

Title: **Acoustically Aided Inertial Navigation: A Real World Experience on the Semi-Submersible Drilling Rig Petrobras XIII**

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Abstract

The theory of combining USBL and Inertial Navigation into an alternative to improve DP references has been discussed over the last few years. A Dual Independent Acoustic Positioning Reference System has been specified by Petrobras over the last ten years as a solution to improve the reliability of DP operations. It should be done without intervention of the operator by providing an additional and automatic weighting against multiple DGPS reference sensors into the DP desk. However, whilst LUSBL systems are highly repeatable and robust positioning systems, the use of two independent systems doubles the number of required seabed transponders from 4 to 8.

Acoustically aided INS provides an alternative solution to the second acoustic input with the addition of a single transponder on the seabed. To prove it, a Lodestar Inertial Navigation Sensor was installed on the P23 in February 2010. It closely coupled with the rig's existing Wideband USBL Transceiver and it was wired up to a Navigation Computer in the DP control room. Acoustically Aided Navigation outputs were then made available to the DP desk.

The DP system was submitted to a number of operational scenarios often conducted during acceptance trials, including changes in heading, moving off the well, transitting on DP in squares or turnings. The trials were conducted in 1760m of water, positioning the rig off a single acoustic transponder and moving the vessel by using a single transponder, checking the baseline for the trails and comparing the results with a high accurate DGPS. The vessel was able to hold position with a DP telegram from the acoustic aided INS solution with equal weighting on DP in compare with DGPS inputs. This paper presents the data, results and conclusions from actual trials on board the Petrobras XXIII drilling unit.

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