ANALYSIS ON JUST IN TIME IMPLEMENTATION FOR IMPROVEMENT OF COST EFFICIENCY IN OIL SEAL PRODUCTION PROCESS

(A Case Study of PT. NOK Indonesia)

SKRIPSI

By

DISA QONITINA SALSABILA
008201000024

Presented to
The Faculty of Economics, President University
In partial fulfillment of the requirements for Bachelor Degree in Economics, Major in Accounting

PRESIDENT UNIVERSITY
Cikarang Baru – Bekasi
Indonesia

2014
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PANEL OF EXAMINERS APPROVAL SHEET

Herewith, the Panel of Examiners declares that the skripsi entitled “Analysis on Just in Time Implementation for Improvement of Cost Efficiency in Oil Seal Production Process (A Case Study of PT. NOK Indonesia)” submitted by (Disa Qonitina Salsabila), Accounting Study Program, Faculty of Business, has been assessed and proved to pass the Oral Examination on (20 January 2014).

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Cikarang, Indonesia, December 12th, 2013

Acknowledge Skripsi Advisor,

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DECLARATION OF ORIGINALITY
I hereby declare that the skripsi entitled “(Analysis on Just in Time Implementation for Improvement of Cost Efficiency in Oil Seal Production Process (PT. NOK Indonesia))” is originally written by myself based on my own research and has never been used for any other purposes before. I, therefore, request for Oral Defense of the Skripsi.

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ANALYSIS ON JUST IN TIME IMPLEMENTATION FOR IMPROVEMENT OF COST EFFICIENCY IN OIL SEAL PRODUCTION PROCESS (A CASE STUDY OF PT. NOK INDONESIA)

ABSTRACT

Preventing and reducing wastage of production costs have been the main focus in mostly automotive manufacturing companies in Indonesia. These trigger companies to compete each other in the market, since automotive industry has become a promising business in Indonesia. The increasing sales of automotive products have made PT. NOK Indonesia an automotive parts manufacturing company to be ready in competing within its competitors. JIT production method is a management decision in reducing waste occurs during production. The effectiveness of its implementation has become crucial to the increment of profits and firm’s competitive position.

A qualitative data analysis was established during the research. A case study was arisen from PT. NOK Indonesia as an automotive parts manufacturing company. JIT production system is implemented in Oil Seal division. The actual system implemented is compared to some theories for analyzing its effectiveness for cost efficiency in the company.

Just in Time as one of PIZ components has been effectively implemented by the company. Cell manufacturing, multi skilled employees, elimination of defective products, and selected suppliers based on their ability to provide high quality raw materials in a timely manner have been conducted. In contrast, the implementation has not been effective in term of reducing setup time. According to PIZ which adapts TPS, some requirements have been fulfilled. Heijunka is implemented by using small lot sizes. Oil Seal is produced in one piece flow. Production is based on customers’ orders (Pull System). In ensuring every process passed, the company has set some standardized work. As a supporting tool, Kanban is implemented as the signal to start production. In ensuring the availability of raw materials, a control for purchasing has been designed. In addition, delivery system was designed to support JIT implementation. However, shortcomings still exist. There is no error detection (Jidoka). There is overtime variable in act time calculation. The efficiency is only 96%. Some defects are still created. Safety stock is still available in warehouse.

Based on findings, there are some aspects should be improved. Some factors trigger the increasing downtime should be reduced. Improving communication between departments should be increased to reduce delay and routine maintenance should be maintained. In reducing defect products, the company should implement Jidoka system. Shortcomings in 100% efficiency are still tolerable because, they are insignificant. In addition, safety stocks policy is still permitted due to tendency of late delivery caused of traffic jam and employees’ strikes.

Key word: JIT (Just in Time), PIZ (Production Idle Zero) and TPS (Toyota Production System)
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CHAPTER I

INTRODUCTION

1.1 Research Background

In this era of globalization every manufacturing company is required to be ready to compete and produce high-quality products with low cost, in order to improve market competitiveness of both domestic and global markets. The era of globalization also requires manufacturing companies to improve the efficiency and effectiveness of the use of its resources in producing high quality products, and timeliness is also required in accordance with the demand of time, in order to be competitive in the global market as well as for the survival of the company.

To prevent wastage of production costs and consumer dissatisfaction of the products produced by the company, the management should be able to control and improve the company's production process, especially in terms of controlling raw materials. Raw materials as company’s inventories in the warehouse should be available timely, efficient, and effective, so the production process will not be hampered.

Current national automotive industry competition is very tight. Competitors in automotive manufacturing industry have been growing from year to year, since this industry sector has a promising future benefits. The development of the automotive industry in Indonesia continues to grow in line with development of technology and production systems that support this industry. The increasing demand of motor vehicles from year to year was one of the triggers accelerated growth in the automotive industry Indonesia. Domestic automotive manufacturers were competing to continue make improvements.
Growth rate of the automotive market share in Indonesia from year to year shows that the needs of people in Indonesia for motor vehicles are still quite high. Based on data from Badan Pusat Statistika Indonesia for the year 2001-2011 the needs of customers for motor vehicles tends to increase every year.

![Image I.1 Research Background](image)

According to data from BPS, the needs of motor vehicles in Indonesia are increasing from year to year. The increment range of motor vehicles needs from year to year is about 3%-27%. The highest total automotive sales increment was happened in 2007, for 27%. But, in the year 2008-2009 the total automotive sales did not increase significantly since there was monetary crisis. The lowest level of total automotive sales increment for 3% was occurred in 1999, it was the time when Indonesia had the highest level of inflation which was impacted by strengthened dollar. Although the sales increase in automotive industry is not very significant, this industry still will be growing due to larger population and economic growth in other sectors of industries.

The automotive industry never stops growing from year to year. This business sector keeps improving, innovating and advancing their technologies. The growing market of
automotive industries’ needs have led companies which manufacture automotive spare parts, especially Oil Seal, have more opportunities in expanding their business by increasing the amount of sales from year to year. Nowadays, products from China have been threatening other automotive manufacturing companies’ products. Interventions of China’s automotive spare part products (Oil Seal) are cheaper than other Oil Seal manufacturers. These interventions have led other competitors to bankruptcy and loss of market.

Other automotive manufacturing companies are required to be able to survive and compete with this tight global competition. Companies need to improve the efficiency and effectiveness of the use of its resources in producing high quality and timeliness which means the companies are able to meet the demand of time from customers, in order to be competitive in the global market as well as for the survival of the companies.

Companies find that they must manage levels of inventory to establish a long-term competitive advantage. Quality, product engineering, prices, overtime, excess capacity, ability to respond to customers (due-date performance), lead times, and overall profitability are all affected by inventory levels. In general, firms with higher inventory levels than their competitors tend to be in a worse competitive position. Inventory management policy has become a competitive weapon.

Previously, there were many manufacturing companies which used traditional reasons for holding inventories. But, the rapid changing of market has changed this point of view in deciding inventory management. The manufacturing companies for many of this traditional, large-batch, high-setup-cost firms have changed dramatically in the past 10 to 20 years. For one thing, the competitive markets are no longer defined by national boundaries. Advances in transportation and communication have contributed significantly to the creation of global competition.
Advances in technology have contributed to shorten life cycles for products, and product diversity has increased. Foreign firms offering higher-quality, lower-cost products with specialized features have created tremendous pressures for domestic large-batch, high-setup-cost firms to increase both quality and product diversity while simultaneously reducing total costs. Other than those reasons, setting and controlling inventories of raw materials in the warehouse should be available in a timely manner, so the production process will not be hampered, is also important. These competitive pressures have led many firms to abandon the EOQ model in favor of a Just in Time approach to manufacturing and purchasing.

Just in Time method has 2 objectives which are to increase profits and to improve a firm’s competitive position. These two objectives are achieved by controlling costs (enabling better price and increased profits), improving delivery performance, and improving quality. Just in Time method offers increased cost efficiency and simultaneously has the flexibility to respond to customer demands for better quality and more variety. Just in Time manufacturing and purchasing represent the continual pursuit of productivity through the elimination of waste. Just in Time is much more than inventory management. Inventories are tied up with some companies’ resources such as cash, space and labor. Other than those resources, inventories are also related with inefficiencies in production and increase the complexity of a firm’s information.

Nowadays, automotive manufacturers have implemented Just in Time production in carrying out their production activities. They adopt this system to improve productivity in order to compete in the growing automotive industry. In addition, it is also intended to anticipate variety of customers’ demand with the products produced.

PT. NOK Indonesia is one of manufacturing companies engaged in the automotive field. The company produces items according to customer orders. PT. NOK Indonesia has
several activities, namely the production of Curing, Trimming, Garter Spring Insert, Screening, Final Inspection, Packing, Dock Audit and Stock In/Shipping. The company has always wanted to increase profits and also increase total sales. Total sales increase will affect the rise in corporate profits.

In achieving company’s main goal, PT. NOK Indonesia as one of manufacturing companies which its field is in automotive industry, has to adapt in its changing business environment and compete with its competitors. This management’s goals have led PT. NOK Indonesia to make a decision for inventory management. Just in Time has been applied at PT. NOK Indonesia as one of policy in managing its inventory.

Just in Time system provides many benefits to the company. The application of this system can help companies to improve product quality, production cost efficiencies, manage inventories of raw materials and can also eliminate the costs that are not necessary. With these considerations, the researcher is interested in discussing “Analysis on Just in Time Implementation for Improvement of Cost Efficiency in Production Process (A Case Study of PT. NOK Indonesia)”.

I.2 Statement of Problem

Nowadays, business automotive manufacturing has been growing rapidly. There are some automotive companies investing and running their business in Indonesia. This growing market defines the increment of barriers which arises from greater competitors within automotive industries. Those barriers have enforced the automotive companies to make other strategies.

