2nd Caesium Workshop: meeting challenges for Fukushima recovery
Session 5: Management of waste and contaminated soil , Oct.9th

Research for development of soil separation technology

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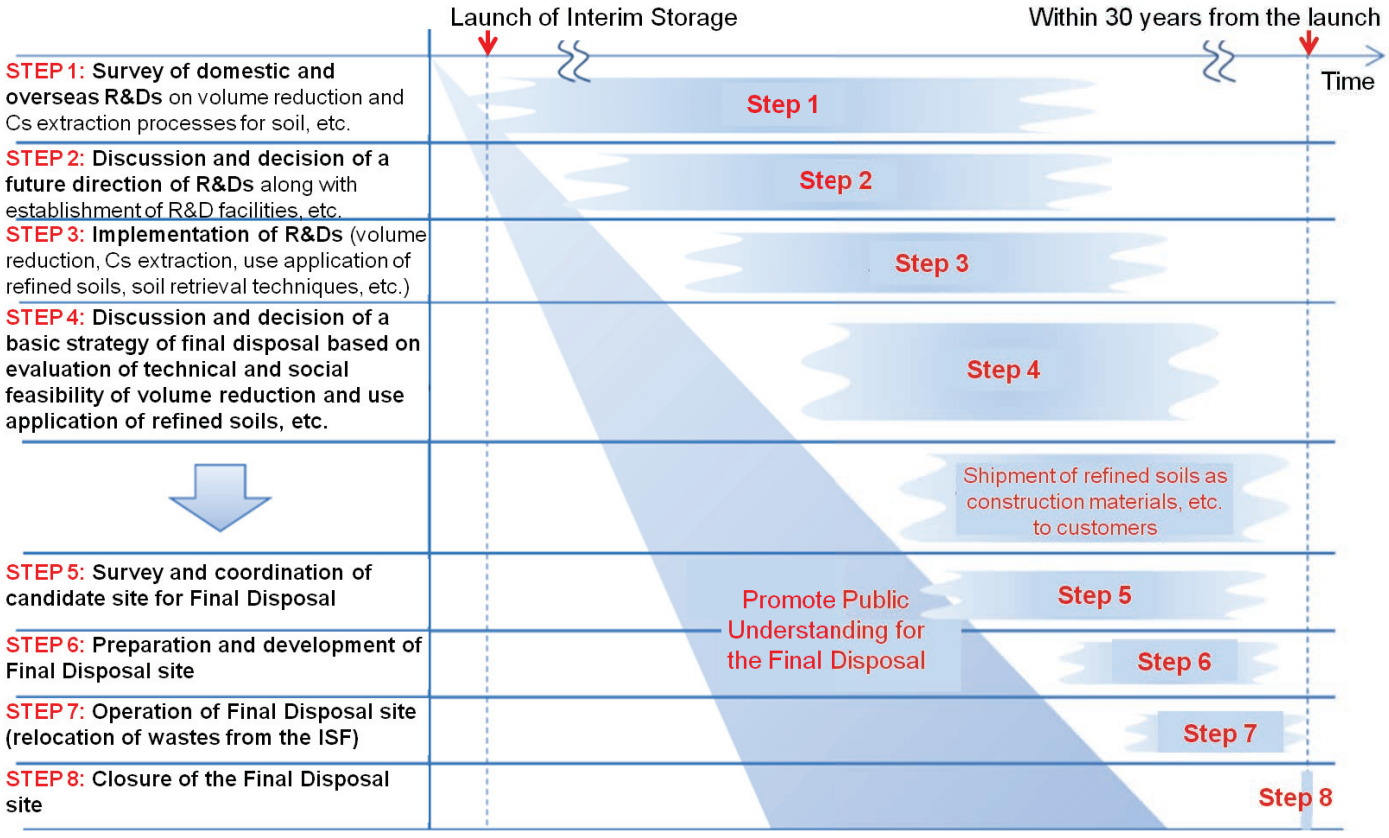
Mitsubishi Materials Corporation (MMC)

Workflow for Final Disposal outside Fukushima Prefecture



*Tentative translation of "Fundamental Policy for Final Disposal outside Fukushima Prefecture (Kengai Saishushobun nimuketa Kangaekata)" (MOE, 2014)
**Some expressions were modified based on "Plan of Interim Storage Facility for removed soils and wastes (Jokyodojoutou no chuukanchozoushisetsu no an nitsuite)" (MOE,2014)

