

AIR QUALITY DIVISION
CHAPTER 6, SECTION 3
OPERATING PERMIT

WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION
122 West 25th Street
Cheyenne, Wyoming 82002



PERMIT NO. 3-2-190

Issue Date: **October 29, 2013**
Expiration Date: **October 29, 2018**
Effective Date: **October 29, 2013**
Replaces Permit No.: **3-1-190-1**

In accordance with the provisions of W.S. §35-11-203 through W.S. §35-11-212 and Chapter 6, Section 3 of the Wyoming Air Quality Standards and Regulations,

WGR Asset Holding Company, LLC
Little Thunder-Stratus Compressor Station
Section 13, Township 43 North, Range 72 West
Campbell County, Wyoming

is authorized to operate a stationary source of air contaminants consisting of emission units described in this permit. The units described are subject to the terms and conditions specified in this permit. All terms and conditions of the permit are enforceable by the State of Wyoming. All terms and conditions of the permit, except those designated as not federally enforceable, are enforceable by EPA and citizens under the Act. A copy of this permit shall be kept on-site at the above named facility or at an acceptable alternate location.

Steven A. Dietrich

Steven A. Dietrich, Administrator
Air Quality Division

10-29-13

Date

Todd Parfitt

Todd Parfitt, Director
Department of Environmental Quality

10/29/13

Date

WAQSR CHAPTER 6, SECTION 3 OPERATING PERMIT

WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY AIR QUALITY DIVISION

TABLE OF CONTENTS

General Information.....	3
Source Emission Points	4
Total Facility Estimated Emissions.....	5
Facility-Specific Permit Conditions.....	6
Facility-Wide Permit Conditions	6
Source-Specific Permit Conditions.....	6
Testing and Monitoring Requirements	7
Recordkeeping Requirements	8
Reporting Requirements	9
WAQSR Chapter 5, Section 2 and 40 CFR 60 Subpart JJJJ Requirements	11
WAQSR Chapter 5, Section 2 and 40 CFR 60 Subpart OOOO Requirements.....	11
WAQSR Chapter 5, Section 3 and 40 CFR 63 Subpart ZZZZ Requirements.....	12
WAQSR Chapter 7, Section 3 Compliance Assurance Monitoring (CAM) Requirements	13
Compliance Certification and Schedule.....	14
Compliance Certification	14
Compliance Schedule.....	14
General Permit Conditions.....	15
State Only Permit Conditions	20
Summary of Source Emission Limits and Requirements	22
Abbreviations.....	24
Definitions.....	25
Appendix A: Compliance Assurance Monitoring Plan	

SOURCE EMISSION POINTS

This table may not include any or all insignificant activities at this facility.

SOURCE ID#	SOURCE DESCRIPTION	SIZE	CH. 6, SEC. 2 PERMITS
E1 (C-601)*	Waukesha L7044GSI Compressor Engine ¹	1680 hp	CT-1712, MD-1133
E2 (C-602)*	Waukesha L7044GSI Compressor Engine ¹	1680 hp	CT-1712, MD-1133
E3 (C-603)*	Waukesha L7044GSI Compressor Engine ¹	1680 hp	MD-491, MD-1133
E4 (C-604)*	Waukesha L7044GSI Compressor Engine ¹	1680 hp	MD-491, MD-1133
E7 (LTSC-6)*	Waukesha F3524GSI Compressor Engine ¹	840 hp	MD-691A, MD-1133
AMN1A	Amine Treater Reboiler	9 MMBtu/hr	MD-6598A
AMN1B	Amine Treater Reboiler	9 MMBtu/hr	MD-6598A
AMN1C	Amine Treater Reboiler	9 MMBtu/hr	MD-6598A
AMN1D	Amine Treater Reboiler	9 MMBtu/hr	MD-6598A
D1b	Dehy Reboiler Heater	0.57 MMBtu/hr	N/A
D2b	Dehy Reboiler Heater	0.57 MMBtu/hr	N/A
D4b	Dehy Reboiler Heater	2.0 MMBtu/hr	N/A
G1	Generac Standby Generator ²	30 hp	Waiver AP-5600

* Alternate source identification number from permit MD-6598A.

¹ Engine is 4-stroke rich burn controlled with air-fuel ratio controls (AFRC) and non-selective catalytic reduction (NSCR) catalysts.

² Engine is 4-stroke rich burn.

TOTAL FACILITY ESTIMATED EMISSIONS

For informational purposes only. These emissions are not to be assumed as permit limits.

POLLUTANT	EMISSIONS (TPY)
CRITERIA POLLUTANT EMISSIONS	
Particulate Matter	Negligible
PM ₁₀ Particulate Matter	Negligible
PM _{2.5} Particulate Matter	Negligible
Sulfur Dioxide (SO ₂)	Negligible
Nitrogen Oxides (NO _x)	82
Carbon Monoxide (CO)	160
Volatile Organic Compounds (VOCs)	74
HAZARDOUS AIR POLLUTANT (HAP) EMISSIONS	0.73
GREENHOUSE GAS EMISSIONS (CO ₂ e)	53,066

Emission estimates are from the operating permit application.

FACILITY-SPECIFIC PERMIT CONDITIONS

Facility-Wide Permit Conditions

- (F1) **FACILITY ENGINE REQUIREMENTS [WAQSR Ch 6, Sec 2 Permit MD-6598A]**
- (a) The facility shall be limited to no more than six engines consisting of the following:
 - (i) Four Waukesha L7044GSI engines equipped with AFRC and NSCR catalysts.
 - (ii) One Waukesha F3524GSI engine equipped with AFRC and NSCR catalyst.
 - (iii) One Generac Emergency Generator.
 - (b) Once removed from the facility, an engine cannot be installed and operated in its place unless authorized by an appropriate permit modification (except as allowed for temporary engine replacement under condition F4).
 - (c) The permittee may expand the engine configuration beyond that described in paragraph (a) upon receipt of a construction or modification permit issued under Chapter 6, Section 2 of WAQSR that authorizes such change. The permittee must, however, submit an application to modify this operating permit within 12 months of commencement of operation for any engine not already included in this permit.

Source-Specific Permit Conditions

- (F2) **VISIBLE EMISSIONS [WAQSR Ch 3, Sec 2]**
 Visible emissions of any contaminant discharged into the atmosphere from any single emission source shall not exhibit greater than 20 percent opacity except for one period or periods aggregating not more than six minutes in any one hour of not more than 40 percent opacity.
- (F3) **FACILITY EMISSIONS AND OPERATING REQUIREMENTS [WAQSR Ch 3, Sec 3; Ch 6, Sec 2 Permits CT-1712, MD-491, MD-691A, MD-1133, MD-6598A and Waiver AP-5600]**
- (a) NO_x and CO emissions from the compressor engines (units E1-E4 and E7) and the Amine Treater Reboilers (units AMN1A-AMN1D) shall not exceed the limits specified in Table I.
 - (b) Compliance with the g/hp-hr limits is considered compliance with the lb/hr and TPY limits as long as each engine is operated at or below its site-rated capacity.
 - (c) The Generac Emergency Generator (unit G1) shall not exceed 1,000 hours of operation per calendar year.
 - (d) The permittee shall operate and maintain the Generac Emergency Generator (unit G1) in accordance with the manufacturer's recommendations.
 - (e) NO_x emissions from the Dehy Reboiler Heaters (units D1b, D2b and D4b) shall not exceed 0.20 lb/MMBtu heat input.
 - (f) The permittee shall operate and maintain each compressor engine (units E1-E4 and E7), air pollution control equipment, and monitoring equipment according to good air pollution control practices at all times, including startup, shutdown, and malfunction

Source Description	NO _x			CO		
	g/hp-hr	lb/hr	TPY	g/hp-hr	lb/hr	TPY
Each Waukesha L7044GSI (units E1-E4)	1.0	3.7	16.2	2.0	7.4	32.4
Waukesha F3524GSI (unit E7)	1.0	1.9	8.3	2.0	3.7	16.2
	lb/MMBtu			lb/MMBtu		
Each Amine Treater Reboiler (units AMN1A-AMN1D)	0.04	0.4	1.6	0.08	0.8	3.2

- (F4) **TEMPORARY ENGINE REPLACEMENT [WAQSR Ch 6, Sec 3(h)(i)(I)]**
- (a) Should an engine break down or require an overhaul, the permittee may bring on site and operate a temporary replacement engine until repairs are made. Permanent replacement of an engine **must** be evaluated by the Division under Ch 6, Sec 2 of WAQSR to determine appropriate permitting action and evaluate the need for additional requirements resulting from the permanent replacement.

- (b) The temporary replacement unit shall be identical or similar to the unit replaced with emission levels at or below those of the unit replaced.
- (c) The permittee shall notify the Division in writing of such replacement within five working days, provide the date of startup of the replacement, and provide a statement regarding the applicability of any New Source Performance Standards (NSPS) in 40 CFR Part 60; any National Emission Standards for Hazardous Air Pollutants (NESHAPs) in 40 CFR Part 63; and Compliance Assurance Monitoring (CAM) in WAQSR Ch 7, Sec 3.

Testing and Monitoring Requirements

(F5) EMISSIONS TESTING [W.S. 35-11-110]

- (a) The Division reserves the right to require additional testing as provided under condition G1 of this permit. Should testing be required, test methods found at 40 CFR 60, Appendix A, shall be used as follows:
 - (i) For visible emissions, Method 9 shall be used.
 - (ii) For particulate emissions, Methods 1-4 and 5 shall be used.
 - (iii) For NO_x emissions, Methods 1-4 and 7 or 7E shall be used.
 - (iv) For CO emissions, Methods 1-4 and 10 shall be used.
 - (v) For alternative test methods, or methods used for other pollutants, the approval of the Administrator must be obtained prior to using the test method to measure emissions.
- (b) Unless otherwise specified, testing shall be conducted in accordance with WAQSR Ch 5, Sec 2(h).

