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PROCESS PERFORMANCE EVALUATION AND IMPROVEMENT FOR THE QUALITY PROGRESS IN THE INDUSTRIAL MANUFACTURING SYSTEMS

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Abstract: As the competition gets tougher, there is more pressure on manufacturing sectors to improve quality and customer satisfaction while decreasing cost and increasing productivity. These can be achieved by using modern quality management systems and process improvement techniques to reduce the process variability and driven waste within manufacturing process using effective application of statistical tools. There are a number of different methods for collecting and evaluation data. One of them is pre-control. Pre-control is a technique that helps shop operators to control the process so that defective parts are not produced. This technique is also simple to understand for the shop operators and statistically robust. In this study, it was used this techniques for the quality progress of the production parts with one-sided geometrical tolerances.

Key words: Process improvement, reduction of process variability, quality progress

1. INTRODUCTION

Manufacturing in the tougher competition environment requires quality progress in all aspects of the company's operations, with processes being done right the first time and defects and waste eradicated from operations.

Modern quality management systems (MQMS) are ensured that management and employees can become involved in the continuous improvement of the production of goods. MQMS is mainly concerned with continuous improvement in all work, and to detailed execution of work elements on the shop floor. It stems from the belief that mistakes can be avoided and defects can be prevented. It leads to continuously improving results, in all aspects of work, as a result of continuously improving capabilities, people, processes, technology and machine capabilities.
The purpose of this paper is to provide some insight into the question of geometrical product specifications and its applications with using pre-control techniques.

2. PROCESS IMPROVEMENT

Quality-based organizations should strive to achieve perfection by continuously improving the business and production processes. Of course, perfection is impossible because the race is never over; however, we must continually strive for its attainment.

Improvement is made by:

- Viewing all work as a process, whether it is associated with production or business activities.
- Making all processes effective, efficient, and adaptable.
- Controlling in-process performance using measures such as scrap reduction, cycle time, control charts, and so forth.
- Maintaining constructive dissatisfaction with the present level of performance.
- Eliminating waste and rework wherever it occurs.
- Investigating activities that do not add value to the product or service, with the aim of eliminating those activities.
- Eliminating non-conformities in all phases of everyone's work, even if the increment of improvement is small.

Continuous process improvement is designed to utilize the resources of the organization to achieve a quality-driven culture. Individuals must think, act, and speak quality. An organization attempts to reach a single-minded link between quality and work execution by educating its constituents to. "continuously" analyze and improve their own work, the processes, and their work group.

The output of one process also can be the input to another process. Outputs usually require performance measures. They are designed to achieve certain desirable outcomes such as customer satisfaction. Feedback is provided in order to improve the process. Process definition begins with defining the internal and/or external customers. The customer defines the purpose of the organization and every process within it. Because the organization exists to serve the customer, process improvements must be defined in terms of increased customer satisfaction as a result of higher quality products.

Using technical tools such as statistical process control (SPC), design of experiment (DoE), benchmarking, quality function deployment (QFD), and so forth.

"Business is a competition. Winning requires effective use of resources. Top management's job is to control those resources. Quality improvement efforts not sponsored by top management will not get the resources required to move up quality levels and will fail."[2].

In this study, they are strategies considered to evaluate measuring data with one-sided tolerances using by pre-control techniques. The geometrical tolerances spread among zero to maximum specification. It will be focused on the situation of an existing, running process during the manufacturing stage of the manufacturing parts as shown in figure 1.

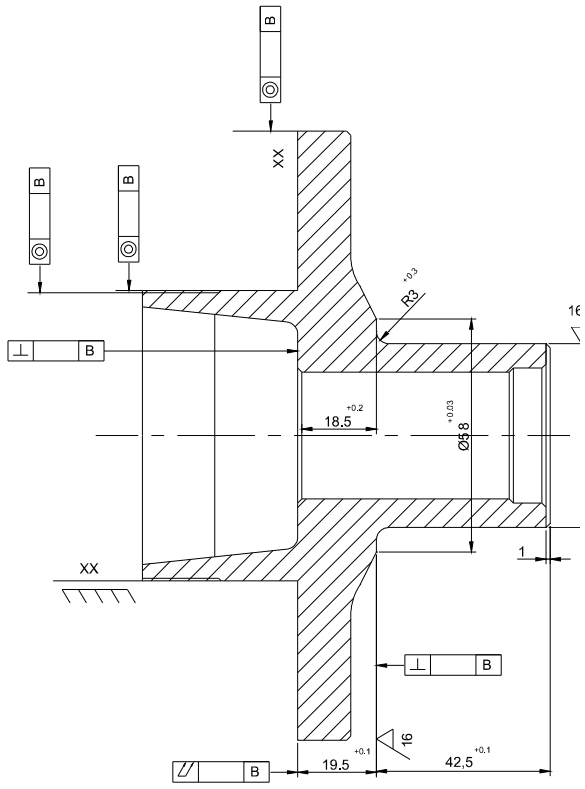

Figure 4. Geometrical tolerances on the production part

In general it is impossible in production engineering to produce machined parts with absolutely accurate dimensions and geometry. It is also not practicable to achieve geometrical perfectly shaped workpieces because the various features (e.g. cylinder, cone, plane and torus in the case of rotational parts) show more or less deviations from their nominal shape. Geometrical tolerances limit only the deviation of the real form of a feature from its nominal form, which will be given by technical drawing. If the machined parts are considered on the whole there occur deviations of location and orientation because interactions between the different features forming the periphery.

As an example for the geometrical tolerances is considered the total run-out deviations on the manufacturing part. The specification of the run-out concerns the description of workpiece surfaces which control some circular symmetry and their deviation from a theoretically exact circular form. The key difference between the run-out to total run-out is the relationship of the tolerance zones and hence measurements, at different positions on the surface in question, with respect to one another.

If the operator can qualify set-up five pieces in a row are in the green zone, the operation will be started. The set-up cannot be qualified unless five pieces in a row are in the green zone. After the qualification, the operator takes two consecutive pieces every 15 minutes for application of pre-control.

The total run-out data is non-normally distributed. Applying pre-control technique for this data is transformed "logx" transformation each value and upper control specification limit. And also, for all data being under the 99% must be $Zn \leq Y$.

$$P(Z \leq \mu + 2{,}326 * \sigma) = \%99 \quad (1)$$

$$Y = \overline{Z} + 2{,}326\sigma \quad (2)$$

After the all transformations were done, in generally the distribution was around the pre-control limit. Total application time, there are 13 products in the red area. So that, examination of reason should be kept on with other process improvement techniques, such as design of experiment methods .

CONCLUSION

Most manufacturers are required to provide information about their manufacturing processes to demonstrate that they are capable of, and are in fact producing, products with high quality.

For this, pre-control is very simple to use for geometrical product specification. It is necessary "logx" transformation for this specification applying of pre-control. On the other hand, pre-control is simple tool that helps to prevent manufacture of defective parts. It doesn't require any charting by the worker.

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