

ABSTRAK

OCTAGIYANI. Analisis *Damage Stability* pada Kapal Samudra Sindo 39 Menggunakan Metode *Deterministic Concept*. Dibimbing oleh Ir. EKO PRAYETNO, S.T., M.Eng. dan MUHD. RIDHO BAIHAQUE, S.T., M.Sc.

Kapal *chemical barge* memiliki risiko mengalami penurunan stabilitas apabila terjadi kerusakan lambung yang menyebabkan kebocoran. Kondisi tersebut dapat mengurangi kemampuan kapal untuk tetap mengapung dan kembali ke posisi tegak setelah mengalami kemiringan. Penelitian ini bertujuan menganalisis *damage stability* pada kapal Samudra Sindo 39 menggunakan metode *Deterministic Concept* berdasarkan lima skenario kerusakan yang mengacu pada *Intact Stability Booklet*, serta mengevaluasi pemenuhannya terhadap kriteria *BKI Rules Volume X*. Penelitian menggunakan pendekatan kuantitatif melalui simulasi numerik dengan perangkat lunak Maxsurf Modeller dan Maxsurf Stability. Model kapal divalidasi melalui perhitungan manual nilai *righting arm* (GZ) dengan selisih sebesar 2,98%; 4,46%; 5,76%; 4,96%; dan 4,29%, sehingga model dinilai mampu merepresentasikan karakteristik stabilitas kapal. Analisis dilakukan menggunakan parameter *Angle of Maximum GZ*, *Maximum GZ at 20° or Greater*, dan *Area 0°–20°*. Hasil penelitian menunjukkan bahwa skenario 1 dan 2 (Full Load Departure dan Full Load Arrival) tidak memenuhi kriteria karena nilai *Angle of Maximum GZ* hanya mencapai 17,3°, lebih kecil dari batas minimum 20°. Sementara itu, skenario 3, 4, dan 5 (Departure Without Cargo, Arrival Without Cargo, dan Lightship) memenuhi seluruh kriteria *BKI Rules Volume X*. Kondisi *lightship* menghasilkan nilai *Maximum GZ* tertinggi sebesar 4,974 m dan *Area 0°–20°* terbesar sebesar 92,221 m.rad. Hasil penelitian menunjukkan bahwa kondisi pemuatan berpengaruh terhadap karakteristik *damage stability*, dimana kondisi muatan penuh menghasilkan stabilitas yang lebih rendah dibandingkan kondisi tanpa muatan maupun *lightship*.

Kata kunci: *Damage Stability, Chemical Barge, Deterministic Concept, Maxsurf Stability, BKI Rules Volume X.*

ABSTRACT

OCTAGIYANI. *Damage Stability Analysis of Samudra Sindo 39 Using the Deterministic Concept Method. Supervised by Ir. EKO PRAYETNO, S.T., M.Eng. and MUHD. RIDHO BAIHAQUE, S.T., M.Sc.*

A chemical barge is at risk of experiencing a reduction in stability when hull damage causes flooding. Such conditions can reduce the vessel's ability to remain afloat and return to its upright position after heeling. This study aims to analyze the damage stability of the Samudra Sindo 39 using the Deterministic Concept method based on five damage scenarios derived from the Intact Stability Booklet, as well as to evaluate its compliance with the criteria specified in the BKI Rules Volume X. This research employed a quantitative approach through numerical simulation using Maxsurf Modeller and Maxsurf Stability software. The ship model was validated through manual calculations of the righting arm (GZ), resulting in deviations of 2.98%, 4.46%, 5.76%, 4.96%, and 4.29%, indicating that the model adequately represented the vessel's stability characteristics. The analysis was conducted using the parameters of Angle of Maximum GZ, Maximum GZ at 20° or Greater, and Area 0°–20°. The results showed that Scenarios 1 and 2 (Full Load Departure and Full Load Arrival) did not satisfy the stability criteria because the Angle of Maximum GZ reached only 17.3°, which is below the minimum requirement of 20°. Meanwhile, Scenarios 3, 4, and 5 (Departure Without Cargo, Arrival Without Cargo, and Lightship) satisfied all the criteria specified in the BKI Rules Volume X. The lightship condition produced the highest Maximum GZ value of 4.974 m and the largest Area 0°–20° of 92.221 m·rad. The results indicate that loading conditions significantly affect the vessel's damage stability, with fully loaded conditions exhibiting lower stability than unloaded and lightship conditions.

Keywords: *Damage Stability, Chemical Barge, Deterministic Concept, Maxsurf Stability, BKI Rules Volume X.*