SIMULATION STUDIES ON THE USE OF STAMPING SOFTWARE ON AUTO PARTS

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Abstract: The procedure of plastic deformation used widely in Auto industry is the stamping tables. Improving the competitiveness of industrial sectors where stamping is often used is by reducing production costs and increase productivity that is obtained by linking traditional knowledge with the ability to forecast simulation. Getting pressed parts without defects depends mainly on three factors: the characteristics of the sheet, the shape of pressing tools and conditions of processing.

1. INTRODUCTION

Mostly, the stamping simulation can be determined: influence of anisotropy on material distribution tensions and deformations, the depth of stamping appearing breaking material; the force evolution depending on the depth of stamping; influence lubrication to contact sheet metal - die and sheet metal - punch; influence of the detention force of sheet metal; influence coefficient of stamping on tensions and deformation. Thus, initially, the process simulation of stamping are defined: geometry used (defining shape and dimensions of tools and sheet metal); discretization blank material; elastic properties of the blank material, the relation between efforts and plastic deformations in the field of plasticity criteria; tools with non deformable rigid elements; contact between active areas of tools and blank.

2. STUDIED STAMPING SIMULATION

Stamping simulation can be done with the aid program *Autoform* carrying out feasibility study for stamping operations:
- the study form product, the outlook area dies
- samples and simulate stamping, stamping assess the feasibility and part process
- validation die design and the process of the stamping sheet metal
- optimization automatic of the die geometry and the process
- lays down the process of stamping completely, making changes in the process
- a generation of pre-range for all operations;
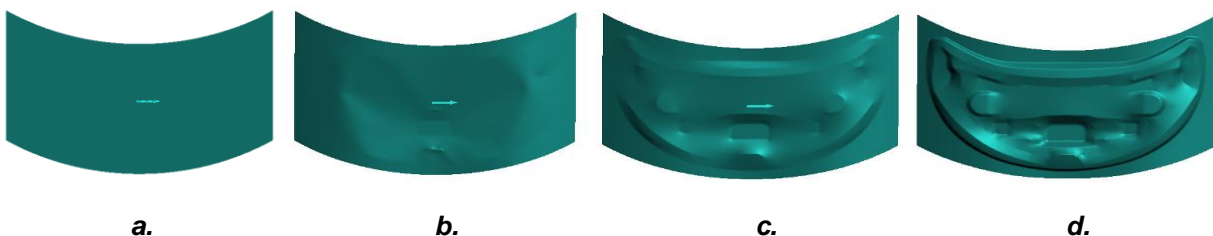- simulating precise of stamping, calibration etc;

| a. | b. | c. | d. |

Figure. 1 Simulation of a simple stamping. A. b. c. d. are deformation stages

The stages of simple stamping effect simulation on the basis of initial phase of sheet metal until the end of operation (Figure 1.)

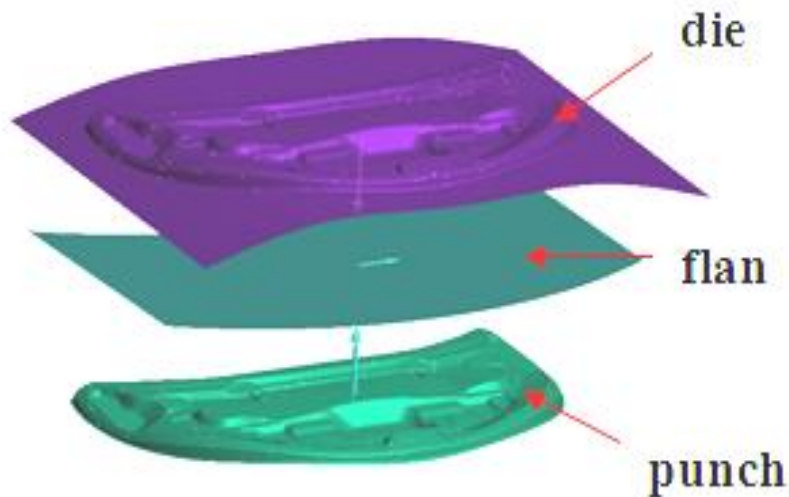In Figure. 2 here are the punch, die stamping and the sheet metal.

