Application of Quality Control Chart in research Quality Management

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Abstract. Research quality management task is to discover and solve scientific and technological research and development in the process of abnormal quality situation.It establish and improve the quality supervision and inspection tracking system, strengthen research quality management efforts, discover and solve problems. This paper introduces the principle of quality control charts, upper and lower limits of the figure to calculate and plot method.It is proposed to determine the status of the quality control rules, and verified by examples given use to discover and solve problems.

Introduction

Research quality is the core competitiveness of research and development unit, is the enterprise survival and development of the cornerstone. Only by relying on scientific research units to provide high quality technical services or research products in order to win the trust of users, and establish a good reputation, and then to remain unbeaten in the fierce competition. Quality management, including quality of work, product quality and service quality. The important task of quality management research units are usually timely detection and timely discover and solve development anomaly occurred during the quality situation, establish and improve work quality supervision and follow-up inspection system, strengthen quality management efforts, to discover and solve problems, eliminate quality risks exist.

Quality control charts is on product quality of the production process timely statistical tool control, it is a process of quality characteristics to be measured, recorded, evaluated, so that the monitoring process is in a controlled state of statistical methods designed to FIG. Since the advent of self-control charts, since it is the product after quality control inspection goes to prevention in order to ensure product quality staff, reduce production costs and improve productivity opened up broad prospects in the world and therefore it has been widely used. [1-6]

Quality control chart inspection

Quality control chart is a traditional test method. So-called normal random fluctuation range is relative, in accordance with the required confidence probability 1 - pgfla and. It usually takes is + 3 Sigma, i.e. management line and center line spacing for 3 Sigma. Among them, a is the normal production of the product quality fluctuation standard deviation. According to the law of normal distribution and normal point falls within the limit probability 1 - pgfla =0.9973, exceeded the limit probability pgfla only 0.0027. So if you find some points out of this limit, it can be inferred that there are some exceptions in the production, the possibility of such an inference error (the first kind of error) is very small, less than 0.3%
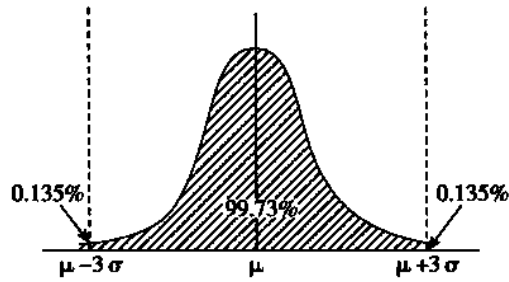
Fig. 1, The probability of normal $u \pm 3s$ distribution in a graph

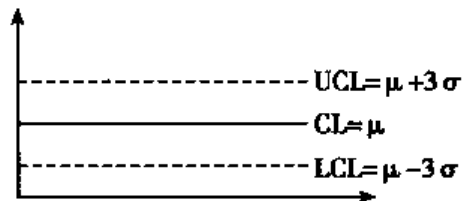Fig. 2, Design principle of graph control chart

$\bar{X}$ -R control chart

For measurement data, this is the most commonly used control chart. It is used to control the object for the length, weight, strength, purity, time, yield and production value of the occasion. Control chart is used to observe the mean change of normal distribution, R control chart is used to observe the distribution of normal distribution or variation, while the -R control chart is used to observe the changes of normal distribution.

Case analysis

In a research project, the acceptance rate is 49.50 + 0.10 (points), and the research process quality is not less than 1, which is a continuous monitoring and testing, and the $\bar{X}$ -R diagram is designed.

Collect data and to be grouped

In the standard case, data collected from scientific research. Every 2 months, from the scientific process of extracting 5 projects, a self rating, consisting of a sample of 5, a total of 25 samples collected.

In general, drawings and $\bar{X}$ -R, each group of sample size n≤10， k≥25 group number.

