Carbon®

A Carbon® DLS™ CASE STUDY

Astoria Pacific Uses EPX 86FR to Solve a Burning Problem

Included in this case study are three questions to help you determine the viability of additive manufacturing for your electronics housing components.

Astoria-Pacific is a developer of wet chemistry analyzers for several markets including clinical, wine, beer, industrial, food, pharmaceutical, and environmental testing laboratories.

One low-volume analyzer that Astoria-Pacific has been providing to medical labs for many years, is an analyzer that performs neonatal blood analysis for certain deficiencies and diseases, such as galactosemia, a rare but potentially deadly disease for newborns. A crucial part in the blood analyzer is the fluorometer, which uses UV light to analyze the contents of samples. This device is extremely sensitive to light and can detect individual photons.

In 2021, Astoria-Pacific suddenly found itself unable to obtain the sheet metal housing needed for its fluorometer. The two manufacturers they had been using prior to Covid-19 were no longer in business. And they were being turned down by manufacturers unwilling to acquire the specialized tooling required to machine the sheet metal housing for the fluorometer.

With blood analyzer orders to fill, their window for finding a new manufacturer was closing fast. The long lead time (8 to 14 weeks) was making it practically impossible without finding an alternative method of producing the fluorometer.

In This Case Study, We Will Explore:

What were Astoria-Pacific's manufacturing options

How EPX 86FR with its UL 94 V-0 fire rating provided the solution

How part consolidation improved an already proven product

How the Carbon solution saves both time and money

QUESTION 01

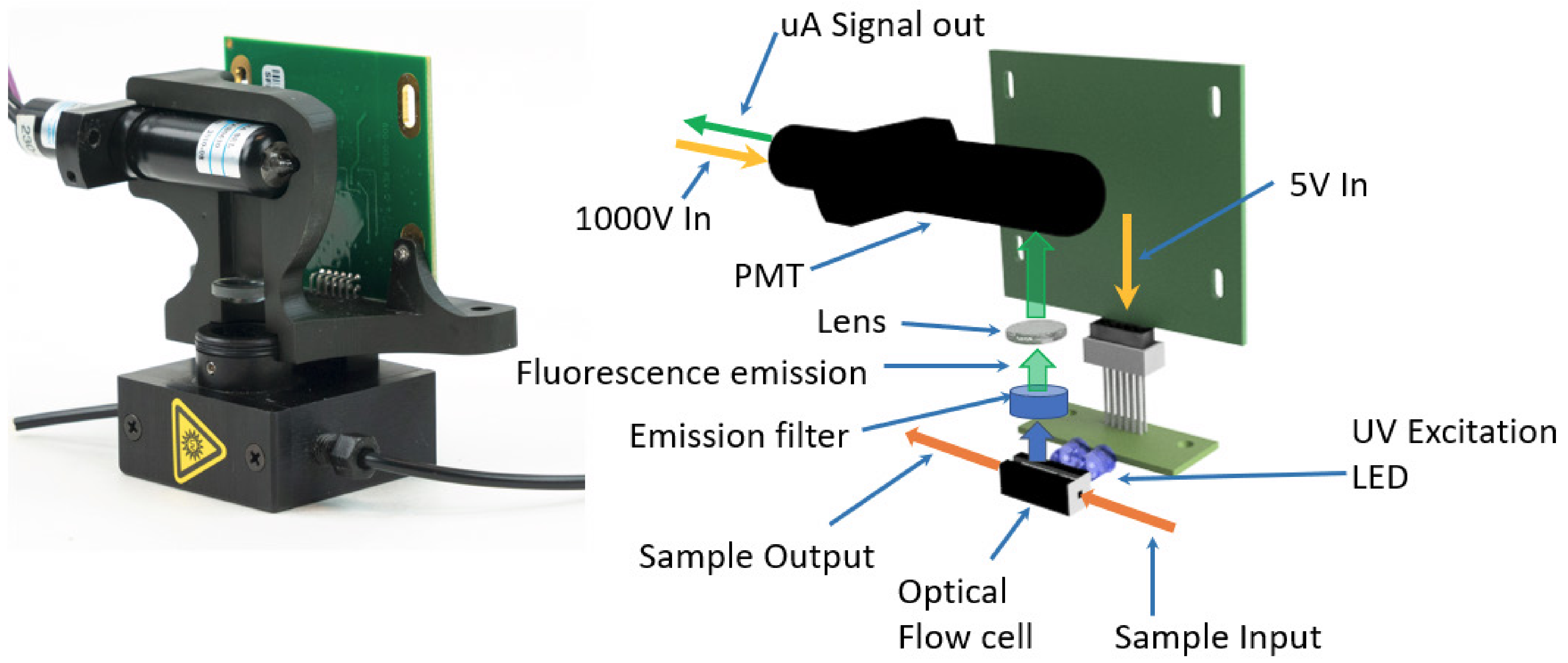
What Are My Manufacturing Options?

