



GE Additive

— THE —
ADDITIVE
JOURNEY

AddWorks™

THE TIME FOR **ADDITIVE IS NOW**

Get trusted experience from GE Additive's AddWorks™
to accelerate your journey



New technologies, increased global competition, economic pressures and other factors are bringing swift changes to manufacturing.

Are you wrestling with how to manage this disruption and keep your business competitive, or even viable?

Disruption presents an opportunity to be innovative with advanced technology like additive manufacturing — to gain economic and performance benefits that give you a competitive advantage.

But are you uncertain about additive's value, or its risks, to your business?

GE Additive's AddWorks™ team intimately knows your challenges. We experienced them, too, asking the same questions you may have now: Is additive right for us? Where do we start? How do we adopt additive and still get a positive business return? What's the timeline?

Because we have faced these challenges and experienced successes with our own additive journey, we can help you navigate yours and find the path most beneficial to your organization's operations and goals.

Find additive solutions that differentiate your business

Our experts work alongside your team, teaching and transferring additive knowledge and skills that enable you to meet modern design, materials science and manufacturing challenges.

AddWorks designers, engineers and material scientists work with you to explore product solutions that may differentiate your parts or systems that provide significant performance benefits. Think solutions that are lighter, stronger and more efficient.

Our extensive experience across many industries — working with multiple additive modalities and operating in a production-level environment — allows AddWorks to provide unique additive manufacturing insight. And we have experience supporting customer qualification efforts for parts used in highly regulated environments.



From the simple to the complex, AddWorks has assisted companies with additive parts development and production in the automotive, aviation and energy/power industries.

ARE THESE ADDITIVE
QUESTIONS ON YOUR MIND?

AddWorks
understands your
additive challenges

1

DEFINE BUSINESS CASE

- What is additive manufacturing? How can it help my business?
- How do we find the right part for additive?
- Which modality and materials should I consider?
- How do we build a team and train them?
- How can we show a quick win for additive technology?
- How do I develop a business case?
- Where is the technology going? Do we need to consider obsolescence?
- How are we going to fund this?

2

DESIGN FOR ADDITIVE

- Can I convert my traditional designs to additive?
- How do I take advantage of additive design capabilities?
- What design capabilities and tools do we need?
- How do we get trained in design for additive?
- How do we select and characterize the right materials?
- What material parameters do we need to use?
- What post-processing steps do we need to consider?
- What heat treatments are necessary to achieve required properties?

3

MAKE A PART

- Where can we print the part?
- What type of support is needed?
- What surface finish can we expect from additive?
- What post-processing is needed after print?
- How does the printed part compare to a traditionally manufactured part?
- What kind of infrastructure will be required to print this part in high volumes?
- What is the path to certification?

4

ENABLE PRODUCTION

- What are our make or buy options?
- How do we scale up to production-level quantities?
- How do we set up an additive facility?
- What are material/powder handling requirements?
- What are the environmental, health and safety (EHS) considerations?
- How will we ensure part-to-part repeatability?
- How will we remove powder from the printed part?
- What inspection techniques should we consider to achieve structural integrity?

5

QUALIFY THE PROCESS

- What additive parts have already been introduced in our industry?
- How would we certify (or qualify) additive parts in our industry?
- What are the additive requirements in place for our industry?
- Do industry-wide material specifications exist for additive?



THE **ADDITIVE** JOURNEY



DEFINE

- Discovery Workshop

DESIGN

- Disruptive design
- Materials development
- Material data

MAKE

- Prototypes
- Post processing

ENABLE

- Facilities consulting
- Production process development
- LRIP

QUALIFY*

- Part and machine qualification

* Securing and maintaining certifications or qualifications with the relevant regulators or to final customer quality requirements remains the responsibility of the customer.

Rely on AddWorks to help you through your additive challenges. We create value by working with you to:

- Get products to market faster
- Implement new technologies that reduce trial- and-error costs
- Bridge the additive talent gap while you build your team
- Support your regulatory and compliance efforts

See what AddWorks offers

Navigate each milestone of your additive journey with AddWorks' experience and expertise.



DISCOVERY WORKSHOP

In this 3-to-5-day onsite session, the AddWorks team shares additive knowledge with your team, using proprietary tools and processes to identify and prioritize additive opportunities.

