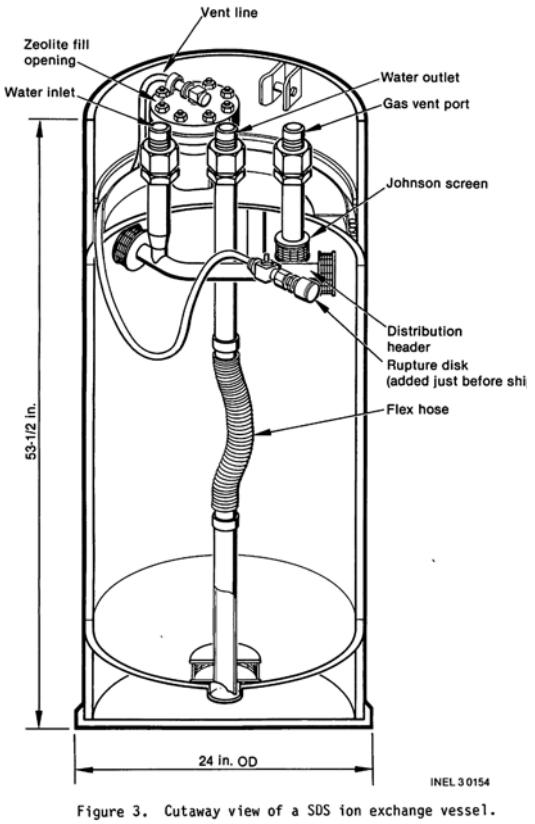


Figure 3. Cutaway view of a SDS ion exchange vessel.

Construction

Government / TEPCO

TOSHIBA | HITACHI-GE | KURION | AREVA | Others

Advisory and back-up R&Ds by Japanese Specialists

JAEA | CRIEPI | others

After KURION had presented the favorable properties of their zeolite and a robust system experienced in US, CRIEPI has started back-up R&Ds for TEPCO to optimize design and operation of the KURION system.

Back-up R&Ds Carried Out by CRIEPI

1) To measure the ion-exchange property of Kurion zeolite in equilibrium condition and column condition for confirming the properties.

2) To develop a code to simulate absorption/desorption kinetics of Cs in each Kurion zeolite column.

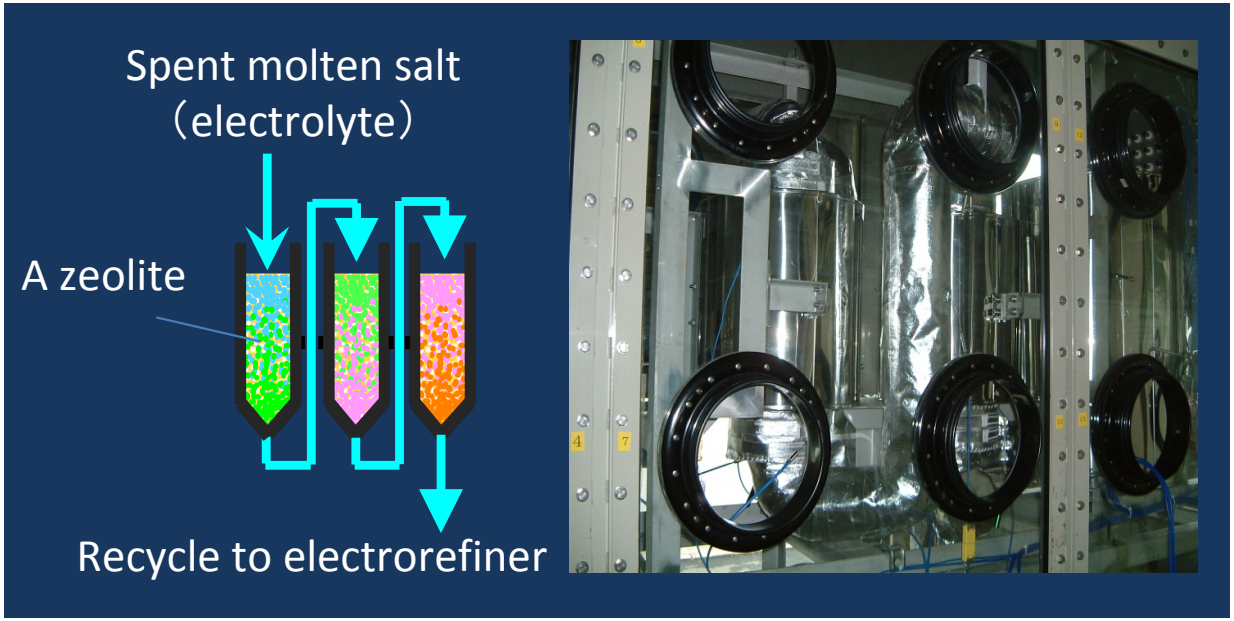
3) To estimate the shielding, heat generation and hydrogen generation for supporting design optimization of KURION system.

