GREEN SHIPPING
WEATHER ROUTING TO ENHANCE SAFETY AND EFFICIENCY OF SHIPPING

Initial Situation
Shipping transports 90% of global goods while consuming 276 mega tonnes of fuel annually. This leads to an emission of 940 mega tonnes of CO₂ and a contribution to 2.5 % of global Greenhouse Gas emissions annually. One approach to reduce these emissions is the application of adaptive weather routing solutions developed at Fraunhofer CML.

Voyage Optimization
Voyage optimization incorporates various tools and guidances to ensure cost effective, low-emission and safe travelling of any vessel on any voyage. Utilizing weather forecasts of all time frames, both long-term strategic routing and short-term harsh weather safety assessment build the foundation which can be extended and customized according to

Key Benefits
CML’s weather routing solutions offer the possibility to
/// improve safety for the vessel, crew, cargo and the environment;
/// enhance efficiency by minimizing time and fuel during voyages; and
/// improve communication between vessel and shore.

Key Issue
Pre-calculated routes are constantly adapted to weather conditions along the track by means of optimization algorithms and long-term weather forecasts. From the tightly scheduled fast RoRo ferry in regular service through the slow steaming container vessel on a deep sea voyage to an innovative ship concept, there is always a need for customized voyage optimization.
Approach
A customized voyage optimization project consists of four consecutive steps:
1. Specify optimization requirements
2. Adapt framework
3. Implement and test functionalities
4. Assess effects and potentials
At all times Fraunhofer CML maintains close contact with the customer to develop a voyage optimization which provides a real client benefit.

Optimization Requirements
Together with the customer, Fraunhofer CML answers the key questions to develop a tailor-made solution for voyage optimization. We elaborate customer requirements regarding the main objective, ship, routing and other constraints as well as the degree of onboard integration, strategic decision support and operational guidance.

Objectives
The system developed by CML is capable to achieve complex objectives with highly sophisticated optimization goals:
/// constant speed or power;
/// specified time of arrival; and
/// fuel and cost savings.

Framework Adaption
In line with user requirements CML derives necessary functionalities and interfaces. Whether the special characteristics of the ship, the route or the operators’ preferences require special attention, new functionalities can be added according to to customer’s demands.

Implementation, Testing & Training
Focus is on the implementation based on state-of-the-art optimization algorithms, the test and documentation of all functionalities. In-house simulation environment allows to test the modules extensively. A subsequent on-site testing at the customer’s premises will allow to verify the usability. The integral part of the hand-over to the customer is an easy-to-understand documentation and an expedient training, delivered online or at the client’s offices, whichever is more suitable.

Assessments
CML offers further scientifically based research on the applicability, effects and potentials of voyage optimization for vessels and fleets. Pre-voyage optimizations and ex-post voyage analysis allow to assess vessels’ economic feasibility, to improve future vessel designs and provide decision support.

KEY BENEFITS OF WEATHER ROUTING AND PERFORMANCE OPTIMIZATION
/// Time and Cost Savings
/// Improved Safety
/// Increased Operational Efficiency
/// Quick Implementation
/// Straightforward Visualization
/// Reporting in a nutshell
/// Individual Solutions
/// Up-to-date scientific foundation

Performance Management
Performance management enables a comparison between the optimized and actual performance of a voyage forming the basis for fuel and emission reductions on the way to Green Shipping. CML’s performance assessments offer the possibility to
/// benchmark ship performances in relation to others or a comparative fleet;
/// identify measures to achieve savings in fuel consumptions and emissions;
/// demonstrate transparency to customers, stakeholders and administration using standardized reporting schemes;
/// receive ETA and speed confidences.
Using adaptive dashboards customers gain quick overviews of their fleet deployment and performance as well as operational profiles depicting critical parameters at-a-glance.

CONTRIBUTION OF SHIPPING TO GREENHOUSE GAS EMISSIONS*

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