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Fence post backfill mix kits
Project 100738

3/15/2016

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PURPOSE: To determine physical and chemical properties of backfill/fence post setting foam from Product A and Product B and Product C.

TESTED FOR
BMK

Testing Personnel
Mike Castner

Testing Reviewer
Dave Modray

EXPERIMENTAL/OBSERVATIONS:

Product A (100 lbs of concrete replacement)

Contents/Instructions as written on packaging:

Product A came with the chemical packaging in a plastic bag. The chemical packaging appears to be comprised of a food grade material, metallic silver lining on the inside. There is an adhesive seal running through the middle of the packaging that separates the two compartments.

Product Features (claimed by packaging):
-sets in 3 minutes
-replaces two 50 lb. bags of concrete mix
-no tools required
-for all types of posts
-contents of the bag expands to produce enough material to install a 4'x4' post in a 3' deep by 8" diameter hole.

Instructions (as written on the packaging):
How to use: Site Preparation: Dig the hole. Make sure that the post is adequately positioned inside the hole. The post should be leveled and braced (or held manually) before mixing. If there is standing water in the hole, backfill partially with oil or gravel until water is no longer visible or pump the water out.

In-bag mixing: The arrows indicate the rolling direction. Roll the pouch toward the central burst seal until it ruptures and allow materials to combine. Mix thoroughly by rubbing the bag along any 90-degree surface (no sharp edges) for 20 seconds by forcing material to travel in the bag, from one end to the other.

Application:
Immediately after mixing, cut one of the bag's corners and pour mixed material evenly into the hole before expansion starts. (Note: material color is green.) Adjust the post if necessary for up to 10 seconds. Do not move the post until material has firmed up. Hardening will be achieved in approximately 3 minutes; thereafter, the post may be left unsupported. Allow approximately 2 hours for the product to set completely before installing the fence, gate or any accessory on the post.

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Do not exceed mixing time (20 sec) as bag may rupture.

Limitations:
Hole must be free of standing water. Do not exceed the mixing time as the bag may rupture. Never allow the material to start expanding inside the bag. Protect from freezing, not for use on structural posts.

Clean up:
Remove excess material immediately using either a solvent-based cleaner or clean cloth to remove splatters of uncured material from the post's surface. Hardened material can only be removed with a hand tool.

Safety Warnings:
Part A (this is assumed to the polyol blend): Combustible liquid. This product contains a chemical known in the State of California to cause cancer. HMIS: 1,2,0,X. VOC: 1.3g/l (A+B Combined). Keep away from heat/sparks/open flames/ hot surfaces. – No smoking. In case of fire: Use extinguishing measures that are appropriate to local circumstances and the surrounding environment for extinction.

Part B (this is assumed to be the iso): Contains: methylenediphenyl diisocyanate (CAS: 26447-40-5), diphenylmethanediisocyanate, isomers and homologues (CAS: 9016-87-9), Causes skin irriation. May cause an allergic reaction. Causes serious eye irritation. Harmful if inhaled. May cause allergy or asthma symptoms. HMIS: *3,1,0,X. VOC: 1.3 g/l (A+B combined).

Mixing/Pouring:

Before pouring the sample, a weight was taken to determine the weight of the packaging with the chemicals prior to application.

Weight Before: 1151.56g

When applying the system, the directions were followed on the label. Also, there is a video attached to this project that shows the mixing and pouring procedure. For the purposes of the project, 5-gallon pail liners were used as a make-shift 'hole' for demonstration purposes.

The seal did not require extensive pressure to burst. Furthermore, it would appear the seal could possibly not separate the chemicals and could result in seepage in the right circumstances.

The mixing was performed on the edge of a counter for exactly 20 seconds. This resulted in a mix that was less than ideal due to green chemical streaks present in the system when being poured. Also, this was the first mix performed on any of the fence post mixes so user inexperience could have also attributed to this poor mix.

After 20 seconds, scissors were used to cut the packaging and then the contents of the bag were poured into pail liner. While pouring there was no distinct odor coming from the system. The bag was warm, however not scorching hot. The chemicals, when mixed, make a green liquid. The dye is even darker in some areas which indicate poor mixing.

The weight of the packaging, along with whatever residual chemical is still left was weighed for comparison against the initial weight.

