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QUALITY AND SUSTAINABILITY

How BERGI-PLAST uses state-of-the-art simulation and measurement technology to achieve its strategic goals

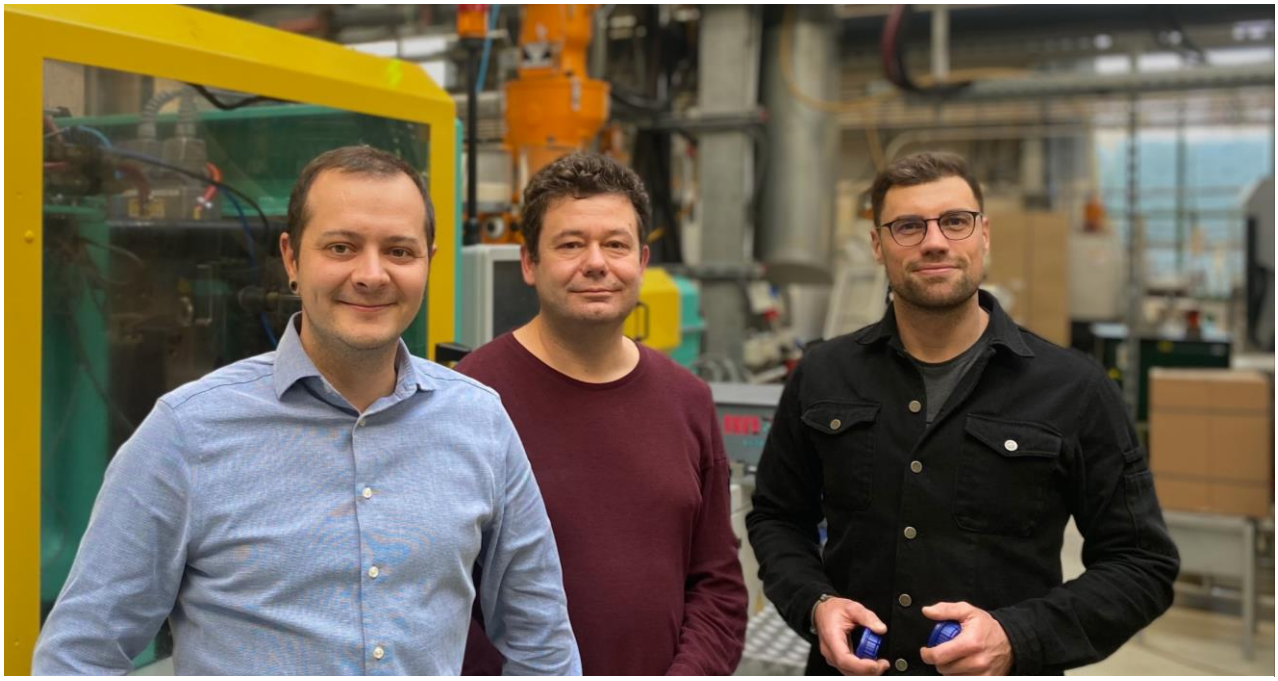

Figure 1: from left, Waldemar Bauch (Head of Production Closures), Heiko Klöber (Design / Operations Planner) and Ronald Dietz (Innovation Manager) from BERGI-PLAST

Quality and sustainability

For more than 100 years, BERGI-PLAST has embodied the deeply rooted values of the German engineering trade: quality, thoroughness and ambitious innovation. As a supplier to the packaging industry and many other branches of industry, BERGI-PLAST primarily manufactures plastic closures and technical parts.

A company can only stays in for this long if it recognizes change and adapts rapidly, continuously innovating to reinvent itself through changing times. And so BERGI-PLAST has identified two themes that it believes will decisively shape the future of the plastics business: Quality and sustainability.

Saving energy and materials

In order to pursue these two goals, BERGI-PLAST systematically invests in the training of its employees, and in the infrastructure they need to be successful.

