

## Power-Saved Bubble Generation by Hydrofoil for Marine Drag Reduction

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Installation of hydrofoils to ship wetted surface enables bubble generation to realize at power consumption much lower than conventional bubble generators. The principle utilizes the low-pressure region created above an angled hydrofoil to induce atmospheric into deep water (see Figure (a)). The performance depends on the shape of the hydrofoil as visualized by our experiments (see (b)) and a set of numerical simulations based on VOF-coupled Navier-Stokes equations (see (c)). The devise has improved the net power saving of a large ship by bubble-base frictional drag reduction as shown in (d). In the paper and the presentation in ICMF2010, we describe the multiphase fluid dynamics in terms of the hydrofoil-water-air triple interaction, and the method to generate many small bubbles at high flow rate using this principle.

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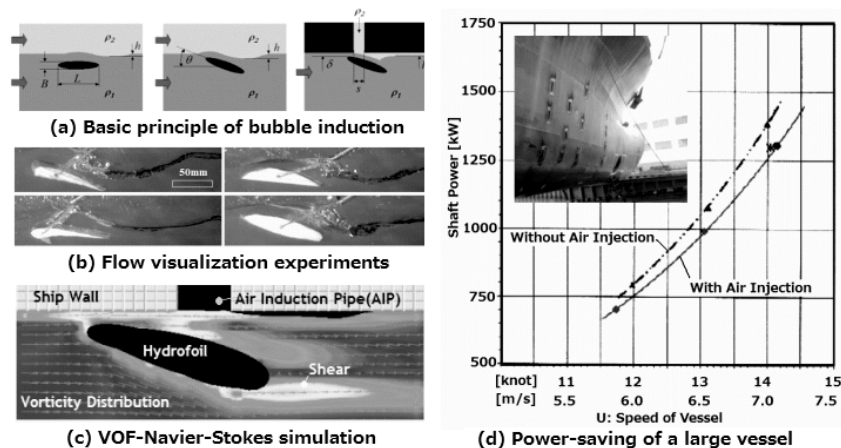


Figure 1. Principle, flow visualization, CFD simulation, and application to a large vessel