

LulzBot Filament Testing Report

Manufacturer: Maker Geeks
Filament Type: PLA
Tested By: Brent Imhoff
Date: 4/19/16

Ease of use: 7/10

Appearance: 8/10

Color consistency: 4/10

Print temperature Range (C): 160-230/40-70

Variance in diameter: (2.80-2.94)

Minimum bend radius: 40mm (in non brittle sections)

Prints using current Lulzbot profiles/temps: Profiles work well on shorter prints, heat creep pops up on longer prints.



General Notes:

- ⑩ Very susceptible to heat creep, caused almost all of the test failures
- ⑩ PLA tends to warp, suspect something added from color/formula
- ⑩ Color consistency is poor (photo below)
- ⑩ Packaged without desiccant, could lead to moisture contamination when stored
- ⑩ Inconsistent sections, alternating from brittle to bendy (mixing?)



Health or environmental risks:

Eye Contact: Contact with eyes may cause irritation

Skin Contact: Substance may cause slight skin irritation

Ingestion: Ingestion may cause gastrointestinal irritation, nausea, vomiting, and diarrhea.

See SDS for full info.

Disposal Options:

In accordance with local and national regulations. Do not contaminate ponds, waterways, or ditches with chemical or used container.

Recommendation:

This PLA can be printed, and did not find any contaminants that can lead to clogging. Not as easy to print with as other PLA's due to heat creep. Due to consistency of color and blend, I would rate this as prints okay. I would not recommend carrying it due to the inconsistencies of blend (color and filament), and its tendency toward heat creep.

LulzBot Filament Testing Report

Manufacturer: 3D Fuel
Filament Name: Algae-fuel
Filament Type: PLA / Algea composite
Tested By: Brent M
Date: 8/10/2015

Ease of use: 9/10
Appearance: 10/10
Size consistency: Above average
Color consistency: Great
Print temperature: 175-210C

Prints using Lulzbot profiles/temp: Yes, with minor tweaks. PLA settings with the hotend temp dropped to 185C

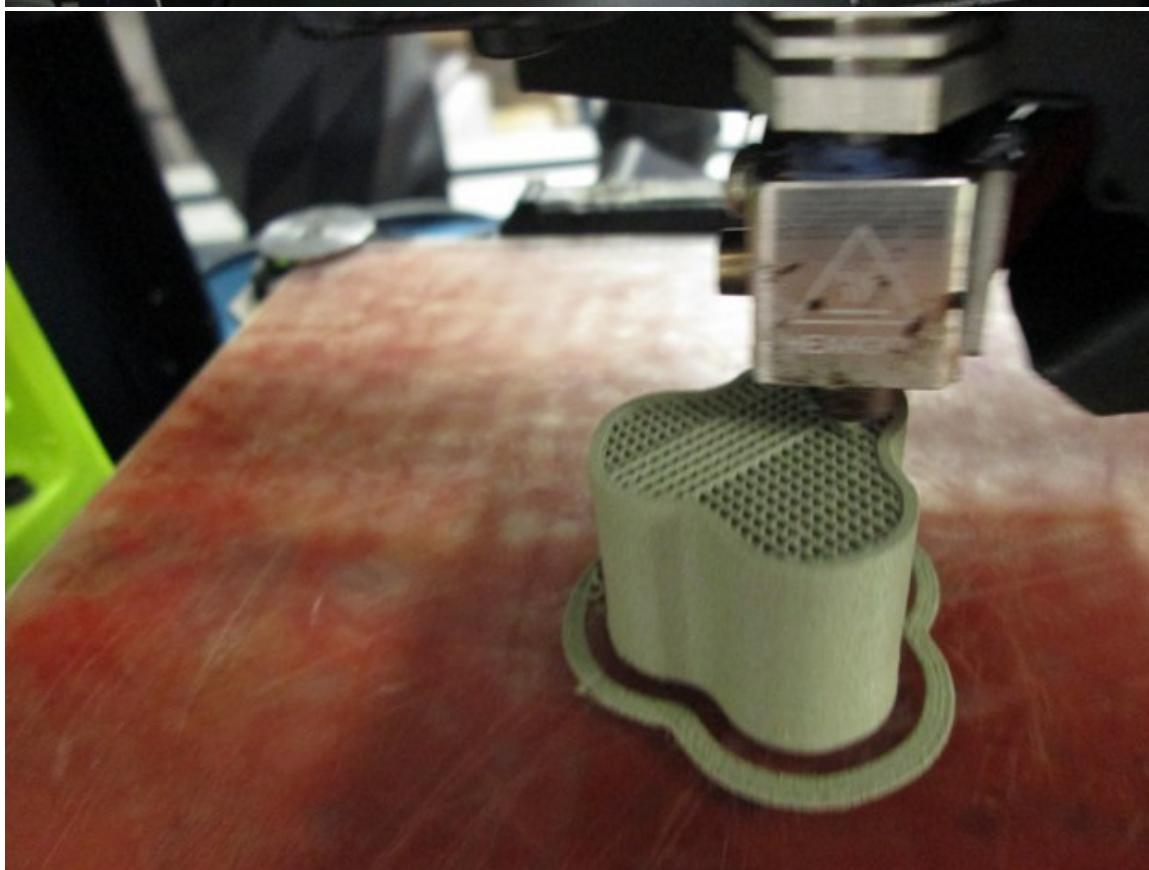
Recommendation: This is really a novel material with some pretty strong environmentally friendly credentials, and it prints easily on our machines. I'd like to see samples of 3mm from these guys to see if it matches the consistency of the 1.75mm, but I'm comfortable saying that this filament is R&D approved for use in LulzBot printers.

Notes:

- Great color consistency, and is a light shade of green with a surface texture similar to many wood/fiber filled PLA composites
- Very professional external packaging, definitely retail ready. Filament came packed inside in a vacuum sealed bag with desiccant on an unlabeled black spool. It's unclear if that will change for production versions.
- This filament has GREAT bridging properties even at low layer heights, very uncommon for PLA and filled PLAs.
- 1.75mm filament prints well through a standard 3mm hexagon.
- It definitely has a ...different... smell from what people are used to with PLA, something akin to seaweed but not terribly pleasant. The smell gets stronger at elevated temperatures, and is pretty bad at ~230C (in the case of switching from HIPS/ABS to the Algae-fuel).
- Printed parts have great surface finish and definition, a lot like Laybrick but with worse stringing (this is a known issue, a modified blend is being produced).
- Has some real environmentally friendly credentials, but keep in mind that this is a blend with 20% algae : 3D Fuel Algae-Fuel PLA Filament is being produced from wild harvested algae and PLA. Using GMO free wild harvested algae is truly a renewable resource. Utilizing algae to produce more sustainable plastic products helps to sequester environmental carbon, clean water and algae does not require the use of arable cropland as most other bioplastics require.

Filament	Variance in diameter	Maximum out of round	Extrusion temperature
Algae-Fuel	1.71-1.77mm (3.4%)	1.74-1.76mm (1.1%)	175C-210C 185C/60C used in print

		quality testing
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LulzBot Filament Testing Report

Manufacturer: Proto Pasta / ProtoPlant
Filament Name: Aromatic Coffee PLA
Filament Type: PLA filled with ~2% coffee extract
Tested By: Brent M.
Date: 12/30/2015

Ease of use: 7/10

Appearance: 10/10

Size consistency: 9/10

Color consistency: 9/10

Print temperature: 225/60

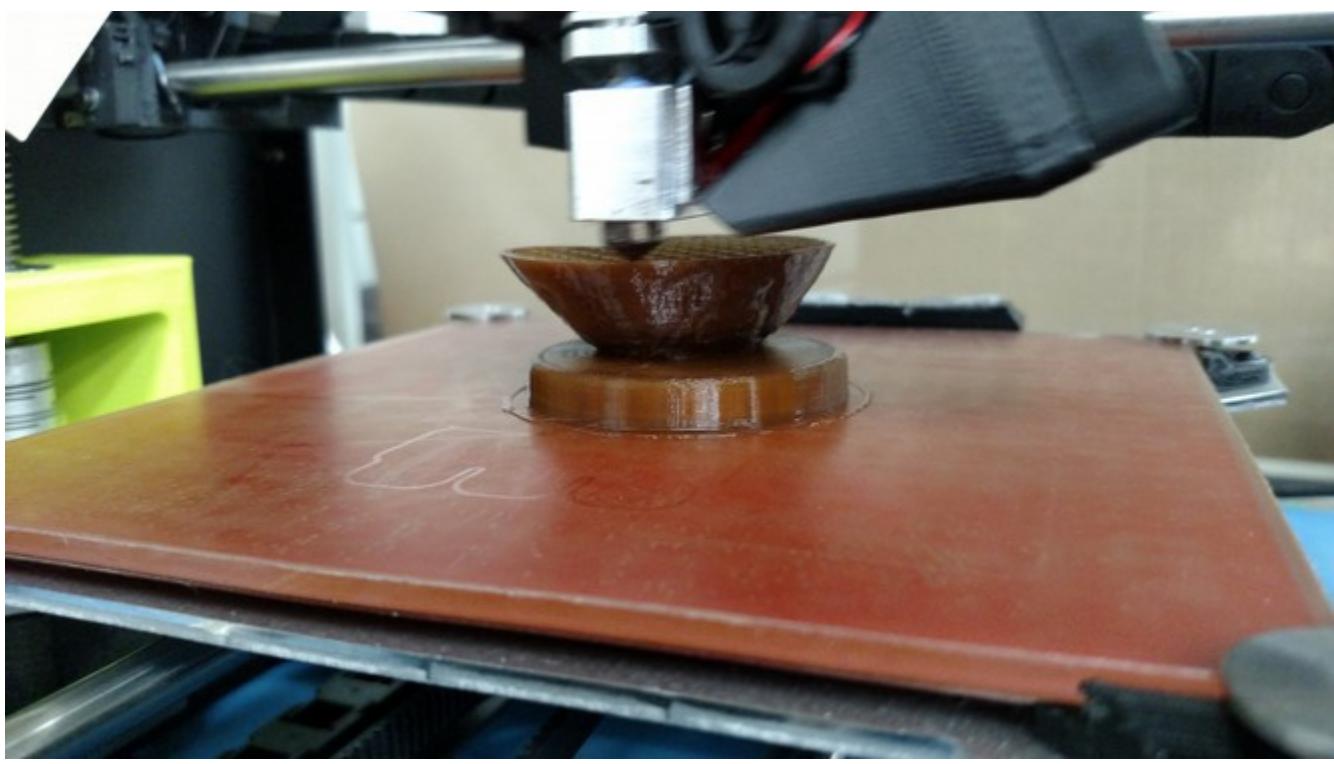
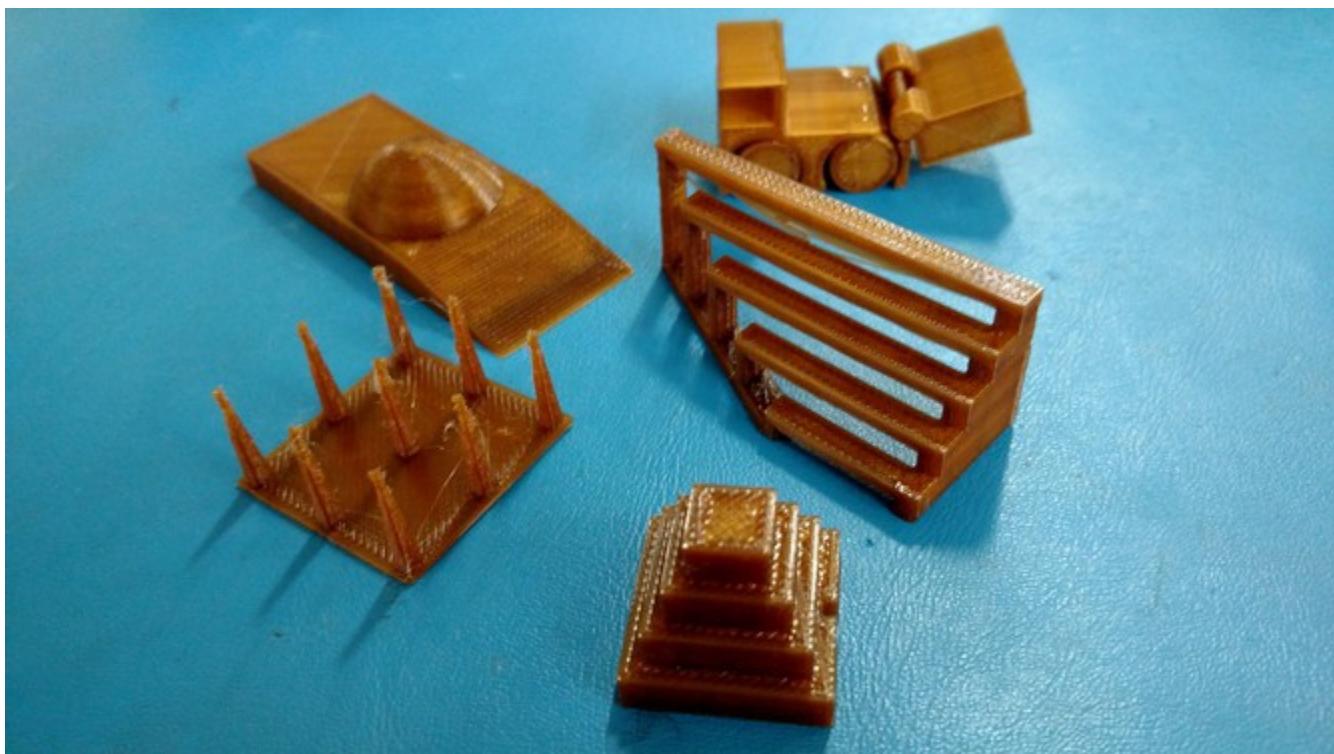
Prints using Lulzbot profiles/temp: Profile had to be created, strips out with std. PLA profiles

Notes:

- The base material for this filament is Protopasta's high temperature PLA
 - It can't be printed with the standard 205C print temperature, needs 220-230C (225 seems ideal).
 - It can be "annealed" by post processing in an oven at ~70-110C, this increases the heat deflection temperature to up to 140C
- The material is 98% HT PLA, ~2% coffee extract
- While printing there's a definite smell of coffee mixed with the sweet odor of PLA, there is no noticeable smell at room temperature.
- The packaging is a standard ProtoPasta cardboard spool with lulzbot label, looks nice.
- The color of the filament changes a bit depending on print temperature and speed, similar to wood filled filaments but not as drastic.
- The MSDS states a maximum safe temperature of 230C.

Recommendation: This is definitely a niche filament, but is of excellent quality and produces nice prints. Definitely R&D approved and can be sold once unique profiles are created. There should be a note on the product page to not bring the filament above 230C.

Filament	Variance in diameter	Maximum out of round	Print temperatures (C)
ProtoPasta Aromatic Coffee (2.85 mm)	2.82-2.86mm (0.04mm) in 10m sample	2.82-2.84mm (0.02mm)	225/60



Enye labs Filament testing notes:

Manufacturer: Enye labs
Filament Name: Recycled PET – clearish – 2.80mm
Filament Type: Off-clear PET – 100% recycled
Date: 3/18/2015

Ease of use: 2/10
Appearance: Good color – looks like what you'd expect from soda bottles
Size consistency: Average, but a bit low
Color consistency: Good, some black contaminants
Print temperature: 240/60 (LulzBot Mini)
Prints using Lulzbot profiles/temps: No

Notes:

b-pet

- A 100% recycled filament is something that a lot of people have been waiting for, and PET is probably the best material to do it with.
- The color is a bit off of clear, with some brown and green added in. I'm not sure if this will deter customers, but I think it's almost a feature -it's just about the color you'd expect from melted down soda bottles.
- Filament size consistency was about on par with most filament, but nominal size was a bit low. If this is consistent we can compensate for it in the filament profile, but it didn't cause any issues in the test prints we ran.
- This filament has a very narrow print temperature range between being able to extrude at all (230) to where it starts to boil (245). That being said, it printed mostly consistently once we got the temperature right.
- It should be fairly cheap compared to other PET's. The filament manufacturer has it on their website for \$30/kg, compared to 66\$/kg for t-glase and 163\$/kg for the chipped "ekocycle" filament from 3D Systems.
- The sample rolls received contained lots of contaminants

Recommendation:

This stuff is great, but not quite there yet. It is more finicky to print with than t-glase, but with a lower price point and 100% recycled content I think a lot of people would prefer it if the contamination could be dealt with.

Filament diameter accuracy / consistency:

Filament	Variance in diameter	Maximum out of round	Extrusion temperature
b-pet	2.70-2.82 (.12mm)	0.06mm (2.76-2.82)	230-240C (printed at 235C with .5mm hex nozzle)





Enye labs Filament testing notes:

Manufacturer: Enye labs
Filament Name: Recycled PET Batch 2– Natural – 3mm
Recycled PET Batch 2– Red – 3mm
Filament Type: PET – 100% recycled
Date: 9/8/2015

Ease of use: 2/10
Appearance: Good color – looks like what you'd expect from soda bottles
Size consistency: Poor – Out of round from ~2.8mm to 2.4mm
Color consistency: Good, some black contaminants
Print temperature: 240/60 (LulzBot Mini)
Prints using Lulzbot profiles/tempo: No

Notes:

b-pet - Red

- Filament size consistency was extremely poor on the red dyed filament, being out of round from 2.85mm maximum in the major dimension to 2.24mm minimum in the minor dimension. This causes the filament to strip much more readily if loaded into the toolhead with the narrow side pressed into the hobbed bolt.
- This filament has a very narrow print temperature range between being able to extrude at all (~240) to where it starts to boil (245). At 245C there were huge inconsistencies in the pressure required to feed. Feeding filament manually by hand at 245C, it's very clear that there are sections that melt more readily than others, resulting in the necessity to print the filament above the temperature that it starts boiling at in order to prevent filament stripping.
- The filament boiled badly at just over the minimum extrusion temperature, similar to nylon filaments that have absorbed water. This leads to inconsistent printing and poor surface finish. It might be dealt with with a better drying process of the filament prior to being extruded into filament.

Recommendation:

This filament is a great concept, but not quite there yet. It is more finicky to print with than t-glase, but with a lower pricepoint and 100% recycled content I think a lot of people would prefer it if we could print consistently with it. For this to happen, the

Filament diameter accuracy / consistency:

Filament	Variance in diameter	Maximum out of round	Extrusion temperature
B-PET (red 3mm batch 2)	2.24mm – 2.88mm	2.42-2.84mm	



PLA++ Physical Properties Datasheet

Property	Test Method	Value	Comment
Melt Flow Index/ g/10 mins	ASTM D1238	5 – 15	Dependent on color. Tested at < 400 ppm moisture
Density/ gcm ⁻³	ASTM D792	1.24	Resin Manufacturer data
Glass transition temperature/ °C	ASTM D3418	55-60	Resin Manufacturer data
Heat Deflection Temperature/ °C *	ASTM D648 at 66 psi	51	
Flexural Modulus/ kpsi	ASTM D790	330	
Tensile Strength at Break/ psi *	ASTM D638, Type IV	3640	
Tensile Strength at Yield/ psi *	ASTM D638, Type IV	4560	
Tensile Elongation/ % *	ASTM D638, Type IV	3.0	
Tensile Modulus/ kpsi *	ASTM D638, Type IV	290	
Notched Izod Impact/ Jm ⁻¹ *	ASTM D256	190	
Chemical Resistance	Unknown	<ul style="list-style-type: none">• Toluene: Sparingly soluble• Isopropyl alcohol: Insoluble• Heptane: Slightly soluble	Resin Manufacturer data

* 3D printed test specimens, 100 % solid, y-axis orientation

LulzBot Filament Testing Report

Manufacturer: Proto Pasta
Filament Name: Black Carbon Fiber PLA 3.0mm
Filament Type: Carbon filled PLA
Date: 7/27/2015

Ease of use: 8/10
Appearance: really nice slightly reflective surface, has a similar surface texture to wood filled filaments
Size consistency: Good
Color consistency: Good
Print temperature: 230/60 (LulzBot Mini)
Prints using Lulzbot profiles/temp: Yes, could use some minor tweaks

Recommendation: This is a super exciting filament, and it prints extremely well as long as the layer height is kept high enough to allow the carbon fibers to pass out of the nozzle (0.2mm or greater). 0.75kg run through a standard hexagon caused slight wear, enlarging the 0.5mm diameter orifice to nearly 0.6mm. We have also received a RMA TAZ with extensive wear to the aluminum nozzle Budashnozzle as well as the extruder body itself.

