

Simufact Additive

Process simulation for metal additive manufacturing



At a glance

Simufact Additive is a simulation solution for metal-based additive manufacturing (AM) processes which focuses on laser powder bed fusion (L-PBF) and metal binder jetting (MBJ) processes.

It can predict and compensate for distortion, compute residual stress and temperature distribution throughout the printing, heat treatment, cutting, hot isostatic pressing (HIP) as well as machining processes virtually before the part is physically manufactured by the 3D metal printer.

Ultimately, Simufact Additive allows the user to overcome the AM obstacles and to print AM parts first time right.



Increase profitability

Save material, time and money by replacing expensive and time-consuming physical try-outs with virtual tests



Fast

Fast solve times without need for large workstation and automated multi-run including scripting.



Design and optimise

Optimise the build-up orientation and compensate distortion automatically to print the part as-designed.



Easy to use

No expert knowledge required through a user-friendly, intuitive software design.



Holistic

Complete AM process simulation: support generation, build, unclamping, heat treatment, cutting, support removal, HIP

Simufact Additive: Your AM simulation companion

Challenges in additive manufacturing

- High costs and material consumption due to too many physical trials to find the optimal AM process settings.
- Lack of knowledge about the feasibility of the AM process at an early design stage, leading to high costs in production due to manual rework of the AM parts at a later stage.
- Lower margins due to inaccurate cost calculation, non-optimised component alignment and non-optimal nesting.
- Failure to meet customer requirements for quality and performance of AM parts.
- Simulation software requires high FEA expert knowledge.

Our solution to overcome your challenges

Metal Powder Bed Fusion simulation

Simufact Additive focuses on Laser Powder Bed Fusion processes including Selective Laser Melting (SLM), Direct Metal Laser Sintering (DMLS) and LaserCUSING®. Direct Energy Deposition (DED) processes are currently covered by Simufact Welding.

Using the pure mechanical approach, you can get meaningful simulation results already within a few minutes correctly predicting the tendency of stresses and distortions. Using the thermomechanical approach, you get the temperature field, history and higher accuracy mechanical results.

PBF Process and Defect Analysis

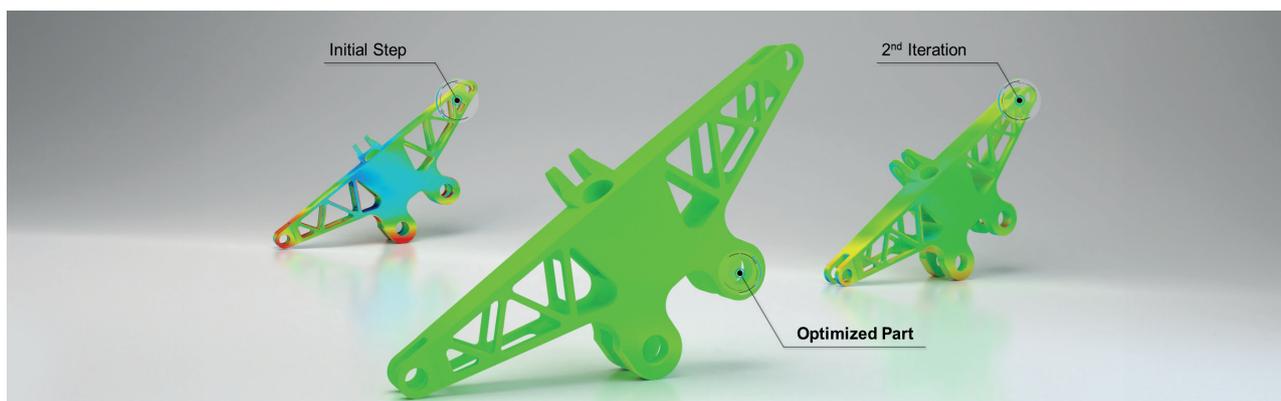
The new module “PBF Process and Defect Analysis” (PDA) revolutionizes metal AM simulation with a multi-scale approach. Swiftly predict defects and optimize local parameters while considering the entire build job and various physical effects combined. This hybrid analytical-numerical model-based module enables rapid thermal history and defect prediction at individual scan vector and powder layer levels within shortest time.

