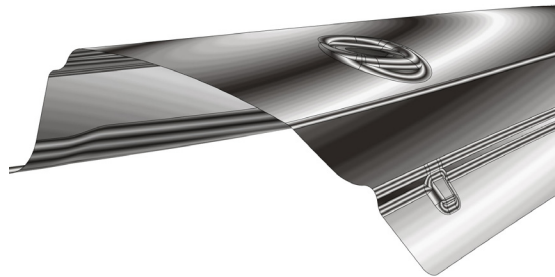


Compensation on measured data. The CMD project

Close collaboration between think3 and BMW Group has led to the development of a solution that covers compensation based on measured data



1. Processing sheet metal

Car makers take months to create a high quality design and do not want to see it disappear in the press shop. **Maintaining design quality throughout the production process** today is a big challenge for all automotive companies. Designs created at the computer by a designer have to be manufactured but, as we all know there are considerable differences between the digital world and the real, physical world.

Processing sheet metal is a complex process. Die stamping sheet metal components and other parts with complex shapes give rise to a problem known as '**spring-back**' (the tendency for a metal part to partially return to its original shape after deformation because of the elastic recovery of the material).

Designers try to correct or prevent material problems of this type with various 'compensation' methods. Currently, designers predict what the shape should look like after spring-back by using FEM (Finite Element Analysis) tools. However, the FEM process is separate from the design process and requires users to spend large amounts of time and effort integrating the results into the modification of the tooling design.

2. The think3 approach: Compensator

In 2002¹ think3 was one of the first companies to talk about the deformation problems which occur during the tooling production process, and the solution of these problems through digital compensation. Until that time, compensation had been done manually.

Think3 has developed a solution which meets surface modeling requirements and solves specific production problems in those cases where tooling and dies require adjustment. **Think3's Compensator** is a solution that automates the compensation process, saving time, replacing tedious manual labor while maintaining the same surface structure (topology) and quality as the original surface model. Using think3's technology reduces user interaction and eliminates the need for designers to spend time rebuilding and redrawing compensated surfaces.

¹ *How to reduce the delay, design accurate and cheaper stamping tool? Introduction of several useful CAD methodologies, at International Symposium on Advanced Metal Forming Technology 2002 – Beijing (China)*

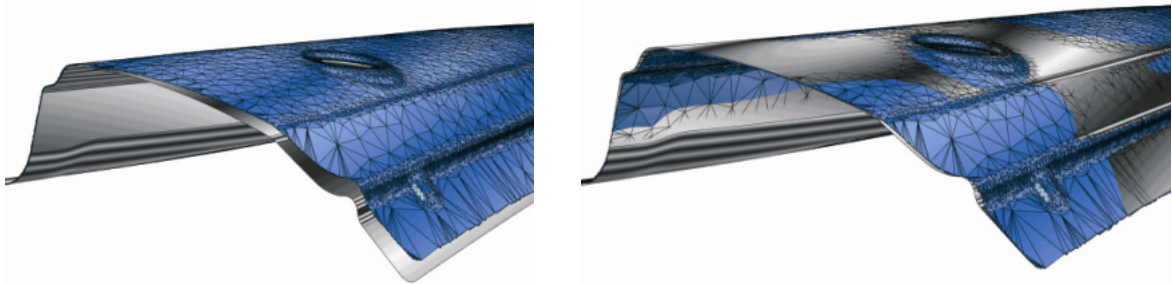
3. Complementary compensation: the CMD project

Close collaboration between **think3** and **BMW Group**, one of the first automotive companies working to install a stable, replicable process able to quickly and safely react on changes of the part, has led to the development of a solution that also covers compensation based on measured data: the CMD tool.

The **CMD (Compensation on Measured Data)** tool is a ThinkDesign/Compensator based tool, developed in partnership with BMW Group, which enables Adaptation or Compensation on Measured Data.

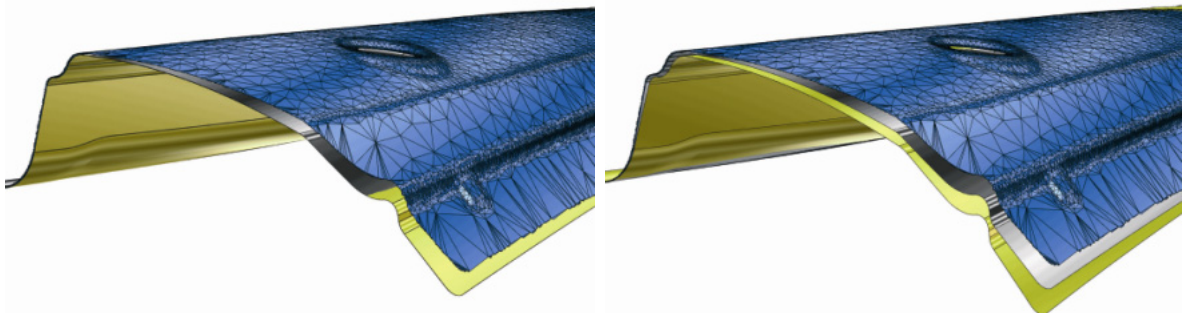
Adaptation – It solves the problem of creating a digital model which is identical to the physical tool. The original surfaces of the 3D model are adapted on the basis of the physical model machined and modified by hand (obtained by scanning).

With this CMD's command it is possible to match the digital model on the physical model in few minutes, rather than days or weeks.



Compensation on measured data - It's possible to compensate the part based on the measured data rather than on data that come from the FEM. The deformation data are applied to the digital model employing an inverse law.

This CMD's functionality applies reverse deformation - reading the deformation from the physical model applied to the digital model. The process is fast and enables the quality of CAD data to be maintained. It takes minutes, instead of several days.



CMD makes it possible to maintain high quality design throughout the process, considerably reduces time and costs and enables car makers to outpace the competition by making complex components which maintain the original design intent. A big additional advantage is that design changes can be handled in a very effective way. Minor design changes can be applied to compensation even without an additional FEM calculation.

For more info: www.think3.com – email: pub-info@think3.com

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