Validation and Testing of Performance Prediction Algorithms

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This report comments on the various methods applied by HydroComp to validate performance prediction algorithms. It also lists algorithms that have been corrected or revised.

HydroComp utilizes public data (parametric models) for its numerical software algorithms. Reliability of these algorithms takes two forms - one, the faithful duplication of the intended data, and two, successful application to real vessels. Two different testing and validation efforts are undertaken to evaluate each algorithm or method.

PARAMETRIC MODELS

Many of the methods are derived from technical literature. Testing is performed to seek out publication errors and to insure that the codes conform with the intended methodology. Such testing follows the process below:

1. Evaluate the statistical development of the parametric model. Review regression process and look for statistical "instability".
2. Perform hand calculations of methods to establish test variables and results.
3. Determine boundary conditions of algorithms (e.g., points of instability or possible calculation error, locations of divide by zero, etc.).
4. Hand check codes against method.
5. Use an algorithm test driver to confirm results of codes.
6. Test installed algorithms within the larger program.

Coding errors, of course, are corrected. Suspected errors within the methods will either cause the method to be rejected, or will initiate a dialog with the original author of the method. HydroComp has established in-depth relationships with many of the international research institutions and experts, and this network is exploited to uncover possible errors and solutions. HydroComp has identified and corrected publication errors in the following algorithms:

Resistance and propulsive coefficients

Series 60	Oortmerssen method
SSPA series	USNA YP series
UBC series	Series 62/65
Howe barge train	Mercier method

Propellers

Kaplan ducted propeller series

APPLICATION

Comparison of the algorithms with model testing or full scale results provides feedback on the applicability of the various methods to contemporary vessels. HydroComp maintains a library of hundreds of model tests and trials for such testing. When trends are discovered, a description of the behavior is noted (typically in the help system and User's Guide).

In some cases, poor behavior can be attributed to numerical problems which are caused when the vessel's parameters are outside the range of the method's dataset. It is often possible to improve this type of poor behavior "at the edges" without compromising the integrity of the method through careful additions to the algorithms. Application behavior has been improved in the following methods:

Resistance and propulsive coefficients

BSHC method
UDenmark method
Holtrop method

