Poka Yoke In Collaborative Inventory Practice To Reduce Action In Automotive Manufacturing

Rio Patria[(1)], Annisaa Wulandari[(2)], Sampik Krisning Tyas[(3)], Sawarni Hasibuan[(4)]
Master Of Industrial Engineering Program, Universitas Mercu Buana, Jakarta Barat
Jl. Meruya Selatan, Kebun Jeruk, Jakarta Barat 11650
Email : tyas.sampik08@gmail.com

Abstract— This paper discusses how Pokayoke helps inventory in the supply chain to reduce losses caused by delays in decision-making by the inventory control department. With the Enterprise Resource Planning (ERP) method, pareto diagrams, fishbone, and SCAMPER diagrams it is found that the company immediately uses alternative solutions that have been obtained so that losses caused by delays in decision-making by the Inventory Controls are reduced or absent.

Index Terms— Pokayoke, Enterprise Resource Planning (ERP), Pareto, fishbone, SCAMPER, chain supply chain

1 INTRODUCTION

Accompaniment on Industrial always requires precision and speed. Accuracy in quality and speed of response is one of the benchmarks in achieving customer satisfaction. Uncertain market demand affects manufacturing process. When viewed from the inventory side, demand uncertainty becomes a source of inventory inaccurate and often causes wastage.

Inventories along the supply chain have significant implications for the financial performance of a company. The amount of money embedded in the form of inventory is usually very large, so that inventory has a value of 25% of the value of the asset it owns. This means that the cost of capital held in the form of a company can be very large. Good inventory management can have a huge impact on a company's financial performance.

Inventories are usually in the form of raw materials, semi-finished goods and finished goods. Demand for finished goods on forecasts causes the number of inventories of finished goods to be reduced so that it appears to be anxious that demand will not be met, so that the production section accelerates production by longer or changes in production schedules. Over time and change of production schedule will take inventory of intermediate goods and raw materials that make the condition of supply of raw materials be reduced. This raises the desire to accelerate the arrival of raw materials from suppliers with the intention of maintaining inventory and on the contrary, Demand for finished goods in the amount of inventory becomes excessive and cause wastage so that production should be stopped or replaced with other types and effects on raw material stocks to be collected for not producing.

If these conditions are not properly monitored, losses often arise from delays in taking action on changes such as overstock / stockout inventory, offline withdrawals, additional shipping costs, rush production and more. Information technology development facilitates the distribution of information, particularly in response to these conditions. However, some software that deal with setup problems in particular is still very expensive.

This research is a case study of Japanese automotive component manufacturing companies as a supplier of motor vehicles in Indonesia. The case is in the Supply Chain Management department that monitors the movement of materials from the purchase of raw materials, warehousing, production schedules for delivery to customers using Microsoft Excel software features. Creating this calculation model using the Poka-Yoke method is to automatically make warning notifications about the state of the inventory and submit a proposal for action to be taken by the user. The hope is that using the applied monitoring model will reduce losses caused by delays in making decisions by the Inventory Control section.

2 LITERATUR REVIEW

2.1 Poka Yoke

Poka is translated as a mistake, and yoke (yokeru) as a precaution. Developer Poké Yoke is a Japanese engineer named Shigeo Shingo. Poka yoke comes from the Japanese language which means an error checking of the error translated into Indonesian as an anti-error. The goal is to prevent or attract people's attention when something goes wrong. Shigeo Shingo has visited the Yamada Electric Plant in 1961. The cause of this problem is that the negligence of workers in carrying out their duties to make the perfect perfect product is sometimes unknown until the product is in the hands of the customer. Management at the factory will warn employees to pay more attention to their work, but the problem will only be lost temporarily and reappear at one point.

The Poka Yoke principle is to avoid mistakes because of human nature, forgetting, not knowing, and accidentally. So that we not only spend energy to remind and blame people to prevent repetition of mistakes, but should focus on how to improve the process so that the same error is not repeated.
The purpose of using the Poka Yoke method is to:

1. Reduce or eliminate 100%
2. There is no opportunity to make a mistake
3. Prevent defects or damage from sources
4. Reduce dependence on Human Resources to make detection
5. Zero defect

2.2 Enterprise Resource Planning (ERP)

ERP (Enterprise Resource Planning) combines multiple management functions into an integrated system and simplifies all flow of information in management functions. ERP is designed to automate basic processes across organizations through centralized databases and eliminate the need for different systems managed by various work units within an organization.

