Is 3D printing eco-friendly?

This article will address the question of the environmental sustainability of 3D printing. In order to look for an answer to this question, it is worth raising some popular issues:

1. Waste from 3D printing;
2. Energy consumption during 3D printing;
3. Toxins generated during 3D printing.

When it comes to the first point in this article, namely "Waste from 3D printing", the situation is quite complicated. On the one hand, a relatively large amount of waste is generated during printing (supports + waste/residue, offcuts). This is undoubtedly negative, and of course one can advise printing without supports, but this is probably not the crucial change. The key, however, may be the choice of materials used to make the 3D printing product. We associate 3D printing mainly with plastic, but it is worth noting that there are more and more materials that we can create with and they have various unusual features. Firstly, compostable (not to be confused with biodegradable)! Plastic that is compostable will have specific features in terms of braking down to chemical compounds (like: carbon dioxide; water, biomass), but also in terms of the time, environment it needs to break down and the toxins it releases.

Read more about it on:

https://www.eea.europa.eu/themes/waste/resource-efficiency/biodegradable-and-compostable-plastics-challenges

One way, therefore, could be to use more environmentally friendly filaments. You can also use water soluble filaments like PVA or HIPS for printing supports to your standard 3D product.

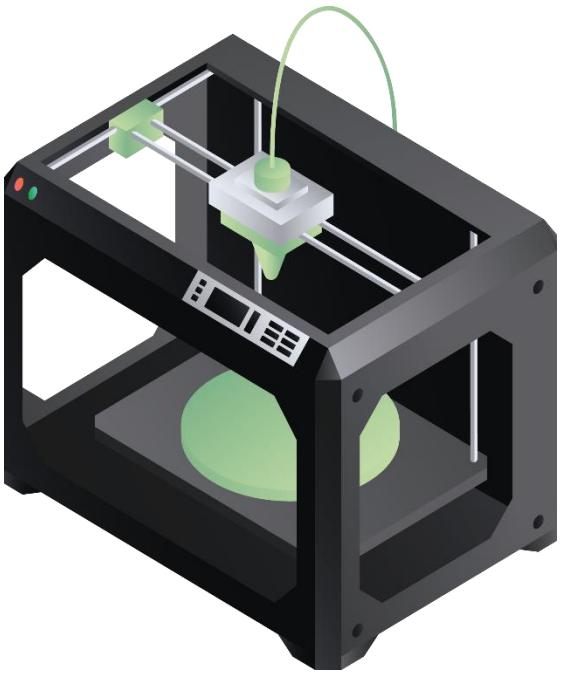
Amongst the popular filaments we can mention ABS, which is neither biodegradable nor compostable. However, it is possible to reuse it. For this purpose, you need to buy filament recycler.

Another popular filament - PLA is possible to compost. It takes approximately 1-3 months to decompose (although it is strongly discourage throwing it in the bin, it is much better to use the industrial facility).

But when it comes to the energy consumption of 3D printing, studies show that it uses between 50 and 100 times more energy to produce the same object. This is not a satisfactory outcome. However, there are indications that this may change when 3D printing is used in mass production.

As far as the toxicity of 3D printing is concerned, it depends on several factors. First of all, yes - during 3D printing some toxic fumes are produced, however it is very important what kind of material and what kind of 3D printer is used. A better decision will be to use a closed printer.

It is worth pointing out that, despite such a harsh assessment of 3D printing, this technology can contribute to supporting ecological solutions. In order to do so, it must continue to develop.



With its popularisation and new solutions, it will be possible to reduce the carbon footprint (due to logistics/material transport, among other things) by creating products at the final destination. 3D printing products are also generally lighter (which also affects logistics). In addition, engineers are presenting more and more new ways to combat the ecological problems related to the aforementioned environmental issues. These include new, more sustainable materials for production, new ways of filtering waste/fumes. There is also a political struggle to force manufacturers to change the way they label their products (production standards).

Currently, a very high level of results in the field of printing from recycled materials is being realised by the:

- **Nefilatek** (Canada) – the level of recycling of materials - 98%
- **Lancashire 3D** (UK) – the level of recycling of materials - 95%
- Danish company **Aage Vestergaard** Larsen together with the university of Aarhus are working to introduce 100% recycled filament.

This article only gives an overview of the problem without going into the details. The situation in the 3D printing industry is changing very dynamically and new solutions are constantly being developed.

Make sure you are following the "3DP TEACHER - implementation of 3D Printing in future education" project's Facebook page to be the first to know when the guidebook is published on project's website.

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Sources:

- Pinshare. (2016). *Guide to Green 3D Printing – 4 Ways to be More Sustainable!*. Retrieved from: https://pinshape.com/blog/guide-green-3d-printing/
- MY3PCONCEPTS. (n.d.). *Moving toward eco-friendly manufacturing.* Retrieved from: http://my3dconcepts.com/explore/eco-friendly/
- Grendys A. (2020). *Duńskie filamenty z recyklingu oraz Dziki Zachód druku 3D*. Retrieved from: https://przemyslprzyszlosci.gov.pl/filamenty-z-recyklingu-i-dziki-zachod-druku-3d/

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