

**State of California  
AIR RESOURCES BOARD**

**Executive Order AB-15-01**

**Relating to ARB Approval of Control Efficiencies for Alternative Control Technologies used for Compliance with the Airborne Toxic Control Measure for Auxiliary Diesel Engines Operated on Ocean-going Vessels At-Berth in a California Port**

**Clean Air Engineering-Maritime, Inc.  
Marine Exhaust Treatment System-1 (METS-1)**

WHEREAS, the Air Resources Board (ARB) has adopted the "Airborne Toxic Control Measure for Auxiliary Diesel Engines Operated on Ocean-going Vessels At-Berth in a California Port" (the "ATCM;" title 17, California Code of Regulations, section 93118.3), which establishes requirements for ocean-going vessels that reduce oxides of nitrogen (NOx) and diesel particulate matter (PM) emissions;

WHEREAS, section 93118.3 (d)(2) and 93118.3 (e) of the ATCM establishes requirements for alternative control technologies that can be used to reduce emissions from ocean-going vessel auxiliary engines while at-berth in a California port;

WHEREAS, no alternative control technologies shall be used to comply with the requirements of the ATCM unless they fulfill the requirements specified in the ATCM;

WHEREAS the ATCM requires the control efficiency for alternative control technologies to be calculated based on an emission test protocol that is approved by the Executive Officer prior to conducting the emission measurements, and that emission measurements are conducted using the test methods specified in section 93118.3(e)(4)(B)(3);

WHEREAS Clean Air Engineering-Maritime, Inc. (CAEM or the applicant) has developed a barge based capture and control system to treat emissions from auxiliary engines on ocean-going vessels called the Marine Exhaust Treatment System-1 (METS-1);

WHEREAS METS-1 consists of a direct connect capture duct, and an emission control unit manufactured by Tri-Mer Corporation of Owosso, MI that uses catalytic impregnated ceramic filters and aqueous ammonia injection to reduce emissions of NOx and PM with a diameter of 2.5 micrometers or less (PM<sub>2.5</sub>);

WHEREAS, CAEM submitted their "Emission Test Protocol For Barge Based Capture and Control System to Treat Emissions from Auxiliary Engines" (Test Protocol) to ARB on August 11, 2014;

WHEREAS, on September 3, 2014, ARB approved CAEM's Test Protocol;

WHEREAS, CAEM submitted their "Test Report for Barge Based Capture and Control System to Treat Emissions from Auxiliary Engines" (Test Report) on March 9, 2015;

WHEREAS, ARB reviewed and evaluated the Test Report for the METS-1 based on the requirements specified in the ATCM;

WHEREAS, the Executive Officer finds it is appropriate to approve the results of the emission measurements and to issue this Executive Order that identifies the approved control efficiencies, operating conditions, recordkeeping and monitoring requirements for METS-1 to allow its use for compliance with the ATCM;

WHEREAS, this approval does not constitute an air pollution permit or eliminate the responsibility of CAEM or the end user to comply with all federal, State, and local laws, rules, and regulations;

NOW, THEREFORE, IT IS ORDERED that the control efficiencies described below are approved for use in demonstrating compliance with the ATCM when the METS-1 system is used as intended by CAEM, in accordance with the following terms and conditions, and in accordance with all other applicable requirements in the ATCM:

#### SYSTEM PARAMETERS

The equipment and system parameters will be consistent with the METS-1 system described in the approved Test Protocol;

#### CONTROL EFFICIENCIES/EMISSIONS CALCULATIONS

1. Capture Efficiency of 90%,
2. PM<sub>2.5</sub> Control Efficiency of 95%,
3. NOx Control Efficiency of 90%,
4. Emissions Rate from the METS-1 diesel generators during start-up and shutdown are uncontrolled, and estimated to be 5.95 lbs per hour NOx (Uncontrolled METS-1 NOx Emission Rate) and 0.18 lbs per hour PM<sub>2.5</sub> (Uncontrolled METS-1 PM<sub>2.5</sub> Emission Rate);

Provided the approved operating conditions are met, the emissions reduced by METS-1 shall be calculated for each visit as follows:

NOx reductions =

$$[(\text{METS-1 Capture Efficiency}) \times (\text{METS-1 NOx Control Efficiency}) \times (\text{Vessel Auxiliary Engine NOx Emission Rate}) \times (\text{Controlled Berthing Time}) \times (\text{Power Requirement})] - [(\text{Uncontrolled METS-1 NOx Emission Rate}) \times (\text{METS-1 Start-up Time} + \text{METS-1 Shutdown Time})]$$

PM<sub>2.5</sub> reductions =

$$[(\text{METS-1 Capture Efficiency}) \times (\text{METS-1 PM}_{2.5} \text{ Control Efficiency}) \times (\text{Vessel Auxiliary Engine PM}_{2.5} \text{ Emission Rate}) \times (\text{Controlled Berthing Time}) \times (\text{Power Requirement})] - [(\text{Uncontrolled METS-1 PM}_{2.5} \text{ Emission Rate}) \times (\text{METS-1 Start-up Time} + \text{METS-1 Shutdown Time})]$$

Where:

METS-1 Capture Efficiency, NOx Control Efficiency and PM<sub>2.5</sub> Control Efficiency, Uncontrolled METS-1 PM<sub>2.5</sub> Emission Rate, and Uncontrolled METS-1 NOx Emission Rate are listed above,

NOx and PM<sub>2.5</sub> Emission Rates for the vessel auxiliary engine are determined pursuant to subsection 93118.3 (e)(3),

Controlled Berthing Time is the actual time each vessel's emissions were being reduced by the METS-1 system,

METS-1 Start-up Time is the actual time the METS-1 system operated during start-up where emissions from the METS-1 diesel generators were uncontrolled,

