rPET Recycled, not Recyclable.

PET is a #1 plastic most commonly associated with water bottles. We throw them into our recycling bins and they get made into new products, one of which is called rPET liners which are used for protective and thermal packaging. These liners offer similar thermal protection to its natural fiber counterparts, like cotton, and are typically less expensive. Once rPET liners have been converted into insulation, they are no longer curbside recyclable and can damage recycling processes.

> "MRF (Materials Recovery Facility) operators would look at the batting as a textile and not want it... MRF operators do not handle textiles"
>
> **- Dave Cornell, Technical Consultant, APR**

> "I'm not certain this type of material is suitable for commercial collection and recycling. MRF equipment is generally designed to handle recycling containers."
>
> **- George Smilow, COO, PQ Recycling**

> "Typically, curbside programs do not accept this type of material."
>
> **- Kara Pochiro, Communications Director, APR**

The Life Cycle of a PET Bottle

PET bottles head to a Materials Recovery Facility via recycling bins. The bottles get sorted among like materials to be converted into new products.

Bottles are usually turned into rPET liners. These are used as insulation for packaging and end up back in the homes of consumers who think this product can be recycled again.

rPET liners either get tangled up in machinery at recycling facilities or are immediately sorted and disposed of in landfills. These liners are functionally a single-use plastic.

Questions?

Interested in more information about rPET, other shipping materials, or ways to greatly reduce your CO_2E emissions? Email us today at **info@temperpack.com**.

PLASTIC TECHNOLOGIES, INC.

Report	
Report Title	Recycle: Evaluation of Insulation Material
Date	September 15, 2016
Issued To	James McGoff TemperPack
Prepared By	Frank Schloss and Julie Voyles *Plastic Technologies, Inc.*
Copies To	Lori Yoder, Wei Zhang – *PTI*
Project #	17260

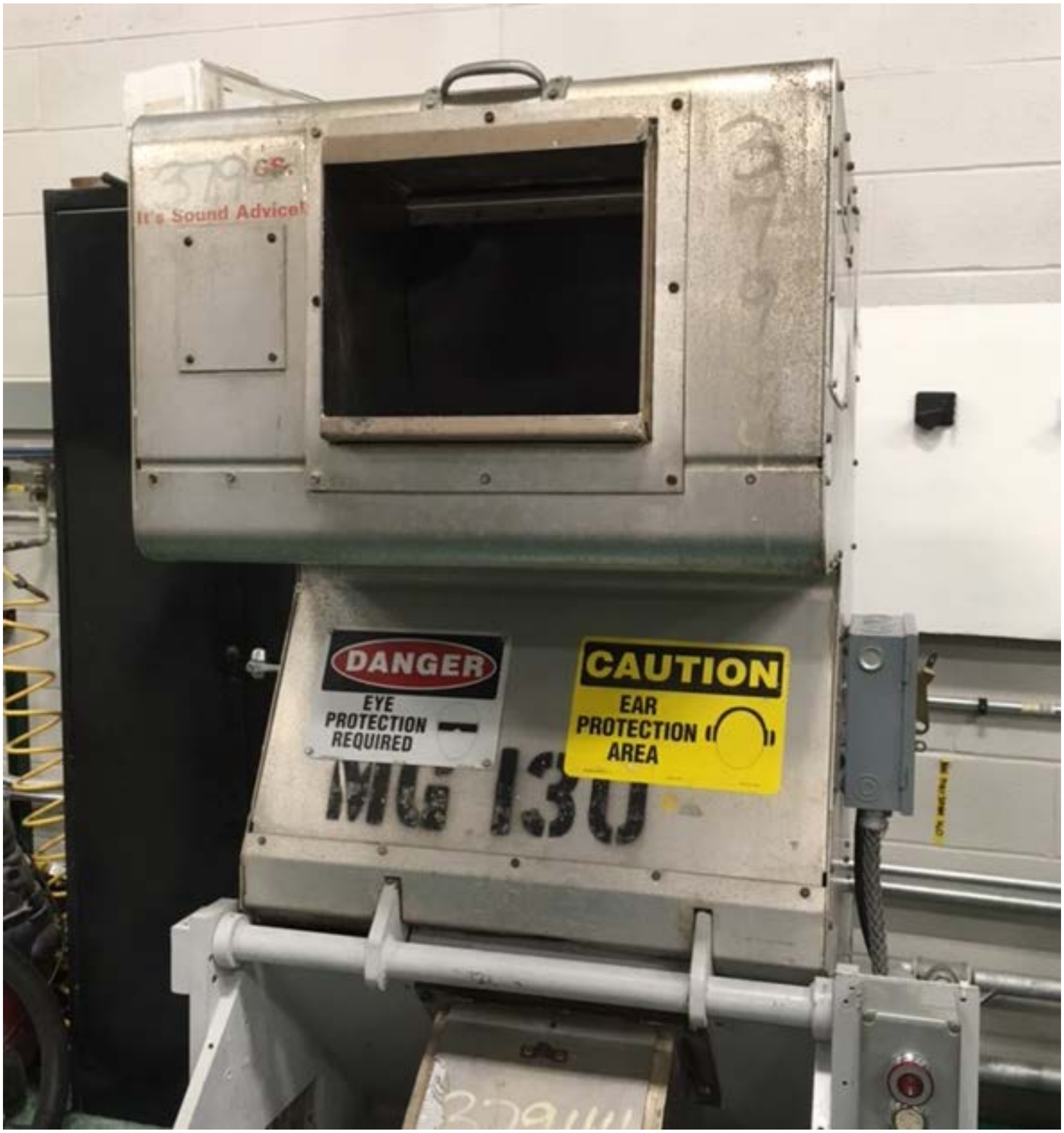
Executive Summary

The insulation material was able to be ground in our laboratory grinder; however, only 60% of the material exited the grinder with the remaining material found to be piled up on the grinder screen. Grinding PET bottles with the insulation material in a ratio of 75% bottle weight to 25% fiber material weight did not improve the grinding process. The resulting ground fiber material clumped together and would not free-flow through the air elutriator.

