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ANALYSIS OF FACTORS AFFECTING VESSEL TURNAROUND TIME AT BULK TERMINAL IN PORT OF TRINCOMALEE

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ABSTRACT - Efficient vessel turnaround time is pivotal for optimizing port operations and enhancing competitiveness. This study investigates factors affecting vessel turnaround time at the bulk terminal in the Port of Trincomalee. Utilizing a mixed-methods approach, quantitative laytime calculation data and qualitative expert surveys were employed to develop a comprehensive process map and identify bottlenecks in the turnaround process. Quantitative analysis revealed insights into the time consumption for each activity, facilitating the development of a detailed process map. Qualitative data provided expert perspectives on operational challenges, corroborating quantitative findings and enhancing the accuracy of bottleneck identification. By integrating quantitative and qualitative findings, specific bottlenecks were pinpointed, paving the way for targeted interventions to improve operational efficiency. This research contributes to the optimization of vessel turnaround processes at the bulk terminal, thereby fostering competitiveness and sustainability in port operations.

Keywords: Vessel turnaround time; Bulk terminal; Process map; Bottlenecks; Port operations

1. INTRODUCTION

Vessel turnaround time (VTT) is the duration required for a vessel to complete its journey from arrival at the port, navigating to its berth, unloading or loading cargo, and departing the port after releasing the tug and pilot [1]. VTT at a bulk port is crucial for operational efficiency and performance assessment [2]. It is a key indicator of a port's capability, efficiency, and productivity in handling cargoes, impacting the port's overall performance [3]. Dry bulk handling is a primary operation at Trincomalee port. Recent modernization efforts and expansions in Trincomalee port have strengthened the port's capabilities, enabling it to handle larger vessels and increasing trade volumes. These enhancements have not only improved infrastructure and logistics but have also elevated Trincomalee's competitiveness in global maritime trade, particularly in East-West container shipping routes [4]. Although vessel turnaround operations have been thoroughly examined in ports around the world [5], there is a lack of previous research that specifically delves into Trincomalee Port and its Bulk operation. By examining both quantitative and qualitative data, the research developed a comprehensive process map and identified bottlenecks in the vessel turnaround process. The study fills a gap in the existing literature by providing insights specific to the Trincomalee port and contributes to the optimization of port operations.

2. MATERIALS AND METHODS

This study used a combination of quantitative and qualitative data collection methods to analyze various factors that influence the VTT at the bulk port in Port of Trincomalee. Quantitative data were gathered through lay time calculation reports of Prima Jetty, providing insights into the duration of operational activities. Qualitative data were obtained through structured survey questionnaires and direct interviews, soliciting expert opinions and firsthand experiences related to VTT challenges and bottlenecks. The survey questionnaire was designed to gather specific insights from participants, aligned with the research goals. The questionnaire featured a blend of closed-ended and open-ended questions.
Quantitative data were subjected to time consumption analysis, elucidating the duration of various operational activities and informing the development of a process map. Qualitative data underwent thematic analysis by utilizing NVivo software to identify recurring themes/ patterns indicative of

operational bottlenecks. The thematic analysis involved categorizing and coding responses to identify common themes.

3. RESULTS AND DISCUSSION

3.1. Factors Identification of the Vessel Turnaround Time

VTT is influenced by various factors within and outside the control of terminal operators. Waiting Time - duration a vessel spends waiting for a berth upon arrival at the port, Berthing Time - time taken for a vessel to be securely docked at the terminal, Cargo Handling Efficiency - efficiency of loading/ unloading cargo, Weather Conditions - environmental factors which can affect vessel maneuvers and terminal operations, Port Infrastructure - quality and capacity of port facilities/ equipment, Management Practices implemented by terminal can be identified as those factors.

3.2. Process Map Development and Bottlenecks Identification

Waiting Time, the period between arrival and departure from the mooring buoy, is negligible due to low vessel traffic at Trincomalee port. Maneuvering time, influenced by vessel size, tugboat availability, and weather, often lies outside terminal control. Berthing time, including breaks and machinery breakdowns, must be minimized to optimize efficiency.

