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A Comparison Between Syncrolift and Floating Dry Dock

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Abstract

The maritime industry relies heavily on efficient and effective ship lifting mechanisms for vessel maintenance, repair, and construction. This abstract provides a concise overview of a comprehensive comparison between two prominent ship lifting technologies: Syncrolift and Floating Dry Dock. Syncrolift systems utilize a platform with synchronized lifting mechanisms, while Floating Dry Docks submerge to lift vessels. This comparative analysis delves into various aspects, including operational capabilities, cost-effectiveness, and adaptability to different vessel types. By examining the strengths and limitations of each technology, this study aims to

provide valuable insights for maritime stakeholders, shipyards, and naval professionals seeking to optimize their ship lifting processes, enhance operational efficiency, and make informed decisions in the dynamic world of maritime operations. The findings presented herein contribute to a better understanding of these vital technologies and their role in shaping the future of ship maintenance and construction.

Keywords: Ship Lifting, Syncrolift, Floating Dry Dock, Ship Maintenance.

1. Introduction

The process of ship lifting holds significant importance in the realm of maritime maintenance and repair, as it plays a vital role in preserving the seaworthiness and operating efficiency of boats throughout their lifespan. There are two commonly employed techniques for raising and maintaining ships, namely the Syncrolift and Floating Dry Dock systems. These approaches possess unique merits and limitations.

2. Syncrolift Systems

Syncrolift systems utilize a sequence of synchronized hoists or elevator platforms that are strategically located along a waterfront, positioned below the surface of the water. These platforms have the capability to be independently lifted or lowered in order to facilitate the lifting of vessels into or out of the sea (Srinivasreddy, V., et al. (2021). Syncrolifts are widely preferred due to their exceptional precision and versatility, enabling the precise positioning and maintenance of ships with a high degree of accuracy. This method demonstrates a high level of compatibility with boats of tiny to medium sizes, providing expedited accessibility to a ship's hull for the purpose of conducting inspections and carrying out necessary repairs. Nevertheless, the capacity of these vessels may be constrained, hence reducing their suitability for really large watercraft (Arumugam Elumalai, V. (2018).