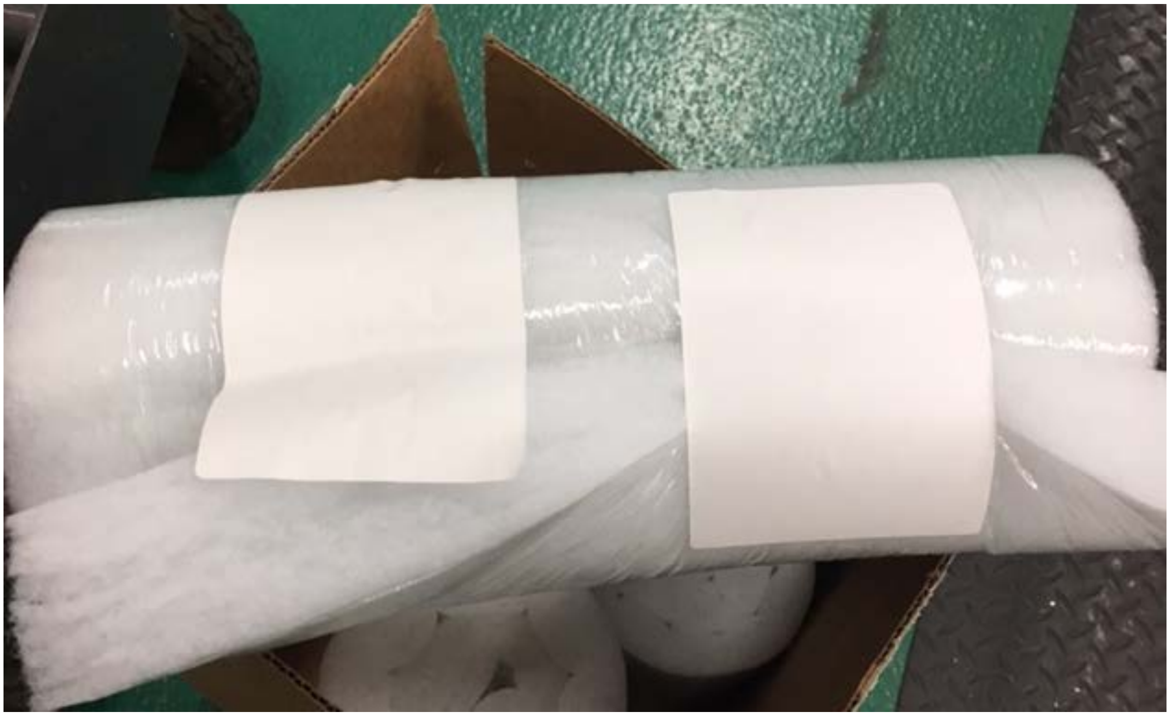
Insulation Material Grinding and Elutriation Experiments

In order to see what would happen to the insulation material, the smallest rolled-up sample was selected for the first experiment. This roll was selected since it was the closest in physical size to 2L PET bottles that we routinely grind into flake. This grinder is equipped with a 3/8” screen to produce flakes that are in the proper range for recycle studies and typical of what are produced in many recycle production grind facilities. The insulation material was tightly rolled up and held in this shape by the supplied paper tape. This sample weighed approximately 100g.

The rolled-up material was thrown into the grinder and the grinder was allowed to run for approximately five minutes until the sound being emitted seemed to have stabilized to the point where no more material was being ground. The material did in fact grind to fiber with approximately 60g exiting the chute. However, this ground material was predominately highly clumped fibers in a ball-like mass. After stopping the grinder and opening it up, we could see that the remainder of the blanket material had been ground but had built up on the screen and was no longer passing through, effectively blocking the screen in a mass of entangled fibers.