(F6) VISIBLE EMISSIONS MONITORING [WAQSR Ch 6, Sec 3(h)(i)(C)(I)]

Periodic monitoring for visible emissions from the compressor engines (units E1-E4 and E7), Amine Treater Reboilers (units AMN1A-AMN1D), Dehy Reboiler Heaters (units D1b, D2b and D4b), and the emergency generator (unit G1) shall consist of monitoring the type of fuel used to ensure natural gas is the sole fuel source for these units.

(F7) CATALYTICALLY CONTROLLED ENGINE EMISSIONS MONITORING [WAQSR Ch 6, Sec 3(h)(i)(C)(I) and Ch 7, Sec 3(c)(ii); Ch 6, Sec 2 Permits CT-1712, MD-491, MD-691A and MD-1133]

For NO_x and CO emissions from the Waukesha L7044GSI catalytically controlled compressor engines (units E1-E4), and for CO emissions from the Waukesha F3524GSI catalytically controlled compressor engine (unit E7), the permittee shall adhere to the compliance assurance monitoring (CAM) plan, attached as Appendix A of this permit, and shall conduct monitoring as follows during active operation of each emission source:

- (a) For each engine, the permittee shall operate and maintain a thermocouple to measure, monitor and record, at minimum once daily, the engine's inlet catalyst temperature.
 - (i) An excursion, which is considered operation outside of the range of 750°F to 1250°F, shall trigger immediate inspection and, if appropriate, corrective action.
- (b) For each engine, the permittee shall operate and maintain a device to measure, monitor and record, at least monthly, the pressure drop across the catalyst.
 - (i) An excursion, which is considered to occur when the pressure changes by more than two inches of water from the reference pressure drop, shall trigger immediate inspection and, if appropriate, corrective action.
 - (A) Reference pressure drop for each engine shall be established during the initial performance test.
 - (B) When a catalyst is replaced, the reference pressure drop shall be re-established for that engine during the first test required, in compliance with condition F7, which occurs after the catalyst replacement.
- (c) The permittee shall measure NO_x and CO emissions from each catalytically controlled compressor engine (units E1-E4 and E7) at least once every calendar year for comparison with the emission limits specified in condition F3, and to further refine the relationship between emissions and the indicator ranges in the CAM plan.
 - (i) The permittee shall measure the CAM indicators during the tests. Following each test, the permittee shall evaluate the data from the test, together with data from previous testing, to determine if the indicator ranges in the CAM plan should be revised.

- (ii) Emissions shall be measured using the Division's portable analyzer monitoring protocol, or the EPA reference methods described in condition F5. The monitoring protocol can be downloaded at <http://deq.state.wy.us/aqd/operating.asp> or is available from the Division upon request.
- (iii) Notification of the test date shall be provided to the Division at least 15 days prior to testing. Results of the tests shall be submitted to the Division within 30 days of completing the tests.
- (d) The permittee shall follow all other applicable requirements under conditions CAM-1 through CAM-4 of this permit.

(F8) EMERGENCY GENERATOR MONITORING

[WAQSR Ch 6, Sec 3(h)(i)(C)(I) and Ch 6, Sec 2 Waiver AP-5600]

- (a) The permittee shall monitor and document the hours of operation of the emergency generator (unit G1) to assess compliance with the annual limit specified in condition F3.
- (b) The permittee shall monitor and document that the manufacturer's recommended maintenance for the emergency generator (unit G1) has been followed.

Recordkeeping Requirements

(F9) TESTING AND MONITORING RECORDS

[WAQSR Ch 6, Sec 3(h)(i)(C)(II); Ch 7, Sec 3(i)(ii); Ch 6, Sec 2 Permit MD-1133 and Waiver AP-5600]

- (a) For any testing performed under condition F5, other than Method 9 observations, the permittee shall record, as applicable, the following:
 - (i) The date, place, and time of sampling, measurements, or observations;
 - (ii) The date(s) the analyses or observations were performed;
 - (iii) The company or entity that performed the analyses or observations;
 - (iv) The analytical techniques or methods used;
 - (v) The results of such analyses or observations;
 - (vi) The operating conditions and parameters as they existed at the time of testing or monitoring; and
 - (vii) Any corrective actions taken.
- (b) For the CAM monitoring required under condition F7:
 - (i) For the catalyst inlet temperature monitoring required under condition F7(a), the permittee shall record the catalyst inlet temperature, any maintenance and/or corrective action triggered, and the dates of catalyst replacement for each engine.
 - (ii) For the pressure drop monitoring required under condition F7(b), the permittee shall record the pressure drop, any maintenance and/or corrective action triggered, the reference pressure drop for each engine at the time of the monitoring, and the dates of catalyst replacement for each engine.
 - (iii) For the NO_x and CO emissions testing required by condition F7(c), the permittee shall record the information listed in (a) above.
 - (iv) The permittee shall record the date, time, and duration of any excursions as well as the CAM indicator value(s) during each excursion.
 - (v) The permittee shall also maintain records of monitoring data, monitor performance data, corrective actions taken, any written quality improvement plan required pursuant to WAQSR Ch 7, Sec 3(h), any activities undertaken to implement a Quality Improvement Plan (QIP), and other supporting information required to be maintained under WAQSR Ch 7, Sec 3.
- (c) For any Method 9 observations required by the Division under condition F5, the permittee shall keep field records in accordance with Section 2.2 of Method 9.
- (d) For the operating hours monitoring required by condition F8(a), the permittee shall record the operating hours of the emergency generator (unit G1).
- (e) The permittee shall retain these records on-site at the facility or at an acceptable alternate location, for a period of at least five years from the date the records are generated, and make them available to the Division upon request.

(F10) MAINTENANCE RECORDS [WAQSR Ch 6, Sec 3(h)(i)(C)(II); Ch 6, Sec 2 Waiver AP-5600]

- (a) The record of maintenance activities for the emergency generator (unit G1) shall include:
 - (i) The maintenance activity performed;
 - (ii) The date and place the activity was performed;

- (iii) The company and individual(s) that performed the activity;
 - (iv) The purpose of the activity; and
 - (v) An explanation for any deviation from the manufacturer's recommendations.
- (b) The permittee shall retain these records on-site at the facility or at an acceptable alternate location, for a period of at least five years from the date the records are generated, and make them available to the Division upon request.

Reporting Requirements

- (F11) NOTIFICATION OF TESTING AND SHUTDOWN [WAQSR Ch 6, Sec 2 Permit MD-1133]
- (a) For the testing required by conditions F5 and F7(c), notification of the test date shall be provided to the Division at least 15 days prior to testing.
 - (b) Upon shutdown and removal of an engine from the facility, written notification is required within 15 days of removal. Such notification shall be submitted on a complete Engine Installation/Removal form
- (F12) TEST REPORTS [WAQSR Ch 6, Sec 3(h)(i)(C)(III); Ch 6, Sec 2 Permits CT-1712, MD-491 and MD-691A]
- (a) The permittee shall report the results of any emissions tests performed under conditions F5 and F7(c), within 30 days of completing the tests.
 - (i) The reports shall also include the evaluation of the CAM indicator ranges as required by condition F7(c)(i). If the evaluation indicates the CAM ranges need to be revised, the permittee shall submit a revised CAM plan to the Division, along with a request to administratively amend the CAM plan, within 60 days of completing the test.
 - (b) The reports shall include the information specified under condition F9(a), reference this permit condition (F12), and be submitted to the Division in accordance with condition G4.
- (F13) MONITORING REPORTS [WAQSR Ch 6, Sec 3(h)(i)(C)(III)]
- (a) The following shall be reported to the Division by January 31 and July 31 each year:
 - (i) Documentation that all emissions units are firing natural gas as specified in condition F6.
 - (ii) The calendar year-to-date operating hours for the emergency generator (unit G1).
 - (iii) Summary results of the CAM monitoring required under condition F7. The results shall include the following, as applicable:
 - (A) Information on the number, duration, and cause of excursions, as applicable, and the maintenance and/or corrective actions taken (if no excursions occurred during the reporting period, this shall be stated in the report);
 - (B) A description of the action taken to implement a QIP (if required) during the reporting period as specified in Chapter 7, Section 3 (h). Upon completion of a QIP, the permittee shall include in the next summary report documentation that the implementation of the plan has reduced the likelihood of similar excursions.
 - (b) All instances of deviations from the conditions of this permit must be clearly identified in each report.
 - (c) The reports shall reference this permit condition (F13), and be submitted to the Division in accordance with condition G4.
- (F14) GREENHOUSE GAS REPORTS [W.S. 35-11-110]
- The permittee shall submit to the Division a summary of any report(s) required to be submitted to the EPA under 40 CFR Part 98.
- (a) The reports shall be submitted to the Division within 60 days of submission to EPA, in a format as specified by the Division.
 - (b) The reports shall be submitted in accordance with condition G4(a)(i) of this permit, to the attention of the Division's Emission Inventory Program. A copy need not be sent to the DEQ Air Quality contact
- (F15) REPORTING EXCESS EMISSIONS & DEVIATIONS FROM PERMIT REQUIREMENTS [WAQSR Ch 6, Sec 3(h)(i)(C)(III)]
- (a) General reporting requirements are described under the General Conditions of this permit. The Division reserves the right to require reports as provided under condition G1 of this permit.

- (b) Emissions which exceed the limits specified in this permit and which are not reported under a different condition of this permit shall be reported annually with the emission inventory unless specifically superseded by condition G17, condition G19, or other condition(s) of this permit. The probable cause of such exceedance, the duration of the exceedance, the magnitude of the exceedance, and any corrective actions or preventative measures taken shall be included in this annual report. For sources and pollutants which are not continuously monitored, if at any time emissions exceed the limits specified in this permit by 100 percent, or if a single episode of emission limit exceedance spans a period of 24 hours or more, such exceedance shall be reported to the Division within one working day of the exceedance. (Excess emissions due to an emergency shall be reported as specified in condition G17. Excess emissions due to unavoidable equipment malfunction shall be reported as specified in condition G19.)
- (c) Any other deviation from the conditions of this permit shall be reported to the Division in writing within 30 days of the deviation or discovery of the deviation.

