ARCHAEA ENERGY

# Landfill Gas Treatment Plan

## Millersville Resource Recovery Facility

**December 2021**

**Prepared for:**
Northeast Maryland Waste Disposal Authority
Tower II/Suite 402, 100 S. Charles Street
Baltimore, MD 21201

# PLAN CERTIFICATION

**Landfill Gas Treatment Monitoring Plan**

**Millersville Resource**
**Recovery Facility**
**Severn, Maryland**

The material and data in this report were prepared under the supervision and direction of the undersigned.

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Regional Manager

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## Review & Revision History

Add the effective date of the most-recent revision to the list below. Do not overwrite or delete any dates. This is intended to be a complete record of all revisions made to this Plan.

| Date of Initial Issuance |
| --- |
| August 31, 2021 |
| **Review/Revision Dates** |
| December 3, 2021 |
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# 1 INTRODUCTION

The Millersville Landfill and Resource Recovery Facility (MLRRF) is located in Anne Arundel County at 389 Burns Crossing Road Severn, Maryland. The landfill is owned by Anne Arundel County Government ("County") and operated by the Department of Public Works' Bureau of Waste Management Services. Under an Agreement with the Northeast Maryland Waste Disposal Authority ("Authority"), Aria Energy, LLC of Novi, MI operates a 3.2 MW Landfill Gas-to-Electricity Facility ("facility') on behalf of the County.

The LFG Treatment System and LFG-fueled engines are housed at a facility within an area located on the northern portion of the landfill property. A gas transmission pipe connects to the header of the existing LFG collection system and a dedicated gas blower/compressor is used to draw LFG to the engine-generator operations. An inlet flow meter (flow totalizer) measures the total amount of LFG fuel that is supplied to the two (2) engines.

Due to the size of the facility and the volume of landfill gas produced, the Millersville Landfill and Resource Recovery Facility is subject to the United States Environmental Protection Agency, (USEPA) New Source Performance Standards (NSPS).

This Site-Specific Treatment System Monitoring Plan is being prepared because Millersville Landfill is subject to control requirements under NSPS Subpart XXX. As part of the landfill gas collection and control system (GCCS) on-site, all or a portion of the landfill gas is "treated" as part of its overall management prior to sale or beneficial use. Per §60.761, a treatment system is one that filters, de-waters, and compresses landfill gas for sale or beneficial use.

A treatment system is one of the acceptable "control systems" under the NSPS rule as set forth in §60.762(b)(2)(iii)(C), which read that the owner may:

> *Route the collected gas to a treatment system that processes the collected gas for subsequent sale or beneficial use such as fuel for combustion, production of vehicle fuel, production of high-Btu gas for pipeline injection, or use as a raw material in a chemical manufacturing process. Venting of treated landfill gas to the ambient air is not allowed. If the treated landfill gas cannot be routed for subsequent sale or beneficial use, then the treated landfill gas must be controlled according to §60.761(b)(2)(iii)(A) or (B).*

Millersville Resource Recovery Facility receives all, or a portion of the landfill gas collected from the Landfill and it processes it through a LFG treatment system which will act as a control system for the landfill gas subject to NSPS control. The monitoring requirements of NSPS, specifically §60.766(g), and §60.768(b)(5) require that:

> *A Site-Specific treatment monitoring plan must include monitoring records of parameters that are identified in the treatment system monitoring plan and ensure that the treatment system*

> *is operating properly for each intended end use of the treated landfill gas. At a minimum, records should include records of filtration, de-watering, and compression parameters that ensure the treatment system is operating properly for each intended end use of the treated landfill gas.*

This site-specific treatment system monitoring plan satisfies the requirements of NSPS Subpart XXX.

This Plan also meets the requirements of the Part 70 Operating Permit (Permit No. 24-003-01471) issued by the Maryland Department of Environment (MDE). In accordance with the Title V, all landfill gas is processed in a treatment system before it is beneficially used as fuel by the engine-generator sets. A summary of the treatment equipment which landfill gas travels through the Millersville Resource Recovery Facility can be found in Section 2 of this Report.

