Assignment 2 - Froude Krylov

OE4080

Visharad Borsutkar - NA18B102

Sept 5 2022

This report compares the results obtain from ANSYS AWQA with the one obtained from matlab for Froude Krylov force on a floating structure.

Froude Krylov force :

Froude-Krylov force is calculated using the pressure distribution on the faces of the submerge part of the floating structure. The Froude-Krylov force gives a reasonable estimate of approximate force on a moderately sized structure. Because of the simple nature of the formula, it can be used to compute force on a variety of complex structures

Horizontal F_x and vertical F_z components of Froude Krylov force F can be calculated from the equations below:

$$F_x = C_H \iint_S p \cdot n_x \, dS$$

$$F_z = C_V \iint_S p \cdot n_z \, dS$$

Where,

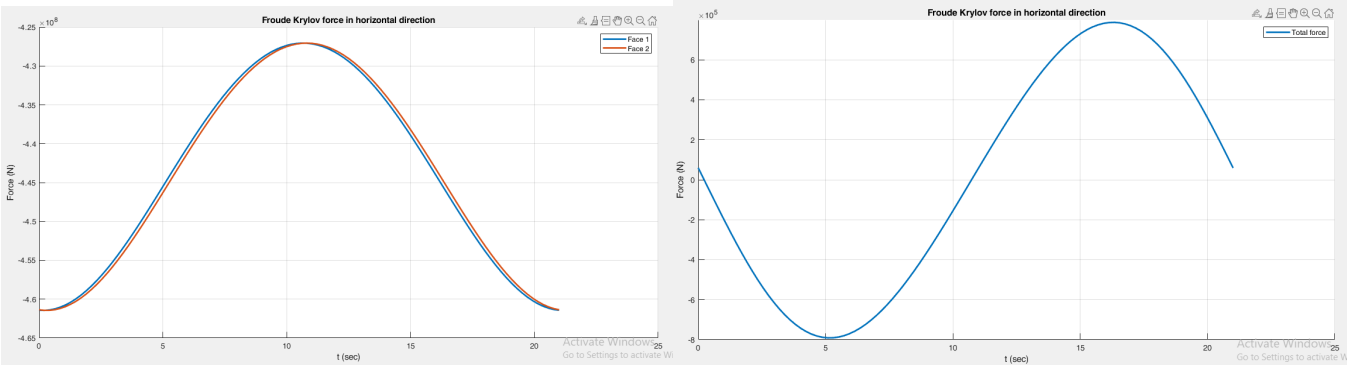
- p is the instantaneous normal pressure
- S is the total submerged area
- C_H and C_V are the constants for horizontal and vertical compoents froude-krylov force respectively.

As the wavelength that we are assuming is much larger than the principle dimension, diameter D, hence, we can assume that the force is only acting in the horizontal direction i.e. x. Hence, the equation for the Froude krylov force simplifies to

$$F = \frac{\rho \, \pi \, D^2 \, \dot{u}}{4}$$

MATLAB :

Implementation of above force is done in MATLAB. MATLAB code used to get the froude krylov ⟶ github results obtained from MATLAB :



(a) plot-1 (b) plot-2

Figure 1: MATLAB results

Ansys AWQA :

The model used in Ansys AWQA :

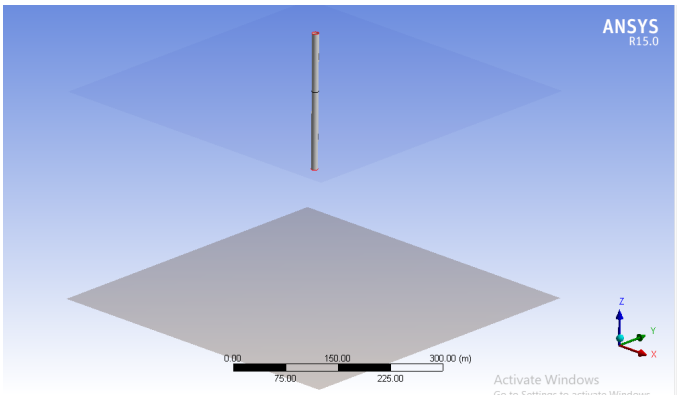
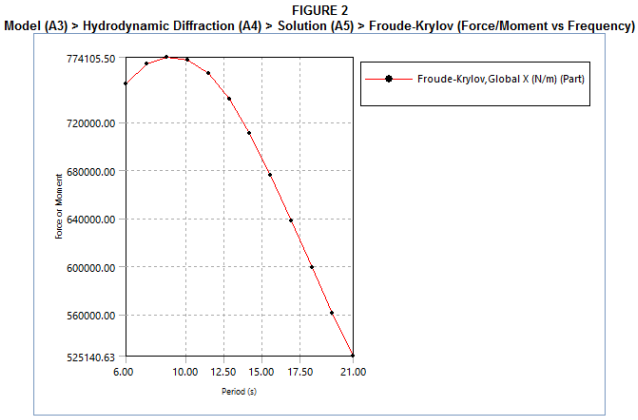


Figure 2: Ansys AWQA

The results from Ansys AWQA are :



(a) Plot

TABLE 18
Model (A3) > Hydrodynamic Diffraction (A4) > Solution (A5) > Froude-Krylov (Force/Moment vs Frequency)

Period (s)	Line 1
21	525140.63
19.636	561021.56
18.273	598878.63
16.909	637723.19
15.545	675778.44
14.182	710607.
12.818	739586.13
11.455	760381.38
10.091	771715.13
8.727	774105.5
7.364	768731.31
6	751958.5

(b) Table

Figure 3: Ansys AWQA results

GitHub link to all the assignments for OE4080 course here