

Reduction of Turnaround Time for Vessels at Cochin Port Trust

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Abstract— Cochin Port is one of the largest ports in India. The performance of Cochin port is improving the development of container terminal. An important objective of Cochin port is to improve its throughput i.e. to minimize the vessel turnaround time (TAT). Turnaround time depends on the effective scheduling and allocation of key resources like yard cranes, quay cranes berths and trucks. ^[15] Issues regarding TAT has been studied and argued by many scholars since the emergence of containerization. Turnaround time is crucial operational indicators which portray port's ability and capability to provide better service and good productivity to the users i.e. the shippers ^[14]. In this paper, we have identified and discussed various indicators that increase turnaround time. The research aims to study in detail about the vessel turnaround time at CPT, how it can be calculated and its relative importance on the overall port performance. From the study, it is being understood that the vessel turnaround time of port increased from the preceding year.

Keywords—Turnaround Time; port efficiency; operational delays; double cycling.

I. INTRODUCTION

Globalization reduces the barriers to trade which lead to growth in marine transportation as well. As a result of this completion among the major port is very stiff to improve their revenue. Now day's shippers look port with high efficiency and productivity. Shippers are looking for the port which can provide optimum services like less turnaround time for vessels, less container damage, direct birthing and efficient customs clearance [3] according to Turnaround time is defined as the total time between the arrival and departure of vessels divided by a total number of vessels [3]. It is very significant to shippers as it indicates the performance and productivity.

The project aims to study the causal factors for low turnaround time of ships at CPT (Cochin Port Trust). The project was conducted for two months duration. Only the traffic department was chosen for the study. From the study, it is being understood that the vessel turnaround time of port increased from the preceding year. The vessel turnaround time was 1.69 during 2014-15 and it increased to 2.18 days in 2015-16. ^{[19][18]} This will create a business problem of customer dissatisfaction and rising costs. So, the study will

focus on exploring the ways to decrease the vessel turnaround time at the port and its feasibility.

Research questions

- What are the factors that affect vessel turnaround time at CoPT and what is the relative importance of each factor towards turnaround time?
- What are the reasons for the increase in turnaround time of vessels at CPT?
- What are the ways in which vessel turnaround time could be decreased?

II. LITERATURE REVIEW

Many scholars have been discussing about vessel turnaround time and efficiency and it is necessary to have proper planning to obtain satisfactory results^[3] Nor Ghani also mentioned that TAT and its importance of queuing theory, along with the importance congested cost^[5]. Berthing cost for shippers is related to turnaround time is very important and it becomes major objective of port to minimize the time vessels spent at berth. The various aspects such as cost, marketing, voyage, scheduling, and planning are taken care by the port berth size. It is easy to resolve a lot of issues in shipping industry if we control the vessel turnaround time. Similarly, when we take supply chain into consideration, high turnaround time simply means that the process from raw material to the final product takes a lot of time^[1]

Based on the research studies conducted in port container terminal, it tells that the performance of port can be measured on quantitative basis, as it is easily assessable. Container terminal in port is a service based system; therefore, efficiency in container port terminal is very important. Efficiency is determined by moves per hour for loading and unloading container to and from the vessel. Nowadays the world trade takes place by cellular vessels, the demand for transportation of goods via sea increases tremendously. Due to this, many port container terminals are expanding in order to meet the present demand. The challenges faced by the port terminal is in achieving shortest turnaround time with more large vessels ^[2]. The shortest the turnaround time, more the port operational efficiency ^{[7][9]}. Achieving So in order to achieve operational efficiency, there are three aspects between planning and

control level which can be segregated into the strategic level, tactical level and operational level ^[21]. This means that container terminals need to enhance their planning which include berth allocation planning, scheduling and operational capability by deploying innovative equipment and state-of-the-art technology so as to optimize logistics in the container terminal process. To ensure the operational efficiency of container terminal it is very important to make sure that port operational flow is able to operate smoothly and make use of resources effectively ^[9]

Small nation have constraint regarding natural issues they are able to surpass its constraint by successfully applying information technology in critical areas. Apart from this, Singapore is also providing supportive government policies to the shipping line, ample investment from government and private, as well as operations, location, and deep water draft for the vessel, and simultaneously sustain Singapore's port among port users.^{[10][11][12][13]} It is identified port performance indicator and make use of it in order to focus on port efficiency and effectiveness as well as in measuring port performance ^[3].

