

# The Additive Revolution: the Edge of Advanced Manufacturing

## Breaking Down the Barriers of AM and Finding your Way to the Forefront of the Uprising

Additive Manufacturing (AM), also known as 3D printing, is the wave of the future. Design any shape you can dream up, produce it on-demand, anywhere; with nothing more than a machine and some powder. For professionals, one of its greatest benefits is the fact that AM offers designers and manufacturers the ability to create complex parts in small batches without the need for costly and time consuming tooling or machining fixtures. So, why isn't everyone using additive manufacturing when it has such compelling advantages?

Today, there are two distinct users of AM: those who have adopted the technology and those who still need to understand if it might be a good fit for their business. Manufacturers and designers already making parts with AM, for example in the aerospace industry, seek answers to questions for every new design. Is it

*"Detailed manufacturability evaluation is essential to find optimum adequacies between AM materials and processes, in a bid to increase the productivity of AM processes - perhaps the most crucial aspect to see AM develop rapidly within the industrial landscape."*

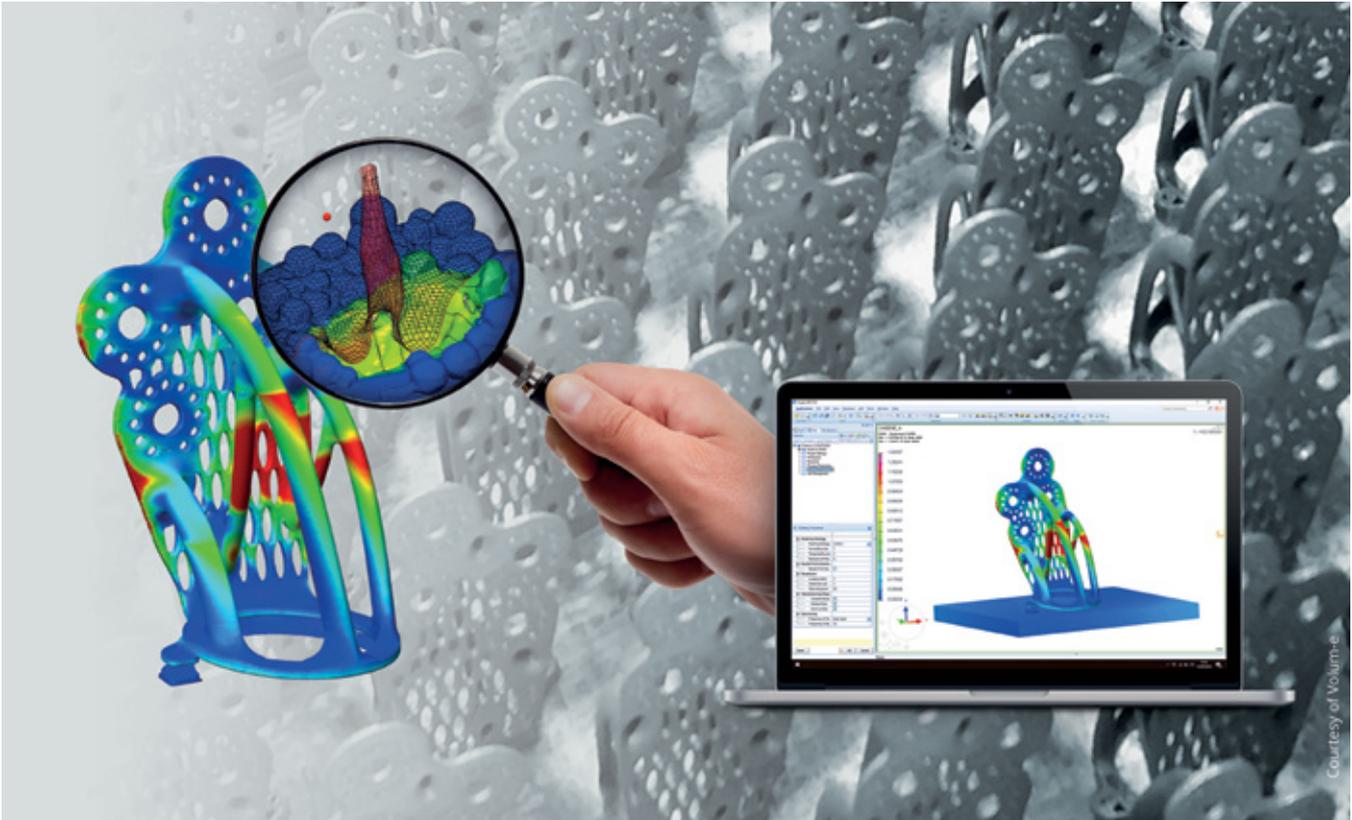
**Lionel Ridosz**  
Industrialization Development Manager  
Zodiac Aerospace

physically possible to make this part? Is there a better way to make this part? What would be the optimal manufacturable design using the full potential of AM freedom of geometry? This group of users wants to answer these questions without neglecting the need to deliver on time,

within the allotted budget, and, if needed, to provide guidance to the designer on the optimal geometry.

Newcomers to AM, on the other hand, have different questions. Is it a good move for my bottom line? How mature is the technology? When should I stop investing in traditional processes, such as machining, and start investing in AM?

Adopting Additive Manufacturing potentially puts industrial manufacturers ahead of competition and entering the game with ESI's Additive Manufacturing solution can secure that advantage. By combining their in-house competencies with ESI's expertise in materials and process performance, such companies are able to identify the most adapted setups and designs. ESI's simple, yet effective, software solution delivers meaningful answers to complex questions such as



optimal process time and throughput, the material price, and paves the way to faster certification.

In summary, ESI Additive Manufacturing solution, which provides an end-to-end solution for both heat treatment and AM processes, helps:

- assess manufacturability, to achieve both optimal design and cost-effective processes;
- harmonize printing technology, material and process parameters to guarantee a reliable high quality of parts;
- eliminate guesswork by accurately exploring competing physical phenomena to eliminate small-scale defects, distortions, and residual stress early in the development cycle;
- predict material properties such as porosity and surface finish;
- reduce cost and time to certification by eliminating the need for physical trial and error; and

- advance capabilities in a cost-effective manner, mitigate risk, and accelerate the deployment of a disruptive technology

ESI Additive Manufacturing offers a unique solution to ensure continuous flow of information from concept through manufacturing to certification. ESI's Center of Excellence for Additive Manufacturing has been leveraging our company's existing expertise in multiphysics, material science, and integrated computational material engineering, to study the specific effects associated to Additive Manufacturing processes. ESI's research teams are involved in numerous projects, including DARPA Open Manufacturing, SOFIA and AMANDE. Collaborating closely with industrial leaders like Honeywell, the team has published numerous technical papers on the challenging topics of AM material quality, process certification and qualification for aeronautics industries.

ESI is constantly improving the AM solution and related services. The latest

*"To achieve manufacturing excellence in Additive Manufacturing, engineers must first understand and control the complex relationship between part design, 3D printing processes, and material quality. This know-how is essential to engage in process qualification."*

**Dr. Jean Sreng**

Business Development Manager  
ESI Additive Manufacturing

release addresses distortion, residual stresses and recoater interaction assessments, and expertise on material quality analysis with local understanding of powder spreading and meltpool dynamics effects. Reasons for late adopters of AM are vanishing fast!



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