Example of report on statistical methods for six sigma

Business, Manufacturing

Abstract

Six Sigma is a production management concept, developed at Motorola Corporation in the 1980s and popularized in the mid-1990s, after Jack Welch used it as a key strategy in General Electric. The essence of the concept is the need to improve the quality of the outputs of each of the processes to minimize defects and statistical variations in operating activities. The concept of using quality management methods, including statistical methods require the use of measurable goals and results, and involves the creation of ad hoc working groups in the company, with projects to address the problems and improve processes.

The name is derived from the statistical concept of standard deviation, denoted by the Greek letter σ. The maturity of the manufacturing process in this concept is described as σ-rated deviation or the percentage of defect-free products at the output, so that the process of 6σ quality output gives 99. 99966% defect-free output, or no more than more than 3. 4 defective output of 1 million operations. Motorola has set as a goal to achieve 6σ quality index for all manufacturing processes, and it is this level and gave the name of the concept.

The Graphic Illustration

Normal distribution curve is an approximation to the model of " Six Sigma." On the horizontal axis lay deviation value, denoted σ, which shows the distance from the expectation μ to the point of inflection of the curve. The spread of values of the curve is directly dependent on the value of the standard deviation - σ. In the notation of this graph there is the following explanation: a product that meets the requirements, it takes on the X-axis position at zero if it is better than required - to the right of zero, worse - to the left. There are cases when the deviation and in a big way - lack of product. The greater the number of issued throughout the product exactly meet the requirements, the higher the curve at zero.

Manufacturers tend to get the process described by the blue graph, possibly red, but not yellow and green.

Calculations

The % of gauge error can be found as:

% gauge error= 5σ+2*master-x*100tolerance

Where x-bar is a mean value of all inspectors' verifications

σ is a standard deviation for all readings

Master is the standardized master product dimension

Tolerance is a tolerance of allowable product (max-min)

Now, the first step is to calculate the standard deviation. According to our calculations in Excel,

σ= 0. 0544846

The next step is to calculate x-bar value. For this we have to find the mean value of all inspectors' verifications. According to our calculations, the mean value is:

x= 2. 484

In our example, the tolerance value is the difference between the allowable dimensions:

Tolerance= max-min= 2. 55-2. 35= 0. 2

The master value is given; it is equal to 2. 5 in.

Now, the difference between master value and x-bar can be calculated in the following way:

2. 5-2. 484= 0. 016

All components are defined. Substitute into the formula:

% gauge error= 5*0. 0544846+2*0. 016*1000. 2= 8. 272423%

Generally, the appropriate maximum of gauge error is 30%, the ideal value must be lower than 10%. As this value is even less than 10%, it is almost ideal gauge error. The manufacturing process is good.

Sources

Warren Brussee, Statistics for Six Sigma Made Easy, Chapter 9 - Simplified Gauge, McGraw Hill Professional, 2004, ISBN 0071734759, 9780071734752