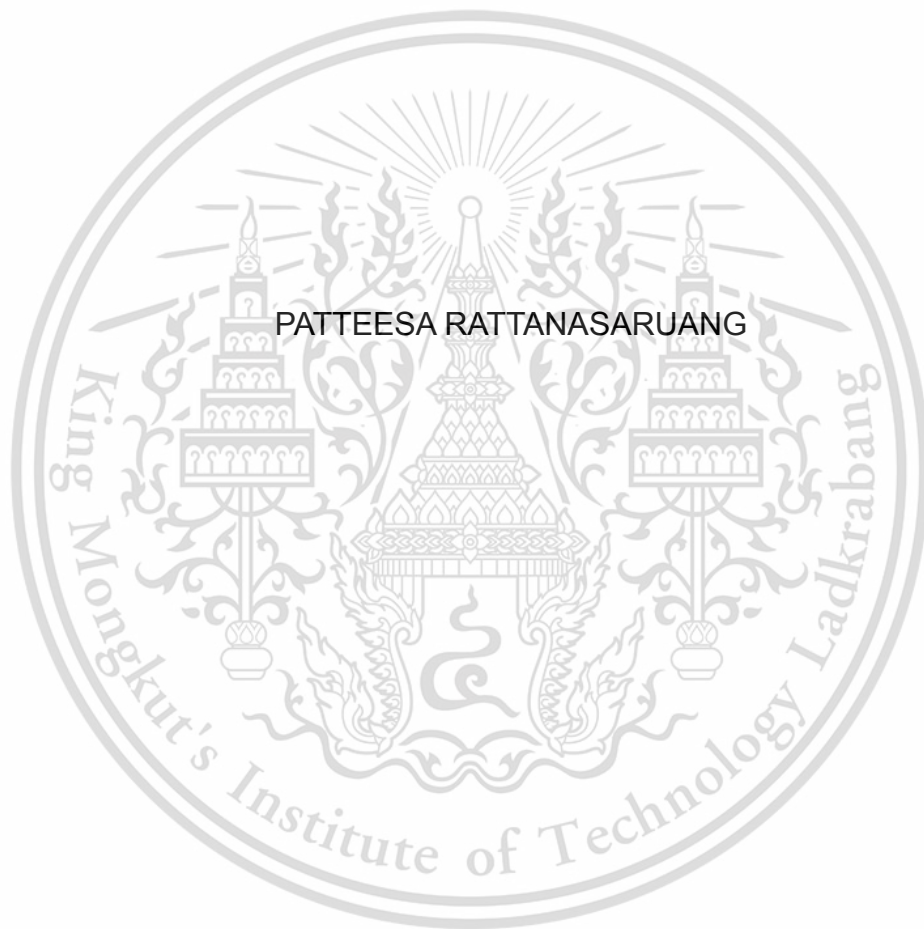


**STUDY ON EFFICIENCY AND MOVEMENT OF TRUCK AT CONTAINER
YARD**



**AN INDEPENDENT REPORT SUBMITTED IN PARTIAL
FULFILLMENT OF THE REQUIREMENT FOR THE DEGREE OF
MASTER OF SCIENCE IN LOGISTICS AND SUPPLY CHAIN
MANAGEMENT
INTERNATIONAL COLLEGE
KING MONGKUT'S INSTITUTE OF TECHNOLOGY LADKRABANG
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ABSTRACT

As the growth of international trade around the world which was increasing number of import and export in many countries. Thailand is country where export many kind of cargo such as auto part, electronic goods, and agricultural products according to several kind of cargo is effect to using more container to export product to aboard. The container yard is a placed to release empty container to customer due to number of using container is growth rapidly and effect to truck congest at container yard and service efficiently to serve customer. In this research focus on study efficiently of container yard to release empty container to customer and capacity to accept return container per day by explanation in general statistic furthermore this research study about factor that effect to average time of truck by using interview method with manager of container yard. This study also concern about vehicle operating time cost which occur from truck waiting on queue to pick up container to acknowledge the total cost per year that container yard have to spend per year. As the result of study factor that effect to average time of truck is occur from various of container grade and lack of equipment which not balance to number of

truck and each equipment have to resoponse many task during day which cause of truck spend time longer in queue to pick empty.



ACKNOWLEDGEMENT

This IS would not completed without well cooperation of container yard where provide valuable data to support this study.

To my IS advisor Dr. Jaruwit Prabnasak I would like to thanks for your kind suggest and well cooperation since the beginning until the end of this study.

I would like to thank all of my friend and my family for always supporting me since the beginning of study until the last day of study.

Patteesa Rattanasaruang

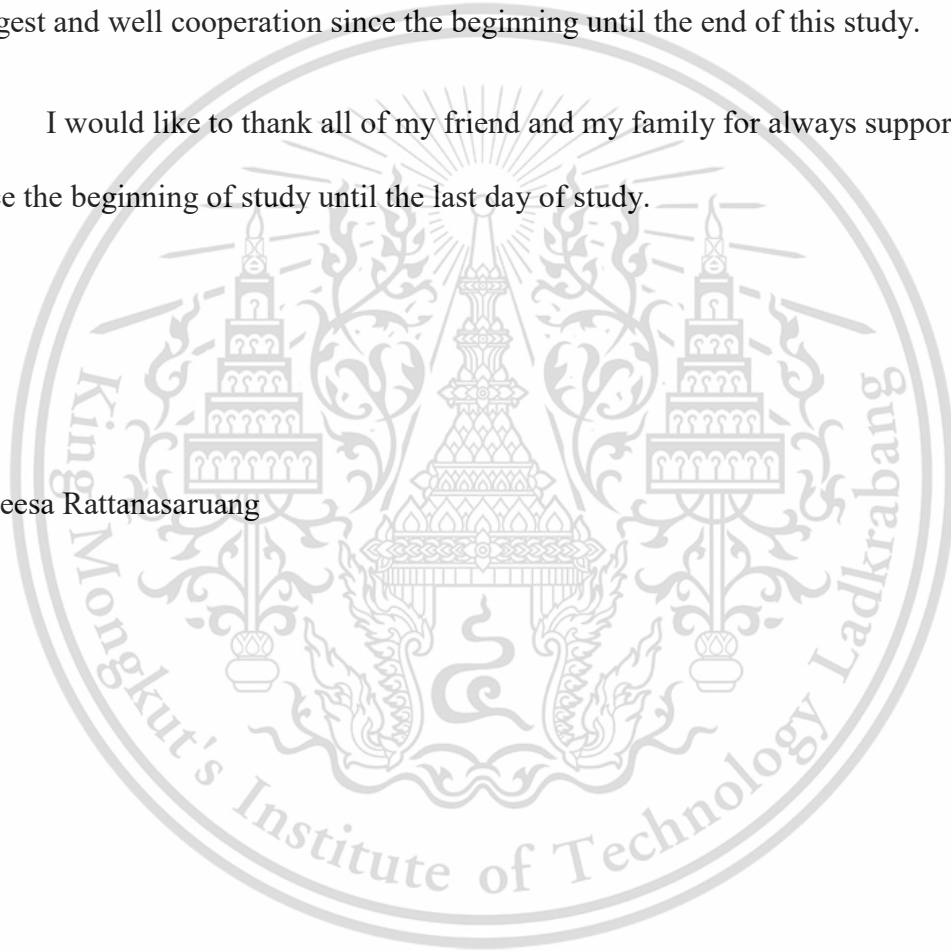


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CHAPTER 1

INTRODUCTION

1.1 Introduction

The evolution of international trade has been started after the World War II. It made many countries around the world start to import and export a cargo or product to other countries. On that period of time most of transportation used ship to transport a cargo from one country to another countries, but not all area of country can used transportation by ship directly, thus people decided to use carriage which now using a truck instead to carry a cargo from the manufacturer or farm to delivery to the port and wait for loading the cargo into the ships. Since the international trade has growth up increasingly, those made business that involved transportation to support customer who want to import and export the cargo cross the country. Today have many companies that services cargo transportation fully processes such as leasing container box, carrier cargo cross the province and country, and many kind of transportation that fit to customer demand. The challenges of companies that provides more than one services is hard to control a factor that might be effect to work process which includes internal factor and external factor such as investment on structure of container yard, economic, and government policy as those cause so companies have to improve work process as well as companies should handle with several kind of obstacles.

Thailand is one of the keys of logistic transport hubs in Association of Southeast Asian Nations (ASEAN).

More than many Thai provinces share borders with many countries such as Myanmar, Laos and Malaysia. With China surging costs of product. It makes many foreign manufacturers are looking to set up new base in countries with lower

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production costs particularly in Vietnam and Myanmar. It makes many manufacturing bases in Southeast Asia. Moreover, it has not decreased Thailand's role as a regional manufacturing powerhouse. Also, it fulfills the role of a key logistics hub for other countries in ASEAN. In a largest exporter in ASEAN. Thailand is a key role in the increasingly sophisticated regional supply chain, especially in terms of meeting the rising demand for cross-border logistic services. These services encircle transportation, as well as managing supply chain functions. Thailand's exports to other ASEAN countries grew by average of percentage during the past. Also, Thailand's growth in exports to neighboring GMS countries, which expanded by high percentage annually over the same period. The emerging opportunities in Thailand's logistics industries. It has many foreign logistics companies such as DHL, FedEx, and Kerry logistic. They have already made inroads into Thailand.

1.2 Background and problem statement

According to growth of international trade which effect to huge number of transportation in many counties. The company that provide logistic services such as carrier, container leasing, and ships liner has to handle with more customer in nowadays. Container yard is one section of company that faced the problem of congestion at gate yard cause of amount of customer that growth rapidly more than 500 trucks per day and construction of container yard was build for longtime so when the number of truck is higher so that make congestion at gate container yard. The company on this research has been faced the problem of congestion at gate container yard that make several truck have to wait on queue for many hours to which some truck has to wait more than 5 hours to pick up a container. Most of truck that in waiting line is a truck that belong to company, which has cost of time for waiting in

queue line called vehicle operating time (VOT) if truck have to wait more longer the cost of vehicle also increasing and company has to responsible with the cost that more extend in every year. This container yard is also services truck that own by other companies and customer's truck, so some of profit will get from customer truck that come to use company services if the efficiency of container yard is below than the standard that will effect to level of customer directly if company would not improve service level or reduce time that truck has to wait on queue it might effect to profit of company. To make services level of company increasing and make customer satisfy so company have to improve work process inside container yard become faster to service more customer and reduce cost of truck that spend on waiting line specially truck of company that company has to response cost of each truck.

1.3 Objective of study

- Quantitative and trend analysis to acknowledge the performance and problem of container yard.
- Qualitative analysis by using review method to explain the result.
- Analysis total cost of container yard operation.
- Recommendation.

1.4 Scope of study

On this research using raw data from company where services container yard in Bangkok area. The data which using to analysis is base on data of gate in and gate out at container yard during year 2014 and 2015.

CHAPTER 2

LITERATURE REVIEW

2.1 Overview of container

Container is usually made from steel or aluminum standard size of container can be divided in 2 sizes, which are 20 feet and 40 feet. The structure of container is very strength, which can be lay more than 10 levels between container will has slot to hold each container together. Normally container has door in two side of its, which have container number and detail about maximum gross weight that container can carry. The unit of container is called Twenty Equivalent Unit (TEU) type of container box can be divided to five categories

1. Dry cargoes are used for product which packing or container and don't need to maintain or control the temperature. The product inside the container is require to block the product from slide or move by using balloon bag to put it in gap between the product and container or using wood blocking as a wall in front and back of product which called wooden partition and if it uses nylon rope it front of container will called lasing.



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Figure 2.1 Dry containers

Source: Smita Singla (16 type of container units and designs for shipping cargo)

2. Refrigerator cargoes are container with air conditioner which controls the temperature at least -18 degree Celsius which the cooler will stick outside the container or have the electric plug which plugs from outside the container. This container type must have thermometer to shows the temperature of container.



Figure 2.2 Refrigerator containers

Source: Smita Singla (16 type of container units and designs for shipping cargo)

3. Garment container this type of container is design for packing product clothing inside of container has coat racks that are often use with fashion item, which do not need to folded or packed.



Figure 2.3 Garment containers

Source: Smita Singla (16 type of container units and designs for shipping cargo)

4. Open top is container sizes 40 feet that design to have no roof for use placing large product such as machines, which can't move through the door, then have to transport by lifting on roof of container instead.



Figure 2.4 Open Top containers

Source: Smita Singla (16 type of container units and designs for shipping cargo)

5. Flat-rack is container which width and length and has standard size as usual container, but the platform of product that use this container type is specific

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such as machines, rock, sculpture, and tractor which for those product maybe transport by a ship as conventional ship, but when transport by using ship as container system it must be placed in a flat-rack for ease to arrange in a form of slot.



