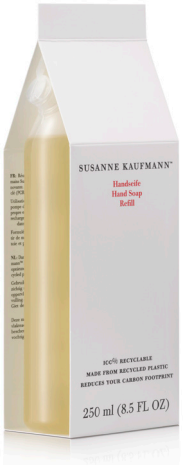
DESIGNER AND SIMULATION: A PERFECT FIT FOR SUSTAINABLE PRODUCTS

When it comes to plastics, the topic of sustainability is increasingly coming into focus in the industry. The packaging solutions and recycling specialist ALPLA Group, an Austrian company operating internationally, has set itself high standards in this regard. To achieve its goals, the company relies on virtual product design to drive its development, with Altair's adaptive simulation solutions playing a vital role. This article features an actual customer solution to demonstrate the value of simulation and provides an outlook on ALPLA's future virtual product development strategy,

Operating on an international level, ALPLA Group develops and produces plastic packaging for the market segments beverages, food, milk and dairy products, cosmetics, household care, motor oil and lubricants, pharmaceuticals, and crop protection. ALPLA is headquartered in Austria and employs over 22,000 people in more than 45 countries, who implement customer requirements while achieving innovative and sustainable solutions. Since 2011, the company has been using simulation solutions from Altair in their development of plastic bottles and the necessary mold constructions.

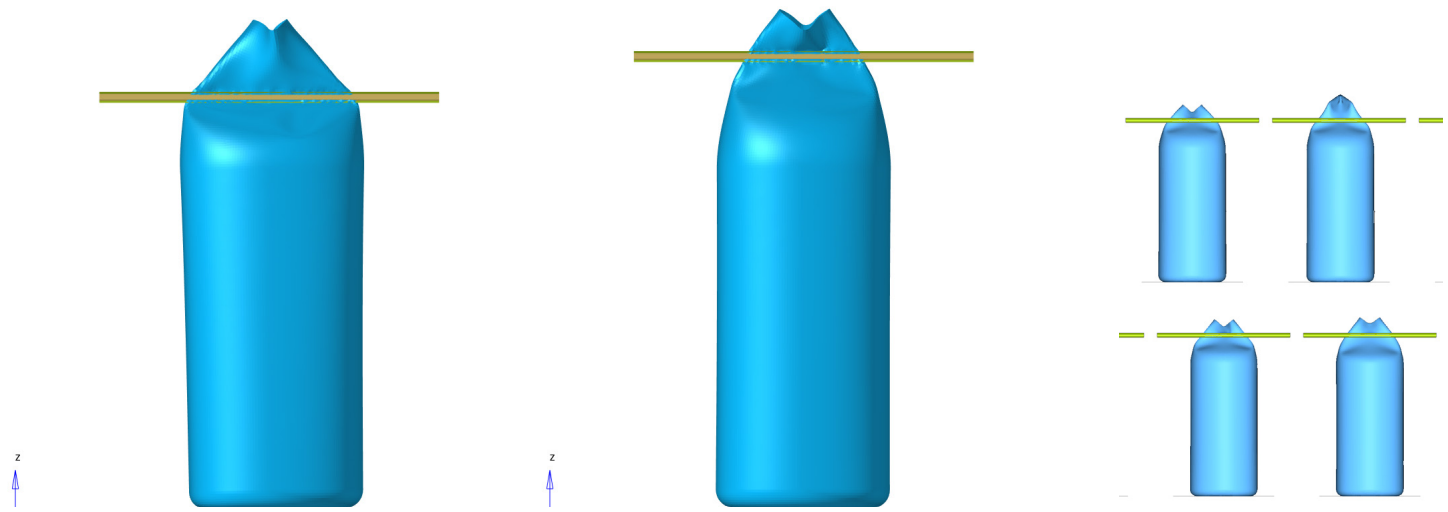


Sequential simulations: Blow molding simulation to determine the thickness distribution for accurate prediction of final product properties in use or misuse.

