

MANAGING STOCK IN WAREHOUSE: A CASE STUDY OF A RETAIL INDUSTRY IN JAKARTA

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Abstract. *Purpose – The purpose of this paper is to inform the warehouse management of PT. Chintaka Bumi Pertiwi, so that the company knows which processes or activities within the current warehouse work process is having problems in terms of performance or causing stock inaccuracy and to propose solution of the problems. Methodology / Approach – The methodology used for research is by interviewing the Logistics and Shipment Chief, Supervisor, and Administrator of PT. Chintaka Bumi Pertiwi warehouse resulting in the current warehouse work process, implemented SOP, number of goods lost during stock inaccuracy, number of inaccuracy case, types of goods lost, warehouse layout, goods placement. The data from interview process then compared to the actual data gathered through direct observation to identify current problems occurring and to see whether there are connections between these data. The compared result of both data collection then analyzed to see the real cause of problems within the company and the proper solution on how to improve current system by solving the identified problem. Last, recommendations will be given to the company on how to do the proposed solutions before and during the implementation. Findings – The inaccuracy case of the company increased by 11.3% with approximate value loss due to goods lost during the stock inaccuracy case in summed up around 30 million Rupiah. The current work processes is experiencing problems caused by procedure, company regulations, and the level of control applied within storage section. Research Limitation – The limitation of this research is the product types, which are CBK4401, CBK3402, CBK6402, CBG6301, CBG6302, and CBG1305 with the highest amount of inaccuracy case among other products; only focusing on the work processes of the warehouse; and the data from 2013 to 2014.*

Introduction

Warehouse is a facility in the supply chain to consolidate products to reduce transportation costs, achieve economies of scale in manufacturing or purchase or provide value-added process and shorten the response time (Bartholdi and Hackman, 2006; Gong Y & De Koster, 2008). The activity to manage the goods stored in the warehouse is called warehousing. While the warehouse has a lot of different operations, they have some common patterns in the material flow and warehouse typical operations such as receiving, put-away, replenishment internal order picking, gathering and sorting, packing, cross-docking, and delivery.

This study is conducted as an initial study of warehouse processes in PT. Chintaka Bumi Pertiwi. The company is a subsidiary company from Dialogue Management Group, having role as a distributor of baby supplies, controlling the flow of goods from the producer to end customer. As the problem arises regarding stock inaccuracy in the warehouse, the company needed to improve it. From the company perspective, the interest towards this study came from the fact that there are concerns in the warehouse as they have suffer loss from stock inaccuracy that occur during stock opname. The main cause of the problem will be analyzed and determined in order to improve the system performance and also reducing the loss. Hence, it is important that the current state of the warehouse process to be properly mapped out before analyze it and planning the improvement. The

company has suffered losses over than 16 million rupiah in 2014 due to this stock inaccuracy, and this number is higher than the losses in 2013 by about 13 million rupiah, therefore become a concern that this number will keep rising in the future if there are no immediate action taken.

Literature Review

Warehousing is a series of processes or activities undertaken to ensure the flow of material and information (Aminoff et al., 2002). Warehousing involve all movements of goods within the warehouse and Distribution Center were receiving, storage / put-away, order picking, and shipping. (Frazelle, 2002; Rouwenhorst et al, 2000):

- **Receiving** – unloading, Quality Control, and disassembling or repacking items for storage
- **Put-away** – determine the appropriate location for goods to transfer them to the specified location to store and wait for orders.
- **Order picking** – pick up goods from both storage and transport them to the sorting process or directly to the shipping area
- **Shipping** – inspecting, packing, palletizing and loading goods into a carrier for delivery

Warehousing in Supply Chain

Warehousing plays important role in the supply chain process. Supply chains will never be so integrated and well coordinated without warehousing. Warehouses are important for a supply chain because they provide raw materials, components, work-in process, and finished goods; operate as distribution and order fulfillment centers; and perform localized and value added warehousing. (Frazelle, 2002)

Warehouse Roles

Warehousing has an important role to integrate and coordinate the supply chain process for the important function of providing (raw materials, components, work process-in, and finished goods), operations (distribution and order fulfillment center), and perform (local and value-added warehouse).

