

**MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
AIR QUALITY DIVISION**

January 19, 2023

**PERMIT TO INSTALL
4-23**

**ISSUED TO
Layline Oil & Gas, LLC**

**LOCATED AT
West Blaney Lane
Leota, Michigan 49665**

**IN THE COUNTY OF
Clare**

**STATE REGISTRATION NUMBER
P1318**

The Air Quality Division has approved this Permit to Install, pursuant to the delegation of authority from the Michigan Department of Environment, Great Lakes, and Energy. This permit is hereby issued in accordance with and subject to Section 5505(1) of Article II, Chapter I, Part 55, Air Pollution Control, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. Pursuant to Air Pollution Control Rule 336.1201(1), this permit constitutes the permittee's authority to install the identified emission unit(s) in accordance with all administrative rules of the Department and the attached conditions. Operation of the emission unit(s) identified in this Permit to Install is allowed pursuant to Rule 336.1201(6).

DATE OF RECEIPT OF ALL INFORMATION REQUIRED BY RULE 203: October 17, 2022	
DATE PERMIT TO INSTALL APPROVED: January 19, 2023	SIGNATURE:
DATE PERMIT VOIDED:	SIGNATURE:
DATE PERMIT REVOKED:	SIGNATURE:

PERMIT TO INSTALL

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COMMON ACRONYMS

AQD	Air Quality Division
BACT	Best Available Control Technology
CAA	Clean Air Act
CAM	Compliance Assurance Monitoring
CEMS	Continuous Emission Monitoring System
CFR	Code of Federal Regulations
COMS	Continuous Opacity Monitoring System
Department/department/EGLE	Michigan Department of Environment, Great Lakes, and Energy
EU	Emission Unit
FG	Flexible Group
GACS	Gallons of Applied Coating Solids
GC	General Condition
GHGs	Greenhouse Gases
HVLP	High Volume Low Pressure*
ID	Identification
IRSL	Initial Risk Screening Level
ITSL	Initial Threshold Screening Level
LAER	Lowest Achievable Emission Rate
MACT	Maximum Achievable Control Technology
MAERS	Michigan Air Emissions Reporting System
MAP	Malfunction Abatement Plan
MSDS	Material Safety Data Sheet
NA	Not Applicable
NAAQS	National Ambient Air Quality Standards
NESHAP	National Emission Standard for Hazardous Air Pollutants
NSPS	New Source Performance Standards
NSR	New Source Review
PS	Performance Specification
PSD	Prevention of Significant Deterioration
PTE	Permanent Total Enclosure
PTI	Permit to Install
RACT	Reasonable Available Control Technology
ROP	Renewable Operating Permit
SC	Special Condition
SCR	Selective Catalytic Reduction
SNCR	Selective Non-Catalytic Reduction
SRN	State Registration Number
TBD	To Be Determined
TEQ	Toxicity Equivalence Quotient
USEPA/EPA	United States Environmental Protection Agency
VE	Visible Emissions

*For HVLP applicators, the pressure measured at the gun air cap shall not exceed 10 psig.

POLLUTANT / MEASUREMENT ABBREVIATIONS

acfm	Actual cubic feet per minute
BTU	British Thermal Unit
°C	Degrees Celsius
CO	Carbon Monoxide
CO ₂ e	Carbon Dioxide Equivalent
dscf	Dry standard cubic foot
dscm	Dry standard cubic meter
°F	Degrees Fahrenheit
gr	Grains
HAP	Hazardous Air Pollutant
Hg	Mercury
hr	Hour
HP	Horsepower
H ₂ S	Hydrogen Sulfide
kW	Kilowatt
lb	Pound
m	Meter
mg	Milligram
mm	Millimeter
MM	Million
MW	Megawatts
NMOC	Non-Methane Organic Compounds
NO _x	Oxides of Nitrogen
ng	Nanogram
PM	Particulate Matter
PM10	Particulate Matter equal to or less than 10 microns in diameter
PM2.5	Particulate Matter equal to or less than 2.5 microns in diameter
pph	Pounds per hour
ppm	Parts per million
ppmv	Parts per million by volume
ppmw	Parts per million by weight
psia	Pounds per square inch absolute
psig	Pounds per square inch gauge
scf	Standard cubic feet
sec	Seconds
SO ₂	Sulfur Dioxide
TAC	Toxic Air Contaminant
Temp	Temperature
THC	Total Hydrocarbons
tpy	Tons per year
µg	Microgram
µm	Micrometer or Micron
VOC	Volatile Organic Compounds
yr	Year

