

## MODERN METHODS OF PRODUCTION CAPACITY USAGE MANAGEMENT IN TEXTILE ENTERPRISES

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**Abstract:** *The article discusses modern methods of managing usage of production capacity at textile enterprises. The author revealed that using of modern tools for planning the production process and design documentation is one of the key actions in increasing the efficiency of the use of production capacity in textile enterprises.*

**Аннотация:** *В данной статье обсуждены современные методы управления использованием производственной мощностью на текстильных предприятиях. Автором выявлено, что применение современных инструментов планирования производственного процесса и оформления проектной документации является одним из ключевых действий в повышении эффективности использования производственной мощностью на текстильных предприятиях.*

**Аннотация:** *Ушбу мақолада тўқимачилик корхоналарида ишлаб чиқариш қувватларидан фойдаланишни бошқаришнинг замонавий усуллари ёритилган. Муаллиф томонидан ишлаб чиқариш жараёнини режалаштириш учун замонавий инструментлардан фойдаланиш, ишлаб чиқариш қувватларидан фойдаланишни бошқариш самарадорлигини оширишнинг энг муҳим омилларидан бири эканлиги аниқланган.*

**Key words:** *textile enterprises, production facilities, efficiency, resources, production units, planning.*

### Introduction

Nowadays, textile and light industry occupies an important position in the economy of the Republic of Uzbekistan and are at the center of industrial production. This sector produces products for public consumption, which, in turn, ensures a large portion of the market. Additionally, industry provides a large number of jobs for the country's population, including the employment of women in the industry, which allows them to maintain a demographic balance in industrial areas. One of the most important factors is the growth of export potential. The growth of export potential is directly proportional to the economic potential of the country and the growth of the living standards of the population.

Uzbekistan currently has a large and diversified textile and light industry network. Its share accounts for 25 percent of industrial output and 13 percent of its production capital. At the same time, 32% of the industrial workers of the republic are working there. Uzbekistan has a rich raw material base (cotton, wool, karakul, silk) for the development and provision of all sectors of the light industry, and also adequate conditions for the rapid development of the economy (natural climatic, territorial and labor resources). The light industry of the Republic is developing at high rates. If in 1991 7% of cotton produced in our country was processed, today it is above 35%. [16] At the present time, by “Uztukimachisanoat” association doing works for increasing labor productivity, filling the domestic market with quality products, increasing export capacity

and creating additional jobs. This, in turn, requires the efficient use of production capacities and determines the relevance of the research topic.

### **Literature review**

The main methodological views were formed in classical works of scientists of A. Smith [1] (Scotland), J. Art. Mile, K. Menchera, D. Nort (USA) and A. Marshall. Also, questions of business assets were discussed in scientific works of foreign scientific economists of E. Adam, R. Vilda, S.Gupta, V.Starr [11] (India), S.Kumar, N.Suresh [12] (India), Güneçikan Ö. [13] (Turkey), V. J. Stephenson and R. Chase [2]. In the field of a theoretical basis and feature of management of production capacities of the enterprises of light industry scientists from the CIS countries G. A. Alexandrov, P. G. Bunich, V. A. Vodyanov [3], N. L. Zaytsev [4], I. M. Petrovich [5], R. A. Fatkhutdinov [6] and A. A. Balabins [7] conducted researches. In their scientific works questions of management of production capacities of the industrial enterprises are considered. Organizational and economic aspects of problems of the textile enterprises are investigated in works of scientists V. N. Privalov [8], Yu.V. Zabaykin [9] and N. B. Kaparov [10].

In Uzbekistan the leading local scientists–economists M.Sharifkhodzhayev, S.S.Gulyamov, B.Yu.Khodiyev, Y.Abdullaev, Sh.Zaynutdinov, N.K.Yuldashev, B.Goyibnazarov and O.Aripovs were engaged in theoretical questions of management of the industrial enterprises and organizational features. But the review of studying of these literatures indicates that modern methods of management of use of production capacity in textile enterprises are not studied rather deeply. In above–stated researches and in scientific works the didn’t pay attention to the problem of increasing performance of production capacity usage in textile enterprises.