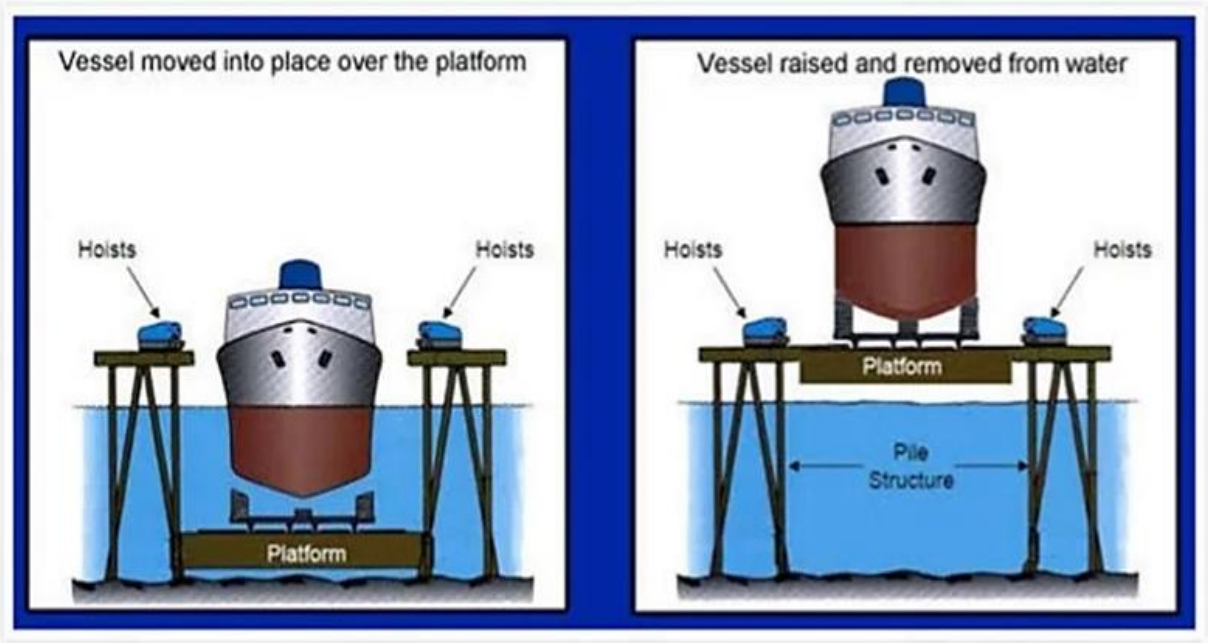

Figure (1): Platform mechanism

On the top surface of each of the beams is either a trestle or a pair of bilge blocks, with the blocks of each pair being on opposite sides of the center of the beam. Regardless of the height of the beam, the trestles may be adjusted to an advantageous position whenever that is necessary. This provides the operator with the ability to show the floor in accordance with the plan of the keel and hull of an approaching ship. When the ship is floated into the slip, the platform can be raised to make precise contact with the ship along the length of the keel in order to raise the ship without affecting the trim position and without imposing undue stress on any component of the system or the hull. This can be done while the ship is still floating in the slip. In addition to that, the lifting platform has upper wood decking components that are supported on the top surfaces of the beams. In addition to this, the platform is outfitted with rail members that provide support for a moveable hydraulically driven

lifting bogie. This bogie is responsible for moving the ship from the ship lift platform to the work bay.

The hydraulic lifting cylinders of the bogies are used to raise the trestles, which allows the vessel to be moved between the ship lift platform and the berth or in the other direction. The lift cylinders of the bogie are linked to three beds that are filled with hydraulic fluid. The vessel will be supported on three points inside a hydraulic bed, and the stresses on each cylinder will be consistent across the bed.

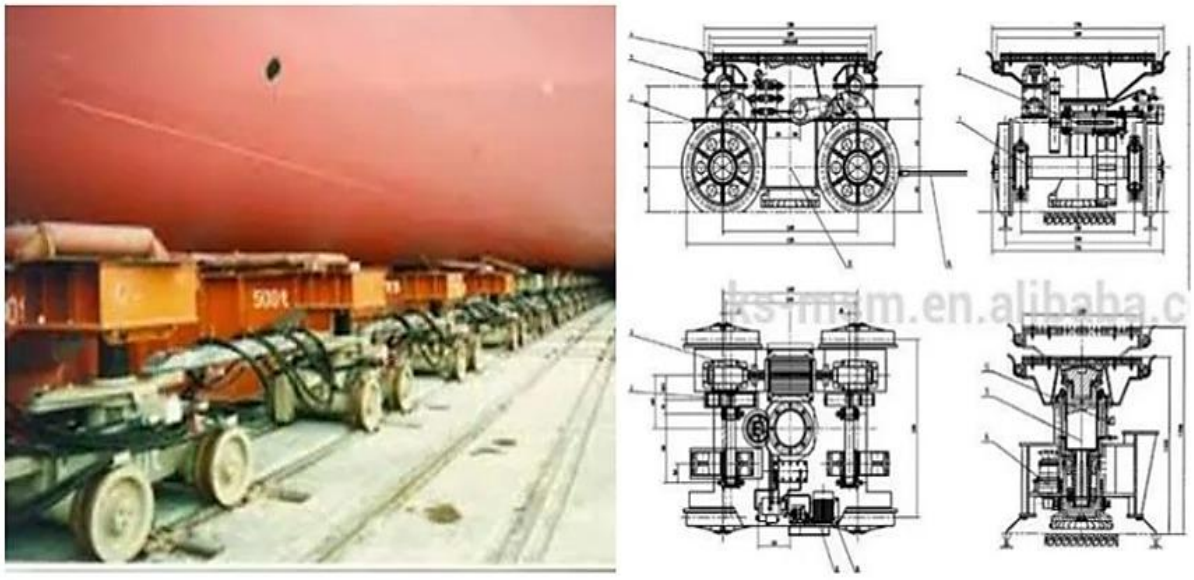

Figure (2): hydraulic bed - Fluid bed

Additionally, the fluid bed may be used in the process of either lifting or launching the vessels. When lifting a vessel with a fluid bed, the trestles will be placed on the platform, and the bogies will stay below the trestles in their original position. The utilization of the bogies is appropriate for use underwater. The platform is going to be lowered, and while it's in the "Fluid - Bed" mode, the bogies are going to be

submerged in water. In this instance, the trestles are supported by the hydraulic cylinders that are located on the bogie. By maintaining functioning of the hydraulic lifting system during the launching or lifting process, deformations of the shoplift platform may be adjusted for, and the vessels can be supported on the hydraulic beds with load distributions that are consistent within each bed.

