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ENGINEERING DESIGN IN INTEGRATED PRODUCT DEVELOPMENT
Design Methods that Work

IMPLEMENTATION OF COMPUTER TECHNIQUES IN PRODUCTION PRACTICE

T. Nadolny*, J. Jakubowski**

*Relpol S.A, – ary
e-mail: Nadolny.T@Relpol.com.pl
** University of Zielona Góra
Faculty of Mechanical Engineering
j.jakubowski@iipm.uz.zgora.pl

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***Abstract**: The article presents the experiences in industry in the scope of computer techniques use in preparation and implementing of the new product into the production. Project success bases not only on the means, mainly software CAD but also the proper preparation of the staff. Taking as an example the preparation for the production of the new products series in Relpol SA we have presented what kind of actions should be taken when using project methods particularly computer based in order to achieve the measurable profits in practise.*

1. INTRODUCTION

In the last years computer techniques in the industrial practise had completely changed its approach to the preparation of new products for the production. After the initial fascination of the complex systems like ProIngeenier, Ideas, it has been stated, that the implementation of such systems does not bring the expected effects and often the preparation process of the new product for the production were prolonged. In case of the small and medium companies the implementation of the partial systems has been considered as much more advantageous. Often the 'single 'employees decide about the efficacy of system use as their knowledge and innovatory activities make possible profiting from the newest high technology accomplishments and computer tools [7,8,10].

In this article we have presented the technique of link of the newest techniques type Rapid Prototyping, Rapid Tooling with the popular and relatively inexpensive systems like CAD/CAM implemented in the Relpol SA company the biggest polish producer of electromagnetic relays.

In order to keep the high market position the company focuses on the steady development and improving of the offered products quality. Those trends reflect in the new strategy, which plans the implementation of the modern and more effective management methods as well as the concentration on product production. The investment in the modern technologies of product production and the use of integrated systems CAX in new products implementations is also its crucial element.

2. COMPUTER TECHNOLOGY IN USE

In order to rise the standards of company work the newest computer techniques are in use. Company computer net includes the integrated system R3 SAP. The following modules operate in its scope: planning production module (PP), materials management (MM), sales (SD), quality (QM), financial (FI), controlling (CO) etc.

Using the possibility of the modern systems CAX and basing on the young, energetic engineers' team, Relpol company has recently implemented few computer systems assisting several projects works: Solid Works, AlphaCam, MoldFlow. Those systems are used in the following departments:

- Designing Department- new products designing;
- Technical Implementation Department- production tools designing, process simulations;
- Tools Department- production of the new tools, regeneration of the existing production tools.

The mentioned systems allowed the saving of time and implementation costs of the new products for even 40% starting from details and production tools designing work, its making, execution of the necessary simulations to the running production. The considerable time and costs savings were achieved on the product and production tools project stage and amounted to 60%, whereas when producing the production tools those systems have made possible quick and faultless creation of the software for CNC.

The methods of the quick prototyping play the very important role in the described process. Thank to them the first models can be made very quickly and precisely (rapid prototyping- stereo lithography) as well as the production tools for the small series (rapid tooling). Methods of the quick production tools making (for the prototypes series) such as silicon forms or making of forming aluminium inserting parts guarantee required accuracy in a very short time of tools making [1,2,3,4,6].

The considerable saving of time needed for the implementing of the new products production, checked, accepted and brining the company profits was the measurable effect of the mentioned technique use.

Presently we work on the considerably project which aim to implement the production of the new sockets for miniature and industrial relays. Beginning of the whole range production of the new products (under the same code of GZT) is planned for the end of September. This project is an example of the quick and modern production implementation of the whole products range.