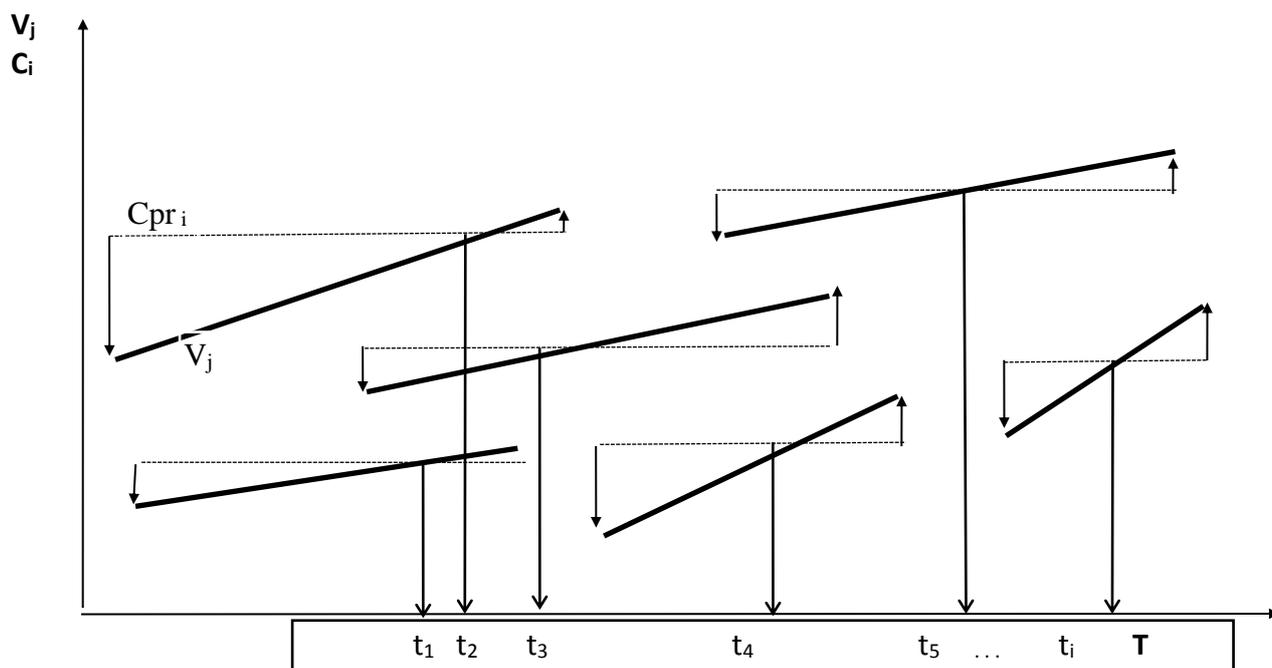
### **Research Methodology**

From our point of view, we should agree with a number of authors who consider it necessary to divide organizations into closed and open systems in order to develop criteria for assessing the effectiveness of management. The reasons for this division are differences in the assessment of the factors influencing the effectiveness of management. Thus, measurement of management effectiveness in closed-type organizations is based on indicators characterizing the use of internal resources and internal processes occurring in the enterprise. The main indicators characterizing the effectiveness in such systems are those that provide measurement of changes, or the volume of output, works, services, or profit per unit of costs. The application of these criteria as a whole does provide an assessment of the adequacy of the level of "return" on invested capital. In this paper we used scientific abstraction, scientific accuracy and econometric methods. To test the proposed method statistical data has been taken conditionally and used data of the enterprise “N”.