Figure 2.5 Flat Rack containers

Source: Smita Singla (16 type of container units and designs for shipping cargo)

6. Tanks container is container, which used for transportation of liquid materials they are used by a huge proportion of entire shipping industry. They are mostly made of strong steel or other anti-corrosive materials providing them with long life and protection to the materials.



Figure 2.6 Tanks containers

Source: Smita Singla (16 type of container units and designs for shipping cargo)

7. Car carrier container is container which design for carrier car cross the country. This kind of container come with collapsible sides that help a car fit snugly inside the containers without the risk of being damaged or moving from the spot.



Figure 2.7 Car Carrier containers

Source: Smita Singla (16 type of container units and designs for shipping cargo)

The transportation by using container vessel the product or goods must be packed in container if the seller is a person who packed the product by their own called consignee load and count (team CY), but if the company who own ship is packed the product at port or inland container depot called container freight station (CFS). For the product that comes from consignee load and count (team CY) must be full container load (FCL), but for the product that comes from container freight station (CFS) can be full container load (FCL) and consolidated, which mean the product is less than 1 container box called less container load (LCL). Container, which use for packing can be divided in 3 sizes

1. Size 20 feet, which have outside dimension, are length 19.6 feet width 8.0 feel and height 8.6 foot. The packing weight max of this container size is 32 to 33.5 cubic meters and 21.7 tons.

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2. Size 40 feet, which have outside dimension, are length 8 feet and width 9.6 feet. The packing weight max of this container size is 76.40 to 76.88 cubic meters that use for dry cargoes product.
3. Size 45 feet, which mostly use in euro transportation for this kind of container can carrier pallet more than container 40 feet or more than 6 pallets. Size of 45 hi cube is length 13.71 meters width 2.34 meters and height 2.89 meters.

The most important part of transportation by using container system is maritime transport, because maritime transport cost is lower and can carry a lot of container box. Before the transport the container box must be stuffing and move the container box to container ships, which design for transportation. The port must be design to support container ships, which called terminal design for suitable both of engineering and environment. (Khanasan, Sawanit, 2013)

Container owner ships there are 2 types of container owner ships, which are owner carried and lease container. Nowadays companies try to reduce the amount of container in their company by using leasing container instead because of if company has many containers in yard it will affect to increase holding cost. Even companies try to use more lease container, but somehow most of container still carries by the owner carried companies.

2.2 Evaluation and trend of container shipping

The shipping industry was happed in 1960 since Malcome Maclean was carried first container between the American ports. Since that time the shipping

industry has been expansion almost every part in the world which is effect from the growth of international trade and technology that increase the demand of customer from many country around the world so that made logistic service company have to increase the performance of container shipping services such as service quality, and cost efficiency. Nowadays, general product is carry by using container and 80 % transport by ships because of maritime transport is lower cost than other transportation and can carry lot of container at the same time. Even maritime transport will take long time to destination, but most of trade between the countries still using ships transport. Although the industry of shipping was establish for 50 years ago, but it still need more the systematic study review about evaluation and trend of container shipping. (Yui-Yip Lau, Adolf K.Y.NG, Xiaowen Fu, Kevin X. Li, 2015)

The world has changed to be globalizations people can be communicate cross-country within minute, and doing business becomes easier than before. The international trade becomes important for growth of country's economic. The main transport of trade between countries will use maritime transport, and 52% of this transport the cargo was carries by the container. Since 1960 container has growth in every year, and then rapid development in 20 years ago by increasing from 85 million twenty Equivalent Unit (TEU) in 1992 to 651 million Twenty Equivalent Unit (TEU) in 2013. The benefit of container is can be ease for transport in every kind of transportation (vessel, ships, truck, train). According to the growth of international trade that also made the challenge between the logistic service companies to improve the service quality, and price of service. (Chang Yee Lee, Dong Ping Song, 2016)

The container shipping is the one most effect to growth of economic since 1990 to 2005 the container was rapid expansion. The growth of container shipping is become from demand of customer and word trade, furthermore the goods and product in present is suit to carry by using container because container box has many kind of that can be support in several kind of product such as if you want to transport something that need temperature control you can use refrigerator container box, but if you want to transport cloth you can use garment container. For the company side their try to increase ship feet and improve quality of port to make the process of loading container becomes faster, and try to use process that ships take a short route and then turnaround in short time. (Eric, 2006)

As the world trade and imbalance of import and export of each countries e.g. developing countries that have export less than import, furthermore the cause of empty container is imbalance of oversea trade and economic crisis thus, which effect to empty container at terminal and when companies hold large amounts of empty container so it will increase company's inventory cost. Another problem is normally import process will use container size 40 or high cube, but for export will use container size 20 instead thus, effect to amount of empty container at terminal. (J. Karmelić, Č. Dundović, I. Kolanović, 2012)

2.3 Terminal structure and handling equipment

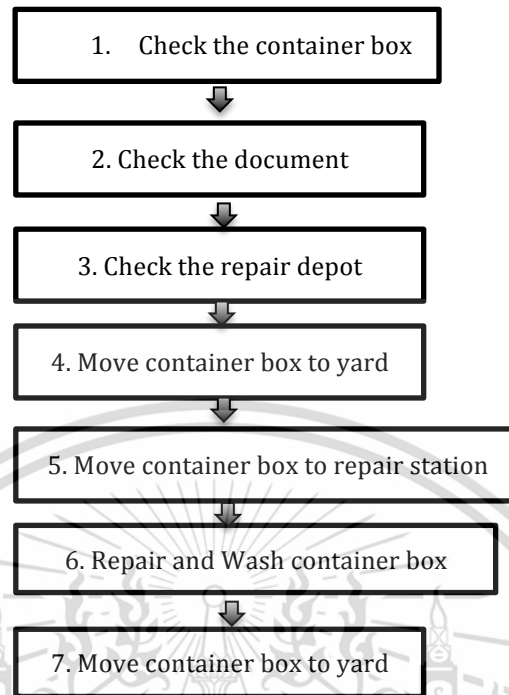


Figure 2.8 Container receiving process at container yard

- 2.3.1 Check the container box is the first step that staff will check the damage points on container box before move it to the yard.
- 2.3.2 Check the document in this step staff will check the number of container box and type of container then insert data to computer.
- 2.3.3 Check the repair depot is to check that repair station is available or not if it not the container box will move to yard and wait for the repair
- 2.3.4 Move container box to yard if the repair station is available the container box will move to the repair station.
- 2.3.5 Move container box to repair station in this step is moving the container box from yard to repair station.
- 2.3.6 Repair and wash the container box is this step a repairman will repair the container box follow as the report that was check in the first step and after

finish the repair the container box will get a wash process to clean dust and dirt.

2.3.7 Move container box to yard in this step after container box was repair and wash then it will move to yard for prepare packed the product.

The international trade has become more important in nowadays thus, that make company have to improve the performance of work process. As the growth of international trade that also increasing amount of container box which use for carry the product from one country to another country everyday so the company have to prepare and well manage to their own container box and make it appropriate with the demand of customer. In present some container box company or logistic service company has problem about delay container repairing process or problem of human resources. To solve the problem of delay container process by divided storing and repairing yard into 3 areas which is small, medium, and high repair and then allocated people with appropriate with the task (Apichai, Sitipon, 2013)

The company tries to improve the performance of container box cycle, which support to the growth of economic and international trade. The mythological that can be solved the problem by using empty container reuse method, which comes from import part. This method can be decrease cost of holding container box incase of company doesn't have enough yard to place the container box, then the company have to hire third company to store the container box instead. The technology is the one important part that will use to stimulation and manage the amount of container box that imported with the product per year then the company can be plan to build appropriate container yard (Kittiphong, 2011)

The container system or process must be improved to appropriate with the customer demand. The companies have to reduce the cost of holding too much container because of if company holding container or have a lot of inventory cost it will decrease the profit of company. Furthermore the contrast of container process is separate container size and empty container in yard is not symmetric yet because of sometime container size 20 is placed in the same place with size 40 thus, this problem is make the process of pick up container is become slower because of when the truck come to the terminal have to wait long time to carry the container and sometime a worker from yard pick up the wrong container size or container that doesn't received wash process yet. To solve the problem is using stimulation program to optimize the container fleet size and optimize cost that should be for holding a container. (Dong, Song, 2009)

The empty container reposition planning is the one method that uses for to consider the safety stock of container that should be in yard. If the companies keep mass of container in yard too much it will decrease freight revenue of company. This method tries to estimate an appropriate amount of container in each port and to minimize cost of reposition empty container. (Feng, Chang, 2008)

As the growths of international trade, which make shipping companies, have to prepare a huge amounts of empty container or using leasing container incase that shipping companies doesn't have enough container. The problem is companies have collected large of empty container, which more than customer demand thus, effect to increase the inventory cost of shipping companies. Furthermore shipping company

must be well manage about allocate a number empty container to each port and each terminal which appropriate amount by limit the number of empty container that should be in yard e.g. if the number of container is less than U (limit number) company have to allocate container from another terminal or port to full fill this terminal. This method will solve the problem of collect unnecessary empty container, and decrease cost of holding over container amounts. (Li, Lueng, Wu, Liu, 2007)

The technology is become more important which uses for design and improves a process of empty container. The companies who own the container will use program to reposition empty container to decrease the cost of distribution empty container between port and terminal then mangle the empty container which appropriate with customer demand and capacity of company that can store the empty container in port and terminal. This program will shows the unnecessary empty container, which made cost of inventory, is increasing. (Bin, Zhongchen, 2006)

The ship liner companies have to manage the amount of empty container in each terminal or port to support the demand. Allocate container from one terminal of port to another is the one method that help problem of container surplus which effect to holding cost of companies and including loading and unloading cost this method also help in some terminal or port that faces the problem of shortage empty container to solved this problem companies has to calculate the number of empty container which should be with the demand of customer in each port or terminal then allocate empty container from terminal or port that have surplus of empty container. This process will companies reduce cost of using leased container. (Zheng, Cai, 2015)

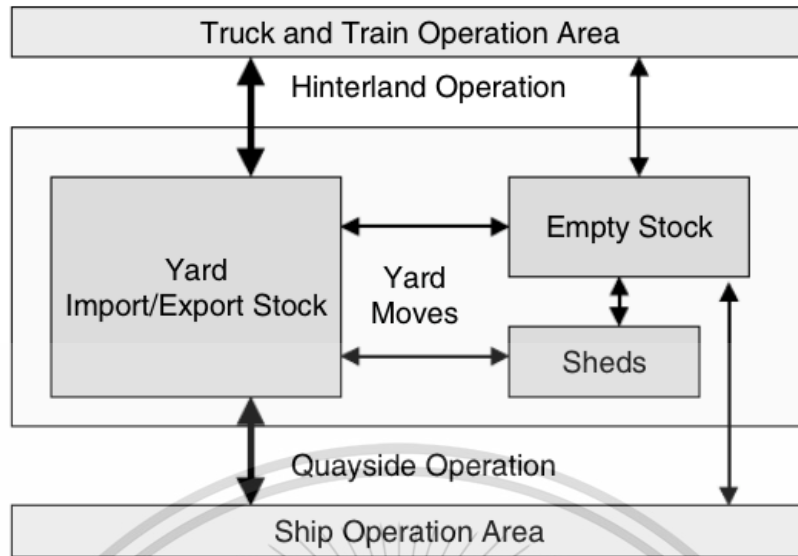


Figure 2.9 Work process of container terminal

The container terminal can be divided in 2 sections, first the part that connect with the port to loading and unloading container to the ships in this process will use crane equipment to load and unload container box from truck or train, and the container which loading from the ships will move to yard and prepare for moving in the next step such as loading to the truck or loading to the train, the second section is land side where the container are loading and unloading from the truck or train which preparing to move to the ships. For the container that already transported product or good to customer will transport to empty container yard where the container will get the repair or wash process, then all those container will move to the yard and wait for order from customer or ship liner. (Dirk, Stefan, Robert, 2004)

