

Create a marking and template-making system/ device for draught marks on ships.

1. Back ground:

Draught marks are markings or numbers placed on hull of a ship. They are typically located on the bow (front), stern (rear) and mid ship of the vessel both port and starboard side. These marks are used to indicate the ship's draught, which is the depth of the ship's hull below the bottom of the appendices (Bottom most point of hull) line. They are marked in a standardized format generally with numbers indicating the ship's draft in meters. They play a critical role in ensuring the safety, stability, Loading condition and efficiency of ships during their voyages(journeys).

The current procedure followed in Hindustan shipyard is as follows:

1. Draught marks (drawing no 50032) will be issued by the design department, indicating the frame numbers and their starting and ending heights of Fwd, Aft and Mid ship draught marks both port and Starboard of the ship.
2. Procedure followed is same for all the draught marks both the port and Sbd side.
3. At the beginning, identifying the frame number on the outer hull/shell where the draught marks are to be marked as per drawing.
4. Arrangement of proper scaffolding at outer hull in way of draught mark frame from top to bottom to suit for marking on shell and also for fitment of reference vertical wooden batten/stand.
5. The Outer hull of the ship in way of draught marks will be properly cleaned, free of undulations and debris for marking.
6. A vertical frame line on shell will be drawn from the top to the bottom on the outer hull.
7. Required vertical lines at a specified spacing(equal to width of letters) parallel to the frame line is marked on the shell as per the drawing (in general draught mark letter width is 80mm, and 20mm spacing exist between letters).
8. A slot cut horizontal flat bar will be welded to shell above the top most point of the draught mark, in way of frame to hold the wooden batten.
9. A vertical wooden batten/stand is provided vertically by bolting one end of the batten to the slot cut horizontal flat bar and the batten is maintained vertically

(Perpendicular to base line) by using scaffolding planks and suitable locking pieces.

10. The Sighting line available on the sighting stand will be shifted to the vertical wooden batten by using a transparent water tube level.
11. With reference to sighting line, Base line and BOA (Bottom of appendix) of the ship will be marked on the wooden batten.
12. Marking scale lines (draught marks) at every 100mm on the wooden batten with reference to starting from BOA to the require height of draught marks.
13. These scale lines will be transferred from the wooden batten to the shell in way of existing vertical lines at draught frame using a transparent water tube.
14. Four corner points of each draught mark letter on the Shell will be obtained.
15. The four corner points of each draught mark letters will be transferred onto papers(80mm width) for using it as a template for designing required letters(as suited at site).
16. These papers will be send to design dept., they will extract the dimensions of the letters from the paper and by using AutoCAD software they will draw the draught mark letters as per standard inside the four coordinates of the letters.
17. After designing, the design department will prepare NC formats for cutting the letters. And these letters are cut at hull shop by using CNC plasma cutting machine.
18. The processed letters will be tack welded on shell in the marked position and draught marks letters fitment will be offered for class inspection.

2. Problem:

The existing process of marking draught marks and lifting the marked letters on to a paper for designing letters is challenging and faces the following challenges:

1. **Labour Dependent:** The current method heavily depends on manual labour and their efficiency for both marking the draught marks and transferring them onto a paper for letter design in AutoCAD. This is not only consuming a significant amount of time but also prone to human errors and also consumes more man-days
2. **Time consuming:** Using a vertical batten and water tube for transferring depth meters onto a shell involves multiples steps, making it time consuming and cumbersome.
3. **Challenging:** Marking draught marks on a curved surfaces, especially at the aft and forward draught marks, can be challenging using above process. This is

