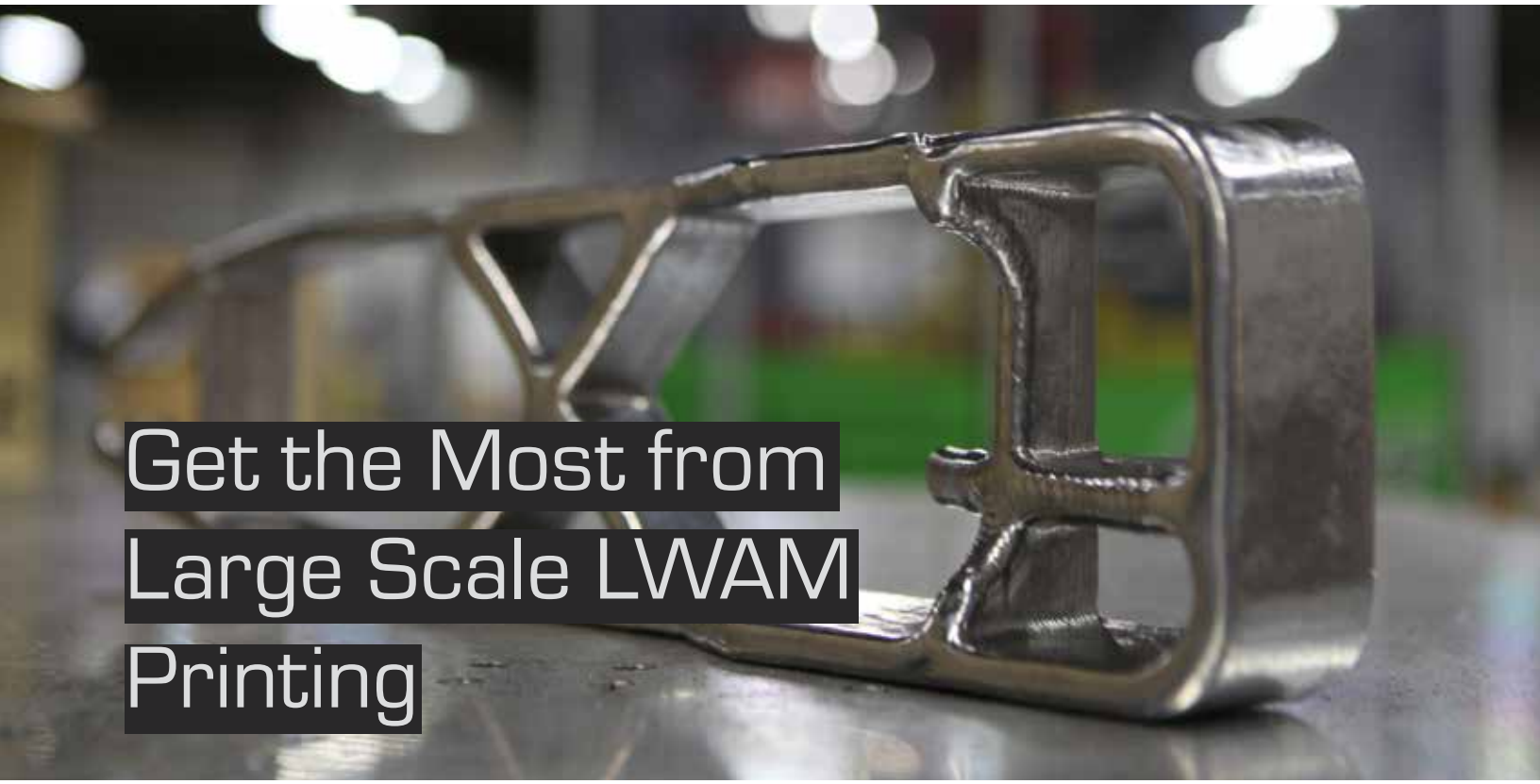
ADDERE ADDITIVE MANUFACTURING

Five Design Tips for Laser Wire 3D Printing

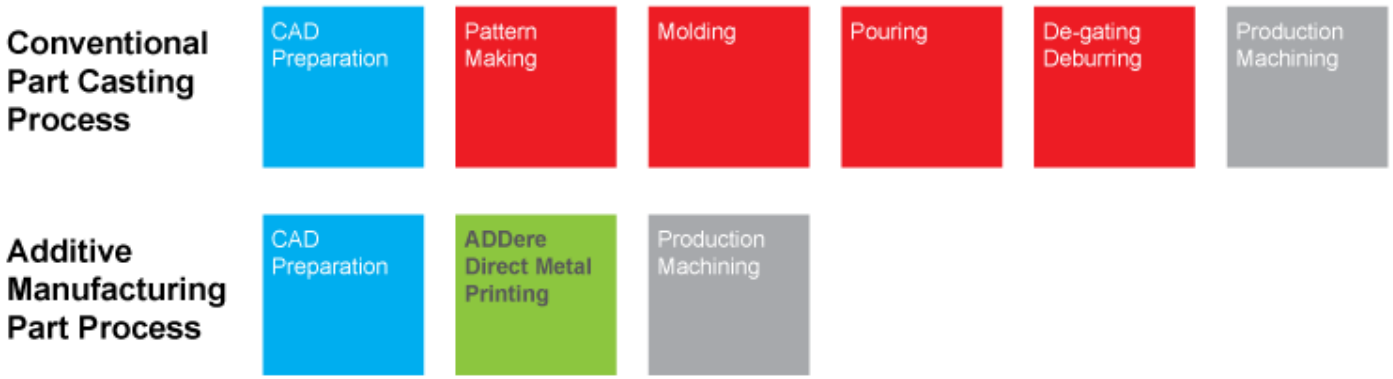


Get the Most from Large Scale LWAM Printing

Laser Wire Additive Manufacturing (LWAM) has a number of exceptional benefits inherent to its process – which can only be achieved in the design process. LWAM also is not without its limitations – it's also important to work within these constraints to build a successful part.

