

Validation case 21

Frequency domain analysis of a barge



Version 15.1.0

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Table of Contents

Chapters	Pag.
Frequency domain analysis of a barge	1
Problem description	1
Mesh	2
Results	4
Validation Summary	6

1 Frequency domain analysis of a barge

Problem description

The present test case concerns the frequency domain analysis of a simple barge. The analysis is performed with wave periods ranging from Tmin = 4.41 s. to Tmax = 22.12 s. with all waves propagating in the direction parallel to the longitudinal axis of the barge. Such a model is intended for the validation of the frequency domain module of SeaFEM. To this aim, the results obtained from the simulations using SeaFEM are compared againsts those obtained with AQWA. Additionally, two different configurations are tested using SeaFEM. Case 1 corresponds to a barge located near a wall (see figure 1 below). Case 2 deals with two identical barges laid side-by-side (see figure 2). Due to the symmetry of the problem, both cases are actually equivalent. Hence, comparison of these two configurations provides an additional verification of the correctness in SeaFEM calculations.



Fig. 1.: barge near a wall



Fig. 2.: two barges laid side-by-side.

The characteristics of the barge are summarized in the following table.



Parameter	Barge
Length (m)	80.0
Breadth (m)	20.0
Draft (m)	10.0
Displacement Weight (kg)	1.64E7
CoG above baseline (m)	3.0
Radius of gyration R_{xx} (m)	20.0
Radius of gyration R _{yy} (m)	5.0
Radius of gyration R_{zz} (m)	20.0

The characteristics of the wall are as follows:

Parameter	Barge
Length (m)	240.0
Depth (m)	12.0

Mesh

Mesh properties for the present analysis are summarized in what follows:

• Case 1:

Mesh properties	
Number of quadrilateral panels in the barge	800
Number of quadrilateral panels in the wall	900

Next picture shows an isometric global view of the mesh used for case 1 in the present analysis.





• Case 2:

Mesh properties	
Nmber of quadrilateral panels in barge 1	800
Number of quadrilateral panels in barge 2	800

Next picture shows an isometric global view of the mesh used for case 2 in the present analysis.





Results

In this section, RAOs results obtained with the frequency domain solver of SeaFEM are compared against the results obtained using AQWA. In particular, Surge, Pitch and Heave RAOs responses of the barge are plotted. AQWA results correspond to the the case of two barges laid side-by-side. In the case of SeaFEM, results from both configurations, (i.e the barge near the wall and two identical barges laid side-by-side) are plotted.

From the resulting graphs, it can be observed that the results provided by SeaFEM for the two configurations under analysis are virtually identical and in very good agreement with the results obtained using AQWA.









Validation Summary

CompassFEM version	15.1.0
Tdyn solver version	15.1.0
RamSeries solver version	15.1.0
Benchmark status	Successfull
Last validation date	27/11/2018