18th International Research/Expert Conference
"Trends in the Development of Machinery and Associated Technology"
TMT 2014, Budapest, Hungary 10-12 September, 2014

DIE FORGING OPTIMALIZATION BY MEANS OF GROUP TECHNOLOGY AND EXPERT SYSTEM USING

Jozef KUBA Ing., PhD.
KAVS, SjF, ŽU Žilina,
Univerzitná 1, 010 26 Žilina.
Slovakia

Ján Moravec, Doc. Ing., PhD.
KAVS, SjF, ŽU Žilina,
Univerzitná 1, 010 26 Žilina.
Slovakia

ABSTRACT
The article brief describes area of die forging process design optimization. Attention is intent on the customer requirements digitalization and their handling according to decision making at frame job method description by means of group technology and expert systems.
Keywords: die forging optimizing, classification parameters database, expert system

1. INTRODUCTION
The wide spectrum of the analyzed parameters (*process attributes*) in forming area, especially in die forging, needs the relative difficult processes according to computer support in technological preparation area. It is necessary to create database of special data and execute their analyze by means of information systems (*MS Access, MS Excel, InterBase, Exsys Corvid, e.g.*), that generate the basis of die forging process optimization.

2. FORGINGS CLASSIFICATION PARAMETERS DATABASE DETERMINING
Choice of classification parameters and key parameters determination, respectively, the selecting of primary or secondary qualifiers is not ever clearly matter. The classificatory database should have been based on the firm knowledge and standardized information (e.g. *standard EN, ČSN, STN, research institute register, etc.*). It is necessary to consider relation among particular properties of the produced product. Therefore the application of information technologies in this field is practically necessary condition.

3. DIGITAL BASE OF DATES AND CLASSIFICATION PARAMETERS APPLICATION IN PRODUCTION RULES CREATION
The classificatory database should also include the classification in term of quality (*precision, surface properties…)*; what is in fact the list of the forging attributes serving as criteria of the customer requirements evaluation.
Parameters dispatching priority according to reevaluation process attributes can be realized by means of tools implemented in expert or database systems (*confidence variables, inference engine, SQL language…*).

Some attributes may even be in relative contra-indication (*high precise ↔ low cost, time consumption reduction*)

