

THE FOUR STAGES OF PREVENTING QUALITY DEFECTS IN PRODUCT MANUFACTURING

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Abstract

After the mass production of the product, the elimination of quality defects often causes a delay in the delivery time to the customer. In this regard, a study was conducted on mass production enterprises, and their advantages and disadvantages were determined during the study. Considering all possible options for eliminating quality defects, optimal ways of development were determined. Based on the received information, the relevance of the selected project topic was justified. The causes of quality defects in product production were found, and four stages of preventing quality defects were shown to these causal factors.

Keywords: Production, quality defects, raw materials, causes of quality defects, four steps to prevent quality defects, determination of quality indicators, tolerance, defective and non-defect.

Introduction

Fixing quality defects after mass production of a product often takes up valuable time before shipping to the customer. Time is a very important factor when it comes to delivering a product to a customer. But this problem cannot be solved due to product quality defects. Factors such as changing materials or ordering components, manufacturing replacement units, product rework and re-inspection can cause delays in delivery when it matters most. Many manufacturing companies rely on pre-shipment inspection to manage product quality. But if you rely solely on inspection to help you identify and eliminate quality defects in your products, waiting until production ends to fix those quality defects and often preventable quality defects will affect a large portion of your orders. By taking several preventive measures [2-6] before production, manufacturers can often see a significant reduction in the number of quality defects in their products. Let's take a look at the four most important steps in preventing quality defects and how they can help you manage product quality.

The first stage. Checking the quality management systems of suppliers of raw materials to your product.

- Check what standards the suppliers of raw materials have implemented in their company and see to what extent they are implemented;
- Studying the quality management system of raw material suppliers;
- Acquaintance with regulatory documents on employees' having sufficient qualifications, training of employees and checking the level of training about specific shortcomings related to their role, whether there is or not;
- Inspection, measurement and test equipment, including checking the correct calibration of instruments and equipment to ensure accurate measurements and results;



- Control of non-conforming products, including marking, identification, evaluation, segregation, disposal and recycling of non-conforming or defective products;
- Labeling, packaging, handling and storage, including inspection procedures to ensure protection against product mix-up, damage, deterioration or contamination;
- Quality records, statistics and analysis, including sampling, defect collection, corrective and preventive action checks, and customer complaint handling.

Before starting work with raw material suppliers, they conduct a quality audit as part of the qualification process mentioned above. The information gathered in a quality audit can help you limit the risk of working with a supplier that may not meet your production requirements or with a "bad" supplier.

The second stage. When negotiating with suppliers, set a price that matches your level of quality.

It is difficult to produce a quality product without using quality materials and spare parts. No matter how well-designed the shirt is, the design cannot beat the use of poor-quality fabric, for example. A slick new smartphone with a faulty camera or display will lead to returns on the consumer side. Many suppliers will gladly accept a low price for your order. But this low price almost always comes at the cost of product quality. This can be done in different ways, for example:

- Use of cheaper raw materials than originally agreed;
- Replacing product components with cheaper alternatives;
- These cost-related issues not only directly affect the quality of the product, but also lead to the measuring instruments used in the production process, testing laboratory equipment and, of course, the process of creating the product.
- To prevent product quality defects, it is recommended to consider the following:
- Price comparison: Ask for price quotes from several suppliers (in short, hold a tender) to see what the typical price for your product is and whether a potential supplier's offer is competitive.
- Ask suppliers for a list of raw materials and detailed prices;
- Changing product design: Often the more complex the manufacturing procedures and the more components needed, the more expensive the product will be to produce.

The third stage. Create a gold standard to define quality performance.

One of the best ways to verify that a supplier is "all talk and no action" is to request a product sample prior to production. Creating a product sample requires the supplier to actually demonstrate that they are capable of producing to the quality standard you desire. In order to avoid product sample quality defects, it is necessary to introduce quality control procedures before mass production.

- A golden sample gives you the opportunity to provide feedback to the supplier and resolve quality issues before production:
- Used parts and materials;
- Compliance with product specifications;



- Adequate functionality and performance;
- Packaging designs, branding and artwork.

After reviewing and confirming the supplier according to the above rule, your product sample becomes a "golden" sample. The gold standard sets the quality standard, so that when quality problems occur during production, workers can take corrective action at their own discretion. This helps prevent a large portion of the finished product from being affected by quality defects. Many products require verification of compliance with a specific international standard or legal regulation in their intended sales market. It is necessary to implement the following practices:

- Security test;
- Product performance and durability testing;
- Check the composition and purity of the material;
- A comparative test or comparison, usually with respect to the performance of a competing product;
- Packaging test.

The fourth stage. Define your tolerances for quality defects in the quality manual.

The company should have a quality manual or quality checklist as a primary resource for staff requirements. Quality checklists for simple products are typically 3-10 pages long, while checklists for more complex products that have undergone extensive testing may be longer. An effective quality manual includes relevant information for the plant and inspection staff, including:

- Product specifications;
- Your tolerance for quality defects;
- Product inspection requirements, including on-site product testing;
- Packaging requirements, including shipping and retail packaging;

One of the most common causes of quality defects does not understand what you want in the first place. It is necessary to know the following concepts.

- Sending a quality checklist to your supplier;
- To know if there are any questions about your requirements.

Of course, another way to do this is to constantly post information on the company's social site, such as testing procedures, including which tests will be conducted for the product and what equipment will be used. Procedures for classifying defects, including issuing a "defective" or "defective" result for inspection based on the type and number of defects found.

In 1955, the Saratov aircraft manufacturing plant in the city of Saratov created and introduced a system of manufacturing a flawless product and organizing its delivery from the first presentation to the technical control department or the customer (Saratov) [1,2]. This system has been created and implemented. The basis of the labor quality assessment system is the percentage of the delivered product in the reporting period T (day, week, month):

$$K = \frac{P_T}{N_T} 100\% \quad (1)$$



here, P_T is the number of products received by the technical control department from the first presentation at time T ; N_T is the number of products entered into the technical control department at time T .

The quality of the work of an individual worker, group, and department is evaluated, and the value of the reward is determined based on the result. Creating a defect-free product and moving to a defect-free labor system usually requires improvement of the production technical base [4]. In the conditions of implementation of the system, control, accounting, analysis, employee training systems were reorganized and improved in the enterprises. Quality schools and quality days are widely used.

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