Sustainability at ALPLA: A Systematic and Consistent Approach

As a recycling specialist and supporter of the "Global Commitment" of the New Plastics Economy (Ellen MacArthur Foundation), ALPLA has been consistently pursuing ambitious sustainability goals for more than 25 years, with the company reporting on the implementation of these goals in an annual sustainability report released at the end of each respective target period. In this report, ALPLA communicates its environmental data, reports on compliance with environmental laws and regulations, and makes transparent which goals were achieved in which time period. In addition to climate neutrality in Austria, increasing energy efficiency, the share of renewable energies in its own plants, and reducing absolute CO2 emissions, the sustainability targets also include the recyclability of products and the development of an ever-increasing number of sustainable innovations. In addition, ALPLA provides financial support to initiatives for the removal of plastics from the environment. For the upcoming period until 2025, ALPLA has set itself new, individual goals, including three very important priorities:

- By 2025, all packaging solutions must be 100% recyclable
- The share of post-consumer recycled materials in total material use is to increase to 25% by 2025
- ALPLA plans to introduce at least three innovative packaging solutions per year that are particularly lightweight and thus reduce material consumption



Simulation to compare the shoulder geometries of the first generation of "The Simple One" – to ensure robust manufacturability.

In order to achieve the sustainability goals mentioned above, ALPLA has already been using virtual product development solutions for more than 10 years, which are now established innovation enablers in ALPLA's product development. In addition to virtual product development tools such as virtual and augmented reality, render engines or rapid prototyping, a very central component is simulation, the use of which helps ALPLA to implement existing and new sustainability goals faster, more successfully, and more efficiently.

Innovation Through Simulation at ALPLA

To develop new products or improve existing products in terms of sustainability in development, manufacturing, transportation and application, ALPLA uses simulation solutions from the Altair® HyperWorks® product development platform.

The Modeling & Simulation (M&S) department at ALPLA's headquarters develops the underlying methods for the virtual representation of the packaging manufacturing process. In this way, production process parameters and material distribution can be optimized. The properties of the packaging can then be predicted based on a process simulation. It is further possible to evaluate design changes for their manufacturability and their influence on properties such as filling, pressure resistance, and packaging safety. In order to evaluate the impact of a geometric design change, the process simulation and the simulation of the end product are conducted successively.

To increase efficiency in product development, existing simulation processes at ALPLA are increasingly automated by the M&S department. The starting point is the question of what the principal steps are, in setting up a simulation. To answer this, problems that were frequently solved by simulation engineers were identified as standard problems. Within these problems, repeating tasks were identified and automated. Combining these automated tasks still required manual inputs at certain stages, but this already laid the foundation for automating an entire solution. The next step was to automate the chain of individual tasks in a simulation so that the entire solution process could be completed with minimal to no manual intervention. These developments enabled solutions to standard problems to be obtained much more quickly.

The easier simulation can be applied, the more extensively it is used and the greater its overall benefit in product development. The value that simulation already has at ALPLA today is shown by the example of the award-winning packaging solution: "The Simple One".

The Simple One: A Simulation-Driven ALPLA Innovation

It is not only in the cosmetics industry that high-quality, classy-looking packaging plays a major role in appealing to customers. To extend the product life cycle of this high-quality primary packaging in terms of sustainability, refill solutions are often the means of choice today. However, these refill systems must also be developed to be as sustainable as possible.