GENERAL CONDITIONS

1. The process or process equipment covered by this permit shall not be reconstructed, relocated, or modified, unless a Permit to Install authorizing such action is issued by the Department, except to the extent such action is exempt from the Permit to Install requirements by any applicable rule. **(R 336.1201(1))**
2. If the installation, construction, reconstruction, relocation, or modification of the equipment for which this permit has been approved has not commenced within 18 months, or has been interrupted for 18 months, this permit shall become void unless otherwise authorized by the Department. Furthermore, the permittee or the designated authorized agent shall notify the Department via the Supervisor, Permit Section, Air Quality Division, Michigan Department of Environment, Great Lakes, and Energy, P.O. Box 30260, Lansing, Michigan 48909-7760, if it is decided not to pursue the installation, construction, reconstruction, relocation, or modification of the equipment allowed by this Permit to Install. **(R 336.1201(4))**
3. If this Permit to Install is issued for a process or process equipment located at a stationary source that is not subject to the Renewable Operating Permit program requirements pursuant to Rule 210 (R 336.1210), operation of the process or process equipment is allowed by this permit if the equipment performs in accordance with the terms and conditions of this Permit to Install. **(R 336.1201(6)(b))**
4. The Department may, after notice and opportunity for a hearing, revoke this Permit to Install if evidence indicates the process or process equipment is not performing in accordance with the terms and conditions of this permit or is violating the Department's rules or the Clean Air Act. **(R 336.1201(8), Section 5510 of Act 451, PA 1994)**
5. The terms and conditions of this Permit to Install shall apply to any person or legal entity that now or hereafter owns or operates the process or process equipment at the location authorized by this Permit to Install. If the new owner or operator submits a written request to the Department pursuant to Rule 219 and the Department approves the request, this permit will be amended to reflect the change of ownership or operational control. The request must include all of the information required by subrules (1)(a), (b), and (c) of Rule 219 and shall be sent to the District Supervisor, Air Quality Division, Michigan Department of Environment, Great Lakes, and Energy. **(R 336.1219)**
6. Operation of this equipment shall not result in the emission of an air contaminant which causes injurious effects to human health or safety, animal life, plant life of significant economic value, or property, or which causes unreasonable interference with the comfortable enjoyment of life and property. **(R 336.1901)**
7. The permittee shall provide notice of an abnormal condition, start-up, shutdown, or malfunction that results in emissions of a hazardous or toxic air pollutant which continue for more than one hour in excess of any applicable standard or limitation, or emissions of any air contaminant continuing for more than two hours in excess of an applicable standard or limitation, as required in Rule 912, to the Department. The notice shall be provided not later than two business days after start-up, shutdown, or discovery of the abnormal condition or malfunction. Written reports, if required, must be filed with the Department within 10 days after the start-up or shutdown occurred, within 10 days after the abnormal condition or malfunction has been corrected, or within 30 days of discovery of the abnormal condition or malfunction, whichever is first. The written reports shall include all of the information required in Rule 912(5). **(R 336.1912)**
8. Approval of this permit does not exempt the permittee from complying with any future applicable requirements which may be promulgated under Part 55 of 1994 PA 451, as amended or the Federal Clean Air Act.
9. Approval of this permit does not obviate the necessity of obtaining such permits or approvals from other units of government as required by law.
10. Operation of this equipment may be subject to other requirements of Part 55 of 1994 PA 451, as amended and the rules promulgated thereunder.