Warehouse Responsibility

Below is the list of responsibility warehouse has to the company related to stock inaccuracy (Jon Schreibfeder, 2008):

- **Organize stock in the warehouse to minimize the cost of filling orders**
It is important to store the material to maximize the efficiency of the order fulfillment process.
- **Keeping inventory records accurate**
If the quantity in the computer system does not match with the one in the warehouse, sales people will not know what is available for sale, and buyers cannot replenish inventory at the right time. This task will probably involve; conducting full physical inventories or cycle counting certain products each day.
- **Ensuring that all material movement is properly recorded.**
This will ensure that quantities in the warehouse to remain accurate. You can have an accurate forecast and bring the material in such a way to minimize your total cost, but if it is not properly recorded in the computer system, there will probably problems after all, such as:
 - Bringing in unnecessary stock because previous stock receipts weren't correctly recorded, resulting in having more inventory than the system reports.
 - Unexpected stock outs due to unrecorded material disbursements, substitutes, damaged parts, and other "sloppy" procedures.
- **Protecting inventory from breakage, spoilage, misplacement, and theft.**
Inventory is valuable, and all employees must realize that their paychecks are from the sales of those inventories. If inventory is "lost", it will be taken from the company's profits. This means that fewer profit dollars are available to pay employees. (Jon Schreibfeder, 2008)

Analysis tools

DMAIC Framework

DMAIC (Define, Measure, Analyze, Improve, and Control) Framework is a method to solve the problem by defining business processes. Each phase builds on the previous one by implementing a long-term solution to the problem as a goal. Define phase is the basis of the entire framework in which the researcher defines a problem, possible improvement for current problems, validating the possible improvement or the problem, identify the needs of their customers, then define the skills and areas that need representation of the project team. The main output of this stage are: Project Charter, the Action Plan, Process Maps, "Quick-Win" Opportunity, Critical Requirements, and Prepared Team.

Measure phase is when the true process, process steps, and corresponding inputs and outputs are identified. Measurement data are identified and validated, or even improved as required. The baseline performance of the measure phase is the data validity and trustworthiness. The main outputs of this phase are: As-Is Process Map, Operational Definitions, Data Collection Plan, Validate Measurement System, Values Stream Mapping, and Baseline Performance. Analyze phase is when the critical inputs are identified using the historical data, then inputs with strong relationship to output by plotting the process map with the historical data or data from interview, making Pareto Charts, and Pie-chart, then analyzed to determine the root cause.

The baseline performance of analyze phase is the critical inputs. The main outputs for this phase are: Data Analysis, To-Be Process Map, Validated Root Causes, and Refine Problem Statement. Improve phase is when potential solutions are identified, evaluated, and optimizing the process. The main outputs for this phase are: Implemented Solution, Process Maps and Documentation, Implementation Milestones, Improvement Impacts and Benefits, Storyboard, and Change Maps. Control phase is when establishing a mistake-proof, replicate improvement to the same process or product, long term measurement and reaction plans. SOPs are developed and process capabilities established. The main outputs for this phase are: Process Control Systems, Standards and Procedures, Training, Team Evaluation, Change Implementation Plans, Potential Problem Analysis, Pilot and Solution Results, Replication Opportunities, Standardization Opportunities, and Project Completion.

Methodology

Analysis of company warehouse current work process is proposed. Literature review, preliminary interview, in-depth interview, field observation, and historical data collection are used to support the analysis of the root cause of stock inaccuracy and for process evaluation. In doing the analysis, the first step is to make the warehouse work process map according to the interview data. Next is comparing the current work process according to interview with the field observation and plotting the historical data with the findings to evaluate the current company performance and to find the relations so the main problem its causes to stock inaccuracy are identified. After identifying the problem, the proper solution depending on the problem can be proposed. Recommendation will also be given in terms what to prepare during and after implementation phase, such as the need to train the employee of using barcode system, training the employee on how to input product data for barcode label. Finally, in-depth interview with the Logistics and Shipment Chief conducted as the highest authority in the warehouse, to validate the analysis of work process. Then the company will decide whether to make use of the solution proposed in the research and implement it or not.

Findings

Current Warehouse Issue

From the PT. Chintaka Bumi Pertiwi stock opname report from 2013 to 2014, it can be seen that the company is currently having an issue of increasing amount of stock inaccuracy in the warehouse. During this stock inaccuracy, many goods are lost, causing losses in term of inventory and eventually company profit. According to the Supervisor, the company already implementing SOP from two

years ago but it did not help in reducing the stock inaccuracy case because the actual work process sometimes violated by the employee, no company regulations in certain process, and lack of control. Figures and charts below shows the total stock inaccuracy case occurring in the company warehouse from 2013 to 2014 increased from 39 cases to 70 cases. This indicates a raise of 31 new cases or 79.5 percent increase in a year, with baby bed being the most goods with stock inaccuracy case.

