



## What You Should Be Looking for in a Modern Metal 3D Printer



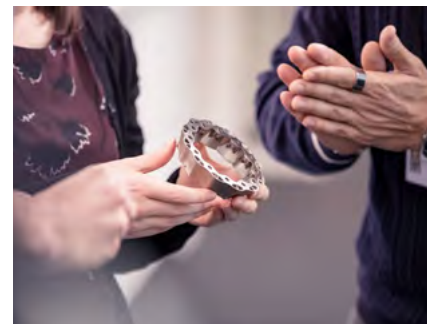
**As an additive manufacturing (AM) expert,** you're well aware of AM's extensive benefits in the realm of production. This isn't your first rodeo: When you're considering the value of a new industrial metal 3D printer, you're likely focusing on three key traits for your production needs:



**Productivity, reliability, and repeatability.**

They're practically the "holy trinity" of features for any AM production platform, and with good reason. The ability to produce high-quality parts efficiently, dependably, and consistently is vital for all manufacturing organizations. As AM continues to evolve, new features have brought productivity, reliability, and repeatability to new heights. These emerging technologies can push that "holy trinity" of attributes beyond the status quo, and they can also help your organization further its position as an innovator in the market.

These groundbreaking capabilities can be difficult to assess because, well, they're new. In this guide, we'll demystify some of these emerging features. We'll explain how they enable greater productivity, reliability, and repeatability, and we'll explain why they deserve greater consideration in your platform assessment process. These features may not be at the top of your wish list, but they can cement your position as an AM leader and innovator.



**Productivity**

**Reliability**

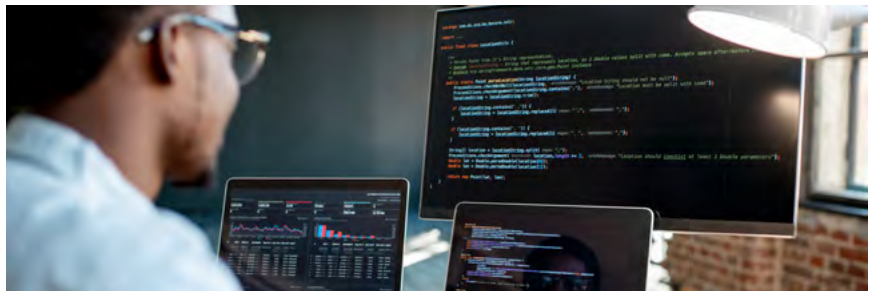
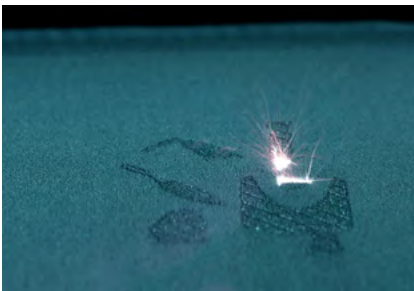
**Repeatability**



# Productivity

Not too long ago, you probably focused on cost-per-part as a top priority for your metal AM purchase decisions. In recent years, productivity has likely become the first thing you ask about.

In the world of AM production, productivity is all about fast build speeds, maximizing machine uptime, high utilization rates, and reducing the time spent on non-productive tasks such as setup and recoating. Several factors influence a machine's productivity, including emerging technologies that can boost productivity to new heights.



## Laser versatility

More lasers doesn't necessarily equate to greater productivity. In fact, the more lasers in your system, the more complexity you add to system management. (More on that in the Reliability section below.) Instead, focus on the versatility of those lasers. Do the machine's lasers cover the entire build area? Will you have the flexibility to assign those lasers in various ways for your production needs? Is the build platform large enough to handle a range of part sizes and rotational symmetric production? All of these factors can boost machine productivity more reliably than sheer laser count.

## Predictive maintenance

The ability to predict downtime before it happens is playing an increasingly important role in optimizing machine uptime and productivity. Look for AM platforms that will allow you to anticipate service needs through data analytics and machine learning. It goes a long way toward proactively implementing contingency plans and increasing machine uptime.



## Remote services and co-maintenance solutions

Worried about the in-house expertise you'll need to support predictive maintenance? The right partner will provide service offerings and software solutions that make predictive maintenance more of a turnkey solution. During your research phase, you should ask about remote services and co-maintenance software solutions that allow you to collaborate with offsite experts and data analysts.



Source: Permedica



### Handling and filtration systems

The design of a machine's handling and filtration system can also influence its overall productivity by increasing overall uptime. Of course, you'll want to look for machines that can remain in operation while these systems are being serviced. Better yet, machines that eliminate filter changes or provide a permanent lifetime filter optimize uptime by reducing service interruptions.



### Speed of setup and recoating

Ultimately, productivity is about reducing non-productive times as much as possible – and every second matters when you're talking about a complex production platform. Speed is a critical feature of any metal 3D printer, and not just when it comes to build times. Consider how quickly the system can be unpacked, how quickly it can be set up, and the speed of the recoater system that distributes every layer of metal powder evenly.