3. Floating Dry Docks

On the other hand, Floating Dry Docks are substantial structures with buoyancy that enables them to partially submerge, facilitating the positioning of a ship above the waterline. After achieving perfect alignment, the ship undergoes a process of deballasting the dock, resulting in its elevation and the subsequent lifting of the vessel above the water surface. Floating dry docks are widely recognized for their capacity to accommodate significantly larger vessels, such as aircraft carriers and supertankers. These vessels offer a spacious work environment suitable for comprehensive repairs, including hull maintenance, and can function as a sturdy platform for tasks such as welding and painting. Nevertheless, the utilization of such systems necessitates significant investment in equipment and time for the processes of ballasting and deballasting, hence diminishing their suitability for expedited operations (Srinivasreddy, V., et al. (2021).

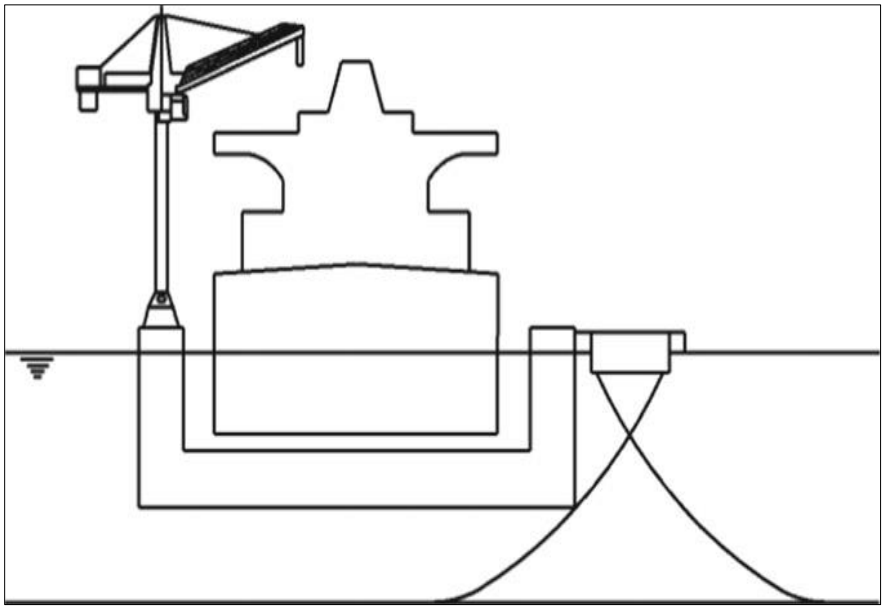

Figure (3): Floating dock catenary mooring

(It is important to take note that the floating dock in its current configuration is secured to a floating mooring dolphin, which in turn is secured to the seabed using a normal catenary system. Although it is more typical to directly link mooring chains, anchors, and the like to floating docks, it is possible to make a connection to the mooring by using a floating mooring dolphin or something similar. This will allow for a more rapid separation from the mooring when it is necessary. As a consequence, the dock may be promptly demobilized in advance of a severe storm event, and quicker reconnection and mobilization can be done once the event has passed, which results in reduced downtime for the facility.)

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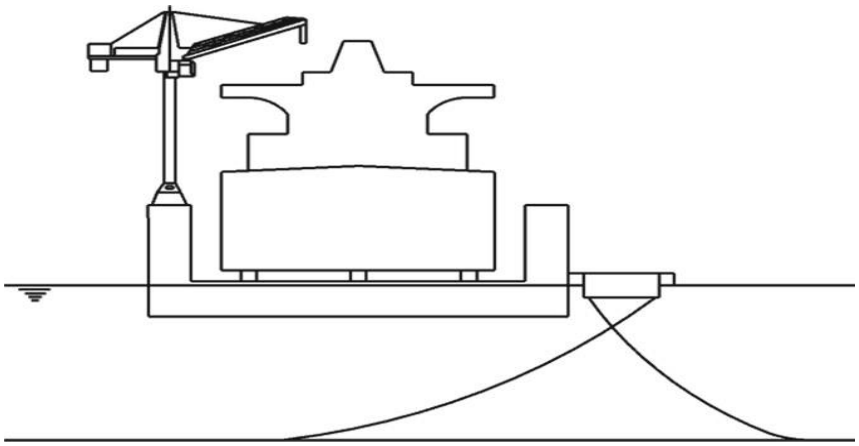