Weight After: 113.46g
Weight Change: 1038.1g

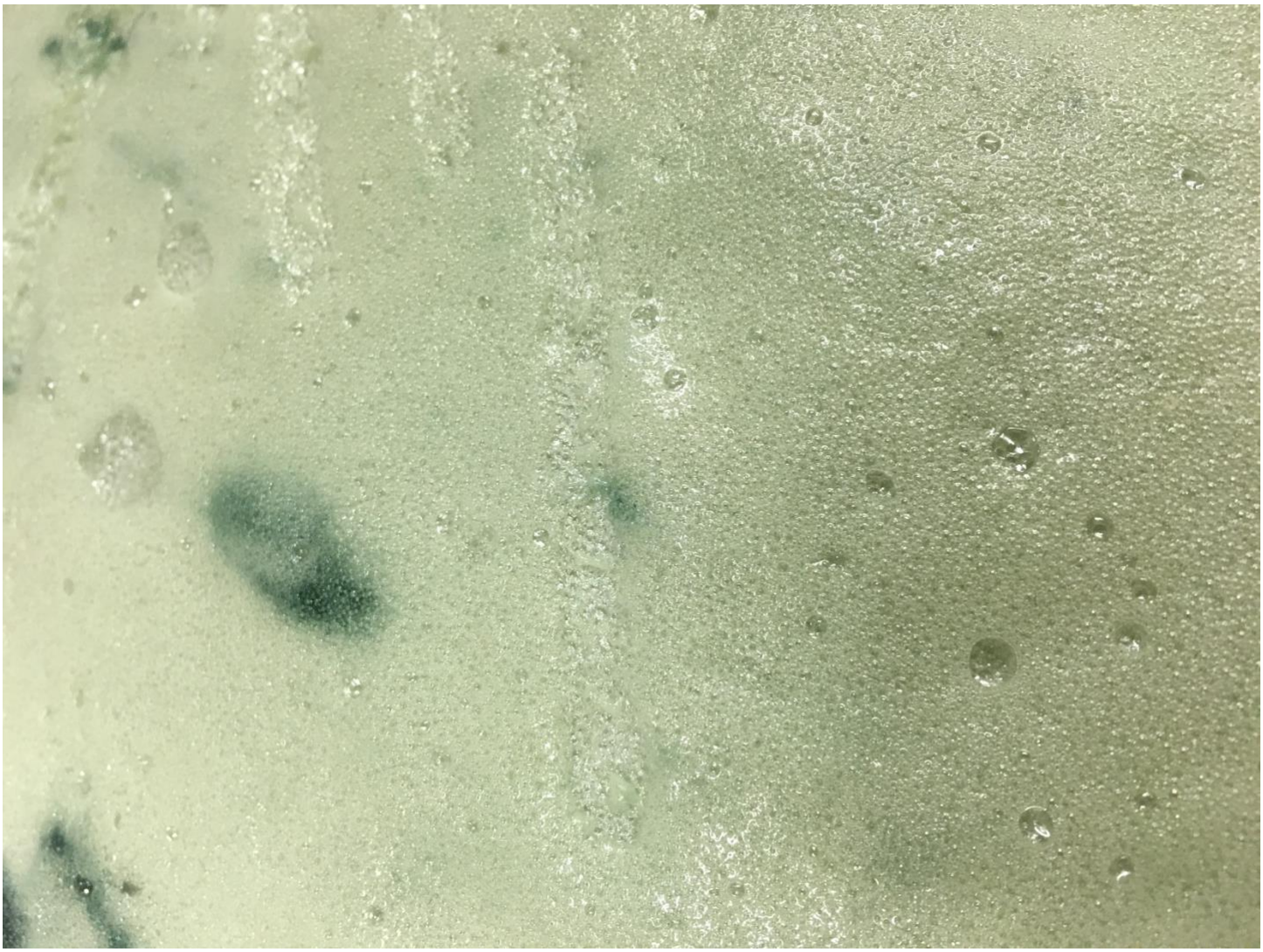
Reactivity Observations:

Exact reactivity times were not recorded in the initial demonstration of the product. However, while the foam was rising it had an almost sudsy consistency even to the point when the foam came over the top of the pail liner.

The gel time is estimated at around 5 minutes 45 seconds. The system was fully Tack Free at 7 minutes and 20 seconds.

The foam stayed ‘squishy’ for over an hour, at around 3 hours it got to the point where it was hard to create any indentation on the surface of the foam.

Cell Structure Observations:
The cell structure seems larger than any type of system at BMK used in similar application. The skin surface appears to have cured well without any indication of structural integrity loss.



Note: Photo above is a close up of the top surface of the fully cured foam skin.

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Note: The picture above shows a sample cut from the middle of the foam. The cells are large, and the foam has a ‘plastic’ feel.

