

US EPA ARCHIVE DOCUMENT

THE ENVIRONMENTAL TECHNOLOGY VERIFICATION  
PROGRAM



## ETV Joint Verification Statement

<b>TECHNOLOGY TYPE:</b>	<b>MOBILE DIESEL ENGINE AIR POLLUTION CONTROL</b>
<b>APPLICATION:</b>	<b>CONTROL OF EMISSIONS FROM MOBILE DIESEL ENGINES IN NONROAD USE BY DIESEL PARTICULATE FILTERS</b>
<b>TECHNOLOGY NAME:</b>	<b>MITSUI ENGINEERING &amp; SHIPBUILDING – DIESEL PARTICULATE FILTER</b>
<b>COMPANY:</b>	<b>PACECO CORP.</b>
<b>ADDRESS:</b>	<b>3854 BAY CENTER PLACE HAYWARD, CA 94545 PHONE: (510) 264-9288 FAX: (510) 264-9280</b>

The U.S. Environmental Protection Agency (EPA) has created the Environmental Technology Verification (ETV) Program to facilitate the deployment of innovative or improved environmental technologies through performance verification and dissemination of information. The goal of the ETV Program is to further environmental protection by accelerating the acceptance and use of improved and cost-effective technologies. ETV seeks to achieve this goal by providing high-quality, peer-reviewed data on technology performance to those involved in the design, distribution, financing, permitting, purchase, and use of environmental technologies.

ETV works in partnership with recognized standards and testing organizations; stakeholder groups, which consist of buyers, vendor organizations, permittees, and other interested parties; and with the full participation of individual technology developers. The program evaluates the performance of innovative technologies by developing test plans that are responsive to the needs of stakeholders, conducting field or laboratory tests (as appropriate), collecting and analyzing data, and preparing peer-reviewed reports. All evaluations are conducted in accordance with rigorous quality assurance (QA) protocols to ensure that data of known and adequate quality are generated and that the results are defensible.

The Air Pollution Control Technology Verification Center (APCT Center), one of six centers under the ETV Program, is operated by RTI International (RTI), in cooperation with EPA's National Risk Management Research Laboratory. The APCT Center has evaluated the performance of an emissions control system consisting of a diesel particulate filter for nonroad diesel engines.

**ETV TEST DESCRIPTION**

All tests were performed in accordance with the *Test/QA Plan for the Verification Testing of Diesel Exhaust Catalysts, PM Filters, and Engine Modification Technologies for Highway and Nonroad Use Diesel Engines* and the *Test-Specific Addendum to ETV Mobile Source Test/QA Plan for Paceco Corp. for the Mitsui Engineering & Shipbuilding-Diesel Particulate Filter*.

These documents are written in accordance with the applicable generic verification protocol and include requirements for quality management, QA, procedures for product selection, auditing of the test laboratories, and test reporting format.

The mobile diesel engine air pollution control technology was tested at Southwest Research Institute. The performance verified was the percentage emission reduction achieved by the technology for particulate matter (PM), nitrogen oxides (NO<sub>x</sub>), hydrocarbons (HC), and carbon monoxide (CO) relative to the performance of the same baseline engine without the technology in place. Operating conditions were documented and ancillary performance measurements were also made. A summary description of the ETV test is provided in Table 1.

**Table 1. Summary Description of the ETV Test**

Test type	Nonroad steady-state Federal Test Procedure (FTP)
Engine family	NA*
Engine make–model year	Cummins Engine Company – 1991 model NTA855-G2
Service class	Off-highway, heavy-duty diesel engine
Engine rated power	Nameplate ratings in generator set service: 420 hp in “prime” service; 465 hp in “standby” service
Engine displacement	14.0 L, six-cylinder inline
Technology	Mitsui Engineering & Shipbuilding Diesel Particulate Filter
Technology description	L-shaped cylindrical canister “muffler” design weighing nominally 200 lb, containing a catalyst bed and a metal mesh filter
Test cycle or mode description	5-mode test cycle for constant-speed engines (ISO 8781 D2 test)
Test fuel description	Ultra-low-sulfur diesel (ULSD) fuel with 15 ppm sulfur maximum
Critical measurements	PM, NO <sub>x</sub> , HC, and CO
Ancillary measurements	CO <sub>2</sub> , NO, NO <sub>2</sub> (by calculation), soluble organic fraction (SOF) of PM, exhaust back-pressure, exhaust temperature, and fuel consumption

\* NA = not applicable. Nonroad engines manufactured prior to 1996 were not certified; no family name identification numbers were assigned.

**VERIFIED TECHNOLOGY DESCRIPTION**

This verification statement applies to the use of the Mitsui Engineering & Shipbuilding Diesel Particulate Filter (MES-DPF) on constant-speed nonroad engines such as those used on the gantry cranes manufactured by Paceco Corp. It is applicable to engines fueled only by ultra-low-sulfur (15 ppm or less) diesel fuel.

This verification statement describes the performance of the tested technology on the diesel engine and fuels identified in Table 1.

## VERIFICATION OF PERFORMANCE

The MES-DPF achieved the reduction in tailpipe emissions shown in Table 2 compared to baseline operation without the MES-DPF.

**Table 2. Verified Emissions Reductions**

Device Type	Mean Emissions Reduction (%)				95% Confidence Limits on the Emissions Reduction (%)			
	PM	NO <sub>x</sub> <sup>a</sup>	HC	CO	PM	NO <sub>x</sub>	HC	CO
Aged	39.2	4.2	<sup>b</sup>	95.0	35-43	2.4-6.0	<sup>b</sup>	88-100
Degreened	38.8	3.0	<sup>b</sup>	94.5	35-42	0.1-5.9	<sup>b</sup>	88-100

<sup>a</sup> The mean NO<sub>2</sub>/NO<sub>x</sub> ratio in % NO<sub>2</sub> was 10 for the baseline test and 31 and 32 for the aged and degreened tests, respectively.

<sup>b</sup> Hydrocarbon emissions reductions could not be quantified or distinguished from 100% with 95% confidence.

The APCT Center QA Officer has reviewed the test results and quality control data and has concluded that the data quality objectives given in the generic verification protocol and test/QA plan have been attained. EPA and APCT Center QA staff have conducted technical assessments of the test laboratory and of the data handling. These assessments confirm that the ETV tests were conducted in accordance with the EPA-approved test/QA plan.

This verification statement verifies the emissions characteristics of the *Mitsui Engineering & Shipbuilding Diesel Particulate Filter (MES-DPF)* for the stated application. Extrapolation outside that range should be done with caution and an understanding of the scientific principles that control the performance of the technology. This verification focuses on emissions. Potential technology users may obtain other types of performance information from the manufacturer.

In accordance with the generic verification protocol, this verification statement is valid, commencing on the date below, indefinitely for application of the *MES-DPF* within the range of applicability of the statement.

<u>Original signed by Sally Gutierrez</u>	<u>2/23/06</u>	<u>Original signed by A. R. Trenholm</u>	<u>2/13/06</u>
Sally Gutierrez	Date	Andrew R. Trenholm	Date
Director		Director	
National Risk Management Research Laboratory		Air Pollution Control Technology Center	
Office of Research and Development			
United States Environmental Protection Agency			