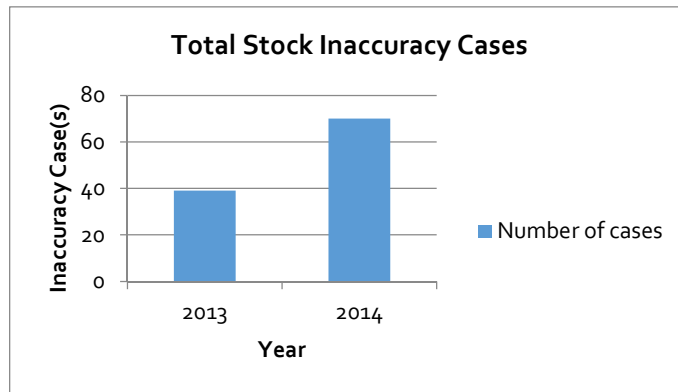


Figure 4.1 Total Stock Inaccuracy Case 2013-2014

There are 39 cases of stock inaccuracy for the six products in 2013. By making the Pareto Chart in Figure 4.7 we can sort the list from highest to lowest case of inaccuracy; CBK6402 was the first with 9 cases, CBK4401 was second with 8 cases, CBK3402 was third with 7 cases, CBG6302 was fifth with 6 cases, CBG1305 was sixth with 6, and CBG6302 was the seventh with 3 cases; thus making the product with most cases was CBK6402 and the least cases was the CBG6302. In 2013, majority of the stock inaccuracy cases were dominated by the baby bed products and the minority being the baby carriers. While in 2014, the cases of both goods type spread evenly; first to fourth were CBK4401, CBK3402, CBG6301 and CBG1305 with 12 cases, fifth and sixth were CBK6402 and CBG6302 with 11 cases.

Current System Analysis

According to the interview with Supervisor, there is SOP implemented for work process managing the four activities in the warehouse are receiving, put-away, order picking, and shipping. These four activities processes and the SOP implemented need to be explored further in order to have better understanding of the current condition.

Receiving Analysis

According to the Supervisor, receiving procedure in PT. Chintaka Bumi Pertiwi warehouse has four identified problems that contribute to stock inaccuracy: miscount, miswritten, misread, and mixed up goods.

Below are the mistakes due to human error occurrences in 2013-2014 acquired from interview with Supervisor.

Table 4.1 Mistakes During QC Process

Mistake During QC Process	Occurrences	
	2013	2014
Miscount	5	7
Miswritten	4	4
Misread	2	1
TOTAL	11	12

The data above shows the most mistakes occurrence in QC process due to human error in 2013 to 2014 is by miscount. The second is miswritten, and the third is misread. From the observation, miscount happened during counting because the process requires higher amount of concentration

as to not make mistakes the goods count. Interview data with Supervisor had shown another problem during receiving that was identified to be the goods placement within the QC section:

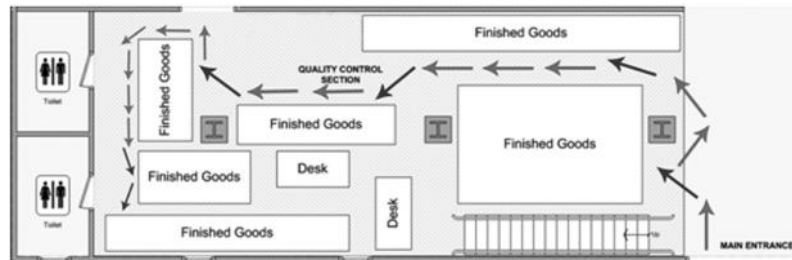


Figure 4.2 Current Goods Placement Work Path

The grey arrow indicates the employee movement path during receiving procedure. The blue arrow indicates the process of employee putting the goods within the section.

The employee can put the goods on any area the black arrow points. The same goes with goods that have passed through the QC process and the goods with identified problem are put anywhere. This mainly happened because there are no regulations about product placement in this section and this can cause goods to get mixed up and confuse the employee during the recording process causing inaccurate stock data. Even though the interview process with the Supervisor stated that mixed up goods is the one causing stock inaccuracy, it is actually because there is no goods arrangement.

Put-away Analysis

From the interview with Supervisor, the problem occurring in this section is the goods arrangement, and access to storage. Even though the employee has already put the same product within the same goods type, this is not enough. There is another consideration for goods placement besides product type such as order frequency. Below is the detail of the order frequency

Order Frequency

According to the Administrator, the sales of products in the company, arranged from the highest sales to the lowest is: baby bed, baby carriers, baby bag. This makes the baby bed is the best seller product of the company and will be the goods with the highest count of being picked out of the storage. Goods that are high in demand should be put in place where the employee can easily access and control. By easily accessed and controlled mean that the goods have to be put at the place where the employee can take the goods as soon as order coming in and easy to notice whenever something happened to the goods such as out of stock or missing goods.

