

## Quality Control Analysis at PT. X.

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**Abstract:** A company needs to run its production process effectively and efficiently to produce a quality product. In reality, however, the company will encounter numerous problems that will affect company's production process, and it will cause a flawed product. This defective product might bring negative effect to the company. The impacts are in form of the production delay, which is caused by the unfulfilled orders of the product; the decrease of customer's trust; and the loss in material, power, and resources. Based on those reasons, a manufacturing company needs to conduct a production control activity called quality control. This study is aimed to identify whether PT. X quality control methods is effective in carrying out the production process, especially for their products of shirts and pants in 2016. A factor that was tested in this study was the effectiveness of quality control method that had been carried out by the company. Statistical Quality Control (SQC) was used as a testing technique in this research. The research method used in this research was descriptive method. The population obtained in this study was the total shirts and pants products during the 2016 production period. The sampling technique used in this study was the non-probability sampling technique paired with purposive sampling. The number of samples discussed in this study used was 45.793 products, those numbers consisted of pants and shirts. The data in this study were obtained through literature study, documentation, dan interview. The data processing technique used in this study was Statistical Quality Control (SQC). The result of this study showed that the quality control method held by PT. X was effective. The effectiveness range of the company's method was 98.33% (shirts) and 98.14% (pants).

**Keywords:** Quality control, Statistical Quality Control, and Effectiveness

### 1. Research Background

In *Quality Management Principles* (ISO Family, 2015) "Companies that already have a good product quality control system must maintain consistency in order to keep up with market demand. The results will be achieved with quality control in order to reduce defective products and increase product quality which will ultimately affect the increase in company profits. This must be done in line with the 7 principles of quality management." This rationalization is taken in accordance with the fact that ISO is used as a reference for various companies in quality control.

According to ISO 9000-I: 2000 *Annex A, Item A.3* as cited by David. L. Goetsch and Stanley B. Davis (2000: 443), states the definition of quality control as follows, "Quality control is defined as all activities within the overall management function that determine quality rules, objective responsibility, and implement them into quality planning, quality control, quality assurance, and quality improvement in a quality system."

According to Dr. Joseph M. Juran quoted by Vincent Gaspersz (2002: 7) defines quality management as a collection of activities related to certain qualities that have characteristics. Quality control is an integrated activity in the company as a means of improving, maintaining, directing and enhancing the quality of production on an ongoing basis so that the goods produced are in accordance with the plan or in other words, reach the standards predetermined by the company (Kholil, 2009).

So it can be concluded that quality control is a continuous effort that can be preventive (prevention) or improvement (improvement) of a product and implemented before the product or service error occurs. This is so that quality errors do not occur in the production process. In line with the *Quality Management Principles* (ISO Family, 2015), if quality control is carried out properly, company leaders will be able to take good actions and policies. Good quality control can also help the leader make a good plan & improve the control system or supervision of the product that has been done.

PT. X is a company engaged in convection, printing, and computer embroidery. PT. X is located on Jl. Cikupa Bobojong RT. 01 RW. 07, Bojongmanggu, Kec. Pameungpeuk, Bandung, West Java (40376). This company has started its production since 1997 and continues to grow until now and has several customer partners, one of which is the Indonesian Ministry of Forestry. One advantage of this is a garment company has complete facilities to meet

the needs of the production start of the process of cutting, screen printing, embroidery, sewing, to the packaging which can all be *dilkakukan* without on *over* to somewhere else.

Based on data from the company's inventory from 2015 to early 2016, the company purchased new machines to increase production capacity, especially for shirts and pants. There are two types of use of this new machine, namely replacing outdated machines and adding production equipment. This purchase was made for several reasons including the old machine having short operating hours due to *overheating* and to reduce the amount of damage caused by *overheating*. However, the purchase of this machine actually had a negative impact on the level of work, especially on the production of pants.