### **Analysis and results**

To assess the effectiveness of management of the use of production capacity in industrial enterprises can be both qualitatively and in quantitative terms, that is, comparing the result with the cost of obtaining it. Evaluate the effectiveness of managing the use of production capacity in industrial enterprises at the level of each enterprise separately, taking into account the requirements set by the governing structures and owners of organizations for the level of the above parameters. This is a kind of internal complex parameter of each enterprise functioning separately, a set of characteristics of individual management entities,

their ability to deliver the goal appropriate to the scale of the organization and make efforts to achieve it.



**Fig.1. Schedule of comparative analysis of capacity utilization.**

In Fig. 1, the vertical axis of ordinates is also the value of the production capacity  $M$  (in the capacity values of the shop), and the value of the output volume  $V$  (in the norm-hours) in the same structural subdivision. they have the same dimensions of the analyzed quantities. If you postpone the current time on the abscissa, it is easy to conclude that with the intensification of the material flow in the network of shops and production sites, which occurs when solving the tasks of developing marketing and continuously increasing production volumes, all workshops and production sites sooner or later pass from the reserve zone production capacity ( $M > V$ ) to the production capacity deficit zone ( $V > C$ ).

The points of such transitions are dispersed in time. This fact allows us to develop a set of organizational measures to prevent inconsistencies in the analyzed values by developing and implementing various scale projects for the reconstruction of production units in which ( $V_{calculated} > C_{project}$ ).

Time-dispersed transition points from the reserve zone to the production capacity deficit zone ( $t_1, t_2 \dots t_i$ ) can be refined in numerical form to determine the values of the intervals of the reconstruction ( $t_{min}, t_{max}$ ):

$$k \int_{t_1}^{t_{min}} v(t) dt = \int_{t_1}^{t_j} M_{,p} dt \quad (1)$$

$$V(t_{max}) = S_{max} \cdot F \quad (2),$$

here

$t_{min}$  - the earliest period of reconstruction;

$t_{max}$  - the latest period of reconstruction;

$t_{ok}$  - estimated payback period of investments, determined in  $t_1$ ;

$t_1$  - the period of the previous reconstruction, expansion or construction of the workshop (site creation);

$V(t)$  - function of change of volumes of release of production in time;

$K$  - the coefficient of change of the reduced costs from the moment  $t_1$ ;

$C_{pr}$  - design production capacity (throughput);

$S_{max}$  - the maximum possible number of pieces of equipment in the shop or on the production site;

$F$  is the annual effective (effective) fund of the unit's operating time per year.

The optimal reconstruction period is usually in the interval  $(t_{min}, t_{max})$ .

There are two options for performing the calculation:

a) the first option is the calculation of the empirical dependence by the mean value method on the calculator;

b) the second option is to check the correlation relationship and calculate the empirical polynomial dependence on a computer using the POLINOM program.

On the first variant of calculations it is necessary to perform the following actions:

1. for the data in the table (note: the current date of the top row of the table is set by the teacher), determine by the average method the equation of the experimental production volume change curve by years -  $V(t)$  (in this case it is a polynomial of the first degree);

2. To perform calculations, set the calculator on the monitor using the "start" button (in case of calculations in the display class);

3. Calculate the deviation values  $e_i$  of the experimental values from the regression line for the system of equations:

$$\begin{cases} e_1 + e_2 + e_3 + e_4 = 0 \\ e_5 + e_6 + e_7 + e_8 = 0 \end{cases} \quad (3)$$

4. on the basis of this system of equations determine the unknown coefficients  $a$  and  $b$  of the regression equation

$$V(t) = aT + b \quad (4)$$

5. To verify the results, construct an appropriate schedule for changing the output by year.

6. Solve equations (1) and (2) for the following data

\* - calculated values (without index reporting data for previous years);

$R_c = 1$  - coefficient of change of the reduced costs from the moment  $t_1$ ;

$C_{pr} = 670,0$  thousand n-h - design production capacity (throughput);

$S_{max} = 180$  - the maximum possible number of pieces of equipment in the shop;

**Table-1.**

### Changing in production volumes in “N” enterprise

Years	2010	2011	2012	2013	2014	2015	2016	2017
$V(t)$ , thousand d hr- hour	539,5	582,0	601,7	597,7	669,6	664,2*	721,1*	774,3*

Source: statistical data has been taken conditionally.

