



# **Freedom Compressor Station**

## **Compressor Engines**

Units 3-1, 3-2, 3-3, 3-4 and 3-5

Continuous Parameter Monitoring System (CPMS)

Monitoring Plan

June 18, 2019

<b>Monitoring Plan Revision History<sup>1</sup></b>			
<b>Revision No.</b>	<b>Revised By</b>	<b>Revision Date</b>	<b>Comments (e.g. Description of Revisions)</b>
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B		October 24, 2016	Draft for Internal Review
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1		June 18, 2019	Add U3-3, 3-4, 3-5

<sup>1</sup>Once issued for use -Revisions must be retained for 5 years from the date of the revision.

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## 1.0 CPMS Monitoring Plan Overview

Facility: Freedom Compressor Station

Physical Address: 12201 Pleasant Lake Rd, Manchester, MI

Consumers Energy's Freedom Compressor Station is a natural gas compressor station used to maintain pressure of the natural gas in order to move it along the pipeline systems. In 2016, two (2) natural gas fired, lean burn, reciprocating engines (Waukesha Model 12V275GL+, 3750 hp each) were installed. In 2019, three (3) additional natural gas fired, lean burn, reciprocating engines (Waukesha Model 12V275GL+, 3750 hp each) were installed. Each engine is of a four stroke design and is spark- ignited (4 stroke lean burn - 4SLB). Each engine is equipped with oxidation catalysts for emissions control.

<b>Engines Subject to RICE MACT &amp; Provisions of this Plan</b>						
Emission Unit ID	Engine ID	Engine Description		Site-Rated HP	Emission Controls	Parameter to be Continuously Monitored
		Manufacturer	Model			
EUENGINE3-1	COMP-3-01-01	GE Waukesha	12V275GL+	3,750	Oxidation Catalyst	Catalyst Inlet Temperature
EUENGINE3-2	COMP-3-01-02	GE Waukesha	12V275GL+	3,750	Oxidation Catalyst	Catalyst Inlet Temperature
EUENGINE3-3	COMP-3-01-03	GE Waukesha	12V275GL+	3,750	Oxidation Catalyst	Catalyst Inlet Temperature
EUENGINE3-4	COMP-3-01-04	GE Waukesha	12V275GL+	3,750	Oxidation Catalyst	Catalyst Inlet Temperature
EUENGINE3-5	COMP-3-01-05	GE Waukesha	12V275GL+	3,750	Oxidation Catalyst	Catalyst Inlet Temperature

### 1.1 Regulatory Requirement

Subpart ZZZZ of 40 CFR 63 [National Emission Standard for Hazardous Air Pollutants (NESHAP) for Reciprocating Internal Combustion Engine (RICE)] requires continuous monitoring of the catalyst inlet temperature for affected units at the Freedom Compressor Station. The primary monitoring requirements are defined in §63.6625(b) and §63.6635 of Subpart ZZZZ. Additional requirements are defined in the General Provisions (part 63, Subpart A), specifically §63.8. §63.6625(b) requires a Monitoring Plan for the continuous parameter monitoring system (CPMS) that monitors the catalyst inlet temperature to ensure compliance with a specified temperature operating limit.

Common criteria associated with CPMS instrumentation and its operation can be used at multiple sites, but Subpart ZZZZ requires a site-specific Monitoring Plan that must be available for review if requested by EPA or delegated state or local air quality agencies.

## **1.2 Definitions**

The following definitions apply:

Unit Startup: Unit startup is initiated in all cases when fuel and ignition are turned on and is considered complete when the unit bypass valve is fully closed.

Unit Shutdown: Unit shutdown is initiated when the issuance of a shutdown command, pushing the shutdown button, or reducing the unit load with intent to shut down if shutting down manually. The shutdown is complete when fuel and ignition have been turned off.

