

Title: DP Stationkeeping Accuracy: a Calculation Approach, Integration in DP plots and Results of a Case Study

Authors: J.W. Serraris, J.L. Cozijn, Marin

Abstract

The stationkeeping capability of DP vessels is traditionally presented in DP capability plots, showing the maximum environmental conditions in which the vessel is capable to maintain its position. For many DP operations, however, the DP stationkeeping accuracy is of primary importance to judge if an operation can be performed or not. Examples of such DP operations include lifting and installation operations, drilling operations and multi-body operations (e.g. offloading, accommodation vessels, or crew transfer). Static DP capability calculations do not provide any information about the stationkeeping accuracy.

A calculation method has been developed to determine the DP stationkeeping capability, as well as the stationkeeping accuracy. The presentation of the results is very similar to the static DP capability plots and allows applying user defined operational criteria in post processing to determine the maximum operational limits. The developed method uses a time-domain simulation model of a vessel with a DP system, including all main components commonly found in real DP systems (Kalman filter, PID controller, allocation algorithm). Time-domain simulations are carried out for a large number (several thousands) of environmental conditions, consisting of current, sea waves, swell and wind. The simulation output is evaluated against multiple operational criteria.

Subsequently, the limiting conditions are presented in polar plots, showing e.g. the stationkeeping accuracy, thruster loading or vessel motions and accelerations. The method has several advantages over traditional static calculations, especially for cases in which the stationkeeping accuracy is an important aspect.

Furthermore, instead of searching for limiting conditions based on operational criteria, simulations are carried out for a complete set of conditions, making it possible to define criteria afterwards and investigate the sensitivity of the operation for changes in criteria.

The paper discusses the methodology followed, the time-domain simulation model and results of a calculation study for an Offshore Supply Vessel (OSV).