VIEW AND COMPARISON OF THE USE OF CAX SYSTEMS FOR MACHINING AND NON- MACHINING PROCESSES

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Annotation: *The paper analysis the problem of chipless technologies (especially forming and casting) from aspect of putting of computer technique. It refers to differences in area of forming and casting in comparison to chip technologies. The aim of article is to hint to the possibility of the use of group technology in this area, and in detail solves the determining of shape coefficient in area of die forging*

1 THE COMPARISON OF CHIPLESS TECHNOLOGIES AND MACHINING FOR SCOPE OF THE USE OF CAX SYSTEMS.

The general chart CAx systems application is practically alike for all manufacture processes independent of type technologies. But it's important to take into consideration the different characteristics of the compared processes.

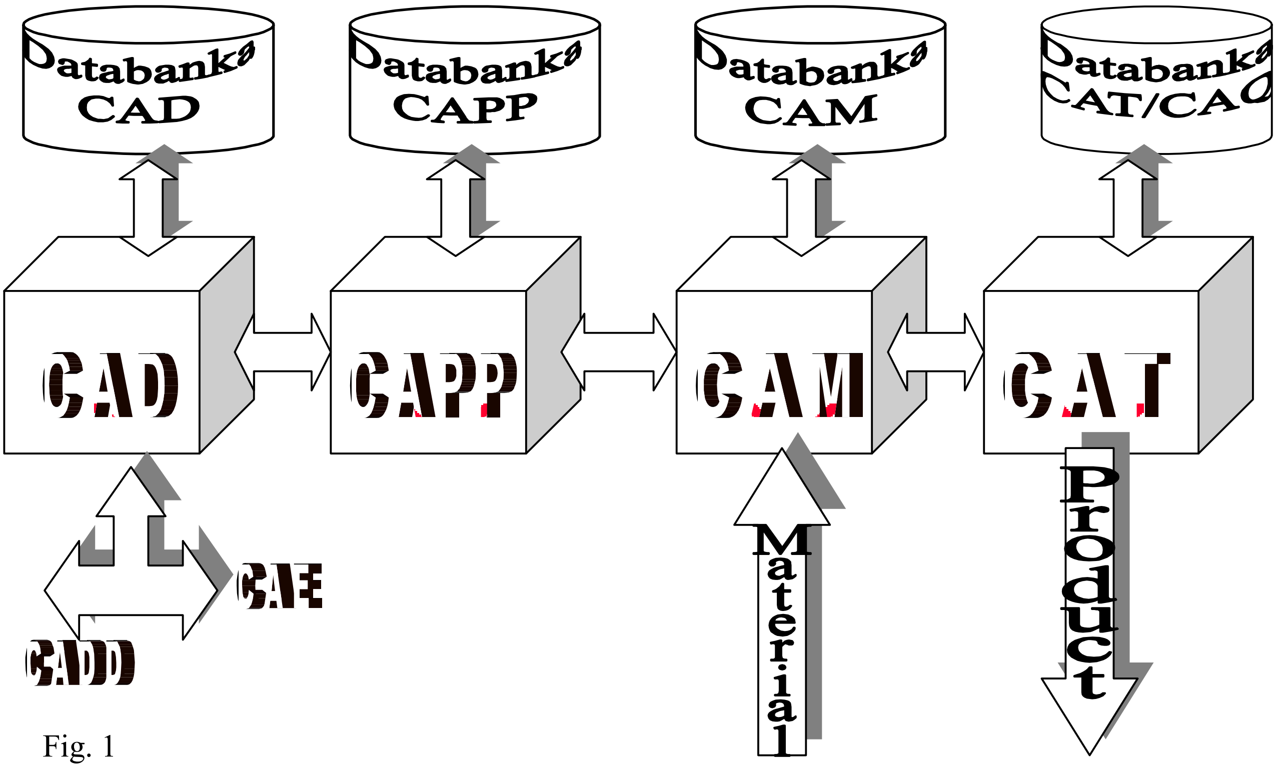

Fig. 1

Machining:

