DP Bow Thruster Noise Remediation in Roger Revelle, Agor-24

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Abstract

For Scripps Institution of Oceanography, represented by The Glosten Associates, a program was initiated to silence the bow thruster in the research vessel ROGER REVELLE, AGOR-24. The ship suffered habitability problems during long-term dynamic positioning (DP) operations. A ½ scale mockup of the ship's bow thruster, sea chest, guard grids and local hull surfaces was constructed for air tests. By measuring velocity distributions at the (absent) impeller location while separately drawing air through the mockup system at high velocity, it was demonstrated by calculation that the offending noise originated in unsteady cavitation of the impeller of the vertical-axis thruster. These and subsequent mock-up measurements were carried out at Offshore Model Basin, Escondido, CA. Several modifications to improve the flow were designed and evaluated in the mockup. Further, a modified impeller was designed on the basis of cavitation avoidance. The new impeller was designed-in-detail and manufactured by Bird-Johnson Company (now Rolls-Royce Naval Marine). This was installed along with several structural modifications of the thruster and sea chest, approved by the thruster manufacturer, at Southwest Marine, San Diego, during ship overhaul. Quantitative measurements of compartment levels of noise and vibration, and structural and water-borne noise were carried out to compare with pre-modification measurements. Results now indicate an absence of bow thruster cavitation noise in adjacent compartments during DP operations. Thrust performance was preserved.

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