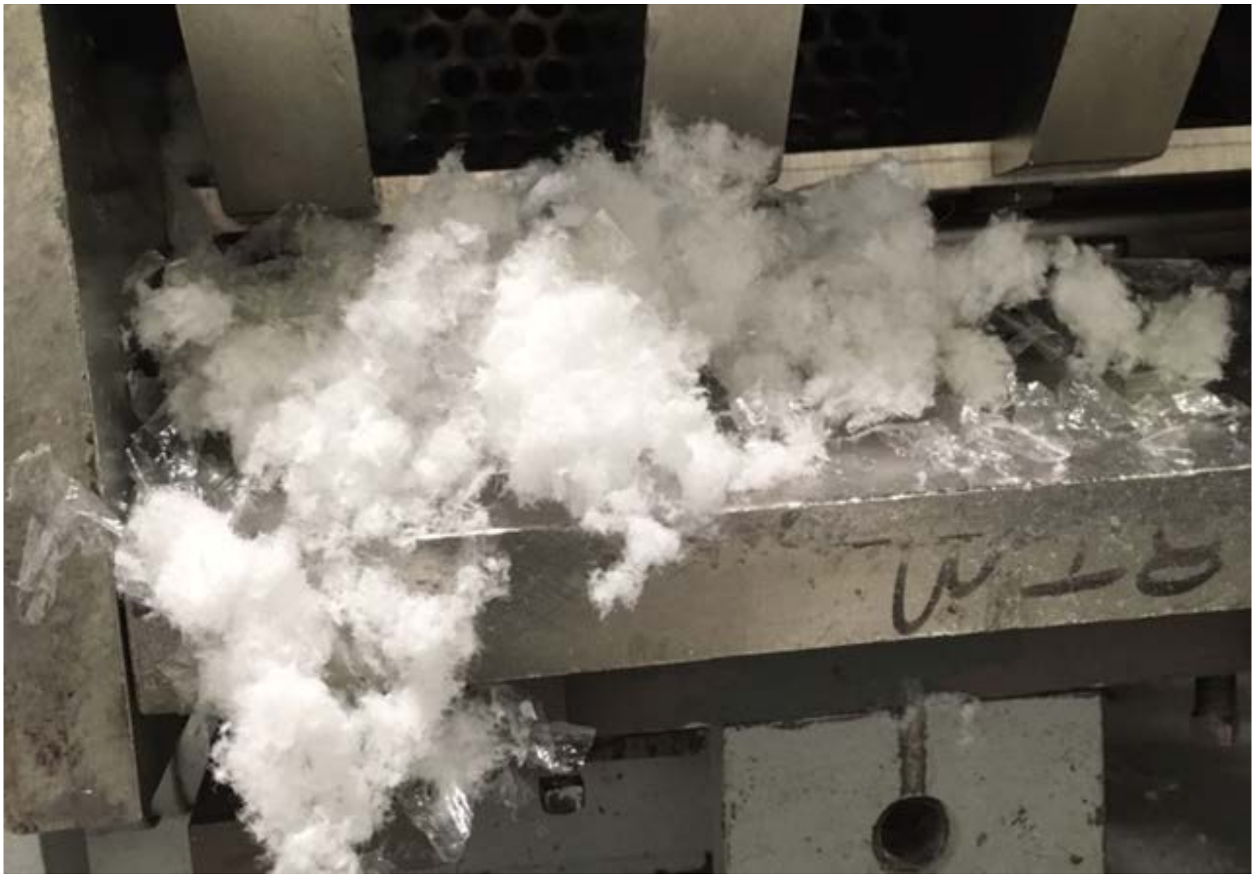


Grinder used in this study using a 3/8" screen



Rolled up Insulation blanket

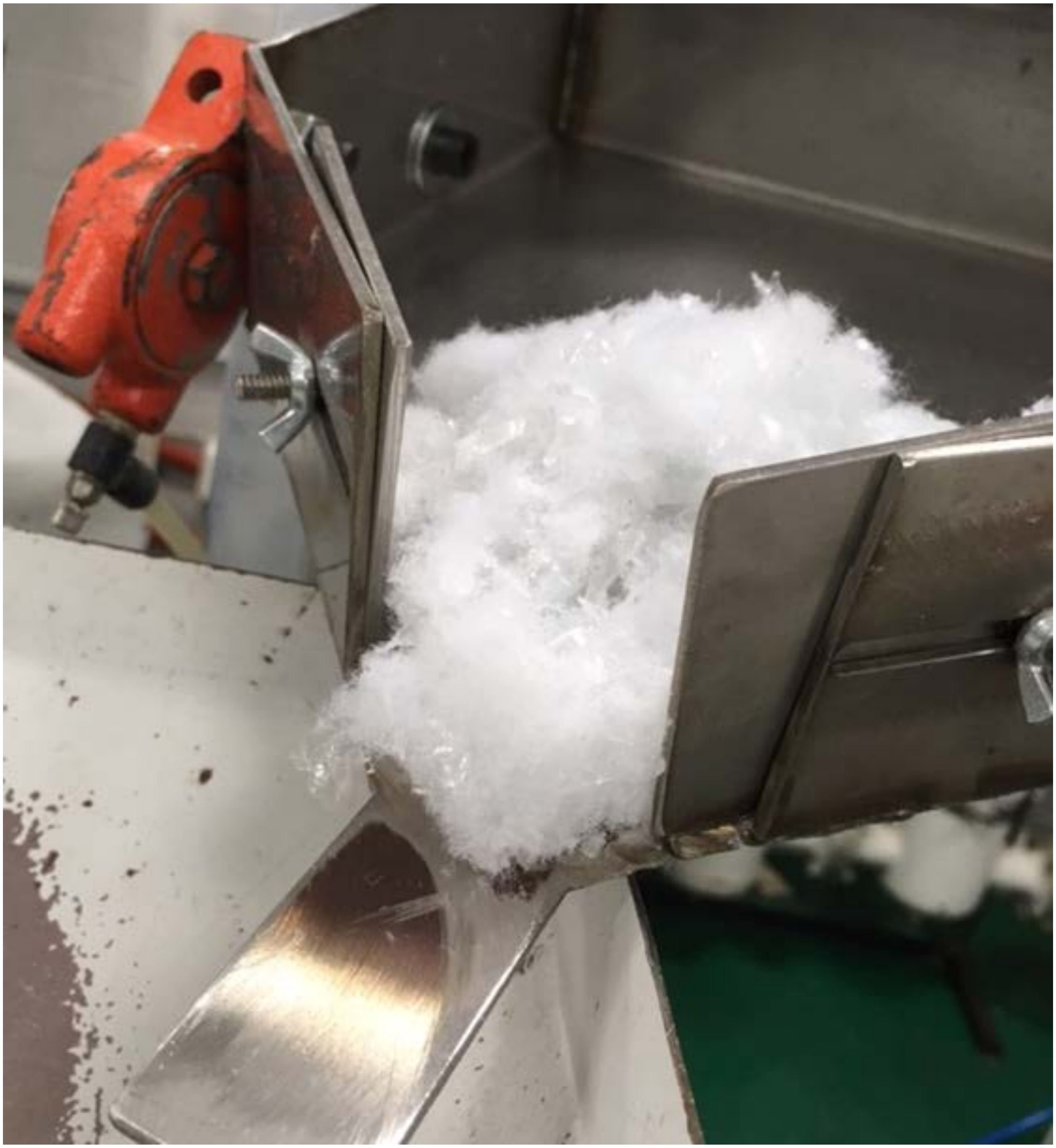
Ground insulation blanket



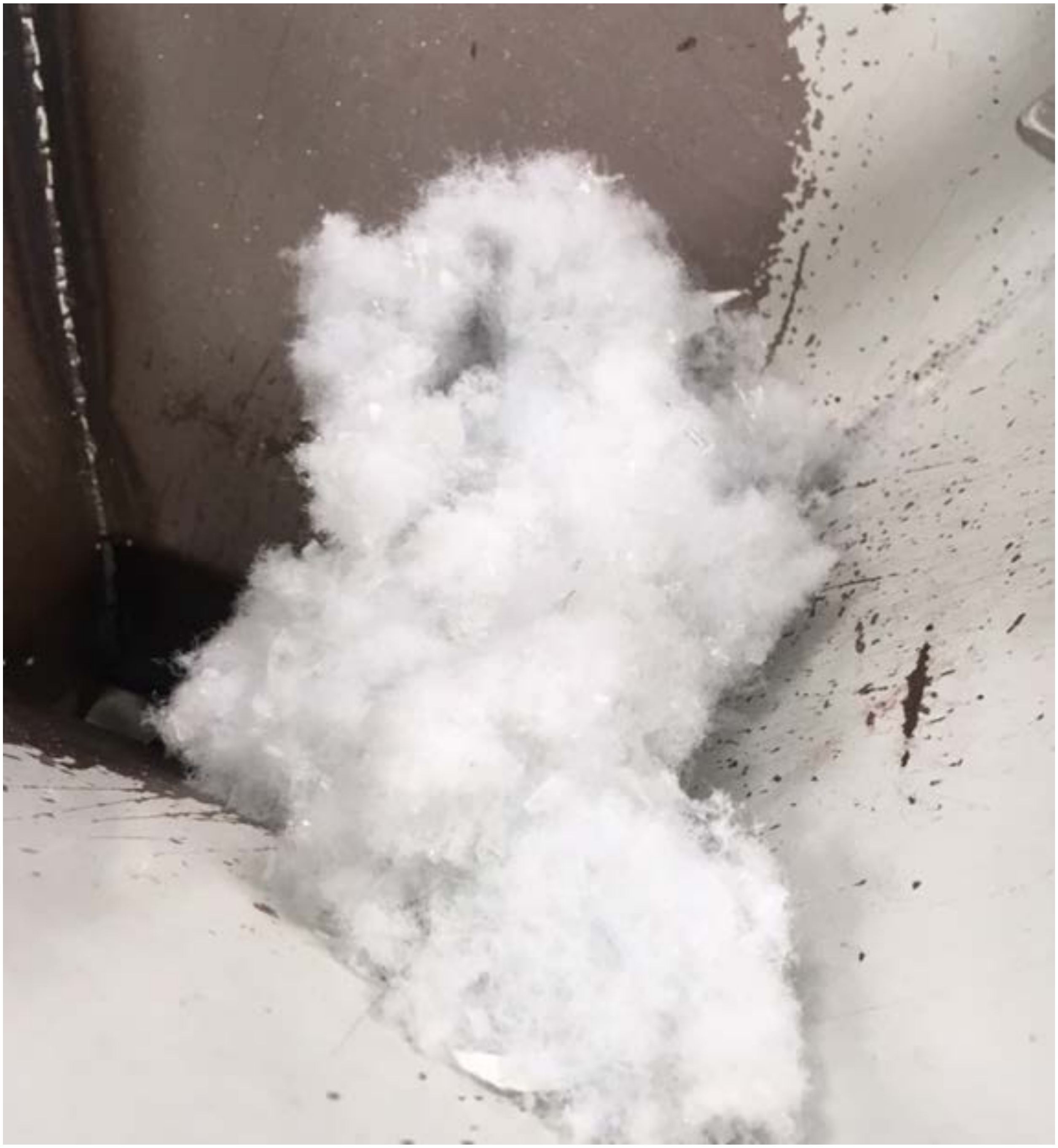
Ground insulation material left in the grinder

As noted above, the material that actually was collected that fell through the chute after grinding was not loose fibers but rather entangled ground fibrous material. This was taken to the air elutriator which is set up to blow PET fines and light materials such as ground labels away from the heavier PET flakes. This device works by having the ground PET flake material fall by gravity down pass a series of baffles that the falling PET bounces off of on its way down to the collection vessel. While the heavier PET flakes are falling, a counter-current stream of air is directed upward blowing the light fines and labels away from the heavier flake into a second collection vessel.

