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The automation of analysis of technological process effectiveness

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Cleaner production

ABSTRACT

Purpose: Improvement of technological processes by the use of technological efficiency analysis can create basis of their optimization. Informatization and computerization of wider and wider scope of activity is one of the most important current development trends of an enterprise.

Design/methodology/approach: Indicators appointment makes it possible to evaluate the process efficiency, which can constitute an optimization basis of particular operation. Model of technological efficiency analysis is based on particular efficiency indicators that characterize operation, taking into account following criteria: operation – material, operation – machine, operation – human, operation – technological parameters.

Findings: From the qualitative and correctness of choose of technology point of view comprehensive technological processes assessment makes up the basis of technological efficiency analysis. Results of technological efficiency analysis of technological process of prove that the chosen model of technological efficiency analysis makes it possible to improve the process continuously by the technological analysis, and application of computer assistance makes it possible to automate the process of efficiency analysis, and finally controlled improvement of technological processes.

Practical implications: For the sake of complexity of technological efficiency analysis one has created an AEPT computer analysis from which result: operation efficiency indicators with distinguished indicators with minimal acceptable values, values of efficiency of the applied samples, value of technological process efficiency.

Originality/value: The created computer analysis of ef technological process efficiency (AEPT) makes it possible to automate the process of analysis and optimization.

Keywords: Production planning and control; Technological efficiency; Technological process; Optimization

1. Introduction

Important aspect of factory development is continuous and systematic analysis of production process, namely technological process. Each enterprise, that wants to exist on the market must be competitive, and the product it is producing must be perceived as competitive in comparison with other of this type, so that it will draw the attention of a potential customer, and after buying it he should be satisfied enough and through this won't look for replacement by the competition. In order to fulfil expectation of a customer, and at the same time bring profits, an enterprise has to produce product of high quality, by a good price, in the possible shortest time. To reach this stand one has to aim at improvement of production conditions so that the technological process will be possibly the most optimal and effective one. Optimization can be gained by continuous process control and its estimation. Information that are collected in this way allow to select production parameters, get a product, that will meet the customers and company management expectations [1-5,9,11-12,14-17].

2. Methodology of research

The technological effectiveness analysis one can use particle determinants of effectiveness that characterize an operation taking into account following criteria: operation – material, operation – machine, operation – a man, operation – technological parameters (fig.1). In such a way conducted analysis shows the influence of particular criterion on the process effectiveness and determines the optimization direction [8,12-16].

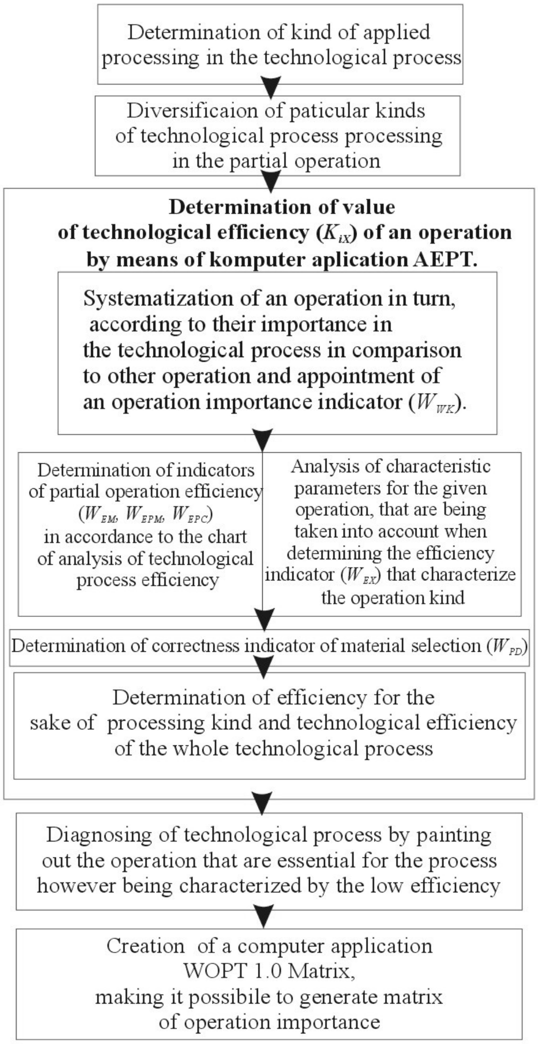

Fig. 1. Stages of technological process analysis

Measuring the efficiency of technological process one has to determine value of technological efficiency indicator (K_{iX}) of an operation, by evaluating indicators of partial efficiency (fig.1) (table 1) [6].

Table 1.
Indicators of partial efficiency

(W_{PD})	correctness of material selection,
(W_{EM}),	efficiency of material
(W_{EPM})	efficiency of machinery work
(W_{EPC})	efficiency of humans work
(W_{EX})	efficiency that determine the kind of an operation during processing

Then we can determine the efficiency for the sake of kind of applied processing and technological efficiency of the whole technological process (E_{PT}).

2.1. Automatization of analysis of efficiency

The algorithm of AETP of data introduction is consistent with the model of technological efficiency determination (fig.2) [6,7].

3. The matrix of operation importance in the technological process (Matrix WOPT 1.0)

Taking into account the model of analysis of technological efficiency (fig. 1), and especially the step, in which matrix of operation importance in the technological process has to be built, one has created a computer application matrix WOPT 1.0.