"We have continuously invested into our injection molding machinery in recent years, replacing old hydraulic machines with new electric ones and also with modern, energy-efficient servo-hydraulic ones. This enables more energy-efficient and environmentally friendly production," explains Innovation Manager Ronald Dietz. *"To this end, we have also installed new measurement technology that should enable us in the future to measure the energy consumption of each individual machine in much greater detail than before."*

Using simulation to boost efficiency and quality

Aside from a faster time to market, improved first-time-right rates and boosted quality means less wasted material.

To systematically achieve such improvements, BERGI-PLAST has invested in SIMCON's CADMOULD simulation software. The simulation enables the optimization of the component, mold, the production process, and machine utilization. There is less

waste in sampling, fewer correction loops are necessary, and the tools and machines are used in a time-, energy- and material-efficient manner.

were filling issues. Either seams appeared at the edge of the part, or some of the cavities were not completely filled. Over a period of months, many different solutions

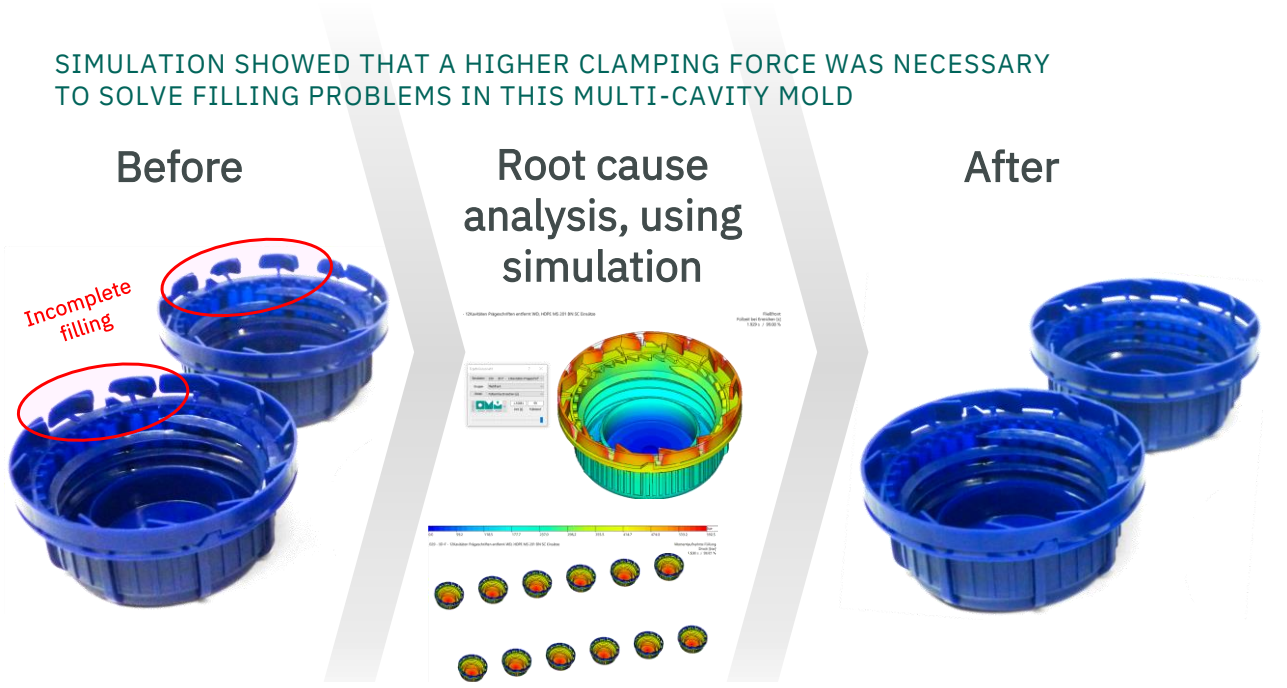

Figure 2: Originally, not all cavities were filled correctly in this multi-cavity mold. Several manual correction attempts could not completely solve the problem. With the help of CADMOULD, it was quickly proven that a higher clamping force was necessary. As a result, the challenges were solved and all cavities now fill completely. A significantly better yield is now achieved, every cycle.