Storage Access

There is no regulation issued by the company about the employee access to the storage, meaning the employee has both access to the storage section and all goods stored inside without being controlled. While there is regulation about order picking, other activity inside the warehouse and who came in and goes out are never known, this can cause unauthorized and unrecorded goods picking process to occur possibly cause the goods missing problem. Even more so, with all the employee wander around the storage, and no security measures such as CCTV or security, it opens the storage section for the possibility of theft.

Order Picking Analysis

Next to be discussed is the order picking. There is problem identified during order picking after interview with the Supervisor which is the higher process time of certain goods. Below is the process time for all goods obtained during observation:

Table 4.2 Order Picking Process Time

Product	Processing Time (in seconds)
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Baby Bed	36
Baby Bag	29
Baby Carrier	28

The data from the chart shows the goods with the longest time required for picking up during order picking process from highest to lowest is baby bed, baby bag, baby carrier. The average processing time of all products is 31 seconds, meaning that the process time for baby bag and baby carrier are good, while the process time for baby bed is not that good. From observation, baby bed process time was affected by the goods placement. The goods placement affected the baby bed picking process by causing the employee to have difficulties to access the goods. The movement path from observation was made as below:



Figure 4.3 Baby Bed Picking Process Pathways

The circled arrow is when employee has to do the extra work to take baby bed: go through the baby bag by moving some of them blocking the path then take the baby bed then put the moved goods back to its place. There are other problem regarding the current goods placement shown in the figure below:

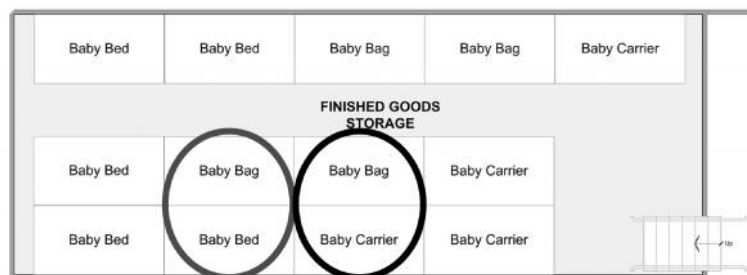


Figure 4.4 Goods Placement Problem in Storage

The grey circle indicates is the same problem as mentioned above: different type of goods being placed in the same column. The black circle indicates possibility of unseen goods because the smaller goods are placed behind bigger goods. From the product measurement in Table 4.6, we can see the baby while the baby carrier only about half in size from the bag with these hidden goods can cause inaccurate stock data. This problem happens when pile of goods bigger in size are placed in front of the smaller goods pile. It will not cause problem if the quantity of the smaller goods exceed those of the bigger goods, but if they have more of the bigger goods, the small goods put behind those pile is very possible to be unseen by the employee because it is harder to see small goods behind the pile of large goods.

Goods Measurement

Below is the goods measurement table made from direct observation by researcher:

Table 4.3 Goods Measurement

Product	Goods Measurement (in cm)		
	Length	Width	Height
Baby Bed	90	15	55

Baby Bag	50	10	32
Baby Carrier	20	10	25

Data from the table shows the goods measurement listed from biggest to smallest are: baby bed, baby bag, baby carrier. Bigger in size means less in quantity the employee can take in one go assuming they have to pick same amount of goods. Less quantity picked in one go also means that the employee have to make repetitive picking to complete the process because the picking up system is fully manual without any use of tools or equipment. Goods weight normally contributes to the amount of goods the employee can take in one goes, but that is not the case with these products. The weight of goods is also affected by material used in it. From the observation, all of the goods in the warehouse are made from polyester and foam weighting less than 1kg, means that the goods weight do not affecting the number of goods that can be carrier in one go, but only the goods measurement. Another problem mentioned by the Supervisor during interview is goods availability. Sometimes the goods ordered are not available in the warehouse, made the company unable to fulfill order from customers. From the observation, it is found out that out of stock due to goods missing and unrecorded picking process is the most cause of being unable to fulfill the order. However, sometimes the goods was actually available but missed due to the, and delay during the put away process

Shipping Analysis

From the in depth interview with Supervisor the only problem this section has was the same problem in continuous workflow: delay in the predecessor activity causes another delay in the next process, continue and accumulate affecting the process output as shipment delay. However the delay in the predecessor process barely affecting the work in this section thanks to the senior employees performances. The senior employees doing this process are seniors with more than 10 years of employment in the company. This means that they are the experts within the company that has more experience and know-how in doing the process than the other employee in another section. Having more experience means that they already know what to do under certain circumstances, like knowing they have to be more careful when handling baby carriers because some of its part is breakable. While the know-how provides them the knowledge to do the work based on the circumstances properly. So, if in this case, there is shipment delay, they can keep up with the delay by using the know-how thus improving the process speed, making the shipment right on the schedule. By putting these seniors within the last line of the process, the company is trying to put the last safety measure to ensure the goods that were about to go out of the warehouse is clean from problem in quantity and quality.