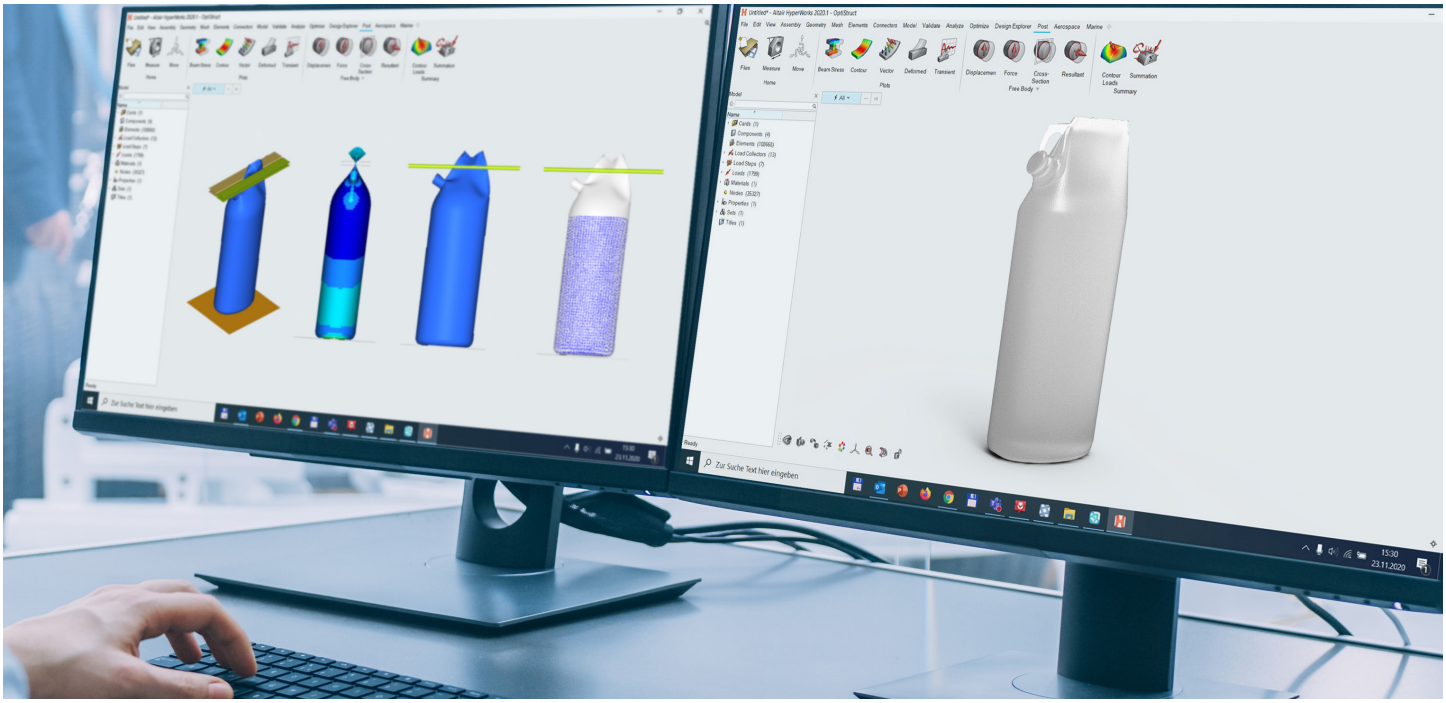
100%

RECYCLED MATERIALS POSSIBLE

100%

RECYCLABLE

CONSISTENT REDUCTION OF MATERIAL AND PRODUCT COMPLEXITY

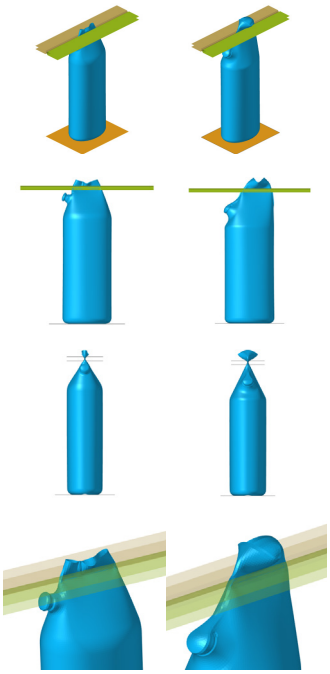


With the product “The Simple One,” ALPLA has set itself the goal of developing a resource-efficient refillable packaging that is extremely lightweight, requires a low material input, has a high recycled content, and should clearly stand out visually from the usual refill bags, thanks to a new design.

Determining the shape of the new bottle was a particular challenge for ALPLA. They had to find an initial shape that would work flawlessly after the process, i.e. take on a defined shape after filling or sealing, while remaining highly stable and not be prone to wrinkling. ALPLA would probably not have been able to solve this task with traditional trials, as the creation of ever-new, modified physical prototypes would have been too costly and would in all likelihood not have accomplished the goal in the given timeframe. To harmonize the design and manufacturing processes with the product functionality, ALPLA relied on a simulation-driven development process.

Thanks to simulation, ALPLA was able to quickly and efficiently arrive at an optimum solution considering design and manufacturing requirements. The result is an ultra-light bottle that can be made from 100% recycled plastic (rHDPE) and is 100% recyclable. The innovative refill system made of sturdy plastic provides an alternative to the soft and often unwieldy refill pouches and also has an appealing appearance. The particularly sustainable packaging solution was brought to market in cooperation with the cosmetics brand Susanne Kaufmann as the first product of its kind and was successfully launched as refill packaging for the brand’s glass bottles.