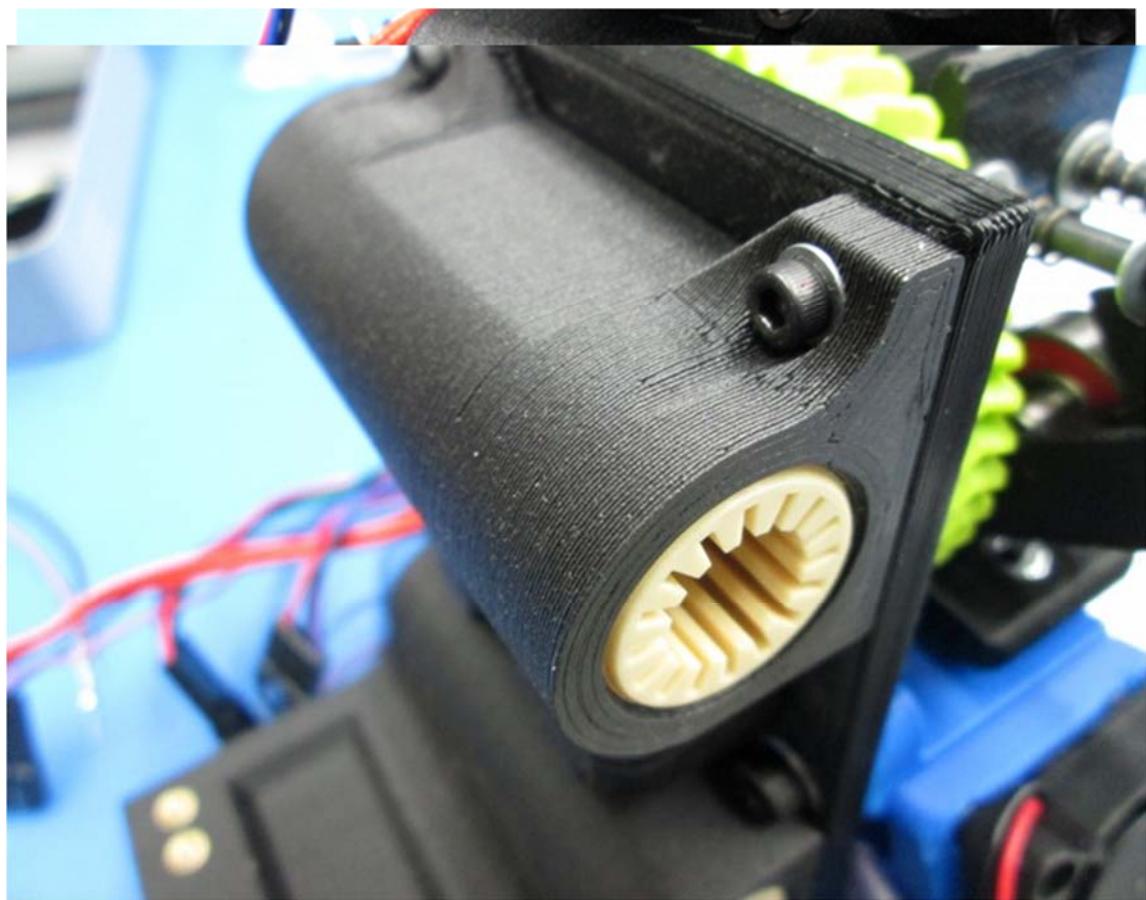
Because of the greatly increased rate of toolhead wear, the best path is to stay away from selling this filament until we can develop a more wear resistant hotend, or decide that toolheads can be considered consumable under our warranty and return policy. We have pushed profiles for the material, as well as a warning to users about the increased wear.

We are proceeding with testing large quantities of the carbon fiber filament with a hexagon modified to have a fully stainless steel filament path. We're in the process of running 9+kg of filament through the hotend to determine any other possible wear points.

Notes:

- Prints well with default PLA settings with the temperature bumped up to 230
- really great looking filament
- despite higher printing temperature, it's got the same low Tg for other PLA's making it unsuitable for any printer parts near the bed or toolhead

Filament	Variance in diameter	Maximum out of round	Extrusion temperature
3.0mm Carbon fiber PLA	2.84-2.90 (.06mm)	0.05mm (2.85-2.90)	190-240C (printed at 230C with standard profiles)



LulzBot Filament Testing Report

Manufacturer: NinjaTek
Filament Name: Cheetah, Multiple colors
Filament Type: PLA
Tested By: Brent M
Date: 02/01/2016

Ease of use: 7/10

Appearance: 10/10 Same basic color set as Ninjaflex/Semiflex

Color consistency: 10/10

Print temperature Range (C): 205-230/0-110

Variance in diameter: (2.86-2.93)

Minimum bend radius: NA, you can tie this stuff in a knot :)

Prints using current Lulzbot profiles/temps: Yes, profiles will have to be created for this material due to its much higher print speed capability.

General Notes:

- Wipe and probe from ninjaflex profiles works well
- Has a much smoother surface texture than ninjaflex
- Color was very consistent throughout the roll.
- Shore hardness of 98A, same as semiflex (ninjaflex is 45A)
- This material warps badly on 40C glass with full fan (227 extrusion temperature). Very badly, this material likely can't be printed on bare glass as semiflex can.
- Cheetah sticks to PEI and releases well – shouldn't need gluestick
- Cheetah prints well at at least double the maximum print speed of ABS.
- Fast prints at 36mm/s infill looked good at 227C, should be able to go much faster if we can raise the temperature. (this is at least 8.64mm³/s for cheetah compared to 4.30 for ninjaflex).

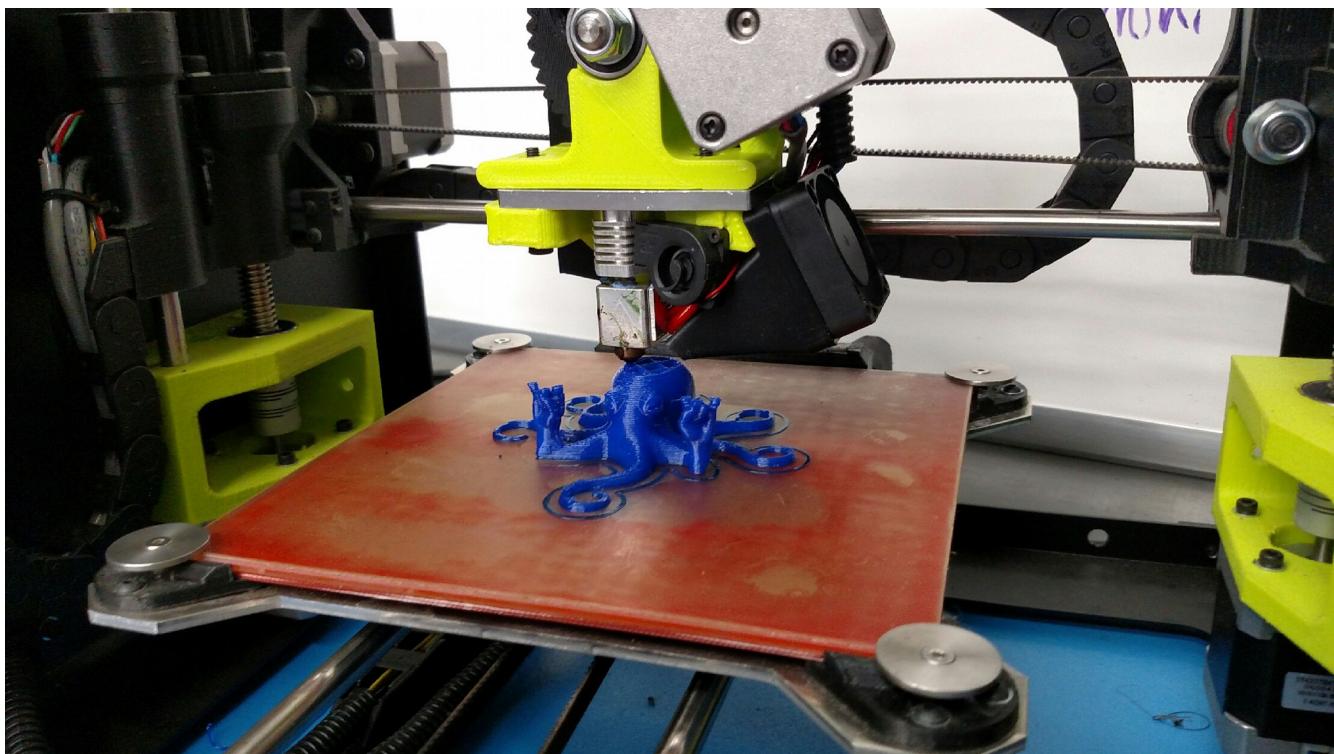
Health or environmental risks:

- 230C is the absolute maximum temperature that this filament should be allowed to reach. Profiles should have temperatures set at 227 or lower in case of temperature fluctuation.
- There is indication that this material is safe up to 250C on Fenner Drives' website, but this needs to be confirmed before we can test higher temperatures.
- Cheetah is poorly biodegradable
- During fused deposition modeling operations, use with ventilation adequate to reduce levels of air contaminants below that which may cause personal injury or illness. Local exhaust ventilation that removes air contaminants from the breathing zone is preferred. General, mechanical, or dilution ventilation may be suitable.

Disposal Options:

- **Material Disposal:** Incinerate in a licensed facility. Do not discharge substance/product into sewer system. Dispose of in a licensed facility.
- **Container Disposal:** Dispose of in accordance with national, state and local regulations.

Recommendation: We should definitely carry this filament as an improved version of semiflex; from my initial impression there is very little reason to use semiflex as opposed to cheetah.



LulzBot Filament Testing Report

Manufacturer: Proto Pasta
Filament Name: Black conductive PLA 3.0mm
Filament Type: Conductive PLA
Date: 3/4/2015

Ease of use: 10/10
Appearance: looks just like black PLA, a bit matte at standard PLA temps
Size consistency: Average
Color consistency: Good
Print temperature: 205/60 (LulzBot Mini)
Prints using Lulzbot profiles/temps: Yes, could use some minor tweaks

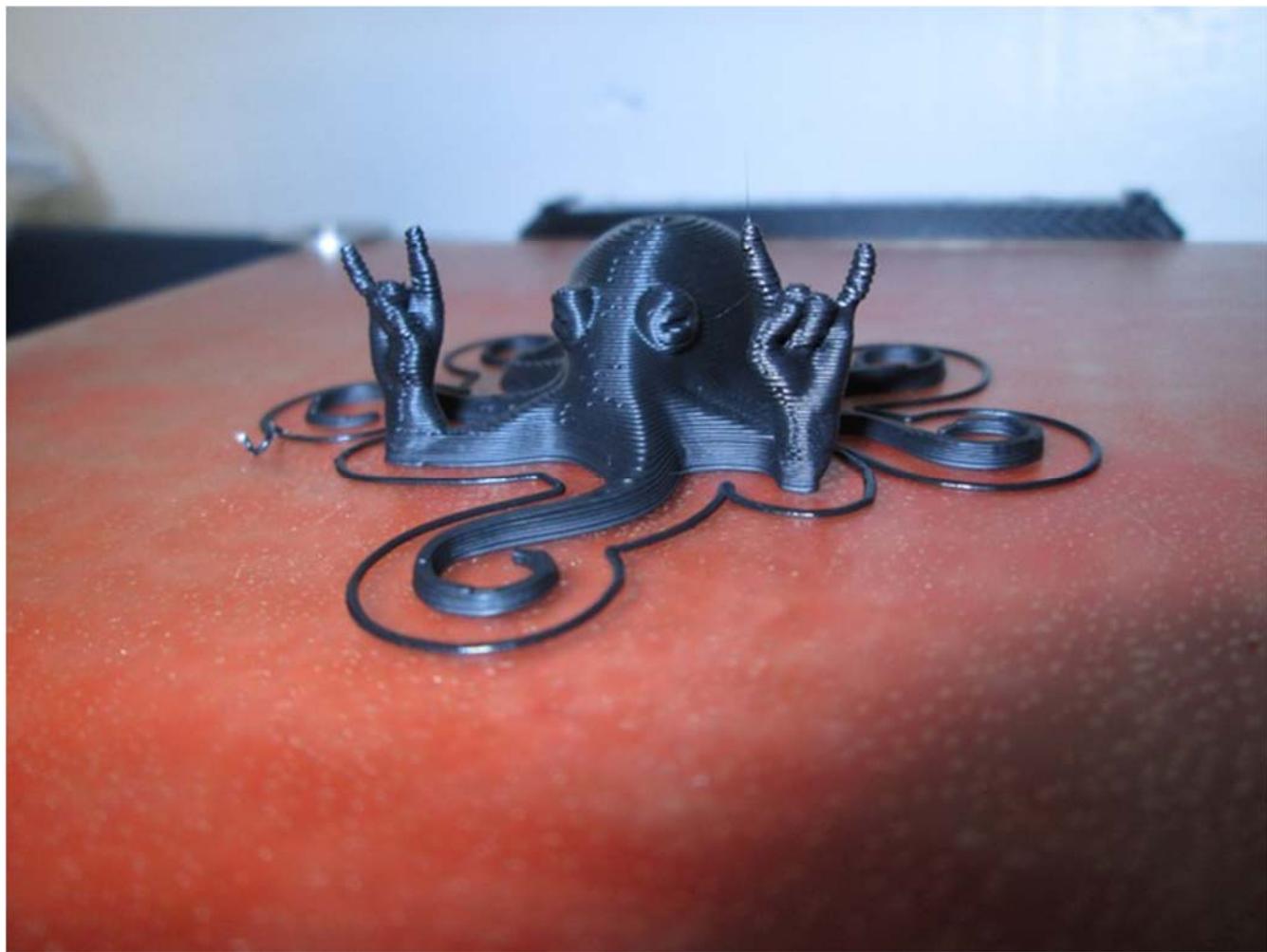
Recommendation: This stuff is great. It's more conductive than either of the esun conductive materials I've tested, it prints like PLA should, and it's got an MSDS. Great looking print first time with no noticeable effects from the conductive additive.

Notes:

- Prints well with default PLA settings
- Wipe works reasonably well, could be made better with custom config
- Diameter consistency was average

Filament	Variance in diameter	Maximum out of round	Extrusion temperature
3.0mm conductive PLA	2.82-2.89 (.07mm)	0.04mm (2.85-2.89)	190-220C (printed at 205C with standard Mini profiles)





E-sun filament testing notes

Red 3mm ABS:

- Diameter varied in a random 1m sample from 2.81 to 2.91mm
- Oozes a bit at 230C, not worse than Village plastic's red ABS

Orange 3mm ABS:

- Diameter varied between 2.78mm and 2.91 over the 3M sample
- Prints well at 230C
- Parts seem more brittle than Village ABS, more like HIPS

3mm natural PVA:

- Boils out of extruder at above 200C, coats inside of buda badly
- Prints well @ 190C
- Dissolves in cold water overnight, much faster in warm moving water (washing)
- Adheres well to ABS printing at 200 (PVA) and 230 (ABS)
- Diameter varied from 2.65 to 2.93mm

3mm HIPS (yellow)

- Prints similarly to ABS
- Diameter of filament sample ranged from 2.82-2.95mm
- Still warped a small amount, but better than ABS
- Has a nice dry look and feel

3mm Natural PLA

- Prints easily at 170-195, oozes quite a bit
- VERY similar to Village PLA
- Diameter was pretty consistent (2.76-2.85mm)
- Back of octopuses' head warped, would probably do better with a fan

3mm Conductive ABS

- Prints very similar to regular abs.
- Doesn't stick to the PET bed as well as normal abs.



Conductive ABS

Esun Filament testing notes 2:

Notes:

PETG Yellow 1.75mm

- Stuck to glass bed very well without any adhesive.
- Not the best material for bridging.
- This material is super strong.

PLA Silver 3mm

- Prints well we have had trouble with silver colored filaments before.
- Silver parts have a glossy look to them.

ABS Blue 3mm

- I didn't use the best settings when printing this but it prints like any other abs.

Laywood Brown 1.75mm

- It looks more like PLA than laywood compared to others like it.
- The color is cool unique one.
- Had to turn the bed temp up to 80 to get it to stick.

Laywood Nature 1.75mm

- Prints similar to the brown is extremely brittle, filament broke while feeding into filament guide.
- Looks like tan PLA but it breaks easier and doesn't stick as well.

Nylon 1.75mm

- Is difficult to print with like most nylon.
- Used a lot of glue stick to get it to stick on the bed.

HIPPS Green 1.75mm

- It prints awesome just like every HIPPS filament.

Flexible 1.75mm

- Has the consistency of bubblegum.
- Could not get it to print filament bends when feeding.
- We could maybe print this if we ever made a flexystruder that was 1.75mm.

UV to Red 1.75mm

- Has the consistency of bubblegum.

Recommendation: .

Filament diameter accuracy / consistency:

Filament	Variance in diameter	Maximum round	Extrusion temperature
PETG	1.67-1.73 (.6mm)	0.01mm (1.72-1.73)	230-250C (printed at 240C with .5mm hex nozzle, bed temp 100C)
PLA Silver	2.79-2.91 (.11mm)	0.01mm (2.9-2.91)	190-220C (printed at 190C with .5mm hex nozzle)
ABS Blue	2.84-2.91 (.6mm)	0.03mm (2.88-2.91)	220-230C (printed at 230C with .5mm hex nozzle)
Laywood Brown	1.58-1.66 (.5mm)	0.06mm (1.60-1.66)	190-200C (printed at 190C with .5mm hex nozzle)
Laywood Nature	1.63-1.72 (.9mm)	0.03mm (1.69-1.72)	190-200C (printed at 190C with .5mm hex nozzle)
Nylon	1.70-1.78 (.8mm)	0.03mm (1.75-1.78)	230-260C (printed at 250 with .5mm hex nozzle)
HIPPS Green	1.61-1.73 (.12mm)	0.02mm (1.71-1.73)	220-230C (printed at 230 with .5mm hex nozzle)
Flexible	1.62-1.68 (.6mm)	0.01mm (1.67-1.68)	190-220C (printed at 200 with .5mm hex nozzle)
UV to Red	1.75-1.77 (.3mm)	.01 mm (1.76-1.77)	
Average	1.75mm (+/- .45mm)	0.025mm	

LulzBot Filament Testing Report

Manufacturer: Proto-Pasta
Filament Type: Everyday PLA
Tested By: bam
Date: 4/25/16

Ease of use: 5/10

Appearance: 7/10

Color consistency: 10/10

Print temperature Range (C): 190-220/40-60

MELTING RANGE: 50°-180°C,

AUTO-IGNITION TEMPERATURE: 300C-400C

DECOMPOSITION TEMPERATURE: 482F (250C)

Variance in diameter: (2.82-2.84)

Minimum bend radius:

Prints using current Lulzbot profiles/temps: No, it would likely work well with standard PLA slowed down to 60% or with the extrusion temperature bumped up to 210C

General Notes:

- Nice looking spool, same recyclable cardboard as their other filaments
- the filament has a nice matte texture similar to ninjaflex, but the prints look glossy and nice like other PLA
- This PLA does not print well with our standard village or esun PLA settings, either the extrusion temperature needs to be raised or the print speed slowed down.
- It's currently unclear if this filament will be released at all and how many colors there might be.
- The name would likely change before release, as e3d has recently started selling a PLA called everyday PLA as well

Health or environmental risks:

'This is a polymeric compound. All ingredients are encapsulated by the polymer and present no likelihood of exposure under normal conditions of processing and handling.'

EYES: Solid/dust may cause irritation due to mechanical action. Dust will not be generated under normal use conditions.

SKIN: Filament is not likely to cause irritation. Contact with molten material may cause thermal burns.

BURNS: Molten material will cause thermal burns, avoid contact.

INHALATION: Processing fumes may cause irritation to the respiratory tract, use in well ventilated areas only.

