

STRUCTURAL STRENGTH ANALYSIS OF A WASTE TRANSPORT VESSEL FOLLOWING CRANE INSTALLATION

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ABSTRACT

The installation of a crane alters the static load distribution on the deck and supporting structures, potentially increasing stress, deformation, and stress concentration in the crane foundation area. Analyses were conducted on a local structural model with crane arm angles of 0°, 45°, and 90° using FEM Static Structural software. Loading conditions accounted for the crane's self-weight and a lifting load equivalent to 80% of the Safe Working Load (SWL). Simulation results were evaluated based on Von Mises stress distribution, allowable stress standards set by the Indonesian Classification Bureau (BKI), and safety factor values. The initial analysis revealed that the structure generated maximum stresses exceeding allowable limits—specifically 3,662.9 MPa at 0°, 3,165.4 MPa at 45°, and 366.57 MPa at 90°—necessitating geometric modifications to reinforce the crane foundation area. A re-analysis following these modifications showed a reduction in stress to levels below the allowable limit (189.57 MPa at 0°, 169.74 MPa at 45°, and 98.214 MPa at 90°) and an improved safety factor meeting BKI requirements. Thus, reinforcing the crane foundation structure effectively enhances the vessel's structural strength, ensuring it can safely withstand the static loads resulting from the crane installation.

Keywords: waste transport vessel, crane, finite element method, Von Mises stress, crane foundation, BKI.