Metal Binder Jetting (sintering)

One of the key challenges for metal binder jetting manufacturers is to predict changes during the sintering process. As a result, many manufacturers are unable to realise the potential of metal binder jetting to reduce the time and cost of manufacturing and enable large volume additive manufacturing with metals.

Simufact Additive supports manufacturers to simulate the shrinkage considering amongst others the thermal strain, friction and the gravity during sintering. Compensating these changes, manufactures print 3D parts “first-time-right” and significantly reduce the high proportion of parts which have to be scrapped, re-processed and expensively re-designed.

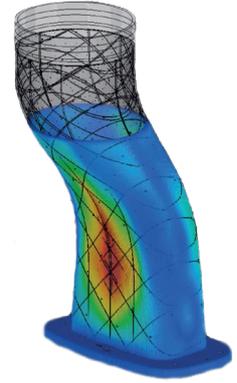
Using Simufact Additive they can also predict sintering-induced stress in advance and indicate where defects might occur. Manufacturers can use this information to manually adjust and reduce the need for multiple product iterations.



Contact us and be a part of our community:

| Visit hexagon.com/products/simufact-additive

5 easy steps: From importing your CAD files to simulation results



Simufact Additive stands out for its pragmatic design, rapid operation, and straightforward learning process. This lets you focus on your AM process, rather than diverting focus to master complex software.

Tailored as an engineering instrument for AM practitioners and manufacturers, Simufact Additive facilitates and eases your day-to-day tasks. With just a few intuitive interactions, you can initiate simulation and evaluation of your AM process:

01 Import and position your geometry or CAD file

The imported geometries can be moved and rotated easily and interactively in the software. All known standard formats and native CAD data are supported through special interfaces.

02 Import or generate support structures automatically

Support structures can be generated easily and automatically in the software. Simply select the type (including block, tree or line support) and its parameters (including tooth pattern, perforation and fragmentation) via easy-to-understand dialogues.

03 Define the AM manufacturing process stages

Your AM production process can be individually defined in our software. You decide whether you want to consider a cutting operation, support removal, HIP (Hot Isostatic Pressing) or heat treatment after 3D printing. The individual process stages can be defined via easy-to-understand dialogues.

04 Select your AM material and generate the Finite Element Mesh

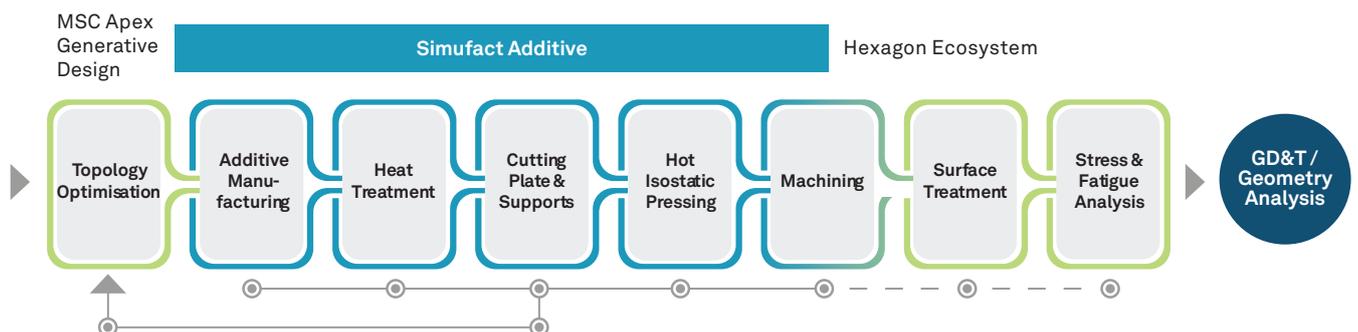
Select a pre-defined material from Simufact's material database or create your own. The Finite Element (FE) Mesh is mandatory to calculate the simulation model in every FEA tool. In general, creating the FE mesh requires a lot of time and expert knowledge. In Simufact products, the creation of the FE mesh is done automatically through just one click.