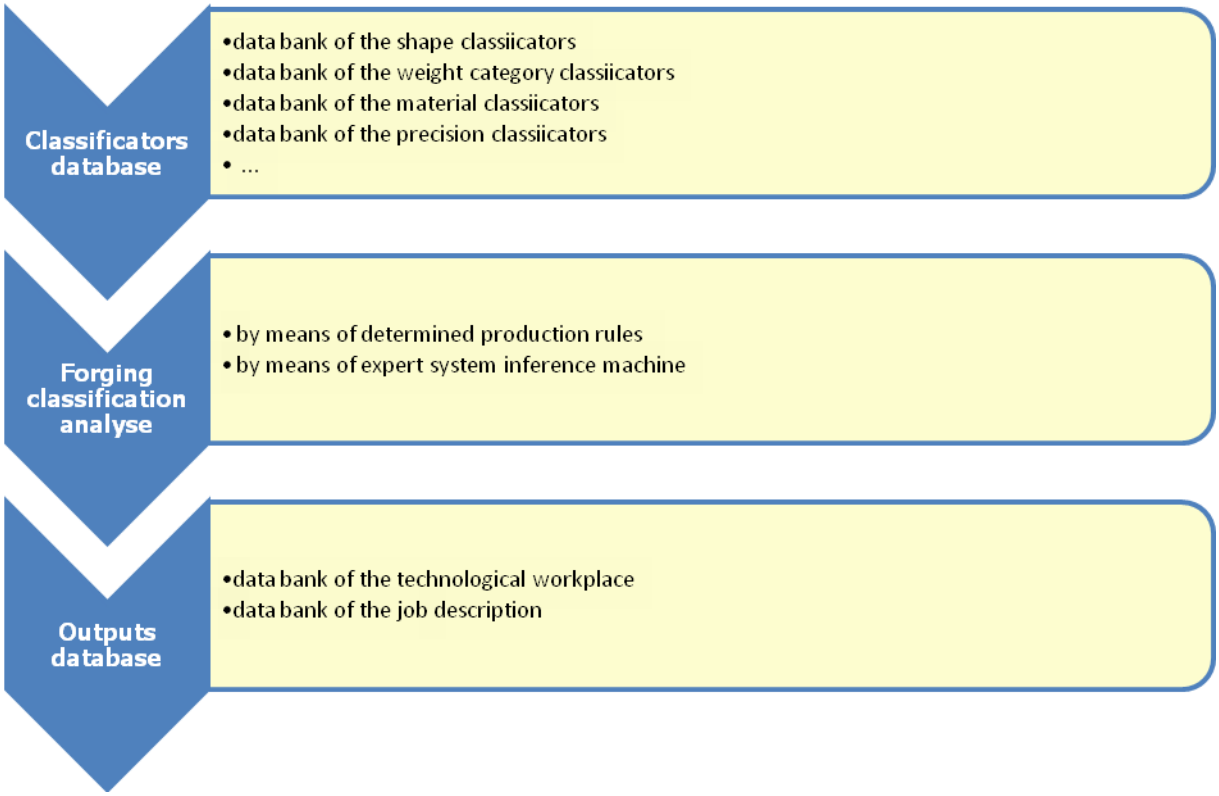

Figure 1. Information system structure of the optimatization of the suitable die forging technological workplace choice

Information system structure (Fig.1.) should consist of the adequate data that create the complex database of the forging potential properties. The next important block of the information system is analyzing module of the input data set from classificatory database (Fig.2, 3). That is solved through expert system by means of production rules set created on the basis of the digitizing concrete

Sort	Word description	Class	Word description	Schematic drawing
4	Circular shapes solid with straight axle	1	Components or semiproducts with constant cross-section	
4	Circular shapes solid with straight axle	2	Components or semiproducts of the cone shape	
4	Circular shapes solid with straight axle	3	Components or semiproducts single stepped	
4	Circular shapes solid with straight axle	4	Components or semiproducts double stepped	
4	Circular shapes solid with straight axle	5	Components or semiproducts stepped with cone	

Figure 2. Part of shape classification database

Classification code of forging weight	Characteristic of weight category
1	to 2 kg
2	above 2 kg to 8 kg
3	above 8 kg to 16 kg
4	above 16 kg to 25 kg
5	above 25 kg to 80 kg
6	above 80 kg to 250 kg
7	above 250 kg

Forging precision classification code	Forging precision characteristic
1	standard precision
2	upper precision
3	high accurate

Figure 3. Database of weight and precision description

production company accomplishment in combination with expert system's inference engine (Fig.4.). The analyze result can be generated in form of the proposals for optimal option of technological workplace and production method (Fig.5.).

The information system output is combination of before mentioned standard information (*obtained from EN, STN, ČSN, research knowledge*) and working conditions handling. Expert system production rules should be summarization of internal know-how and knowledge from relevant technical field, in this case die forging.

4. CONCLUSION

Meaningful information system (*database system and expert system*) in area of design respectively selection of optimal workplace for die forging process is conditional by creating of the complete working places and job methods digital database.

