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40 CFR 63 Subpart ZZZZ
Reciprocating Internal Combustion Engines
(RICE MACT)
Diversion Diesel Pump
Engine A (D-200A)

The Dow Chemical Company
Michigan Operations
Midland, MI

Quality Information

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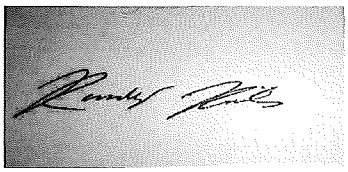	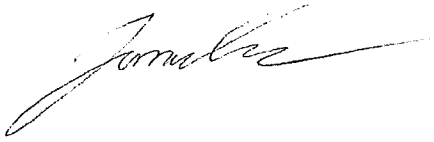
Randy Reinke Environmental Technician	James Edmister, PM Air Quality Scientist IV

Prepared for:

Chuck Glenn
Air SME
The Dow Chemical Company
Freeport, Texas, 77541
T: 979.709.2307

E: cglenn@dow.ccom

Managed by:

Mr. James Edmister
Project Manager
M: (585) 721-9128 (cell)
E: James.Edmister@aecom.com

AECOM
3700 James Savage Rd
Midland, MI 48642
USA
www.aecom.com

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1. Introduction

1.1 Summary of Test Program

The Dow Chemical Company (Dow) in Midland, Michigan, is a large complex with manufacturing and utility plants. Dow's Michigan Operations (MiOps) is a major source of Hazardous Air Pollutants (HAPS).

AECOM was contracted to conducted compliance sampling on two 1050 horsepower (hp) non-emergency diesel engines (called Engine A and Engine B) to demonstrate compliance with the RICE MACT, 40CFR63, Subpart ZZZZ. The engines are operated to divert influent wastewater and storm water away from the on-site wastewater treatment plant (WWTP) to wastewater storage tanks for a variety of reasons. The testing was conducted to demonstrate compliance with emissions and operating limits found in 63.6600(d), Table 2c of the RICE MACT, 40CFR63, Subpart ZZZZ.

The following table summarizes the pertinent data for this compliance test:

Responsible Groups	• The Dow Chemical Company • Michigan Department of Energy, Great Lakes, and Environment. (EGLE) • Environmental Protection Agency (EPA)
Applicable Regulations	• ROP- MI-A4033-2017b • 40 CFR 63 Subpart ZZZZ (RICE MACT)
Industry / Plant	• Environmental Operations Plant (EVO)
Plant Location	• The Dow Chemical Company Midland, MI, 48667
Unit Installation Date	• Engine A 6/2/2021 • Engine B 3/17/2022
Unit Initial Compliance Date	• Engine A 11/18/2021 • Engine B TBD
Air Pollution Control Equipment	• All engines are equiped with dual single stage catalytic reduction and closed crankcase filtration emission control system
Emission Points	• P200 Diesel Engine A
Pollutants/Diluent Measured	• Carbon Monoxide (CO) • Oxygen (O_2)
Test Dates	• May 17, 2022 (Engine A only)

1.2 Key Personnel

Names and affiliations of personnel, including their roles in the test program, are summarized in the following table.

Role	Role Description	Name	Affiliation
Process Focal Point	• Coordinate plant operation during the test. • Ensure the unit is operating at the agreed upon conditions in the test plan. • Collect any process data required. • Provide all technical support related to process operation.	Morgan Raup	Dow Chemical
Environmental Focal Point	• Ensure all regulatory requirements and citations are reviewed and considered for the testing.	Becky Meyerholt	Dow Chemical
Air SME	• Leadership of the sampling program. • Develop the overall testing plan. • Determine the correct sample methods.	Chuck Glenn	Dow Chemical
Technical Reviewer	• Completes technical review of the test data.	Rob Sava	AECOM
Field Team Leader	• Ensures field sampling meets the quality assurance objectives of the plan.	Randy Reinke	AECOM
Sample Project Leader	• Ensures data generated meets the quality assurance objectives of the plan.	James Edmister	AECOM

