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The Use of Quality Management Techniques: The Application of the New Seven Tools

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Abstract: The implementation of total quality management cannot be successful without utilizing suitable quality management tools and techniques. Access to appropriate quality management tools and techniques has been put forward as a vital for successful quality work. Over the past decade, many research that has been conducted dealt with the importance of using quality management tools and techniques and the effects of those on business performance. In spite of the effective use of quality management tools and techniques, many organizations do face difficulties in their implementation. Some common difficulties could be mentioned here: poorly designed training and support, inappropriate use of tools and techniques, as well as poor measurement and data handling. The objective of this research is to show the application of the quality management techniques effectively. A case study was conducted at PT. Zenith Pharmaceuticals which is located in Semarang, Indonesia. The company encounters a problem on a production floor. There are a large number of products that are not associated with customer specifications. The new seven tools are then employed to identify and recognize the factors which could cause the Triocid strips become defective. In the end, the quality improvement design is proposed to minimize the number of product defect.

Keywords: Quality management; new seven tools.

1. Introduction

The use and selection of quality management tools and techniques play a key role in supporting and developing the continuous improvement of an organization [1-5]. These tools and techniques: (1) allow everyone to involve in the improvement process and solve their own problems, (2) let the processes to be monitored and evaluated, (3) develop a mindset of continuous improvement, (4) transfer experience from quality improvement activities to everyday business operations, and (5) reinforce teamwork through problem-solving [2].

Tools and techniques are considered as practical methods, skills, means or mechanism that can be applied to particular tasks [2]. A single tool may be described as a device which has a clear role and often narrow in focus and is usually used on its own. Example of tools is cause and effect diagrams, relationship diagrams, and control charts. In contrast, a technique has a wider application than a tool. Viewed simply, techniques can be thought of as a collection of tools. For example, statistical process control employs a variety of tools such as graphs, histograms, as well as control charts. These may affect performance because they make it possible to determine the root cause of quality problems in order to identify and solve such problems or to identify opportunities for improvement [6, 7].

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However, despite the widespread consensus that using tools and techniques are ways of managing organizations to improve overall effectiveness and performance, they encounter a range of difficulties in the use and application of these tools and techniques [2, 8].

This paper aims to show the use of the quality management techniques effectively and efficiently in an organization. The new seven tools, also known as seven new tools or seven management tools, are utilized to identify factors which cause the production defect. Furthermore, the quality improvement design is proposed to minimize the number of product belongs to non-conforming.

The new seven tools comprise affinity diagram, matrix diagram, tree diagram, arrow diagram, relationship diagram, matrix data analysis, and process decision program chart (PDPC). They are rather different from seven basic quality tools (QC7) proposed by [9]. The latter is somewhat known as a quantitative technique while the former as a qualitative technique [10]. Although up to 95% of quality-related problems can be solved with the QC7 [9], the success requires an additional set of tools to manage verbal information [11]. It takes place since managers often deal with structuring unstructured ideas, formulating business plans, or organizing and controlling complex projects. In addition, the simplest models are the best to be applied at all levels from senior management to junior staff [12]. It makes the new seven tools attract decision makers and experts and their use is increasingly growing [13].

2. Research method

The research has been conducted at PT. Zenith Pharmaceuticals which is located in Semarang, Central Java Province, Indonesia. It is a company which engages in the field of pharmacy. It produces a variety of drugs, such as capsules, pills, and syrups.

Currently, the company faces a problem on the production floor, i.e. a large number of products that are not in accordance with customer specifications. There are many types of defective products, such as inappropriate dimensions, cracked, damaged packaging and so forth. Within a day, the company is able to produce 21,725 to 61,949 Triocid strips. However, not all can be marketed; in addition, the sample data taken from the last month shows that the proportion of nonconforming product has exceeded the *p*-chart's upper control limit (UCL) so many times (see Figure 1).