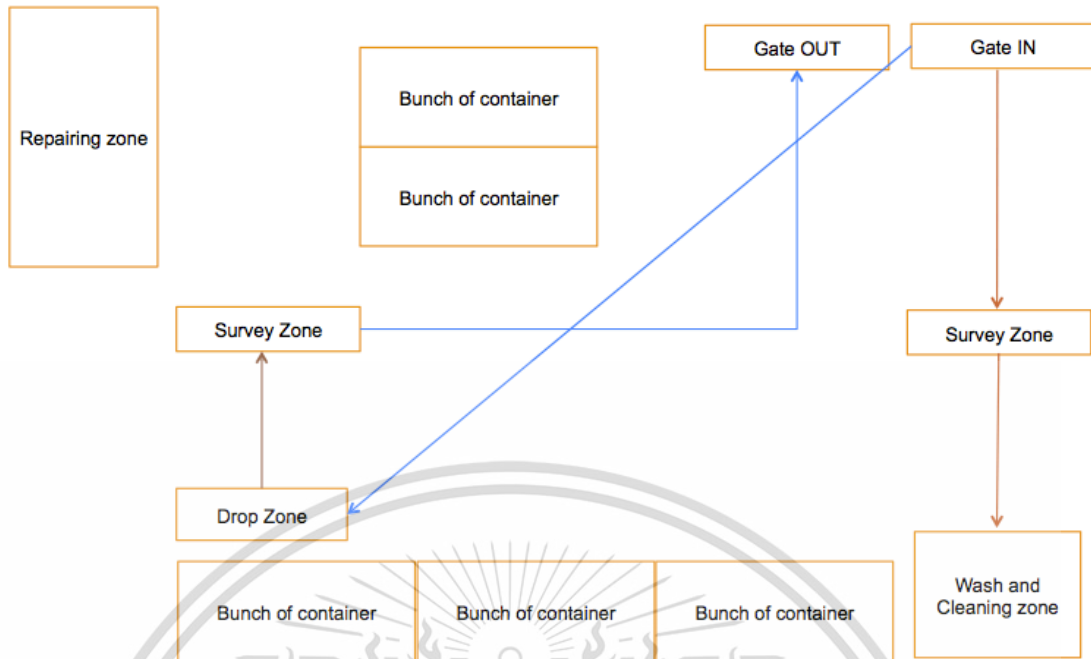


Figure 2.10 Lay out of container yard

The structure of container yard on this case study can be describe as figure below by start from gate in of container yard as figure can notice that have 2 arrows line first arrow is explain about when truck come to return empty container after use it and container will move to survey zone which investigate empty container that have any damaged or not if container is damage customer have to pay for damage cost, but for empty container which not damage customer will only pay for cleaning cost for damage container will move to repairing zone first then move to wash and cleaning zone, but for available empty container will move to cleaning zone directly. Second arrow is describe work process when truck come to pick empty container first truck will give job document to gate in staff then truck will move to drop zone and waiting on queue to pick up empty container after received truck will move to survey to investigate and checked that empty container is fit to customer need or not after this process finish truck will move to gate out of container yard.

2.4 Container Terminals

Container terminal is a place to collect and prepare container box to response customer demand at container terminal can be divided more than one section, which is maintenance and repairing section, yard management section, gate in-out section, and custom operation section. Container terminal where the container has been loading to the ship for export and also the place that the ship will berth at port side to discharge container box that import from another country. Container terminal is the place that company has to spend a lot of expense to maintain process smoothly and improves efficiently of terminal to offer best service to customer. Companies try to reduce cost and time of working process such as loading and discharge processes that have to work with the ship is this process take long time it will effect to the next ship that will berth after can be delay. On this paper is the present about performance of port container terminal by using GPSS simulation model to analysis and evaluate activity of container terminal. (Popescu, V., Menadil, H., Izet-Ünsalan, K.-Ö, 2008)

Container terminal where the containers have been move from one kind of transport to another such as the container comes with truck and then move into yard to prepare loading to the ship. Nowadays the demand of using container is rapidly growth, which effect terminal operation management process. Container terminal has to work with pressure and well management with truck rail and ship schedule if the schedule is delay it will affect to another transportation. The purpose of container terminal is try to improve performance by increasing efficiently of working process and uses resource optimization. (Hipólito, T.a, Nabais, J.L.b , Botto, M.A.a, 2016)

Container terminal can be divided into 2 sections first is sea side where the ship will transship at port and unload or load container from the vessel then the container will be pick up by truck and transport to customer the second is land side where the truck will transport container from terminal to different places or pick up container to loading cargo to the vessel. According to growth of international trade which increasing truck and vessel schedule become more swiftly special at peak hour sometime the truck have to wait longer. To solved this problem Truck Appointment System (TAS) has been uses in some port to reduce congestion and decreasing time that truck has to spend at terminal. In this research study about advantage of Truck Appointment System (TAS) and evaluate affect to yard operation process. (Ramirez, Gonzalez, Smith, Guerra, 2016)

Cargo terminal have to handle with many kind of container type such as dry container, reefer container, special container. Normally container terminal structure will have only each of one gate in and gate out, thus that will occur the traffic problem of truck. On this paper has stimulation a model to study about gate in gate out planning and investment also research about gate structure to solved the problem of traffic inside container terminal. (Keceli, 2016)

The process of export or outbound container a container will carry by truck and then load to ship at terminal. In this research the purpose is optimization cost and balancing time of loading and unloading process. The model to solve the problem is using heuristic algorithm by collect data from Jinzhou port. The result shows that cost of terminal has been decreasing and efficiently of yard also increasing. (Yang, Cheng, 2016)

2.5 Improving terminal management

The growth of international trade makes logistic companies has to improve work process to become faster and more accurate. Container terminal is the one important process for logistic companies where the truck comes to pick up container for loading cargo if the process take long time it will effect to ships schedule so the logistic companies should design or finding method to improve the efficiency to decrease time space and reduce total cost of operation process (Tsai, Lu, Chang, 2016)

Container terminal business is the one kind of service industry, which companies have to concern about level of service quality. In this research is study about evaluating service quality at Shahid Rajae container terminal at Bandar Abbes port. The model that using for evaluation is SERVQUAL model by using 165 samples and then distributed questionnaire to checked customer satisfy. The result shows that all five dimensions in model are all significant for the first dimension that most important is tangible, second is reliability, assurance, responsiveness, and last one is empathy after checked the result also found that Shahid Rajae was received the highest score among of 9 terminal companies. (Sayareh, J.a, Iranshahi, S.b, Golfakhrabadi, N.c 2016)

Logistic companies have to improve efficiently of working process, which include container terminal, container depot, and container equipment. While the growth of international trade that effect to increase number of truck which come to pick up container is more congestion special in peak time that make truck have to wait

in line longer. In this paper purpose is forecasting number of truck arriving rate per day and a time that truck have to waiting in line at container terminal by using heretical data, environment of terminal, and equipment of yard. To solved a problem on the study using artificial neural network to reduce waiting time of truck at container terminal or container depot. (Hill, Bose, J.W., 2016)

The biggest problem of container terminal is congestion of truck at gate of terminal the consequence of too much truck at the same time is truck have to waiting in line longer and waste of cost that spend on waiting such as opportunity cost, fuel cost this problem has been happened at container terminal all around the world. To solve the problem in some terminal is implement system which called advance booking system to manage time of truck to arrive at terminal and to reduce time that truck have to wait on queue line. Advance booking system will work coordinate with truck appointment system to manage time that truck should come to pick up container at terminal gate by using data for advance booking list. On this research after implement advance booking system and truck appointment system we found that manage work process at gate terminal is better and also reduce congestion at gate terminal. (Gracie, Gonzalez, R.G, Mar-ortize, 2016)

Storage yard is the place where collect amounts of empty containers that wait to pick up and loading cargo, thus storage yard will face the problem of truck congestion at yard, furthermore terminal have to spend on quay operation at the sea side of the terminal. The object in this research is minimization of cost quay and time that truck spend on waiting line to solved the problem we use linear programing to reduce the cost of quay operation. (Jin, Lee, Cao, 2016)

2.6 Empty container logistic

Empty container logistic is involved with movement and distribution of empty container in each port and terminal. The container logistic cycle is start from the container that empty and then transport to loading point to load a cargo then transport by truck, rail, ships, or air to the designation, but sometime the empty container doesn't directly to loading point or have more than one stop e.g. some empty containers are allocated to another terminal or yard to prepare for full fill customer demand, or incase that customer is loading cargo by their own the empty container will transport from container terminal to customer. Furthermore in nowadays has a company that leasing empty container for shipping companies or container companies for incase that company doesn't have enough container to respond the customer demand. (Le Dam Hanh, 2003)

2.7 Movement of empty containers

The empty container cycle movement can be divided in 3 ways as the figure 2.4 is the kind of empty container movement for

first, the container was carried the cargo from country A at port A by using ships to country B at port B and then the container was transport by train or truck to local receiver in country B for unloading cargo, and then the empty container will move back to port and ships back to country A at port A in this kind of movement called reposition of empty container.

Second, the container was carried the cargo by ships from country A at port A to country B at port B and then the container will transport by truck or train to the local receiver in country B to unloading the cargo then the empty container will move

back to port terminal and move to local shipper who want the empty container to load cargo for export to Asia country, and then the container that was loading the cargo will move back to port terminal for transport back by ships to Asia country this kind of movement is called empty container reuse.

Third, is similar with the b) movement, but the container that was unloading cargo from local receiver will transport by truck or train directly to local shipper to load a cargo that want to export to Asia country, and then the container will move back to port to transport back by ships to Asia Country. (Le Dam Hanh, 2003)

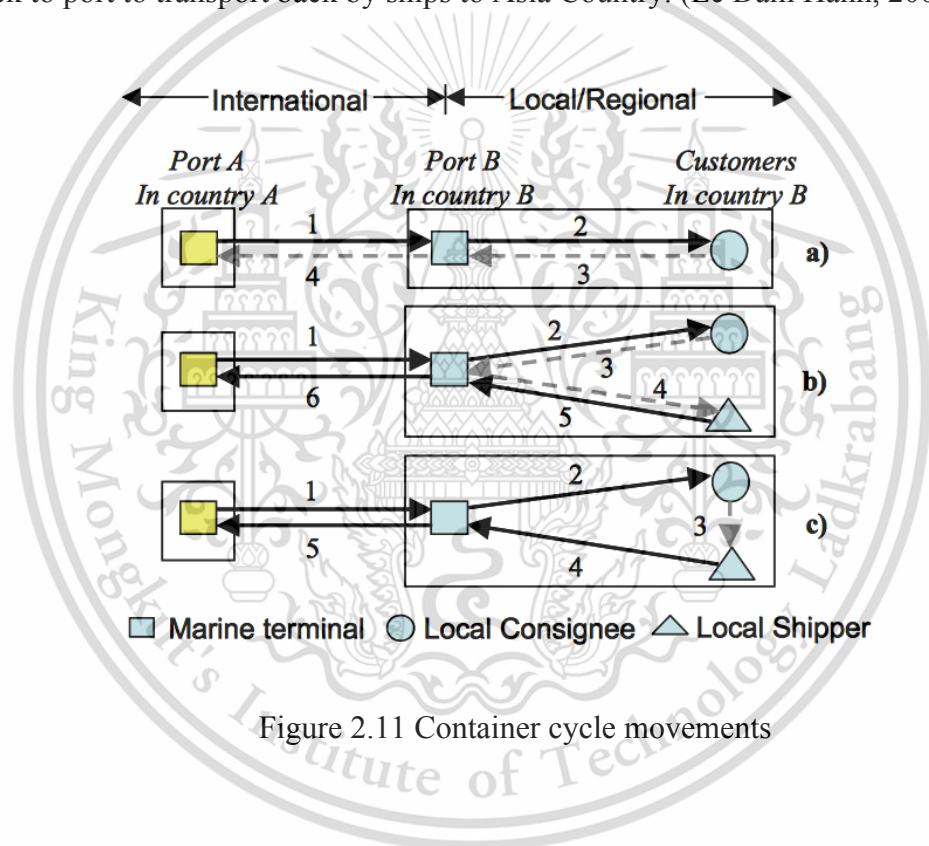


Figure 2.11 Container cycle movements

2.8 Vehicle of time

Vehicle of time (VOT) is value of time that wasted on per trip which if use time to do another activity might be increasing value of economic.

Type of vichecle	Propation of vichecle (%)	Propaton of trip per purpose(%)		VOT year 2015 (baht/unit/hour)
		Business	Over time	
Bicycle	3.65%	41.23%	58.77%	62.13
Motorcycle	13.76%	45.12%	54.88%	62.50
Personal car	55.06%	49.42%	50.58%	222.05
Mini bus	4.74%	65.54%	34.46%	329.05
Miduem bus	1.82%	43.86%	56.14%	519.47
Large bus	0.26%	37.50%	62.50%	846.15
Pick up truck	11.01%	62.79%	37.21%	116.89
Miduem truck	5.70%	86.52%	13.48%	76.84
Large truck	1.60%	82.00%	18.00%	95.21
Truck tailor	2.40%	84.00%	16.00%	92.89

Figure 2.12 Vehicle operating time cost

As above figure on this research will use cost from large truck and truck tailor and then divide by 2 to know the average cost which equal to 94 baht per unit per hour. The reason that have to use 2 kind of truck because of container yard which use to be case study has 2 kind of this truck come to pick up empty container so decided to use average cost of large truck and truck tailor to analyze.

CHAPTER 3

RESEARCH METABOLOGY

3.1 Data Collection

The research using raw data from gate in and gate out record which shows number of truck per unit, date in and date out of container also time in and time out of each truck. The data that use to analysis receive from period during year 2014 and 2015 which data is separate into each month start from January to December. The total number of raw data, which used to analysis in year 2014, is 176,764 trucks and 181,180 trucks in year 2015.