Tool trajectory = F (surface curve finish workpiece)

Reciprocal: Shape of workpiece = F (Tool trajectory)

Working, casting:

Shape of forging, casting = F (Tool shape)
Reciprocal: Tool shape = F (Shape of forging, casting)

1.1 CAD

It would has been, respectively to become minimum standard into resolution of production stage.
In area of construction it isn't manifest contrast in conception application between chipless technologies and machining (The problem can be at circumscription of reducing areas for their complexity, where by chipless technologies it is possible to gain the complex shapes, extra into moulding and casting. It is given by state material within manufacture operation. It is plastic or liquid state of material).
Additional components are module for simulation behaviour fabrication; visualisation and verification of process (CAE) that solve e.g. problem of collision of tool and workpiece, collision of tool and jig. At chipless technologies it is mainly prediction of potential failures – cracks, which are initiated big caloric gradient (must be emplacement chills), shrink holes caused bad position of riser, folds at forging caused false flowing material into die (necessary alteration of drafts or reducing radius).
Systems of simulation of technological operation are in area chipless technologies on relatively high level (AUTOFORGE, FORGE 2D and 3D, Magma, Simtec).

1.2 Mainly features of the use of simulation software in working and casting

- Application simulation software for 3D problems henceforth hasn't broad scope into industrial practice on account of big cost existent software, necessity long computational date of solving problems (hours or days for receiving final result [1]) unlike axial balanced problems where's sufficient 2D simulation of technological operation
- Henceforth it is necessary to use for choice of parameters of process knowledge, which are obtained by experience
- Demand embedding true entrance information
- To consider weather tool to regard as perfectly solid body and to neglect elastic-plastic deformations on dividing line tool – product / these deformations have influence on life of tools for low-cycle fatigue of tool material /
- To accomplish corrections of tools and process to follow results simulation
- Necessity to execute benchmark of tool designed in accordance with simulation operation

1.3 The effect of the use of simulation systems:

- Optimalization of tool design and technological process
- Reduction number of necessary operations
- Reduction number of wasters and material losses
- Prediction parameters of process (force, energy, time of teeming etc.)
- Prediction deformation of tool
- Prediction tool life
- Prediction quantity of material consumption (optimal dimensions of flash or riser)
- Prediction failures (folds, cracks, shrink holes)
- Prediction influence of friction on material flowing in die or mould
- Prediction of internal stress

In ambition acquire time and price effective using of simulation of manufacture process, it is possible to neglect non essential geometric parameters, that haven't cardinal influence on material flowing, e.g. small radius into dies [2], respectively to neglect "REMESHING". It certainly lows quality results of simulation process.

1.4 CAPP

Mainly contribution would had be into effective solving problems, that are emplacement in front of technician, who is designing production process. CAPP application should facilitate, minimise routine actions and optimize the work of technician. Aim is to decrease work time of TPP.

In area of TgPP (technological production preparation) is contrast between chipless technology and machining caused by different way of change intermediate product to final component and by different influence of component shape on process parameters.

Machining: At different shape it is different number of operations (with increasing complexity of component shape increase number of operations)

Number of operations = F (shape of detail)

Working: Different shape hasn't to change number of operation, but it can to change size of energy, force and another parameters of forging.

Energy, force = F (shape of detail)

Casting shape complexity affects at example time of teeming or design class of pattern equipment etc.

