



**PREMIUM 3D PRINTING FILAMENT MADE
SUSTAINABLY FROM RECYCLED PLASTIC**

SEPTEMBER 2019

ENVIRONMENTAL PROBLEM



GLOBAL PLASTIC PROBLEM



The production of plastic uses around **8%** of the world's oil production



More than **300 million tonnes** of plastic produced each year



Less than 10% of plastic recycled; most of it ends up in our oceans

3D PRINTING



3D printers typically use plastic as a feedstock - the majority of which is made from **virgin plastic**



7 million desktop 3D printers in use by 2020

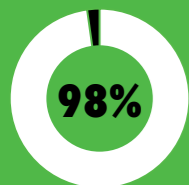


More than **100 million kilograms** of filament will be needed

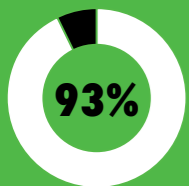
Whilst at its core 3D printing is fundamentally less wasteful than traditional, subtractive manufacturing methods, the use of plastic as a feedstock has the potential to exacerbate the **global plastic epidemic** unless we can find a **sustainable solution...**

GROWING ENVIRONMENTAL AWARENESS

CONSUMER



98% of 3D printer users believe recycling is important



93% would buy recycled filament



Two-thirds of those are motivated by environmental reasons

BUSINESS



Save money by reducing material costs



Address market demand as customers become more environmentally-aware



Comply with company policy and environmental management systems

EDUCATION



42% of carbon emissions from the schools sector come from procurement; almost 1% of total carbon emissions in the UK



Comply with school/college/university procurement policy



Lead by example - sustainability is embedded in curriculums at all levels

REDUCING THE ENVIRONMENTAL IMPACT OF FFF 3D PRINTING

Sustainability is at the heart of our business model. In response to the global plastic problem - and the potential rise in plastic use because of 3D printing - we are committed to;

- Provide a sustainable source of raw materials to 3D printing users
- Greatly reduce the environmental impact of plastic-rich products
- Minimise the amount of plastic being sent to the diminishing landfill sites
- Avoid the consumption of the Earth's oil stocks
- Consume less energy than producing new, virgin polymers
- Encourage a sustainable lifestyle for current and future generations



Recycling material diverted from the waste stream during a manufacturing processes such as extrusion



Recycling post-consumer waste - such as plastic bottles - which can no longer be used for its intended purpose



We also utilise plant-based bioplastics when there is no recycled alternative



All 1kg+ products are spooled onto a 100% recyclable cardboard spool which can be widely recycled

PRODUCTION

Where possible, recycled materials will be used to produce our 3D printer filament, in accordance with ISO 14021:2016;

Post-consumer recycled material: Material generated by households or by commercial, industrial and institutional facilities in their role as end-users of the product which can no longer be used for its intended purpose. This includes returns of material from the distribution chain.

Pre-consumer recycled material: Material diverted from the waste stream during a manufacturing process.

Material sourcing

A careful selection criteria is in place in order to guarantee quality, consistent waste streams. We use both post-consumer waste – for example recycled PET bottles to produce our ONE PET filament, as well as post-industrial waste such as material diverted from the waste stream during a manufacturing process which is how we produce our PLA filament, for example.

Manufacturing

This process starts by feeding plastic material from a hopper into the barrel of the extruder. The material is melted by the mechanical energy generated by turning screws and by heaters arranged along the barrel. The molten polymer is then forced into a die, which shapes the polymer into the shape of filament – either 1.75mm or 2.85mm.

Quality assurance

During extrusion, filament is measured by lasers from 2-axes, with an alarm bell sounding if the diameter falls outside our high standards. Filament is then wound onto bulk spools for visual inspection before it is put onto the individual spools to be packaged. Each batch produced undergoes a rigorous 3D printing test; if we're not happy with the print quality then it won't leave the factory, simple as.

WHAT DO PEOPLE THINK?

98%

of current customers rate us as 'very high quality' or 'high quality'

"A fantastic filament, worthy of printing in your printers"

Joel Telling, 3D Printing Nerd

"A very good solution for those who want to recycle but don't have the time or resources"

Joe Larson, 3D Printing Professor

"It's a really good filament... if it wasn't any good I'd tell you"

Chuck Hellebuyck, CHEP 3D Printing

"Well priced and looks fantastic"

Angus Deveson, Makers Muse

"Quality recycled filament that is truly reliable, very forgiving and easy to print with!"