What Were Astoria-Pacific's Manufacturing Options?

Whitney Menzel, a Mechanical Engineer and head of the Engineering department at Astoria-Pacific. Whitney has worked for Astoria Pacific for 14 years and leads the design team developing new tools, making improvements to existing tools, and building replacement parts to keep their legacy equipment functioning in the field.

Faced with the reality of limited time to produce the parts with a new manufacturer, and knowing that lead times just continue to get longer, Whitney chose to go in a different direction. As he put it, the real problem with lead times these days is that "you're in a queue with a machinist, and if you miss that, your lead times will double… it's volatile… your lead times are not predictable whatsoever".

Whitney, who is no stranger to 3D printing, having worked with 3D printers for 8 years, saw the obvious solution to the problem. The only catch was that he needed a resin that complied with the medical industry's rigorous safety requirements for electronic equipment – namely flammability code UL 94 V-0. This code essentially means that any plastic part being included in an electrical device must be made of self-extinguishing plastic. Enter EPX 86FR.



QUESTION 02

How Can I Add Functionality to My Part Using 3D Printing That I Couldn’t Do with Traditional Methods?

How EPX 86FR Made the Fluorometer 3D Printable

As they say, luck favors the prepared. Around the same time Whitney found out that they had a serious manufacturing problem, he also learned that Carbon had a new resin with V-0 flammability rating, EPX 86FR. Very quickly, Whitney was able to get the resin from Carbon and print a sample to confirm for himself that the characteristics of EPX 86FR were exactly what he was looking for. The characteristics that mattered to Whitney were:

