THE IMPACT OF MULTI-BODY OPERATIONS ON DP CAPABILITY

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ABSTRACT

As offshore activities are growing, the marine operations are becoming more complex involving the presence of few or several vessels in proximity to each other which increases the risk associated to those operations. Shuttle tankers, PSVs, floatels are often equipped with DP systems for maintaining position. The capability of these systems is defined during design phase by the DP manufacturer based on the assumption of standalone operation and considering environmental load cases prescribed in Industry standards (ex. wind, wave and current all aligned). During a realistic operational condition, however, the presence of other units may significantly alter the loads acting on the DP vessel which will affect somehow its station keeping capacity. Furthermore, in some areas of the world, the misalignment between the environmental loads and the presence of several wave trains from different directions (ex. off-shore Brazil) shall be considered in the sake of safety of the operation. In order to provide the clients means to simulate these complex operations (including moored vessels), a DP module has been integrated to Bureau Veritas multi-body mooring software, ARIANE. In this paper, the case of a DP floatel vessel operating close to a turret moored FPSO in Brazilian waters is analyzed and the differences in the DP capacity under realistic conditions with respect to the original DP capability are presented and discussed.

INTRODUCTION

In the Offshore Industry the reliance on DP vessels is ever growing, leading to an increase of the complexity of the marine operations. Nowadays, there are a large number of operations involving vessels working in close proximity to each other which imposes a high demand of reliability and capability to the DP systems. In order to estimate the DP vessel capability, one may first understand the loads acting on the vessel that need to be counteracted by the system in order to maintain the vessel’s position. These loads are usually estimated during the design assuming a standalone operation and a set of environmental conditions (wind, waves and current). It has already been underlined numerically in [1] and experimentally in [2] that during a realistic operation, however, the hydrodynamic interactions between the vessels and with the thrusters can result in significant changes in the loads that may affect the station keeping capacity. Another important concern is the dynamic behavior of a vessel when it fails to keep position in order to evaluate the risk of collision with the neighboring structures.

Since more than 25 years, Bureau Veritas develops the software ARIANE which is dedicated to the analysis of moored vessels. In the last decade, the software has evolved to include the capability of considering multi-body interactions (hydrodynamic and mechanical) as well as shallow water operations. In way of benefitting from the advanced motion simulator inside ARIANE and to provide to the clients a DP simulation tool, a DP module has been developed by Bureau Veritas in partnership with the Brazilian company Chemtech (Siemens Group) and interfaced to ARIANE. The tool has been employed in the analysis of a floatel vessel operating on a turret moored FPSO under the environmental conditions typical from Campos Basin in Brazil. The hydrodynamic interaction between the two vessels will be highlighted. Furthermore, the