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.

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...
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 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.
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. 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 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 Aßfalg, 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.