ANALYZE THE INEFFICIENT TAKT TIME PRODUCTION AND HIGH CUSTOMER COMPLAINT FOR SUPPORT WHEEL CARRIER COMPONENT TO IMPROVE LEAN PRODUCTION SYSTEM LEVEL AT AUTOKEEN SDN BHD

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ABSTRACT

This project presents a research to analyze the inefficient takt time production and high customer complaint for support wheel carrier part to improve level of Lean Production System (LPS) at Autokeen Sdn Bhd. The case study method has been conducted at Autokeen Sdn Bhd especially at support wheel carrier workstation. The main purpose of this research is to give the recommendation to improve the takt production and customer complaint criteria in Autokeen LPS evaluation. From the research, the finding shows that the process cycle time for produce support wheel carrier is over the customer takt time. This problem because the customer takt time never being calculates and be display at support wheel carrier workstation. For the customer complaint criteria, many cases of defect part are delivering to customer because of man power carelessness. After all problems root causes being analyze the recommendation is given to improve the criteria of takt production and customer complaint.

ABSTRAK

Projek ini membentangkan kajian untuk menganalisis kriteria *takt production* dan aduan pelanggan yang tinggi untuk komponen *support wheel carrier* bagi meningkatkan tahap Sistem Pengeluaran Lean (LPS) di Autokeen Sdn Bhd. Kaedah kajian kes telah dijalankan di Autokeen Sdn Bhd terutamanya di stesen kerja *support wheel carrier*. Tujuan utama kajian ini adalah untuk memberi cadangan untuk penambahbaikan kriteria *takt production* dan aduan pelanggan dalam penilaian LPS Autokeen. Daripada hasil penyelidikan menunjukkan bahawa *cycle time* untuk menghasilkan komponen *support wheel carrier* adalah melebihi *takt time* pelanggan. Masalah ini kerana *takt time* pelanggan tidak pernah dikira dan dipaparkan pada stesen kerja *support wheel carrier*. Bagi kriteria aduan pelanggan, banyak kes yang melibatkan komponen yang mempunyai kecacatan terlepas kepada pihak pelanggan. Masalah ini berpunca kelalaian tenaga kerja. Selepas semua punca masalah di analisis syor untuk penambahbaikan dikemukakan untuk memperbaiki kriteria *takt production* dan aduan pelanggan.

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CHAPTER 1

INTRODUCTION

1.1 RESEARCH BACKGROUND

Today manufacturing industries especially in automotive has very tight competition and struggle to meet the challenges to improve the productivity of the company. In the modern era of automotive industry, the customers generally demand very good quality of cars with the reasonable price. Because of this current trend, many companies have taken Lean Production System (LPS) as a great management tool to improve their quality and productivity of their products. Now, LPS has become a widely acceptable and adoptable best manufacturing practice across countries and industries (Holweg, 2007).Lean Production System was originally established by the Toyota philosophy. The Lean Production System also known as Toyota Production System (TPS). Through the lean practice the companies make effort to reduce the waste that will affect the quality, cost, delivery of product, increase safety and morale.

In Malaysia automotive industry, the early initiative towards the implementation of LPS within the automotive industry undertaken by the government was the introduction of the Malaysia Japan Automotive Industries Co-Operation (MAJAICO-A1) program, a collaborative effort between the Malaysian government and the Japanese Government towards inculcation LPS in this country. The program was initiated in July 2006 and was managed by SME Corporation, is one of the agencies under Ministry of International Trade and Industry (MITI). A total of 87 automotive related companies participated in this 5 years (2006 – 2011) program with 220 projects were successfully implemented. One of the major reasons to implement LPS in Malaysia automotive industry is to face the implementing of Asean Free Tariff Area (AFTA) by which will required the company to improve their productivity, efficiency and also the quality of the product in order to remain competitive in the market area. AFTA was established in 1992. AFTA is a collective effort by ASEAN member countries to reduce tariffs on intra-ASEAN trade. The purpose was to develop greater trade and industrial linkages among ASEAN member countries.

