



## Analysis of Water Depth Variation Impact on CALM Buoy Performance for Shallow Water Condition

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**Abstract:** The SPM CALM Buoy is an offshore facility for loading/unloading crude oil. The SPM CALM Buoy in Indonesia is mostly operated in shallow water, so an analysis of the depth variation impact on the performance of the CALM Buoy is of necessity. The results of the analysis of the ship motion in free floating condition under the conditions of regular waves and spectral response show that the surge, sway, and yaw motions are influenced by depth variations, while the heave, roll, and pitch are influenced by frequency. For the CALM Buoy, all movements are affected by the depth variations. The results of the analysis in mooring condition show that the tension on the mooring line and offset on the CALM Buoy are affected by variations in depth and not affected by the towing force of the ship. The deeper the water area, the higher the values of the tension and offset. At a depth of 21 m to 42 m, a pre-tension of 10% of MBL is used, while at a depth of 50 m, a pre-tension of 15% of MBL is used since the initial pre-tension of 10% is unable to accommodate the movement of the CALM Buoy. This is because the second order wave load has a greater influence on moored structures such as the CALM Buoy.

**Keywords:** CALM Buoy; offset; shallow water; second order; tension.

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