Ul 94 V-0 Flammability Rating

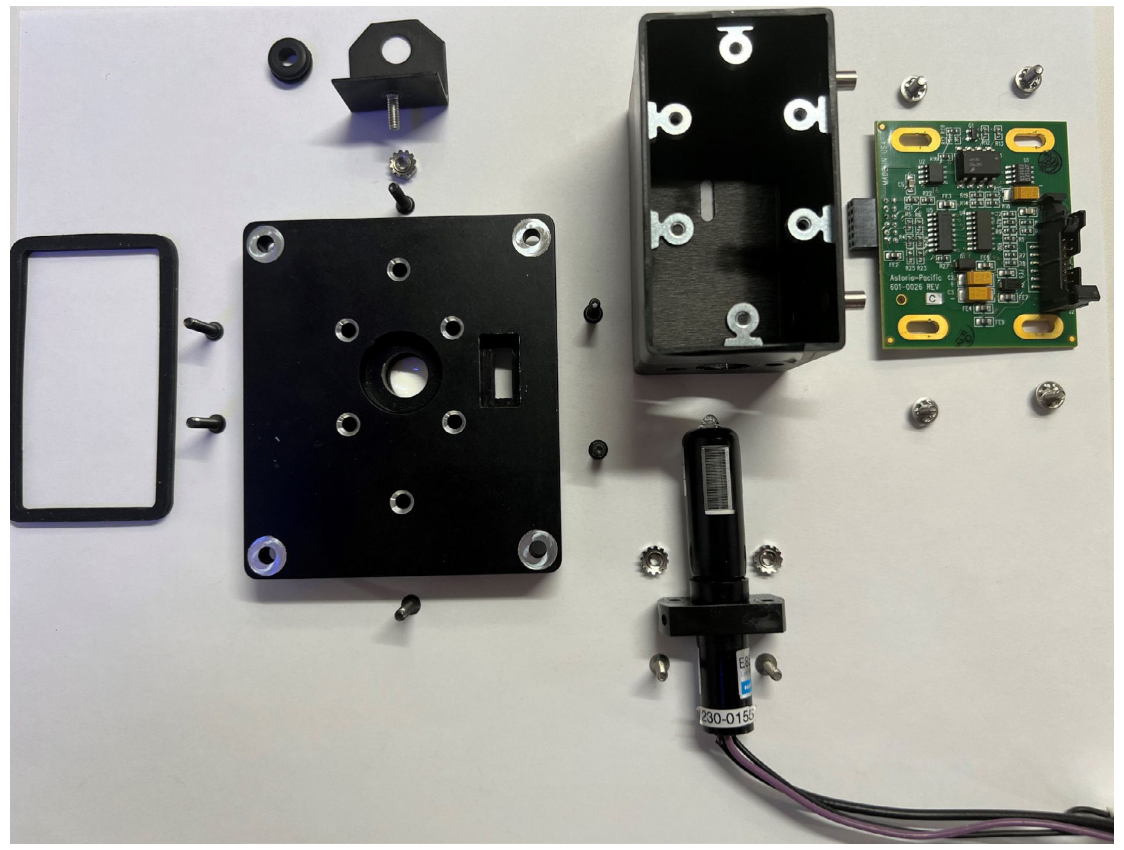
A Very Dark Black Color That Is Perfect For This Type Of Light-Sensitive Device

