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MANAGEMENT QUALITY AUTOMATION IN FMS

To provide the quality of products is one of the main problems at modern flexible manufacture, for example, the mechanic processing production. The set quality indicators are conditioned by such factors as the product quality, the quality of work and service, the requirements of high level and tough competition.

The classic interpretation of quality management implies forming special approaches to the management of an organization or enterprise. These approaches are focused on the product quality and are based on the participation of all employees in the activities targeted to achieve success. It can be done by satisfying the customers' demands, getting profit by the enterprise and providing society with the benefit.

The quality is a complex notion according to the standard ISO 9001. It combines a set of different product properties. These properties condition the product intended usage and quality management at the stage of production. Taking into account all the mentioned above, the quality management can be considered as a process directed to achieve the set quality indicators, e.g., reliability, workability, safety and others. It takes place at performing some technological operations. Making technical decision is also of great significance. This decision is made to detect the causes which lead to the quality indexes deviation from the set ones and to correct them. The automation of this process can be considered as making such decision. (Fig. 1).

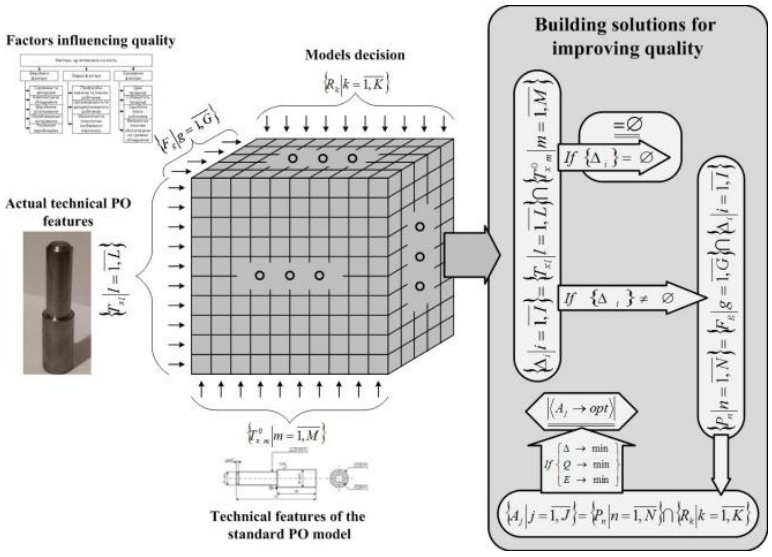

Fig.1. The graphical interpretation of quality management at the stage of production

It is easy to see, that the set quality indicators of the production object (PO) can be provided at the stage of production in mechanic processing FMS with reliability, workability and safety. It is recommended to influence such technical features of PO as placement deviations, the deviations from rectilinear position and cylindricity, longitude

section profile deviation, the deviations from roundness, roughness deviations and strength properties.

The comparison of the multiplicity of set technical features of the standard PO model to the multiplicity of the actual technical PO features has to be performed at the process of the automated control of the quality decision making. If there is no correspondence of the actual PO technical features with the set ones, it is possible to create the possible deviation multiplicity of technical features, which can cause the PO quality decrease.

$$\Delta_i \; i = 1, I \;\; = \;\; T_{x_l} \; l = 1, L \;\; \cap \;\; T^0_{x\,m} \; m = 1, M \qquad (1)$$

If there is a deviation, the quality decrease in whole takes place and it is important to detect the factors which have caused this. In such case the possible causes have to be analyzed. Therefore, the comparison of the deviation multiplicity to the factors of influence multiplicity is recommended:

$$P_n \; n = 1, N \;\; = \;\; \begin{matrix} \Delta_i \; i = 1, I \;\; \cap \;\; F_g \; g = 1, G \;\; ,якщо \;\; \Delta_i \;\; \neq \emptyset \\ 0, якщо \;\; \Delta_i \;\; = \emptyset \end{matrix} \qquad (2)$$

The PO quality decision-making implies finding the multiplicity of separate solutions which influence PO quality much and are recommended to implement:

$$A_j \; j = 1, J \;\; = \;\; P_n \; n = 1, N \;\; \cap \;\; R_k \; k = 1, K \qquad (3)$$

The final decision making can be implemented as ranging of the solution multiplicity, if the optimality conditions are the same as in (3):

$$A_j \to opt \;\; ,якщо \;\; \begin{matrix} \Delta \to min \\ Q \to max \\ E \to min \end{matrix} \qquad (4)$$

where: Δ - is the deviation of real technical PO feature values; Q - is the efficiency of PO production; E - are the financial and economic costs related to the elimination of the causes leading to the quality decrease.

