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Quality Management through Computer Simulation

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Abstract ***The development of CAD technique (Computer Aided Design) and CAE (Computer Aided Engineering) creates new possibilities for an important integration of reiability from the projection process of stamps and dies.***

Keywords ***Reliability, CAD technique, quality***

I. INTRODUCTION

The specialists think when a product leaves the compartment of the project there are established almost 70% from the all spending for its making. So, during the projection, the base cost can be determined and it can be changed with difficulty. For reducing those costs involves a lot of time and effort.

The development of CAD technique (Computer Aided Design) and CAE (Computer Aided Engineering) creates new possibilities for an important integration of reliability from the projection process of stamps and dies. Spreading of the network computers and the highest methods of simulation on them give to the project engineers and the specialist in the reliability possibility to use dates and the methods of analysing during the projection for:

- To estimate for different reliability during stamps and dies are created in a CAD field;
- To identify ways of spoiling and to analyse the faults for reliability prediction with a stimulate on the computer before making and testing the stamps and dies prototype;
- To stimulate the process of making and to anticipate the changing effects in the projection regarding the cost and the efficiency for the process of production;
- To find and apply the rules which can help the engineers in the optimisation for special features of reliability with others stamps and dies.

Although the dates for mechanic system are fewer, with an adaptation of methods of simulationng and the CAD packets, we can create a field for working so that to become a full part of mechanic project for reliability.

For stamps and dies projection it can be used high methods of simulating and CAD packets for geometric modelling, structure, dynamic and thermal analyses. Nowadays some of these methods are used in the design Department, but it is necessary the integration and the applying of these methods both by the projection engineers and the specialist of reliability.

Using of new methods CAD/CAE leads to a better projection of stamps and dies with involving of specialists in reliability and offer:

- Using by projection engineers of analyse results for reliability and optimisation;
- Using of simulationng techniques till the beginning of projection;
- Increasing of organization capacity of dates, less the times for feed-back to assure the automatic bringing up-to-date;
- Improving the projection, with involving of specialists in the reliability in the projection process, both directly and implementation of projection algorithms for reliability use by the designers;
- Improving the communication and propagate the dates between the designers and specialists in the reliability.

The immediately potential for applying the CAD/CAE methods in the projection for the reliability of the stamps and the dies depends by the using:

- The graphs based on the station for working which may CAD interactions projection with the methods of simulation at moderating costs;
- The powerful working stations, equip with the last generation of computers, at the convenient costs;
- The network of computers equip with soft which allowed to use entire working station and servers and the access in a few time at the central base date;
- The transition of CAD industry to production of projection system on the computer which allowed to create geometric models which can support the analyse and simulation projection;

The designees created with CAD system are excerpted and imported in the structural models for making the models of finished element. These models are imported then into an analyses programme with finished element to create moulds of material and of rigidity, distribution for solicitation from the material, ways of deformation and correct coefficient of tensions. The resulting dates are used by the dynamic simulation programme of stamps and dies, resulting the loading component that are combined with correct coefficient to create solicitations and tensions in critical zone of component elements(fig. 1).

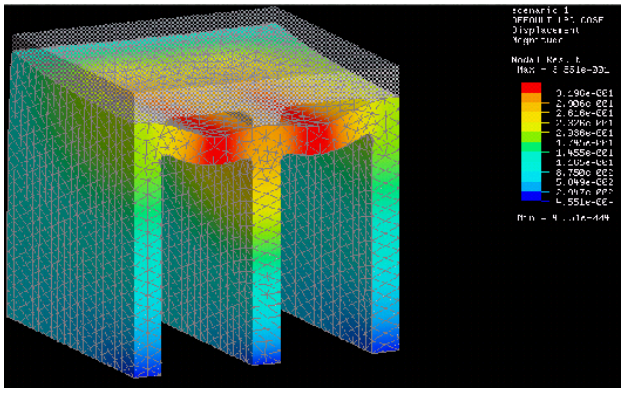

Fig. 1. Solicitations and tensions in critical zone of component elements.

In concordance with these I submit at a dynamic solicitation a part of a moulding that is a base assembly where are active parts of the stamps.

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This moulding made of gnarled cast iron was sectioned without a sidewall so that to see inside how a cell works without a sidewall. In practice, all the cells are closed and the sidewalls have more consolidate.

It could be observed that the stamps for the stamping have big loading in the connecting zones between two areas where the materials is forced to flow after two directions or the deformation takes place with making the material thin.

The stamps for cutting out, perforation and cutting are the most solicitation along the cutting knives and dies. From these observations I did measures on the parts and on the stamps after the stamp made 10.000 parts. The sides of the parts and all their physical size were compared with ideal projection part on the computer. The measures were made with high quality equipment coupled on the computer which offer us difference between it and the mathematic part. The dates were written in the Excel table were processed making a graph to evidence the constant different size. The parts were chosen with small size for an easy measure and an easy using of stamps on the press.

