Information system of operative-dispatcher management of production processes of primary processing of raw cotton

I.H.Siddikov,N.U. Setmetov, U.O. Khujanazarov

Department of Information Technology, Tashkent State Technical University, Uzbekistan
Urgench branch of TashkentUniversity of Information Technologiesnamed after Muhammad al-Khwarizmi
Department of Automation and Control of Technological Processes and Production, Tashkent Institute of Textile and
light industry

ABSTRACT: The information support of operative - dispatching management of the continuous control and operative regulation of a course of processing manufacture of a clap (cotton), and also project of conceptual model of process ODM with use of the verbal description and diagram of methodology IDEF0 (ICAM Definition) is designed.

KEY WORDS: information system, operational dispatch control, primary cotton processing, optimal planning.

I.INTRODUCTION

The process of primary processing of raw cotton (PPC) refers to the technological processes for the production of homogeneous products and is characterized by the features of objects of this class. Finished fiber is produced at several interconnected facilities, each of which performs specific technological operations (drying, cleaning, ginning, lintering, pressing and warehousing of finished products, etc.). Consideration of control systems for each unit requires knowledge of the characteristics of the entire chain, requires a systematic approach. The relationship between individual machines (or unit sections) is determined by the requirements for the output variables of each object in order to ensure the required fiber characteristics, as well as the subordination of the functioning criteria of each machine to the general criterion of the efficiency of the process as a whole.

II.THE PRODUCTION PROCESS OF PRIMARY PROCESSING OF RAW COTTON AS AN OBJECT OF MANAGEMENT

The process is unsteady. On the one hand, the object itself changes during operation (the teeth of the serrated drums become dull and break, the lashes are erased, the aggregates are clogged with dirt, periodic replacement of units and parts is made). On the other hand, process improvement leads to a change in the dependencies that determine the production process. The verification of previously constructed models on newly collected data in the normal operation mode gives a significant error in predicting output values. In addition to the non-stationarity of the object, the contribution to this error is made by changes in parameters unaccounted for in the models, measurement errors, as well as inter-varietal differences in raw materials.

We will consider the managed cotton ginning enterprise as a complex consisting of a number of technological units (equipment) for the primary processing of cotton, warehouses of various types of raw materials and final products, intermediate storage of semi-finished products.

The input of the control object is a lot of modifications of the feedstock - raw cotton of various types of collection and varieties. The output of the control object - the cotton plant - is a lot of final products - cotton fiber, lint, sowing, and technical seeds, etc. The main material flows in the enterprise understudy with a discrete-continuous technological process are the flows of feedstock (raw cotton) and intermediate and final products of primary processing of raw cotton.

The main production of this class of enterprises consists of drying, cleaning, genie, linter, and press sections, where the technological process of processing raw cotton is carried out [1].

Taking into account the features of the production process and the requirements arising from them for the system operative - dispatching management (ODM), we formulate the research objectives. The main goal of the

production process of primary processing of raw cotton is to ensure the preservation of the natural physical and mechanical properties of the fiber and its release in accordance with GOST standards.

III. BUILDING AN INFORMATION SYSTEM ODM PPC

Therefore, the purpose of the work is formulated as follows: To design an information support system for the operational dispatch control of continuous monitoring and operational regulation of the cotton ginning production in order to ensure uniform fulfillment of the stock-taking plan. To implement the functional tasks of operational dispatch control of the main processes of the production sites of the ginnery, it is necessary to develop a draft conceptual model of the ODM process using the verbal description and diagram of the IDEF0 (ICAM Definition) methodology. According to the developed conceptual model of the main production process of the ginning enterprise, the dispatcher of the planning and dispatching department forms shift tasks taking into account the priority of the intensity of the launch of modification of the batch of processed raw cotton, according to the current production plan.

Recently noticeable increase in interest in the construction of optimal schedules for various service systems is due to a significant increase in the level of automation of all types of human activities, including the management of these activities of primary cotton processing enterprises. The quality of the functioning of modern production is largely determined by the decisions taken at the stages of scheduling and operational management. Along with the improvement of the quality of planning decisions, the requirements to reduce the terms of their development, increase the efficiency and flexibility of management are becoming more stringent.

In ginning production, the problems of synchronization, coordination and increasing production continuity are solved by identifying launch combinations in which each of the technological routes is best synchronized with the moment vacancies from processing the previous modification of the processed batch of raw cotton.

In enterprise management, the subsystem of operational dispatching production management is central, as it is the main functional subsystem of the integrated enterprise management system, which has the greatest impact on the efficiency of the enterprise and serves as a link between other subsystems [2,3].

Operational dispatch control is a combination of centralized continuous monitoring and operational regulation of the production process in order to ensure uniform fulfillment of the nomenclature plan [3, 4].

In different types of production, the specific content of the dispatching management has a number of significant features. The ginning enterprise is characterized by a linear layout, where each modification of the processed batch of raw cotton actually undergoes the same processing operations. Thus, this production is characterized by the division of the production process into separate relatively short operations (drying, cleaning, ginning, lintering, pressing), performed on specially equipped, sequentially parallel workstations - technological lines.