## 1.1 Millersville Resource Recovery Facility Process Description

The Millersville Resource Recovery facility is designed to accept up to 1,100 scfm of landfill gas from Millersville Landfill to beneficially use the low BTU fuel to run two (2) Caterpillar G3520C engine-generator sets. Prior to combustion in the engines, the LFG is processed through a gas treatment system which filters, de-waters, and compresses the LFG for beneficial use.

## 1.2 Recordkeeping

Data related to inlet landfill gas flow/methane content is monitored continuously and recorded by the facility's SCADA system. The MLRRF responsible personnel also compiles and distributes this information daily to ensure abnormalities are identified in a timely manner. An End of Month Report is finalized and submitted for QA/QC review no later than the 5th of the following month.

# 2 EQUIPMENT FUNCTION AND MONITORING

The gas received from the Landfill is initially de-watered in knockout tanks that are located upstream of the Millersville Resource Recovery Facility's gas treatment system where a portion of the condensate in the LFG is removed.

After the initial knockout tank de-watering, the LFG is treated in equipment and processes operated by Aria Energy that consist of:

1. A primary filter vessel/KO#1 that contains a coalescing filter, which is designed to remove particles in the gas stream that are 5.0 micron and larger. Condensate collected by the coalescing filter falls to the bottom of the vessel where it flows by gravity to a sump that transfers the liquid back to the landfill for processing.
2. Gas blower for compression of the de-watered LFG.
3. An air-to-gas cooler to reduce the temperature of the gas (which is heated by the blower during gas compression) to within ~10 Degs F of ambient air temperature.
4. A polishing filter/KO#2 vessel that contains a coalescing filter, which is designed to remove particles that are 1.0 micron and larger. Condensate collected by the coalescing filter falls to the bottom of the vessel where it flows by gravity to a sump that transfers the liquid back to the landfill for processing.

Aria Energy has developed a set of operating parameters to be routinely checked. These will be recorded and monitored over time and are subject to change and revision through the operation and balancing of the plant. Each piece of equipment provides a specific function in the treatment process and Aria monitors various parameters at each piece of equipment on a scheduled basis to determine that the equipment is performing its intended function. The following summarizes the function of each piece of equipment and what Aria monitors to determine it is operating properly.

## 2.1 Condensate Knockout—LFG Inlet Sump

This vessel functions very similarly to a civil engineering designed manhole/pump station. Wet gas flows via headers pipes into this sump. Due to the diameter of the sump and change in flow direction the gas slows down and as a result condensate droplets in the gas fall to the bottom of the sump. Collected condensate in the Inlet Sump is pumped pneumatically into the plant waste water system.

The Millersville Landfill and Resource Recovery Facility's (MLRRF) staff observes the Inlet Sump level weekly and initiates pump down of the sump as needed into the plant waste water system.

## 2.2 Condensate Knockout Tank—KO#1

The purpose of KO#1 is liquid removal. Wet gas flows from the plant header pipe under vacuum into KO#1. Due to the diameter of the tank, the gas slows down/hits the walls of the vessel, and as a result condensate droplets in the gas fall to the bottom of the tank. Additionally, a vane mist eliminator with drain legs helps to filter the landfill gas to 5.0 microns at an efficiency of 99.9%. As the wet gas flows through the vane mist eliminator droplets are forced into contact with larger droplets, and drain to the bottom of the tank through a drain leg. Condensate collected in the bottom of the separator is automatically pumped directly to the plant waste water system.

At least once weekly, the MLRRF staff monitors the differential pressure across the moisture separator, and checks the VFDs for normal operating ranges (Amperage / Load). On a weekly basis, an operator observes the liquid level in the moisture separator via a sight glass.

The pressure drop across each of the coalescing filters is monitored using an analog differential pressure gauge (manometer). Large differential pressures (dP) indicate that the filters are wet or loaded with particulate matter and should be replaced. The dP across the primary and polishing filters should be less than or equal to 4 pounds per square inch differential (psid), which is equivalent to 100 inches of water column (in. H2O). If the pressure drop across either of the coalescing filters is greater than the specified value, the associated filters will be replaced.