Nowadays, Just in Time method has been popularly applied by many manufacturing companies. Just in Time becomes a choice in deciding the company’s policy, especially for cost efficiency through inventory management. This inventory method is also
applied in PT. NOK Indonesia. In the case of PT. NOK Indonesia, researcher has built some questions which are:

1. How is the implementation of Just in Time method to improve the efficiency of production costs in PT. NOK Indonesia?
2. How is the process of purchasing, producing, and delivering the goods from factory to customers at PT. NOK Indonesia?
3. Does Just in Time method implemented by the company effective?

I.3. Research Objectives

Based on the issues that have been formulated, the researcher has some objectives in writing this thesis. These are the following research objectives to be achieved:

1. To find out how the implementation of Just in Time method to improve the efficiency of production costs in PT. NOK Indonesia
2. To find out how the process of purchasing, production, and delivery processes using the Just in Time in production process of PT. NOK Indonesia
3. To know the effectiveness of Just in Method applied in PT. NOK Indonesia
4. To evaluate the performance of Just in Time implemented in PT. NOK Indonesia by showing cost reduction evidence

I.4. Research Limitation

With limited time in doing this observation and writing this thesis, researcher will not be discussing broad topic about Just in Time. In this research the writer will be discussing about:

1. This research will discuss Just in Time implemented by the company and the process of production, purchasing and delivering
2. Analyzing the effectiveness of Just in Time implemented in PT. NOK Indonesia using some indicators such as manufacturing cell, multi skilled employees, eliminating defects, reducing setup time, suppliers selection

3. As the evidence of effective Just in Time implemented in the company, costs orientation, production output (Comparison between finished goods and defects products), and finished goods delivery systems will be discussed

I.5. Benefits of Research

The benefits and usefulness of this research are:

1. For Researcher:
   Increase knowledge about the implementation of Just in Time method to improve the efficiency of production costs.

2. For the Company:
   Provide information and solutions about the advantages and disadvantages of applying the method of Just in Time, produced the goods in a timely manner, and reduce excess costs in order to reach the efficiency of production.

3. For Readers:
   Provide information and references on the application of Just in Time production system
CHAPTER II
LITERATURE REVIEW

II.1. Theoretical Review

II.1.1. Effectiveness

Reider (2002) explains that, “Effectiveness means the company got the results or benefits based on tasks and objectives that have been established or the number of measurable criteria.” (p. 22). Results of effectiveness include:

- Assessment of the planning system on the development of realistic goals, objective, and detailed planning
- Effectiveness assessment based on management measurement
- Determination of the extent to which these results can be achieved
- Identify the factors that hinder the performance of the company's results

II.1.2. Efficiency

Reider (2002) explains that, “Efficiency means the company carries out its responsibilities with minimum expenditure.” (p. 21). Examples of inefficient operations and must be considered are:

- Using manual and computerized procedures that do not fit
- Inefficient working paper flow
- Inefficient procedure and operational system
- Complexity of organizational hierarchy or organizational communication within the company is complex and difficult
- Duplication of effort
II.1.3. Production Process

Production is an activity which is undertaken to add value to an object or create new object that is more useful to meet the needs of customers. According to Heizer and Render (2011) write, “The production is an activity related to the creation of goods and services through the conversion of inputs into outputs.” (p. 550).

While Assauri (2008) stated that, “Production is an activity or process that transforms input into output. In general, production system can be defined into three main kinds of systems in forming goods producing activities.” (p. 239). Which are:

1. Continuous production, where production equipments used are compiled and arranged in sequence regarding to activities in producing the products, as well as material flows process has been standardized.
2. Intermittent production, where production activities carried out are not standardized, but the production process is based on product should be finished, so the production equipments used are prepared and set to be more flexible to be used for producing variety of products and sizes.
3. Project process, whereby the production activities are carried out at different places and times, so used production equipments are located at the site where the project is held as planned before.

II.1.4. Concept of Cost

Cost of production is a very important factor in a manufacturing company. These charges arose from the company’s core activities and generally cover most of the total costs of the company. Every entrepreneur should be able to
calculate the cost of production in order to establish the cost of goods produced. Production costs represent costs incurred to process raw materials into finished products ready for sale.

Jay Heizer and Barry Render (2006) state in the book Operations Management that, “There are prominent types of waste.” (p. 630). There are:

1. Waste from Overproduction
2. Transportation Waste
3. Processing Waste
4. Waste from Product Defects
5. Waste of Waiting/idle time
6. Inventory Waste
7. Waste of Motion

Heitger, Mowen and Hansen (2012) explain that “Product costs are those costs, both direct and indirect, of producing a product in a manufacturing firm or of acquiring a product in a merchandising firm and preparing it for sale.” (p. 236).


1. Direct Material: Direct materials are those materials that are directly traceable to the goods or services being produced.
2. Direct Labor: Direct labor is labor that is directly traceable to the goods or services being produced.
3. Overhead: All production costs other than direct materials and direct labor (e.g. electricity, direct labor overtime, rent expense, etc)

II.1.5. Just in Time Systems

Business and economic development in Indonesia at this time is quite fast, it can be seen from the number of small firms and large national and international companies in Indonesia. The increasing number of companies in Indonesia led to a fairly high level of competition, companies are required to produce high-quality goods, low production costs, and also can send goods produced in a timely manner to the customers, to help companies do the right production system is needed in order to achieve efficiency and optimal performance of the company.

Imai (1997) define “Timely Production System (Just in Time) is a system of production or modern manufacturing management system developed by Japanese firms. The principle of this system is producing the requested goods by customers at the requested amount within the time needed. Just in Time system is also seen as a system of production designed to get the quality, cost and good delivery time as possible, by eliminating all the waste contained in internal process, so the manufacturers are able to deliver the requested goods in accordance with customers’ needs in a timely manner.”(p.354).

Heizer, Jay, Barry Render (2005) state “Just in Time System is a philosophy that centered on reducing inventory costs. All raw materials and materials must arrive at workstation at the time needed, not too fast, not too slow. Production must be completed and available to customers when the customers need the goods produced, not too fast, not too slow.” (p. 240).
II.2. Previous Research

- Agung Nugroho (2008), conducted research on the determinants Just in Time system performance by using the Analytic Network Process with a case study on PT Nippon Indosari Corpindo. As a bakery industry with trademark Sari Roti Boti, PT Nippon Indosari Corpindo has established manufacturing planning and control with Just in Time system. Measurement of company performance in the presence of Just in Time System implementation was based on aspects of quality, level supply and productivity.

- Anton Leo (2007) had conducted a study on PT Birina Multi Power, a company which is engaged in the manufacture of household appliances. Issues facing this company are the inefficiency and waste derived from the irregularities that occurred on the production floor. Just in Time production system, it is recommended to achieve the level of high efficiency in the production process with minimal cost. Companies must eliminate seven types of waste in the production floor by definition Toyota (Over production, Inventory, Transportation, Delay, Over processing, Rework, and unnecessary movement). Value Stream Map used as a tool to identify waste and source.

II.3. Theoretical Framework

II.3.1. History of Just In Time

Stephen N. Chapman (2006) in the book The Fundamentals of Production Planning and Control explain that “Just in Time system was firstly introduced in the early 1970s by T. Ohno, Executive Vice President of Toyota Motors Corporation. The focus was on lowering production costs at a time when raw material prices were skyrocketing. Just in Time production systems was arisen, because there was enforcement needs to improve quality and
productivity after World War II and also to compete with the automobile industries in the U.S. and Europe. Just in Time production system is often referred to as the Toyota Production System. When there was world oil crisis in 1973 and 1978, Just in Time system was used by many firms - Japanese firms. The main purpose of this system is to reduce production costs and increase productivity by eliminating waste such as buildup of inventory, overproduction and waiting time.”(p. 195).

II.3.2. Definition of Just in Time

Noreen Garrison (2003) in the book Managerial Accounting “When a company uses the Just In Time (JIT) production and inventory control system, they purchase materials and produce units only as needed to meet actual customer demand. In JIT systems, inventories are reduced to the minimum and in some cases are zero.” (p. 13).

William K. Carter and Milton F. Usry (2006) state “Just in Time is a philosophy that focused on cost reduction through the elimination of inventory.” (p. 323).

Heizer, Jay, Barry Render (2005) explain that “Just in Time is a philosophy centered on the reduction of cost through elimination of inventory. All materials and components should arrive at the work station when they needed - no earlier and no later. Production should be completed and available to customers when the customers needed them - no earlier no later.” (p. 240).

Ronald W. Hilton (2008) write “Just in Time is a system for inventory control and manufacturing process in which there is no purchase of inventory and manufacturing activities until they are needed.” (p. 235).
II.3.3. Advantages of Just In Time


1. Reducing space requirements
2. Reducing inventory investment at the purchase, raw materials, goods in process and finished goods
3. Reducing lead time
4. Increasing the productivity of direct-labor employees, indirect-support employees, and administrative staff
5. Improving equipment utilization
6. Reducing paperwork and only requires a simple planning system
7. Set the valid priority for scheduling
8. Encourage workforce participation


1. Elimination of failure
2. Makes the system flexible
3. Reduces the preparation time and the production process
4. Eliminate waste
5. Minimizing production time
6. Simplify the process, especially when the customer is part of the system (e.g. retail and ATM)
II.3.4. Disadvantages of Just In Time


1. The absence of supply of raw materials to sustain in the event of disruption of production
2. Increased stress levels of employees
3. The high risk of implementing the system and an entirely new approach
4. Just in Time system can cause problems when there is a sudden surge in demand. If the item is a main inventory (e.g. goods in Hari Raya), the company would probably be wise to store the inventory.
5. Takes a long time to implement and feel the results immediately


1. The high risk in introducing an entirely new approach
2. Initial investment and implementation costs
3. It takes a long time to get a significant improvement
4. Reliance on perfect quality goods from suppliers
5. Inability of suppliers to adapt the method JIT
6. The need for production stability when demand is highly variable or seasonal
7. Reduce flexibility in reducing setup time and associated costs
8. Lack of commitment in the organization
9. Lack of cooperation and trust between employees
10. JIT problems in connecting to other information systems
11. The need to change the layout of the facility
12. Increased stress on the workforce
13. The inability of some people to accept delegated responsibilities

II.3.5. Just in Time Purchasing

Dr. Carter and Milton F. Usry (2006) explain in the book Cost Accounting: Just in Time and Backflushing 13th edition, “The JIT approach to purchasing emphasizes reducing the number of suppliers and improving the quality of both the materials and the procurement function. The objective is to move materials directly from the supplier to the plant floor with little or no inspection and to eliminate storage except for brief periods directly on the plant floor.” (p. 10-6).