Existing SOP Analysis

There is only one SOP implemented in the company for the work process. Below is the SOP issued by the company for work process:

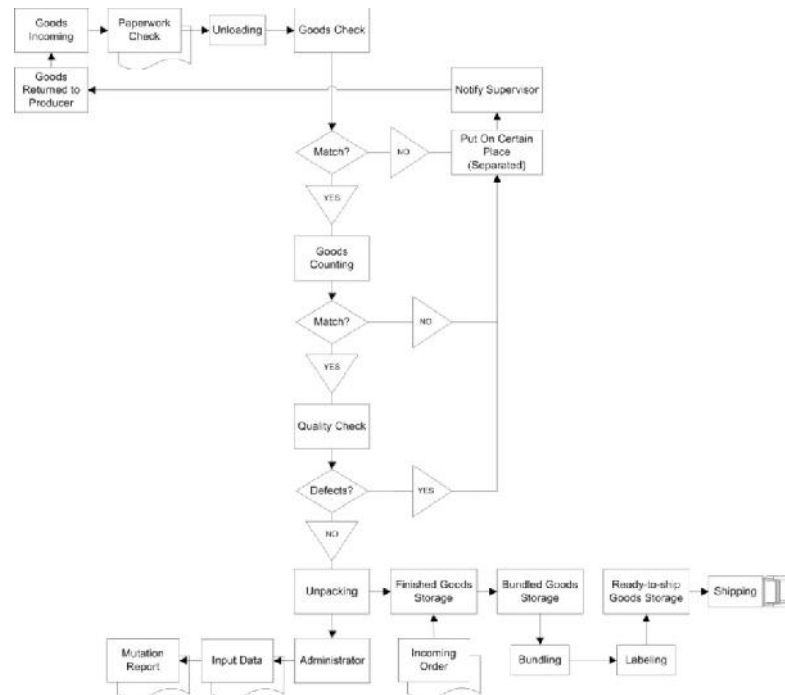


Figure 4.5 Warehouse Work Process SOP

According to the Logistics and Shipment Chief, work process SOP issued by the company is designed to provide better control and enable fast response to problem during the process. This statement can be proved by the need of paperwork at the start of goods coming to the warehouse and when goods are about to be picked up for shipment. This is to make sure that the company to always keep track of its inventory ensuring the data and actual amount to be accurate, assuming that the process in between is done correctly. The fast response to problem can be seen by the “Notify Supervisor” activity right after the discovery of problem during receiving process. This way, the Supervisor will quickly receive report including the problem, giving early notification immediately after problem was identified thus making fast decision for solution, as soon as possible. However, the report quality affecting the time required to make decision and quality of the solution provided. The reports from previous months can also be used by the Supervisor in making preventive measures to prevent same kind of problems in the future.

Proposed Solution Analysis

The analysis of the existing system proves that there are ways to improve two of the company current work process: Receiving, and Put-Away. Details on the how to improve the system will be explored and analyzed below:

Receiving Process Proposed Solution

There are two proposed solution in this process regarding the data recording system and goods arrangement in QC section.

Data Recording System

From the interview with Supervisor, one of the processes affecting to stock inaccuracy within this section is data recording during quality control. The current data record system from the warehouse work process is mapped as below:

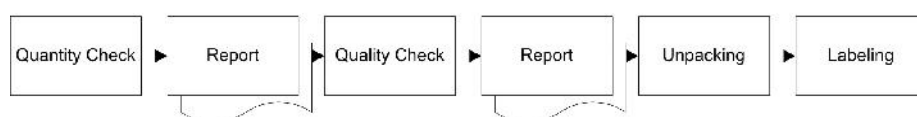


Figure 4.6 Current Data Record Process Map

There are 6 steps in data recording process, each one of them done by manual labor, and from the observation takes about 4 to 6 hours to complete. The use of manual labor for process means that

the process is in risk of human errors. Moreover, the analysis of receiving process in the previous section shown that human error like miscount, miswritten, and misread during the data recording process is directly affecting stock data accuracy causing the stock inaccuracies. Thus, the need of new system that can replace the manual labor during data recording process as a solution to reduce the risk of human error is required in order to reduce the stock inaccuracy, and that can be achieved by implementing barcode system. Along with a procedural change from manual labor to barcode system, a new data recording process map is made as below:

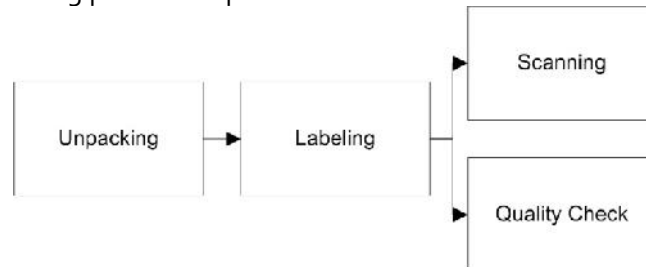


Figure 4.7 New Data Recording Process Map by Implementing Barcode System

The new data recording process map will consist of and three steps; unpacking, labeling; and quality control by scanning and quality check. Two less step to be done means that they employee will have reduce in workload by 33.3%. Unpacking process will become the starting process; followed by labeling process in which the employee prints the barcode labels for each product and paste them on the goods packaging; last is the Quality Control process consists of Scanning and Quality Check, both done simultaneously. Below is the list of problems that can be solved by the implementation of barcode system:

Table 4.4 Problem Solved by Barcode System

Problem	Cause	Solution
Miswritten	Lack of concentration, sleepy	Printed barcode label
Miscount	Lack of concentration, sleepy	Scanning
Misread	Unclear handwriting, sleepy	Scanning

The miswritten problem due to lack of concentration during work and sleepiness can be solved by the printed barcode label because there will be no need for the employee to do any data input but just print-and-paste. The miscount problem due to lack of concentration and sleepiness can be solved by scanning because the employee would not have to count the goods but just scan the barcode and let the computer do the calculations. The misread problem due to unclear handwriting and sleepiness can be solved by scanning because there will be no need to read the label on the package to make data record; the Scanning process includes the quantity counting and data recording which directly go to the company data server; enable the Supervisor and Administrator to look at the incoming goods and defected goods records almost immediately after the input process by themselves, enable the Supervisor to immediately contact the producer for goods return and replacement. The implementation of barcode system also has problem at the beginning of implementation process and possible problem after the implementation. The problem at the beginning of implementation process is the need to input all product data into the company server and to integrate the scanners with the Supervisor and Administrator computers. Possible problems after the implementation process are: employee misprints barcode label, employee double-scanning the goods, broken scanner, power outage, computer problems, run out of printing label for barcode.

Goods Arrangement in QC section

Another problem in the receiving process is the QC section did not have goods arrangement to separate the checked goods from the unchecked goods. Below is the current QC section layout that shows the goods arrangement in the section:



Figure 4.8 Current QC Section Goods Arrangement

With the current placement there 6 separate places used to store goods without space allocation to arrange where the checked goods, where unchecked goods, or the defected goods should be put in the section. These separate places without space allocation to arrange the goods placement causes the goods being mixed up, and confuse the employee doing the QC process. The next solution researcher came up with is to set up new goods arrangement within the section as the figure below:

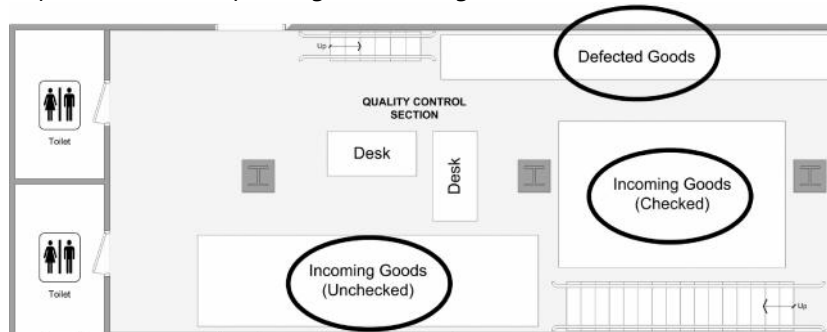


Figure 4.9 Goods Placement in QC Section

The list of problem being solved by using this goods arrangement in the QC section listed as below:

Table 4.5 Problem Solved By New Goods Arrangement in QC Section

Problem	Cause	Solution
Mixed up goods	No Goods Arrangement	Space allocation to store the 3 goods type in the section

Unlike the current arrangement, the new goods arrangement will separate the 3 kinds of goods stored in this section; unchecked incoming goods, checked incoming goods, and defected goods. The arrangement will be set up like this: the new incoming goods that have not been checked will be put in the separate location behind the employee workspace; and if during checking process there are goods identified with problem, they will be moved to the separated space for defected goods; the goods passed through the QC process will be put into the space on the right of the employee workspace. By using these goods arrangement in the section will solve the problem of goods being mixed up and also make it easier for the employee to take the checked goods for transport to storage because all of it now put in the same location and near the entrance.