The replacement filters will be of comparable design for critical air or gas service applications where high-efficiency removal of oil or water droplets and particulate solids is required.

## 2.3 Positive Displacement Blower

One positive displacement blower move the gas, by applying a vacuum on the wellfield and providing positive pressure gas to the downstream treatment system and engine-generator sets. The blower is powered by an explosion proof 100 hp electric motor.

At least once weekly, MLRRF staff observes the blower oil levels daily and records this on the daily operator checklist. Process parameters related to the blowers including pressures and temperatures are also periodically monitored and recorded. The SCADA control system/program logic control will trigger an alarm to indicate an out-of-range process value.

On a daily basis, an operator observes the operation of the electric motors, listens for out of the ordinary sounds and checks for significant changes in vibration or temperature. Additionally, a third party performs advanced vibration monitoring on the blowers and drive motors at periodic intervals.

## 2.4 Vertical Moisture Separator—KO#2

KO#2 operates in an identical manner to KO#1 as described above.

The purpose of KO#2 is liquid removal. Wet gas flows from the plant header pipe under vacuum into KO#2. Due to the diameter of the tank, the gas slows down/hits the walls of the vessel, and as a result condensate droplets in the gas fall to the bottom of the tank. Additionally, a vane mist eliminator with drain legs helps to filter the landfill gas to 1.0 microns at an efficiency of 99.9%. As the wet gas flows through the vane mist eliminator droplets are forced into contact with larger droplets, and drain to the bottom of the tank through a drain leg. Condensate collected in the bottom of the separator is automatically pumped directly to the plant waste water system.

At least once weekly, the MLRRF staff monitors the differential pressure across the moisture separator, and checks the VFDs for normal operating ranges (Amperage / Load). On a weekly basis, an operator observes the liquid level in the moisture separator via a sight glass.

The pressure drop across each of the coalescing filters is monitored using an analog differential pressure gauge (manometer). Large differential pressures (dP) indicate that the filters are wet or loaded with particulate matter and should be replaced. The dP across the primary and polishing filters should be less than or equal to 4 pounds per square inch differential (psid), which is equivalent to 100 inches of water column (in. H2O). If the pressure drop across either of the coalescing filters is greater than the specified value, the associated filters will be replaced.

The replacement filters will be of comparable design for critical air or gas service applications where high-efficiency removal of oil or water droplets and particulate solids is required.

## 2.5 Air-to-Gas Cooler

The purpose of the cooler is to cool the landfill gas to lower its dew point to remove the majority of any remaining moisture. The temperature of the gas (fuel) at the outlet of the air-to-gas cooler is measured with an analog temperature gauge. The air-to-gas cooler is used to reduce the temperature of the fuel (which becomes elevated during the compression process).

Outlet gas temperatures greater than 120°F are an indication of problems with the operation of the air-to-gas cooler. A temperature switch will sound an alarm if the outlet gas temperatures exceed 135°F.

If the outlet temperature of the air-to-gas cooler is greater than 120°F, an investigation of the equipment will be performed and corrective actions implemented.

The plant HMI Gas Panel & SCADA system constantly monitors the gas temperature and pressure prior to and after the cooler. The MLRRF staff visually observes the cooler for any abnormalities.

**Table 1 - Landfill Gas Treatment System Monitoring Plan**

| Equipment | Parameter | Inspection Frequency | Monitoring Device | Range of Operation | Basis |
|---|---|---|---|---|---|
| Compressor/ Blower | Discharge Pressure (compression) | Continuously Monitored by SCADA | Pressure monitoring device | 1-10 psi | Manufacturer Recommendation |
| Coalescing Filter Vessel / Final Gas Filter | Differential Pressure (filtration) | At least once weekly | Pressure monitoring device | 0.0 - 4.0 psi/2 to 100 inches WC (Differential pressure between inlet & outlet of filter vessel) | Manufacturer Recommendation |
| Gas Cooler (moisture removal) | Differential Temperature (de-watering) | Continuously Monitored by SCADA | Temperature gauge | Differential temperature of at least 10°F | Manufacturer Recommendation |

