Title: BOLLARD PULL ANALYSIS SPECIFICATION

Subject: Marine Transport Analysis

Project: All

Client: All

Spec no: 098503  Revision: 0  Period:

A. GENERAL

This document specifies the bollard pull analysis model as available on the Online Marine Engineering website at the following URL's

www.transportanalysis.com
www.OnlineMarineEngineering.com

Example Transport Model

The transport BOLLARD model can be used to determine if a proposed tug arrangement is suitable for a defined tow. The analysis includes general floatation condition, 3-D Diffraction of the barge and resistance calculations.

To run the analysis the user should define the vessel, the cargo, and the environment and the tugs. Based on this data the analysis will run on our server and the results will be sent back to the user right after the analysis is
The following two reports are available:

1) Summary Report
This report will only present the conclusions of the analysis without the supporting data

2) Full Bollard Report
The report of this analysis will include the floatation analysis and the full report of the bollard pull analysis. Also the tow speed will be estimated based on the tug characteristics.

Tow speed estimate diagram

B. METHOD STATEMENT
The Bollard model has been programmed in MOSES from UltraMarine. MOSES is a multipurpose marine and structural simulation computer program widely used for transport and installation design of offshore structures. See the ultramarine internet website for more information on MOSES, address is: http://www.ultramarine.com/

The vessel model is represented by a 3-D plate representation of the hull outer surface. Most models also include the inner ballast compartments as 3-D Plates. The cargo is modelled as spread masses in longitudinal direction as specified by the user. The size and the volume of the cargo is indicated and used to determine wind drag loads on the model.

B.1 Minimum Bollard pull analysis
The minimum required bollard pull will be calculated using the defined environmental conditions form either the NDI or DNV guidelines. Both guidelines requires the tugs to hold the tow against these condition at zero forward speed.
The loads considered are wind drag, current drag and wave drift forces.

**B.2 Tow speed estimate**

The model will also predict the tow speed for the proposed tug arrangement based on several power settings of the tugs. The tow speed will be presented for Stillwater and for a user defined environmental condition. Barge and tug wave resistance has not been included in the tow speed estimate. It has been considered that the speed is usually low enough to justify the negligence of the wave resistance.

**OUTPUT OF ANALYSIS**

The transport analysis provides the following data and checks:

1. Summary of the Design Basis of the analysis
2. Barge draft and ballast condition
3. Summary of all masses
4. Guideline minimum Bollard pull check
5. Tow speed estimate for the proposed tugs

The bollard pull requirements and guideline check can be set to DNV or NDI.

**CLIENT PROVIDED DATA**

The following data needs to be provided for a full run of the transport model:

1. Define method to set draft of barge
2. Mass, size and location of Cargo Items
3. Design significant wave height
4. Design Wind Conditions
5. Define target tow speed

**STANDARDS AND CODES**