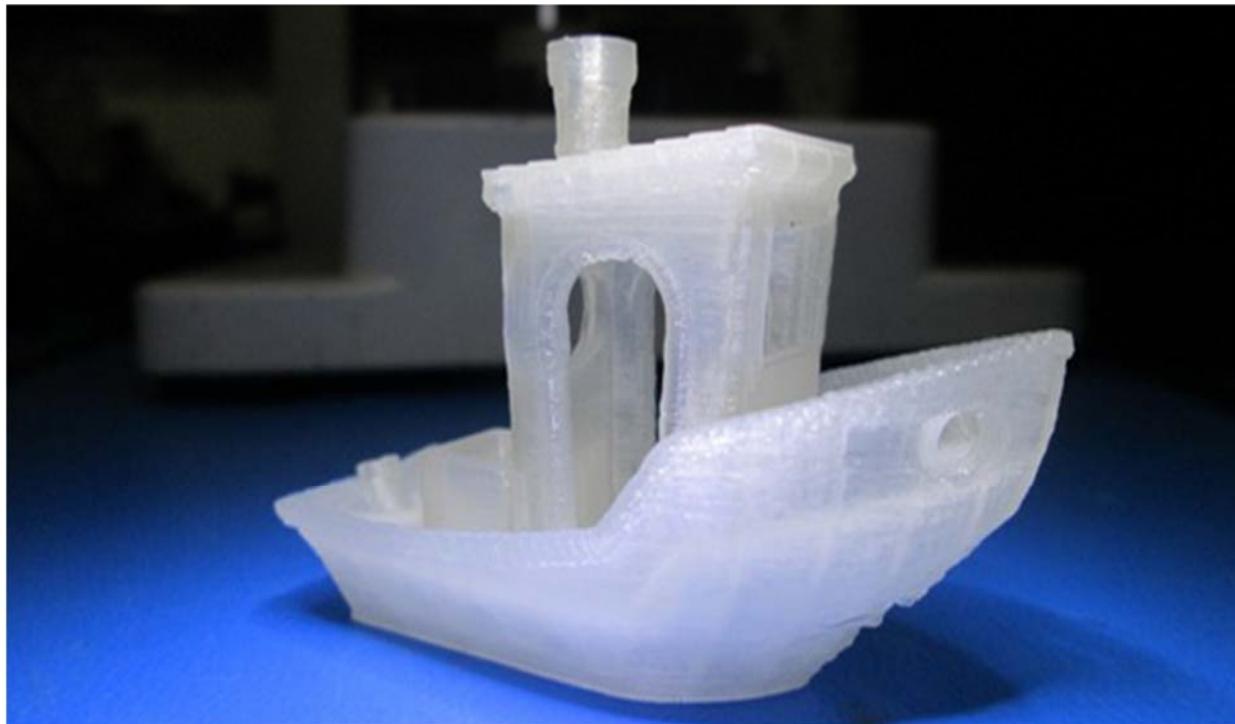
CHRONIC HEALTH HAZARDS: None known for this compound.

Disposal Options:

'WASTE DISPOSAL METHOD: In accordance with local and national regulations. Do not contaminate ponds, waterways or ditches with chemical or used container. For recycling, contact local waste disposal centers.'

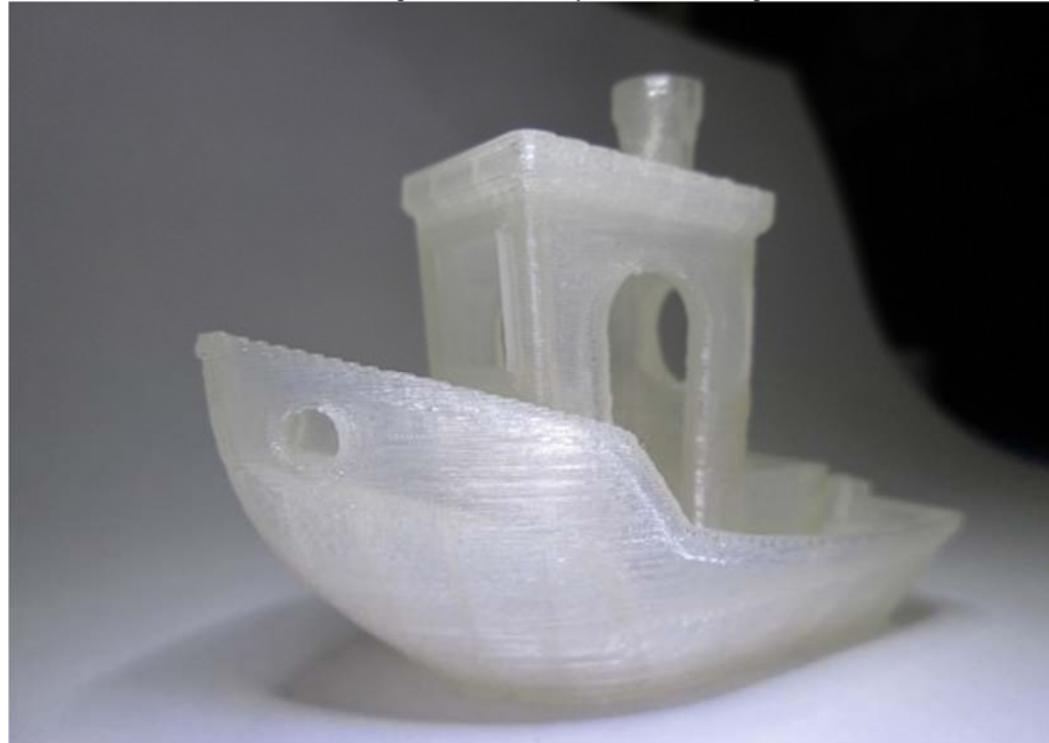
Recommendation:

Overall this is a very nice PLA, and the sample received has the most consistent thickness of any filament I've ever tested. In order to carry this filament we would need to create unique profiles for it.



ABOVE: Print with standard PLA settings, you can see a noticeable improvement when the minimum layer setting cuts in, slowing down the print.

BELLOW: Standard PLA settings with min layer time changed from 20 to 40s.



LulzBot Filament Testing Report

Manufacturer: Functionalize
Filament Name: PLA 3mm Black conductive
Filament Type: F-Electric
Tested By: Patrick R.
Date: 02/16/2016

Ease of use: 8/10

Appearance: 9/10

Color consistency: 10/10

Print temperature Range (C): 200-230/50-60

Variance in diameter: (2.86-2.86)

Minimum bend radius: Filament breaks very easily.

Prints using current Lulzbot profiles/temps: Default conductive profile works great.

General Notes:

- Manufacturer recommended printing range 215C to 230C (215 yielded better results for me).
- Filament is extremely brittle need to make sure there are no sharp bends to avoid snapping.
- Color was consistent throughout reel.
- Nice professional looking packaging and reel.
- It was measured around the same resistivity as our current conductive filament.
- Best part about this filament is that it does not require extra purging to clean out and does not leave a residue on the pei like the protopasta filament.

Health or environmental risks:

May cause eye irritation, May cause respiratory irritation, if sanding, if swallowed seek immediate medical attention.

Disposal Options:

Do not dispose of down drain. Do not create dust when cleaning up, use water sprayer if necessary.

Recommendation:

It might be a little more expensive, and a little more brittle but has some real positives to it prints with default conductive profile, does not leave residue on pei, and it purges out of the nozzle easily.



Illustration

1: Functionalize



Illustration

2: Protopasta

LulzBot Filament Testing Report

Manufacturer: 3DFuel
Filament Name: Advanced PLA
Filament Type: PLA
Tested By:
Date: 03/01/2016

Ease of use: X/10

Appearance: X/10

Color consistency: 10/10

Print temperature Range (C): 190-230/50-60

Melting Range: 150-180°C/302-356°F

Conditions to Avoid: Temperatures above 230°C/446°F. Avoid keeping resin molten for excessive periods of time at elevated temperatures. Prolonged exposure will cause polymer degradation.

Variance in diameter: (1.68-1.73mm)

Minimum bend radius: <1", not especially brittle

Prints using current Lulzbot profiles/temp: Custom profiles should be created. Tested with std PLA with extrusion temp set to 210

Notes:

- This is the same base material and ProtoPasta's high temp PLA, CAS No. 9051-89-2
- Prints well with standard PLA settings, 210 at the extruder is better for fast printing.
- Seems to be a bit stiffer than our e-sun PLA, and had excellent layer adhesion.
- Printed parts heated to 135 are much more rigid than comparable ABS parts, super impressive for a PLA
 - It should be noted that the PLA is still definitely above its glass transition temperature in this testing, and that a printed part would permanently deform at these elevated temperatures, just not as much.
- Nice glossy surface finish at 205C, good layer adhesion.
 - Mechanical properties and layer adhesion are improved at 210C extruder temperature.
- Extruded in the USA
- Color consistency was good and had nice glossy surface finish

Health or environmental risks:

Principle Routes of Exposure: Eye contact, skin contact, inhalation, ingestion.

Acute Toxicity: No target organ effects noted following ingestion or dermal exposure in animal studies.

Local Effects: Product dust may be irritating to eyes, skin and respiratory system. Resin particles, like other inert materials, are mechanically irritating to eyes. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.

Specific Effects: May cause skin irritation and/or dermatitis. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough. Burning produces irritant flames.

Long Term Toxicity: None found

Carcinogenic Effects: None of the components of this product are listed as carcinogens by IARC,

NTP, or OSHA.

Ecotoxicity: EC50/72h/algae > 1100 mg/L

Mobility: No data available

Persistence, Degradability: No data available

Bioaccumulation: Does not bioaccumulate.

Disposal Options:

Dispose of in accordance with national, state, and local regulations.

Recommendation: This advanced PLA is modified to have a higher heat tolerance than normal PLA, and even higher than ABS. In our testing it exhibited more ductility and impact resistance than standard PLA, making it more of a competitor with HIPS or ABS than with our other PLAs. At 135C, it's much more rigid than ABS, although it will still deform pretty readily. It prints well with default Lulzbot PLA settings but does better with the hotend temperature turned up to 210C. It is definitely "LulzBot Approved" from our criteria in R&D. It's only available in a limited range of colors, so it likely would not be a replacement for e-Sun PLA, but could be sold as another offering of high temperature PLA.



APLA (white) after being removed from a 135C oven exhibits some deformability, but impressively little. For reference the black ABS test piece was very easily bent into a u shape at the same temperature. Pretty cool.

LulzBot Filament Testing Report

Manufacturer: Two Bears
Filament Type: bioFila plaTec
Tested By: Patrick
Date: 4/25/16

Ease of use: 10/10

Appearance: 9/10

Color consistency: 10/10

Print temperature Range (C): 185C-220C

Material Physical Properties:

Melting point / range: 160-230C

Ignition temperature: not listed

Decomposition temperature: not listed

Variance in diameter: (2.80-2.85)

Minimum bend radius: Under 6mm was not able to get this to snap easily.

Prints using current Lulzbot profiles/temp: Yes prints great using standard pla profiles.

General Notes:

- ⑩ This pla is more durable on the reel than most of the other pla filaments we have tested.
- ⑩ Is expensive and only available in natural color.
- ⑩ Color consistent throughout the roll.
- ⑩ It looks like they stamped the wrong expiration date on the reel then tried to correct it with a ball point pen.
- ⑩ Printed parts behave like abs when broken rather than shattering like most pla.

Health or environmental risks:

Under normal conditions the processing and compounding is stable and there are no observable hazardous reactions nor products of decomposition.

No toxicologic short-term or long-term effects are known.

The material is only composed of eco-friendly components. So the material can be counted as eco-friendly.

Disposal Options:

The best way of disposal is

- I.) Recycling, i.e. recovery of the material or
- II.) burn, with due regard to the local laws and regulations

Recommendation:

Filament itself is great, prints are durable, bridging/overhangs look awesome. Reel was mislabeled and then fixed with ball point pen, looks a little unprofessional. Overall I would recommend this filament assuming the little cosmetic things on the reel were fixed so that it would be presentable to a customer.



LulzBot Filament Testing Report

Manufacturer: TwoBEars
Filament Type: Silk
Tested By: Patrick
Date: 4/29/2016

Ease of use: 8/10
Appearance: 10/10
Color consistency: 10/10
Print temperature Range (C): 180-200 C

Material Physical Properties:

Melting point / range: 140-200°C
Ignition temperature: not tested
Decomposition temperature: 205-210°C

Variance in diameter: (2.78-2.93)

Minimum bend radius: This filament is really bendy couldnt get it to break.

Prints using current Lulzbot profiles/temp:

A new profile would need to be created for this filament it doesnt print well at pla temperatures.
Changed temp to 180 and increased min layer time to 25-30 and turned fan on full at 3 mm to get good results.

General Notes:

- ⑩ Parts have a really cool shiny finish to them.
- ⑩ Prints great at a low temperature.
- ⑩ Color consistent throughout the roll.
- ⑩ Nice professional looking packaging.
- ⑩ I think they accidentally stamped the wrong exp. Date on this reel.

Health or environmental risks:

Under normal conditions the processing and compounding is stable and there are no observable hazardous reactions nor products of decomposition.

No toxicologic short-term or long-term effects are known.

The material is only composed of eco-friendly components. So the material can be counted as eco-friendly.

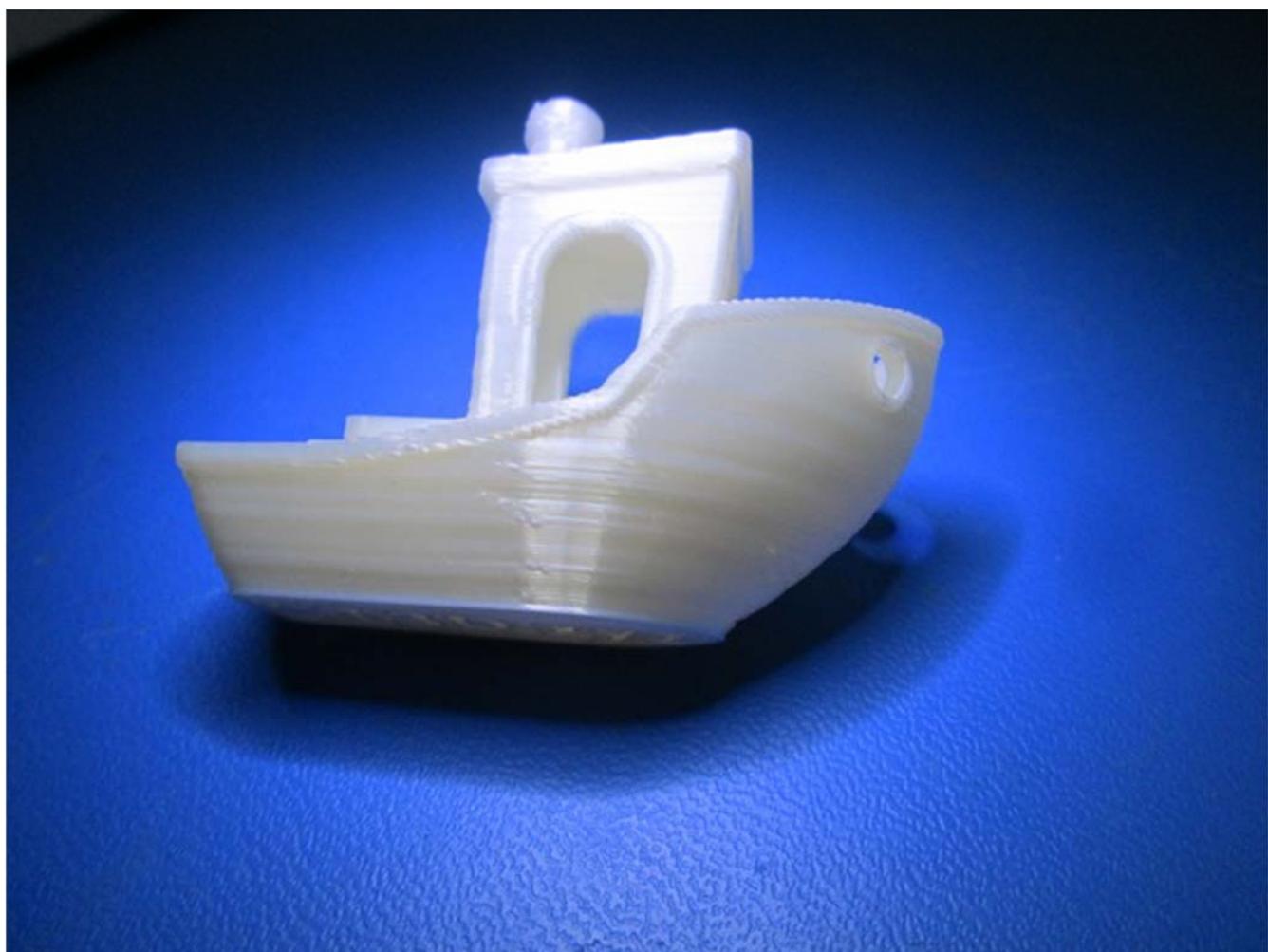
Disposal Options:

The best way of disposal is

- I.) Recycling, i.e. recovery of the material or
- II.) burn, with due regard to the local laws and regulations

Recommendation:

I highly recommend we sell this filament the prints look great and its a specialty filament that cant really be compared to anything else.



LulzBot Filament Testing Report

Manufacturer: Smart Materials 3d / enye labs
Filament Name: b-pet
Filament Type: recycled PET
Tested By: Brent M
Date: 03/15/2016

Ease of use:

X/10

Appearance:

7/10

Color consistency:

9/10

Print temperature Range (C): 245-260 (SDS softening 170F)

Variance in diameter: (2.80-2.83)

Minimum bend radius: N/A

Prints using current Lulzbot profiles/temp: No

General Notes:

- Packaged on a colorfabb style clear spool with nice label. Spool was dirty inside of the sealed plastic bag.
- The material still has a very narrow print range, seems to do best at 250C
- Color is pretty consistent
- 1 of 3 prints successful with default profile, slowing down print doesn't seem to help
- Material became noticeably clouded after 1 week in r&d
- Seems to do well with INOVA profile with extruder temp bumped up to 250C with a freshly opened reel
- Certain layers turn cloudy white during printing, seems to be related to back-pressure (shows up on overfilled/squished layers)

Health or environmental risks:

Threshold Limit Value (TLV): Not established

Emergency and First Aid: If burned by contact with molten material, cool quickly as possible with water, and then go to see a physician for treatment of burn.

Exposure effects:

Inhalation: No data available

Eyes: Can cause mechanical irritation

May be harmful by ingestion, causes eye and skin irritation

None of the components present in this material at concentrations equal to or greater than 0.1% are listed by IARC, NTP, OSHA or ACGIH as a carcinogen.

Disposal Options:

Recycle, landfill, or incineration. Observe regulations of local authority.

Transportation: This material is NOT classified as dangerous for transport

Recommendation:

LulzBot Filament Testing Report

Manufacturer: E3D Online

Filament Type: Scaffold

Tested By: Bam

Date: 7.22.16

Ease of use: 6/10

Appearance: 8/10 (Support material, color is irrelevant)

Color consistency: 10/10

Print temperature Range (C): (180-210/0-90)

Variance in diameter: (2.84-2.89)

Minimum bend radius: N/A

Prints using current Lulzbot profiles/temps: Yes, can be used with PVA dual extrusion profiles

Manufacturers Properties:

Melting point: 150-230C

Flash point: >200C

Auto-ignition temperature: 520C

General Notes:

- Nice packaging, and interesting grey opaque color for a PVA
- Seems to be more rigid than PVA, and forms better support structures
- This PVA has been chemically modified to work better with PET materials, but also shows great adhesion to HIPS.
- Prints extremely well when package is first opened, but absorbs water very readily
- Tends to degrade quickly when the reel has absorbed water leading to clogs in nearly all prints after the first few hours of having the reel exposed to the air.
- Contains 99%+ PVA with the remainder being methanol from the manufacturing process

Health or environmental risks:

Dangerous Decomposition Products: Build-up of dangerous/toxic fumes possible in cases of fire/high temperature.

