

MSC Apex Generative Design

Bridge the gap between design and manufacturing with Smart Generative Design



At a glance

MSC Apex Generative Design is the fully automated generative design solution built on the most intuitive CAE environment in the world, MSC Apex. It exploits all the easy-to-use and easy-to-learn features of MSC Apex while employing an innovative generative design engine in the background. Thus, it dramatically decreases the effort required in the design optimisation workflow.

Simplicity

No expert knowledge required for conducting optimisations through a high user-focused software design

Automated design

Almost automatically generate multiple smoothed design candidates that all satisfy the design criteria while minimising the weight.

Import and validation

Import existing geometries or mesh, find optimised design candidates, and perform design validation - all inside a single CAE environment.

Direct output

Export geometry that can be directly manufactured and used immediately without manual re-work.

One process

Import the resulting geometries in Simufact Additive or Digimat AM to achieve cost-efficient first-time-right result for every part

MSC Apex Generative Design

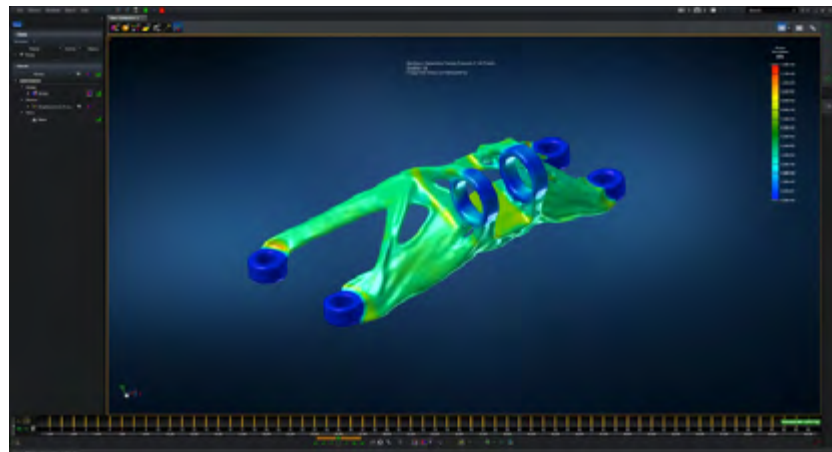
Design for Additive Manufacturing (DfAM) without expert knowledge

MSC Apex Generative Design is designed specifically to generate the detailed and highly complex structures that only additive processes can manufacture. The optimised designs exhibit perfect transitions between structure elements such as struts and shells as well as they contain usually self-supporting structures that ensure the results can be sent straight to print.

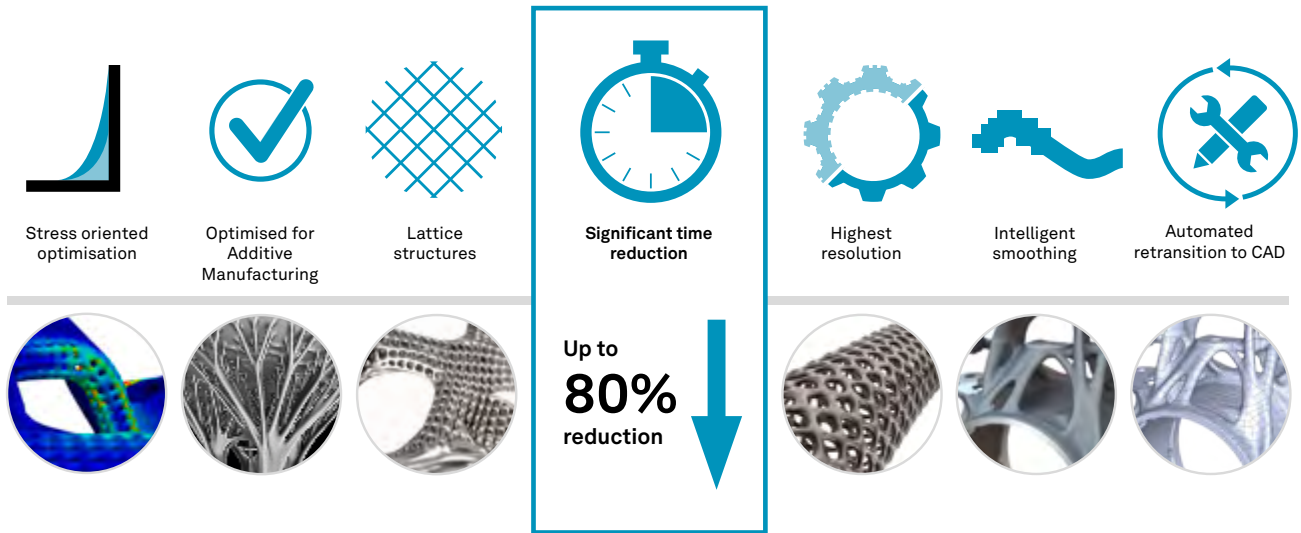
However, in cases where further manufacturing and design validation is necessary, MSC Apex Generative Design is interoperable with Simufact Additive, Digimat AM, and MSC Nastran. The advantages of this innovative software are compelling:

