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INCREASING THE EFFICIENCY OF PRODUCTION CAPACITY UTILIZATION IN TEXTILE ENTERPRISES BASED ON THE OPTIMIZATION MODEL OF THE PRODUCTION PROGRAM

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ABOUT ARTICLE

Key words: Production capacity, multivariate analysis, dispersion, rational use, textile industry, optimization.

Abstract: In this paper has been investigated increasing the efficiency of production capacity utilization in textile enterprises based on the optimization model of the production program.

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INTRODUCTION

In the history of the development of the world economy, rich experience has been accumulated in the management of the effective use of production capacities in the improvement of the management of industrial production factors, but the possibilities of rational use of the existing resource potential in large industrial companies have not been fully exploited. "World trade 5.2 percent, 6.1 percent of the export of industrial products are textile industry products. By the end of 2018, the use of production capacity in this sector was "in India. It is 88.0 percent, 81.2 percent in the Netherlands, 81.0 percent in China, and 78.9 percent in Turkey. In other developing countries with high live labor capacity, this indicator is even lower.

Scientific research centers in the world have conducted scientific research in the directions of optimizing the use of production capacity in textile enterprises, managing resources in the enterprise, and improving the product supply chain in textile enterprises. Currently, in textile enterprises, making management decisions to increase the efficiency of the use of production facilities, introducing modern MRP II, ERP automated management systems in the management of the use of production facilities, strategic planning of the use of production facilities (IChQF), developing the development strategy of the enterprise and increasing the efficiency of management Scientific research is being carried out in priority directions.

LITERATURE REVIEW

Many foreign scientists, including F. Robert Jacobs, Richard B Chase, Cline W., Doeringer P., Crean S., Dickerson K.G., Nordas H. K., Verma S., Juyoung, on the issues of increasing the management efficiency

of enterprises and effective use of production factors Lee, Xiajun A, Dorothe´e H., Mayukh D. etc. carried out scientific research.

In the countries of the Commonwealth of Independent States, M.S. Abryutina, A.I. Belov, G.N. Dobrin, A.E. Karlik, M.I. Bukhalkov,

V.N. Vasiliev, O.S. Vikhansky, A.I. Naumov, M.V. Dadalova and K.S. Scientists like Krivyakin conducted scientific research.

N.S.Ziyadullaev, A.Sh.Bekmurodov, M.R.Boltabaev, N.Q.Yoldoshev, U.A.Shodmonova, G.E.Zahidov, R Scientific works of S. Muratov, A. A. Tillyakhodjaev, Z. A. Khakimov, S. Sh. Yusupov, O. Davronov and other economist-scientists are dedicated.

Despite the significant contribution of the listed scientists to the science of management, until today, a single point of view on the effective use of production factors in improving the management of the enterprise has not been developed, comprehensive approaches to the formation of conditions for the effective use of production capacities and their support have not been researched. For this reason, it is appropriate to carry out research on improving the theoretical and methodological foundations of organizing the effective use of production factors in improving the management of textile enterprises.

ANALYSIS AND RESULTS

In order to effectively use production capacity in textile enterprises in the conditions of innovative development of the economy, it is a leading task to study the changing market requirements and create a production program based on it.

Taking into account the variety of products produced in textile enterprises, it is necessary to solve technical, economic and organizational complex issues of the management system. The purpose of solving such issues is to satisfy the market demands by using the production potential of the enterprises (all technical, financial, food and energy potentials).

It is known that the level of efficiency of the use of production capacity of enterprises directly depends on the optimality of the production program, which determines the type of products and their weight. The rational use of labor resources, that is, equipment, which is the basis of the production process in enterprises, leads to the fulfillment of the enterprise's production plans, increases its efficiency and profitability of the enterprise.

Various types and models of looms are installed in the textile enterprises operating in the Namangan region, which is studied as an object in this dissertation, which leads to many variants of the program of production of various products in several types of looms.

For example, in the textile industry, if it is necessary to plan the production of 4 different products on 3 types of machines, then the total number of options of the production program will be more than 30,000. In such conditions, choosing the most optimal of the available options becomes a problem that cannot be solved using simple planning methods. The use of economic mathematical methods, particularly linear programming methods, to solve these complex problems can be of great benefit to enterprises. Creating mathematical expressions of problems using linear programming methods and calculating them with the help of IT technologies, the time and other expenses spent on it, the profit from optimization of the production program can be many times greater.