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Viscosity/Ratio Testing

For viscosity, another Pdocut A select package was opened and each part was poured into a jar and weighed. In order to make sure most of the chemical was out of the packaging a popsicle stick was used to squeeze the remaining chemical into the jar. All samples were 25ºC. The iso seemed very thin.

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Product B (50 lbs of concrete replacement)

Bag contents:
-pair of gloves
-instructions
-chemical packaging

Claims (as claimed on packaging):
-replaces 50lbs (23 kg) of concrete
-Sets posts in 5 minutes
-No water required
-Mixes in just 30 seconds
-Expands to fill the post hole
-Ideal for all types of posts
-Can be used during winter

Instructions (provided in bag with chemicals):
Removed images for anonymity.

Safety Warnings (on chemical packaging):
May irritate the skin and eyes. Harmful if swallowed. Part B (assumed in this to be the iso) may cause strong respiratory allergic reactions in individuals sensitive to isocyanates. Do not get in eyes, on skin or on clothing. Do not swallow or breathe fumes. Contains MDI (an isocyanate) and polymeric isocyanates.

Caution: If instructions are carefully followed, Product B packaging prevents user against contact with Part A and Part B chemicals. Mixed material poured inside the hole contains no hazardous ingredients.

Mixing/Pouring:
The weight of the packaging was taken before pouring.
Weight before: 663.40g

Instructions were followed while mixing the chemical. The plastic clip that runs along the middle of the packaging is a separator for the chemicals prior to mixing. There is a video attached to this project that shows the mixing process for this system. Removing the plastic clip required more force most than the Product A system in order to combine both parts, however this plastic clip appears to create a stronger separation that would most likely result

in less cross contamination in product transit. This product said to mix for 30 seconds which resulted in a better looking mix than the Product A system.

While pouring the chemical into a 5-pound pail liner, there was a very distinct odor. The polyol smells like oil. The smell was so strong that a door had to be opened in the lab to further ventilate the area.

The packaging heated slightly after pouring while the chemicals were reacting.

The weight of the packaging was taken after pouring.
Weight after: 92.5g
Weight Change: 570.9g

Reactivity Observations:
This system, which is designed to only replace 50lbs of concrete, did not completely rise out of the pail liner. It had roughly a 3-minute gel time, and a 5.5-minute tack free. The Product B system hardened a lot quicker than the Product A system did. The polyol odor was still pungent in the system days after initially reacting the chemicals.

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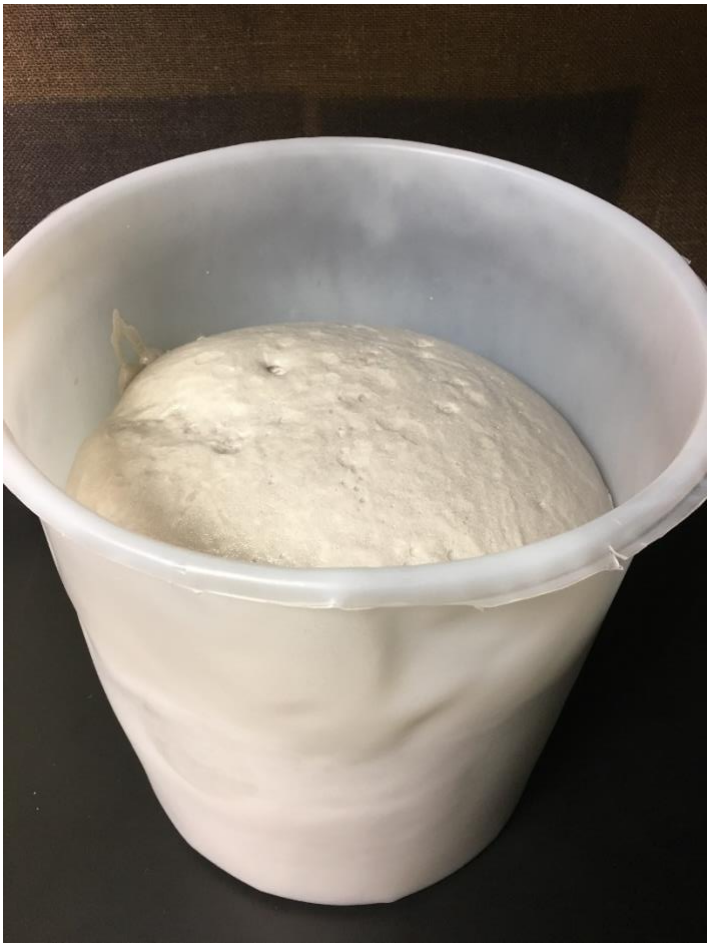

Cell Structure Observations:

The cells appear to be similar in size to that of the Product A system. However, the surface is more friable than that of the Product A system. The surface easily flakes when compressed.

