

MATERIALS



ABOVE: With athletic drive, Bernd Krömer's team successfully applies AutoForm software

BELOW: Ford Fiesta body in white, made up of manufactured parts simulated in-house using AutoForm software

MATERIAL ISSUES

If the feasibility of new stampings is to be checked or manufactured, Ford staff in Cologne use AutoForm software.



ISMR SAYS

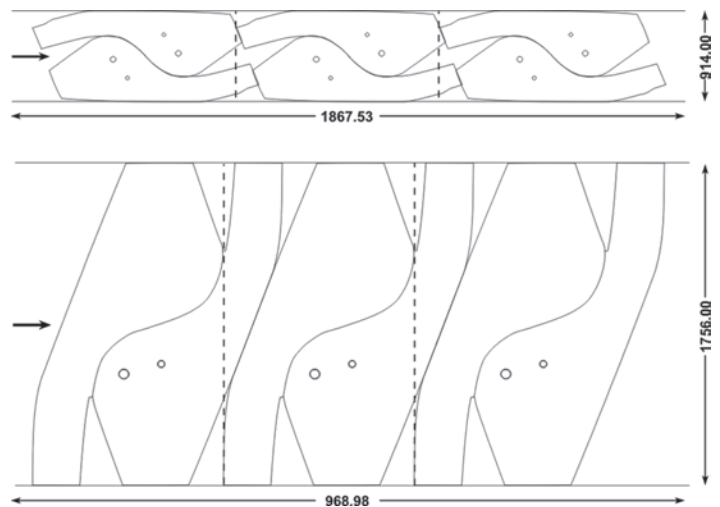
Six years ago, the highest strength steel which was stamped by Ford on a part was still 600 MPa. Today, this figure is 600 to 780 MPa on many parts.

There is no springback compensation of stamped parts without enduring robustness! This statement made by Bernd Krömer, Manager of Die Systems Stamping Engineering Europe at Ford Werke GmbH in Cologne, clearly underlines that springback which occurs during the forming of high-strength steels cannot always be solved by a single compensation calculation. Ford uses dozens of simulations and analytical evaluations of them to handle the varying conditions of production. Without this approach, which has been applied on a daily basis for more than a year, certain part characteristics would not even be possible – let alone at reduced cost and faster part availability.

SHEET METAL FORMING SIMULATION

Ford began simulation of sheet metal forming with its own system. Due to the limited internal development potential at the time and rapid technical advancements, Ford felt compelled to look for a more efficient system. Various methods were then compared. In 1997, as a result of this comparison, Ford decided on software from AutoForm Engineering. Since then, it has remained true to its choice.

The bottom diagram illustrates a 2% increase in material utilisation compared to the top diagram. By applying AutoForm-Nesting software, Ford saves a double-digit million sum



“The material utilisation rate on all current Ford models is one of the highest of the European automotive OEMs and saves Ford a multi-digit sum each year”

The application of software has been continually extended over the years. Approximately half of the specialists in Bernd Krömer's team currently work with AutoForm software. The introduction of the software also led to, among other things, organisational changes. Four years ago, the Blank Development department was merged with Process/FEM. In addition, there are now staff members who are solely responsible for fine-tuning the findings of AutoForm-DieDesigner simulation results. Other staff members in turn guarantee that the changes to the tool are incorporated directly in CAD.

All in all, over the past few years, there has been an increase in the number of tasks for which Bernd Krömer's department is now responsible. The volume of work has increased as a result of the additional new programmes which the team manages as quality demands rise while development times shorten. This can only be properly managed with efficient software.

FROM DESIGN PROPOSAL TO FINISHED PART

If the feasibility of new stampings is to be checked

or manufactured, the staff in Cologne use AutoForm software. When critical springback occurs in a part, nominal part surfaces are compensated according to the previous reliability calculation done with AutoForm-Sigma. This is how Ford is able to ensure robust production.

“The press shop production should then run so reliably that, even with varying conditions such as variations in material properties, reliable production is not at risk,” AutoForm told ISMR. “In this way, Ford covers the entire forming process chain, from the first design proposal to the finished part, all with simulation tools.”

RAPID RESULTS AT LOWER COSTS

As a result of the seamless coverage which simulation tools provide, development times can also be significantly reduced. Today's shortened software computing time and optimal hardware also contribute to this. Since this does not affect quality, Ford can run more computational loops and therefore react much faster to part changes. The advantages are obvious in view of the average three to four adjustments made

