PLA Scrap Sheet Making Process

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Research

Problem & Solution

Problem

The Makerspace has an excess of PLA waste from near-constant use of their 3d printers

Solution

The Makerspace already had made a few sheets. We wanted to continue working on this process.

Our Inspiration - Precious Plastic's Sheetpress

Our Goals

- Create a replicable sheet making workflow
- Understand the material properties of PLA when melted into a sheet
- Refine the sheets into an accessible material
- Increase supply of sheets

02

Prototyping

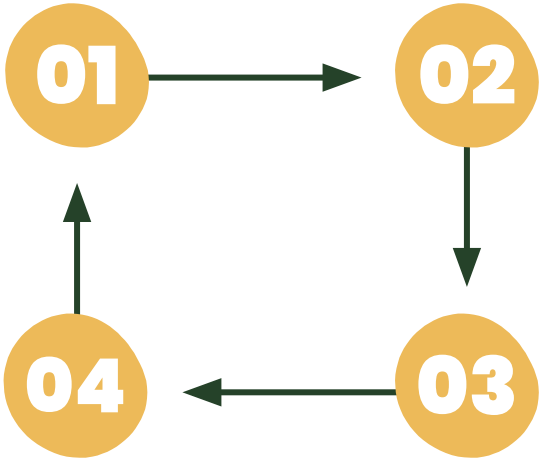
Overall Flow

Projects

People use PLA for their projects

PLA Scrap

Projects produce PLA scrap



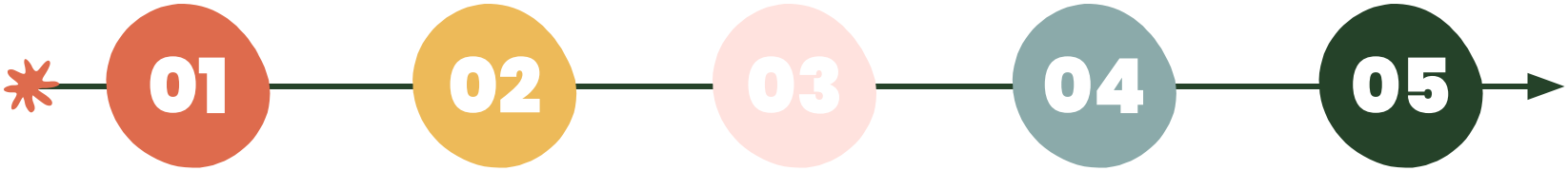
Shredding

PLA scraps are shredded

Sheets

PLA shreds are used to create sheets

Our Process



Shred

Breaking PLA into smaller pieces

Weigh

Adding constraints to create constant sheet dimensions

Heat

Place in oven and allow shreds to melt down.

