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INFORMATION SYSTEM FOR INJECTION MOLDING TOOLS

Lubomír Vašek
Faculty of Technology , Tomas Bata University Zlin
Nám.TGM 275, Zlín
Czech Republic

Michal Staněk
Faculty of Technology , Tomas Bata University Zlin
Nám.TGM 275, Zlín
Czech Republic

ABSTRACT
Tools for injection molding are very expensive parts of this kind of production and they must be handled very carefully. An important part of their handling is the management of data related to the tools. The important data for injection molding tools is possible divide to different areas - economical, technological, production etc. With an increasing impact of information technologies on manufacturing we get the possibility to effectively manage their use and to obtain an important influence on the increase of productivity and reduction of manufacturing costs. It is commonly today handle all data for some objects inside the more or less specific information system. This information system must be integrated into a complex control system for the whole manufacturing system – the interface to all relevant subsystems must be defined and implemented. This paper describes proposal and implementation of such information system, which was developed in the Institute of Production Engineering of Faculty of Technology, Tomas Bata University in Zlin, Czech Republic in cooperation with the Faculty of Applied Informatics of Tomas Bata University in Zlin and Faculty of Mechanical Engineering, Technical University Brno, Czech Republic.
Keywords: tool management, information system, injection molding tools

1. INTRODUCTION
Today it is necessary to use new methods of effective tool management and to optimize the use of tools in manufacturing processes. To achieve that, we must have possibility to get fast and simply exact information about the location and state of tools and about their technological characteristics. The application of such methods is possible with the use of information technologies – it is effective to form an information system for tool management (ISTM) [2]. This paper describes application of such information system, called NAHOS [1], developed in Tomas Bata University in Zlin and Technical University in Brno, into injection molding production.

2. TOOL MANAGEMENT IN INJECTION MOLDING PRODUCTION
Injection molding is one of the most important methods of processing plastics in the production of consumer and industrial goods. The companies which produce injection molded parts usually have many different molds. It is very important to have detailed information about these tools because of their next usage and maintenance. The review of this information is shown in table in Fig.1.

The data for injection molding tools have different form – they are texts, numbers, tables, pictures, graphs. Some examples are in Fig.2–5. All data types are stored in database and handled by described ISTM.

Main data
- name, number
- weight
- dimension
- product description

Design of injection mold

Multiplicity of injection mold

Runner and gate system
- cold runner
- hot runner (producer)
- combination

Ejection system
- cylindrical ejector pin
- prismatic ejector pin
- stripper plate mold
- three plate mold
- screw mechanism
- combination

Normalized parts
- yes (producer)
- no

Technological parameters

Injection molding cycle
- course of pressure
- course of temperature
- pvT diagram

Injection unit
- melt temperature
- temperature zones
- injected volume
- injection rate
- injection pressure

