THE DISASSEMBLY PROCESSES PLANNING
BY CAPP SYSTEM SYSKLASS

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Abstract: New product is only rarely represented by single part; prevailingly it is complex of functionally interacted parts realized by the assembling technology. The technology of assembling is not being adequately and complexly developing in the comparison with the research in other manufacturing areas. It is also required to put the same importance to the disassembling technologies. In paper are presented the possibilities of application of computer aided systems appears to be necessary in the field of modernization of technological preparation of production in assembling and disassembling technological areas.
Keywords: process planning, disassembly processes, CAPP systems

1. INTRODUCTION

At present time, the application of computer aided systems appears to be necessary in the field of modernization of technological preparation of production in assembling and disassembling technological areas. The options for application of various types of computer aided systems in the area of disassembling technology are analyzed in the frame of project. Concrete output of project solution will be represented by program system of computer aided process planning in the field of disassembling technology applicable to personal computers.

2. TECHNOLOGY OF ASSEMBLING AND DISASSEMBLING

Providing the assumptions for automated disassembling influences likes in assembling, efficiency of disassembling operations. Disassembling topic is in many points of view more complicated as assembling. It is necessary to take into account that disassembled products can be worn, corroded, damaged, their shape can be changed that all influence to organization and used techniques of disassembling. Automation of assembling and disassembling is most frequently ensured by two basic ways [1]:

- by exploitation of automated assembling and disassembling machine tools, which can be arranged to automatically controlled plants able to assemble or disassemble groups of products,
- by exploitation of flexible assembling or disassembling devices.

The relation between new product and conception of disassembling system is comparable to the relation between new product design and manufacturing system conception. But there exists the time delay between design of new product and completing its life cycle during which it is possible to develop disassembling techniques. Since present products are often not designed for easy disassembling, the costs of their disassembling will be high [7].

Weak aspect of disassembling is its high labor content. Current disassembling operations are mostly performed manually and only a few of them are performed by automation. Usually, large disassembling plants are very rare, for example such as car disassembling, require a lot of manual work, supported by handle manipulation with tools. This work is physically demanding, dirty and sometimes dangerous. Therefore, it is needed to create organized, efficient, highly mechanized and partially automated disassembling plants.

Complex automation of technological process planning is not possible without realization of computer aided process planning systems in the area of product's disassembly technology. In the frame of CIM (Computer Integrated Manufacturing), there is defined independent section - CAPP (Computer Aided Process Planning). It is possible to realize technological documentation for various technologies with the use of computer technique devices. Similarly, it is possible to design and realize program systems aimed to automated creation of technological documentation in the area of product disassembling that will contribute to their faster environmentally suitable liquidation [5].

3. COMPUTER AIDED PROCESS PLANNING IN DISASSEMBLY

One of the most installed software system in Slovakia, based on group technology principle, is variant Computer Aided Process Planning (CAPP) system SYSKLASS made by GTS Detva Company. Group technology is one of the source innovation theoretical principles. It is one of the important methodological elements of product and technology profiling of the manufacturing systems functional solution, of their control, etc. Theoretical concept of original group technology classifies it to the standardization methods. Original concept of group technology oriented its applications to low-series productions, and its main contribution was increasing the series of production [2].

System SYSKLASS is based on method, which uses the combination of graphics and data identification of produced items. This method enables automated classifying, respectively identifying of any produced item and next generating of most suitable technological documentation.

Base idea of this system is to realize any activity from constructional development, through constructional and technological preparation, to tools manufacturing in the manner that the system can provide the closest suitable typical or unified solution for each level in:

- construction drawing,
- specification of raw material,
- technology of production,
- documentation for fixtures and tools.

Updating system SYSKLASS means filling its valid (real) database by the data, which then create basic structure of this system. Solving the issue of database on general level should be very non-efficient with respect to the fact that disassembling similarly as assembling is manufacturing process including countless number of operations, activities and high variability of parts and tools for performing this activity. Most optimal solution for such modification of the system is performing the concrete disassembling activity of selected factory, which uses the system for creating and performing technological procedures. Such solved modification should have the result in performed detailed procedure and in quick creation of technological procedures and high level of system SYSKLASS application exploitation in factory.