Note: Cells are large and resemble closely to the Product A system tested before. This picture is from the top of the foam along the cured surface.

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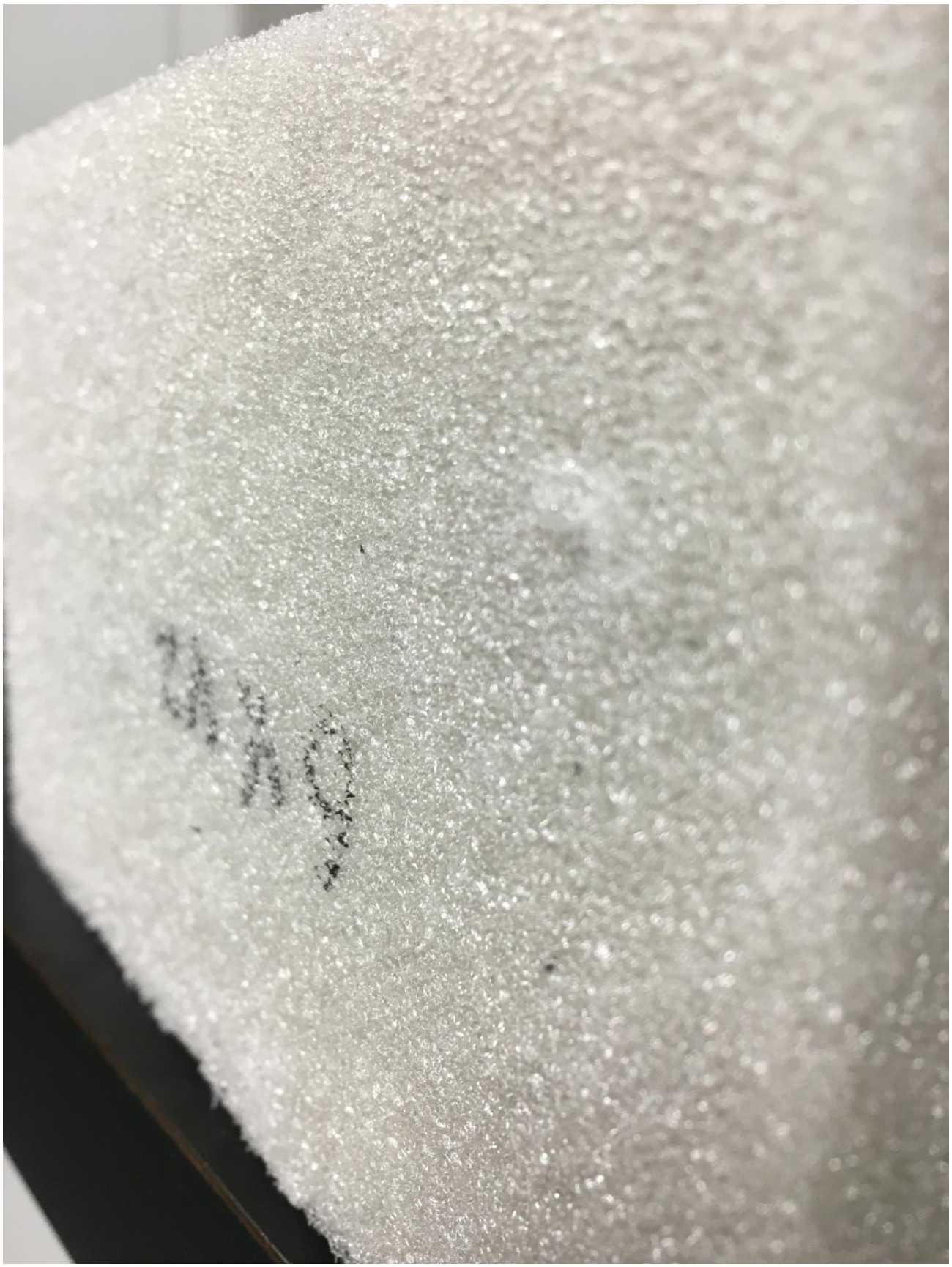

Viscosity/Ratio Testing:

Each side of the packaging was weighed and poured into jars. In order to take the viscosity, the chemicals were placed in smaller jars. The chemicals were all tested at 25ºC. Again, the odor of the polyol was very strong whenever it was being handled.