Don R. Hansen and Maryanne M. (2007) explain in the book of Managerial Accounting Mowen 8th edition, “Just in Time Purchasing requires suppliers to deliver parts and materials just in time for production. Supplier linkages are vital. Supply of parts must be linked to production, which is linked to demand.” (p. 628).

Charles T. Horngren, M. Srikat Datar, George Foster, Madhav Rajan, and Christopher Ittner (2009) state in the book Cost Accounting: A Managerial Emphasis 13th edition, “Just in Time (JIT) purchasing is the purchase of materials (or goods) so that they are delivered just as needed for production (or sales).” (p. 732).

1. Supplier development and supplier relations undergo fundamental changes

2. Purchasing department should develop long-term relationships with suppliers

3. Although price is important, the delivery schedule, product quality, and mutual trust and cooperation become the main basis for the selection of suppliers

4. Suppliers are encouraged to extend JIT methods to their own suppliers

5. Supplier is usually located near the factory of its customers, or if the location is further, they are usually clustered together. This leads to shorter lead times and more reliable.

6. Shipments are sent directly to the customer's production line

7. Parts shipped in small sizes, standard size containers with minimal work paper in the right amount

8. Material sent is approaching perfect quality

II.3.6. Just in Time Manufacturing

Don R. Hansen and Maryanne M. Mowen (2007) explain in the book of Managerial Accounting 8th edition, “Just in Time manufacturing is a demand pull system that requires goods to be pulled through the system by the present demand rather pushed through the system on a fixed schedule based on anticipated demand.” (p. 628).

1. Production is organized in manufacturing cells, a grouping of all different types of equipment used to make a given product. Material move from one machine to another, and various operations are performed in sequence, minimizing materials handling costs.

2. Workers are hired and trained to be multiskilled and capable of performing a variety of operations and tasks, including minor repairs and routine equipment maintenance.

3. Defects are aggressively eliminated. Aggressively defects can be eliminated. Because of the close relationship between workstations in the production line and minimal inventory on each workstation, eliminating the root cause of the defect as soon as possible. Low inventory levels allow workers to track the problem to solve the problems on the previous workstation in the production process, in which the possibility of the problem stems.

4. Setup time - the time required to get equipment, tools, and materials ready to start the production of a component or product - is reduced.

5. Suppliers are selected on the basis of their ability to deliver quality materials in a timely manner.


1. Plant Layout

With JIT method, factory is divided into several manufacturing plant cells. The manufacturing cells classify machines based on goods
produced. Workers in manufacturing cells have been trained to run all existing engines (multiskilled).

2. Grouping and Empowerment of Employees

Multitasking ability of workers is directly related to the method that applies Just in Time pull-through system. Workers who have free time when there is no order, so that unproductive time can be used for doing some supporting activities. In addition, workers also have substantial participation in the activities of the organization. Input from workers are considered and used to improve the process.

3. Total Quality Control

Just in Time is very stressed in quality. Poor quality cannot be tolerated in the production activities that do not have inventory. Therefore, it is needed to apply Total Quality Control (TQC). The Total Quality Control can help companies maintain production quality and reduce production errors.

4. Traceability of Overhead Costs

By using the Just in Time, the overhead costs that were previously attached using driver tracing and allocation can now be traced by direct tracing. Manufacturing cells structure, multiskilled labors, and the decentralization of production is the cause can be traced to the overhead costs.

5. Inventory Effects

Little amount of inventory is the key to success in applying Just in Time method. Piling up of inventories is a waste which can cause losses to company.
Vincent Gasperz (2005) explains in a book entitled Production Planning and Inventory Control, “Just in Time Manufacturing the basic concept of Just in Time Manufacturing is producing the required output, the time required by the customer, the amount of customer needs, at every stage of the production process in the system, with the most economical or the most efficient.” (p. 37).

Vincent Gasperz (2005) describes Just in Time Manufacturing systems with the image below:

Diagram II.3.6. Just in Time Manufacturing System

II.3.7. Kanban

R. Dan Reid and Nada R. Sanders (2005) explain in the book Operations Management: An Integrated Approach, “Kanban means signal or card in Japanese. Most often a kanban card has information on it such as the product name, the part number, and the quality that needs to be produced.” (p. 228).

Lee Krajewski, Ritzman and Malhotra (2007) write in the book Operations Management: Process and Value Chains, "Kanban is a Japanese word meaning card or visible record refers to cards used to control the flow of production through a factory.” (p. 344).

John M. Gross and Kenneth R. McInnis (2003) explain in the book Kanban Made Simple: Demystifying and Applying Toyota’s Legendary Manufacturing Process, “Kanban comes from Japanese which means “signboard" which also means demand scheduling. With kanban scheduling, operators use visual signals to determine how many times they should run and stop or change over. Kanban rules also tell the operator what to do when problems arise. A planned kanban has visual indicators that allow managers and supervisors to see at a glance the status of the schedule lines.” (p. 2).

Kanban can replace:

1. Scheduling daily activities necessary to operate the production process.
2. Production planner and supervisor needs to continue to monitor the status of the schedule to determine the next item to run and when to change.

John M. Gross and Kenneth R. McInnis (2003) state, “Kanban has some benefits”: (p. 4)

1. Reduce inventory
2. Increase the production flow
3. Prevent overproduction
4. Places control at the operational level (with operator)
5. Creating visual scheduling and process management
6. Increase responsiveness to changes in demand
7. Minimize the risk of inventory obsolescence
8. Improve the ability to manage the supply chain (supply chain)

Hansen and Mowen (2007) write in the book Managerial Accounting, “Kanban system has three types of cards”: (p. 635)

1. Withdrawal Kanban: Contains the amount of material to be taken from the previous production process
2. Production Kanban: Contains a number of parts to be manufactured
3. Vendor Kanban: Used to notify suppliers to deliver raw materials

II.3.8. Quality Control


1. Just in Time reduces the cost of a good quality. This occurs due to excess of production costs, products that require rework, inventory investment, space investment and damage inventory costs. Just in Time inventory decrease the inventories, so fewer defective units in inventory and fewer defective units produced, then fewer units that need to be reworked.
2. In addition to reduce queues and lead time, Just in Time also keep in mind the evidence of the error and limit the number of potential sources of errors. Just in Time held early warning system for problems of quality and fewer defects in the production unit.
3. Better quality means required less reserve, so Just in Time is more easily applied. Often the goal is to protect the storage inventory of poor production performance caused by the unreliable quality.

Gasperz (2005) states that “Integrated quality control in Just in Time system aims to build an attitude based on three main principles, namely”: (p. 40).

1. The first principle: Defect-free output is more important than the output itself
2. The second principle: Defects, errors, malfunction, congestion, and others can be prevented
3. The third principle: Precautions cheaper than reworking
CHAPTER III

DATA PROCESSING METHOD

AND COMPANY’S EXISTING CONDITION

III.1. Research Methods

The research method used was a qualitative case study method, which analyzes all the events in the production of oil seal, the process of purchasing raw materials, production processes, and the delivery process, then evaluate the implementation of the production method based on supporting theories exist as references and comparison between the activities of production oil seal with the associated theory and the researcher can draw conclusions and suggestions to the company, especially oil seal production process as input on the problems that exist within the company in order to resolve issues quickly and accurately. Other than comparing between actual conditions and supporting theories, researcher will also show the evidence of JIT for cost efficiency through simple mathematical calculation. Results of the analysis are the core of this case study.

III.2. Company’s Existing Condition

III.2.1. Company’s History

PT. NOK Indonesia (NIN) is a company engaged in manufacturing and trading of sealing devices. PT. NOK Indonesia is located in MM2100 Industrial Area, Jl. Sulawesi Block II F - 3, West Cikarang, Bekasi. PT. NOK Indonesia was established on May 27, 1996.

The purposes and objectives of the company’s establishment is to meet the needs of Oil Seal and Bush in the automotive industry and the general
machinery and rubber seals (O-ring and Rubber Only), in the field of electronics and household equipments (Home appliances), both domestic and export. Besides, it also helps the domestic automotive industry in increasing the use of local content component which is still dependent on imports.

General Meeting of Shareholders on July 22nd, 2013, determined the composition of Board of Commissioners and Directors as follows:

**Directors**

President Director : Mr. Senji Kagawa  
Directors : Mr. Masaya Sanjo  
Mr. Arman Ali

**Commissioners**

President Commissioner : Mr. Eiji Taniyama

III.2.2. Company’s Legal Form

PT. NOK Indonesia was established under the framework of the Foreign Investment Law No. 1, 1967 based on notarial deed No. 142 of Laksmi Moerti Adhianto, S. H. dated 27 May 1996, and was amended by deed NO. 13 dated 4 November 1996 of the same notary. The Company’s Articles of Association and the amendment were approved by the Minister of Justice in its Decree No. C2 - 10.375-HT.01.01 Th.96 dated 18 November, 1996. The letter was published in the State Gazette No. 4 Supplement No. 203 dated 14 January 1997.

III.2.3. Company’s Location

The decision of location for the establishment of a plant is usually based on the following matters:
1. **Raw Material Orientation**: Selected location is close to raw material sources.

2. **Market Orientation**: Select a location close to the market.