Calorific gradient, casting module … = F (shape of detail)

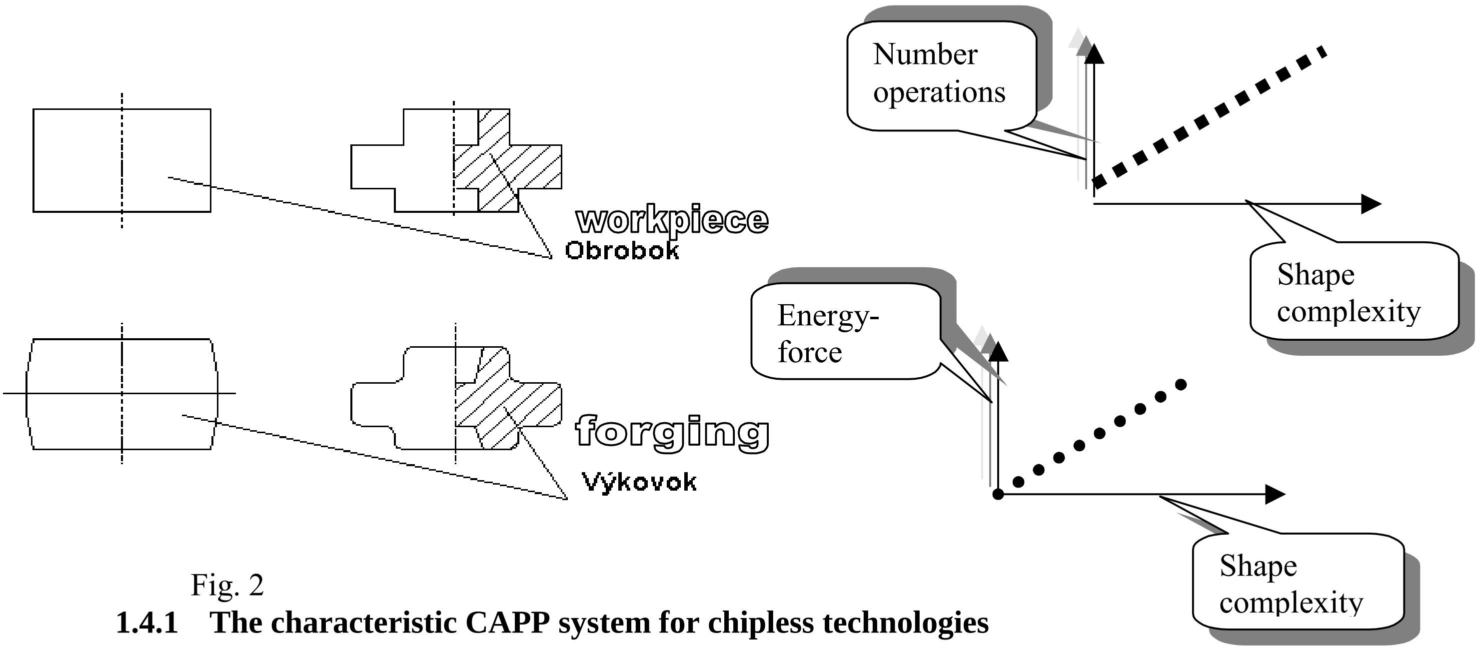

Fig. 2

1.4.1 The characteristic CAPP system for chipless technologies

Way of the use: → interactive

Maximum using of human potential (experiences) in co-operation with computer technique:

- speed
- elimination routine calculations
- displaying not only unambiguous result for concrete input date , but to offer graphic representation of results in definite limitation interval of parameters for better orientation of technician
- exploitation system warn signals at incorrect input or output dates

Database: → open

- date describing material properties
- base of product components
- base of machines, etc.

