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The Study of Managing Stock Level and Storage Space for Aircraft Spare Parts: The Case of Transpo Logistics Co., Ltd.

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Abstract

This research is studied the study of managing stock level and storage space for aircraft spare parts: The case of Transpo logistics Co., Ltd which will be focused on warehouse operations and any other problems related to warehouse and transportation of Transpo business involved with aircraft parts. The research will be studied the current problems in the warehouse such as order picking process, storage process, placing the goods at the walkway, no classified of goods and the careless driving of company's employee. The way to study is the permission of Transpo International Company to access to Company's warehouse in order to study warehouse operation and analyze the current problem which the research process is covered both studying for before improvement process and for after improvement process in the warehouse by using the research tools which are the Fish bone diagram to show the relationship between the problem and the cause, Primary Data, Secondary Data, Flowchart, Economic Order Quantity Model (EOQ Model) and the last is timing for picking order. Therefore, the outcome will be focused on the efficiency of the warehouse. The average time of picking order both before improvement and after improvement is found that the timing for before improvement took a longer time than after improvement which the first floor is 1.38, the second floor is 1.53 and both are 1.76, but the result for before improvement and after improvement changed a few. It is quite the same in a similar way because most of employees are very busy all day. The efficiency of warehouse operation improvement is not received a good result. However, it is considered as Transpo International Company trends to improve warehouse operation in the future.

Keywords: Stock Level, Storage Space, Aircraft Spare Parts

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1. Introduction

Warehouse's duty is for receiving goods and raw materials to store in the warehouse through the counting process and; sorting process and classifying those martials into groups in order to be easy for checking and production plan. Good warehouse operation planning is an important strategy of working that helps the successful business. Warehouse space usage affect the expense for maintaining control of raw materials and goods quality.

Nowadays, some organizations have ordered the goods to store in the warehouse. Transpo Company has improper storage systems such as warehouse operation, improper placement, placing the goods wrong position, placing the goods at the walkway, placing the goods too far to take it out to deliver to customer, no classification, placing the goods as general and the careless driving of company's employee that cause the goods to be damaged and cannot deliver to customer. These problems above are investigated to find the causes and solutions.

Researcher is interested in the problem that arises from the case of Transpo International Company which the problem is improper storage system about the aircraft part in the warehouse, improper placement and placing the goods wrong position. When the new goods arrive, the worker moves the goods placing around the walkway and empty space in front of warehouse. The old goods will be put into the back. Picking up the old goods to deliver to customer will be difficult. Moreover, the negligence of the driver of the company is also the point that the accident will be happened. The goods will be damaged and cannot deliver to customer on time. The storage of goods of recent employee is not organized which there are no storage categories, so it is difficult to find the goods and waste the time. In case there are new employees working in this position replace the employee who does not come to work, come to work late or take day off. The new employees will not be able to find the goods when it is time to deliver to customer because the recent employee relies on experience they have and familiarity.

Transpo International Company established in 1973 and operated in Thailand for more than 40 years. The target of Transpo focuses on quality of working to make customer satisfied with the service. Transpo develops the business all the time in order to get more experience to apply to customer and focuses on investment, and develops warehouse operation, IT, transportation management and solution related to customer. Transpo has the solution both inside country and outside country which Transpo is the agency doing business following the customer's needs. They provide both Land transportation and Air transportation. The Transpo Group is one of the oldest and largest multi modal transportation service companies in Thailand. Transpo Logistics has 3 offices which are Suvarnabhumi International, Don Muang Airport and the ocean services operation is at Klong Toey Port.

Transpo is the agency or broker about importing and exporting goods and transportation service in order to service to customer who wants to process their businesses. There are many types of goods that is in Transpo's responsibility for transportation business such as rice, clothes, car parts, aircraft parts and any other goods. Most of customers of aircraft part are Thai airline. Thai airline will process their businesses such as ordering aircraft parts in abroad by themselves to repair their airplane and ordering aircraft parts to stock in the warehouse of their company if there is the problem with their airplane in case. The objectives of the study were to: 1) identify warehouse workflow, 2) study warehouse operating system for aircraft part which is easy for using, saving the time and having a good resource system, 3) solve the problem affecting daily time and quality, 4) optimize the layout and picking time, and 5) study inventory strategy EOQ.

