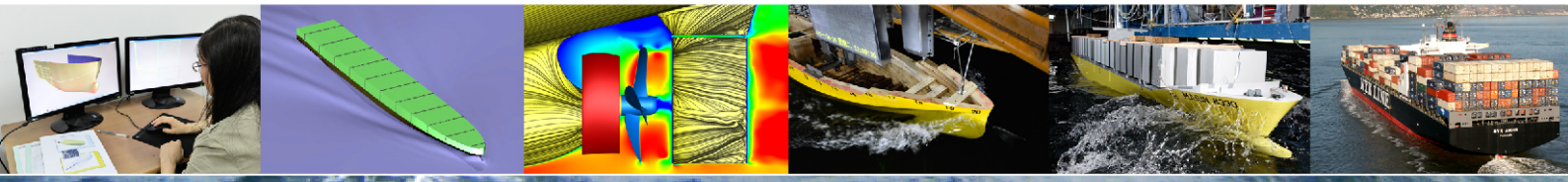


Building a leading hydrodynamic consultancy base in Asia

创建亚洲领先的水动力学咨询基地

Prediction of propulsive performance 推进性能预报

QDESP

QDESP predicts the resistance and propulsion characteristics of displacement ships. The predictions are based on formulas obtained from a regression analysis on results of MARIN model experiments and sea trials.

QDESP can be used to estimate the speed and propulsion power in the early design stage. Correlation with test or trial data of similar ships is possible. The test data can be used to derive the correlation allowance as input for a new design.

QDESP 可预报排水型船的阻力和自航特性。预报是基于由 MARIN 模型试验和试航结果通过回归分析所得出的公式上得到的。

QDESP 可以用来在早期的设计阶段评估航速和推进功率。相近船型的试验或者试航数据可进行修正。这些试验数据可用于导出相关修正量以作为新的设计中的输入。

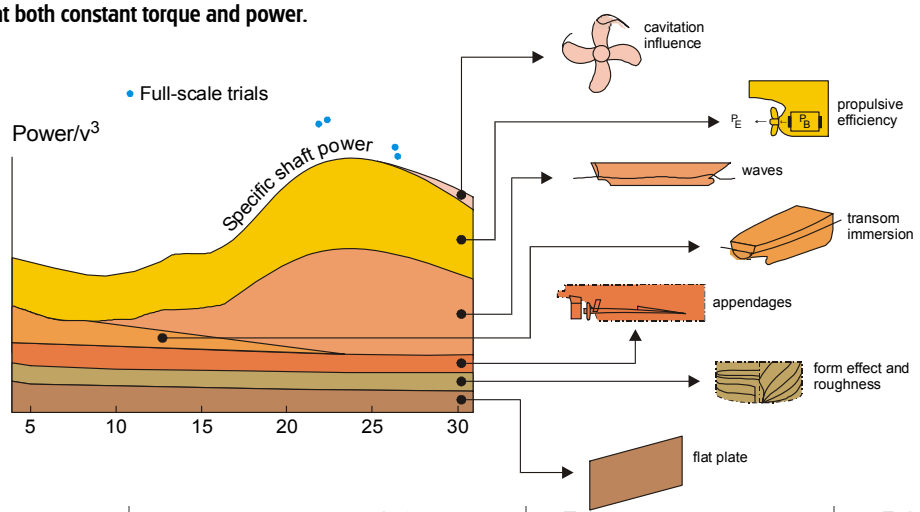
The input parameters are the main dimensions of the ship, the displacement volume, the form coefficients CM, CWP LCB, the bulb particulars, the immersed transom area when at rest and various parameters related to the propeller arrangement. For the calculation of the drag of stream-lined and flow-oriented appendages either the equivalent appendage drag factor and wetted surface area or a detailed description of the various appendages can be provided.

QDESP 可提供设计航速下或者设计功率下的阻力成分和推进效率，阻力、推力和推进功率与航速的关系以及在恒定转矩和功率下的推进性能表格。

输入的参数是船舶主尺度，排水体积，形状系数 CM、CWP、LCB，球首参数，静止时尾板水下部分面积和大量与螺旋桨布置有关的参数。对于与流线方向一致的附体的阻力计算，相当的附体阻力因子和湿表面积或者不同附体的具体描述都可以提供。

Application 应用范围

QDESP delivers the resistance components and propulsion efficiency for the design speed or the design power, a review of the resistance, the thrust and propulsive power as a function of the speed and tables of the pulling performance at both constant torque and power.



