

**EXPERIMENTAL ANALYSIS ON THE DYNAMIC RESPONSE OF MOORED SEMI-  
SUBMERSIBLE IN REGULAR WAVE**



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## 5. Report

### 5.1 Proposed Executive Summary

This research starts with the critical review of the importance to study the dynamic response of semi-submersible. Then it concentrates on the problem to determine the dynamic response of an existing floating structures. Then it describes the way to find out the procedure to analysis the dynamic response of a floating structure. There are several standard methods to find out the dynamic response of semi-submersible. In this research, the dynamic responses of semi-submersible will analysis by utilizing experimental method.

The objective for this research is to develop and conduct the experimental technique to analysis the dynamic response of moored semi-submersible in regular wave. It will carry out the result to determine the behaviour of mooring lines tension due to semi-submersible's response in regular wave. From these result, it would use to evaluate the interaction between the response of semi-submersible and its mooring lines tension in regular wave.

To achieve the objective, this research will conduct through three phases. Phase 1 (Identify the experimental study approaches) - concentrates on the problem to carry out the dynamic response of an existing semi-submersible. Then it describes the way to find out the procedure to analysis the dynamic response of a moored semi-submersible in regular waves. Phase 2 (Model preparation) - consists of inclining test, swing test, decay test and spring calibration. Will perform to determine the natural period, vertical centre of gravity of the model (KG), metacentric (GM), radius of gyration for pitch and roll stiffness of the mooring lines spring as well and determine the geometric similitude, hydrodynamic similitude and structural similitude as well. Phase 3 (Conduct experiment and data analysis) - Conduct the experiment in regular wave under various condition.

Outcomes from the data analysis through the experiment will figure out the dynamic response of moored semi-submersible in regular wave. The experimental technique use in this research can be used to pre-determine the dynamic behaviour when subjected to waves, in other word can be known as seakeeping.

## 5.2 Enhanced Executive Summary

The reaction to the translation motion specifically heave response to the mooring line tension of a typical semi-submersible with square column under regular waves in wave heading condition is reported in this paper. A 112.1 kg model of semisubmersible with geometrically scale 1:81 has been tested in physical wave tank under wave frequency from 0.4297 Hz to 1.7189 Hz with interval 0.1433 Hz. Model was moored horizontally which attached to the structure above the water surface level in head wave with four linear springs at corresponding column respectively. Such a system does not have practical usage but is used to study the loading and response of the semisubmersible in the absence of the catenary mooring lines. The tensions on the mooring lines is measured by load cells coincide with the non-contacting optic tracker. Optic tracker is used to accomplish the measurement of heave response. The force measured by the load cells were analyzed to obtained the behavior of the mooring lines tension at every frequency. From the experimental analysis, it is found that under wave heading condition the tension in forward mooring lines is 2 to 4 times greater than the tension in aft mooring lines. The heave obviously showed that their response directly influenced by the mooring line tension. The mooring forces are not equally shared by forward and aft mooring lines. It also showed that the behavior of all mooring lines forces at each column have a similar trend along the frequency.

**KEYWORDS:** Experimental Investigation; Mooring Line Force; Semi-submersible; Heave Response

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