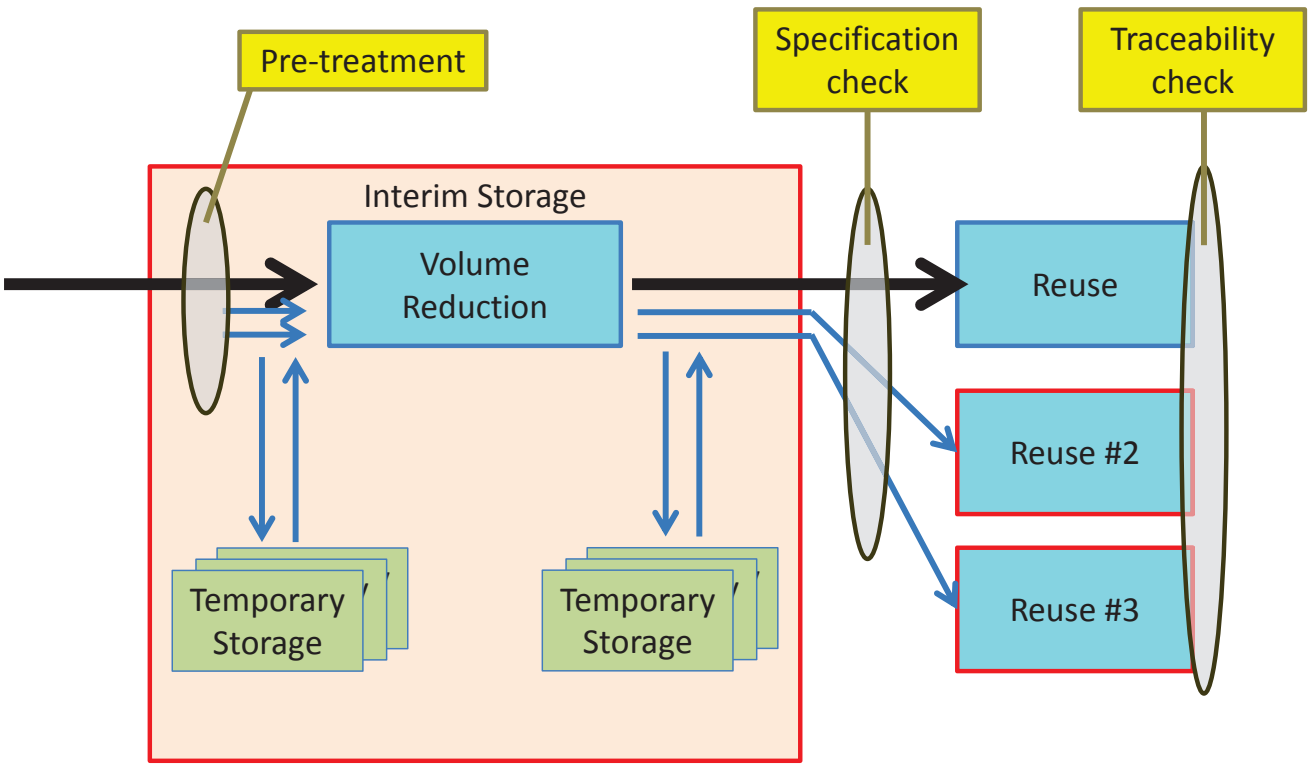
JAEA started a new project on soil waste treatment this year.
MMC supports JAEA.

