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Development of the inventory management system into scientific-production enterprise “Alliyans”

The problems of inventory management for the manufacturing company are the most numerous classes of economy sums. Correct and timely definition of optimal inventory management strategy and normative level of resources allow liquidating assumed stoppage of production process. Many optimization algorithms were developed to solve this problem and one of the most effective of them is stochastic version of a model to identify economic size of order. This algorithm was used to develop inventory management system for company “Alliyans” whose the main field of work is production of paints and varnishes. It was suggested to analyze the most popular ingredients for production and find out which economic size of order will be the most optimal to avoid pauses in the production process.

Firstly, statistic data were analyzed for 2 years of work to understand how we can approximate the statistical distribution function to one of the standard distribution functions. It was proved that this function can be described by the standard distribution functions by using standard general formula of the statistical distribution function [1].

After this an approximation was made for demand distribution using normal distribution. Normal distributions are important in statistics and are often used in the natural and social sciences to represent real-valued random variables whose distributions are not known [2]. The next step was to test the hypothesis about the normal distribution of demand at a level of significance 0.05 by using Pearson criterion. The results showed that the difference between experimental and theoretical data is negligible. The study data are in good agreement with the normal distribution.

After conducting such studies for each constituent components, we can say that the demand for 3 types of main composite components of paint and varnishes are distributed according to the normal distribution.

The main step was to determine the economic size of the order of components. In this case the resulting function of total costs per unit time has this form [3]. This formula was purposed firstly by Hemdy Taha in 1971 [3]. By using mathematical transformations to this formula, the optimal order will be found from formulas and [3]. Since the equations can not be determined explicitly, a numerical algorithm proposed by Hadley and Whitein[3] is used to find optimal size of order and level of stocks when we need to make a new order. The final part of this research was sensitivity check. The main idea was to check if some parameters of normal distribution are changed, how it will influence on the size of order and on the level of stocks after which we need to make a new order (further R*). Firstly, the expected value was gradually increased and it showed only linear dependence. That means that

with increasing of expected value it does not show any significant changes: with increasing of expected value R* also increased and size of order was still the same. After this expected value was fixed and standard deviation was increased. This experiment also showed almost linear dependence, that is mean no specific or unforeseen deviations were observed. With increasing of standard deviation both R* and the order size increased.

Having compared the indicators of total costs of the existing inventory management system at the enterprise and developed this research, it was concluded that the stochastic version of the model of the economic order is more advantageous. The savings amounted to 0.077 thousand hryvnias on each order of the 3 main components. So it helped to reduce total costs up to 11% for each order. This is significant result for big manufacturing company because the volume of orders per year can be amount to millions. The development of the inventory management system has minimized total costs compared to the total costs of the existing inventory management model at the enterprise.

References

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