

ISMR Says: Special purpose software systems reduced the effort spent by Allgaier Automotive on tryout and unavoidable part modifications.

STAND & DELIVER

➤ Allgaier Automotive used a novel approach to simulate and improve its forming process as well as compensate for material springback

Ever increasing price pressure and shorter deadlines are just some of the many challenges faced by the German die-making industry. Using traditional methods to overcome these challenges is not good enough. For Ralf Schmidt, engineering and die-making manager of Allgaier Automotive, competitive advantage could only be achieved by taking a new approach.

At Allgaier, this meant generating the process layout and die faces using special purpose software systems, whilst simulating and improving the entire forming process and compensating springback by modifying die faces. The main goal was to reduce the effort spent on tryout and unavoidable part modifications. Such an approach had the potential to make significant savings in time and money. A reduction in the double-digit percentage range was envisaged by the company.

Completing such a project alone did not seem realistic, given the available resources as well as the extent of the work. Partners were called in to complete the forming expertise of the die and tool makers at Allgaier for the simulation of the entire process chain.

Participants and project

With AutoForm Engineering GmbH and Tebis AG (Technische Informationssysteme AG) as partners, Ralf Schmidt built his project team. Allgaier already had software products from both companies in place. Now they needed to be optimized in combination with each other and completed with further enhanced software solutions from both companies – with the entire process chain to the finished forming tool in mind.

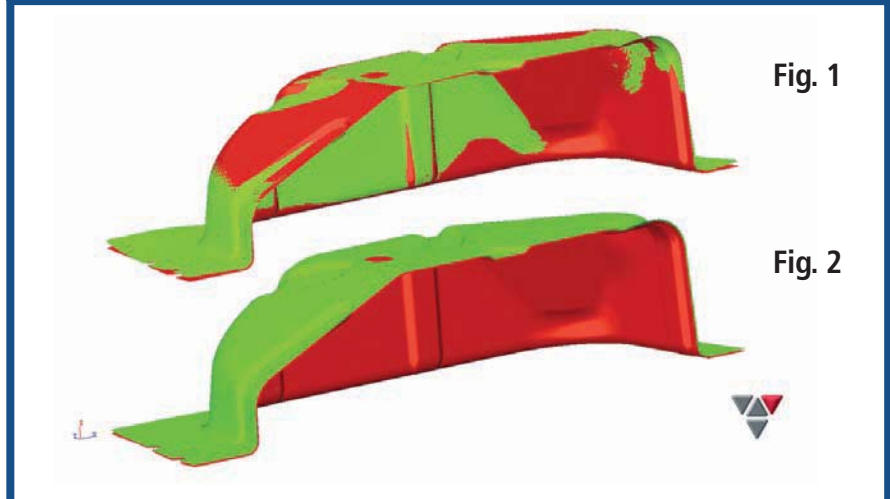


Fig. 1: Colour display of springback in AutoForm before compensation
Fig. 2: Colour display of springback in AutoForm after compensation

An SUV sheet metal part from a premium manufacturer was used as a test object. This was no trial, however, but a real project. The risk was proportionately high. Allgaier's customer expected delivery of the finished stampings in time and at the usual quality level. Despite several unknown factors, Allgaier wanted to handle the project as it normally would - not divorced from day-to-day business. A parallel development in the traditional way, using CATIA V4/V5, had never been planned.

Foreseeable challenges

Successful die-making is the result of carefully elaborated processes and smooth logistics. One of the challenges along the way is, for example, springback. Often, it does not show up until the tryout stage with the first pressed parts. Until the parts meet the specifications and are accepted by the customer, they may need to be subjected to several correction loops, which entail enormous cost. In addition, the more

tools developed in parallel and the number of correction loops per part, the more unfavourable the planning reliability and overall logistics are also affected. To significantly reduce the number of correction loops and to make the tryout a lot easier to plan for Allgaier, springback should be anticipated and compensated for as much as possible.

Another challenge expected by Allgaier concerned the interface of the software programs. On one hand, there was the CATIA V5 CAD system with the parts data, on the other hand were different software programs, each optimized for a specific process step: For process layout and simulation AutoForm was used while, for the generation of die faces and milling data, Tebis was applied.