High Chemical Resistance

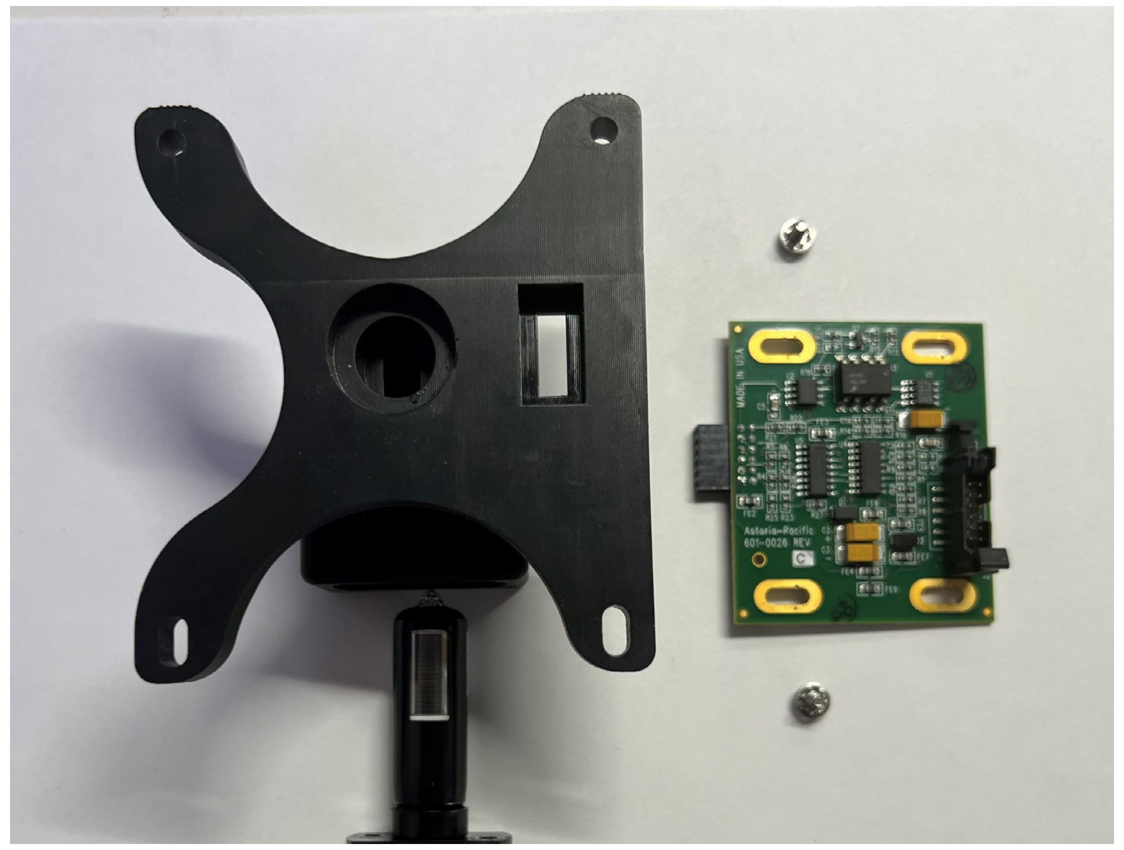
High Accuracy Resin That Can Repeatedly Print A Part To A Precise Specification