11. Except as provided in subrules (2) and (3) or unless the special conditions of the Permit to Install include an alternate opacity limit established pursuant to subrule (4) of Rule 301, the permittee shall not cause or permit to be discharged into the outer air from a process or process equipment a visible emission of density greater than the most stringent of the following. The grading of visible emissions shall be determined in accordance with Rule 303 (R 336.1303). **(R 336.1301)**
 - a) A six-minute average of 20 percent opacity, except for one six-minute average per hour of not more than 27 percent opacity.
 - b) A visible emission limit specified by an applicable federal new source performance standard.
 - c) A visible emission limit specified as a condition of this Permit to Install.
12. Collected air contaminants shall be removed as necessary to maintain the equipment at the required operating efficiency. The collection and disposal of air contaminants shall be performed in a manner so as to minimize the introduction of contaminants to the outer air. Transport of collected air contaminants in Priority I and II areas requires the use of material handling methods specified in Rule 370(2). **(R 336.1370)**
13. The Department may require the permittee to conduct acceptable performance tests, at the permittee's expense, in accordance with Rule 1001 and Rule 1003, under any of the conditions listed in Rule 1001. **(R 336.2001)**

EMISSION UNIT SPECIAL CONDITIONS

EMISSION UNIT SUMMARY TABLE

The descriptions provided below are for informational purposes and do not constitute enforceable conditions.

Emission Unit ID	Emission Unit Description (Including Process Equipment & Control Device(s))	Flexible Group ID
EUSWEETENING	Sour gas is put through a sweetening process that uses amines to remove H ₂ S from the gas. H ₂ S from the sour gas is sent to either an acid gas injection system or a flare. The flare converts H ₂ S to sulfur dioxide (SO ₂), which is less dangerous and less odorous than H ₂ S.	FGPRODUCTION
EUHEATER1	0.5 MMBTU/hr natural gas fired heater treater.	FGPRODUCTION
EUHEATER2	0.4 MMBTU/hr natural gas fired heater treater.	FGPRODUCTION
EUHEATER3	0.5 MMBTU/hr natural gas fired tank heater.	FGPRODUCTION
EUHEATER4	0.5 MMBTU/hr natural gas fired amine plant reboiler.	FGPRODUCTION
EUTANKS	Three (3) 400-barrel oil tanks.	FGPRODUCTION
EUDEHY	Desiccant dehydrator to remove water from natural gas.	FGPRODUCTION

Changes to the equipment described in this table are subject to the requirements of R 336.1201, except as allowed by R 336.1278 to R 336.1291.

EUSWEETENING EMISSION UNIT CONDITIONS

DESCRIPTION

Sour gas is put through a sweetening process that uses amines to remove H₂S from the gas. H₂S from the sour gas is sent to either an acid gas injection system or a flare. The flare converts H₂S to sulfur dioxide (SO₂), which is less dangerous and less odorous than H₂S.

Flexible Group ID: FGPRODUCTION

POLLUTION CONTROL EQUIPMENT

A flare is used to convert H₂S to SO₂ before being vented to the atmosphere. An acid gas injection (AGI) system will be installed to completely re-inject H₂S into oil or gas bearing geologic strata.

I. EMISSION LIMIT(S)

NA

II. MATERIAL LIMIT(S)

NA

III. PROCESS/OPERATIONAL RESTRICTION(S)

1. No later than 60 days after issuance of this permit, the permittee shall submit to the AQD District Supervisor, for review and approval, a preventative maintenance / malfunction abatement plan (PM / MAP). If the PM/MAP fails to address or inadequately addresses an event that meets the characteristics of a malfunction, the permittee shall revise the PM/MAP within 45 days after such an event occurs. The revised plan shall include procedures for operating and maintaining the process equipment, add-on pollution control device(s), or monitoring equipment during similar malfunction events, and a program for corrective actions for such events. Any revisions made to the PM/MAP shall be submitted to the AQD District Supervisor for review and approval. **(R 336.1205(1)(a), R 336.1910, R 336.1911)**
2. No later than 60 days after issuance of this permit, the permittee shall submit to the AQD District Supervisor, for review and approval, an approved H₂S Monitoring Plan that includes the following information:
 - a) A diagram showing the location of all monitors at EUSWEETENING;
 - b) A description of the monitoring equipment and the alarm systems and levels that will be utilized;
 - c) An overall plan for ensuring the monitors will be operated at all times when EUSWEETENING is operating.