WAQSR CHAPTER 5, SECTION 2 NEW SOURCE PERFORMANCE STANDARDS (NSPS) AND
40 CFR 60 SUBPART JJJJ REQUIREMENTS
FOR STATIONARY SPARK IGNITION INTERNAL COMBUSTION ENGINES

SUBPART JJJJ [40 CFR Part 60 Subparts A and JJJJ; WAQSR Ch 5, Sec 2]

As applicable, the permittee shall meet all requirements of 40 CFR 60 Subparts A and JJJJ, and WAQSR Ch 5, Sec 2, as they apply to affected stationary spark ignition (SI) internal combustion engines (ICE). (As required by condition F4(c), if an engine is replaced or reconstructed, subpart applicability will need to be reevaluated and a statement regarding applicability submitted to the Division.) For the purposes of this subpart, the date that construction commences is the date the engine is ordered by the owner or operator. An affected source is defined at §60.4230, including the emergency generator engine (unit G1).

On May 14, 2013, engines E1-E4 and E7 were not subject to Subpart JJJJ according to information submitted to the Division by the permittee. Engine G1 must meet the requirements of Subpart ZZZZ by meeting the requirements of 40 CFR 60, Subpart JJJJ. However, on May 14, 2013, engine G1 had no applicable requirements from Subpart JJJJ because of its date of manufacture.

40 CFR 60 SUBPART OOOO REQUIREMENTS
FOR CRUDE OIL AND NATURAL GAS PRODUCTION, TRANSMISSION AND DISTRIBUTION

SUBPART OOOO REQUIREMENTS

[40 CFR 60 Subparts A and OOOO; and WAQSR Ch 5, Sec 2]

The permittee shall meet all applicable requirements of 40 CFR 60 Subparts A and OOOO and WAQSR Ch 5, Sec 2 as they apply to affected facilities as specified under §60.5365.

The subparts are available at <http://www.gpoaccess.gov/cfr/retrieve.html>, or from the Division upon request.

**WAQSR CHAPTER 5, SECTION 3 NATIONAL EMISSION STANDARDS FOR
HAZARDOUS AIR POLLUTANTS (NESHAPS) AND**

**40 CFR 63 SUBPART ZZZZ REQUIREMENTS
FOR STATIONARY RECIPROCATING INTERNAL COMBUSTION ENGINES**

SUBPART ZZZZ REQUIREMENTS [40 CFR 63 Subparts A and ZZZZ; WAQSR Ch 5, Sec 3]

The permittee shall meet all requirements of 40 CFR 63 Subparts A and ZZZZ and WAQSR Ch 5, Sec 3 as they apply to each affected source as indicated in §63.6590(a). An affected source is any existing, new, or reconstructed stationary RICE located at a major or area source of HAP emissions, excluding stationary RICE being tested at a stationary RICE test cell/stand. (As required by condition F4(c), if an engine is replaced or reconstructed, subpart applicability will need to be re-evaluated and a statement regarding applicability submitted to the Division.) This facility is currently identified as an area source of HAP emissions. Affected sources at this facility include the five Waukesha compressor engines (units E1-E4 and E7) and the Generac Emergency Generator engine (unit G1).

The subparts are available at <http://www.gpoaccess.gov/cfr/retrieve.html>, or from the Division upon request.

WAQSR CHAPTER 7, SECTION 3
COMPLIANCE ASSURANCE MONITORING (CAM) REQUIREMENTS

WAQSR Ch 7, Sec 3 is available at <http://deq.state.wy.us/aqd/standards.asp>, or from the Division upon request.

- (CAM-1) **COMPLIANCE ASSURANCE MONITORING REQUIREMENTS [WAQSR Ch 7, Sec 3(b) and (c)]**
The permittee shall follow the CAM plan attached as Appendix A of this permit and meet all CAM requirements of WAQSR Chapter 7, Section 3 as they apply to the units identified in condition F7. Compliance with the source specific monitoring, recordkeeping, and reporting requirements of this permit meets the monitoring, recordkeeping, and reporting requirements of WAQSR Ch 7, Sec 3, except for additional requirements specified under conditions CAM-2 through CAM-4.
- (CAM-2) **OPERATION OF APPROVED MONITORING [WAQSR Ch 7, Sec 3(g)]**
- (a) At all times, the permittee shall maintain the monitoring under this section, including but not limited to, maintaining necessary parts for routine repairs of the monitoring equipment.
 - (b) Except for monitoring malfunctions, associated repairs, and required quality assurance or control activities, the permittee shall conduct all monitoring in continuous operation (or at all required intervals) at all times that the pollutant specific emissions unit is operating.
 - (c) Upon detecting an excursion, the permittee shall restore operation of the pollutant-specific emission unit to its normal or usual manner of operation as expeditiously as practicable in accordance with good air pollution control practices. The response shall include minimizing the period of any start-up, shutdown or malfunction and taking any corrective actions to restore normal operation and prevent the likely recurrence of the cause of an excursion.
 - (d) If the permittee identifies a failure to achieve compliance with an emission limit for which the monitoring did not provide an indication of an excursion while providing valid data, or the results of compliance or performance testing documents a need to modify the existing indicator ranges, the permittee shall promptly notify the Division and, if necessary, submit a proposed modification to this permit to address the necessary monitoring changes.
- (CAM-3) **QUALITY IMPROVEMENT PLAN (QIP) REQUIREMENTS [WAQSR Ch 7, Sec 3(h)]**
- (a) If the Division or the EPA Administrator determines, based on available information, that the permittee has used unacceptable procedures in response to an excursion or exceedance, the permittee may be required to develop and implement a Quality Improvement Plan (QIP).
 - (b) If required, the permittee shall maintain a written Quality Improvement Plan (QIP) and have it available for inspection.
 - (c) The plan shall include procedures for conducting one or more of the following:
 - (i) Improved preventative maintenance practices.
 - (ii) Process operation changes.
 - (iii) Appropriate improvements to control methods.
 - (iv) Other steps appropriate to correct control.
 - (v) More frequent or improved monitoring (in conjunction with (i)- (iv) above).
 - (d) If a QIP is required, the permittee shall develop and implement a QIP as expeditiously as practicable and shall notify the Division if the period for completing the QIP exceeds 180 days from the date on which the need to implement the QIP was determined.
 - (e) Following implementation of a QIP, upon any subsequent determination under paragraph (a) above, the Division may require the permittee to make reasonable changes to the QIP if the QIP failed to address the cause of control device problems, or failed to provide adequate procedures for correcting control device problems as expeditiously as practicable.
 - (f) Implementation of a QIP shall not excuse the permittee from compliance with any existing emission limit(s) or any existing monitoring, testing, reporting, or recordkeeping requirements that may be applicable to the facility.
- (CAM-4) **SAVINGS PROVISIONS [WAQSR Ch 7, Sec 3(j)]**
Nothing in the CAM regulations shall excuse the permittee from compliance with any existing emission limit or standard, or any existing monitoring, testing, reporting or recordkeeping requirement that may be applicable to the facility.

COMPLIANCE CERTIFICATION AND SCHEDULE

Compliance Certification [WAQSR Ch 6, Sec 3(h)(iii)(E)]

- (C1) (a) The permittee shall submit by January 31 each year a certification addressing compliance with the requirements of this permit. The certification shall be submitted as a stand-alone document separate from any monitoring reports required under this permit.
- (b) (i) For visible emissions the permittee shall assess compliance with condition F2 of this permit by verifying natural gas was the sole fuel source used for the units listed in condition I6.
- (ii) For NO_x and CO emissions, the permittee shall assess compliance with condition F3 by conducting the testing and monitoring required by condition F7.
- (iii) For the operating hours limitations on the emergency generator (unit G1), the permittee shall assess compliance with condition F3(c) by conducting the monitoring required by condition F8(a) and by reviewing the records kept in accordance with condition F9(d).
- (iv) For emergency generator engine (unit G1) maintenance, the permittee shall verify that the records are kept in accordance with condition F10.
- (v) For greenhouse gas reporting, the permittee shall assess compliance with condition F14 by verifying that reports were submitted in accordance with condition F14(b).
- (vi) For any affected facility subject to 40 CFR 60 Subpart OOOO, the permittee shall assess compliance with Subpart OOOO by conducting any applicable testing and monitoring required by §§60.5413 through 60.5417 and by reviewing any applicable records required by §§60.5420.
- (vii) The permittee shall assess compliance with Part 63 Subpart ZZZZ by conducting any applicable testing and monitoring required by §§63.6610 through 63.6640 and by reviewing the records required by §§63.6655 and 63.6665.
- (c) The compliance certification shall include:
- (i) The permit condition or applicable requirement that is the basis of the certification;
- (ii) The current compliance status;
- (iii) Whether compliance was continuous or intermittent; and
- (iv) The methods used for determining compliance.
- (d) For any permit conditions or applicable requirements for which the source is not in compliance, the permittee shall submit with the compliance certification a proposed compliance plan and schedule for Division approval.
- (e) The compliance certification shall be submitted to the Division in accordance with condition G4 of this permit and to the Assistant Regional Administrator, Office of Enforcement, Compliance, and Environmental Justice (8ENF-T), U.S. EPA - Region VIII, 1595 Wynkoop Street, Denver, CO 80202-1129.
- (f) Determinations of compliance or violations of this permit are not restricted to the monitoring requirements listed in paragraph (b) of this condition; other credible evidence may be used.

Compliance Schedule [WAQSR Ch 6, Sec 3(h)(iii)(C) and (D)]

- (C2) The permittee shall continue to comply with the applicable requirements with which the permittee has certified that it is already in compliance.
- (C3) The permittee shall comply in a timely manner with applicable requirements that become effective during the term of this permit.