3.2 Quantitative Analysis

3.2.1 Frequency analysis by summary total number of truck movement of year 2014 and 2015 by using Excel software. First, use summary tools to summarize number of container movement, which include come into gate and out from container yard in each month of year 2014 and 2015. On this analysis will divide data in to 2 set first is gate in data and second is gate out data. For number of gate in data is record from truck that come to return empty container after used or delivery empty container which reposition from other country which has not time record when truck leave the container yard but for gate out data is record truck that come to pick up empty container at container yard for this dataset has time since truck pass thought gate and time that truck leave container gate yard. This analysis is purpose to acknowledge the performance of container yard and capacity to received container of this container yard furthermore to perspective number of truck movement per year and per month.

3.2.2 Frequency analysis by calculate average time of truck that spend at container yard to acknowledge services performance of container yard by using raw data which receive from gate out data for this dataset has record time of truck since arrive at gate container yard until leave or out from gate of container yard then use Excel software to calculate time of truck that spend in container yard, but raw dataset of gate out cannot be calculate directly so have to change type of data to be type that can be used to calculate after that will use Excel software to analysis total time of each truck that spends at container terminal. According to enormous of dataset and hard to summarize so decided to find average time of truck by divide into each month to represent time of truck that spends at container yard.

3.2.3 Compare average time of truck with total number of truck this analysis is using raw data of gate in and gate out of year 2014 and 2015 for purpose of this analysis is acknowledge performance of container yard by comparing total number of truck that using services of container terminal and average time that truck spend at container yard this analysis can be shows the relationship of total number of truck can be effect to average time of truck or not. Furthermore will compare average time of truck during year 2014 and 2015 have trend of result similar as year before or different. On this part of analysis will use interview method to explain about result in case that the result is trend to different from last period or additional factor that effect to average time of truck.

3.2.4 Analysis daily on this part is using data from summarize total gate in and gate out on each month. Due to raw data of gate in and gate out has only date month and year and not classify in day yet so to acknowledge number of truck that movement during on Monday to Sunday have to use excel software to change data (date-month-year) into Monday to Sunday instead by use function Text in excel

software then date of data is change into day. Daily analysis is shows the movement of truck everyday during year 2014 and 2015 this result can be shows which day that truck come to pick up empty container highest and on which day that gate faced the problem of congestion at gate container yard furthermore the result of previous year can be used to forecast the daily number of truck that come to pick up empty container in the next year. The result of this analysis can be help staff of container yard to prepare labor and machine to fit with number of truck.

3.2.5 Analysis regression model to find the relationship between total number of truck and total number of truck time over to acknowledge that the number of truck is effect to number of truck time over or not which means if the total number of truck movement is higher so the number of truck time over will higher too or not.

3.2.6 Percentage of truck time over than 1 hour on this part is focus on percentage time of truck over during year 2014 and 2015 to investigate and comparing that the percentage of truck is increasing or decreasing compare with the same period of the previously year

3.2.7 Analysis vehicle operating cost on this part is using data of number of truck that spend time more than 1 hour at container yard to calculate cost of truck that waste on waiting line to pick up empty container by refer value of vehicle operating cost

3.3 Qualitative Analysis

3.3.1 Descriptive analysis by using interview method with entrepreneur of container yard to explain about time of truck that over, same event in the same period of the year, and factor that effect to services efficiently of container yard.

3.3.2 Descriptive analysis by interview with manager of container yard to acknowledge about recommendation in future improving which support government roadmap that want to develop Thailand to be hub of logistic in ASEAN. On this part will acknowledge a comment and attitude of private company that need any support from the government such as subsidy to buy new equipment or decrease interest rate for logistic company that need to improve their container yard efficiency.



CHAPTER 4

RESULT AND DISCUSSION

4.1 General statistics

On this part will total number of truck movement during year 2014 and 2015 to acknowledge the capacity of container yard for data which use to analyze is collect from gate in and gate out data of container yard and divide data into each month to obviously shows truck movement by month. For data gate in is collect from truck that come to return empty container after use it only, but for gate out data is collect from truck that come to pick up empty container at container yard.

4.1.1 Total number of truck movement at container yard in year 2014

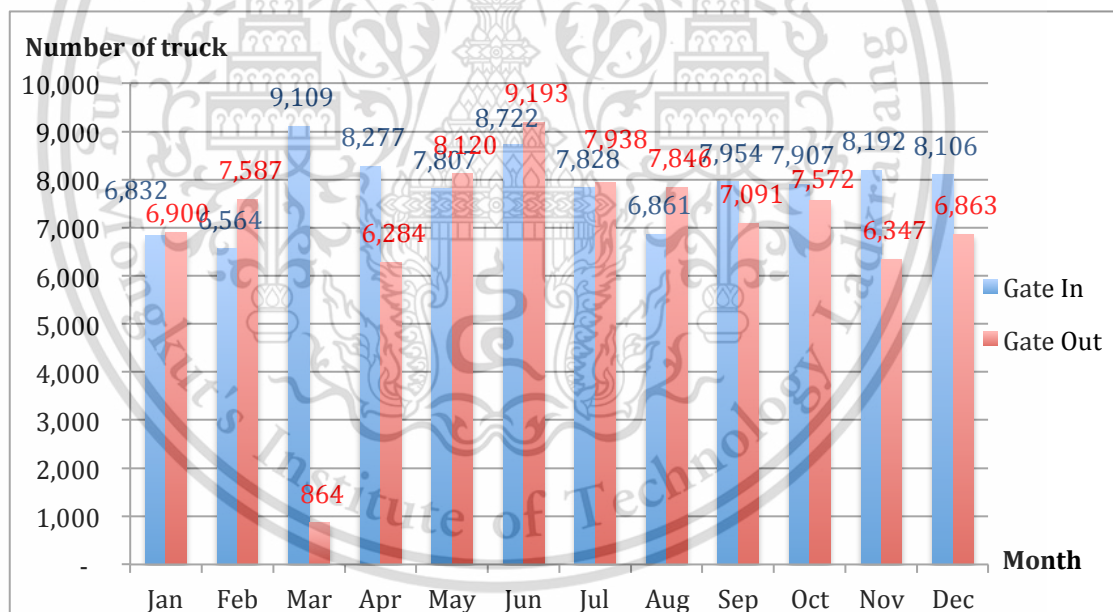


Table 4.1 Total numbers of truck movement in year 2014

As above table shows the number of truck movement at container yard in year 2014, which divided into monthly. As figure can notice that the average number of truck movement is approximately 6,000 units per month for the highest truck movement is around 9,000 units and the lowest truck movement is approximately

6,000 units for number of truck movement in year 2014 mostly of every month have similar number of truck movement which approximately 6,000 to 9,000 units per month. According to above figure can be notice that on March the number of truck movement is discrepancy from other month, which have 864 trucks movement that come to pick up empty container with this number of movement can be assume that the container yard might face the problem with working process so to acknowledge and to explain about huge different number that occur so decided to interview with manager of container yard as the interview manger said during that time company has been faced the problem of serious container shortage on that period of time and container yard cannot provide the container cover all customer demand due to company have many kind of container which design to fit with customer want such as special container for food. For this situation if container that company have does not fit to customer's cargo company cannot released empty container to customer and that why number of gate out container is less than other month. For the number of gate in that seems actual as other month because the container has been record the time of truck that come to pick up empty container when their pass thought the gate but not every truck that come and received the empty container so that make number of movement become huge different.

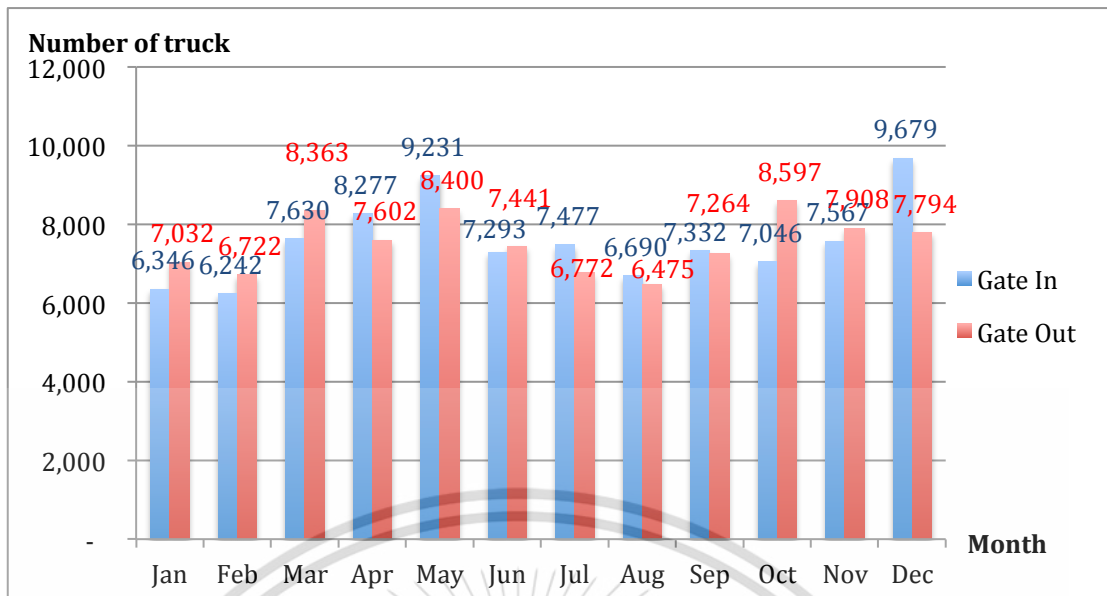


Table 4.2 Total number of truck movement at container yard in year 2015

As above figure shows the number of truck movement at container yard in year 2015, which divided into monthly. As figure can be notice that the average number of truck movement is approximately 6,000 units per month same as year 2014, but total number of truck movement in this year is a bit higher than previously year around 1,000 trucks. The highest number of gate in is on December, which equal to 9,600 units and the highest gate out is on October, which equal to 8,500 units. For lowest number of gate in is on February is 6,200 units and for gate out is on August is equal to 6,600 units. After analysis total number of truck movement in year 2015 found that if compare with year 2014 the number of truck movement in year 2015 is increasing around 1,000 units according to higher number of gate out can assume that the number of export is increasing more than year 2014 because of company services only transport cargo cross the country and all of container will load to vessel for export so can be use this number of gate out to estimate number of export in the future. Finally the analysis also found that the number of movement is stable all year and don't have any special situation occur during the year.

4.1.2 Average time of truck at container yard year 2014

In this part is analysis time of truck that spend at container yard in year 2014 and 2015 this analysis using gate out dataset which have time of truck since truck arrived at gate in of container yard until truck is leave gate out of container yard. The reason that using gate out data because of gate in data is data which doesn't collect time of truck out gate but have only time of truck that arrived at container gate for gate in data is data which collect time of truck that come to return empty container after customer use it or empty container which reposition from aboard for support export cargo. According to exceed number of raw data which have a lot of number of truck so decided to use average time of truck to represent time of truck that spend at container yard by divided in to each month.

Month	The average time of truck
January	36 minutes
February	50 minutes
March	1 hour and 9 minutes
April	54 minutes
May	1 hour and 1minutes
June	45 minutes
July	37 minutes
August	59 minutes
September	41 minutes
October	45 minutes
November	40 minutes
December	37 minutes
Total time average of truck	48 minutes

Table 4.3 Average time of truck at container yard in year 2014

As above table shows the average time of truck in year 2014 which have average time in year 48 minutes which not over than ISO standard, but when separate in to monthly found that have 2 months which truck spend time to pick up empty container over than 1 hour. As above table shows that on March truck has been spend time for waiting container around 1 hour, which is same on May as per review with manager of container yard found that on March of year 2014 company has been faced the situation of shortage container and truck has to spend over the night to pick up empty container so that why the average time of truck is huge different than other month, furthermore on May the manager of container yard said on this month is in rainy season most of everyday had a heavy rain which make work process become slower or sometime have to stop all work process until the rain stop. For the fastest average time in year 2014 is on December and July, which spend average time in 37 minutes. For the average time per year found that truck will spend time in waiting line approximately 48 minutes, which not over than ISO standard that limit a truck should not spend more than 1 hour to get the service.

4.1.3 Average time of truck at container yard in year 2015

Month	The average time of truck
January	35 minutes
February	32 minutes
March	36 minutes
April	39 minutes
May	45 minutes
June	40 minutes

July	37 minutes
August	37 minutes
September	40 minutes
October	42 minutes
November	36 minutes
December	42 minutes
Total time average of truck	39 minutes

Table 4.4 Average time of truck at container yard in year 2015

As above table shows the average time of truck in year 2015 is 39 minutes which decreasing from year 2014 around 9 minutes after analysis average time of truck by monthly found that truck spend time at container. According to figure found that the fastest average time is on February which using 32 minutes to pick up empty container and the slowest is on May which same as in year 2014 but on 2015 the average time of May had been decreasing approximately 56 minutes. For the average per year found that in year 2015 truck spend time to waiting in line approximately 39 minutes, which not over than ISO standard that limit a truck should not spend more than 1 hour to get the service.

