

FRIENDSHIP-Framework

The competitive edge in hull form optimization

The challenge of optimizing hull forms

Increasing ship energy efficiency and complying with environmental regulations like IMO's Energy Efficiency Design Index demand advanced technologies for optimizing hull forms. Top-performing ship hulls are potentially decisive to succeed in the competition for customers and market position. Owing to the market's overcapacity customers demand better product performance and a better price. Simulation-driven design is a technology that allows designers to develop better designs in shorter time. The introduction of simulation-driven design increasingly gives leading ship yards, design offices and model basins the competitive edge for fast and successful hull design.

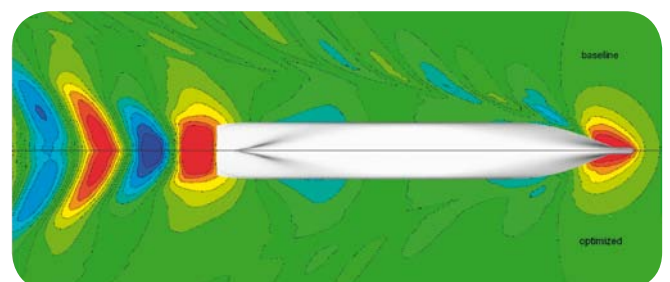
The solution you need

The FRIENDSHIP-Framework offers simulation-driven design solutions for effective hull form development. It is the only software that is particularly suited for hull form optimization – from engineers for engineers. Integrated simulation and automated geometry variation accelerate the design process and lead to better performing products than other approaches. If done manually, change requests for a hull form usually require hours to days under elaborate consideration of constraints. Performance examination of manually generated variants by CFD or model tests often advises a design change leading to further iterations, which burdens budget and schedule. Parametric modeling, in contrast, reduces the effort of a change in design to seconds while automatically monitoring constraints.

Integrated simulation is readily available to analyze the design's performance. Within the FRIENDSHIP-Framework the user defines the degrees of freedom, constraints and performance objectives of the specific optimization task – and the system delivers the performance of hundreds of design variants in overnight studies. Optimization algorithms drive the variant generation and assessment. In the end, only the best performing variant will usually be turned into a physical prototype for subsequent model testing.

Sample of increased efficiency: MSC Danit

Daewoo Shipbuilding & Marine Engineering (DSME) used the FRIENDSHIP-Framework for the hydrodynamic optimization of the 14,000 TEU container vessel MSC Danit. The software



Wave resistance optimization: favorable wave patterns of the optimized hull form (lower half) in comparison to the baseline (upper half)

was used to realize form variation and carry out optimization. Compared to the baseline design, the final hull form showed an improvement of 50 percent reduced wave resistance, better propulsion performance and a higher robustness of the vessel with respect to off-design conditions. According to DSME, the application of the design software achieved a faster optimization process, increased automation in the design process and improved speed performance of the vessel. Backed by the positive results, DSME now uses the FRIENDSHIP-Framework routinely for the optimization of new hull designs before model testing.

How you benefit

Creating and assessing hundreds of variants in overnight studies gives you a knowledge advantage in the preliminary design phase, especially prior to the lines freeze. You are able to choose the best design variant for model testing from numerous alternatives based on comprehensive performance assessment. You gain higher knowledge and improved design quality long before the model testing and building phase.

Hull form optimization within the FRIENDSHIP-Framework is your competitive edge. It realizes a range of tangible benefits:

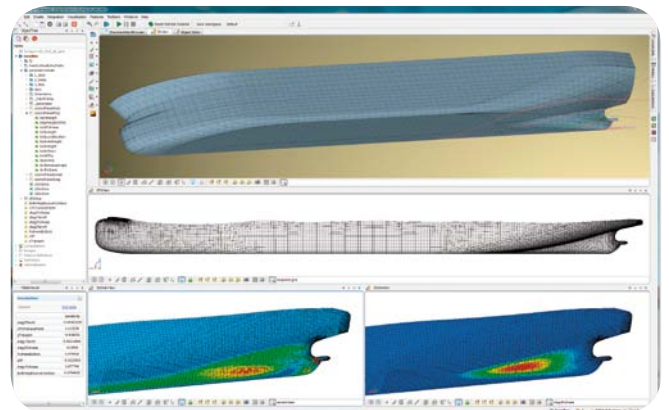
- Integration platform with tight interfacing of external codes and simulation programs like CFD solvers (e.g. SHIPFLOW, FINE/Marine, STAR-CCM+, ANSYS CFX, FLUENT, Neptune, Wavis, Seakeeper, MAPS and OpenFOAM).
- Improved design quality: better hydro and aerodynamics, increased energy efficiency (typically 5 % for ship hulls), better seakeeping, higher robustness, reduced maintenance costs
- Reduced development time: more designs and deeper insight with existing capacity from a very early stage
- Lower costs and less time spent in model testing, less physical prototypes, reduced risk of expensive late changes
- Facilitated design and optimization from imported geometry (IGES, offset files, STL) and from scratch
- Embedded optimization algorithms for systematic variation (e.g. Sobol), single objective optimization (e.g. Tangent Search Method) and multi-objective optimization (e.g. NSGA-II Genetic Algorithm)

The FRIENDSHIP-Framework.

Software for simulation-driven design | Faster processes. Better products. Higher competitiveness.

Software-related services

Our software solutions are complemented by comprehensive implementation and support services. We analyze your current design process and fit a customized simulation-driven design solution. We assist you in the selection of suitable simulation codes. We make sure that you get the most out of our software and show you how – with a pilot optimization project and training on your site. Our services range from configuration assistance, technical consultancy, process integration and customization to professional training and data migration. We are delighted to work with you on your own individual solution!



Aftbody optimization: adjoint sensitivities on the aftbody of a bulk carrier, indicating favorable areas for shape changes

FRIENDSHIP SYSTEMS your best partner

Based on long-standing design expertise the company develops and distributes the FRIENDSHIP-Framework. As part of the GL Group with decades of experience and more than 6.000 specialists around the globe we offer you the highest investment security.