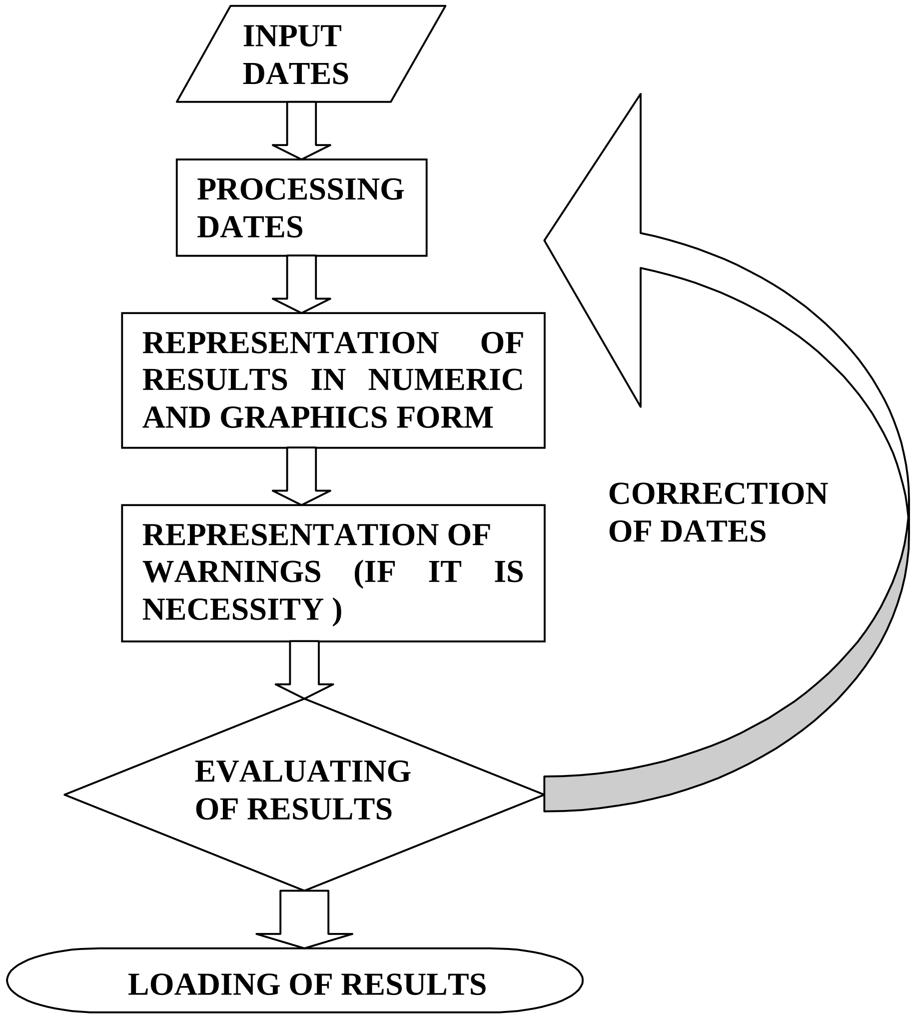

Fig. 3

1.5 CAM

Degree of putting this system is in area of chipless technologies relatively lowly, about high measure putting it can be spoken practically only case of flat forming
Data and programme preparation (POSTPROCESSORING) for automated fabrication in chipless technologies is emplacement on others base and on the ground of already recollect difference of dependence of shape detail and tool shape.
Systems several have created libraries of postprocessors for the most using control systems.

1.6 CAT, CAQ

In area of gauging is not contrast in concept application, it is more dominant quantity application. General effort is in the present the use of statistical analysis processes:

- designation regulation bound operation
- evaluate diffusion gauging celebrity
- assignment value of stability process indicator
- acquirement certificate VDA 6.1 for motor industry

2 THE EXPLOITATION GROUP TECHNOLOGY IN CHIPLESS TECHNOLOGIES

General importance is equivalent other technologies. It is mainly acceleration of work in TgPP, elimination "Creating already creating", and detection similar details from product database of corporation.