2. Plant and Sampling Location Description

2.1 Facility Description

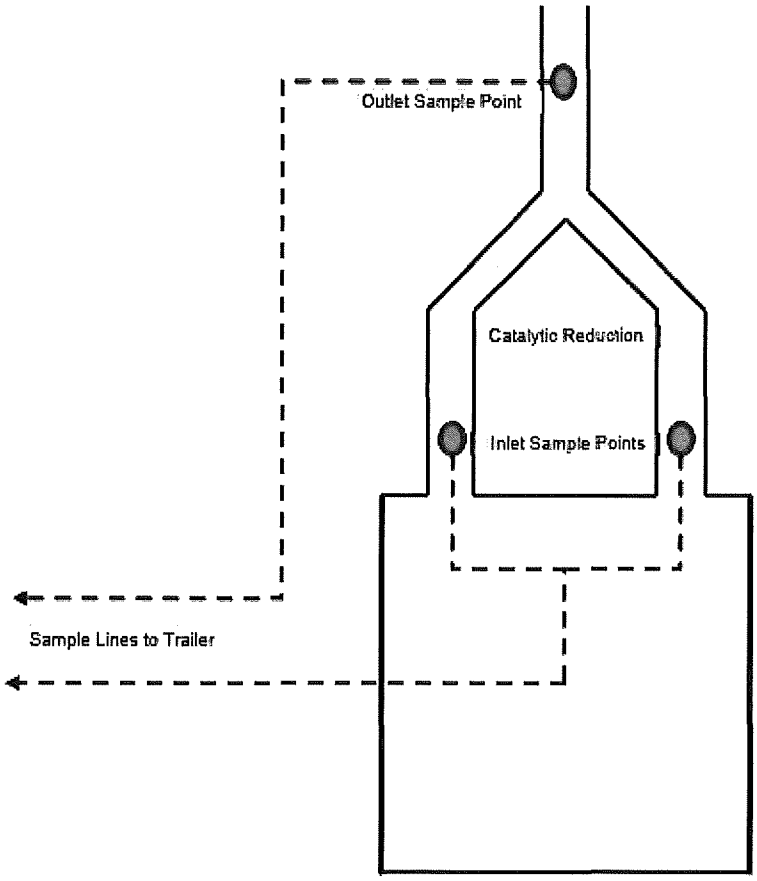
Dow operates a chemical manufacturing facility in Midland, Michigan. Environmental Operations (EVO) operates two diesel 1050 hp engines to divert influent wastewater and storm water away from the on-site wastewater treatment plant (WWTP) to wastewater storage tanks for a variety of reasons.

Engine A completed its initial performance test on November 18, 2021. This report includes the results from the May 17, 2022 testing of Engine A only due to an equipment malfunction on Engine B. Engine B will be tested for its initial compliance test as soon as the equipment is operational.

The testing was conducted to demonstrate compliance with emissions and operating limits found in 63.6600(d), Table 2b of the RICE MACT, 40CFR63, Subpart ZZZZ.

2.2 Flue Gas Sampling Locations

Sampling was conducted on Engine A prior to and after the dual (in parallel) single stage catalytic reduction. Flue gas sample locations met the minimum guidelines for carbon monoxide (CO) and oxygen (O_2) sampling.



3. Summary and Discussion of Test Results

3.1 Objectives and Test Matrix

Under contract with Dow, Midland Operations, AECOM, Inc., conducted compliance sampling on the engines located at the Environmental Operations Plant (EVO) at Dow's Michigan Operations facility (MiOps). These engines are operated in non-emergency situations to manage wastewater and storm water at the MiOps site. The testing was conducted to demonstrate compliance with emissions and operating limits found in 63.6600(d), Table 2c. The specific objectives of this test were to:

- Verify the scrubber reduction efficiency (SRE) for CO is greater than 70%.