Cooling system
- water
- oil
- temperature unit (type)
- temperature

Closing unit
- clamping force
- feed speed

Clamping
- screws
- clamps

Operation parameters

Number of cycles

Repairs and corrections

Storage rules
- place
- lubrication
- corrosion prevention

Transport and installation

Figure 1. Data structure and contents for injection molding tools

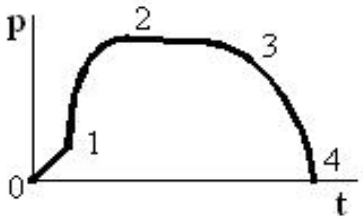

Figure 3. Example of the injection molding cycle - course of pressure

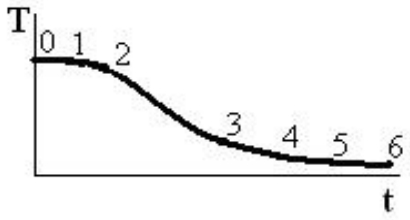

Figure 4. Example of the injection molding cycle - course of temperature

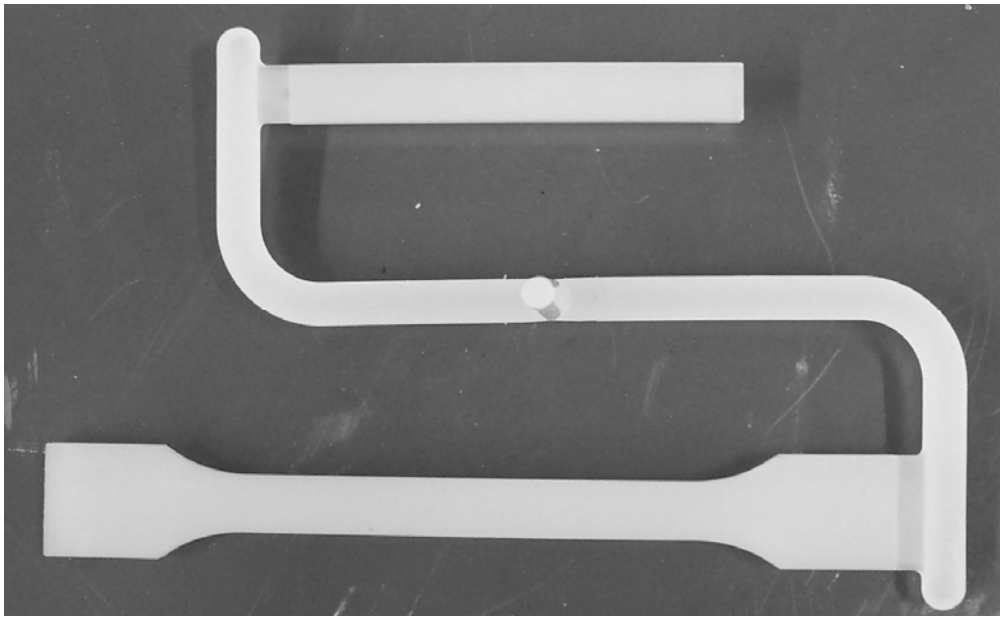

Figure 2. Example of the injected part

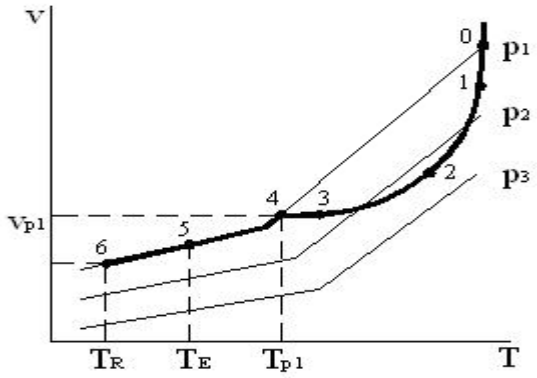

Figure 5. Example of pvT diagram

3. ARCHITECTURE OF THE INFORMATION SYSTEM FOR TOOL MANAGEMENT

The architecture of the ISTM NAHOS (see Fig.6) was designed to fulfil following main requirements for such kind of information system:

- multiuser application
- open system which must be able simply add or modify used procedures which can be typical for production system where implemented – the flexibility of system (i.e. possibility use functions specific to implementing enterprise)
- independence on the used HW and basic SW (operation system) – the implemented ISTM can simply cooperate with different information and control systems used for whole enterprise

Client/server architecture was chosen with respect to the planned utilization of the IS.
A single central database located on the server is another advantage of the system. This guarantees a simple access to the up-to-date data for all users and simplifies the control and maintenance of the data.

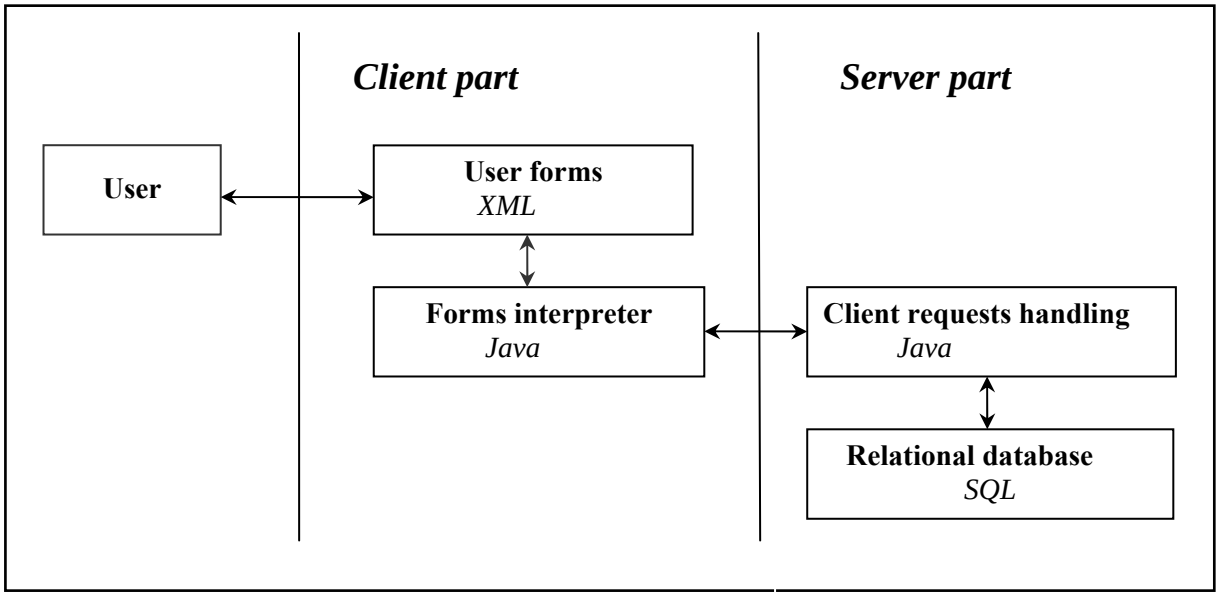

Figure 6. Architecture and used information technologies for ISTM NAHOS

The programming language was selected (Java) with respect to the compatibility of created applications with particular operating systems. This allows us to use client workstations with Windows operating system and a server with UNIX operating system (or Linux, etc.).

The user interface is based on the forms used for data presentation and for inputs. The form is described by a XML document, where are defined used control elements (buttons, labels, combo boxes, tables etc.), actions connected with these elements and also whole data handling in form of SQL queries. This concept allows define the "bussiness logic" of application inside of forms. The forms are enough opened for user, so it brings for application high flexibility and possibility of its simple modification by user according his demands.

All information about the application is saved to a separate database, which is located on server. This database has tables with a description of the application environment – names of the databases with user data, users and their passwords, user groups, etc. One of the most important is the table with a description of particular forms. It gives a possibility simply distribute and manage the application (including multiple running application on the same client workstation, concurrent running of different application with the same client part of SW).

4. CONCLUSIONS

Described information system for injection molding tools was developed and tested in laboratory of Institute of Production Engineering of Faculty of Technology, Tomas Bata University in Zlin. From the testing come some recomendation for improvements of the system. After they will be fully realised, the system will be implemented in industrial injection molding production.

5. ACKNOWLEDGMENT

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6. REFERENCES

[1] Vašek L., Hulman M.: Tool Management in CIM systems 10th International Research/Expert Conference TMT 2006, Barcelona-Lloret de Mar, Spain, 11-15 September, 2006.

[2] Molnár Z., Juřenčák B., Riessler P.: Informační systém podniku. 1st ed.. Univerzita Tomáše Bati ve Zlíně, Fakulta managementu a ekonomiky. Zlín. 2001.