METS-1 Shutdown Time is the actual time the METS-1 system operated during shutdown, where emissions from the METS-1 diesel generators were uncontrolled, and

Power Requirement is the electrical power requirement for each vessel as determined pursuant to subsection 93118.3 (e)(1)(C);

## APPROVED OPERATING CONDITIONS

<b>Parameter</b>	<b>Value</b>
Ocean-going Vessel type	Container Vessels
Ocean-going Vessel Engine type	One auxiliary engine
Fuel composition limitations	Marine distillate fuel with $\leq 0.1\%$ sulfur content
Engine exhaust temperature requirements	350-700°F
Other parameters that affect performance	Filter face velocity less than 0.03 m/s
Static Pressure	Minimum of -0.2 inches of water at the capture system shuttle
Maximum engine MCR (kilowatt (kW)) for each engine type	2500 kW
Allowable operating range (kW)	600-1500 kW; only one auxiliary engine may be controlled per METS-1 system
Exhaust flow rate that can be treated (standard cubic feet per minute (scfm))	1020 to 5100 scfm of engine exhaust
Maintenance Requirements	Per Section 5: Maintenance in CAEM's Test Protocol

The ammonia slip emissions through the METS-1 shall not exceed 5 ppmdv, averaged over 60 minutes;

## MONITORING REQUIREMENTS

CAEM shall submit summary data to the Executive Officer from the continuous emission monitoring system (CEMS), including emission levels of NO<sub>x</sub>, PM<sub>2.5</sub>, ammonia, and capture efficiency, after every 1000 hours of operation, and at a minimum annually, to verify that the emission reduction levels are maintained;

CAEM shall maintain the METS-1 system in accordance with Section 5: Maintenance in the Test Protocol;

CAEM shall continue to use the CEMS data collection methods specified in Section 7: Continuous Emissions Monitoring in the Test Protocol and summarized in Confidential Attachment B to this Executive Order unless prior approval from the Executive Officer is given;

The Executive Officer may request that the METS-1 system be tested annually using the test methods specified in the ATCM to demonstrate the overall percentage of the emission reduction being achieved, and the results of such testing shall be provided to the Executive Officer within 30 days of the testing;

## RECORDKEEPING AND REPORTING REQUIREMENTS

CAEM must notify any Fleet that uses the METS-1 system for compliance with the

At-Berth Regulation, that the fleet should keep the following records for a period of five years, in addition to the requirements of Section 93118.3 (g)(1)(B) and (g)(2)(B), and that these records shall be supplied to the Executive Officer within 30 days of a request from ARB staff, at the address provided in ARB staff's request:

1. Dates and times when the METS-1 system initially ties to the vessel and subsequently when the METS-1 system unties from the vessel,
2. Dates and times when the vessel auxiliary engines are connected to the METS-1 system and emissions are being controlled, and subsequently when the auxiliary engine emissions stop being controlled by the METS-1 system.

CAEM must keep the following records for a period of five years on the use of the METS-1 system. These records shall be supplied to the Executive Officer within 30 days of a request from ARB staff, at the address provided in ARB staff's request:

1. Record of each vessel that controlled auxiliary engine emissions with the METS-1 system while the vessel was docked at berth:
  - a. Name of vessel
  - b. Port and terminal where vessel is at-berth
2. Dates and times when the METS-1 system initially ties to the vessel and subsequently when the METS-1 system unties from the vessel.
3. Date and times when the vessel auxiliary engines are connected to the METS-1 system and emissions are being controlled, and subsequently when the auxiliary engine emissions stop being controlled by the METS-1 system.
4. CEMS data and Event Summary METS-1 form for each vessel visit where METS-1 system is used to reduce emissions for compliance with the ACTM.
5. Date, time, and description of any equipment failure with the METS-1 system that affected the ability of the vessel to control auxiliary engine emissions.

CAEM shall notify the Fleet, as defined in Section 93118.3 (c)(16), within 5 business days after any visit where the reductions from METS-1 system are less than the approved capture and control efficiencies in this Executive Order.

CAEM shall submit a completed Event Summary METS-1 form as shown in Confidential Attachment A to the Executive Officer within 5 business days after any visit where the reductions from METS-1 system are less than the approved capture and control efficiencies in this Executive Order.

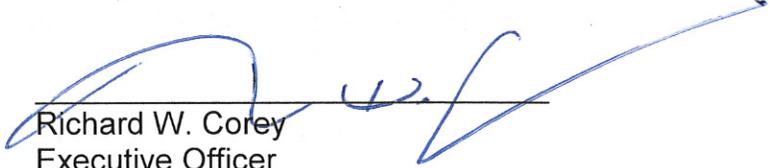
BE IT FURTHER ORDERED Executive Officer may request periodic emissions testing or other types of monitoring to verify the proper operation of the METS-1 system and

may modify the testing frequency as he/she deems appropriate.

BE IT FURTHER ORDERED, no changes are permitted to METS-1 design or approved operating parameters unless ARB is notified in advance, and ARB evaluates the changes and determines that METS-1 will continue to meet the capture and control efficiencies specified in this Executive Order. The changes must be approved in writing by the Executive Officer before the modified METS-1 or modified operating parameters may be used for compliance with the ATCM. The Executive Officer may revoke this Executive Order if the METS-1 system design or approved operating parameters are changed without prior notification and approval by the Executive Officer.

BE IT FURTHER ORDERED, this Executive Order shall be voided if the Executive Officer determines that METS-1 does not comply with any of the specifications in this Executive Order.

Executed at Sacramento, California, this 25<sup>th</sup> day of June 2015.

  
Richard W. Corey  
Executive Officer