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Product C

Bag contents:
-pair of gloves
-instructions
-chemical packaging

Claims:
-replaces 2x50lbs (23 kg) of concrete
-Sets posts in 5 minutes
-No water required
-Mixes in just 30 seconds
-Expands to fill the post hole
-Ideal for all types of posts
-Can be used during winter

Instructions (provided in bag with chemicals):
Images removed for anonymity

Safety Warnings:
Same as the Product B replacement system.

Mixing/Pouring:
The weight of the packaging was taken before pouring.
Weight before: 959.38g

Instructions were followed while mixing the chemical. The plastic clip that runs along the middle of the packaging is a separator for the chemicals prior to mixing. There is a video attached to this project that shows the mixing process for this system.

The pouring procedure that was followed was identical to the Product A replacement. There was no distinct smell with this system, and the color was almost identical. While pouring this system a lot of chemical was left in the bag, this could be due to higher viscosity material and partly to user error when pouring the chemicals.

The packaging heated slightly after pouring while the chemicals were reacting.

The weight of the packaging was taken after pouring.
Weight after: 169.15g

Weight Change: 790.23g

Reactivity Observations:

Exact reactivity times were not recorded in the initial demonstration of the product. This system appeared to react a lot faster than the other systems.

Tack Free time was around 4 minutes 30 seconds.

The foam rose just above the pail liner (in comparison the Product A system marketed to replace the same amount of concrete rose higher out of the pail liner at a higher density). This is most likely due to the excess foam in the packaging from a bad pour, or the more viscous material not flowing out of the packaging as well.

The outside of the foam appeared friable in the couple days after initial reaction (flicking the foam with your finger nail would cause the foam to flake), however a week after pouring the system appeared to be less friable. This is most likely attributed to the additional isocyanate reacting over a longer period of time.