The decision support system (DSS) is recommended for the practical implementation. It is a complex of interactive modules and the corresponding quality management stages (Fig.2) are distributed among them. The interaction of the modules is performed on the basis of the production rules and DSS functioning is done by using QFD methodology. It is a flexible method of decision making which allows performing the grounded PO quality control and is used by the authors at the stage of the determination the significance of the PO technical features.

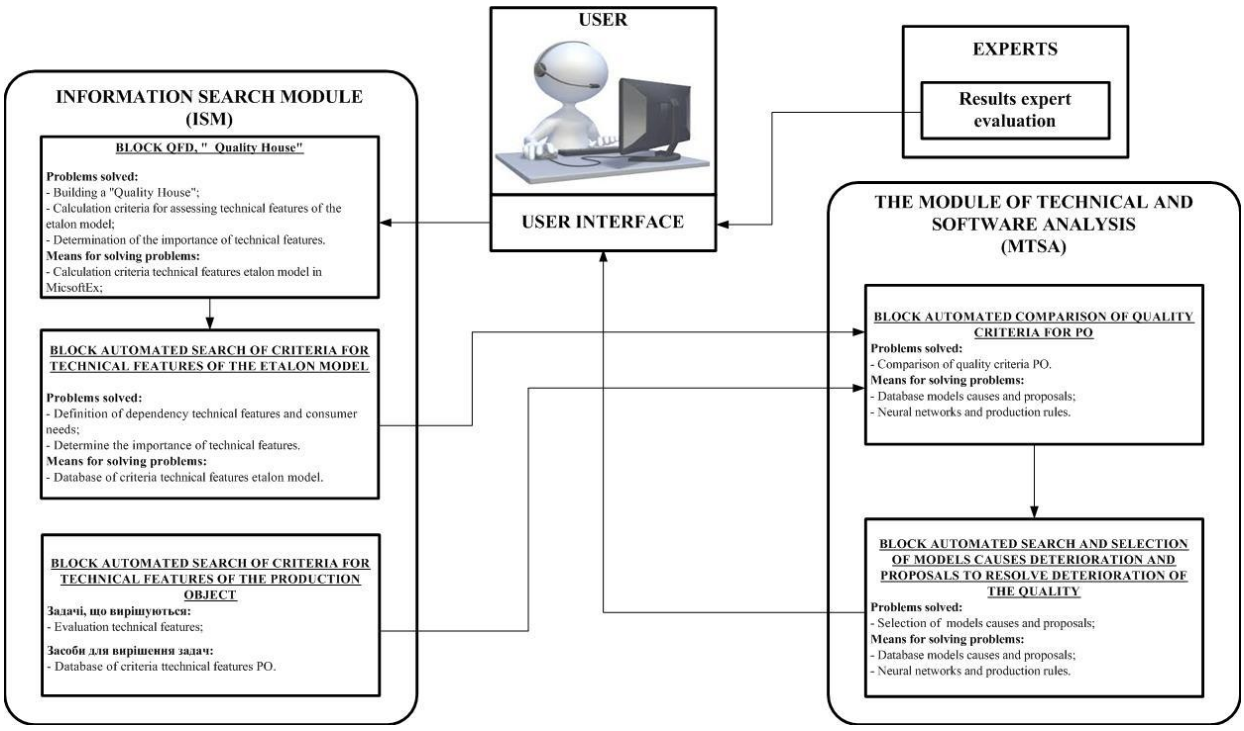

Fig. 2. The DSS structure for the automation of PO quality control at the stage of production.

DSS consists of the information search module (ISM) , the module of technical and software analysis (MTSA) and the user interface. The operations are executed in the modules as in the expressions (1) – (4). The MTSA consists of the indicator comparison unit, the determination of deviations of the production objects quality, the unit of search and selection the models of the causes of the quality decrease and the propositions as to the improvements to solve the task of comparison of PO quality criteria by the expressions (1), (2) and to find the models of causes and propositions by the expressions (3), (4).

Thus, the DSS is designed as an interactive automated system or software complex used to assist and support decisions of the quality control at the stage of production. It provides the grounded and objective analysis of the PO technical features which influence the quality indicators and shows the ways to improve them in complex production conditions.

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