Cool

Pull from oven and allow to cool in pan

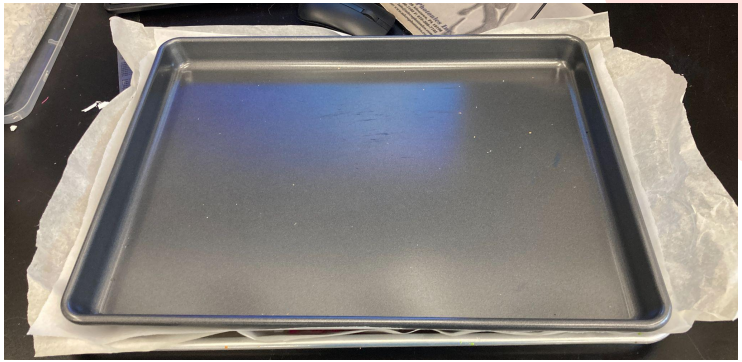
Sheet

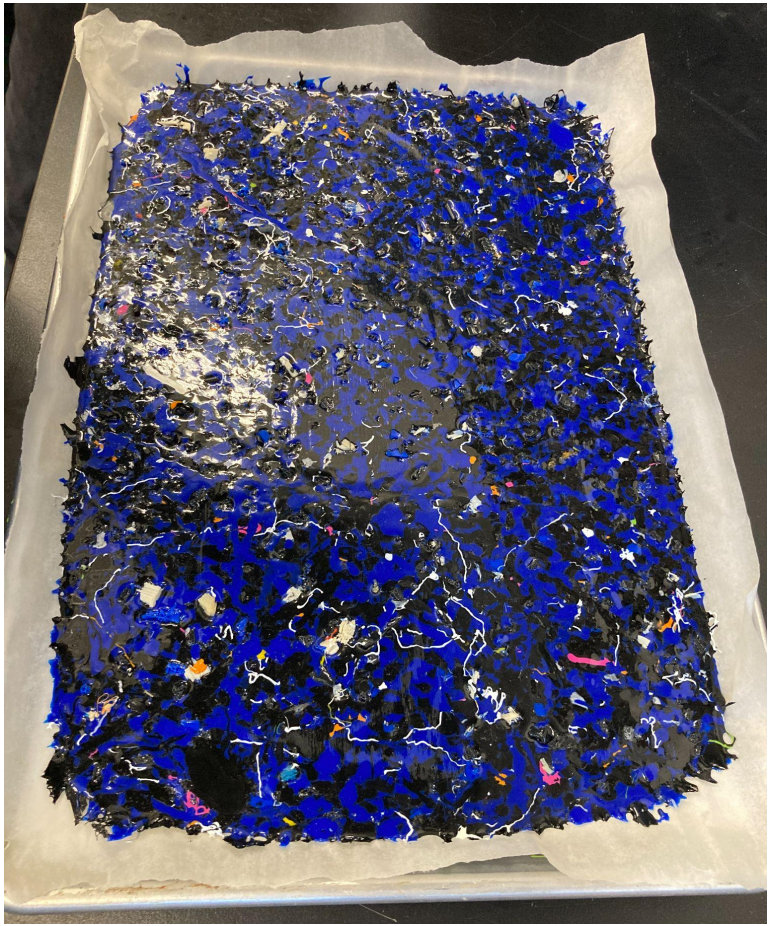
Pull sheet from pan and use material for users desire


NYU
design


250
MakerSpace - Tools


250
MakerSpace - Tools



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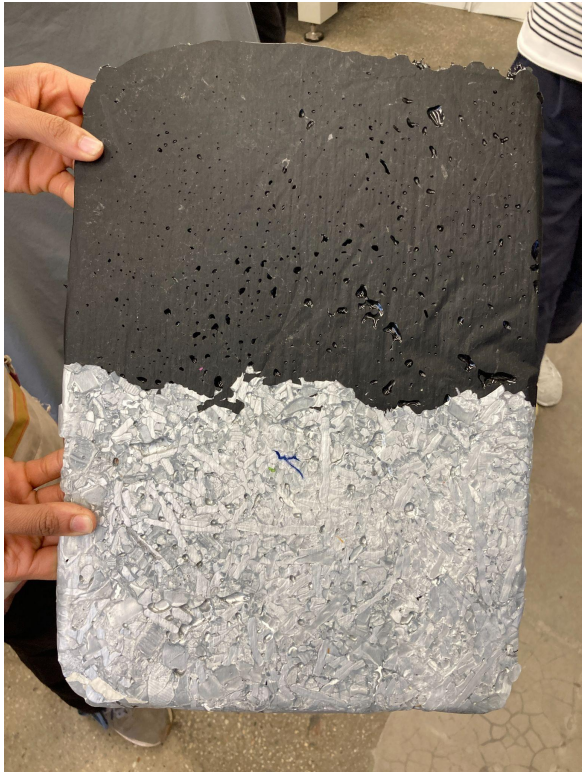


Our Documentation

Trial Number	1	2	3	4	5
Starting Weight	450g	450g	450g	802g	N/A
Ending Weight	717g	455g	450g		
Oven Temperature	350	350	350	350	350
Description of Setup	Sheet, parchment paper, PLA waste	Pan, Sheet, PLA, Sheet, Pan	Pan Sheet PLA Sheet Pan	Pan PLA	Pan PLA Pan
Cooking Time	75 minutes	75 minutes	90 minutes	100 minutes	
Description of Cooling	Sheet, parchment paper, PLA waste, parchment paper, second sheet	Pan, Sheet, PLA, Sheet, Pan	Pan Sheet PLA Sheet Pan	Pan PLA	Pan PLA Pan
Cooling Time	15 minutes	15 minutes	15	15	15
Lessons Learned	Apply more heat and more time. Get apply physical adjustments during heating process	Mostly flat on the top. Matte finish when in contact with parchment. May need to do multiple rounds of heating to get even surface on both sides	Came out matte. May need to work on bubbles.	I use large pan. The bottom surface is perfect. But need a little more PLA, some parts have holes.	No Scale, just eyeballed and did not use parchment to keep glossy texture

