Analysis the Causes of Delays in Receiving Goods Services Using the Failure Modes and Effect Analysis Method (Case Study of PT Schneider Electric Manufacturing Batam)

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Abstract. Warehouse is useful as a place to provide information about the status, availability and even condition of goods from suppliers to consumers or end users. However, some of the problems that occur in the warehouse, especially in the process of receiving goods PT Schneider Electric Manufacturing Batam in the first stage will identify problems using a pareto diagram to get priority problems. Then it is implemented using the failure mode and effect analysis method to get the priority for improvement to be carried out. The results of the analysis show that late transactions and missing GR can be avoided with team commitment by reminding again about the transaction of picking up fiber goods by doing a Cyclecount first and matching the system with the actual.

Keywords: Receiving goods, Warehouse, Pareto diagrams, FMEA.

1 Introduction

In the developing modern area, Especially in recent times that require industrial companies to increase the quantity and quality of production. Every manufacturing company does not only focus on the methods that can be used to make products, the most important thing to consider is how to maintain the inventory of raw materials. Many of them improve existing systems or processes to reduce the error rate that occurs. The company must be able to control the problem of raw material inventory well, If the company lacks stock of raw materials, it will hinder the production process. Meanwhile, according to book Operation Management defines a warehouse or warehouse is a place to store goods that have other functions related to supply chain activities such as sorting and packaging goods before entering the distribution process [5]. The definition of warehouse or warehousing is one part of the logistics of a business that has the function of storing inventory and providing information related to inventory that is always updated and easily accessible to interested parties [1].

Warehouse has three main activities, namely the process of receiving goods, the process of storing goods (storage), and the process of distributing goods. Based on its activities, warehouses are divided into several categories in the process [5]:

1. Receiving is the receipt of materials from suppliers that have been ordered by the supply chain, by passing material inputs into the company's system. This includes taking orders from shippers, controlling quality, inspecting goods and determining storage locations, assigning and even labeling [6].

2. Put away is part of the transfer of materials that have been inputted into the system to the location of the storage of goods.

3. Material handle is part of preparing raw materials for production needs.

4. Replenishment is part of adding material to replenish warehouse stock that has been supplied to production

Warehouse must be supported by good warehousing activities, because it is very important for the success of a company in achieving its goals, therefore it must be supported by good warehousing activities as well, there is an initial process in the warehouse management system, materials entering the warehouse will enter the inbound process on receiving. From the initial receiving stage, the material received from the supplier will be unloaded from the container to enter the receiving area. After the material enters the receiving area, the material will be checked physically and the quantity received is based on the delivery order (DO) that has been requested. After the material is received in accordance with (DO) and no defects are found in the goods, then the material will enter the input process using the SAP system. The material input process into the system is the last stage of the receiving process and will proceed to the put away process by storing the material into the warehouse. In addition, there needs to be a registration system that can act as the inventory management. With good information management, it is hoped that operations can go smoothly. According to Bitner Z, a service differs from a product when viewed from a physical point of view, because the service itself is in principle intangible or intangible [2].

PT Schneider Electric Manufacturing Batam is an electrical manufacturing company. Other products manufactured by the company include contactors, push buttons, pilot lights, buzzers/horns, contact blocks, sensors, PLC (programmable logic controls), MCB (miniature circuit breakers) and VSD (variable speed drive). The types of products that are produced a lot require companies to pay attention to the process of receiving goods from suppliers.

Based on the facts, researchers are encouraged to conduct research on the receiving process, from the initial observation and discussion with the receiving department, several problems were found that hindered service in the process of receiving goods such as one of them in the Good Receiving (GR) application system, due to double inputting material where the system should reject the same Delivery Order (DO) number code that had been inputted before.

Table 1: Double GR due to system error

Part Number	GR Number	Date receive	QTY	DO	Time entry	Date Entry
AAV55041	5011728320	01.03.2023	800	DO23014352	20:41:03	01.03.2023
AAV55041	5011728424	01.03.2023	800	DO23014352	20:41:17	01.03.2023
AAV55039	5011728327	01.03.2023	360	DO23014342	20:42:53	01.03.2023
AAV55039	5011728326	01.03.2023	360	DO23014342	20:41:59	01.03.2023

Part Number	GR Number	Date receive	QTY	DO	Time entry	Date Entry
240002110A04	5011727723	01.03.2023	96	DO23014348	20:41:44	01.03.2023
240002110A04	5011728427	01.03.2023	96	DO23014348	20:42:07	01.03.2023
240002111A05	5011728323	01.03.2023	160	DO23014349	20:41:13	01.03.2023
240002111A05	5011728321	01.03.2023	160	DO23014349	20:41:30	01.03.2023
240002113A03	5011728325	01.03.2023	24	DO23014340	20:41:29	01.03.2023
240002113A03	5011728322	01.03.2023	24	DO23014340	20:41:56	01.03.2023
240002120A04	5011728324	01.03.2023	148	DO23014341	20:41:21	01.03.2023
240002120A04	5011728425	01.03.2023	148	DO23014341	20:41:37	01.03.2023
S1B87833A07	5011728426	01.03.2023	12	DO23014343	20:41:38	01.03.2023
S1B87833A07	5011728724	01.03.2023	12	DO23014343	20:41:52	01.03.2023