Based on data from the company in the early semester of 2016, the number of shirts produced was 14,425 units and produced pants as many as 6,244 units. However, in this study, the solution to the problem of product defects will be more focused on the production of shirts and pants. The company has problems with the number of defective products produced due to various factors and indications of defects from products based on the number of orders that have not been fulfilled at maturity, the existence of orders that exceed the delivery schedule (due to repairs), corrections and complaints from consumers, and the work system which has not been optimal which causes a decrease in the quality and profit of the company. Evaluation of the process of production activities is carried out at the end of each month of the production period by the company with the tolerance limit allowed by the company, namely 2% of the total production. Meanwhile, in May 2016 the production process experienced a failure rate of 2.96%.

The quality control applied by the company today is to carry out manual checks on the condition of machines and products at the end of each production stage. The stages of production carried out are marking, cutting, PPIC, embroidery, sewing, finishing, and *quality control*. The company also takes precautionary steps by carrying out additional production for every 50 production units that can be used by inventory or as a substitute for defective products.

Although this has been done by the company, the increase in failure rate for each company to receive large orders continues. This can be concluded based on data from companies collected until 2019.

## 2. Purpose of Research

One of the ways that companies can promise good product quality is to set quality standards and carry out quality control. The author identifies the problems that will be discussed as follows:

1. What actions are taken by the division of *Quality Control* PT. X to reduce product defects?
2. What factors in 2016 that caused product defects occurred at PT. X?
3. What is the level of effectiveness of quality control (*quality control*) by implementing the applicable protocol?

## 3. Literature

According to Sofjan Assauri (2008: 7), the definition of production is as follows, "Production is all activities in creating and increasing the utility (*utility*) of a good or service, for which activities are needed production factors in economics in the form of land, labor, , and skills (*organization, managerial, and skills*).

Meanwhile, according to Bambang Prishardoyo (2005: 26), defines production as follows, "Production is an activity carried out to meet human needs by producing goods or increasing the use value of goods and services."

From the definition of the definition of production above, it can be interpreted that production is an activity to transform the factors of production, so as to increase or add value to the form, time and place of a good or service to meet human needs obtained through exchange.

Production activities are one of the final processes carried out by the company in producing *output* in the form of goods and services which are the objectives of the previously defined production plan. The production process is also one of the activities of transforming *input* into *output* as is well known, *input* is the materials needed in production activities while *output* is a product that aims to fulfill consumer orders.

According to Hendra Kusuma (2009: 5) the definition of a production process is input in the form of raw materials, then raw materials are converted (with the help of equipment, time, money and so on) into outputs called the final product. Another definition of the production process is put forward by Sofjan Assauri (2008: 75) who states that the production process is a method, method and technique to create or add to the use of a good or service by using resources (labor, machinery, materials and funds. ) which exists.

To carry out the production process that has been planned beforehand, the company must have production sources that can support production activities to run smoothly. Production sources according to Sofjan Assauri (2008: 75) are as follows labor, machine, materials, and funds or capital.

Quality control is one of the important techniques in operations management to produce goods and services according to the desired standards and to maintain product quality in accordance with predetermined provisions. Quality is a relative term, from a consumer perspective quality is closely related to taste (*fitness for use*). The product will be said to be of high quality if it has good use with consumers. Another view says that quality is a product or service that can increase the status of its users. There are also those who say that goods or services provide benefits (*measure of utility and usefulness*). In general, the quality of goods or services can be related to constraints, durability, time, appearance, integrity, purity, individuality, or a combination of these factors.

According to Zulian Yamit (2003: 347), quality is:

"A relative term that is very dependent on the situation from a consumer's point of view, subjectively people say quality is something that suits one's taste (*fitness for use*)."

In terms of the treasury of the International Organization for Standardization (ISO) it is said that:

"Quality is the overall characteristics and characteristics of a product or service whose ability can satisfy needs, both expressly and hiddenly."

The definition of quality control according to Sofjan Assauri (2008: 212) is as follows:

"Quality control is an effort to maintain the quality or quality of the goods produced, in order to comply with the product specifications that have been determined based on the policy of the company leadership."

From the above understanding, it can be concluded that quality control is an effort to maintain or add the quality of the goods produced to conform to the product specifications set by the company.

In detail, it can be said that the objectives of quality control according to Sofjan Assauri (2008: 212) are:

1. So that the products produced can reach predetermined quality standards.
2. Try to keep the inspection costs as low as possible.
3. Try to keep the design costs of products and processes using a certain quality of production to be as small as possible.
4. Try to keep production costs as low as possible.