Malfunction: A malfunction means any sudden, infrequent, and not reasonably preventable failure of air pollution control and monitoring equipment, which causes or has the potential to cause, the emission limitations to be exceeded.

A CPMS is out-of-control :

The CPMS fails a performance test audit, relative accuracy audit, relative accuracy test audit, or linearity test audit.

## **2.0 Performance Criteria and Design Specifications**

This section provides information on the affected RICE and the CPMS instrumentation and equipment. Per §63.6625(b)(1)(i), the CPMS Monitoring Plan must include monitoring system design specification and equipment performance criteria for the sample interface, detector signal analyzer, and data acquisition and calculations.

The purpose of the CPMS is to:

- Monitor the catalyst inlet temperature on a continuous basis (not including periods of startup, shutdown, or malfunction)
- Collect measurements at least once every 15 minutes
- Average the data on a 4-hour rolling basis

### **2.1 Temperature Measurement Sample Interface**

The temperature sensor was installed using the manufacturer's specifications, taking into account access, safety, and a location such that representative measurements will be obtained.

### **2.2 Temperature Measurement Device Specifications**

The following specifications apply to the temperature measurement devices:

Thermocouples located pre catalyst with a +/- 1% full scale accuracy

#### **2.2.1 Wiring**

Conduit cable is installed per the latest edition of the National Electric Code.

#### **2.2.2 Data Acquisition System**

The data acquisition system (DAS) is composed of a local UCP that monitors sensors and records the catalyst inlet temperatures. The DAS will record the following: [§63.8(c)(2)(ii)]

- 15-minute snapshot temperature readings
- 4-hour rolling average temperature (recorded every 15 minutes)
- The recorded data is accessible on-site.

#### **2.2.3 Reporting System**

A reporting software is used to collect the data and for long-term retention of the data.

### **3.0 Temperature Monitoring System Performance Evaluation and Periodic QA/QC Procedures**

Per §63.6625(b)(1)(iii), the site-specific monitoring plan must address the following:

*Equipment performance evaluations, system accuracy audits, or other audit procedures.*

#### **3.1 Periodicity**

All equipment will be calibrated and meet general requirements for accuracy  
Annual QA/QC evaluations of the CPMS shall be conducted as described below.

#### **3.2 Methodology**

The performance of the CPMS will be validated by performing periodic standard calibrations

##### **3.2.1 Calibration**

The calibrations will be in accordance with manufacturer's recommendations and company policies and procedures. The methods used shall address both the temperature element, differential pressure transducer, and the DAS. A work order documenting steps to be followed shall be used.

##### **3.2.2 Accuracy**

The accuracy criteria for the validation check is  $\pm 1.0$  percent of full scale

#### **3.3 Notification**

A notification of the date the CPMS performance evaluation is scheduled to begin shall be submitted with the notification of performance test.

#### **3.4 Documentation**

Closeout of the work order shall be considered sufficient documentation provided, field readings, and/or other results, as appropriate, are included in the closeout comments or attached to the work order.



### **3.5 Malfunctioning CPMS**

In the event of a malfunction of the CPMS, the engine shall be shut down until such time as troubleshooting can occur. Operation of the engine while troubleshooting a malfunction of the CPMS is acceptable. Possible indications of a malfunction include, but are not limited to:

- Temperatures out of range (high or low)
- Erroneous or nonsensical data

#### **3.5.1 Recordkeeping and Reporting**

Documenting the malfunction of the CPMS, and corrective actions taken additionally, the Environmental Department should be notified of any serious malfunction.

#### **3.5.2 Troubleshooting a Malfunctioning CPMS**

Freedom shall troubleshoot the CPMS according to the manufacturer's recommendations, company policy and procedures and good operating practices.

