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Role And Place of Statistical Acceptance Control of Products

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Abstract: In production lines, product quality is determined by the acceptance method, in which a defective product can pass the sampling test stage. That is why product quality control can be carried out by a continuous method. This method uses a sampling of individual items from which it is possible to determine which type of product can be defective.

Key words: Product quality, selective control, continuous control, probability theory and mathematical statistics, defective product, continuous control, quality assurance, products. General provisions. Acceptance quality control is usually understood as a set of activities carried out during the production process and after its completion, in order to verify the compliance of product quality indicators with the established requirements.

1. Introduction

The main task of acceptance control is to reject batches, the contamination of which with defective products exceeds the level established by the normative and technical documentation for the normal course of production. At the same time, the normal course of production is understood to be such a state when the basic requirements of the technology are met. During the normal course of production, the contamination of batches with defective products is small, but it increases sharply if there are serious violations of the technological process. Acceptance control should be organized in such a way that most of the lots released during the normal course of production are accepted, while lots with a large contamination of defective products, released under conditions of a malfunctioning technological process, are rejected [1-6].

2. Material and Methods

The problem posed can be solved most simply and accurately with the help of continuous control, in which every manufactured product sample is subjected to control. However, in production such control is often impossible: first, complete control is not always economically justified; secondly, the control must be non-destructive, that is, the product after the control must not lose its consumer properties.

In most cases, these conditions are not met, and therefore complete control is used for especially critical products, since it allows you to hand over practically defect-free products to the consumer. However, in conditions of mass production, even this very strict control (if it is not automated!) Does not guarantee the absolute quality of the product: with continuous control and sorting, the inspector quickly gets tired, his attention weakens, as a result of which he can miss a defect and reject a defect-free product. In order to guarantee an impeccable assessment of product quality by non-automated (manual) control methods, it is necessary, as shown by numerous studies, to carry out six-fold continuous control [7-10].

The conducted research in the field of probability theory and mathematical statistics led to the conclusion that to assess the degree of contamination of a batch with defective products and to make a decision on the quality of finished products, there is no need to conduct a complete check of all products, but it is enough to examine only a part of the batch - a sample.

The essence of statistical acceptance control is as follows. From a batch of products with a volume of N, observing the principle of randomness, a sample of n pieces is selected, and n, as a rule, is much less than N. All samples of the sample are subjected to control, as a result of which the degree of suitability of each sample of this sample for further use is determined. Then one or another generalized characteristics are calculated, which are compared with the normative ones. As a result of the comparison, a judgment is made on the quality of the entire batch and a decision is made on its further use [11-13].

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3. Results

Statistical acceptance control should not be understood only as finished product control (acceptance). It can also be used in incoming inspection operations, during operational control after the completion of a technological operation and in other cases when a decision is made about the suitability for use of a batch or product flow.

Quality control plan and principles of its selection in production. To organize acceptance control, it is necessary to set a system of rules - a control plan, in which it is necessary to indicate how products should be selected for inspection, after what number of tested products to make a decision on rejection, batch acceptance or on the further continuation of control.

4. Discussion

Currently, three principles of choosing a control plan have become widespread.

First principle. On the basis of data on the operation of products, the permissible fraction of product defectiveness is established, that is, such a limiting level of quality, a decrease in which, for one reason or another, by the consumer and the supplier is undesirable. The sample size is set in such a way that for any product quality before control, the quality of the accepted product is no worse than the acceptable in operation.

The disadvantage of this principle is that control plans do not take into account the nature of the distribution of the level of input quality, i.e. the level of quality of products supplied for control.

Second principle. The sample size is set on the basis of the effectiveness of the control, given that further increase in the sample size does not bring a significant improvement in the output level of product quality (i.e., the level of quality after control).

To use the second principle, it is necessary to first conduct special studies in order to establish the distribution law of the input quality level, which seems to be a very difficult organizational and mathematical problem.

In most cases, the binomial distribution is used as a first approximation to distribute the number of defective items in a batch. However, this distribution should be viewed as the ideal standard for a well-regulated, stable production, as it arises when every item in a batch is likely to be defective with the same probability.

Lack of the second principle for choosing a control plan. Determination of a fixed distribution of the number of defective products in a batch in the case when there are some irregularities in the technological process is extremely problematic and doubtful, since all the results are of a private nature and far from universality [14].

It seems more reasonable to choose a control plan according to the first principle, followed by adjusting the control procedure based on a statistical assessment of the level of output quality based on the results of accepting a large number of lots.

Third principle. This principle presupposes a business case for control plans. Based on the analysis of the manufacturing and operation of products, accounting for their cost, including control costs; losses from the receipt of defective products - the sample size is established, at which the maximum economic effect is achieved in comparison with continuous control or production, in which the acceptance of products is carried out without control.

5. Conclusion

Taking into account the cost factors associated with the introduction of control allows you to create a more flexible system of control plans. The difficulty in solving this problem lies in the correct consideration of cost factors. Let's consider briefly the main ones.

First, by rejecting a batch as not meeting consumer requirements, we incur damage associated with the production of the batch, if it is destroyed, or with additional costs for control, if the decision to reject entails a complete check. Such damage is easy to calculate. A more difficult economic task is to assess the losses associated with the creation and operation of material assets by those suitable products that were rejected as part of a batch rejected by control.

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Secondly, having made a decision on the acceptance of a batch, we accept the defective items contained in it. Using them at subsequent stages will lead to damage, the assessment of which also seems to be a very difficult economic task [13, 14].

Lack of the third principle for choosing a control plan. The creation of a universal methodology for solving the problem of planning acceptance tests (i.e. a methodology for drawing up a control program) based on an economic approach is impossible.

The last two principles most fully take into account the interests of not only the manufacturer and the consumer, but also the industry as a whole.

However, their use is associated with the solution of a number of complex organizational, economic and mathematical problems that have not been solved at present.

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