$F = 4015$  hours. for a two-shift operation mode - the annual effective (effective) fund of the operating time of a unit of equipment per year.

Calculations of the regression line and the timing of reconstruction:

$$\begin{cases} 539,5 = a \cdot 4 + b, \\ 774,3 = a \cdot 11 + b \end{cases}$$

$$234,8 = 7a$$

$$a = 33,54.$$

$$539,5 = 33,54 \cdot 4 + b$$

$$b = 405.$$

$$V(t) = 33,54 \cdot t + 405$$

$$\int_4^4 33,54 \cdot t + 405 dt \int_4^{4+5} 670 dt$$

Payback period 5 years

$$\frac{33,54 \cdot t^2}{2} + 405 \cdot t^2 = 670 \cdot t$$

$$\frac{33,54 \cdot t_{min}^2}{2} + 405 \cdot t_{min} - \left( \frac{33,54 \cdot 4^2}{2} + 405 \cdot 4 \right) = 670 \cdot 9 - 670 \cdot 4$$

$$16,77 \cdot t_{min}^2 + 405 \cdot t_{min} - 5239,68 = 0$$

In solving this quadratic equation, the following roots are obtained:

$$t_{min 1} = -33,49 \text{ (has no physical meaning)} \text{ и } t_{min 2} = 9,32.$$

$$0,32 \cdot 365 = 117$$

Thus, the deadline for completion of work is April 27, 2019.

$$33,54 \cdot t + 405,34 = 180 \cdot 4,015$$

$$t = 9,46$$

$$0,46 \cdot 365 \approx 168$$

The maximum deadline for completion of works is June 7, 2019..

$$K_n = \frac{\text{secondary time}}{\text{critical time}}$$

$$K_{n 2-25} = \frac{199}{238} = 0,83$$

$$K_{n 2-24} = \frac{157}{231} = 0,67$$

$$K_{n 2-22} = \frac{186}{141} = 0,84$$

$$K_{n 2-19} = \frac{144}{108} = 0,95$$

$$K_{n 2-16} = \frac{112}{44} = 0,8$$

$$K_{n 2-11} = \frac{77}{27} = 0,57$$

$$K_{n 2-10} = \frac{63}{35} = 0,42$$

$$K_{n 4-10} = \frac{42}{21} = 0,83$$

$$K_{n 4-10} = \frac{21}{42} = 0,5$$

$$K_{n 11-14} = \frac{14}{14} = 1$$

$$K_{n\ 13-17} = \frac{14}{35} = 0,4$$
$$K_{n\ 16-20} = \frac{14}{35} = 0,4$$
$$K_{n\ 19-23} = \frac{14}{35} = 0,4$$
$$K_{n\ 24-26} = \frac{7}{7} = 1$$
$$K_{n\ 11-28} = \frac{30}{175} = 0,17$$
$$K_{n\ 11-29} = \frac{56}{210} = 0,26$$

After determining the empirical dependence, it is recommended to perform an analysis of the capacity utilization through the ratio of the volume of production and the size of the production capacity and determine the terms of reconstruction or technical re-equipment according to formulas (1) and (2) for structural divisions of the enterprise that have large imbalances in production capacity.

The next step is to create a graph-tree target program. Targeted programs differ from other methods of organizational design of processes: definition of goals, optimization of means of their achievement and used resources, evaluation of project effectiveness, development of special tools for program management. All these works are carried out on the basis of modeling and optimization of the organizational system.

