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Mathematical Model Of Textile Enterprise Sales Prevention

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Annotation: Dedicated to the development of models for the construction of logistics management system of production resources of the textile enterprise, in this chapter the algorithmic model of information-analytical support of the process of management of production resources of the enterprise and the mathematical model of forecasting sales of textile enterprises construction, solving the main problems of organizational design of the production system, modeling on the basis of a logistical approach.

Keywords: Textile, mathematical model, production, management, forecasting.

The situation of a modern textile enterprise, which does not have sufficient and modern production capacity at the time of rapid development of modern manufacturing enterprises, requires balancing the range of products produced.
A comprehensive approach to determining the balance of the range of products of a textile enterprise should be based not only on structural terms, but also on the following factors:
- goals and objectives of production;
- The composition and structure of the range;
- Dynamics of product range changes;
- The relationship between market demand and product consumption.

All this is done using modern mathematical models.
We will consider the process of building a mathematical model of sales forecasting for textile enterprises based on the algorithm presented in [15].
The objective function is expressed as the square of the difference between the empirical and theoretical values (fi or ni) of the current consumption of the product. In turn, the theoretical value is given by the basic equation of the non-uniform effect model, expressed as a function of the relative consumption of the current relative consumption accumulated at the beginning of the year under consideration. In the final form, the search function for the optimal parameters of the model is represented as follows:

$$S^2 = \sum_{i=1}^{T} (f_i - (p + qF_i^{6})*(1 - F_i))^2 \rightarrow \min,$$

where i is the number of the period, T is the number of the last period, f and F are the variables of the actual curve of the life cycle of the product under consideration, taken as known quantities, and the coefficients q, p and b are the parameters sought. The purpose of solving the optimization problem is to find the extreme values of the objective function when the parameters q, p and b are limited in the form $0 \leq q \leq 1$, $0 \leq p \leq 1$, $0 \leq b \leq 1$.
We solve the problem of nonlinear optimization, defined by the objective function and constraints. To do this, we use the method of constructing base vectors from the category of correctly distributed universal neural networks. As a result, we find the sought parameters of the model equation that optimally approximates the curve describing the product life cycle. Mathematical model of meeting the demand for a product in a textile enterprise is represented by:

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$$Z = \min\{\sum_{(i)} (n_i - x_i)^2\};$$

The model of maximizing the value of the demand for textile products, the actual volume of sales of the i-th product xi, the selling price of this product, taking into account the volume of sales Ci (amount) The market size of the i-th product is determined by the maximum value of the sum of the ratios of d to:

$$Z = \max\{\sum_{(i)} \frac{C_i * X_i}{d_i}\}$$

The model of maximization of the integral indicator classifying the prospects of the product produced by the textile enterprise is expressed as the maximum value of the product of the volume of production of each product multiplied by the perspective coefficient Kperi calculated by the expert method for this type of product :

$$Z = \max\{\sum_{(i)} K_i^{пер} * n_i\}$$

The target criteria of the optimization models under consideration in the production program can also be applied to dynamic optimization models. It is accepted to divide these criteria into two groups: status variables and management variables. The state variable Si is a p-dimensional vector of the state of the system in the i-th stage of the controlled process, which consists of n steps. It can be expressed as follows:

$$\overline{Si} = [si1;\ si2;\ ....sij....sip]$$

where sij is the state of the j-th component of the system in the i-th stage of the controlled process.
The control variable Xi is the m-dimensional vector of the control action in the first stage of the process. It can also be provided in more detail:

$$\overline{Xi} = [xi1;\ xi2;\ ....xij....xim]$$

where xij is the j-th direction of the control effect (movement) in the i-th stage of the controlled process. In cases where it is possible to occur in real processes, that is, when the ratio of state and control vectors occurs, ie m = p, this value is assigned to the j-part (component) of the system in the i-th stage of the process. can be defined as a management effect (action).
The relationship between status and management variables is expressed in the following recurrent relationship:

$$\overline{Si} = f(\ \overline{Si\text{-}1};\ \ \overline{Xi\text{-}1}\ )$$

In mathematics, a recurrent relation is a relationship that allows the nth term of a sequence to be calculated using its known n-1st term.
The dynamic programming model can be limited in the following ways:

$$\overline{Xi}\ k\ X$$

where X is a set given in n-dimensional space, k is a set of options for mathematical relations between the limiting parts (more, less, equal, unequal, large or equal, whole, etc.).
An integral condition for the formation of a dynamic programming problem is the definition of a specific efficiency (goal) function in the following form:

$$W = \max\{\varphi(\overline{S1};\ \overline{X1}) + \sum_{i=1}^{n} \varphi 1(\overline{Si};\ \overline{Xi})\}$$

Given the above recurrent relationship, this objective function can take the following form:

$$W = \max\{\varphi 2\ (\overline{S1};\ \overline{X1};\ \overline{X2}....\overline{Xi}....\overline{Xn})\}$$

The above (built) models differ from the existing ones in that they provide information about the current status and prospects of each component of the product range. That is, these models allow you to calculate the following indicators: the forecast of sales for the current period, as well as an assessment of

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their future dynamics. As a result, these models allow the decision to assign each product to a particular group in terms of expected dynamics.

Models and algorithms aimed at balancing the range of products produced in the conditions of scarcity of production resources will ensure the competitive development of the textile industry.

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