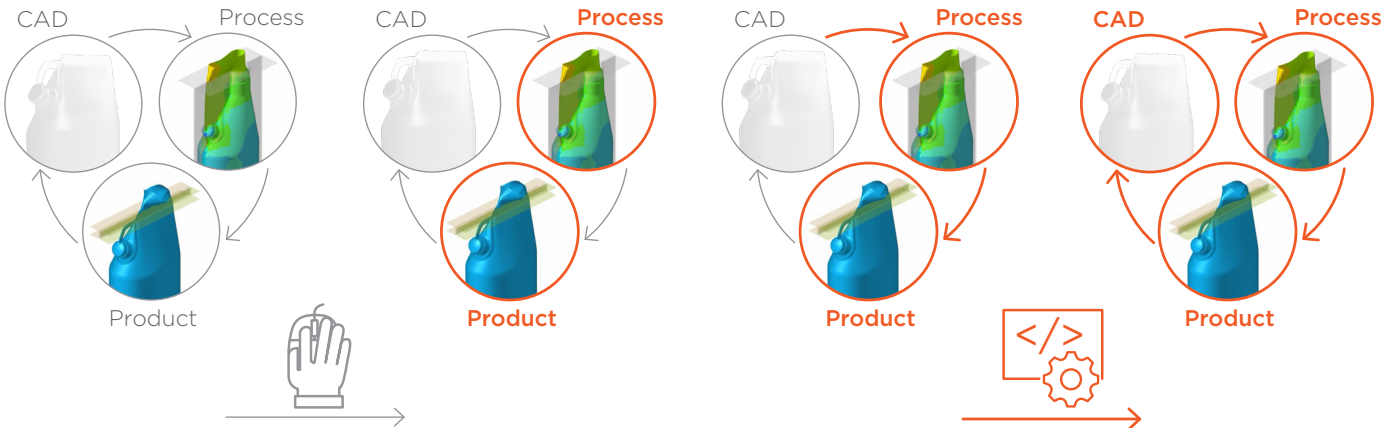
With the help of simulation, ALPLA has succeeded in developing an innovation that goes far beyond the fulfillment of sustainability goals and customer requests: In the meantime, “The Simple One,” in whose form simulation played a major role, has won several design awards.



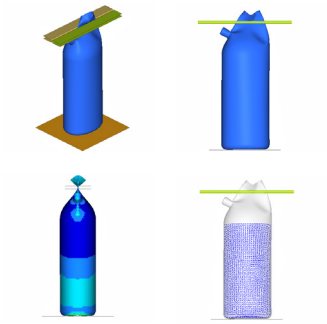
Studies on spout position: center (left) vs. off-center (right).

Avoiding the Bottleneck: Democratizing Simulation

Through the successful use of simulation in the development of “The Simple One,” ALPLA has shown the value of simulation in product development and the potential that is offered here if simulation can be used on a large scale beyond the specialized departments. In order to fully exploit this potential, the next step should be to make simulation accessible to a broader user group within the company. This can be achieved by means of a tailored offering from the simulation development team at ALPLA M&S. The fact that Altair’s software solutions are highly adaptable and capable of automation is critical for ALPLA. The professional application of these capabilities by ALPLA’s simulation engineers enables the company to represent processes and bring together different expertise.



"HyperWorks allows us to bring in and implement our domain know-how. By being able to tailor it to our needs, we are able to be effective quickly. And do it exactly as needed for our specific domain," said Oswald Valtiner, Head of Modeling & Simulation, ALPLA.



Simulation of the filling and closing of the package.

Roadmap Simulation: From Method Development to Broad Application

Altair tools are already having an invaluable impact at ALPLA. The interactions in product development (design, dimensioning and manufacturing process) are very extensive and require significant know-how. Altair tools enable ALPLA engineers to map their processes and their individual domain know-how easily and precisely. The foundation of virtual product development at ALPLA is being laid in the M&S department. Currently, ALPLA is working on using more automation in the future to achieve a complete democratization of simulation.

> **"Simulation was the key enabler for this 100% circular packaging system, driving the exploration of new ideas and accelerating the entire development in a cost-effective manner."**
>
> Oliver Unterlechner, Ideation Manager, Corporate Development & Innovation, ALPLA

Outlook

The simulation applications for industrial designers are currently being tested at ALPLA headquarters. The knowledge and experience gained from these trials will be used to further develop automation and democratization in stages. The long-term goal is to make the use of simulation even more efficient for all development projects throughout the company and to make simulation technology available to a broader group of users. This will ensure that ALPLA will continue to develop innovations that both win awards and conserve resources in the future.

To learn more about driving sustainability processes through digitization, please contact us.