4.1.4 Compare time of truck 2014 and 2015

According to previously analysis about average time of truck that spend at container yard found that the average time in year 2015 is decreasing from year 2014 so decided to compare average number of truck between year 2014 and 2015 to acknowledge average time in the same period of time of year 2014 and 2015 which similar or different.

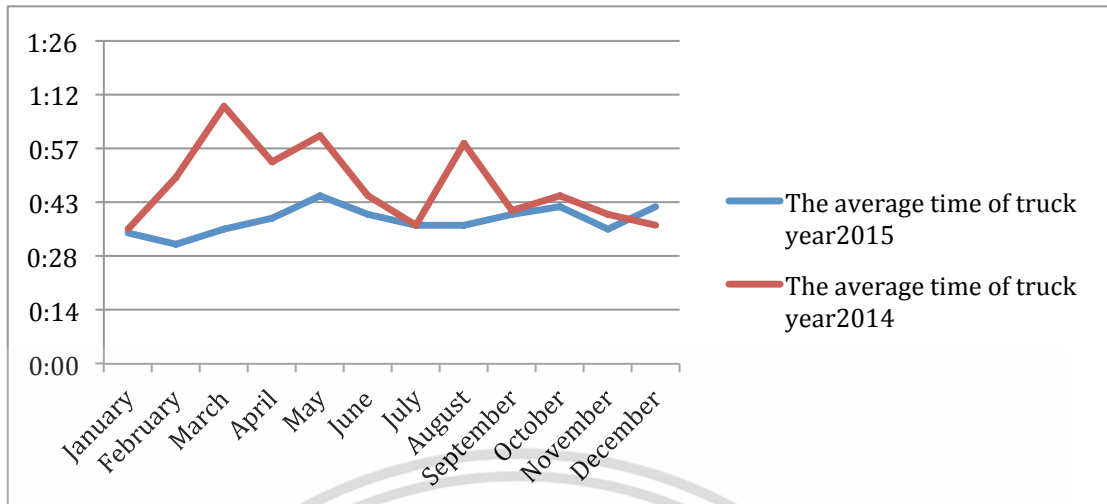


Table 4.5 Compare average time of truck in year 2014 and 2015

As table shows the average time during year 2014 and 2015 by separated on each month from January to December according to above figure found that the average time in year 2014 is higher than year 2015 by the highest time of truck in year 2014 is approximately 1 hour which different from year 2015 which have highest time approximately 45 minutes. For the last quarter of year 2014 and 2015 the average time of truck is seems similar which using time approximately 40 minutes furthermore on December found that the average time of year 2015 is more than year 2014 to acknowledge the factor that effect to decrease average time of truck so decided to collect data by interview with manager of container yard after reviews with the manager of container yard said that during last quarter of year 2015 export number of Thailand is more growth than year 2014 so that make increase number of truck during that time for further factor and detail that make time of truck in year 2015 is decreasing will shows in part of qualitative analysis.

4.2 Analysis monthly

4.2.1 Regression model analysis total number of truck and average time of truck

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.416 ^a	.173	.091	1758.24659	.173	2.096	1	10	.178

a. Predictors: (Constant), total number of truck year 2014

b. Dependent Variable: average time of truck in year 2014

Table 4.6 Regression model summary of total number of truck and average time of truck year 2014

As the table shows that value of R Square is 0.173, which not close to 1 means the relationship between total number of truck and average time of truck is not related and when checked with value of adjust R Square also found that the value is equal to 0.091 which not close to 1 so can conclude that the number of truck is not effect to average time of truck.

According to result of regression model in year 2014 shows that the relationship between total number of truck and average time of truck is not related, but on that year the container face the problem of shortage empty container so can be assume that it might effect to value of R square so will analysis regression model in year 2015 to known the value of R square that seem to same as year 2014 or not

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Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.762 ^a	.580	.538	1050.09710	.580	13.815	1	10	.004

a. Predictors: (Constant), total number of truck year 2015

b. Dependent Variable: average time of truck year 2015

Table 4.7 Regression model summary of total number of truck and average time of truck year 2015

As the table shows that the value of R Square is 0.580, which is not close to 1 which mean the relationship between total number of truck and average time of truck is not related and the value of R Square in year 2015 is more than 2014 despite the number of truck movement in year 2015 is more stable and have not special situation was occur. After acknowledge R Square value of year 2014 and 2015

According to result of year 2014 and 2015 can conclude that the number of truck is not effect to the average time of truck that use a container yard which mean it should have another factor that effect to average time of truck so decided to review with container yard staff to acknowledge the exactly factor that effect to average time of truck after review with container yard staff said the main reason that effect to average time of truck is grade of container that customer need due to customer have a lot of condition to pick up empty container such as food grade container, good smell container, rusty not over than 10% according to many grade and many condition from customer and some container is not fit to customer need so container yard have to

repair or improve container immediately while truck have to wait until container ready. The staff of container yard explains that before the container out from yard have to pass the survey first then the diver will check a quality of container that fit to customer need or not if it not container yard have to find a new one that fit to and in rainy season container yard always faced the problem of container wet that make customer cannot loading cargo after pick up container and some of customer decide to wait until container is dry enough to loading cargo then will pick up container and in rainy season don't have enough sunlight to make container dry before release to customer so the truck that decide to wait on queue make the time average of truck become longer after interview found that the main reason that effect to average time is condition of container that customer need.

4.2.2 Total number of truck in year 2014 and 2015 compare with average time of truck in each month

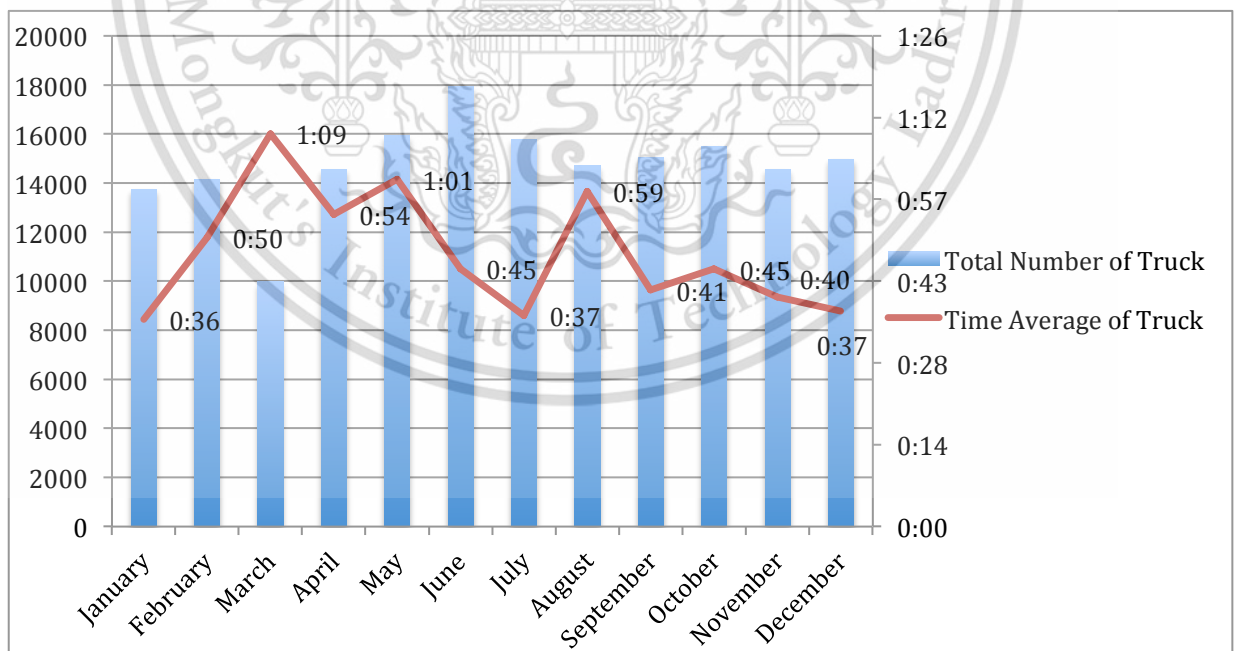


Table 4.8 Total number of truck and time average of truck in year 2014

As the table shows average time of truck that spend at container yard by compare with total number of truck movement on each month after analysis found that the average time of truck is not depend on number of truck movement means even total number of truck on that month is 10,000 movements but the time average is less than some month such as on July number of movement is around 15,000 movements but the average of time is approximately 43 minutes or on March that have movement around 10,000 movements but the time average is around 1 hour which on that time the company has been faced the problem of series shortage container so that make time average is huge different from another month. After review with manager of container yard to describe about this chart said the time of work process will fast or slow is depend on many factors such as machine run smoothly during work hour because of folk lift or side loader machine is not response only pick up empty container to truck but it also use to move container from repairing station to container empty available zone and move empty container return to repairing station so that make some time truck has to wait in queue for a long time, mistake from pick up container wrong condition or does not fit to customer want due to company has many grades of container so that make sometime container yard staff is pick up the wrong container or some customer does not remark to using highest grade of container but when receive the container their want to change to used highest grade instead so that make container yard staff have to pick up the new container and make the work process become slower which also effect to another truck that waiting on the queue.

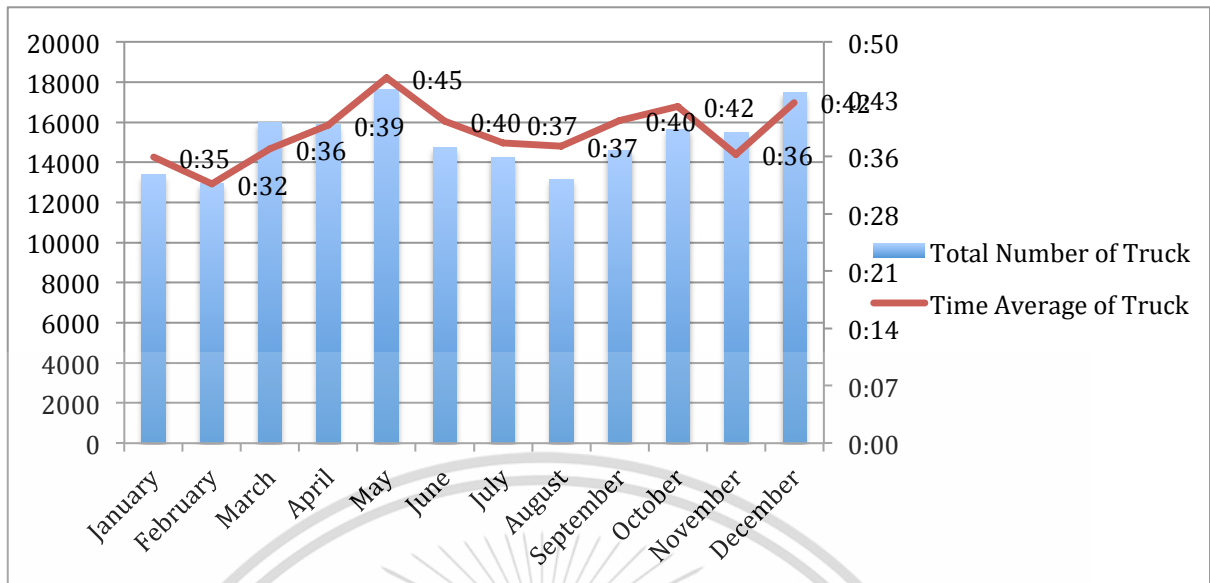


Table 4.9 Total number of truck time average of truck in year 2015

As table show the average time of truck compare with total number of container movement in each month of year 2015 found that the average time of truck is decreasing from 2014 by the average time of truck of every month is not over than 1 hour which the highest average time is on May which around 45 minutes and the fastest average time of truck is on February approximately 30 minutes. After analysis found that the average time of this year is mostly the same and more stable than year 2015 by the average time of this year is approximately 39 minutes which is less than year 2014. In this year on May the average time of truck still highest same as in year 2014 to explain the same situation that happed continually, after review with manager of container yard found that on May is in the rainy season that almost have rain in everyday and when rain fall every process of movement container have to be stop because of avoid dangerous situation that might occur. As the figure also notice that during March to May the number of truck is petty high than other month because of during that time is period of export fruit and rice.