2.3 Diagram Pareto

Pareto diagram is a standard method of quality control to obtain maximum outcomes or select a major problem and is again regarded as an easy approach and as a solution in a relatively complex field. Pareto diagrams are images that classify data from left to right from highest to lowest level. This can help find the most important issues to be resolved (top ranking) to those who need not be resolved (lowest rank). In addition, Pareto Figures can also be used to compare process conditions, such as process inconsistencies, before and after corrective actions are taken into process.

2.4 Fishbone Diagram

The basic function of the fish bone diagram (fishbone) is to identify and arrange the causes that may arise from certain effects and then separate the roots. and in most cases it must test whether the reason for the hypothesis is true, and whether the enlargement or the reduction will produce the desired result. With this fish bone diagram will be able to provide many advantages besides solving quality problems that are an important concern of the company.

2.5 SCAMPER

At this stage alternative solutions are sought by the SCAMPER method. The SCAMPER technique will be very helpful in determining the product. SCAMPER's technique is basically just to stimulate our creative ideas so as not to be caught up in the constraints that have existed so far. This technique can also be said as a "think outside the box" technique.
SCAMPER means:

1. S = substitute (substitute): support component, material, human;
2. C = merge (merge): mix, merge of other goods or services, unite;
3. A = adapt (adapt): change, change function, use some other elements;
4. M = modify (modify): increase or decrease scale, change shape, modify attributes (such as color, etc);
5. P = put into other uses (used for other uses);
6. E = delete (delete): delete elements, make it easier, and so on;
7. R = upside down (reversed / reversed): rotates from inside or out from top to bottom, also uses reversal

3 Researc Methodology

This research was conducted at the Supply Chain Management department, especially in the Inventory Control and Procurement section. The Inventory Control section is responsible for the availability of inventory both in the form of semi-finished goods and finished goods, and calculates the material requirements needed to meet customers' requests. Whereas Procurement is responsible for material purchases to suppliers from PO issuance to the arrival of materials in the warehouse.
The stages of research carried out can be seen in the diagram below:

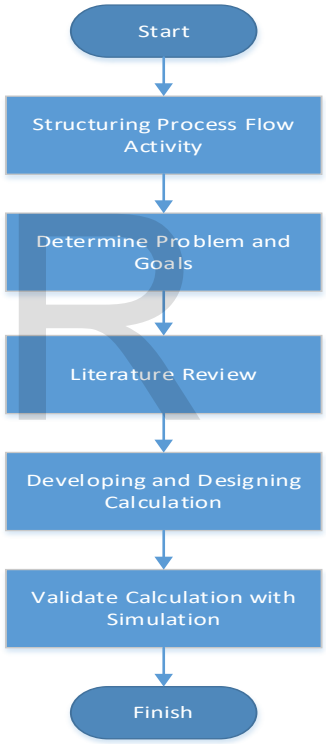

Fig. 1. Research Methodology

4 Result And Discussion

Structuring Process Flow Activity

In general, the process flow that occurs in the inventory control section is as follows:

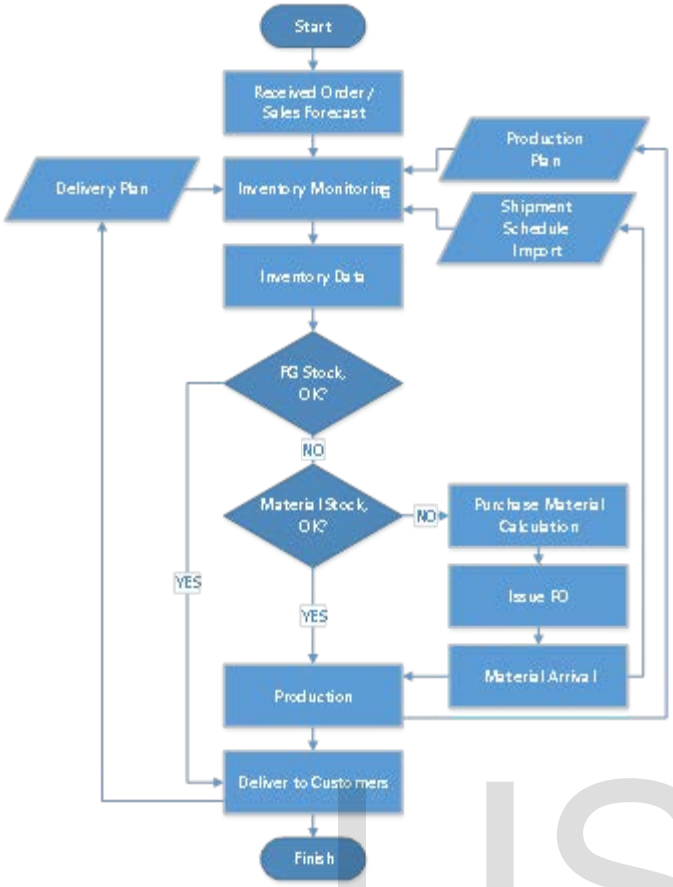

Fig. 2. Process Flow Activity

Based on the Process Flow Activity that has been obtained, it can be seen that the monitoring process is a very important process because the monitoring process integrates some data obtained from other Departments.

