

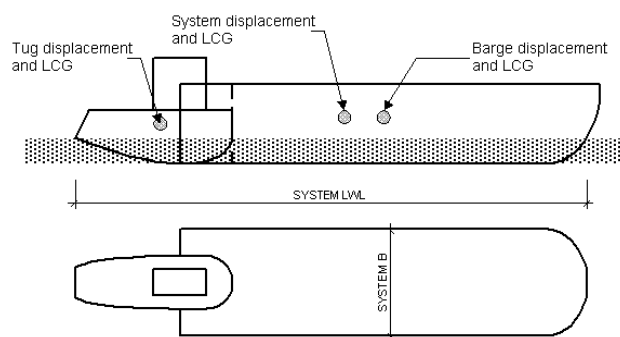
Predicting Resistance and Power for an Integrated Tug/Barge Using NavCad

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Predicting resistance and power for an integrated tug/barge (ITB) unit requires us to consider the connected "system". However, experience has shown that the resistance prediction of the system and the power prediction must be treated differently. The recommendations shown herein are based on a limited review of actual trial data. There is very little information available about the hydrodynamics of ITBs, and much of what is presented below is based on common sense, validated with a handful of actual sea trials.

RESISTANCE

The approach here is to model the tug and barge as a single ship system. It will be necessary to calculate the total length, displacement, wetted surface and system LCB. Use maximum beam and draft (most likely from the barge). You can then choose a suitable prediction method for the new ship system. The illustration below shows this:



You will want to remember to add appendage drag. (This typically amounts from 5% to 10% of the bare-hull drag.) Also, many ITBs have significant hull and superstructure area, so wind drag may be significant.

POWER PREDICTION

Predicting power is the same as for any vessel using NavCad, with one exception - the calculation of the propulsive coefficients (wake fraction, thrust deduction, relative-rotative efficiency) are best modeled by considering the tug only. Intuitively this makes sense if you consider the nature of these coefficients. The water flow gets "reset" with turbulence at the intersection of the tug and barge, leading us to conclude that it is the tug's geometry that drives the coefficients. Trial data has suggested that this is the proper approach.

Our recommended technique is simply to prepare a second project for the tug only, run a Shaft Power calculation to predict the propulsive coefficients, and then manually transfer these coefficients to your integrated system project. (You can also do a copy/paste for an entry grid selection in System Analysis Edit->Hull.) Then run Shaft Power or System Analysis without predicting new coefficients.

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