When creating mathematical expressions for the optimization of the production program, it is necessary to observe several conditions:

1. The main purpose of the problem to be solved is clearly defined and it should have quantitative dimensions.

2. The conditions for solving the problem have quantitative dimensions, like its purpose, and should be quantitatively connected with the indicators representing the purpose of the problem.
A full mathematical expression of the problem can be made only when the above conditions are met. In the optimization of the production program, the following economic indicators can be accepted as criteria indicators representing the purpose of the issue:
Increase the volume of the produced product in terms of kind and value indicators.
Increasing labor productivity.
Reducing the cost of the manufactured product.
Increase the profit from the sale of the product.
Reducing the amount of raw materials or labor required to complete the production program.
Increasing the level of efficiency of enterprises.
The conditions necessary for the production of products in the enterprises are accepted as the conditions for solving the problems.
It is known that the conditions of production of products mainly include the use of labor tools, raw materials, and labor resources.
We use the following conditional symbols to construct a mathematical expression that represents the purpose of the problem described above and the conditions for its solution:
i - дастгоҳлар турлари сони ($i = \overline{1,m}$)
a - маҳсулот турлари сони
X_{ij}- турдаги дастгоҳда ишлаб чиқарилган, j -турдаги маҳсулот ҳажми.
t_{ij}- i турдаги дастгоҳда ишлаб чиқарилган j турдаги махсулотнинг бир бирлигини ишлаб чиқариш учун сарфланадиган иш вақти
t_{ijr}- j турдаги маҳсулотнинг бир бирлигини ишлаб чиқариш учун i турдаги дастгоҳда ишлаб чиқарилганда сарф бўладиган r касбдаги иш вақти.
a_{ij}- j турдаги маҳсулотнинг бир бирлигини ишлаб чиқариш учун i турдаги дастгоҳнинг сарфлайдиган иш вақти.
e_{ijk}- i турдаги дастгоҳда ишлаб чиқарилган j турдаги маҳсулотниг бир бирлигига сарф қилинаёттган k турдаги хомашёнинг миқдори.
S_{ij} - турлари дастгоҳда ишлаб чиқарилган турдаги маҳсулотнинг таннархи.
- p_{ij} турдаги дастгоҳда ишлаб чиқарилган турдаги маҳсулотниг бир бирлигини сотишдан олинадиган фойда
- c_{ij} турлаги махсулотнинг сотилиш баҳоси
- M_i турдаги дастгоҳнинг иш соатларини жамғармаси (фонди)
- B_j турдаги маҳсулотларнинг ишлаб чиқариш режасида кўзда тутилган ҳажми
- T_1 ва T_2 – мос равишда корхонадаги меҳнат жамғармаларинниг миқдори.
- A_k Корхоналарнинг турдаги хомашёларининг жамғармаси.

- the number of types of machines
- the number of product types
- produced on a type of machine, - type of product size.
- working time spent on the production of one unit of the type of product produced on the type machine
- working time in the profession, which is spent on the production of one unit of the product of the type on the machine of the type.
- the working time spent by the type of machine to produce one unit of the type of product.

- the amount of k type of raw materials used for one unit of the type of product produced on the type machine.
- types are the cost of the type of product produced on the machine.
- the profit from the sale of one unit of the product of the type produced in the type machine
- the selling price of various products
- fund of working hours of the type of machine (fund)
- the volume provided for in the production plan of the type of products
- T1 and T2 – the amount of labor savings in the enterprise, respectively.
- Savings of types of raw materials of enterprises.

Using these conditional symbols, it is possible to construct a mathematical expression of the problem of optimizing the production program. It consists of equalities and inequalities representing the terms of the function and the solution of the problem.

Several of the aforementioned technical and economic indicators can be used as benchmarks in constructing the objective functions of the production program optimization problem. Which of these indicators to choose depends on the intended goal of solving the problem of optimizing the production program.

If the enterprise wants to increase its quantitative indicators, indicators such as the volume of manufactured products, labor productivity, and profit from the sale of products can be taken as criteria indicators for constructing the objective function. If the enterprise wants to improve its economic indicators without changing the volume of production, i.e. wants to increase the efficiency of using all its resources, then it is possible to accept indicators such as raw materials spent on the production of products, labor savings, and the cost of products as criteria indicators.

Here are the objective functions of the production program optimization problem, which are structured according to several criteria:

1. According to the criterion of increasing the volume of manufactured products:

$$L(x) = \sum_{i=1}^{m} \sum_{j=1}^{n} \cdot X_{ij} \rightarrow max \qquad (1)$$

2. To increase the volume of the company's product:

$$L(x) = \sum_{i=1}^{m} \sum_{j=1}^{n} C_j \cdot X_{ij} \rightarrow max \qquad (2)$$

3. According to the criterion of increasing profit from the sale of manufactured products:

$$L(x) = \sum_{i=1}^{m} \sum_{j=1}^{n} p_{ij} \cdot X_{ij} \rightarrow max \qquad (3)$$

4. According to the criterion of reducing the labor spent on manufactured products:

$L(x) = \sum_{i=1}^{m} \sum_{j=1}^{n} t_{ij} \cdot X_{ij} \rightarrow min$ (4)

$$L(x) = \sum_{i=1}^{m} \sum_{j=1}^{n} t_{ijr} \cdot X_{ij} \rightarrow min \qquad (5)$$

5. According to the criterion of reducing the amount of raw materials used for manufactured products:

$$L(x) = \sum_{i=1}^{m} \sum_{j=1}^{n} \sum_{r=1}^{k} L_{ijk} \cdot X_{ij} \rightarrow min \qquad (6)$$

6. According to the criterion of reducing the cost of manufactured goods:

$$L(x) = \sum_{i=1}^{m} \sum_{j=1}^{n} S_{ij} \cdot X_{ij} \rightarrow min \qquad (7)$$

