Saltstone Processing of Low-Level Waste at Savannah River Site

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INTRODUCTION

The process and safe storage of low-level radioactive waste at Savannah River site is of concern. The Saltstone formulation (a cementitious mixture) must produce a waste form that meets both placement and performance properties, Saltstone is a breakthrough process that not only encloses the tanks, but absorbs some of the damaging chemicals to be transported offline.

METHODOLOGY

Some of the experiments that will yield results to as the perfect premix ratio for the Saltstone that will be poured into the vials include:

- **Leach Testing** - Percolating sample for pH, conductivity and release of contaminants
- **Concrete Compression Testing** - Strength of sample
- **Blaine Fineness Testing** - Measures Air Permeability of dry cementitious materials
- **Hydraulic Conductivity Testing** - Measure the capability of a medium to transmit water
- **Moisture Content Analysis** - Performance for bulk Drying

**NATURE OF THE APPARATUS** - The Saltstone is a permeability apparatus that consists of the following parts:

- Permeability Cell
- Perforated Disk
- Flat Paper
- Manometer
- Measurement Based Timer

**Two major reasons why this apparatus was chosen to determine the porosity are:**
- Sample testing of NIST Standard Portland cement and the Holcim Portland cement are expensive (app. $20)
- Usually takes several work days to get results.

**RESULTS FROM COMPRESSION TESTING**

These results clearly indicate that the layering process of the pore washes the concrete sample. But the million dollar question is how much it will weaken the sample. With further examination of the results that were yielded, the sample cylinder performed the best with an average stress level of 223.0 lb/in² meanwhile all of the other samples gave similar results that improved around 197.0 lb/in² until failure.

**LABORATORY TESTING via AMEC Environment & Infrastructure Co.**

- **ASTM C 39/C 311 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens Using a Flexural Beam Permeameter**
- **AMEC: Environment & Infrastructure Co.** has provided us with a full report regarding the hydraulic conductivity of the samples that we have been testing in our laboratories.
- **Upon inspection of their reports I have the following information:**

**LEACH TESTING**

- The Sample is processed via ASTM C 204 - Standard Test Method for Accelerated Leach Test for Diffusive Releases from Solidified Waste to determine what kind of affect the Saltstone mixture will have after it has stabilized the cement located in the waste tanks. The samples will be determined using a chromatic sample in the laboratories to stimulate the effects that can be done to the environment around the Savannah River Site. This test method can be used to:
  - Compare releases of waste components from various types of solidification agents and formulations.
  - Determine diffusion coefficients for the release of waste components from waste forms at any specific times.
  - Determine the dependence of time for diffusive release.

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**REFERENCES**

- **AMEC** - www.amec.com
- **ASTM** - www.astm.org
- **Savannah River Remediation** - http://www.srremediation.com/saltstone.html
- **Thermoscientific** - http://www.thermoscientific.com/ecomm/productsdetail?productId=11958175&groupType=D152
- **Leach** - www.thermoscientific.com/ecomm/productsdetail?productId=11958175&groupType=D152
- **Savannah River** - www.srremediation.com/saltstone.html
- **International** - www.thermoscientific.com/ecomm/productsdetail?productId=11958175&groupType=D152
- **Miami** - www.thermoscientific.com/ecomm/productsdetail?productId=11958175&groupType=D152
- **Florida International University** - www.thermoscientific.com/ecomm/productsdetail?productId=11958175&groupType=D152
- **Aiken** - www.thermoscientific.com/ecomm/productsdetail?productId=11958175&groupType=D152
- **Savannah River National Laboratory** - www.thermoscientific.com/ecomm/productsdetail?productId=11958175&groupType=D152
- **Aiken** - www.thermoscientific.com/ecomm/productsdetail?productId=11958175&groupType=D152
- **Miami** - www.thermoscientific.com/ecomm/productsdetail?productId=11958175&groupType=D152