3. **Junction Market**: Selected location is close to raw material sources or markets. The selection considerations are usually influenced by the cost of transportation. Other factors to be considered are availability of manpower and facilities at the location.

PT. NOK Indonesia is located in MM2100 Industrial Estate, and was built on a land area of 2 hectares. Based on its location, it is clear that this company is more inclined to Junction Market, because most of its market shares are in Jakarta and West Java, also are close to the main source of raw materials which are mostly located in West Java, even the most market shares and raw materials sources are in that industrial area. Other than that reason, PT. NOK Indonesia’s location is not too far from the port and access to and from the port is not very difficult, because highway access is easy to reach for receiving imported raw materials, also shipping products both for export and local/domestic.

**III.2.4. Company Mission**

- Promoting Oil Seal manufacturing technology which is characterized by excellent quality and reliable to meet the customers’ needs
- Promoting research efforts and development carried out by the partners in the entire world.
- Providing basic research and technology development that is the seed or the beginning of new products
III.2.5. Company Vision

Improving the company’s performance by keep innovating with advanced technology to face the dynamic business environment among industries.

III.2.6. Organization Structure and Job Description

One factor which is important in a company is the organizational structure. The organizational structure depicts the division of duties, powers and responsibilities of each part of the appropriate.

Organizational structure used PT. NIN is a line and staff organizational structure, in which each employee received direct orders from superiors. To ensure work activities at PT. NIN and achievement of corporate goals, it has been established an organizational structure which is effective and efficient (see attachment). The following job descriptions of each department in PT. NIN, as follows:

a) President Director

- Conducting coordination meetings with the Unit Managers, in order to achieve the objectives in the annual operation and financial plan, as well as the company’s annual budget has been implemented in the GMS
- Signing all policies that have been implemented in the Board of Directors meeting
- Responsible for the development and advancement of all matters related to the company or management

b) Finance and Administration Director

- Supervising and controlling the implementation of the policies approved by the President Director
c) **Head Department**

- **Finance and Accounting Department**
  - Handling all transactions relating to financial companies
  - Maintaining and keeping the company's Cash Flow
  - Preparing financial statements, i.e. Balance Sheet, Income Statement, Statement of Changes in Equity and Cash Flow
  - Responsible for all corporate taxes
  - Building a good relationship in Banking, Tax Office and the Government

- **Personnel and General Affairs Department**
  - Establishing procedures and employment programs to ensure good relations with employees
  - Conducting employees selection according to user demand
  - Evaluating employees’ performances

- **Sales and Marketing Department**
  - Developing and planning sales target for the period
  - Planning, coordinating and supervising the activities of optimal marketing and distribution, so sales targets can be achieved

- **Production Planning Control Department**
  - Making production plans based on customer orders
  - Arranging the provision of raw materials before production begins
  - Controlling the production starting raw materials to finished goods
✓ Issuing tags and weekly job schedule

- **Warehouse**
  ✓ Storing and maintaining stock inventory levels
  ✓ Preparing goods will be delivered to customers
  ✓ Issuing goods in accordance with the applicable procedures and be responsible for items in the store or warehouse
  ✓ Conducting periodic stock taking

- **Purchasing Department**
  ✓ Looking for the best suppliers in terms of quantity and quality must be guaranteed
  ✓ Preparing and managing the procurement of materials, both stock and non-stock materials
  ✓ Issuing Purchase Orders (POs)

- **Production Department**
  ✓ Running production based on orders from the PPC
  ✓ Coordinating, managing and supervising all activities related to production process

- **Quality Control Department**
  ✓ Handling documents related to quality
  ✓ Performing final inspection and doc audit on products before delivering to customers

- **Maintenance Engineering Department**
  ✓ Installing and setting-up new machines
  ✓ Implementing Preventive Maintenance on a scheduled basis
  ✓ Maintaining machines for supporting production activities
✓ Planning and making lay out of the factory for optimizing production process flows

- QS (Quality System)
  ✓ Checking the documents
  ✓ Conduct internal audits

- ISO 14001 Office

- Education Department
  ✓ Improving employees’ skills
  ✓ Implementing and evaluating training to all new employees, intern students and SMK students who have study in the field work

III.3. Production System at PT. NOK Indonesia

Production systems implemented by PT. NOK Indonesia is Production Idle Zero (PIZ). PIZ is a term used to describe activities that encouraged companies to eliminate all muda (waste) in production process. At Toyota, waste removal is called Idle Zero which is called IZ by NOK. In this system, all activities in production process are the activities which encourage all employees to participate for improvement in waste reduction, so cost reduction can be achieved.

In 1977, President Director of NOK, Mr. Ueyama attempted to form a robust system (Stable profit taking structure), as a reference and a method by NOK. The idea of creating this system was as the efforts to eliminate waste which was an adaptation of Toyota Production System (TPS) completely. Below is the picture of TPS house:
III.3.1. Just in Time

Just in Time is one of the pillars in Toyota Production System (TPS) house. At PT. NOK Indonesia, Just in Time is one of essential components in Production Idle System (PIZ) system. Through Just in Time, the company will perform production activities efficiently which the company will only produce products needed, when required by customers, as well as in the number of customers’ needs or quantity requested by customers. Thus, all forms of activities that do not give any value added to the products can be minimized.

Through Just in Time production system, PT. NOK Indonesia expects to produce high quality products with low costs which concern to timeliness. Efficiency is improved by reducing all types of waste that may occurs during production such as over production, waiting time, transportation, over process, inventories (WIP), motion, defect. Through reducing these wastes, production costs can be reduced as efficiently as possible.
III.3.2. Jidoka

Jidoka is a system that served to identify abnormalities that occur in the implementation of activities production. Abnormality occurred during the production process will soon be known, so that repairment can be done and the defects caused by the abnormality will not be continued to the next process. Jidoka or commonly known by the name automation is supported by the two major equipments which are poka yoke (error free equipment) and andon. Poka yoke is a detector that is placed on production equipment to prevent the occurrence of errors. If abnormal conditions occur, then production process will immediately cease (line stop). While andon is an electrical panel that provides visual information about the problems position occurred, so that immediate handling can be done in the central of abnormality. Below is the diagram of Jidoka concept:

Diagram IV.1.2. Diagram of Jidoka System
The case of PT. NOK Indonesia, the company does not have automation Jidoka which will detect all production process. If abnormalities occurred during production process, the machine will not give alert to operators through automatic alarm. So, the operators at PT. NOK Indonesia are really encouraged to be very detail in screening some abnormalities of defects occurred, otherwise more defect products will be produce which can cause more costs (rework or scraps).

Implementation of Jidoka at PT. NOK Indonesia is done in one way, which is manually. Jidoka in manual process involves intervention of workers directly. If abnormal conditions occur, team member will pull the andon’s lever in any process posts to inform abnormality. Team leader with its members will soon fix the abnormality. If the abnormality cannot be resolved to the extent post process, the production line will be stopped. It is intended to prevent the continuation of abnormality to the next process. The company doesn’t implement Jidoka, because the company thinks the disadvantages are bigger than the advantages as current condition of the business.

Table IV.1.2. Advantages and Disadvantages of Jidoka

<table>
<thead>
<tr>
<th>Advantages of Jidoka</th>
<th>Disadvantages of Jidoka</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early detection of defects</td>
<td>Difficult improvement in next Kaizen</td>
</tr>
<tr>
<td>No defective products produced</td>
<td>Easy to occur machine stop (Chokotei)</td>
</tr>
<tr>
<td>To minimize poor quality</td>
<td>Longer set up time</td>
</tr>
<tr>
<td>To prevent equipment breakdown</td>
<td>Expensive investment</td>
</tr>
<tr>
<td>High-quality products and improvement in productivity</td>
<td>Expensive depreciation expenses</td>
</tr>
</tbody>
</table>
III.3.3. Heijunka

The next part of Toyota Production System is Heijunka which is the basis of the production system. Heijunka is a production method whereby not only the same total production, but also the composition variations and working time needed in one production period. Heijunka is often called as production leveling or production smoothing. Through the implementation of Heijunka, production activities are more efficient and free of waste (muda). In Heijunka, the products will be manufactured in small lot sizes.

In carrying out Heijunka to be implemented, PT. NOK Indonesia has 2 strategies:

- **Quantity per item distribution**: Used for removing variations appeared in product per item flow every day. Assembling a mix of models in each small batch.

- **Total volume distribution**: Minimizing variations appeared in total production volume for 2 months (E.g. March and April).

Through this Heijunka, production activities carry out will tend to be stable, yet flexible based on existing production capacity. Thus, fluctuations in production process which will complicate Just in Time and cause wastage can be avoided.

Implementation of this production system is certainly need continuous improvement or in Japanese is known as Kaizen. PT. NOK Indonesia always improves in reducing any kind of wastes and achieves optimum company’s performance. Through sustainable continuous improvement, the company will be able to compete in the national automotive industry.
III.4. Oil Seal Production Unit

III.4.1. Oil Seal Functions and Components

In accordance with the company’s name, PT NOK (Nippon Oil Seal Kogyou) Indonesia is a manufacturing company that manufactures Oil Seal as its main product. Here is the picture of Oil Seals:

![Picture of Oil Seals](image1)

Oil Seal is one component of a functioning machine to withstand leakage of oil / lubrication of the engine and also to prevent the entry of dust or dirt into the engine. The main components forming this automotive spare part are Metal Case, Rubber and Garter Spring. The 3 components have their own functions.

a) **Metal Case**

b) **Rubber**

c) **Garter Spring**

![Diagram of Oil Seal Components](image2)
III.4.1.1. Metal Case

Metal Case (MC) is used for shaping the Oil Seal and to sustain it in its original position when mounted on the machine.

Below is the flow process in producing Metal Case (M/C):

1) **Forming** is a process of metal case forming from hoop iron or sheet iron using mold and dies in Power Press machine. This is the flow process in forming M/C:

![Diagram III.4.1.1. (1). Flow Process of Forming](image)

2) **Trimming** is a process of forming certain large angle (bevel) and or cutting thick part (width) in metal case.

