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Abstract: FRC Corrosion Prevention

The USCG FRC fleet is experiencing corrosion at an unacceptable rate in the FRC propulsion shaft tunnels. An investigation into this problem was conducted from the perspectives of “root cause” and “prevention.” Root causes for the corrosion stem from an unfortunate interaction in a complex, two-stage galvanic protection system on-board the ship that uses both passive zinc protection and impressed current cathodic protection (ICCP) from an active, feedback-controlled power supply. By using custom measuring instruments and applying them on an in service FRC in order to better understand the complications with galvanic protection on the FRC, crucial insights were discovered. The ICCP power supply unit is intended to prevent corrosion by actively injecting current through the starboard anode in order to raise the magnitude of the voltage measured between the reference electrode and the hull. The FRC design expects the combination of ICCP and passive zinc installation to provide dual approach to ensuring corrosion protection. However, additional passive protection provided by zinc installation in the starboard bow thruster near the reference electrode raises the measured protection level causing the automatic controller in the ICCP power supply unit of the FRC to “think” that the ship is adequately protected, thus turning off the active current protection. The ship puts intense wear on the passive zinc protection and receives no benefit from the ICCP, which has effectively turned itself “off.” The difficult-to-protect shaft tunnel rusts when the local zincs in the tunnel expend before the scheduled maintenance cycle. This presentation will include a full summary of analysis and results, along with a review of laboratory experiments, computer numeric simulations, and field experiments with several FRCs in the USCG fleet concluding with specific, actionable suggestions for mitigating corrosion in the FRC stern tube.