## **4.0 CPMS Operation and Maintenance**

### **4.1 CPMS Operation**

Prior to conducting performance testing, as required by 40 CFR 63 subpart ZZZZ, the CPMS shall be installed, operational and the data verified. Verification of operation status shall, at a minimum, include completion of the manufacturers written specifications or recommendations for installation, operation, and calibration of the system. The CPMS will be in operation whenever the monitored engine operates, with the exception of monitoring malfunctions, associated repairs, and required quality assurance or control activities.

Alarms shall be provided as follows:

- The CPMS shall alarm when the oxidation catalyst inlet temperature reaches 450°F decreasing or 1350°F increasing
- Alarms shall be disabled as follows:
  - Low temperature: during unit startup

## **4.2 CPMS Maintenance**

### **4.2.1 Preventative Maintenance**

CPMS maintenance will be conducted in accordance with company policy and procedures. Additionally, periodic station walk downs will be performed to check on obvious signs of malfunction of the equipment.

### **4.2.2 Corrective Maintenance**

Corrective maintenance will be conducted according to manufacturer's recommendations, company policy and procedures, and good operating practices, in a manner consistent with safety and good air pollution control practices for minimizing emissions in the event of a CPMS malfunction, impending malfunction, or out-of-control CPMS.

## **4.3 Spare Parts**

Spare parts for the CPMS may not always be maintained in inventory. If a spare part for the system is not available when needed, the affected engine will be shut down until such time as the necessary until the spare part can be procured and installed.

## **5.0 Data Management**

### **5.1 Valid Data**

Valid data is defined as data not "recorded during monitoring malfunctions, associated repairs, and required quality assurance or control activities". Specifically, valid data is comprised of:

- 15-minute temperature readings (not recorded during monitoring malfunctions, associated repairs, and required quality assurance or control activities)
- 4-hour rolling averages

## 5.2 Data Review

Operations shall periodically review the CPMS data to:

- Confirm all required data is being collected
- Identify any data collected that was not valid data
- Confirm that no exceedances of temperature limits occurred

Missing Data:

If missing data is unrecoverable (e.g., due to power failure), exceedances are identified, or non-valid data is identified, the Environmental Department shall be notified.

Additionally, in the event of repeated instances of missing data, whether recoverable or unrecoverable, over a short duration of time, an investigation as to the causes is to be conducted.

## 5.3 Recordkeeping

The following data collected by the CPMS will be retained for a period of five years and easily accessible.

- Each 4-hour rolling average
- Each 15-minute data point used to calculate
- The algorithm/calculation methodology used to reduce data
- All readings taken during CPMS breakdowns or out-of-control periods

Additionally, the following information shall be collected and maintained regarding the CPMS:

- The date and time identifying each period during which the CPMS was inoperative, except for zero (low-level) and high-level checks
- The date and time identifying each period during which the CPMS was out-of-control
- The date and time of commencement and completion of each time period where the CPMS 4-hour rolling temperature was out of the specified limits in this plan, other than during periods other than startups, shutdowns and malfunctions of the affected source.
- The nature and cause of any malfunction (if known)
- The corrective action taken or preventative measures adopted
- The nature of the repairs or adjustments to the CPMS that was inoperative or out of control
- The total process operating time during the reporting period
- Documentation of any QA/QC procedures performed for CPMS

