R&D Innovation

Project Title

Open Water & Tank Model Testing to Compare Wind Farm Service Vessel Hull Form Performance Against Prevailing Conditions.

Assignment

To characterise the performance of different fast work boat multi-hull designs, from 15m to 40m in length, defining the performance benefits and drawbacks of each hull design approach.

Approach

- Six hull forms were selected designs included existing industry standard forms and a number of new, novel design proposals.
- Physical models were constructed and tank tested, comparing their calm and head sea rough water performance over a range of speeds, displacements, trims and hull separations.
- The performance of the models when manoeuvring on a wind turbine tower was investigated over different sea conditions, tidal rates, thrust levels and fender arrangements.
- Tank testing also investigated added resistance in waves, the effect of freeboard and hull form on slamming and deck wetness and the ability of each design to carry a significant cargo load on the foredeck.
- Various hull appendages were investigated, including bilge keels, hull foils, active/passive fins and interceptors, in order to assess their effect on motion damping and powering performance.
- Physical models were then adapted for free running, open water testing - providing for the most realistic operational assessment possible.
- These fully instrumented models were run in measured open sea conditions over a range of significant wave heights and at both transit and loiter speeds.
- In parallel to this hydrodynamic research programme, instrumented sea trials of new build vessels undertaken prior to delivery and the performance monitoring of vessels in service has provided a unique opportunity to correlate theoretical, test and trials data.

- Personnel safety and comfort were considered in detail with assessments of sea-sickness, whole body vibration and the safety of operational personnel working on the vessel.

Highlights

- The physical models built for free running, open water testing were equipped with propeller and water jet propulsion systems, appendages and superstructures.
- Data-loggers and cameras on the models recorded the vessel's onboard characteristics, including the control inputs from the remote helmsmen.
- Long fast runs at different headings, impossible in the confines of conventional research facilities, allowed good statistical data to be logged.
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Outcomes

- The results of this breakthrough research project provide a significant advance in the understanding of the design of small fast workboats for wind farm support activities.
- Analysed by an assessment team comprising naval architects, skippers and operators, the research programme has been directed at minimising risk in the provision of these specialist vessels to customers.
- This research provides the unique ability to predict the likely performance, operational availability and fuel economy of these hull designs for particular sea areas, routes and tasks - reducing the risk of selecting an inappropriate vessel for a given task.
- This significant database provides the basis for the development of the next generation of fast offshore work boats and wind farm service vessels.