ISSN : 1978-774X

PLANNING A SIMULATION MODEL FOR LOADING AND UNLOADING CONTAINERS TO DECREASE THE *CYCLE TIME*

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ABSTRACT

Transportation technology is developing very fast every day, which results in many transportation modes used to distribute goods, one of them is containers. PT. Multi Terminal Indonesia (PT. MTI) is facing problems at the Intersuler 009 Container Terminal where the long cycle time is supported by the existence of over time. This study will simulate the Intersuler 009 Container Terminal, using the Pro Model to look into the present condition and will provide scenarios based on the utility of the material handling. Based on this study result, scenario 4 will provide the shortest Cycle Time.

Keywords*: Simulation, container, Cycle time, material handling.*

1. INTRODUCTION

Transportation technology is developing very fast every day, resulting in the use of many transportation modes to distribute products. Many companies are studying new ways to transport and to pack their goods easier, more practically and safely. One of the systems used is by employing containers.

The process of loading and unloading containers will need a special infrastructure at the port. The special port infra structure which conducts the loading and unloading activities of the containers is called the containers terminal. To ascertain that the loading and unloading of the goods are smoothly done, the container terminal needs to sufficiently to equip it with loading and unloading equipments. If the quantity of the equipments is not sufficient, the loading and unloading activities will take more time and the quantity of ships and containers served will be less. This condition will create a queuing of ships and it will inflict a financial lost to the container terminal as well as to the shipping company. The queuing of the ships and containers will cause the shipping company to increase their cost.

PT. Multi Terminal Indonesia (further abbreviated to PT. MTI) is one of the companies that is active in sea transportation. PT. MTI has a few terminals: Multi Purpose terminal, container terminal, and Logistic terminal. The problem which will be discussed in this study is only at the container terminal.

The actual Cycle Time situation (the material handling time needed to load and unload the container) at PT MITI is 17-18 hours per ship. This is because there is a boat that only load and unload 300 boxes, but there is also that reaches 700 boxes. Therefore, a higher cost must be paid and vice versa. Besides, there are also problems with the scheduling of ships that will moor and ships that are in overtime and problems associated with how to optimize the pile up of the container's place.

PT. MTI has taken the policy to increase the port's quality, e.g. providing and organizing the port's facilities to enable it to quickly conduct loading and unloading activities, hence, the company can allocate the tie up place and decides on the loading and unloading production targets. The long loading and unloading time of containers can influence the level of the moor's occupancy, which can change the tie up time which will not be in accordance with the departure as well as with the arrival of the vessel at the next port. This fact can increase the operational cost and will lessen the trust of the customers which will shift their containers to another container company. Because of these reasons, the study find out

how to completely optimize the services of the container terminal so that it will have a positive result for PT. MTI. The whole study will be simulated using the Pro Model.

2. INITIAL CONDITION AT PT.MTI

The problems which takes place at the Intersuler Container Terminal 009 P.T. MTI is regarding the *cycle time* which sometimes is considered to be slow supported by the overtime. Although there is seldom a complaint from PT. MTI customers, however, if the present system used, is not straightened out, more problems will come up.

Illustration Process of the services at the Intersular Container terminal 009

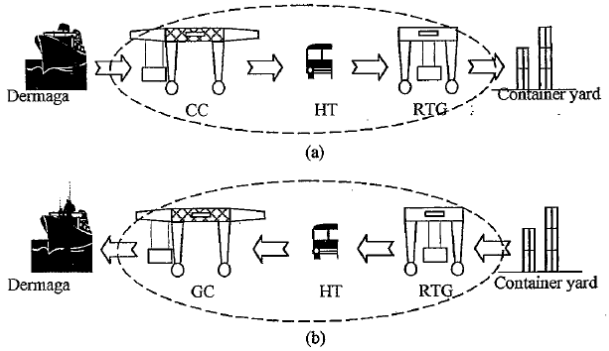

Figure 1. Unloading (a) and loading (b) flow of activities at the containers terminal

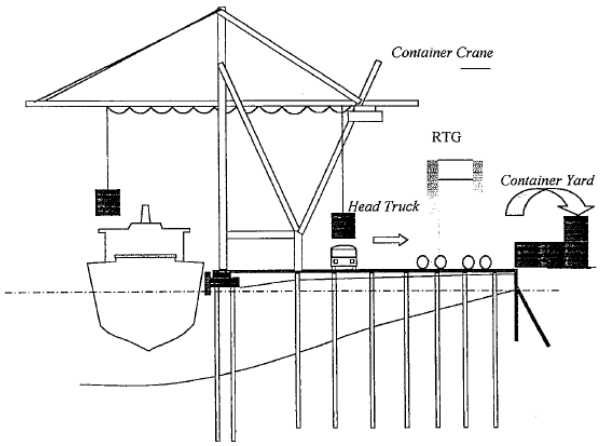

Figure 2 Illustration of loading and unloading at the Ocean Going container port (009)

3. RESEARCH METHOD

Simulation was conducted using the Pro Model, with the replication as many as 16 running hours.