Figure. 2 Representation of the punch, die stamping and the flan

Autoform incremental simulates the complete process of stamping:
- simulating all stages of process: bending, stamping etc;
- calculated efforts in tools (Figure. 3.)
- analyze and optimize the pieces faults, cracks, splits, strain, quality of parts layout.
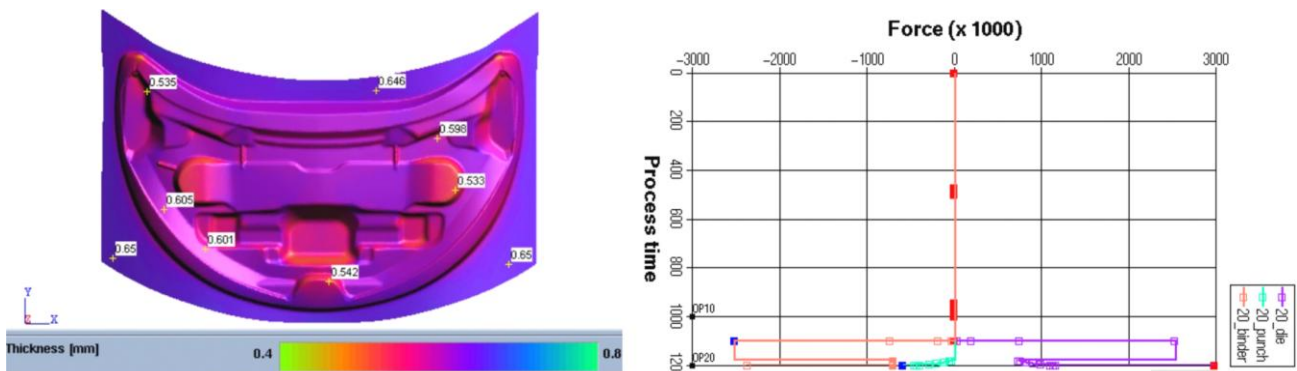   We can also see the material thickness at different points by right-clicking on these points (Figure. 3).

Figure. 3 Material thicknesses in different points and the efforts in the tools

An example of the appearance of wrinkles at another car product, a double effect stamping with 10 mm before the PMI (a), with 5 mm before the PMI (b) and with 2 mm before the PMI (c). (Figure. 4).
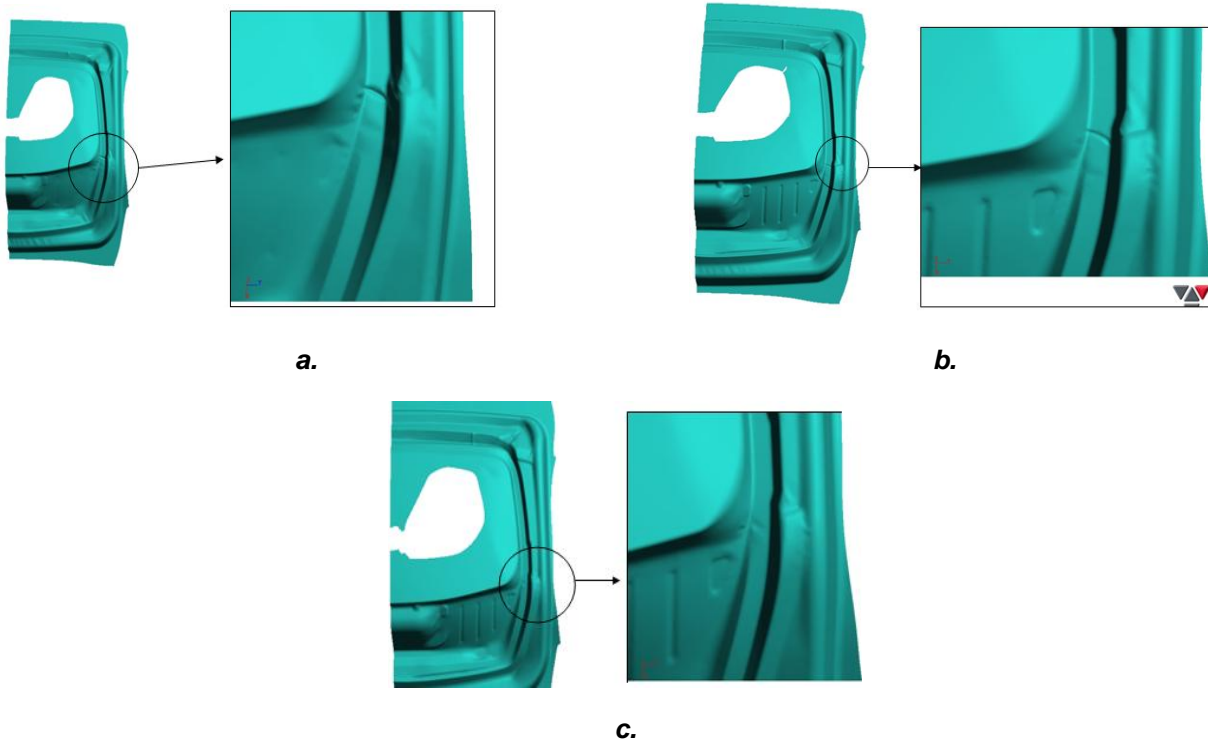
The material of car product is DC 04 AM.

a.   *b.*

c.