Put-away Process Proposed Solution

Analysis of PT. Chintaka Bumi Pertiwi current put-away process shows the problem being goods arrangement and storage access. Therefore, proposed solutions for both of the problem within put-away process are suggested by researcher as follow:

Goods Arrangement

Below is the current goods arrangement used by the employee to put goods in the section:



Figure 4.10 Current Storage Section Goods Arrangement

Using the current arrangement, there are 3 spots to look for when the employee is looking for baby bag, 3 spots to look for when the employee is looking for baby bag, and another 3 spots to look for when the employee is looking for baby carrier. The current arrangement make the employee who did not memorized the goods location in the storage to look for these spots to find the goods they want; there is chance of goods counted as missing because the smaller goods are placed behind the bigger goods marked with the arrow; and the baby bed put on the back side of storage is having higher process time despite it being the best seller goods meaning that the goods are leaving the storage often. Below is the proposed goods arrangement for the storage section suggested by researcher:



Figure 4.11 Proposed Goods Arrangement in Storage Section

As we can see from the figure above, the new arrangement put the same product type within the same location without mixing the placement of any product type in one column. By using this arrangement, the employee would only have 1 certain row, or spot to look for the baby bed, baby bag, and the baby carriers, reducing the time to go looking for spots to find the goods by 66.7%. Below is the list of the problems solved using this goods arrangement:

Table 4.6 Problem Solved By New Arrangement in Storage Section

Problem	Cause	Suggestion
Unseen Goods	Smaller goods put behind bigger goods	Putting same product type into one section
Harder Access to Certain Goods	Goods are put behind different product type	Putting same product type into one section
Baby Bed High TProcess Time	Put on the further side of the storage	Separated to fill in the top row from entrance all the way to the back of the storage

his proposed goods arrangement eliminate the problem of unseen goods since all the big and small goods are placed separately in their own group; solving the baby bed placement being at the further back despite being the most frequent goods taken out of the warehouse by separating the baby bed

placement to fill the entire row from near entrance to further back separated from other goods type; and make it easier for the employee to pick up by not having to move other goods type to reach the desired goods for it is being grouped according to their product type.

Storage Access

As it is known from the findings and analysis, one of the problems within the section that contributes to stock inaccuracy is due to the uncontrolled storage access. There are two type of storage access caused by the current system; authorized and unauthorized. Below is the storage access process map caused by the current system:

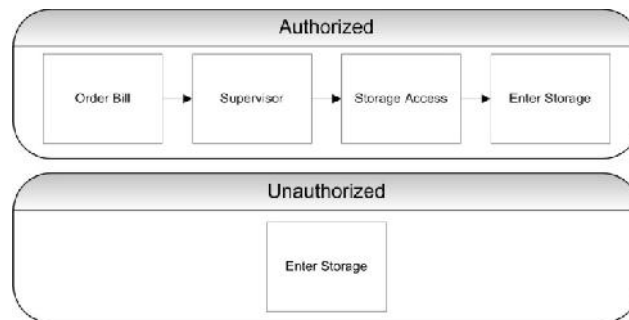


Figure 4.12 Two Types of Storage Access Due To Current System

Using the current system, as we can see above, there two types of access to the storage: employee in need to do order picking having the order bill authorized by Supervisor then entering storage to do the order picking process, and the employee with unknown intention and just enter the storage. This happened because the company regulations before order picking process occurring in the storage section while issuing no regulations about the storage access for other employee and no control over the storage access. From this situation, there are two proposed solution suggested by researcher to solve the problems: assign a PIC and new regulation for storage access.