FORD COLOGNE

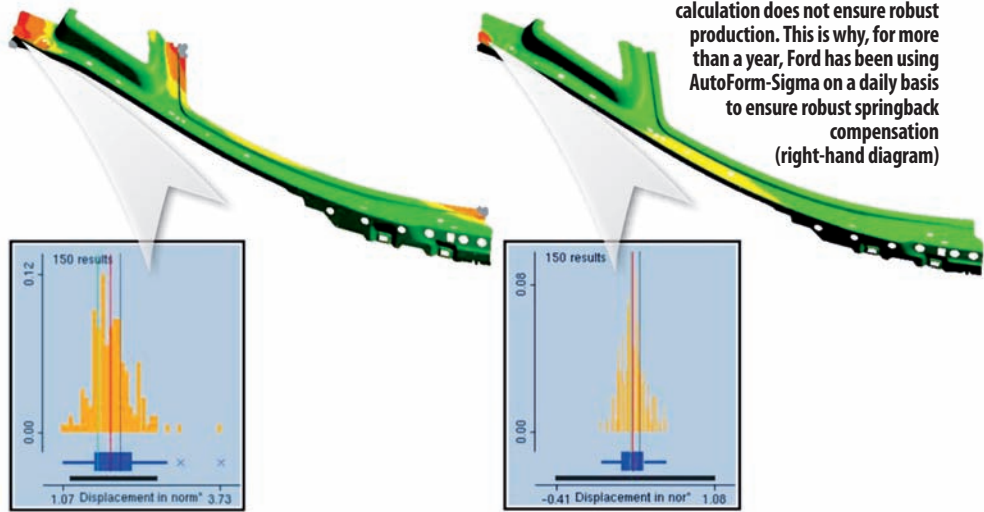
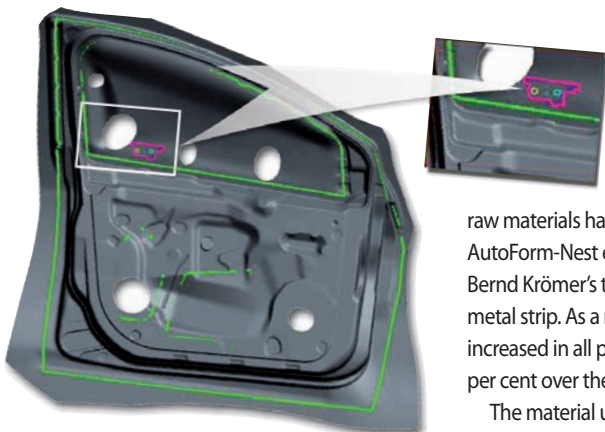
Ford has been in business in Germany since 1925 and, since then, has manufactured more than 40 million cars. More than 17,000 people from over 50 nations work at Ford's headquarters in Cologne-Niehl. Apart from the manufacture of the Ford Fiesta and Ford Fusion models, motor and transmission manufacture as well as forge and casting production are carried out here. The Fiesta plant is considered to be a top European plant in terms of efficient manufacturing.

Cologne is also home to the department known as Die Systems Stamping Engineering Europe. The field of activity here is cold forming as well as the feasibility and process of sheet metal parts and the ramp-up of new automobile models. This is one of the pioneer departments in terms of the systematic application of simulation software. Today, every part manufactured here is simulated. FOR FURTHER INFORMATION ABOUT FORD, visit www.ford.de

AUTOFORM ENGINEERING

AutoForm offers software solutions for the die-making and sheet metal forming industries along the entire process chain. With over 200 employees, AutoForm is recognised as a leading provider of software for product manufacturability, tool and material cost calculation, die face design and virtual process optimisation. All of the Top 20 automotive OEMs and most of their suppliers have selected AutoForm as their software of choice. Besides its headquarters in Switzerland, AutoForm has offices in Germany, The Netherlands, France, Spain, Italy, USA, Mexico, Brazil, India, China, Japan and Korea. AutoForm is also present through its agents in more than 15 other countries. FOR DETAILED INFORMATION, please visit www.autoform.com

BELOW: Unused space in a window cut of a door inner panel with two more stampings within the same tool – the result has a positive effect on material utilisation



BELOW: One single compensation calculation does not ensure robust production. This is why, for more than a year, Ford has been using AutoForm-Sigma on a daily basis to ensure robust springback compensation (right-hand diagram)

until a part is released as, for example, with ultra high-strength materials (UHSS). In addition, Ford is trying to shorten times in the tool trial phase which could also result in cost savings. Bernd Krömer recalls that the time and financial gains were especially impressive with side member parts such as trunk lids as well as door inner panels. Generally, he considers the application of AutoForm software to be worthwhile across all parts of a vehicle programme. This is based on experience, considering the 90 per cent production depth of all stamped parts on a Ford car body.

In addition, Ford consistently checks simulation results. Checklists with important production parameters, measuring documentation such as FLD reports or simple traffic light lists, make it possible to compare the results with production and identify weaknesses in FEM calculations. The forming specialists in the Die Systems Stamping Engineering Europe department have an important say in matters concerning the sequence of operations and the resulting tool investments or cost per unit. Through simulations, AutoForm helps them to decide, for example, whether four instead of five operations are feasible thereby making it possible to save cost.

BETTER MATERIAL UTILISATION

Material utilisation has always been an extremely important issue at Ford. The rising price of raw materials has made this even more significant. AutoForm-Nest enables the blank specialists in Bernd Krömer's team to optimally utilise the blank or metal strip. As a result, material utilisation has increased in all programmes by approximately four per cent over the past four years.

The material utilisation rate on all current Ford

models is one of the highest of the European automotive OEMs and saves Ford a multi-digit sum each year. Naturally, the blank specialists are interested in increasing material utilisation further by, for example, occupying unused space in a window cut of a door inner panel with two more stampings within the same tool.

Bernd Krömer, Manager Die Systems Stamping Engineering Europe, adds: "AutoForm software gives us a greater scope of action in sheet metal forming without compromising reliability. In this way, we save on investment and are, on average, much faster."

REVIEW AND FORECAST

In the past, experienced tool makers acquired their technical expertise for new process design intuitively, to a certain degree, from practical experience. Their extensive wealth of experience, however, could not hold up against the new high-strength and ultra-high-strength materials which are continually coming onto the market. Six years ago, the highest strength steel which was stamped by Ford on a part was still 600 MPa. Today, this figure is 600 to 780 MPa on many parts. It has already gained some initial production experience which, in turn, has been integrated into the new FEM calculations to some extent.

The value of software solutions used by Ford for years is growing. The acceptance of its use in tool manufacturing was not, however, instant. According to Bernd Krömer, it took between two and three years for this to evolve. When almost similar results from simulated and produced parts became apparent (when, for example, wrinkle tendencies on a drawn part appeared in the exact same way on the software), these were compelling arguments. This high correlation between the physical drawings, or stamped parts, is one of the main reasons why Bernd Krömer cannot imagine working without AutoForm software now. ■