Improvements are possible not just for new molds, but also for existing molds that are already being used in ongoing production, explains Heiko Klöber (responsible for design and operations planning at BERGI-PLAST):

"For example, we had a multi-cavity mold for a canister lid, where we faced a challenge. Absolute precision is essential for these lids. Only in this way can the target tear-off force of the sealing ring, which indicates the integrity of the lid, be precisely met. The forces must be exactly right. However, because the plastic needs to flow across very thin bridges, filling problems can occur. Since we produce this part in very large quantities, cycle time and efficiency are absolutely crucial."

The challenge: Whenever an attempt was made to use all cavities in the mold, there

were tested, process parameters were varied, and various improvements were made to the mold. In the end, the decision was made to accept that some cavities remained incompletely filled, as long as good results were achieved in the other cavities. This approach lasted for almost a year.

"But after we received the software in mid-2020, this was one of the first simulations we ran," explains Ronald Dietz. *"Simulating the mold enabled us to find out where the problem lay: the clamping force of the machine was simply too low by an order of magnitude. We had already suspected this as one of many possible causes, but the simulation enabled us to really prove it and eliminate all doubt. And lo and behold: after switching to a larger machine, all cavities are now filled without quality problems. We've achieved*

better quality, less waste, and higher efficiency in each production cycle."

The team assessed that if the newly acquired simulation had been used right from the start, numerous correction loops and physical tests could have been saved, and series production could have started weeks earlier. In fact, switching to the "bigger" machine at the beginning of series production would have allowed the company to produce about 700,000 more parts in the same amount of time, or to produce the same number of parts in about 11 full days less. The moral of the story: it pays to use simulation from the start.