Modifications or revisions to the plan shall be submitted to and approved by the AQD District Supervisor. **(R 336.1205(1)(a), R 336.1403(5)(d))**

3. Once the AGI system is installed, the permittee shall not operate EUSWEETENING unless the AGI system or emergency/pressure relief flare are installed and operating properly. **(R 336.1205(1)(a), R 336.1403(1))**
4. The permittee shall not operate EUSWEETENING unless all emergency relief valves are vented to the flare. **(R 336.1403(5)(c))**
5. If the concentration of hydrogen sulfide is more than 100 ppm in any building enclosing the sweetening process, all process inflow streams to the facility shall automatically begin a safe and orderly shutdown. Full operation may be resumed only after successful corrective measures have been applied. **(R 336.1403(5)(e))**

6. In the event that the pilot flame is extinguished, shut-in of EUSWEETENING shall commence automatically within one second. Operation of EUSWEETENING shall not be restarted unless the pilot flame is reignited and maintained. **(R 336.1403(2), R 336.1403(5)(f))**

IV. DESIGN/EQUIPMENT PARAMETER(S)

1. The flare shall be equipped with a continuously burning pilot flame or automatic ignitors. **(R 336.1403(2))**
2. The flare shall be equipped with failsafe flame sensors with an alarm activated by flame failure. **(R 336.1403(2))**

V. TESTING/SAMPLING

Records shall be maintained on file for a period of five years. **(R 336.1201(3))**

1. The permittee shall determine the representative hydrogen sulfide (H₂S) concentration in the treated gas exiting EUSWEETENING at least once per calendar month, using colorimetric detector tubes (e.g. Draeger Tubes) or the equivalent. **(R 336.1205, R 336.1225, R 336.1403(5)(a))**

VI. MONITORING/RECORDKEEPING

Records shall be maintained on file for a period of five years. **(R 336.1201(3))**

1. The permittee shall continuously monitor the concentrations of H₂S in the building enclosing the sweetening process. The sensors shall be placed as close to process equipment as practicable. The system shall be designed, installed, and maintained to provide a visual alarm when the hydrogen sulfide concentration is more than 50 ppm. **(R 336.1403(5)(d))**
2. The permittee shall record the H₂S concentration of treated gas leaving EUSWEETENING on a monthly basis in accordance with SC V.1. The permittee shall keep the records on file at a location approved by the AQD District Supervisor and make them available to the Department upon request. **(R 336.1205, R 336.1225, 40 CFR 52.21(c) & (d))**
3. Upon completion of installation of the AGI system, the permittee shall record the time and duration of each incidence of emergency flaring of sour gas. The permittee shall calculate the amount of SO₂ emitted from the incidence in accordance with Appendix A. The permittee shall keep the records on file at a location approved by the AQD District Supervisor and make them available to the Department upon request. **(R 336.1205, R 336.1225, 40 CFR 52.21(c) & (d))**
4. Upon completion of installation of the AGI system, the permittee shall maintain records of malfunctions and abnormal conditions. The records shall include the date, time, the cause of the malfunction or abnormal condition, and the corrective action taken and/or operational changes made to prevent a reoccurrence. **(R 336.1205(1)(a), R 336.1912)**

VII. REPORTING

1. Upon completion of installation of the AGI system, and not later than 45 days following any venting of acid gas to the emergency/pressure relief flare, the permittee shall submit to the AQD District Supervisor a report that includes all of the information specified in SC VI.3. **(R 336.1205)**

VIII. STACK/VENT RESTRICTION(S)

NA

IX. OTHER REQUIREMENT(S)

1. The permittee shall install and maintain fencing and warning signs and/or other measures as necessary to prevent unauthorized individuals from entering the plant property or buildings. Signs shall read "Danger – Poison Gas" with at least one sign on each side of the plant property. **(R 336.1403(5)(b))**

FLEXIBLE GROUP SPECIAL CONDITIONS

FLEXIBLE GROUP SUMMARY TABLE

The descriptions provided below are for informational purposes and do not constitute enforceable conditions.