Figure (4): Floating dock catenary mooring—mooring system design with lateral load

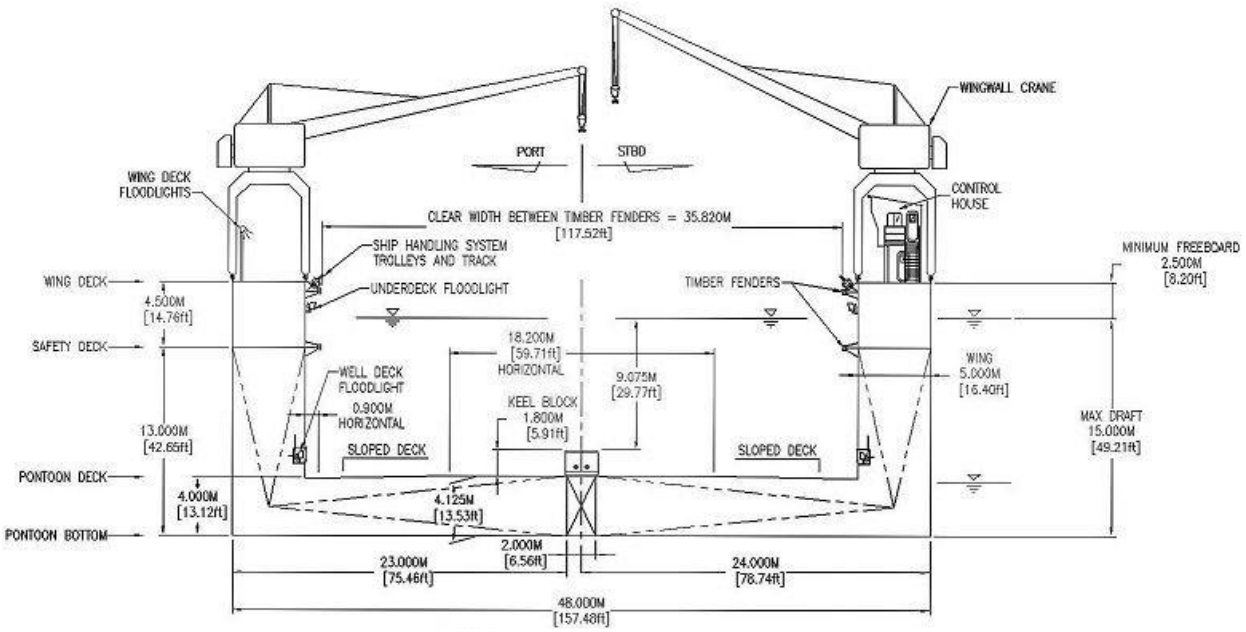

Figure (5): Floating drydock (Inch-Pound, 2009)

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In general, the primary designing considerations are the same as with graving, but in floating drydocks there are some differences, such as neglecting soil influences and focusing on the stability of the structure while sailing and serving the vessels. Since it floats on the surface of the water, it will tip under the influence of waves, so special attention must be paid to ensure that it does not tip over. There are restrictions on the slope, the most common of which are 19 degrees (in the direction of the length) and 27 degrees (in the direction of the width), In addition to the dynamic stress brought on by moving cranes, the design of individual chambers and connections must be carried out as well (Inch-Pound. 2009).

4. A Comparison Between Syncrolift and Floating Dry Dock

The selection between Syncrolift and Floating Dry Dock for the purpose of ship lifting is contingent upon the distinct requirements and attributes of the vessel under consideration. Syncrolifts provide a combination of accuracy and efficiency for smaller and medium-sized ships, whilst Floating Dry Docks are essential for the maintenance of large boats necessitating major repairs. When making decisions regarding the appropriate lifting method for their activities, ship operators and repair facilities must give careful consideration to these factors (Crandall, P. S. (1985).

