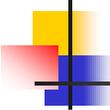


# Maritime Diesel Emission Control Technologies

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1

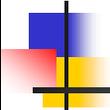


## Projects

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- U.S. Navy Work Boat / Barge
- Blue and Gold Ferry
- Port Container Handling Equipment
- Paceco Corp.
- Vycon Flywheel
- Railpower Hybrid Diesel RTG Crane

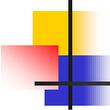
2



## Commercial Harbor Craft Diesel Emission Control Technologies

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3

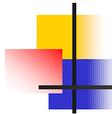


## U.S. Navy Work Boat / Barge

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- Engines: (2) 2-stroke DDC 12V-71 engines (1974)
- Technology:
  - Rebuilt engine with Clean Cam Technology (CCT) System (combustion chamber and injector modifications and turbocharger addition)
  - Rypos active diesel particulate filter (DPF)
- Fuel: low sulfur diesel
- Preliminary Results:
  - CCT: 38% reduction of PM, 71% reduction of NOx
  - DPF: 76% reduction of PM, small reduction of NOx
  - CCT + DPF: 85% Reduction of PM from baseline  
74% Reduction of NOx from baseline
- Durability and final emission testing to be done this fall

4

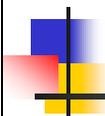


## Blue and Gold Passenger Ferry

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- Engines: (2) 2-stroke DDC Series 60 engines
- Technology:
  - Claire Longview silicon carbide diesel particulate filter (DPF) for propulsion engine
- Previous testing: problems with backpressure and temperature
- Working with Claire, BAAQMD, and U.C. Riverside to facilitate new testing

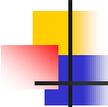
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## Port Container Handling Equipment Diesel Emission Control Technologies

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6

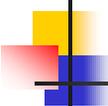


## Identification and Demonstration of Emission Control Systems for Port Container Handling Equipment

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- Project part of ARCO SEP funds
- Equipment: RTG cranes, top-picks, side-picks, reach stackers
- Goal: Identify, install, and demonstrate retrofit emission control devices that may lead to verification
- Project steps:
  - Collection Of Key Operating Parameters Necessary To Determine Emission Control System Applicability
    - Data log exhaust temperatures (completed)
  - Solicitation Of Technology Providers (in progress)
  - Terminal Operator/Equipment Solicitation
  - Demonstration and Emission Testing
  - Final Report

7

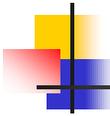


## Paceco Corp.

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- Engines:
  - RTG cranes with a rated power of 225 kW to 450 kW
  - Pre-1996 or certified Tier 1, 2, or 3 PM
- Technology:
  - Mitsui Engineering and Shipbuilding Diesel Particulate Filter (MES-DPF)
- Verified for:
  - Level 1 control (= 25% PM reduction)
- Fuel: CARB diesel (15 ppm sulfur limit)
- Also verified by U.S. EPA

8

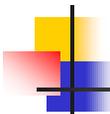


## Vycon

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- Engines: on RTG cranes
- Technology:
  - 2 flywheels that store energy when the crane lowers a load and releases energy when the crane lifts a load;
  - Reduces peak load
- Flywheels installed on RTG crane in POLB
- Preliminary findings include fuel savings and possible PM reduction
- Working with Vycon and U.C. Riverside to develop a testing protocol for possible verification

9



## Railpower

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- Engines: on RTG cranes
- Technology:
  - hybrid diesel generator set and battery pack
- Demonstrating in Vancouver, Canada

10