THE STAMPING PROCESS AND THE MANAGEMENT OF A SPECIFIC PROJECT

SOVAR-RUNCEANU Marian
[1]Facultatea: Inginerie Industriala si Robotica, Specializarea:Master Conceptie si Managementul in Productica, Anul de studii: 2 , e-mail: sovar.runceanu_marian@yahoo.com

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REZUMAT: The design of auto body dies and dies is an ongoing activity as automobile manufacturers are constantly looking to improve their production processes to increase the efficiency and quality of their products. The design and development of high-precision dies and dies for auto body manufacturing is a critical and ongoing activity, as a number of factors such as tolerance, complex shapes and non-uniform geometries require advanced technologies and special expertise. The objective of the chosen theme is to make a hood according to the specifications. The design of the technological process is realized in Catia V5 and its simulation in Autoform. The technological process contains all the operations that each piece goes through from the semi-finished product to the final shape. Each operation is accompanied by the technical time norm.
The landmark for which we realized the technological embossing process with the related time norm is the "Hood", which is an exterior part, with a complex, asymmetrical shape, which is part of the entire car body.

CUVINTE CHEIE: embossing, punch, mold, technological process, simulation.

1. Introduction

The objective of the chosen theme is to make a hood according to the specifications.

The hood of a car is a body component that protects the engine and allows quick access for maintenance to the engine or other components.

The construction of the hood differs from car to car, but most can be accessed easily, opening from inside the car with the help of a special button.

Usually the hood is made of steel, but materials such as aluminum or carbon and fiberglass are quickly gaining popularity.

2. Current status

The design of auto body dies and dies is an ongoing activity as automakers are constantly looking to improve their production processes to increase the efficiency and quality of their products. The design and development of high-precision punches and dies for auto body manufacturing is a critical and ongoing activity, a number of factors such as tolerance, complex shapes and non-uniform geometries require advanced technologies and special expertise.

The design and construction of the embossing dies are elaborated in close connection with the shape and dimensions of the workpieces, with the required precision, the material from which they are made, the production volume, what machines the press department has.

When designing the molds, both ensuring the functionality for the given conditions must be taken into account, as well as the possibility of easy production of the component parts, by providing the most technological constructive forms. From this point of view, it is necessary to choose the simplest standardized and normalized constructive solutions, which at the same time offer the possibility of easy and convenient assembly and maintenance.

In general, when designing the embossing dies, certain conditions must be ensured, such as :

- high quality of mold parts;
- high productivity;
- easy execution and low cost;
- durability as high as possible;
- high security in the work process.

The design and manufacture of embossing dies starts from certain initial conditions, such as:

- drawing of the molded part;
- the operations plan in case the part is obtained in several successive operations, which require different tools;
- the cutting plan of the semi-finished product;
- working diagram of the mold;
- a copy of the part to be molded.

According to the mode of operation, they can be classified as:

- simple effect embossing dies;
- double effect embossing dies;

In the structure of the embossing dies we find four main elements:

- Punch;
- Superior package;
- Lower package;
- Retaining element.

3. The case study

For this case study, we chose the benchmark Bonnet Panel, made of steel-HX220BD with a thickness of 0.65 mm.

The input data for this type of landmark are the following:

- 3D digitization;
- Pregame;
- TG plan.

Fig.1 shows the 3D Digitization, designed by Design. This is the part drawing in Catia – Catpart format.

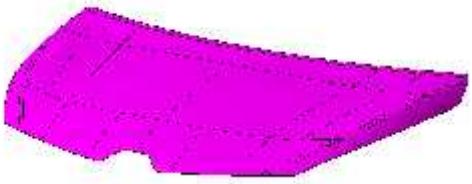

Fig.1 Digitization 3D

Pregama – is an official document, a pre-study carried out for this range, in which various technical details are presented, such as:

Number of operations;

- The manufacturing site;
- Main and secondary press lines;
- Material and thickness;
- Dimensions of the flan:
- Commitment of the material.