Data Schedule Delivery to Customers, is needed as initial information which is used in the inventory control section to make production planning and material delivery planning by suppliers. This data is also the target inventory level needed.

b. Production Planning Data, used as a reference for the adequacy of material inventory on production needs.

c. The Supplier Shipment Schedule data, needed to determine the availability of materials or semi-finished goods that have been produced by the supplier. The Inventory Control section can determine efficient transportation modes. and the exact departure time in accordance with the planned arrival.

d. Supporting Data, among others, Leadtime, Inventory policy, Production Capacity, etc.

5 Determine Problem And Goals

5.1 Problem Identification

In the current situation the company has used the ERP information system. However, the ERP system used only provides inventory requirements, production plans and delivery schedules separately. Therefore, it is difficult to see future inventory conditions with recent forecast changes.

Table 1 is the result of an analysis based on interviews with the Supply Chain Manager (SCM) found problems that occurred within the last 1 year.

Table 1. Poka Yoke Classification using Enterprise Resource Planning (ERP)

Problem	Description
Shortage Delivery	Stockout inventory that impact failure to deliver to Customers
Wrong Calculation	Wrong to calculate Production/ Material needs that impact stockout to produce/deliver
Overstock Inventory	Overstock inventory for several types
Inaccuracy Stock Data	Inaccuracy stock data between system with actual
Back Order	Back order to customers increase due to stockout
High Overtime	High overtime Cost due to waiting receiving material urgent

Fig. 3. The Problem Diagram of the Company Inventory

The above Pareto Chart explains that two common problems are based on weighting of Impact and Urgency variables.

5.2 Root Causes

From the main problem that occurs is Shortage delivery hence further analysis about the cause of the problem using Fishbone Diagram Analysis.

There were 16 analyzes of the causes of shortage delivery problems.

