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ESTIMATION OF ADDED RESISTANCE OF A SHIP IN REGULAR WAVES

Summary

One of the objectives in the design of marine vehicle is the capability to sustain speed in a seaway. Therefore, the estimation of added resistance of a ship in a seaway is becoming of great importance in ship design. The term "Added Resistance" is used to describe the phenomenon of energy loss due to forces related to the energy transmitted from the ship to the water and to wave generation.
Two methods of added resistance calculation are briefly presented, one developed by Faltinsen, and the other by Salvesen. Both are based on the Salvesen, Tuck and Faltinsen linear strip theory, as they use it to define the wave induced motions. The first one obtains the added resistance by direct pressure integration, while the second one consists in the potential flow solution. Also, as a third method, an empirical approximation of the Salvesen method for the short wave lengths region is included.
The calculations of added resistance due to waves are performed according to the chosen methods for four different ships: two containerships, a bulk carrier and a ro-ro. The results are presented graphically, with the comparison to experimental results for the available cases.

***Key words**: added resistance, motion of a ship in waves, speed loss.*

ODREĐIVANJE DODATNOG OTPORA BRODA NA PRAVILNIM VALOVIMA

Sažetak

Jedan od ciljeva projektiranja plovnih objekata je mogućnost održavanja brzine plovidbe na valovima / nemirnom moru. Prema tome, određivanje dodatnog otpora broda zbog utjecaja valova ima velik značaj u kod projektiranja. Izraz „dodatni otpor" odnosi se na pojavu gubitka energije uslijed sila vezanih uz energiju koju brod prenosi na okolnu vodu i stvaranje valova.
U radu su ukratko izložene dvije metode, od kojih je jedna temelji na Faltinsenovom radu, a druga na Salvesenovom. Obje metode proizlaze iz Salvesenove, Tuckove i Faltinsenove linearne vrpčaste teorije, jer se pomoću nje određuju gibanja inducirana djelovanjem valova. Međutim, kod prve metode dodatni otpor dobiva se direktnom integracijom tlakova, dok se u drugoj rješava potencijalno strujanje. Osim ove dvije, radi usporedbe je uvedena i treća metoda, odnosno iskustvena aproksimacija Salvesenove metode za područje manjih valnih duljina.
Primjenom navedenih metoda, provedeni su proračuni dodatnog otpora zbog utjecaja valova za četiri različita broda: dva broda za prijevoz kontejnera, jedna brod za prijevoz rasutog tereta i jedan ro-ro. Rezultati su prikazani grafički, uz usporedbu s eksperimentalnim vrijednostima za dostupne slučajeve.

***Key words**: dodatni otpor, gibanje broda na valovima, gubitak brzine*