Study on Drag Reduction of a Ship due to a Drainage Slit

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Abstract: In this paper, research on drag reduction of a two-tailed ship with bulbous bow due to a drainage slit is carried out using numerical simulation, and the computational result is verified by measuring the total drag force and velocity distribution for the ship models in the wind tunnel. The flow field around three different ship model, which are original ship model, ship model with a drainage slit from the bow to stern and ship model with a drainage slit from the bow to step, are calculated by adopting SST k-ω model, neglecting the influence of free surface. The computational total force and velocity around the bow and stern accords with the experimental result. Furthermore the influence of flow field and drag reduction that effected by the drainage are analyzed. The research results show: pressure coefficient decreases obviously on the bow, and wall shear stress diminishes slightly. The velocity field near the inlet and outlet of the slit changed a lot. The drag reduction ratio is greater than 2%. According to the flow structure and the pressure variation on different parts of the three ship models, the mechanism of the drag reduction of this passive control method are discussed. The reasons for the drag reduction are the pressure drop on the bow and the variation at the flow field of the stern by opening the drainage slit.

Key words: Drag reduction, Pressure distribution, numerical simulation, velocity measurement

Figure 1: The original ship model.
References