GENERAL PERMIT CONDITIONS

Powers of the Administrator: [W.S. 35-11-110]

- (G1) (a) The Administrator may require the owner or operator of any point source to complete plans and specifications for any application for a permit required by the Wyoming Environmental Quality Act or regulations made pursuant thereto and require the submission of such reports regarding actual or potential violations of the Wyoming Environmental Quality Act or regulations thereunder.
- (b) The Administrator may require the owner or operator of any point source to establish and maintain records; make reports; install, use and maintain monitoring equipment or methods; sample emissions, or provide such other information as may be reasonably required and specified.

Permit Renewal and Expiration: [WAQSR Ch 6, Sec 3(c)(i)(C), (d)(ii), (d)(iv)(B), and (h)(i)(B)] [W.S. 35-11-206(f)]

- (G2) This permit is issued for a fixed term of five years. Permit expiration terminates the permittee's right to operate unless a timely and complete renewal application is submitted at least six months prior to the date of permit expiration. If the permittee submits a timely and complete application for renewal, the permittee's failure to have an operating permit is not a violation of WAQSR Chapter 6, Section 3 until the Division takes final action on the renewal application. This protection shall cease to apply after a completeness determination if the applicant fails to submit by the deadline specified in writing by the Division any additional information identified as being needed to process the application.

Duty to Supplement: [WAQSR Ch 6, Sec 3(c)(iii)]

- (G3) The permittee, upon becoming aware that any relevant facts were omitted or incorrect information was submitted in the permit application, shall promptly submit such supplementary facts or corrected information. The permittee shall also provide additional information as necessary to address any requirements that become applicable to the facility after this permit is issued.

Submissions: [WAQSR Ch 6, Sec 3(c)(iv)] [W.S. 35-11-206(c)]

- (G4) Any document submitted shall be certified as being true, accurate, and complete by a responsible official.
- (a) Submissions to the Division.
- (i) Any submissions to the Division including reports, certifications, and emission inventories required under this permit shall be submitted as separate, stand-alone documents and shall be sent to:
Administrator, Air Quality Division
122 West 25th Street
Cheyenne, Wyoming 82002
- (ii) Unless otherwise noted elsewhere in this permit, a copy of each submission to the Administrator under paragraph (a)(i) of this condition shall be sent to the DEQ Air Quality Contact listed on page 3 of this permit.
- (b) Submissions to EPA.
- (i) Each certification required under condition C1 of this permit shall also be sent to:
Assistant Regional Administrator
Office of Enforcement, Compliance, and Environmental Justice (8ENFT)
U.S. EPA - Region VIII
1595 Wynkoop Street
Denver, CO 80202-1129.
- (ii) All other required submissions to EPA shall be sent to:
Office of Partnerships and Regulatory Assistance
Air and Radiation Program (8P-AR)
U.S. EPA - Region VIII
1595 Wynkoop Street
Denver, CO 80202-1129

Changes for Which No Permit Revision Is Required: [WAQSR Ch 6, Sec 3(d)(iii)]

- (G5) The permittee may change operations without a permit revision provided that:
- (a) The change is not a modification under any provision of title I of the Clean Air Act;
 - (b) The change has met the requirements of Chapter 6, Section 2 of the WAQSR and is not a modification under Chapter 5, Section 2 or Chapter 6, Section 4 of the WAQSR and the changes do not exceed the emissions allowed under the permit (whether expressed therein as a rate of emissions or in terms of total emissions); and
 - (c) The permittee provides EPA and the Division with written notification at least 14 days in advance of the proposed change. The permittee, EPA, and the Division shall attach such notice to their copy of the relevant permit. For each such change, the written notification required shall include a brief description of the change within the permitted facility, the date on which the change will occur, any change in emissions, and any permit term or condition that is no longer applicable as a result of the change. The permit shield, if one exists for this permit, shall not apply to any such change made.

Transfer of Ownership or Operation: [WAQSR Ch 6, Sec 3(d)(v)(A)(IV)]

- (G6) A change in ownership or operational control of this facility is treated as an administrative permit amendment if no other change in this permit is necessary and provided that a written agreement containing a specific date for transfer of permit responsibility, coverage, and liability between the current and new permittee has been submitted to the Division.

Reopening for Cause: [WAQSR Ch 6, Sec 3(d)(vii)] [W.S. 35-11-206(f)(ii) and (iv)]

- (G7) The Division will reopen and revise this permit as necessary to remedy deficiencies in the following circumstances:
- (a) Additional applicable requirements under the Clean Air Act or the WAQSR that become applicable to this source if the remaining permit term is three or more years. Such reopening shall be completed not later than 18 months after promulgation of the applicable requirement. No reopening is required if the effective date of the requirement is later than the date on which the permit is due to expire, unless the original permit or any of its terms and conditions have been extended.
 - (b) Additional requirements (including excess emissions requirements) become applicable to an affected source under the acid rain program. Upon approval by EPA, excess emissions offset plans shall be deemed to be incorporated into the permit.
 - (c) The Division or EPA determines that the permit contains a material mistake or that inaccurate statements were made in establishing the emissions standards or other terms or conditions of the permit.
 - (d) The Division or EPA determines that the permit must be revised or revoked to assure compliance with applicable requirements.

Annual Fee Payment: [WAQSR Ch 6, Sec 3(f)(i), (ii), and (vi)] [W.S. 35-11-211]

- (G8) The permittee shall, as a condition of continued operations, submit an annual fee to the Division as established in Chapter 6, Section 3 (f) of the WAQSR. The Division shall give written notice of the amount of fee to be assessed and the basis for such fee assessment annually. The assessed fee is due on receipt of the notice unless the fee assessment is appealed pursuant to W.S. 35-11-211(d). If any part of the fee assessment is not appealed it shall be paid to the Division on receipt of the written notice. Any remaining fee which may be due after completion of the appeal is immediately due and payable upon issuance of the Council's decision. Failure to pay fees owed the Division is a violation of Chapter 6, Section 3 (f) and W.S. 35-11-203 and may be cause for the revocation of this permit.

Annual Emissions Inventories: [WAQSR Ch 6, Sec 3(f)(v)(G)]

- (G9) The permittee shall submit an annual emission inventory for this facility to the Division for fee assessment and compliance determinations within 60 days following the end of the calendar year. The emissions inventory shall be in a format specified by the Division.

Severability Clause: [WAQSR Ch 6, Sec 3(h)(i)(E)]

- (G10) The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

Compliance: [WAQSR Ch 6, Sec 3(h)(i)(F)(I) and (II)] [W.S. 35-11-203(b)]

- (G11) The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Clean Air Act, Article 2 of the Wyoming Environmental Quality Act, and the WAQSR and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

Permit Actions: [WAQSR Ch 6, Sec 3(h)(i)(F)(III)] [W.S. 35-11-206(f)]

- (G12) This permit may be modified, revoked, reopened, and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or of a notification of planned changes or anticipated noncompliance does not stay any permit condition.

Property Rights: [WAQSR Ch 6, Sec 3(h)(i)(F)(IV)]

- (G13) This permit does not convey any property rights of any sort, or any exclusive privilege.

Duty to Provide Information: [WAQSR Ch 6, Sec 3(h)(i)(F)(V)]

- (G14) The permittee shall furnish to the Division, within a reasonable time, any information that the Division may request in writing to determine whether cause exists for modifying, revoking and reissuing, or terminating the permit or to determine compliance with the permit. Upon request, the permittee shall also furnish to the Division copies of records required to be kept by the permit, including information claimed and shown to be confidential under W.S. 35-11-1101 (a) of the Wyoming Environmental Quality Act. Upon request by the Division, the permittee shall also furnish confidential information directly to EPA along with a claim of confidentiality.

Emissions Trading: [WAQSR Ch 6, Sec 3(h)(i)(H)]

- (G15) No permit revision is required, under any approved economic incentives, marketable permits, emissions trading and other similar programs or processes for changes that are provided for in this permit.

Inspection and Entry: [WAQSR Ch 6, Sec 3(h)(iii)(B)] [W.S. 35-11-206(c)]

- (G16) Authorized representatives of the Division, upon presentation of credentials and other documents as may be required by law, shall be given permission to:
- (a) enter upon the permittee's premises where a source is located or emissions related activity is conducted, or where records must be kept under the conditions of this permit;
 - (b) have access to and copy at reasonable times any records that must be kept under the conditions of this permit;
 - (c) inspect at reasonable times any facilities, equipment (including monitoring and air pollution control equipment), practices, or operations regulated or required under this permit;
 - (d) sample or monitor any substances or parameters at any location, during operating hours, for the purpose of assuring compliance with this permit or applicable requirements.

Excess Emissions Due to an Emergency: [WAQSR Ch 6, Sec 3(I)]

- (G17) The permittee may seek to establish that noncompliance with a technology-based emission limitation under this permit was due to an emergency, as defined in Ch 6, Sec 3(l)(i) of the WAQSR. To do so, the permittee shall demonstrate the affirmative defense of emergency through properly signed, contemporaneous operating logs, or other relevant evidence that:
- (a) an emergency occurred and that the permittee can identify the cause(s) of the emergency;
 - (b) the permitted facility was, at the time, being properly operated;
 - (c) during the period of the emergency the permittee took all reasonable steps to minimize levels of emissions that exceeded the emissions standards, or other requirements in this permit;

- (d) The permittee submitted notice of the emergency to the Division within one working day of the time when emission limitations were exceeded due to the emergency. This notice must contain a description of the emergency, any steps taken to mitigate emissions, and corrective actions taken.

Diluting and Concealing Emissions: [WAQSR Ch 1, Sec 4]

- (G18) No person shall cause or permit the installation or use of any device, contrivance, or operational schedule which, without resulting in reduction of the total amount of air contaminant released to the atmosphere, shall dilute or conceal an emission from a source. This condition shall not apply to the control of odors.