MOTIVATION FOR STUDY

At port terminals, one of the most important factors related to customer satisfaction is ship waiting time. For the competitive advantage of a port terminal ship waiting time is one of the important contributor. Port terminals with low waiting time can attract more ships than port terminals. Waiting and queuing times at berthing area of port terminals are the biggest problem that port managers encounter. Long waiting times have a negative impact on port terminal efficiency and ship managers prefer to berth at a port terminal with low waiting time and high efficiency. At port terminals, the port management is concerned with service rates because by increasing the service rate port efficiency can be dramatically increased. On the other hand, ship management/control and port customers care about waiting time, which means they tried to select a port terminal with lower service waiting time. At port terminals, port management focused on the port output rate which has an effect on port terminal productivity. On the other hand, port customers and ship management are concerned with terminal waiting time. Ship waiting time at port container terminals includes different types of the queue.

The major relevance of the study to reduce turnaround times lies in the fact that for shipping and delivering goods, time is considered as the most important factor than the cost of transporting goods. Moreover, the cost cannot be changed by many of the government ports as the rates they charge and the price of equipment they purchase is fixed by the government as well as the Tariff Authority for Major Ports (TAMP). Ships before starting their voyage will have a schedule as to when should they arrive at a port; depart from a port and reach the next destination. All the activities are planned according to this schedule and failure to act according to the schedule will create a huge loss for the ship and the traffic at sea route will also become unfavorable creating further delay. A delay of 1 day could cost around Rs 1 lakhs of loss for the shippers as per

the estimates. For many of the international ports like the port in Singapore, average turnaround time is less than a day.

If we analyze the turnaround time pattern of ships at CPT, we could see that for the past three years 2013, 2014 and 2015 the turnaround time was below 2 days due to which company was able to attract ships in the year 2016^{[18][19]} but as the ship traffic increased port was not able to maintain its low turnaround time. Ideally the turnaround time of ships should remain stable regardless of the traffic or size of cargo. The top managers of port are of the view that if port is not able to reduce the turnaround time to anything below 2 days; it will not be able to maintain the level of traffic it has achieved in this year. It should also be noted that a major competitor of CPT, the Jawaharlal Nehru Port Trust was able to achieve a turnaround time of 2.01 days with better infrastructure facilities due to which the port is losing some customers to JNPT despite of the fact that CPT has better location advantages than JNPT. This information was obtained from a feedback survey conducted by the marketing department. Another factor for worry is that pre berthing detention time which is also a constituent of turnaround time has decreased from 20.22 days to 15.86 days. So the relative increase in turnaround time is much higher. The port was not able to reduce the turnaround time despite the fact that pre berthing time was low. This is also a factor of concern. Another factor is that the average output per ship berth day decreased to 15661 tonnes during the year from 16770 tonnes in the preceding year. Average output per ship berth day is the total tonnage handled distributed over the total number of berth days. Average output per ship berth day has decreased this year means that total number of berth days has increased which is not a good indicator. The major international competitors for CPT, the Colombo port and the Singapore port are having turnaround times of less than 24 hours.

III. ANALYSIS

A. Turnaround time calculation components

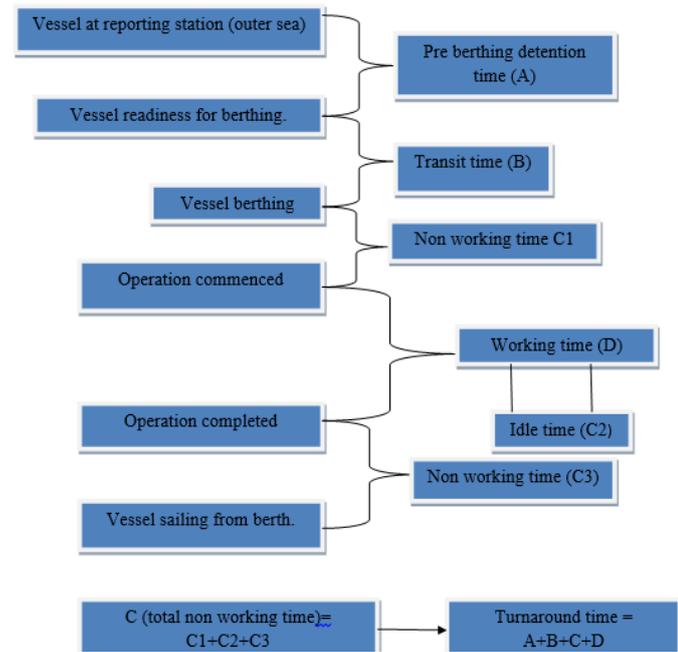


Fig 1: TRT Calculation

- Pre-berthing detention time (PBD): Time between vessel readiness for berthing vessel arrival at reporting station.
- Transit time: time taken by the ship for sale from outer sea to the berth and get berthed. Transit time normally cannot be reduced unless berth unavailability causes a delay for berthing.
- Working time: it is the time during which actual operations of loading/ unloading occurs. It normally doesn't include idle time
- Non-working time: it is the sum of idle time from the time of berthing to the time of start of work. The idle time during ship operations an idle time taken from the time of completion of operations to sailing from the berth.