Example of statistical power prediction 统计功率预报案例

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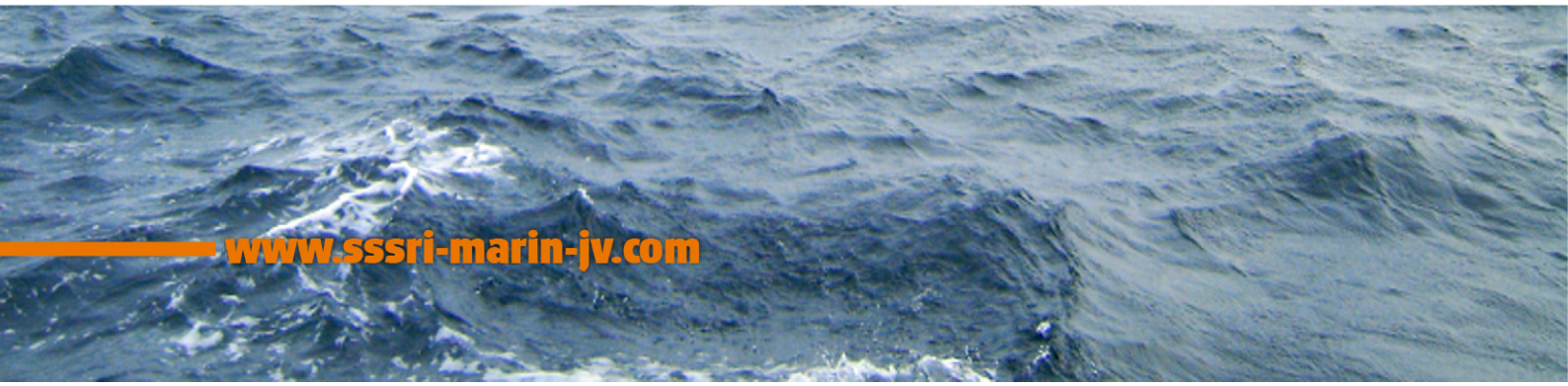

Computational approach 计算方法

QDESP applies a simple hydrodynamic model for the resistance components according to the form factor method. As to the propeller-hull interaction statistical, formulas were derived for the wake fraction, the thrust deduction factor and the relative-rotative efficiency. The preliminary design of a propeller is based on the Wageningen B-series or Ka-series polynomials. The propeller can be designed either for fixed speed or for fixed power.

In addition, either the diameter or the rotation rate can be optimised within given constraints. Effects of cavitation on the propulsion, if any, are approximated. QDESP is suitable for some generic optimising hull forms related to main dimensions, but optimisation on detailed hull characteristics is discouraged. In this case, the performance effects of various parameters are modelled with insufficient accuracy.

QDESP 根据形状因子法为阻力提供了一个简单的水动力模型。至于桨船的相互作用，统计公式导出了伴流分数，推力减额和相对旋转效率。螺旋桨的初步设计是基于瓦根宁根的 B 系列或者 Ka 系列的多项式。螺旋桨可以在固定航速或者固定功率情况下设计。

另外，直径和转速都可以在给定的限制条件下优化。对于推进器上的空泡影响，即便要，也可以估算出来。QDESP 适用于一些与主尺度有关的一般船型优化，但是不建议针对具体船型进行优化。在这种情况下，大量对性能影响的参数只是在精确度不够的条件下模拟的。

Accuracy 准确度

As to the accuracy, QDESP results show both systematic and random deviations. Random deviations are about 8 per cent of the delivered power for large, comparatively slow ships (Fn<0.25) and tend to be larger in the steep, pre-hump range around Fn=0.3.

The accuracy in the post hump range is comparable to the accuracy at low speeds. An accuracy similar to model tests can be achieved when QDESP is correlated with relevant model test data.

Regarding the systematic deviations it is noted that QDESP represents 'the average ship'. Optimised hull forms can perform 5-10 percent better than predicted by QDESP. For special hull forms such as dredgers and barges QDESP can be used only when checked first against results of similar ships. QDESP cannot be used for planing craft.

就准确度而言，QDESP 结果给出了系统误差和随机误差。随机误差对于低速肥大船（Fn 0.25）来说可能有 8%的收到功率误差，而且在 Fn=0.3 时的陡峭范围内的临界区域可能会变得更大。在超临界区时的准确度和低速下的准确度差不多。当 QDESP 和相近的船模试验数据修正后，便可以得到与船模试验相当的准确度。

至于系统误差，应注意到 QDESP 描述的是平均化的船舶。优化船型可以比 QDESP 预报的好 5-10%。对于像挖泥船和驳船这样特殊船型，只有在首先校核相近船结果后才能使用 QDESP。

QDESP 不适用于滑行艇。

References 参考文献

- Holtrop, J.; "A Statistical Resistance Prediction Method with a Speed Dependent Form Factor", SMSSH 88, Varna, October 1988.
- Holtrop, J.; "A Statistical Re-analysis of Resistance and Propulsion Data", International Shipbuilding Progress 31, November 1984.

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