

*Neven Hadžić, Maro Ćorak, Joško Parunov, Kalman Žiha
Faculty of Mechanical Engineering and Naval Architecture, Zagreb*

COMPUTATIONAL UNCERTAINTIES OF HULL GIRDER RELIABILITY MODELLING

Summary

The aim of this paper is to investigate the computational uncertainties by applying different methods in reliability analysis of ship hull girder. The International Maritime Organization (IMO) proposals for hull girder reliability assessment are undertaken for probabilistic modelling of ship ultimate strength under combined longitudinal still water and wave bending moments both for hogging and sagging conditions. The example in the paper considers a typical service profile of a chemical tanker in as-built state and in corroded condition. The three methods of reliability analysis are compared in the paper: the First Order Second Moment (FOSM), the Advanced First Order Reliability Method (FORM) and the Monte Carlo Simulation (MCS). The conclusions resume the results of comparison of applied methods and discuss the appropriateness of reliability methods in ship hull girder safety assessments.

Key words: hull girder, reliability, , uncertainty, FOSM, FORM, MCS, chemical tanker.

RAČUNSKE NEIZVJESNOSTI MODELIRANJA POUZDANOSTI BRODSKOG TRUPA

Sažetak

Cilj ovog rada je ispitati računske neizvjesnosti primjenom različitih postupaka analize pouzdanosti broskog trupa. Za modeliranje granične čvrstoće broskog trupa pod zajedničkim djelovanjem uzdužnih momenata savijanja na mirnoj vodi i na valovima, kako u progibu tako i u pregibu, preuzete se preopruke Međunarodne organizacije za pomorstvo (IMO) za ocjenu pouzdanosti. Primjer u članku razmatra tipičnu službu tankera za kemikalije za tek izgrađeni brod i za trup izložen hrđanju. U članku su uspoređena tri postupka analize pouzdanosti: Metoda prvog reda sa statističkim momentima drugog reda (FOSM), Napredna metoda prvog reda (AFORM) i Monte Carlo simulacija (MCS). U zaključcima se rezimiraju podaci usporedbi primjenjenih postupaka te se raspravljaju odgovarajući postupci za ocjenu sigurnosti broskog trupa.

Ključne riječi: brodski trup, pouzdanost, neizvjesnost, FOSM, FORM, MCS, tanker za kemikalije