3) **Bonding** is a process of adhesive layer (bonding) on the surface of the metal case to glue the rubber part on the metal case. This is the flow process in bonding M/C:

![Diagram III.4.1.1. (3). Flow Process of Bonding](image)
III.4.1.2. Rubber

The function of rubber is used for keeping the liquid from leaking out and preventing the dust of dirt to enter the engine.

Below is the diagram of rubber flow production process:

![Diagram III.4.1.2. Flow Process of Producing Rubber](image)

1) **Weighing** is a process of counting the mass of each raw material needed
2) **Mixing** is a process of mixing all materials which already prepared
3) **Compounding** is a process of mixing rubber compound with accelerator and vulcanizing agent
4) **Sheeting** is a process of making rubber compound into layers
5) **Cooling**
6) **Warming Up** is used for making the forming process easier
7) **Blanking** is a forming process which use Dies and Mandrel
8) **Belting** is cutting rubber compound into rubber belt
9) **Shearing** is cutting rubber compound into rubber shearing
III.4.1.3. Garter Spring

Garter spring is used for sustaining the pressure on the shaft Sealing Lip of Oil Seal and Rubber. So, the pressure on all parts of shafts will remain the same. The flow of Garter Spring production process as diagram below:

1) **Coiling** is spiral formation process

2) **Joining** is the process of switching the front to the rear of the spring

3) **Annealing** is an additional process on spring not yet joined (with heated), so spring has more stable tension values

4) **Blackening** is corrosion prevention process on spring with chemical

5) **Oiling** is corrosion prevention process on spring with oil

6) **Packing**

III.4.2. Oil Seal Production Process

The process of making an Oil Seal requires a series of long process, starting from planning and designing the drawings of a certain Oil Seal which based on customer’s order. In producing an Oil Seal, there are 2 kinds of processes which should be done. Those processes are main or core process and out of
process. Main or core process is the flow of process which should be finished to all products produced by PT. NOK Indonesia. On the other hand, Out of Process is the process should be finished in Oil Seal Unit only. Production process in Oil Seal Unit starts from raw materials arrival into final products is ready to be sent to the consumers’ hand can be seen in the following flow charts:

Diagram III.4.2. Flow Process of Producing Oil Seal
Main or Core Process:

1) **Curing**
   
   Curing is the process of rubber maturation and rubber combination with metal case inside the cavity, so that the oil seal with a particular shape is formed. Cavity is the inside part in Mold which is used for forming the products.

2) **Post Cure**
   
   Post cure is a continue maturation process after curing process to obtain the desired end product. Below are the purposes of post cure process:
   
   - Improving rubber vulcanization process
   - Removing volatile material in rubber
   - Improving production efficiency, increasing product varieties and improving quality of oil seal per lot

3) **Trimming**
   
   - The process of forming sealing lip and inner diameter (ID) of the oil seal
   - The process of removing excess rubber (deflashing) and cut at certain angle on E-portion (chamfering) of oil seal

4) **Garter Spring Insert**
   
   Garter spring insert is the installation of a garter spring on the spring pocket which using auto spring inserts machine or trimmer.

5) **100% Screening**
   
   In this phase of process, Oil Seals produced in 1 lot will be visually checked by the operator.
6) **Final Inspection**

In final inspection process, Oil Seals produced will be checked based on sampling in 1 lot. There are some items should be checked in final inspection process, which are:

- Material rubber, material metal case, marking and OOP
- Spring
- Dimension
- Bonding strength
- Visual/Appearance

7) **Packing**

Packing process will be done after Oil Seals produced in 1 lot ready to be sent to customers. In packing final products, PT. NOK Indonesia has some packing methods. Packing methods used in delivering final goods to customer is based on customers’ orders. These are the pacing methods:

- Unit (U)
- Roll (R)
- Bulk (B)
- Plastic Sheet (U)
- Mambo (M)
- Candy (S)

8) **Dock Audit**

Dock audit is the final process after packing which should be done before delivering final goods to customers. In this process, we should
check the condition of packing and marking of Oil Seals as final confirmation. There are some items should be checked, which are:

- Packing label
- Marking
- Material rubber and spring
- OOP
- Quantity/roll or quantity/unit
- Paper size or units
- Etc

Out of Process:

1) *Latex Coating*

Latex coating is the process of coating color on the surface of the Oil Seal on E-portion part or the Outer Diameter (OD) part. The function of latex coating is to prevent corrosion on Oil Seal and to easy installation on housing machine.

2) *Bending*

Bending is a process of bending metal case on the D-portion to the inside, in order to facilitate easy installation of Oil Seal to housing machine.

3) *Acid Dipping*

Acid dipping is a dyeing process of Oil Seal into the solvent acid, in order to harden the rubber on the pocket spring part.

4) *Assembly*

Assembly is the process of combining Oil Seal with metal case, rubber only or other Oil Seals.
5) **Stacking**

Stacking is the process of bond unification between Oil Seal and rubber only using a power press machine.

6) **Hole Punching**

Hole punching is a punching process one part of the Oil Seal (Using Hole Punch machine), in order to facilitate the discharge of dirty grease or other lubricant on the inside of the machine.

7) **OD (Outer Diameter) Finishing**

Outer Diameter (OD) finishing is the process of finishing E-portion which aimed to get more accurate OD (Big Sizes) product sizes in accordance with customers’ orders.

8) **Centerless Grinding**

Centerless Grinding is the process of finishing E-portion which aimed to get more accurate OD (Small and Medium Sizes) product sizes in accordance with customers’ orders.

9) **Greasing**

Greasing is the process of giving grease on Sealing Lip-portion, Grease Holder-portion or Dust Lip-portion.

### III.5. Just in Time Implementation in Oil Seal Unit at PT. NOK Indonesia

Implementation of production systems Just in Time (JIT) has been carried out by PT. NOK Indonesia as a form of Production Idle Zero (PIZ) system implementation in the company. The implementation of this production system is a form of corporate uniformity system for NOK group all over the world (Indonesia, Japan, German, Thailand, Vietnam, China and Singapore).
Just in Time is not the whole system which exists at PT. NOK Indonesia, but one of components which support Production Idle Zero (PIZ) system implemented. Even this system cannot stand alone without any other two supporting components, namely Jidoka (Autonomation) and Heijunka (Production mix evenly or production distribution). On production implementation system, Just in Time is viewed as “a way” that is used in production process by using PIZ. So, Just in Time is not the main system, but a supporting system into one unity in the Production Idle Zero.

Implementation of Just in Time system can run smoothly if it fulfills three principles that should run perfectly, which are existence of one piece flow, existence of tact time, and doing pull system in production process. If one of these three principles is not running perfectly, therefore Just in Time condition cannot be fulfilled. The implications of the imperfection are going to cause the failure of systems and line stop.

III.5.1. Purchasing and Procurement Process of Raw Materials in Oil Seal Production Unit

The process starts from the initial product order according to the customers’ orders to Sales Department of PT. NOK Indonesia. The company will only conduct the production when there are orders from customers. Furthermore, PR (Purchase Request) sent to the Production and Panning Control (PPC) Department to be checked, input and planned for quantity of raw materials should be purchased. PR which has been endorsed by the PPC Dept later will be given to Purchasing Department. After that, Purchasing Department will issue P/O (Purchase Order) which contains type of Oil Seal, quantity requested and price quotation agreed. After issuing P/O and approved for purchasing, then Purchasing Department will contact supplier. After raw materials from
supplier arrived, Production Planning and Control (PPC) Department will issue Internal Kanban (Job Tag) to Production section. After receiving Job Tag, production floor will start the production process according to the desired order.

Raw materials procurement process with Just in Time production system, the company will only prepare the raw materials in accordance with customers’ orders. In this case, Just in Time method used had reduced the costs incurred in terms of its raw materials purchased and also risk of over storing raw materials.

**III.5.2. One Piece Flow**

One Piece Flow is a way to create a continuous flow of goods. One piece flow aims to move products through the manufacturing process one-piece at a time, at a rate determined by customers' needs. Through this flow process, the company will reduce the time needed to produce a product from raw materials to finished goods at the highest quality, lowest cost and shortest delivery time.

Implementation of one piece flow at PT. NOK Indonesia is carried out by manufacturing one unit of product at each process continuously and sequentially (Curing-Finished Goods). When orders came which is marked by throwing kanban, it is the sign for production process. The production process flow starts from raw materials or production components from suppliers which flows into factories, and workers will make components and assemble the orders. After orders have been completed and checked by Quality Control Department, then the orders will be delivered to customers.

Flow production components from suppliers which is risky to be delayed due to transportation process, forcing the company to use small lots as small as
possible while preserving safety stocks. An ideal one piece flow has been successfully applied to Oil Seal production unit at PT. NOK Indonesia. Production stream flows exactly one unit of one process to the next process. In this way, workers will shorten travel time and eliminate production egress semi-finished goods between processes.

III.5.3. Tact Time

The second principle of Just in Time is a tact time. Tact time is defined as the length of time used for producing 1 piece of part or product. Tact is a term in German language which means rhythm. Tact time is expressed in units of time such as seconds, minutes, even hours. Tact at PT. NOK Indonesia is counted using units of minutes. Through the use of tact time, we are able to know how much time it takes to produce 1 unit of products to meet customers’ orders. The ratio of the amount of time available production compared with the number of requests on a single time is how to define the tact time in the production process.

Formula to calculate tact time is expressed in Equation (1):

\[
Tact\ Time = \frac{Total\ work\ time\ available}{Number\ of\ orders}
\]

Tact time in Equation 1 is tact time used in normal production working hours without overtime (OT). In this normal condition, the efficiency is considered to be finished 100 percent. This occurs because the workers work according working hours as agreed, but in the field work, the efficiency is less than 100 percent.