Comparing LWAM to Low-Run Casting

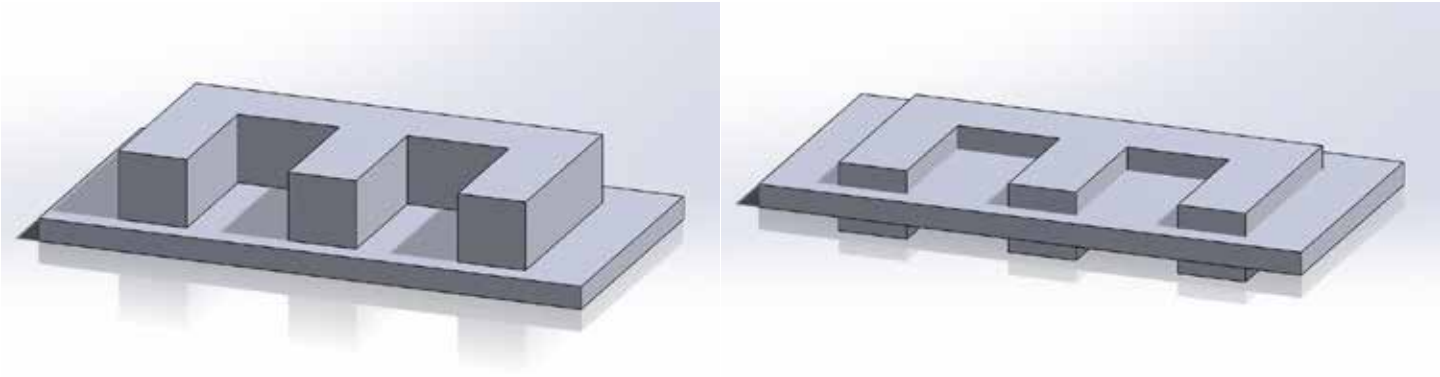
It's best to compare the LWAM process to that of a typical sand casting process. Where, if properly executed, the laser wire additive process produces a part with similar or slightly better finish quality in terms of surface finish and dimension. This also means that a LWAM part will need finishing processes much like a casting would. Processes like milling or surfacing will be needed to bring the part to production ready.



