

During a typical optimization assignment, the ABS Energy Efficiency team will guide the owner through the following steps:

ABS INDEPENDENT HYDRODYNAMIC OPTIMIZATION

A paradigm shift in ship design has occurred in recent years. Previously, ships were designed to perform with minimum fuel consumption at one design point, i.e., at one specific speed/draft combination. However, uncertain fuel prices and regulations impacting energy efficiency have forced industry to investigate ways to reduce fuel consumption.

To ensure that a vessel has the best possible performance, design parameters must be reviewed thoroughly. For every point in the operational profile, each candidate design must be investigated and a weighted performance must be calculated to find the candidate with the lowest fuel consumption. To perform such investigations today, designers use advanced parametric design tools coupled with state-of-the-art Computational Fluid Dynamics (CFD).

ABS offers an independent hydrodynamic optimization service. The assignment can cover complete

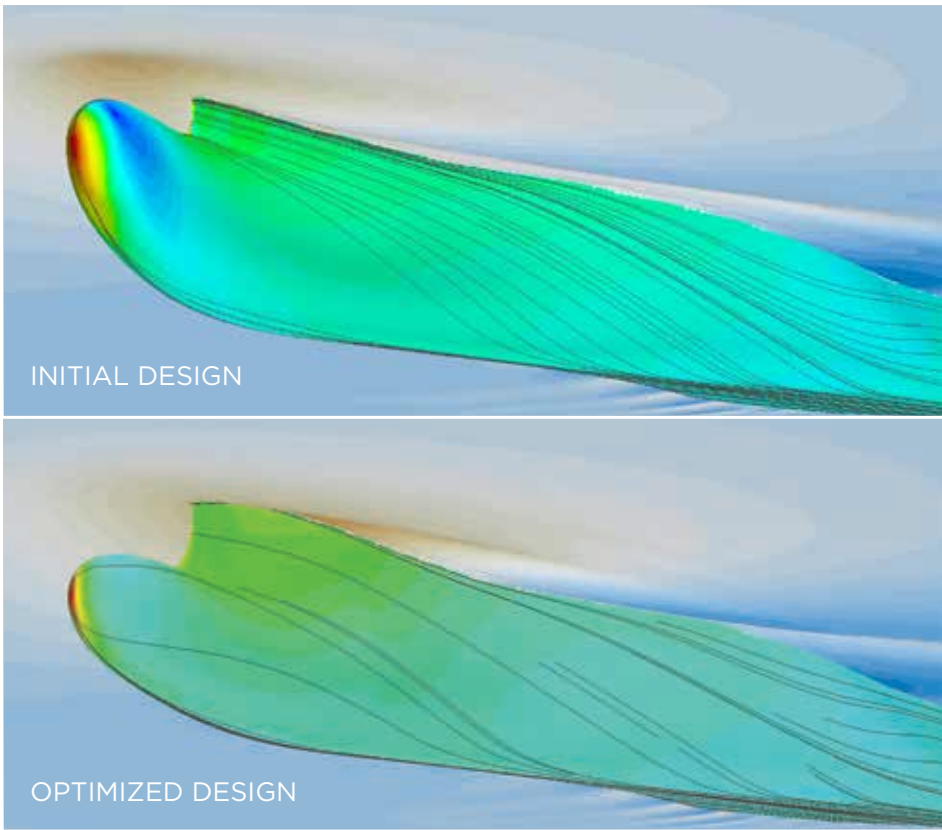
hull forms, bulbous bows, appendages, etc. The service is a package of tasks that guides the owner through the optimization process to ensure a fuel efficient new vessel design or vessel conversion.

It is important that ABS gets involved early in the design phase to gain the most from the independent optimization service. At an early stage on new construction, there are usually less design restrictions and less costs related to eventual design changes.



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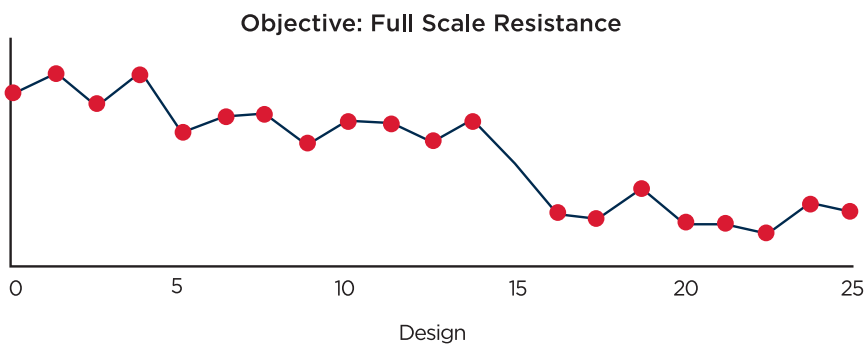
STEP 01	Review and discuss the vessel's design and intended operation to understand possible constraints / hard points.
STEP 02	Define operational profile in collaboration with the owner.
STEP 03	Perform CFD simulations of the initial hull form to establish a baseline performance for comparisons of the optimized hull form.
STEP 04	Perform parametric optimization starting from the initial hull lines in search of the most fuel efficient vessel design.
STEP 05	Perform CFD simulations of the optimized hull form and compare performance with the initial to document the potential savings.



The ABS Energy Efficiency team is multi-disciplinary, with extensive experience in ship hydrodynamics, numerical modeling, model testing, full scale measurements, design, ship management and operations and regulatory compliance. Each service builds upon the ABS position as a leading provider of classification and regulatory compliance services, and

seeks to further our mission of protecting life, property and the environment. Leveraging extensive experience and knowledge enables ABS to provide detailed and in-depth recommendations supported by advanced tools to help owners and operators meet their operational and regulatory needs.

History of Full Scale Resistance Value as Optimization Progresses



For additional information on ABS' Energy Efficiency services, please contact us at: energyefficiency@eagle.org

STEP
06

Provide recommendations on possible changes or points for further clarification.

STEP
07

Assist with the matching of propeller and main engine.

STEP
08

Provide a final presentation and a brief report with recommendations.

STEP
09

Assist the client with a techno-economic evaluation of the optimized hull form's impact to the overall economics of the vessel.

STEP
10

Assist with the planning and evaluation of model test program.



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