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2. Literature Review

2.1 Theory and Definition

Nowadays, the warehouse has played an important role in the industrial business. To make the business easier, having good warehouse operating system is very important for each type of work in order to develop the warehouse operation.

The aircraft is the same as the car which we buy the car in order to use for working in daily life. It requires the maintenance such as motor oil, engine, car radiator, wheel tire and other parts. In the same way, when aircraft are used for airline business, every aircraft part has its own functional life. When it is time to change the new one, the airline needs to change the parts for high efficiency following Airbus Company or Boeing Company. Airline needs to concern with the safety because it involved in the business of airline. Therefore, maintenance planning is very important for airline business because airline processes the business all the time. If airline is not good at maintenance planning when the problem of aircraft part occurs, airline may lose the revenue for doing business. Aircraft parts must be stocked in the airline's warehouses. When it is time to change the aircraft part or spare part, the aircraft part will be taken out of airline's warehouse for changing or repairing, so the aircraft will be able to fly as scheduled, so each airline has its own warehouse to stock the aircraft part for changing and repairing. Most of the aircraft parts are Wing, Slat, Flap, Fuselage, Engine, Nose Gear and Tire which the feature of each part is not the same because of weight, width, length and height. Transpo needs to concern with the dimension of aircraft part to maintain the aircraft part in warehouse before shipping to customer and provides suitable space, and equipment in warehouse to store the aircraft part because the aircraft part is one of the biggest goods.

- Warehouse is a space that is planned for efficient use. Storage process duty is storing the goods during movement process in order to support storing the goods. 2.1.2 Warehouse operation is the process of integrating resources to make progress warehouse business to achieve the objective of the warehouse.
- The environment in the warehouse is the things inside the warehouse including moving the goods, storing the goods and the working process of employee in the warehouse.
- Shipping is checking the ordering and classification. The goods will be stored in the box, package, pallet, container and the goods will be attached the label, the bar code system to the goods and recorded the information to prepare shipping to customer.
- Class-based storage is the goods classification following the customer's needs.

2.2 Literature Survey

Sirinapa and Sujitra (2008) wrote the study and Improvement Inventory System: The case of Techno Communication Ltd., Part. The objective is to study the inventory control system in order to improve the inventory system to be more effective by beginning studying about the cause of the problem with the inventory system from recording in the checklist since June to August 2008 for a period of 3 months by using the Pareto Diagram to select the appropriate problem and use the fishbone diagram to analyze the causes of the inventory problem and propose a solution using the principle of the Inventory management system. The outcome shows that the real cause of the problem of inventory the goods does not match to stock card, the problem of ordering redundant goods and the deteriorated goods is mixed with the good one. Therefore, research have studied the way to reduce the inventory problem above by creating Stock Card to calculate minimum stock level including maximum stock level, goods classification, storage space, the use of color code sign by

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Nopporn, Tassaneewan and Supaporn (2007) wrote the study of the Procedure in Managing the Warehouse: The case study of Carpenter Thai Company Limited. The objective is to study the working environment in the warehouse in order to study the process of warehouse operation for warehouse improvement. The research has a chance to access to Carpenter Thai Company limited and studies the warehouse process before improving of Company. To improve the way to work more effectively, the research uses ABC analysis for goods classification, theory of visual quality control which is used to create labels of type of goods and security management theory which is used to organize the warehouses in order to improve the warehouse. The outcome of improvement of the warehouse can be summarized as follows: The average time for receiving the goods to store in the warehouse after improving is reduced at 23.05 seconds, the average time for delivery after improving is reduced at 8.64 seconds and the distance for delivery after improving is reduced at 9.94 meters.

Pairat, Narudom and Warut (2002) studied Warehouse Management. The objective was to study the process of improvement of warehouse management program by using microcomputer machine. A study is about the description of Stock program which the program shows the information on the screen display at Stock program system. Therefore, the Stock program should tell the duty of working of each program and tell all important systems. This is a guide way to use applied program in order to have the best way of warehouse operation.