4.3 Analysis daily

4.3.1 Compare amount of truck between days in year 2014

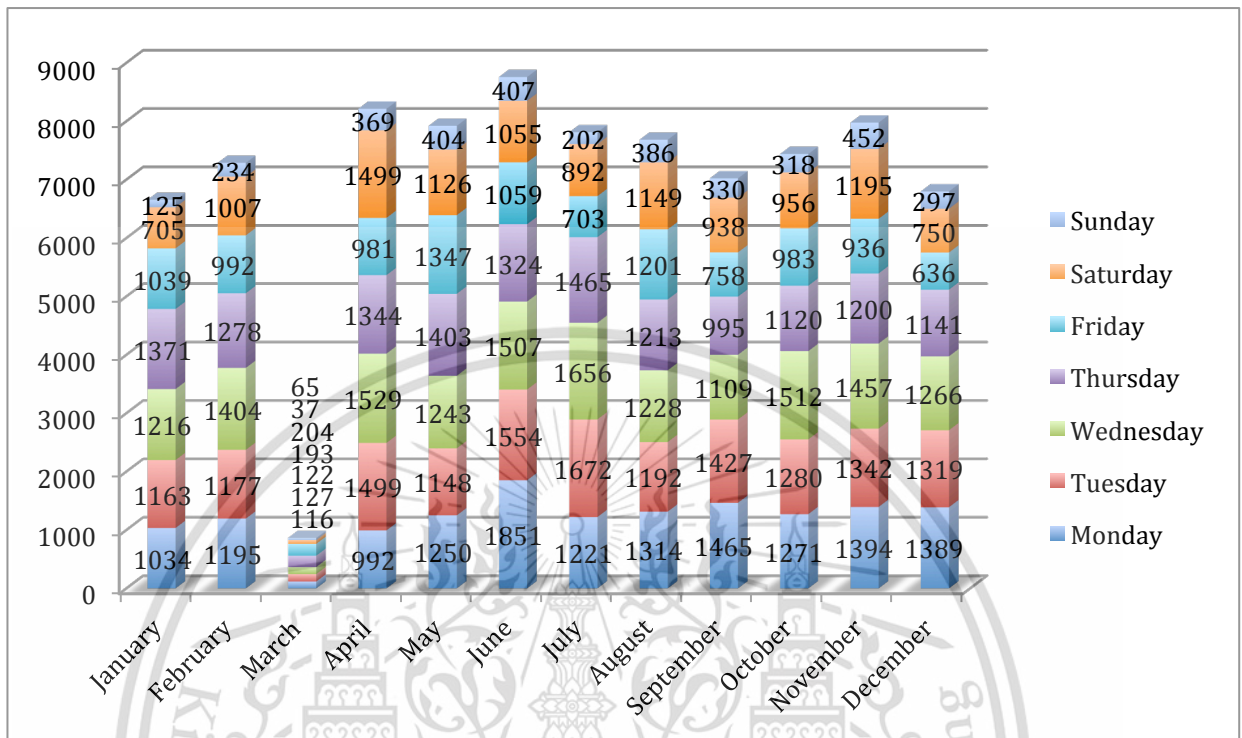


Table 4.10 Number of truck during Monday to Friday in year 2014

As the table found that the day that truck come to pick up empty container mostly come on Monday to Thursday because of vessel schedule which normally discharge at port or terminal at the end of week so customer is comes to pick up empty container and then move back to their factory to loading cargo and then move container full load to terminal. Normally customer is decided to pick up empty container before vessel discharge around 3 to 5 days to avoid expense about storage cost that might over than free time that customer get which for normal customer will get free time around 7 days and very important customer (VIP) will get around 14 days by the way if customer come to pick up early their have to leave full container at their factory which not have enough space to leave container and if customer move container to terminal many days before vessel discharge customer have to pay storage

charge to terminal. According to above figure can see that on Saturday have lot of truck come to pick up empty container most of customer that come to pick up is very important customer (VIP) which have free days around 7 days the reason that group of this customer come to pick up empty container early because of huge volume their use normally very important customer (VIP) use empty container to export cargo around 100-200 units per week which make them come to pick up empty container early to prepare loading cargo and move to terminal on time when vessel discharge.

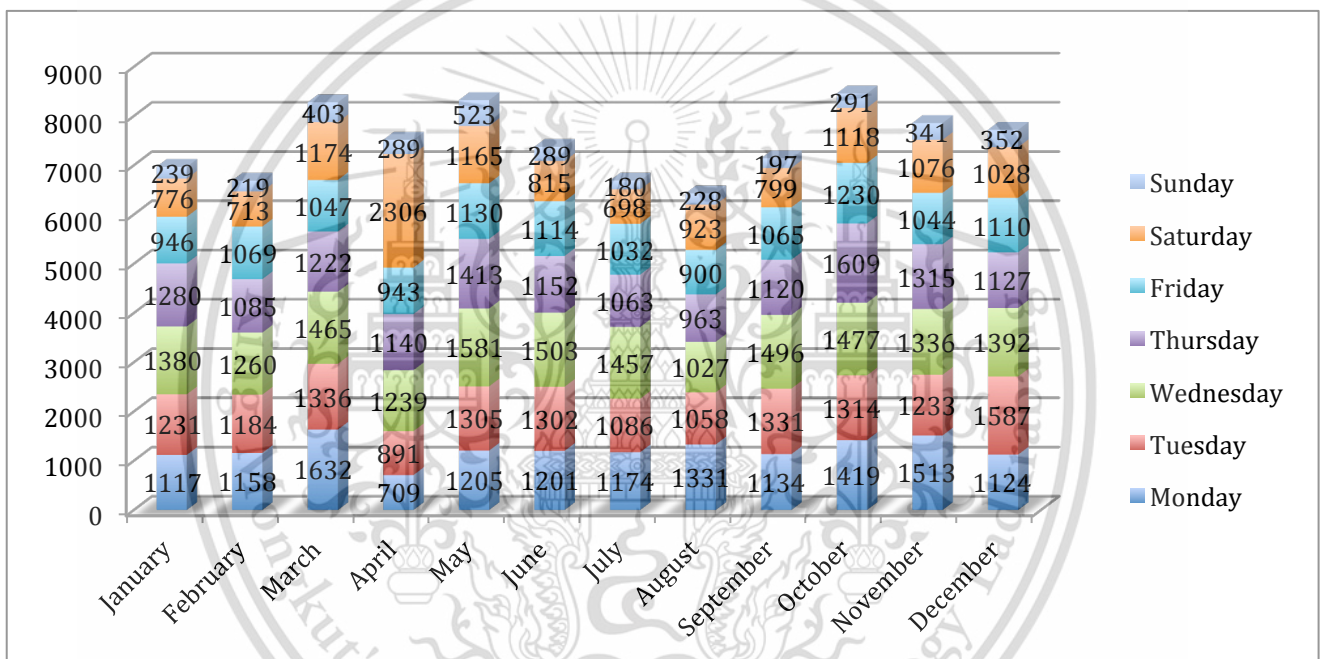


Table 4.11 Number of truck during Monday to Friday in year 2015

As table of number of truck on daily year 2015 is trend similar with the year before. The highest number of truck is during Monday to Thursday same as year 2014, which this movement was take place from vessel schedule. After analysis data of year 2014 and 2015 found that the result of this analyze can be used to forecast the number of truck in the same period of next year which useful for container yard to prepare labor or machine with can support number of truck in each day and also to reduce number of truck that using time more than 1 hour to pick up empty container.

4.4 Analysis time of truck which over than 1 hour

4.4.1 Compare proportion of number of truck that over than 1 hour with total

number of truck

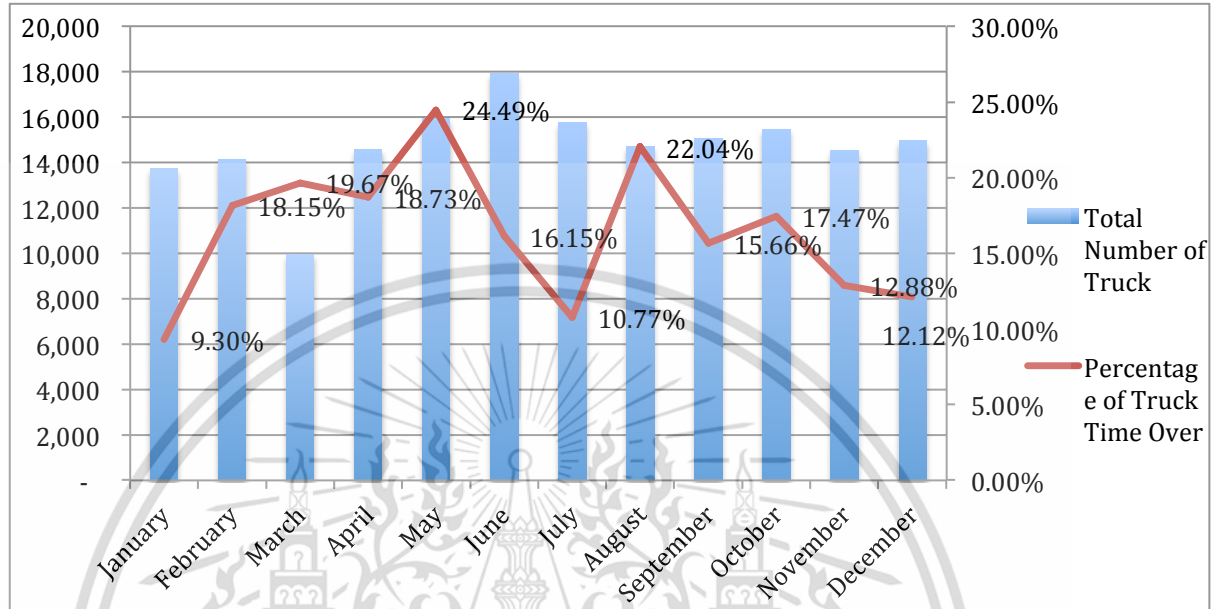


Table 4.12 Proportion number of truck over than 1 hour and total number of truck movement year 2014

As table can see the percentage of truck that over than 1 hour for month that have highest percentage of truck time over is June which have 25% of truck that wait longer more than 1 hour compare with total number of gate in and gate out data, and the least percentage of truck is January which have approximately 10% of truck that using time more than 1 hour. For the percentage of truck using time over than 1 hour is not stable and kind of different such as on June the number of gate in and gate out is about 9,000 movements but the percentage of truck time over is only 15% which is huge different with May that number of gate in and gate out is not many different but the percentage of truck time over is around 25%.

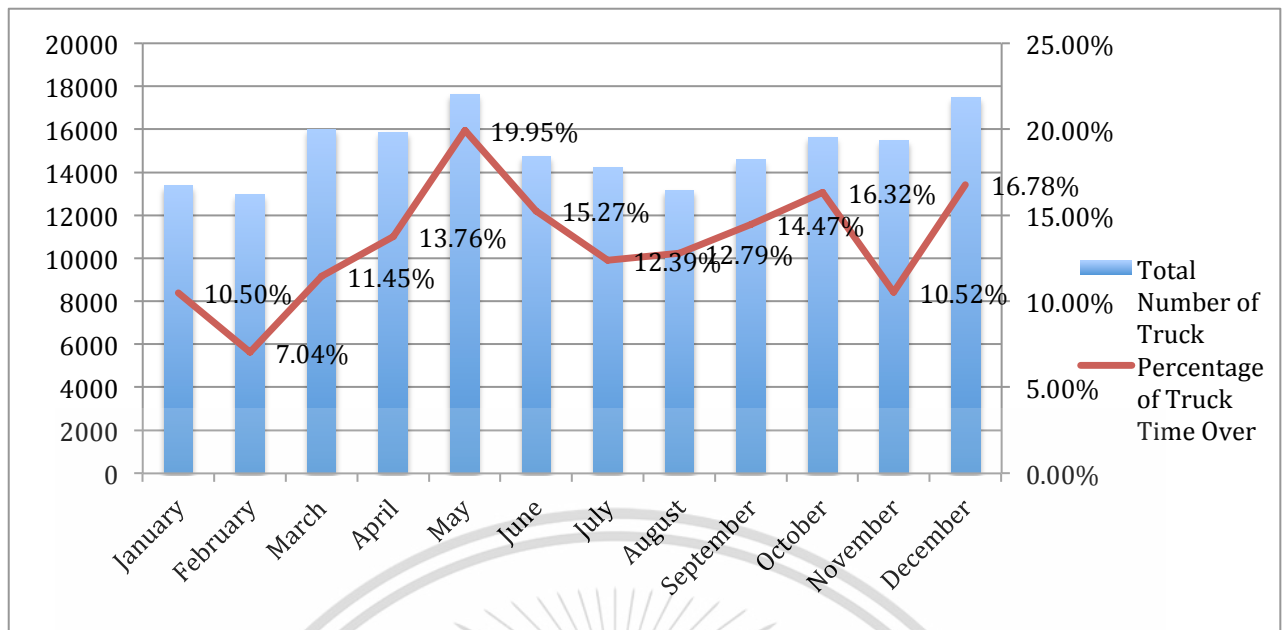


Table 4.13 Proportion number of truck over than 1 hour and total number of gate in and gate out year 2015

As figure shows proportion of total number of truck that move in and move out at container yard and percentage of truck that spend time to pick up empty container over than 1 hour during January to December in year 2015 from the figure found that the highest percentage is on May which have around 20% of truck that waiting more than 1 hour and on February have the lowest percentage of truck that waiting more than 1 hour which around 10%. From the figure can notice that comparing with the year before also found that on May have the highest percentage as well furthermore the proportion of truck that using time more than 1 hour is decreasing compare with same period during year 2014 and 2015 by proportion of truck in year 2014 is during 10 to 25 % but in year 2015 the proportion is decreasing to 8 to 20 %.

