

How to Prepare Your Facility For an Industrial 3D Printer

Set your organization up for success by considering the key elements of a seamless and efficient additive manufacturing system installation

Key takeaways:

- A breakdown of the day-of installation requirements
- System and material storage dos and don'ts
- Personal protective equipment and why it's important
- Preparing your team for industrial 3D printing before and after installation

Introduction

Whether you have made the decision to purchase an industrial 3D printer or are still weighing the pros and cons, the requirements of an AM system installation in your facility need to be understood. An EOS system has specific installation requirements for many reasons, some due to the size and power brought by the large system set-up, and others to maximize the safety of your machine operators. Let's dive in to learn how best to prepare for the delivery of an industrial 3D printer and how to set your team up for success before your system delivery date.

The Key Factors to a Successful System Installation

If you already have a manufacturing shop floor, you are familiar with the requirements of traditional machining equipment such as power supply, air conditioning, pressurization, and safety, among other requirements. You may have already scoped out where you would like to place your new AM system on the shop floor, but here are a few factors to consider before assigning a home to your soon-to-be delivered AM system.

Separating your AM system from other machines

Although many machine shops tend to use large, open air system bays for their production needs, an AM system needs to be separated based on whether it is running polymer or metal materials and needs to be distanced from other traditional manufacturing machines.

Although powder handling safety is of the utmost importance and emphasized in operator training, there are still small particles that escape when refilling or removing an application from a build. If a metal AM system's material is contaminated with polymer particles or vice versa, it can cause issues within the current build of that system or those to come afterwards. This is why we require all system areas to be controlled by separation to reduce the risk of damage.

An AM system must be also because of the issues that can be caused by other machines operating around it. If a traditional manufacturing machine that vibrates, emits a level of radiation, or produces high frequencies is next to an AM system, it can corrupt the machine build and operation.



Accounting for your atmosphere

Once you have determined the best plan to separate your AM system from the rest of the equipment on your machine floor, you need to consider the atmosphere of the room. The room's temperature and humidity can not only effect the materials, but the productivity of your system. For the ideal operating atmosphere, EOS recommends systems be kept in the following conditions:

Permissible operating room temperatures:

- At maximum 80% relative atmospheric humidity: > 15 - 20 °C
- At maximum 60% relative atmospheric humidity: > 20 - 25 °C
- At maximum 45% relative atmospheric humidity: > 25 - 30 °C

We tend to see this issue rise during the change of seasons, and without temperature control for both the system and materials, elevated temperatures inside the machine can cause intricate electronics to begin to fail.

For proper material storage, we recommend the following:

Metal powder storage for originally packed bin:

- Permissible room temperature: 10 - 40°C
- Permissible relative atmospheric humidity: maximum 80%

Metal powder storage for non-originally packed bin:

- Permissible room temperature: 15 - 25°C
- Permissible relative atmospheric humidity: maximum 40%

Plastic powder storage:

- Permissible room temperature: 20 - 25°C
- Permissible relative atmospheric humidity: approximately 40 - 60%

Although material storage may not be the first thing that comes to mind when preparing for installation of an industrial 3D printer, it is a crucial step in ensuring your new AM system's success.



Level floor, strong floor

Many machine shops have already evaluated their flooring strength requirements for traditional manufacturing machines, but because our systems vary in size and dimension, it is something our service team reiterate before system installation to ensure your facility is able to safely bear the weight requirements of the AM system and peripheral products. Consider the weight of the system plus the material, the peripheral products around the system, and the people that will be standing and/or operating the system. The floor must be hard, flat, and level with a surface unevenness less than 5 mm (about 0.2 in)/m².

Gauging the gas requirements

For EOS metal 3D printers, a supply of both nitrogen and argon gas is required for operation. For polymer systems, only nitrogen is required. Many traditional shop floors do not have a direct argon supply, so we recommend evaluating your shop floor and confirming the ordinance within your county/state. If you're interested in learning more about the required safety standards of argon gas in your facility, please visit your state's government website or **OSHA**, the Occupational Safety and Health Administration website.

Electrical and cooling accessibility

Your electrical supply will not only ensure your system runs properly, but a correct electrical connection will help with deterring stalled or failed builds due to

inconsistent power. If the optimal connection conditions cannot be met at or near your AM system, a three-phase power supply must be provided using a transformer solution. To avoid power interferences, there can be no other large electric motors connected to the same circuit. If there are, it will cause power to be taken from the laser supply.

