ShipX Ship Speed and Powering

Predicting Speed Loss in a Seaway

SINTEF Ocean has developed a program for numerical calculation of involuntary speed loss in waves. The program is very well suited to be used in the early design phase. The program is integrated in the hydrodynamic workbench ShipX.

The motivation for developing this software was to enable the ShipX workbench environment to provide the user with the ability to calculate calm water performance as well as speed loss in waves within one product. Both of these features were implemented in the ShipX Plug-In "Ship Speed and Powering". The Plug-In is based on the work behind the SINTEF Ocean products Em-Power (calm water resistance and propulsion) and Seaway (speed loss in a seaway).

BACKGROUND

When the ship encounters waves, the total resistance increases and the propeller thrust decreases. As a result, the ship cannot sustain the same forward speed as in calm water. Involuntary speed loss in waves is a result of a change in point of equilibrium between the total ship resistance and propeller thrust.

- Speed loss components included:
- Added resistance in waves (typically from ShipX Vessel Responses (Veres))
- Thrust loss due to ship motions in waves
- Wind resistance

INPUT

Speed loss calculations require a relatively large set of input data. The engine and propeller characteristics must be known, as well as the total still-water resistance and added resistance in waves. If speed loss calculations are to be performed for an irregular sea-state, the wave spectrum defining the sea-state is required input. The ship motions are required for the calculation of thrust reduction in waves.

The calculation of ship motions and added resistance in waves is done in the ShipX Vessel Responses (Veres) Plug-In and the results are used as input in speed-loss calculation.

USE

In the development of ShipX Ship Speed and Powering, a fast to use, easy-to-learn user interface has been one of the main focuses, avoiding manual editing of input files. The speed loss software is integrated as an application in ShipX, and has the same intuitive, easy-to-use user interface as the rest of ShipX. Running the calculations takes from a few seconds up to a minute, depending on the speed of the computer, and the number of environmental conditions (sea-states and wave headings). As soon as the calculations are finished, reports and plots are available directly from ShipX. Reports and plots can easily be exported to Microsoft Word for quick and easy report generation.
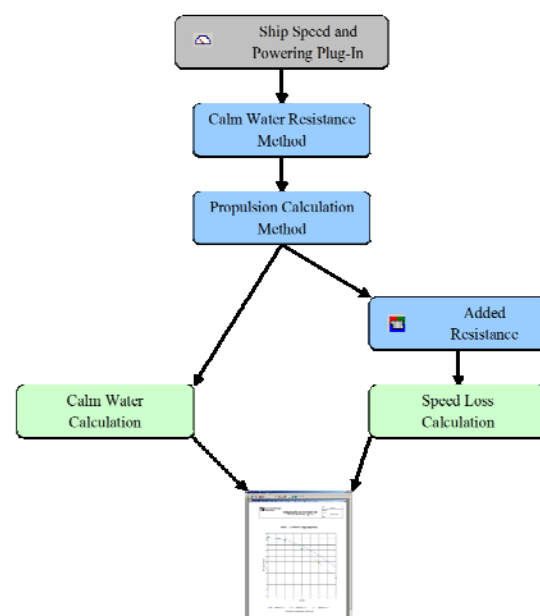
The new program has been tested against the existing SINTEF
Ocean Seaway code and produces identical results.