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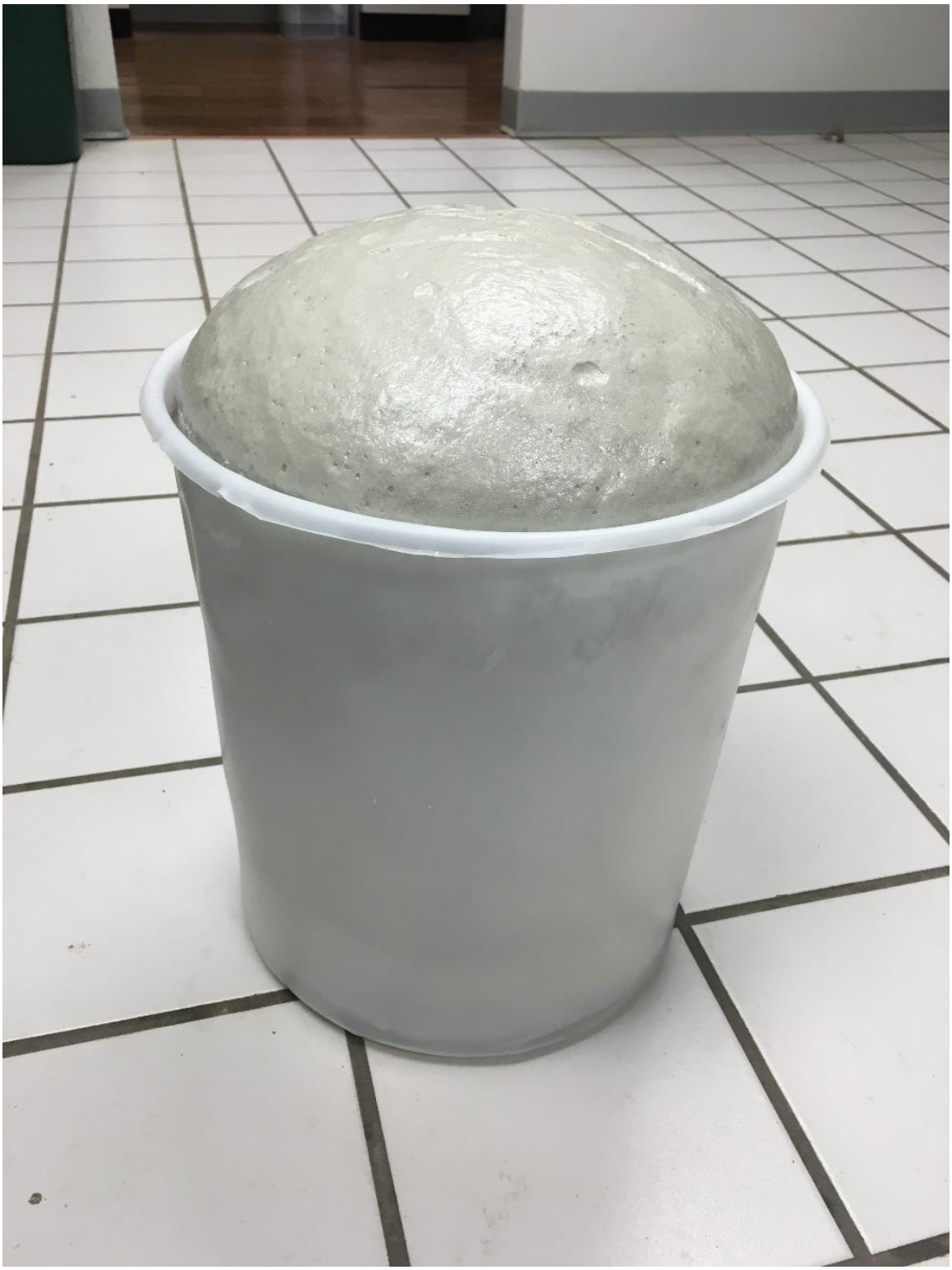
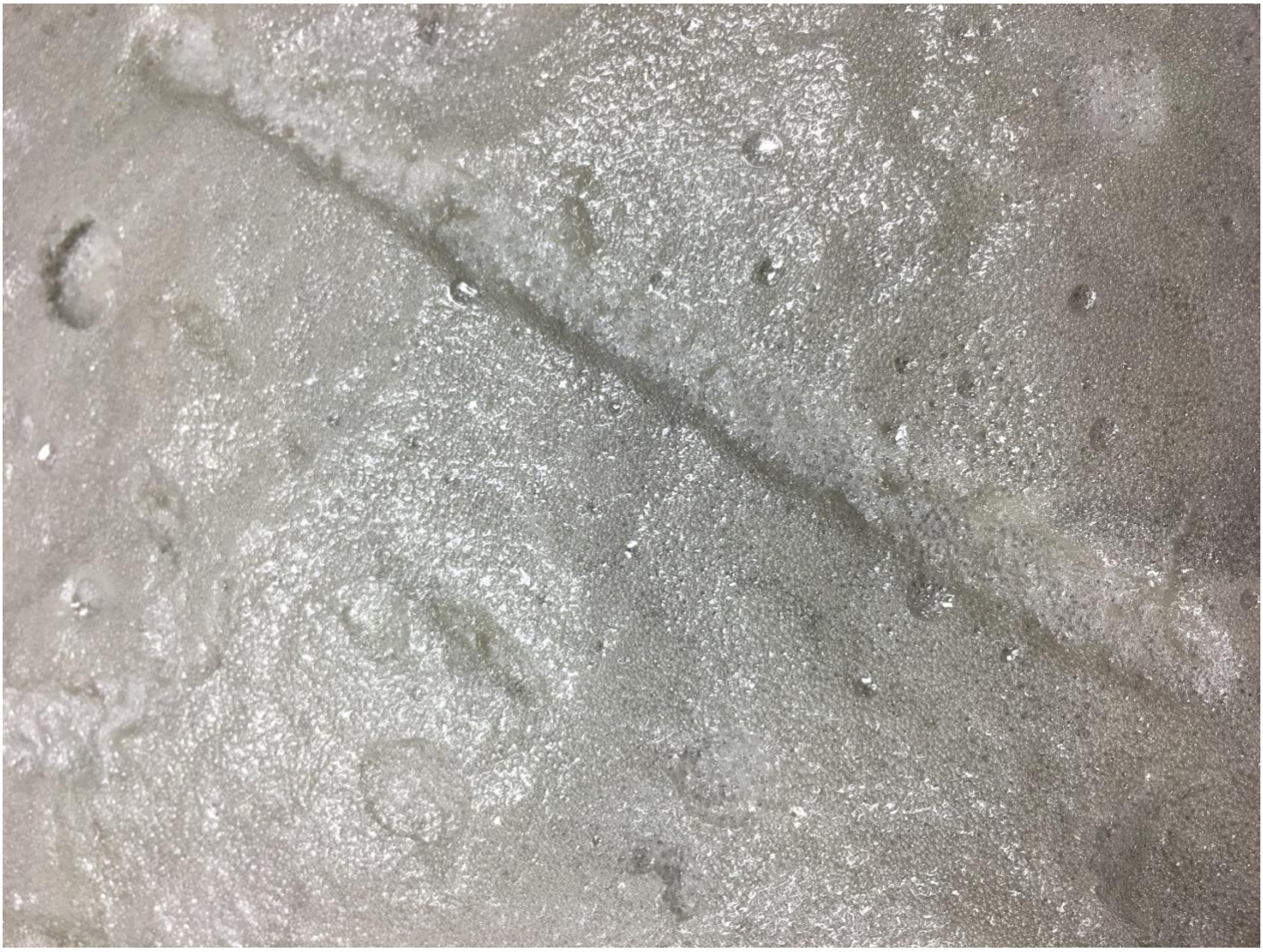