B. Pre- Berth Detention time

The pre-berthing procedure involved here is that when the vessel arrives at the outer sea, the port will get information and will send the pilot of CPT to the vessel and the pilot will take the vessel to the berth and it gets berthed. Before the pilot takes the vessel to the berth, all the documents are cross-checked. If any of this procedure took more time its cause delay and will increase the turnaround time.

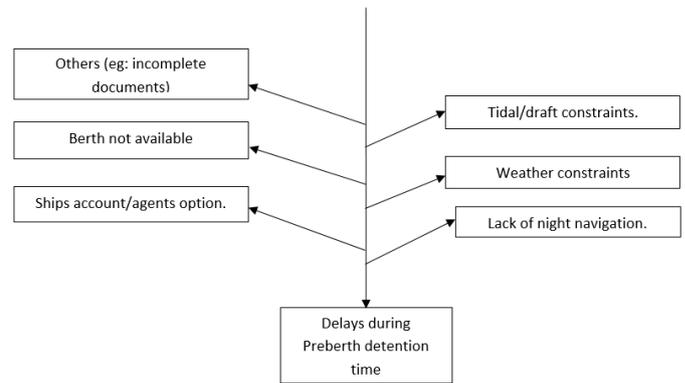


Fig: cause and effect diagram

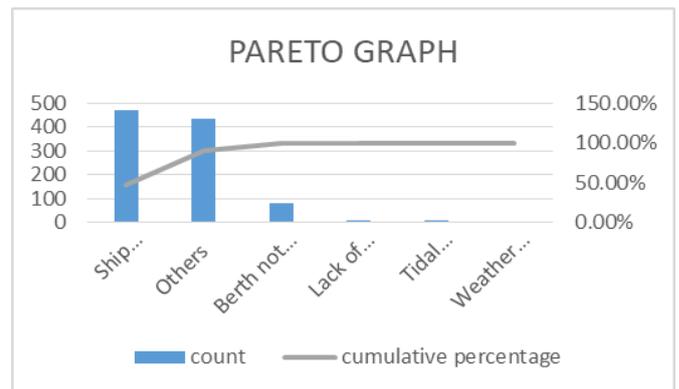


Fig 2: Pareto Graph

From the root cause analysis the major cause for the delay due to shipping agent options this occurs due to the particular choice of ship-owners to arrive at a particular time. Delays may occur due to the cascading effect of the delays that occurred in previous ports, weather constraints that have occurred on the way, reduction in speed due to fuel unavailability etc.

C. Working Time

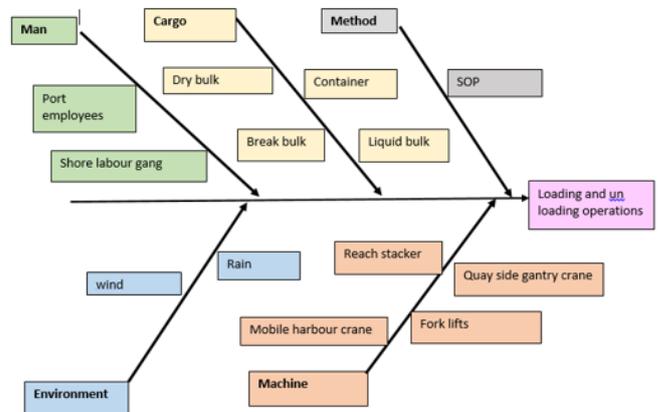


Fig 3: Cause –Effect

- Equipment breakdown/ nonavailability: this is a common issue in many of the ports but here it

becomes a problem because of the poor preventive and breakdown maintenance practices and limited equipment availability. For example, only one crane is available for a ship at a time.