Joe Casha, 3D Maker Noob

"The colours are really good compared to most others"

Anton Månsson, 3D Print Tech Design

CASE STUDY

Used by **more than 3000** makers, 3D Hubs, businesses and universities, Filamentive has become a **main player** in the 3D printing materials market. Our material are used globally - from prototyping and development applications to end-use products.

Here is one example use-case for our materials.



"Filamentive's filament prints beautifully and they always deliver on time, the customer service is always excellent. On top of their filament being recycled, they're the only supplier we know that uses cardboard spools which massively reduces our waste given that we order in bulk. We love their eco-friendly efforts and fully support their focus on and development of filaments that are 100% recycled."

Samantha Payne, COO, Open Bionics

Open Bionics uses Filamentive materials to create stunning aesthetic covers for their 'Hero Arms', - a 3D printed bionic limb for amputees and people with limb differences. Open Bionics champions diversity, inclusion, and celebration of personality. Filamentive enables them to reliably build beautiful designs that their users love.

Open Bionics uses filamentive materials to print their 3D printed robotic hand, The Brunel Hand. The Brunel Hand is an affordable robotic hand for researchers to perform and test dexterous tasks. <https://openbionics.com/>



ULTIMAKER MATERIAL ALLIANCE

Filamentive is pleased to announce our participation in The Ultimaker Material Alliance Program – a collaboration allowing filament companies to offer their products in Ultimaker Marketplace.

As such, Filamentive materials will be listed in the Ultimaker software and all 3D printing settings will be provided to make sure that we can together offer unprecedented hassle-free printing, first-time-right-printing and ease of use to our joint end-users – substantially improving printing reliability and printing quality.



Ravi Toor, Managing Director at Filamentive: ***"Plastic waste is a global problem, and technology such as 3D printing has the power to facilitate sustainable development and resource efficiency. With more than 100,000 Ultimaker users in the professional market and 3 million Cura users worldwide, the availability of Filamentive material profiles will increase the awareness, credibility and ultimately use of recycled materials to further reduce the environmental impact of FFF 3D printing."***

Bart van As, Product Manager Materials at Ultimaker: ***"Ultimaker Printers are suitable for professional 3D printing by offering a hassle free 3D printing experience with industrial-grade materials. We are very proud to inform the market that 4 different types of filaments of Filamentive will soon be available through the Ultimaker Marketplace. These print profiles have been optimized using Ultimaker's specialized software that is available to partners in our Ultimaker Material Alliance Program. 3D printing professionals worldwide can soon use FFF technology to print with a recycled material in order to achieve beautifully designed results printed in 3D. With this addition, the Ultimaker Marketplace offers even more solutions catering to the needs of our customers."***

DECLARATION OF RECYCLED CONTENT

We are committed to using a high-percentage of recycled materials in all products manufactured and sold, as well as committing to recyclable spools and packaging. The following products have been evaluated according to: **BS EN ISO 14021:2016**

Environmental labels and declarations – Self-declared environmental claims (Type II environmental labelling)

Product	Recycled content (%)	Spool Recyclability (%)	Source of recycled material
PLA¹	55	100*	Post-industrial extrusion waste
PLA Matte²	70	100*	Post-industrial extrusion waste
ePLA²	50	100*	Post-industrial extrusion waste
PLA Cosmic²	10	100*	Post-industrial extrusion waste
Wood¹	81	100*	Post-industrial extrusion waste
ONE PET²	100	100*	Post-consumer PET waste
PETg¹	67	100*	Post-industrial extrusion waste
Carbon Fibre¹	100	100*	Post-industrial extrusion waste
ABS¹	64	100*	Post-industrial extrusion waste
ASA¹	50	100*	Post-industrial extrusion waste

¹ = based on 2018 production

² = based on projected 2019 production

* = based on 1kg> products

Recycled content can change over time due to new guidelines, operating conditions, suppliers and availability of raw materials. Please visit www.filamentive.com or email: info@filamentive.com for current technical information. Issue Date: January 2019