In the figure 2, the pre-model of the hood with the characteristic specifications is attached to her:

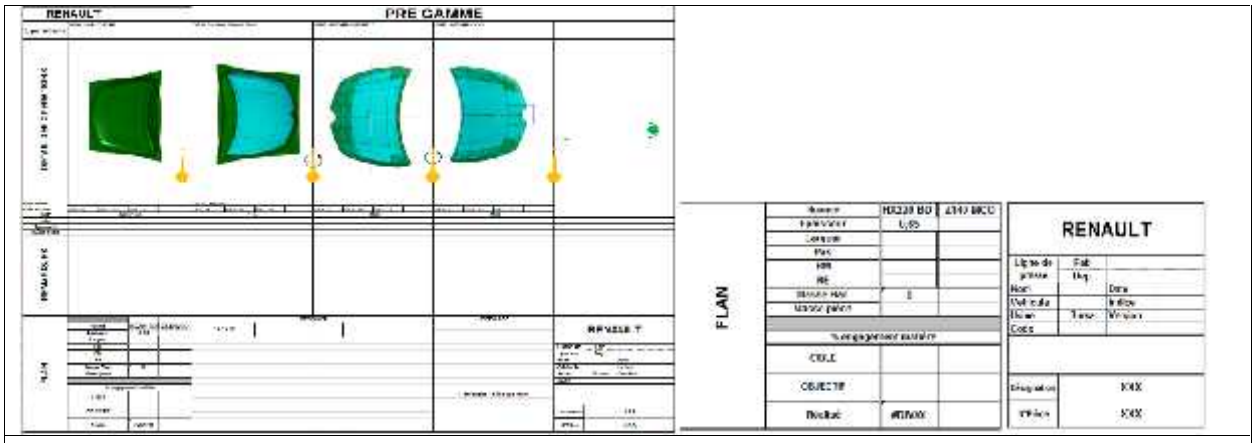

Fig.2 Hood pregama

The TG plan is illustrated in Fig.3 This represents the part drawing, in the machine assembly,with all the details (ex: contact areas with other parts):

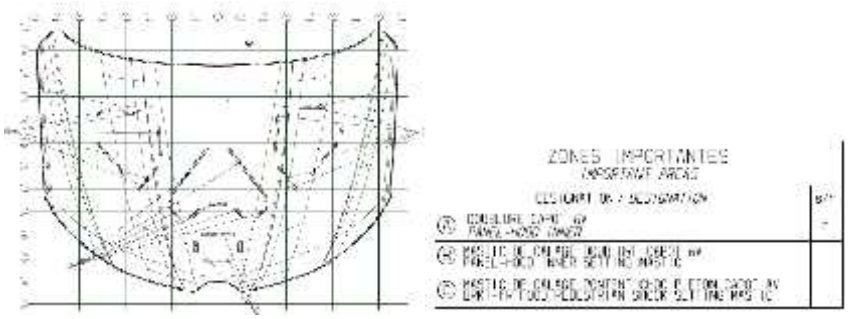

Fig.3 TG PLAN

After analyzing the input data, the surfaces specific to this type of landmark are built, respecting Renault-Nissan norms and standards.

The analysis of the piece consists of:

- Identifying the appearance areas;
- Identification of mooring areas,
- Checking if the piece complies with the Product/Process design standards (material/ plate thickness, depth, radius values, etc.).

The design of the technological process is realized in Catia V5 and consists of the following actions:

1. The part received from Design is in the car axles, more precisely in its position on the vehicle.

This position does not allow a correct embossing. Balancing (fig 4.8) the piece allows:

- Balancing the embossing depth;
- Avoiding negative areas;
- Protection of appearance areas;
- Favoring the poincon attack.

In the following figure (Fig. 4), the swinging of the hood at the angle mentioned in the preamble is represented.

