NATIONAL TECHNICAL UNIVERSITY COLLEGE OF MALAYSIA

Quality Improvement in Manufacturing Industries

Thesis submitted in accordance with the requirements of the National Technical University College of Malaysia for the Degree of Bachelor of Engineering (Honours) Manufacturing (Process)

By

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December 2005

APPROVAL

This thesis submitted to the senate of KUTKM and has been accepted as fulfillment of the requirement for the degree of Bachelor of Engineering (Honours) Manufacturing (Process). The members of the supervisory committee are as follows:

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Main supervisor

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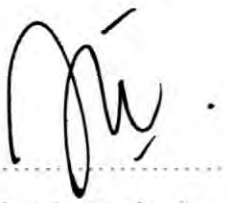
DECLARATION

I hereby, declare this thesis entitle "Quality Improvement in Manufacturing Industries" is the result of my own research except as cited in the reference.



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ABSTRACT

Effort to reduce both the variability of a process and the production of nonconforming items should be ongoing because quality improvement is never-ending process. Quality improvement must be distinguished from quality control. Improvements programmed seek to enhance actively the quality of a product; often through process improvement and reduction of process variability. This paper proposes a more effective quality control chart that is specifically applicable to occasions where the number of faults is limited. This paper also covers a variety of tools, and it can be consider that the Seven Ishikawa tools its name also Seven quality control tools are among the most useful and famous tools. The main goal of the use of these tools in the manufacturing processes is to determine if a process being analyzed is within the established parameters in control process or not Out of control process. Through the time, a constant improvement has been accepted as the main objective of companies for all the fields, but this improvement is always keeping Seven Quality control tools as the base.

Keyword: Quality improvement, seven (7) quality control tools, seven (7) new quality control tools.

ABSTRAK

Usaha untuk meningkatkan pengeluaran mestilah berterusan kerana peningkatan kualiti adalah satu proses yang berterusan. Program peningkatan di cari untuk meningkatkan kualiti produk dengan lebih giat. Biasanya peningkatan kualiti ini akan menjalankan peningkatan proses dan mengurangkan kepelbagain proses. Tesis ini mencadangkan carta kawalan kualiti yang lebih efektif secara khususnya dapat di aplikasikan dalam keadaan di mana bilangan ralatnya adalah terhad. Kajian ini juga merangkumi kepelbagaian kaedah dan ianya ialah tujuh(7) kaedah Ishikawa atau dikenali sebagai tujuh (7) kaedah kawalan kualiti di mana ia adalah salah satu kaedah yang sering digunakan dan juga sangat berguna dalam proses peningkatan kualiti.Matlamat utama kegunaan kaedah ini dalam proses pembuatan adalah untuk mengenal pasti sama ada proses yang sedang di analisis berada dalam parameter yang ditetapkan dalam proses pengawalan atau terkeluar dari kawalan. Peningkatan yang tidak berubah telah diterima sebagai objektif utama syarikat dalam semua bidang, tetapi peningkatan ini sentiasa mengekalkan tujuh(7) kaedah kawalan kualiti sebagai asas.

DEDICATION

Specially dedicated to;
My beloved Father, Ab.Rahman Abdullah
and My Mother, Ramlah Abu Bakar
who are very concern, understanding, patient ,
support, and for demonstrating the value education, hard work, and persistence.
Thanks for everything.

To Basir Zainal Abidin, and All My Sibling,
I also would like to say thanks.

A time to remember family and friends, too;
A time reminisces, and says;
Thank You...

ACKNOWLEDMENT

Alhamdulillah, thank you for Allah, the Most Merciful, the almighty for his giving me to complete the final project. First of all, I would like to express my appreciation and sincere gratitude to my supervisor, En.Abd Halim Hakim bin Abd Aziz for his irreplaceable unfailing patience, guidance and encouragement throughout the whole course of this work. Without his valuable advice and understanding, the thesis phase 1 could not been successfully complete. To all CTRM Sdn Bhd employees, I am very thankful for your scholarly advice and willingness to help. The recommendations and insights of CTRM Sdn Bhd employees were quite helpful in conducting the research. And also to En Akramin Mohamad,Cik Noor Ajian Mohd Lair and all the lectures of Manufacturing Faculty.

I extend my warmest thanks to my family especially to my parents, En. Ab Rahman Abdullah and Pn Ramlah Abu Bakar to their support and patience during the completion of this thesis. Special appreciation is address to Mr Basir bin Zainal Abidin for being thoughtful and supportive. Without their help, it would be Impossible for me to complete my final project phase 1 successfully.

I would like to express my gratitude to my truly friend to their support and patience during the completion of this thesis.

Your cooperation is highly appreciated. May Allah Bless You all.....

