

CUSTOMER SUCCESS STORY

Incodema3D looks to 6K Additive for metal powder supply and recycling as their production volumes increase

Scaling-Up to Production Manufacturing

Established as a short-run sheet metal prototype manufacturer in 2001, Incodema3D has since increased the scope and size of its business to support manufacturers from prototyping right through to production-scale manufacturing. A contract manufacturer and leading provider of direct metal printing the company sees most of its business come from the aerospace and defense sectors. Increased demand and larger volume orders led to Incodema3D increasing the footprint of its facility by 50 percent in 2021 and expanding production capacity significantly – which, in turn, has resulted in a greater dependence on its metal powder supply.

The Wider Impact of Large Volume Production

“Even small differences can make a big impact when large volumes are involved,” says Incodema3D Director of Additive Manufacturing and Metrology Operations, Kevin Engel. “We are talking to clients now about projects for 2023 that will require 10 tons of metal powder per month. When you’re going through that volume of powder, recycling becomes imperative. Add to it the desire to become a more environmentally friendly manufacturer, then sustainability becomes key when evaluating new suppliers.”

Incodema3D’s target customers are serial production manufacturers that they can take from prototype all the way through to production. However, it was as the business was scaling up for more production contracts that the environmental impact of production became more apparent than ever. Agreements with local scrapyards to recycle material were getting harder to come by and didn’t really provide a fully satisfactory solution, “they don’t really want the powder,” explains Engel, “it’s not easy for them to recycle and if they give you anything for it, it’s not much, it’s pennies on the dollar.”

CHALLENGE:

Incodema3D needed to find a sustainable domestic AM metal powder supplier to meet their aerospace and defense customers production demands and find a solution for their used powder.

SOLUTION:

6K Additive metal powders meet all quality requirements and are sustainably produced in the US. Additionally, 6K Additive purchases used powder which provides a partner for Incodema3D’s waste stream.

RESULTS:

Incodema3D has reduced their overall material cost by 15%, found a sustainable solution to their stockpile of used metal powder and can provide their customers with quality printed parts exceeding their requirements.

“

By recycling our used powder with 6K Additive we have been able to drive down our contribution costs for material by 15% and growing.” says Kevin Engel, Director of Additive Manufacturing and Metrology Operations, Incodema3D.

As such, used powder became a burden. As Engel says, “no-one wants to see the powder going to landfill.” With some empty space at the facility – allocated for the 2021 expansion – Incodema3D had the luxury of being able to store material, hoping there would be a development allowing it to be put to good use, “and low and behold, 6K Additive came in.”

Pre-Qualification of 6K Additive’s Nickel Alloy 625

Any manufacturing business has quality prerequisites, but serving the aerospace and defense industries, as Incodema3D does, involves particularly stringent requirements to meet compliance. In addition, any new vendor would need to meet not only current volume needs but also future volume requirements. So, while Incodema3D was very interested in 6K Additive’s sustainability proposition, it wasn’t the only factor to be considered.

With its high strength and outstanding corrosion resistance, nickel alloy 625 is a popular material with Incodema3D’s customer applications. With production volumes expected to grow rapidly, Incodema3D chose to put 6K Additive produced Ni 625 powder through its paces and see if the quality and performance of the material could reach benchmarks. This will allow Incodema3D to tap into the environmental advantages of 6K Additive’s AM powders.

Excellent density, good flowability and bulk quantities were key aspects in review. Incodema3D used its own internal qualification build (as shown in Illustration 1), which was then tested by an independent lab. Each part tested was ‘as built’ straight off the machine, with no heat treatment.

“The lab tested five samples and each one returned density results of 99.9% which far exceeds the minimum requirement,” affirms Engel, “anything over 99.5% density in additive manufacturing is a good part.” As shown in Illustration 2.

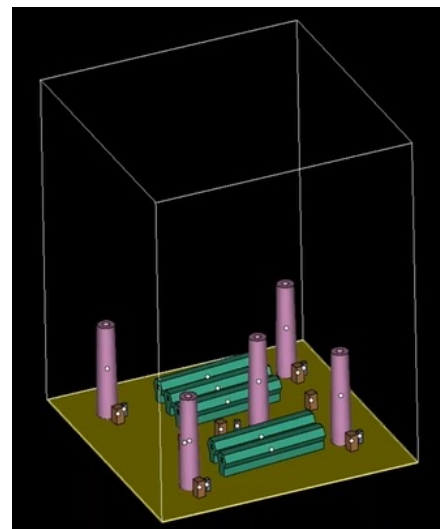


ILLUSTRATION 1:
Incodema3D’s internal qualification built to test tensile strength, microstructure, density, and chemical composition using 6K Additive powder

Sample	Percent Density	Percent Porosity	Max Pore Area (µm ²)	Avg. Pore Area (µm ²)	Max Pore Dia. (µm)	Avg. Pore Dia. (µm)
1	>99.9	<0.1	1,105	136	43.6	9.4
2	>99.9	<0.1	591	90	30.2	7.8
3	>99.9	<0.1	1,663	186	55.2	12.2
4	>99.9	<0.1	756	272	36.7	17.7
5	>99.9	<0.1	1,132	318	45.5	17.1

ILLUSTRATION 2:
Density data for 6K Additive’s Nickel Alloy 625

Incodema3D compared the data against multiple factors;

- legacy vendor results
- their internal printer specifications
- customer requirements

Their goal for tensile strength was to hit 125ksi, maintain around 85 for yield strength, and have elongation above 30. As shown in Illustration 3, 6K Additive exceeded each requirement.

Sample	Tensile Strength (ksi)	Yield Strength (ksi)	Elongation at Break (%)	Reduction in Area (%)
XY-1	144	102	40.5	56
XY-2	144	101	39.5	51
XY-3	145	102	40.8	51
XY-4	144	102	40.6	53
XY-5	145	102	40.8	53
Z-1	133	88.5	43.4	51
Z-2	131	86.5	45.1	55
Z-3	132	88	44.2	52
Z-4	130	88.5	47.5	59
Z-5	134	89.5	44.7	51

ILLUSTRATION 3:
Tensile data for 6K Additive's Nickel Alloy 625

6K Additive is a domestic supplier and not only met but exceeded every goal we set," says Engel. "Serving the US defense industry, having a domestic supplier is important – making disruption less likely and factoring in security issues, provides another key benefit for 6K Additive."

Moving to Recycled, Sustainable Metal Powders

Since the qualification and testing program, Incodema3D has been recycling their used powder and using 6K Additive's virgin powders in production. "Now we just load up a pallet, contact 6K Additive and they pick it up and roll it into their recycling program," states Engel. "We started the process knowing we had this repository of valuable materials that we couldn't convert into real-world value. And we knew that when you scale-up production, you really come into margins making an impact – both to costs and the environment.

6K Additive produces a full suite of AM powders including Ni718/625, low oxygen (500-700ppm) Ti64, stainless steel 316/17-4, copper 18150 and GRCOP, refractory powders including tungsten, tantalum, and rhenium.

If you are interested in 6K Additive powders or want to learn more about the powder buy-back program, visit 6KAdditive.com.