In actual, efficiency set by the company is included in calculating tact time. PT. NOK Indonesia itself has a policy the target of 94 percent efficiency in the production process. Number or total work time available will be added by
overtime period (If any) and the ratio will be multiplied by the level of efficiency that has been determined. Formula to calculate actual tact time is expressed in Equation 2:

\[
Actual \ Tact \ Time = \frac{(Total \ work \ time \ available + overtime (OT)) \times Efficiency}{Number \ of \ orders}
\]

<table>
<thead>
<tr>
<th>Month</th>
<th>Qty Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>April</td>
<td>10,829,067.00</td>
</tr>
<tr>
<td>May</td>
<td>10,606,834.00</td>
</tr>
<tr>
<td>June</td>
<td>10,384,680.00</td>
</tr>
<tr>
<td>July</td>
<td>11,208,831.00</td>
</tr>
</tbody>
</table>

Table III.5.3. Total Sales from April-July 2013

According sales data above, average number of customers’ orders from April to July 2013 is 10,757,353 units per month, number of working days including overtime is 23 days per month, working hours 16 hours per day and 96 percent efficiency, production tact time is 0.12 seconds per unit or 0.001970 minutes per unit.

Based on the calculations above, it is known that the production process tact time in each post is 0.001970 minutes or 0.12 seconds. Besides describing the length of operation in every post, this also describes that within every 0.001970 minutes will come out a new Oil Seal from production process. This production speed or tact time may change in the next months due to number of customers’ orders and total work time available. Efforts in continuous improvement on movement of workers and development of technology can shorten the tact time, so the production process time usage will be more efficient.
Through the determination of actual tact time, meaning the company has considered the obstacles that will occur such as operating constraints, the capacity of the equipment, parts procurement, the availability of man power, and balance plan. Thus, the implementation of actual tact time must be controlled, so predetermined tact time will be achieved. Without the existence of tact time, it is potential to cause overproduction or production shortage. This may happen, because the speed of man power (workers) in producing the products does not have a certain standard.

Tact time that has been determined by management is a theoretical numbers required to complete one unit of product at each process. Current implementation, the time required by workers to complete a process will be referred to cycle time. Cycle time is the actual time required by each operator in completing operational tasks in sequence existing processes without muri (Including walking time and waiting time).

### III.5.4. Pull System

The next principle in Just in Time implementation at PT. NOK Indonesia is pull system. This system is a revolution of the conventional system typically performs push system in the production process. In push system each process will generate units as many as possible to be proceeded into next process without knowing whether the next process needs those units from previous process or not. In contrast, the implementation of pull system processes, the next process will draw all parts produced from previous process in accordance with the type, number and only when necessary. So, that the products from previous process are the raw materials for the next process.
The implementation of pull system helps to smooth the production process. Every day the production activities will be run as efficiently as possible with the level of wastage due to overproduction and large inventories can be minimized. Besides that reason, the use of pull system is very flexible in facing demand changes such as changes in product quantity or product model from customers’ orders. Adaptation of changes is only made at the end of the production line, whereas the previous process will automatically follow the changes. Thus, the possibility of out of product within processes can be avoided.

PT. NOK Indonesia as one of companies which implements Just in Time production system, the company will only produce or manufacture Oil Seals when there are orders from the customers.

III.5.5. Standardized Work

Through these three principles described above, a system has been called Just in Time. In its implementation in field work, Just in Time production system also needs two tools to support the three main principles that have been described above. Standardized work and Kanban are 2 main tools which support Just in Time implementation at PT. NOK Indonesia. Both of these tools are instruments used to smooth the operation process starting upstream to downstream.

Standardized work is defined as production methods focus on the movement of people with an efficient order process and without waste (muda). Implementation of standardized work in every process is important, in order to ensure the uniformity in every process passed. Almost all of the work to produce Oil Seal is performed automatically by using advanced technology,
therefore uniformity or standards is a tool used to prevent irregularities in the implementation of various production operations. Without the existence of standardized work, will result in various problems such as:

1. Cycle time changes resulting in the ineffectiveness of Just in Time
2. Failure to achieve the ideal way of working, so muda (waste), mura (irregularity) and muri (compulsion) are not detected and Kaizen cannot be implemented
3. Different ways of working will produce different products with different levels of quality

PT. NOK Indonesia considers that the standard of work is a beginning point in implementing kaizen (continuous improvement) in company. By applying standardized work, the process of making the product will be on time to tact time determined. The most important thing in standardized work applied by the company is able to guarantee safety and smooth working of the employees. Standardized work also regulates a variety of safe working methods in producing high quality and cheap goods. So that these working standards will be used as management *genba*, which is the management of abnormal circumstances, management cares, as well as daily management of the production process.

There are three elements in standardized work. Those three elements are tact time, sequence of work and standard in stock process. Tact time as previously discussed is the length of time that is used to make one part or products. The order process is a sequence of work which employees (team members) perform the most efficient steps of movement in the production process. On the other hand, standard in stock process is the minimum number
of items required in a process. So, the work can still be done repeatedly to follow sequence of processes which had been determined during production bottlenecks.

III.5.6. Kanban System

The next tool of Just in Time production system implementation is Kanban (Kanban system). Kanban is the tool for communication in the Just in Time production system, in Japanese language Kanban means sign boards. Kanban is used as a production control for implementing Just in Time production system. In general, Kanban has some functions which are:

- Prevention of overproduction
- Providing for production instruction
- Tool for visual control

Issuance of Kanban is a signal for workers to start production process. When Kanban is sent to the previous process, the part that receives the Kanban will soon do production process to meet the demands of the next process in accordance the number and specifications of the goods listed on the Kanban.

Production process will begin during the production cycle Kanban. There are some practical rules applied to Kanban at PT. NOK Indonesia, namely:

1. Parts or components will be used must be 100 percent in perfect condition
2. Taking parts from previous process before continuing next process
3. The quantity produced in previous process must be the same as quantity written on
4. Production and delivery will not be done if there is no Kanban cycle
5. On the delivery of goods, Kanban should always accompany the goods mentioned.

6. Actual item quantity should be the same with the quantity listed on the Kanban sheet.

Every single sheet of Kanban is only used for one type of part (component), but the quantity of items ordered for each Kanban sheets depends on the standards set by the company. According to its functions, PT. NOK Indonesia divides Kanban into two, namely Internal Kanban and External Kanban (Job Tag):

1. Internal Kanban is Kanban used and circulated in PT. NOK Indonesia environment. Usually, this internal Kanban is called Job Tag. This job tag will accompany parts produced starting the very first process until finish.

2. External Kanban is Kanban used and circulated out of PT. NOK Indonesia. Usually this Kanban is called Kanban material which serves to order components to suppliers (suppliers). This Kanban will be issued when there is an order from customer, and then will be given to Purchase Department.

Kanban systems use in the production process at PT. NOK Indonesia can help workers to do the job efficiently. When Kanban is issued, the production process will immediately begin. All components or parts or production raw materials needed will be provided in accordance to quantity and required specifications listed on the Kanban. Thus, the number of items produced will be adjusted to number of required items.
III.5.7. Finished Goods Delivery System

One of important things in implementing Just in Time method is delivery system. In this system, on time production is not the only thing should be considered, but on time delivery to customers has been a big consideration in implementing Just in Time. On time delivery will become one of requirements should be fulfilled in attracting and satisfying customers. In delivering finished goods to customers, PT. NOK Indonesia implements 2 kinds of methods which are direct delivery and milk run delivery.

III.5.7.1. Direct Delivery

![Flow of Direct Delivery](image)

The first method is direct delivery method which is the first delivery method in Just in Time. In this delivery system, PT. NOK Indonesia as supplier will be directly delivering the finished goods to each customers. In this system, the company has divided into 3 different delivery regions which are MM2100, west area (Jabodetabek) and east area (Karawang, Cikarang, Cikampek and etc). The purpose of differentiating delivery regions is to make the delivery to customers easier and to make time used for delivering
more efficient. According to the data from the company, lead time for delivery had been decreased from 3 days into 1.5 days. The decreasing lead time shows that direct delivery system at PT. NOK Indonesia is effectively implemented. Somehow, the company has to suffer some disadvantages of this system such as:

- Late delivery caused by unpredictable traffic condition (traffic jam, riots and etc)
- Accident might occur during shipping

III.5.7.2. Milk run Delivery

Milk Run delivery system describes the process of delivering finished goods from multiple suppliers in a single cycle ride. This method incorporates some part shipping processes in one route regularly with the same relative time period every day. In milk run delivery system, PT. NOK Indonesia as the supplier will not deliver the finished goods to customers’ factories. But, the customers will take the finished goods at PT. NOK Indonesia’s factory. In this
delivery system the company has reduced freight costs and time, since the company doesn’t need to deliver directly to customers’ factories. In addition, PT. NOK Indonesia does not have to suffer the risks of late delivery and accident might occur during shipping to customers. However, in this delivery system the company has to suffer another risk which is the customers do not take their orders in the factory, the company has built a policy. In this policy, the customers cannot cancel the Purchase Order (PO). So, if the customers do not take the finished goods in the factory, the company is still allowed to claim the money from customers.

In deciding whether the finished goods will be delivered using direct delivery or milk run delivery, the agreements will discussed in the beginning of the contract between PT. NOK Indonesia and its customers.

III.6. Research Framework

Production system implementation requires a careful planning to protect and ensure the sustainability of the system to run according to plan. The production planning begins with procurement of materials planning to meet the needs of the production of raw materials in accordance with actual needs and avoid all forms of waste. Implementation of Just in Time production system supported by some factors and various elements associated with the production system in the company.

Procurement of materials planning considers 2 parts which will be combined. The first is the internal part of the company that is application of Just in Time production system itself. The company must has its own rules and policies related to the production system they hold on the production floor. One application of this system
reflected in the pattern of delivery of raw materials in the production subsystem. Pattern has been formed and then applied to the actual production floor strict supervision.

