

REVIEW ON CONTAINER DEPOT OPERATIONS

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Abstract

Container depot provides various services to support the containerization industry such as empty container storage, maintenance and repairing (M & R), on-hiring and off-hiring of containers for shipping liners'. Empty container and ex-laden container will be repair and clean based on their condition before storage and releasing to exporter. Empty containers are arranged by container shipping liners by appointing hauliers' to repositioning these containers from seaport container terminal yard to on dock (within the port area but outside container terminal yard) and container depot.

Index Terms-- Container Depot, Ondock, Offdock, Container Terminal

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INTRODUCTION

A typical container depot only has a gate or entrance for entry and exit to ensure all the operations of depot-in and depot-out. This will avoid overlapping of work in the container depot that helps to minimise daily operational costs. However, it indirectly increases the workload at the entrance especially during certain peak hour. The peak hour induce congestion at the entrance. This situation is usually caused by clustering of truckers or hauliers arriving at the same time. It will affect and reduce the productivity of container depot that may cause delay in delivery.

Furthermore, the smooth and efficient operation of depot-in and depot-out will ensure the high throughput volume of container depot. It not only reduces the time-consuming of truck drivers or hauliers' for loading and unloading of containers, but it also increases the profit and revenue of the container depot. The efficient and effective operation of depot-in and depot-out will increase the confidence of customers that will attract more businesses to the container depot.

Empty containers will be checked and ascertained at inspection area after registration at administration office. The condition of container will be estimated by the employees of depot who will decide either storage directly or send for repairing and cleaning. Container is in good condition that will be store directly in the container depot yard. For container in poor condition, the employees will list down and photograph all the items that are needed for repairing and cleaning. Container in poor condition will be stored at a particular place for repairing and cleaning. The clearing and repairing list or estimate of repair (EOR) will be emailed to container owner for approval before any repairing and washing carry out.

Depot Daily Operation

Every day the container depot operator will provide its service to huge numbers of container fleets owners' and hauliers'. Averagely, daily traffic ranges from 400 to 550 prime movers per day. The container depot operator also tries to service every container fleets operators within 45 minutes.

Productivity of administration department at depot-in and depot-out is low and less effective during the peak hour especially before and after public holiday. During the peak hour, many hauliers go to container depot at the same time that will cause the congestion at the entrance. The entrance only can accommodate less than 10 trucks at the same time due to the

lack of space. Furthermore, the administration needs to register and key in the data or information for each empty container that passes through the main entrance. After keyed in the data, they also need to communicate with other department in the depot to follow up the condition of container. It consumes a lot of time that also induce the severe delay of lifting on and lifting off (LOLO) container process inside the depot. It also becomes worse during the bad weather especially rainy day that may affect the process of seeking the location of container.

Most of the container depot is divided into four sections based on the services. The particular flow of container movement is set and enforced by the container depot operator that helps to ensure the smooth container movement in the depot. It also helps to improve the process of loading and unloading container in the depot. The first section is storage section that stores good condition (AV) containers for short or long period. Figure 2.1, shows the storage section in container depot. After maintenance services, the containers are also stacked at this section until obtain the request from the shipping liners. The containers are stacked from 5 to 9 level heights using the reach-stackers. The storage section is also divided into several parts according to the shipping companies. The first in first out method (FIFO) is also adopted by the depot operator for stacking the container. It helps to avoid the prolong storage of container in the depot.



Figure 1. Storage Section.
Source: EPASA Depot Pasir Gudang

The second section is maintenance section that includes the repairing and refurbishment services. Figure 2.2, shows the maintenance section in container depot. Container(s) in poor condition will be stacking at this section after inspection process. The staffs will list out the repairing services that send to administration department for getting the approval from the

container's owner. The damaged containers will be repaired and painted at this section once getting the approval. The containers will be stacking at the storage section after the maintenance process is done.



Figure 2. Maintenance Section.
Source: EPASA Depot Pasir Gudang

The cleaning section is one of the sections that help to wash and clean containers with chemical washing detergent. Figure 2.3, shows the cleaning section in container depot. After the inspecting process, dirty containers will be stacked in this section. The staffs will photograph and list out the cleaning service that also send to administration department. The container depot operator only precedes the cleaning services once the administration department gets the approval from the owner of container. Based on the type of stains, the different types of chemical washing detergent are used to wash the containers. For example, some stains request two or three time cleaning process for eliminating the stains totally.



