

Project Report

Paint filter tests for Outpak slurry solution

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1 Summary

In this project, the PI's group performed a series of paint filter tests for Outpak slurry solutions. In this test, a series of test samples were made by mixture of fresh paint and various amount of liquid water. After each sample was prepared, it was placed in a paint filter [1]. If any portion of the material passes through and drops from the filter within the 5-min test period, the material is deemed to contain free liquids. The amount of water dropped in the graduated cylinder will be read and recorded.

Leftover paint in building decoration/construction needs to be washed off by water. However, the mixture solution of paint and wash off water contains lead and other heavy metals, which may induce significant environmental concern. Appropriate disposal/treatment method is required to control and solidify the liquid mixture. The Outpak's slurry powder provides a good approach to quickly solidify the waste liquid mixture before it is buried in a landfill site. After a certain percentage of slurry powder is mixed with the mixture solution, a gel-like product (solid state) is immediately formed and holds the paint waste tightly within. The microstructural mechanism is that the gel forms a solid that can lock the paint inside. The Outpak holds two working assumptions that (1) the slurry powder blended with water can quickly solidify and form a gel; (2) the formed solid gel can last for longer term landfill uses without rehydrate. The aim of this paint filter test is to confirm the two assumptions made by Outpak. The results showed that the slurry powder converts the mixture solution quickly to gel and no liquid water has been seen leached out of painter filter. Furthermore, the results showed that the formed gel is a stable solid and does not rehydrate at outdoor environment for long term landfill.

The paint filter test is the US EPA approved test method (EPA 9095B) [2] to determine the presence of free liquids in a representative sample of waste. The testing procedures in this project were exactly according to the EPA 9095B method. The EPA 9095B testing method is referenced in the regulations pertaining to hazardous waste landfills. This method is used to determine the presence of free liquids in a representative sample of waste paint [3]. A predetermined amount of material is placed in a paint filter. If any portion of the material passes through and drops from the filter within the 5-min test period, the material is deemed to contain free liquids [4].

2 Disclaimer

The project that is the subject of this report was done under contract for the Outpak. The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Boise State University. This report does not constitute a certification, standard, specification, or regulation. It is intended as a service for the paint slurry materials selection, optimization, and design process.

This project was conducted at Dr. Yang Lu's research laboratory at Boise State University. Dr. Lu's laboratory served as a third party testing facility that measured the slurry material liquid filtering property of Outpak. Boise State University assumes no responsibility whatsoever for its use by other parties, and makes no guarantees, expressed or implied, about its quality, reliability, or any other characteristic. Boise State University makes no warranty, expressed or implied, to users of Outpak slurry materials and accepts no responsibility for its use.

3 Testing Methodology and Results

Follow up with the U.S. EPA approved test method (EPA 9095B), a series of mixture solutions (samples) are placed in a paint filter. If any portion of the sample passes through and drops from the filter in a five minute period, then the material is considered to contain free liquids. The amount of liquid dropped in the graduated cylinder will be recorded. The testing equipment includes a paint filter, a funnel, a graduated cylinder, and a ring stand. The paint filter is a standard conical paint filter (fine meshed size) available at local paint stores. The presence of free liquids indicated by the paint filter test may affect the decision maker whether the hazardous waste can go to landfill for disposal. In order to confirm assumption (1) and (2), the PI's group performed Experiments 1 and 2, respectively.

3.1 Experiment 1

Mixing procedure: Mix the slurry powder with the liquid and wait for 5 minutes before transferring into the test setup. The amount of slurry powder was calculated for a 100 mL sample by taking the ratio of one slurry powder packet for every 2 gallons to what was needed for a 100 mL sample.

Testing procedure: Place paint slurry into filter and measure the amount of water leached into the graduated cylinder after 5 minutes. Experimental tests are random phenomena. In order to remove randomness of individual test, the research group repeated the procedure 5 times for each water/paint concentration and record the average reading in Table 1. Note that the details of each test with each sample percentage is documented in the Appendix.

Table 1. Overview of Results

Test #	Amount of paint (vol%)	Residue vol (ml)
1	0	0
2	20	0
3	40	0
4	60	<i>Not Tested</i>
5	80	<i>Not Tested</i>
6	100	<i>Not Tested</i>



Figure 1. The test setup area in laboratory. The paint is grey, while the slurry powder is clear.

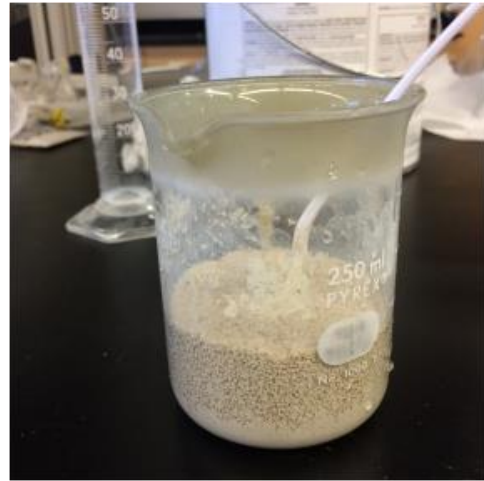


Figure 2. The paint slurry after the slurry powder was mixed in; Setting the sample for 5 minutes

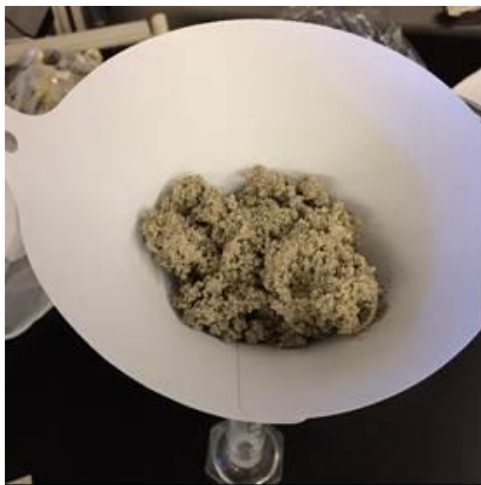


Figure 3. The paint slurry when dumped into the filter



Figure 4. The filtration apparatus to measure leaching

Figure 1 and Figure 2 show the test setup area in PI's research laboratory. The paint slurry sample was mixed in a flask before it was transferred in the filter. Figure 3 shows the paint slurry when dumped into the filter. Figure 4 shows the filtration apparatus to measure leaching.