4) To carry out preliminary tests to vitrify the Cs-loaded KURION media as one of waste treatment options.

Main items of poster presentation

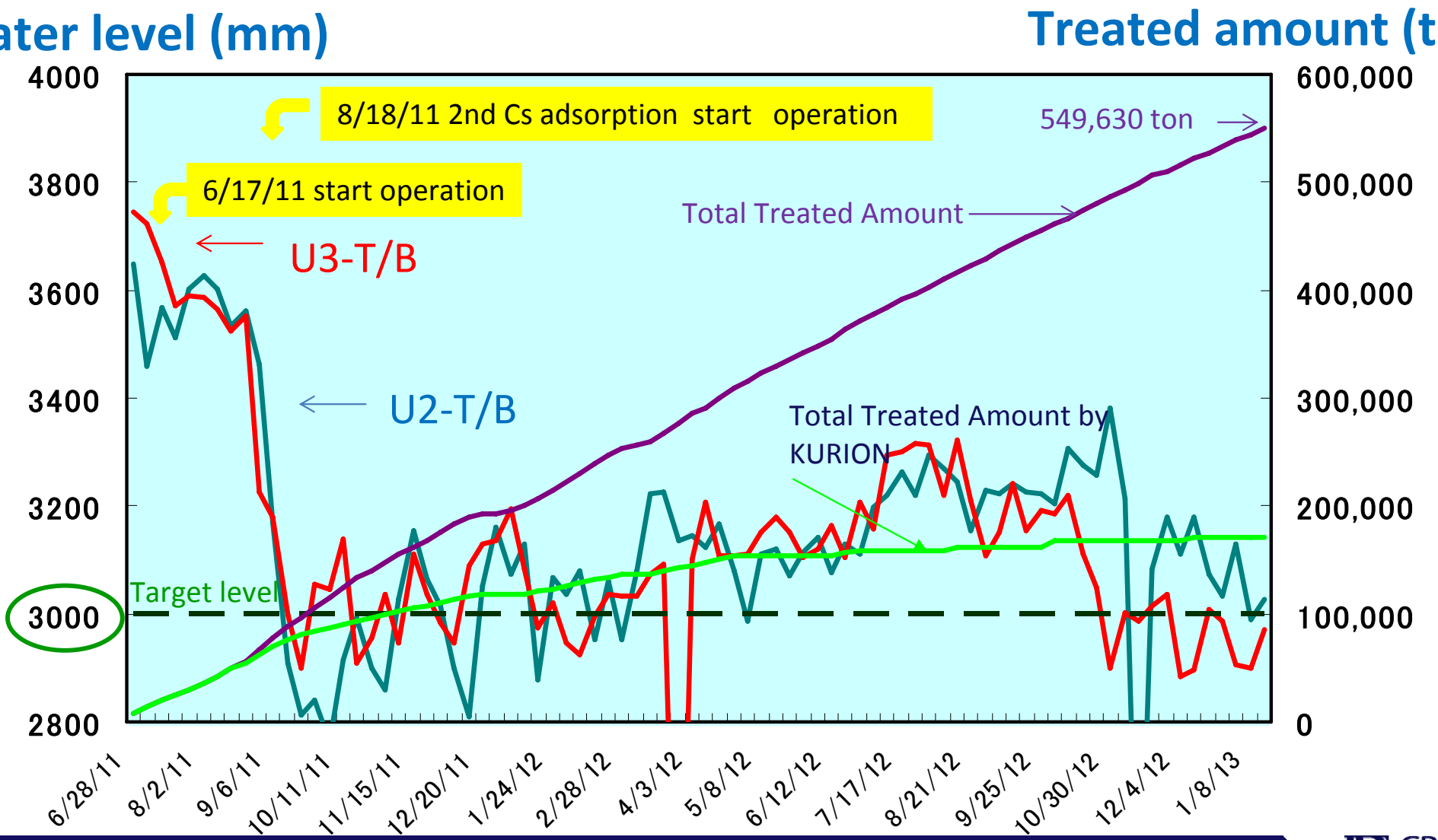
CRIEPI'S back-ground

Long experience in zeolite column engineering as dry-reprocessing technology for spent nuclear fuels (Spent salt treatment).



(as Conclusions) How Much Water Has Been Treated ?

- 549,630 ton in total till Jan.15th
- Water level has kept around 3,000 mm O.P., where overflow can be avoided even for strong rainfall.
- KURION contributed to avoidance of the initial critical situation.



70% of Cs has been removed by KURION system