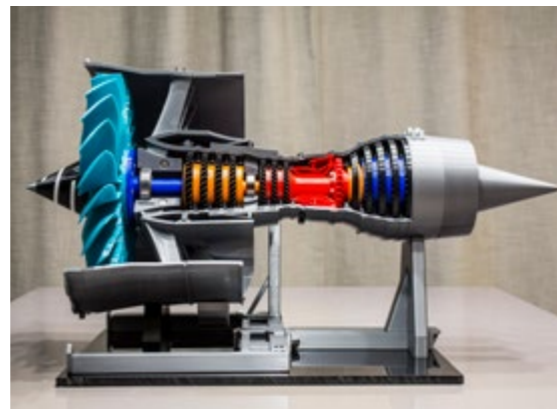
MATERIALS GUIDE

Material	Summary	Printing Temperature (°C)	Heated Bed Temperature (°C)	Print Speed	Fan Speed (%)	Adhesion	Nozzle Requirement?
PLA	Easy to print and low warp - ideal for general prototyping	205 ±10	0-60	Medium-High	50-100	hairspray, bluetape, glass, PEI	≥0.2mm
PLA Matte	Matte-finish and textured feel	205 ±10	0-60	Medium-High	50-100	hairspray, bluetape, glass, PEI	≥0.2mm
ePLA	Engineering-grade PLA with mechanical properties and heat resistance of 95°C+	235 ±10	0-70	Medium-High	75-100	hairspray, bluetape, glass, PEI	≥0.2mm
PLA Cosmic	Featuring non-toxic metallic flakes for that extra sparkle	215 ±10	0-60	Medium-High	50-100	hairspray, bluetape, glass, PEI	≥0.4mm
Wood	PLA-based; looks, smells and feels like wood	210 ±10	0-60	Medium-High	50-100	hairspray, bluetape, glass, PEI	≥0.4mm
ONE PET	Stiff and tough PET material made from recycled plastic bottles	250 ±10	80-100	Medium	40-70	hairspray, bluetape, glass, PEI	≥0.2mm
PETg	Easy to print and durable - also food contact acceptable	215 ±10	60-80	High	50-100	hairspray, bluetape, glass, PEI	N/A
Carbon Fibre	PET-based filament featuring 20% carbon fibre powder for extra rigidity	235 ±10	0-60	High	50-100	hairspray, bluetape, glass, PEI	Hardened nozzle; ≥0.5mm
ABS	High impact strength with minimal warping	250 ±10	80-100	Medium	0-25	hairspray, bluetape, glass, PEI	≥0.2mm
ASA	Strong, minimal warping and UV resistant so perfect for outdoors	245 ±10	80-100	Medium	0-25	hairspray, bluetape, glass, PEI	≥0.2mm
bioPC	Impact resistant, high chemical resistant and heat resistant to 100°C	270 ±10	100	Low-Medium	10%	hairspray, bluetape, glass, PEI	≥0.2mm
FLEXpro	Flexible, heat resistant to 140°C, oil-resistant and 450% elongation at break	235 ±15	0-60	Medium-Fast	Medium-Fast	hairspray, bluetape, glass, PEI	≥0.2mm

PRODUCT: **rPLA**

RECYCLED ORIGIN. UNRIVALLED QUALITY

Short for polylactic acid, PLA is a bioplastic derived from plant-based sources. However, PLA production is depleting natural resources faster than they can be replenished. To address this issue, we have pioneered rPLA 3D printer filament, still boasting the same great PLA features such as; low warping, limited smell and premium print quality – but with the added benefit of being produced from factory waste streams as opposed to virgin pellets. All users of rPLA can feel good about reducing environmental impact, whilst being confident that the print quality will still be one of the best on the market!



© An Duong

Colours available:



PRODUCT: **PLA Matte**

MAGICALLY MATTE. TERRIFICALLY TEXTURED

As the name suggests, this is the perfect filament for those desiring a matte finish. The printed surface diffuses light to give it a matte look and reduce visibility of layer lines. Not to mention the added texture finish.



© Tom Jackson / Filament Frenzy

Colours available:



PRODUCT: **PLA COSMIC**

OUT OF THIS WORLD!

Our highly-rated PLA, with the addition of non-toxic metallic flakes for that extra sparkle - the surface finish also reduces layer lines for that added magic!



© Lancashire3D Ltd

Colours available:



PRODUCT: **ePLA**

HARDER. BETTER. FASTER. STRONGER.

An engineering-grade PLA filament - comparable in performance to ABS, featuring 95°C< heat resistance (after annealing) and the ability to print at speeds above 120mm/s. Semi-matte finish.



Colours available:



PRODUCT: **XL SPOOLS**

Did you know we offer XL spools of our 3D printing filament – in sizes up to 8.5 kg?

Why Use XL Spools?

Large volume prints - The bigger the prints, the more filament you need!

Hassle-free - Reduce spool changes and ensure your printer doesn't run-out of filament!

Reduce cost - winding large spools is more efficient for us and we can therefore pass-on the cost savings!



PRODUCT: **WOOD**

SMELLS LIKE WOOD, LOOKS LIKE WOOD, FEELS LIKE WOOD

Filamentive Wood is a PLA-based composite 3D printer filament. 40% of the formula is made from recycled wood fibres, providing a realistic wood colour, finish and even smell. Some wood filaments can be difficult to print, so our goal was to offer a wood filament that is easy to work with and we have succeeded – many of our customers praise this filament for “printing like butter”. You can even post-process your wood 3D prints – such as sanding, varnishing and coating – to make eye-catching, decorative wood objects.