These parts are shown in the next picture(fig. 2):

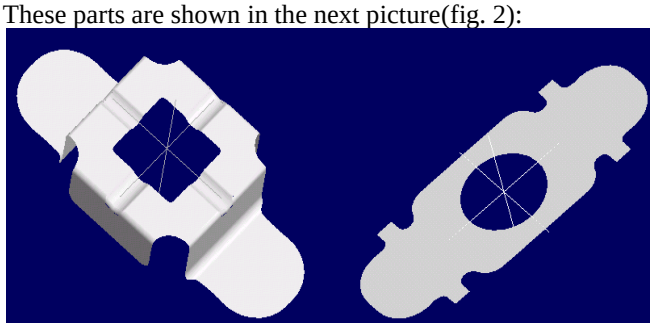

Fig. 2. The parts were chosen with small size for an easy measure and an easy using of stamps on the press.

The results of the measures in the Excel tables are in the next pictures(fig. 3, fig. 4):

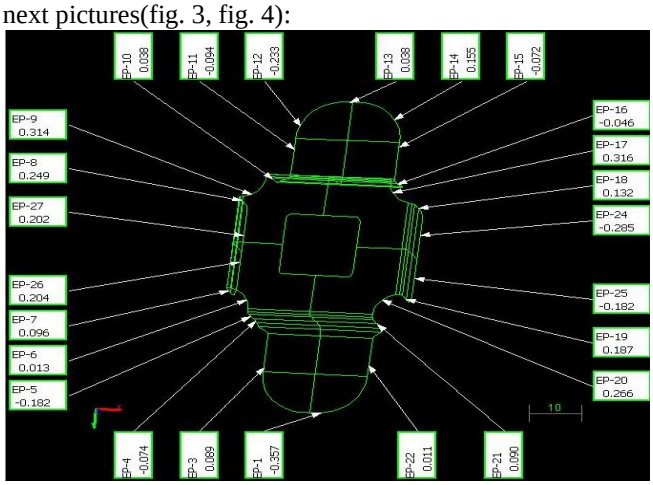

Fig. 3. The results of the measures

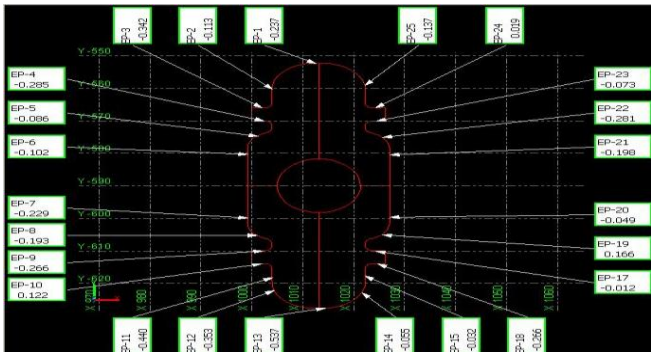

Fig. 4. The Deviation of the Sizes from the Nominal Value

The fundamental developments made by simulating technology and programmes up till now permit the quantitative prediction of the stamps and dies, based on their structure and component elements, long time before making and testing the prototype.

Using simulating programmes, the team can realise the prediction of the performance and the reliable characteristics and can evaluate the changes of the blueprint.

To maximal the blueprint is to integrate the maximal methods in a CAD/CAE medium. This fact leads to the maxim of the blueprint of the component elements, thus it is possible to analyse the shortcomings in the blueprint stage to analyse the way of the deficiency, to analyse the accessibility and behaviour of the stamps and the dies in their working place. The passing from serial engineering to simulation can be realised by exploiting the existent blueprint methods to obtain the reliable characteristics before realising and testing the prototype. To maxim the blueprint is a long-term purpose, it can be realised through simulation. The evolution of the blueprint methods and techniques required by the blueprint functions implies a significant change of the blueprint methods, which must realise the convergence of the highest characteristics with the reliable ones. Although the evolution of the project methods is relatively independent of the functions, which must be realised during the projection, this is a dependent on the CAE evolution and simulation methods. If there are many events as decisions type which occur in the same time, than their processing order will be given by certain rules that must be included in the simulating programme. Among the ordered rules could be included (as concerned the system particularities) and the aleatory rules, too. Today the dedicated programme packets don't put in evidence all these stages and they require only the module you work in, the technological limits of the used material and the nature of the forces that load the given system. Thus we can introduce in the prepared system the part or the assembly of parts where it can be described the movements' types between the parts and the existent coupling type. After this we can activate the calculation module in the respective context. To see how the part behaviours at its stamp deformation, we made the above-mentioned stages then we processed the numeric value in different points considered fragile by the system. The system also presented the dynamic deforming model and thus we could observe the maximum solicitations occurred in the colour palette. After these it could be taken decisions that declare the part is well projected technological because functional speaking it is verified in a real time by the 3D used programmes. If the holes appeared on the part it means the part was wrong in its projection and the execution technological must be reprocessed.