Flexible Group ID	Flexible Group Description	Associated Emission Unit IDs
FGPRODUCTION	All oil and gas production equipment at the facility.	EUSWEETENING EUHEATER1 EUHEATER2 EUHEATER3 EUHEATER4 EUTANKS EUDEHY

**FGPRODUCTION
 FLEXIBLE GROUP CONDITIONS**

DESCRIPTION

All oil and gas production equipment at the facility.

Emission Unit: EUSWEETENING, EUHEATER1, EUHEATER2, EUHEATER3, EUHEATER4, EUTANKS, EUDEHY

POLLUTION CONTROL EQUIPMENT

Flare

I. EMISSION LIMIT(S)

Pollutant	Limit	Time Period / Operating Scenario	Equipment	Monitoring / Testing Method	Underlying Applicable Requirements
1. SO ₂	68 tpy	12-month rolling time period as determined at the end of each calendar month	FGPRODUCTION	SC VI.3	R 336.1205(1)(a) & (3), 40 CFR 52.21(c) & (d)

II. MATERIAL LIMIT(S)

Material	Limit	Time Period / Operating Scenario	Equipment	Monitoring / Testing Method	Underlying Applicable Requirements
1. Hydrogen sulfide (H ₂ S) sent to the flare	38.0 tons per year	12-month rolling time period as determined at the end of each calendar month	FGPRODUCTION	SC VI.1, SC VI.2	R 336.1205(1)(a) & 3
2. Hydrogen sulfide (H ₂ S) sent to the flare	6,333 lbs/month	Calendar Month	FGPRODUCTION	SC VI.2	R 336.1205(1)(a) & 3, R 336.1225
3. Gas sent to the flare	54.58 MMcf/yr	12-month rolling time period as determined at the end of each calendar month	FGPRODUCTION	SC VI.1	R 336.1205(1)(a) & 3

III. PROCESS/OPERATIONAL RESTRICTION(S)

1. The permittee shall not allow sour gas from storage tanks, oil/gas separators, heater treaters, or other equipment in FGPRODUCTION to be emitted to the atmosphere without burning in a flare, incinerator, or equivalent control device. (R 336.1224, R 336.1225, R 336.1403, R 336.1702(a), R 336.1901, R 336.1910)
2. No later than 60 days after issuance of this permit, the permittee shall submit to the AQD District Supervisor, for review and approval, a preventative maintenance/malfunction abatement plan (PM/MAP) for operation of the flare associated with FGPRODUCTION. After approval of the PM/MAP by the AQD District Supervisor, the permittee shall not operate FGPRODUCTION unless the PM/MAP, or an alternate plan approved by the AQD District Supervisor, is implemented, and maintained. The plan shall incorporate procedures recommended by the equipment manufacturer as well as incorporating standard industry practices. At a minimum, the plan shall include:

- a) Identification of the equipment and, if applicable, air-cleaning device and the supervisory personnel responsible for overseeing the inspection, maintenance, and repair.
- b) Description of the items or conditions to be inspected and frequency of the inspections or repairs.
- c) Identification of the equipment and, if applicable, air-cleaning device, operating parameters that shall be monitored to detect a malfunction or failure, the normal operating range of these parameters and a description of the method of monitoring or surveillance procedures.
- d) Identification of the major replacement parts that shall be maintained in inventory for quick replacement.
- e) A description of the corrective procedures or operational changes that shall be taken in the event of a malfunction or failure to achieve compliance with the applicable emission limits.

