COLLOQUIUM

Group: **Engineering Fluid Dynamics**

As part of her/his MSc thesis assignment

Sil van Brummen

will give a presentation, entitled:

Slamming on overboard structures during transportation

Date: **15-04-2016**
Time: **11:30**
Room: **N109**

Summary:

This study investigates the hydrodynamic loads on foundation piles during water impact, with the main focus on the slamming contribution. Slamming is an impact force originating from a high pressure area, located in the spray root, which arises when an object penetrates an air-water interface. The local scale and short time duration of slamming make it difficult to obtain accurate experimental results.

The nonlinear water entry problem is studied numerically with Star-CCM+. Two- and three-dimensional models are created with which water entry is simulated by forcing a cylinder with a constant velocity through an initially undisturbed free surface. The impact force is extracted and expressed as the dimensionless slamming coefficient C_s. In this study the slamming coefficient is assumed to be a function of 5 variables, $C_s = C_s(Vt/R\,, Re, Fr, L/D\,, \theta)$ and the influence of these variables is investigated. Two- and three-dimensional results are compared to experimental and numerical data and validated. The obtained slamming coefficients are in line with experimental data and show good agreement with other numerical results.

In this study it is found the CFL number has to be bounded between 0.5 and 1 in order to obtain a physically correct jet. This is caused by limitations of the volume of fluid (VOF) convection scheme implemented in Star-CCM+. For further improvement of jet formation the Reynolds number is artificially decreased by increasing the dynamic viscosity of both water and air. Additionally this showed that the Reynolds number has no significant influence on the slamming coefficient. A case study is performed with the validated three-dimensional model. Inclined piles are moved through the free surface in a parabolic like motion, simulating a complete water entry to exit trajectory. In this case study it is found that the greatest load on the piles is related to buoyancy and inertia forces and not to slamming. Based on these findings a new formulation to compute the water entry force for a pile during transportation is proposed.

Assessment committee:

Prof.dr.ir. C.H. Venner	(chairman)
Dr.ir. R. Hagmeijer	(mentor)
Dr. A. Pistidda	(mentor from company)
Ir. J.P. Schilder	(external member)

Chairman,

d.d. 1/4/2016