So the main purpose of quality control is to get a guarantee that the quality of the product or service produced is in accordance with the established quality standards at the lowest possible cost.

To carry out quality control properly, it is necessary to understand several steps in implementing quality control. According to Roger G. Schroeder (2017: 143), to implement quality planning, control and development through a quality cycle the steps needed are:

1. Determining quality characteristics.
2. Deciding how to measure each characteristic.
3. Establish quality standards.
4. Determine the appropriate test for each standard.
5. Find and repair cases of low quality products.
6. Carry out a continuous improvement process.

Quoted from Wildan Yanuar's (2010) thesis, according to **Douglas C. Montgomery** (2001: 26), the factors that can affect the company's quality control are:

### **1. Process capability**

The limits to be achieved must be adjusted to the existing process capabilities. There is no point in controlling a process within limits that exceeds the ability or capability of the existing process.

### **2. Applicable**

specifications Specifications for the production results to be achieved must be applicable, when viewed from the point of view of process capabilities and consumer desires or needs to be achieved from these products. In this case, it must be ascertained first whether the specifications can apply from the two aspects mentioned above before quality control in the process can begin.

### **3. Acceptable level of non-conformity**

The purpose of controlling a process is to reduce the product that is below the standard to a minimum. The level of control imposed depends on the number of products that fall below acceptable standards.

### Quality costs Quality

costs greatly affect the level of quality control in producing products. If you want to produce high quality products to satisfy consumer needs, then it requires a relatively higher quality cost.

#### A. Quality Control

According to **Koontz and O'Donell in Fattah (2007: 175)** "controlling is the measuring and correcting of activities of subordinates to assure that events conform to plans" or control is the measurement and correction of performance in order to ensure company goals and the designed plan is achieved. Meanwhile, according to **Siagian in Fattah (2007: 176)** "control is the process of observing the implementation of all organizational activities to ensure that all work that is being carried out goes according to a predetermined plan".

According to **Evans and Lindsay (2007; 236)** control is needed for 2 reasons, namely:

1. Control is the basis for effective daily work management for all levels
2. Long-term improvement cannot be applied to a process unless the process is well controlled.

A system control has 3 components, **Evans and Lindsay (2007: 236)**, namely:

1. Standard or objective
2. Ways to measure success
3. Comparison between actual results and standards, and basis to form the basis for corrective action.

From the explanation above, it can be concluded that control is part of the basis of management and a tool that can be used to observe and measure all activities so that all work can run well and in accordance with company objectives.

According to **Ernie and Saefullah (2005: 327)**, the types of supervision are divided into 3, namely:

1. Initial

Supervision is carried out at the commencement of work implementation. This is done to prevent irregularities in the implementation of work.

2. Supervision of the Process

Supervision is carried out when a work process is in progress to ensure whether the work carried out is in accordance with the stated objectives.

3. Final

Supervision is carried out at the end of the work process.

In controlling there are 4 steps used by **Evans and Lindsay (2007: 236)**, namely:

1. Determining standards

Determining cost quality standards (*cost quality*), work quality standards (*performance quality*), standards safety quality (*safety quality*), standards the quality of reliability (*reliability quality*) required for a product.

2. Assessing conformance

Comparing the conformity of products made with predetermined standards.

3. Acting when necessary

Correcting the problem and its causes through factors that include *marketing, design, engineering*, production, and maintenance of factors that affect customer satisfaction.

4. Planning for improvement

Planning a continuous effort to improve standards of cost, performance, safety and reliability.

#### B. Benefits and Objectives of Quality Control

According to **Tampubolon (2014: 96)**, the task for operations is to determine the critical point to focus attention in the production process, so that the quality of the production results can be met. Achieving quality targets will benefit the company in placing its position in the market (*market position*). Thus the quality of projects for the company in the determination of:

1. *companiesreputable(company reputation)*; if the company's position can be as a market leader (*market leader*), this condition shows that the quality of the company is compared to other competitors. Conversely, if the company is only a *market follower*, the company must try to control the quality of its products to be even better (*market reposition*). Thus quality is very useful in shaping a company's reputation, through the quality of its production.

