

Miba Sinter Austria GmbH creates optimized lightweight designs over lunchtime



By Dr. Gereon Deppe, Hexagon | MSC Software

Semi-automated part optimization with generative design

Now that Additive Manufacturing has reached mainstream and is either being talked about or implemented in manufacturing centers all around the world, new software solutions for design generation and optimization are needed to exploit the potential of this new manufacturing process. So far though, the process of manually adapting conventional designs has involved both a very high amount of work and a high amount of expertise. MSC Software makes this process easier now with MSC Apex Generative Design, and with its semi-autonomous workflow, creating new designs is now easier than ever.

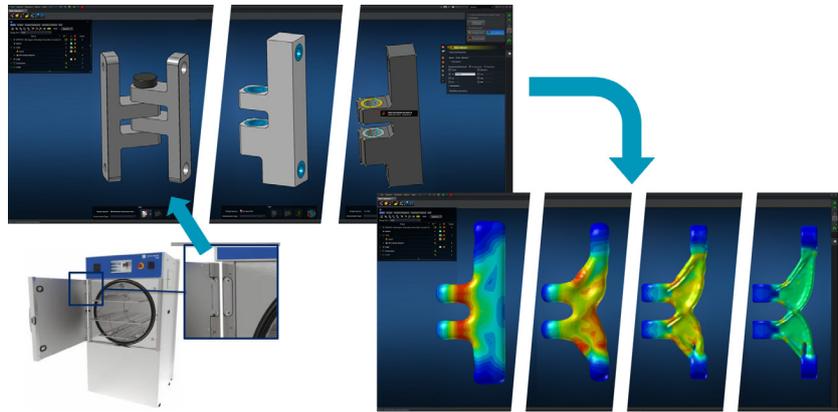
Fast optimization, even for simple parts

The significantly more efficient workflow of MSC Apex Generative Design 2020 realizes considerable time savings compared to existing optimization solutions and manual part design”, promises Dr. Thomas Reiher, Director Generative Design. He continued, “With a drastic reduction of the optimization and development time, it is now also profitable to optimize simple parts as well as complex optimization models.” The successful cooperation between MSC Software and MIBA Sinter Austria GmbH, a technology leader for powder metallurgical applications, shows that this can also be implemented cost-efficiently in practice.

To put this to the test, Miba Sinter Austria GmbH decided to optimize the hinge on a sintering furnace. Due to the lower number of pieces being manufactured, Miba decided it was a good candidate for additive production, and thus MSC Apex Generative Design could be used as well. A complex optimization for such a part does not usually appear to be economical, since the optimization process is so time-consuming – and manual construction with technology-specific experience would therefore be necessary. With MSC Apex Generative Design 2020, this assumption could be broken, since Miba was able to start and finish the complete optimization within an hour.

Model setup within minutes

The existing CAD data was first imported into MSC Apex Generative Design 2020. The design and non-design areas required for optimization were created directly within the software with just a few clicks of the mouse, due to the tool’s integrated modelling functions. Non-design-areas such as connection and force introduction points, remained unchanged. The engineers were then able to define the optimization parameters in a few different scenarios, so that a variety of optimized design candidates could be gathered. Once it was completed, the software had generated a variety of design candidates from which Miba Sinter Austria GmbH was able to select the most promising design candidate.



As the final step, the maximum stress was input, and the simulation was started.

Optimization almost in real-time

Once the process began, the software automatically created a mesh within seconds. Due to the automatic adjustment of the mesh resolution, the first optimization iterations were run through within seconds, and as the iterations increased in complexity, the mesh began to refine automatically, and thus began slowing down a bit (up to a few minutes for each iteration). Thankfully though, during the optimization process all intermediate steps were visualized and displayed in the user interface in real-time. If they didn’t like what they saw during each iteration of the optimization, Miba’s engineers had the ability to react immediately to possible errors in the model setup. Users were then able to gather information on displacement and mass, as it was displayed graphically during the optimization. Though Miba chose not to use this functionality, MSC Apex Generative Design optimizations could have alternatively been run on their graphics card (GPU), and remote solving on compute servers was also possible. These two additional options could have increased their simulation performance even further.

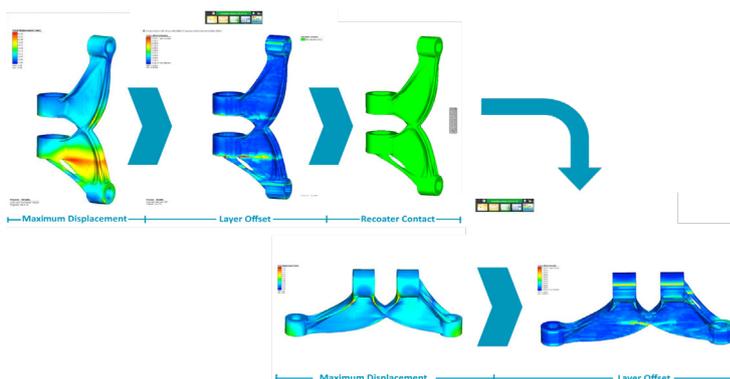
Exploring the design space with generative design

In the case of the above-mentioned hinge from MIBA Sinter Austria GmbH, the three design proposals (with different stress goals)

resulted in a mass reduction for each hinge from 76 g to 54 g (a 30% reduction). This reduction resulted in significantly lower raw material usage and production time, thus lowering production costs in the long term. Dr. Martin Laher, Director for Miba Sinter Austria GmbH, agreed: “To be more cost-effective, a redesign was absolutely necessary. With MSC Apex Generative Design 2020, we were able to show that printing time and costs could be significantly reduced, and we are now more competitive with additive manufacturing.” With a calculation time of just 40 minutes per design on a normal workstation, such applications in product development can be realized even over a 1-hour lunch break.

Integrated workflow for FEA validation and production

The Additive Design and Manufacturing workflow provided a 1-2-3 punch for Miba Sinter Austria GmbH. Due to the good data communication between Design, Simulation, and Manufacturing software within the MSC Software additive workflow, the design result could be transferred into the renowned FEM solver MSC Nastran for certified validation, which allowed an immediate re-analysis of the resulting design without much manual effort. Since MSC Apex Generative Design allowed a direct import into the manufacturing simulation of Simufact Additive, the generated lightweight design was then optimized to the precise requirements of the 3D print. The results showed that a shrink line would occur when it was manufactured upright, which allowed the Miba engineers to rethink their print process, and with Simufact Additive, a different print position could be found, which not only prevented the shrink line, but also reduced the height of the build job. At the end of the day, Miba Sinter Austria GmbH found that by using the appropriate digital tools, even the lunch break can become a highly productive and creative time.



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