**Reviewed and approved by:** Jeff Sacks, Regional Manager

# 3 MAINTENANCE & RESPONSIBLE PERSONNEL

As discussed in previous sections, MLRRF responsible personnel observes and documents the operation of the treatment system on regular intervals. If an operator observes that the equipment is operating abnormally, or if an operator observes/documents that an operating parameter is out of its recommended/ normal range, than maintenance actions will be taken. Regular preventative maintenance and non-routine maintenance will be performed on the Landfill Gas Treatment System in accordance with the Preventative Maintenance/ Malfunction Abatement Plan which is maintained onsite. Various alarms will signal if a piece of equipment experiences a malfunction and is no longer able to function correctly.

All supervisory personnel responsible for overseeing the inspection, maintenance, and repair of the plant are listed below:

| Name | Title | Phone Number |
|---|---|---|
| Rick Covell | Power Gen Operations Manager | 904.669.9645 |
| Jeff Sacks | RNG Regional Manager | 734.796.6763 |
| Wesley Herman | Lead Operator | 410.618.7771 |
| Christopher Rosas | Plant Operator | 410.618.7771 |

# 4 REGULATORY SUMMARY

This site-specific treatment system monitoring plan satisfies the requirements of §60.766(h) and §60.768(b)(5)(ii). Each element of the monitoring plan is listed here followed by the site-specific information related to this specific treatment system. The requirement will be shown in bold, italicized text followed by the site-specific response for the Site.

***§60.768(b)(5)(ii)(A) Monitoring records of parameters that are identified in the treatment system monitoring plan and that ensure the treatment system is operating properly for each intended end use of the treated landfill gas. At a minimum, records should include records of filtration, de-watering, and compression parameters that ensure the treatment system is operating properly for each intended end use of the treated landfill gas.***

Per §60.766(g)(1), flow must be continuously (at least once every 15 minutes) monitored into the treatment system. The flow measurement device will be maintained and calibrated per manufacturer's recommendations. Also, per §60.766(g)(2), if there is a bypass line, from the treatment system, it must be secured in the closed position and inspected at least monthly to verify that gas is not being diverted to the bypass line and circumventing appropriate NSPS control.

Per §60.768(c) all records must be 5 years up-to-date, readily accessible, on-site.

***§60.768(b)(5)(ii)(B) Monitoring methods, frequencies, and operating ranges for each monitored operating parameter based on manufacturer's recommendations or engineering analysis for each intended end use of the treated landfill gas.***

Table 1 describes monitoring methods, frequencies, and operating ranges for each monitored treatment operating parameter.

***§60.768(b)(5)(ii)(C) Documentation of the monitoring methods and ranges, along with justification for their use.***

The justification for the monitoring methods and ranges for each monitored treatment operating parameter is based on operational experience and/or manufacturer recommendation. This section is required since the ranges of these treatment parameters are not prescribed by the NSPS rules, rather, they are to be set on a site-specific basis (since different beneficial uses and gas sales require different levels of treatment).

***§60.768(b)(5)(ii)(D) Identify who is responsible (by job title) for the data collection.***

The following job titles that are authorized to take these readings: Regional Manager, Lead Operator, Operator

***§60.768(b)(5)(ii)(E) Processes and methods used to collect the necessary data.***

Table 1 demonstrates how each type of treatment parameter (filtration, de-watering, and compression) will be monitored.

***§60.768(b)(5)(ii)(F) Description of the procedures and methods that are used for quality assurance, maintenance, and repair of the continuous monitoring systems.***

The data and equipment are reviewed regularly during the month to verify accuracy and to evaluate for trends that may be characteristic of diminishing performance. Additionally, staff will perform visual inspections of the equipment and note issues as they arise. Repairs will be made as necessary. At a minimum, filters will be cleaned and or replaced as needed to maintain the listed differential pressures.