Based on the interview results, the concept of Good Receiving (GR) is a receiving process carried out in a warehouse using several transaction sources, which allows rapid entry of goods receipt data by searching for previous transaction data that serves as a basis for proof. and the goods will appear and stay matched the quantity or condition of the goods. The goods are then set by default by the default receipt area system, then proceed through the verification and approval process followed by the placement process to a predefined locker location. The process of receiving goods carried out in a warehouse or a place from the previous transaction is [7]:

1. Purchase Order or PO

    Manually can be with purchase requisition and quotation

2. After PO, the system will immediately send a notification to the vendor which can be sent via email.

3. After the vendor receives the notification, the vendor will prepare the specifications of the goods or materials in accordance with the PO and will send it

4. Next, the GR process of goods is carried out

5. Receiving invoices that will be done is making invoices and memos.

6. Payment to vendors

In this study, failure mode and effect analysis (FMEA) will be used to identify the root cause of the problems faced during the receiving process and help develop improvement proposals so that the problem can be avoided. Failure mode and effect analysis can help identify, prioritize, and eliminate known and/or potential failures in the system, design, or manufacturing process before they reach the customer. The goal is to eliminate failure modes or reduce their risk.[8] This study also used a pareto chart to illustrate the magnitude of the level of problems ranging from the largest to the smallest.

2 Analysis Methods

FMEA Failure Mode and Effects Analysis (FMEA) is a tool used in many industries that is useful for identifying defects, assessing their impact, and prioritizing errors based on their consequences [3]. In this study, qualitative descriptive methods were used using FMEA (Failure Mode and Effect Analysis) analysis methods which aimed to prevent failures in the process of receiving goods and also to identify and optimize processes in the warehouse.

1. Observing the process of receiving goods

2. Identify potensial failure

3. Identify potensial effect

4. Create a Pareto chart to find out the types of problems that are a big priority

5. FMEA (Failure Mode and Effect Analysis), from data processing that has been carried out

6. The next step is to make recommendations for improvements to prevent existing problems.

   The stages carried out, namely in this research, are as follows:

   a. Creating Failure Mode and Effect, after knowing the causal factors obtained from the identification results, it will then be input into the FMEA table then described in more detail.

   b. Identify potential failures (seriousness of problems) that may occur at each stage of the process (severity) with a rating in table 2

Table 2: Table Rating Severity

Effect	Description	Rating
None	Failures have no impact on customers	1
Very Minor	Very little disruption to the Production Line	2
Minor	There are minor interruptions while the process is in progress	3
Very Low	Moderate portions (< 10%) of very low products may need to be reworked	4
Low	Most products may need to be reworked for moderate portions (< 15%). processing, but some minor problems occur.	5
Moderate	Moderate (> 20%) from the product may have to be disposed of.	6
High	The process can be stopped.	7

Effect	Description	Rating
Very High	Customers are very dissatisfied with unreliable processes.	8
Hazard with warning	Failure will occur with a warning.	9
Hazard with no Warning	Failure will occur without warning.	10

c. Identify the frequency with which a problem can occur (occurrence), The following is the occurrence rating table

Table 3: Table Rating Occurrences

Occurrence	Description	Frequency	Rating
Remote	Errors related to similar processes	< 1 in 1,500,000	1
Low	Isolated errors associated with similar processes	1 in 150,000	2
		1 in 15,000	3
Moderate	Related to similar, but insignificant processes comparison	1 in 2000	4
		1 in 400	5
		1 in 80	6
High	Similar processes often fail	1 in 20	7
		1 in 8	8
Very high	The process of failure is almost inevitable	1 in 3	9
		>1 in 2	10

d. Identify existing control systems (detection)

Table 4: Table Rating Detection

Detection	Description	Rating
Almost certain	Process control will almost certainly detect or prevent potential causes of the next failure mode	1

Detection	Description	Rating
Very high	Very high process control capabilities that will detect or prevent potential causes of subsequent failure modes	2
high	Process control capable of detecting potential causes of subsequent failure modes	3
Moderately high	Process control capable of detecting potential causes of subsequent failure modes	4
Moderate	Able to control processes that will detect or prevent Potential causes of the next failure mode	5
Low	Process control capable of detecting potential causes of subsequent failure modes	6
Very low	Process control detects or prevents potential causes of subsequent failure modes	7

    e.   Determining RPN (Risk Priority Number), RPN calculation is carried out to get risk priority that is included in the critical category. The following is a table of RPN ratings [1] Based Risk Assessment Techniques:

501 - 1000   High

251 - 500   Moderate

1 - 250   Low

7. Results and discussion

At this stage, identify suggestions for improvement using the 5W + 1H approach (what, why, who, where, when and how) This identification is intended to suggest improvements in the form of preventive and corrective actions to correct problems that may be encountered. This approach is used to discover emerging problems, namely [4]:

1) Identify what improvement plans need to be done (What),

2) Why improvements are needed (Why),

3) Refers to who the people involved are (Who)

4) Determine the location that needs improvement (Where),

5) Determine when repairs can be made (When),

6) Establish appropriate corrective measures (How).

The source of this study data is from primary and secondary data, where primary data is obtained from observations and interviews and secondary data is obtained from GR and archival data.

Observations were made while observing the receiving process at PT Schneider Electric Manufacturing Batam. Open and in-depth interviews with warehouse controllers, methods engineers and warehouse specialists. Meanwhile, secondary data is taken from the data provided as GR and Put away data for 2022 and how the process is going.

3 Results and Discussion

Failure Modes are ways or modes where something can fail. Failure is any fault and, in this method, it mainly affects the potential and actual. Effects are how these failures can lead to waste, defects, or harmful outcomes for customers or even the company. Effects Analysis that studies the consequences of such failures or errors. Failures can be prioritized by how serious the consequences are, how often they occur and how quickly they are detected [2].

Secondary data were collected from data processing results during GR & Put away interviews and data analysis. The results of identifying problems that occurred during 2022, the results of identifying problems during consumption will be presented in the form of Pareto charts. Table 5 shows the types of failure modes during reception obtained from interviews with resource people.

Table 5 : Potential failure modes in the receiving process

Potential Failure Mode	Potential Failure
Double GR	Application error
Material nonconformity	Material not match in document
Missing GR	PO Problem (Top up qty / missing document)
Return to Supplier	Errors in material or quantity delivery
Late Binning	Process more than 8 hours
Late Transaction	Human error, Problem PO, Qty material miss match, system error

In addition, the Pareto chart identifies several problems when 80 is applied rule of 20 comparison, which means that fixing 20% of priority problems can lead to an 80% increase [9].
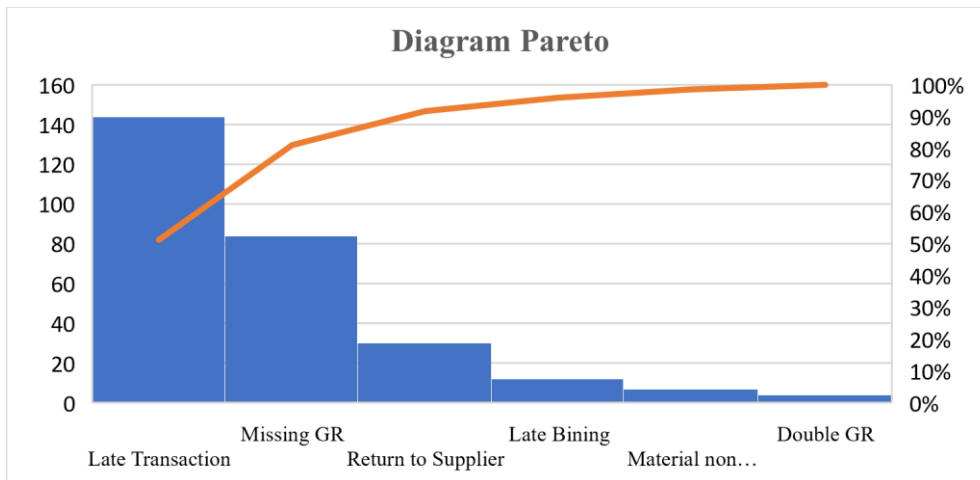
Figure 1: Pareto Diagram Problems that arise in the Receiving Process

Based on the results of the field observations, data processing and analysis performed by the receiving service researchers through the Pareto chart, the issues obtained have a priority of 20 % or higher specifically when there is a GR missing transaction and a late transaction. The next step is to determine the Severity (S), Occurrence (O) and Detection (D) values.

Assessment of each failure mode is obtained from the results of field studies and data processing discussions with related parties. The assessment results are shown in table 6.

