

1. ABSTRACT

An emission control system combining diesel particulate filters (DPF) with selective catalytic reduction (SCR) has been developed for retrofit to diesel engines in harborcraft. The SCR system builds on the existing Compact SCR™ technology developed for harborcraft by Engine, Fuel, and Emissions Engineering, Inc. For modern Tier II diesel engines, the Compact SCR system alone can bring both NO_x and PM emissions to well within the limits specified in ARB's harborcraft emission regulations. The same is not true for the older Tier 0 diesel engines found in many California harborcraft, due to the much higher PM emissions that these engines produce. The combined DPF+Compact SCR system is designed as a "bolt on" retrofit for these older Tier 0 diesels, and to reduce their emissions to below Tier 4 limits. For Tier 0 engines that are otherwise in good condition, this technology is expected to be both less expensive and more effective than repowering with new diesels meeting Tier 2 or Tier 3 emission standards.

The Compact SCR+DPF systems are being demonstrated on M/V *Royal Star*, a passenger ferry and excursion vessel owned and operated by Blue and Gold Fleet of San Francisco. The main propulsion engines on this vessel are two Caterpillar 3412 diesels rated at 520 horsepower each, while the generator engines are two Caterpillar D377s. The generators are rated at 50 kW each. To date, the Compact SCR system and main engine DPFs have undergone about 450 hours of operation, beginning in September 2009. The DPFs for the generator engines were installed only in April, 2010, and have not yet been subjected to operation. M/V *Royal Star* is presently out of service, undergoing repairs to her marine gearing, and EF&EE is taking advantage of this interlude to revise the electric regeneration system for the DPFs. The full system, comprising Compact SCR and DPF installations on both main engines and both generators, is expected to go into operation when the vessel returns to service about the end of April.

Preliminary emission testing on the Starboard Main engine showed NO_x control efficiency of 85 to 90%, depending on load. PM efficiency was 78% at 50% load, but dropped to less than 50% at the 75% and full-load conditions. This is ascribed to inadequate passive regeneration clogging the DPF with soot, causing the DPF bypass valve to open under high load. The revised active regeneration system is expected to eliminate this problem.