### Powder reservoir size

The size of the machine's powder reservoir has a direct influence on productivity. Larger powder reservoirs allow machines to complete more jobs before needing to be taken offline and refilled.



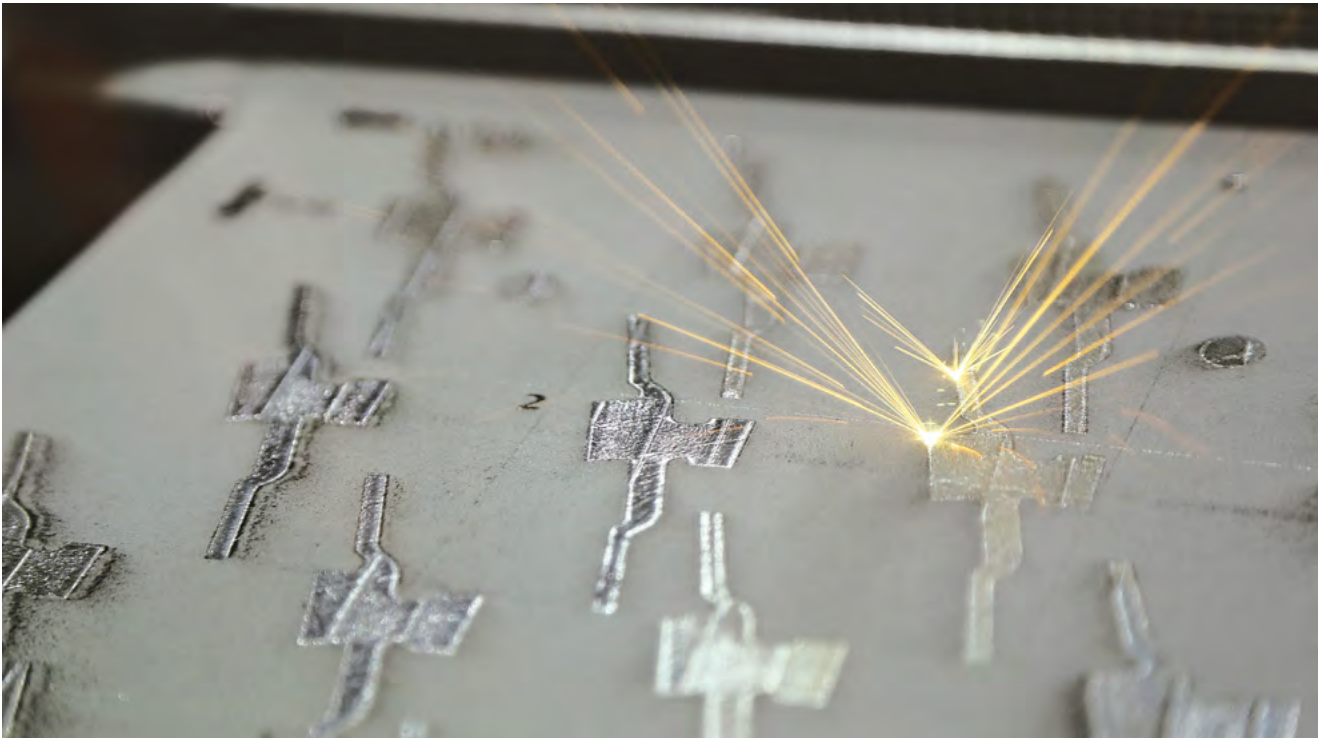
### Ease-of-use

Easy operation is not traditionally associated with machine productivity, but it can play a major role in optimizing utilization. The ability to start up quickly and automate key aspects of each build can greatly impact overall productivity – as well as eliminate human error from the equation.



## Reliability

Assessing the reliability of a modern metal AM system involves a lot more than “kicking the tires.” Traditional attributes and state-of-the-art features work together to bolster a system's dependability and resilience. In this section, we'll cover the traits and features that indicate superior reliability in a modern metal AM machine.



### Thermal compensation features

As noted in the productivity section above, more lasers make system maintenance a lot more challenging. Each laser must be managed and maintained purposefully, and the smoke produced by the lasers during build processes must be handled adeptly to maintain operational integrity. With a laser-based metal AM system, thermal management features ensure system performance will not be affected by large amounts of heat.

### Mechanical compensation features

Working together with thermal management features, mechanical compensation features also play a major role in preventing the machine's frame and optical elements expanding or shifting with increased temperatures.

### Gas flow

Similarly, the gas flow within the build chamber must be designed for stable operation. Proper design will help guarantee the stability of parts over the long haul. The ideal behavior is uniform laminar gas flow across every section of the build plate.



Source: Ariane Group

### Mechanical design

Of course, a system's overall reliability is heavily influenced by its mechanical design. To ensure consistent, repeatable processing and part quality, you'll need a stable frame that can stand the test of time.

# AM Production Gamechangers: Emerging Considerations for AM Experts

As important as they are in the decision process, productivity, reliability, and repeatability are ultimately just table stakes in the AM production universe. You should be thinking beyond that "holy trinity" of attributes. To remain an AM leader, you should embrace cutting-edge features, capabilities, processes, and services that will help you maintain a position of innovation in your market.



