

Pressure Measurement on the Surface of a Rigid Cylindrical Body during Slamming Wave Impact

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I. INTRODUCTION

Water wave slamming on marine structures is a critical sea load which always involves very high localized pressure peaks travelling very fast over the surface of the structure. To prevent naval constructions from failing due to wave impact, slamming loads should be carefully investigated. Hence, it is necessary to estimate these loads. Besides analytical and numerical calculations, experimental data is of crucial importance.

II. MEASURING SLAMMING LOADS

Experimentally, slamming loads can be measured by performing pressure recordings on the surface of the object during impact. Literature [1] showed that precise and correct measurements are very difficult to perform, especially for slamming events with small deadrise angles. Large scatter mostly characterizes the measurements.

III. EXPERIMENTAL STUDY

To improve the pressure recordings, a detailed study is necessary. A rigid cylindrical body, characterized by a variable deadrise angle (= angle between water surface and object surface), was chosen as test object.

A. Experimental test facilities

Two test facilities are used to perform slamming drop tests: a vertical drop set-up and a rotational drop set-up (Figure 1).



Figure 1. Vertical and rotational drop set-up

B. Factors affecting the pressure recordings

- (i) **Deadrise angle:** a very small shift can result in large pressure variations.
- (ii) **Sensor mounting:** flush mounting (= in line with object's surface) is essential to avoid air bubbles and turbulences.
- (iii) **Temperature shock:** before impact, the sensors should be cooled down to water temperature.
- (iv) **Water surface profile:** reproducibility is only guaranteed if successive tests are performed with a calm water surface.
- (v) **Degree of object's wetness:** successive experiments should be performed with dry object surfaces.
- (vi) **Sampling rate of DAQ-system:** > 200 kHz is required to measure the complete pressure peak.
- (vii) **Sensor cable length:** cables should not be long to avoid capacitive signal effects.

IV. CONCLUSIONS

Taking into account all mentioned parameters, a significant decrease in scatter was achieved in the pressure measurements.

- [1] Lin, M.-C. and L.-D. Shieh, *Flow visualization and pressure characteristics of a cylinder for water impact*. Applied Ocean Research, 1997. **19**(2): p. 101-112.

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