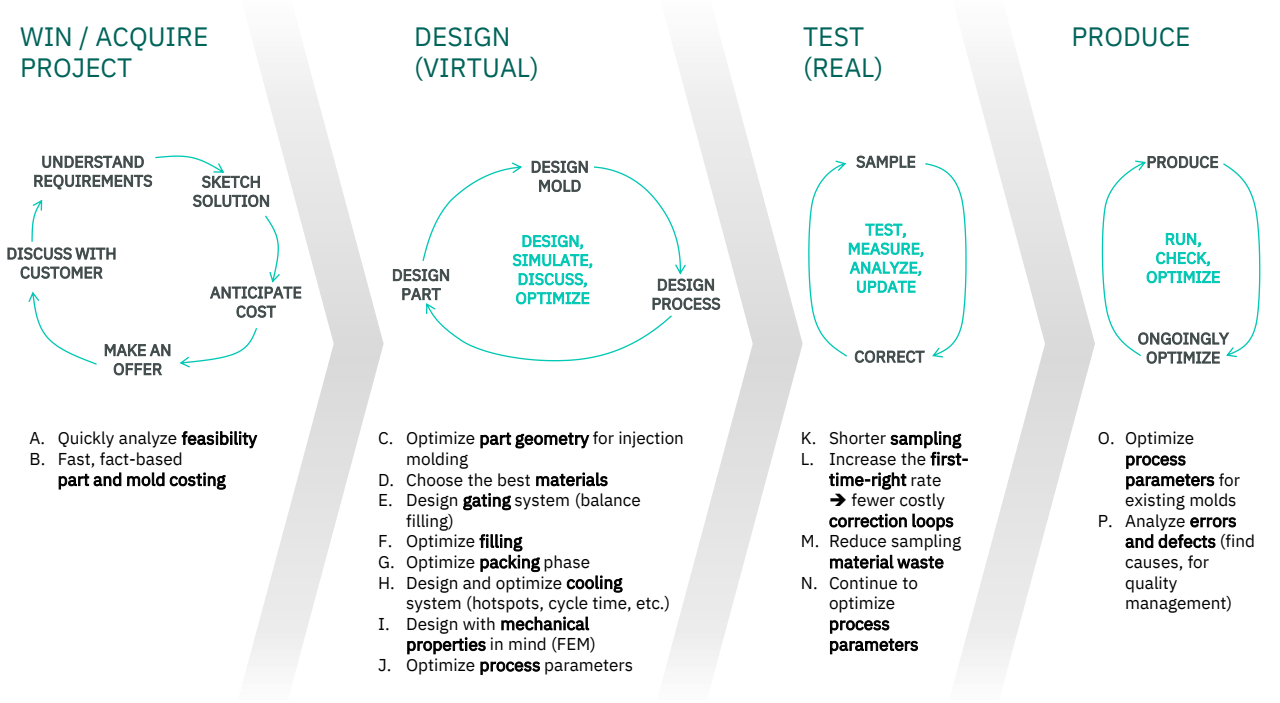

Figure 3: Applications of injection molding simulation software. There are use cases along the entire process chain, but the greatest effect is achieved when simulation results are already used in the design phase.

The greatest effect: simulation already in the design phase

In the future, BERGI-PLAST have incorporated simulation as a standard part of their design process. Simulation will be used not only to improve existing molds, but also much earlier in the process, during component and mold design. This will open up many more levers to reduce material consumption, and at the same time optimize quality and cycle times. After all, once the mold has been built, changes become much more expensive and time-consuming. The automatic VARIMOS injection molding optimization software in particular can achieve a great deal, even in the design phase. Angela Kriescher, Head of Product Management at SIMCON, creators of the CADMOULD simulation VARIMOS optimization software tools, describes it like this:

"Simply put, you tell VARIMOS what you want to achieve, in terms of part geometry and other quality measures. VARIMOS then determines subtle optimizations for your part geometry, process parameters, and mold properties. VARIMOS achieves this by automatically simulating many different parameter combinations and analyzing the results. This gives you more than just a "point estimate" of a classical simulation. Without having to go through tedious manual trial and error, you can

see which parameters really impact quality. And you get recommendations for how to set those parameters. This saves engineers a lot of time-consuming, tedious trial and error. And it frees up capacity to focus on the tasks that only you can do: to interpret the results, discuss them with colleagues and customers, and make decisions, together."

Experience from thousands of digitalization projects that SIMCON has run, shows that the greatest value can be achieved if simulation is used **early in the process.** That way, you can systematically de-risk your design decisions, and ensure that your part and mold designs are plastic-compatible, from the start. Ronald Dietz agrees:

"What some companies in the market do wrong is that they first design the entire mold in CAD, including the cooling system, and only afterwards run a confirmatory simulation, in order to do some final tweaking of the process parameters. At BERGI-PLAST, we have made the experience that it is worthwhile to use simulation much earlier. If you design and optimize, for example, your cooling system, with the help of simulation, and only then transfer it to CAD, you can avoid a lot of errors. You simply would not have discovered those errors in CAD, without the simulation. The part itself should also be optimized, in an iterative interplay between simulation and CAD, to make sure the design is suitable for injection molding, right from the start. Extremely precise, subtle changes in wall thickness can often achieve decisive improvements in component properties, which would not at all be obvious in CAD. In order to exploit these advantages, it is important that you still have the freedom to make adjustments to the component and the mold, at the time of simulation. And doing those adjustments virtually, on the computer, is much less expensive than doing physical corrections after the mold is built."

The key point here is that the introduction of digitalization is not only a question of the right software. It is also a question of the right ways of working and work processes.

Laying the foundations for the future

BERGI-PLAST's experience shows that by setting the right course at an early stage, the company's environmental and quality goals can be achieved more fully, more efficiently, faster, and with less stress and risk.

The competitive advantage of many industrial champions in Germany lies in their dedication to quality and innovation. Through systematic, continuous improvement, companies can maintain these advantages and expand them, step by step. And so BERGI-PLAST's current investments in simulation and environmental technology can contribute to a foundation for the next century of the company’s story.

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