Figure 3. Washing section.
Source: EPASA Depot Pasir Gudang

The last section is transshipment section that stores containers such as ISO tank containers. These containers will be transfer to the ISO tank container depot that specially handle and clean such containers. I.e.:ISO tank container which contain chemical residue. Generally, normal container depot is not equipped with the special handling infrastructures to handle these dangerous goods ISO tank containers. The depot only stores these containers for temporary.

The container management system is adopted by the administration department of depot that helps to manage and track all containers in the depot. By using this system, it helps to monitor and manage the volume of containers in the depot. All the detail of containers are recorded in the system such as owner of container, number of container, type of container, condition and grade of container, date of arrived and departure, maintenance record, and other. Walkie-talkie is used by the administration department and operation department for communication in the depot. For example, the administration department will follows up and key in the storage location of container into the system via the walkie-talkie.

Container Depot Handling Equipment

Various containers handling equipment in the container depot for lift-on and lift-off containers (LOLO) from truck to depot or vice versa. By using these, it helps to improve the service level and operational efficiency of the container depot. It also helps to reduce the turnaround time of haulage companies' prime mover in container depot that increases the throughput volume of depot. Through the increasing of empty container throughput volume, it also increases the turnover of container depot.

Heavy duty forklift trucks, lifts trucks, and reach stacker are widely used in the container depot. These container handling machines are one of the most flexible solutions to a small or medium sized container depot. By using these machines, the empty containers can to be moved or stacked quickly and efficiently. In Figure 2.4, it shows a 7-tonne heavy duty forklift is used for loading and unloading and for stacking in the depot. For example, it is also used to stack the empty container at washing area that usually stack up to 2-high.



Figure 4. A unit of 7-tonne heavy duty forklift.
Source: EPASA Depot, Pasir Gudang

Figure 2.5, shows a container handling machine used in the container depot. The heavy lift truck improve the productivity of container depot that also allows high density block stacking up to 9-high. It improves the space utilization of container depot that increases the storage volume of container depot. These machines are equipped with single stacking spreader or double stacking spreader. These machines are allowed to lifts up to 8 containers high with single stacking spreader. Through double stacking spreader, the container can be lifts up to 2-over-6.



Figure 5. A of unit of heavy lift truck.
Source: EPASA Depot, Pasir Gudang

LITERATURE REVIEW

Globalization, economic growth and the rising Chinese economy have boosted flows of goods from one continent to another and this has significantly affected the development of container transport (Visser, *et al.*[1]. The rapid development of container transport also stimulates the growth of other businesses such as container depot, freight forwarder, haulage industry as well as maritime logistics industry. The increasing number of containers flow is induced by the rapid development. In addition, space limitation in seaport container terminal unable to accommodate the continuous increasing number of container flow due to high

demand of containerisation. As stated by (Dirk Steenken, Stefan Voß, and Robert Stahlbock[2])the container storage area is usually separated into different stacks (or blocks) which are differentiated into rows, bays and tiers. Some stack areas are reserved for special containers like reefers which need electrical connection, dangerous goods, or overheight/overwidth containers which do not allow for normal stacking. Often stacks are separated into areas for export, import, special, and empty containers as shown in Figure 2.6