Such filled database will not have its exploitation in creating the technological procedures in other factory or in change of the shape representatives of disassembling process, which shapes are different from other parts about more than 60%. The base and most used is disassembling of joints. It includes both disassembling of demountable joints as same as disassembling of un-demountable joints. First step in the design of joints disassembling technology is selection and classification of individual joint types. Basic division is to groups of demountable and un-demountable joints. Next division is shown in Fig. 1. Most used types of concrete sort of joints have been selected to every type of joint.

The following section is the classification of individual joints types. Classification of parts in mechanical engineering production brings defined order into production base of factory that improves and increases efficiency of technological production preparation. Classification of produced parts is decisive activity for exploitation of the group technology principles in the area of construction and technological documentation creation. It means creation of produced item model that sufficiently abstracts those item properties, whose are needed for identifying some component and for following identification of the technological

conditions for realization of its manufacturing. Main property influencing the criteria of exactness is geometrical shape [4].
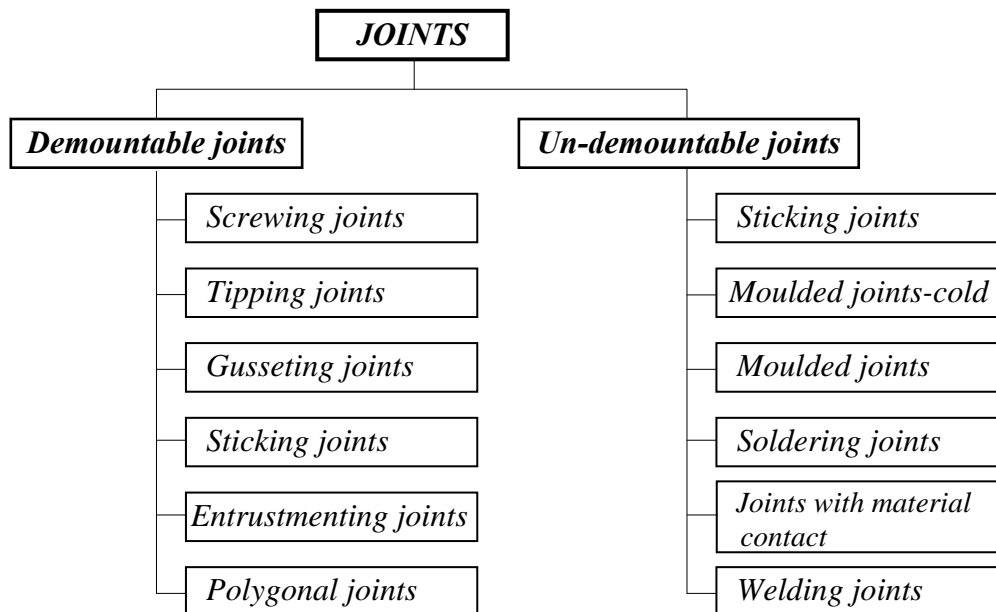

Fig. 1 Basic types of demountable and un-demountable joints

Classification is:

- shape classification,
- data classification,
- auxiliary technological data, enhanced classification.
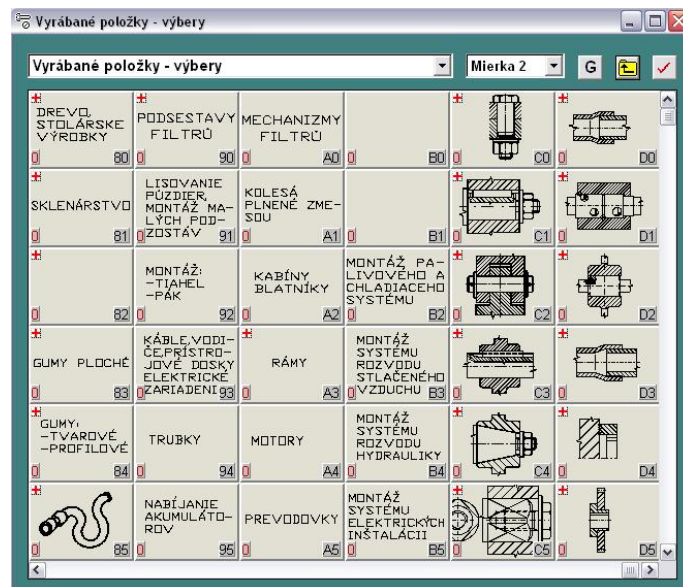