Autokeen Sdn.Bhd was established in 1988 and makes their operation in Shah Alam, Selangor. The main activities of this company are producing pressed metal parts, tools and dies making. The main customer of this company is Proton and Perodua which is represent the biggest automotive players in Malaysia. Autokeen consists of three main groups. The groups are manufacturing, procurement & vendor development and finance.

In overall, the implementation of LPS at Autokeen was going well, but unfortunately at support wheel carrier workstation there are a few problems that influenced Autokeen LPS level that need very serious concern and improvement such as the criteria of takt production and quality. This is because at this workstation there are a lot of problems that related with quality issues such as customer complaint of products and also low cycle time of the process.

1.2 PROBLEM STATEMENT

At support wheel carrier workstation that is two problems that have been affect the score for Autokeen LPS level evaluation. The problems are the cycle time of the process is over the customer takt time and also the high customer complaint. To go further for this research some research question need to take serious consideration. There are:

1) How to reduce the customer complaint?
2) How to improve the cycle time of making support wheel carrier?
3) What are the defects that happen on support wheel carrier parts?
4) Is the current procedure is the correct approach to produce support wheel carrier?
5) Is there any better approach to produce support wheel carrier?

1.3 RESEARCH OBJECTIVE

The purposes of the research are:

1) To analyze the root causes of inefficient process cycle time and high customer complaint for support wheel carrier part.
2) To give suggestion for improve process cycle time at support wheel carrier workstation
3) To give suggestion for reducing theof amount customer complaint of support wheel carrier

1.4 SCOPE OF THE PROJECT

The scope of the project is important to make sure that the research not be out of the research objectives. Scopes for this research are:

1) Time

   Time for make this research involve two study semester starting from September 2011 until June 2012.

2) Area of research

   The research been conducted at Autokeen. This company been selected because it involve with MAJAICO-A1 program. MAJAICO-A1program is a collaborative effort between the Malaysian government and the Japanese Government towards inculcation LPS in Malaysia automotive industry.

3) Part Concentration

   The support wheel carrier has been selected because this part have problem related to takt production and also quality issues.

4) Ishikawa diagram (Man, Method, Material, Machine, Environment)

   The Ishikawa diagram has been used to analyze the root cause of the problem and to come out the solution

CHAPTER 2

LITERATURE REVIEW

2.1 LEAN PRODUCTION SYSTEM

Lean Production System (LPS) was originally established by the Toyota philosophy. The Lean Manufacturing System also known as Toyota Production System (TPS). In 1990 Womack, Jones and Ross created the term lean production. Since then, it has become common to use the word lean as shorthand for lean production (Ahrens.T, 2006).

Lean production directly descended from and is frequently used as a proxy for Toyota Production System (TPS), which itself evolved from Taiichi Ohno's experiments and initiatives over three decades at Toyota Motor Company. TPS was formally introduced in the U.S. in 1984 when New United Motor Manufacturing, Inc. (NUMMI)was established as a joint venture between Toyota and General Motors, but its informal transfer to the U.S. began much earlier, occurring over time in a piecemeal fashion.(Shah& Ward, 2007).

In the years of reconstruction following the Second World War, Japanese industry including Toyota had a problem in order to compete with the others car makers especially with three giant car makers at that time that are Ford, General Motor and Chrysler. Actually, Toyota at that time was nearly bankrupt when Taiichi Ohno, the company's Assembly Shop Manager, took in hand the task of redesigning production. Through the

observation and study about the problems that occurred at his organization, Ohno come out with some ideas to improve the efficiency and also productivity for the production. The ideas are:

- Build only what is needed
- Eliminate non value added activities
- Everyone have the right to stop the production if something wrong happen

2.2 LEAN PHILOSOPHY

According to Womack, Jones and Ross, they define lean as a way to create new work rather than simply destroying jobs in the name of efficiency. In their definition, lean is a thought process and a philosophy, not a tool, used to look at a business whether it is manufacturing, service or any other activity with a supplier and a customer relation with the goal of eliminating non-value added tasks (Womack, Jones, Ross 1990). While the Gary Convis (Convis, 2001) defined that the LPS is an integrated and interdependent system that consist of many element such as the tools, the philosophy and management.