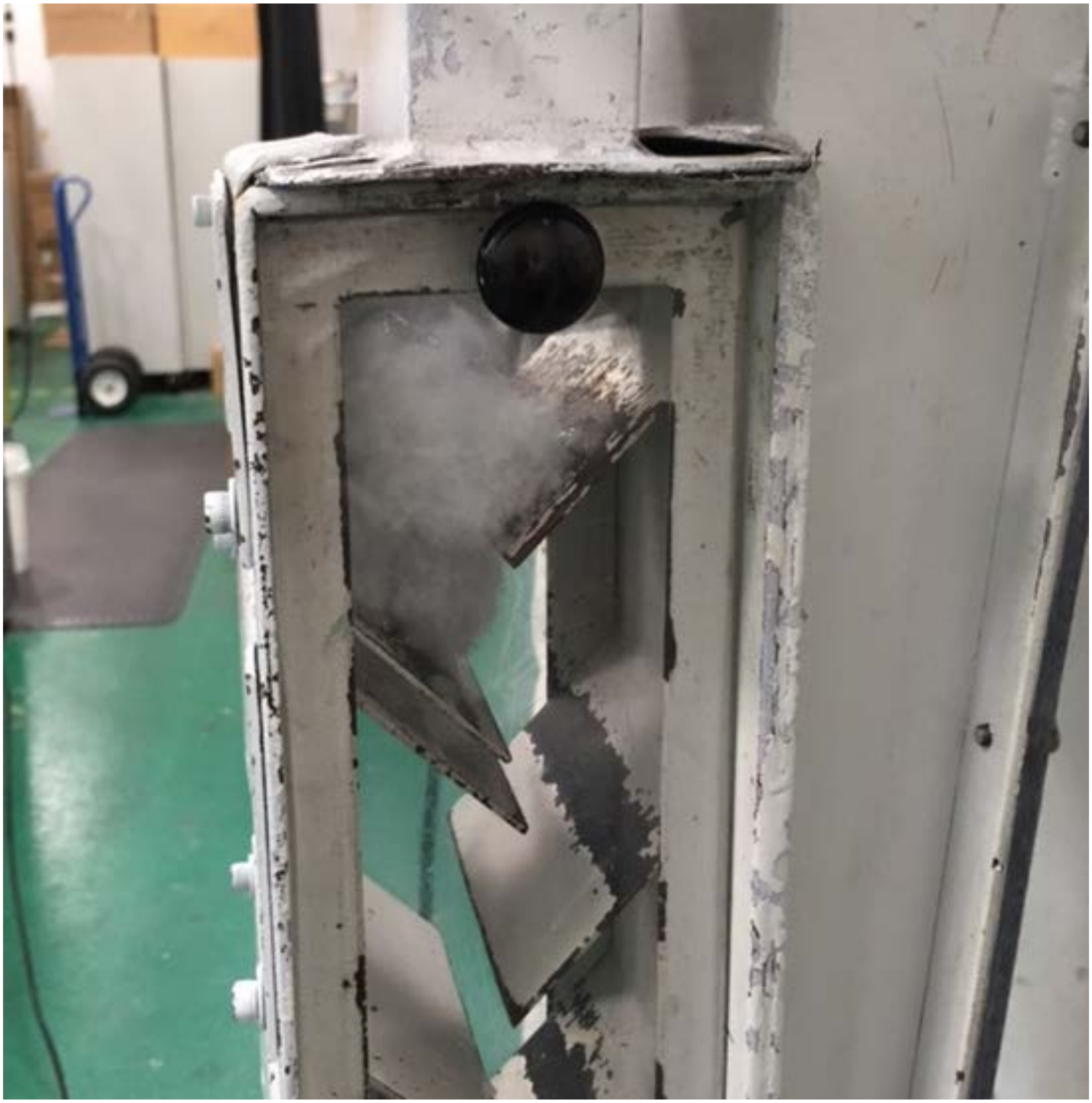
When this ground entangled fibrous material was placed in the feeder chute of the air elutriation device, the fibrous clumps would not flow through the chute opening into the feed area of the elutriator. The elutriator has vibratory assist (that is used to help flake freely flow through the feeder chute into the elutriator) but this had no effect on making the fibrous material flow. Therefore, the entangled material was literally pushed into the elutriator opening to see what would happen. These clumps of material fell down to the first baffle and stopped there as they remained as a fibrous mass that would not drop any further down the elutriator. Thus, this material could not be subjected to the traditional elutriation step.