According to (Frankel, E. G. (1985), Ship lifting is an essential procedure within the marine sector, facilitating the upkeep, restoration, and fabrication of vessels. Syncrolifts and Floating Dry Docks are two often employed techniques for hoisting vessels out of the sea. These methods exhibit notable variations in terms of their functionality, benefits, and practical uses. This paper presents a comparative analysis of Syncrolifts and Floating Dry Docks:

4.1 Operation

- The Syncrolift: A Syncrolift refers to a specialized platform including a set of lifting cradles or platforms that are controlled separately. The cradles are linked to a centralized control system that facilitates their simultaneous elevation and descent, thereby guaranteeing the synchronized vertical movement of many boats. The Syncrolift system is immersed in water, and vessels are transferred onto the cradles for the purpose of elevation.
- Floating Dry Dock: A Floating Dry Dock is a substantial aquatic structure that contains a submerged area on its deck, facilitating the buoyancy of vessels. Upon entering the dock, the water is drained, resulting in the dry dock ascending and subsequently elevating the vessel above the sea surface. Floating dry docks are available in a range of dimensions to handle diverse categories and magnitudes of vessels (Salzer, J. R. (1986).

4.2 Capacity

- Syncrolift: Syncrolifts are commonly employed for the handling and maintenance of vessels that fall within the smaller to medium-sized range. This category encompasses various types of watercraft, including offshore patrol boats, yachts, and fishing boats. These vessels are better suited for maritime transportation in bodies of water with rather shallow depths.
- A floating dry dock: Floating dry docks have the capacity to accommodate a diverse spectrum of vessel dimensions, encompassing both diminutive watercraft and substantial navy and commercial ships. The primary factors that affect their capacity are their dimensions and buoyancy (Mackie, K. P., & Deane, R. F. (2006).

4.3 Flexibility

- The Syncrolift: Syncrolifts provide enhanced versatility by enabling the concurrent lifting and launching of numerous vessels. The utilization of synchronized cradles facilitates expedient and effective operations, rendering them well-suited for shipyards characterized by a significant volume of throughput.
- Floating Dry Dock: Floating dry docks exhibit greater versatility in terms of their ability to accommodate a wide range of vessel types and sizes. Nevertheless, it is important to note that these vessels typically necessitate additional time for both the process of docking and undocking, hence potentially constraining their overall throughput capacity.

4.4 Maintenance and Repair

- The Syncrolift: Syncrolifts are highly suitable for performing maintenance and repair tasks of a reasonably expedited nature, including but not limited to hull cleaning, painting, and minor repairs. Additionally, they are well-suited for the purpose of launching recently constructed watercraft.
- A Floating Dry Dock: Floating dry docks are frequently utilized for comprehensive maintenance and repair operations, including dry-docking for significant overhauls, structural repairs, and retrofitting. These mechanisms provide enhanced entry to the hull and systems of a vessel (Morra, T. (2012).

4.5 Infrastructure and Cost

- The Syncrolift: The establishment of a Syncrolift system necessitates a smaller amount of infrastructure in comparison to that required for a Floating Dry Dock. This has the potential to enhance the cost-effectiveness of Syncrolifts as a viable alternative for smaller shipyards.

- Floating Dry Dock: The construction and upkeep of a Floating Dry Dock entail a considerable financial commitment and necessitate a major allocation of waterfront area. Nevertheless, these dry-docking services prove to be economically advantageous for shipyards and larger vessels with substantial demand.

The selection between Syncrolift and Floating Dry Dock is contingent upon the particular requirements of the shipyard, the dimensions and classification of the vessels to be accommodated, and financial factors. Smaller shipyards or shipyards with a focus on smaller vessels may choose to utilize Syncrolifts, whilst larger shipyards that cater to a wide variety of vessels may elect to invest in Floating Dry Docks in order to enhance their flexibility and capacity (Dharmadhikari, S. et al. (1978).

5. Conclusion

Syncrolift and Floating Dry Dock serve the same purpose. The choice between these two types should be decide to make has to be carefully weighed. They may both serve the same functions, but they are wildly different. should be make proper research to study the area and other factors such as operation, capacity, flexibility, maintenance, repair, infrastructure, and cost before making the decision to choose between Syncrolift and Floating Dry Dock.

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