The primary goal of LPS was to reduce the cost and to improve productivity by eliminating wastes or non-value added activities (Womack, 1990). The critical starting point for lean thinking is to specify the value .The value can only be defined by the ultimate customer. And it's only meaningful when expressed in terms of s specific product (a good or services, and often both at once) which meet the customer's needs at a specific price at a specific time. While the waste can be describes as the activities that not add any value to the operation (Shingo, 1989). There are seven wastes have been described in The Toyota Production System (Ohno, 1988). The wastes are over processing, over production, transportation, waiting, defects, unnecessary inventories and unnecessary motion.

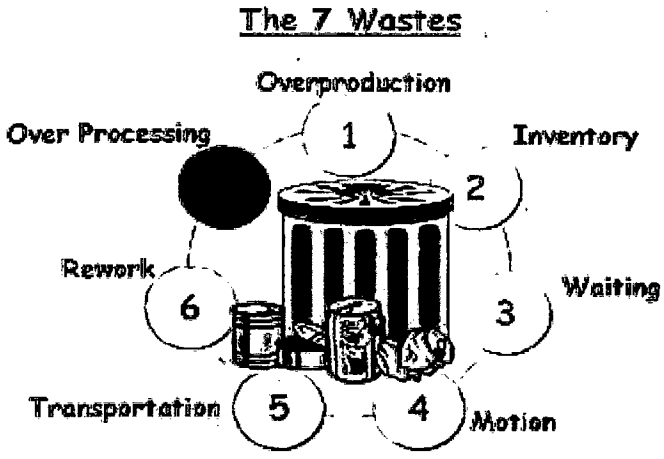

Figure 2.1: The Seven Wastes (based on Ohno, 1988)

According to Shears and Shook (2004) they define the LPS into a few parts that always be referred as "Lean Production System House".

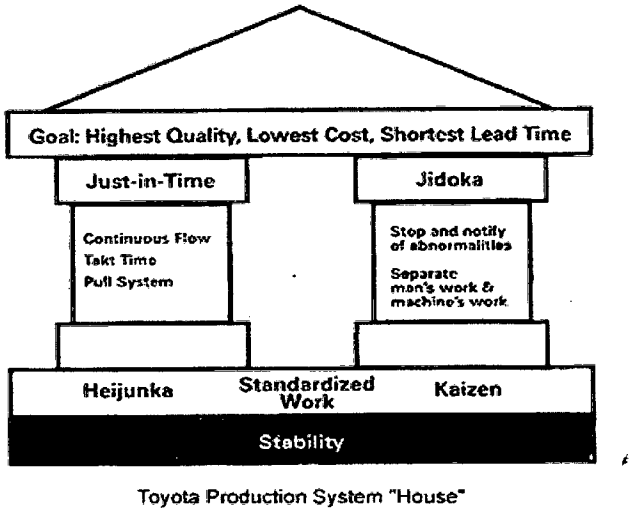

Figure 2.2: Lean Production System house

The base for successful implementation of LPS is the stability of the operation in the production. According to Ohno, he mentioned that the organization does not deliver a strategy to become lean, if a business still has unstable processes (Ohno, 1988). In order to achieve the stability, three elements must be achieved. There are the standardized work, Kaizen and Heijunka. The LPS is support with two main pillars that are the Just- in- Time (JIT) and Jidoka.