Mathematical expressions based on the above criteria are solved using the linear programming method. In the issue of optimization of the production program, when the indicators relative to the objective functions are selected as criteria, the objective functions are constructed as follows:

7. According to the criterion of reducing the amount of labor spent on one unit of the product

$$L(x) = \frac{\sum_{i=1}^{m}\sum_{j=1}^{n} t_{ij} \cdot X_{ij}}{\sum_{i=1}^{m}\sum_{j=1}^{n} X_{ij}} \to min \qquad (8)$$

8. According to the criterion of cost reduction in the cost of manufactured goods

$$L(x) = \frac{\sum_{i=1}^{m}\sum_{j=1}^{n} s_{ij} \cdot X_{ij}}{\sum_{i=1}^{m}\sum_{j=1}^{n} X_{ij}} \to min \qquad (9)$$

9. On labor productivity and product production efficiency indicators

$$L(x) = \frac{\sum_{i=1}^{m}\sum_{j=1}^{n} \cdot X_{ij}}{\sum_{i=1}^{m}\sum_{j=1}^{n} t_{ij} \cdot X_{ij}} \to max \qquad (10)$$

10. According to criteria for increasing labor productivity in terms of natural and value indicators

$$L(x) = \frac{\sum_{i=1}^{m}\sum_{j=1}^{n} c_j \cdot X_{ij}}{\sum_{i=1}^{m}\sum_{j=1}^{n} t_{ij} \cdot X_{ij}} \to max \qquad (11)$$

11. According to the criterion of increasing the efficiency of product production

$$L(x) = \frac{\sum_{i=1}^{m}\sum_{j=1}^{n} p_j \cdot X_{ij}}{\sum_{i=1}^{m}\sum_{j=1}^{n} s_{ij} \cdot X_{ij}} \to max \qquad (12)$$

The above-mentioned goals are achieved taking into account the specific conditions of production enterprises. These conditions are the conditions that reflect the sales activities of the company and the manufactured products.

In the conditions of competition, it is necessary to organize management activities in textile enterprises, taking into account the requirements of customers for the manufactured products. Taking into account that the resources in the enterprise are limited, we formulate the mathematical expression of the optimization problem:

1. Conditions for using the working time savings of production machines:

$$\sum_{j=1}^{n} a_{ij} \cdot X_{ij} \le M_j, \qquad (j = \overline{1,n})$$

1. Conditions for using reserves of raw materials in the enterprise:

$$\sum_{i=1}^{m}\sum_{j=1}^{n} L_{ij} \cdot X_{ij} \le A_k, \qquad (k = \overline{1,l})$$

Use of working time savings of workers in existing professions in the enterprise:

$$\sum_{i=1}^{m}\sum_{j=1}^{n} t_{ij} \cdot X_{ij} \le T_r, \qquad (r = \overline{1,e})$$

Condition of production of customer products:

$$\sum_{j=1}^{n} X_{ij} \ge B_j, \qquad (j = \overline{1,n})$$

Product demand must be produced at the planned level.

$$\sum_{j=1}^{n} X_{ij} = B_j, \qquad (j = \overline{n+1,n})$$

The following condition must also be met:

$$X_{ij} \ge 0, \qquad (i = \overline{1,m})/(j = \overline{1,n})$$

The expressions presented above show the main production capacities of the enterprises and the terms of sale of the product. Using these expressions, it is possible to create a mathematical expression of the production program optimization problem according to any criterion indicator.

If we choose the functions from (1) to (5), the problem can be solved by linear programming methods, taking into account the conditions.

If we take the functions from (7) to (11), the problem can be solved using the fractional linear programming method, taking into account the limiting conditions of the conditions in the enterprise.

When finding the optimal version of the production program by the above methods, the size units of the manufactured products can be whole numbers or fractional numbers. If the number of products produced in the enterprise is physically valid only if there is a whole number, then the quantity that is being sought for the solution of the problem, that is, the amount of products produced on certain types of machines, must also be a whole number.

CONCLUSIONS

In this case, the optimization problem of the production program becomes a problem of the integer programming method. Such problems are solved using the first algorithm of "Gamory". The problem of optimizing a production program can also be a problem of integer programming in other cases.

Thus, the research carried out in the third chapter made it possible to obtain the following results:

1. Development of a scheme for the formation of demand for production capacity in textile enterprises for effective use of production capacity.
2. Development of a mechanism for controlling the use of production capacity using the hierarchies method, choosing the Pareto efficiency of many alternatives in textile enterprises.
3. Improvement of the model of efficient use of production capacity, increase of labor productivity, improvement of corporate spirit and corporate culture using lean production means - 5S system in textile enterprises. To justify the effectiveness of introducing the "5S" organizational system (sorting, keeping order, keeping clean, standardizing, improving) as an element of increasing process quality and production culture in textile enterprises to manage the use of production capacity.
4. For effective use of production capacity in textile enterprises, studying the changing market requirements and creating a production program based on the type of product creates the possibility of effective use of production capacity.

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