2. *Product liability(productability)*, is a challenge for companies in the marketing of a product, if the product cause problems for customers or markets, is the responsibility of the company materially and morally.

3. Global aspects (*Global Implication*), in the era of globalization which observes that every product or service marketed internationally must be able to compete in quality, and in terms of lower prices, as well as designs that are in accordance with international market demands, the result is that the global aspect will directly affect the quality of a result of the operational process.

### C. *Statistical Process Control (SPC)*

*Statistical Process Control* is a statistical technique that is widely used to ensure that processes meet standards. In other words, other than *Statistical Process Control* is a process used to monitor standards, make measurements and take corrective action while a product or service is being produced. (Heizer and Render, 2014). Meanwhile, according to Assauri in Miramsyah (2017) argued that the notion of *Statistical Process Control (SPC)* is a system developed to maintain a uniform standard of production quality, at a minimum cost level and apply assistance to achieve efficiency.

Based on the understanding according to the experts, it can be concluded that statistical quality control is a system to maintain the standard of quality of production at the minimum cost level which is designed to evaluate quality in terms of conformity with specifications.

Quality control statistically by using *Statistical Process Control (SPC)* has 7 tools that are useful in measuring and controlling the quality as mentioned by Heizer and Render (2014), 7 aids in measuring and controlling the quality of, among others:

1. Sheets check (*CheckSheet*).
2. Histogram.
3. Pareto chart.
4. Flow diagram.
5. Scatter Chart.
6. Control Chart.
7. (*Fishbone Diagram Fishbone Diagram -Cause and Effect Diagram*)

## 4. Discussion

### A. Implementation of Quality Control Measures at PT. X

In carrying out its production process, a company will always strive to produce products with specifications that comply with the standards set by the company itself. This is strongly influenced by competition in business which forces companies to be able to produce high quality products according to the desires and needs of consumers to achieve the expected level of satisfaction. The hope of producing high quality products is specifically realized by the application of *quality control*. Following are the responsibilities & duties of the division of the *Quality Control* company PT. X:

#### Conceptual

- a. Responsible for the implementation of the quality system used by the company in accordance with the certification obtained.
- b. Responsible for work procedures and manuals.
- c. Responsible for the quality and quantity of products produced in accordance with *orders* customer.
- d. Responsible for the documentation is good and right from the beginning of the process until the completion stage (*finishing*) at *produksi* process.
- e. Responsible for carrying out quality procedures, approving and validating decisions made for non-quality products.

#### Technical

- a. Responsible for inspection / testing activities and supervision of testing machines and measuring instruments in inspection.
- b. Responsible for the quality of raw materials and finished products in accordance with customer specifications.
- c. Responsible for smooth technical matters with suppliers and customers.
- d. Responsible for quality certification both locally and internationally.
- e. Making claims, claim answers, technical information and corrective and preventive action.
- f. Analyze product failures and establish countermeasures.

Not only in the checking process at the end of the production process, there are several kinds of tasks carried out by the division *quality control* to ensure that their responsibilities are fulfilled. These tasks are divided into 3 types:

1. *Material Quality Control*

- a. Checking incoming materials, making claims if the requested material does not meet the quality standards of the company.
  - b. Receive materials that meet the quality standards of the company for delivery and storage in the warehouse.
  - c. Make reports on quality materials below the quality standards of the company.
2. *In-line Quality Control*
    - a. Conduct checks on the production process, both on products that are being produced, and on production equipment.
    - b. Ensuring production is carried out according to procedures.
    - c. Looking for the causes of product failure in the production process.
    - d. Making reports on the implementation of quality control and documenting all quality control activities during production (*in-line quality control*).
  3. *Outgoing Quality Control*
    - a. Re-checking the quality of the finished product before delivery.
    - b. Making reports on the implementation of final(*quality control outgoing quality control*) and failure of existing products.
    - c. Documenting all activities *outgoing quality control*

All of these responsibilities and duties are assigned, of course, with the hope that the processing of raw materials in the production process can be carried out properly and there is supervision in the production process. This is done to reduce the number of defective products that can cause losses to the company.

