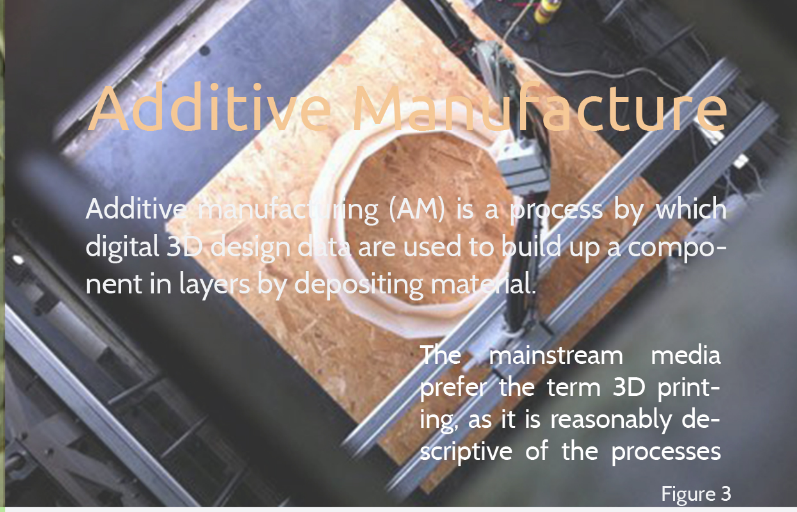
Value of Bioplastics in towards a circular economy

Celluloid is the very first bio-plastic, discovered in 1855, used instead of valuable ivory.

Figure 1 Figure 2

Additive Manufacture

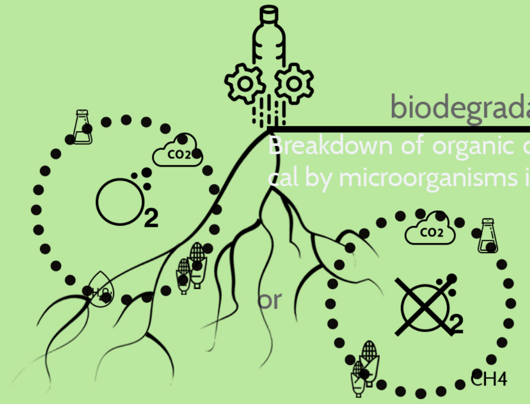


Additive manufacturing (AM) is a process by which digital 3D design data are used to build up a component in layers by depositing material.

The mainstream media prefer the term 3D printing, as it is reasonably descriptive of the processes

Figure 3

1980, bioplastics become once again a focus of research and development, with the principal interest on:



biodegradability

Breakdown of organic chemical by microorganisms into:

The place, the rate and the extend of degradation should be consistent with the disposal method

In the late 1980s, the 3D printing was associated with the term rapid prototyping (RP).

Faster and cheaper way of making initial models to check form and fit.

Advances in software, process, and materials mean that functional parts can now be manufactured.

Such designs are built with less material use, and ample freedom in form and flexibility.

Figure 4

compostability

mineralization into a composting system, and completion of its biodegradation during the end-use of the compost (no ecotoxicity) .

The common technique focuses on printing the envelope and internal structure of the walls using plastics. The structure is filled with weight (sand, concrete), isolation material and the infrastructure.

In later years the main interest was shifted towards the renewable resource aspect of the:

bio-based

the plastics that are derived from biomass (biodegradable organic material derived from plants, animals, and microorganisms and is considered as

End-Of Life

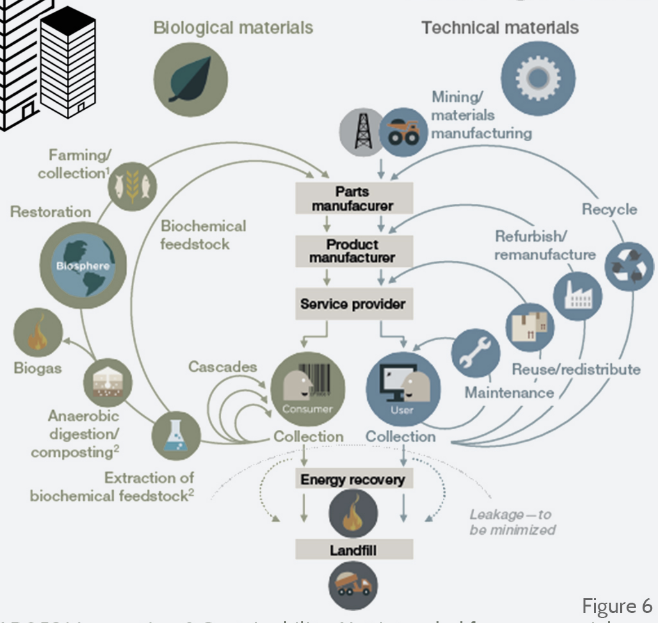


Figure 6

"circular economy is restorative and regenerative by design, aiming to keep products, components and materials at their highest utility and value at all times, distinguishing between technical and biological cycles".

recycling of bioplastics it should always be the priority that both the stored bio-based carbon and the energy contained are recycled in technical recycling installations.