05 Start simulation and open your simulation results

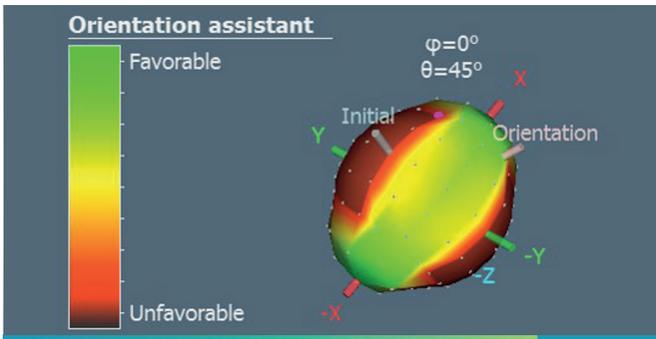
After an automatic model check has been carried out – to avoid unnecessary simulation abortion –, the model can be started by simply pressing the start button. The simulation results can be evaluated either after the calculation or even during the calculation. Pre-defined result variables for specific applications are displayed so that the user can make a quick statement about the results.



You can modify and refine your simulation models to examine or enhance your AM process. Simply recalculate with varying parameters, such as AM material and diverse build-up orientations. Following the simulation, outcomes from different models can be juxtaposed for comparative analysis. This perspective lets you virtually understand how specific factors of your AM parameters influence the behaviors of your AM part.

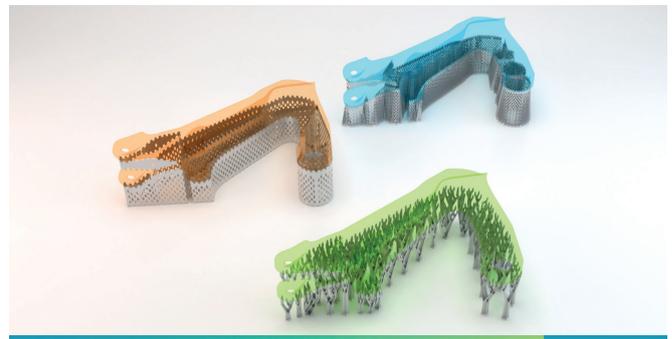


Simulation tool for additive manufacturing processes designed for productivity and simplicity



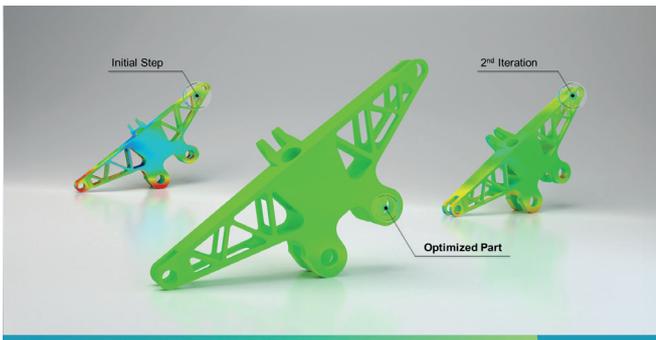
Orientation assistant

Our orientation assistant can determine the best orientation of your AM component to reduce support structures, production time and resulting costs.



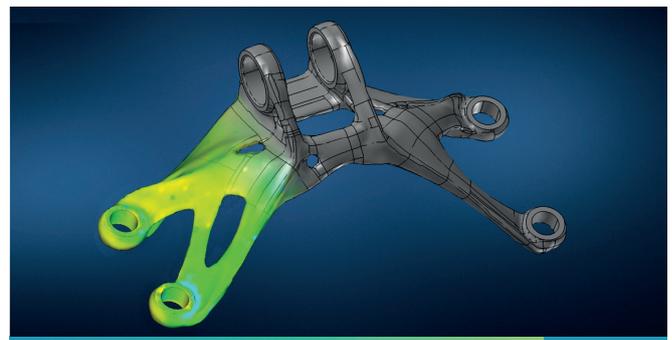
Automatic support generation

No additional software required to create block, tree or line structures, which can be generated automatically in our software with just one click.