Qualitative interviews provided insights into operational challenges and improvement opportunities at Prima Jetty. The identification and mitigation of operational bottlenecks are imperative for enhancing operational efficiency and optimizing turnaround time. Electrical breakdowns emerge as a critical concern, threatening to halt operations and incur substantial financial losses if not promptly addressed. Stand-by generators are crucial to prevent disruptions caused by power cuts. Conveyor belt failures represent another formidable obstacle. Quick repairs by skilled engineers and having spare parts on hand are essential to minimize downtime. Finally, following recommended usage guidelines and implementing preventative measures are key to avoiding machine failures. Discharge quantity variations further complicate the cargo handling process, necessitating meticulous planning and the adoption of optimization techniques to maintain consistent discharge rates throughout the operation. Anticipating adverse weather conditions and ensuring timely pilot availability are additional challenges that demand proactive measures to minimize disruptions. The morale of laborers emerges as a critical factor influencing productivity and performance. Addressing challenges such as electrical breakdowns, conveyor belt failures, machine overuse, discharge quantity variations, weather anticipation, pilot availability, labor morale, and equipment maintenance are crucial steps towards achieving operational objectives.

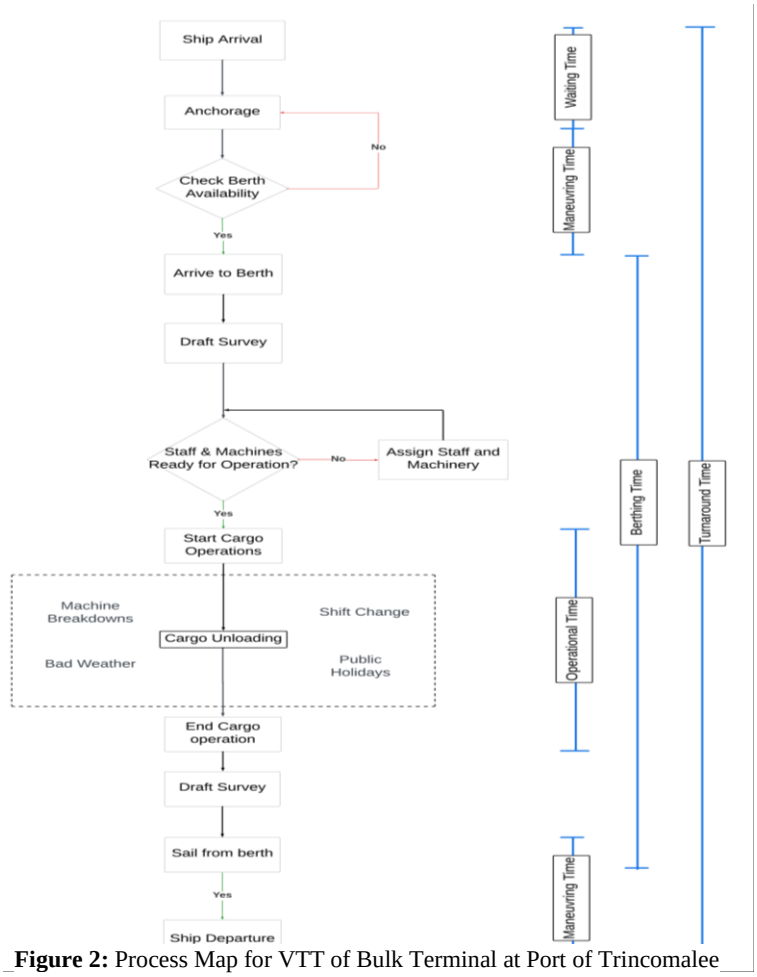

Figure 2: Process Map for VTT of Bulk Terminal at Port of Trincomalee

4. CONCLUSION

The study underscores the importance of analyzing factors affecting vessel turnaround time to enhance operational efficiency at the bulk terminal in the Port of Trincomalee. By integrating quantitative and qualitative data, specific bottlenecks were identified, paving the way for targeted interventions to improve port operations. After an extensive examination of various bottlenecks prevalent in bulk cargo handling terminals, it is evident that these challenges pose significant impediments to operational efficiency and turnaround time optimization. Future research may focus on implementing and evaluating proposed interventions to validate their efficacy and sustainability.

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