Nattawut, Wimolrat, Chutima and Siriporn (2004) studied the design of Inventory Control System: The case of USTAR (Thailand) Co., Ltd, Prachinburi. The objective is to study the inventory control system. The researcher studies the old system first. After that, the research designs and improves the inventory control system to make more efficient by the theory related to the inventory control system such as Barcode system. The outcome is the company has a fast inventory control system and easy to check the goods in the warehouse. The ordering the goods of customer will be correct and able to reduce inventory maintenance cost.

Pawenrat (2010) studied Improving efficiency and analyzing problems both in the past and in the present: The case of High Quality Garment Co. Ltd. The outcome is the problem was caused by the management did not pay attention on warehouse operation in every month which is inventory counting system. The layout of the warehouse is not yet available. The employee also lacked the planning, management and operation of the warehouse. The warehouse layout is designed for overall warehouse system. The company identify the duty for each employee in the warehouse. KPIs are measured and inventory is counted at the end of the month. The result of warehouse improvement is the rate of using the storage space in the warehouse decreased 20% which reduces the picking time about raw material by 34%, the rate of picking time about raw material mistakes reduces by 92% and reduces the number of placing wrong positions by 100%. The recommendation for the development of warehouse management is that the employee in the organization must cooperate together as teamwork to improve the efficiency of warehouse operation activity.

Manon (2011) studied problems and strategies for solving problems to improve the efficiency of EMS industry services: the case of Trinity Electronics (Thailand) Ltd. The objective is to study the major problems that caused directly impact on productivity such as warehouse layout and lack of maintenance machinery which the efficiency of the factory production is not as it should be. From the problem, The researcher has taken the theory of Systematic Layout Planning (SLP) to apply to the problem and provides a continuous maintenance plan for the machinery. The objective is to provide warehouse layout suitable for the warehouse. As a result, the new warehouse layout can reduce the total removal distance by up to 70.4% and the time required to produce is getting lesser.

Chakapong and Sirichai (2009) studied the new warehouse layout about how to improve the new warehouse layout to reduce the distance and time. The objective is to study warehouse layout which the researcher introduced the systematic layout of warehouse in accordance with the principle of (SLP). The process is to study the basic information of warehouse layout, flow of paper box production and the relationship of activity. The researcher offers 3 types as follow: warehouse layout A has shorter production distances and more straight lines than the original warehouse layout when comparing to the original warehouse layout, warehouse layout B has shorer production distances which it is inconvenient for operation or working process, warehouse layout C is easily working process. Therefore, the researcher selected warehouse layout A to apply with warehouse layout improvement process and it can reduce the distance 27.76 %. The time for efficiency can reduce the production time of warehouse layout 51.80%.

Pornthep and Warinot (2011) studied warehouse layout improvement: the case of Z Company Limited. The objective is to study warehouse layout to design the layout by increasing the area for the production flexibility which is cooling tower Company Limited for export both inside country and outside country. There are 4 products which are A series, B sun-series, C-series and D series. The main product of production is A series. The researcher has found that this factory has problems with space usage. Therefore, the researcher has improved and set the new plan to create the new warehouse by using Systematic Layout Planning pattern to analyze in this case. After improvement, the warehouse has more efficient warehouse as follow: The space for the first floor is increased from 228.47 Square Meter to 300.47 Square Meter or increased by 7.69 %. The space for the second floor is increased from 0 Square Meter to 139 Square Meter or increased by 18.38 %. The space for the third floor is increased from 238.29 Square Meter to 296.79 Square Meter or increased by 7.74 %.

Suttipong (2007) studied the optimization of warehouse layout: the case of K Furniture Company Limited. The objective is to study the impact of the inefficient warehouse layout of the company due to the expansion of warehouse space is not suitable and the flow of production is not continuous which can waste the time for waiting and the cost for production is very high and often has the accident because of there is no systematic planning which it will waste the time about movement. The researcher has analyzed and solved the problem that warehouse layout should be created as U which the production will be continuous and can reduce production process. Moreover, there are increased spaces for each department total 612 Square Meter which can reduce the distance from the starting point to the destination point for movement 212 Meter and can reduce the time for movement 12.7 minutes. As a result, the total production process decreased from 112.2 minutes to 99.5 minutes or reduced the production time by 11.32%.