Saving time by over a third

The customer presented Allgaier with the CATIA data of the sheet metal part. This data was immediately imported into the AutoForm-DieDesigner software and a tooling concept derived which covered

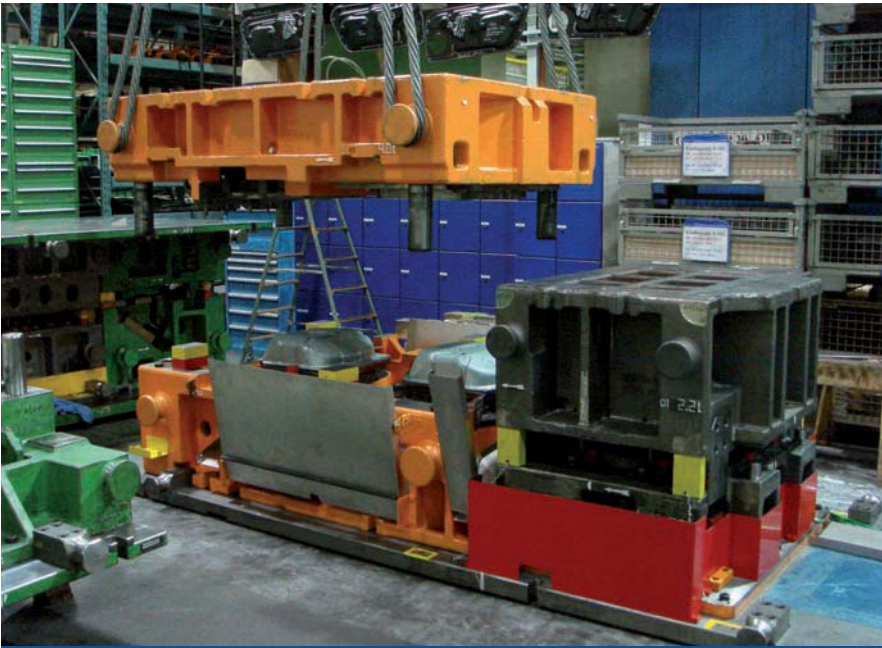


Fig. 3: The die for the sheet metal part of a SUV is ready for the production press.

the following operations: drawing, trimming, piercing and re-striking. On the basis of the concept data, exported to the Tebis software, surfaces for the drawing and re-striking operations were generated with Tebis RSC (Rapid Surface Creation) and forwarded for tool engineering. Thus, the design of tools (solids) could start immediately and cast iron parts could be ordered.

At the same time, using AutoForm-Incremental, the process layout

department checked and optimized the draw die generated with AutoForm-DieDesigner until the simulation results showed the required part quality and optimal material usage. This optimal forming process was subsequently checked for robustness under real manufacturing conditions. Unavoidable noise of the material properties and process parameters had to be taken into account. A geometrical modification of the die surfaces for springback compensation would only be of sustainable success for reproducible springback. As the robustness was confirmed, compensation of the draw die and of re-striking operations could then take place. The result was that AutoForm mesh data, including compensated

FACTBOX

ALLGAIER IN A NUTSHELL

Allgaier Werke GmbH boasts a history which goes back over one hundred years for two business streams: automotive and process technology. Headquartered in Uhingen, Allgaier Automotive acts as a system provider for the international automotive industry. This covers the production of pressed parts and ready-to-install car body components made of steel and aluminum. In addition, Allgaier's activities include the development and manufacturing of high quality forming tools. A speciality of the Allgaier Automotive Division is the development of fuel tanks as complete systems and the subsequent manufacture of these on automated equipment.

The number of trainees at Allgaier is above average so that the company can ensure an active new generation of employees for the complex, promising tasks of the future. Read more about Allgaier at www.allgaier.de.

springback, was now available.

After being compensated and optimized for robustness, the draw die faces were exported to Tebis again. The AutoForm – Tebis interface delivers the changes compared to the initial concept data. Thus, the Tebis-Morphing software can update the draw die surfaces with the click of a button. In this way, high-quality surfaces are developed which already include the springback

FACTBOX

AUTOFORM IN A NUTSHELL

AutoForm Engineering develops and markets specialized die face design and simulation software for the automotive and sheet metal forming industries. With all of the Top 20 automobile producers and customers, AutoForm is recognized as the number one provider of software for product formability, die face design and virtual tryouts to the global automotive industry. AutoForm offices are located in Switzerland, Germany, The Netherlands, France, Spain, Italy, USA, Mexico, India, China, Japan and Korea. The company also serves the needs of its customers through agents and distributors in more than 15 other countries (Turkey, Brazil, etc.). For detailed information visit: www.autoform.com



Fig. 4: After the deep-drawing process, the sheet metal part is trimmed, pierced and restroked.