This problem has been going on for quite a long time and caused not only waste but also cost for the company. The waste is in the form of cost for use of resources during the production process. Therefore, the causes of this problem have to be analyzed to minimize both the number of defective products and cost associated with the nonconforming products. The new seven tools are applied to deal with.

This study used direct observation, data and document collecting, and interview as research instruments. The direct observation is conducted to be aware of the reality in the company. Data and document collection has been done by compiling the information through logbook, standard operations procedures (SOP), and other documents related. The interviews also have been done with the operator of the production department and company's top level management.

3. Case study: result and discussion

3.1. Affinity diagram

An affinity diagram is a tool used to gather a large number of ideas, opinions, problems, and solutions. They are collected through brainstorming and then are grouped according to their natural relationship. The affinity diagram of the defect causes for Triocid strips is shown in Figure 2.

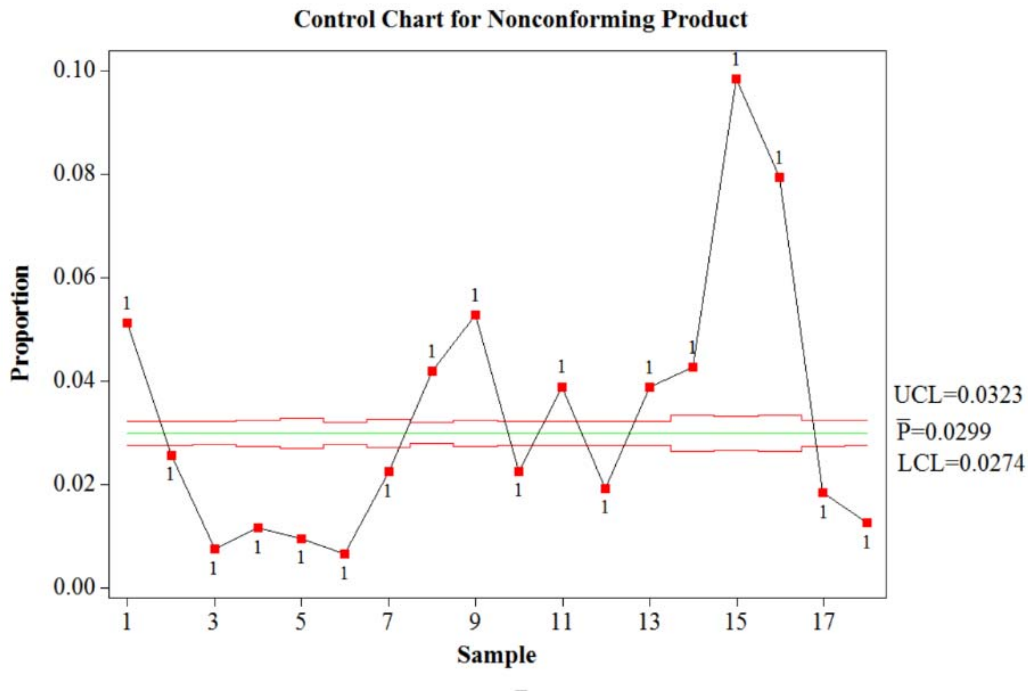

Figure 1. Control chart for the nonconforming product.

Why Triocid strips are frequently defect?	
Condition of Aluminum	**Condition of Machines**
• Inappropriate supplier selection • Aluminum packaging is too thin or too tick	• Worn out tools • Imprecise machining process • Machines are often breakdown • Tools are often broken and blunt
Process	**Condition of Operators**
• Unstable temperature • Product's path is often blocked • Discontinuous process	• Initial setting error • Unresponsive

Figure 2. Affinity diagram for defect causes of Triocid strips.

The defect causes of Triocid strips are classified into four major categories: aluminum's condition, process, the condition of machines and conditions of operators. Aluminum's initial condition is influenced by the difference of its thickness and choosing the wrong supplier. Machines' condition is affected by worn out and blunt tools, breakdown machines, and imprecise machining process. Human error or operators' error is influenced by the initial setting error and less responsive when the process is not going smoothly. Error in the process is influenced by too much delay and stop during the process, unstable temperature when stripping, and capsule's track is not going smoothly.

