

3D Printing in Industry

The use of 3D printing is becoming part of the daily panorama of both industrial and educational reality with a rapid transition from the CAD 3D models to a hands-on model, regardless of the type of material desired. With the demand for more customised products with shorter life spans – from clothing, to housing and automobiles – the rapidness with which the products are put in production is essential. Due to its nature, 3D printing is becoming increasingly preferred either as a validation process or as a player in the final product generation.

The growth of 3D printing is one a mark of the beginning of the 21st century. The global industrial 3D printing market size was of 10.41 billion USD in 2019, however, by 2027 it is expected to reach 54.96 billion USD, with an average annual growth rate of 23.5%.

[<https://www.fortunebusinessinsights.com/industry-reports/3d-printing-market-101902>]

The market performance was increased with the pandemic of COVID-19 and the subsequent crisis that limited the supply chains, shortened the labour periods of companies and the manufacturing materials availability. An example of the role of 3D printing in this situation had to do with the production of personal protective equipment (PPE) and medical devices. Both individuals and companies with access to 3D printing technology rushed to produce items in need for medical purposes.

[<https://www.weforum.org/agenda/2020/03/3d-printed-emergency-breathingvalves-covid-19/>]



Figure 1 - Respiratory valve for breathing apparatus developed by an Italian start-up company.

Even though the pandemic increased the momentum that 3D printing has been gathering, it is important to highlight the key-features of this group of technologies that set them as promising for advanced processes of manufacturing.

3D printing is part of the formerly known Rapid Prototyping technologies that, as the name indicates, were essentially used for the fabrication of prototypes for aesthetical evaluation, dimensional approval, coupling testing and other purposes that needed to be fully defined before mass production. The main advantage of 3D printing over other additive manufacturing processes is the versatility since it is a fast process with the possibility of employing different materials at low costs. These factors allow the reduction of time for the validation process of the prototyped parts, reducing the lead time and enabling them to be quickly employed.

Simultaneously, 3D printing is becoming more used as final product manufacturing process, especially due to the ability to produce complex shapes without limitations, due to its method of layer-by-layer deposition. The flexibility of design it allows is becoming increasingly more important in the conception of new products. One of the major downsides of the AM production is the economic viability that is scarce for high-volume production, with injection moulding displaying higher competitiveness for plastic parts production.

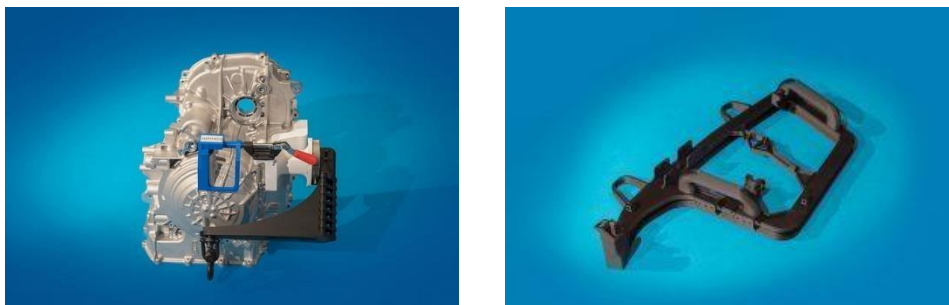


Figure 2 - Assembly lift assist, on the left, and window alignment tool, on the right, used by Ford in the assembly plants.

For certain industries such as aeronautical one feature that is guaranteed by 3D printing and represents an engineering gain is the reduced weight of the components, allowing to partially fill the component without compromising the mechanical integrity. In this sector, the materials used are essentially metallic compounds with a polymeric matrix, which are recognised for its high cost, however, the material efficiency in 3D printing is very close to 100%, allowing a high profitability of the raw material.

The trend of 3D printing is becoming contagious to the industry and even in some industries that the final product is not able to employ 3D printing in a profitable way, these processes allow gains

in the manufacturing processes, such as Ford that started using 3Dprinted parts such as an injection mould lifter, an assembly lift assist and a window alignment tool. These components do not take part of the final vehicles however are items that add value and reduce production times in the assembly lines and manufacturing stages of the components. In the European continent, the manufacturer Porsche started using 3D printing to produce components for classic vehicles whose moulds are no longer possible to use and very expensive to reproduce for such low tiers.

[<https://newsroom.porsche.com/en/company/porsche-classic-3d-printer-spareparts-sls-printer-production-cars-innovative-14816.html>]

Given the examples showed, it is possible to comprehend why the use of 3D printing is becoming more and more important for the competitive industries. The challenges of the high production times and low profitability are the key to propel this additive manufacturing process to a new level.

It is possible to find more information about 3D printing, including applications, trends and its benefits for Education in the “3DP TEACHERS’ GUIDEBOOK”. 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](#).