

Additive Manufacturing for Turbomachinery

Improve Performance, Uptime, and Efficiency

For over three decades, 3D Systems has worked with turbomachinery manufacturers and turbine parts suppliers on their applications.

Whether we're designing components for metal 3D printing and investment casting to optimize turbine performance and service life, or enabling technology transfer for successful integration, 3D Systems helps manufacturers and suppliers achieve lasting success in a highly competitive industry.



Solving Turbomachinery Challenges

Ever-increasing global energy demand and accelerating decarbonization efforts are universal challenges for turbomachinery manufacturers, resulting in the need for increased performance and efficiency.

Fuel Efficiency

The key to gas turbine fuel-to-power efficiency is the operating temperature. Higher temperatures typically mean higher efficiencies, which can lead to more economical operation. Even a 1% efficiency increase has a huge impact when measured on a gigawatt scale.

Power Output

Turbomachinery manufacturers and suppliers must meet increasing efficiency and output demands. End users require as much power output as possible, with the least amount of input fuel, all within rapidly narrowing environmental standards.

Reliability

Continuous operation, as long as months, with minimal maintenance is essential.

Supply Chain Efficiency

Reducing the number of components can decrease assembly cost, improve supply chain efficiency, and accelerate time-to-market.

An End-to-End Partnership

With the combination of our expert teams, manufacturing facilities, equipment, software, and materials, 3D Systems helps turbomachinery manufacturers and suppliers scale up to reduce costs, boost performance, and accelerate delivery through each stage of a product's lifecycle. Across installation, hands-on training, and consulting support, as well as our ability to develop pre-qualified manufacturing processes for critical parts, we help our customers reach production volumes to reduce costs and accelerate delivery times. Our dedicated team works with you across every step, from pre-production to full-scale volume production.



Explore

Strategic consulting to identify customer needs



Innovate

Joint applications development and design for additive (DfAM) for specific needs



Develop

QA and process characterization from pre-prototype through prototype



Validate

Training, validation, and certification



Produce

Production and manufacturing services



Scale

Scale up and technology transfer

Your Path to Advanced Metal Parts

Create Stronger, More Reliable Investment Casting Patterns

3D Systems is the only additive manufacturing company to offer a comprehensive additive manufacturing solution for investment casting, with dedicated products for every stage of your metal casting workflow. We offer powerful software solutions for CAD design and build styles specifically for investment casting (QuickCast® Diamond™), reverse engineering and inspection, best-in-class materials for 3D printing and post-processing (Accura® Fidelity™, Patch and Bond), and cutting-edge stereolithography (SLA) technology.

This complete 3D printing solution delivers everything from micro to extra-large, hollow casting patterns. Due to the nature of QuickCast Diamond, the solution delivers massive, lightweight patterns with thin, durable shells. A specialty infill strategy allows for the pattern to consume the minimum amount of material with the fastest build speed, while also maintaining dimensional stability during the coating and burn out process.



Increase Design Freedom with Direct Metal Printing (DMP) for Unmatched Performance

3D Systems' DMP Flex 350, Factory 350, and Factory 500, together with the 3DXpert® software package, provides an integrated metal additive manufacturing solution that delivers superior digital production with optimal throughput, efficiency, capacity, and flexibility.

3D Systems provides a suite of advanced metal materials for every application, including nickel-based superalloys, titanium, stainless steel, and aluminum.

Unique Metal Materials Capabilities

3D Systems' DMP printers feature unique vacuum chamber technology that enables best-in-class low oxygen atmosphere (<25 ppm). This results in improved material properties, increased material efficiency, and reduced argon gas consumption, resulting in exceptionally strong parts of high chemical purity. The extremely low oxygen environment improves part assembly, eliminating oxygen bubbles for superior weld quality.

Advance Turbomachinery Power Generation and Fuel Performance

Cutting-edge additive manufacturing solutions and services advance turbomachinery power generation and fuel performance while increasing uptime and improving supply chain efficiency.



Design for Performance

Design parts for optimized functionality instead of making sacrifices for manufacturability. By enabling features such as conformal cooling channels, novel gas and fluid flow geometries, and consolidated part assemblies, you can increase performance, reliability, manufacturing yield, and supply chain efficiency, all while reducing labor costs.



Advance Power Generation

Increased fuel efficiency, longer component lifetime, and turbomachinery uptime can have a huge impact on power generation yield.



Accelerate Time-to-Market

With no tooling required, 3D printed investment casting patterns and direct metal printing can shrink design cycles by weeks or months, reduce inventory costs, and create new business opportunities.



Partner for Technology Expertise

Our team of experts have extensive experience helping turbomachinery manufacturers choose the right technologies to solve their challenges.



Improve Scalability

3D Systems' advanced manufacturing capabilities can increase your capacity as needed, providing unprecedented flexibility.



Enhance Turbomachinery Performance and Economics

Incorporating 3D printing solutions into turbomachinery and turbine component manufacturing workflows enables you to rapidly deliver part designs that maximize the performance, quality, and yield of gas turbines.

Rapidly and economically design and deliver metal parts with fewer assemblies and higher complexity to enhance reliability, increase lifetime, and improve thermal efficiency and fluid flow.

Combustor Components

Increase Fuel Efficiency and Performance with Consolidated Components and Optimized Geometries

20:1 component reduction

\$2M average annual fuel savings

2x increase in component lifetime

- Direct metal printing enables complex geometries to be produced, including internal structures in heat-resistant superalloys
- Optimized designs and reduced part counts of combustor components improve performance and fuel efficiency, increase reliability, and reduce manufacturing costs
- Time-to-market is much faster with additive manufacturing



Stator Vanes

Simplify Manufacturing and Supply Chain with Monolithic Parts

500 mm diameter seamless direct metal printing part size

Up to 200:1 part count reduction

Up to 1600 K operating temperature achieved

- Reduce points of failure by consolidating several parts into a single, monolithic part
- Increase yield and reliability while reducing labor costs
- Improve thermal performance with optimized internal cooling channels
- Accelerate lead times with tool-less direct metal printing and 3D printed patterns for investment casting
- Reduce costs compared to machining from billet with expensive metals



Impellers

More Efficient Gas Turbine Impellers, Faster and at Lower Cost

Up to 80% material waste reduction

90% cost reduction over conventional
wax patterns

30x faster time to market

- Enable new levels of design complexity to improve impeller efficiency to compress air
- Optimize impellers for higher gas and fluid performance with rapid design iteration
- Reduce weight with topology optimization and lattice structures
- Eliminate tooling lead time and costs with direct metal printing of the most complex geometries and stereolithography for large investment casting patterns



Casings and Ducting

Complex Metal Casings and Ducting, Without Tooling Time and Costs


90% cost reduction over conventional
wax patterns

30x faster time to market

No tooling required

- Produce low-volume runs of large, complex turbomachinery casings and ducting from economical 3D printed investment casting patterns in just a few days
- Increase design freedom to improve exhaust efficiency with smoother and more efficient gas flow structures
- Reduce part counts of assemblies for fewer points of failure to increase reliability and uptime



A man in a dark shirt and pants stands with his arms outstretched, positioned in front of a large, semi-transparent gear graphic. The background is a solid teal color.

Advance Turbomachinery Efficiency with 3D Systems' Additive Manufacturing Solutions

Additive manufacturing can empower turbomachinery manufacturers and turbine parts suppliers to design for performance and improve fuel efficiency, power output, reliability, and supply chain efficiency. Our 3D printing solutions and technology expertise can help you build better turbines and parts, faster.

Learn how 3D Systems can help you today.

For questions/sales: