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Mobile Arm Retrieval System Test Simulant Recipes

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Abstract: The purpose of this document is to provide Columbia Energy with test simulant recipes to be used in the testing of the Mobile Arm Retrieval System

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Mobile Arm Retrieval System Test Simulant Recipes

Introduction

The following three simulant recipes were selected for testing of the Mobile Arm Retrieval System (MARS). A brief basis is provided for each. These recipes may be adjusted, primarily in potential changes to the mix concentrations, e.g., 42% water vs. 40%.

Recipe One

This simulant represents the bulk of the waste in the tank. It is soft and easy to move around with sluicers or mechanical means.

Bulk unsluiced sludge by weight %

- Water 40%
- Kaolin clay 40%
- Sand 10%
- Plaster of Paris 10%

This simulant is based upon previous testing activities and is believed to represent a realistic sludge mix with shear strength of ~ 750 Pa. All ingredients are environmentally acceptable.

Video is available that shows the behavior of this simulant.

Recipe Two

This simulant represents the sand like material that is observed on the bottom of the tanks as bulk retrieval is nearing completion. It can be pushed around by a jet but settles very rapidly and is difficult to get into the pump suction.

Bulk sluiced sludge by weight %

- Sand 70%
- Hematite 30%
- Water saturated

This simulant is based in part upon particle type (metals and heavy metals) sent to the tanks from the processing facilities, and on observation of waste behavior during retrievals to date.

Materials are environmentally acceptable.

Recipe Three

This simulant is intended to represent the cobble observed in piles in the tank and the hard heel. It does not breakup under sluicing or driving the Foldtrack over it. However, it does slowly abrade to a sand like consistency as it is pushed back and forth across the tank.

Hard heel by weight %: (A sand-based cured grout with a compressive strength of approximately 50 psi.)

- 1-2% chipped gravel
- 5.9 % flyash
- 0.9% cement
- 13.7% water
- 78% cement sand.

Sand particle size no greater than 1/8" should be used. The mixture shall be cured for greater than 1 week. Once the grout is cured it can be broken up into chunks about 12 inches across or can be left as a monolithic pour. The grout should be poured in a slab 2-5 inches thick.

A less strong simulant (20 psi vs. 50 psi) was developed for past testing activities. This one is believed to be a realistic representation of the 'cobble' we have experienced in actual retrieval operations.

Materials are environmentally acceptable

References

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3) PNNL-11685, Rev. 0, "Retrieval Process Development and Enhancements Waste Simulant Compositions and Defensibility," dated September 1997. Authors: M.R. Powell, G.R. Golcar & J.G.H. Geeting (Pacific Northwest National Laboratory- PNNL).