The second is the external party of the company, here supplier which has a very important role in supporting Just in Time production system owned by the company. The performance of suppliers are assessed or evaluated in terms of quality in supporting Just in Time production applied at PT. NOK Indonesia. Other than that, suppliers are also required to have a high responsibility in facing demand changes for raw materials from the company, since the demand to suppliers will be fluctuated.

Just in Time production system and the role of the suppliers is an interrelated or interconnected system. Good cooperation between the two parties will determine the success of Just in Time production system implementation. Effectiveness of the system is absolutely important. However, the effective system is able to lead towards continuous improvement and consistent towards perfectness. Furthermore, the success of Just in Time implementation can generate efficiencies and eliminate waste in the production process, which in turn can improve the competitiveness of enterprises.
In this research, data collection techniques used is as follows:

**III.7.1. Primary Data Collection Techniques**

Primary data collection technique is data collected directly at the study site.

Primary data were collected with the following instrument:

a. In-depth interview is by asking questions directly related to the number of parties that are based on intensive conversation with a purpose to acquire the information needed. Informant interview method is intended for research that has been set. The researcher will interview some personnel in related departments.
III.7.2. Secondary Data Collection Techniques

Secondary data collection technique is the technique of data collection through the study of literature materials necessary to support the primary data. Secondary data collection is done by the following instruments:

a. The literature study is collecting data from books, scientific papers, journals and the opinion of experts that have relevance to the issues under investigation
CHAPTER IV
ANALYSIS AND EVALUATION

IV.1. Effectiveness of Just in Time Implementation at PT. NOK Indonesia

IV.1.1. Production is regulated in a cell manufacturing (Manufacturing Cell)

PT. NOK Indonesia as a manufacturing company, which produces many kinds of automotive spare part products, had implemented manufacturing cell. This implementation can be shown by dividing each department process based on products, e.g. Oil Seal unit. In this Oil Seal unit, the products will be produced continuously or at one-time. The products will be manufactured starting from raw materials until finished goods ready to be delivered to customer (Curing-finished goods). Insert spring and screening are combined in trimming process (Vertical flow).

![Vertical Flow Layout](image-url)
In manufacturing cell, the machines and other factory tools must be placed closer one to another. In locating the machines to be closer, the company must maintain the production department based on its products, not based on process. In addition, the machine should be placed in horizontal flow to support one-piece flow production.

The considerations for dividing each department process based on product are to reduce the motion time of employees, space and WIP inventory. That was the reason for company to change the layout to be vertical. Previously, PT. NOK Indonesia implemented horizontal flow process in Oil Seal production unit.

**Before (Horizontal Flow)**

![Horizontal Flow Layout](image)

As we can see from picture IV.1.1. horizontal flow layout, the company needs wider space to place its insert spring line and screening line. Those two lines were considered as waste if the processes were separated. Other than that reason, company found that the employees need more time to move from line curing to line trimming, insert spring and screening. This *muda* (waste) is considered costly, because the longer time to move the products from one process to another process can cause slow movement of WIP. In addition, if the motion time can be reduced, the company can produce more products.
When PT. NOK Indonesia implemented horizontal flow in production process, the production process required 12.6 men power for one cycle and more spaces for placing line insert spring and screening. Through kaizen (improvement activities), the production department proposed new lay out which was vertical flow. In vertical flow, line insert spring and screening are combined in line trimming. After implementing the new lay out (vertical flow), the company had reduced men power for 3.6 in one cycle, so total men power required for one cycle in producing Oil Seals are 8 employees. In addition, space required was reduced since process inserts spring and screening already combined in trimming process.

IV.1.2. Multi Skilled Employees

In hiring employees, the company has multiple steps to be passed and become the company’s employees. After the candidates are confirmed to pass all requirements and hired as company’s employees, the new employees will not be directly asked to do the jobs. Before sending the employees to the production floor, the company will give training for 2 weeks such as introduced to for environment, cultures and standardized work in the company.

Multi skilled employees are the next requirement should be fulfilled in implementing Just in Time system. The employees must be trained to be able to do some kinds of works, not only one type of job. In addition, employees are required to be able to operate or run more than one production tool including its maintenance.

By giving the training, the company expects the employees will be ready to operate or run some machines (Curing, trimming, insert sping and screening),
including the maintenance. This aims to reduce the risk of delaying production caused by the absence of employees. By giving training, the company expects the employees will be multi skilled, so they can cover the job of employee who is absent.

By hiring multi skilled employees, the company can reduce the cost for paying salaries. Using current production layout, the company has reduced men power for 3.4 employees or equal to 3 employees.

**IV.1.3. Eliminating Defects**

Based on Table IV.3.3, we can see that there was a decrease or elimination of defective finished goods from April-July 2013. In April 2013, the total percentage of Oil Seals defect was as much as 2.20% when it was using horizontal layout. It was significantly decreased to point 0.14% on May 2013, 0.10% on June 2013 and 0.11% on July 2013. Even though the defect products had decreased, the total defect products has not been equal to zero.

<table>
<thead>
<tr>
<th>Month</th>
<th>Cost (Rupiah)</th>
<th>Qty Sales</th>
<th>Unit Cost (Rupiah)</th>
<th>Defective</th>
<th>Qty Defect</th>
<th>Cost Down (Rupiah)</th>
</tr>
</thead>
<tbody>
<tr>
<td>April</td>
<td>21,472,322,009</td>
<td>10,829,067</td>
<td>1,983</td>
<td>2.20%</td>
<td>238,239</td>
<td>472,391,084</td>
</tr>
<tr>
<td>May</td>
<td>20,416,484,672</td>
<td>10,606,834</td>
<td>1,925</td>
<td>0.14%</td>
<td>14,850</td>
<td>28,583,079</td>
</tr>
<tr>
<td>June</td>
<td>20,041,572,506</td>
<td>10,384,680</td>
<td>1,930</td>
<td>0.10%</td>
<td>10,385</td>
<td>20,041,573</td>
</tr>
<tr>
<td>July</td>
<td>21,947,792,861</td>
<td>11,208,831</td>
<td>1,958</td>
<td>0.11%</td>
<td>12,330</td>
<td>24,142,572</td>
</tr>
</tbody>
</table>

Source: Production Planning Control Oil Seal Unit at PT. NOK Indonesia

The company should maintain the percentage of defect products until zero, so the company does not need to rework the defects.
The company always maintains and ensures the quality of their goods. The company is eager to manufacture high quality products which oriented on zero defects, especially in Oil Seal production unit, to fulfill customers’ orders. Although tight inspection has been conducted, the zero is still cannot reach 0%. These defects are produced because, the company doesn’t have Jidoka system. While Jidoka system will automatically detect if there some defect products produced.

Based on Table IV.3.3, it can be seen that there was a decrease or elimination of defective finished goods from April-July 2013. In April 2013, the total percentage of Oil Seals defect was as much as 2.20% which was equal to 238,239 units at cost per unit Rp 1,983. At this rate of defect products, the company had suffered more costs at amount Rp 472,391,084. The total defects in May 2013 was 0.14% or equal to 14,850 units at cost per unit Rp 1,925 which was equal total costs increased at amount Rp 28,583,079. In June 2013, the percentage of defect products was decreased for 0.04% into 0.10%. Total quantity defects were 10,385 units at cost per unit Rp 1,930 which the total costs equal to Rp 20,041,573. In the last month of research, July 2013, the defects were increased for 0.01% into 0.11%. The total quantity defects were 12,330 units at cost per unit Rp 1,958 which the total costs equal to Rp 24,142,572.

IV.1.4. Reducing Setup Time

According to the data of PT. NOK Indonesia, the setup time was getting slower. This can be seen by the increasing total downtime in the production floor.
Table IV.3.4. Total Downtime from April-July 2013

<table>
<thead>
<tr>
<th>Month</th>
<th>Total Downtime/Minute</th>
</tr>
</thead>
<tbody>
<tr>
<td>April 2013</td>
<td>1,144.82</td>
</tr>
<tr>
<td>May 2013</td>
<td>1,197.75</td>
</tr>
<tr>
<td>June 2013</td>
<td>1,197.75</td>
</tr>
<tr>
<td>July 2013</td>
<td>1,197.75</td>
</tr>
</tbody>
</table>

Source: Production Department, Oil Seal Unit at PT. NOK Indonesia

Seen in Table IV.3.4, total downtime PT. NOK Indonesia was increased during the month of April 2013 to May 2013, but from June-July 2013 the downtime was remained the same.

The company should maintain the level of down time and not let the down time increase, in order to make the machines more productive.

Based on the research, the increasing downtime is caused by some problems during setup time such as:

1. Damage to production machinery, so maintenance is needed
2. Mold wash/polish
3. Metal Case delay
4. Rubber delay

However, routine maintenance of production machinery is important. In the company, the operators must check the condition of machine after they use the machine. Sometimes, some of the employees do not check the condition of the machine after usage. This can cause damage to production machinery in the company. While setting up the machine, the mold should be installed on the
machine. Sometimes, the mold is difficult to be installed. So, the mold must be washed or polished. Lastly, the cause of metal case and rubber delay is late information from PPC Dept. to production floor.

**IV.1.5. Suppliers Selection**

There are some steps should be done in approving vendors (See Appendices). Local suppliers are selected based on requirements according to company’s standard policy such as:

1. Company profile (Legal form of entity and location)
3. Organizational Structure
4. Kind of Production
5. Term of delivery
6. Quality of products and machines at suppliers
7. Price quotation
8. Payment term

To ensure the capability of the suppliers in serving raw materials needed by PT. NOK Indonesia, the company has to audit directly at suppliers’ sites or factories.

The suppliers must be selected based on their ability to provide high quality raw materials in a timely manner. Reliable and trustworthy supplier that can provide high quality raw materials at the right time is an important factor in Just in Time production system. The company should appoint small number of suppliers that have production bases around or nearly their factory. It is
intended for suppliers’ easy mobility access as efficiently as possible. Distance, travel time and any other potential risks can be minimized.

