

Combating **COVID-19** with 3D Printing

What a pandemic taught us about
manufacturing and supply chain

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The spread of COVID-19

COVID-19 totally changed our daily lives, but not only. With the appearance of new problems and challenges, innovative solutions rose up and 3D printing is playing a crucial role.

This year started with an unexpected pandemic situation which quickly encompassed the world. We saw how governments, private enterprise, non-governmental organizations, and individuals quickly took action to the evolving crisis. Indeed, during this COVID-19 pandemic, we all had to face new situations and new challenges. This whole dramatic situation totally changed our manufacturing landscape but also highlighted some technologies, giving more space to innovation and creativity.

The novel Coronavirus (COVID-19) is a highly infectious disease causing respiratory illness, leaving many patients to may require respirators and leaving healthcare professional unequipped to contain the outbreak. One thing is certain: no one was prepared for this pandemic, and this resulted in a lack of proper protection for workers on the frontline, a lack of medical devices, and a lack for precautions to mitigate the spread of the virus.

One thing you have certainly noticed from the first days of the pandemic, is the presence of 3D printing in the news. From Italy, Asia, France to the US, many media were mentioning the arrival of numerous 3D printing projects. Additive manufacturing has been a big actor during the fight against COVID-19. This pandemic taught us some interesting facts about additive manufacturing and the strengths of this technology.

Let's see what are the different problems encountered during this pandemic and how our manufacturing habits had to adapt and evolve. In this context, 3D printing brought reactivity and new solutions and many questions to answer: How can we produce while countries are on lockdown and factories closed? What are the other possibilities when all traditional manufacturing techniques are not enough?

The disruption of global supply chains

The COVID-19 pandemic emphasized some existing problems of our global supply chains. It actually showed the vulnerability of a whole traditional system and its lack of flexibility. During this period, some question were asked: How can we produce urgently needed protective equipment without access traditional methods? How can we get adapted medical equipment when and where it is needed?

89

million
medical masks
required each
month

6x

Increase in cost
of surgical
masks

40%

Estimated need
to increase
manufacturing
of PPE



Urgently needed protective equipment

No one was really prepared to face such an event. People on the frontline, such as healthcare workers, needed proper PPE (Personal Protective Equipment). In order to face this situation correctly, all frontline workers should have been safe and perfectly equipped from the beginning. With global demand sky-rocketing and disrupted supply chains, many countries turned to local manufacturing.

But, one issue became quite clear early on, traditional methods such as injection molding would be inadequate to produce the equipment in such a small amount of time; these technologies lacked the reactivity to produce the urgently needed resources. With closed borders and disrupted postal services, getting the right parts became even more complex.

In these conditions, additive manufacturing offered great reactivity. Thanks to 3D printing technologies hospitals were able to get the protections they needed in just a few days. With the short lead times offered by 3D manufacturing, these small series were easily manufactured and delivered to hospitals.

But, how are such a short lead times even possible with 3D printing?

While choosing a manufacturing technique such as injection molding, you need the time to manufacture molds before getting the opportunity to manufacture the actual part. With additive manufacturing, you can just print the part you need directly from a 3D model. There is no waste of time trying to get the perfect mold!

Moreover, to get small series and custom parts, additive manufacturing appears to be a cheaper and faster option, which is certainly good news during a pandemic situation, impacting the whole economic model.

This need of protective equipment also highlights another problem: our storage systems. In some situations, the stocks needed are impossible to predict. That is why an on-demand manufacturing technique such as 3D printing appears to be an interesting solution.



Adapted medical equipment

With massive shortages of critical ventilator parts, how did 3D printing create perfectly adapted parts in such a short time?

Healthcare workers were not only facing a lack of PPE. Indeed, as the pandemic grew, hospitals were not able to keep up with the massive influx of patients needing a respiratory aid. The reason for this issue? In normal times, hospitals are not used to absorbing an unprecedented flow of patients with the exact same respiratory needs. The goal here was to find a new solution, quite quickly.

Already known for its usefulness in the medical field, additive manufacturing actually appeared to be a real answer to manufacture adapted medical equipment. Indeed, 3D printing is the perfect technique to get a rapid prototyping process done, making it possible to develop new innovative devices, test it, validate it, and in a few days, get functional and live-saving solutions produced at scale.

For example, 3D printed adaptors fixed on snorkeling masks from sporting goods company, Decathlon appeared as a solution to the lack of ventilators in some hospitals. 3D printing made it easier to adapt these scuba diving masks to a ventilator to actually save people's lives.

More than a quick manufacturing technique, 3D printing offers the possibility to develop any kind of parts. From valves to ventilators, from adaptors to face shields, additive manufacturing is an on-demand manufacturing technique, allowing to create custom parts. Hospital received needed parts in record time, when traditional manufacturers were not able to deliver.

Disrupted logistics and distribution

This COVID-19 pandemic also highlighted a big issue: the vulnerability of the global supply chain. When such an emergency situation pops up, you might need more specific parts in quite a hurry. We saw that it was nearly impossible. Factories were shut down, borders were closed, and everything was came to a halt. What if the solution was to turn to local production and to other manufacturing techniques, offering as much flexibility as possible when you need it. Getting a reliable manufacturer, close to you, might avoid lot of problems during unexpected times. Local manufacturers will be here for you and are more accessible while travel restrictions are on the agenda.

The pandemic showed that a whole new logistical system was possible and, efficient. In this situation,

traditional supply-chains and distribution circuits were not working 100% and other solutions had to be found.

Using technologies such as 3D printing showed that more flexibility can be implemented in supply-chains. What happen when you urgently need new parts? When you can rely on your traditional storage system? When certain parts are defective or on recall?