Unavoidable Equipment Malfunction: [WAQSR Ch 1, Sec 5]

- (G19) (a) Any source believing that any emissions in excess of established regulation limits or standards resulted from an unavoidable equipment malfunction, shall notify the Division within 24 hours of the incident via telephone, electronic mail, fax, or other similar method. A detailed description of the circumstances of the incident as described in paragraph 5(a)(i)(A) Chapter 1, including a corrective program directed at preventing future such incidents, must be submitted within 14 days of the onset of the incident. The Administrator may extend this 14-day time period for cause.
- (b) The burden of proof is on the owner or operator of the source to provide sufficient information to demonstrate that an unavoidable equipment malfunction occurred.

Fugitive Dust: [WAQSR Ch 3, Sec 2(f)]

- (G20) The permittee shall minimize fugitive dust in compliance with standards in Ch 3, Sec 2(f) of WAQSR for construction/demolition activities, handling and transportation of materials, and agricultural practices.

Carbon Monoxide: [WAQSR Ch 3, Sec 5]

- (G21) The emission of carbon monoxide in stack gases from any stationary source shall be limited as may be necessary to prevent ambient standards from being exceeded.

Asbestos: [WAQSR Ch 3, Sec 8]

- (G22) The permittee shall comply with emission standards for asbestos during abatement, demolition, renovation, manufacturing, spraying and fabricating activities.
 - (a) No owner or operator shall build, erect, install, or use any article, machine, equipment, process, or method, the use of which conceals an emission which would otherwise constitute a violation of an applicable standard. Such concealment includes, but is not limited to, the use of gaseous dilutants to achieve compliance with a visible emissions standard, and the piecemeal carrying out of an operation to avoid coverage by a standard that applies only to operations larger than a specified size.
 - (b) All owners and operators conducting an asbestos abatement project, including an abatement project on a residential building, shall be responsible for complying with Federal requirements and State standards for packaging, transportation, and delivery to an approved waste disposal facility as provided in paragraph (m) of Ch 3, Sec 8.
 - (c) The permittee shall follow State and Federal standards for any demolition and renovation activities conducted at this facility, including:
 - (i) A thorough inspection of the affected facility or part of the facility where the demolition or renovation activity will occur shall be conducted to determine the presence of asbestos, including Category I and Category II non-friable asbestos containing material. The results of the inspection will determine which notification and asbestos abatement procedures are applicable to the activity.
 - (ii) The owner or operator shall follow the appropriate notification requirements of Ch 3, Sec 8(i)(ii).
 - (iii) The owner or operator shall follow the appropriate procedures for asbestos emissions control, as specified in Chapter 3, Section 8(i)(iii).
 - (d) No owner or operator of a facility may install or reinstall on a facility component any insulating materials that contain commercial asbestos if the materials are either molded and friable or wet-applied and friable after drying. The provisions of this paragraph do not apply to spray-applied insulating materials regulated under paragraph (j) of Ch 3, Sec 8.
 - (e) The permittee shall comply with all other requirements of WAQSR Ch 3, Sec 8.

Open Burning Restrictions: [WAQSR Ch 10, Sec 2]

- (G23) The permittee conducting an open burn shall comply with all rules and regulations of the Wyoming Department of Environmental Quality, Division of Air Quality, and with the Wyoming Environmental Quality Act.
- (a) No person shall burn prohibited materials using an open burning method, except as may be authorized by permit. *"Prohibited materials"* means substances including, but not limited to; natural or synthetic rubber products, including tires; waste petroleum products, such as oil or used oil filters; insulated wire; plastic products, including polyvinyl chloride ("PVC") pipe, tubing and connectors; tar, asphalt, asphalt shingles, or tar paper; railroad ties; wood, wood waste, or lumber that is painted or chemically treated; explosives or ammunition; batteries; hazardous waste products; asbestos or asbestos containing materials; or materials which cause dense smoke discharges, excluding refuse and flaring associated with oil and gas well testing, completions and well workovers.
- (b) No person or organization shall conduct or cause or permit open burning for the disposal of trade wastes, for a salvage operation, for the destruction of fire hazards if so designated by a jurisdictional fire authority, or for firefighting training, except when it can be shown by a person or organization that such open burning is absolutely necessary and in the public interest. Any person or organization intending to engage in such open burning shall file a request to do so with the Division.

Sulfur Dioxide Emission Trading and Inventory Program [WAQSR Ch 14]

- (G24) Any BART (Best Available Retrofit Technology) eligible facility, or facility which has actual emissions of SO₂ greater than 100 tpy in calendar year 2000 or any subsequent year, shall comply with the applicable requirements of WAQSR Ch 14, Sections 1 through 3, with the exceptions described in sections 2(c) and 3(a).

Stratospheric Ozone Protection Requirements: [40 CFR Part 82]

- (G25) The permittee shall comply with all applicable Stratospheric Ozone Protection Requirements, including but not limited to:
- (a) *Standards for Appliances* [40 CFR Part 82, Subpart F]
The permittee shall comply with the standards for recycling and emission reduction pursuant to 40 CFR Part 82, Subpart F - Recycling and Emissions Reduction, except as provided for motor vehicle air conditioners (MVACs) in Subpart B:
- (i) Persons opening appliances for maintenance, service, repair, or disposal must comply with the required practices pursuant to §82.156.
 - (ii) Equipment used during the maintenance, service, repair, or disposal of appliances must comply with the standards for recycling and recovery equipment pursuant to §82.158.
 - (iii) Persons performing maintenance, service, repair, or disposal of appliances must be certified by an approved technician certification program pursuant to §82.161.
 - (iv) Persons disposing of small appliances, MVACs, and MVAC-like appliances must comply with record keeping requirements pursuant to §82.166. ("MVAC-like appliance" is defined at §82.152).
 - (v) Persons owning commercial or industrial process refrigeration equipment must comply with the leak repair requirements pursuant to §82.166.
 - (vi) Owners/operators of appliances normally containing 50 or more pounds of refrigerant must keep records of refrigerant purchased and added to such appliances pursuant to §82.166.
 - (vii) The permittee shall comply with all other requirements of Subpart F.
- (b) *Standards for Motor Vehicle Air Conditioners* [40 CFR Part 82, Subpart B]
If the permittee performs a service on motor (fleet) vehicles when this service involves ozone-depleting substance refrigerant in the MVAC, the permittee is subject to all the applicable requirements as specified in 40 CFR Part 82, Subpart B, Servicing of Motor Vehicle Air Conditioners. The term "motor vehicle" as used in Subpart B does not include a vehicle in which final assembly of the vehicle has not been completed. The term "MVAC" as used in Subpart B does not include the air-tight sealed refrigeration system used as refrigerated cargo, or the system used on passenger buses using HCFC-22 refrigerant.

STATE ONLY PERMIT CONDITIONS

The conditions listed in this section are State only requirements and are not federally enforceable.

Ambient Standards

(S1) The permittee shall operate the emission units described in this permit such that the following ambient standards are not exceeded:

POLLUTANT	STANDARD	CONDITION	WAQSR CH. 2, SEC.
PM ₁₀ particulate matter	50 micrograms per cubic meter	annual arithmetic mean	2 (a)
	150 micrograms per cubic meter	24-hr average concentration with not more than one exceedance per year	
PM _{2.5} particulate matter	15 micrograms per cubic meter	annual arithmetic mean	2 (b)
	35 micrograms per cubic meter	98 th percentile 24-hr average concentration	
Nitrogen dioxide	53 parts per billion	annual average concentration	3
	100 parts per billion	three-year average of the annual 98 th percentile of the daily maximum 1-hr average concentration	
	0.053 parts per million	annual arithmetic mean	
Sulfur dioxide	75 parts per billion	three-year average of the annual (99 th percentile) of the daily max 1-hr average	4
	0.5 parts per million	3-hr blocks not to be exceeded more than once per calendar year	
Carbon monoxide	10 milligrams per cubic meter	max 8-hr concentration with not more than one exceedance per year	5
	40 milligrams per cubic meter	max 1-hr concentration with not more than one exceedance per year	
Ozone	0.075 parts per million	three-year average of the annual fourth-highest daily maximum 8-hr average concentration	6
Hydrogen sulfide	70 micrograms per cubic meter	½ hour average not to be exceeded more than two times per year	7
	40 micrograms per cubic meter	½ hour average not to be exceeded more than two times in any five consecutive days	
Suspended sulfate	0.25 milligrams SO ₃ per 100 square centimeters per day	maximum annual average	8
	0.50 milligrams SO ₃ per 100 square centimeters per day	maximum 30-day value	
Lead and its compounds	0.15 micrograms per cubic meter	maximum arithmetic 3-month mean concentration for a 3-year period	10

Hydrogen Sulfide: [WAQSR Ch 3, Sec 7]

- (S2) Any exit process gas stream containing hydrogen sulfide which is discharged to the atmosphere from any source shall be vented, incinerated, flared or otherwise disposed of in such a manner that ambient sulfur dioxide and hydrogen sulfide standards are not exceeded.

Odors: [WAQSR Ch 2, Sec 11]

- (S3) (a) The ambient air standard for odors from any source shall be limited to an odor emission at the property line which is undetectable at seven dilutions with odor free air as determined by a scentometer as manufactured by the Barnebey-Cheney Company or any other instrument, device, or technique designated by the Division as producing equivalent results. The occurrence of odors shall be measured so that at least two measurements can be made within a period of one hour, these determinations being separated by at least 15 minutes.
- (b) Odor producing materials shall be stored, transported, and handled in a manner that odors produced from such materials are confined and that accumulation of such materials resulting from spillage or other escape is prevented.