Figure. 4. Appearance of wrinkles. A, b c are different stages of deformation

In the simulation below (Figure.5) can be seen the splits (with the red color) and an example of Forming Limit Diagram for the same car product.
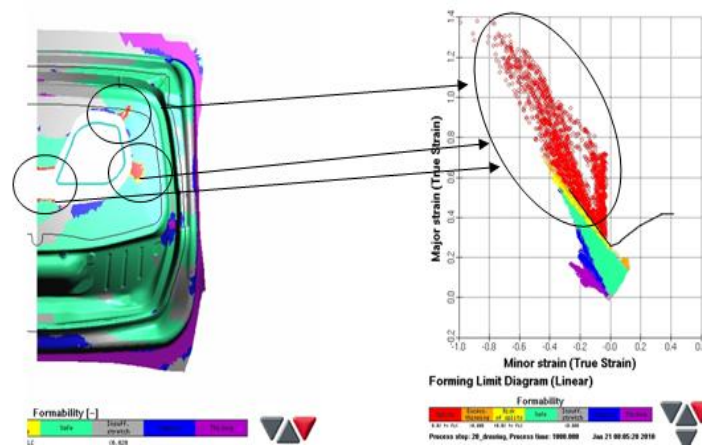

Figure. 5. Splits appearance and a Forming Limit Diagram

These splits extend to the corner of the piece resulting waste. So the proposal is to change the material with DC 05 AM and the result is better.
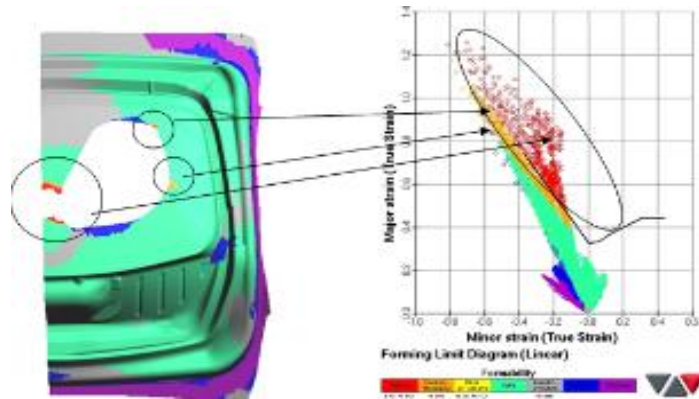
These results can be seen in Figure 6.

Figure. 6 Splits appearance and a Forming Limit Diagram

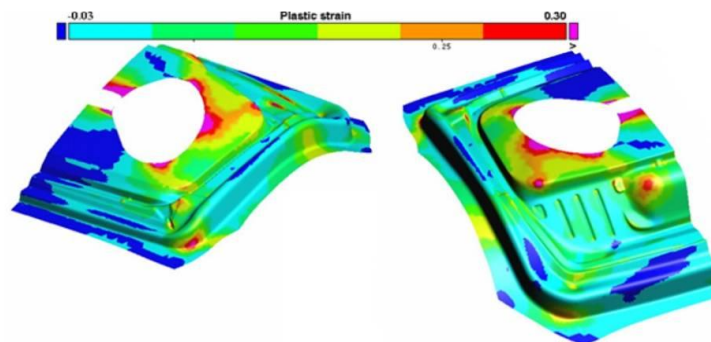From point of view of the plastic strain we can see an example in Figure. 7.

Figure. 7. Representation of the plastic strain

3. CONCLUSIONS:

Stamping simulation expert must specify the following:
- the punch position
- the stamping direction must comply
- the coefficient of friction
- the plays
- raising efforts
- attack of the punch
- curves effort of punch, blank holder and matrix
- plastic deformations
- point defects

References:

[1] Iliescu C., "Tehnologia stantarii si matritarii", Editura didactica si pedagogica, Bucuresti, 1977
[2] www.autoform.com