Conditions to avoid: No data available

Ecological:

Mobility: No data available

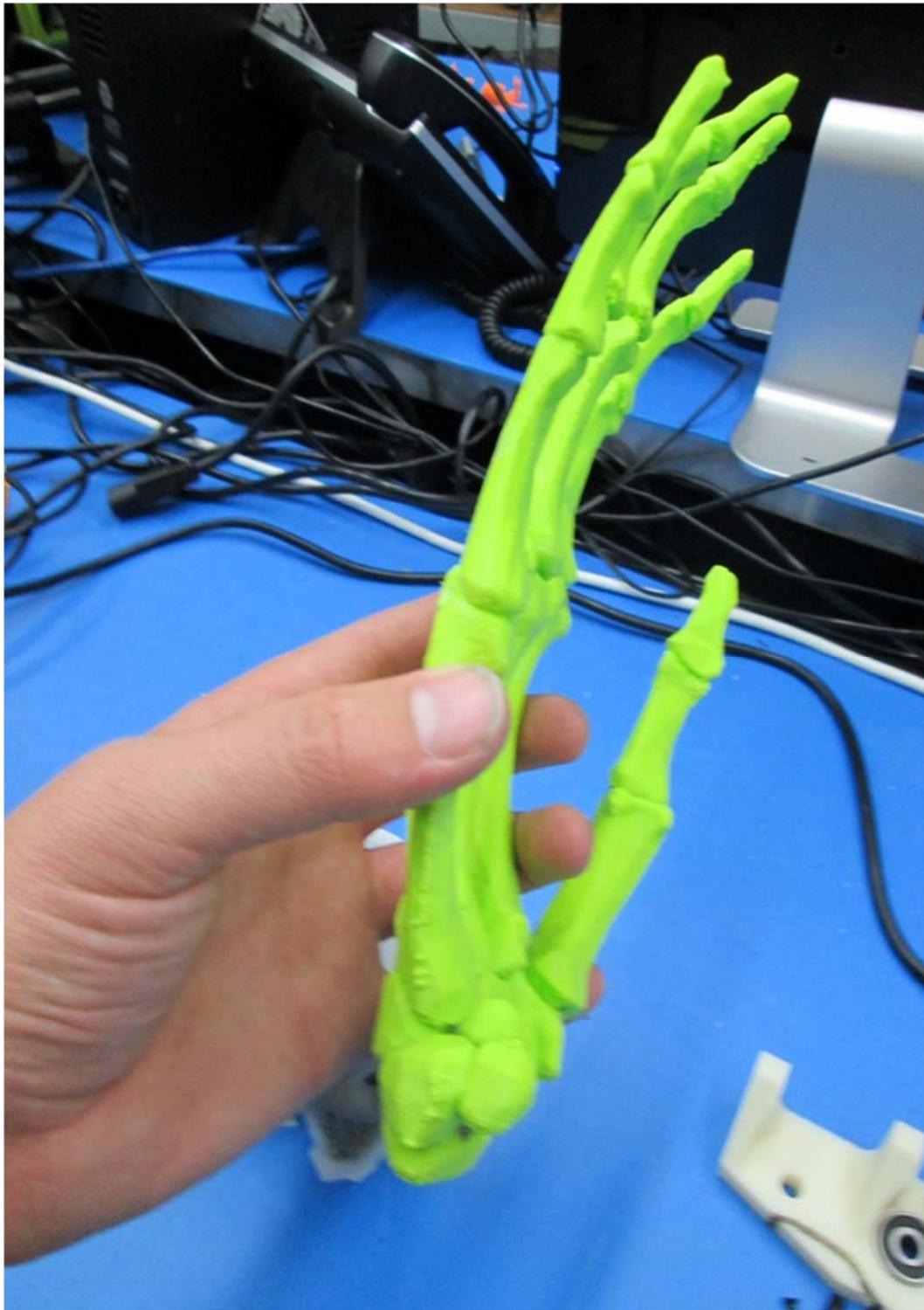
Bioaccumulation: Readily biodegradable

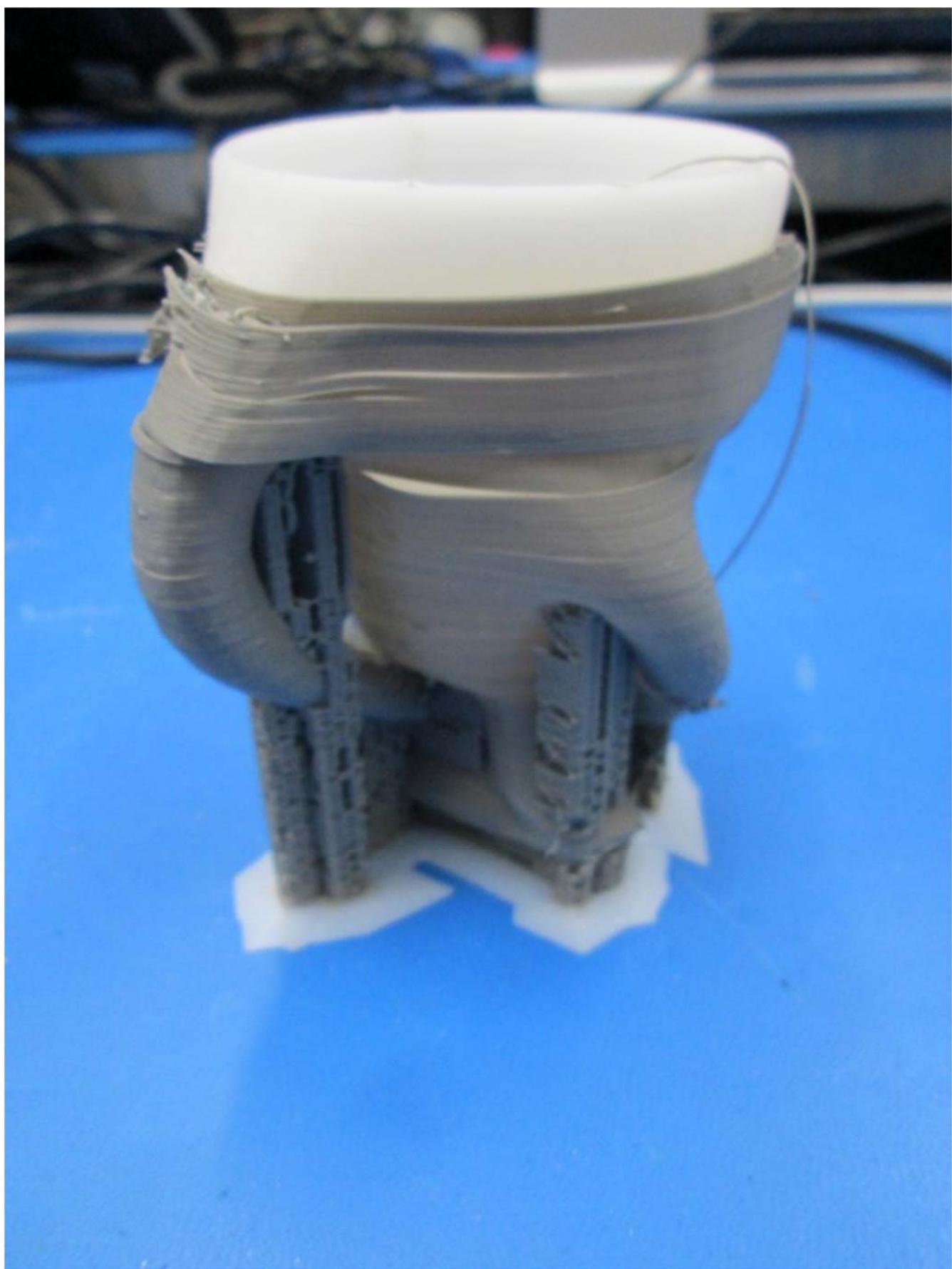
Ecotoxicity effects: Data not available.

Disposal Options:

Disposal: In accordance with local and national regulations. Do not dispose of together with household waste. Waste codes should be assigned by the user based on the application for which the product was used. Recommend putting this on product page if we carry the material since it's likely to get dumped down a drain.

Recommendation: This filament performs better than standard PVA in many ways, creating rigid, dimensionally accurate support and adhering to a wider variety of materials. That being said, if the reel is left out for even one day, it begins to clog frequently rather than just bubbling furiously. Based off of this we cannot recommend scaffold until moisture no longer causes complete failure (clogs). E3d has this filament listed as a work in progress, so we may touch base with them in the future.





LulzBot Filament Testing Report

Manufacturer: MakerGeeks
Filament Name: HIPS
Filament Type: HIPS
Tested By: Brent M
Date: 01/12/2016

Ease of use: X/10
Appearance: X/10
Color consistency: 10/10

Print temperature Range (C): 190-230/50-60

Variance in diameter: (X.XX-X-XX)

Minimum bend radius:

Prints using current Lulzbot profiles/temps: Yes, profiles had to be created for this material

General Notes:

- Great density and feel, especially when polished
- Needed to be printed at a hotter temperature than manufacturer recommends (230 vs 190-210C)
- Color was very consistent throughout the roll.
- Nice professional looking packaging.
- The material is pretty brittle when printed (similar to laybrick), but it feeds off of the spool very nicely.
- Material tends to build up on the tip of the nozzle and cause print defects
-

Health/Toxicity Risks:

Ingestion

Single dose oral LD50 has not been determined.

Typical for this family of materials. Estimated LD50, Rat > 5,000 mg/kg

Skin Absorption

The dermal LD50 has not been determined.

Typical for this family of materials. Estimated LD50, Rabbit > 2,000 mg/kg

Inhalation

The LC50 has not been determined.

Repeated Dose Toxicity

Based on available data, repeated exposures are not anticipated to cause significant adverse effects.

Environmental Risks:

Movement & Partitioning

No bioconcentration of the polymeric component is expected because of its high molecular weight. In the terrestrial environment, material is expected to remain in the soil. In the aquatic environment, material will sink and remain in the sediment.

Persistence and Degradability

This water-insoluble polymeric solid is expected to be inert in the environment. Surface

photodegradation is expected with exposure to sunlight. No appreciable biodegradation is expected.

ECOTOXICITY

Not expected to be acutely toxic, but material in pellet or bead form may mechanically cause adverse effects if ingested by waterfowl or aquatic life.

Disposal Options:

DO NOT DUMP INTO ANY SEWERS, ON THE GROUND, OR INTO ANY BODY OF WATER. All disposal practices must be in compliance with all Federal, State/Provincial and local laws and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator. The preferred options include sending to a licensed, permitted: Recycler, Reclaimer, Incinerator or other thermal destruction device.

Recommendation:

LulzBot Filament Testing Report

Manufacturer: Breathe-3DP
Filament Name: PLA++
Filament Type: PLA
Tested By: Brent M
Date: 01/12/2016

Ease of use: 10/10

Appearance: 9/10

Color consistency: 10/10

Print temperature Range (C):

Melting Point (C): 180 – 220°C

Decomposition Temperature (C): 240°C

Variance in diameter: (2.82-2.85)

Minimum bend radius: NA, extremely ductile

Prints using current Lulzbot profiles/temp: Ooh yeah :) default PLA settings look great

General Notes:

- Only comes currently in 7 opaque colors, but they're nice colors
- Spool and box feel and look cheap
- Extremely ductile, feels like ABS
- Prints extremely well using default PLA settings
- Spools are labeled with an ID number
- Printed parts do much better than PLA/PHA on overhangs

Health Risks:

Eyes: No significant eye irritation or eye toxicity during normal use.

Skin: No significant skin irritation. Molten polymer may cause thermal burns.

Ingestion: May cause irritation to the throat, mouth and stomach and / or may cause nausea.

Inhalation: Inhalation of process fumes and vapors may cause irritation in the respiratory system.

Chronic: No known chronic health effects

Environmental Risks:

Ecotoxicity: No information available.

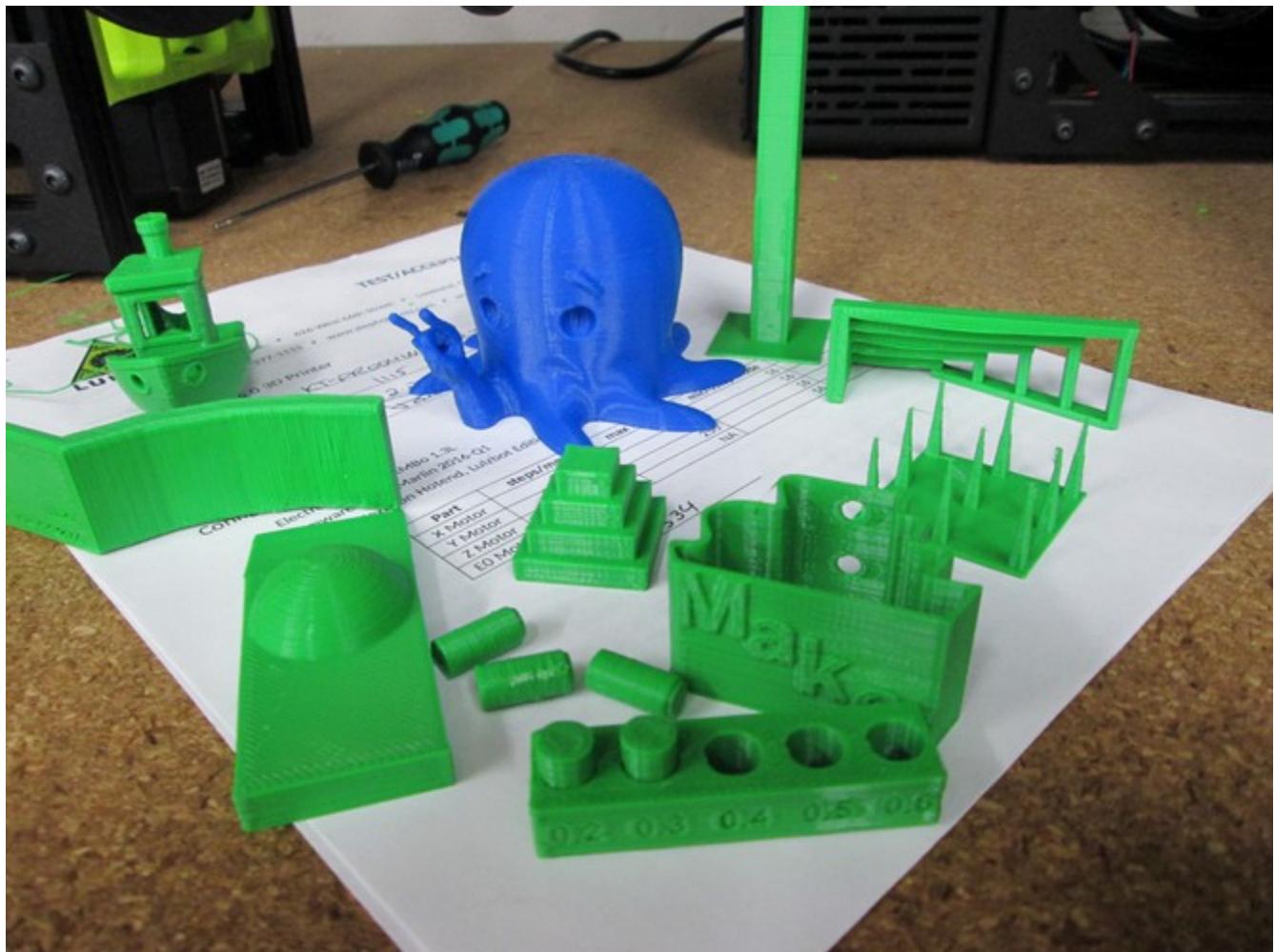
Persistence and degradability: No information available.

Bioaccumulative potential: No information available.

Disposal Options:

Dispose of this product in accordance with local, state and federal regulations.

Recommendation: This filament is LulzBot approved, we should definitely consider this company as a PLA supplier. Size and color consistency are great, and it prints like good PLA should. They sell thins on their site for \$48/kg, so it would be more of a village plastics PLA competitor than an eSun replacement.







LulzBot Filament Testing Report

Manufacturer: Polymaker

Filament Type: PC-Max

Tested By: Bam

Date: 5/12/16

Ease of use: 10/10

Appearance: 10/10

Color consistency: 10/10

Print temperature Range (C): (250-270/80-100)

Variance in diameter: (2.83-2.86)

Minimum bend radius: NA, can tie in knot

Prints using current Lulzbot profiles/temp: No, but preliminary profiles are in experimental branch

Manufacturers Specifications:

Polycarbonate Content > 70 %

Printing Temperature: 250-270°C

Auto ignition temperature: 454°C

General Notes:

- The filament printed extremely well with the recommended print settings at both 0.38mm layer height and 0.15mm LH.
- The filament has a nice glossy finish and great inter-layer adhesion printing at 260C with no fan.
- This PC showed zero warping printing a spool arm full build volume on a mini
- No PEI treatment necessary, this sticks well to PEI as low as 80C
- Great packaging, feels very high end. The spool comes with a small booklet with tech specs and print setting recommendations, very nice.
- The spool is great, clear with clearly marked filament name, print speeds and temps and an awesome dial gauge to indicate how much filament is left in grams.
- Retail pricing will be \$39.99/0.75kg
- Glass transition temperature is over 110C, making this a replacement for ABS in any high heat applications.

Health or environmental risks:

At combustion, CO₂, CO released

Health: Molten material will produce thermal burns on skin and cause eye damage.

Carcinogenicity: No info available

Environmental: Not Available

Environmental precautions and protective procedures - Prevent entry into waterways, sewers, basements or confined areas.

Use in well ventilated area.

Disposal Options:

Disposal method - Waste must be disposed of in accordance with federal, state and local environmental control regulations.

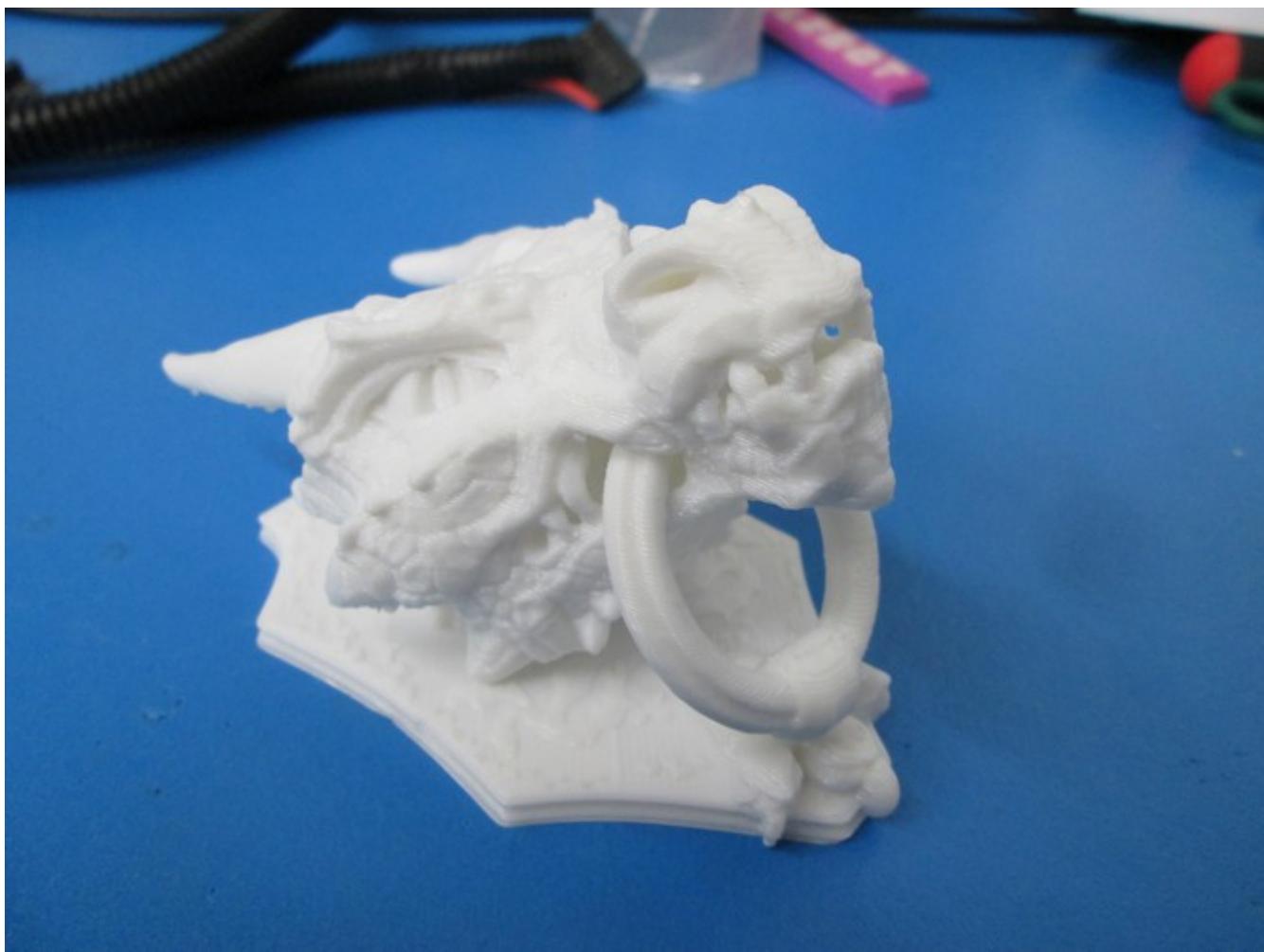
Disposal precaution - Consider the requirements of any applicable waste treatment management regulation.