If the plan fails to address or inadequately addresses an event that meets the characteristics of a malfunction at the time the plan is initially developed, the owner or operator shall revise the plan within 45 days after such an event occurs and submit the revised plan for approval to the AQD District Supervisor. Should the AQD determine the PM / MAP to be inadequate, the AQD District Supervisor may request modification of the plan to address those inadequacies. **(R 336.1224, R 336.1225, R 336.1702(a), R 336.1901, R 336.1910, R 336.1911, R 336.1912)**

IV. DESIGN/EQUIPMENT PARAMETER(S)

1. The permittee shall properly operate all of the following: **(R 336.1224, R 336.1225, R 336.1403(2), R 336.1702(a), R 336.1910)**
 - a) A continuously burning pilot flame at the flare. Pilot fuel shall be only sweet gas. Sweet gas is defined as any gas containing 1 grain or less of hydrogen sulfide (approximately 16 ppmv) or 10 grains or less of total sulfur per 100 standard cubic feet.
 - b) A mechanism that will automatically stop fluid flow into the facility in the event that the flare pilot flame is extinguished. The permittee shall not resume fluid flow into FGPRODUCTION unless the flare pilot flame is re-ignited and maintained.

V. TESTING/SAMPLING

NA

VI. MONITORING/RECORDKEEPING

Records shall be maintained on file for a period of five years. **(R 336.1201(3))**

1. The permittee shall monitor and record all of the following at the frequency indicated:
 - a) Volumetric flow rate of sour gas going to the flare – per day, per calendar month, and per 12-month rolling time period.
 - b) Readings of the concentration of hydrogen sulfide in the sour gas sent to the FGPRODUCTION flare – monthly. Both of the following are acceptable means of determining the concentration of hydrogen sulfide in the sour gas:
 - i) Colorimetric detector tube.
 - ii) Laboratory gas analysis.

The permittee shall perform 6 consecutive monthly readings of the concentration of hydrogen sulfide in the sour gas. After successful completion of the 6 consecutive monthly readings, the permittee may request an alternative monitoring schedule. Any request for an alternative monitoring schedule shall be submitted to the AQD District Supervisor for approval. The requested monitoring frequency shall be no less than annual. **(R 336.1205, R 336.1225, 40 CFR 52.21(c) & (d))**

2. The permittee shall calculate and record the mass flow rate of H₂S that went to the flare each calendar month using all of the following:
 - a) The most recently determined concentration of hydrogen sulfide in the sour gas.
 - b) The monthly volume of sour gas that went to the flare.
 - c) The following equation:

$$\frac{\text{lbs } H_2S}{\text{month}} = \frac{\text{ft}^3 \text{ sour gas}}{\text{month}} \times \frac{\text{ft}^3 H_2S}{100 \text{ ft}^3 \text{ sour gas}} \times \frac{\text{lbmol } H_2S}{385 \text{ ft}^3 H_2S} \times \frac{34 \text{ lb } H_2S}{\text{lbmol } H_2S}$$

The permittee shall complete the calculations in a format acceptable to the AQD District Supervisor by the last day of the calendar month, for the previous calendar month. The permittee shall maintain the records monthly and 12-month rolling time period as determined at the end of each calendar month. The permittee shall keep these records on file at a location approved by the AQD District Supervisor and make them available to the Department upon request. **(R 336.1205, R 336.1225, R 336.1403(5)(a), 40 CFR 52.21(c) & (d))**

3. The permittee shall keep, in a satisfactory manner, monthly and 12-month rolling time period calculation records of SO₂ emissions for all emission units in FGPRODUCTION. The permittee shall use an assumed 95% H₂S destruction efficiency to calculate SO₂ emissions, unless the AQD District Supervisor approves the use of a different destruction efficiency for the calculations. The permittee shall complete the calculations in a format acceptable to the AQD District Supervisor by the last day of the calendar month, for the previous calendar month. The permittee shall keep these records on file at a location approved by the AQD District Supervisor and make them available to the Department upon request. **(R 336.1205(3), 40 CFR 52.21(c) & (d))**
4. The permittee shall maintain a log of all maintenance activities conducted according to the PM/MAP (pursuant to SC III.2). The permittee shall keep this log on file at a location approved by the AQD District Supervisor and make it available to the Department upon request. **(R 336.1911, R 336.1912)**

VII. REPORTING

NA

VIII. STACK/VENT RESTRICTION(S)

The exhaust gases from the stacks listed in the table below shall be discharged unobstructed vertically upwards to the ambient air unless otherwise noted:

Stack & Vent ID	Maximum Exhaust Diameter / Dimensions (inches)	Minimum Height Above Ground (feet)	Underlying Applicable Requirements
1. SVFLARE	8	40	R 336.1225, 40 CFR 52.21(c) & (d)

IX. OTHER REQUIREMENT(S)

1. The permittee shall comply with all provisions of the federal Standards of Performance for New Stationary Sources as specified in 40 CFR Part 60 Subparts A and OOOOa, as they apply to FGPRODUCTION. **(40 CFR Part 60 Subparts A & OOOOa)**

APPENDIX A Calculations For Flaring Incidents

Upon completion of installation of the acid gas injection system, the permittee shall use the following calculations in conjunction with monitoring, testing or recordkeeping data to determine compliance with the applicable requirements referenced in EUSWEETENING.

Venting Acid Gas to the Emergency/Pressure Relief Flare:

$$\text{Tons } SO_2 = FR \times TD \times \text{Conc}(H_2S) \times 8.44 \times 10^{-5}$$

Where:

FR = Average flow rate to the emergency/pressure relief flare during the venting of acid gas to the flare
(scf per hour)

TD = Total duration of venting of acid gas to the emergency/pressure relief flare (hours)

Conc(*H*₂*S*) = Average concentration of H₂S in the acid gas vented to the emergency/pressure relief flare.
(scf H₂S per scf gas)

$$8.44 \times 10^{-5} = \frac{\text{lbmol } H_2S}{379 \text{ scf } H_2S} \times \frac{64 \text{ lb } SO_2}{\text{lbmol } H_2S} \times \frac{\text{ton}}{2000 \text{ lbs}}$$

**Preventative Maintenance / Malfunction Abatement Plan (PM / MAP)
 Content Checklist for Engines Required to Submit a PM / MAP**

PM / MAP Content		Location	
		Page	Section / Table
1	Contact Person		
Engines			
2	Engine Identification: Include the engine make / model and type of engine (i.e. rich or lean burn). Identify engines with add on control and AFRC. If add on control is present, identify type of control.		
3	Engine Operating Variables To Be Monitored. Include a copy of the normal engine maintenance log.		
4	Corrective procedures or operational changes that will be taken in the event of a malfunction.		
5	Major parts replacement inventory for engines.		
Add-On Controls			
6	Catalytic Converter operating variables to be monitored. Include the method and frequency of monitoring these variables; provide the normal operating range of these variables.		
7	Corrective actions to be taken in event of malfunction of the catalytic converter.		
8	AFRC O ₂ Sensor replacement schedule or operating variables to be monitored		
9	Corrective actions to be taken in event of malfunction of the AFRC		
10	Emission testing utilizing portable analyzer		
11	Scheduled maintenance of control equipment		
12	Major parts replacement inventory for add on control.		
13	Identify supervisory personnel responsible for overseeing inspection, maintenance and repair of add on controls.		
14	Recordkeeping and retention of records.		
15	Updates of PM / MAP as necessary.		

Guidance Document
For Preventative Maintenance / Malfunction Abatement Plan (PM / MAP) Checklist

1. Contact Person: Include the name, title, telephone number (extension if applicable) and e-mail address for the person that may be contacted with questions regarding this Preventative Maintenance / Malfunction Abatement Plan (PM / MAP) with the transmittal letter accompanying the PM / MAP rather than within the body of the PM / MAP.

Engines

2. Engine Identification: For each engine at the facility, list the engine manufacturer, model and type of engine (rich burn or lean burn) and the type of add-on control equipment used (oxidation catalyst, three-way catalyst), if any. Also, identify each engine with an air to fuel ratio controller (AFRC).
3. Engine operating variables to be monitored: Provide the normal engine maintenance log.
4. Corrective procedures in the event of an engine malfunction: Provide a brief summary of the procedures that will take place in the event of an engine malfunction. A malfunction is defined in Rule 113(d) of the State of Michigan Air Pollution Control Rules which states, in part, 'any sudden, infrequent and not reasonable preventable failure of the equipment to operate in a normal or usual manner. Failures caused in part by poor maintenance or careless operations are not malfunctions.'
5. Major parts replacement inventory: Provide a list of major replacement parts that shall be maintained in inventory for quick replacement. If no replacement parts are kept on site provide a statement that no parts shall be kept.