Fibrous material sitting in the elutriator feed chute



Fibrous material sitting in the top of the elutriator feed throat

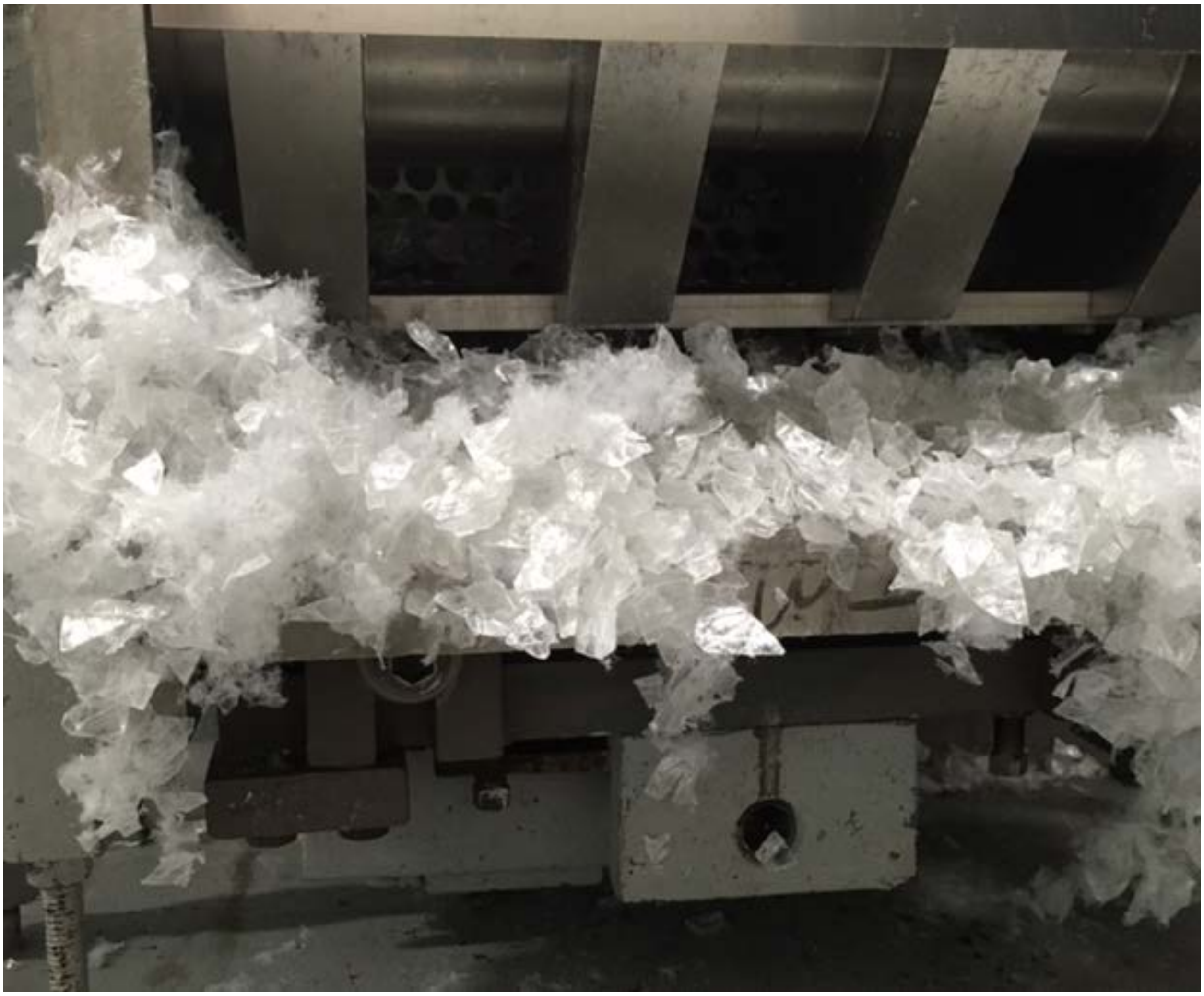


Fibrous material trapped in the first baffle

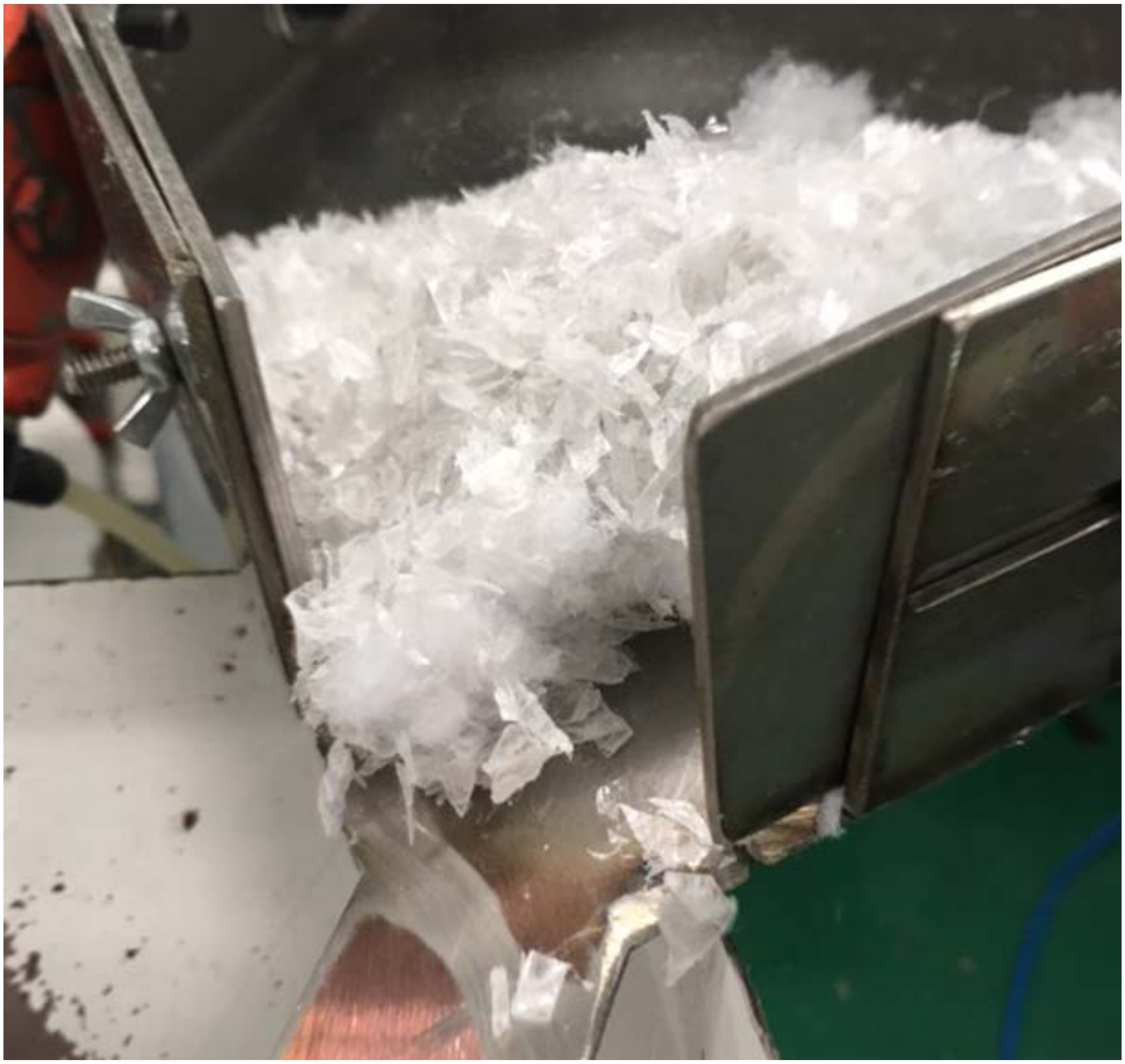
A second grinding experiment was performed on a second rolled-up insulation blanket, approximately the same size as before weighing 103g. For this experiment, the rolled-up mat was thrown into the grinder and immediately followed by grinding about 6.5 2L bottles. This produced a ratio of 25% fiber mat and 75% bottles by weight. Once the grinding was deemed to be complete, the weight of material that fell through the chute was found to be 248g that once again consisted of matted fibrous material with ground PET bottle flake mixed in with the fibers. When the grinder was opened, a large mass of ground material (both clumps of fibers and bottle flake) was once again found sitting on the screen, unable to fall through.