3.2. Matrix diagram

Matrix diagram is a tool that is often used to describe the actions needed for an improved process or product. It consists of rows and columns that describe the relationship between two or more factors to obtain information about the nature and strength of the problem. The matrix diagram of the defect causes for Triocid strips is shown in Figure 3.

Aluminum thickness	●	△	△	△
Bad condition machines	△	●	△	●
Human error	○	○	●	○
Inaccurate method	○	△	○	△
Factors / **Improvement Activities** / **Specific Activities**	Choosing the right suppliers	Doing the preventive maintenance	Publishing operators' SOP	Purchasing new machine
Giving specific job desciption	△	△	●	△
Checking production machine	△	●	△	○
Giving an instruction for proper temperature	●	△	●	●

Figure 3. Matrix diagram for defect causes of Triocid strips.

The diagram compares the relation between three factors: improvement activities, factors caused defective, and specific actions that have been done. Improvement activities consist of preventive maintenance, choosing the right suppliers to get the proper aluminum thickness, publishing operators' SOP, and purchasing a new machine. Specific actions are classified into three actions: giving specific job description in order to make operators focus on one task, checking production machine regularly, and giving an instruction of proper temperature for stripping process. Factors caused defective consist of aluminum thickness, bad condition of machines, human error, and inaccurate method. As a result, it can be concluded that the first priority is machine condition, the second is human error, process error, and the last is aluminum thickness.

3.3. Tree diagram

A tree diagram is a tool used to solve any concepts, such as policies, targets, goals, objectives, ideas, issues, tasks, or activities at a lower level and detailed. Tree diagram begins with one item that is branched into two or more trunks; each trunk is then branched into two or more branches, and so forth; so it looks like a tree with many trunks and branches.

In order to decrease the number Triocid stripping reject, there are several aspects which have to be considered, such as preventive maintenance, keep the pills on track, and determine the proper temperature. The aim of preventive maintenance is to keep the machine in a good condition. Two actions have to be done to acquire this aim, i.e. checking machine condition regularly and removing parts which are corrupted to increase machine durability. For complete actions for reducing the number of Triocid stripping reject see Figure 4.