# 5 IMPLEMENTATION OF AND UPDATES TO PLAN

## 5.1 Implementation of the Plan

This Treatment System Report has been prepared by Aria Energy to meet the EPA's and MDE's requirements for the treatment system at the Millersville Landfill and Resource Recovery Facility located in Severn, MD. This plan is not intended to comprehensively address every possible monitoring or maintenance activity that could be conducted on the treatment system, but rather this plan does establish the following:

1. A general understanding of the function of each piece of equipment in the treatment system.

2. Operational parameters that will be observed and documented throughout the treatment system to indicate proper performance

3. Appropriate monitoring procedures of the treatment system.

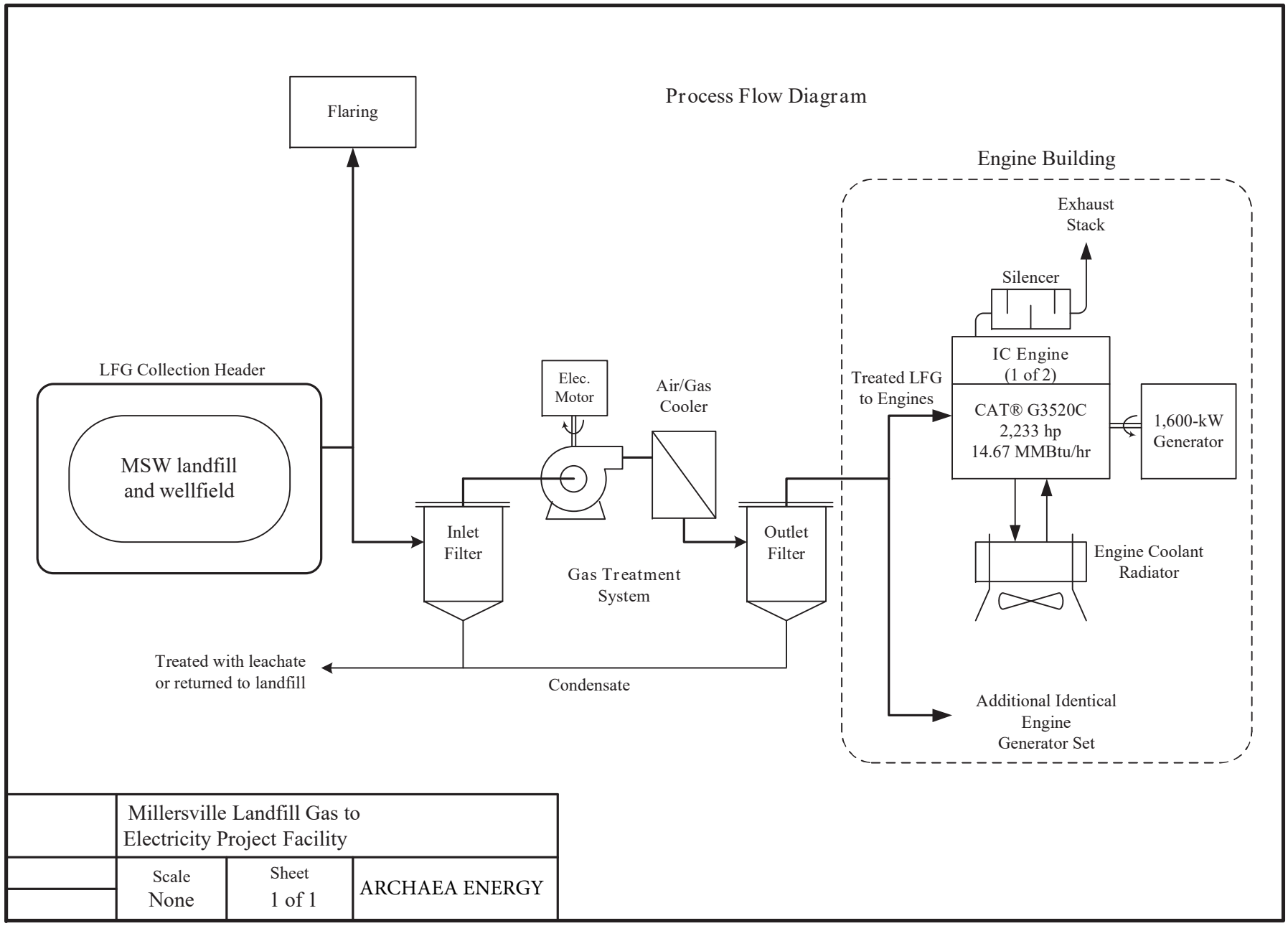
The overall goals of this plan are to provide assurance to the MDE that the treatment system is being operated and maintained in a manner that complies with the NSPS while allowing MLRRF the operational flexibility to maximize the processing of the landfill gas.