Figure 5


Figure 7


Figure 8

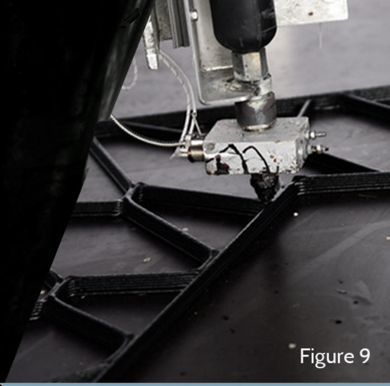


Figure 9

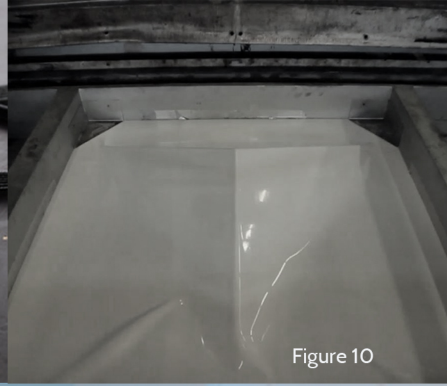
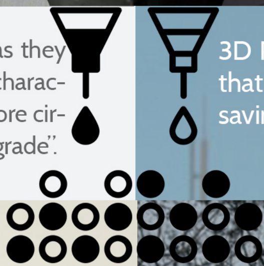


Figure 10

Bioplastics fit in this new economic concept as they help to break away from the linear economy characterized by "make, use, dispose" in favor of a more circular model based on "reuse, recycle or biodegrade".



3D Printing can also fit in the concept of a circular economy, given that the manufacturing process itself can lead to significant material savings, because there is virtually no production waste.


Figure 11


Figure 12


Figure 13

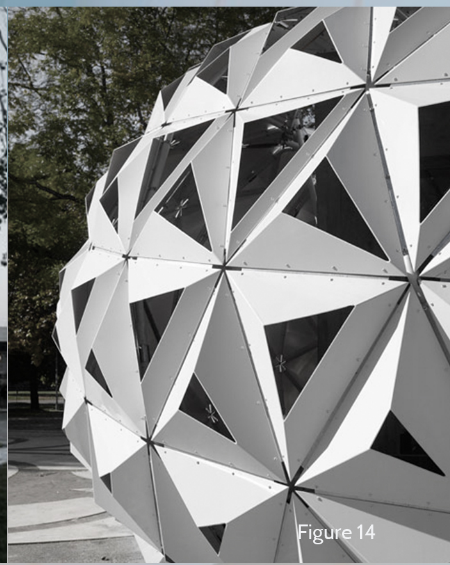
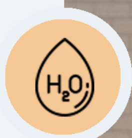


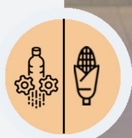
Figure 14

3D Printing with bioplastics?



The significant water footprint of bioplastic feedstocks, as well as the risk of deforestation in tropical regions and countries

Biodegradable bioplastics will only break down in a high-temperature industrial composting facility, not in an average household compost bin.



Energy consumption and amount of material used. Plastic is a complex, highly refined synthetic material – so why create something that requires a significant amount of energy to manufacture, only to shortly have it completely decomposed into the soil?

Karaiskou A.; *Evaluating Bioplastics-The potential of bioplastics in 3D printed applications towards a circular economy;* Delft, 2016

Figure 1: https://warehousebizongo.wordpress.com/2016/01/30/a-story-on-how-plastic-took-the-world-by-storm/

Figure 2: http://www.dezeen.com/2015/11/11/peter-marigolds-pocket-sized-formcard-mouldable-plastic-glue-bioplastic-design-kickstarter/

Figure 3: https://likemyplace.wordpress.com/2014/03/24/3d-x-prefab-kamermaker-the-worlds-first-3d-printed-house-begins-construction-amsterdam-the-nl-2014/

Figure 4+9: http://www.tu.no/artikler/her-bygger-det-nederlandske-arkitektfirmaet-hus-med-3d-printer/231805

Figure 5+12:http://www.dezeen.com/2015/01/19/jean-louis-iratzoki-first-bioplastic-chair-alki-polymer/

Figure 6: http://reports.weforum.org/toward-the-circular-economy-accelerating-the-scale-up-across-global-supply-chains/from-linear-to-circular-accelerating-a-proven-concept/?doing_wp_cron=1479050625.7989909648895263671875

Figure 7: http://trellisbioplastic.com/products-services/bioplastic-resin-rollstocks/

Figure 8+10+14: http://www.dezeen.com/2013/11/09/arboskin-spiky-pavilion-with-facademade-from-bioplastics-by-itke/

Figure 11:http://www.huffingtonpost.com/2014/03/15/plastic-shrimp-shells-bpa-_n_4966857.html

Figure 13: http://www.dezeen.com/2016/08/30/dus-architects-3d-printed-micro-home-amsterdam-cabin-bathtub/

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