## B. Factors Causes of Product Defect

### 1. Types at Quality Conformity Shirt & Product

Though the company has to conduct quality control at every process of production, in particular production periods can still be found nonconformity product that sometimes exceed the tolerance of disability has been established by the company. To find out the cause of this discrepancy, a more careful review is required. Types of product non-conformities found included:

1. Sewing errors.
2. The installation of attributes that are not neat.
3. Color differences/fading colors.
4. Tears and holes in fabrics due to mishandling.
5. Order error.

### 2. Factors that cause non-conformity with the quality of the company's products. The

Implementation of production activities may have problems that cause disruption to the predetermined plans. However, in an effort to maintain good product quality, companies must be able to find out the causes of these problems. Some of these problems arise from within the company itself. So, to overcome this, there are several factors that need to be considered by the company so that the products produced can maintain the standards that have been set. The factors in question are:

1. Raw Materials
2. Machine and Equipment
3. Human Resources
4. Method
5. Work Environment

## C. Analysis Using *Statistical Quality Control* (SQC)

This research will use statistical test analysis, which is a different test to see the effectiveness of the *standard defects* used by the company. In addition to the use of differential tests, techniques *Statistical Quality Control* will be used to further analyze the causes of defects that affect the discovery of many defective products over several production periods.

### 1. Machine (*Machine*)

In a significant amount of production carried out by the company has a dependence on the machine used. The following are observations of machine use in several divisions:

- a. In the sewing division, the machines used are 8 units of Typical Sewing Machines (2000 rpm), 5 units of Chuki (2500 rpm), 1 unit Gemsy (300 rpm), Juki (2500 rpm) 4 units, Juz (2500 rpm) 1 unit, Siruba (VI 3900-3829) 1 unit, Yamata (150 rpm) 4 units, with a total of 24 sewing machines. On types of sewing machines with high *rotation per minute* (rpm), machines tend to more easily *overheat* when used for the same period of time compared to machines with low rpm. This situation sometimes interferes with the production process, a machine is

*overheated* uncomfortable to use due to changes in engine rotation that interfere with the sewing process.

b. The embroidery division uses automatic machines that depend on the software used in the embroidery process. The embroidery machines used were 2 Head Embroidery Machines (BE MI 11-4G.20 T), 1 Unit Head Embroidery Machines (BEXML), and 1 Unit Head Embroidery Machines (Barudan), with a total of 4 machines. Usually errors on embroidery machines are caused by problems with the software of the machine used, the input command for each software used by each machine has differences, this also can cause errors if the machine operator is not familiar with a particular machine series.

#### 2. Labor / HR

3. Not all employees at PT. X is *familiar* with machines used, especially in complex machines such as overlocking and embroidery machines, this is one of the causes of product defects. Another reason is that at times of very high order companies use employees *outsourcing* who have less work experience than full-time employees. Then, during times of surge in bookings, some employees were forced to do overtime and became exhausted.

#### 4. Raw Materials

Raw materials as the main constituent of the products being produced have a huge influence on product defects. Raw materials such as yarn, cloth, screen printing equipment, and rope must meet company standards. *Material* that is damaged and does not meet company standards will result in defective products. Material storage is also an important factor affecting the quality of materials. Materials that are rarely used or have a slow turnaround are prone to experiencing damage that is only realized during use.

#### 5. Method

The method of work done by PT. X is always developing and adapting to every order it receives. Modernization carried out by the company to maximize production with the use of technology machines in each division is clear evidence of the company to improve production quality. However, the role of humans is still very high in the company's production process. Especially as a company that carries out a production *Order to Produce* (OTP) system, a communication system *real time* with customers is needed to avoid wasted time and energy use due to miscommunication with customers. This error rate is quite large and affects the achievement of company performance even though it does not directly affect the production process.

