



# Sintavia gets the inside track with micro-CT

The metal additive manufacturing company Sintavia adds Nikon Metrology CT to its state-of-the-art facility in Florida, USA to further control the additive manufacturing process.

Additive manufacturing is making enormous waves throughout every industry. The technology allows ultimate flexibility in creating the most intricate and complex features ever designed for manufacturing.

As the technology establishes itself as a vital manufacturing tool for producing ultimately efficient components, companies such as Sintavia have to be ahead of the game. Sintavia is the global leader for independent metal additive manufacturing in industries with precision applications. The additive manufacturing market is constantly growing, and in this climate, Sintavia sets itself apart by providing a full design through-production contract manufacturer.

Based in Davie, Florida (USA), Sintavia's portfolio includes a whole range of equipment. The facility features 8 high speed additive manufacturing machines, as well as post-processing equipment,

powder, metrology and mechanical testing laboratories, and various quality assurance tools. Using powder bed fusion (PBF) and electron/laser beam melting, Sintavia is currently manufacturing with Inconel 718, Inconel 625, Aluminium, Titanium, Cobalt Chrome, Stainless Steel, and other proprietary powders.

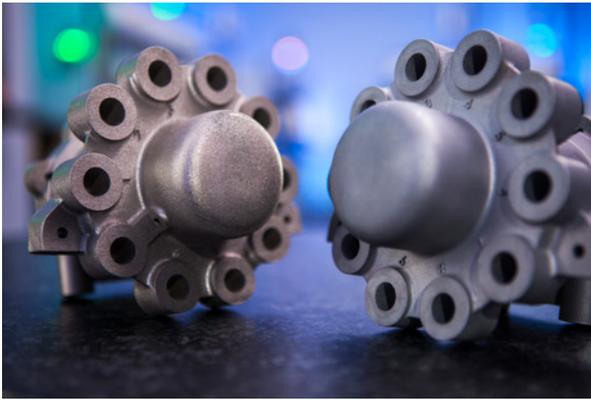
## To understand the process, is to control the process

As Sintavia sets itself apart with its beginning-to-end manufacturing, its biggest asset is having full and total control of the additive manufacturing process. Without complete control, you do not have complete understanding of the process.

Brian Neff, Sintavia's CEO, summarizes this by stating, "If you don't understand and control the process, you won't build what you want to build".

Typically, both traditional and additive manufacturing faults include microscopic voids and gaps within the structure. These voids can cause stress fractures and reduce the longevity of a component's lifecycle. To produce the most reliable components for a customer, these must be identified and eradicated.

Additive manufacturing allows for very special design features such as



■ Sintavia metal AM parts are used in important industries, including aerospace & defense, oil & natural gas, automotive, and ground power generation.



■ The micro-focus CT system allows to visualize individual metal powder particles.



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*Brian Neff - CEO at Sintavia*

conformal cooling inserts, functional integration, complex geometries, lattice networks and hollow members to be produced. These internal designs can only be inspected with CT scanning.

"There are thousands of metal AM machines in place globally with just as many people if not more still figuring the process out," says Brian Neff. "We're making it a mission to work with our customers to develop optimal parameters for their builds. If you don't understand and control the process, you won't build what you want to build."

Though estimates vary, researchers agree that the market is growing:

- Consulting firm IDC – global spending on desktop and industrial 3D printers hit about \$11 billion in 2015 and is forecast to reach \$27 billion by 2019
- MarketsandMarkets – 3D printing will experience a 30% compound annual growth rate (CAGR) and reach \$30 billion by 2022
- PwC – 52% of manufacturers in 2016 expected 3D printing to be used in high-volume production in the next three to five years, up from 38% in 2014

Amidst such growth numbers, Sintavia is doing much more than promoting its 3D printing capabilities – it is positioning itself as a full-service, design-through-production provider. In addition to eight high-speed powder-bed metal printing machines, Sintavia's full post processing department includes a hot isostatic press, vacuum heat treatment, CNC machining, EDM equipment, and destructive and non-destructive testing capability.

"Working with our customers to develop optimal parameters for builds demands nothing less than total process knowledge and understanding," Neff says. "Sintavia is able to optimize parameters, serially manufacture, and audit quality much faster than any of our competitors."