2.2.1 Standardized Work

The first element is standardized work. The standardized work can be defined as a process method whereby part can be produce with same quality and speed whoever performed it. The basic fundamental to perform the standardized work is through the implementation of 5s, clear work shop rule and teamwork among staff in work area. After the basic fundamental has been completed, clarify working method of operation through the job standard is necessary. Example of job standard is Standard Operation Procedure (SOP) work instruction and quality check sheet. In order to successfully implement the standardized work, another three elements must be performing. First, the takt time which is decide the operation speed to produce with the speed that customer needs must be consider. Second, the work sequences that represent the quantity of work for one person and the last element are decision of standard in process stock.

2.2.2 Heijunka

The Heijunka is Japanese term that can be defined as the production leveling or also sometimes be referring as production smoothing. Heijunka technique generally employed for scheduling of production activities in order to control inventory, decrease lead times and produce a mix of products and in appropriate volumes as per the customer demand. A smoothed production is the most economical method of manufacturing by eliminating high fluctuations concerning quantity and product variety and by low work in progress (WIP) inventory (Takeda, 1996).

2.2.3 Kaizen

Kaizen is Japanese term that means "improvement" or "change for better". Kaizen also a process that, when done correctly, humanizes the workplace, eliminates the non-value added that consist of Muda (waste), Muri (overburden) and Mura (unevenness of work), and teaches people how to perform experiments on their work using the scientific method and how to learn to spot and eliminate waste in business processes. The format for kaizen can be individual, suggestion system, small group, or large group. Successfully implementation of Kaizen needs the commitment from all staff in organization that start with the top management to the shop floor members.

2.2.4 Just In Time (JIT)

The concept of JIT can be defined as to produce the right part needed, at the right time, at the right place with the right amount that customer needed (Ohno, 1988). The concept of JIT must be done by using the minimum resources of manpower, material and machinery. To perform the JIT concept, it always related with three elements. There is the takt time production, flow production and pull system.

A takt time is the production speed of " how many minutes is use to produce one piece" according to the customer order. To practice takt time production, the takt time of operation is calculated, the necessary man power also be calculated while the work balancing and standardized work must be implement.

For flow production, the main target is to minimize the level of Work in Progress inventory. The flow production can be achieved with produce small lot size, the arrangement of machine is by process flow and the flow of material is not complex. The LPS does not deal well with complex process control problems (Tempel&Holländer, 2001).

The pull system is a pull system is where processes are based on customer demand. The concept is that each process is manufacturing each component in line with another department to build a final part to the exact expectation of delivery from the customer. The important technical elements for pull systems to succeed are:

1. Flowing product in small batches (approaching one piece flow where possible)
2. Pacing the processes to takt time (to stop overproduction)
3. Signaling replenishment via a Kanban signal
4. Leveling of product mix and quantity over time

One of the best techniques to represent the pull system is through the implementation of Kanban. Kanban is visual card which were used for making delivery and supply system.

2.2.5 Jidoka

Jidoka is called autonomation, meaning automation with human intelligence.This principle was invented when Toyoda Sakichi, the company founder, created an auto-activated weaving machine at the end of the 19th century, which stopped instantly if one of the warp or weft threads broke (Mildenburg, 2000). The aim of Jidoka is to stop any abnormality in process so that can always produce 100% good products and to minimize man power.

The mechanism that can be used to stop any abnormality is by using the Andon system. Andon is mechanism to alert or stop in any abnormal situation of machine or operator. For prevent the abnormality the Poka-yoke concept is always be implement. Poka-yoke is Japanese term that mean "misake-proofing". A poka-yoke is any mechanism in a lean manufacturing process that helps an equipment operator avoid (*yokeru*) mistakes (*poka*).

2.3 IMPLEMENTATION OF LPS IN MALAYSIA AUTOMOTIVE INDUSTRY

In Malaysia, the LPS was be bought indirectly by Toyota group company such as Nippon Denso Sdn Bhd, Kayaba (M) Sdn Bhd, and Toyota Assembly Plan. Then, this system has been launched officially to Malaysia automotive industry through the Malaysia Japan Automotive Industry Cooperation (MAJAICO A1) program. This program is an initiative under Economic Partnership Agreement, Malaysia and Japan (EPA) and being started from July 2006.