Cell Structure Observations:
The cell structure of this system appeared almost identical to that of the Product A system.

This system showed signs of shrinkage. While sitting in the pail liner, the foam shrunk enough that it was able to easily slide out. Furthermore, the same day the compression samples were cut shrinking was observed in the samples.



Note: This is a close up of the top surface of the Product C replacement.

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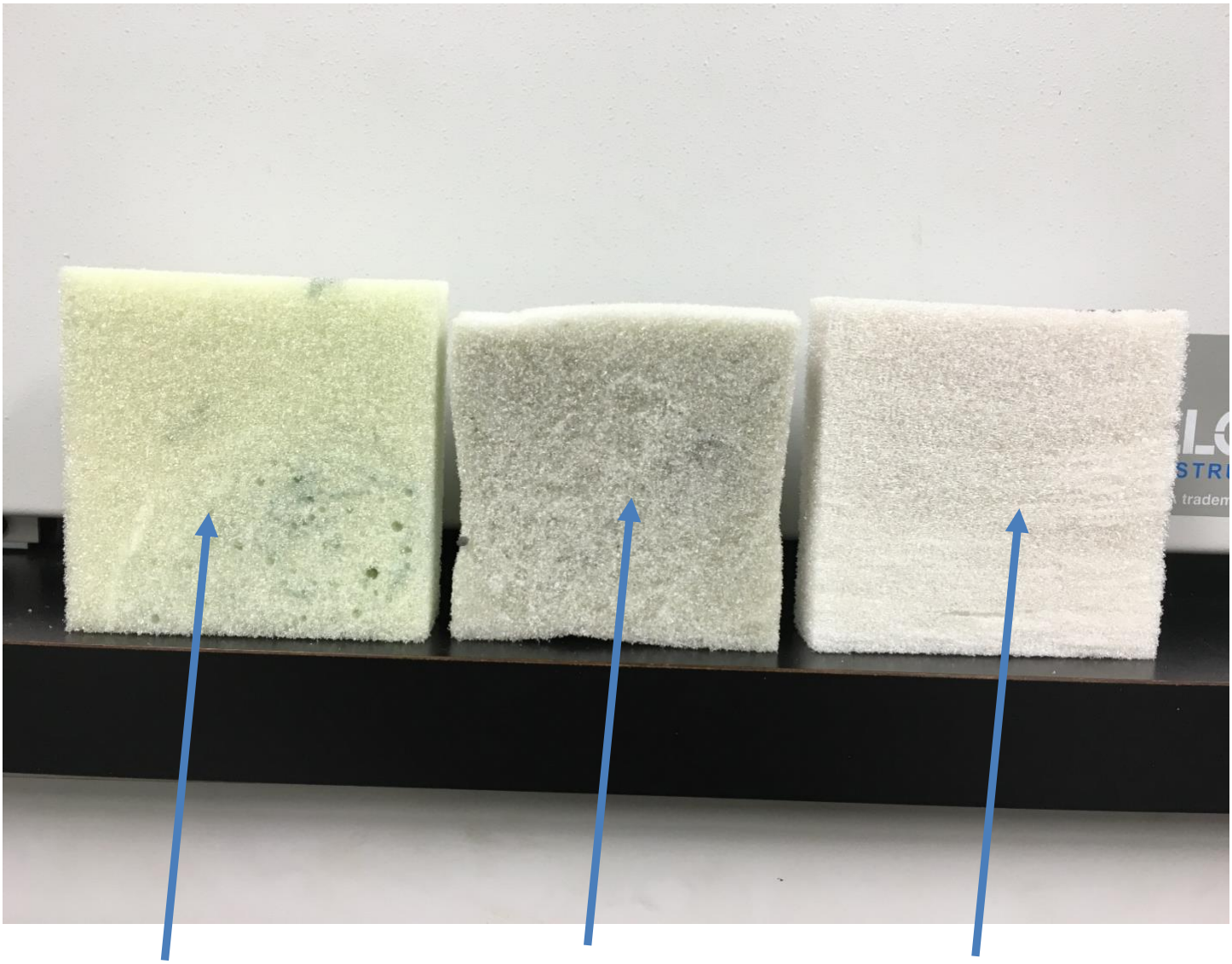
Note: This is the inside surface of the Product C system.