3.1. Elements System

The following is part of the details of the element system which is used to stimulate the loading and unloading process of PT. MTI. The simulation will be conducted with the Pro Model 6.0 Model.

1. Entities: container, vessel
2. Location, quay, container collection place
3. Resources: operator, Container Crane (CC), Head Truck (HT), Rubber yred Gantry (RTG)
4. Routing Sequences: loading and unloading and routing resources
5. Work Schedules (the exact in-and outgoing of the vessel, the speed and the Quantity of material handling that can be used)

3.2. Decision Variables

The aim of this simulation is to optimize the loading and unloading process of PT.MRI, by organizing the quantity of the Container Cranes (CC) consisting of 4 units. The Head Truck (HT) total 16 units, and Rubber Tyred Gantry (RTG) totalling 14 units, owned by the company, hence, the cycle time of PT.MTI will be shorter.

3.3. Assumptions

The assumption used in this study is: The operator is always present at the loading and unloading process (ready): There is no downtime, and the frequency of the damages at PT MTI can be neglected; The size and genre of the vessel are using the average size and genre ; and the size of the container uses the average container's size. This is aimed to lessen the stimulation complexity.

4. RESULT AND DISCUSSION

Simulation was conducted using the Pro Model, with the replication as many as 16 running hours. Having conducted the simulation, the following are the utilities of

the *Container Crane*, the *Head Truck*, and the *Rubber Tyred Gantry*.

Table 1. Result of the utility of the Container Crane, the Head Truck and the Rubber Tyred Gantry (The Initial Condition)

Rubber Tyred Gantry		*Container Crane*		*Head Truck*	
No	% Utilization	No	% Utilization	No	% Utilization
1	8.38	1	4.79	1	16.51
2	7.12	2	4.43	2-3	99.59
3	0.71	3	1.03	4	56.98
4	2.08	4	0	5	68.17
5-14	0			6	58.58
				7	52.72
				8-16	0

Based on Table 1, an alternative scenario can be constructed, in which the minimum amount of RTG is 4 units, the minimum amount of HT is 7 units and the minimum CC is 3 units. However, although the *container cranes* are used for the loading and unloading processes, has resulted in an utility percentage of less than 5%, hence, the *Container Crane's* alternative scenario is partly allocated to the unloading process and another part to the loading process.

4.1. Alternatives Scenarios

The alternatives used in this simulation consist of four scenarios, in which the proposed scenario is based on the utility result of the initial condition of the model. The following alternative scenario is proposed.

1. Scenario 1 : Unload : 2 C*ontainer Cranes*; Load :1 *Container Crane*; Unload & Load : *8 Head Trucks*, 4 RTG
2. Scenario 2 : Unload : 1 *Container Crane*; Load: 1 *Container Crane*; Unload & Load : 10 *Head Trucks*, 4 RTG
3. Scenario 3 : Unload : 1 *Container Crane*, Load : 1 *Container Crane*; Unload & Load : 16 *Head Trucks*, 4 RTG.
4. Scenario 4 : Unload : *1 Container Crane*; Loads : 1 Container Crane; Unload & Load : 8 *Head Trucks*, 8 RTG

4.2. Scenarios Result

Experiments have been conducted using the PROMODEL**.** The following is the total result and the average *Cycle Time* for load and unload.

Table 2. Total and Average Load Cycle Time for Early model and All Scenarios (in seconds)

Cycle Time	Initial Condition	Scenario 1
Total	25504.5	19969.85
Average	1594.03	1248.11563
Cycle Time	Scenario 2	Scenario 3
Total	19169.85	14883.05
Average	1198.116	930.190625
Cycle Time	Scenario 4	
Total	9689.65	
Average	605.6031	

Table 3. Total and Average Unload Cycle Time for Early model and All Scenarios (in Seconds)

Cycle Time	Initial Condition	Scenario 1
Total	6933.14	5091.446
Average	433.3213	318.215
Cycle Time	Scenario 2	Scenario 3
Total	5114.136	4861.495
Average	319.633	303.843
Cycle Time	Scenario 4	
Total	4484.499	
Average	280.281	

The simulation result shows that scenario 4 has a shorter *Cycle Time* compared to other scenarios and the early model. This is because the early model has used all *material handling* without the function allocation, so that it makes the *Cycle Time* longer, and the 1-4 scenario has divided part of the *material handling* to unload and another part to load, so that the *Cycle Time* becomes faster. Scenario 4 has the lowest *Cycle Time* because the allocation made is in accordance with the system model of PT. Multi Terminal Indonesia.

5. CONCLUSION

Based on the analysis, the best scenario is the scenario 4, because is uses s *material handling* allocation which is in accordance with the system model of PT. Multi Terminal Indonesia, hence the unloading and loading time is the smallest. Scenario 4 consists of 2 *container cranes* for unloading, 1 *container crane* for loading, 8 *head trucks* and 8 RTG. The cycle time for loading is 10 hours and the cycle time for unloading is 5 hours.

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