



# Metal Additive Manufacturing for Turbomachinery

A Solution for Your Entire Product Lifecycle

## Build the Impossible

Turbomachinery parts are traditionally made using manufacturing processes that require long product development cycles, sacrifices in optimal performance geometry, or both.

With the VELO<sup>3D</sup> AM Solution, manufacturing without compromise is no longer an impossible task – whether you are looking to utilize Additive Manufacturing (AM) for new product development, serial production, or direct part replacement. Make the parts you want, when you want them.

## The VELO<sup>3D</sup> AM Solution vs. Traditional Manufacturing

Turbomachinery can leverage the VELO<sup>3D</sup> AM Solution in multiple ways.

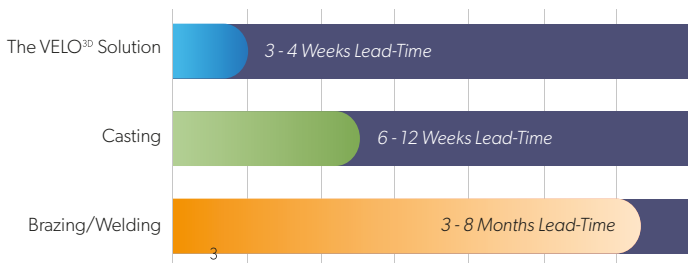
### For New Product Development & Serial Production

- Unlimited design flexibility
- Rapid iteration
- Scale on-demand



### For Direct Part Replacement

- Low-volume or single-part production, *as-designed*
- Nimble supply chain - print on any machine, any location, with consistent quality.



While castings are cheap and relatively quick, they can be tooling and time intensive for small quantities. Brazing and welding requires an even longer time investment, and often delivers surface finishes and tolerances that are not required. With the VELO<sup>3D</sup> AM Solution, high-quality, reliable parts can be delivered in just 3-4 weeks.

## Built from the Ground Up with Production in Mind

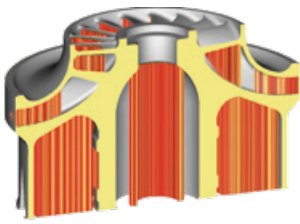
The VELO<sup>3D</sup> AM Solution is a fully integrated system:

- Flow<sup>TM</sup>: The pre-print software removes the need for specialty knowledge with a vast library of feature specific processing parameters.
- Sapphire<sup>®</sup>: The printers ensure repeatability with push-button calibration and real-time, multi-sensor, monitoring.
- Assure<sup>TM</sup>: The quality system validates the part, layer-by-layer, providing a final report with unmatched insight into the build.

*Expect traceability, reliability, and consistency every time.*

# How Does the VELO<sup>3D</sup> AM Solution Support Turbomachinery?

Axisymmetry of parts such as impellers is critical. However, traditional metal AM systems are forced to print parts like these at an angle to minimize the need for support structures during printing. This will cause dimensional instability as well as asymmetric mechanical properties and surface finishes.



Conventional 3D Printer  
(supports in red)



The VELO<sup>3D</sup> AM Solution

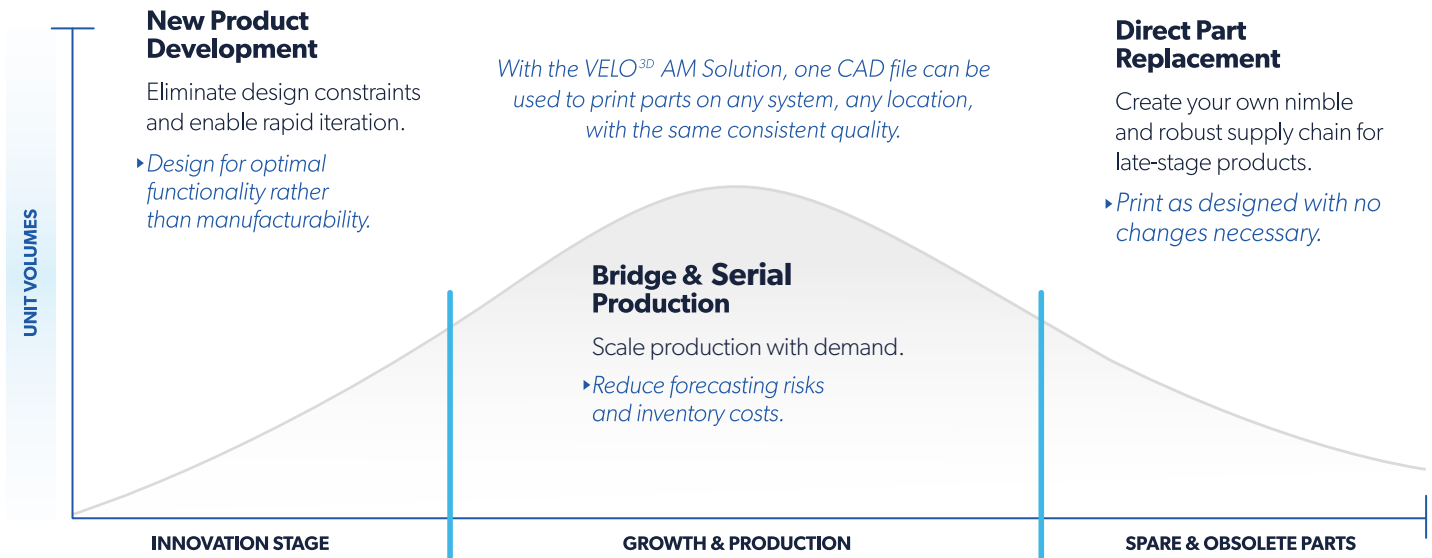
But, with VELO<sup>3D</sup>'s SupportFree™ technology, near-horizontal features can be printed entirely without supports, maintaining axisymmetry and greatly reducing the need for post-processing.

*SupportFree metal AM frees us up to use the geometry we'd like to use rather than being pushed into using a design that compromises the aerodynamics in order to make an AM-friendly part.*

*Chad Robertson, Senior Engineering*



# A Manufacturing Solution for Your Entire Product Lifecycle



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