2. The surface of the greenhouse-flan (prestable) is the support surface of the sheet during time the embossing process. Especially for appearance parts, this surface must be developable and as close as possible to the part received from the customer in order to privilege the commitment of the material. In Fig. 5, the front panel of the hood is illustrated:

Fig.4 Balancing

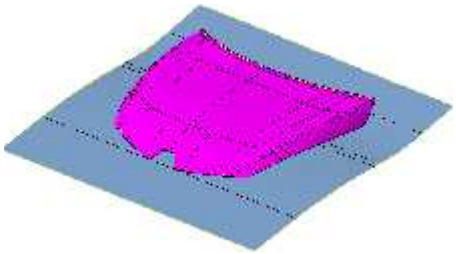

Fig.5 Preset

3. Making the habillage (fig 6) - represents the "clothing" of the piece -the joining area of the part with the pre-stable surface.

Habillage construction criteria:

- Regularization of embossing;
- Protection of appearance areas;
- Respecting the mowing areas, directly or with a cam;
- Optimization of material consumption;

Figure 6 highlights the habillage built on the basis of the initial piece.

4. During the construction of the habillage and the prestable, the presented process is taken into account in pre-cut (live trimming/bending areas, etc.).

Figure 7 shows the form of the mold (preset with habillage):

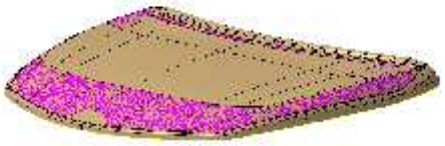

Fig.6 Habillage-ul

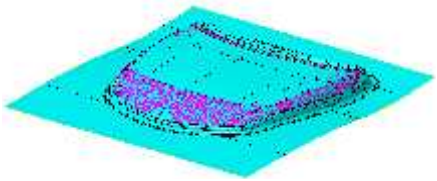

Fig.7 Molded form

After finalizing the mold surface, all the data are entered into an FEA-Autoform software. It allows analyzing the reliability of the part both from the point of view of formability and appearance.

Required data for a simulation in AF:

- The mold surface (Fig 8);
- Material book (Fig 9);
- Sheet thickness;
- Flan (Fig 10);
- Junci (mechanical brakes) (Fig 11).

Brakes are mechanical brakes that have the role of:

- To brake the plate in its movement, to favor the elongation of the material;
- To let the plate "flow" in certain areas, to avoid breakage;
- To limit the formation of folds in certain areas.

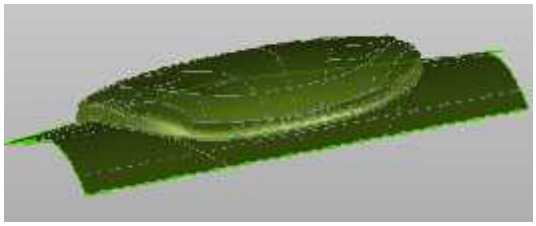

Fig.8 Molded surface

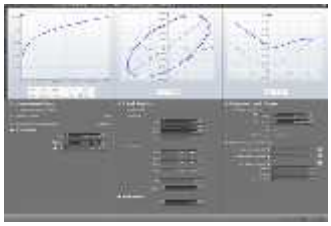

Fig.9 Manual Book

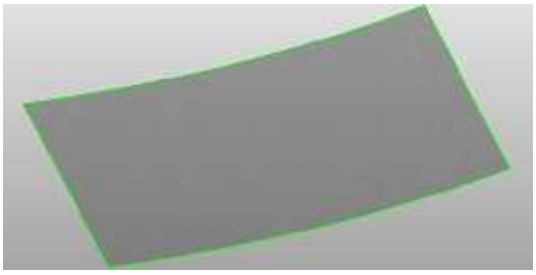

Fig.10 Flan

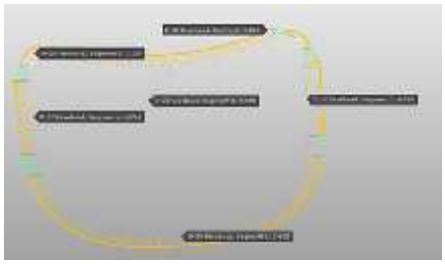

Fig.11 Junks

In AUTOFORM, the embossing forces are automatically calculated and the most important analyzes are performed, such as:

- Formability;
- Plasticity;
- Analysis of scratches;

Fig.12 Formability check

Fig.13 Plasticity check

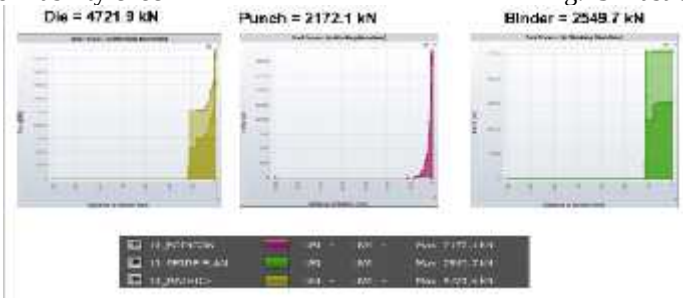

Fig. 14 Calculation of embossing forces

If the part is not feasible, following the optimization of the pre-installation and the habillage, product modification requests are made (DFPP-process-product feasibility requests).

These DFPPs are analyzed by the studies office and can be integrated or not. If they cannot be integrated, meetings are held to find a solution to satisfy the needs of all the departments involved (embossing, dyeing, assembly...etc).

Figure15 shows an example of DFPP with the corresponding details.

Fig.15 DFPP example

After completing operation 10 - embossing, proceed to the construction of the half operation - operation 20 - trimming, represented in (Fig. 16).

Trimming can be done directly or with a cam. Operation 30 - direct bending, we have it illustrated in Fig. 17.

Figure 18 shows the operation 40, necessary in the case of the chosen landmark. This operation represents cam bending in the logo area.

The output data for this milestone are the 3D and 2D Manufacturing Sheet. Figure 19 shows the 3D Manufacturing Sheet.

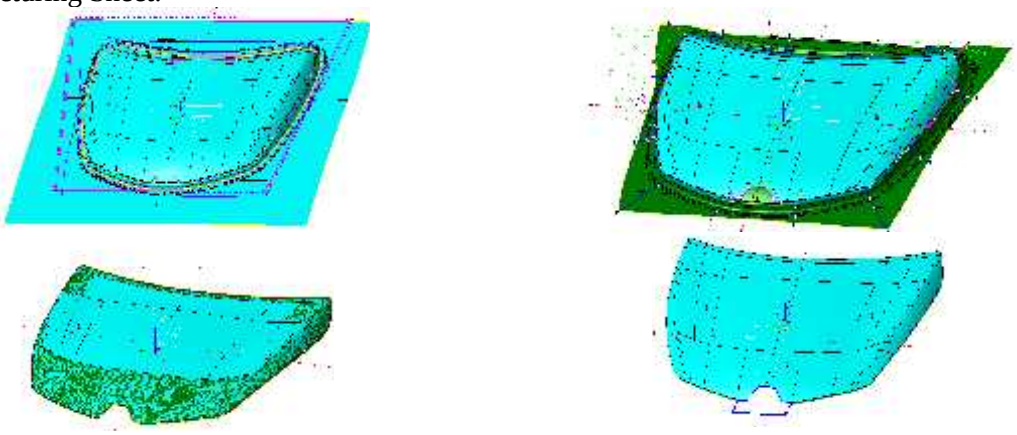

Fig.19 Manufacturing sheet

The 2D manufacturing sheet includes an administrative sheet in which all the administrative details are specified (manufacturing site, press lines, type of automation, inventory number, etc.) and a technical sheet for each individual operation.

4. Conclusions

Establishing the optimal technological process of execution leads to obtaining the final product in quality conditions, in the terms requested by the client and at minimum costs.

The technological process contains all the operations that each piece goes through from the semi-finished product to the final shape. Each operation is accompanied by the technical time norm.

The landmark for which we realized the technological embossing process with the related time norm is the "Hood", which is an exterior part, with a complex, asymmetrical shape, which is part of the entire car body.

5. Bibliography

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