Product A System

Minimal Shrinkage

Product C System

Significant Shrinkage

Product B System

Some Shrinkage

Note: This system would have more shrinkage if cut parallel to foam rise. This is also why the foam appears a different color.

Viscosity/Ratio Testing

The procedure for viscosity was the same for the other systems, every system was tested at 25ºC, and each part of the system was poured and weighed in individual jars. The polyol was placed in a smaller jar to perform viscosity testing. It appears this polyol has a different coloring agent (perhaps a pigment rather than a dye) that sticks to the sides more than that of the Product B replacement. This could explain the difference in odor between the two Product B & C systems.

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RESULTS

Product A

Density
Dimensions of sample: 5.947”x5.949”x4.652”
Weight of Sample: 86.5g
Density: **2.00pcf**

Viscosity/Ratio
Iso: 645.19g and 52.5 cps
Polyol: 454.38g and 674 cps
Ratio: 100A/70.43B

Compression Testing

Sample	Length (in.)	Width (in.)	Height (in.)	Max Load	Stress at Maximum load (lbf/in^2)	Weight (lb)
1	4.015	3.995	0.999	255.08	15.903	0.0173
2	4.03	3.983	1.027	273.86	17.062	0.01775
3	4	3.971	1.029	275.44	17.341	0.0182
4	3.994	3.989	1.018	282.63	17.74	0.0191
5	4.007	3.971	1.008	272.54	17.128	0.02135
Averages	4.0092	3.9818	1.0162	271.91	17.0348	0.01874

Closed Cell Testing

Sample	% Closed Cell Absolute	% Closed Cell Adjusted
1	86.98	104.02
2	80.44	92.88
3	77.28	88.57
Averages	81.56666667	90.725

Note: The 104.02 value was ignored for the averages of the adjusted values

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Product B

Density
Dimensions of sample: 5.967”x5.982”x3.585
Weight of Sample: 64.42g
Density: **1.92pcf**

Viscosity/Ratio
Iso: 234.5g and 213.5 cps
Polyol: 358.29 and 1420 cps
Ratio:100A/65.45B

Compression Testing

Sample	Length (in.)	Width (in.)	Height (in.)	Max Load	Stress at Maximum load (lbf/in^2)	Weight (lb)
1	3.967	3.951	0.987	120.18	7.6802	0.01765
2	3.967	3.952	1.001	140.51	8.9625	0.01755
3	3.989	3.927	0.995	109.84	7.0122	0.0181
Averages	3.974333333	3.943333333	0.994333333	123.51	7.884966667	0.017766667
Note: These were performed improperly and will have to be rerun with the remaining chemical left.						

Closed Cell Testing

Sample	% Closed Cell Absolute	% Closed Cell Adjusted
1	75.94	92.09
2	78.64	95.97
Averages	77.29	94.03

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Product C

Density

Dimensions of sample: 5.971”x6.005”x5.972
Weight of Sample: 108.49g
Density:**1.93pcf**

Viscosity/Ratio Testing

Iso: 564.19g and 225 cps
Polyol: 320.65g and 1620 cps
Ratio: 100A/56.8B

Compression Testing

Sample	Length (in.)	Width (in.)	Height (in.)	Max Load	Stress at Maximum load (lbf/in^2)	Weight (lb)
1	3.941	3.932	0.978	415.66	26.823	0.0187
2	3.954	3.935	0.987	369.1	23.723	0.01775
3	3.961	3.923	0.989	336.85	21.677	0.0175
4	3.968	3.975	0.985	349.39	22.151	0.01725
5	3.976	4.008	0.986	398.89	25.031	0.01705
Averages	3.96	3.9546	0.985	373.978	23.881	0.01765

Closed Cell Testing

Sample	% Closed Cell Absolute	% Closed Cell Adjusted
1	70.63	24
2	74.79	82.17
3	77.13	99.04
Averages	74.18333333	90.605

Note: The 24 value was ignored for the averages of the adjusted values