## 6.0 PROGRAM OF CORRECTIVE ACTION FOR A MALFUNCTIONING CPMS

### Data Acquisition CPMS Not Continuously Working

#### **Event Procedures:**

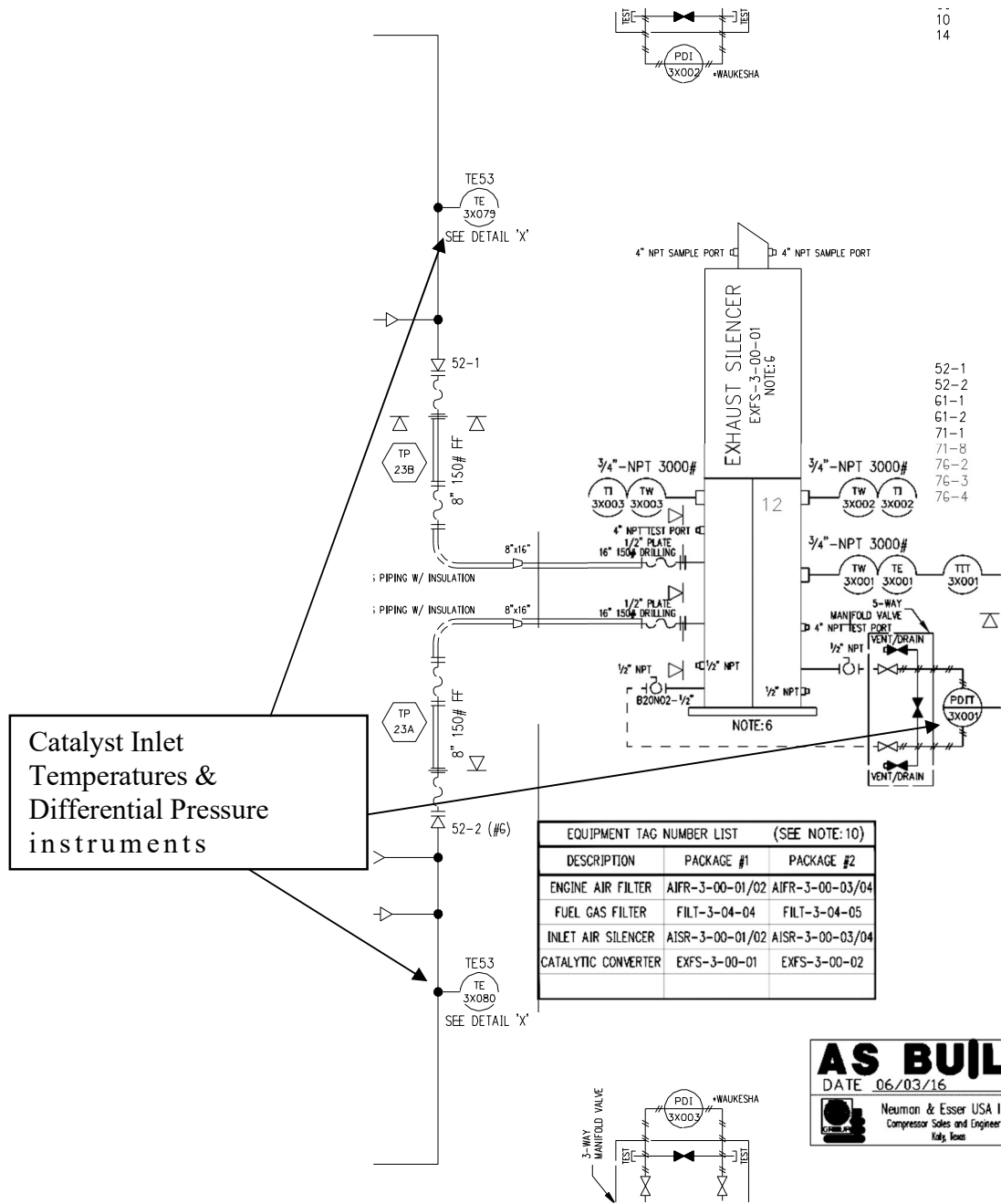
- If the Data Acquisition System is not working, restore system operation as soon as practical. Troubleshoot per manufacturer's recommendations, including reinstallation of software, inspection/repair of power or communications connections and wiring, if required.
- Confirm restoration of data acquisition system operation.

### Thermocouple Not Working or Working Improperly

#### **Event Procedures:**

- If the thermocouple is not working or working improperly, restore system operation as soon as practical. Conduct troubleshooting per manufacturer's instructions.
- Identify required adjustment, repair, or replacement, per manufacturer instructions. Complete required actions.

# FIGURES



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