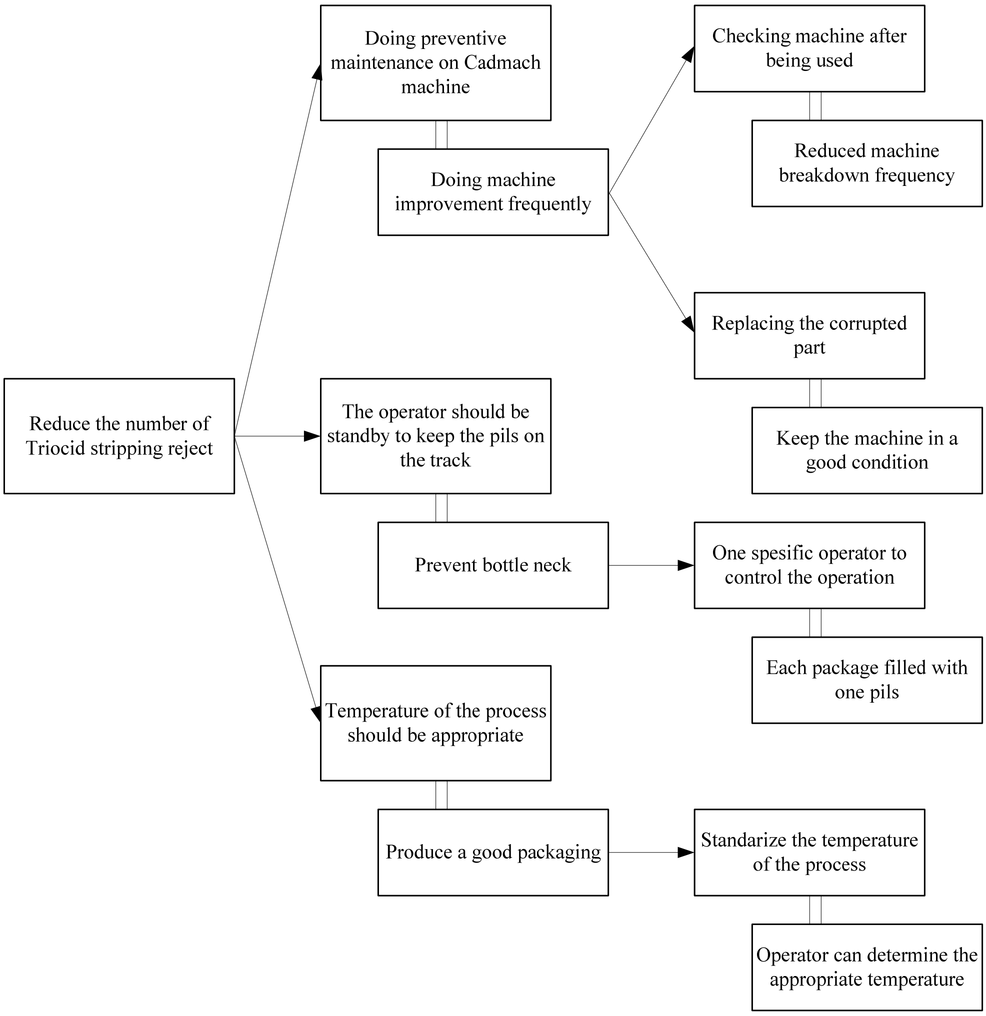

Figure 4. Tree diagram for defect causes of Triocid strips.

3.4. Arrow diagram

Arrow diagram illustrates the order of the production process. Good process order to reduce the number of reject products starts from machine set-up to make the machine operates normally and setting appropriate temperature for stripping. Next activity is transporting medicine from storage and arranging aluminium roll to machine before the operation starts. After confirming all activities have been put in order, pills are poured by the operators. They have to control the product and make sure each slot filled by one pill. Strips were taken out by operators and then accumulated and transferred to storage.

3.5. Relationship diagram

Relationship diagram or diagram linkage problem is a tool to analyse the relationship between cause and effect of various complex issues so that it can be easily distinguished between the trigger of a problem and the result of a problem.

3.6. Matrix data analysis

Matrix data analysis is a tool used to retrieve the data that is displayed in a matrix diagram and set it so that it can more easily be shown and demonstrated the strength of the relationship between variables. The relationship between the variable data displayed on both axes are identified using the symbols for degrees of interest or numerical data for evaluation. The tool is most often used as a characteristic display of data for the sake of conducting market research and explain the products and services.

3.7. Process decision program chart

Process decision program chart (PDPC) is a diagram representing activity of planning and possible situation that may occur so PDPC not only made for the purposes of the final solution of a problem, but also to cope with the risk of shock that may occur. In other words PDPC used for planning scenario, it has to be planned how the possibility of settlement of the problem. PDPC gives description how to reduce the number of defect in Triocid stripping process. To achieve this goal, it is classified into three steps: managing aluminium thickness, keep machine in a good condition, and control stripping temperature. A problem faced when controlling the temperature is the imprecise data that the operators have to input. To solve this problem, operator fast response is needed. If the operator cannot do this task properly, adding one more operator to monitor this process is recommended. Giving SOP to operators will could reduce the number of defect products in Triocid stripping. Another activities is applying punishment to operators who break some parts, adding one operator to control machining process, and rearrange the agreement with supplier. The PDPC for reducing the number of Triocid stripping reject is shown in Figure 5.

