

MARIN and SHELL examine how LNG sloshing affects ship motions

MARIN has been involved in several studies where the sloshing of liquids inside tanks was affecting the ship motions. However, LNG sloshing may cause a different roll response due to the dynamic loads inside the tank. More specifically, the period at which the maximum roll response occurs changes due to the internal LNG waves.

Olaf Waals, o.waals@marin.nl

At present MARIN is developing a simplified numerical model that describes the overall sloshing forces inside an LNG tank. These forces can then be applied to MARIN's time domain tool aNySIM. Then with a correctly tuned model, MARIN is aiming to assess the vessel motions during LNG offloading operations for partially filled tanks.

To validate this numerical model the results of sloshing tests performed together with

Shell are being used. In these tests MARIN mounted a spherical tank onto a oscillating frame and measured the resulting forces. During offloading operations the filling rate of the tanks is changing. As a consequence, the dynamic response of the tank is also changing. The challenge of this work is to find a numerical model that covers the main physics that describe the forces that the tank produces for various filling rates. At the same time the method should be computa-

tionally efficient . This is important because MARIN wants to be able to compute the response for many sea states.

Part of the research is to compare the forces of the numerical model to actual model tests to validate the forces for various frequencies and motion amplitudes. Although no results can be shared at this point MARIN intends to issue a joint publication with Shell for this project. —