THE CRITERIA OF PARTS CLASSIFICATION WITH ASPECT TO COMPUTER SUPPORT IN TECHNOLOGICAL PRODUCTION PREPARATION AREA

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ABSTRACT
In this paper is described the classification of forgings and castings in comparison to classification of work-pieces produced by cutting processes. It analyses the question of parts dynamic sorting with computer assistance (database management). Sorting (grouping) of parts also depends on kind of job description (method of manufacturing). The determining fact is the sequence of operations or character of operations that are executable on one place of work so-called group operations (machine operations, forming operations, pouring operations, etc.). The parts classification should be count with the classification parameters vagueness. The brief view of this problem is also "component" of the paper.
Keywords: part classification, technologies comparison, group technology, computer support

1. CLASSIFICATION IN MACHINING
Group technology in machining is begun by grouping parts into families based on their attributes. Usually, these attributes are based on geometric or production process characteristics. Geometric classification of families is normally based on size and shape, while production process classification is based on the type, sequence and number of machining operations. The type of machining operation is determined by such things as the method of processing, the method of holding the part, the tooling and the cutting conditions of processing. The identification of a family of parts that has similarities permits the economies of scale normally associated with mass production to be applied to small-lot, batch production. Therefore, successful grouping of related parts into families is a key to implementation of the group technology philosophy in machining. There are at least three basic methods that can be used to form part families:
- visual classification,
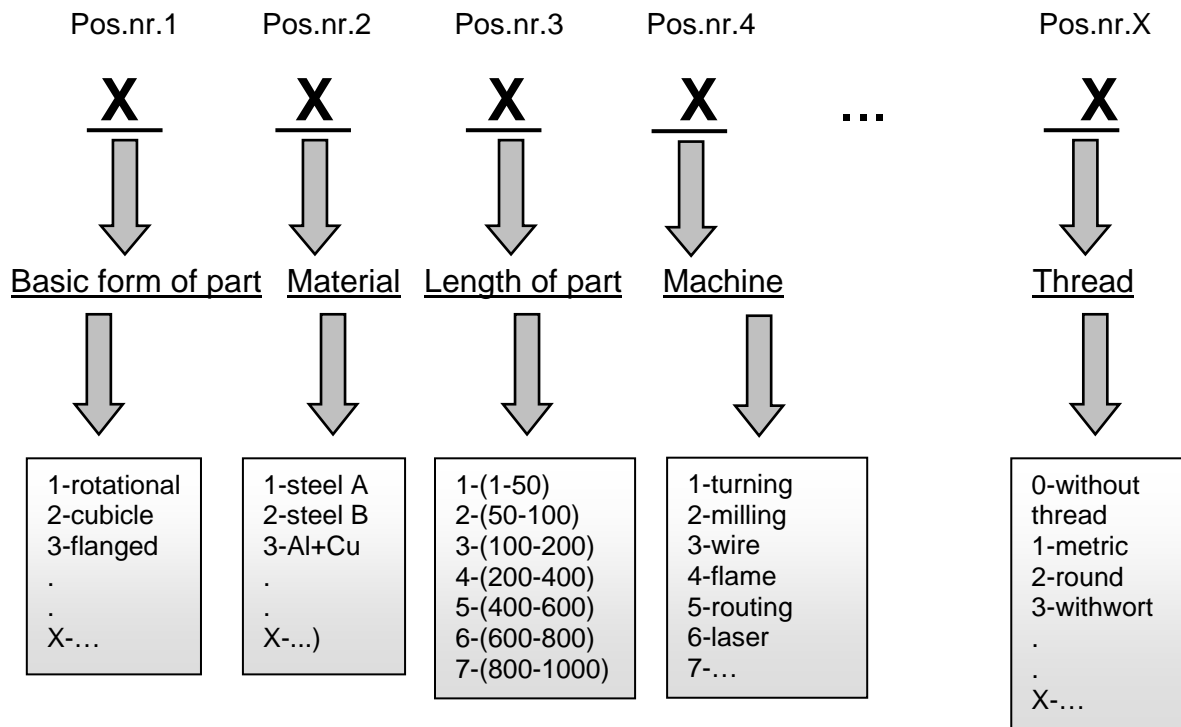- production flow analysis,
- coding and classification.

Figure 1. Common structure of classification system and GT code

The visual classification is based on visual comparing of components and parts' shape by engineer and subsequent classification of similar parts into a part family. This method is highly simple and fast but it leads to very inconsistent results because seldom two people will group a set of parts into the same families.

Production flow analysis is a structured technique developed for analysing the sequence of type operations that parts go through during fabrication. Parts that go through common operations are grouped into part families. Similarly, the machines used to perform these common operations may be grouped as a cell, consequently, this technique can be used in facility layout.