4.4.2 Table percentage of truck that over than 1 hour

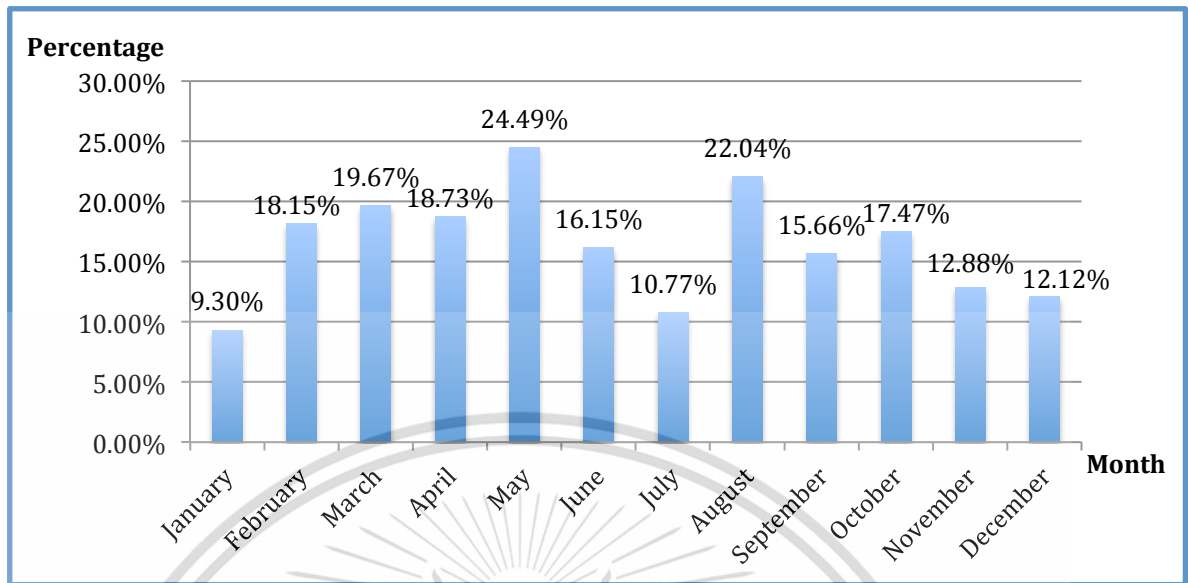


Table 4.14 Percentage of truck that over than 1 hour year 2014

As table found that the percent average time of truck is approximately 15% by the highest number of truck that spend more than 1 hour to pick up empty container is on May which have approximately 25% and the fewest percentage is on January have number of truck that over than 1 hour approximately 9%.

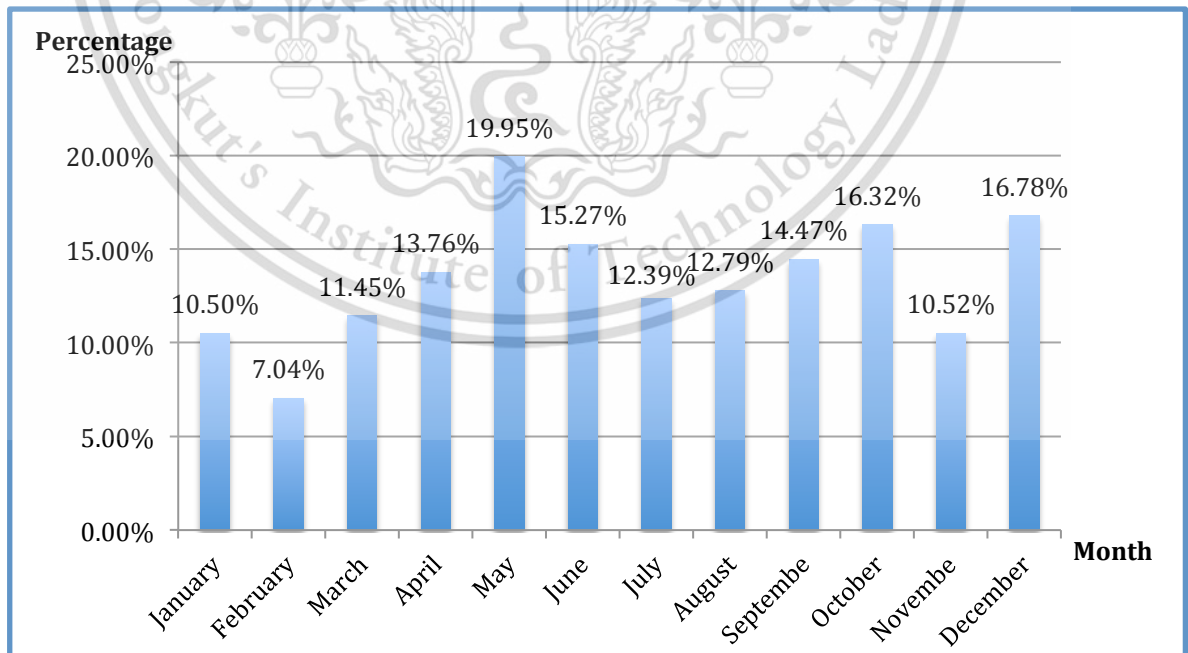


Table 4.15 Percentage of truck that over than 1 hour in year 2015

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As the table found that the percentage average time of truck that spend more than 1 hour to pick up empty container is approximately 13% and the highest percentage is on May which approximately 20% and the fewest month is on February which about 7%.

4.5 Analysis vehicle operating time

4.5.1 Compare total cost of vehicle operating time in year 2014 and 2015

(truck waiting on queue more than 1 hour)

Year	Amount of truck that over than 1 hour	Average time in year	Vehicle operating time Per hour	Total cost
2014	13,794 trucks	2 hour 10 and minutes	94 baht	2,813,700.12 baht
2015	12,164 trucks	1 hour and 43 minutes	94 baht	1,966,674.52 baht

Table 4.16 Total cost of vehicle operating time in year 2014 and 2015

As table shows the total cost of vehicle operating time in year 2014 and 2015 found that total cost of year 2015 is lower than 2014. Even though, total number of truck at gate in and gate out data is higher than 2014 around 4,400 trucks but number of truck that spend more than 1 hour at container yard is decreasing approximately 1,630 trucks which can saving cost around 847,025 baht

4.5.2 Compare total vehicle operating cost of total number of truck that movement at container yard in year 2014 and 2015

Year	Total number of truck	Average time in year	Vehicle operating time Per hour	Total cost
2014	176,764 trucks	48 minutes	94 baht	13,292,652 baht
2015	181,180 trucks	39 minutes	94 baht	11,070,098 baht

Table 4.17 Total cost of vehicle operating time of truck movement at container yard in year 2014 and 2015

As the table show total cost of vehicle operating time in year 2014 and 2015 found that the total cost of vehicle operating time in year 2014 is 13,292,652 baht and year 2015 is 11,070,098 baht as the result found that the cost is decreasing around 2,222,554 baht and average time in year 2015 also decreasing approximately 9 minutes.

To acknowledge the percentage of vehicle operating cost of truck that spend time over than 1 hour compare with total operating cost in each year found that the cost of truck time over in year 2014 is around 21.17% of total operating cost in that year and in year 2015 the cost of truck time over is around 17.77% of total vehicle operating cost in year 2015 as the result can be explain that around 21% of total cost of vehicle operating time that company paid in year 2014 came from number of truck that spend time over than 1 hour but when compare percentage in year 2015 found that the vehicle operating cost is 17% which means company can save cost of vehicle operating time of truck time over around 3%.

4.5.3 Compare the numbers of total trucks and trucks exceeding 1 hour

Year	Trucks exceeding 1 hour	Total trucks	Proportion
2014	13,794	176,764	7.8%
2015	12,164	181,180	6.7%
Average	12,979	178,972	7.3%

Table 4.18 Compare proportion of total number of truck and number of truck exceed 1 hour

As the table found that the proportion of truck time over than 1 hour when compare with total number of truck in year 2014 is 7.8% and in year 2015 is 6.7%, which is decreasing from previous year around 1%. For the average number of truck than waiting in queue line more than 1 hour in these 2 year is 12,979 which have proportion around 7.3% compare with total average number of truck in 2 year.

4.5.4 Compare the total VOT of total trucks and trucks exceeding 1 hour

Year	VOT of trucks exceeding 1 hour	VOT of total trucks	Proportion
2014	2,813,700	13,292,652	21.2%
2015	1,966,675	11,070,098	17.8%
Average	2,390,187	12,181,375	19.6%

Table 4.19 Compare vehicle operating time cost between trucks exceed than 1 hour and total number of trucks

As table found that proportion of vehicle operating time cost of truck that spend time over than 1 hour in year 2014 is 21.2% when compare with total vehicle operating time cost and year 2015 is 17.8% which is decrease 3.4% from previous year. For average proportion of vehicle operating time cost of truck time over in these 2 year is 19.6%

4.5.5 Compare the average VOT of total trucks and trucks exceeding 1 hour

Year	VOC of trucks exceeding 1 hour	VOC of total trucks	Proportion
2014	204.0	75.2	271.3%
2015	161.7	61.1	264.6%
Average	183	68	268.3%

Table 4.20 Compare vehicle operating time cost per unit between truck time over than 1 hour and total number of truck

As table the vehicle operating time cost of truck in year 2014 truck that spend time not over 1 hour has cost around 75.2 baht, but for truck that exceeding 1 hour vehicle operating time cost is raise to 204 baht. It mean if trucks spend time over that 1 hour has to spend more over to 271% or 128 baht per trucks same as year 2015 that truck exceeding 1 hour have spend more cost around 264% when compare with group of truck that spend not over than 1 hour. The average proportion of vehicle operating time cost of truck of these 2 years is 268%.

4.5.6 Explanation about decreasing cost of vehicle operating time in year 2015

According to cost of vehicle operating time in year 2015 is decreasing around 1 million baht so decided to interview manager of container yard to acknowledge the

improvement in previous year as interview found that in year 2015 company has been brought new equipment and hired more employee.

On year 2015 company has been brought a new one folk lift which use for pick up container box to truck which folk lift which folk lift performance it can pick up container that not high than 2 level and normally plan of container yard will collect container height at 5- 7 level in one cluster so folk lift will normally use to lift off container from a truck which come from empty return instead. After company brought a new folk lift the work process of lift off container become faster and smoothly. According to growth number of truck so company has been decided to brought new equipment side loader which is use for pick up container in highest level of container row. In year 2015 company has brought 2 new sides loader to speed up pick up container process in yard because of limitation of folk lift that can not pick up container more than 3 levels and before 2015 company has only one side loader to pick up container and when it was broke down it will effect directly delay to pick up container process. After brought 2 new sides loader the pick up process become faster and percentage of time delay is decrease.

The improving of container yard in year 2015 has been hired more employee to improve work process inside container yard which can be divide into section first, gate in and gate out section before year 2015 has 2 staffs to process document of truck that come into container yard but in nowadays company has been hired one more staff to process document. Second, section is container yard staff that has responsibility to check accurate of container before release to customer and check container damage in case that customer return empty container before year 2015 this section have 5 staffs on this duty then company has decided to hired 5 more to balance number of truck that will enter gate faster after company hired more staff at gate section.

4.5.3 Future forecast cost of vehicle operating time

Finally, after analyze vehicle operating time cost of year 2014 and 2015 found that if container yard can reduce at least 1 minutes the company can saves economics cost approximately 31,300 baht. According to government roadmap to develop Thailand to be logistic hub of Association of Southeast Asian Nations (ASEN) and reduce logistic cost in country as the result of this study shows that the cost of logistic can be decreasing but have to cooperate with government to success because of the cost of improving efficiently of container yard is a lot of expense that private company have to pay if the government can be support some part of expense it will help private company more attend to improve their own container yard and furthermore will make total cost of logistic inside Thailand become lower.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

The structure of container yard was made over than 20 years ago which limit the performance of container yard to service customer according to rapidly growth of export number every year is effect to truck congestion at container yard gate. When analysis found that the structure of container yard has one gate in and one gate out so every trucks that comes to container yard have to wait in one line queue and when rush hour which have many truck come to pick up empty container so time of waiting become longer furthermore, layout of container yard is not symmetrically empty container was separately into each part of container yard which make process of pick up container becomes slower due to some case that available container is not fit to customer need and have to wait container at repair section to complete first which this reason make forklift have to drive to repair zone and then move container back to survey zone to release container to customer. To improve performance of work container yard should renew lay out to placed container together to make pick up process becomes faster. In case that company can be improve the structure of container yard it will decrease congestion at gate yard, furthermore the time of truck waiting on queue to purchase a ticket to pick up empty container or return container after use become more faster.

