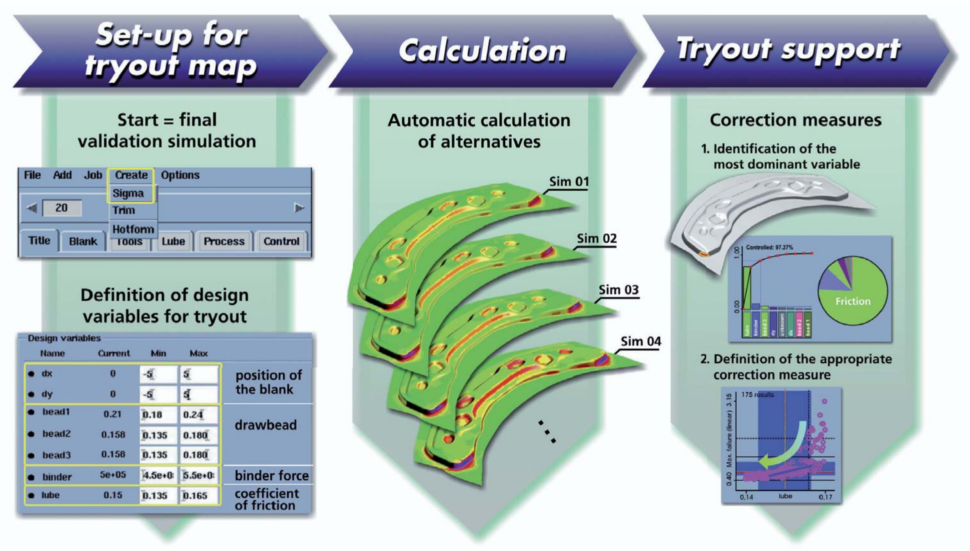
ISMR SAYS:

"Systematic tool tryout offers better results than 'trial and error' testing"

With systematic tool tryout, the tool shop can successfully deal with complex part geometry, high-strength steel materials, tight deadline requirements and high quality demands

SYSTEMATIC TRYOUT



Above: (Figure1) Three steps to systematic tryout support

The fine tuning of a forming tool during tryout is a cost- and time-intensive step on the path to a functioning tool. Correctional work and modifications are inevitable. Every correction loop saved therefore offers an immediate advantage in terms of time and money. Any improvement in the effectiveness in tryout automatically increases competitiveness.

This, says manufacturer AutoForm, is generally not possible using today's trial and error principle. Success, it says, is assured through a systematic approach, which is not confined to the boundaries of individual operational departments. It is based on reliable simulation results which are correctly evaluated and lead to a considerably reduced number of correction loops.

Engineering (including stamping simulation) and tryout are separate operational departments in the tool shop with different facilities but also in terms of the point in time of application during the development of a tool. When the release for milling of the tool is issued, Engineering generally addresses new projects while the Tryout team is just getting to work. In fact, both departments actually examine the same questions: where are the critical areas in the part, which measures can resolve these effectively and what happens to the other areas as a result?

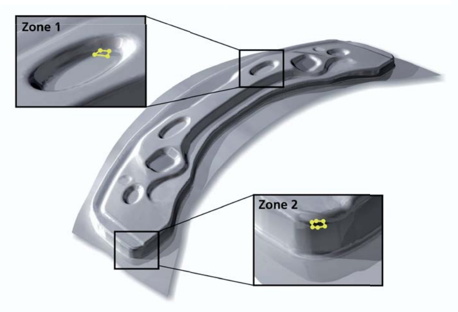
SIMULATION-BASED TRYOUT SUPPORT

For an effective tryout, both operational departments have to bundle activities together. Generally, the Tryout team must carry out several correction loops on the tool until it can be used to produce a part of the required quality. Each of these correction loops costs time and money. Furthermore, the effectiveness of these correctional measures is often only evident afterwards.

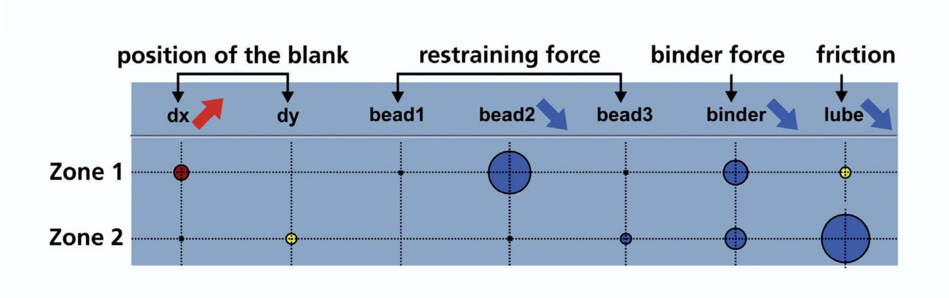
This is where engineering applies simulation-based tryout support. All the theoretically possible correction measures, which can be taken in real tryout, are copied in a simulation model. Their calculation – a sensitivity analysis – takes place parallel to tool manufacturing. Before altering the tool, the results are available thus allowing for the simulation-based tryout support. Should a problem arise in tryout, the cause can be identified on the computer. It quickly becomes evident which measures have had a positive influence on the forming result (Figure 1).