If the classification and coding technique is used, parts are examined and codes are assigned to each part based on the attributes of parts. These codes can then be sorted so that parts with similar codes are grouped as a part family. Because these codes are assigned in a manner that does not require much judgement, the part families developed by this technique do not suffer from judgement inconsistencies. A disadvantage of using the coding and classification technique is that a large amount of time may be required to develop and tailor a code to meet the needs of a specific company. Afterwards, coding the parts will take an even larger amount of time. However, when it is properly applied, the results are much better than when other techniques are used.

There are several reasons why so many coding systems have been developed. For example, the existing systems did not capture information that the developer though was important, the manner in which a code was developed was inconvenient, or the code was difficult to use. By the using of coding and classification a company has two basic alternatives:

- create its own coding system
- purchase an already existing system

The process of creation of resident coding system requires substantial effort and high level of developers' knowledge and this is the reason why so many enterprises purchase an already existing system, but then the enterprise must modify it to fit the particular needs of the firm. It is more advantageous, because the process of accommodating the coding system requires much less effort and shorter time period. In the definition process each company must consider the costs: for modification of purchased system, or for creation its own one.

2. DIFFERENCES OF APPROACHE TO CLASSIFICATION USING IN FRAME OF NON-MACHINING TECHNOLOGIES

In comparison to the machining, it is needed the different approach to classification of the part properties characterisation in forging or casting frame:

- segmentation characterisation:
  - ➢ relation of parts' volume to the volume of bounding box,
  - ➢ relation of parts' volume to the area of a part (important feature in term of heat transfer between dies /moulds/ and produced part).
- geometric properties (complexity characterization):
  - ➢ relation of dimensions (height to diameter, max. diameter to min. diameter, …),
  - ➢ thickness of walls, radiuses' dimensions, …,
  - ➢ number of dimensions (complexity measure), etc.,
- separation (dividing) plane of die block /mould/ position,

"Separation - dividing plane represents sharp contrast between workpiece on the one hand and forge piece /casting/ on the other hand, influence on choice of product equipment that can be horizontal one vertical forging press, moulding line for castings with horizontal and vertical dividing plane"

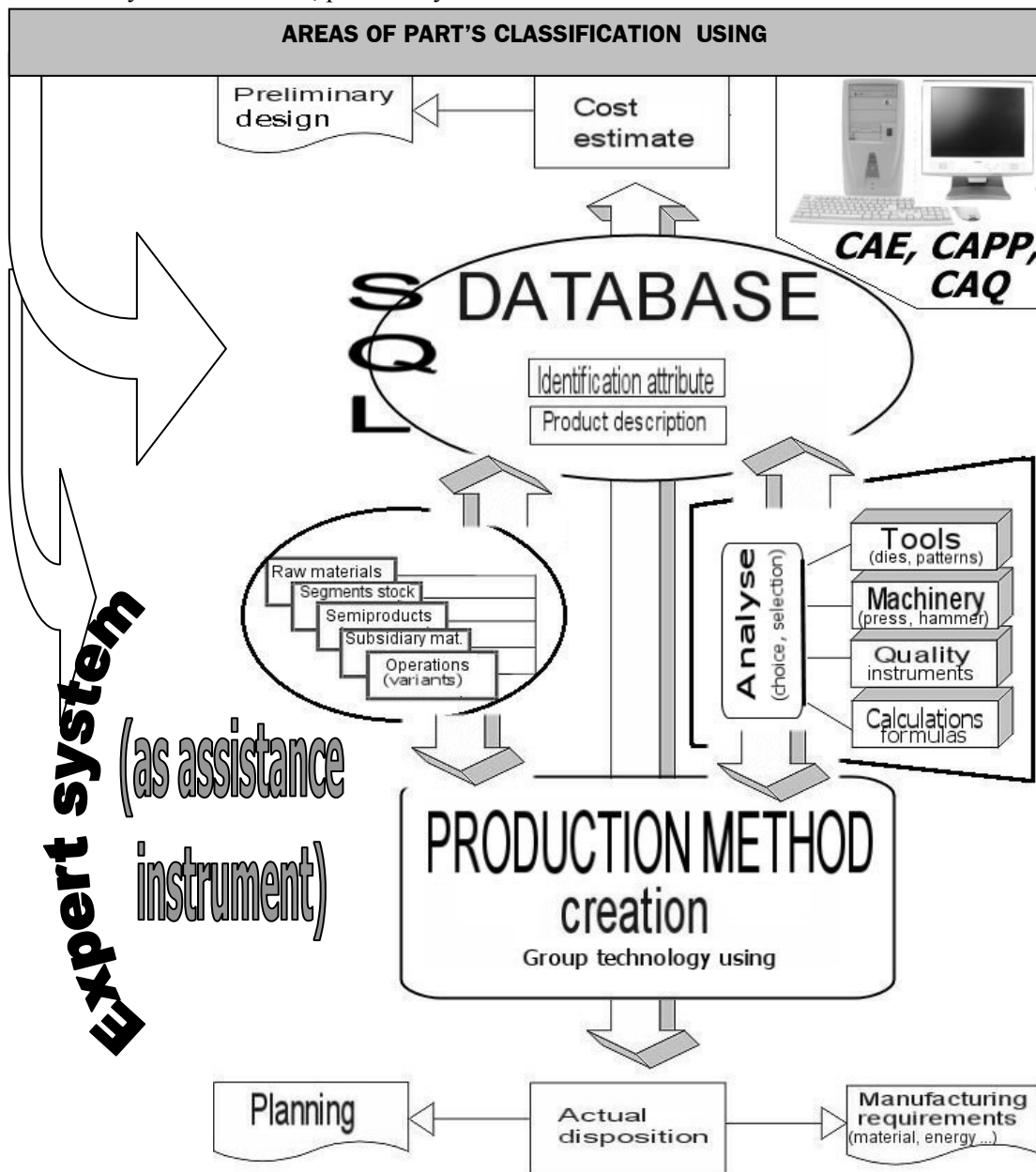- ability of deformation, pourability.