3. Research Methodology

3.1 Population and Sample

The employee and the wage table, and the working table of the company will be shown in Table 1 and Table 2.

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Table 1 The total employees and the wage table

The total employees are 900 employees		
Position	Quantity	Wage per people
Supervisor	12	800 – 1,000
Warehouse Leader	35	600
Operation	781	300 – 350
Company's driver	72	400

Table 2 Working table

Activity	Time
In the morning	8.00 AM
In the break time	12.00 PM
In the afternoon	13.00 PM
Finish	17.00 PM
Starting OT	17.30 PM
Ending OT	20.30 PM

3.2 Research Procedure

Research Design

This research will study the current problems in the warehouse about aircraft parts of Transpo Co., Ltd which are related to warehouse operation such as order picking process and storage process by using the fish bone diagram as the research tool to analyze the problems.

Steps in Research
- Step 1 To study the storage process in the warehouse and how to move the goods or aircraft part.
- Step 2 To study order picking in the warehouse.

3.3 Research Tools

To analyze the causes of problems in the warehouse by using fish bone diagram, primary data, secondary data and flowchart were used to analyze the problem along with finding the cause and providing the solution. The fish bone diagram shows the relationship between the problem and the cause which the fish bones diagram consists of the following parts:

Primary Data is the data from asking the question to the employee in the company about the problems related to the warehouse about which the employee can be able to give the opinion for the problem.

Secondary Data is the company's data which is from the direct company records research and website. These data are about warehouse operation.

A flowchart is the graphical or pictorial representation of an algorithm with the help of different symbols, arrows and shapes in order to demonstrate a working process which an algorithm is a set of steps to complete a task and it is the step by step of data processing or problem solving. An algorithm

can be presented by a flowchart. Using flowchart to analyze the working process would be an advantage.

Material management which can help about sufficient goods for production. Low inventory costs can have the method in a number of ways, depending on the demand of the goods. The entrepreneur can choose the appropriate system to meet the right system of inventory management system in the current industrial business which can be divided as follow:

Economic Order Quantity (EOQ)

Just-In-Time (JIT)

Economical order size which this system is based on the lowest total cost of inventory.

Economical Order Size for fixed demand.

3.4 Data Analysis and Statistics

To perform the data collection in the warehouse and the problem that encountered in the warehouse before the operation process, and also after operation process in order to compare the operation process result.

3.5 Research methodology mapping

According to visiting Transpo's warehouse, new goods which is aircraft part is moved to the front area near the door and the walkway when new goods is delivered in the warehouse. Some types of goods are placed at wrong position, no classified, the old goods will be put into the back. Therefore, it is difficult to find the goods and it wastes the time. Moreover, the negligence of the driver of the company is the point that the accident can be happened.

4. Anticipated Results and Recommendation

4.1 Anticipated Results

This research studies the current problem in the warehouse about aircraft part of Transpo International Company. The result found that the problems are divided into 3 parts which can analyze the problem with the fish bone diagram.

1) Storage system which when new arrival aircraft parts are placed and moved to the front area near the door and the walkway because of lack of coordination. The employees do not be careful about using equipment which the equipment is placed at anywhere. Secondly, the goods are not categorized in the warehouse and the walkway is a limited area. Thirdly, they take a long time to pick the order to customer.
2) Teamwork and collaboration which they are analyzed that there are no specific responsibilities of working process for some employees and the frequency of recruitment. Secondly, the document is switched with each other.
3) The safety system of the Company's driver which the goods are easily damaged because of fast driving. The Company's vehicle dropped the bridge.

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To suggest the problem above, the solution processes are as follows:

1). Storage system which this part will be separated into 3 causes. Firstly, new arrival goods or aircraft parts are placed and moved to the front area near the door because of lack of coordination of employee in advance before the goods are arrived. This case is informed to the Company by providing the solution which is about communication that the employee should be contacted to each other before the goods are arrived for 3-4 hours in advance to provide and prepare the area and the equipment for moving the goods for storage in order to be stored the goods at the right position and the employee should be enough for working process. For the case of picking order, they take a long time to pick the order, timing for picking the order for before improvement and after improvement in the warehouse is applied to this case. Secondly, the walkway is too limited area which it is inconvenient for equipment usage for the walkway area and the equipment is considered as disorganized equipment because the equipment is placed at anywhere. Therefore, this case cannot be figured out the problem, but the way of solving the problem is informing to the company about the problem of disorganized equipment spread around the warehouse. This case is considered by the company and informed to cargo department. Thirdly, the goods are not categorized in the warehouse because there are no specific areas for storing goods including aircraft part. This case is asked for the permission of the company to be allowed to work as real working to separate the goods between the general goods and aircraft part by the employee itself. Because of too many types of goods and most of employees are quite busy which they work all day, the company informed to cargo department about this case.