3.2 Facility Operations

For engines >500HP the facility must:

- Minimize idle time at startup to <30 minutes
- Maintain the catalyst so that the pressure drop across the catalyst does not change by more than 2 inches of water at 100 percent load plus or minus 10 percent from the pressure drop across the catalyst measured during the initial performance test; AND
- Exhaust maintained such that 450°F ≥ catalyst inlet temperature ≤ 1350°F

During Engine A's initial performance test on November 18, 2021, the engine was operated at 96% load speed due to an operational limitation that has since been resolved. The test on Engine A that occurred on May 17, 2022, was operated without this limitation in place so the load speed was 100%

3.3 Test Results

Table 3-1: P200 Engine A Test Summary

SAMPLE TYPE	TEST METHOD	*ACTUAL EMISSION REDUCTION	REQUIRED EMISSION REDUCTION
CO Emissions (SRE)	EPA Method 10	95 %	70 %

* Average over three one-hour runs.

Table 3-2: P200 Engine A Test Run Data

PARAMETER	RUN 1	RUN 2	RUN 3	AVERAGE
Sample Date	05/17/2022	05/17/2022	05/17/2022	--
Sample Times (start/end)	10:05-11:05	11:35-12:35	13:05-14:05	--
Outlet CO (ppmv @ 15% O_2)	1.65	1.35	1.40	1.47
Inlet CO (ppmv @ 15% O_2)	32.68	32.07	32.92	32.55
CO (SRE %)	**95.0**	**95.8**	**95.7**	**95**

Table 3-3: P200 Engine A Process Data

PARAMETER	RUN 1	RUN 2	RUN 3	AVERAGE
Sample Date	05/17/2022	05/17/2022	05/17/2022	--
Sample Times (start-end)	10:05-11:05	11:35-12:35	13:05-14:05	--
Engine RPM (RPM)	1439	1414	1403	1418
Engine Load Speed	100	100	100	100
Fuel Consumed (% of Tank)	2.67	2.81	2.85	2.78
Outlet Temp (Deg F)	165.4	166.7	166.7	166.3
Catalyst A				
Catalyst Inlet Temp (Deg F)	755	753	762	757
Differential Pressure (IWC)	22.6	22.6	22.5	22.6
Catalyst B				
Catalyst Inlet Temp (Deg F)	759	759	767	762
Differential Pressure (IWC)	21.3	21.3	21.2	21.3

4. Sampling and Analytical Procedures

4.1 Test Methods

All sampling and analytical procedures are EPA published methods or methods allowed by 63.6610. This compliance test utilized the following methods:

- EPA Method 3A for O_2 Concentration
- EPA Method 10 for CO Concentration

Procedures
The above methods were performed using mobile continuous emission monitors provided by the AECOM internal testing team. Gas was withdrawn from the stack and transported to monitors located at ground level. A stainless-steel probe was inserted into the stack and used to collect sample gas. A Teflon sample line heated to 250°F transported sample gas from the probe to the analyzers. The analyzers were kept at a constant temperature inside the mobile laboratory.

Sample gas was collected continuously from the stack. At the mobile laboratory, the stack gas is routed to a condenser and then transported to the analyzers for analysis.

EPA Method 3A (Flue Gas Composition and Molecular Weight)
EPA Method 3A (Instrumental Method) was utilized to determine the diluent during each run on the outlet.

An analyzer measured O_2 content on the basis of the strong paramagnetic properties of O_2 relative to other compounds present in combustion gases. In the presence of a magnetic field, O_2 molecules become temporary magnets. The analyzer determines the sample gas O_2 concentration by detecting the displacement torque of the sample test body in the presence of a magnetic field.

EPA Method 10 (CO Sampling and Analysis)
EPA Method 10 was utilized to determine carbon monoxide concentrations during each run on the outlet.

An analyzer measured CO based on its absorption of infrared radiation. The infrared unit uses a single beam, single wavelength technique, with wavelength selection being achieved by a carefully specified narrow band optical filter making it highly selective for CO measurement in the presence of other infrared-absorbing gases.

Figure 4-1: SAMPLING TRAIN USED FOR CO & O_2 (M10 & M3A)