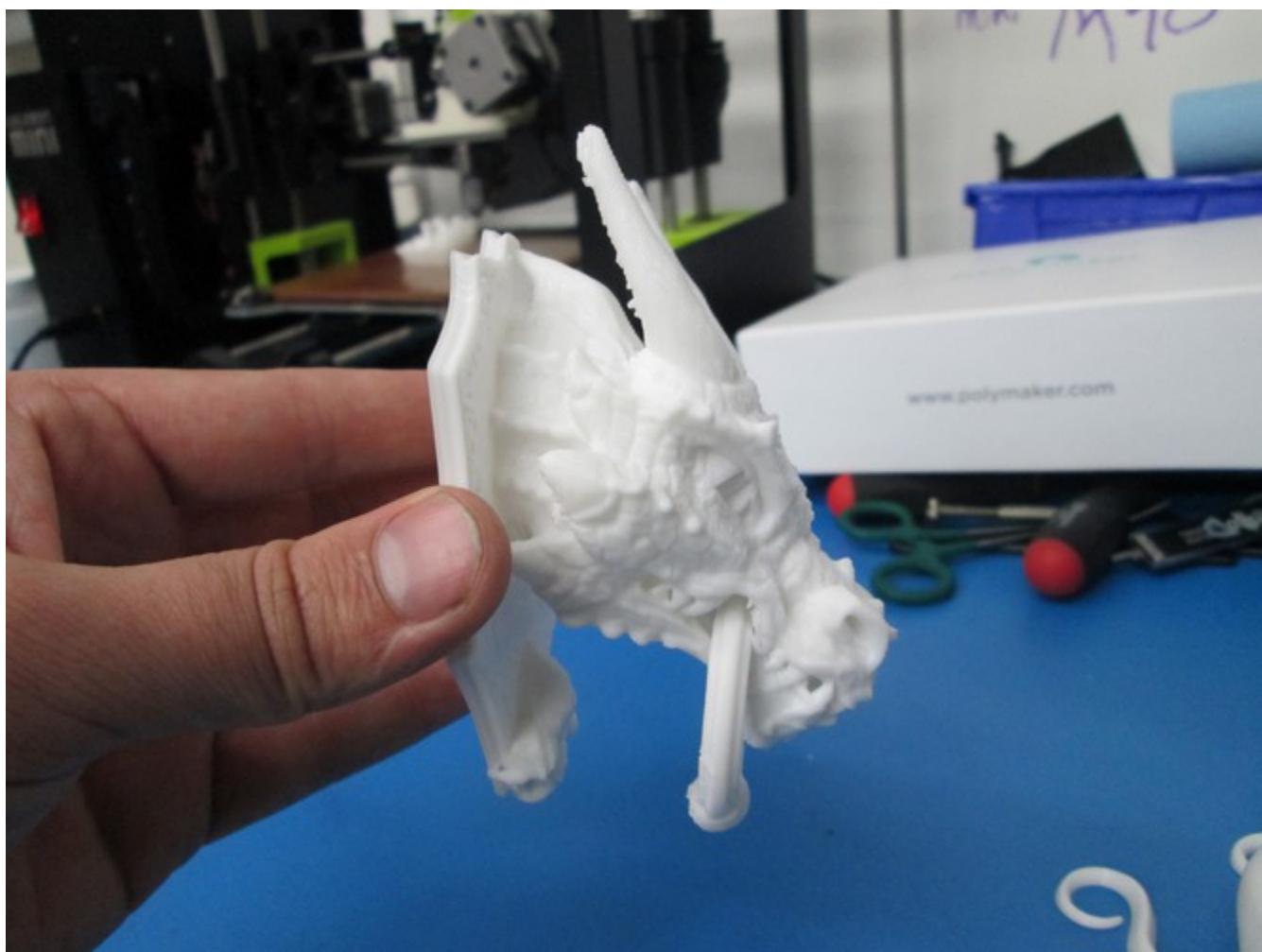
Recommendation:

I recommend that we carry this filament and promote it as a default material for high strength applications. This has been the best experience I've ever had with any type of filament by far. The packaging is the best I've seen from any manufacturer, the filament remaining sticker on the spool is simple and genius. Most impressively, this polycarbonate shows no warping while maintaining the heat resistance and strength that people expect from PC. I am beyond impressed with this filament and will be buying some personally as soon as it is released.









LulzBot Filament Testing Report

Manufacturer: Polymakr

Filament Type: PolyFlex

Tested By: Bam

Date: 5.25.16

Ease of use: 9/10 *Requires flexystruder

Appearance: 8/10 (limited color options available)

Color consistency: 10/10

Print temperature Range (C): (210-235/0-60)

Variance in diameter: (x.xx-x.xx)

Minimum bend radius: N/A

Prints using current Lulzbot profiles/temps: Yes, ninjaflex, can at least double print speed

Manufacturers Properties:

Melting point: Not determined

Flash point: Not determined

Auto-ignition temperature: Not determined

General Notes:

- Same great packaging as the other new Polymaker filaments
- Well labeled reel with remaining filament markings
- No durometer listed, but feels somewhere between Ninjaflex and Semiflex
- Prints extremely well, able to consistently extrude 10.8mm³/s (ninjaflex tops out around 4.5mm³/s)
- Contains 90%+ TPU with the remainder being PLA
- Currently comes in black, white, orange and yellow

Health or environmental risks:

Dangerous Decomposition Products: Burning produces obnoxious and toxic fumes, carbon monoxide, carbon dioxide, hydrogen cyanide, nitrogen oxides, isocyanate.

Conditions to avoid: No data available

HMIS (U.S.A.):

Health Hazard: 0

Fire Hazard: 1

Reactivity: 0

Ecological:

Mobility: No data available

Bioaccumulation: Poorly biodegradable

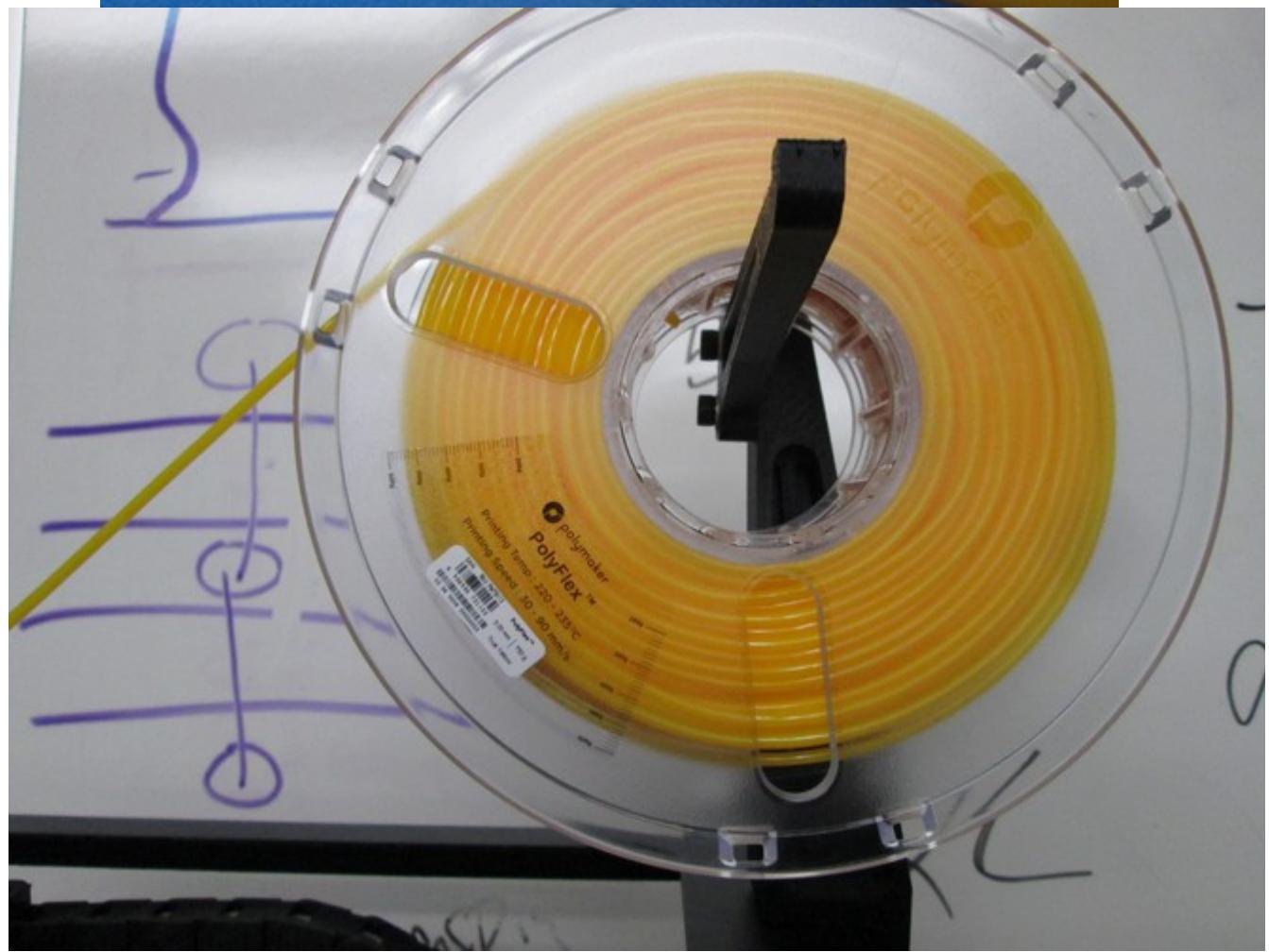
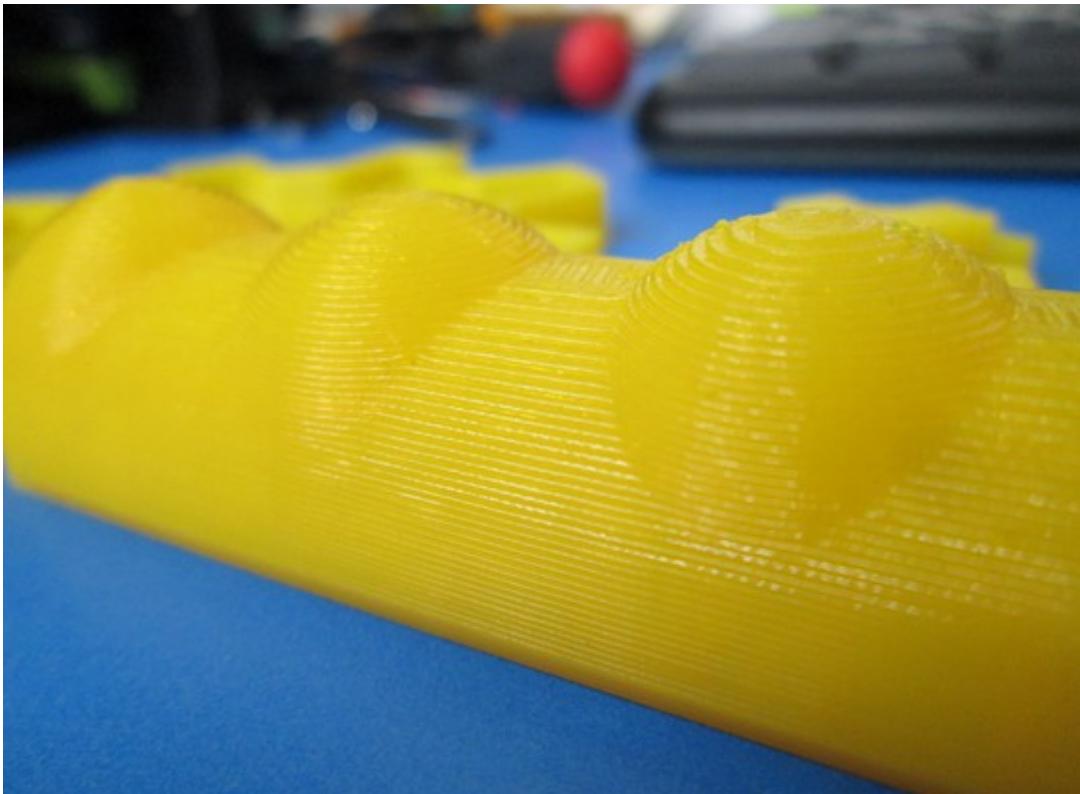
Ecotoxicity effects: Data not available.

Disposal Options:

Waste Disposal Methods: In accordance with local and national regulations. Do not contaminate ponds, waterways or ditches with chemical or used container. Contact manufacturer if needed.

Recommendation: This filament requires a flexystruder, but prints extremely well. This would be a great addition to our currently small lineup of flexible materials and might make a better starter material than Ninjaflex because of it's ease of use and increased print speed.





LulzBot Filament Testing Report

Manufacturer: Polymaker

Filament Type: PC-Max

Tested By: Bam

Date: 5/12/16

Ease of use: 10/10

Appearance: 10/10

Color consistency: 10/10

Print temperature Range (C): (250-270/80-100)

Variance in diameter: (2.83-2.86)

Minimum bend radius: NA, can tie in knot

Prints using current Lulzbot profiles/temps: No, but preliminary profiles are in experimental branch

Manufacturers Specifications:

Polycarbonate Content > 70 %

Printing Temperature: 250-270°C

Auto ignition temperature: 454°C

General Notes:

- The filament printed extremely well with the recommended print settings at both 0.38mm layer height and 0.15mm LH.
- The filament has a nice glossy finish and great inter-layer adhesion printing at 260C with no fan.
- This PC showed zero warping printing a spool arm full build volume on a mini
- No PEI treatment necessary, this sticks well to PEI as low as 80C
 - Subsequent testing shows that PC-Max can adhere too well to PEI, we should likely recommend gluestick.
- Great packaging, feels very high end. The spool comes with a small booklet with tech specs and print setting recommendations, very nice.
- The spool is great, clear with clearly marked filament name, print speeds and temps and an awesome dial gauge to indicate how much filament is left in grams.
- Retail pricing will be \$39.99/0.75kg
- Glass transition temperature is over 110C, making this a replacement for ABS in any high heat applications.

Health or environmental risks:

At combustion, CO₂, CO released

Health: Molten material will produce thermal burns on skin and cause eye damage.

Carcinogenicity: No info available

Environmental: Not Available

Environmental precautions and protective procedures - Prevent entry into waterways, sewers, basements or confined areas.

Use in well ventilated area.

Disposal Options:

Disposal method - Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Disposal precaution - Consider the requirements of any applicable waste treatment management regulation.

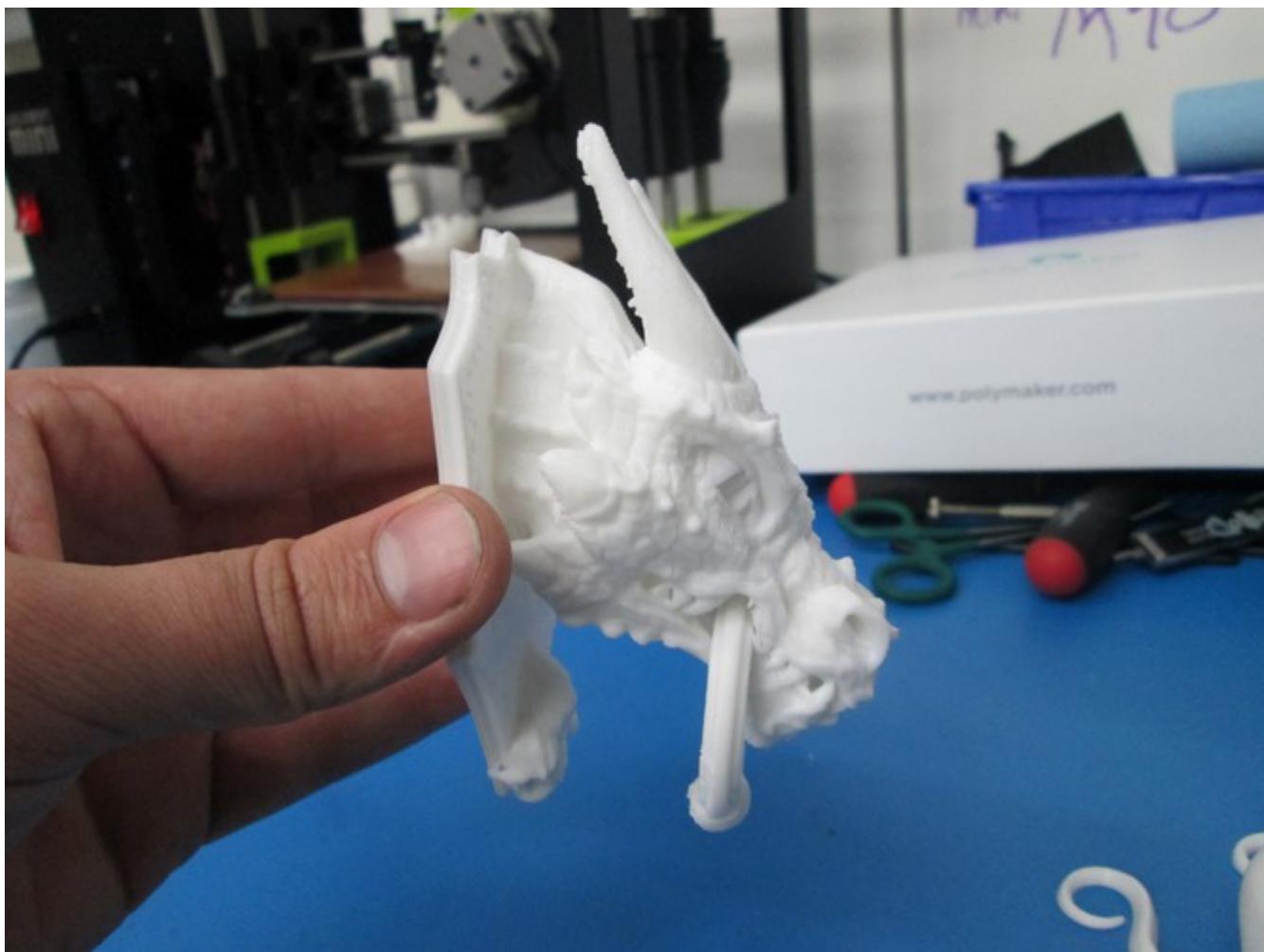
Recommendation:

I recommend that we carry this filament and promote it as a default material for high strength applications. This has been the best experience I've ever had with any type of filament by far. The packaging is the best I've seen from any manufacturer, the filament remaining sticker on the spool is simple and genius. Most impressively, this polycarbonate shows no warping while maintaining the heat resistance and strength that people expect from PC. I am beyond impressed with this filament and will be buying some personally as soon as it is released.









LulzBot Filament Testing Report

Manufacturer: Toner Plastics
Filament Type: PLA
Tested By: Patrick
Date: 6/15/16

Ease of use: 9/10

Appearance: 8/10

Color consistency: 6/10

Print temperature Range (C): (190C-230C)

Variance in diameter: (2.85-2.92)

Minimum bend radius: Under 5mm

Prints using current Lulzbot profiles/temp: Yes

Manufacturers Conditions to avoid: Temperatures above 446F (230 °C).

Manufacturers Decomposition temperature: 482F (250C)

Manufacturers Autoignition temperature: 388C

General Notes:

- Filament comes in variety of colors including translucence.
- Translucence filaments were very inconsistent.
- Inconsistent coloring seen in standard colors as well (not as prevalent)
- Reels come packaged very similar to village plastics.
- Had no problems with clogging or snapping pla.
- Some of the translucence looked really cool because they were inconsistent if they were renamed to be camo or rainbow green they would be an excellent addition to our filament lineup. The question is could the remain consistently inconsistent? (doubtful)

Health or environmental risks:

Minimal risk per MSDS

Disposal Options:

Waste from residues / unused products: In accordance with local and national regulations. Do not contaminate ponds, waterways or ditches with chemical or used container.

Recommendation:

Overall this filament falls short in almost every aspect to polylite pla. Some of the translucent could be added if they were renamed so that inconsistency was a feature of the filament. A couple of solid colors also showed uneven coloring. We cannot recommend carrying this filament due to inconsistency in the coloring, as we have also seen this in past samples.



LulzBot Filament Testing Report

Manufacturer: Toner Plastics

Filament Type: HIPS

Tested By:

Date:

Ease of use: X/10

Appearance: X/10

Color consistency: X/10

Print temperature Range (C): XXX-XXX/XX-XX

Variance in diameter: (X.XX-X-XX)

Minimum bend radius:

Prints using current Lulzbot profiles/temps:

Manufacturers Temperatures: Melting point: >120°C

General Notes:

- Great density and feel, especially when polished
- Needed to be printed at a hotter temperature than manufacturer recommends (230 vs 190-210C)
- Color was very consistent throughout the roll.
- Nice professional looking packaging.
- The material is pretty brittle when printed (similar to laybrick), but it feeds off of the spool very nicely.
- Material tends to build up on the tip of the nozzle and cause print defects

Health risks:

Ventilation: Necessary for fumes and gases when melting.

Personal Protection Eyes: Wear safety glasses or chemical goggles for general purpose.

Respiratory: Wear appropriate respiratory masks as needed.

Gloves: Necessary for handling melted material.

Note: It is the responsibility of the user to determine the adequacy of any protection or safety measures.

Environmental risks:

Aquatic toxicity: No evidence of aquatic toxicity.

Mobility in soil: No data available

Persistence and degradability: Toner Plastics HIPS 3D Printer Filament

Biodegradation: Product is not readily biodegradable, the product is likely to persist in the environment.

Additional ecological information: General information: Do not allow to enter into ground-water, surface water or drains.

Disposal Options:

Controlled incineration or landfill according to local, state or national laws and regulations concerning health and pollution.

LulzBot Filament Testing Report

Manufacturer: Proto Pasta / ProtoPlant
Filament Name: High Temperature PLA
Filament Type: Annealable PLA filled
Tested By: Brent M.
Date: 1/25/2015

Ease of use: 8/10

Appearance: 10/10

Size consistency: 9/10

Color consistency: 9/10

Print temperature: 225/60

Prints using Lulzbot profiles/temps: Profile had to be created, strips out with std. PLA profiles

SDS:

- We should include notes to NOT bring the material above it's safe working temperature of 230C max. Doing so could produce "...obnoxious and toxic fumes. Aldehydes. Carbon monoxide (CO). carbon dioxide (CO₂)
- As with all plastics, we should warn customers to wear protective equipment (dust mask) if they will be sanding the printed parts.
- *Disposal:* This filament should not be discharged into waterways, We likely don't need to make a note of this
- No other outstanding hazards noted in the MSDS.