SUMMARY OF SOURCE EMISSION LIMITS AND REQUIREMENTS

Source ID#: **E1-E4** Source Description: **Waukesha L7044GSI Compressor Engines**

Pollutant	Emissions Limit/Work Practice Standard	Corresponding Regulation(s)	Testing Requirements	Monitoring Requirements	Recordkeeping Requirements	Reporting Requirements
Particulate	20 percent opacity [F2]	WAQSR Ch 3, Sec 2	Testing if required [F5]	Verification of natural gas firing [F6]	Record the results of any additional testing [F9]	Semiannual: report type of fuel fired [F13] Report excess emissions and permit deviations [F15]
NO _x	1.0 g/hp-hr, 3.7 lb/hr and 16.2 TPY [F3]	WAQSR Ch 6, Sec 2 Permits CT-1712, MD-491, MD-1133	Annual testing [F7] and/or Testing if required [F5]	Annual test [F7] Catalyst monitoring and maintenance [F7]	Record monitoring results [F9]	15 days: notify of testing [F11] 30 days: report test results [F12] Semiannual: report monitoring results [F13] Report excess emissions and permit deviations [F15]
CO	2.0 g/hp-hr, 7.4 lb/hr and 32.4 TPY [F3]	WAQSR Ch 6, Sec 2 Permits CT-1712, MD-491, MD-1133	Annual testing [F7] and/or Testing if required [F5]	Annual test [F7] Catalyst monitoring and maintenance [F7]	Record monitoring results [F9]	15 days: notify of testing [F11] 30 days: report test results [F12] Semiannual: report monitoring results [F13] Report excess emissions and permit deviations [F15]
HAPs	WAQSR Ch 5, Sec 3 and 40 CFR 63 Subparts A & ZZZZ					

Source ID#: **E7** Source Description: **Waukesha F3524GSI Compressor Engine**

Pollutant	Emissions Limit/Work Practice Standard	Corresponding Regulation(s)	Testing Requirements	Monitoring Requirements	Recordkeeping Requirements	Reporting Requirements
Particulate	20 percent opacity [F2]	WAQSR Ch 3, Sec 2	Testing if required [F5]	Verification of natural gas firing [F6]	Record the results of any additional testing [F9]	Semiannual: report type of fuel fired [F13] Report excess emissions and permit deviations [F15]
NO _x	1.0 g/hp-hr, 3.7 lb/hr and 16.2 TPY [F3]	WAQSR Ch 6, Sec 2 Permits MD-691A, MD-1133	Annual testing [F7] and/or Testing if required [F5]	Annual test [F7] Catalyst monitoring and maintenance [F7]	Record monitoring results [F9]	15 days: notify of testing [F11] 30 days: report test results [F12] Semiannual: report monitoring results [F13] Report excess emissions and permit deviations [F15]
CO	2.0 g/hp-hr, 7.4 lb/hr and 32.4 TPY [F3]	WAQSR Ch 6, Sec 2 Permits MD-691A, MD-1133	Annual testing [F7] and/or Testing if required [F5]	Annual test [F7] Catalyst monitoring and maintenance [F7]	Record monitoring results [F9]	15 days: notify of testing [F11] 30 days: report test results [F12] Semiannual: report monitoring results [F13] Report excess emissions and permit deviations [F15]
HAPs	WAQSR Ch 5, Sec 3 and 40 CFR 63 Subparts A & ZZZZ					

These tables are intended only to highlight and summarize applicable requirements for each source. The corresponding permit conditions, listed in brackets, contain detailed descriptions of the compliance requirements. Compliance with the summary conditions in these tables may not be sufficient to meet permit requirements. These tables may not reflect all emission sources at this facility.

Source ID#: G1 Source Description: Generac Emergency Generator Engine

Pollutant	Emissions Limit/Work Practice Standard	Corresponding Regulation(s)	Testing Requirements	Monitoring Requirements	Recordkeeping Requirements	Reporting Requirements
Particulate	20 percent opacity [F2]	WAQSR Ch 3, Sec 2	Testing if required [F5]	Verification of natural gas firing [F6]	Record the results of any additional testing [F9]	Semiannual: report type of fuel fired [F13] Report excess emissions and permit deviations [F15]
NO _x	1,000 hrs/year limit [F3] Maintain per manufacturer recommendations [F3]	WAQSR Ch 6, Sec 2 Waiver AP-5600	Testing if required [F5]	Monitor operating hours [F8] Monitor maintenance [F8]	Record operating hours [F9] Record maintenance activities [F10]	Semiannual: report calendar year-to-date operating hours [F13] Report excess emissions and permit deviations [F15]
CO	1,000 hrs/year limit [F3] Maintain per manufacturer recommendations [F3]	WAQSR Ch 6, Sec 2 Waiver AP-5600	Testing if required [F5]	Monitor operating hours [F8] Monitor maintenance [F8]	Record operating hours [F9] Record maintenance activities [F10]	Semiannual: report calendar year-to-date operating hours [F13] Report excess emissions and permit deviations [F15]
HAPs	WAQSR Ch 5, Sec 3 and 40 CFR 63 Subparts A & ZZZZ					

Source ID#: D1b, D2b and D4b

Source Description: Dehy Reboiler Heaters

Pollutant	Emissions Limit/Work Practice Standard	Corresponding Regulation(s)	Testing Requirements	Monitoring Requirements	Recordkeeping Requirements	Reporting Requirements
Particulate	20 percent opacity [F2]	WAQSR Ch 3, Sec 2	Testing if required [F5]	Verification of natural gas firing [F6]	Record the results of any additional testing [F9]	Report type of fuel fired [F13] Report excess emissions and permit deviations [F15]
NO _x	0.20 lb/MMBtu [F3]	WAQSR Ch 3, Sec 3	Testing if required [F5]	None	Record any test results [F9]	Report excess emissions and permit deviations [F15]

Source ID#: AMN1A, AMN1B, AMN1C and AMN1D

Source Description: Amine Treater Reboiler

Pollutant	Emissions Limit/Work Practice Standard	Corresponding Regulation(s)	Testing Requirements	Monitoring Requirements	Recordkeeping Requirements	Reporting Requirements
Particulate	20 percent opacity [F2]	WAQSR Ch 3, Sec 2	Testing if required [F5]	Verification of natural gas firing [F6]	Record results of any additional testing [F9]	Report type of fuel fired [F13] Report excess emissions and permit deviations [F15]
NO _x	0.04 lb/MMBtu, 0.4 lb/hr and 1.6 TPY [F3]	WAQSR Ch 6, Sec 2 Permit MD-6598A	Testing if required [F5]	None	Record any test results [F9]	Report excess emissions and permit deviations [F15]
CO	0.08 lb/MMBtu, 0.8 lb/hr and 3.2 TPY [F3]	WAQSR Ch 6, Sec 2 Permit MD-6598A	Testing if required [F5]	None	Record any test results [F9]	Report excess emissions and permit deviations [F15]

These tables are intended only to highlight and summarize applicable requirements for each source. The corresponding permit conditions, listed in brackets, contain detailed descriptions of the compliance requirements. Compliance with the summary conditions in these tables may not be sufficient to meet permit requirements. These tables may not reflect all emission sources at this facility.

ABBREVIATIONS

ACFM	Actual cubic feet per minute
AFRC	Air-fuel ratio controls
AQD	Air Quality Division
BACT	Best available control technology (see Definitions)
Btu	British thermal unit
CAA	Clean Air Act
CAM	Compliance Assurance Monitoring
C.F.R.	Code of Federal Regulations
CO	Carbon monoxide
DEQ	Wyoming Department of Environmental Quality
EPA	United States Environmental Protection Agency (see Definitions)
ESP	Electrostatic Precipitator
g/hp-hr	Gram(s) per horsepower hour
gal	Gallon(s)
gr	Grain(s)
H ₂ S	Hydrogen sulfide
HAP(s)	Hazardous air pollutant(s)
hp	Horsepower
hr	Hour(s)
lb	Pound(s)
M	Thousand
MACT	Maximum available control technology (see Definitions)
mfr	Manufacturer
mg	Milligram(s)
MM	Million
MVACs	Motor vehicle air conditioners
NMHC(s)	Non-methane hydrocarbon(s)
NO _x	Oxides of nitrogen
NSCR	Non-selective catalytic reduction
O ₂	Oxygen
PM	Particulate matter
PM ₁₀	Particulate matter less than or equal to a nominal diameter of 10 micrometers
ppmv	Parts per million (by volume)
ppmw	Parts per million (by weight)
QIP	Quality Improvement Plan
RICE	Reciprocating internal combustion engine
SCF	Standard cubic foot (feet)
SCFD	Standard cubic foot (feet) per day
SCM	Standard cubic meter(s)
SIC	Standard Industrial Classification
SO ₂	Sulfur dioxide
SO _x	Oxides of sulfur
TBD	To be determined
TPD	Ton(s) per day
TPH	Ton(s) per hour
TPY	Tons per year
U.S.C.	United States Code
µg	Microgram(s)
VOC(s)	Volatile organic compound(s)
W.S.	Wyoming Statute
WAQSR	Wyoming Air Quality Standards & Regulations (see Definitions)

DEFINITIONS

"Act" means the Clean Air Act, as amended, 42 U.S.C. 7401, *et seq.*

"Administrator" means Administrator of the Air Quality Division, Wyoming Department of Environmental Quality.