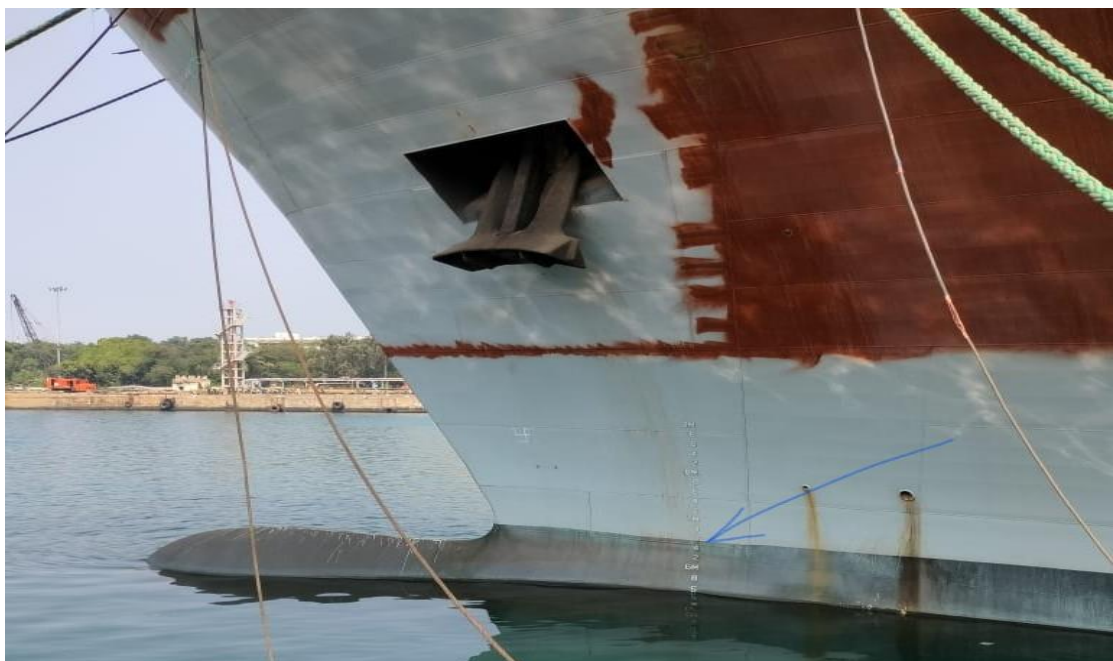
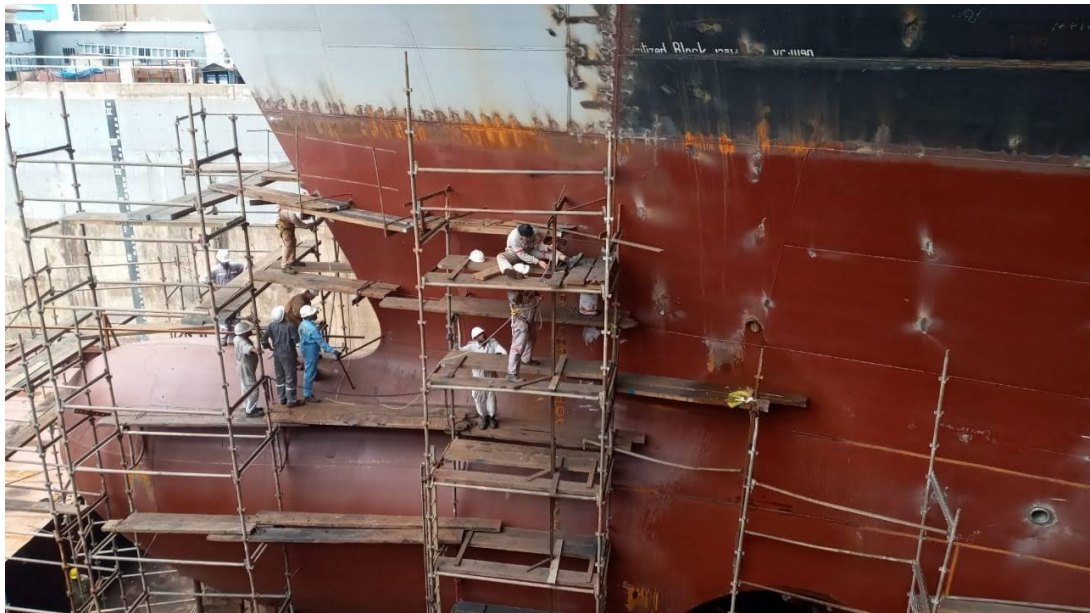
because the curved surface can make it difficult to mark and to ensure accuracy of markings.

