World Academy of Science, Engineering and Technology
International Journal of Aerospace and Mechanical Engineering
Vol:14, No:12, 2020

The Pressure Distribution on the Rectangular and Trapezoidal Storage Tanks' Perimeters Due to Liquid Sloshing Impact

Authors : Hassan Saghi, Gholam Reza Askarzadeh Garmroud, Seyyed Ali Reza Emamian

Abstract : Sloshing phenomenon is a complicated free surface flow problem that increases the dynamic pressure on the sidewalls and the bottom of the storage tanks. When the storage tanks are partially filled, it is essential to be able to evaluate the fluid dynamic loads on the tank's perimeter. In this paper, a numerical code was developed to determine the pressure distribution on the rectangular and trapezoidal storage tanks' perimeters due to liquid sloshing impact. Assuming the fluid to be inviscid, the Laplace equation and the nonlinear free surface boundary conditions are solved using coupled BEM-FEM. The code performance for sloshing modeling is validated against available data. Finally, this code is used for partially filled rectangular and trapezoidal storage tanks and the pressure distribution on the tanks' perimeters due to liquid sloshing impact is estimated. The results show that the maximum pressure on the perimeter of the rectangular and trapezoidal storage tanks was decreased along the sidewalls from the top to the bottom. Furthermore, the period of the pressure distribution is different for different points on the tank's perimeter and it is bigger in the trapezoidal tanks compared to the rectangular ones.

Keywords : pressure distribution, liquid sloshing impact, sway motion, trapezoidal storage tank, coupled BEM-FEM
Conference Title : ICGHOST 2020 : International Conference on Ghost Conference
Conference Location : ghost city, Other
Conference Dates : December 12-13, 2020