1. Incentive

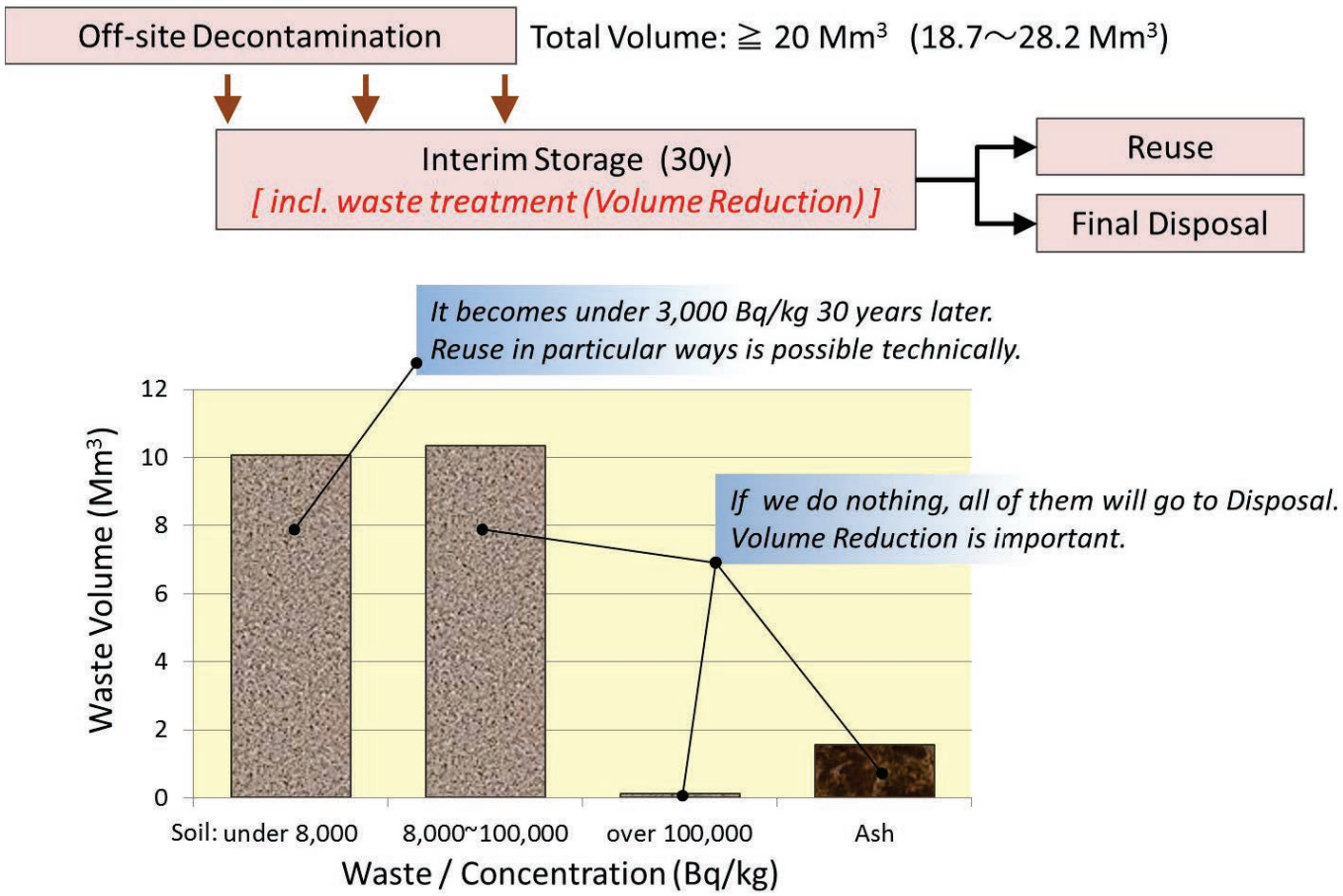
Volume of Cs-contaminated waste generated from off-site decontamination works in Fukushima was estimated very large. Therefore, **practical Volume Reduction of the waste combined with practical Reuse** is very important for final disposal.

2. Purpose

1) To design (select) appropriate and practical Volume Reduction methods (Separation, Extraction, Concentration, etc.)
2) To design appropriate Reuse scenarios and methods.



Fate of Waste gathered by Off-site Decontamination (estimated at starting)



Main themes of each year

Year	Volume Reduction	Reuse
FY2014	Literature Survey	Development of Scenarios, Preliminary Calculation
FY2015	Small Scale Experiments	(Same as above)
FY2016	Demonstration Experiments	Design of Practical Reuse
FY2017	Design of Practical Volume Reduction Plant combined with Practical Reuse Scenario	

FY2014's Theme and Working Structure

JAEA

Mitsubishi Materials Corp. (MMC)

- Literature Survey
- Hearing to Companies
- Dose calculation of Reuse

1) Waste property

- Mass, Cs concentration, Chemical/Mineral composition, their relations, etc.

2) Capability of Existing Volume Reduction Technology

(1) Many Domestic technologies.

