Preliminary Investigation of Disposal Characteristics of DAW from NPPs

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Introduction

Since Kyeongju was selected as the low-level radioactive waste disposal site in 2005, which had been long cherished wish for nuclear industries in Korea, KHNP has been making great efforts for the timely construction of the disposal facility to meet the goal of accepting wastes in 2009.

In parallel, KHNP has been preparing for characterization of the wastes stored on site, which should be in accordance with both MOST Notice 2005-18 and the Site Specific Waste Acceptance Criteria(WAC) which is under review by the regulatory organization so that wastes from nuclear power plants could be transferred to the disposal facility from 2009. However, there are some wastes produced and stored on site prior to the establishment of the regulations concerned in Korea although mostly they were generated in accordance with shallow land disposal criteria. In this regard, characterization of the wastes is one of the most important factors for evaluation and demonstration of their suitability to the WAC.

The aim of the paper is to preliminarily investigate basic physicochmeical characteristics of wastes, especially DAW(dry active waste) stored on nuclear power plant sites for their comprehensive analysis.

Evaluation Methods

Firstly, radioactive waste treatment procedures for DAW were reviewed for their classification, water contents in the wastes, weight and radiation characteristics such as dose rate and contamination and etc. Secondly, statistical analysis on DAW was performed using REM(KHNP's data base management system for radioactive wastes) in order to evaluate its characteristics in comparison with the current draft WAC which will be hopefully approved soon by the regulatory body. Lastly, field investigation on the power plant sites and interview with personnel in charge of radioactive waste treatment were carried out for the study.

Results and discussion

Waste classification and treatment

According to the plant operation procedures DAWs were segregated depending on their physical and chemical forms before they were packaged in 200L or 320L drums. They were found to be classified as 22 groups of wastes which were also categorized as combustibles and noncombustibles. Among the former are plastics, cotton clothes, papers, low-active spent resin and charcoal whereas contaminated soil, sludge, metal scraps and gypsum are among the latter. Number. of DAW drums stored on sites by contents is described as in Fig. 1.

Combustibles were compressed in drums after water contents in wastes, especially papers, were removed using high speed extractors and driers. Noncombustibles were mostly packaged in drums without further treatment though some wastes with high void space such as metal scraps were cut into small pieces and compressed. Homogeneous wet wastes such as sludge or low-active spent resin were found to be solidified or dewatered and dried naturally under the relatively dry condition in radiation controlled area before they were packaged in drums. Also most of DAW drums were recompacted for further volume reduction by a 2000t supercompactor.

Water contents

Plant DAW treatment procedures of dewatering and compression clearly indicated that there had been little possibility of exceeding 0.5w/o of free-standing water in DAW. This judgement was quantitatively supported by KHNP's analysis[1] performed on waste drums in 2005, which showed that no free standing water was found although no. of drums for the analysis was limited for comprehensive evaluation of all the wastes. Low-active spent resin among homogeneous DAW thanks to several months of drying process is expected to have water

contents less than the limit. However, nonsolidified sludge needs to be analyzed for their water contents.

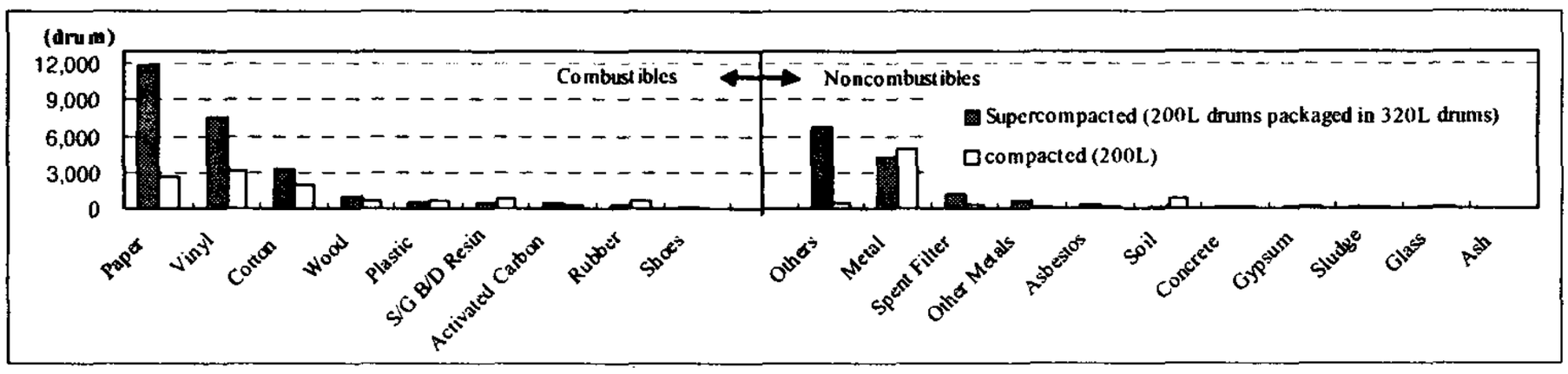

Figure 1. Classification of DAW drums stored on nuclear power plant sites as of December 2006