3.2 Results of Experiment 1

Follow up with the experiment schedule we worked in the laboratory performing the paint slurry test step by step. There was no observed free liquid (0ml of leachate) leached from the filter when the Outpak slurry powder product was mixed into a paint solution in various percentages. This indicates that this product effectively prevents leaching of detrimental paint when used properly.

It is noteworthy that we only had a very small amount of paint to work with so we ran out of paint about halfway our experiments. However, from the results available we can expect that as long as enough slurry powder is provided (according to the product's user instruction), the slurry powder can quickly form gel-like solid and lock the paint in a solid state.

3.3 *Experiment 2*

Testing procedure: The same mixing procedure that was used in **Experiment 1** was followed for this experiment. This time, a 20 mL sample of paint, and 80 mL sample of water were mixed together with 2.29 g of slurry powder. The sample was left to sit for 5 minutes upon mixing, and was then placed into the filtration apparatus. In order to simulate the actual landfill disposal situation, this sample was left outdoor environment for 3 days and the results were observed. Figure 5 shows the apparatus in a clean and dry outdoor location. Figure 6 shows the dried paint slurry after sitting outside for 3 days. There was no rehydrating observed with the formed gel.



Figure 5. The apparatus in a clean and dry outside location



Figure 6. The dried paint slurry after sitting outside for 3 days

3.4 *Results of Experiment 2*

No leaching occurred when the paint slurry was left to sit outside for three days. Over the course of three days, the slurry did not rehydrate, but rather completely dried out. This indicates that this product is a safe alternative to disposing of detrimental liquids because it dries up quickly and cleanly, and makes for easier disposal. This indicates that the product will not leach even after left to sit outside.

4 **Conclusion**

The paint filter test results showed that the slurry powder converts the mixture solution quickly to gel-like solid and no liquid water has been seen leached out of painter filter. Furthermore, the results indicated that the formed gel is a stable solid and does not rehydrate at outdoor environment for long term landfill. From the results available we can expect that as long as enough slurry powder is provided (according to the product's user instruction), the slurry powder

can quickly form gel-like solid and lock the paint in a solid state without rehydrating in landfill disposal environment.

Appendix

In depth look at data:

Test 1:

Vol% paint : 0%; Vol% water: 100%; Paint vol (ml): 0 mL

Slurry powder weight (g): 2.29 g slurry powder

Trial #	Residue vol (ml)
1	0.0
2	0.0
3	0.0
4	0.0
5	0.0

Average residue vol (ml): 0

Test 2:

Vol% paint : 20%; Vol% water: 80%; Paint vol (ml): 20 mL

Slurry powder weight (g): 2.28 g

Trial #	Residue vol (ml)
1	0.0
2	0.0
3	0.0
4	0.0
5	0.0

Average residue vol (ml): 0

Test 3:

Vol% paint: 40%; Vol% water: 60%; Paint vol (ml): 40 mL

Slurry powder weight (g): 2.29 g

Trial #	Residue vol (ml)
1	0.0
2	0.0
3	0.0
4	0.0
5	0.0

Average residue vol (ml): 0

Test 4:

It was determined that this test did not need to be run due to the fact that leaching did not occur with any of the previous samples. This product is meant for use in a mixture that is more water concentrated than paint, so it was deemed unnecessary to perform any further tests in this manner.

Vol% paint: 60%; Vol% water: 40%; Paint vol (ml): 60 ml

Slurry powder weight (g): N/A

Trial #	Residue vol (ml)
1	<i>Not Tested</i>
2	<i>Not Tested</i>
3	<i>Not Tested</i>
4	<i>Not Tested</i>
5	<i>Not Tested</i>

Average residue vol (ml): N/A

Test 5:

It was determined that this test did not need to be run due to the fact that leaching did not occur with any of the previous samples. This product is meant for use in a mixture that is more water concentrated than paint, so it was deemed unnecessary to perform any further tests in this manner.

Vol% paint: 80%; Vol% water: 20%; Paint vol (ml): 80 ml

Slurry powder weight (g): N/A

Trial #	Residue vol (ml)
1	<i>Not Tested</i>
2	<i>Not Tested</i>
3	<i>Not Tested</i>
4	<i>Not Tested</i>
5	<i>Not Tested</i>

Average residue vol (ml): N/A

Test 6:

It was determined that this test did not need to be run due to the fact that leaching did not occur with any of the previous samples. This product is meant for use in a mixture that is

more water concentrated than paint, so it was deemed unnecessary to perform any further tests in this manner.

Vol% paint: 100%; Vol% water: 0%; Paint vol (ml): 100 ml

Slurry powder weight (g): *N/A*

Trial #	Residue vol (ml)
1	<i>Not Tested</i>
2	<i>Not Tested</i>
3	<i>Not Tested</i>
4	<i>Not Tested</i>
5	<i>Not Tested</i>

Average residue vol (ml): *N/A*

Reference

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