### Fast inspections & full control

Previously, Sintavia relied on external measurements. It was very successful for line-of-sight, however not so much for capturing passageways and chambers produced through additive manufacturing. Sintavia decided to invest in the latest CT scanning technology to achieve the desired level of quality control required for precision industries.

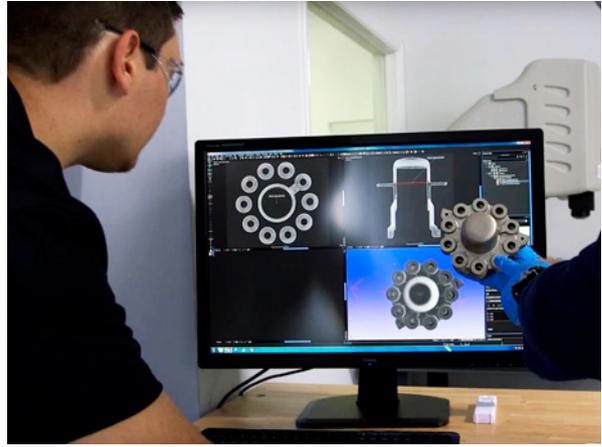
As a manufacturing company that excels in all aspects of the process from start to finish, it was obvious that Sintavia needed to invest in a CT scanner. Other companies often outsource the CT scanning inspection and verification but as a global leader in independent metal AM, the final decision was taken to invest in the technology. To have in-house CT scanning capabilities enables quick inspections and allows full control over the quality of product.

As an independent metal AM company, Sintavia handles a lot of varied requests and requirements for the components it produces. Throughout aerospace, automotive, and oil & gas industries, Sintavia produces a broad spectrum of parts for various companies. There is an enormous amount of responsibility on Sintavia to manufacture components without error, and CT is the only way to gauge if parts are being manufactured correctly.

Sintavia technicians understand the importance of inspection and process verification in quality control. Manufacturing standards are the highest in aviation, Neff says, driving the need for a quality control process that is robust and repeatable to clearly demonstrate and improve part quality. It is essential to know whether voids or inclusions are present, how large they are (both individually and in total), where they occur – and also whether the dimensions of the part conform to those of the design.



■ A part is placed on a rotate stage and 2D X-ray images are taken at incremental angles. Then the 2D X-rays images are reconstructed into a 3D model.



■ CT analysis is extremely versatile : external/internal dimensional inspection, compare to CAD model, sectioning in any direction, material and void analysis, etc

In such cases, X-ray computed tomography (micro CT) is a powerful answer, and Sintavia has installed a 320 micro-focus CT system from Nikon Metrology. By converting 2D pixels to 3D voxels, supplying a full 3D density map of the samples, micro CT gives all this information in an easy-to-read visual format.

### Better insights, reduced costs with Nikon CT

With traditional manufacturing processes, a few radiographs at specific orientations can suffice. But with additive layer manufacturing (ALM), the whole part needs to be inspected, particularly for aerospace parts with stringent tolerances. Inspection must include:

- Powder residues blocking channels
- Defects (voids & inclusions) –porosity, contamination, cracking
- Departure from the CAD model – dimensional analysis, wall thickness measurements, warping

Micro CT can determine the cooling and flow channels built in by the ALM process to an accuracy of 50µm to 100µm (depending on acquisition parameters). Micro-CT can find defects within samples down to a resolution given by the number of pixels across the detector.

Given a sample 100 mm across, and a detector 2,000 pixels across, the limiting resolution would be 50µm. Resolution is also limited by the focal spot size of the X-ray source, which may range from 80µm for high energies down to less than 1µm for low energies.

The size of sample that can be scanned with CT depends on the material it is made of and the energy of the X-ray source, measured in kilovolts (kV). Larger lower density samples can be scanned, as can smaller higher density samples.

Micro CT is now much faster and more suitable for production-line use and CT scanning of similar parts can be automated for loading and unloading. Scan times down to a few tens of seconds per part are possible. Nikon CT offers:

- Better insight into the inside of ALM parts
- Faster optimization of ALM prototyping, production processes
- Quality control, higher confidence in incoming, outgoing parts
- Reduced costs by avoiding destructive testing

Striving for total understanding in anything is the process of the scholar, the visionary, and the insightful. With the rewriting of the manufacturing rules book that 3D printing brings, X-ray CT is a powerful partner for non-destructively assuring geometrical and tolerance quality control.

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