## Big data analytics

One of the biggest advantages of being an AM first-mover is that you have years of AM production data at your disposal. Big data analytics applications will help you predict outcomes and optimize your production environments over time – and remain several steps ahead of your competition. Managing big data is a critical part of that process. Make sure you don't overlook the work it takes to ensure data works seamlessly with machine learning applications. Look for a metal AM platform that provides a solid foundation for future possibilities and offers standard interfaces for connecting with other systems and applications. Ultimately, you should be able to pull pertinent build data from your machine via easy-to-use software, or even automate retrieval of that data into your existing ERP system.

## Digital inventory

Have you fully explored digitizing your part and product inventory? By producing parts on demand and eliminating the need for physical warehouses, you will make your supply chains more nimble, decentralized, less prone to disruption, and more sustainable. Look for a metal AM platform -- and an expert partner -- that will help you develop and implement a successful digital inventory project.

## Cybersecurity

In both those scenarios – digital inventory and big data analytics – cybersecurity is more important than ever. Robust data security is needed to safeguard your digital part and product portfolio, prevent unwanted access to your proprietary data, eliminate counterfeit printing, and manage printing rights effectively. Being able to lock down build jobs and custom parameter sets may allow others to manufacture your parts, but not view or retain your IP. Look for a metal AM platform that you can trust with your data and puts your security first.

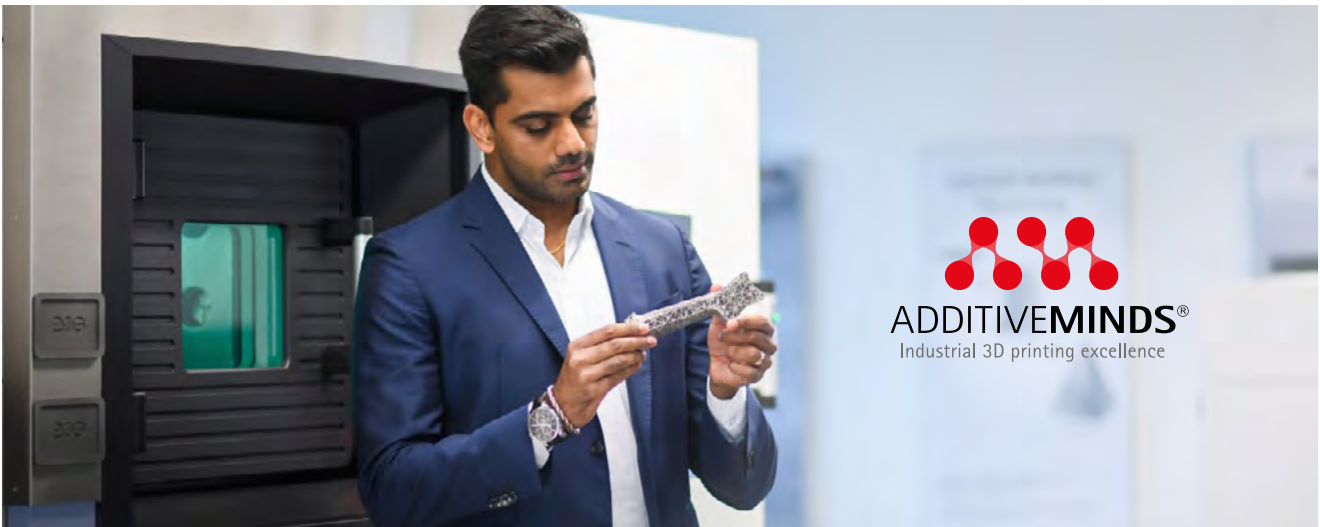


### Sustainability

AM enables greater end-to-end organizational sustainability, and it goes far beyond the fact that less waste is produced during AM processes. You should explore additional sustainability gains that can be achieved through product design, digital inventory for spare parts, materials, and personalized production that will extend lifecycles and reduce waste. Look for recyclable materials, opportunities to localize and streamline your value chain, and scan-to-print capabilities that can create a stronger bond between your customers and your products.

### A trusted partner

You're already an AM expert. Just think what you could achieve if you had a team of people just like you to collaborate with: A team of fellow AM experts that can visit you on site, assess your future roadmap, work with you on optimizing materials and processes, and discuss the latest industry best practices. They'll be able to understand your unique needs, provide experienced consultation, answer your questions, and anticipate your needs as they evolve.



## Get the expert-level AM guidance you need.

AM experts require expert-level guidance. The EOS [Additive Minds team of consultants](#) provides clarity and solutions that no other OEM can offer. We understand the challenges that AM experts face, and our diverse portfolio of technology, services, and consulting solutions was built on 30+ years of mastery of laser, material, and process.

The Additive Minds team takes pride in being a trusted partner that will explore your complex needs, understand your position as a leader in the AM space, and provide thoughtful insights that enable your future advancement.


**Reach out, and let's get started.**


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