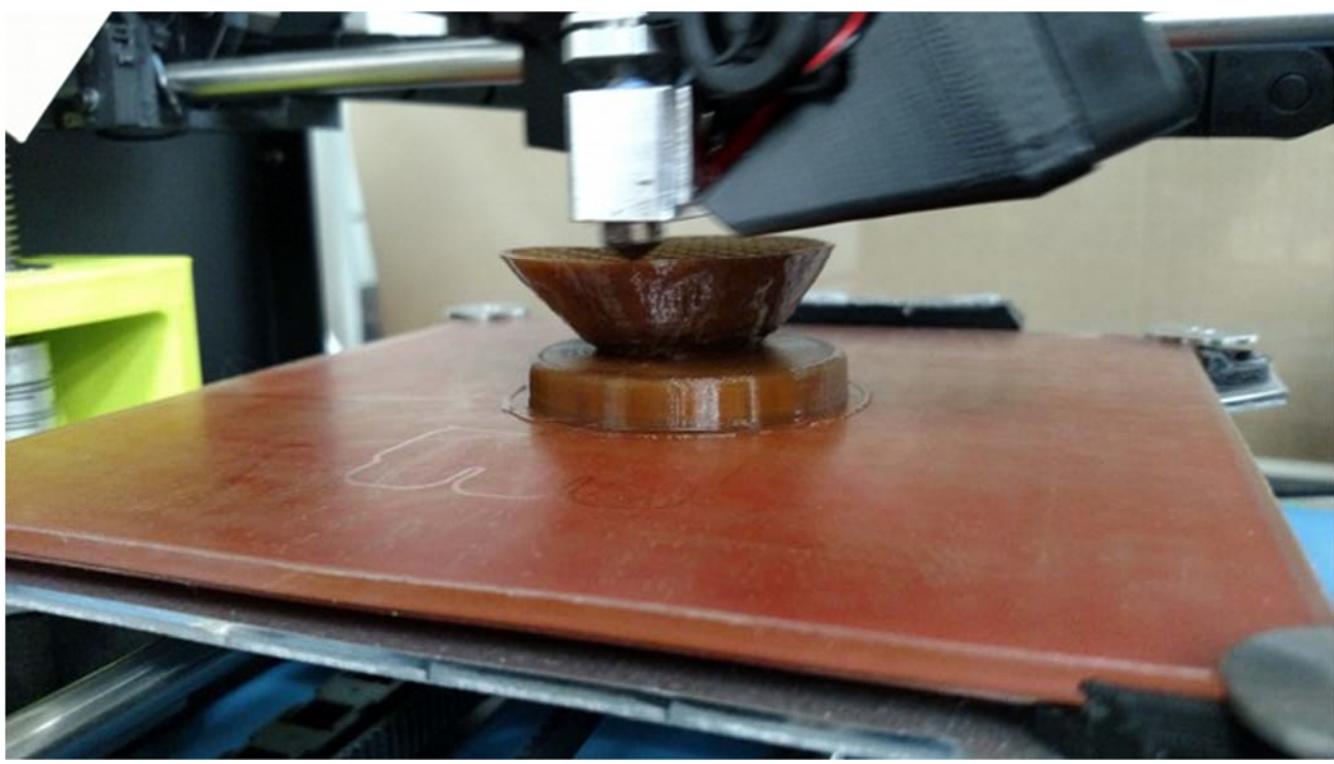
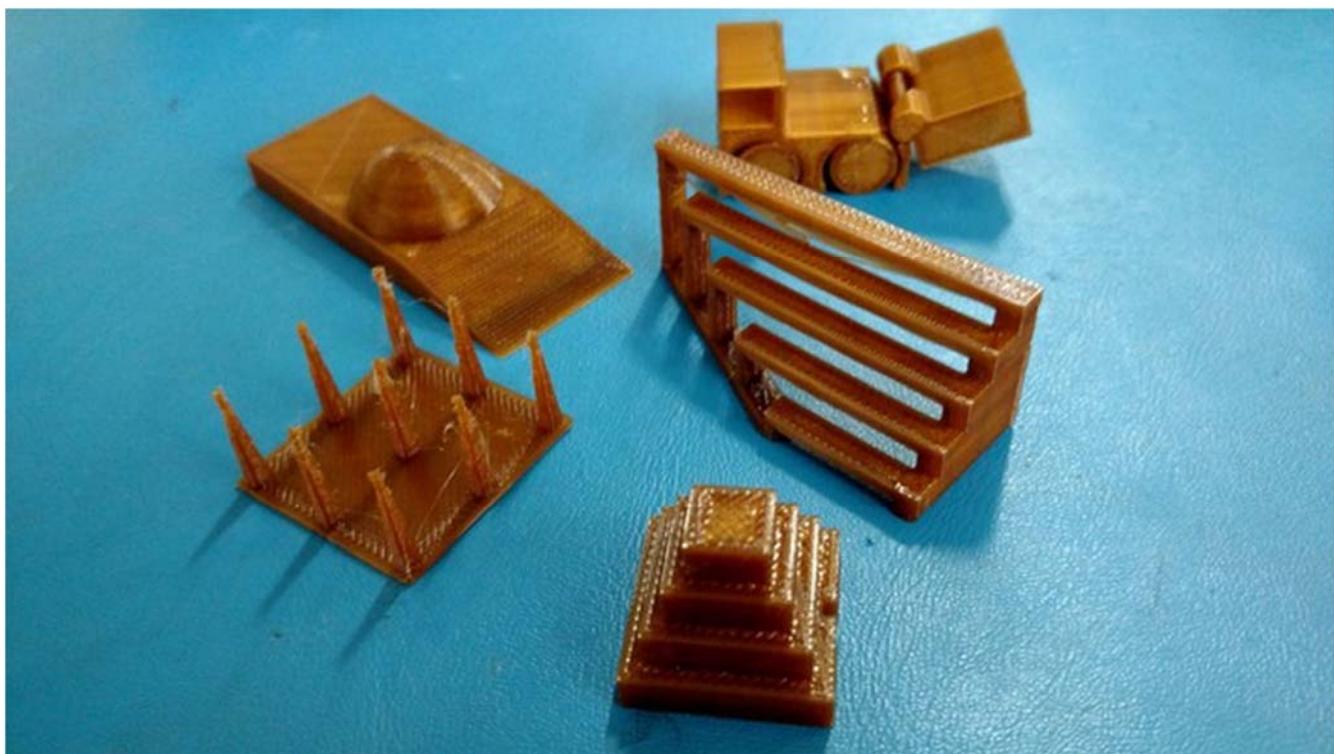
Notes:

- The base material for this filament is Protopasta's high temperature PLA
 - It can't be printed with the standard 205C print temperature, needs 220-230C (225 seems ideal).
 - It can be "annealed" by post processing in an oven at ~70-110C, this increases the heat deflection temperature to up to 140C
- The filament currently comes in dark silver, white, brown (coffee-scented) and greenish (pine scented)
- The packaging is a standard ProtoPasta cardboard spool with lulzbot label, looks nice.
- The color of the filament changes a bit depending on print temperature and speed, similar to wood filled filaments but not as drastic.
- The MSDS states a maximum safe temperature of 230C.

Recommendation: This is definitely a niche filament, but is of excellent quality and produces nice prints. Definitely R&D approved and can be sold once unique profiles are created. There should be a note on the product page to not bring the filament above 230C.

Filament	Variance in diameter	Maximum out of round	Print temperatures (C)
ProtoPasta High temperature PLA (2.85 mm)	2.82-2.86mm (0.04mm) in 10m sample	2.82-2.84mm (0.02mm)	225/60





IC3D filament testing

Blue ABS 3mm

The filament is round, without any noticeable sections that are out of round by more than .1mm. The diameter varied a bit more, ranging from 2.75mm to 2.98mm, all within the spec that we get from village. Stuck down with standard lulz juice VERY well (maybe too well).

Seemed to ooze a bit more, maybe needs a slightly lower extrusion temp?

Prints:

Noz:230C, Bed:85C

Material: iglidur® I170-PF

1) General

The material iglidur® I170-PF, developed by igus®, was developed and tested solely for the "Fused-Deposition-Modeling" (FDM) manufacturing method. As such iglidur® I170-PF is more challenging to process than iglidur® I180-PF.

2) Example processing parameters

The optimal processing parameters depend on various printing-conditions. Therefore the recommended temperature-fields are:

- Nozzle temperature: 240 – 260 °C
- Bed temperature: 90 – 110 °C

3) Adhesion

Standard procedures which are used to assure adhesion (of standard ABS materials) on the printing bed can be applied.

The following methods were so far successfully tested:

- Blue-Tape (e.g. Scotch 2090) glued glass and apply glue (e.g. Pritt Power) on it
- Perforated plate (e.g. dot matrix board made of hard paper without Cu coating)
- Permanent printing plates

4) Further processing instructions:

When feeding the filament, the bends should not be too tight, i.e. the radius should not be less than 50 mm.

Please ensure good ventilation or suction during processing. In addition, please wear appropriate protective gear when handling the hot melt.

If the friction-wheel revolves, it is recommended to reduce the "retract" at the settings from the "slicer".

The material may not be heated to a temperature higher than 280 °C. If the material is heated to a temperature above 300 °C, dangerous decomposition products are released.

Based on the supplier's experience and the information provided by the supplier, the product has no adverse health effects if properly handled and used in accordance with the intended purpose.

Material: iglidur® I180-PF

1) General

The material "iglidur® I180-PF", developed by igus®, was developed and tested solely for the "Fused-Deposition-Modeling" (FDM) manufacturing method.

2) Example processing parameters

The optimal processing parameters depend on various printing-conditions. Therefore the recommended temperature-fields are:

- Nozzle temperature: 250 – 260 °C
- Print bed temperature: 90 – 110 °C

3) Adhesion

Standard procedures which are used to assure adhesion (of standard ABS materials) on the printing bed can be applied.

The following methods were so far successfully tested:

- Blue-Tape glued glass (e.g. Scotch 2090) and apply glue (e.g. Pritt Power) on it
- Perforated plate (e.g. dot matrix board made of hard paper without Cu coating)
- Permanent printing plates

4) Further processing instructions:

Please ensure good ventilation or suction during processing. In addition, please wear appropriate protective gear when handling the hot melt.

The material may not be heated to a temperature higher than 280 °C. If the material is heated to a temperature above 300 °C, dangerous decomposition products are released.

Based on the supplier's experience and the information provided by the supplier, the product has no adverse health effects if properly handled and used in accordance with the intended purpose.

Material: iglidur® J260-PF

1) General

The material iglidur® J260-PF, developed by igus®, is suitable for the “Fused-Deposition-Modeling” (FDM).

2) Example processing parameters

The optimal processing parameters depend on various printing-conditions. Therefore the recommended temperature-fields are:

- Nozzle temperature: 260 – 280 °C
- Bed temperature: 100 – 130 °C

3) Adhesion

Standard procedures which are used to assure adhesion (of standard ABS materials) on the printing bed can be applied.

The following methods were so far successfully tested:

- Blue-Tape (e.g. Scotch 2090) glued glass and apply glue (e.g. Pritt Power) on it
- Perforated plate (e.g. dot matrix board made of hard paper without Cu coating)
- Permanent printing plates

4) Further processing instructions:

When feeding the filament, the bends should not be too tight, i.e. the radius should not be less than 30 mm.

Please ensure good ventilation or suction during processing. In addition, please wear appropriate protective gear when handling the hot melt.

If the friction-wheel revolves, it is recommended to reduce the “retract” at the settings from the “slicer”.

The material may not be heated to a temperature higher than 300 °C. If the material is heated to a temperature above 330 °C, dangerous decomposition products are released.

Based on the supplier’s experience and the information provided by the supplier, the product has no adverse health effects if properly handled and used in accordance with the intended purpose.

Iwatani Filament testing notes:

Notes:

PLA 11

- There was some stripping of the filament when printing at high speeds.
- Sticks almost to good to the bed I had difficulty removing the part.
- The part looks awesome and feels very solid.
- The filament diameter is consistent throughout the reel.

PLA 11U

- This one also reminds me of t-glass a little bit.
- Seems to be stronger and more rigid like the PLA 12U.

PLA 12U

- This stuff prints awesome and is clearest of the three filaments tested.
- It doesn't strip as easily as the PLA 11.
- This has the most consistent diameter of the three filaments from the company.

PLA 12

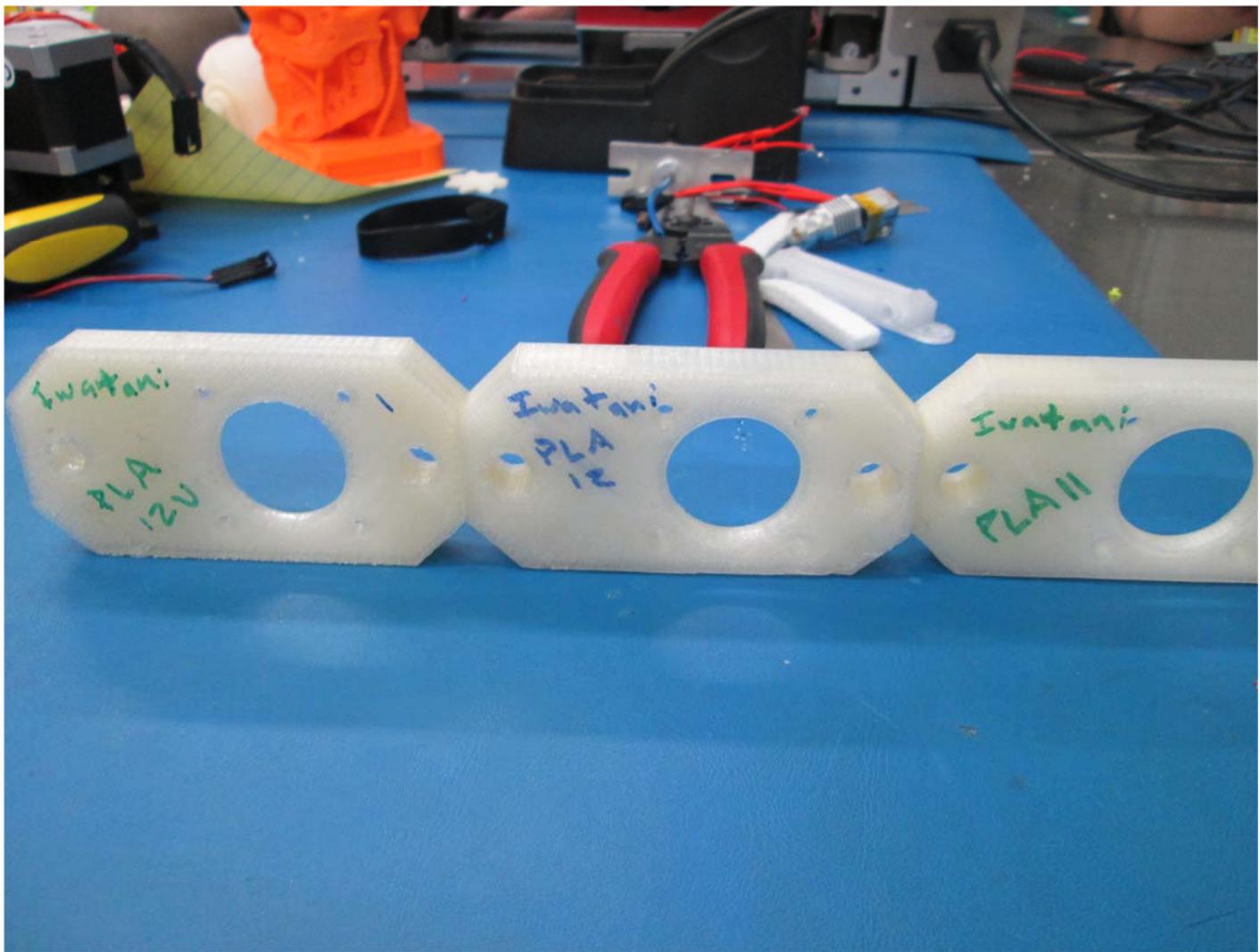
- This stuff prints similar to PLA 12U.
- The only difference in this filament vs the others was the sharpie seemed to bleed.

Recommendation:

All four filaments printed well and were consistent throughout the reel. My favorite was the PLA 12U. The PLA 12 and 12U looked like t-glass but printed like PLA which was awesome.

Filament diameter accuracy / consistency:

Filament	Variance in diameter	Maximum out of round	Extrusion temperature
PLA 11	1.70-1.75 (.02mm)	0.02mm (1.73-1.75)	185C (printed with .4 nozzle)
PLA 11U	1.71-1.73(.02mm)	.01mm (1.72-1.73)	185C (printed at 190C with .4 nozzle)
PLA 12U	1.70-1.71 (.01mm)	0.01mm (1.70-1.71)	185C (printed with .4 nozzle)
PLA 12	1.67-1.77 (.10mm)	0.02mm (1.75-1.77)	185C (printed with .4 nozzle)
Average	1.71mm (+/- .043mm)	0.016mm (1.73)	





Let's talk about Biodegradability of Plastic

By: Benno & Eva Besler

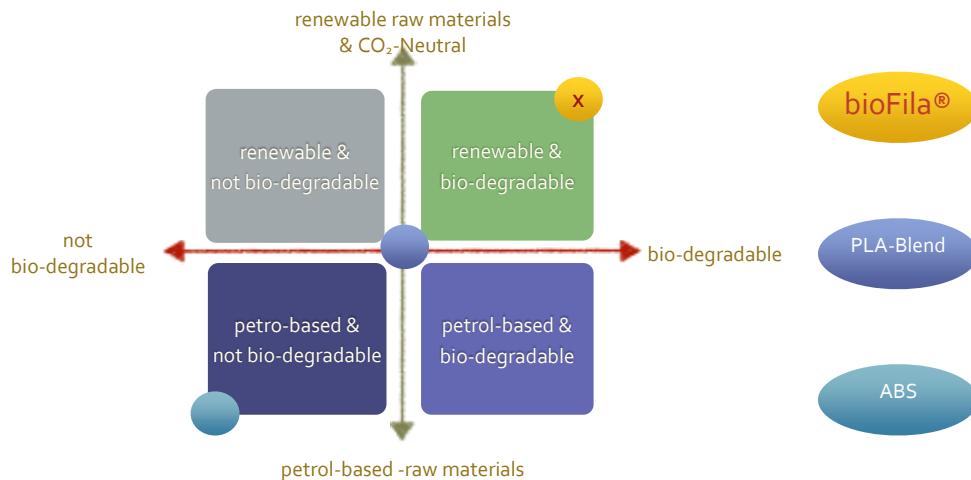
Date: 23.02.2016

Version: 3

GENERAL INFORMATION

bioFila® are compounds made of biopolymers and optimized for 3D printing. They are also usable for extrusion and molding.

Newest information are available on our homepage: <http://www.two-bears.eu>, section [data sheets](#).



Ender's classification of biopolymers:

Qualification & Certificates

Sustainable materials

Our materials are biopolymers out of sustainable raw materials like wood, starch or lignin. Our materials do not depend on changes of the oil market and they will stay available after the oil age. They can be reintegrated into the natural material cycle and have a neutral CO₂-balance.

Biodegradability

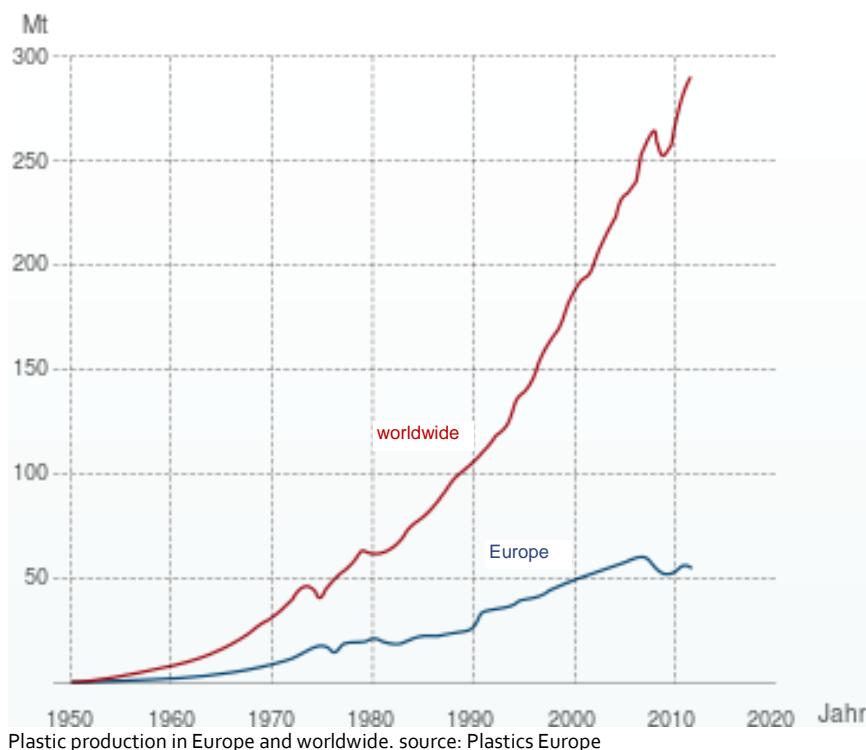
bioFila® materials are tested for biodegradability in line with the standards DIN/ISO 14851/14852.