The sensitivity analysis is based on the engineering department's final simulation, through which the tool is produced. All of the required criteria with regard to material failure, wrinkling etc. are therefore fulfilled. This simulation set-up is now extended. Correctional measures, such as the modification of die radius, are defined in the form of scatter ranges. The originally planned 10mm die radius in the tool can therefore be assigned a value from 8 to 15mm.

In the same way, the positioning of the blank and the blank shape, as well as the restraining force and the binder force are variable. Numerous other correctional



Above: (Figure 2) Problem areas in a deep drawn part during tool tryouts. Zone 1: tear in embossed area. Zone 2: excessive thinning.



Above: (Figure 3) Influence of correctional measures on thinning

measures, such as the position and size of holes for relief, can also be considered. Moreover, company-specific adjustments to standard correctional measures are also possible. The simulation for tryout support is carried out based on all this input.

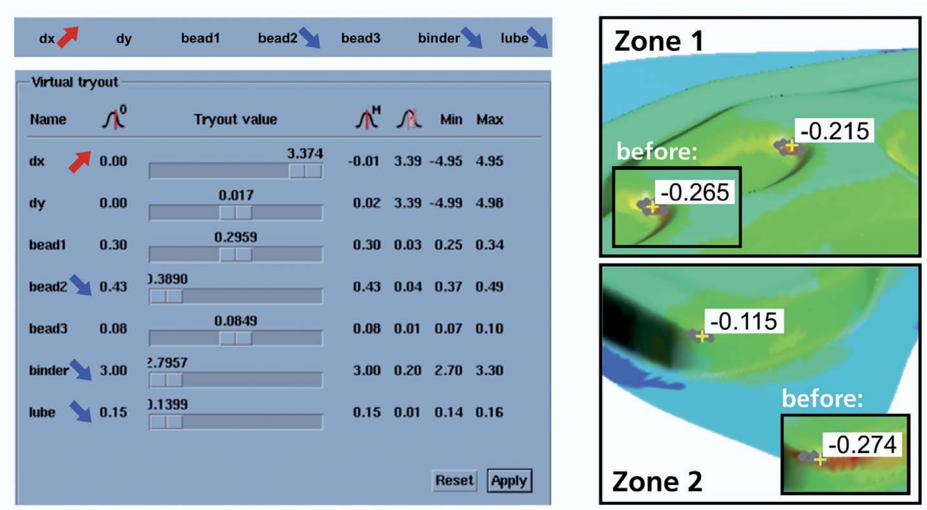
AN EXAMPLE OF TRYOUT SUPPORT

Should a problem arise in tryout, Engineering refers to previously calculated simulation results in AutoForm-Sigma. The software provides support for users in determining suitable correction measures. By using a tryout map, a concrete recommended action for the next correction loop is worked out and an action plan can be developed (Figs 2-4). Should the Tryout team, for example, identify two problem areas, a tear in the base of an embossment as well as a 23% thinned spot in the wall which has a maximum stretch tolerance of 20% (Figure 2), Engineering can examine these two areas more closely on the computer.

AutoForm-Sigma takes the user in logical steps through the analysis. A comparison of the sensitivities shows, at a glance, which correctional measures have had no effect whatsoever and which measures offer a real chance of resolving the particular problem (Figure 3). Coloured circles in varying sizes show that the problem area can generally be influenced. The circle colour indicates whether a drawbead, for example, is to be increased or reduced. The larger the circle, the more effective is the correction measure. An action plan can then be quickly drawn up which, in practice, is often made up of a combination of correctional measures. The correctional measures are implemented either as sequential steps or in the most efficient logical way.

Before the action plan can be applied to steel and iron, users should check on the computer the effect that each individual correctional measure has on the entire part. Should, for example, a radius be made larger (to prevent a tear) wrinkles can quickly appear in other part areas. The correctional measure applied resolves the original problem but, at the same time, creates a new one as a result. This makes a compromise necessary to guarantee that neither wrinkles nor tears will appear. Using sliders, AutoForm-Sigma is able to progressively adjust the strength of each of the individual correctional measures and to simultaneously follow the effects on the entire part on the computer screen (Figure 4). The action plan is carried out on the tool only when the appropriate adjustments have been determined.

Below: (Figure 4) Examination of action plan



THE SYSTEMATIC WAY

"The procedure described, with the collaboration of operating departments, ensures high process transparency and is the basis for systematic tool tryout. The effects of correctional measures are first calculated on the computer. At the same time, company-specific standards are taken into consideration in the calculation of tool tryout.

"Should problems occur in tryout, counteractive measures can be quickly and easily identified. The sum of all the individual measures ultimately leads to an action plan. Finally, the examination of the planned correctional measures guarantees that all the original faults have been eliminated and that no new ones have been created," AutoForm told ISMR.

CONCLUSION

With systematic tool tryout, the tool shop can successfully deal with complex part geometry, high-strength steel materials, tight deadline requirements for process engineering or tool manufacturing as well as high quality demands. Systematic tool tryout, rather than 'trial and error', saves time and money. ISMR

ABOUT AUTOFORM-SIGMA

AutoForm-Sigma is a software product for the sensitivity analysis and optimisation of stamping processes. It provides support in tryout, which optimises tool adjustment and can reduce many correction loops. The effect and sensitivity of design parameters is graphically presented so that the process can be easily followed and development time can be reduced. See **www.autoform.com** for more details.