Production process improvement of manufacture by generation efficient control-and-measuring tool's kit

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Abstract. Machine building manufactories ensures competitiveness if they use innovation methods of their organization. Authors of article proposed innovation methods of preproduction engineering based on control-and-measuring procedures complex. Complex of control-and-measuring procedures is implemented by system of computer-aided planning multiproduct technologic process (SCAPMTP). SCAPMTP was created by D.Sc. (Engineering), Professor Bochkarev P. Yu. Subsystem of the generation of the reasonable control-and-measuring kit procedure is one of the main parts of the control-and-measuring procedures complex. This subsystem allowed cutting time for technological process details manufacturing.

1. Introduction
Key aspect of development machining production is intellectual technology process details manufacturing. Automatized of the preproduction plantings is main direction to intellectualization for manufacture. System of computer-aided planning multiproduct technologic process [1] developed for updating technological processes details manufacturing. Basic advantages of SCAPMTP are cutting time and material input preproduction manufacturing process. This allowed development by authors’ control-and-measuring procedures complex (CCMP) [2]. CCMP ensures automatized preproduction planning manufacture and this is belong worldwide trend development of industry.

2. Formulation of the problem
The control-and-measuring procedures complex (figure 1) allowed get initial data for development technological process and this information about real manufacturing situation assists controlling influence on the process of implementation of the developed technological process of manufacturing products, by making adjustments at the planning stage. Real manufacturing situation is the state of the production system at the current moment of production of a specific product range, for example: component billet surfaces actual sizes, technical specification tools and machining tools variants manufacturing system, control-and-measuring instruments and jigs. Controlling influence on the production process is possible being because of SCAPMTP main difference that is communication among the various processes planning and production [1].
Control-and-measuring procedures complex developed for solving such technological process manufacturing products problems as:
- development coordinate control methodology for figurine-shaped details measurement and this methodology is designed to planning technological process manufactory details;
- generation of reasonable control-and-measuring kit for actual manufacturing situation and sizing characteristics of details surfaces.

Control-and-measuring procedures complex best documented in authors articles, for example [2]. This research structured like working expansion of article [1], and handles a problem CCMP – formalization of generation of reasonable control-and-measuring kit procedures. Named task points at improving the technological process of manufacturing products in the rapidly changing production situation of machining enterprises.

Main procedures for organization of optimal control-and-measuring kit are (figure 2):
- generation of possible tools variants in the control-and-measuring kit of the manufacturing system;
- selection of irrational control-and-measuring kits;
- generation of reasonable control-and-measuring kit for actual manufacturing situation.

Figure 1. Control-and-measuring procedures complex in the system of computer-aided planning multiproduct technologic process.
Figure 2. Schematic diagram of the procedures for reasonable control-and-measuring kit.

Figure 3. Algorithmic description for various generation control-and-measuring kits in the system of computer-aided planning multiproduct technologic process.
Mathematic models generation of reasonable control-and-measuring kit for actual manufacturing situation procedures was print in article [1]. This article presents algorithms for software of the reasonable control-and-measuring kit procedures.

The figure 2 has shown the generation of the reasonable control-and-measuring kit procedure laps. The figures 3 and 4 have shown algorithmic description for reasonable control-and-measuring kit in the manufacturing system.

**Figure 4.** A algorithmic description for reasonable control-and-measuring kit in the system of computer-aided planning multiproduct technologic process.

Laps of generation of reasonable control-and-measuring kit is carried out by using the genetic algorithm [3] is about control-and-measuring kits generated at the previous stage may have control-and-measuring instruments which don’t correspond real manufacturing situation, so this control-and-measuring instruments procedure take procedures’ selection of irrational control-and-measuring tools from kit based on the test for homogeneity and cutting time of use them in technological process. The test for homogeneity allows choice of unit size for control-and-measuring tools, each of which can be applied to as many different control-and-measuring procedures as possible.

That way, a mutation entries for a set of appropriate measuring instruments in a rational kit which corresponds conditions for minimizing the time of control-and-measurement procedures and test for homogeneity and this mutation is introduced by which a new measurement and control tools is added from the database of the system of computer-aided planning multiproduct technologic process. Then the new control-and-measuring instrument is checked for procedures with the tests. The result is the new and it is also tested for a correspondence of the real manufacturing situation. This action is repeated cyclically and depends on the algorithm work time and the technical and economic...
expediency of control-and-measuring procedure. So this new various control-and-measuring tools are the reasonable control-and-measuring kit actual for real manufacturing situation.

3. Conclusion
Development of algorithms for software to reasonable control-and-measuring kit for real manufacturing situation demonstrates efficiency of the complex control-and-measuring procedures in SCAPMTP and allows using CCMP in the tradition mechanical manufacturing systems for them modernization.

Application of the reasonable control-and-measuring kit procedure confirmed registered certificates of state registration of computer programs [4 – 5].

References
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