Automatic distortion compensation

This feature allows the user to perform an automatic distortion compensation to obtain a pre-distorted geometry leading to the original shape after the actual 3D printing.



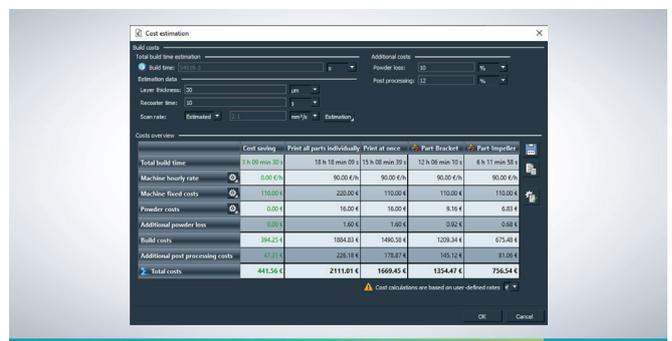
CAD export

CAD export morphs and exports the resulting mesh as a deformed CAD geometry and enables to compare it with the scanned geometry.



Machine export

Combine process simulation and job preparation all in one: Generate build files and export them directly to the machine of selected vendors.



Cost estimation

You want to do a quick cost calculation before sending an estimate for your customer? With our integrated cost estimation, you can calculate individual and total print costs.

PBF Process and Defect Analysis

A novel multi-scale process simulation approach for predicting location-specific defects within full-scale geometries

In additive manufacturing, uniform thermal conditions don't result from maintaining constant (unmoderated) build parameters. Identifying the "ideal" parameters poses difficulty, as evaluating the risk of defects involves trial and error. Qualifying and certifying new L-PBF build recipes and parts proves to be costly. Often, standard parameter sets pertaining to laser power and scanning velocity result in fusion-related defects, such as lack of fusion, keyhole formation, balling, or high surface roughness.

Introducing a Novel Approach to L-PBF Process Simulation

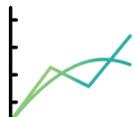
Simufact Additive's PBF Process and Defect Analysis (PDA) proposes a unique approach by carrying out a multi-scale L-PBF AM process simulation. It predicts defects at the meso scale and subsequently performs an analysis on the full (macro) part scale. The swift semi-analytical solution incorporates relevant physical effects of the melting process while delivering results on a full part scale within minutes.

Benefits



Speed

Quickly optimize projects with the rapid assessment of process parameter selection



