

**CHALLENGE:**

Qualify AM process simulation solutions and deploy it within Safran's operating units.

**SOLUTION:**

Simufact Additive is used in product design and production support as part of their feasibility studies.

**PRODUCTS USED:**

Simufact Additive

**CUSTOMER:**

Safran Tech is Safran's Research & Technology Center, a strategic tool for innovation



# Simufact Additive: Collaborative Simultaneous Engineering Tool for Additive Manufacturing

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## Introducing Additive Manufacturing

Additive manufacturing is a process that has been used for some years in Safran's production centers. Safran Additive Manufacturing - a technology platform attached to Safran Tech, Safran's dedicated research center - is aiming to support the widespread use of the additive manufacturing technology within the Group: first by recommending tools and standards while evaluating and validating the solutions through use cases, then by accompanying the companies of the Group in the deployment and use of these tools.

Additive manufacturing of metal components is becoming more and more widespread in all sectors of industry. A major advantage of this technology is the geometry design freedom that allows the creation of optimized shapes according to the targeted function. It now starts to be used for the serial production of high-tech parts, particularly in the aeronautics and space industry. Another key benefit of using 3D printing technologies is the ability to reduce the weight, cost and complexity of parts production without sacrificing the reliability and durability of materials.

## The additive manufacturing Challenge

Although some applications are already in production, many are still at the proof-of-concept stage. Thus, in order to expand the use of additive manufacturing and make

the most of this technology, it is essential to accelerate the capability to model additive manufacturing processes in detail - and more broadly, to improve the understanding of the technology by the relevant employees within our Group.

The Methods, Tools and Application team of Safran Additive Manufacturing is operating in this context. The objective of the team is to evaluate and qualify additive manufacturing process simulation solutions, and then facilitate their deployment within the various Safran's operating units.

## Simulation of the additive manufacturing process

One of the manufacturing processes in which Safran Additive Manufacturing is more specifically interested in, is the Laser Beam Melting (LBM) process. The simulation of this process aims at identifying issues associated with part distortion during the manufacturing process, as well as the potential risks of failure of the part and its supporting structure. Safran called on MSC Software, which offers a solution that uniquely covers the entire manufacturing process, from the initial melting step of the part to the completion of a final HIP treatment (Hot Isostatic Pressing), including all post-processing operations such as a stress-relaxation heat treatment, baseplate cutting and supports removal. This solution is Simufact Additive.

Safran Additive Manufacturing uses the software iteratively as part of our feasibility studies for the following two applications:

- For production support: to virtually develop and validate the process, in order to reduce physical iterations on the machine;
- Further upstream, in the product design phase: to check the manufacturability of parts and to take into account the specific constraints linked to the process during the product design phase.

Simufact Additive allows for the identification of potential issues due to deformation of parts during the manufacturing phase and post-treatment operations, risk of collision with the recoater, as well as the possible risks of failure of the part itself or the supporting structure attached to the part.

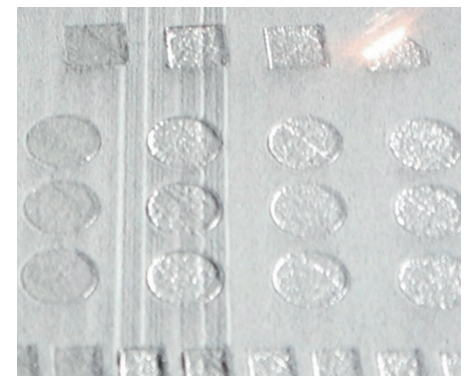


Figure 1 : Example of the effect of a 3D printer scraper / workpiece collision on the powder bed