The definition of program objectives usually starts from a general goal. Practice has developed special ways of formulating goals: they must contain a description of the expected result, beginning with the verb in the imperative mood and in an indefinite form. In many cases, such formulations contain numerical characteristics of the timing and key indicators of the expected results.

On the basis of the general goal, they often formulate the goals of the second, third and subsequent levels. They are usually called tasks. Tasks are defined by the same rules as the general goal, but in more detailed decomposition. If the complex of tasks of each subsequent level in accordance with the rules of formal logic generalizes the complete decomposition of the general goal (or tasks of the previous level), then it is possible to construct a tree-graph of program goals.

The goals and objectives of the program can be distributed at the hierarchical levels of the management system, in this case the enterprise, in order to ensure their visibility and specific distribution of responsibility for the executors of the target program. For simple programs, goals and objectives are sometimes formulated simply by enumerating them.

Each goal of the lower hierarchical level, which should be understandable to the responsible executor, is associated with a specific set of tools and resources to achieve them. This is, as a rule, a list of works performed. The ways of presenting it can be different - it can be just a list of activities, distributed by specific performers, it can be a network fragment of the structural mathematical model of the organization process, it can be a schedule, or another timetable for the organization process in time.

#### Discussion of research results

Optimization of network graphs, both general and local, is designed to reduce the time and money spent on the development of projects, which envisage organizational projects.

The solution of this problem is first sought in the way of improving the structure of the work:

1. Increase their parallelization (for example, for the enlarged network schedule, ensure the technological design of the products are carried out at the design stages and stages of work, and the design of reconstruction works - at the stages of technological preparation of production);

2. Differentiation of some labor-intensive works on series, lines, starting complexes (for the above example, the design and manufacture of technological equipment is divided into turn);

3. Elimination of some non-essential works (in the above example, replacing work (8-10) - "Development of a robotic line layout" on a fictitious one allows to shorten the length of the critical path by 7 days), etc.

The next steps of optimization, besides said, involve redistributing resources from non-critical paths to the work of the critical path. For this, in particular, often redistribute the performers between works of the same type of professional content.

Other important means of reducing the time and resources required to perform work according to the network schedules are:

1. Unification of works - in this regard, in practice, widely use the ESKD standards (unified system of design documentation), ESTD (unified system of technological documentation), other unified systems of organization of processes (development of organizational and administrative documentation, technological preparation of production, production of new products for production );

2. Automation of processes - to solve this problem in the practice of organizational design are widely used

CAD - CAD systems;

ASTPP - automated systems of technological preparation of production;

SAP - automated programming systems;

ASNI - automated systems of scientific research;

automated systems for examination of investment projects and other systems of automation of organizational processes.

3. Development of technically justified time norms for the performance of works most frequently used in organizational design (rationing of labor in scientific organizations and engineering services of enterprises, rationing of the work of managers, specialists and employees, rationing of labor of all categories of workers, including those engaged in servicing production; microelement standards of time, the use of mathematical methods and computer technology in the normalization of labor, the application of photographs of the working day and the nometazha at the analysis of labor, the development of special instruments for timekeeping observations);

4. Professional development of performers on the basis of targeted training of specialists in the system of higher and secondary vocational education; wide application of innovative methods of training specialists; retraining of staff; remote self-education in computer networks; development of new technologies for use in organizational projects and other methods aimed not only at reducing the time and money spent in organizational design, but also ensuring the indispensable development of objects of organizational design based on scientific and technological progress.

In the course of the work, various methods of mathematical modeling and optimization

of design solutions were studied and applied on the basis of: determination of regression dependencies, calculation of typical integrals on this basis, structural optimization of the organizational solutions of the target program, preparation of initial data for simulation on SPSS, and use of normative documentation for the design of the project. The knowledge and practical skills obtained in the course of this course work can be used later in the development of various schedules for the organization of production, for the design of business plans, the design and design documentation for reorganization.