How Part Consolidation Improved an Already Proven Product

After confirming that EPX 86FR was suited for his needs, the easiest solution to Whitney's problem was simply to print the part that they couldn't get manufactured, and then assemble the fluorometer as usual. But now that time was no longer a factor due to the speed of in-house 3D printing, Whitney could focus on making improvements to the fluorometer. As Whitney put it "with Carbon, the speed coupled with the quality of the materials is kind of freeing as an engineer, to be able to stop thinking about 'if a machinist can make it', and start thinking about how your design can function." And in three days, Whitney had designed and printed a better fluorometer.



Original part

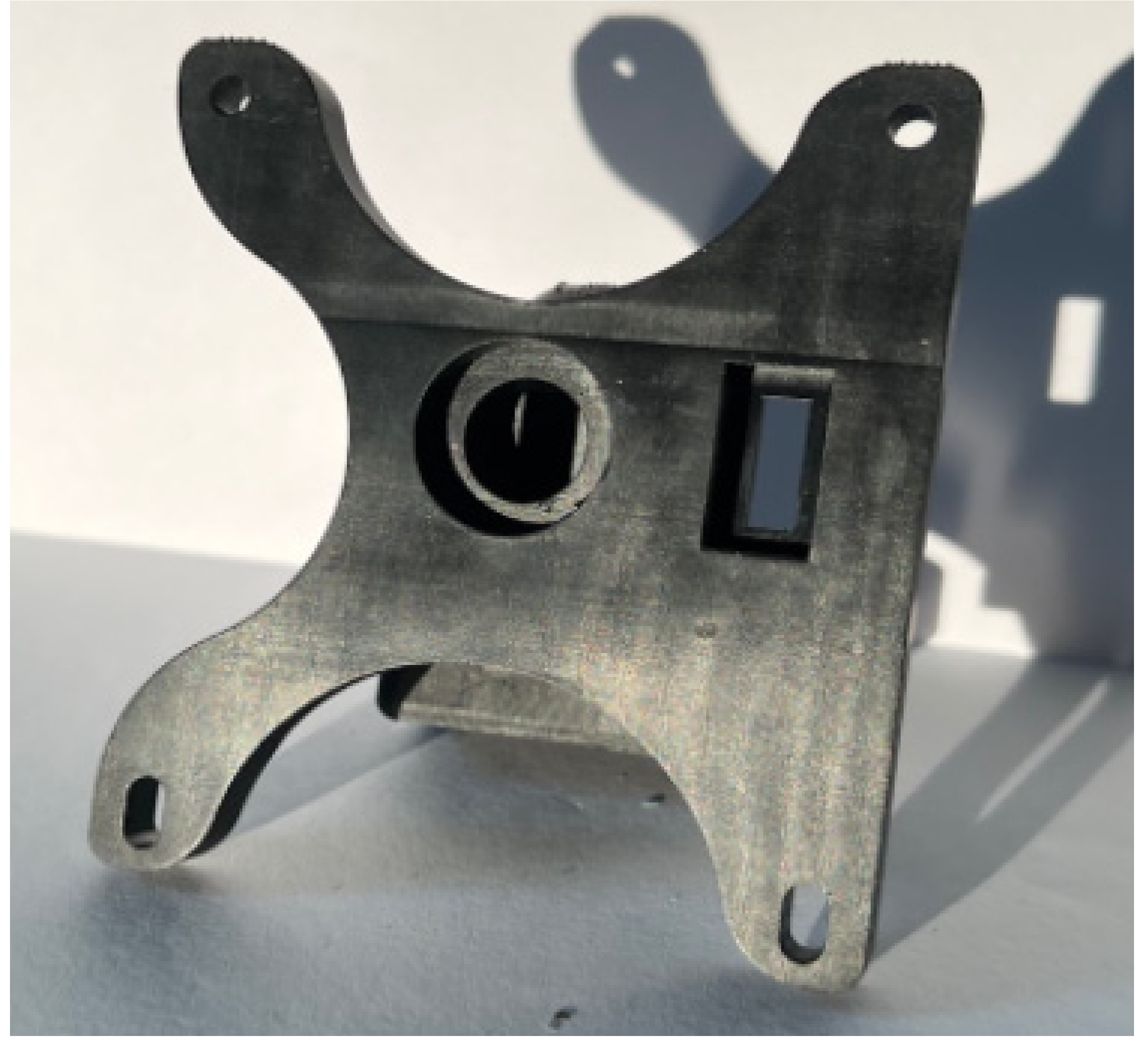


3D printed part

Using a Carbon M1 printer, Whitney's first iteration was simply to print the exact part that was needed. Then he began making improvements to the design, and later that same day he had a second print that already combined three parts into one. By the end of the third day, he had his fourth and final iteration of his design. He had combined 11 metal, plastic, and rubber parts into one 3D printable part.

Whitney believes in "designing for manufacture", which essentially means while designing your product you keep in mind how the product will be manufactured, so you can optimize for the method of manufacturing.

By taking full advantage of the 3D printing capabilities, Whitney was able to create a better fluorometer. The readings from the fluorometer have improved because the EPX 86FR printed part is a blacker substance with no potential for light leaks, and Whitney incorporated a set screw that now allows the fluorometer to be precisely adjusted to achieve the optimum signal to noise ratio, providing an even higher level of confidence in the accuracy of a product that was already performing at stellar levels. In all the years that Astoria-Pacific has been making this neonatal blood analyzer, they have never had a false positive.