Assign one of the senior employees in the Shipping section to be a Person in Charge of the storage section with new job description. The assigned PIC has to be one with experiences in the storage section in order to adapt faster to the new job list. The PIC main job is to monitor the goods and employee traffic in the warehouse; all of the goods stored, incoming goods, goods taken, employee coming into the storage, employee coming out of storage, and for whom the order bill is issued, will be made into weekly report by the PIC. This weekly reports can be used later by the Supervisor during the Stock Opname process to help tracking the goods in case of stock inaccuracy so the company can track the goods whereabouts and the cause of inaccuracy faster rather than ordering the employee to look all the reports from all the processes, and find the goods for unseen goods possibility. If the inaccuracy case is identified due to thievery, the company can make faster identification of the culprit being the employee or outside people, thus also help in making preventive measures to protect the goods inside the storage.

Second is to regulate storage access in the storage. The new regulation will be as follows: there will be no access inside the storage section unless for storing and order picking process, no access to the storage granted without showing the PIC the access card. For storing process, the employee in duty for transport the goods inside the warehouse will need to show the waybill stamped by the Supervisor as the access card, and the employee in duty with stamped order bill as the access card. The process of accessing the storage is mapped as below:

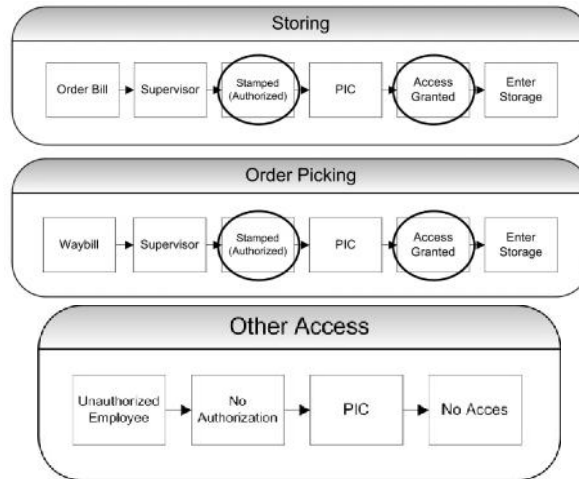


Figure 4.13 New Storage Access Process After Regulation

As we can see from the figure above, all the access is being limited to authorized employee for specific task and no other access are allowed into the warehouse. The circle mark on the figure indicates the security measures set up by the regulation to ensure that the employee who enter the storage have to either being authorized by Supervisor and granted access by the PIC after showing the access card. Problem that can be solved by assigning a PIC and new storage access regulation is listed as below:

Table 4.7 Problem Solved by Assign PIC and New Storage Access Regulation

Problem	Cause	Solution
Uncontrolled Goods Movement in The Storage	No controlling measure in the storage	Assign PIC
Missing Goods	No controlling measure in the storage	Assign PIC
Slow Goods Tracking During Inaccuracy	No controlling measure in the storage	PIC Weekly Report
Unauthorized Access	Uncontrolled employee traffic to the storage	Assign PIC, new storage access regulation
	No security measures for storage access	

Conclusion

Most of the problems identified during the analyze phase shown that most of the problem in this company is happening due to the company regulation and procedure. This is proved by the problems being human errors caused by the manual labor procedure, mixed up goods caused by no goods arrangement, slow process time also due to no goods arrangement, and uncontrolled storage access due to no storage access regulation. The company has identified some of their own problems but apparently the problem identified was not the real cause but only a symptom caused by the real problem. While the interview data provide the information regarding the work processes inside the warehouse along with its problems and what caused by the problems, some of the information proved to be different from the actual situation. For example is the Shipment process; the warehouse Supervisor mentioned during the interview that shipment delay is often the problem happened in this section and this is caused by the delay during the previous process that accumulates to the next process and eventually ends up to delay the last process which is the shipment; but, the actual data acquired from direct observation prove it otherwise. The goods indeed often getting delayed to arrive into the Shipping section and the accumulating process delay is the cause of it, but it barely affecting to the shipping process due to the performance of the senior employees put in the section as the last safety net for the warehouse to ensure that the delivery will

be right on schedule by utilizing their years of experience and the know-how to work faster without reducing the result quality.

Recommendation

The following recommendations are provided to PT. Chintaka Bumi Pertiwi in case of implementation the proposed solution:

- Before implementing the barcode system, it is recommended to train the employee on how input the data for barcode label in case of new types of product, train the employee on how to do scanning with the barcode, and during the implementation, it also suggested to have technician ready in the warehouse in case of system error or hardware damage for fast repair or replacement.
- For the goods arrangement in the warehouse section, it is recommended for the PIC to always keep up to date with the sales data because it can help when the need to rearrange the goods arises.
- For the Supervisor not to leave their stamp anywhere or give easily passed it to someone because the stamp is now used for giving the employee access to the storage and if some random person can have access to the stamp, meaning they also have direct access to the goods inside the storage.

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