Table 3 The comparison of the average of picking order for before improvement and after improvement by timing

Floor	Before (minute)	After (minute)	The difference (minute)	The percentage
1	1.38	1.13	0.25	18.12
2	1.53	1.27	0.26	16.99
Both	1.76	1.55	0.21	11.93

From the table shown in Table 3, the timing which is the average time of picking order both before improvement and after improvement, it is found that the timing before improvement takes a longer time than after improvement. The difference result changes only a little because most of employees are very busy related to working all day which the efficiency of warehouse operation improvement is not getting so much result, but it is considered as the Company trends to improve the warehouse operation in term of picking order as soon as possible which can be in the future.

2). Teamwork and collaboration which there are no specific responsibilities for most of employees because of too many employees and some employees will be free during working day. This case is informed to the Company about the recruitment that the exact position in the warehouse should be specific responsibility of specific employees and the qualification of each employee should be matched with the type of work they are assigned to do in order to work effectively. Therefore, this case is considered by Transpo International Company and taken a little bit of time to approve. Another case is the document management. The important document is put together with the others which means the documents can be switched with each other. This case is also informed to the company about the solution. After Transpo receives the suggestion, Transpo informed to cargo department and the result will be appeared for the following day.

3). The safety system of the Company's driver which Transpo used to experience with the

damaged because the truck dropped the bridge. This case is informed to the Company about the suggestion that the Company should specify the qualification of driver applicant which is at least 2-3 years' experience or specify the number of appropriate years' experience in driver employee in the industry factory.

4.2 Recommendation

For Storage system, the employee should contact to each other before the goods are arrived 3-4 hours in advance to provide and prepare the area and the equipment for moving the goods for storage in order to store the goods at the right position. The employee should be enough for the working process. Secondly, the walkway is too limited area which it is inconvenient for equipment usage for the walkway area and the equipment is considered as disorganized equipment. This case cannot be fingered out the problem. If the equipment is well organized, it also receives a good result for the limited area for the walkway. This case is also considered by the company and informed to cargo department. Thirdly, the company should specify the exact storage area for type of goods in order to be easy for the process but the result is the Company tries to separate the goods between general goods and aircraft part by providing the area for storing aircraft part.

For Teamwork and collaboration, the company should provide the specific responsibility for the current employee to work in their own position, not general positions. The related field of education could be Business Administration, Logistics Management, Financial Management and other related fields. In the same way, the Company should release the new rule by specifying the period of time of recruitment to be effective for working and the number of employees should be sufficient. The document should be in a group of each goods in order to prevent the loss of documents.

For the safety system of the Company's driver, it is very important for the safety of the Company's driver that every driver need to be trained seriously before real working which should be an advantage.

References

Apiprachayasakul, K. (2017). Inventory Management. Bangkok: Focusmedia and Publishing Company Limited.

Apiprachayasakul, K. (2013). Warehouse and Distribution Management. Bangkok : Focusmedia and Publishing Company Limited.

Apiprachayasakul, K. (2016). Warehouse Space Management. Bangkok : Focusmedia and Publishing Company Limited.

Arunvipada, P., Jittapornpinij, N. and Kittiyakornnupong, W. (2002). The study of Warehouse Management. Bachelor Thesis (Business Computer), Faculty of Business Administration, King Mongkut's University of Technology North Bangkok.

Chantarapirom, M. (2011). The study of problems and strategies for solving problems to improve the efficiency of EMS industry services: the case of Trinity Electronics (Thailand) Ltd. Master Thesis (Logistic Management), Faculty of Business Administration, The University of the Thai Chamber

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