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Program Complex of Statistical Calculations for Control the Quality of Products at Lebedinsky Plant of Piston Rings

M. Bahmach, E. Lavrov
Sumy State University, Ukraine, prof_lavrov@mail.ru

Abstract. The problem of quality control during serial production. The program complex control and quality management at Lebedinsky plant of piston rings.
Keywords. Modeling, Quality Control, Probability.

INTRODUCTION

It was identified the problem of low quality products at Lebedinsky plant of piston rings, which requires complex decisions of the introduction of information technology quality management [1,2].

FORMULATION OF THE PROBLEM

It is necessary to develop a software system for the department of technical quality control, which is based on an existing mathematical tools of statistical analysis of the production process, such as [3,4], will perform calculations needed to support decision making on quality.

RESULTS

General characteristics of the software system.

Basic functions (figure 1):

• determining the likelihood of defective products;

• construction of number allocation likelihood of defective products based on the average number per unit time of marriage;

• calculation of probabilities yield products for a given statistical parameters;

• calculation of statistical unknown parameters of the known data;

• implementation of statistical analysis of a sample of product parameters, calculate the mean and variance limits of access and control, histogram graphs superimposed with probability distribution function of the density of the normal law;

• construction of control charts (X-card and S-Cards);

• calculation of risk-producer and the customer at the receiving party quality control of finished products using various combinations of the control samples and risk graph depending on percentage of defective products.

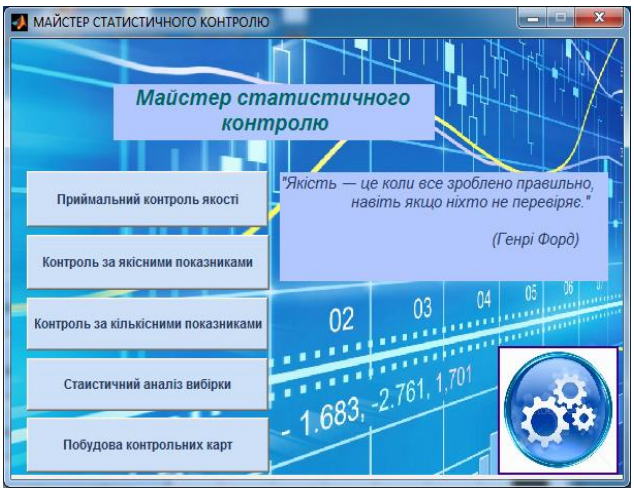

Figure 1 - The main window

Main subsystems.

Subsystem "Acceptance quality control".

Purpose: used to calculate the risk of the manufacturer and the customer during the final control, depending on the different parameters of the sample particles and permissible percentage of defective products.

Risk is a manufacturer in the sense of failure probabilities of receiving party products lack percentage of which is permissible. The

risk of the customer is the meaning of the likelihood of unwanted party take percentage of marriage.

Figure 2 shows the main window of the subsystem.

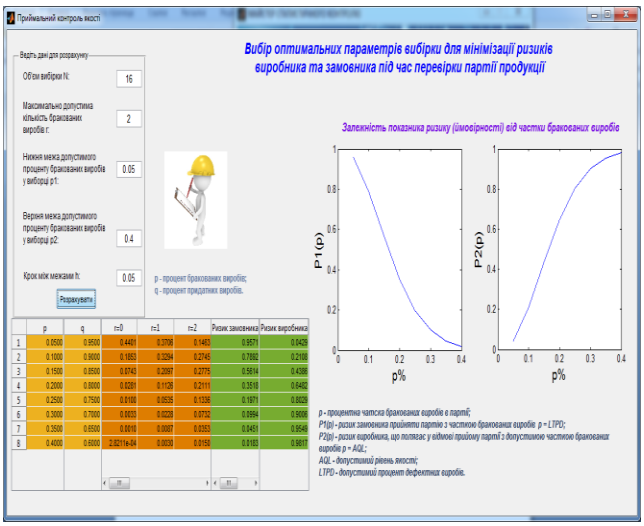

Figure 2 - Main window of subsystem "receiving quality control»

Subsystem "Control for qualitative indicators".

Purpose: construction of a number of the distribution of defective products for a certain period. We use statistics: the average number of defective products per unit of time and the maximum number of defective products for a certain period, calculated the probability that the number of defective products does not exceed a given. The main window of subsystem presented in figure 3.

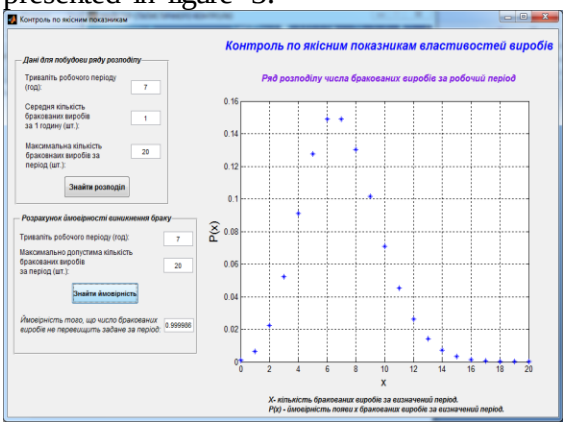

Figure 3 - Main window of subsystem "Control of the Quality indicators»

Subsystem "Control for quantitative indicators".