"Applicable requirement" means all of the following as they apply to emissions units at a source subject to Chapter 6, Section 3 of the WAQSR (including requirements with future effective compliance dates that have been promulgated or approved by the EPA or the State through rulemaking at the time of issuance of the operating permit):

- (a) Any standard or other requirement provided for in the Wyoming implementation plan approved or promulgated by EPA under title I of the Act that implements the relevant requirements of the Act, including any revisions to the plan promulgated in 40 C.F.R. Part 52;
- (b) Any standards or requirements in the WAQSR which are not a part of the approved Wyoming implementation plan and are not federally enforceable;
- (c) Any term or condition of any preconstruction permits issued pursuant to regulations approved or promulgated through rulemaking under title I, including parts C or D of the Act and including Chapter 5, Section 2 and Chapter 6, Sections 2 and 4 of the WAQSR;
- (d) Any standard or other requirement promulgated under Section 111 of the Act, including Section 111(d) and Chapter 5, Section 2 of the WAQSR;
- (e) Any standard or other requirement under Section 112 of the Act, including any requirement concerning accident prevention under Section 112(r)(7) of the Act and including any regulations promulgated by EPA and the State pursuant to Section 112 of the Act;
- (f) Any standard or other requirement of the acid rain program under title IV of the Act or the regulations promulgated thereunder;
- (g) Any requirements established pursuant to Section 504(b) or Section 114(a)(3) of the Act concerning enhanced monitoring and compliance certifications;
- (h) Any standard or other requirement governing solid waste incineration, under Section 129 of the Act;
- (i) Any standard or other requirement for consumer and commercial products, under Section 183(e) of the Act (having to do with the release of volatile organic compounds under ozone control requirements);
- (j) Any standard or other requirement of the regulations promulgated to protect stratospheric ozone under title VI of the Act, unless the EPA has determined that such requirements need not be contained in a title V permit;
- (k) Any national ambient air quality standard or increment or visibility requirement under part C of title I of the Act, but only as it would apply to temporary sources permitted pursuant to Section 504(e) of the Act; and
- (l) Any state ambient air quality standard or increment or visibility requirement of the WAQSR.
- (m) Nothing under paragraphs (A) through (L) above shall be construed as affecting the allowance program and Phase II compliance schedule under the acid rain provision of Title IV of the Act.

"BACT" or "Best available control technology" means an emission limitation (including a visible emission standard) based on the maximum degree of reduction of each pollutant subject to regulation under the WAQSR or regulation under the Federal Clean Air Act, which would be emitted from or which results for any proposed major emitting facility or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application or production processes and available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant. If the Administrator determines that technological or economic limitations on the application of measurement methodology to a particular class of sources would make the imposition of an emission standard infeasible, he may instead prescribe a design, equipment, work practice or operational standard or combination thereof to satisfy the requirement of Best Available Control Technology. Such standard shall, to the degree possible, set forth the emission reduction achievable by implementation of such design, equipment, work practice, or operation and shall provide for compliance by means which achieve equivalent results. Application of BACT shall not

result in emissions in excess of those allowed under Chapter 5, Section 2 of the WAQSR and any other new source performance standard or national emission standards for hazardous air pollutants promulgated by EPA but not yet adopted by the state.

"Department" means the Wyoming Department of Environmental Quality or its Director.

"Director" means the Director of the Wyoming Department of Environmental Quality.

"Division" means the Air Quality Division of the Wyoming Department of Environmental Quality or its Administrator.

"Emergency" means any situation arising from sudden and reasonably unforeseeable events beyond the control of the source, including acts of God, which situation requires immediate corrective action to restore normal operation, and that causes the source to exceed a technology-based emission limitation under the permit, due to unavoidable increases in emissions attributable to the emergency. An emergency shall not include noncompliance to the extent caused by improperly designed equipment, lack of preventative maintenance, careless or improper operation, or operator error.

"EPA" means the Administrator of the U.S. Environmental Protection Agency or the Administrator's designee.

"Fuel-burning equipment" means any furnace, boiler apparatus, stack, or appurtenances thereto used in the process of burning fuel or other combustible material for the purpose of producing heat or power by indirect heat transfer.

"Fugitive emissions" means those emissions which could not reasonably pass through a stack chimney, vent, or other functionally equivalent opening.

"Insignificant activities" means those activities which are incidental to the facility's primary business activity and which result in emissions of less than one ton per year of a regulated pollutant not included in the Section 112 (b) list of hazardous air pollutants or emissions less than 1000 pounds per year of a pollutant regulated pursuant to listing under Section 112 (b) of the Act provided, however, such emission levels of hazardous air pollutants do not exceed exemptions based on insignificant emission levels established by EPA through rulemaking for modification under Section 112 (g) of the Act.

"MACT" or "Maximum achievable control technology" means the maximum degree of reduction in emissions that is deemed achievable for new sources in a category or subcategory that shall not be less stringent than the emission control that is achieved in practice by the best controlled similar source, as determined by the Administrator. Emission standards promulgated for existing sources in a category or subcategory may be less stringent than standards for new sources in the same category or subcategory but shall not be less stringent, and may be more stringent than:

- (a) the average emission limitation achieved by the best performing 12 percent of the existing sources (for which the Administrator has emission information), excluding those sources that have, within 18 months before the emission standard is proposed or within 30 months before such standard is promulgated, whichever is later, first achieved a level of emission rate or emission reduction which complies, or would comply if the source is not subject to such standard, with the lowest achievable emission rate applicable to the source category and prevailing at the time, in the category or subcategory for categories and subcategories with 30 or more sources, or
- (b) the average emission limitation achieved by the best performing five sources (for which the Administrator has or could reasonably obtain emissions information) in the category or subcategory for categories or subcategories with fewer than 30 sources.

"Modification" means any physical change in, or change in the method of operation of, an affected facility which increases the amount of any air pollutant (to which any state standards applies) emitted by such facility or which results in the emission of any such air pollutant not previously emitted.

"Permittee" means the person or entity to whom a Chapter 6, Section 3 permit is issued.

"Potential to emit" means the maximum capacity of a stationary source to emit any air pollutant under its physical and operational design. Any physical or operational limitation on the capacity of a source to emit an air pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored or processed, shall be treated as part of its design if the limitation is enforceable by EPA and the Division. This term does not alter or affect the use of this term for any other purposes under the Act, or the term "capacity factor" as used in title IV of the Act or the regulations promulgated thereunder.

"Regulated air pollutant" means the following:

- (a) Nitrogen oxides (NO_x) or any volatile organic compound;
- (b) Any pollutant for which a national ambient air quality standard has been promulgated;
- (c) Any pollutant that is subject to any standard established in Chapter 5, Section 2 of the WAQSR or Section 111 of the Act;
- (d) Any Class I or II substance subject to a standard promulgated under or established by title VI of the Act; or
- (e) Any pollutant subject to a standard promulgated under Section 112 or other requirements established under Section 112 of the Act, including Sections 112(g), (j), and (r) of the Act, including the following:
 - (i) Any pollutant subject to requirements under Section 112(j) of the Act. If EPA fails to promulgate a standard by the date established pursuant to Section 112(e) of the Act, any pollutant for which a subject source would be major shall be considered to be regulated on the date 18 months after the applicable date established pursuant to Section 112(e) of the Act; and
 - (ii) Any pollutant for which the requirements of Section 112(g)(2) of the Act have been met, but only with respect to the individual source subject to Section 112(g)(2) requirement.
- (f) Pollutants regulated solely under Section 112(r) of the Act are to be regulated only with respect to the requirements of Section 112(r) for permits issued under this Chapter 6, Section 3 of the WAQSR.

"Renewal" means the process by which a permit is reissued at the end of its term.

"Responsible official" means one of the following:

- (a) For a corporation:
 - (i) A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation; or
 - (ii) A duly authorized representative of such person if the representative is responsible for the overall operation of one or more manufacturing, production, or operating facilities applying for or subject to a permit and either:
 - (A) the facilities employ more than 250 persons or have gross annual sales or expenditures exceeding \$25 million (in second quarter 1980 dollars); or
 - (B) the delegation of authority to such representative is approved in advance by the Division;
- (b) For a partnership or sole proprietorship: a general partner or the proprietor, respectively;
- (c) For a municipality, State, Federal, or other public agency: Either a principal executive officer or ranking elected official. For the purposes of this part, a principal executive officer of a federal agency includes the chief executive officer having responsibility for the overall operations of a principal geographic unit of the agency; or
- (d) For affected sources:
 - (i) The designated representative or alternate designated representative in so far as actions, standards, requirements, or prohibitions under title IV of the Act or the regulations promulgated thereunder are concerned; and
 - (ii) The designated representative, alternate designated representative, or responsible official under Chapter 6, Section 3 (b)(xxvi) of the WAQSR for all other purposes under this section.

"WAQSR" means the Wyoming Air Quality Standards and Regulations promulgated under the Wyoming Environmental Quality Act, W.S. §35-11-101, *et seq.*



APPENDIX A
COMPLIANCE ASSURANCE MONITORING PLAN



ANADARKO PETROLEUM CORPORATION

COMPLIANCE ASSURANCE MONITORING PLAN:
RICH BURN NATURAL GAS FIRED COMPRESSOR ENGINES EQUIPPED WITH
CATALYTIC CONVERTERS FOR CONTROL OF NO_x AND CO

LITTLE THUNDER - STRATUS COMPRESSOR STATION

I. Background

A. Emissions Unit

Description: Rich burn natural gas compressor engines

Identification: E1, E2, E3, E4, E7

Facility: Little Thunder - Stratus Compressor Station

B. Applicable Regulation, Emission Limit, and Monitoring Requirements

Regulation: Permits CT-1712, MD-491, MD-691A, MD-1133, MD-6598 (corrected)

CAM Emission limits: E1, E2, E3, E4 (Waukesha 7044)

NO_x: 1.0 g/hp-hr, 3.7 lb/hr, 16.2 tpy

CO: 2.0 g/hp-hr, 7.4 lb/hr, 32.4 tpy

E7 (Waukesha 3524)

CO: 2.0 g/hp-hr, 3.7 lb/hr, 16.2 tpy

Monitoring requirements: The key elements of the monitoring approach are presented in Table 1.

C. Control Technology, Capture System, Bypass, PTE

Controls: Non-selective catalytic reduction

Capture System: N/A

Bypass: none

PTE after controls: E2, E3, E4 (Waukesha 7044)

NO_x: 16.2 tpy, CO: 32.4 tpy

E7 (Waukesha 3524)

CO: 16.2 tpy

(Based on manufacturer's stated removal efficiency and original design specifications.)

II. Monitoring Approach

The key elements of the monitoring approach are presented in the attached table.