Figure 2. Classification in design process (part of computer support)

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3. GROUP TECHNOLOGY IN FORGING AND CASTING AREA

In analysis of the forging /casting/ process is needed to consider the fact of material flowing in cavity of die block /mould/. It is related to the specific material properties (plasticity, workability, running, etc.) and using of the specific engine plant - presses, hammers, forming and casting machine. The application principles of group technology using at the forging area or casting in competition to machining is difference from various aspects. The transformation of semiproduct to finally product is expressly different (for example the melt transformation into casting). In this area is very important the product largeness, dimensions' relationships of product produced by specific set of machines, tools and fixtures. The separation /dividing/ plane and its position are very important too. The classification of forging /casting/ parts can be used also at the production rules creation of expert system in frame of technologist thinking simulation area (with using of fuzzy approach e.g.).
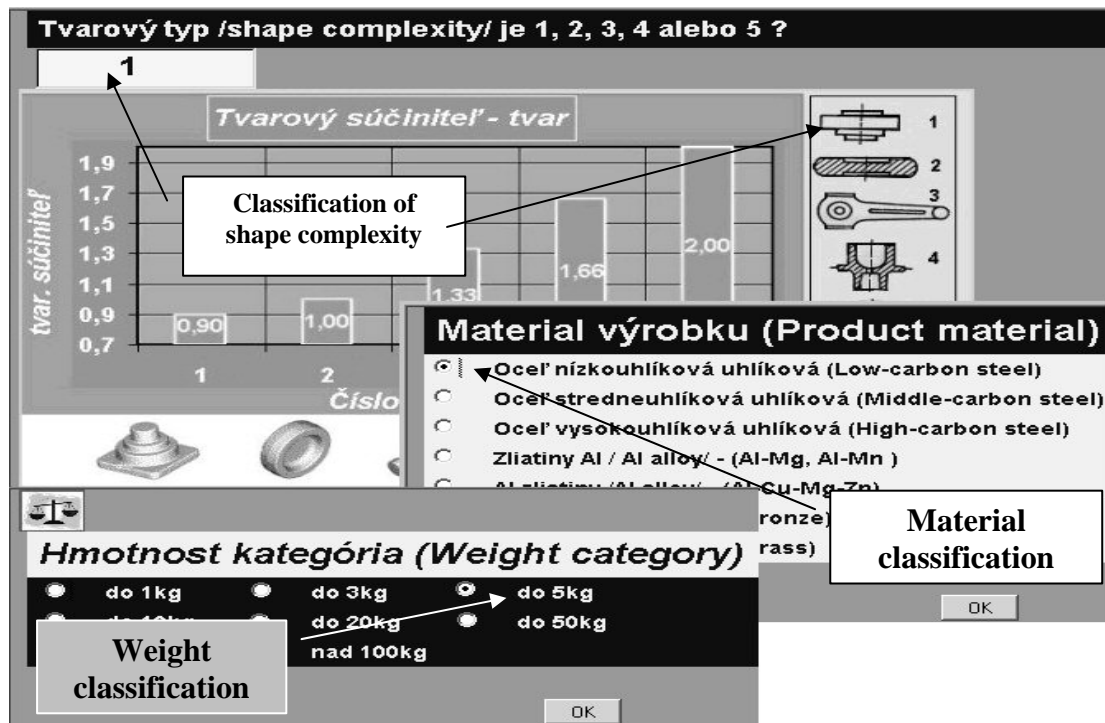

Figure 3. Example of interaction (user - expert system)

4. CONCLUSION

The maximal using of technological process standardization (group technology, e.g.) is contingent on suitable information database, which also enables the complex information management (data mining, SQL language and multidimensional databases using) in frame of computer support. It is important to underline of specific relatedness of forging and casting design process technological similarity according to walls' thickness, parts' transition radiuses, material flowing, etc. These parameters can fundamentally change production character in spite of common material using or simple shape class of product.

5. REFERENCES

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