

Controllable Pitch Propeller Hydraulic Fluid Discharge Summary

Description of Discharge

How is this discharge generated? This discharge is the hydraulic fluid that is discharged into the surrounding seawater from propeller seals as part of normal operation, and the hydraulic fluid released during routine maintenance of the propellers.

Controllable pitch propellers (CPP) are used to control a vessel's speed or direction while maintaining constant propulsion plant output (i.e., varying the pitch, or "bite," of the propeller blades allows the propulsion shaft to remain turning at a constant speed). CPP blade pitch is controlled hydraulically through a system of pumps, pistons, and gears. Hydraulic oil may be released from CPP assemblies under three conditions: leakage through CPP seals, releases during underwater CPP repair and maintenance activities, or releases from equipment used for CPP blade replacement.

Which vessels generate this discharge? Over 200 Armed Forces vessels have CPP systems.

How often and where is this discharge generated? Leakage through CPP seals can occur within 12 n.m., but seal leakage is more likely to occur while the vessel is underway than while pierside or at anchor because the CPP system operates under higher pressure when a vessel is underway. Blade replacement occurs in port on an as-needed basis when dry-docking is unavailable or impractical, resulting in some discharge of hydraulic oil. Approximately 30 blade replacements and blade port cover removals (for maintenance) are conducted annually, fleetwide.

Analysis

Nature of Discharge: CPP assemblies are designed to operate at 400 psi without leaking. Typical pressures while pierside range from 6 to 8 psi. CPP seals are designed to last five to seven years, which is the longest period between dry-dock cycles, and are inspected quarterly to check for damage or excessive wear. Because of the hub design and the frequent CPP seal inspections, leaks of hydraulic oil from CPP hubs are found to be negligible. During the procedure for CPP blade replacement, however, hydraulic oil is released to the environment from tools and other equipment. In addition, hydraulic oil could also leak from the CPP hub during a CPP blade port cover removal.

Discussion and Discharge Determination

Discussion: The Navy's repair procedures impose certain requirements during blade replacement and blade port cover removal to minimize the amount of hydraulic oil released to the extent possible. In addition, booms are placed around the aft end of the vessel to contain possible oil release during these procedures. Nevertheless, EPA and DoD have determined that the amount of hydraulic oil released during underwater CPP maintenance could exceed State water quality criteria. Constituents of the discharge could include paraffins, olefins, and metals such as copper, aluminum, tin, nickel, and lead. Metal concentrations are expected to be low because hydraulic oil is not corrosive, and the hydraulic oil is continually filtered to protect against system failures.

EPA and DOD have determined that pollution controls are necessary to mitigate the potential adverse environmental impacts that could result from releases of hydraulic oil during underwater maintenance on controllable pitch propellers. The existing repair procedures and the staging of containment booms and oil skimming equipment to capture released oil demonstrate the availability of MPCDs (i.e., best management practices) for this discharge. Therefore, EPA and DoD have determined that it is reasonable and practicable to require MPCDs to control discharges of CPP hydraulic fluid.

Determination: A marine pollution control device is required.