Our Documentation

Trial Number	6	7	8	9
Starting Weight	N/A	470g	500g	450g
Ending Weight		470g	500g	450g
Oven Temperature	350	350	350	350
Description of Setup	Pan PLA	Pan PLA Pan Weights	First Half: Pan PLA Pan Weights Second Half: Pan PLA Parchment Paper Pan Weights	Pan Mold Release PLA Mold Release Pan Weights
Cooking Time		90 minutes	155 minutes	90 minutes
Description of Cooling	Pan PLA	Pan PLA Pan Weights	Pan PLA	Pan Mold Release PLA Mold Release Pan Weights
Cooling Time	15	15	15	15
Lessons Learned	No Scale, Eyeballed, no top pan because full sheet	Came out glossy, difficult to remove top pan and PLA, bubbles	Extra time didn't seem to make a difference.	Mold release was helpful.

Refinements/Lessons Learned

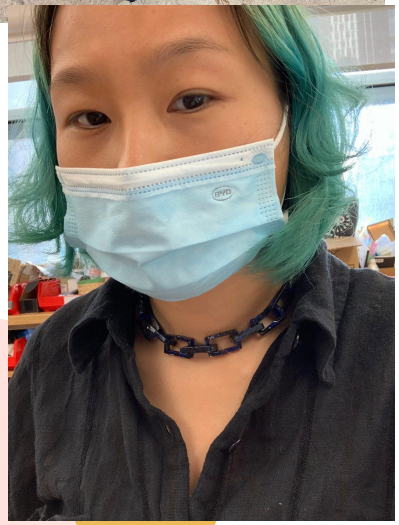
- Using a 2nd pan and weight has mostly flattened the top side to create a flat sheet
- Parchment paper creates a matte surface while no paper gives a glossy surface
- Tapping bubbles has yielded no results, PLA needs to be hotter to yield results
- Thickness is correlated with amount of scrap measured as well as weight applied.
- ~400-450g of scrap = 3.5-5.5 mm of thickness

Plastic Usage

03

The Products

Physical Prototypes

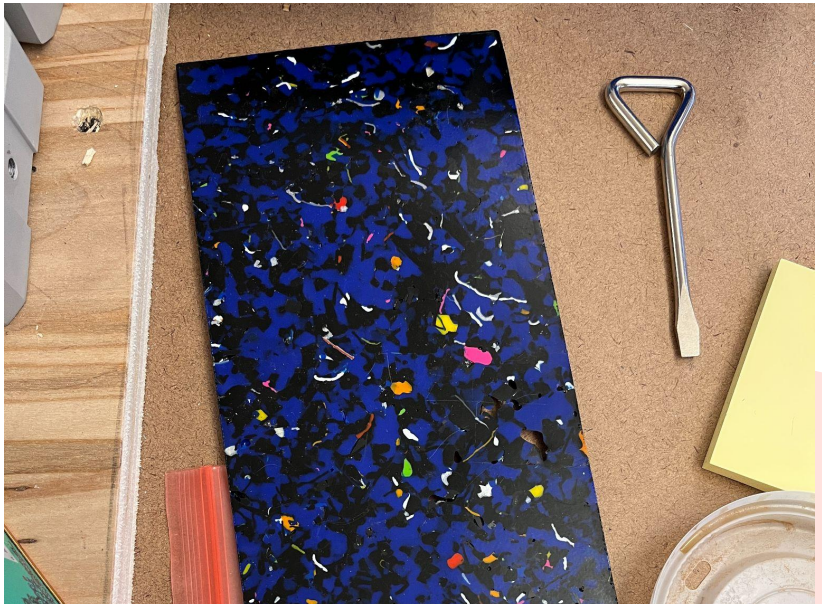


04

Next Steps

Plastic Potential

- An alternative material that can be used instead of acrylic
- Easy to remelt after mistakes
- Heat guns and acrylic heaters can help to fix mistakes
- Uses scraps and is cheaper to produce
- Wide variety in color marbling



Next Steps

- Facilitate more deliveries from outside makerspace for scrap PLA to prevent the plastic from ending up in trash
- More experiments with sheets
- Buying more supplies
- Creating a sheet rig as described by Garrett
    - 1. Rigid flat plane with multiple pans or ribs system
    - 2. Square walls to contain shape
    - 3. Top plate to add pressure and top heat

Thank you!