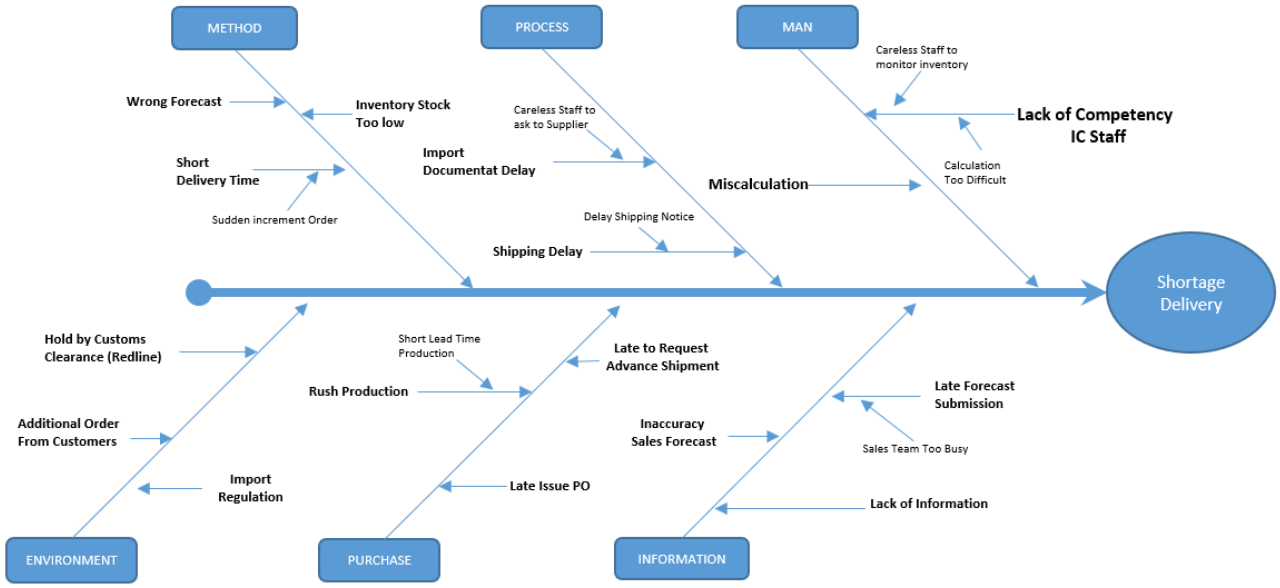

Fig. 4. Fish Bone Diagram

Tabel 2. Root Cause and Description

No	Root Cause	Description
1	Late to request advance	Late to request advance Shipment to supplier that impacted arrival goods is not match with production plan/ delivery
2	Import Document Delay	Import Documentation delay. Goods can't be process on Custom
3	Miscalculation	Wrong Formula, Quantity order to supplier wrong
4	Lack of competency IC Staff	IC staff careless to monitor persediaan
5	Low Stock	Persediaan stock going low because of sudden increment of order
6	Inaccuracy Sales Forecast	Gap between forecast and actual order id too big more than expectation
7	Late PO Issuance	Delay PO issuance due to lack of information forecast
8	Short Delivery Tim	Insufficient time to produce material/products compare to delivery time to customer
9	Late Forecast Submission	Lack of information from customers to make sales forecast
10	Shipping Delay	Crowded shipment on port
11	Add. Order	Additional order from customers over than expected
12	Hold by Customs Clearance (Redline)	Random check by custom clearance that takes extra time for arrival in warehouse
13	Rush Production	Many changing type in production to fulfill customers requirement
14	Wrong Forecast	Wrong forecast for specific types
15	Lack of Information	Lack of information related marketshare that related with forecast
16	Import Regulation	Amandement import regulation that make import process takes more time

5.3 Alternative Solution

At this stage is looking for alternative solution using SCAMPER method. And 5 of the biggest alternatives with the highest value based on the weight of the user's criteria criteria are as follows:

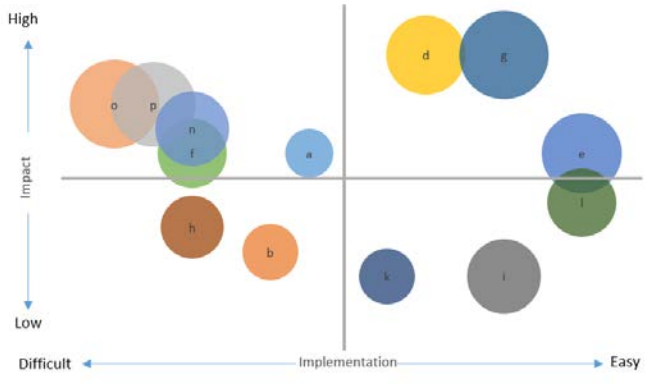

Fig. 5. Alternative solutions using the SCAMPER method

SCAMPER To overcome the shortage of dispatch problems, 5 alternative solutions can be used, 5 alternative solutions are:

1. Combine (C): Develop a Monitoring Computation with notification alert with a score of 480
2. Combine (C): Develop a file sharing system that combines information from other sections with a score of 460
3. Reduce (M): Optimize information technology with basis for social media / Looping email and others, with a score of 220
4. Combine (C): Corporate with IT team to develop new information system, with a score of 240
5. Replacement (S): New Earnings System, with a score of 180

Table 3. Alternatives required by users

Item Code	Method	Alternative	Score						Grand Total
			Impact to Solve Problem (40)		Cost (40)		Leadtime to Implement (20)		
			Score	Total Score	Score	Total Score	Score	Total Score	
g	Combine (C)	Develop Monitoring Calculation that have notification alert	5	200	5	200	4	80	480
d	Combine (C)	Develop sharing file system that integrated information from other section	5	200	5	200	3	60	460
l	Minify (M)	Optimize information Technology with basis Social media / Looping email etc.	1	40	2	80	5	100	220
e	Combine (C)	Coorporate with IT team to develop new information system	3	120	2	80	2	40	240
a	Substitute (S)	Procure New System	3	120	1	40	1	20	180

6 Conclusion Ans Sugestion

6.1 Conclusion

The most common problems in inventory surveillance activities are: Shortage Delivery, Incorrect Calculation, Excess Inventory, Inaccurate Stock Data, Back and High Time Command. After weighing / printing with Pareto diagrams the most important and immediate problem solved is the delivery of the deficiency.

6.2 Suggestion

The company immediately implements alternative solutions that have been obtained so the losses caused by delays in decision making by the Inventory Control department are reduced or even absent.

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