(2) Two Oversea technologies

Lawrence Berkeley National Laboratory (U.S.A)

- Magnetic separation

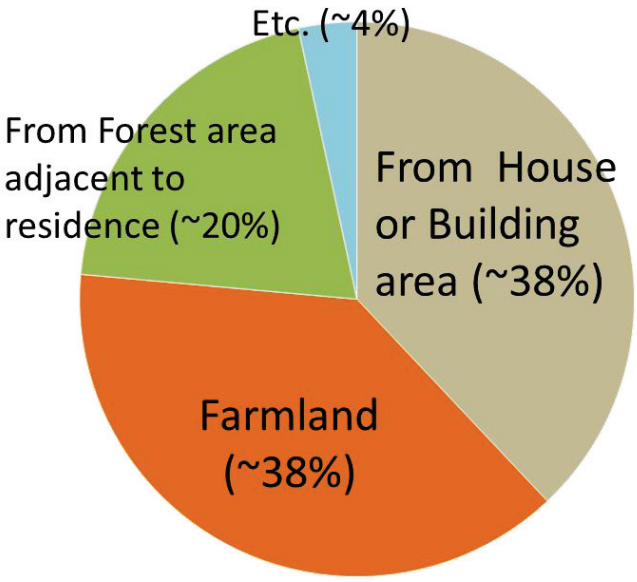
BMG Engineering AG (Switzerland)

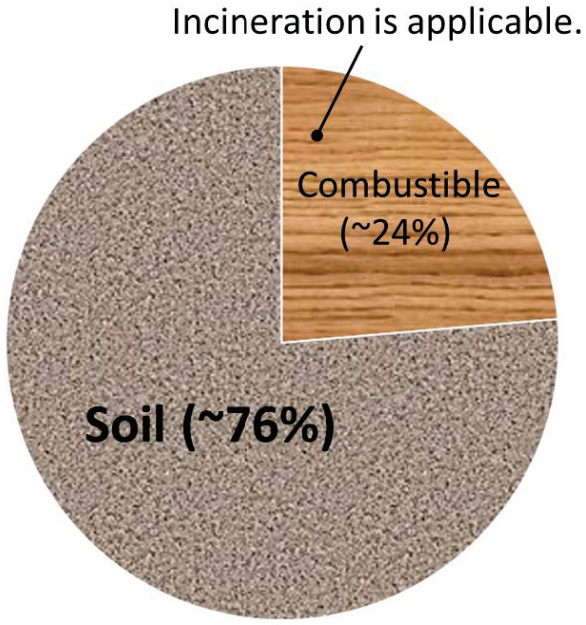
- Conventional wet separation used in European Industry

3) Practical Reuse scenario and Safety analysis

Rough Estimation of Contents of Waste from Off-site Decontamination

Total: ≧20 Mm^3





*Volume reduction of **Soil** waste is important*

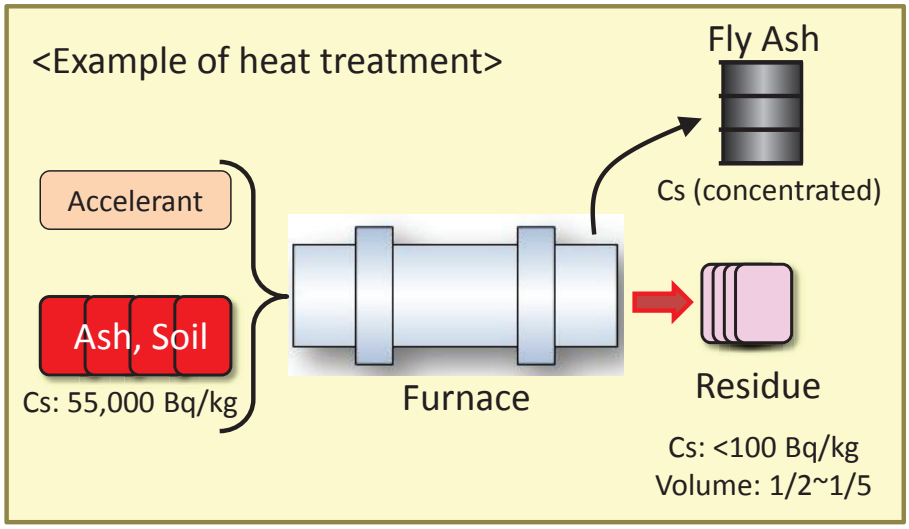
1) Size Separation (Classification)

2) Chemical Treatment (expensive)

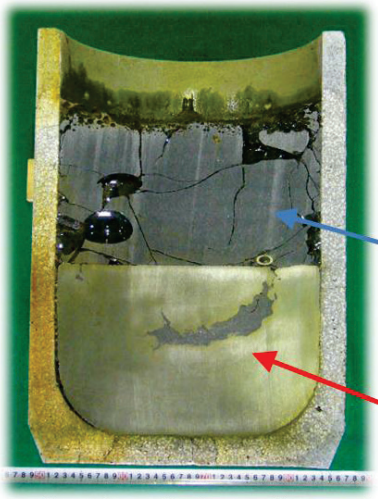
- ✓ Mainly for Organic material in soil. Oxalic acid with low heating is used to extract Cs from soil.

