

# CTAC CBFO Technical Assistance Contractor

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**RWMC-TWCP-4020**

Idaho National Engineering and Environmental Laboratory

May 30, 2001

CCN 22123

Mr. L. S. Sygitowicz  
Manager of Projects  
Waste Management  
P.O. Box 2528, MS 2510  
Idaho Falls, Idaho 83415-2510

**SOLIDIFIED WASTE RESIDUAL LIQUID DE-WATERING INVESTIGATION AT THE IDAHO  
NATIONAL ENGINEERING AND ENVIRONMENTAL LABORATORY**

Dear Mr. Sygitowicz:

Attached is the conclusion of the solidified waste residual liquid de-watering investigation at the Idaho National Engineering and Environment Laboratory (INEEL).

Any questions or concerns please contact Dr. Rod E. Arbon of my staff at (208) 526-1867.

Sincerely,

T. H. Monk, Project Manager  
3,100m<sup>3</sup> Project

REA:sh

Enclosure

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**Mr. L. S. Sygitowicz**  
**May 23, 2001**  
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**Uniform File Code: 6152/7403**  
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Enclosure  
May 23, 2001  
CCN 22123

**Solidified Waste Residual Liquid De-watering Investigation at the Idaho National Engineering and Environmental Laboratory**

**Introduction:**

This assessment addresses the potential de-watering of solidified waste at the Idaho National Engineering and Environmental Laboratory (INEEL). In January 2001, a drum containing Item Description Code (IDC) 001 sludge was shipped from the INEEL Radioactive Waste Management Complex to Argonne National Laboratory West (ANL-W) where it underwent visual examination. Based upon the Real-Time Radiography (RTR) examination, which occurred December 12, 2000, the drum did not contain residual liquids greater than Waste Acceptance Criteria (WAC) limits. Upon opening, the drum was estimated to contain 15-20 liters (L) of liquid on top of the sludge. Given this there was a concern that the drum de-watered en route to ANL-W exceeding the 1% WAC drum limit for residual liquid. Because it was near the end of the shift, the lid was replaced for the night. The following morning ANL-W operators estimated that approximately 500 mL of liquid remained. That is, 500 mL remained on the surface of the sludge where earlier there was an estimated 15-20 L. Loss of the liquid was ruled out. The drum was weighed upon entering and exiting ANL-W. The weights were identical. In accordance with ANL-W procedure HFEF-6890, Rev. 4c, vermiculite was added to absorb the remaining liquid (additional details can be found in a fact sheet dated May 9, 2001 concerning this incident).

To better quantify this observation the following additional actions were taken: acceptable knowledge documents were reviewed and the phenomenon of de-watering of the sludge investigated. In addition the impact to the INEEL miscertification rate was evaluated.

**Acceptable Knowledge Review:**

Excess residual liquid was first identified as a concern in the mid-1980s primarily for IDCs 001,002, and 800 sludge's. Rocky Flats Plant (RFP) drums containing sludge waste, in storage at the INEEL, were identified as containing free liquids during RTR examinations at the INEEL. Additionally, containers that had passed RTR examination at the INEEL (i.e. meet WAC limits for residual liquids) were subsequently discovered to have liquids ranging from 130 mL to 2.7 L upon visual examination at the RFP (TRU Waste Sample Program Volume 1 - Waste Characterization EGG-WM-6503). Currently, it is unknown whether the drums de-watered during transport or were miscertified at RTR. The acceptable knowledge record yields no information as to the extent of de-watering in any one drum or to the potential number of drums impacted. Sludge drums have been sent to ANL-W for coring and subsequent RCRA analysis. It has been observed that after coring the liquid will occasionally seep into the core hole. However

when ANL-W places the remaining core back, residual liquids have not been observed on the surface.

IDCs 001,002, 800 sludges were all generated from treatment operations in Building 774. IDCs 007, 803 and 807 were generated from treatment operations in Building 374. The sludges were immobilized using different processes over time and the differences were reflected in the issuance of different IDCs. 800 series IDCs utilized treatment processes which would be expected to form more stable matrixes than the 001, 002, 007 IDCs.

According to acceptable knowledge, Building 374 sludge specifically the IDC 007 drums are most likely to have excess residual liquids, but first and second stage sludges (IDC 001 and IDC 002) may also contain excess residual liquids. RTR examinations confirm these expectations. Earlier pack dates (IDC 001, 002, and 007) to date have experienced a rejection rate of approximately 20% while later pack dates (IDC 800, 803 and 807) have experienced to date a reject rate of 3%.