We considered the superior part as a die and the inferior part as a press, we loaded the system with the necessary force uniform distributed on the respective surface and we introduced an iron plane between them. We calculated the resilience coefficient of the material, the type of material and its thick. We also introduced the deforming speed resulted from the calculation and the type of used stamp. After the dynamic simulating we obtained a film in which the time was divided into 50 units.

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To evidence the most important moments we extract two moments at 40 and 50 where we can see the beginning of the part dangerous elongation(fig. 5, fig. 6). The last moment shows us the iron plate suffered an effort that exceeded the resilience coefficient led to the appearance of the holes.

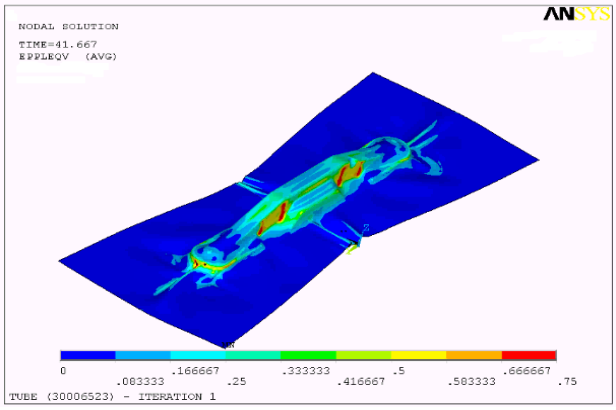

Fig. 5. Dynamic simulating, moments at 40

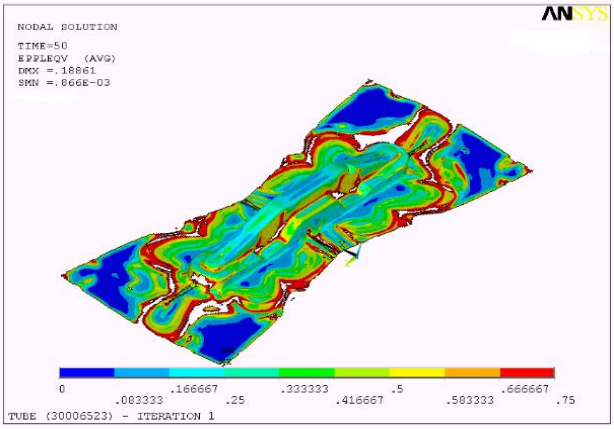

Fig. 6. Dynamic simulating, moments at 50

Due to the fact, the part couldn't be processed in only a stamp we asked the programme to simplify the surfaces where simulated process resulted a pre-stamp with wide angles. These don't grow the iron plate thinner between the press and the die.

In the projecting technology we came with new down surfaces. These allowed not to creasing the active part of the pieces. At the second stamp-sizing the part was good without any new holes.

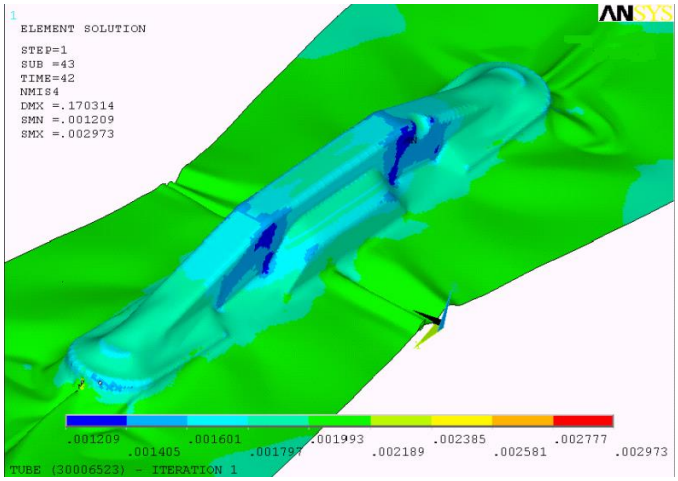

Fig. 6. Dynamic simulating

These colour-measured pictures help us to see the appeared on the part(fig. 6).

CONCLUSION

on these surfaces the iron plate rules strongly on the press and the die finally leading to a more rapid wear and tear. This thing can imply using the high mingled materials which are more expensive so that in the end the wear and tear of the press and the die to be more uniform and to resist in time at the projected number of the parts. Thus we can reach the reliable imposed by the die owner and we can use rational materials implied in the stamp building. We can finally have smaller costs. Beginning with the classic projection of the stamp and the die this paper wants to improve the technology to reduce the variability of the process and the cost of the products by applying some modern process of analysing and projecting.

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