Our materials are biodegradable like wood and can be re-integrated into the natural cycles, without wasting the environment, not like petrol based plastic.

All ingredients used (even pigments for colors) are biodegradable.

No waste, no impact to environment and human health. The perfect material for a clean industrial future.

Current situation



be Produced quantity of plastic worldwide in 2013: about 300 mio. metric tons.

Only 43% of the waste will recycled and 55% will be used for energy production.

- The varietal recycling is difficult because of the use of different plastics, additives and fillers. Only with PET as varietal recycling is possible.
- The highest share of the produced plastics will be burnt, is lost for the recycling cycle and have an impact to our atmosphere.
- About 6 Mio to. of plastic are wasting the oceans every year and create a lot of problems.
Keyword: "Great Pacific Garbage Patch". Today you'll find in the oceans 6 times more plastic than plankton. In some regions it is even 46 times more.

Plastic and Ocean

How the waste arrives in the oceans?

Today 80% of the global waste come by inflow and 20% of the waste are created by shipping, fishing and their lost equipment or the offshore industry, research, oil and gas platforms or the aqua cultures.

Which are the sources of the waste in the oceans?

The main inflow is from municipal effluent, localised flatting out of dumpsites and illegal dumping and the tourism. Rivers and floods bring the swimming waste into the ocean.

How long stays the waste in the ocean?

The waste contains 75% plastic, which is nearly undestroyable. Plastic decay after several decades and sometimes over centuries under the impact of salt water, sun and abrasion. An example, a plastic bag needs 10-20 years, a polystyrene cup 50 years and a PET bottle about 450 years

Why is plastic in the ocean so dangerous?

On one hand, plastic decay very slow by the impact of salt water, sun and abrasion into smaller parts by releasing toxic substances into the environment. On the other, many animals die, because of lost fishing equipment or by swallowing waste, they can't digest.

What is the scale of the pollution?

Every year, we produce about 300 million metric tons of plastic and about 10 million metric tons ends as waste in the sea (UNEP).

So, you can find 18.000 plastic parts per square kilometer on the surface of the sea.

How the waste is spread?

15 % of the waste swims on the surface of the sea, more than 70% sinks to the seabed and about 15% is stranded on the coast.

Summary:

Recycling of plastic is an approach, which is usable for a limited number of plastics and which can not 100% ensure that plastic will not pollute our environment. Plastic in the environment effects the ecological systems and is a danger for our livelihood, because of the very long decay times of 400-1000 years.

The industrial production of plastic start in the 1950's, meaning 65 years ago. The first plastic produced 65 years ago still exist in the environment and needs another 350 years for the complete degradation.

In other words, all plastic ever produced still exist in our environment, exceptional they have been burned. With the increase of the world population, this problem grows and grows and we won't picture the effect.

But it does not help to close the eyes and we start to develop bioplastics, which does not pollute the environment, which can be reintegrated into the natural ecological cycles and which are based on sustainable sources.

In the environment our bioplastic needs the same time like wood for biodegradation. That means a natural time for biological degradation of about 10 years.

So, our material can be the raw material of the grow of plants in future.

Why bioFila®?

If you have a look to the technical features of PLA and other BioPlastics, you will recognize that these plastics are not usable for technical demanding products.

PLA blends have normally a softening temperature of 55°C and the Charpy values shows also a limited use for technical products.

Therefore, twoBEars set oneself to develop a new generation of high performance plastics.

Our newest product is bioFila plaTec, with a softening temperature of 120°C and Charpy impact strength of more than 200kg/m² (10 times higher than ABS).

So, BIOFILA PLATEC IS THE FIRST BIOPLASTIC WHICH A REAL COMPETITOR FOR EXISTING HIGH PERFORMANCE PLASTICS

bioFila® plaTec is not only optimized for 3D printing, it can be used also for extrusion and injection molding.

This enables you to use one material from prototype to serial production.

Some data for orientation you'll find below.

3D PRINTING PARAMETERS

Temperatures & speed

Depending for the printer the temperatures should be in the following range:

Product	Dim.	bioFila® plaTec
Hotend	(°C)	185-205°C
Heat-bed	(°C)	55-65°C
speed	mm/sec	30 - 120
decomposition temperature	°C	215

Attention:

Please be aware, if you print with higher material temperature than the decomposition temperature, the material could emit unknown products, which could be dangerous. Please have a look to our Safety Data Sheets (SDS) on our homepage and respect the general rules for 3D printing. Material temperature is not equal to hot-end temperature, because you have to respect the dwell times for heating up the material. One indication that you print with too high temperature is a smell of the print and that the material turn dark.

Please work general in save environment with filtering systems, ventilation system and/or extractor hood.

Start easy printing

The printing with bioFila® is very easy. Set the parameters above and start to print. But every printer is different and if it does not work, here a short description how to start.

1. Start in park position and with the lowest temperature (see table)
2. Try to extrude with your hot-end 10mm material.
3. If the material sticks, increase the temperature by 5 degrees and continue with point 2 until the material start to flow. This is the minimum temperature for printing. (
4. With 10 degrees higher than the minimum temperature you will have the best process temperature for printing with the lowest speed (here 30mm/sec)

Optimization of printing

If you want to increase the speed of printing you normally need some optimization loops.

As rule of thumb you should increase the temperature by 10°C if you print 20mm/s faster.

At the end the sojourn time is responsible for the material temperature, which should not be higher than the decomposition temperature. If you print with very high speed, you have to minimize the ramp-up and stop times to prevent / minimize a decomposition of the material.

For any problems with the printing, don't hesitate to contact us and we will help you to solve it.

EXTRUSION & INJECTION MOLDING

Both materials are tested for injection molding and extrusion, so it's easy for you to use prototype parts out of the 3D printer and transfer the results to a mass production line. General you will get better mechanical results in your extrusion or injection molding than in 3D-printing. That will be a further safety margin for your design.

You will be faster and better if you use bioFila® from design to production.

For any question or support, don't hesitate to contact us.

MATERIAL DATA OVERVIEW

bioFila vs. PLA & ABS

Measurement	Test method	Dim.	bioFila silk	bioFila linen	bioFila plaTec	PLA	ABS
Density 23°C	DIN EN ISO 1183	g/cm³	1,25	1,40	1,40	1,28	1,07
Tensile test Stress at yield	DIN EN ISO 527-2	MPa	51	43	44	55	48
Tensile modulus	DIN EN ISO 527-1	GPa	2,50	2,70	2,60	5,10	2,20
Charpy impact strength 23°C	DIN EN ISO 179/1eU	kJ/m²	60	58	217	8	55
Softening temperature (Vicat / VST A50)	DIN EN ISO 306	°C	57	58	120	60	100
Melding temperature	ISO 11357	°C	165	153	180	180	180

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sources: Bund, Plastic Europe, Wikipedia, Umweltbundesamt (exp.: 63/2015), NABU, WWF

Contact:

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LulzBot Filament Testing Report

Manufacturer: Chromastrand
Filament Name: Prima
Filament Type: Amphora (Eastman)
Tested By: Brent M
Date: 8/11/2015

Ease of use: 10/10
Appearance: 10/10 – great pantone match for the lulzbot green
Size consistency: 9/10
Color consistency: 10/10
Print temperature: 235/60

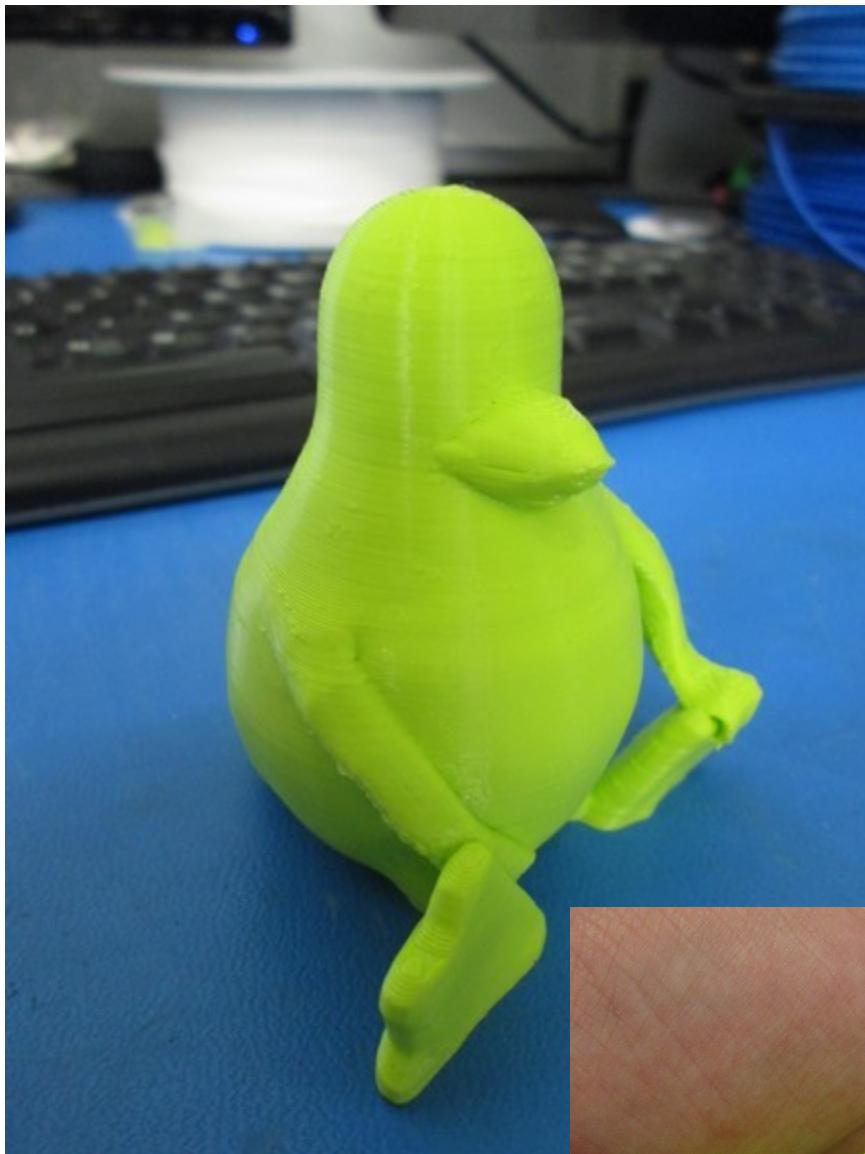
Prints using Lulzbot profiles/temps: Yes, prints great with the N-Vent profiles

Recommendation: This is a material that we already know is great, and in our signature color. The filament prints well using our standard N-Vent profiles, which would likely need to be cloned if we release this filament under the new name (Chromastrand Prima ←?).

Notes:

- This filament prints just like the N-Vent brand of Amphora as expected
- The LulzBot Green pantone match is really good, much better than village plastics and on par with e-sun's color matching
- Color was consistent throughout the roll
- Interestingly, the filament itself has a very smooth surface texture compared to the Taulman version, it doesn't seem to effect printing at all
- Came on generic spool in a plastic bag as it's an initial testing run, not sure what the final packaging is going to look like.

Filament	Variance in diameter	Maximum out of round	Extrusion temperature
Lulzbot Green Chromastrand Prima	2.82-2.86mm in 10m sample (<2%)	2.83-2.86mm	235/60 worked well, running cooler could improve overhangs



Right: Comparison of Prima with our existing Lulz Green HIPS from E-sun.

Polymakr Filament testing notes:

Notes:

- The Polyflex extrudes well, can be printed faster with a flexystruder (80mm/s) but will work with a standard extruder.
- The polyflex wasn't as stringy and produced better looking parts than ninjaflex typically does.
- Was not nearly as flexible and the ninjaflex, produces much harder parts. Feels like polypropylene <--- huge advantage.
- The polymax printed well as well, and made parts that feel a lot like ABS, but easier to print.
- The polymax has a fairly high printing temperature, but it's softening temperature (Tg) is lower, making it unsuitable for a lot of printer parts.
- The consistency of the filament diameter for both was a bit worse than the filament that we're used to (Village +/- 0.04mm, Saniwave +/-0.03mm, Polymakr +/-0.055), although it's roundness was consistent with other filament on the market. The diameter consistency could improve as polymakr starts ramping up production and dialing in the extrusion process.

Recommendation: Both filaments print well and could add value to our filament lineup, though the filament diameter consistency is pretty poor compared to village plastics or even some of the cheaper mfr's. Again, I would expect this to improve as Polymakr ramps up production and dials in their extruders.

I especially like the **polyflex** – adding another (and potentially lower cost) flexible material to our lineup would be great. The higher rigidity of the polyflex over ninjaflex could be a real selling point; perfect for snap fit applications (think Tupperware lids). I'd really like to try out the other colors and get this in our store.

The **polymax** was also really cool, although it wasn't too different from the saniwave PLA/TPU blend that we've tried out (slightly stronger, but for high strength parts T-glase is more dimensionally accurate and should be stronger). I'm not sure that the higher cost of polymax would be justified if we also had the saniwave filament in the lineup. We could carry them as different grades of the same product (high strength PLA blend).

Filament diameter accuracy / consistency:

Filament	Variance in diameter	Maximum out of round	Extrusion temperature
White Polymax	2.88-2.99 (.11mm)	0.07mm (2.87-2.94)	200-230C (printed best @ 225C w/ buda)
White Polyflex	2.79-2.91 (.12mm)	0.02mm (2.85-2.87)	220-235 (printed @ 230C w/ flexystruder)
Average	2.89mm (+/- 5.75mm)	0.045mm	

Prusa Research ABS notes:

We received 4 1 kg samples of ABS from Prusa Research; White, Yellow, Green and Blue. The blue came on a nice silver plastic spool similar to the ones we're currently getting from Alpha Plastics. The other colors came on cardboard spools that didn't spin evenly, leading to a few more snags than we're used to.



Yellow: The yellow is a nice color, and it prints much better than the yellow that we've had in stock in the past.

The diameter varied from 2.70mm to 2.91mm in a 1m sample.

Blue:

The diameter of the blue filament ranged from 2.81 to 2.91 across a 1m sample. The filament prints well using 230C and standard gcode.

Green:

the green filament printed badly on the first attempt, it appeared to be too little extrusion

The diameter of the green filament ranged from 2.82mm to 3.01mm across a 1m sample

White: The white sample looks a bit less glossy than our current white ABS, prints well at 230C and has nice consistent diameter.

The diameter in a 1m sample was very consistent, ranging from 2.84mm to 2.90mm

Recreus FilaFlex Filament testing notes:

Notes:

Brown Filaflex

- This stuff is far more consistent in diameter than the last samples I tested from them, but still has much more variance than Ninjaflex or any of our rigid filaments
- Feels much more flexible than ninjaflex
- They've perfectly matched the color of dog poop

Black 3mm Filaflex

- This is about as consistent as the brown 3mm filaflex; it's way better than filaflex used to be but still pretty bad compared to most of the other filaments on the market today
- Strings badly at 230, prints much better at 220 but speeds need to be reduced
-

Recommendation: .

They're getting better at extruding the stuff, but it's still not there yet. I think the only reason to have this in the store is if we can get it as a cheaper alternative to the generally better ninjaflex. It comes in some nice colors but the inconsistency in diameter makes it a worse alternative to ninjaflex.

Filament diameter accuracy / consistency:

Filament	Variance in diameter	Maximum out of round	Extrusion temperature
Brown 3mm	2.63-2.88 (.25mm) ninjaflex typically varries from 2.84 to 2.91 for reference	0.09mm (2.71-2.80)	225-230C, very stringy at 230, stripped at 220. Most likely needs to be printed at ~220 at lower speeds than ninjaflex
Black 3mm	2.61-2.85 (.24mm)	0.08mm (2.67-2.75)	Printed same as brown filaflex
Average	2.74mm (+/- 0.15mm)	0.085mm (Not great)	

Saniwave Filament testing notes:

Notes:

- The PLA contains a small amount of TPU, making it stickier when melted and less brittle than standard PLA.
- ABS came in nice looking colors, produced strong parts
- All filament was actually a bit more consistent than Village Plastic's filament (avg variance of 0.04mm), but was slightly larger (Village's filament tends to be 2.85 +/- 0.04mm, this tends to be 2.97 +/- 0.03mm). Might not seem like a lot but this will cause a well calibrated machine to over extrude by ~7% on average. We can compensate in the slic3r configuration, but will need to have a separate config for this plastic.
- Seemed to droop slightly more than standard PLA (see Brent I's Pi jar print), could fix with more time spent on configuration

Recommendation: I really liked the PLA, it prints easily and makes slightly stronger parts than standard PLA. I think that the difference in diameter of filament is a bit of a deal breaker if we want to supplement our existing ABS and PLA filament as 2 ABS/PLA config's would be messy. We could hype that the PLA is mixed with TPU and sell it as a separate material with its own configuration, I think people would love it (and its way cheap). We could also contact and see if they can try to make us slightly smaller diameter filament.

Filament diameter accuracy / consistency:

Filament	Variance in diameter	Maximum out of round	Extrusion temperature
Natural PLA	2.93-3.01 (0.08mm)	0.05mm (2.96-3.01)	150C-200C (185 ideal)
Black PLA	2.96-3.01 (0.05mm)	0.06mm (2.95-3.01)	165-210 (200C ideal)
Yellow PLA	2.92-2.98 (0.06mm)	0.05mm (2.92-2.97)	150-200C (180C ideal)
Green ABS	2.93-2.99 (0.06mm)	0.04 mm (2.94-2.98)	215-240C (230C ideal)
Blue ABS	2.95-2.99 (0.04mm)	0.03mm (2.95-2.98)	210-240C (230C ideal)
Orange ABS	2.97-3.00 (0.03mm)	0.03mm (2.97-3.00)	210-240C (230C ideal)
Average	2.97mm +/- 0.03	0.043mm	

	TAZ 5 noz temp	bed temp	Part removal temp	Notes
T-glase	245	60	50	
Laywood	190	60	40-50	
ABS	240	110	60	
PLA	205	60	40-50	
HIPS	240	110	50	
Nylon 618	240	110	60	use gluestick
Nylon 645	240	110	60	use gluestick
Bridge	230	100	60	use gluestick
bamboofill	190	60	40-50	
Bronzefill	230	60	40-50	
Copperfill	230	60	40-50	
laybrick	190	60	40-50	
Stainless steel PLA	200	60	40-50	
esun conductive	225	100	60	use gluestick
Polycarbonate	290	110	60-70	
tritan	280	95	60	
Ninjaflex	230	50	50	

Torwell Filament testing notes:

Notes:

T-Glass

- Prints great the green looks really good.
- Sticks to the bed well.
- The diameter varies greatly I was worried about the filament stripping.

Flex

- Has very consistent diameter for a flexible filament.
- Was the first time we printed this material through a hot end extruder and not our flexystruder.

Nylon

- Had trouble finding a good temp to print at. Started bubbling at 220 but was not sticking to itself at 210.
- It turned a green color when heated up instead of staying black.

Recommendation:

The T-glass and Flex all printed well if we ever decide to sell 1.75 filament they would be good choices.

Filament diameter accuracy / consistency:

Filament	Variance in diameter	Maximum out of round	Extrusion temperature
T-Glass	1.71-1.83 (.12mm)	0.04mm (1.79-1.83)	240C (printed with .4 nozzle)
Flex	1.74-1.76 (.02mm)	.01mm (1.72-1.73)	185C (printed at 190C with .4 nozzle)
Nylon	1.70-1.73 (.03mm)	.01mm (1.72-1.73)	220C (printed with .4 nozzle)
Average	1.74mm (+/- .0475mm)	0.0175mm (1.74)	



Illustration 1: Flex and Nylon

LulzBot Filament Testing Report

Manufacturer: Toner Plastics
Filament Name: Black PLA 2.88mm, Lot # 76983
Filament Type: Opaque black pla
Date: 1/4/2015

Ease of use: 9/10
Appearance: Good, dull surface at standard Lulzbot print temps
Size consistency: Good
Color consistency: No variance
Print temperature: 205/60 (LulzBot Mini)
Prints using Lulzbot profiles/temps: Yes

Recommendation: This PLA prints great at our with our standard print profiles. Is very similar to their opaque red PLA, the extrusion consistency was good, but more recent samples of TP PLA are much more consistent.