Fig. 5: The sheet metal part is deep-drawn in the first station (left-hand side), then it is trimmed and pierced at a first stage in the second station (right).

compensation and the results of the robustness calculation. The Tebis surface technology also made it possible to generate the surfaces of the part in milling quality. The time-consuming method spent on reconstructing several surfaces in CATIA V5 was eliminated. Moreover, springback compensation had already been taken into account. As a last check, the Tebis surfaces were simulated again in the AutoForm software. The result was satisfactory for all concerned parties. Although CATIA V5 was ignored on the way to the milling data, the customer's request to receive all data in this format could be met. Both AutoForm and Tebis make their data available in CATIA V5.

One thing was certain for Ralf Schmidt: the project had worked. The

overall process was correct and was supported by all participants. In the example, everything fitted so that the desired progress level was reached. With the support of both partners, Allgaier could save three correction loops and more than a third of the development time. The skilful implementation of the AutoForm and Tebis software and their collaboration meant that remarkable savings could be achieved in the design process and even more in the tryout. Thanks to the simulation, several loops for springback compensation required in the empirical method could be saved. Allgaier's engineering and die-making manager commented that, beside the appropriate software tools, the success of the project also largely resulted from the smooth cooperation of all three

FACTBOX

TEBIS IN A NUTSHELL

Founded in 1984, Tebis AG is one of the leading providers of 3D CAD/CAM software, in particular for the styling, model making, tool and mould manufacturing sectors. As of today, more than 5000 systems have been installed at more than 1500 sites world-wide. Most European, Asian and American car manufacturers use Tebis. Over 600 companies active in the die-making industry use Tebis technology. The user-friendly CAD features are used by die face designers and planning engineers to constructively develop forming tools and to prepare them for milling. NC programmers use the Tebis CAM modules to calculate 2 to 5-axis paths for technologies like drilling and milling as well as wire and laser cutting. Since 2006, Tebis and AutoForm have enjoyed a technological and sales-oriented cooperation supporting common development and customer projects. Read more about Tebis at www.tebis.com.

company participants.

The project success prompted Allgaier to acquire additional AutoForm and Tebis software and to invest in a specific training programme of the staff involved. The training programme was provided in-house by specialists from AutoForm and Tebis.

According to Helmar ABfalg, CEO of Allgaier Werke GmbH, this innovative approach allowed Allgaier to strengthen its reputation as a high-quality manufacturer. In the future, said the company, acknowledged product quality would be accompanied by the shortest possible delivery times at competitive prices.

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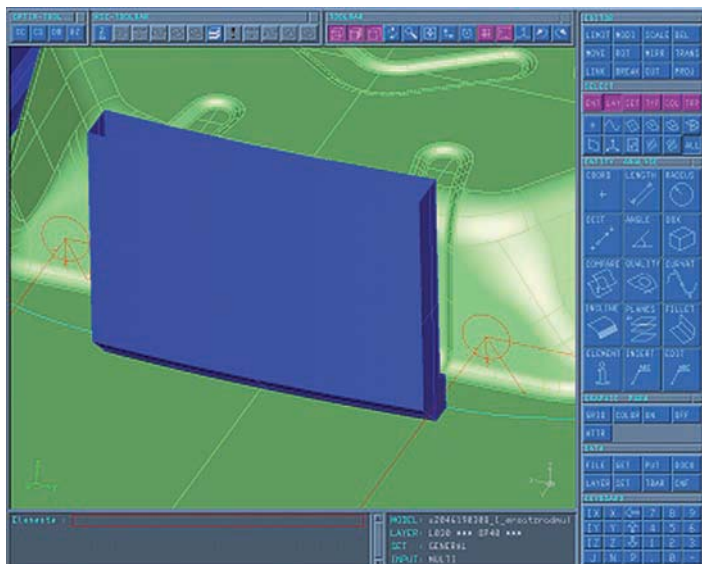


Fig. 6: Part of the trim steel generated in Tebis