If the Plan fails to address or inadequately addresses regulatory requirements set forth by MI EGLE, or NSPS Subpart XXX, the plan shall be revised within 45 days.

## 5.2 Updates to the Plan

This Plan will be updated within 60 days of replacing or expanding the components of the landfill gas treatment system. If no components of the plant are replaced or expanded with components described herein, the Plan will be reviewed and updated as needed at least once every 5 years.

# APPENDIX A
# Simplified Block Flow Diagram




| | Millersville Landfill Gas to Electricity Project Facility | | |
|---|---|---|---|
| | Scale None | Sheet 1 of 1 | ARCHAEA ENERGY |

# APPENDIX B
# Inspection Checklist

## Millersville - Daily Readings

| | Morning | |
|---|---|---|
| | Unit 1 | Unit 2 |
| Serial # | GZJ00492 | GZJ00496 |
| JW Temperature Out / In | / | / |
| M/U Oil Level (fill below 6 g) | | |
| Combustion Air Temp | | |
| Battery Charger Amps / Volts | / | / |
| SCAC Temperature In / Out | / | / |
| Crank Case Vent | | |
| Gas Pressure | | |

Condensate meter (gallon)

Total power in 24hrs (KWH)

**Gas Conditions**

| | Flow | BTU | CO2 | O2 | Flare pressure |
|---|---|---|---|---|---|
| 12:00 | | | | | |
| 24:00 | | | | | |

**Switchgear**

| | Morning | |
|---|---|---|
| | Unit 1 | Unit 2 |
| Generator Effective Kw | | |
| Megawatt Hours (489) | | |
| Engine Hours | | |
| Filtered Engine Oil Pressure | | |
| Engine Oil PSID | | |
| Engine Coolant Pressure | | |
| Engine Coolant Temp | | |
| Engine Oil Temp | | |
| Throttle Angle | | |

| | | |
|---|---|---|
| Engine Oil | U1: | U2: |
| Intake Manifold Temps: | U1: | U2: |

| Compressor Station | Frequency (HZ) | Temp Left | Temp Right |
|---|---|---|---|
| Compressor 1 | | | |
| | | | |
| | | | |
| | | | |

| Coalescing Filter Towers Differential Pressure ( IN H2O ) | |
|---|---|
| Primary | Polishing |
| | |

Filter Tower Sight glasses Checked ? (circle) YES

| Tie | | Methane | | Plant | | Operator Name: |
|---|---|---|---|---|---|---|
| Date | / / | STUB ( IN H2O ) | | Air Press | | |
| Time | | CH4 | | Plant Temp | | _____ |
| Volts | / / | CO2 | | Ambient Temp | | _____ |
| Amps | / / | O2 | | **Oil Tanks** | | |
| Total Kw | | BTU | | New: | (Order @ 1000 gal) | |
| Kw Hr Total | | Gas Head Temp | | Used: | (Call @ 1880 gal) | |
| SCFM | | Gas Head Press | | CAP: New - 2500, Used - 1500 | | |
| SCFM Total | | **Notes:** | | | | |
| Incoming Power | | Note any leaks or other potential problems below | | | | |
| Incoming Power Total | | | | | | |
| 48V S/B Battery Amps / Volts | / | | | | | |