Table 6: Table of severity (S), occurrence (O), and detection (D) values

Process	Potential Failure Mode	Potential Effect	S	O	D
Receiving goods	Missing GR	PO Problem (Top up qty / missing document)	7	3	4
	Late Transaction	Human error, Problem PO, Qty material Miss match, system error	9	8	4

After knowing the value of Severity (S), Occurrence (O), and Detection (D), the total RPN value will be obtained, the RPN value is obtained from the results of the multiplication of Severity (S), Occurrence (O), and Detection (D), after that the RPN value that has been obtained is sorted to get which cause gets the highest rank or priority to the lowest. Table 7 shows the RPN value results from each failure mode

Table 7. Table RPN Value

Potential Failure Mode	Potential Cause	RPN	Rank
Late Transaction	The system has not entered the PD2 bin (Hanging 902), Lack of discipline in taking goods, The actual system is different because the collection in 1 transaction must be based on SPQ (Standard Packing Quantity) or in 1 box.	288	1
Missing GR	Double entry process, Making PO less than the invoice sent, and PO has not been released by the system	84	2

In the table above the potential error has an RPN (Risk Priority Number) value which is the result of multiplication between the Severity, Occurrence, and Detection levels. The determination of the value is based on the results of discussions with resource persons in the process of receiving goods, RPN in late transaction failure mode is included in the moderate category and missing GR is included in the low category.

This is the basis for identifying improvement proposals against improvement priorities. Based on the results of data processing using the FMEA method, failure modes will be obtained in the Receiving Goods process. Therefore, it is necessary to carry out a repair process to reduce the RPN value which can result in continuous failures or errors, in order to work more efficiently and productively. The RPN value in the data is included in the medium category.

The following is a proposal for correction for errors that occur and to prevent delays in the process of receiving goods and the person responsible for repairs using the 5W + 1H approach (what, when, why, who, where and how).

Based on the 5W+1H approach (what, where, when, who, why, and how). The following are recommended fixes to avoid delays:
1. Late transaction
2. The improvement plan includes creating PO must be in accordance with the delivery of goods with the same quantity and invoices must also be in accordance with the date listed, so that there are no GR errors that can cause delayed payments
3. Missing GR
   Improvement plans are carried out by following the flow of the system. Transactions will be carried out automatically with the SAP system so as to reduce the problem of transactions carried out by the warehouse so as not to cause losses in terms of materials used that are not included in the payment.

Table 8: 5W + 1H approach (what, where, when, who, why, and how)

Potential failure mode	Potential effect	What	Why	Where	When	Who	How
		What are the plans for future improvements?	Why do improvements need to be made?	Where will the repairs be carried out?	When will the fix be implemented?	Who does?	How to make repairs?
Missing GR	PO Problem (Top up qty/ missing document)	The Improvement Plan includes creating PO must be in accordance with the delivery of goods with the same quantity and invoices must also be in accordance with the date	So that there are no GR errors that can cause pending payments	Receiving	Q1 - Q4 (The beginning of the year to the end of the year follows developments) Continuous improvement	WHS / Supply chain	1. Reverse GR with double entry occurring 2. top up (Quantity addition to PO system) 3. Do a po release with the approval of the manager
Late Transaction	Human error, PO Problem, Qty material Mismatch, dan error system	The improvement plan carried out with the retrieval process must follow the flow of the system and actual accordingly. Transactions will be done automatically with the SAP system so as to reduce transaction problems carried out by WHS	The system does not result in transactions in terms of goods used, but does not enter into payment	Receiving	Q1 - Q4 (The beginning of the year to the end of the year follows developments) Continuous improvement	WHS	1. Process hanging 902 systems by moving systems on storage (PD2). 2. Team commitment by reminding about the pick-up transaction 3. Perform a Cycle count first and match the system to the actual

4 Conclusion

In general, the purpose of this study is to identify problems that occur in the process of entering goods is to find out the causes of these problems and propose improvements to avoid possible potential failures using the Failure Mode and Effect Analysis method (FMEA).

Based on the results of data processing, field observations and analysis to see the failure of the goods receipt process using the Pareto diagram, it can be concluded that the main problems of this process are late transactions and missing GR. Some of the reasons identified are human error, purchasing problems, material quantity mismatches and system errors are the main reasons that must be corrected immediately.

Suggestions for improvements that can be made to avoid errors in the process of entering goods are determined based on the RPN (Risk Priority Number) value of the Failure Mode and Effect Analysis method (FMEA), followed by the 5W+1H approach (what, where, when, who, why, and how).

Proposed improvements are when:

Late transaction improvement plans implemented with the rollback process must follow the system process and refresh accordingly. Transactions will be carried out automatically with the SAP system so that it can reduce transaction problems carried out by WHS, then the storage process can be carried out or moving to 902 by moving the system to PD2 storage, then commitment in the team is also needed by reminding each other about the transaction of taking goods and can also be cycled in advance to match the actual

Missing GR can then be carried out improvement plans include making PO must be in accordance with the delivery of goods with the same qty and invoices must also match the date on tera then reverse GR can be done with double entry which occurs then can be topped up (adding qty to the PO system) then do release PO with the approval of the manager.

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