This material was then placed into the air elutriator feed chute to see if the entrapped PET bottle flake might alter how this material flowed. Unfortunately, the same result was obtained. This matted material would not free flow into the elutriator. When it was pushed into the elutriator opening, the material once again built up on the first baffle with a small amount falling to the second baffle. If this were to happen in a production elutriation system, the fibrous matted material appears as if it would simply dam up in the elutriator prohibiting any other material from flowing past. A small amount (~1g) that consisted of loose fibers was blown off of the mixture. Based on the light weight of these fibers, it is expected that if clumping was not an issue and the fibers could free flow through the elutriator, the vast majority would be blown away from the heavier PET bottle flakes and lost to the reclaiming operation.

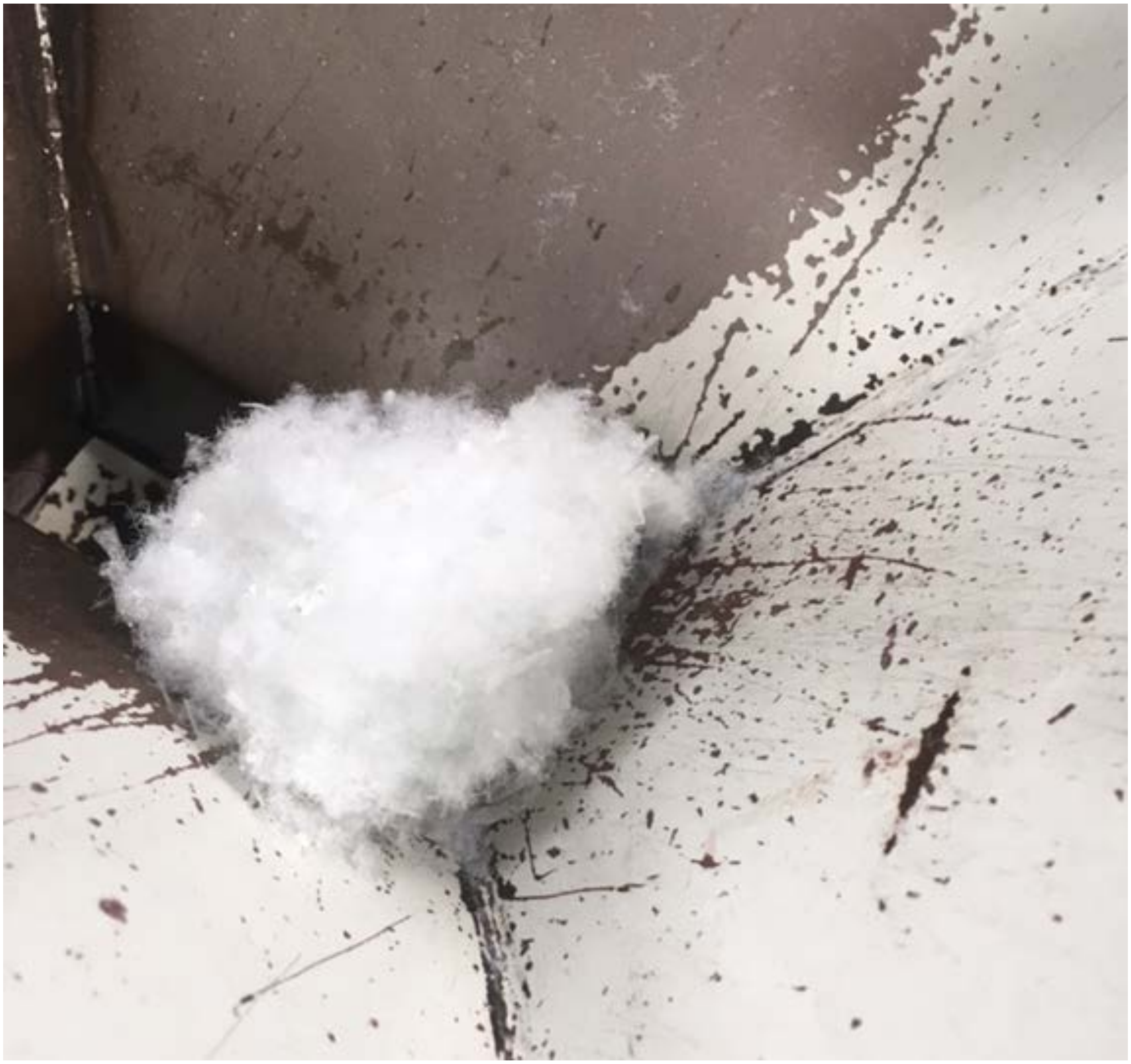
Ground insulation material with 2L bottle flake