3) Heat Treatment (expensive)

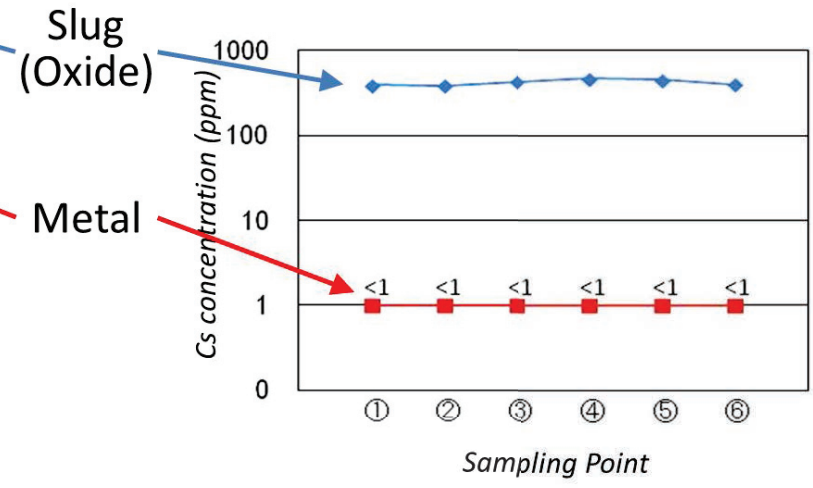
- ✓ Furnace is used at high temperature (>1,000 ℃).
- ✓ Accelerant [$Ca(OH)_2$, $CaCl_2$] is added to vaporize Cs.



(No main theme)