As the analysis the average time of truck can conclude that the factor that effect to average time of truck is not depend on number of truck that come to pick up empty container, but the main factor which effect to average time of truck are container is not fit to customer need even customer has been booking and require special condition before come to pick up container but for customer that does not require any

special condition company will released container called “keep cargo worthy” to customer, but some customer cannot accept the quality of container so their want to change a new container and willing to pay surcharge of changing container which this reason make process of pick up empty container becomes delay. Second factor is container yard do not have enough equipment to support number of truck that come to pick up empty container which make company have to repeat process of pick up empty container again which make the rest of trucks have to wait longer and also make work process becomes slow and delay. Furthermore each equipment such as forklift and side loader have to take response work more than one task which means each equipment have to pick up return container from customer and move to wash zone and then move to repairing zone in case that container was damage and then move to available container zone while response those process as mention equipment also to service truck that come to receive empty container at the same time and incase that equipment stop work working or having rain which make truck have to wait on queue more longer according to problem of lack equipment to support pick up container process is lead to truck spend time more than 1 over in container yard. After study performance and movement of truck found that in everyday or every month have truck that spend time more than 1 hour to pick up empty container the main cause was occur from company shortage container to release to customer which happened from delay of the vessel or delay of shuttling empty reposition from the terminal to depot. Another factor that make truck spend time more than 1 hour are equipment stop working and seasonal of weather likes rainy season which if have rain fall down the container yard will stop working immediately to avoid accident that might occur. Furthermore every truck those come to pick up empty and return container have cost which called vehicle operating cost that calculate from time of

truck spend in each trip or round the cost will decreasing as long as truck spending time. According to standard of service at container yard which limit time of picking up and return container should not over than 1 hour in each truck, but after study time of truck found that in everyday have truck spend time more than 1 hour which in year 2014 have truck spend time over around 13,000 trucks and 2015 around 12,000 trucks even the number of truck is decreasing but the cost of vehicle operating time is still high which approximately 1.9 million baht per year if the company can reduce number of truck time over or container yard should be more strict on time per each truck and try to finish process of pick up and return container within 1 hour company can be use this money to improve efficiently of container yard service instead such as buying new equipment to increase service level and decrease time of each tuck to reduce vehicle operating time cost.

Finally to improve efficiently of container yard by restructure might be last choice that company will choose due to restructure of container yard might take long time and during the improvement might effect to service level of container yard because of when restructure some selection or some part of container yard have to close which means truck have to spend time longer to pick up and return container furthermore the limitation of space around container yard is not appropriate to expend area according to area around this container yard is fully with another container yard and warehouse with above cause container yard should decide to set up new container yard which not far from the old one to reduce congestion at gate container yard and to make balance between equipment and number of truck. Second to solve problem of lack equipment of company should buy new equipment which balance to number of truck, moreover container yard should take 1 task to 1 equipment to make work

process becomes faster such as one equipment is response to pick up empty return from customer only to reduce congestion and truck time over.



REFERENCES

Yui-Yip Lau., Adolf K. Y. Ng ., Xiaowen Fu ., Kevin X. Li (2013). Evolution and Trend of Container Shipping:

<https://www.researchgate.net/publication/271668597>

C.Y.Lee., & Dong-Ping Song (2016). Ocean Container Transport in Global Supply Chains: <https://www.researchgate.net/publication/302984964>

Deutsche Bank Research (2006). Container Shipping: Overcapacity Inevitable Despite Increasing Demand:

http://www.dbresearch.com/PROD/DBR_INTERNET_DE-PROD/PROD000000000198081.pdf

P.I. Le Dam Hanh (2003). The Logistics of Empty Cargo Containers in the Southern California Region:

<http://www.freightworks.org/Documents/Logistics%20of%20Empty%20Containers%20in%20the%20Southern%20California%20Region.pdf>

Bin Wang., & Zhongchen Wang (2007). The Optimization of Intermodal Empty Container Reposition of Land-carriage:

<http://www.sciencedirect.com/science/article/pii/S1570667207600208>

APPENDIX

Jan-14			
Date	Amount of truck	Over 1 hour	Percentage
Monday	1034	92	8.90%
Tuesday	1163	98	8.43%
Wednesday	1216	112	9.21%
Thursday	1371	144	10.50%
Friday	1039	99	9.53%
Saturday	705	59	8.37%
Sunday	125	15	12.00%
Total	6653	619	9.30%

Feb-14			
Date	Amount of truck	Over 1 hour	Percentage
Monday	1195	131	10.96%
Tuesday	1177	186	15.80%
Wednesday	1404	330	23.50%
Thursday	1278	269	21.05%
Friday	992	192	19.35%
Saturday	1007	182	18.07%
Sunday	234	33	14.10%
Total	7287	1323	18.16%

Mar-14			
Date	Amount of truck	Over 1 hour	Percentage
Monday	116	25	21.55%
Tuesday	127	22	17.32%
Wednesday	122	26	21.31%
Thursday	193	31	16.06%
Friday	204	47	23.04%
Saturday	65	12	18.46%
Sunday	37	7	18.92%
Total	864	170	19.68%

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Apr-14			
Date	Amount of truck	Over 1 hour	Percentage
Monday	992	192	19.35%
Tuesday	1499	298	19.88%
Wednesday	1529	325	21.26%
Thursday	1344	298	22.17%
Friday	981	209	21.30%
Saturday	1499	158	10.54%
Sunday	369	59	15.99%
Total	8213	1539	18.74%

May-14			
Date	Amount of truck	Over 1 hour	Percentage
Monday	1250	311	24.88%
Tuesday	1148	384	33.45%
Wednesday	1243	350	28.16%
Thursday	1403	317	22.59%
Friday	1347	293	21.75%
Saturday	1126	212	18.83%
Sunday	404	73	18.07%
Total	7921	1940	24.49%

Jun-14			
Date	Amount of truck	Over 1 hour	Percentage
Monday	1851	261	14.10%
Tuesday	1554	306	19.69%
Wednesday	1507	365	24.22%
Thursday	1324	221	16.69%
Friday	1059	108	10.20%
Saturday	1055	107	10.14%
Sunday	407	47	11.55%
Total	8757	1415	16.16%

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Jul-14			
Date	Amount of truck	Over 1 hour	Percentage
Monday	1221	125	10.24%
Tuesday	1672	230	13.76%
Wednesday	1656	171	10.33%
Thursday	1465	146	9.97%
Friday	703	59	8.39%
Saturday	892	90	10.09%
Sunday	202	21	10.40%
Total	7811	842	10.78%

Aug-14			
Date	Amount of truck	Over 1 hour	Percentage
Monday	1314	353	26.86%
Tuesday	1192	259	21.73%
Wednesday	1228	387	31.51%
Thursday	1213	257	21.19%
Friday	1201	189	15.74%
Saturday	1149	212	18.45%
Sunday	386	37	9.59%
Total	7683	1694	22.05%

Sep-14			
Date	Amount of truck	Over 1 hour	Percentage
Monday	1465	264	18.02%
Tuesday	1427	291	20.39%
Wednesday	1109	119	10.73%
Thursday	995	150	15.08%
Friday	758	79	10.42%
Saturday	938	160	17.06%
Sunday	330	37	11.21%
Total	7022	1100	15.67%

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Oct-14			
Date	Amount of truck	Over 1 hour	Percentage
Monday	1271	199	15.66%
Tuesday	1280	266	20.78%
Wednesday	1512	311	20.57%
Thursday	1120	160	14.29%
Friday	983	93	9.46%
Saturday	956	208	21.76%
Sunday	318	63	19.81%
Total	7440	1300	17.47%

Nov-14			
Date	Amount of truck	Over 1 hour	Percentage
Monday	1394	218	15.64%
Tuesday	1342	205	15.28%
Wednesday	1457	241	16.54%
Thursday	1200	89	7.42%
Friday	936	82	8.76%
Saturday	1195	150	12.55%
Sunday	452	43	9.51%
Total	7976	1028	12.89%

Dec-14			
Date	Amount of truck	Over 1 hour	Percentage
Monday	1389	164	11.81%
Tuesday	1319	113	8.57%
Wednesday	1266	212	16.75%
Thursday	1141	121	10.60%
Friday	636	63	9.91%
Saturday	750	134	17.87%
Sunday	297	17	5.72%
Total	6798	824	12.12%

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Jan-15			
Date	Amount of truck	Over 1 hour	Percentage
Monday	1117	124	11.10%
Tuesday	1231	136	11.05%
Wednesday	1380	149	10.80%
Thursday	1280	135	10.55%
Friday	946	69	7.29%
Saturday	776	86	11.08%
Sunday	239	33	13.81%
Total	6969	732	10.50%

Feb-15			
Date	Amount of truck	Over 1 hour	Percentage
Monday	1158	92	7.94%
Tuesday	1184	89	7.52%
Wednesday	1260	97	7.70%
Thursday	1085	92	8.48%
Friday	1069	70	6.55%
Saturday	713	31	4.35%
Sunday	219	16	7.31%
Total	6688	471	7.04%

Mar-15			
Date	Amount of truck	Over 1 hour	Percentage
Monday	1632	193	11.83%
Tuesday	1336	144	10.78%
Wednesday	1465	240	16.38%
Thursday	1222	150	12.27%
Friday	1047	66	6.30%
Saturday	1174	125	10.65%
Sunday	403	30	7.44%
Total	8279	948	11.45%

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Apr-15			
Date	Amount of truck	Over 1 hour	Percentage
Monday	709	101	14.25%
Tuesday	891	112	12.57%
Wednesday	1239	193	15.58%
Thursday	1140	173	15.18%
Friday	943	111	11.77%
Saturday	2306	308	13.36%
Sunday	289	37	12.80%
Total	7517	1035	13.77%

May-15			
Date	Amount of truck	Over 1 hour	Percentage
Monday	1205	229	19.00%
Tuesday	1305	245	18.77%
Wednesday	1581	492	31.12%
Thursday	1413	295	20.88%
Friday	1130	172	15.22%
Saturday	1165	163	13.99%
Sunday	523	65	12.43%
Total	8322	1661	19.96%

Jun-15			
Date	Amount of truck	Over 1 hour	Percentage
Monday	1201	186	15.49%
Tuesday	1302	217	16.67%
Wednesday	1503	296	19.69%
Thursday	1152	159	13.80%
Friday	1114	183	16.43%
Saturday	815	57	6.99%
Sunday	289	29	10.03%
Total	7376	1127	15.28%

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Jul-15			
Date	Amount of truck	Over 1 hour	Percentage
Monday	1174	151	12.86%
Tuesday	1086	143	13.17%
Wednesday	1457	181	12.42%
Thursday	1063	134	12.61%
Friday	1032	112	10.85%
Saturday	698	91	13.04%
Sunday	180	17	9.44%
Total	6690	829	12.39%

Aug-15			
Date	Amount of truck	Over 1 hour	Percentage
Monday	1331	181	13.60%
Tuesday	1058	155	14.65%
Wednesday	1027	142	13.83%
Thursday	963	136	14.12%
Friday	900	91	10.11%
Saturday	923	99	10.73%
Sunday	228	19	8.33%
Total	6430	823	12.80%

Sep-15			
Date	Amount of truck	Over 1 hour	Percentage
Monday	1134	154	13.58%
Tuesday	1331	160	12.02%
Wednesday	1496	230	15.37%
Thursday	1120	157	14.02%
Friday	1065	173	16.24%
Saturday	799	134	16.77%
Sunday	197	26	13.20%
Total	7142	1034	14.48%

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Oct-15			
Date	Amount of truck	Over 1 hour	Percentage
Monday	1419	232	16.35%
Tuesday	1314	257	19.56%
Wednesday	1477	257	17.40%
Thursday	1609	250	15.54%
Friday	1230	208	16.91%
Saturday	1118	156	13.95%
Sunday	291	21	7.22%
Total	8458	1381	16.33%

Nov-15			
Date	Amount of truck	Over 1 hour	Percentage
Monday	1513	134	8.86%
Tuesday	1233	171	13.87%
Wednesday	1336	130	9.73%
Thursday	1315	135	10.27%
Friday	1044	127	12.16%
Saturday	1076	105	9.76%
Sunday	341	25	7.33%
Total	7858	827	10.52%

Dec-15			
Date	Amount of truck	Over 1 hour	Percentage
Monday	1124	195	17.35%
Tuesday	1587	325	20.48%
Wednesday	1392	216	15.52%
Thursday	1127	156	13.84%
Friday	1110	175	15.77%
Saturday	1028	199	19.36%
Sunday	352	30	8.52%
Total	7720	1296	16.79%

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