- Power failure
- Weather constraints: for break bulk and dry bulk cargo the turnaround time increases during monsoon. Wheat and Salt imports increased mainly during monsoon season which causes increase in TRT
- Season Contract workers who lack expertise in cargo handling
- Frequent labour strikes
- Shifts in gang – The labour gang working on a particular shift stop their work when the shift is over and does not wait for the next labour gang to take up the remaining work. This results in an idle time of 30 minutes to 1 hour between the gang shifts which results in reduced productivity.

IV. SUGGETION FOR IMPROVEMENT.

To reduce the operational delays FMEA is done, the factors causing delays are ranked based on the severity and recommendations are suggested to avoid such issues in future.

FAILURE MODE AND EFFECTS ANALYSIS									
Item:	delay in hading cargo		Responsibility:	Mr. Rajeev Kumar		FMEA number:	123456		
Model:	Current		Prepared by:	KOKILA A V		Page :	1		
Core Team:	traffic department					FMEA Date (Orig):	08-06-2017		
Process Function	Potential Failure Mode	Potential Effect(s) of Failure	S e v e r i t y	Potential Cause(s)/ Mechanis c u	Current Process Controls	t e	R P N	Recommended Action(s)	
delay in cargo handling operation	equipment failure	lost average of 5-7 hrs	10	lack of stanby device and lack of maintnace	proper maintenance	5	400	1. inspection druing regular intervals, 2.purchase one more mobile harbour crane,as inf now they are depending on ships crane to handle cargo. 3. double cycling to handle continer cargos.	
	shift gang leaving shift without waiting other gang to enter shift	lost of time by 30 min to 1 hr	7	Improper scheduling of gang per shift	inform workers to be on time	2	140	1. proper sheduling of shifts so that no break occur while other shift gang enter. 2.inform and supervise the work to avoid early leaving.	
	weather constrains	unable to handle dry(conventioal goods) during rain	6	import of conventioal goods increase during manson season	handle it during less rain	2	60	no recomentation(unable to control weather constraints)	

Fig 4: FMEA

A. Suggestions

- Assistance for preparation of documents: Currently, to prepare the documents for export of goods exporter has to directly go to the customs department and prepare the documents. This process takes time as the exporters will not be so aware of the procedures. As a result, it creates a delay for the preparation of documents and without the documents, the ship cannot sail from the berth. So a separate small department can be created at the port for customs liaison. This can make the process faster since he knows regarding the procedures and preparation of documents can be started once the ship has registered with the port for unloading

- Implement double cycling. : Turnaround time of vessel includes the time taken to unload and load cargos/containers. When unloading and loading a ship, cranes usually spend only half of their moves carrying a container/cargo. During the time of unloading, the crane comes empty while moving to the ship. During the time of loading, the crane is empty when returning to the dock. Double cycling is the practice of making use of these “empty” moves to carry a container, thus making the crane more productive, and reducing turn-around time. [15] With current single cycling or status quo methods, the number of moves necessary to turn-around the ship is fixed, and does not depend on the order in which the crane operates on the ship’s columns. With double cycling, however, the number of moves depends on the order of operations. Therefore, the problem of double cycling is one of scheduling jobs, or finding the order in which to operate on the columns that minimizes ship turn-around time. The benefits of double cycling are significant for both hatched and hatch less ships, and are robust to constraints on the sequence of operations.
- Purchase of additional equipment and preventive maintenance: Purchase of additional equipment and preventive maintenance like cranes for lease has to be performed to prevent equipment unavailability. Since it is purchased on the lease it does not impose many financial obligations on the port. Also, good preventive maintenance has to be carried out at regular intervals to prevent equipment breakdown. Normally what happens is that when a period of inactivity occurs equipment are not given any maintenance and when a sudden surge of activity (ship arrival) occurs, equipment is being used without any maintenance. This leads to equipment breakdown and hence creates delays.
- Proper scheduling for shift gang & Supervision during work time and attendance of labour: while scheduling gang per ship, the contractors who are in charge of bringing labour to work should ensure that all the labour are available and shift should be scheduled such that there is no gap between each shift. Continuous monitoring is highly recommended to improve work efficiency of labours.

V. CONCLUSION

The main objective of the project is to identify the factors that increase the vessel turnaround time of Cochin port trust and to provide suggestion to reduce turnaround time. In this project, the major factors cause delays are: delay in pre-detention time, and delay occur during the working time i.e. operational delays. This study was limited to, comparison and analysis of quantitative factors influencing the turnaround time that can be measured physically and also reliable data were not

available in order to conduct a detailed comparative study of operational and financial aspects of the Cochin port with other major ports in India. Based on this study suggestion are provided to control the increase in turnaround time.

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