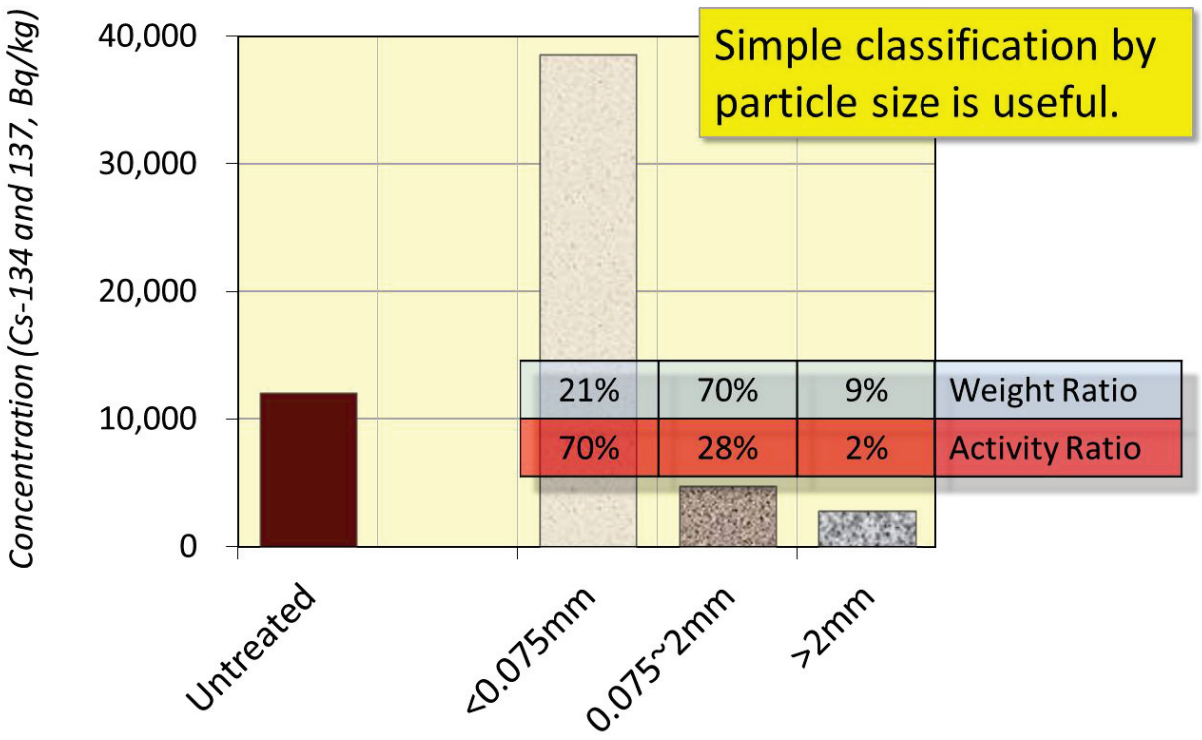


Sectional view of metal containing Cs after melting.



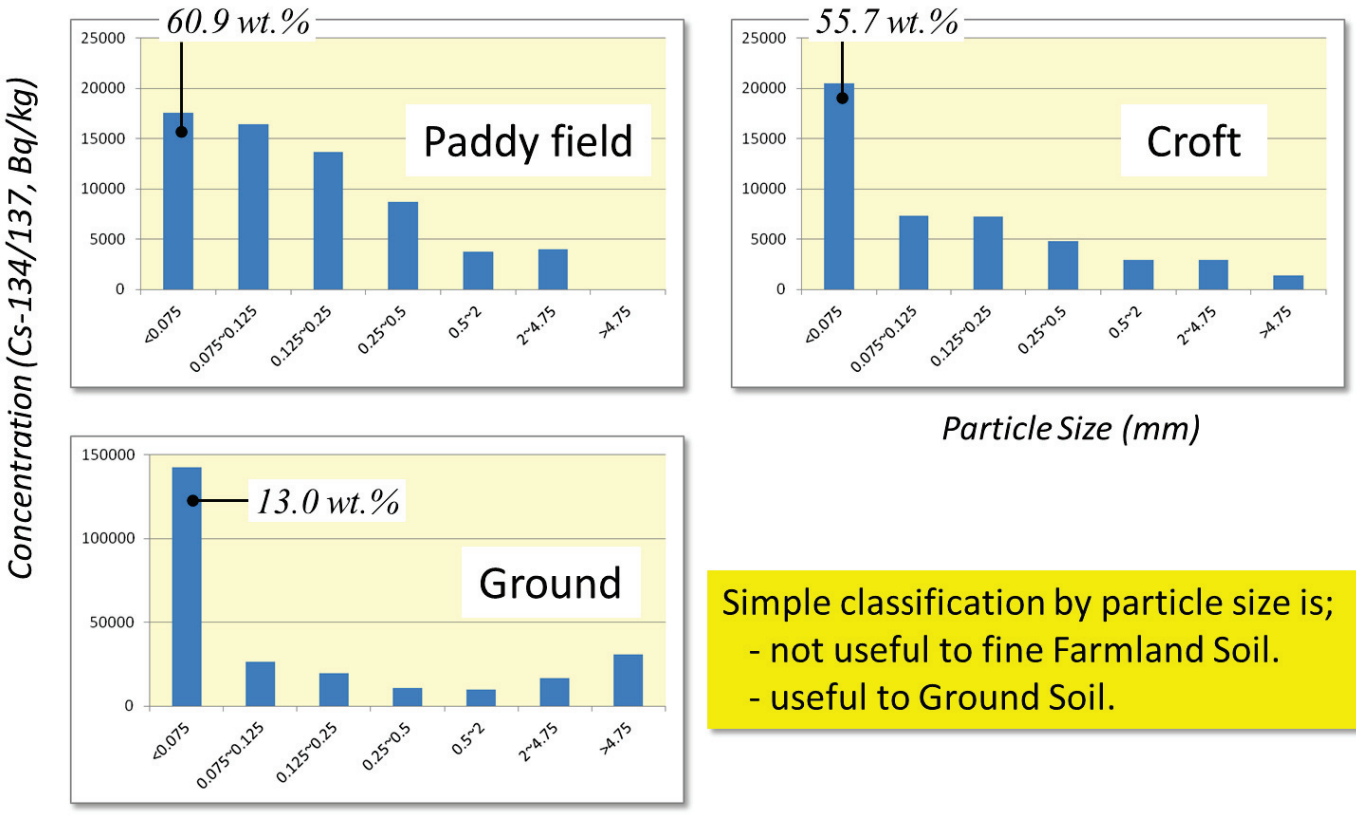
Sasaki, N., Ueta, S., et al., "Applicability of High-frequency Induction Heating to decontaminate Cs contaminated metal waste", Mitsubishi Materials Corporation Report (2013).