Project works started in the end of September 2001. Works scope included:

- new products designing documentations working out
- production tools documentation working out and its making (moulding forms, punch, mounting tools etc)
- prototypes making – stereo lithography method and prototype series tools
- choice and purchasing of the new technological machines (among others: injection moulding machines with the needed equipment) and regeneration of the existing machines
- creation of the complete products production technology

Realisation of so many stages depending on each other's required the creation of the close cooperating team which main role was the organisation and help in the aimed target realization. The group of four people were directly co-ordinating the complex stages in the company departments.

Project works started from the making of the first stylistic sketches of the new products. Designers target was the creation of the reliable, functional, technologic and modern design.

After the acceptation of the stylistic project we have started working on the each details designing by using the system SOLID WORKS. It made possible the creation of the parametrical and mass details' models, it's assembling in units, as well as the making of the first simulation of their simultaneous work.

On this stage of the project works, the first analyses of the elements injection process using MOLD FLOW software were done. The obtained results confirmed (or not) technology of the design and helped in working out the optimal design of the injection forms.

When making elements of the tools, mass models were very useful for generating the software for CNC using the application of AlphaCAM.

It should be emphasised that a considerable number of tools have been made internally by the company – 15 injection forms, 12 punching dies, - 14 others tools, as well as several mounting and auxiliary tools.

Schematic presentation of the project works is shown on the fig. 1, whereas on the fig. 2 we can see photos of the two real products of the series GZT relays.

3. SUMMARY

Thank to the commitment of the considerable group of people and the use of the modern systems of CAD/CAM Relpol SA introduced the new ranges of products on the market in 12 months.

In this moment we would like to emphasis the considerable profits coming from the use of those systems. Despite the fact that its purchase costs are high, engineers training necessary, resistance from the older employees used to another methods of designing quite strong those systems are one of the effective means to overcome the strong 'western' competition. Quick introduction of the new product on the market before the other companies guarantee a success.

Taking as an example the first such a considerable implementation with the use of application CAD/CAM in Relpol SA it's able to prove that the profit of the company from so quick production introduction of the fully examined and functional products is few times higher than the implementation of all those systems in the same time.