YOU GET:

- A prioritized list of potential additive parts and systems
- A high-level cost, part performance and business case analysis
- An additive manufacturing strategy for selected parts

THE GE DIFFERENCE

- We customize the Discovery Workshop to meet your needs.
- Our multidisciplinary team offers production-level experience.
- We provide access to GE Additive's best practices, processes and tools for part identification and costing.

DISRUPTIVE DESIGN

Work with the AddWorks team for additive design, engineering and materials assistance, with access to GE design examples. Gain quicker turnaround time on parts design vs. in-house creation.

YOU GET:

- Design files to print identified additive parts
- A full business case report
- An additive roadmap for your product line

THE GE DIFFERENCE

- Our design team has developed 100+ production applications.
- We customize design to suit your needs.
- By collaborating with our team, you gain useful additive knowledge.

MATERIALS DEVELOPMENT

AddWorks materials experts provide assistance on materials selection from GE Additive's catalog, along with developing parameters and testing protocols to achieve desired material properties. The cycle time to achieve a new alloy's printability is demonstrably reduced.

YOU GET:

- Material selection guidance after our Discovery Workshop
- Set parameters and post-processing for the new materials
- Initial materials property data to facilitate part design

THE GE DIFFERENCE

- We provide knowledge and experience through more than 1,000 materials scientists across GE.
- We deliver mechanical performance productivity for you.

ADDITIONAL SERVICES



Additive manufacturing lab

Some organizations may not be ready to install a machine on their own site to print. AddWorks will work with customers to "rent" a machine at a GE facility to expedite learning.

Materials qualification

AddWorks develops process steps and tools for customer-implemented powder and material qualification processes. AddWorks will also help define and create statistical data sets to develop baseline properties of interest to the customer.

Material data

AddWorks materials experts can help define and create material property data sets required to enable designs for additive. This includes providing statistically based data sets and specific testing to validate designs.

Quality control planning

AddWorks will work with customers to help develop a quality plan for production manufacturing of the AM part. Your organization's quality management systems and industry specific quality standards will dictate the final quality requirements.

PROTOTYPES/ PRINTING PARTS

AddWorks prints additive-designed parts and helps determine and execute post-processing steps to achieve your result. This determines feasibility before making a capital investment and provides a bridge to support initial production while you set up your additive supply chain.

YOU GET:

- Printed parts that meet your fit or functional testing requirements
- Improved product designs based on what you learned during parts printing
- Full process router for repeated manufacturability

THE GE DIFFERENCE

- We focus on part quality and meeting your specifications.
- We don't just print parts — we develop a post-processing router and process to deliver to you.
- We offer multiple printing locations.

PRODUCTION PROCESS DEVELOPMENT

The AddWorks team can help structure your manufacturing process to achieve increased productivity, including technical requirements, materials, build strategies and post-processing. Gain the right build for a lower cost and reduce manufacturing losses.

YOU GET:

- A production process development plan
- A final production build file
- Process specifications and technical plans

THE GE DIFFERENCE

- We offer High Rate Initial Production (HRIP) AM experience.
- We provide a factory focus, not just a machine focus.
- Our Production Process Design includes design, material, machine and industrial applications.

PART AND MACHINE QUALIFICATION

Addworks helps you set up the production process to achieve ongoing part repeatability — confirming that printed parts meet your product and industry-specific requirements. Our experience helps reduce trial and error costs while identifying and mitigating risks.

YOU GET:

- Qualified additive parts/processes
- Certification support: appropriate qualification level to requirements

THE GE DIFFERENCE

- We deliver a customized solution.
- We have certified AM parts in the highly regulated aviation industry and have experience in several other industries.

AddWorks supports you along the entire additive journey — creating an additive mindset with lasting impact for your organization.

Is additive the right path for you? Tap into AddWorks' experience. Work with our team in a Discovery Workshop to explore how additive may benefit your manufacturing strategy.

You can benefit from our trusted track record of broad expertise in design, engineering and materials science specifically for additive technology.

Our experience and lessons learned in adopting additive design are shared to advance your additive journey and your organization's manufacturing capabilities.



GE Additive is leading the additive industry through world-class machines, materials and engineering consulting services, recognizing the value and potential additive brings to modern design and manufacturing challenges.

Are you ready to advance with additive?

Start with our Discovery Workshop.

AddWorks™

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