



UNITED STATES COAST GUARD

U.S. Department of Homeland Security

MARINE INVESTIGATIONS LESSONS LEARNED

Assistant Commandant for Marine Safety, Security and Stewardship

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Improper Assembly of Shaft Seals

This document presents lessons learned during a casualty investigation. It provides useful information for marine inspection and investigation personnel in addition to owners and operators of Towing Vessels and other vessels having similar characteristics.

Recently a towing vessel nearly sank while conducting vessel assist operations in San Juan harbor. A large volume of water flooded the engine room when the vessel applied astern propulsion. Within a few minutes, severe flooding filled the engine room with twelve feet of water. Fortunately the Master was able to intentionally ground the vessel to avoid sinking.

An investigation revealed that the water had entered through a gap between the vessel's shaft seal and its mounting flange. When the vessel applied astern propulsion, the force of water was directed down the shaft towards its seal thus dislodging it from the flanged mounting / mating surface. The vessel had recently installed a Kobelco brand dry shaft seal during a yard period. Installation required a new flanged mounting welded to the vessel structure.

The mounting flange had been tapped for the use with M20 metric bolts. During installation the seal was secured to its mounting flange with eight $\frac{3}{4}$ inch diameter (nominal size) bolts. The differences in the diameters of the tapped hole for a $\frac{3}{4}$ inch bolt and a M20 bolt is quite small and the pitch of the threads are very similar. Because of these similarities the use of a $\frac{3}{4}$ inch bolt into a 20M metric tapped hole may go unnoticed.

In this instance, the improperly fitting bolts eventually loosened and allowed the seal assembly to separate substantially from the flange mounting surface when astern propulsion was applied. Post casualty, the owner / operator reinstalled the proper bolts and enhanced the installation with the use of a locking device to prevent future loosening.

"Human error" likely resulted in the selection and installation of improper bolts. Inadequate "situational awareness" may have contributed and failed to provide the proper "defenses" to prevent the casualty. Careful and routine machinery space rounds by competent persons and attention to critical areas like shaft sealing arrangements may have detected the initial loosening of the bolts and leakage occurring at the seal.

The Coast Guard **strongly** recommends that owner operators of vessels utilizing Kobelco shaft seals or similar devices ensure that the proper fasteners are used. Further, critical inspection of machinery should take place anytime modifications are made and regular inspection of important areas such as shaft seals, skin valves, sea chests and other hull appurtenances should be part of a daily machinery space rounds onboard any vessel.

This document is provided for informational purposes only and does not relieve any domestic or international safety, operational or material requirement. Developed by the Headquarters Office of Investigations and Analysis and the Investigations Division, USCG Sector San Juan. Shaft seal questions can be addressed to LT Sarah Geoffrion, Chief of Investigations at Sarah.J.Geoffrion@uscg.mil. Other questions can be addressed to Mr. Ken Olsen at Kenneth.W.Olsen@uscg.mil.