III. Response to Excursion

- A. Excursions of the inlet temperature range, pressure differential across the catalyst, or NO_x or CO levels during emission testing, will trigger an inspection, corrective action, and reporting. Maintenance personnel will inspect the compressors within 72 hours of receiving notification and make needed repairs as soon as practicable. Operation will return to normal upon completed corrective action.
- B. Quality Improvement Plan (QIP) Threshold: Any excursion of NO_x or CO levels during emission testing, while inlet temperature or pressure differential are within the ranges of this plan, shall trigger a QIP. (Note: Proposing a QIP threshold in the CAM submittal is not required.)

1. The first part of the document discusses the importance of maintaining accurate records of all transactions. This is essential for ensuring the integrity of the financial data and for providing a clear audit trail. The records should be kept up-to-date and should be easily accessible to all relevant parties.

2. The second part of the document outlines the various methods used to collect and analyze data. These methods include direct observation, interviews, and the use of specialized software. Each method has its own strengths and weaknesses, and it is important to choose the most appropriate one for the specific situation.

3. The third part of the document describes the process of data analysis. This involves identifying patterns and trends in the data, and then using statistical techniques to test hypotheses. The results of the analysis should be presented in a clear and concise manner, using tables and graphs where appropriate.

4. The fourth part of the document discusses the importance of communication in the research process. This involves sharing the results of the research with the relevant stakeholders, and providing them with the information they need to make informed decisions. It is also important to communicate the findings of the research to the wider community, where appropriate.

5. The fifth part of the document concludes with a summary of the key findings of the research. It also provides some recommendations for future research, based on the limitations of the current study. The overall goal of the research is to provide a better understanding of the issues at hand, and to inform the development of effective policies and programs.

MONITORING APPROACH: Little Thunder - Stratus Compressor Station

	Indicator No. 1	Indicator No. 2	Indicator No. 3	Indicator No. 4
I. Indicator	Temperature of exhaust gas into the catalyst.	Pressure differential across the catalyst.	NO _x and CO measurement.	Inspection/Preventative Maintenance (IPM) in accordance with PM Plan (see attached PM Plan).
Measurement Approach	Exhaust gas temperature into the catalyst is monitored continuously using in-line thermocouples.	The pressure of the inlet catalyst is measured with a pressure gauge. The outlet catalyst pressure is assumed to be atmospheric.	NO _x and CO are measured using either the Division's portable monitoring protocol or Reference Methods.	Inspections according to the PM Plan. Maintenance performed as needed.
II. Indicator Range	Temperature at the inlet of the catalyst shall be maintained between 750°F and 1250°F.	An excursion is defined as a pressure differential change of more than 2 inches of water as compared to the pressure differential measured during the initial performance test. If the catalyst is replaced, the reference pressure drop will be reestablished during the next annual testing required by the permit and an excursion is defined as a pressure differential change of more than 2 inches of water as compared to this reestablished pressure differential.	NO _x and CO above permitted values.	N/A
III. Performance Criteria				
A. Data Representativeness	Temperature is measured at the inlet of the catalyst by a thermocouple. The minimum accuracy of the temperature gauge between the indicator range (750°F and 1250°F) is +/-19°F.	The pressure of the inlet catalyst is measured with a pressure gauge The gauge has a minimum accuracy of 0.25 inches of water.	Gases are measured at the exhaust of the catalyst under normal operating conditions.	IPM is performed on the engine and catalyst system (engine operations, over temperature system, exhaust temperature (thermocouples), air/ fuel ratio controller, oxygen sensors, and emissions monitoring).
B. QA/QC Practices and Criteria	Proper measurement of the thermocouple scanner or other end device is validated at least annually.	Proper measurement of the pressure gauge is validated at least annually. Potential plugging of inlet catalyst down tubes are checked during monthly pressure measurements.	As stated in reference method and portable monitoring protocols.	Qualified personnel perform IPM.
C. Monitoring Frequency	Temperature is monitored continuously. Compliance with temperature indicator range is demonstrated from daily inlet catalyst temperature records.	Pressure differential is monitored at least once per calendar month. No monitoring is required for months when engine is not operated.	Emission testing (frequency specified in the TV permit) to verify compliance with permitted emission limits.	Inspections according to the PM Plan.
Data Collection Procedures	Temperature data will be recorded once per day. No observation required for days when engine is not operated.	Pressure differential data will be recorded at least once per month. A note will be made on months when engine is not operated.	As specified in method and portable monitoring protocols.	Records are maintained to document IPM inspections, and any maintenance performed.
Averaging period	None.	None.	None.	N/A.

Revised September 2012

JUSTIFICATION

I. Background

The monitoring approach outlined here applies to the three-way non-selective reduction catalyst system used on the natural gas fired compressor engines. The catalyst system is a passive unit and does not have mechanical components. The reduction reaction does not take place properly if the temperature of the engine exhaust gas into the catalyst system is too low or too high. A significant change in pressure drop across the catalyst may indicate damage or fouling to the catalyst.

II. Rationale for Selection of Performance Indicators

Temperature into the catalyst unit is measured because temperature excursions can indicate problems with engine operation that can prevent the chemical reaction from taking place in the catalyst bed. Too low of an exhaust gas temperature reduces the activity of the intended chemical/catalyst reaction. Too high of an exhaust gas temperature can indicate engine problems which can damage the catalyst unit. Daily monitoring of inlet gas temperature to the catalyst will help assure proper operation of the catalyst. Compliance with the temperature indicator range is demonstrated from daily inlet catalyst temperature records.

Pressure differential across the catalyst may indicate if the catalyst unit is damaged, resulting in channeling or other problems, or if there is fouling/plugging in the catalyst. Both conditions would result in reduced catalyst performance.

Implementation of the Inspection/Preventative Maintenance (IPM) Plan related to the operation of the engines and catalyst system provides assurance that they are in good repair and operating properly. Items on the IPM checklist include checking engine operation for proper operation, testing of the over temperature system, checking the temperature of the exhaust (the thermocouples are stable instruments and are to be validated annually), inspecting the fuel/air ratio controller and oxygen sensors, and testing of emissions of the engine exhaust.

NO_x and CO emissions testing (frequency specified in the TV permit) will demonstrate continued compliance with emission limits and the possible link between the temperature indicator range, pressure differential, implementation of the IPM plan, and proper operation of the engines and catalyst.

III. Rationale for Selection of Indicator Ranges

An exhaust gas temperature range of 750°F to 1250°F has been selected based upon the catalyst manufacturer's suggested operating parameters for optimal chemical reaction and this company's field experience. This is also the temperature range that is a required operating limitation for rich burn, catalytically controlled engines subject to the reciprocating internal combustion engine (RICE) NESHAP. A pressure differential change of more than 2 inches of water is based on information from the catalyst vendor which indicated that such a change should trigger catalyst inspection for damage or fouling. (The load during the monthly pressure measurement and the most recent emissions test must be similar in order to make an excursion determination.) This indicator range is also consistent with operating limitations in the RICE NESHAP. The IPM checklist was developed based on manufacturer's recommendations and the company's operating experience with similar units.

ANADARKO PETROLEUM CORPORATION

RICH BURN NATURAL GAS FIRED ENGINES WITH CATALYTIC CONVERTERS PREVENTATIVE MAINTENANCE PLAN - WYOMING

(Revised October 2009)

The following is a Preventative Maintenance (PM) plan for all rich burn, natural gas fired compressor engines equipped with catalytic converters in Wyoming. The PM plan will ensure optimum operations of the converters, avoid situations that could cause converter damage, and identify problems in a timely manner.

ENGINE OPERATIONS

Proper engine operation is critical to the performance of catalytic converters. If an engine misfires, it produces high catalyst temperatures because the unburned air/fuel mixture burns when it contacts the catalyst. Several misfiring cylinders can produce enough heat to cause permanent damage to the catalyst.

Preventative Maintenance: Each engine will be checked weekly for proper operations.

OVER TEMPERATURE SYSTEM

Each converter is equipped with an over temperature system which protects the catalyst from excessive temperature conditions caused by misfires.

Preventative Maintenance: The catalyst over temperature system will be tested annually to ensure it is working. This consists of grounding the switch and creating an alarm on the control panel.

EXHAUST TEMPERATURE

For efficient converter operations, the exhaust gas must be above 750° F at all times, with a maximum of 1250° F.

Preventative Maintenance: The temperature of the exhaust gas will be checked after every 2190 hours of operation.

AIR/FUEL RATIO CONTROLLER

The air/fuel ratio controllers are used in conjunction with catalytic converters to control emissions. The air/fuel ratio controllers are set to control emissions at the allowable rates.

Preventative Maintenance: The air/fuel ratio set points will be checked annually and adjusted accordingly. The controller will be checked weekly to ensure it is operating, and that there are no alarms of the engine exceeding the limits of the controller. Oxygen sensors that are located in the exhaust manifold will be replaced every 2190 hours of operation. Oxygen sensors that are not located in the exhaust manifold will be replaced on an annual basis, or as needed.

PERFORMANCE MONITORING

To track performance of the converters and to detect early signs of converter problems NO_x and CO emissions will be monitored in the exhaust stream.

Preventative Maintenance: Following the applicable State/Federal protocol for portable analyzers, a portable analyzer test will be performed annually (or at the frequency indicated in the air permit) to determine NO_x and CO emission rates in the exhaust gas.

THE UNIVERSITY OF CHICAGO

THE UNIVERSITY OF CHICAGO
DIVISION OF THE PHYSICAL SCIENCES
DEPARTMENT OF CHEMISTRY

NAME: _____
ID: _____
SECTION: _____

PROBLEM SET 1

1. The following reaction scheme shows the reaction of a substituted alkene with a reagent. Predict the major product and justify your answer.



PROBLEM SET 2

2. Propose a mechanism for the following reaction. Show all electron pushing arrows and intermediates.



PROBLEM SET 3

3. Rank the following carbocations in order of increasing stability.



PROBLEM SET 4

4. Draw the transition state for the following reaction. Indicate the partial bonds and partial charges.



PROBLEM SET 5