### **Conclusions and suggestions**

The conducted studies showed that the problem organization of effective use of production capacity is quite complex and covers a wide range of tasks. But It should be noted that the main one is the identification, analysis and justification of the feasibility of creating reserves for production capacity associated with the need to eliminate the causes of disproportions in production. Along with, the problem of reservation production capacity is one of the important directions ensuring sustainable development of enterprises taking into account market requirements marketing-production and instability of economic relations. In the conditions of uncertainty of the external environment, enterprises can there are situations when it is required to attract additional reserves which causes temporary disproportions in production facilities different production sites and divisions. At the enterprise there may be contradictions and imbalances in activities, which will negatively affect the efficiency of production, cause violations of the coordinated functioning of all production links. Elimination of consequences of imbalance in production predetermines the need to ensure an adequate level of proportionality in capacity through redistribution of resources, creation and regulation of the use of various production varies in space and time.

### **References**

1. Adam Smith. An Inquiry into the Nature and Causes of the Wealth of Nations. A selected Edition. Edited with an Introduction and Notes by Kathrun Sutherland. –Oxford University Press. 1998. 618 pp.
2. Richard B Chase and F. Robert Jacobs. Operations and Supply Chain Management: The Core. Book. Feb 4, 2016.
3. Vodyanov A., Gavrilova O., & Marshova T. (2006). Proizvodstvennye moshchnosti rossiiskoi promyshlennosti v kontekste problem ekonomicheskogo rosta. Rossiiskii ekonomicheskii zhurnal, (2), 15
4. Zaitsev N. L. (2009). Ekonomika, organizatsiya i upravlenie predpriyatiem. Moscow, Infra-M, 536 p.
5. Petrovich I. M. (1990). Proizvodstvennaya moshchnost i ekonomika predpriyatiya. Moscow, Ekonomika.
6. Fatkhutdinov R. A. (2001). Organizatsiya proizvodstva. Moscow, INFRA-M, 669 p.
7. Balabin A. A. (1991). Modelirovanie rezervov proizvodstvennykh moshchnostei (medotraslevoi aspekt): avtoreferat diss. ... kand. ekon. nauk. Novosibirsk, 1991. 21 p.
8. Privalov V. N. (2005). Organizatsionno-ekonomicheskoe obespechenie povysheniya effektivnosti ispolzovaniya potentsiala proizvodstva tekstilnogo promyshlennogo oborudovaniya: avtoref. diss. ... kand. ekon. nauk. Kostroma, 19p.

9. Zabaikin Yu. V. (2006). Sovershenstvovanie organizatsii proizvodstva na tekstilnykh predpriyatiyakh: avtoref. diss. ... kand. ekon. nauk. Moscow, 2006. 21 p.
10. Kaparova N. B. (2007). Mnogourovnevaya sistema povysheniya effektivnosti trikotazha: avtoref. disc. ... kand. ekon. nauk. St. Petersburg, 2007. 19 p.
11. S. Gupta, V. Starr. Production and Operations Management Systems. Taylor & Francis group. 2014. 510pp.
12. S. Kumar, N. Suresh. Production and Operations Management. New Delhi. 2008. 284pp.
13. Güneçikan Ö. “Kapasite Planlaması ve Optimim Stok Kontrolü Yönetimi”. Kahramanmaraş Üniversitesi, Sosyal Bilimler Enstitüsü, Yayınlanmamış Yüksek Lisans Tezi, 2008 – 481p.
14. Ortikov A. The economy of industry [Text] / A. Ortikov. // Tutorial. Tashkent. 2014. - 314 p.
15. Isaev R., Kosimov SM, Tilyahodjaev M.A. Business plan and production organization. [Text] / R. Isaev. S.M. Kosimov. M.A. Tilyahodzhaev // Textbook. Tashkent, 2011. - 264 pp.
16. Annual Reports of “Uztukimachisanoat” association by 2015-2016y.