While using 3D printing, it is possible to get exactly the amount of parts you need, different variations of the same part, or get small or medium volumes without minimum order quantities.



Mitigating the spread

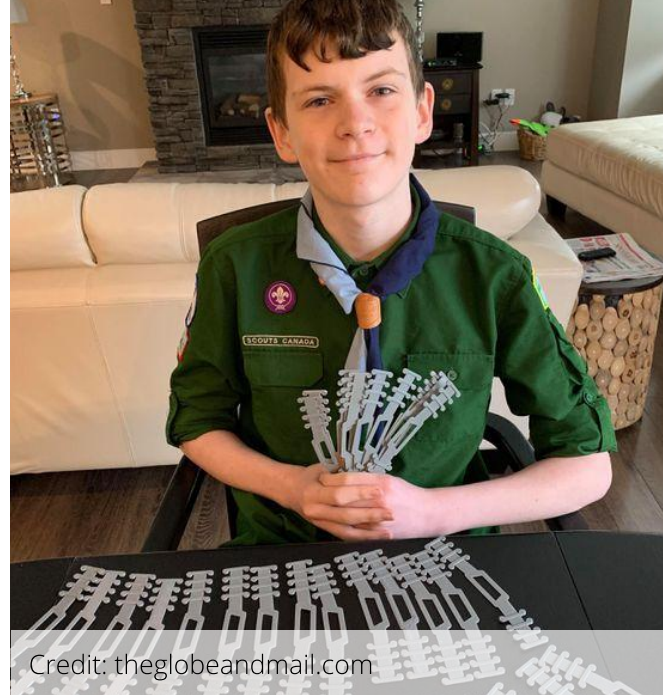
3D printing professionals and hobbyists were both invested to limit the spread of COVID-19.

This pandemic also taught us about the solidarity and the creativity of the 3D printing community. Creators all around the world committed to help by designing and testing new devices. The whole community of makers immediately took the initiative to develop and design protective equipment to help frontline workers in their communities. Also, a majority of the people with a simple FDM 3D printer at home decided to print parts and help.

3D printing professionals were also involved in this battle against COVID-19. A lot of them collaborated with the government or directly with hospitals to create the stock needed and face the lack of adapted equipments.

Solutions were found to reduce contacts with surfaces such as door handles, gel-dispensers, or other high contact surfaces. Simple devices were created in no time, with perfect adaptability to everyone's daily life and can easily limit the spread of the virus. But the true highlight of this community of creators, is the way they banded together to share their designs and know-how.

Young and old, professional or hobbyist, the passion for 3D printing and inquisitive people helped to create adapted tools to minimize the outbreak and help healthcare workers.



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Credit: cleankey.ca



The limitations of 3D printing solutions

If additive manufacturing brought a lot of solutions during this pandemic situation, we also observed some limits to the use of additive manufacturing. First, a lot of hobbyists wanted to help and started to 3D print parts. Even if the intention is good, these parts made of 3D printable plastic filament are not always fully sterilizable, which typically means they are single use and then must be safely disposed of. When it comes to medical applications, specific certified materials have to be used, and most desktop FDM 3D printers are not able to produce reliable devices.

3D printing has to be used in a reasonable and secure way. Even while using industrial 3D printing techniques, medical parts have to be tested and certified for certain applications.

Moreover, in some cases, 3D printing is not a viable long-term solution. For simple geometries such as

visors, the benefits of additive manufacturing are quite limited outside an emergency crisis. Using additive manufacturing has to make sense and has to be used in order to optimize your product itself, or your usual manufacturing process. This manufacturing technique can offer you great advantages in terms of reactivity and lead-time. Long-term 3D printing opportunities have to be identified in order to make the most of the benefits offered by this 3D technology.

Additive manufacturing is particularly interesting to create complex designs and intricate geometries. It is a great manufacturing tool to get lightweight parts, using innovative design techniques. But for simple parts such as visors, if 3D printing was the best solution to get them produced in no time, we can't deny that injection molding remains the best solution to mass-produce them in normal times.

3D printing for crisis management

This pandemic showed that benefits of additive manufacturing are essential during critical situations. But reactivity and flexibility are not only needed during a pandemic.

One of the main things we've learned during this pandemic is that additive manufacturing can definitely help any type of business during crisis periods. This time, it was during a pandemic but during any kind of emergency situation, additive manufacturing can be the solution you need. With short lead times and no minimum orders, you get the exact amount of parts you need when you need them. Additive manufacturing offered the flexibility and the reactivity needed in a crisis.

Everyone is used to traditional manufacturing techniques such as CNC machining and injection molding. In normal times, these technique might be perfectly adapted for a lot of projects, but knowing what can happen with a crisis like this one: additive

manufacturing has to be implemented and considered as a real alternative.

This crisis emphasized the basics strengths of 3D printing, and showed us that speed, innovation and reliability were accessible to anyone and to all companies that needed it. Now, the next step is to use what this COVID-19 pandemic taught us. Because all this learning is not only applicable to the medical system: it can obviously be applied to other industries, without exception. Additive manufacturing offers unlimited possibilities to all kinds of companies, from automotive to electronics and luxury industries.





Industrial 3D Printing, On-Demand

Sculpteo's online 3D printing platform brings you industrial capacity 3D printing in 3 clicks.

When specific parts are needed urgently, you have to find a reliable manufacturer and partner to deliver what you need, on time. We saw here that 3D printing can help to save lives, but in normal times, it can also help to save your business and your production.

With a wide range of 3D printing technologies and materials, an online 3D printing service such as Sculpteo can help many industries go through new challenges, implement more flexibility, and bring new innovative solutions.

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