Determination of indicator of operation importance (Wwk) is an inherent element of analysis model of technological efficiency concerning the technological process. Indicator of operation importance (Wwk) was created on the basis of operation importance matrix. Building of matrix allow us to determine importance of particular operation, is based on determination of significance of the analyzed operation (Krz), that is determined in relation to other operation [6,7,13].

Calculation of value of operation importance (K_{rz}) is being realized by establishment of importance of the analyzed operation with reference to all operation that occur in the technological process (table 2).

Table 2.
Determination of indicator K_{rz}

K_{rz}= 1	when the analyzed operation is more important as the comparable one – it gets the value of is written down in matrix
K_{rz}= 0,5	if the importance of comparable operation for the technological process is equal
K_{rz}=0,75	if the importance of the analyzed operation is higher than the comparable one, however the comparable operation has a determined meaning

Matrix WOPT 1.0. program allow to generate in a quick way matrix of operation importance, that is taking place in following stages (fig.3).

The program allow also to copy the content of matrix to other computer applications, besides in “matrix of operation importance menu” exist such a possibility to edit the basic matrix of operation importance, what follows changing of operation names and also change of weight importance.

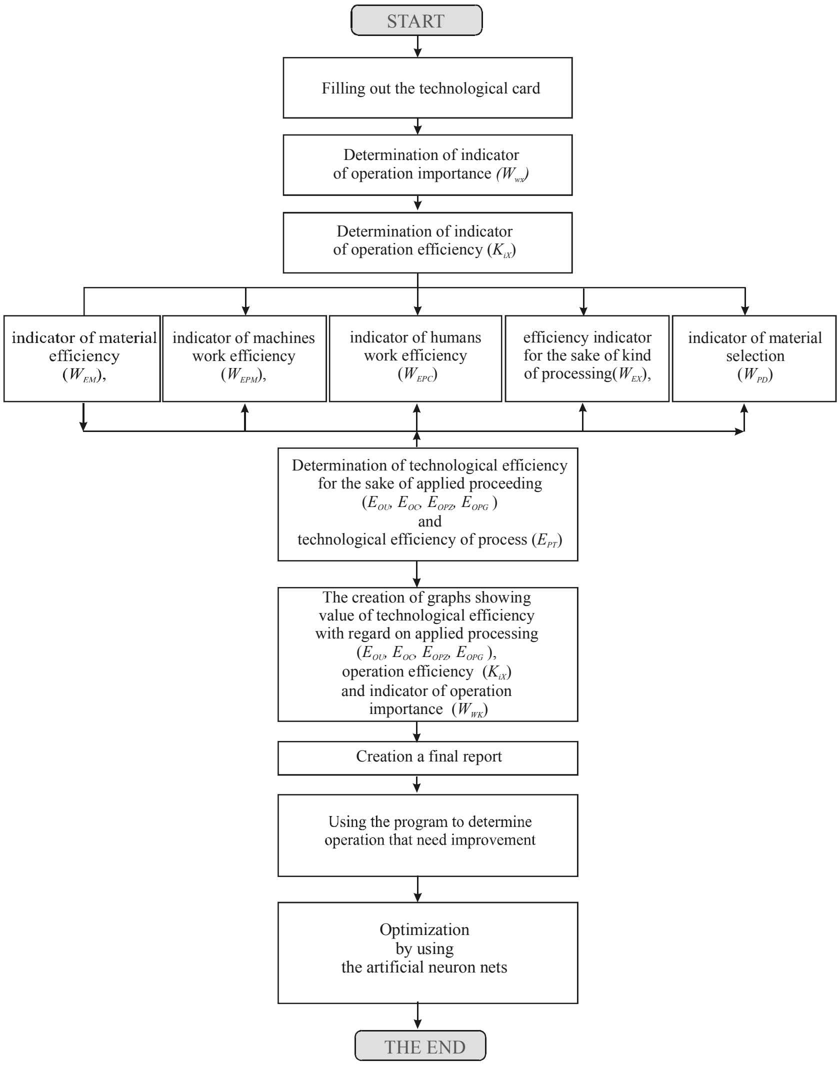

Fig. 2. Algorithm of proceedings by conducting the analysis of technological process efficiency by the use of computer application (AEPT) [6]

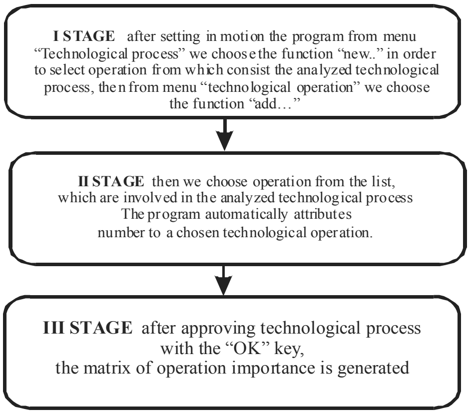

Fig. 3. Determination of matrix of operation importance by WOPT 1.0

4. Conclusions

The part of production process connected with the form, dimensions, surface quality and physicochemical properties of the processed object change, is technological process. Structure of the production process in technological depiction is being defined as system of phases and technological operation together with material, energy and informative connections that are necessary to produce the final product. Activities involved in the technological process has a significant meaning for the production and are a subject of special researches in order to improve them. The right study of technological processes and their realization in particular production departments significantly influence: quantity, quality, time and costs of plan production and as well in unit and small mass production, as in big-mass and massive production [5,9-11].

Method of computer application makes it possible to point out the studied indicators and asses finally the process efficiency in order to plan optimization of particular operation [1-4].

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