Calculate the sample mean and sample range

The calculation results also fill in the table 4 - 15.

$$\bar{X}_i = \frac{1}{n}\sum X_i, i = 1,2,3,......n$$

$$R = X_{i\max} - X_{i\min}$$

Calculate the total average and range average

$$\bar{\bar{X}}_i = \frac{1}{k}\sum_{i=1}^{k} \bar{X}_i = 49.5068$$

$$\bar{R} = \frac{1}{k}\sum_{i=1}^{k} k_i = 0.0800$$

Calculation control line

$$\bar{X}\begin{cases} UCL = \bar{\bar{X}} + A_2 R = 49.5068 + 0.577 \times 0.0800 = 49.5530 \\ CL = \bar{\bar{X}} = 49.5068 \\ LCL = \bar{\bar{X}} - A_2 R = 49.5068 - 0.577 \times 0.0800 = 49.4606 \end{cases}$$

$$R \rangle \begin{cases} UCL = \bar{D}\,\bar{R} = 2.115 \times 0.0800 = 0.1692 \\ CL = \bar{R} = 0.0800 \\ LCL = D_3 R ¼ \bar{p}\ 0 \end{cases}$$

On the formula, A2, D4, and D3 were found in the control chart (see Table 2), when n=5, D3 < 0, D4=2.115.

Production control chart

Respectively $\bar{X}$ and R diagram, two plans must be drawn on the same page, so as to facilitate the control analysis. In the $\bar{X}$ and R diagram, in the figure, the vertical axis in the same line, the horizontal axis parallel to each other, and scale alignment. First make a R figure, if the R is normal, then make $\bar{X}$ a picture. In this case due to the lower bound on the map R is negative, but range R impossible is negative, so the R control limit line can province bribe (0), as shown in the figure.

Scanning points

Draw points on the control chart, as shown in figure, according to the map and R diagram of each sample.

Analyze whether the production process is in statistical control

According to the analysis of the control chart of the judge rules, analysis of the production process is in statistical control state. After analysis, the production process in this example is in statistical control. Computational process capability indices are as follows.
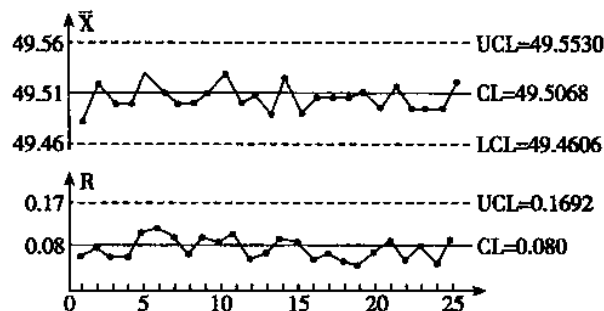

Figure of the length of figure $\bar{X}$ -R

C_P value

$$C_p = \frac{T}{6s} = \frac{T}{6R/d_{2(n)}} = \frac{0.20}{6 \times 0.08 \div 2.326} = 0.97$$

In mathematics, R and s are generally biased estimates, so theR / $d_{2(n)}$ and S / $C_{4(n)}$ is used to estimate the total.

R／$d_{2(n)}$estimation s is more convenient, but in general only n less than 0 is used. Here n = 5, R／$d_{2(n)}$ estimation

$d_{2(n)}$、$c_{4(n)}$ is the coefficient of correction, check the control chart (see Appendix two), n = 5, D2 (n) =2.326.

Coefficient k:

$$k = \frac{|u-M|}{T/2} = \frac{\left|\bar{\bar{X}} - M\right|}{T/2} = \frac{|49.5068-49.5|}{0.20\div2} = 0.068$$

M - tolerance center

The process capability index Cpk:

$$c_{pk} = (1-k)c_p = (1-0.068)\times0.97 = 0.9$$

If the process quality requirements for the process capability index is not less than 1, the analysis of the control chart into the control chart, should take measures to improve the processing accuracy.

Reasons to find

From the following reasons:

research project personnel whether there is a change, the new changes in the study of the effect is stable.

Whether the research method of 6.8.2 is correct, the research conclusion is verified by practice research process is controllable in the process, whether there is a check or review.

Project is the subject of expert checks

Whether the research results of the 6.8.5 project are the experts

Summary

Quality control chart statistical test results must be combined with sample value segregation. To make quality control charts, first of all, we should recently under normal conditions, data collection, and the data of sample segregation value check and calculation of control limits should be included in the segregation of the value, but the manufacture control chart should be segregation values are plotted in the diagram

Quality control chart is not only widely used in product quality management, but also applied to scientific research project management, to judge whether the development process is abnormal, whether in the normal state of stability, ease of control analysis, to find the cause, improve management.

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