Cs Concentration of “School yard soil” (example)



Data from “Tanaka, M., Kawabata, J., et al. (Kajima Corporation), Effect of Decontamination of Wear and Classification of Soil Contaminated with Radioactive Materials, The 19th Symposium on Soil and Groundwater Contamination and Remediation, June 13th and 14th in 2013”.

Cs Concentration of “Farmland” (example)

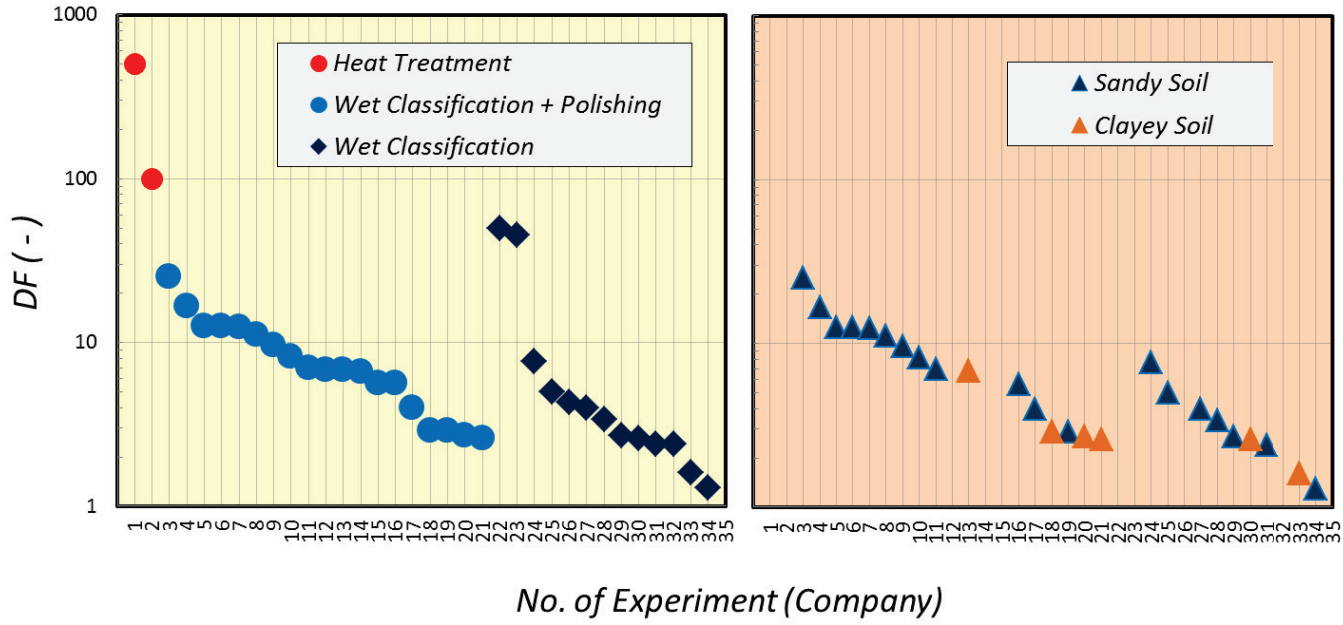


Simple classification by particle size is;
- not useful to fine Farmland Soil.
- useful to Ground Soil.

Data of Ito et al. (2012) is graphed by presenter.
Ito, K., Miyahara, H., et al. (2012) Practical Approach to Decontamination of Radioactive Cesium-Contaminated Matter in Agricultural Region by Improved Wet Classification and Use of Geomaterials, Journal of Atomic Energy Society of Japan (in Japanese), Vol.11, No.4, p.255-271.

Decontamination Factor (DF) of Demonstration Experiments

Data from Demonstration Experiments funded by MOE or Fukushima Prefecture.
Notes: Soils were different.



Conclusion at present

■ Volume reduction of Soil waste is important .

✓A simple Classification is applicable to coarse soil such as Soil removed from house or school yards .

✓A simple Classification is not applicable to fine soil such as Soil removed from Farmlands.

⇒More data of the relationship between soil particle size and Cs concentration is necessary.

■ Promotion of Reuse of decontaminated Soil is important

✓If good technically, still no good socially.

⇒From the viewpoint to help public acceptance, technical data will be organize.