

Lifting off simulation of an offshore supply vessel considering ocean environmental loads and lifting off velocity

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Abstract. An OSV (Offshore Support Vessel) is being used to install a structure which is laid on its deck or an adjacent transport barge by lifting off the structure with its own crane, lifting in the air, crossing splash zone, deeply submerging, and lastly landing it. There are some major considerations during these operations. Especially, when lifting off the structure, if operating conditions such as ocean environmental loads and lifting off velocity are not suitable, the collision can be occurred due to the relative motion between the structure and the OSV or the transport barge. To solve this problem, this study performs the physics-based simulation of the lifting off step while the OSV installs the structure. The simulation includes the calculation of dynamic responses of the OSV and the structure, including the collision detection between the transport barge and the structure. To check the applicability of the physics-based simulation, it is applied to a problem of the lifting off step by varying the ocean environmental loads and the lifting off velocity. As a result, it is confirmed that the operability of the lifting off step are affected by the conditions.

Keywords: offshore support vessel; lifting off; physics-based simulation; ocean environmental loads; lifting off velocity

1. Introduction

1.1 Research background

1.1.1 Offshore installation methods

The particular characteristics of an offshore structure are not like those of an onshore or near-shore structure. Thus, it cannot be constructed in its actual site, and might be built in shipyard, transferred, transported to the site, and finally deployed at there. There are various methods to transfer, transport, and deploy it, as shown in Fig. 1.

The transferring operation is that an offshore structure is moved from shipyard to means of transporting. The major methods of the transferring operation are a loading out method, a floating

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In the future, the way to quantify the sensitivity of the collisions to different ocean environmental loads will be studied. Also, dynamic positioning of the OSV, ocean environmental loads by irregular wave, and the interaction among floaters will be considered in the simulation. And, the simulation for other steps of the lifting operation such as lifting in the air, crossing splash zone, deeply submerging, and landing in Fig. 2 will be performed.

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