#### **VE Potential De-watering Incident:**

The original RTR examination did identify an outer ring of free liquid estimated at 2.00 pints. The RTR tape underwent additional review. The configuration of waste matrix and location of the water made estimating the volume difficult. Multiple reviewers viewed the tape. The liquid volume in the drums is estimated to be 4-9 L prior to transport to ANL-W.

In addition, the visual examination tape from ANL-W underwent additional scrutiny. The original volume estimate of 15-20 L at ANL-W was overestimated by as much as 50%. The depth of the liquid on top of the sludge was measured with a screwdriver at three locations near the center of the ridged liner. The depth of the liquid was assumed to be uniform across the entire surface of the waste. This was not the case. Once the liquid was reabsorbed into the matrix it was determined that the surface was dish shaped. Thus, the original volume estimate of the liquid on the surface of the sludge was overestimated and the actual volume of liquid upon initial drum opening was actually between 7.5-10 L. These two residual liquid values reported in the re-examination of RTR of 4-9 L and the volume estimate of 7.5-10 L of liquid during initial inspection of VE overlap. As a result, it cannot be determined that de-watering occurred as a result of transportation.

The drum liner was replaced over the sludge and the drum was closed for the night while the pH meter and absorbent material were gathered and packaged for use in the glovebox. The volume of liquid remaining on the surface of the sludge the following morning was estimated to be only 500 ml. The loss of the liquid overnight was most likely the result of disturbing the surface of the sludge with the screwdriver during the determination of the liquid depth.

**Additional De-watering Investigation:**

In an effort to determine if de-watering occurs as a result of transportation, 30 containers were randomly selected from the certified homogeneous solids summary category group. The drums selected included both First/Second Stage Sludge and Building 374 Sludge. These 30 containers had undergone RTR. The drums were loaded onto a truck and driven around to simulate the transportation of containers to ANL-W. RTR was again performed and 2 of the 30 containers were identified as containing excess liquids. Upon closer review of the original RTR examination, the two-drums initially contained residual liquids. There was no change as a result of transporting drums.

**Miscertification Rate for Homogeneous Solids:**

RTR is a nondestructive process used to confirm the description of the physical waste items and the absence of prohibited waste forms including free liquids. The INEEL sampling program is maintained to provide QC verification of RTR activities. Drums are selected at random, the number dependent on the miscertification rate, and opened to visually verify the nature and quantity of the contents. Visual observations are then compared to the acceptance criteria for WIPP certification and TRUPACT-II transportation. The sampling frequency and number of drums sampled are determined by an annual statistical evaluation and documented in Engineering Design File (EDF) RWMC-363, SWEPP Certified Sampling Program. The WAP requirement to be achieved is that the true miscertification rate for the population is less than 14% percent with 90% confidence. Calculating the upper 90% confidence limit on the true miscertification rate and comparing this limit to 14% confirm this. The upper 90% confidence limit is calculated based on a random sample from the population of interest. Excess residual liquid is one of the prohibited items listed in the WIPP Waste Analysis Plan (WAP) and if not appropriately identified is one of the possible causes for miscertification of a container. Free liquids have been the cause of miscertifications.

To quantify the extent of the miscertification rate due to free liquids the historical miscertification rates were investigated. Under Revision 5 of the WIPP WAC Revision, 267 containers from the homogeneous solids summary category group were visually examined after RTR had been performed. Of these 267 containers, two were miscertified (EDF-RWMC-363 Revision 14) due to the failure to detect or quantify excess free liquids.

Using Waste Analysis Plan (WAP) criteria, from August 4, 2000 to February 4, 2001, 21 containers of homogeneous solids were randomly selected and subjected to visual examination. Of these 21 containers, 1 was miscertified. The miscertification was due to the failure to detect excess free liquids.

If we use all of the data collected to date, there have been 318 homogeneous solids containers visually examined. Five of these were miscertified due to excess free liquids. This is a miscertification rate of 1.9%. An upper 90% confidence limit on the true miscertification rate of the homogeneous solids summary category group is 2.9%, well below the 14% threshold.

**Conclusion:**

At the INEEL, identification of residual liquid in waste containers is accomplished by the combination of acceptable knowledge, real-time radiography, and visual examination. Non-compliant containers are segregated and dispositioned for future treatment. The INEEL container certification process is WAP compliant in the identification and segregation of homogeneous solid waste drums containing excess residual liquids prior to dispositioning. The miscertification rate indicates compliance with the WAP requirements.

Based on the data set available. De-watering has not been established to occur, as a result of transporting drums. There is no doubt that some sludge drums do contain excess residual liquids. AK and the characterization processes confirm this. When residual liquid is formed is unknown. It is not expected that free liquids would generate during transport to the WIPP facility.

  
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Rod E. Arbon Site Project Office

5-23-01  
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