Colours available:

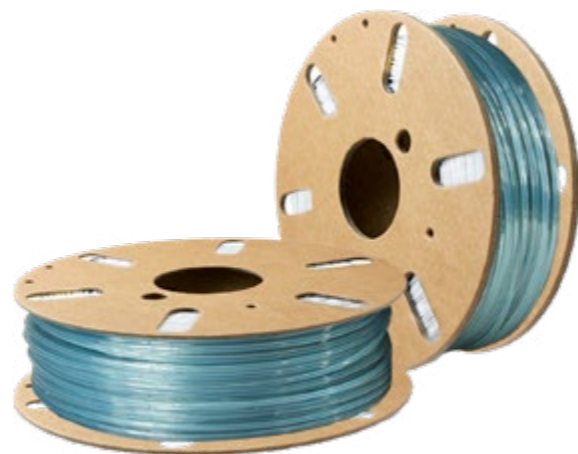


PRODUCT: **ONE PET**

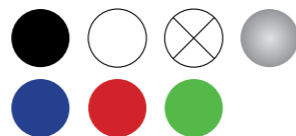
WASTESTREAM TO MAINSTREAM!

100% recycled filament made from post-consumer PET plastic bottle waste. This is a stiff and tough material with excellent interlayer adhesion, available in a wide range of colours to suit needs and requirements.

Where our regular PETg has a better impact resistance, ONE PET boasts superior technical properties such as tensile strength, elongation strain at break and tensile modulus.



Colours available:



PRODUCT: **rPETG**

PRINTS LIKE PLA, STRONG LIKE ABS. PERFECT HYBRID

PET plastic originates from non-renewable sources, and recycling rates remain low. To reduce the consumption of virgin PET, our PETg is produced from PET waste streams - typically from extrusion processes. Overall, rPETg is strong, does not warp, and is odour neutral - a perfect all-rounder, ideal for those strong and durable parts. It is even safe for food contact!



Colours available:



PRODUCT: **CARBON FIBRE**

3D PRINT WITH REAL CARBON. WITHOUT THE FOOTPRINT

Carbon fibre is known for being strong, yet lightweight – and now you can 3D print with it! Our carbon fibre filament is a PET-based composite containing 20% recycled carbon fibres. Filamentive carbon fibre is stiff, impact resistant, and heat resistant up to 80°C. Your carbon fibre 3D printed objects will have an attractive matte black surface, and you'll be pleased to know the filament is dimensionally stable, and will not warp during print. The ideal filament for functional and mechanical parts, such as RC/drones components.



© Tom Jackson / Filament Frenzy

Colours available:



Please note: A hardened/steel nozzle is recommended as carbon fibre is inherently abrasive

PRODUCT: **rABS**

RECYCLED. REDEFINED. REVOLUTIONARY.

ABS is a common 3D printer filament, famous for its strength. However, ABS is also infamous for warping and being generally environmentally unfriendly. Filamentive has changed this – rABS features >60% recycled content to reduce the use of raw ABS and consume less energy. We have also ensured that the material has minimal warping, as well as excellent adhesion – both interlayer and to the heated bed. Filamentive rABS has enhanced strength compared to regular ABS- the ideal material if you require strong, lightweight, impact resistant parts.



Colours available:



Please note: rABS can still produce some fumes so print in a well-ventilated area

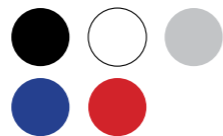
PRODUCT: **ASA**

THE PERFECT FILAMENT FOR THE OUTDOORS

ASA features many of the same properties as our rABS - including high strength and little/no warp - but with the added benefit of UV resistance. As always, we strive for perfection, and the excellent interlayer adhesion ensures great looking, high performance parts. Overall, ASA is the perfect engineering filament for those prints that need to withstand external environments.



Colours available:



PRODUCT: **bioPC**

HIGH STRENGTH AND HIGH HEAT RESISTANCE, WITH NO HARMFUL EFFECTS

A copolyester material, boasting heat resistance to 100°C, high impact resistance and chemical resistance. Polycarbonate filaments typically contain Bisphenol A (BPA) – a chemical strongly linked to serious health and environmental impacts. As an ethical brand, we're pleased to announce that our bioPC is BPA-free. Overall, this is an impressive, easy to print, engineering-grade filament.