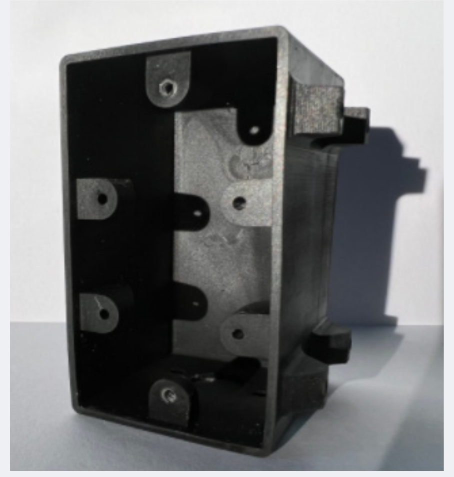


4th iteration

Whitney's Fluorometer Design Timeline

Day 1

1st iteration
Print time: 80 minute

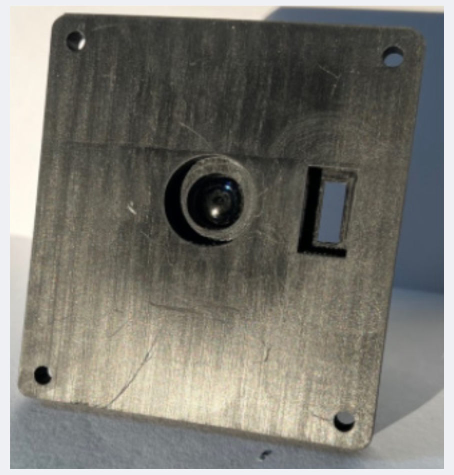


Day 1

2nd iteration
Print time: 120 minute

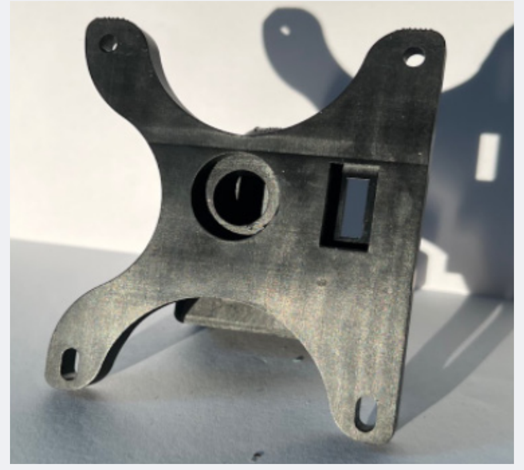
Day 2

3rd iteration
Print time: 150 minute



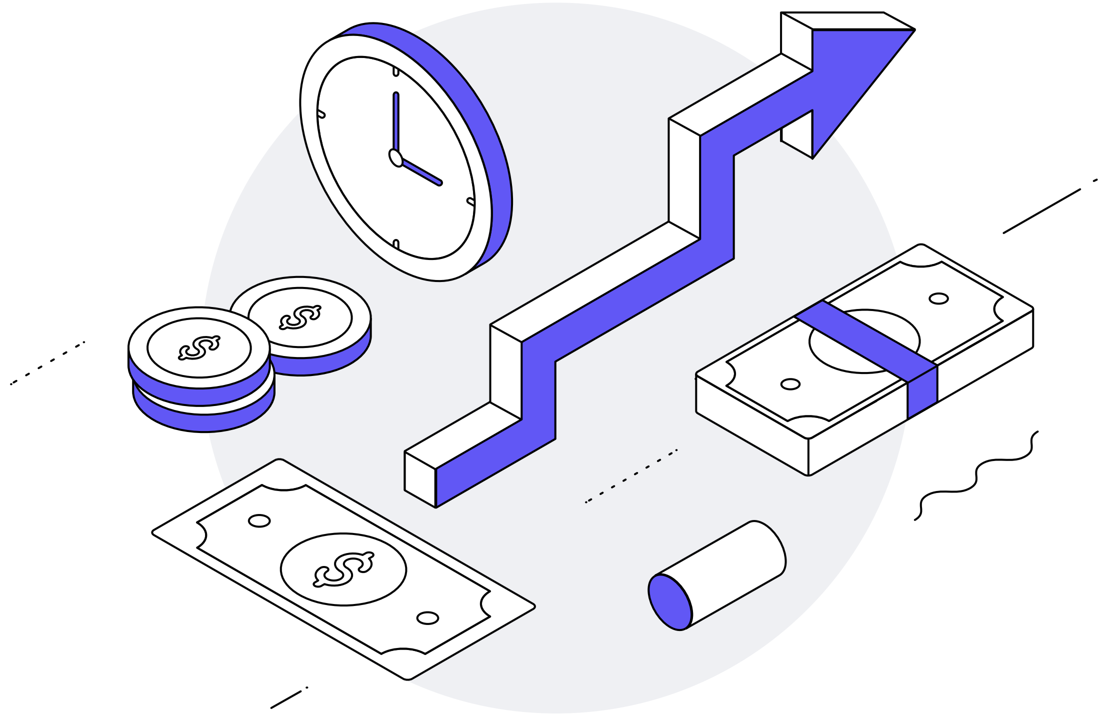
Day 3

4th iteration
Print time: 120 minute



QUESTION 03

How Would My Costs Change if I Were Able to Turn Around Critical Components On Demand?



"The actual cost savings for the 11 parts that were replaced by the 3D printed part was from $81 to $30."

How the Carbon Solution Saves Both Time and Money

Using 3D printing in-house is a form of vertical manufacturing that saves in lead time as well as costs. The actual cost savings depend on the specific part, whereas there is always a benefit to doing away with the long lead times. For the fluorometer, the crucial savings was in eliminating the lead time for the part. A dramatic change from 8 to 14 weeks for a first prototype, down to 1 day for the first prototype and 3 days for a final part.