Radiation

Radiation level of DAW was mostly found to be quite low(fig. 2). No specific problems associated with transportation and handling would be expected. Its nuclide concentration is being measured on sites by drum nuclide assay systems with addition of difficult-to-measure elements by scaling factors whose effectiveness is under review by the regulatory body. However, preliminary evaluation showed that most of its concentration would be well within the WAC limit except few.

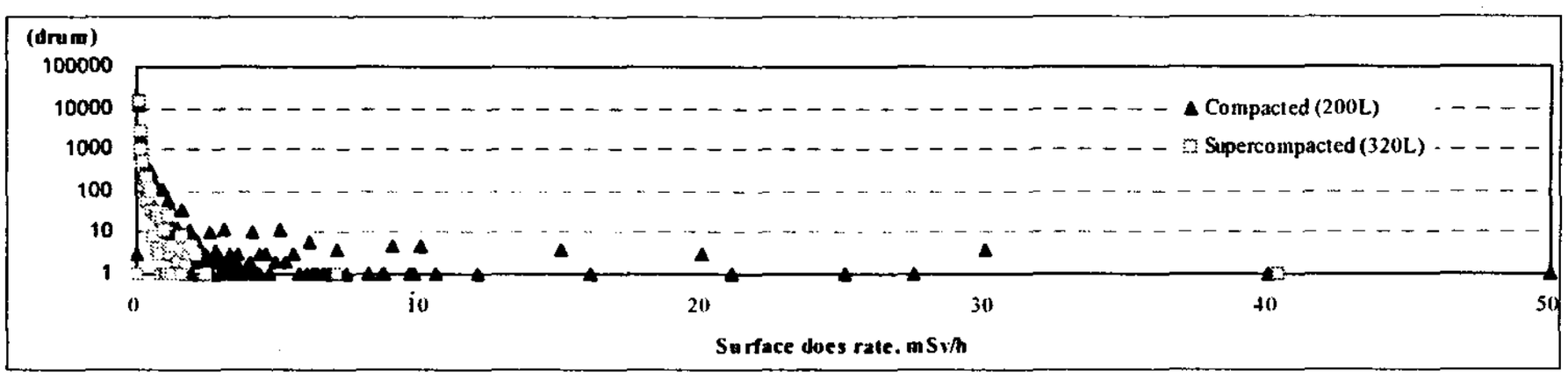

Figure 2. Average γ dose rate of DAW drums stored on sites as of December 2006

Chelating agents and hazardous chemicals

Decontamination agents used for floor and equipment such as RCP internals were investigated to contain very low concentration of EDTA of about 0.05w/o[2]and citric acid of about 2.0 w/o[3] respectively. In addition, as they were used for cleaning of the wet surface and also dewatered prior to packaging, it is reasonable that only small amount of them was absorbed by decontamination papers. KHNP's destructive analysis of drums containing papers showed that the concentration of EDTA was found to be less than 0.1 w/o with peak of 0.42w/o[1], which is well below the concentration limit specified in WAC and supportive of the evaluation above although the investigation was limited to several drums. Portable sprays used for cleaning small devices in a power plant were also investigated for their contents and amounts for a period of 10 months. There were no positive signs of specific chelating agents contained against general expectations.

Conclusion

Core characteristics of DAWs for disposal were reviewed. In terms of free standing water, concentration of chelating agents and radiation level, it is expected that they could meet the current draft waste acceptance criteria and could be transported to the disposal site without specific problems encountered except for highly active wastes and dispersive wastes, which may need further treatment. The investigation results will be used for optimum selection of waste drums for destructive analysis and thus, for giving representativeness for each waste group whose characteristics will be quantitatively compared with the WAC for final delivery to the disposal site.

References

1. "Physical/Chemical Characterization of Radioactive Waste Forms of NPPs," KHNP, Sep. 2005
2. "Telephone Call with Continental Trade Company" 2007
3. "Chemical Decontamination Procedure for RCP internals," KPS, 2003