Colours available:



PRODUCT: FLEX

HIGH PERFORMANCE, FLEXIBLE FILAMENT. WITHOUT THE PROBLEMS

Our flexible filament has been formulated from the highest quality thermoplastic polyurethane (TPU) – it is strong, flexible, heat resistant up to 140°C, and features excellent printability on both direct-drive and Bowden extruder systems. Overall this is the perfect flexible filament, combining material properties and ease of use - ideal for orthopedic, prosthetics, RC and many other applications.



Colours available:



Please note: Oven re-drying is recommended to eliminate moisture when the filament has out of the bag for many hours

PROJECTS

We take great pleasure from seeing the end result - our clients are the true visionaries and being a small part of such impactful work makes it all worthwhile - here are a few examples of amazing projects Filamentive materials have been used for...

RHS Chelsea Flower Show

'The Pearlfisher Garden' at the 2018 RHS Chelsea Flower Show features a 3D-printed sculpture of a Pearl Diver made from our recycled PLA plastic - the final piece was printed by our friends, 3D Folkes.



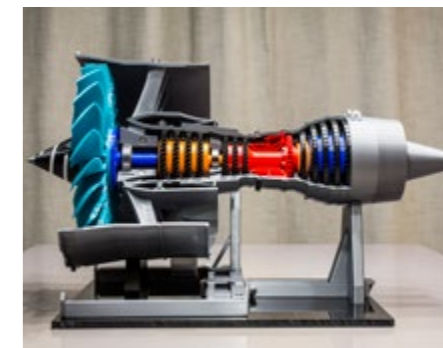
2018 Walk for WasteAid

The Walk for WasteAid 2018 raised over £10,000 to support better waste management around the world and everyone who made it across the finishing line received a 3D printed medal made from our recycled plastic 3D printing filament.



3D-printed jet engine

This realistic, 3D-printed, 3-shaft jet engine - designed and 3D-printed by An Duong - went viral via LinkedIn, amassing six-figure post views in a matter of days!



TECHNICAL DATA

Product	Specific Gravity (g/cc)	MFI (g/10min)	Tensile Strength at Yield (MPa)	Elongation-Strain at Break (%)	Tensile (E) Modulus (MPa)	Vicat Softening Temp. (°C)	Heat Deflection Temp. (°C)	Glass Transition Temp. (°C)	RoHS Compliant	REACH Compliant
rPLA/PLA Matte	1.24	9.56	70	20%	3120	60		57	✓	✓
PLA Cosmic	1.24	9.56	70	20%	3120	60		57	✓	✓
ePLA	1.27	6	N/A	47%	4000		95+ after annealing	60	✓	✓
Wood	1.2	5	70 MPa (MD) 100 MPa (TD)	170% (MD) 110% (TD)	1900 MPa (MD) 2300 MPa (TD)	45			✓	✓
rPETg	1.27	6.4	50	23%	2020		70	77	✓	✓
ONE PET	1.17	N/A	57	370%	2300				✓	✓
Carbon Fibre	1.19	N/A	53	8%	3800		80		✓	✓
ABS	1.1	41	44	34%	2030	97			✓	✓
ASA	1.11	26.6	48	15%	2020	98			✓	✓
FLEXpro	1.16	57	50	450%	150	138	42	-16	✓	✓

OUR STORY

01 **Where it all began...** Ravi begins studying BA Environment and Business at University of Leeds where he soon learns about the environmental impact of plastic as well as the growing need for sustainability in business **December 2013**

02 **Concepting...** Ravi receives early funding prizes and awards to pursue Filamentive as a viable business **September 2015 - September 2016**

03 **Launch...** After a soft-launch and further market research to validate the business model, Filamentive is fully launched **May 2017**

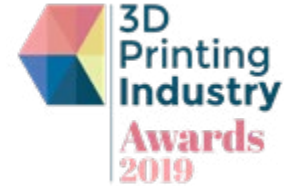
04 **Impact...** Filamentive's approach to addressing the plastic problem leads to being named as "One of the Worlds' Most Impactful Start-ups" by Web Summit **November 2017**

05 **Recognition...** Filamentive establishes itself as a key player in the filament market, as well as industry recognition via a Material Company of the Year shortlisting **May 2018**

06 **Scale...** With more than 100,000 Ultimaker users in the professional market and 3 million Cura users worldwide, the availability of Filamentive material profiles on Ultimaker Marketplace increases awareness, credibility and ultimately use of recycled materials to further reduce the environmental impact of FFF 3D printing **August 2019**



“One of the world’s
most impactful start ups”



“MATERIAL COMPANY
OF THE YEAR *finalist*”

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