Purpose: construction schedule probability of being the value set in parameter within a given standard deviation.

The main window of subsystem presented in figure 4.

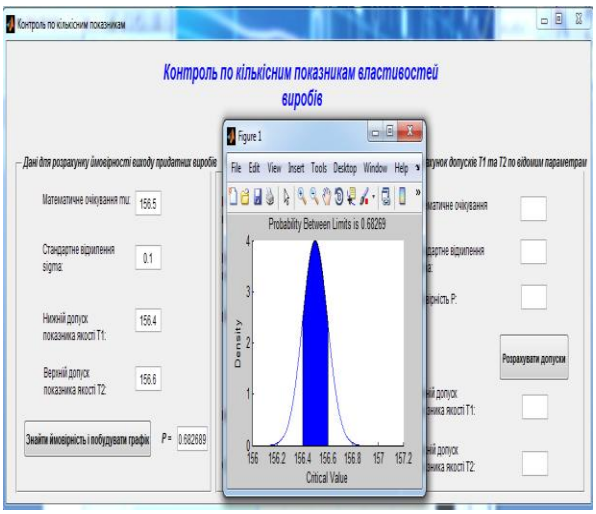

Figure 4 - Main window of subsystem "Control for Quantitative indicators»

Subsystem "Statistical analysis of sample".

Purpose: statistical analysis of sample parameters, histogram superimposed on the graph of the probability distribution density of the normal law. The main window of subsystem presented in figure 5.

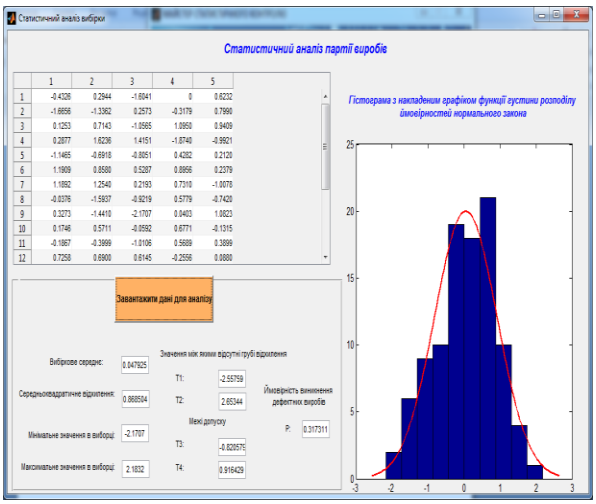

Figure 5 - Main window of subsystem "Statistical analysis of the sample»

Subsystem "Control cards".

Purpose: building control arithmetic cards (X-Card), which is applied selectively arithmetic mean of the controlled parameter, building S-Card, that contains the value of sample standard deviation..

The purpose of control charts - find abnormal changes in the data for processes that are repeated and give criteria to identify lack of statistical control. The process is statistically controlled state, if only due to random variability causes. After determining that the received variability of any deviation from it considered the result of special reasons, which should identify, eliminate or reduce their impact.

The using of the control cards and careful analysis will lead to better understanding and improvement process, minimizing losses marriage.

The problem of statistical process control - maintenance and support processes at a reasonable and stable level that guarantees the products and services specified requirements.

The main window subsystem presented in figure 6.

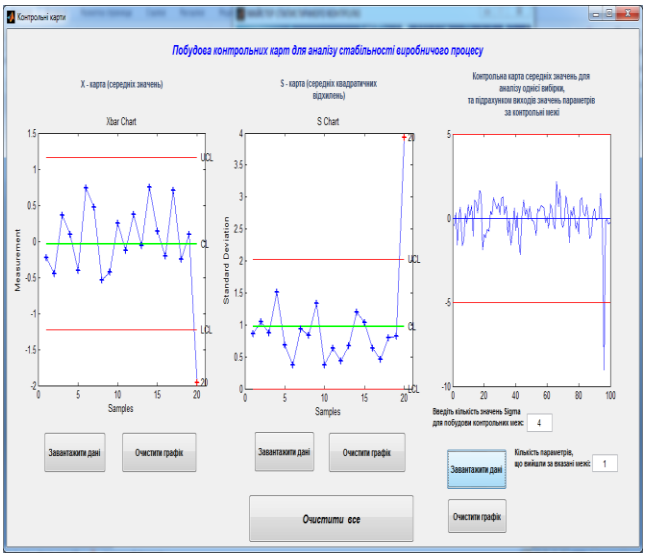

Figure 6 - Main window of subsystem «Control card»

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CONCLUSIONS

The system passes test operation at Lebedinsky plant of piston rings.

Full-scale implementation of the system will solve the problem of assessment of the likelihood of violations of the process, optimize production processes, choice points, methods and techniques of control measures to ensure high quality products.

The results may be useful for engineering enterprises with discrete production.

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