



## MARITIME

# ECO RETROFIT

## Improve your vessel's performance for today's market

By reducing fuel costs, you can make one of the highest impacts on your bottom line, thereby improving your profit margin. Backed by DNV GL's Maritime Advisory, you can benefit from the lowest possible fuel consumption thanks to ECO Retrofit.

### **The challenge: competition with newer ships**

Existing vessels have to compete with new, more energy-efficient ships entering the market. A charterer's negative assessment of the vessel's fuel efficiency can lead to lower rates or - worst case - to no charter agreement at all. To make vessels competitive in today's market, owners need to take action and consider retrofitting the older ships in their fleet or those that are not fit for purpose.

### **The answer: ECO Retrofit**

Covering the broad range of retrofit options, the modular ECO Retrofit approach helps you to evaluate, identify, prioritise and implement the best retrofit measures tailored to your needs, vessel and budget.

ECO Retrofit considers four specific levers that provide the highest impact and best return on investment - taking your individual operating profile into account - namely:

- **Bow form** - to optimise the bulbous bow under consideration of relevant design constraints
- **Engine and auxiliary systems** - to improve the efficiency of your ship's operating systems for real energy demand
- **Propeller** - to recommend the best-suited propeller for highest efficiency
- **Propulsion Improving Devices (PIDs)** and appendages - to evaluate and support your decision of the best-suited PID

Furthermore, DNV GL's experts can assist you with additional advice on any further possible retrofit measures.

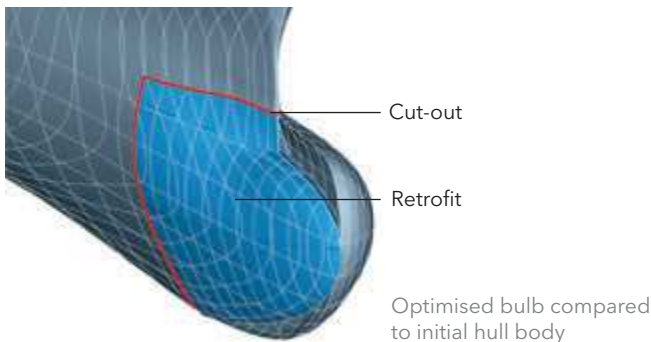


### Effective step-by-step approach

Our experts guide you throughout your project - from a high-level scanning and prioritisation of options to actual detailed implementation. Starting with an initial cost-benefit assessment, we provide you with our comprehensive estimation concerning your options and their return on investment. This report allows you to choose the options that most effectively improve the performance of your vessel. In a second step, we develop the full analysis required for implementation. For instance, we generate the new hull geometry and support you during detailed engineering.

### Leading technology ensures best results

The unique approach for bow optimisation developed by DNV GL's team goes beyond standard computational fluid dynamics (CFD) and model tests to find the optimal solution for your requirements. Parametric modelling, advanced CFD and genetic optimisation strategies are combined to take bow optimisation to a new level. A detailed analysis of the propeller, PIDs and optimised bow is carried out via fully viscous RANS analysis.



### Our ECO Retrofit solution offers:

- Initial cost-benefit study from an expert perspective for a number of possible retrofit/upgrade topics
- Definition of a sensible speed-draught target matrix and assessment of steel drawings to identify possible scenarios for hull shape conversions
- Provision of a reliable savings potential indication per retrofit measure utilising our expertise and state-of-the-art computational tools
- Development of the detailed technical retrofit solutions based on your specific selection
- Guidance and expert advice addressing all topics related to support, for instance towards tank test institutes, sub-suppliers, yards' works and sea trials

### Your benefits with ECO Retrofit:

- Quick and reliable assessment of expected savings for the measures based on your individual operational needs
- Independent, highest standard expert advice and guidance to meet your business' specific requirements
- Outstanding quality and reputable advisory services thanks to our world-leading combination of software tools, computational capacity and expertise
- Increased economic value through higher vessel attractiveness on the market, offering a sustainable competitive advantage

DNV GL likewise offers a broad range of advisory services during the concept design phase as well as other solutions for enhancing operations to be more fuel efficient. Please contact us to discuss further fuel-saving measures.

### SAVING FUEL WITH ECO RETROFIT

The owner of a 13,100 TEU container carrier considered retrofitting the ship's hull shape to today's speed profile in slow steaming mode. DNV GL's experts and the ship owner jointly derived a new operational matrix for speed and draft. For two alternative steel cut-out options, some hundred alternative designs were calculated and compared to find the most beneficial in terms of operational demand.

- DNV GL calculated an average fuel saving of 5 percent with the retrofitted bow design in accordance with the target matrix
- The maximum savings for one of the defined target conditions was 11 percent
- Owners expect a financial benefit of USD 925,000 per year just for the retrofitted bow
- Further savings of about 5 percent were achieved by the interaction of the new (bow) hull form with a derated engine and new propeller design

On the basis of DNV GL's final report, the owner chose to perform tank testing in order to show the overall results to the charterer for approval.

### Greener shipping from the experts

DNV GL's Maritime Advisory is specialised in impartial maritime consultancy and advanced engineering services, with a focus on enhancing energy efficiency both in design and operation. Our experienced staff has leading technological expertise across all ship segments and helps ship owners, operators, yards and designers globally to improve fuel efficiency, minimise environmental impact and increase profitability. We are the largest maritime advisory company with a global presence: more than 300 experts support the industry in the key challenges of today.