



PRESSING FOR CHANGE AT ATNA

SIMULATION FOR INNOVATIVE DESIGN: A NEW APPROACH TO HOLISTIC DESIGN DECISIONS

About the Customer

ATNA Industrial Solutions GmbH started as a spin-off of the German Technical University Bergakademie Freiberg (TU Freiberg) following a research project funded by the German program EXIST for business startups. As part of this two-year project, four engineers developed a new hydraulic press machine for briquetting – a technology compressing material into solid shapes/ briquettes – and built their first prototype. The success of this prototype, which delivered high quality at a high throughput, inspired the team to start ATNA – a startup with the vision to revolutionize briquetting by building better and more efficient briquetting presses. As the concept of briquetting has become popular for various raw materials (wood, straw, coal) and waste materials (sludge, PU foam, plastic shreds) – the demand for flexible and efficient pressing machines is high. ATNA develops and manufactures customized hydraulic presses of all sizes for the European and worldwide market.

Their Challenge

The demand for biomass briquetting is steadily increasing since the use of brown coal fuel will be dramatically reduced to meet CO₂ emission targets in the near future. Many big plants across Europe will stop producing brown coal briquettes by the end of 2022. To address this trend and growing demand for alternative fuel options, ATNA set out to develop a new generation of briquetting presses. While conventional briquetting presses such as the roller press achieve high throughputs, they have limitations in producing high-quality briquettes of difficult raw material. On the other hand, conventional hydraulic presses can achieve a high quality, but deliver only a low throughput.

60% ▼

LESS TIME TO CUSTOMIZE

80% ▲

MORE SIMULATED SUBASSEMBLIES

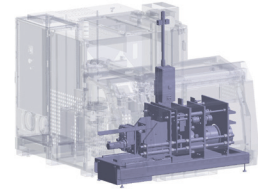
15% ▼

LESS MATERIAL USED



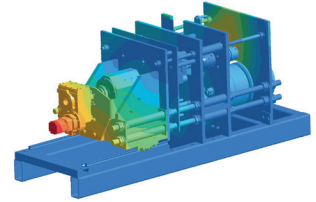
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ATNA's goal was to design an improved hydraulic press which can achieve the high throughput of a roller press while delivering a high briquette quality. At first, the team used a CAD embedded FEA system available to them, to study subassemblies, but this was a cumbersome and time-consuming task, in addition ATNA was not able to analyze the entire system. As a result, simulation was strictly limited to absolutely necessary calculations of forces and resulting stresses on the parts. To accomplish their design targets, however, the startup needed simulation tools that help them to get the bigger picture and would deliver an overall assessment of their new designs to speed up their development process.



Our Solution

ATNA was offered to implement Altair SimSolid® under the global Altair Startup program which is tailored to the needs of high-tech startups offering access to all types of simulation, high-performance computing, and artificial intelligence solutions at an affordable price. When the ATNA founders tested SimSolid, they were genuinely impressed. The structural simulation tool allowed them to virtually simulate entire machines quickly and efficiently with a high degree of accuracy.



The developers applied SimSolid to structurally design their innovative briquetting press that can produce briquettes in a multistage pressing process (pre-compacting, pre-pressing, main pressing, and extraction) and realized high throughputs with low energy consumption. SimSolid enabled the ATNA team to study complete complex assemblies, including more than 2800 parts, accurate forces and resulting stresses of the entire system, and provided an overall structural insight on the machine's behavior faster than ever. It allowed the engineers to make assessments during design revisions by running simulations on the fly to detect disadvantageous operational conditions and design faults. While it took the ATNA engineers several days to calculate even small model changes, with the traditional finite element method (FEM) tool, SimSolid provided them with initial results within 30 seconds.

TOP: Altair SimSolid enabled the overall evaluation of the ATNA GreenLine S50 briquette press.
BOTTOM: Simulation of all force-transmitting elements with Altair SimSolid.

ATNA also applies SimSolid to customize presses tailored to customer requirements, such as special operating conditions including high pressures up to 5600 kilonewtons. With SimSolid, ATNA can now study how the design affects the deflection of these pressures and thus the entire structure.

Results

Powered by the Altair Startup program, ATNA was efficiently able to study many variants thanks to the reduced modeling time and incredible computational speed of Altair SimSolid's meshless simulation. Whereas previously the construction had to be halted for several days to change a minor design detail, the team can now detect faults and calculate changes within minutes or even seconds. This also translated into safety benefits. SimSolid's fast calculation times enable the team to model large and complex machine structures and subassemblies within minutes, providing them with the ability to fully assess many variants to find the best design.

"Thanks to Altair SimSolid we can now simulate an entire complex machine in a fraction of the time, which we couldn't do before with any other simulation tool," said Hagen Möller, design engineer at ATNA. "The speed of SimSolid helps us gain insights into the behavior of complex structures under load very quickly and early in the design process. And unlike conventional FEM tools, it can be used during the daily design process, which is relevant to us as a young company with limited engineering capacity."

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