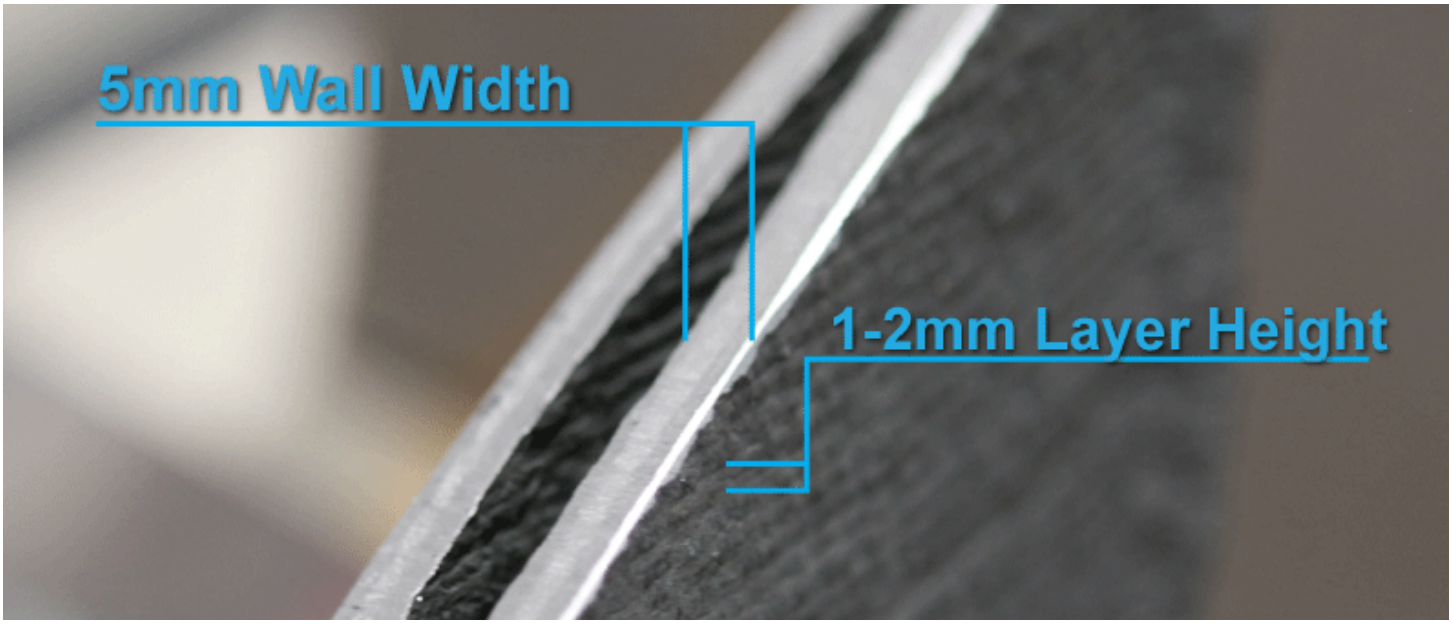
One of the biggest areas where LWAM and casting are different is in production time. In the time it takes to make a core for the casting process, LWAM creates a just-out-of-the-mold-quality part – only one that does not suffer from the possible metallurgical issues found in casting like micro- or macro-porosity, cold shuts or laps, and scabbing. The ADDere closed loop feedback laser system virtually guarantees the best quality interlayer consolidation and freedom from impurities.

Planning for Success

The key to getting the most out of LWAM is to build to the process' strengths while preparing for its limitations. With that in mind, we've put together five tips to help you ready your part for success in LWAM printing.



1. Think about designing the substrate into the part. Much like FDM processes, LWAM builds components off of a base plane. Unlike FDM, it can also build from both sides with a base plane through a part's centerline. More complex shapes are possible as long as the substrate material – that's built of the same material as the printed portion – is integrated correctly within the part.
In order to be successful, most parts need to have the base plane integrated into the design. As the LWAM process is essentially printing in molten metal, the plane needs to support all future layers. Best to locate the plane through the part's longest section.