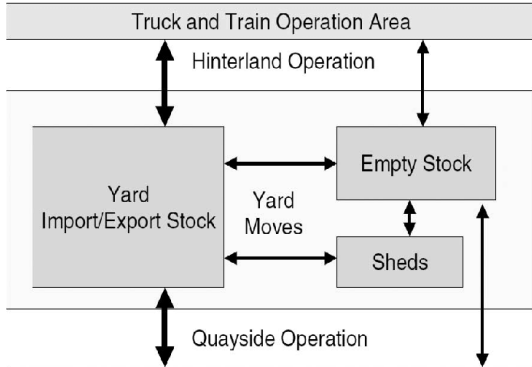


Figure 6. Operation areas of a seaport container terminal and flow of transports

The container depot and on dock are built to mitigate the problem of space limitation in container terminal seaport. Both depots can help to avoid the prolong storage in seaport container terminal that causes the congestion in port. These container depots not only offer storage service, it also provides the added values services such as repairing, maintenance, clearing and other. Both depots are located outside of the seaport container yard that has no restriction of land space. These depots are also set up nearby the port area that facilitates the process of loading and unloading of empty and ex-laden containers. The short distance between the seaport and container depots helps to minimize the transportation cost and insurance premium of haulage industry. These container depots not only help to mitigate the congestion and delay in port, it also help to avoid the demurrage charges, detention charges and other charges due to the prolong storage in port area.

Container depots are required all over the world in order to support shipping companies with for example reparation of containers, consolidation of goods as well as acting as a buffer due to trade imbalances (Anderson & Widstrand [3]). The container depot also increases the efficiency of port through direct delivery and storage of containers in the depots that located at outside of port area. Due to emergence the container depot, it helps to increase the volume of throughput in the port that increases its efficiency and productivity.

Container depot only handles the empty containers due to the restriction of regulations and laws. Container depot provides numerous services to container owners, including empty container storage, empty container transshipment, repairing, cleaning and others. Various types of containers are serviced by the depot such as standard container, high cube container, open top container, collapsible flat rack container, platform container, and refrigerated container. The depot is also equipped with heavy duty forklift trucks that able to handle containers, including reach stacker, lift truck and forklift truck. With such heavy duty forklift trucks, containers can be stacked until 5 to 9 level height that increases the space utilization of the depot.

Containerization improves the method of transport for goods especially the logistics industry. It facilitates the movement of goods that also generates high demand of containerization all

over the world. The container depot is one of the service industries that are directly generated by the containerization. The container depot also provide various services for extend the life cycle of container.

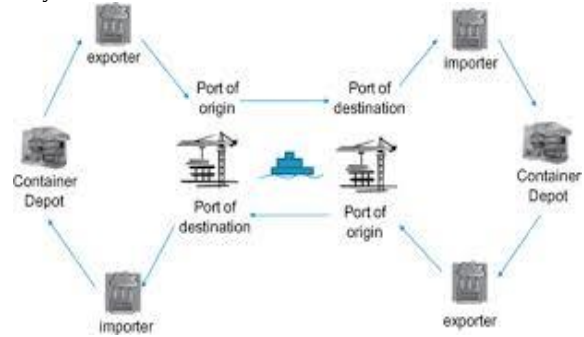


Figure 7. Basic container flows

Source: Adapted from Dong-Wong Song, Photis M. Panayines[4] Maritime Logistics: Contemporary Issues.

Figure 2.7, shows the container flow is operated through landmasses and oceans. Many aspects are involved into the container flow such as ports, container depots, importers, and exporters. The land and sea mode of transportation are widely used for moving and shipping the containers either laden container or empty container. These transportation modes offer the lower transportation cost to the shippers that also increase the demand of containerization.

CONCLUSION

The increasing demand of containerization creates the close relationship between container depot, on dock and haulage industry and shipping liners. Pressure is mounting on container depot capacity to perform ever efficient operation to their customers. The efficient gate operations are crucial to container depot since their impacts are not isolated to the efficiency of the operation within depot but also extend to the road traffic on nearby freeways.

REFERENCE

1. Visser, J., Konings, R., Pielage, B.-J., & Wiegman, B. (2007). A New Hinterland Transport Concept for The Port of Rotterdam: Organisational and/ or technological challenge? Transportation Research Forum , 2-4.
2. Dirk Steenken1, Stefan Voß, and Robert Stahlbock, (2004). Container terminal operation and operations research – a classification and literature review.
3. Anderson, N., & Widstrand, J. (2012). Evaluation of Empty Container Transportation and Opportunities for Improvement: A Case Study of The Port of Gothenburg, Sweden: Chalmers University of Technology.
4. Song, D.-W., & Panayides, P. M. (2012). Maritime Logistics: Contemporary Issues. UK: Emerald Group.

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