



BETTER PRESS TOOLS WITH ADDITIVE MANUFACTURING

INNOVATIVE DESIGN, LESS MATERIAL AND GUARANTEED SUCCESSFUL MANUFACTURE

About the Customer

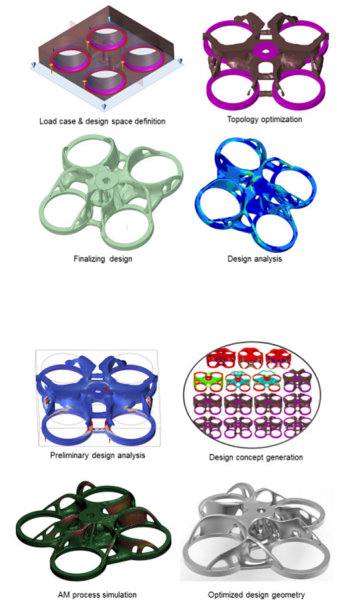
With engineering professionals based in offices from Scandinavia to China, Etteplan offers a range of innovative engineering solutions to the world's leading manufacturing companies for industrial equipment and plant engineering.

By combining additive manufacturing (AM) expertise with Etteplan's experience in engineering, simulation and mechanical design, their customers receive a comprehensive set of services related



Etteplan's AM press tool met Wärtsilä's objectives with its fast turn-round, cost and the fact it reduced material waste with its self-supporting design. Our team of talented experts, armed with Altair's integrated design and analysis tools, used topology optimization and Amphyon's print process simulation to come up with a print-ready design in 1 week.

Erin Komi, AM Specialist,
Etteplan



to the creation of additive manufactured goods. By carefully selecting the multi-disciplinary team, together using an integrated simulation-driven design approach, the most challenging engineering or manufacturing problems can be resolved to deliver efficient workflows and guarantee fast results.

Their Challenge

Etteplan's client Wärtsilä were looking to redesign their valve spring press tools used for mounting cylinder head valves. A lighter structure made by additive manufacturing was considered to replace the machined and welded fabrication if it could withstand the spring forces of over 30 kN generated during use. With restrictions imposed on manufacturing cost and material usage, Wärtsilä also wanted to understand how quickly this type of engineering and design task could be completed.

Our Solution

Etteplan's project team comprised experts in AM production, AM design, topology optimization and print process simulation. The design workflow started with definition of available design space, boundary conditions and maximum potential loads that the tool would be exposed to during operation. Altair OptiStruct™ and Altair Inspire™ simulations solutions were used to run topology optimization and finite element (FE) analyses to create design concepts. Using NURBS surfaces, which offer the ease of polygonal modeling, Inspire generated smooth CAD surfaces over the topology optimized results while retaining the organic features of the design. OptiStruct was then used for performance evaluation of the final component design, and Additive Works Amphyon software, part of the Altair Partner Alliance (APA), simulated the print process to ensure that the component was printable and that maximum distortion levels were within reason. Four potential metals were explored for the final additive manufactured component.

Results

Etteplan's AM press tool design was ready to be printed within one week from when the project starting data was frozen. The topology optimized design met both the cost and material usage targets. The innovative design was self-supporting to further reduce manufacturing costs by eliminating material waste and minimizing post-processing efforts. Etteplan's final design of the press tool met Wärtsilä's initial AM design objectives.

The fast turnaround in this successful project relied on deploying a team of experts who used an integrated design approach combining Altair's topology optimization and Amphyon's print process simulation to guarantee that the part could be successfully manufactured.

To learn more, please visit altair.com/additive-manufacturing

LEFT: Designed by Etteplan, Wärtsilä AM press tool for mounting cylinder head valves.
TOP: Etteplan's simulation driven AM design workflow for the Wärtsilä press tool.