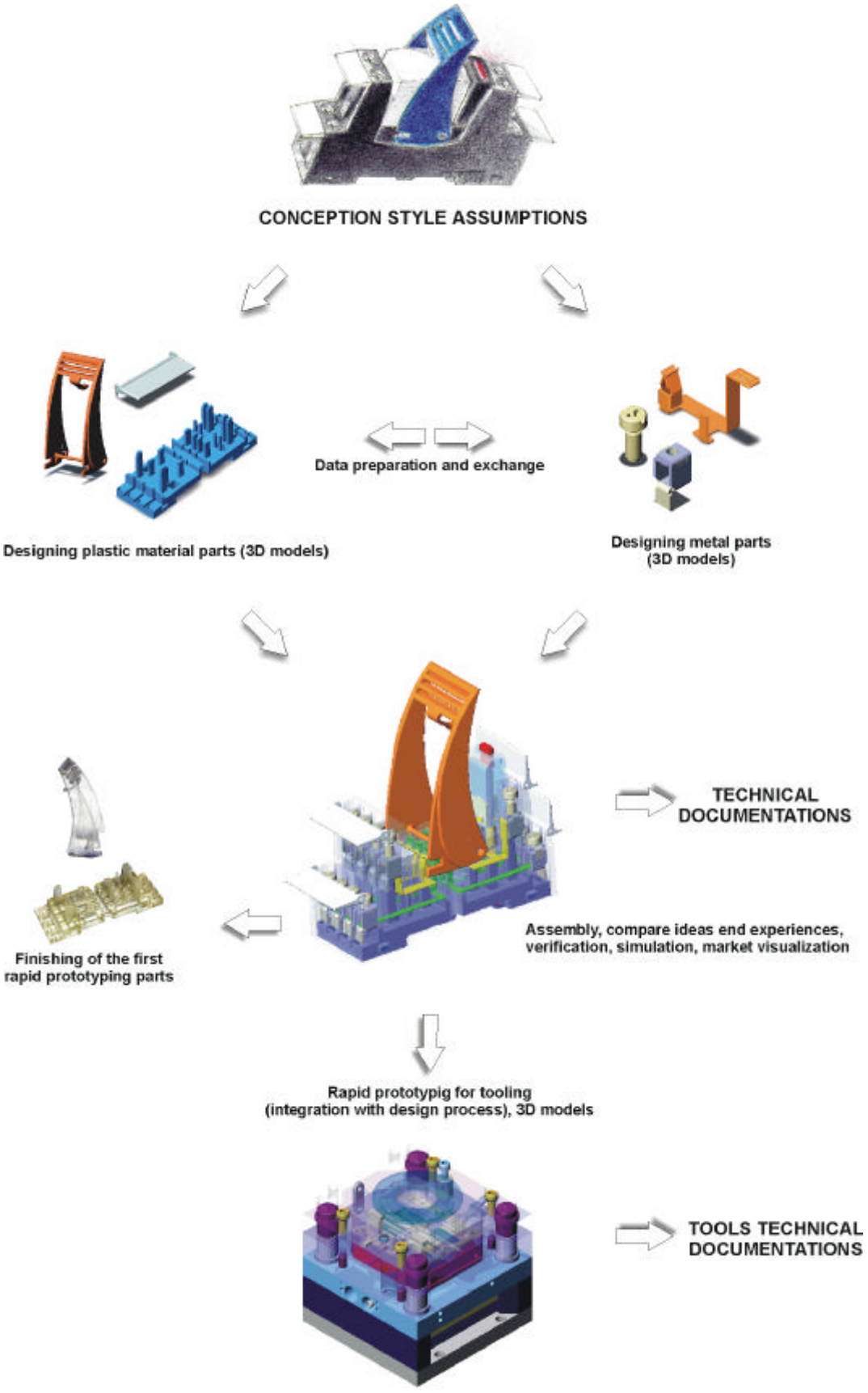

Fig. 1 Schematic presentation of the project works

Fig.2. Photos of the two products of the series GZT

References

[1] Bossak M., Z. Nita.: *Applications of Rapid Prototyping in designing.* (*in Polish*) The XIX Sympozjon PKM, Zielona Góra 1999.

[2] Sochowski P., Kucharz K. *Rapid prototype building* (in polish). – AUTO–technika motoryzacyjna 9/1999

[3] Chlebus E., Cholewa M. „*Rapid prototyping – rapid tooling*" – CADCAM Forum 11/1999

[4] Chlebus E., Cholewa M. „*Rapid prototyping – rapid tooling (in Polish). Product Mangement*, 1-2/1999.

[5] Friedrich R., M. Kochman, *CAE Techniques for Hearing Aid Production.* [in:] Cax Techniques. Proceedings of the 4th International Scientific Colloquium. Fachhochschule Bielefeld, Germany, 1999, p. 429-439.

[6] Jakubowski J., A. Majorczyk, T. Nadolny,: *Efficient estimation of rapid prototyping technique on new part example. (in Polish)* XIII Conference: Computer Aided Design Methods and means. Warsaw University, Warsaw 2001.

[7] Chlebus E., *Computer techniques Cax in product engineering.* (in Polish) WNT, Warsaw 2000.

[8] Jêdrzejewski J., *The role of virtualisations in product improvement*. (in Polish) Conference TPP'2001, t.II, p.129-140, Poznañ 2001.

[9] Novak-Marcinicin J., *Use of Virtual Reality technologies in computer aided technological workplaces planning*. Kon. Projektowanie Procesów Technologicznych TPP'2001, t.II, p.267-272, Poznañ 2001.

[10] Weiss Z., *Computer techniques in firm Technical University of Poznañ.* Poznañ 1998.

[11] Gawlik J., K. Karbowski, R.Rakoczy, *CAD/CAM system implementation in reverse engineering*. (in Polish) Conference „Manufacturing'01", Poznañ 2001, v 1, p. 71-77.