

Printalloy® 3-D Metal Powder Printing – Initial Capabilities

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APP has developed a 3-D metal powder printing technology and is able to produce low cost metal components that meet the metallurgical properties of MPIF Standard 35 for metal injection molding. We can successfully manufacture 100s of components in less than 48 hours. Our focus to date has been to determine the machine parameters to produce different geometries and to evaluate the metallurgy of the produced components. We have also done an initial dimensional capability study.

APP's printing technology has shown to have a fairly large process window. Geometry capability has shown to be fairly wide. The following image shows various geometries that have been produced using this technology.



Figure 1: Example APP 17-4PH Printalloy® Components that meet MPIF Standard 35 Metallurgical Requirements.

Mechanical Properties:

Material Property	Standard	MPIF Standard 35 specification	sintered	H900 HT
Density (g/cc)	ASTM B 311	7.5	7.55	7.55
Carbon (%)	ASTM E 350	0.07 max	0.01	0.01
Hardness (HRC)	ASTM E 18	27 (H900 = 33)	28	40

Initial Dimensional Capabilities:

Our first dimensional study has shown that our build depth capability is better than our x-y plane capability. To obtain a Cp of 1.33 a tolerance of +/-0.0075" is required in the x/y plane and a tolerance of +/-0.005" in the z plane. These are only our first samples from the machine and are sure to improve after optimization. Looking closer at the data, one can see that the data is actually +/-0.0025" in the x/y plane and +/-0.002" in the z-plane.

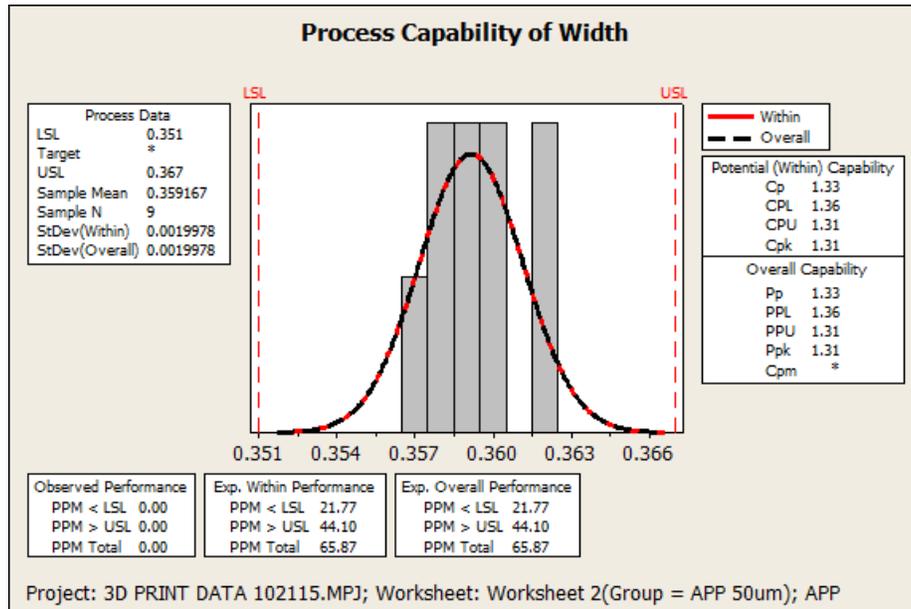


Figure 2: Process Capability in the x/y plane.

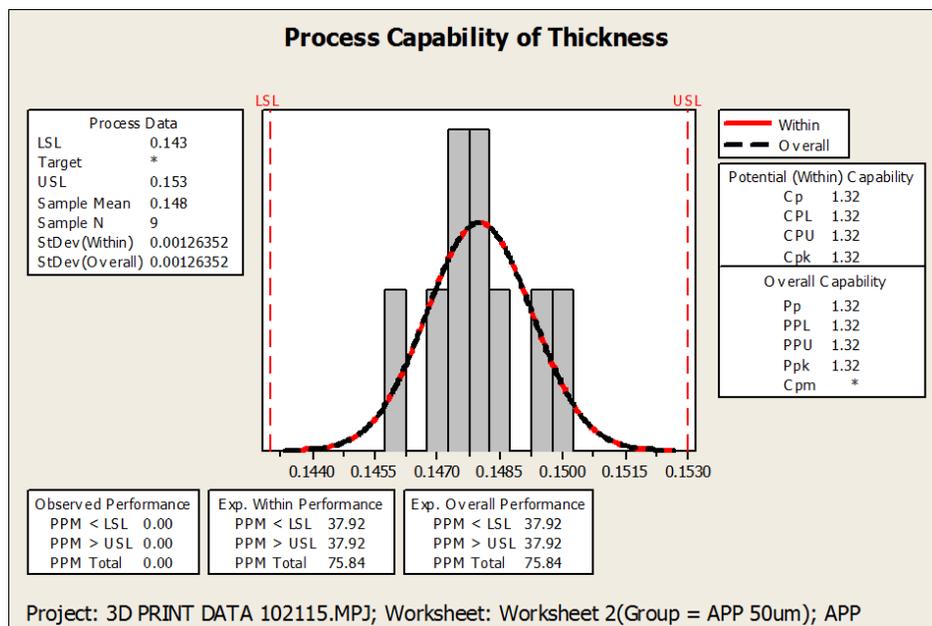


Figure 3: Process Capability in the z plane.

Initial Observations:

- Broad geometric capabilities including threads.
- 17-4PH SS alloy that meets MPIF Standard 35 Specifications.
- X and Y plane tolerance capabilities as high as $\pm 0.0025''$.
- Z plane tolerance capabilities as high as $\pm 0.002''$.

Please look for new whitepapers at www.4-app.com as we further develop and improve our technology.

To have your components printed using our technology, please contact sales@4-app.com.