Notes:

- Prints well using standard PLA settings
- Very little stringing
- Seems like it should be printed at a hotter temperature than our current PLA, but does fine at the default settings

Filament	Variance in diameter	Maximum out of round	Extrusion temperature
2.88mm PLA Batch # 77274	2.86-2.93 (.07mm) Note: More recent samples are better	0.04mm (2.87-2.91)	190-210C (printed at 205C with standard Mini profiles)



LulzBot Filament Testing Report

Manufacturer: Toner Plastics
Filament Name: 3.0mm Copper PLA Natural
Filament Type: Copper colored PLA
Date: 2/11/2015

Ease of use: 9/10
Appearance: Great
Size consistency: Great consistency
Color consistency: Very good
Print temperature: 205/60
Prints using Lulzbot profiles/temps: Yes

Recommendation: I really like this stuff, and I haven't seen another copper colored PLA that looks this good. Might be worth having in the store alongside e-sun PLA.

Notes:

- This stuff looks great, better than a lot of polished bronzefill parts I've seen
- Prints well using standard Mini PLA profiles
- Non-conductive and about the same weight as normal PLA – need to make sure people don't confuse it with metal filled filaments
- Bridges well and doesn't ooze much

Filament	Variance in diameter	Maximum out of round	Extrusion temperature
Copper PLA	2.84-2.91 (.06mm)	0.03mm (2.84-2.87)	180-230C (printed at 230C in .5mm hex nozzle)



LulzBot Filament Testing Report

Manufacturer: Toner Plastics
Filament Name: Nylon 2.88mm
Filament Type: Flexible Nylon
Date: 3/9/2015

Ease of use: 1/10

Appearance: Semi-translucent white

Size consistency: Great

Color consistency: Great

Print temperature: ??? could not get it to extrude consistently

Prints using Lulzbot profiles.temps: No

Recommendation: So far I haven't been able to get this stuff to extrude consistently at any temperature. It seems to melt enough to be forced through the nozzle at around 230C, but will not extrude consistently anywhere between 230 and 270C (where the nylon is boiling).

Notes:

- Extrudes by hand @ 240C, will strip if driven at 70mm/s
- 260C print @ <10mm/s still stripper in first layer
- Extrusion quality looks great, just haven't figured out how to print it

Filament	Variance in diameter	Maximum out of round	Extrusion temperature
2.88mm Nylon	2.84-2.89 (.05mm)	0.03mm (2.84-2.87)	???

LulzBot Filament Testing Report

Manufacturer: Toner Plastics
Filament Name: Red PLA 2.88mm, Lot # 77274
Filament Type: Opaque red pla
Date: 1/2/2015

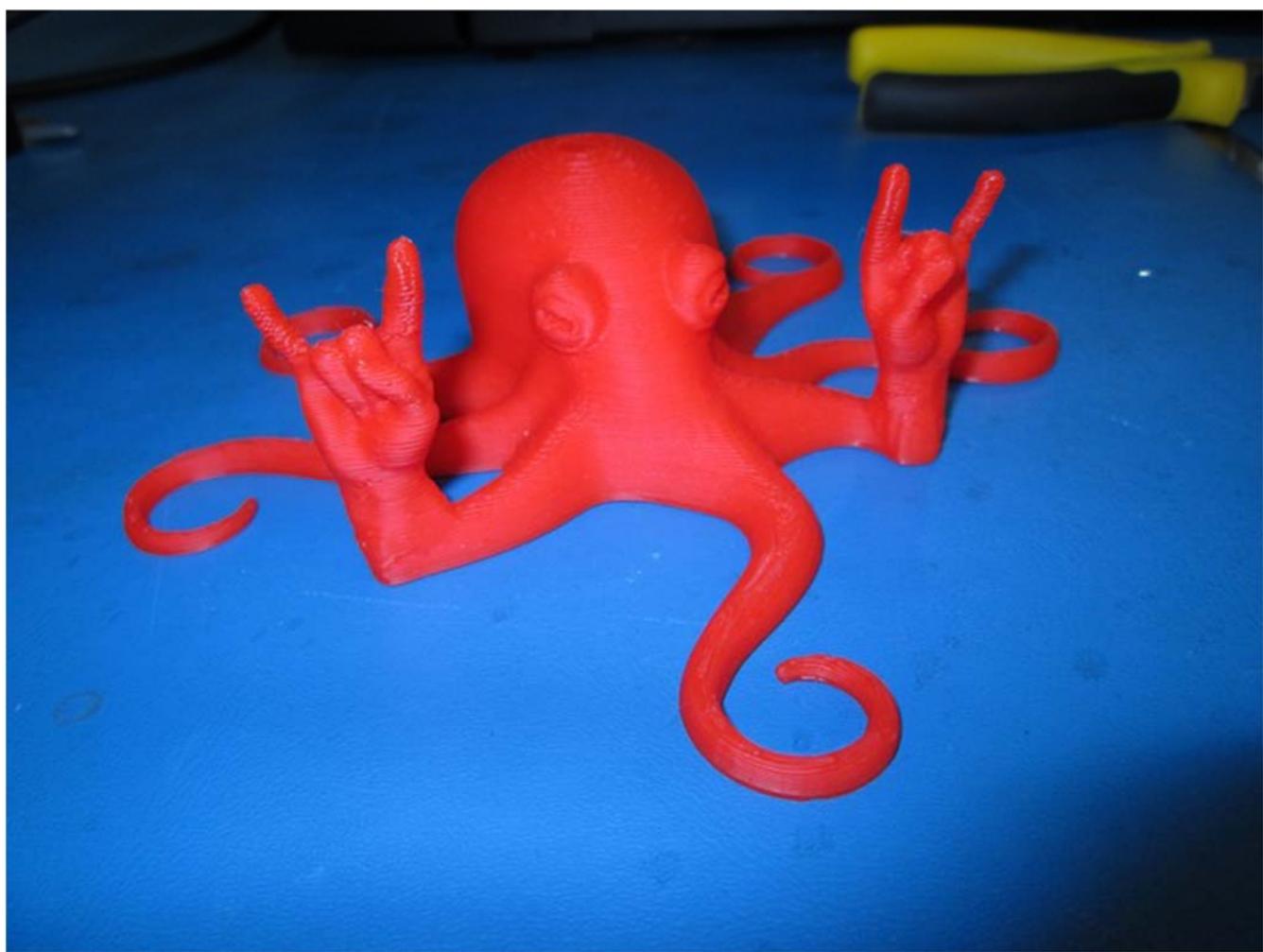
Ease of use: 9/10
Appearance: Good, dull surface at standard Lulzbot print temps
Size consistency: Average
Color consistency: No variance
Print temperature: 205/60 (LulzBot Mini)
Prints using Lulzbot profiles/temps: Yes

Recommendation: This PLA prints great at our with our standard print profiles. The extrusion consistency was average, but more recent samples of TP PLA are much more consistent.

Notes:

- ⑩ Prints well using standard PLA settings
- ⑩ Nice color, would like to see some translucent PLA from them
- ⑩ Very little stringing
- ⑩ Seems like it should be printed at a hotter temperature than our current PLA, but does fine at the default settings

Filament	Variance in diameter	Maximum out of round	Extrusion temperature
2.88mm PLA Batch # 77274	2.81-2.96 (.15mm) Note: More recent samples are much better	0.07mm (2.84-2.91)	190-210C (printed at 205C with standard Mini profiles)



LulzBot Filament Testing Report

Manufacturer: Toner Plastics
Filament Name: 2.88mm TPU, Lot# 41420
Filament Type: Clear TPU
Date: 2/11/2015

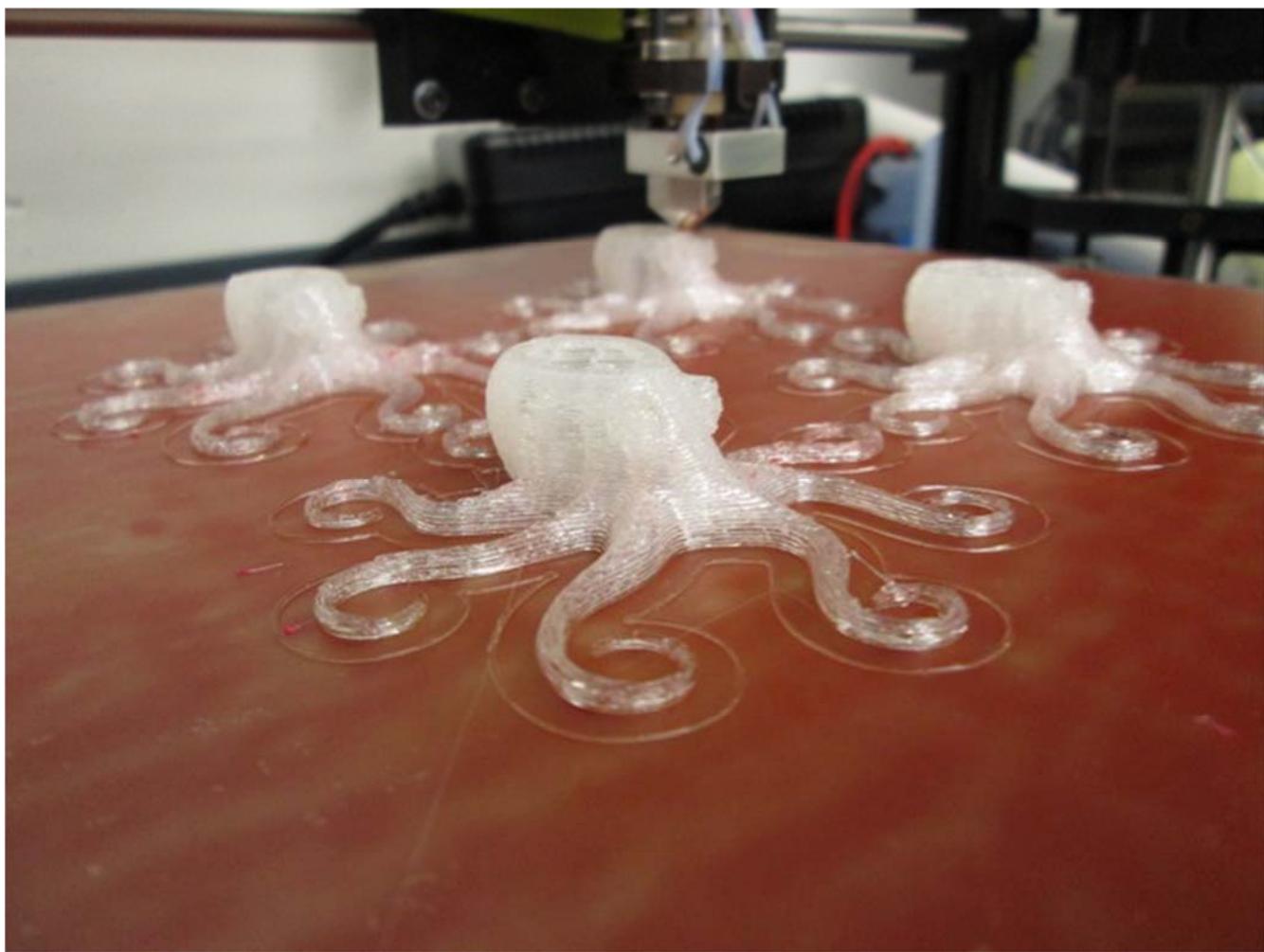
Ease of use: 6/10
Appearance: Great, looks like T-glase when printed
Size consistency: Excellent (for TPU)
Color consistency: No variance
Print temperature: 230/50 (LulzBot Flexystruder)
Prints using Lulzbot profiles/temps: Yes

Recommendation: This stuff prints just like our current TPU, ninjaflex. It might not make sense to carry it alongside ninjaflex if it only comes in clear, but if they can get more colors out it could be a great alternative.

Notes:

- ⑩ This stuff prints well in the flexystruder, almost exactly the same as ninjaflex
- ⑩ This stuff definitely needs the flexystruder
- ⑩ It also looks about the same as ninjaflex when printed, but several people were crazy about how clear it is before printing.
- ⑩ The smooth surface doesn't seem to have much effect when compared to ninjaflex
- ⑩

Filament	Variance in diameter	Maximum out of round	Extrusion temperature
2.88mm TPU	2.88-2.93 (.05mm) Note: This is AWESOME for an elastomer	0.03mm (2.88-2.91)	210-240C (printed at 230C with standard flexystruder)



LulzBot Filament Testing Report

Manufacturer: Toner Plastics
Filament Name: White PLA 3.0mm
Filament Type: White PLA (seems like PLA/TPU blend)
Date: 2/11/2015

Ease of use: 5/10
Appearance: Good color
Size consistency: Good, but a bit high
Color consistency: Good
Print temperature: 210/60 (LulzBot Mini)
Prints using Lulzbot profiles.temps: No

Recommendation: While it's a good strong, and surprisingly flexible PLA, it prints differently from general PLA, making me think that it's got some sort of elastomer additive. It does not wipe properly because of this using the standard PLA profiles, so it would have to be named/marketed as something other than basic PLA.

Notes:

- ⑩ The small spool is a great size, and one of the best looking spools I've seen
- ⑩ Fails bed leveling because of bad wipe
- ⑩ Feels a lot like other PLA/TPU blends (polymax, saniwave PLA, etc)
- ⑩ Interlayer adhesion is great, produces nice flexible parts that fail like ABS

Filament	Variance in diameter	Maximum out of round	Extrusion temperature
3.0mm White PLA	2.94-2.97 (.03mm)	0.02mm (2.95-2.97)	190-220C (printed at 210C with standard Mini profiles)



LulzBot Filament Testing Report

Manufacturer: Toner Plastics
Filament Name: Yellow ABS 2.88mm, Lot # 76174
Filament Type: Yellow ABS
Date: 1/4/2015

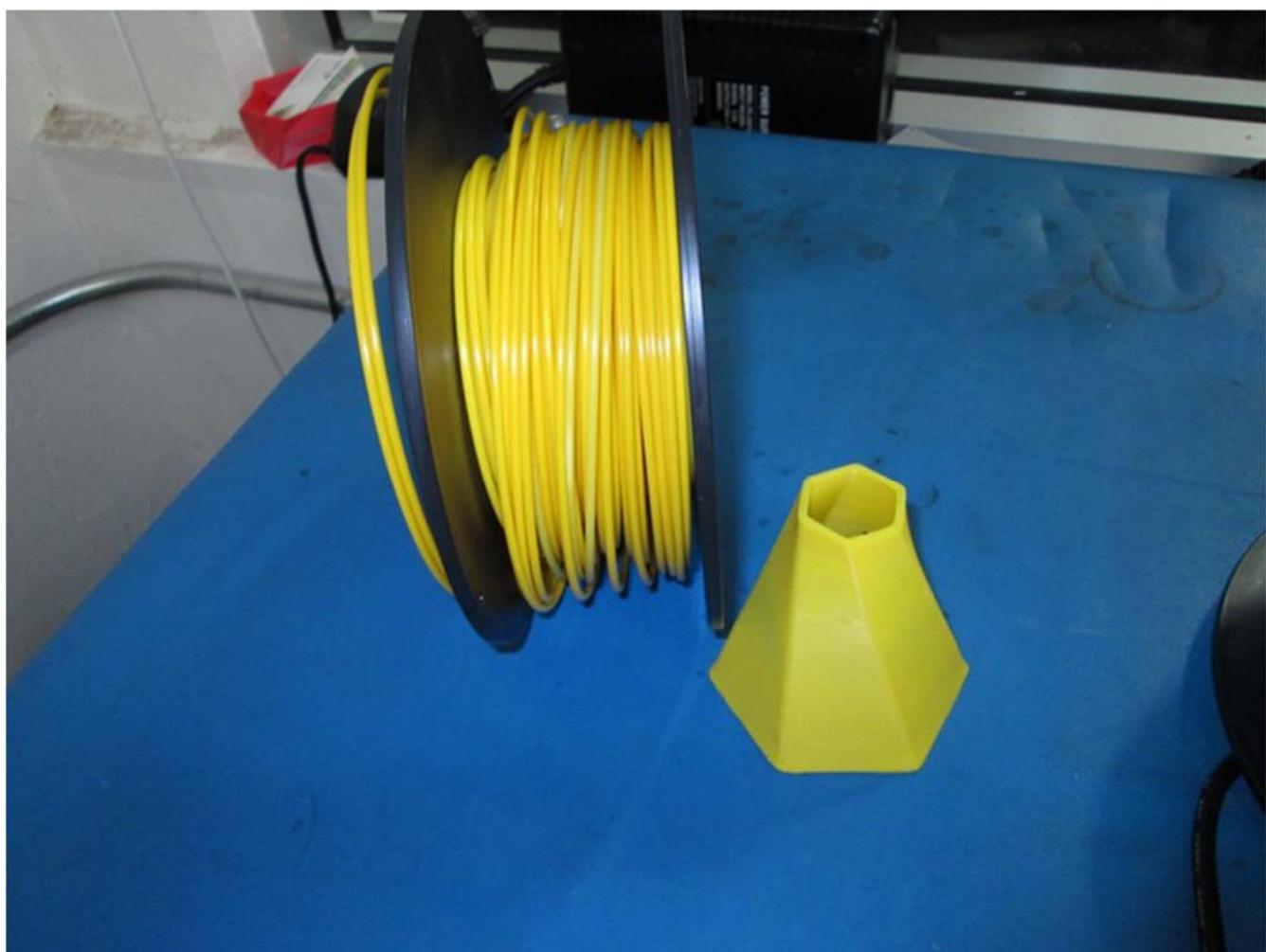
Ease of use: 9/10
Appearance: Good color, but varies widely through spool
Size consistency: Great
Color consistency: BAD variance, from great yellow to almost natural ABS color
Print temperature: 240/110 (LulzBot Mini)
Prints using Lulzbot profiles.temps: Yes

Recommendation: This ABS prints well and forms good strong parts. The lack of color consistency is something that we would absolutely accept returns on, it makes this otherwise great ABS seem like much lower quality stuff.

Notes:

- Prints well using standard ABS settings
- We need the color issue to be addressed
- Interlayer adhesion is great, definitely strong enough to use for our in-house production.

Filament	Variance in diameter	Maximum out of round	Extrusion temperature
2.88mm ABS Batch # 76174	2.84-2.89 (.05mm)	0.03mm (2.86-2.89)	230-240C (printed at 240C with standard Mini profiles)



LulzBot Filament Testing Report

Manufacturer: Verbatim
Filament Name: PLA natural 3mm
Filament Type: PLA
Tested By: Brent M
Date: 7/10/2015

Ease of use: 10/10, Prints well with standard PLA profiles
Appearance: 10/10, definitely the nicest looking natural PLA I've seen, much whiter than normal
Size consistency: Excellent, 2.88-2.89 across a 20m sample
Color consistency: N/A, this is a non colored sample
Print temperature: Prints well at 205C/60C with 100% fan
Prints using Lulzbot profiles/temp: Yes

Recommendation:

This seems to be a very high quality filament, on par with in-PLA and some of the other high end PLA's on the market so it's unclear if it would add anything to our lineup. It came well packages in a vacuum sealed bag with desiccant, and a nice custom HDPE spool (one of the few spools we've seen marked with recycling information). It's got great dimensional accuracy and printability, definitely "LulzBot Approved".

Notes:

- This PLA was the most consistent filament tested here to date in terms of roundness and diameter.
- Much lighter color than e-sun's natural PLA, especially when printed
- Plain packaging, but really nice quality and appearance. Colors and labels have the feel of an inkjet cartridge
- Great bridging ability and dimensional accuracy
- Has a nice glossy appearance when printed at 205C

Filament	Variance in diameter	Maximum out of round	Extrusion temperature
Natural PLA	0.01mm (2.88-2.89)	0.01 (2.88-2.89)	200-220 (205/60 works well on LulzBot Mini)

LulzBot Filament Testing Report

Manufacturer: 3DOM USA
Filament Name: Wound Up
Filament Type: Coffee filled PLA
Tested By: Brent M
Date: 9/15/15

Ease of use: 10/10 – prints just like regular PLA

Appearance: 9/10

Size consistency: Good

Color consistency: Good

Print temperature: 200-205C / 60C

Prints using Lulzbot profiles/temps: Yes, using standard PLA profiles

Recommendation: This is a pretty fun filament that smells a bit like coffee while printing, and a LOT like coffee when opening the bag (it contains a coffee pouch). Printed parts have great color and surface finish, a nice translucent brown PLA, finished parts do not smell noticeably like coffee when cool. It's a fun filament to print with, and definitely "Lulzbot Approved".

Notes:

- Nice sweet coffee smell when printing
- Seems to be more of a dyed PLA than a filled PLA
- Prints well with standard PLA settings, for a default profile for this material I would drop extrusion temp to 200C, no other changes seem to be needed.
- Finished parts do not smell like anything really.
- Filament came packaged nicely in a branded box complete with a real quality report on the mean diameter, ovality and production date. Nice!

Filament	Variance in diameter	Maximum out of round	Extrusion temperature
"Wound Up" Coffee PLA	2.77-2.84mm (2.805mm AVG) 0.07mm variance	2.80-2.83 (0.03mm ovality)	190-210C range 200C / 60C ideal