Selecting capable suppliers requires lot of time and costs. Therefore, the company will establish good relationship with some suppliers selected through a long-term contract, at least 1 year. This has become a big consideration. If the company has to find new suppliers more often, the company needs more time and costs to spend. According data gathered at PT. NOK Indonesia, the company has more than 1 year contract with its suppliers. In addition, most of local suppliers are located nearly the factory plants (MM210). This has become a consideration for the purpose of cost efficiency and reducing risks may occur such as late delivery from suppliers, out of stock and etc.
Table IV.1. Effectiveness on Just in Time Implementation for Improvement of Cost Efficiency in Oil Seal Production Process (PT. NOK Indonesia)

<table>
<thead>
<tr>
<th>No</th>
<th>Effectiveness Indicator</th>
<th>Implementation Yes/No</th>
<th>Actual Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Manufacturing Cells</td>
<td>Yes</td>
<td>Production layout is already based on products produced and machines are closely place from one to another, also one-piece flow is already implemented.</td>
</tr>
<tr>
<td>2</td>
<td>Multi Skilled Employees</td>
<td>Yes</td>
<td>Employees are trained to be multi skilled.</td>
</tr>
<tr>
<td>3</td>
<td>Eliminating Defects</td>
<td>Yes</td>
<td>Defects are effectively eliminated.</td>
</tr>
<tr>
<td>4</td>
<td>Reducing Setup Time</td>
<td>No</td>
<td>Setup time hasn't been reduced effectively, so the downtime is getting higher.</td>
</tr>
<tr>
<td>5</td>
<td>Suppliers Selection</td>
<td>Yes</td>
<td>Selection of suppliers is tight, and many requirements should be fulfilled by the suppliers.</td>
</tr>
</tbody>
</table>
IV.2. Managerial Implications

After analyzing and assessing the relationship between production system PT. NOK Indonesia Oil Seal production unit with five main characteristics of the Just in Time production system according to T. Horngren, Srikant M. Flat, Alnoor Bhimani, and George Foster, the researcher can conclude that PT. NOK Indonesia is almost already running an ideal Just in Time production system. However, implementing an ideal Just in Time production system is not easy.

As a company which implementing Production Idle Zero (PIZ) as a new idea from Toyota Production System (TPS), PT. NOK Indonesia is almost ideally implementing this system. However, in actual condition there are still some deviations such as tact time calculation is slightly different between the theoretical and actual as there is the variable overtime, the determination of the level of efficiency is less than 100 percent and the non-existence of automatic alarm when there are some defects. Yet, all of these shortcomings are still tolerated since the impact to production is not significant.

According to management policy, PT. NOK Indonesia has established a policy for saving some extra stocks in store for safety stock. However, this policy has become contrary to Just in Time system according to the book. On Just in Time production system, inventory is a waste which can lead to considerable cost and should be avoided. Ideally, Just in Time production system does not allow storing more stocks or inventories. But, some obstacles may occur at any time and have great potential to stop the production process without any inventories excess as a safety stock. Therefore, minimum amount of stocks is still tolerated in order to anticipate this.

Safety stock is used for anticipating production failed whether caused by human error or system error. Before the system completely stops (line stop) due to errors, inventories of raw materials will be issued to maintain production process keeps
running. In determining the safety stock, the company had established some standards. According to company’s policy, the total safety stock will be based on trend order for 3-6 months before.

- **Re-Order Point (ROP):** a stock level condition when material order shall do, for delivered before safety stock limit used.

For determining the amount of safety stock, the company has created a formula for calculation. As followed, Equation 3:

\[ SS = (A \times L) \times C \]

**Description:**
- A : Variable that evaluated every month based on material characteristic and other factors that must state on formula
- C : Consumption per period
- L : Material order lead time

Below is the safety stock required for 2nd semester which based on sales trend during January to June 2013:

A= 0.5 (fast moving)
L= 2 weeks
C= 100 kg/week

\[ SS= (0.5 \times 2) \times 100 = 100 \text{ kg} \]
So, according to calculation above the safety stock should be stored at PT. NOK
Indonesia’s warehouse for the 2nd semester (July-December 2013) will be 100 kg.

Although this management policy is contrary from the characteristic of Just in
Time method, management had considered some risks which may occur if there is no
safety stock at store. The management prefers to have this policy, because the costs of
storing some safety stock are cheaper than having risks to suffer line stop caused by
inventory shortage.
V.1. Conclusions

According to research result and discussion from previous chapters, the researcher has concluded that:

1. Implementation of Just in Time production system at PT. NOK Indonesia, particularly in Oil Seal production unit has been implemented effectively. Cell manufacturing, multi skilled employees, elimination of defective products, and selected suppliers based on their ability to provide high quality raw materials in a timely manner have been conducted. In contrast, the implementation has not been effective in term of reducing setup time.

2. The company implements Production Idle Zero which has 3 pillars Just in Time, Jidoka and Heijunka. In implementing those 3 pillars, the company use purchasing and procurement process, one-piece flow, tact time, pull system, standardized work, kanban and delivery system.

3. A continuous production process is implemented at PT. NOK Indonesia. The production is started from curing, trimming, garter spring insert, screening, final inspection, packing, dock audit and shipping. All of these processes should be done continuously in one time, usually called one-piece flow.

4. Purchases will be done when the company gets order from customers. When Sales Dept. Gets C/O, then it will issue purchase request (P/R). The P/R will be given to PPC Department. After P/R is authorized by the PPC Dept., P/R will be given to Purchase Dept. Next, Purchase Dept. will issue purchase order (P/O). After that, Purchase Dept. will contact supplier. After raw materials
come to factory, PPC Dept. will document the receiving report. Lastly, PPC Dept. will issue kanban.

5. Delivery system is important in Just in Time implementation. The company implements 2 delivery system methods, milk run delivery and direct delivery. In milk run delivery, the company doesn’t have to send the goods to the customers and to prevent the customers do not take the goods, the P/O cannot be cancelled. On the other hand, in direct delivery the company needs to send the goods directly to customers. In direct delivery system, the company decided to divide 3 delivery regions which are MM2100, east and west. After making this decision, the lead time had reduced from 3 days to 1.5 days.

Table V.1. Summary of Just in Time Implementation at PT. NOK Indonesia

<table>
<thead>
<tr>
<th>No</th>
<th>Just in Time Implementation</th>
<th>Implementation Yes/No</th>
<th>Actual Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Automatic Error Detection (Jidoka)</td>
<td>No</td>
<td>There is no automatic error detection. So, the defects will be sought manually.</td>
</tr>
<tr>
<td>2</td>
<td>Production Leveling or Production Smoothing (Heijunka)</td>
<td>Yes</td>
<td>The company uses small lot sizes in producing Oil Seals.</td>
</tr>
<tr>
<td>3</td>
<td>One-piece Flow</td>
<td>Yes</td>
<td>Manufacturing one unit of product at each process continuously and sequentially (Curing-</td>
</tr>
<tr>
<td></td>
<td>Finished Goods)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>----------------</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>4</td>
<td>Tact Time</td>
<td>Yes</td>
<td>Tact time calculation is not exactly the same as theory in the book, since there is still another variable which is overtime.</td>
</tr>
<tr>
<td>5</td>
<td>Pull System</td>
<td>Yes</td>
<td>The production will start when there are orders from customers.</td>
</tr>
<tr>
<td>6</td>
<td>Standardized Work</td>
<td>Yes</td>
<td>Uniformity or standards is a tool used to prevent irregularities in the implementation of various production operations.</td>
</tr>
<tr>
<td>7</td>
<td>Kanban System</td>
<td>Yes</td>
<td>There are 2 types of Kanban which are Internal Kanban (Job Tag) and External Kanban (Kanban Material).</td>
</tr>
<tr>
<td>8</td>
<td>Cost Reduction</td>
<td>Yes</td>
<td>Some costs has been</td>
</tr>
</tbody>
</table>
reduced such as men power, space layout and defect products.  

<table>
<thead>
<tr>
<th></th>
<th>Reduced such as men power, space layout and defect products.</th>
<th>The efficiency can be achieved by PT. NOK Indonesia is still 96%.</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>100% Efficiency</td>
<td>No</td>
</tr>
<tr>
<td>10</td>
<td>Zero defects</td>
<td>No</td>
</tr>
<tr>
<td>11</td>
<td>Zero inventory</td>
<td>No</td>
</tr>
</tbody>
</table>

V.2. Recommendations

Implementation of Just in Time production system has provided many benefits for the company, especially in terms of tight global competition. Just in Time also provide benefits, especially in terms of improving the efficiency of production costs and produce high quality products only. Therefore, the company, especially Oil Seal production unit should maintain and improve the implementation of Just in Time production system in order to be more effective and efficient in running the entire
operations of the company. The researcher provides some suggestions to Oil Seal production unit at PT. NOK Indonesia as follows:

1. The downtime of the company is increasing from month to month (April-July 2013). The setup time at PT. NOK Indonesia should be improved. There are some factors which can increase the downtime at the production floor such as damage to production machinery which needs repairment, mold wash/polish, metal case delay and rubber. In preventing damage to production machinery and mold wash/polish, the company needs to make checkboard about the condition of the machine and need to wash or polish the mold after usage. In addition, to reduce the rubber and metal case delay, the flow of information from PPC Dept. to production floor should be increased. In increasing the flow of information, PPC Dept. needs to give production plan to production floor.

2. In Just in Time production system, the company is encouraged to have zero defects. However, defect products in the company is not zero, bet there is a few of defects left. This is caused by the non-existence of Jidoka (automatic error detect). A manufacturing company needs automatic early error detector to prevent and to reduce the number of defect products. In reducing the defect products until zero level, the company should improve Jidoka implementation, since the company is growing larger and the orders from customers will be continuously increased. This system will help the company to detect if there are some defects produced, so the company is also able to reduce the costs of production (costs of rework or scraps).