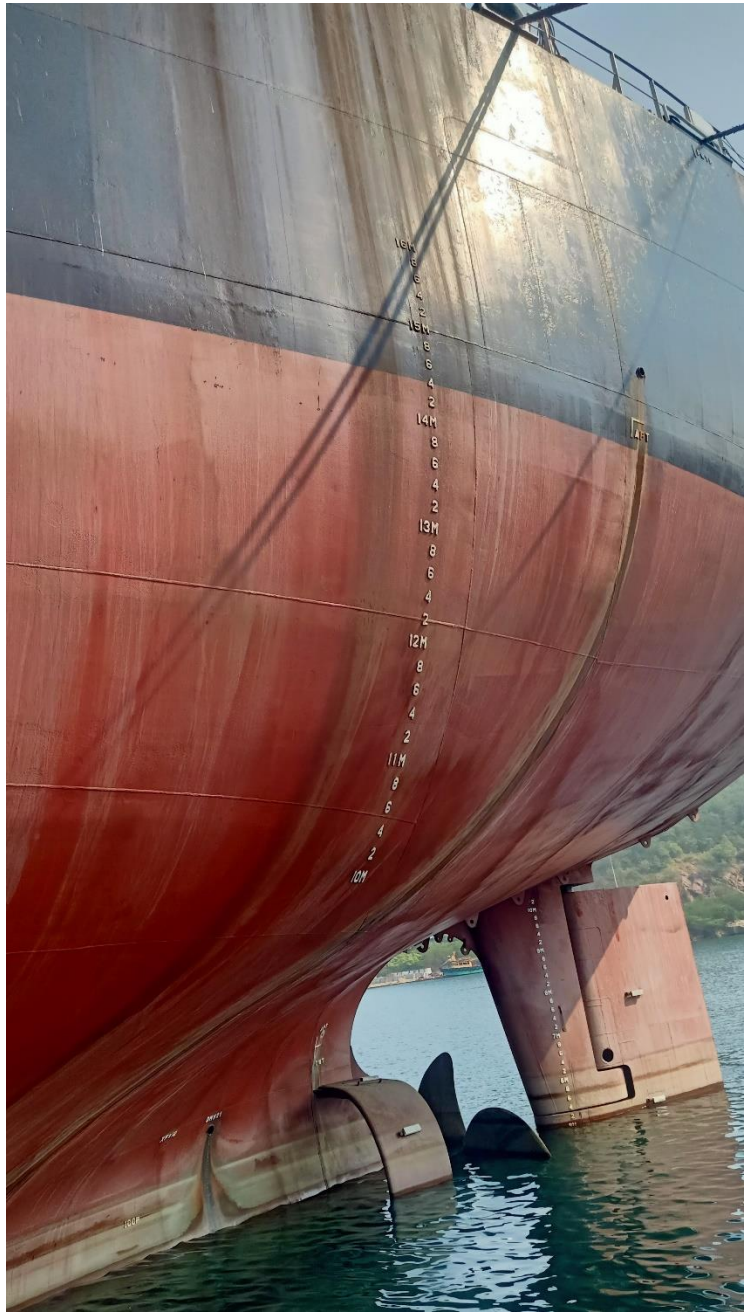
3. Solution needed:

A Solution is needed to improve the process of marking draught marks and transferring them for letter design. The solution should aim to:

1. Digital device: A digital device is required which has the capabilities to handle the requirement of water tube, wooden batten/scale, measuring tape to carry out the job.
2. Automate the Marking process: Automated method for marking draught marks that reduces the dependency on manual labour, ensuring accuracy and efficiency.
3. Digital data capturing: Utilize technology for capturing X, Y, Z coordinates of the each draught marks directly into a digital format, eliminating the need for manually transferring of letters into a paper.
4. Data storage & output: Efficient data storage system is required for storage of four corner points of coordinates (X,Y,Z) of all draught mark letters. The data saved in the device should be transferred to computer in word/text format.
5. Accuracy, User-friendly, Time efficiency: The solution should be significant faster, minimize the potential for errors and inaccuracies in marking and capturing. It should be user friendly.

Note: Relevant Photos attached







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