#### 6. Environment (*Environment*)

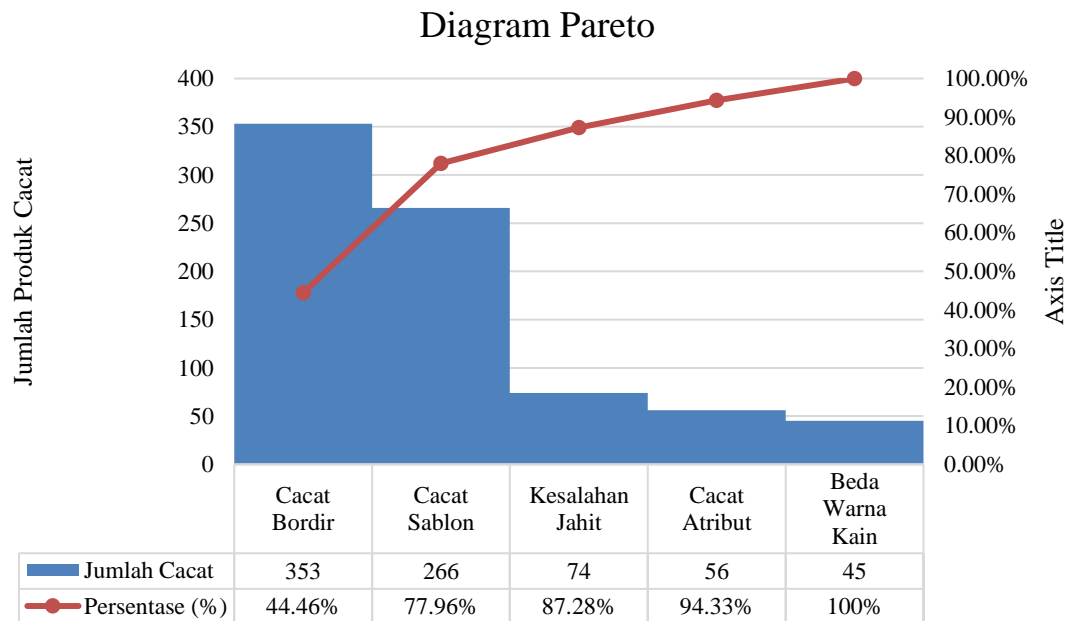
Verbal communication is still the main way of communication in companies to provide a chain of command. With noisy room conditions, sometimes the delivery of this chain of orders is interrupted. Although they do not significantly affect the quality of production or products, such incidents are better avoided.

### Pareto Diagram

Product defects will be sorted to identify and see the process that can be repaired to reduce product defects using this Pareto Diagram. In making it, it takes the number of defects for each type of defect from the results of the research that has been done. To make a Pareto diagram, first a table must be drawn up that lists each number and type of disability from the results of the research that has been carried out. From the table above, it can be seen that the order of control in looking for causal factors and problem solving from the largest to the smallest is as follows:

- |    |   |
|----|---|
| 1. | The most types of failure in the 2016 production period were Embroidery Defects.                  |
| 2. | The second most common type of failure in the 2016 production period was Screen Printing Defects. |
| 3. | The 3rd most failure type in the 2016 production period was Sewing Errors.                        |
| 4. | The 4th most common type of failure in the 2016 production period is Attribute Defects.           |
| 5. | The fifth or most recent failure type in the 2016 production period is Different Fabric Colors.   |

Based on the data and information above, a Pareto diagram can be drawn up below:



**Figure 1**  
**Pareto Diagram Types of Shirt & Pants Product Defects**

From the Pareto table & diagram above, it can be seen that after looking at the factors that cause defects from the largest to the smallest for the types of clothing and pants products during the 2016 production period, the most dominant is defects in the embroidery process.

**5. Summary**

Based on the results of the research and discussion in the previous chapter, the following conclusions were formed:

The results showed the actions taken by the Quality Control division of PT. X succeeded in reducing product defects.

There are several factors that cause product defects in 2016 which are significant, namely:

The machines are caused by a lack of maintenance on the machines, some machines used often experience overheating problems, and the embroidery machines used by the company are difficult to operate.

Humans are characterized by a lack of expertise for some employees and detail factors during the production period.

Raw materials caused by storage rooms or warehouses and material mismatches, namely damage to materials due to both delivery and storage.

Methods caused by the company's OTP production system that allow order mismatches and product design mismatches due to miscommunication with customers.

Noisy environment inside the factory.

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