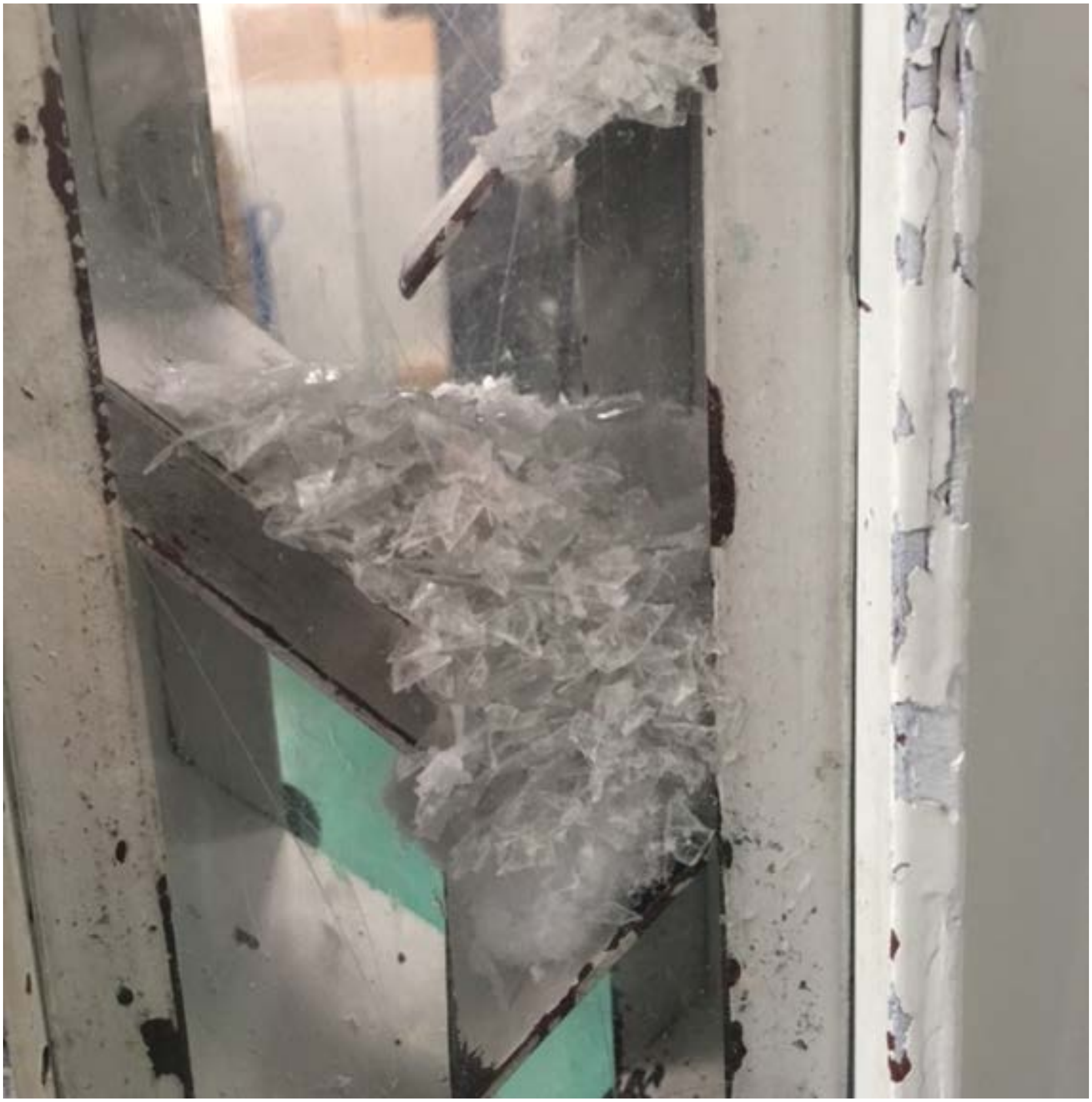
Ground fibrous material with bottle flake built up in the grinder screen



Fibrous material and bottle flake sitting in elutriator feed chute



Fibrous material sitting on the top of the elutriator feed throat



Fibrous material and bottle flake trapped on baffles in the elutriator

A third elutriation experiment was perform where we tried to physically blend 90% by weight of ground PET bottle flake with only 10% by weight of ground fibrous material. Unfortunately, we could not get the clumped fibrous matted material to separate easily to blend with the PET flakes. Because we still had clumps of fibrous material present, it was felt a third elutriation experiment would fail as did the previous two. Therefore, no additional work was performed.

Results Summary

- The insulation blanket was able to be ground in our small laboratory grinder.
- The resulting ground fibers agglomerated into large clumps of highly entangled fibers.
- Approximately 40% of the material thrown into the grinder built up on the screen and would not exit the grinder.
- Adding PET bottles to the grinder immediately following the mat did not appear to remedy the clumping issue. The PET flake simply got entrapped within the fibrous clumps where once again about 40% of the material ended up sitting on the screen within the grinder.
- These large clumps of fibers prevented the material from free flowing out of the elutriator chute.
- These same clumps of fiber when physically forced into the elutriator would not free flow by gravity through the elutriator as the sample fell onto the baffles and stopped, effectively blocking flow of any additional material.

Experimental Limitations

These experiments were performed on small laboratory equipment that is routinely used to perform PET bottle recycle studies. These pieces of equipment have been able to simulate larger production systems for routine recycle studies. The experiments performed here were unique in that the fibrous materials formed entangled fiber clumps that simply did not behave like normal bottle flake material. We are unable to predict how a large-scale production grinder might treat a single rolled-up insulation blanket, where a much larger quantity of bottles follow the blanket into the grinder. A single fiber mat mixed with a much larger amount of PET bottles might over time result in forcing more of this material through the screens.

Additionally, a number of PET reclaimers use wet grinding techniques that we cannot simulate in the lab. We do not know if a wet grinding technique would alter how the material grinds or if this type of grinding would remedy the clumping that was seen in these experiments.

If the ground fibers from the rolled-up insulation blanket still exits these wet grinders as highly entangled fibrous clumps that cannot be broken up, these clumps would be expected to become problematic even in larger air elutriation systems. Additionally, there are other types of fines removal equipment in use that might offer a different result when dealing with clumped fibrous materials.