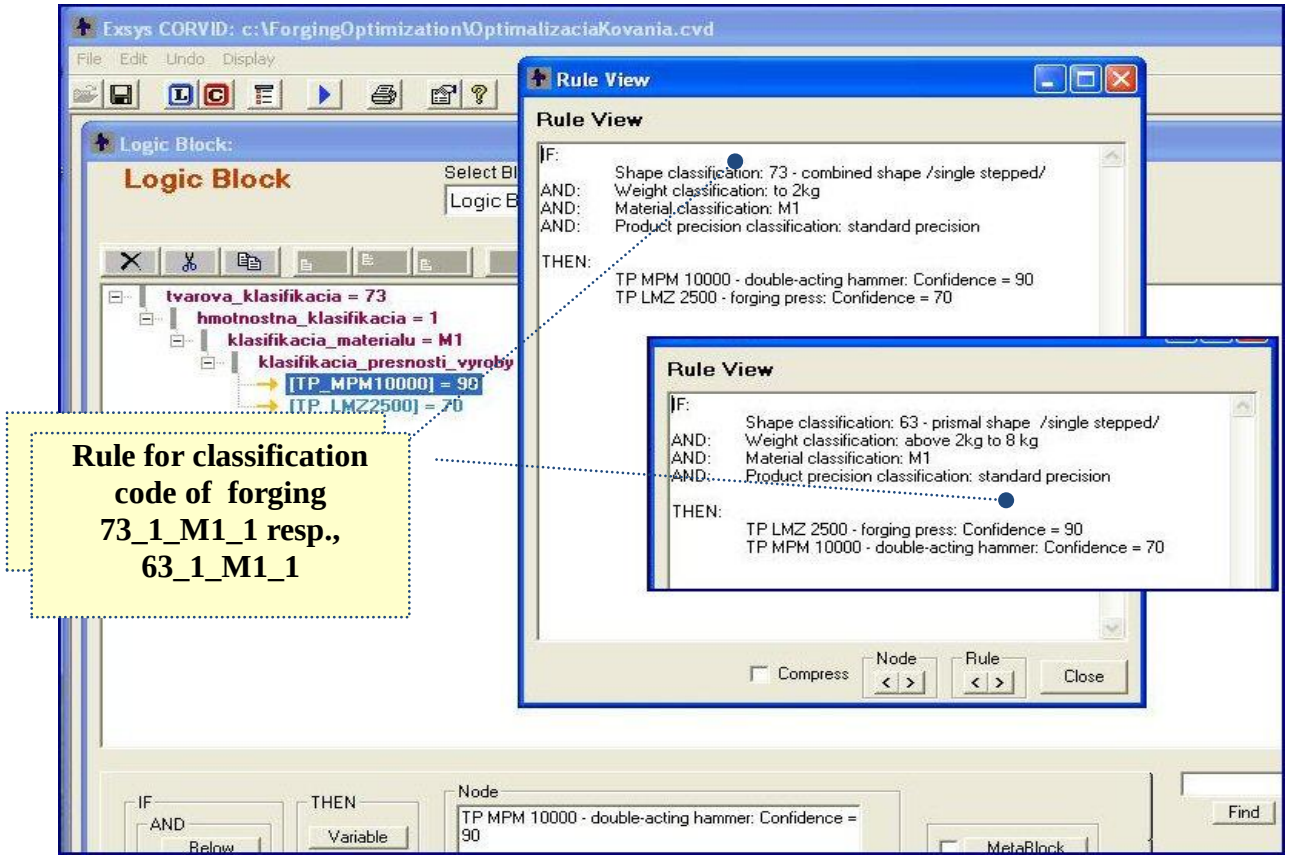

Figure 4. Production rules of working place determination examples

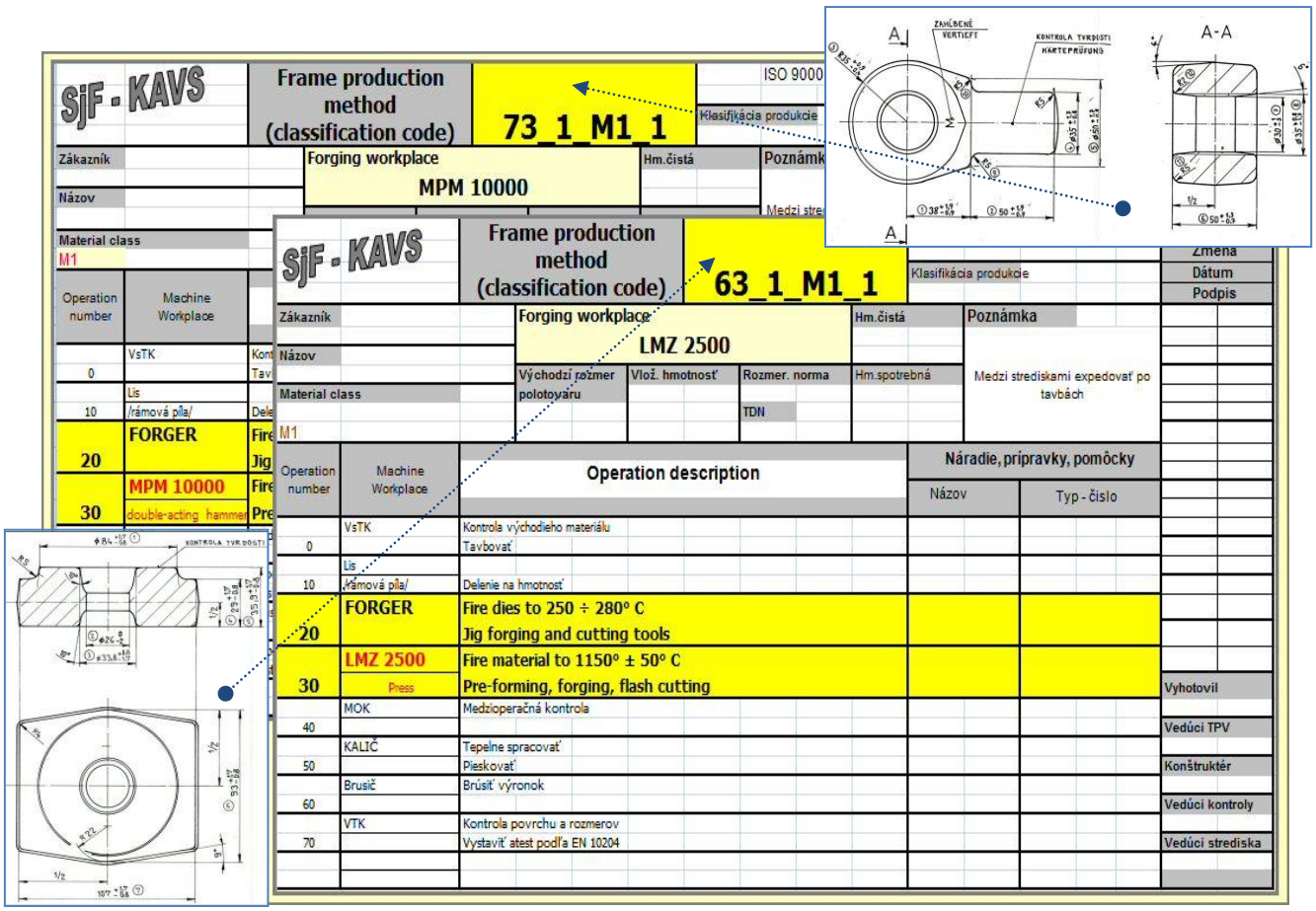

Figure 5. Example of suitable frame production methods related to forging's classification code

5. REFERENCES

[1] Elias, M.Awad (2003): Building knowledge automation expert systems.Universty of Virginia,

[2] Kostka, P.: Metal forming, Slovenská technická univerzita v Bratislave, Slovakia, ISBN 80-227 – 1801 - 7,

[3] Kuba, J.: View of automated technological production preparation with aspect on forging process, Academic journal of manufacturing engineering, Issue 2/2009, Editura Politehnica, Romania, ISSN 1583-7904,

[4] InfoWare 5/2013, DigitalVision, ISSN 1335-4787,

[5] EN 10243-1, ČSN 42 9030, ČSN 42 9002.

The article was created in frame of VEGA 1/0551/14