TABLE OF CONTENTS

LIST OF FIGURE

LIST OF TABLE

CHAPTER 1

INTRODUCTION

1.1 Overview of Research Project

Since W. Edwards Deming emphasized the role of statistical thinking in understanding and solving problems, quality improvement has been a major theme in worldwide industry. Many companies have adopted the use of statistical techniques, and the application of these methods has become well established in aerospace, automotive, electronics, pharmaceutical, semiconductor and other manufacturing industries.

Today's global business environment calls for organizations to develop, implement and maintain effective quality management systems. While the objectives of quality improvement are clear, the roadmap to reaching a superior quality operation is more difficult and complex. Our clients deal with a host of issues - from resources development and training and complaints management to lab operations excellence, compliance, and documentation

In recent years, statistical methods have also been explored by banks, insurance companies, government agencies and health care organizations interested in improving the quality of their services to customers.

1.3 Scope of Studies

This research presents the case study at the industries to improve the quality. This paper focused in improves the quality using the seven quality control tools. By using the seven quality control tools quality was controlled and the problem was detected. The limitation is study the quality improvement by using the seven quality control tools that applied at the manufacturing industries.

2.3Quality Improvement

FDA's quality system regulation (QSR) and ISO 9001 encourage device manufacturers to incorporate continuous quality improvement processes as a part of their quality systems. While companies have adopted different methods to control design and manufacturing outcomes, the intent is always the same: quality improvement.

Hitoshi Kume, a recipient of the 1989 Deming Prize for use of quality principles, defines problems as "undesirable results of a job." Quality improvement efforts work best when problems are addressed systematically using a consistent and analytic approach; the methodology shouldn't change just because the problem changes. Keeping the steps to problem-solving simple allows workers to learn the process and how to use the tools effectively.

Easy to implement and follow up, the most commonly used and well-known quality process is the plan/do/check/act (PDCA) cycle (Figure 1). Other processes are a takeoff of this method, much in the way that computers today are takeoffs of the original IBM system. The PDCA cycle promotes continuous improvement and should thus be visualized as a spiral instead of a closed circle.

Another popular quality improvement process is the six-step PROFIT model in which the acronym stands for:

P = Problem definition.

R = Root cause identification and analysis.

O = Optimal solution based on root cause(s).

F = Finalize how the corrective action will be implemented.

I = Implement the plan.

CHAPTER 2

LITERATURE REVIEW

2.1Quality

Quality can mean individual can interpret different things to different people in a variety of ways. Quality may be thought to have two main divisions:

i. The quality of a manufactured product
ii. The quality of service received

From a manufacturing standpoint quality is simply conformance to specifications. The ultimate customer could describe quality as fitness for use. When trying to edge out of competition, quality can be interpreted as producing the very best product or providing the very best service. (Gerald M.Smitch, 1991)

2.2Improvement

There are many definitions on improvement. Refer to the definition for "improvement" in the American Heritage Dictionary; it can be define as the act or quality of improving or state of being improved

T = Track the effectiveness of the implementation and verify that the desired results are met.

If the desired results are not met, the cycle is repeated. Both the PDCA and the PROFIT models can be used for problem solving as well as for continuous quality improvement. In companies that follow total quality principles, whichever model is chosen should be used consistently in every department or function in which quality improvement teams are working. (Ashweni Sahni, 1998)

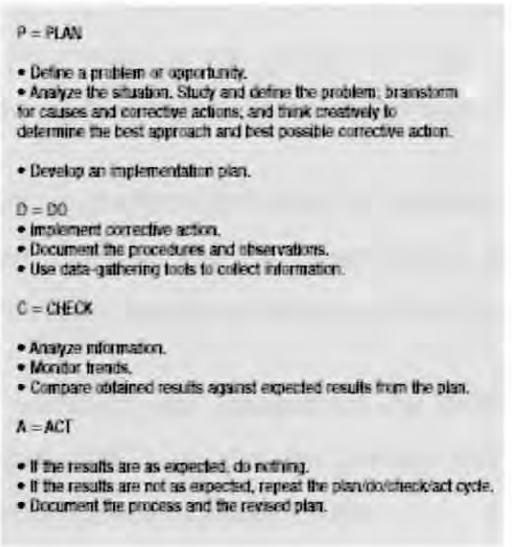

Figure 2.1: The most common process for quality improvement (Ashweni Sahni, 1998)

Efforts to reduce both the variability of process and the production of nonconforming item should be ongoing because quality improvement is a never ending process. Where as process control deals with identification and elimination of special causes that force a system to go out of control (for example; tool wear, operator fatigue, poor raw material), quality improvement related to the detection and elimination of common cause.Common causes are inherent to the system and are always present. Their impact on the output may be uniform relatives to that of special causes.

Special causes are mainly controllable by the operator, but common causes need the attention of management. Therefore, quality improvement can take place only through the joint effort of operator and management, with the emphasis primarily on the latter for instance, a decision to replace the milling machine must be made by management.