Advantages

- No expert knowledge required - optimisation is highly automated
- Multiple design candidates generated based on optimisation settings
- The results are always smooth and tailored for a direct Additive Manufacturing production
- Interoperability for validation of mechanical integrity and manufacturability
- Cost savings through a much more efficient and innovative process of product design

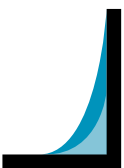


Benefits MSC Apex Generative Design



Significant time reduction

MSC Apex Generative Design makes design for manufacturing smarter because it combines speed with high levels of automation to significantly reduce the time required for optimisation. The result is a fast, cost-efficient and integrated process.



Stress constraint based optimisation

Stresses are usually the most important layout criterion for a part design. MSC Apex Generative Design technology makes it possible to optimise in a stress-oriented manner. This approach enables a true bionic-shaped design, with a very homogenous stress distribution to ensure high part reliability.



Optimisation for Additive Manufacturing

Every manufacturing technology requires an adapted design to avoid quality issues when manufacturing a part. This is especially important to get Additive Manufacturing first time right. Consequently, MSC Apex Generative Design creates geometries which are perfectly tailored for 3D printing.



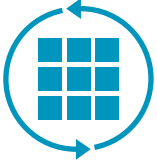
Automated retransition to CAD

Conventional optimisation software requires the use of additional retransition software to transition computer-generated structures to CAD, and the know-how and experience to use it. MSC Apex Generative Design incorporates this core functionality in a single environment and automatically transfers the design for optimal CAD/CAM linkage.



Intelligent smoothing

The efficient transition into fine and smooth surfaces is automatically conducted by an intelligent algorithm. A defect-free surface is inevitable, ensuring the high quality of every single part.



Automatic mesh generation

The mesh for the optimisation model is automatically generated and error-free compared to a manual, time-consuming process using conventional optimisation software.



Robust, automatic adjustment of resolution

MSC Apex Generative Design makes it possible to automatically adjust the resolution or geometry. Once a rough geometry has been generated, the software increasingly refines the resolution until a finer, more detailed structure is achieved.



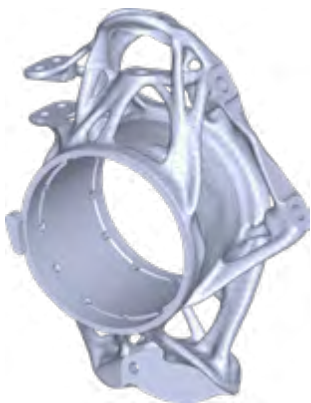
Highest resolution

MSC Apex Generative Design is designed specifically to generate the detailed and highly complex structures that only additive processes can manufacture. It is impossible to realise the necessary extent of calculation effort with conventional optimisation software.



Lattice structure optimisation

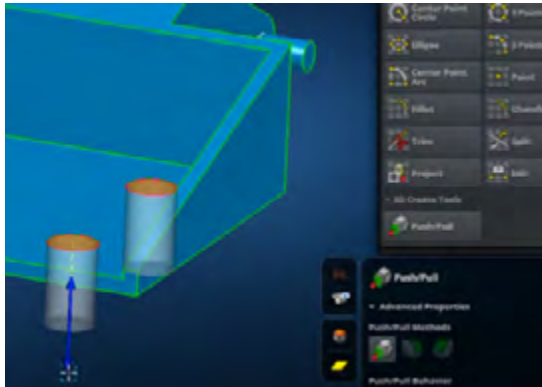
Lattice structures have a high potential for light weighting. Yet, the transition from solid material to lattice structures is usually critical and prone to a defect. With MSC Apex Generative Design, the complete structure can be automatically optimised to generate a smooth stress-optimised transition so that the structures optimally grow together.



The division of conception, construction and calculation is set free, it is all integrated in one solution - MSC Apex Generative Design!

MSC Apex Generative Design now leverages the practical Apex modeler functionalities. The CAE specific, direct modeling enables a very fast and user-friendly model set-up. The solution features sophisticated and interactive tools that are easy to use and easy to learn. With Apex Modeler, CAD data at any complexity can be used as input for preparing the optimisation or you can start right from scratch. CAD manipulation for defining design and non-design spaces is lean and smooth with the smart split tool, the data can easily be adapted to the requirements. Different variations can be tried out and compared in a single, integrated software.