If your facility is located in a turbulent weather region or experiences regular power outages, we recommend leveraging an **Uninterrupted Power Supplies system (UPS)**. UPS technology, supplied by ABB, is a power voltage protection device that improves power quality and assists with avoiding build losses due to power outages. Depending on how many systems are running, the UPS can keep a system running for up to five minutes at full load or up to one hour supporting one system (for example, an EOS M 290).



Your internal cooling water circuit is another important building feature that is required to use the water-water cooling system, a peripheral product provided by EOS with your AM system. Proper storage and use of the EOS cooling system allows your industrial 3D printer to maximize this peripheral product.

Preparing personal protective equipment

Personal Protective Equipment (PPE) is a part of operating any large, high-powered manufacturing system. With industrial 3D printers, particularly metal systems, there are specific protective equipment requirements for servicing the system. Here are the PPE accessories we recommend your team orders before your system installation:



For respiratory and face shielding needed to operate an metal AM system during certain steps, we recommend the **3M Versaflo Heavy Industry PAPR Kit TR-300-HIK**. In the accessories kit that is provided with a metal system purchase, there is one welding cape included. If there is an additional technician aiding in a filter change, they will need one for flash protection as well.

For fire resistant clothing to prevent powder exposure and flash risk, we recommend **Dickies** or **Carhartt FR Coveralls**. Our technicians leverage these brands when operating and servicing our AM systems in-house as well as in the field.

For powder handling, we recommend **nitrile gloves**, same as the pairs included in your system accessories kit.

For fire resistant gloves while handling hot plates and any tasks related to filters or condensate, we recommend the **Lincoln Electric Traditional MIG/Stick Welding Gloves** or a similar product with fire resistant qualities.

For foot safety and ESD (Electrostatic Dissipative) shoes, we recommend the **Red Wing Shoes Safety Slip-On** or a similar trade-made shoe. Shoes with ESD protection will have an SD or lightning bolt symbol visible in the product information section.



Practicing safety around your system

Despite state-of-the-art design and technical measures, there are still potential risks to operating and housing an AM system if installed incorrectly. Educating your team on the procedures and potential hazards that come with an AM system is the best way to safely navigate your new piece of machinery. When you purchase an AM system, you will receive multiple safety guidelines and operational procedures on how to safeguard your shop floor. Until then, here are a few safety guidelines that will be covered when it comes time to install your AM system:

Metal and polymer material handling

Metal and polymer material handling are important to the environment surrounding the system and the health of your operators. Following proper procedure for material handling will mitigate many of the potential hazards associated with using both types of AM materials.

Gas safety

Nitrogen, argon, and inert gas can affect oxygen levels in an enclosed space. Proper disposal and discharge of the gas should be established before using to power your AM system.

Cleaning equipment

Using the correct cleaning equipment both improves the operation of your AM system and ensures the safety of your team while the system is in use. For metal AM systems, the wet separator accessory is needed to properly dispose of residual metal powder for optimal machine safety.



Fire and explosion prevention

Leveraging your AM system safety procedures is required for fire and explosion prevention. Items such as PPE, the antistatic mat, the wet separator, inert gas supply, and proper material storage all play a role in reducing risk.

Electromagnetic compatibility

EOS systems are ISM devices, which means high-frequency devices such as mobile phones can interfere with operation of the system. Do not operate any equipment that emits high-frequency radiation in the room where the machine is installed.

Thermal and chemical hazards

Multiple parts of your build platform are hot during the build process, immediately after, and during the cooling period. Wearing PPE can protect your team against harmful physical contact.

Proper material and liquid disposal

Disposal of metal and polymer powder must be in accordance with the local and national regulations. All rooms in which the machine stands or metal powder is stored must also be in accordance with your state.

Day-of installation requirements

For a smooth process of unloading the machine and peripheral products, a forklift and a lifting truck with appropriate carrying capacity must be available at your organization's installation location. The route from the loading bay to the system's permanent installation space must also be clear of ground unevenness and the doorways must be able to accommodate the size of the package and forklift plus a buffer space of 5 cm (about 1.97 in).

Lastly, EOS service personnel must be briefed on the conditions of the installation location. The connections on the machine should be laid out and the building must be designed such that the supply lines to the machine can run and be protected against mechanical damage. For your best installation experience, we recommend the peripheral products be as close as possible to the installation site.

Timing and training after installation

Before or after your AM system installation, it is beneficial for your team to leverage the **Additive Minds Academy**, our portfolio of in-person, virtual, or hybrid online e-learning and training that can get your engineering team up to (AM) speed.

Whether your team is already knowledgeable in industrial 3D printing or learning as you grow, our Additive Minds Academy gives your engineers the freedom to learn on the job. The Academy also offers courses on technical topics such as post-processing, AM design, and more.



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