The cost savings for the fluorometer was not in the price of the part. **The actual cost savings for the 11 parts that were replaced by the 3D printed part was from $81 to $30 (a savings of 63%).** Additional cost savings with the new fluorometer came in a **reduction of assembly time from 40 minutes to 3 minutes.**

Whitney gave an example of another part where the cost savings were significant; a manifold used in another Astoria-Pacific product. That part used to be machined at a cost of $1000 per unit. **By 3D printing that part in-house, the cost dropped to about $30 (a savings of 97%).**

Whitney's Recommendations for Planning Additive Manufacturing:

Consider the material needs of your product. Keep in mind any regulations for the product.

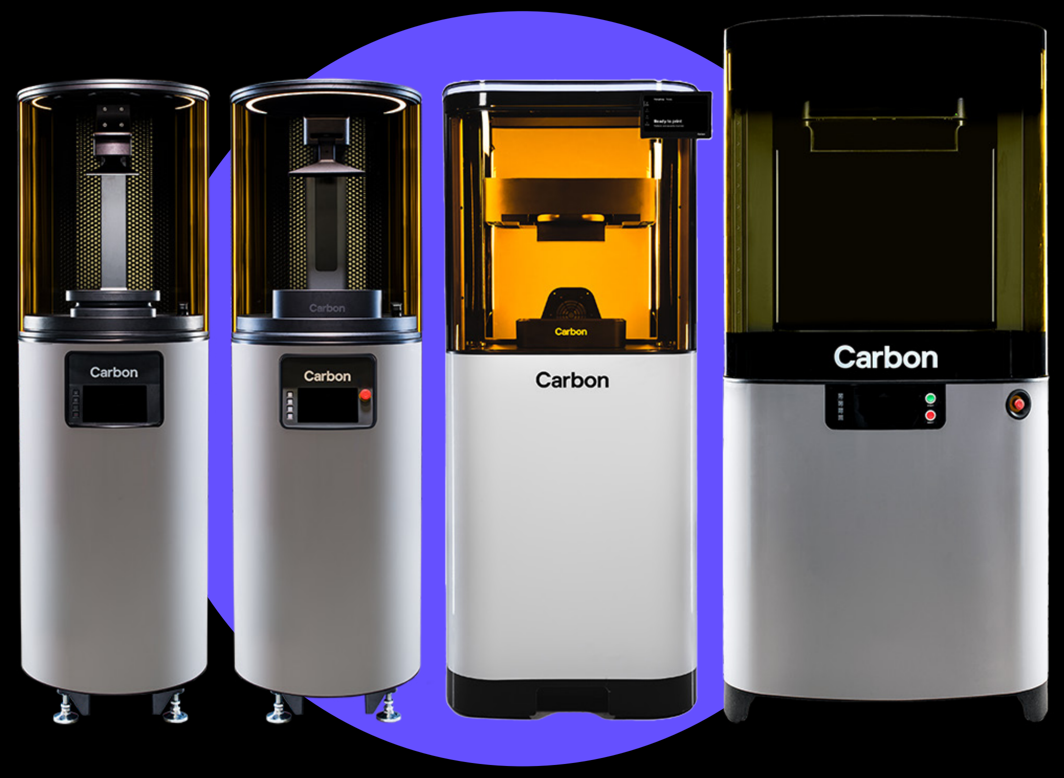
Find the 3D printer that fits your most important needs. Production ready, speed of print, scalability for production growth.

Consider ease of use of the 3D printer. Keep in mind the experience level of your production staff.

Consider resin management. How easy is it to change resin?

ABOUT WHITNEY MENZEL

Whitney Menzel is a Mechanical Engineer and head of the Engineering department at Astoria-Pacific and a Research Engineer at Oregon Health Science University.



Summary

Carbon Digital Light Synthesis has afforded Astoria-Pacific International the ability to avoid the current trappings of the low-volume manufacturing industry by reducing project cycle times. With AM's game-changing agile production process, Whitney finds that he can focus all his creative ingenuity into the design and function of the part rather than worrying about the unpredictability of traditional manufacturing.

GET A SAMPLE PART

CHAT WITH AN EXPERT

3D as It's Meant to Be

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