The main objective of MAJAICO A1 program is to improve Malaysian Automotive Industries competitiveness. The agenda of this program is to increase productivity improvement through quality defect reduction, inventory reduction, die change saving time and also to develop local lean experts. A total of 80 companies had participated in the MAJAICO A1 LPS involving more than 150 projects.

Besides that, another agenda of this program is to develop the local LPS expert. This step is important as a long term plan to develop lean culture in Malaysia automotive industry and another point is to make sure the local automotive company can conduct their lean program without be assist from Japanese LPS expert in future. Through this program, the participated company have achieved temporary result such as the cost saving in operation and also long term result such as the lean culture have been develop in the organization

2.4 QUALITY

A part of LPS itself the quality issues be one of the important point. The meaning of quality is can be different from one person to another person. According to Crosby, Philip (1979) he defined quality as conformance to requirement. But the Edwards Deming, W. (1986) believes that the quality should be aimed at meeting customer needs now and in the future. Another meaning of quality is from A.V.Feigenbaum (1991). He described quality as the overall characteristics of products and services that include marketing, engineering, manufacture, and maintenance, where such products and services in its use will suit your needs and expectations of customers. As overall conclusion, quality is to provide or produce product and services that meet the customers need, have value to the customers and also have continues improvement to produce better output.

2.4.1 Quality Control

According to Prof. Kaoru Ishikawa, a Japanese expert to define the quality control of integrated quality control is "an activity by developing, designing, producing and delivering quality products or services the most economical, most useful and always satisfy the customer". The quality control also can be described as the activity or action that be taken to produce the product with the minimize defect according to a few process. Example of quality control process is inspection the products, testing the product before be launch, make statistical data of defects and others. The general objectives of quality control are as follows:

i) To ensure that the product or services meet the quality standards.

ii) To minimize the defective products as small as possible

iii) Determine the corrective action needs to be done if there is a product that is produced does not meet established standards.

iv) To plan for improving the quality of the products made

2.4.2 Seven Quality Tools

The quality tools are be design to troubleshoot the problem especially problem that related with quality by providing the graphical technique. According to Kaoru Ishikawa, he believes that by using the quality tools, 95% of the company problem can be solved. The tools are:

i) Flow chart
ii) Ishikawa diagram
iii) Checklists
iv) Pareto chart
v) Histogram
vi) Scatter diagram
vii) Control chart

The figure 2.3 below shows the usage of seven quality tools for process monitoring, data acquisition and quality improvement.

