WEBINAR FAQs

Thank you for joining our webinar “Understanding Additive Manufacturing Economics - A Critical Piece to the Additive Business Case”. We had a lot of great questions but unfortunately, didn’t have time during the webinar to get to them all. So, below is an extract of frequently asked questions.

1. Does layer thickness account for part complexity? Build cost is usually highly dependent on this very simple parameter.

Yes, although the effect of changing layer thickness is more directly tied to the feature resolution of the part. In other words, whether you can increase layer thickness to reduce print times is subject to the part feature resolution and surface requirements and the maturity level of the material’s parameter development.

2. How can I avoid adding unnecessary complexity to pieces I design?

First, identify the performance criteria for the part you are designing. Design the part to meet the functional requirements while keeping geometry simple. For example, reduce the number of curves on a per-layer basis. This will require not just the geometry definition of the part, but also the orientation of the part during the print. When designing for weight optimization, resist the temptation to leverage tight lattices and think about more organic shapes. A dendritic topology can enhance structural capability and still be lightweight but might be less geometrically complex than a tight lattice, for example. But, if the performance criteria require a highly complex surface to get the benefit, then by all means, get complex!

3. What improvements are being made to machine architectures to increase the productivity and to bring down final part costs?

The most notable changes we currently see are addressing all three aspects of Overall Equipment Effectiveness (OEE).

Some companies are reducing touch time and machine changeover for increased availability, and addressing yield with improvements to machine processes, such as the gas flow over the scan field. For productivity specifically, there is a lot of research ongoing right now looking at optimizing parameter sets and themes. Because these directly correlate to specific machine productivity, those are the "low hanging fruit." But with machine architecture, we see a push for more powerful energy sources and additional power sources. Many OEMs are adding additional, higher-powered lasers. Additionally, there is a focus on specific beam controls that affect both part quality and build speeds.

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4. Is the 3000% change just because of poor scan-hatch generation limitations?

No, in fact, it has everything to do with data! Imagine a small cube versus a large highly-latticed structure. A small cube will send a much simpler set of instructions to the machine than the larger, more complex part. Therefore, a simple part generates less data and less "stuff" that the machine needs to do each layer. It can take as little as a few seconds to scan the entire geometry for each layer of the cube, while a highly complex part that must "trace" the entire perimeter of the geometry and that can take several minutes to finish. That massive change of scan time on each layer is due strictly to the amount of data present.

5. When calculating the performance aspect of the Overall Equipment Effectiveness (OEE), how is the possible output value determined?

Performance = Actual Output / Possible Output x 100. Using that definition, we would calculate possible output using a normal unit, such as hours, and determining if we operate at the theoretical maximum availability and what is the number of builds that can be completed. In this case, we'd use the input geometry to analyze the build time (in the machine and material combination desired). Then, we'd simply record the actual output compared against the theoretical maximum to determine the ratio.

6. If I were to be planning to introduce additive manufacturing to a company, I am new in, what should the first steps to manifesting that plan?0mg and 7mg powder - which one is better of heat exchanger material?

There are many successful ways to introduce additive, but there are a few that will be easier if you are just entering a new company.

The first recommendation is to learn the business model your business is currently running. Ask how the company makes money and ask the structure of the supply chain and sourcing teams. How do the company operate? Understanding what is important to the current business and identifying where there are gaps or opportunities allows you to position your solution in a way that solves an existing problem or fills a gap.

Also, spend equally as much time interrogating the product and its functions. What criteria does the design team use to evaluate the product and the components? Use additive to solve a problem that matters to the company. Does something need to be lighter? Offer better fuel consumption? Decrease time to market? Provide rapid customization, such as for a medical patient? Additive can and will change the game, so understanding all of these aspects will help you form the strategy to sell the concept to stakeholders.

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8. How does the contour x hatch cost relation apply to Electron Beam Melting, where we also have preheating?

It still applies, but just in a different proportion and some different considerations. Electron Beam Melting (EBM) themes are designed similarly and have a lot of the same exposure elements to Direct Metal Laser Melting (DMLM) or other additive manufacturing processes. The change to the build time model is that there are other parameter elements such as the pre-heating, that add time and allow EBM to generate quality parts.
Also, due to the difference in energy source and machine architecture, many of the parameters would have different speeds and powers between EBM and DMLM.

9. Do you account for build quality variation across the build plate and how does it change the OEE?

This would largely affect the yield (or quality) portion of the Overall Equipment Effectives (OEE) calculation. Many machine OEMs are focused on process quality and enhancing things like airflow which help to create even part quality across the build platform. These enhancements have a direct impact on cost, not just because you need to build fewer builds to hit your production target, but you may require fewer machines, and have less waste product that needs to be processed and removed. With batch ordering as well, it can shorten lead times for delivery.

10. Do you have any suggestions on a model for industries to value shorter process lead-time?

Shorter lead times can be measured in changes to your Order To Remittance (OTR) times, which signals that orders can be fulfilled much faster.
In some cases, it will change a company's accounts payable/receivable and as such, may alter payment strategies. Other items might be “New Product Introduction (NPI) Cycle Time" or "Product Development Time," where shorter lead times can lead to less cash required or higher output gained for a fixed level of investment.
Speed to market can be another metric to assess how quickly a product can enter the marketplace, leading to quicker generation of cash. Shortening product release times directly leads to quicker revenue gains. Another option would be to measure reduction in Work in Progress (WIP) and warehousing as lead times are decreased, especially in the case of investment tooling, molds and dies.