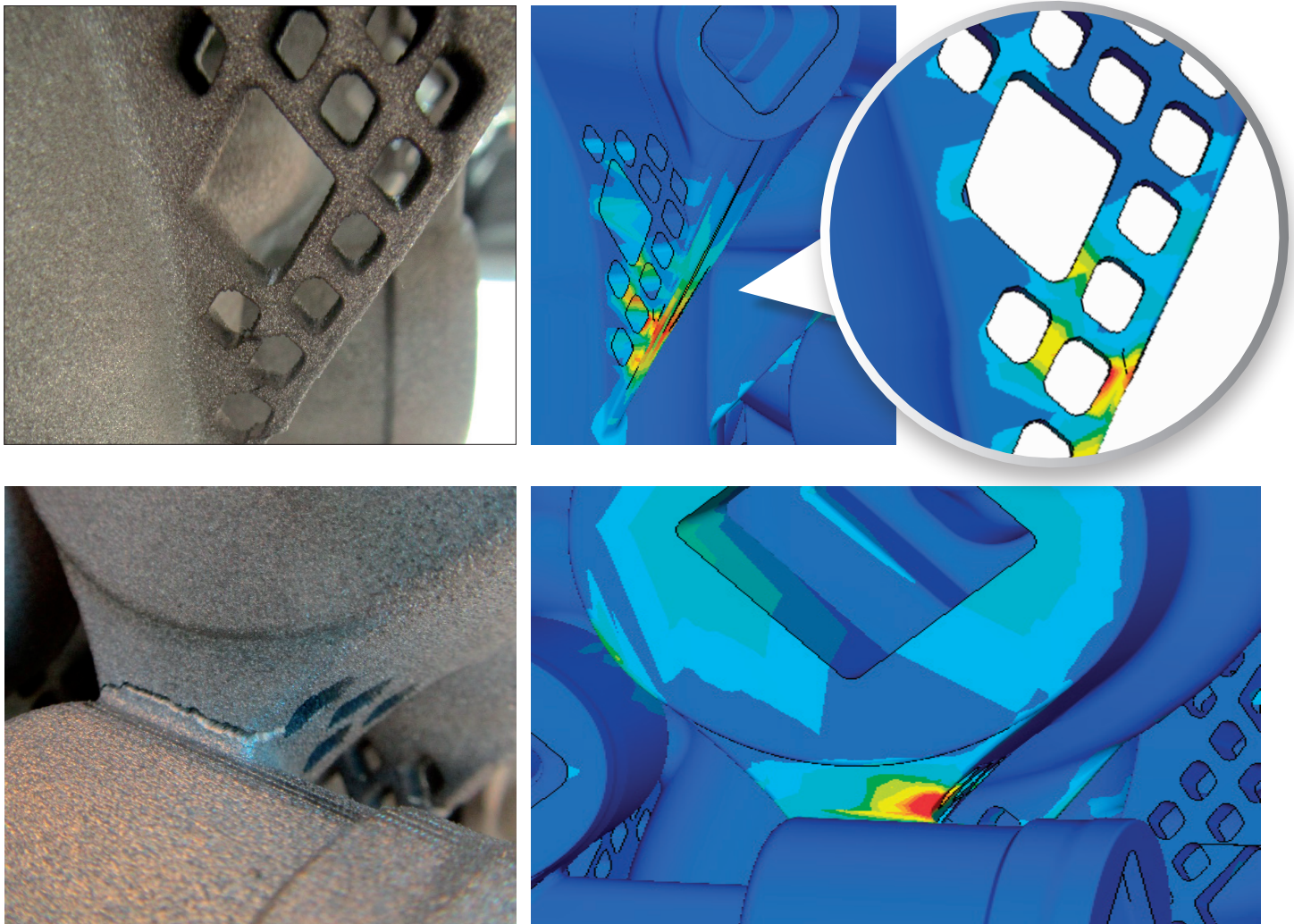


Figure 2: Example of macro-cracks on LBM parts that appeared during the manufacturing process due to part distortion and Simufact Additive stress predictions of the parts (Red is high, blue is low)

Figures 1 and 2 illustrate two types of failures that can happen in additive manufacturing: 3d printer scraper / workpiece collision in the power bed during the manufacturing process, and large scale crack formation during the 3d printing process due to inherent stresses in the part during the manufacturing process.

### The benefits of Simufact Additive to Safran

The use of Simufact Additive has enabled us to save considerable time in production preparation thanks to the predictive nature of the software, which limits development by manufacturing iterations by using virtual development upstream, but also during the part design phase, by enabling us to anticipate the effects and limitations of the process at the product design level.

One of the added values of the Simufact Additive solution is that it allows us to bring together two activities: engineering and production. On the one hand, people from engineering who design parts with a strong focus on part performance in service, and, on the other hand, the methods office who master the industrial processes and its associated constraints. Simufact Additive is a solution well adapted to simultaneous engineering that facilitates dialogue between the different business activities involved in the same project. In addition, the software is easy to use, with an intuitive, business-oriented interface that allows for quick and easy appropriation/ownership.

### Conclusions

Safran Additive Manufacturing has taken full advantage of the added value of the Simufact

Additive solution in order to secure the integration of the additive manufacturing processes into its “product-process” development processes, both upstream during product design and downstream for the production launch.

Safran Additive Manufacturing is now focusing on extending the use of the Simufact Additive solution to different types of parts and different grades of material, in order to improve the design process for additive manufacturing as a whole. MSC Software supports Safran Additive Manufacturing and the Group in achieving this objective through this solution that integrates into the global additive manufacturing value chain, ensuring a quality and open digital continuity.