Add-On Controls

6. Catalytic converter operating variables to be monitored: Provide the following:
 - a) A list of variables that will be monitored to measure catalytic converter performance including the catalytic converter inlet and outlet temperature, pressure differential across the catalytic converter, and any other relevant catalytic converter variables that are monitored.
 - b) The normal operating range that has been developed for each variable; acceptable ranges shall include documentation as to how the range was determined (i.e. manufacturer's recommendations or determined in the field with documentation or testing).
 - c) The method of monitoring the variables, and
 - d) The frequency of monitoring the variables.
7. Corrective procedures in the event of a malfunction of the catalytic converter: Malfunction is defined in number four above. Provide information on what steps shall be taken when a variable is out of range. This could include monitoring of emissions or cleaning and/or replacement of the catalytic converter.
8. AFRC O₂ sensor replacement schedule or operating variables to be monitored: Chose either (a) or (b).
 - a) O₂ sensor replacement interval or sensor life detector
 - b) If monitoring, provide:
 - i. A list of variables monitored to measure AFRC performance (i.e. millivolt output, O₂, and/or any other relevant AFRC variables that are monitored).
 - ii. The normal operating range that has been developed for each variable; acceptable ranges shall include documentation as to how the range was determined (i.e. manufacturer's recommendations or determined in the field with documentation or testing).
 - iii. The method of monitoring the variables.
 - iv. The frequency of monitoring the variables.

9. Corrective procedures in the event of a malfunction of the AFRC: Malfunction is defined in number 4 above. If choosing monitoring in paragraph 8.b above, provide information on what steps shall be taken when a variable is out of range.
10. Emission checks: Describe when a portable analyzer would be used and how it will be used.
 - a) Calibration of the analyzer will be conducted as required by manufacturer's specifications. Records shall be kept on file and made available to the Air Quality Division upon request.
 - b) Checks for both CO and NO_x.
 - c) Checks to be used to:
 - i. Check performance if monitored parameter is out of normal range, e.g. low inlet temperature (an engine specific minimum inlet temperature could then be established).
 - ii. When vendor cleaned catalyst is installed. This check will normally occur in the 12-18 month window as specified for routine cleaning.
 - d) Companies may choose to perform any of following the three valid methods:
 - i. Inlet and outlet checks and estimate destruction efficiency.
 - ii. Outlet testing and check for g/hp-hr compared to levels used for permitting.
 - iii. Outlet testing and use the uncontrolled vendor data to establish destruction efficiency.
11. Scheduled maintenance: Describe the scheduled cleaning and/or replacement of the catalytic converter.
 - a) Frequency of catalytic converter inspection and field catalyst media cleaning (vacuum catalyst face): Follow vendor recommendations, typically 12-18 months unless parameters (pressure drop, temperature deviations, etc) indicate otherwise.
 - b) Catalyst media removal and wash in chemical solution by manufacturer (if catalyst media does not respond to field cleaning). A replacement catalyst media will be used during the cleaning process.
 - c) Catalytic converter gasket replacement: Follow vendor recommendations, typically 12-18 months when catalyst is serviced.
 - d) Replace catalyst media if not functioning properly after vendor cleaning, or in lieu of vendor cleaning.
12. Major parts replacement inventory: Provide a list of major replacement parts that shall be maintained in inventory for quick replacement. If no replacement parts are kept on site provide a statement that no parts shall be kept.
13. Supervisory personnel responsible for maintenance of the control equipment: Include the contact information. This person or position can be a company employee or contractor and may or may not be the same person / position listed in number one above.
14. Retention of records: Records shall be kept on file and retained as described in the permit.
15. Updates of PM / MAP: Any updates to the plan shall be submitted to the AQD District Supervisor for written approval as required in the permit (the Department recommends the PM / MAP be reviewed annually).