4. Conclusion

The practical example within this paper clearly supports the application of quality management tools and techniques. The quality management technique: the new seven tools could be employed to reduce the number of Triocid stripping reject in PT. Zenith Pharmaceuticals. This problem has been going on for quite a long time and caused waste and cost for the company. This paper could help the quality control manager to run the quality management program effectively in order to manage continuous improvement process.

The research suggests that the following are key to the successful implementation, use, and success of applying the new seven tools:

- In-depth knowledge of the process;
- Formal training in problem-solving techniques;
- Appropriateness of tools selected for use;
- Application simple models at all levels in the organization to aid communication and learning.

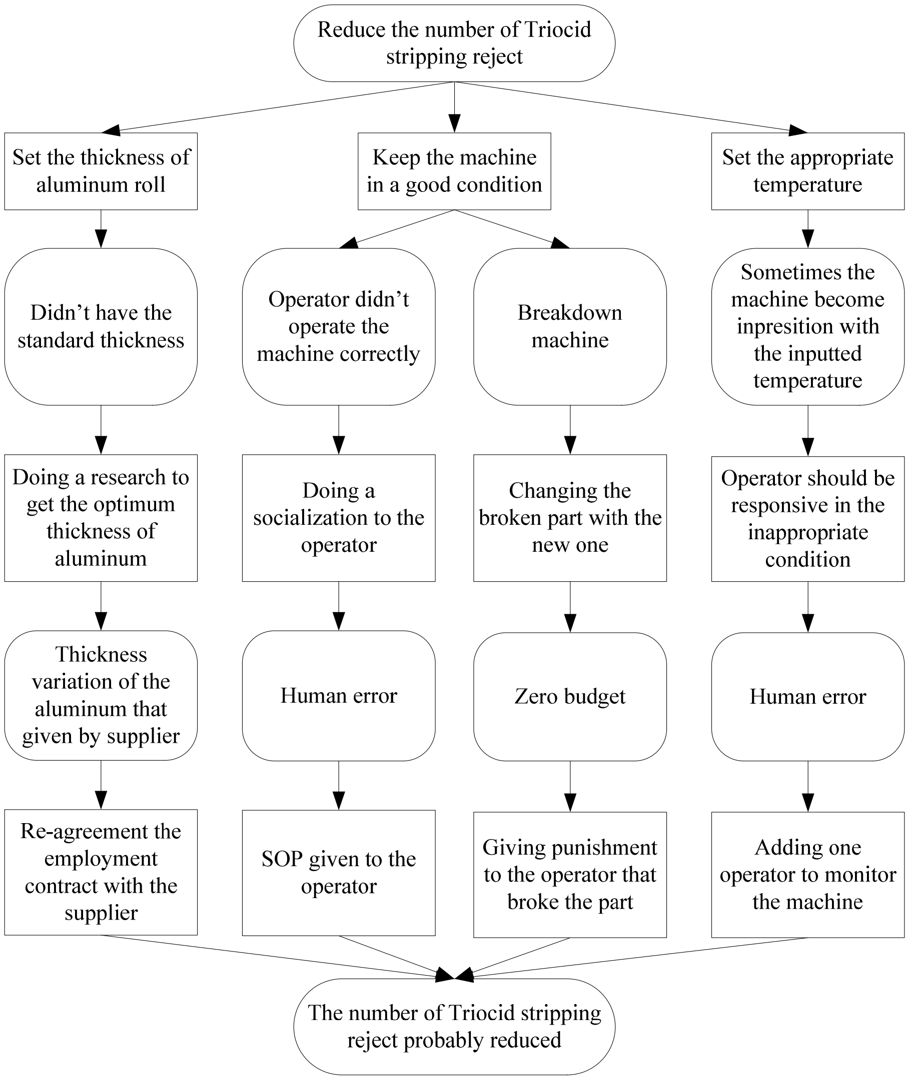

Figure 5. PDPC for reducing the number of Triocid stripping reject.

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