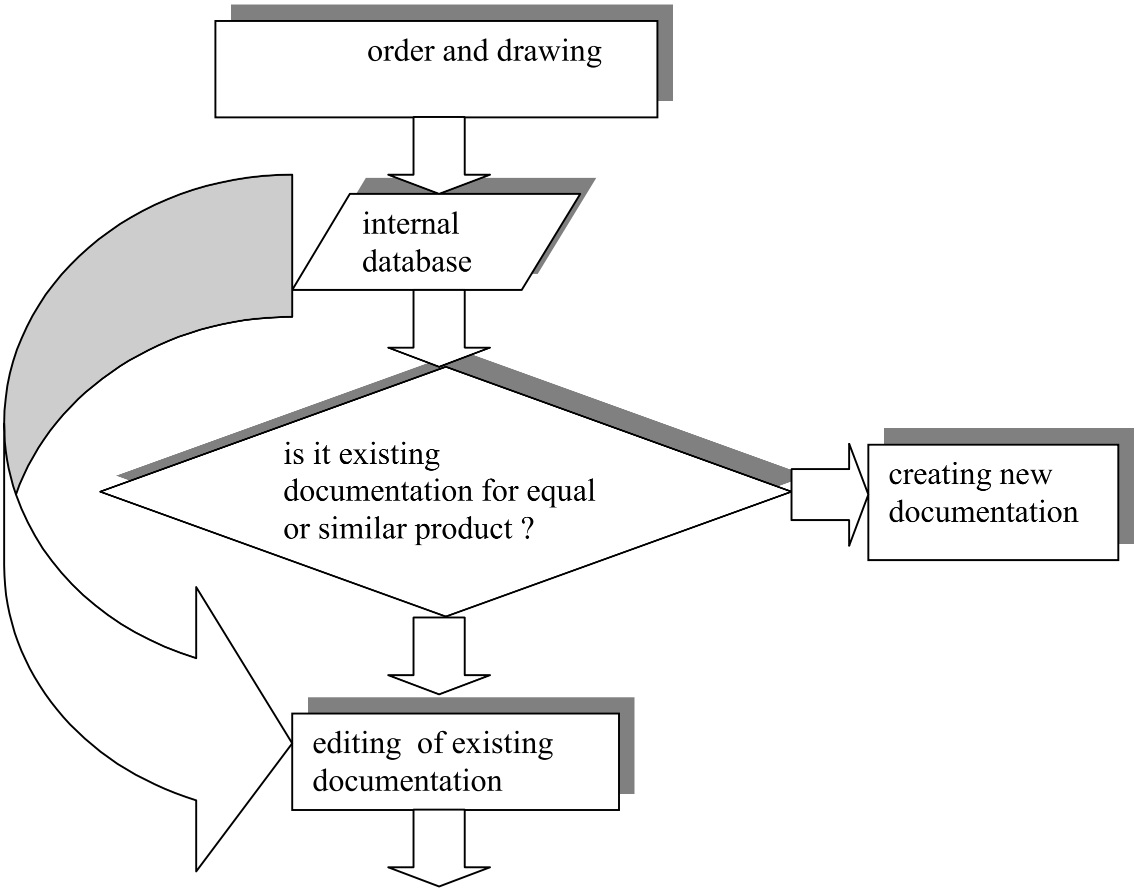

Fig. 4

For description of forging and casting is possible to use more-places classification code, which signs components according to:

- weight
- material
- shape
- precision

…

In further will be analysed the determination of shape coefficient of forging and corrections force and energy parameters of forging process:

- Accomplishment shape code of forging to numeric form (natural number)
- Optimalization functional expressing of dependence change of shape complexity coefficient on shape complexity of forging

- Realisation of calculations of shape complexity coefficient at the hand of computational techniques (Creating optimal procedures for object program coding)
- Including calculations into created information system (Creating graphic superstructure execution calculations)
- Correction energy and force parameters by shape complexity coefficient

The classification code (XX_{DT} X_S X_P X_T) accordance STN 42 9002:
XX_{DT} – sort and class
X_S - group
X_P - subgroup
X_T – technological aspect

The determination functional expressing dependence of shape complexity coefficient on shape complexity:

Shape complexity coefficient = F (shape complexity)

Shape complexity coefficient = F [f_1(XXdt); f_2($X_S X_P X_T$)]

Force, energy = F (shape complexity coefficient...)

At castings it is can be apply exploitation classification cod associated to determination of design class of pattern equipment:

Design class of pattern equipment = F (shape complexity, precision...)

In conclusion maybe to state, that it is necessity to devote attention for exploitation computer support in area of chipless technologies and group technology in order to eliminate behind after machining.

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