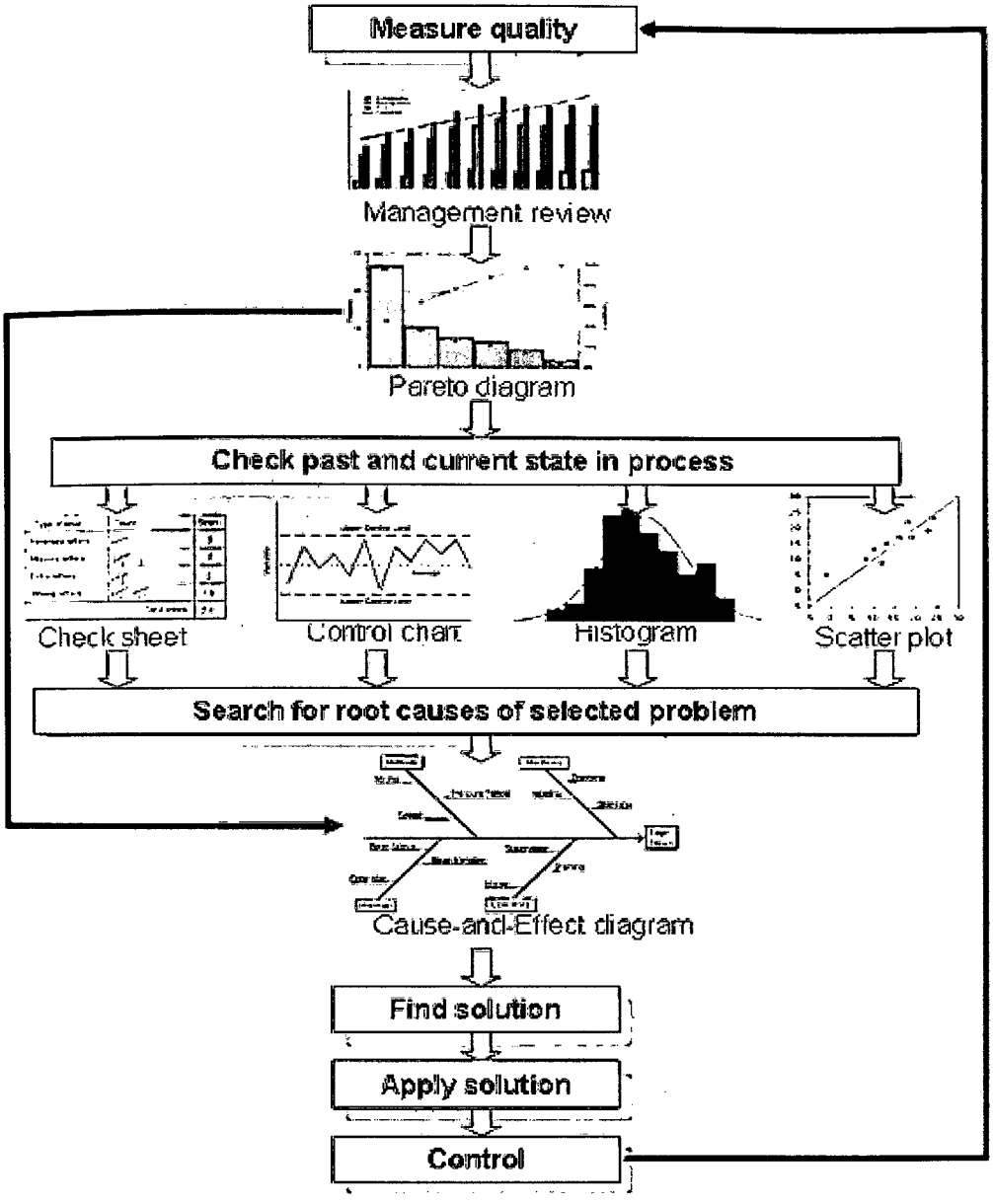

Figure 2.3: Seven quality tools for quality improvement

2.5 TAKT PRODUCTION

Takt production or takt time production can be defined as the maximum time allowed producing the product at the rate of customer request it. "Takt Time" is a German word for rhythm or meter describing the pace of production required to meet the customer demand. In other word the takt production is defined as how fast the organization needs to manufacture the product to meet customers demand. In order to apply takt production, two important points need very serious concern. First, the production that moves faster than takt time will give the result of overproduction that being identified as the most fundamental waste. Second, the production that moves lower that takt time will give the result of bottlenecks and waiting. Takt time can be calculated by using this formula:

$$T = \frac{T_a}{T_d} \tag{2.1}$$

Where,

T = Takt time, e.g. [minutes of work / unit produced]

T_a = Net time available to work, e.g. [minutes of work / day]

T_d = Time demand (customer demand), e.g. [units required / day]

There are several steps that can be used to apply takt production. There are:

i) Calculate the customer demand usually according day by day.
ii) Calculate operation net time available (excluding break, meeting time etc)
iii) Calculate the takt time
iv) Calculate the production process cycle time
v) Compare the production process cycle time with takt time using chart (recommended bar chart)
vi) Make improvement of process.