ESSENTIUM

19025 N. Heatherwilde Blvd, Suite 100,
Pflugerville, TX 78660
Email: Sales@Essentium.com
ESSENTIUM.COM

TEXAS A&M UNIVERSITY

THE TEXAS A&M UNIVERSITY SYSTEM

Worlds Protect 3D Prints 13 End-Use Components for COVID-19 Breathalyzers

USING ESSENTIUM TECHNOLOGY, ENGINEERS REDUCE LEAD TIME AND COST FOR DISEASE DETECTION KIOSKS

EXECUTIVE SUMMARY

Using the Essentium High Speed Extrusion (HSE™) 3D Printing Platform and Essentium PA-CF and PLA, Worlds Protect was able to conceptualize, design, prototype, and manufacture 10 functional COVID-19 breathalyzer kiosks in an expedited time frame. Essentium technology helped Worlds Protect achieve:

- 66% reduction in lead time for some parts
- 90% reduction in cost for some components
- Rapid iteration to conceptualize, design, and develop in days instead of weeks

SITUATION OVERVIEW

In the summer of 2020, only months after the World Health Organization declared the novel coronavirus (COVID-19) outbreak a global pandemic, the United States was facing a severe shortage in Polymerase Chain Reaction (PCR) tests for COVID-19. In response, Worlds Inc., the United States Air Force, and The Texas A&M University System began collaborating to create a breathalyzer that would help increase COVID-19 testing ability.

This partnership called Worlds Protect set out to create a contact-free breathalyzer kiosk to test for COVID-19 using disease-detecting artificial intelligence (AI) technology. This breathalyzer would require the patient to use a disposable straw to blow into the kiosk. The breath would then go through a mass spectrometer, where AI would determine indicators of volatile organic compounds from the spectrum of the elements in the breath. Finally, test results would be sent to the patient's smartphone in less than a minute.

THE CHALLENGE

At the beginning of the project, The Texas A&M University System was tasked to quickly create 10 kiosks: Five for the U.S. Air Force and five for The Texas A&M University System. During that time the researchers were able to conceptualize, design, prototype, manufacture, and assemble each kiosk.

Using traditional manufacturing processes, taking a product from concept to final product can take years. Due to this tight timeline and an unpredictable supply chain caused by the pandemic, The Texas A&M System did not have the time to lean on traditional manufacturing for part creation. The researchers needed to find a solution that would enable them to manufacture complex part designs and increase prototyping speed without sacrificing mechanical properties.

THE SOLUTION

To speed up the manufacturing process, the team of engineers at Texas A&M University decided to use commercial off-the-shelf parts as much as possible. However, when complex geometries were needed, they turned to in-house 3D-printed components as a fast and cost-effective solution.

Thanks to The Texas A&M University System, Worlds Protect had access to six Essentium High Speed Extrusion (HSE) 180•ST 3D Printers. This fleet of 3D printers allowed them to quickly design and iterate, and print parts in less than a day, sometimes using all six machines at once.

“As we rapidly designed the kiosks, we identified supports, mounting brackets, and spacers, that could be 3D printed,” said Maulik Kotecha, a doctoral student at Texas A&M University. “In addition, several brackets and electrical plate covers were too difficult to manufacture using traditional methods.”

During part design, the team used low-cost Essentium PLA to iterate, but the final parts needed to withstand temperatures up to 100 C and have sufficient tensile strength. Due to its exceptional strength, temperature resistance, and printability, Essentium PA-CF proved to be the ideal material for end-use components.

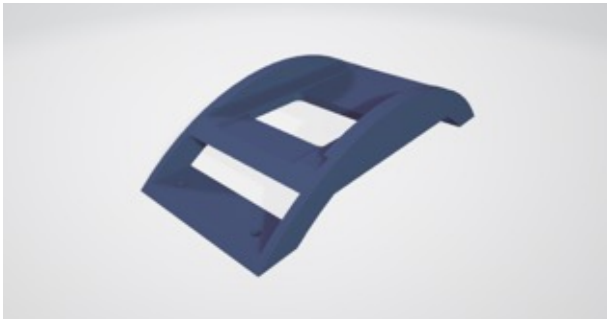

Figure 1: LCD Bracket, printed ten per build

Figure 2: Jetson Holder, printed ten per build

BUSINESS OUTCOMES

With collaboration from Worlds Inc. and the U.S. Air Force, The Texas A&M University System used Essentium machines and materials to produce breathalyzer kiosks one month ahead of schedule. This was made possible in part by the significant reduction in lead time for kiosk components. Most of these parts were printed in less than a day, **66% faster than the three-day turnaround for the in-house fabrication facility**, which relies primarily on traditional subtractive manufacturing methods.

In addition to meeting the deadline, Worlds Protect team was able to reduce costs by 90% in some instances. For example, one of the mountings that are used in the final product was quoted at $110 for a machined version but cost only $12 to 3D print.

After development is complete, the Worlds Protect COVID-19 breathalyzer kiosks will be distributed for research purposes. Five will be deployed on Texas A&M University in College Station, TX and five of them will be deployed at various Air Force facilities.

Essentium, Inc. provides industrial 3D printing solutions that are disrupting traditional manufacturing processes by bringing product strength and production speed together, at scale, with a no-compromise engineering material set. Essentium manufactures and delivers innovative industrial 3D printers, materials, software, and services, enabling the world’s top manufacturers to bridge the gap between 3D printing and machining and embrace the future of advanced manufacturing. Essentium is AS9100D certified and ITAR registered.