Quality improvement should be the objective of all components and individuals. That improves the rate of return of profitably by increased productivity and by the cost reduction. It is consistent with the philosophy that company should continually seek to expand its competitive edge. It supports the principle that no deviation from a standard is acceptable, which is akin to the principle of the loss function developed in the Taguchi methods. So, even if the product is the product is within the specification limits, and ongoing effort should be made to reduce its variability around the target value.

Some methods include such graphical technique as Pareto analysis, histogram and causes and effect or fish bone diagram. Quality improvement through design may also be achieved through experimental design technique and the Taguchi method.

Several authors have identified and categorized the different stages associated with quality improvement Pall (1987) divides the process into three stages: commitment, consolidation and maturity. (Amitava Mitra, 1998)

2.4Seven Basic Quality Control Tools

Chaudhry, S.S. and Higbie, J.R. (1989) said, "SPC is the use of statistically based method to evaluate a process or its output to achieve or maintain a state of control". This definition is broad enough to include all statistically-based techniques ranging from taking a random sample to very sophisticated design of experiments. Although there is no single list for these statistically-based tools (methods), also known as quality tools, there is however a general agreement on the following seven tools:

i. Flow chart.
ii. Histogram.
iii. Cause and effect (fishbone) diagram.
iv. Pareto analysis (diagram).
v. Control charts.
vi. Scatter diagram.
vii. Checklist.

The opinion from Pavel Mach, Jessica Guhqueta (2001), Kaoru Ishikawa integrated the 7 Statistical tools in the 1960's. He promoted these tools; their main purpose is to improve all kind of processes, promoting the interrelation and teamwork of all people involved. The tools are easy to use, so it would let everybody to understand, learn to manage them and to take advantage of the improvements that these represent. The main goals of the quality tools are:

i. Increase the communication between operators and arrangement
ii. Detection of Problems and decrease the recurrence of problems
iii. Improve all kind of processes including manufacturing, educational, and business processes.

Once the basic problem-solving or quality improvement process is understood, the addition of quality tools can make the process proceed more quickly and systematically. Seven simple tools can be used by any professional to ease the quality improvement process: flowcharts, check sheets, Pareto diagrams, cause and effect diagrams, histograms, scatter diagrams, and control charts. The concept behind the seven basic tools came from Kaoru Ishikawa, a renowned quality expert from Japan. According to Ishikawa, 95% of quality-related problems can be resolved with these basic tools. The key to successful problem resolution is the ability to identify the problem, use the appropriate tools based on the nature of the problem, and communicate the solution quickly to others. Inexperienced personnel might do best by starting with the Pareto chart

and the cause and effect diagram before tackling the use of the other tools. Those two tools are used most widely by quality improvement teams.

2.4.1Flow Chart

Flowcharts describe a process in as much detail as possible by graphically displaying the steps in proper sequence. A good flowchart should show all process steps under analysis by the quality improvement team, identify critical process points for control, suggest areas for further improvement, and help explain and solve a problem.

The flowchart in **Figure 2.2** illustrates a simple production process in which parts are received, inspected, and sent to subassembly operations and painting. After completing this loop, the parts can be shipped as subassemblies after passing a final test or they can complete a second cycle consisting of final assembly, inspection and testing, painting, final testing, and shipping.)

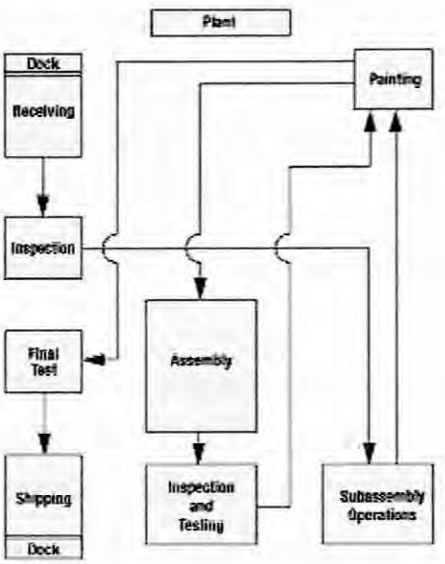

FIGURE 2.2: Flow chart for simple production process (Ashweni Sahni, 1998)

Flowcharts can be simple, such as the one featured in **Figure 2.3**, or they can be made up of numerous boxes, symbols, and if/then directional steps. In more complex versions, flowcharts indicate the process steps in the appropriate sequence, the conditions in those steps, and the related constraints by using elements such as arrows, yes/no choices, or if/then statements.

Figure 2.3: Example for the Flow chart (Sue Ryan, July, 1997)

Everyday the hundreds of tasks are completed in order to meet specific objectives. Much of our work flows between departments, offices and other organizations. It is easier to see how specific tasks and activities contribute to our mission if we can picture the whole process. A flowchart illustrates the activities performed and the flow of resources and information in a process. Two types of flowcharts are particularly useful high level and detailed. (Ashweni Sahni, 1998a)