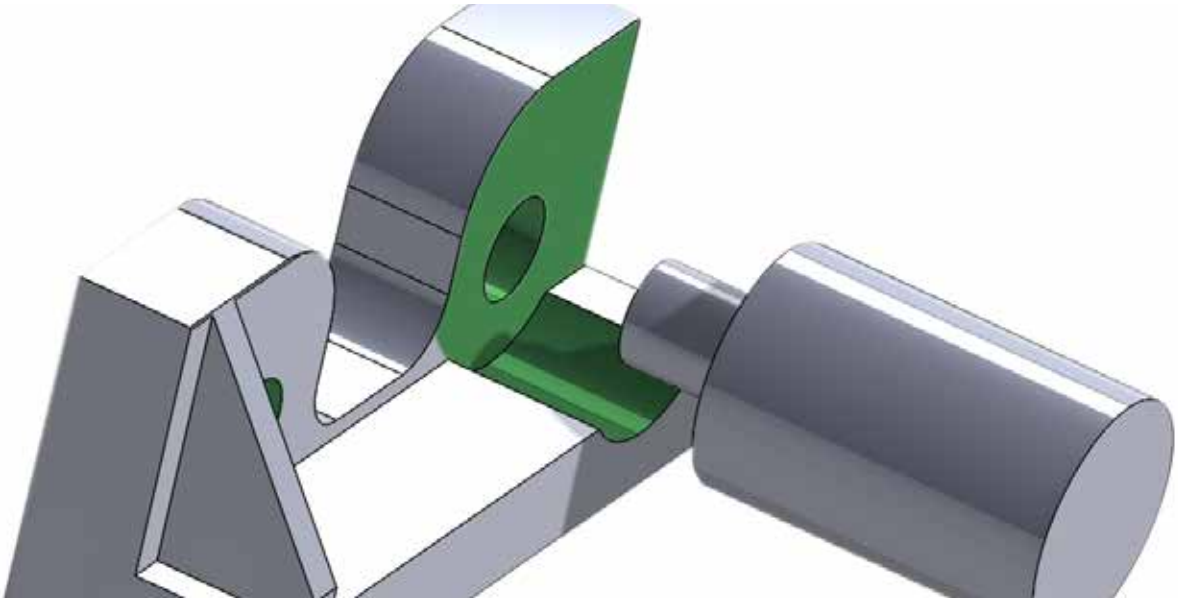
2. Know the process' layer heights and wall thicknesses – LWAM systems typically produce larger wall thicknesses than their SLS cousins. Best to stay at or larger than 5mm wall thicknesses for the ADDere process and be mindful that each layer of the system averages about 1-2mm in height. This doesn't mean the finished part needs to conform to these heights and thicknesses – just know that achieving smaller dimensions may fall to a finish machining process after the print is complete. While the printed material is a solid mass of the specified material, that material has the same metallurgical characteristics of a similar thickness of billet. Best to indicate those machining specifications on the product at the onset.

3. Watch out for overhangs. While the ADDere system, with its motion control offers abilities beyond those of conventional gantry systems, can offer much more shape capability with geometry, it's best to work to reduce complex overhangs more than 20 degrees in any given shape. Much like conventional 3D printers, going perpendicular to the base may turn out to be impossible for LWAM processes.

With shapes that absolutely will need features of this sort, consider designing in support features that would be removed in a secondary process. Fill in overhangs or small details and plan for a finishing operation to remove the material after the build.

4. Keep in mind a finishing process probably will be necessary. LWAM systems are near-net-shape producers. This means that while this system can produce a large component quicker and more cost effectively than other additive manufacturing processes, chances are it will require final finishing to achieve more stringent tolerances similar to castings.

It's best to design in critical features at the onset. Machining in precisely placed holes or finishing mating surfaces will need to be accomplished with conventional milling or surfacing equipment. In this way, higher tolerances can be achieved. Borrowing from casting, it might be best to consider building in datum points to help facilitate location for secondary processes.



5. Indicate critical features. With LWAM systems, keep in mind final finish machining will be necessary for integrating laser wire printed components into assemblies with other parts. Knowing how the component will be used and the stresses it will see is also important in determining a build strategy. It's best to think through to these next steps beyond 3D printing to what the final part needs to achieve. Understanding the downstream fit and tolerances and indicating where on the part these will occur is good practice. Be on the lookout for unique features that require a special finished shape, specific feature location or operational stresses and kinetics.

Calling out where secondary operations need to happen will help LWAM printers determine the best print strategy to take, and what modifications may need to be accommodated in the CAD file to provide an acceptable print. Providing where those high importance areas and features is important so extra material can be added to make the subtractive finishing processes successful. Detailed finished drawings and models go a long way to help create the best layout for printing, as well as good communication with the printers to make sure the information is conveyed and understood.

Get Expert Help

While these tips are certainly not the only things to consider when using the laser wire additive process, we feel these set a designer or engineer on the right path for success. Of course we have skilled and experienced engineers available at ADDere to guide your design process from concept to 3D metal printing success.

Please feel free to contact us to learn more or send us your project today. We're more than happy partner with you to make your prints a success!

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