One solution: modelling and optimisation



Easy design space generation with push & pull

Using the push & pull feature the user can easily edit the existing geometry to receive a perfect Design Space without any hassle



Offset for fast non-design definition

Defining non-design areas has never been easier before. Select or append a geometric form and add a defined offset to it.



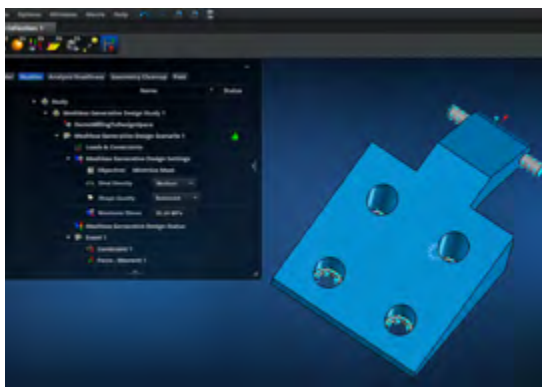
Click displacement constraints

Select the generated non-design offset and add displacement constraints and it's all set.



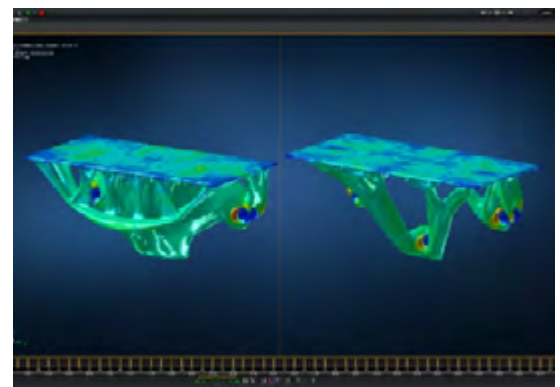
Simple force application

Choose one or more parts of the geometry and apply forces, moments or gravity to it to define the load cases for the part.



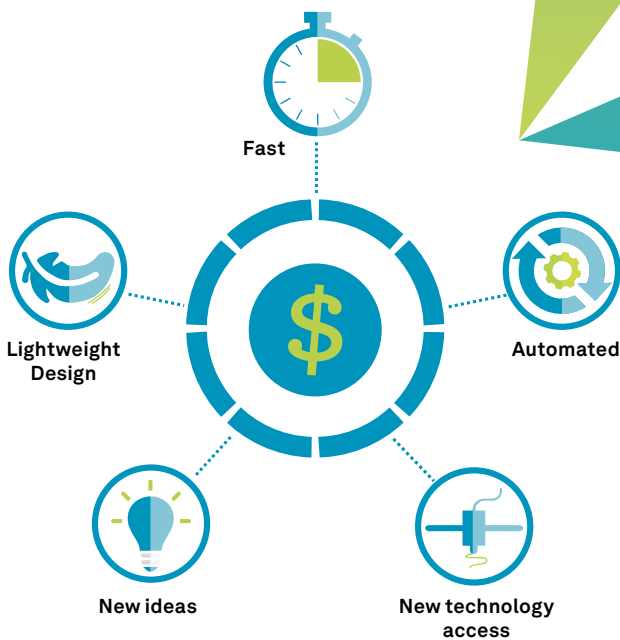
Quick optimisation set-up

All important Optimisation settings are directly at hand, select from the drop-down list the relevant items, apply a stress goal and the model is ready for optimisation.



Post-processing & comparison

View every iteration and compare the results of different designs in the post-processing editor to identify the most promising design for the optimisation challenge.



Design your costs

MSC Apex Generative Design makes it possible to design the costs of a part. Designs are no longer solely focused on the manufacturability but function-oriented and purpose driven. Through lightweight design material within production can be saved, reducing time and costs of the print. The lower weight can help save resources within operation.

The highly automated process with clever algorithms enables a very fast optimisation run. The easy and time-efficient model set-up in combination with a high-speed simulation makes it possible to generate several design concepts from which the most promising and cost-efficient one can be chosen given the further requirements such as material and processes etc. The low time effort reduces

overall costs in product design and shortens the time-to-market.

While offering a lot of potential through its freedom of design, faultless 3D printing is still very difficult to achieve when the design is not perfectly adapted to the technology's needs. Generating designs tailored for Additive Manufacturing, the access to this promising technology even without expert knowledge is enabled by MSC Apex Generative Design. The organic shaped designs created by the software, also lead to new ideas and new solutions, driving innovation for the company. Applying MSC Apex Generative Design saves costs at every stage of the product's lifecycle!

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

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

MSC Software, part of Hexagon's Manufacturing Intelligence division, is one of the ten original software companies and a global leader in helping product manufacturers to advance their engineering methods with simulation software and services. Learn more at [mscsoftware.com](https://www.mscsoftware.com). Hexagon's Manufacturing Intelligence division provides solutions that utilise data from design and engineering, production and metrology to make manufacturing smarter.

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