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TYPOLOGY ANALYSIS FOR THE OPTIMISATION OF A STAMPING PROCESS

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Stamping a car part seems to be an easy job in the car industry. However, the limits the stamping process faces weakens the production of perfectly shaped parts. Also, some industrials seem to keep hardly the secret of its optimisation.

In fact, the stamping of a metal sheet to form a car part may corrupt it by having it too expended or even necked. This might lead to the striction, rupture of the metal sheet or crippling on the external pieces of the unit [1]. As a result, the stamping process, facing its limits, cannot produce complex car parts such as strut towers. Therefore, in order to minimise these risks, the stamping process itself needs to be optimized by enhancing the geometrical shapes of the tools in use.

One side of our work consists of the programing of an algorithm that will be included in a module for the company's software we are collaborating with. This algorithm calculates optimised directions of stamping. The other side of the work is focused on the programing of another algorithm which would allow multiplying the different stamping scenarios by modifying the shape of the part to be stamped.

1) Stamping process optimisation:

In order to enhance the process, we need to determine the direction of the stamping. This has to satisfy two criterions:

Criteria 1: No back draft.

Criteria 2: homogeneity in the distribution of the pushing forces on the blank.

The programme that had been added to the company's numerical platform named Salomé allows calculating automatically the optimal orientation of the part to be stamped.

2) Calculating the different stamping scenarios

The criteria 1 gives a lot of constrains as it restricts the number of possible solutions. So in order to enlarge the number of solutions, we can operate some modifications on the shape of

the part, when possible, such as unfolding some of its borders. In order to do that, we have developed a flattening method which consists of moving a 3D surface to a 2D plan inspired from the works of Wang and al. 2002 [2]. The advantage of our method is the simplicity of its principle as it keeps the original distances without additional minimising of a possible energy of deformation of the mesh.

Once the borders of the car piece flattened, the recalculation of the stamping direction will allow getting optimised solutions, and better performing shapes of the stamping tools.

The main aim of our works is to give free access of this complex and deep technology to any industrial who would like to create from car parts to kitchen tools.

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