Ideal parameters

Derive a parameter set truly adapted to the project to prevent costly defect



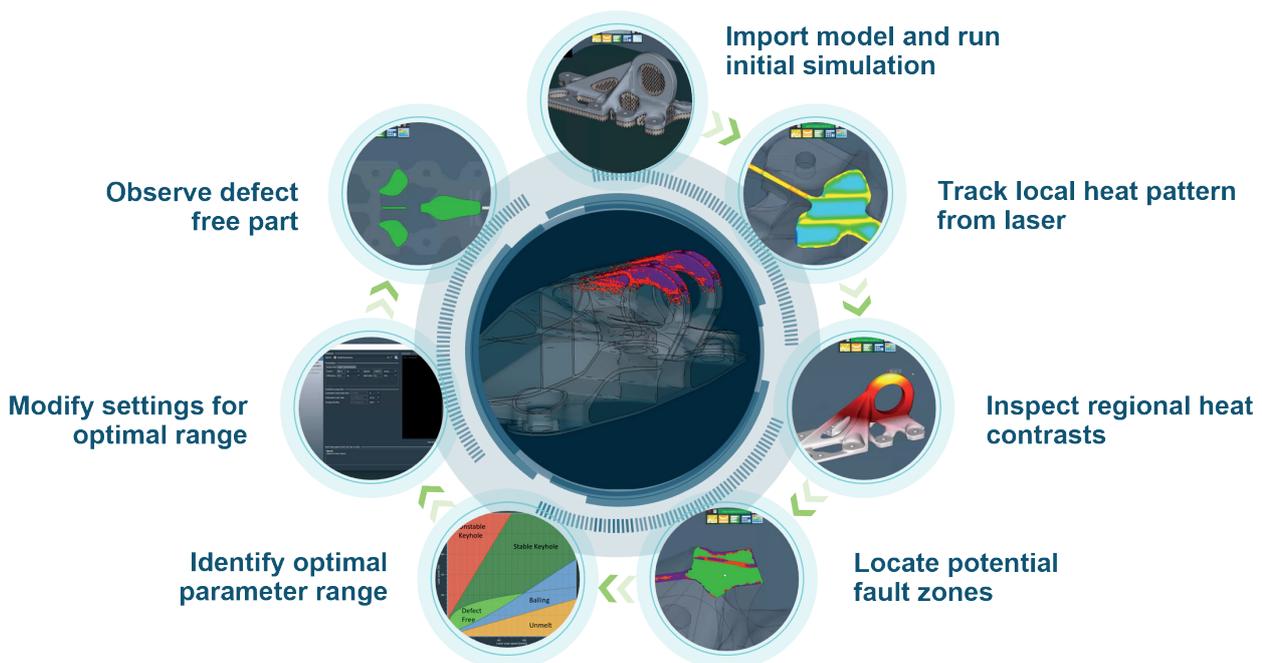
Full scale analysis

Local temperature profile and history within the build gives a holistic analysis



Quantify risk

Predict the risk of defects throughout the part without trial and error



Learn more at hexagon.com/products/simufact-additive/pbf-process-and-defect-analysis



Nexus Integration



Nexus is an open platform that enhances smart manufacturing collaboration by connecting people, technologies and data, accelerating innovation and time to market. The world of manufacturing is fluid and ever-changing. The way we work should be too. Amplify your productivity with new digital experiences to drive your digital transformation.



Nexus helps connect people with data from across the enterprise to make processes smarter. Our vision is to support the product lifecycle from ideation to maintenance, but today we are starting by leveraging the data sources we own including simulation, production, metrology and quality. In time, Nexus will enable seamless use of data from the other products involved in the product lifecycle.



The Additive Manufacturing Collection makes it a reality to get from the design to a manufacturing ready part in one connected workflow and with the option of multiple engineers working on the same project with the identical data – enabled by Nexus. Material data, build orientation and more are synced and directly updated between the software tools, ensuring everybody is working with the most recent data without taking care of the data transfer.



Leveraging the huge potential of additive manufacturing requires proper design and. Tweaking the design manually for additive manufacturing is time-consuming, error-prone and can cause costly defects.

The Additive Manufacturing Collection provides all tools required for stable AM design and manufacturing. Start with creating optimized, lightweight designs with generative design, validate design candidates and prepare and simulate the manufacturing process for optimal quality and hassle-free production. Deploy metrology tools to ensure the final parts exactly meet the desired high-quality standard – all connected, while integrating simulation into the design phase, ensuring high-quality results for a successful business outcome.





Hexagon is a global leader in digital reality solutions, combining sensor, software and autonomous technologies. We are putting data to work to boost efficiency, productivity, quality and safety across industrial, manufacturing, infrastructure, public sector, and mobility applications.

Our technologies are shaping production and people-related ecosystems to become increasingly connected and autonomous – ensuring a scalable, sustainable future.

Hexagon's Manufacturing Intelligence division provides solutions that use data from design and engineering, production and metrology to make manufacturing smarter. For more information, visit hexagon.com.

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