An analysis of the features of the operational dispatch control of the production site and the existing automated systems for the operational management of the production of the ginnery shows that the production process of this enterprise is characterized by a relatively rapid change in the parameters of the production cycle, especially the parameters of the processed raw materials, modifications of raw cotton, in space and time, as well as random values of the time course of individual processes [3,4].

In real conditions of production of ODMs, the dispenser carries out the production process of the ginning enterprise, relying on his experience and intuition, he also determines rational ways to get out of emergency situations. However, the dispatcher is physically unable to process a huge amount of information about the current state of intensity in production, materials, and most importantly - use this information to analyze the current situation in detail and make prompt and informed decisions on adjusting production schedules, identifying and eliminating the causes of unforeseen equipment downtime, under loading overloading of aggregates (drying, cleaning, ginning, lintering, pressing).

To implement the functional tasks of operational dispatch control of the main processes of the production sites of the ginnery, a draft conceptual model of the ODM process was constructed using the verbal description and diagram of the IDEF0 (ICAM Definition) methodology [5, 6].

In the control process, the output information is continuously compared with the planned information at various stages of the production process, in which the dispatcher receives a comprehensive linguistic assessment of situations that arose at the production sites of the main production of the ginning enterprise. After analyzing the information received about the current state of production processes, he makes an operational decision to eliminate deviations from the production schedule. At the end of the shift, the dispatcher analyzes and evaluates the efficiency of the production sites of the main production for the shift, issues reporting forms and archives the information. Operational and supervisory control of PPC is presented in the figure.

The inputs to the ODM process are the current schedule of the main production; operational information on the condition of units of equipment, backlogs and pneumatic vehicles; primary indicators of the implementation of the plan. The control input of the ODM is the regulatory acts that regulate the production processes of the main production. The outputs of the process are: shift tasks; launch plan for modification of the feedstock (launch intensity) taking into account priorities; a report on the current situation of the technological and production process (state of units of equipment, machines, units, state of production, fulfillment of a shift task, etc.); report on the implementation of the production plan for quality and quantity; assessment of the quality of the functioning of the main production process; information retrieved from the archive.
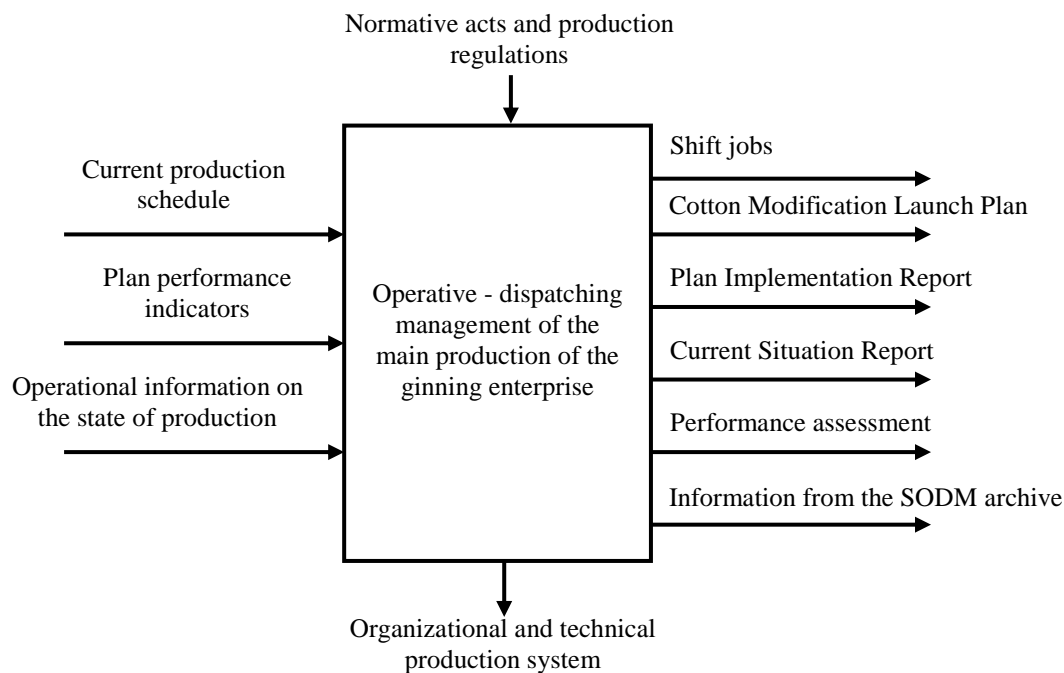

Fig. IDEF0 diagram for the process of operative - dispatching management of the PPC

IV. CONCLUSION

Thus, the designed information system for the operative - dispatching management of the main production of the ginnery corresponding to the main functional tasks of the operative - dispatching management of production sites allows to reduce the downtime of production lines and optimally allocate resources, will increase production efficiency as a whole.

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