Fig. 2 First graphical level of classification system for demountable and un-demountable joints

Graphics classification system is the tool for shape classification of parts. Graphics classification system is divided to two levels. The purpose of shape classification is creation of digital model of produced item, which contains the properties needed for functional identification of some component and following for identification of technological-manufacturing conditions for disassembling realization. Individual shape properties of produced or disassembled items are interpreted by adequate shape characteristics.

GRAFKLAS program is adapted for real creation of shape representatives for disassembling process, in which the picture becomes the member of graphics matrix immediately after its creation. After ending the creation or editing the picture, the picture immediately becomes to be a part of graphics matrix. After ending the creation or editing the picture, it is automatically saved in selected position in graphics matrix.

Internal editor serves for sketching pictorial representatives, which enables to sketch the picture in two color levels:

- Sections of pictures that will be visible in showing the graphics matrix also in zoom mode are sketched into the first level.
- Sections of pictures that will not be visible in showing the graphics matrix are sketched into the second level. This way will improve readability and transparency of pictures.

The example of created first graphical level of classification system for demountable and un-demountable joints in system Sysklass is on Fig. 2, second graphical level of classification system for demountable screwing joints is on Fig. 3.
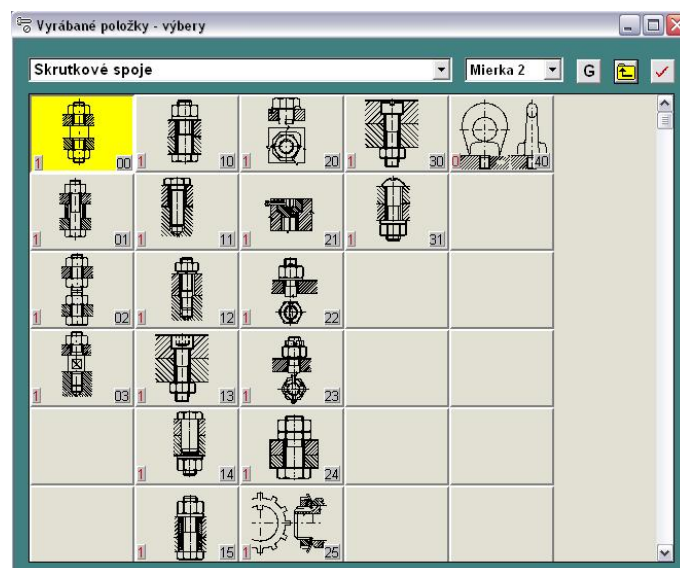

Fig. 3 Second graphical level of classification system for demountable screwing joints

Next part is creation of technological documentation for individual joint types. Technological documentation contains all necessary information about the way of production and workplaces, where the individual operations are performed, as also as defined economical markers. Output is represented by technological procedures, which serve as a base for performing individual activities on workplace. Creation of technological documentation is performed in work database under subsystem SYSTEP and can be divided into four points: head of operation, technological procedure, output standard, used standard and special TVV objects.

4. CONCLUSION

Engaging SYSKLASS system to factory preproduction phases is not single-step activity. It is longtime process starting with the analysis of production base (production profile) of the factory and finishing by debugging the system with respect to the requirements of service stuff. SYSKLASS can be classified as a learning system. It absorbs lifetime experiences of factory workers (know how), which can be used also by other less experienced workers [5].

5. LITERATURE

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