TECHNICAL REVIEW DOCUMENT
for
OPERATING PERMIT 99OPCY216
to be issued to:

Duke Energy Field Services, LLC
Ladder Creek Helium Plant
Cheyenne County
Source ID 0170209

Prepared by Michael E. Jensen
August 16, 2000

I. PURPOSE:

This document establishes the basis for decisions made regarding the Applicable Requirements, Emission Factors, Monitoring Plan and Compliance Status of Emission Units covered within the Operating Permit proposed for this site. It is designed for reference during review of the proposed permit by the EPA and during Public Comment. This narrative is intended only as an adjunct for the reviewer and has no legal standing. Conclusions in this document are based on information provided in the original application submittal of October 1, 1999, a supplemental Title V technical information submittal of November 4, 1999, as well as numerous technical information submittals needed for the preparation of the construction permit(s), as well as numerous telephone contacts with the applicant.

On April 16, 1998, the Colorado Air Quality Control Commission directed the Division to implement new procedures regarding the use of short term emission and production/throughput limits on Construction Permits. These procedures are being directly implemented in all Operating Permits that had not started their Public Comment period as of April 16, 1998. All short term emission and production/throughput limits that appeared in the Construction Permits associated with this facility that are not required by a specific State or Federal standard or by the above referenced Division procedures have been deleted and all annual emission and production/throughput limits converted to a rolling twelve (12) month total. Note that, if applicable, appropriate modeling to demonstrate compliance with the National Ambient Air Quality Standards was conducted as part of the Construction Permit processing procedures. If required by this permit, portable monitoring results and/or EPA reference test method results will be multiplied by 8760 hours for comparison to annual emission limits unless there is a specific condition in the permit restricting the hours of operation.

Any revisions made to the underlying construction permits associated with this facility made in conjunction with the processing of this operating permit application have been reviewed in accordance with the requirements of Regulation No. 3, Part B, Construction Permits, and have been found to meet all applicable substantive and procedural requirements. This operating permit incorporates and shall be considered to be a combined construction/operating permit for any such revisions, and the permittee shall be allowed to operate under the revised conditions upon issuance of

this operating permit without applying for a revision to this permit or for an additional or revised Construction Permit.

II. Source Description:

The Ladder Creek Helium Plant is designed to recover helium and natural gas liquid (NGL) products from field natural gas. Inlet gas from the local fields enters the plant and is routed through an inlet gas separator. Entrained liquids consisting of condensate and water are removed from the inlet gas stream and are routed to storage tanks. The inlet gas is then routed through an amine sweetening unit to remove carbon dioxide. The carbon dioxide and some volatile organic compounds are vented to the atmosphere through the amine regeneration still vent. The gas -fired amine regeneration reboiler heater emits flue gas to the atmosphere.

The sweetened gas from the amine unit is routed through a molecular sieve dehydration unit to remove moisture. The sieve beds are periodically regenerated by passing a small stream of hot residue gas (regen gas) through the bed. The regen gas is heated in the regen gas heater and routed back to the inlet gas stream after regenerating the sieve beds. The only emissions to the atmosphere from this dehydration process are the flue gas emissions from the gas-fired regen heater.

The gas stream from the molecular sieve is cooled using a closed loop propane refrigeration system. The refrigeration compressors are electrically driven. There are no emissions to the atmosphere associated with the refrigeration system. The cooled gas is routed to the cold box. A series of heat exchangers in the cold box further cool the gas to remove NGL product, nitrogen, and crude helium. The NGL product is routed to pipeline sales. A portion of the nitrogen removed is routed to storage and used for the process heat transfer. The remaining nitrogen is vented to the atmosphere. The crude helium is purified on-site. After removal of the NGL product, nitrogen and crude helium, the remaining residue gas has a high methane content. The residue gas is recompressed using two gas-fired internal combustion engine driven compressors. The engines emit exhaust gas to the atmosphere. A small portion of the compressed residue gas is used as the regen gas for the molecular sieve as described above. The remaining gas is routed to pipeline sales.

Three gas-fired turbines are used to generate electrical power for the plant. These three turbines emit exhaust gas to the atmosphere. Fugitive VOC emissions from leaking equipment components are also emitted from the plant.

The facility is located at 41707 County Road P. It is about three (3) miles west of Cheyenne Wells, in Cheyenne County, Colorado. The area in which the plant operates is designated as attainment for all criteria pollutants. Kansas is an affected state within 50 miles of the plant. There are no Federal Class I designated area within 100 kilometers of the plant.

The modifications of Construction Permit 97CY0207 set the Potential To Emit (PTE) for the entire plant as shown in the following table. The actual emissions shown exceed the PTE because of the Division calculation procedure used in the last data base update which has not yet been modified.

Pollutant	Potential to Emit (tpy)	Actuals (tpy)
NOx	217.1	219.3
VOC	111.3	7.2
CO	171.4	168.5
PM	23.4	20.9

The potential emissions are limited by the conditions in Construction Permit 97CY0207 at a level that classifies this source as a synthetic minor with respect to Prevention of Significant Deterioration (PSD) requirements.

The Initial Approval for Construction Permit 97CY0207 was issued May 30, 1997. The compliance testing required by the Construction Permit found the volatile organic compound emissions from the amine regeneration still vent exceeded the permit limit. The vent emissions were tested again to confirm the exceedance of the permit limit. The Title V application included a request to increase the amine still vent volatile organic compound emissions limit and the emissions limits for the two heaters. The issuance of the Title V permit will be equivalent to the issuance of a modification of the Initial Approval of the Construction Permit. Since the equipment covered by the modification of Construction Permit 97CY0207 will have been operating for more than 180 days by the due date of the first semi-annual monitoring required by this Operating Permit, the Division considers that the Responsible Official certification submitted with that report will serve as the self-certification of compliance with the provisions of the modified Construction Permit.

As a result of the initial performance test identifying non-compliance of the vent emissions with the permit limit, Duke and the Division entered into a Compliance on Consent (COC) Order. As part of the settlement of the COC Duke agreed to perform a Special Environmental Project (SEP). The SEP will involve a cooperative study with the Gas Research Institute in evaluating the use of various glycol formulations. The study will be conducted at the Duke Energy Marla Compressor Station.

III. EMISSION SOURCES:

The following sources are specifically regulated under the terms and conditions of the Operating Permit for this plant:

2400 HP Natural Gas Fired Internal Combustion Engines Powering Compressors
C001 - Caterpillar Model 3608-RIC SN 4WF00061
C002 - Caterpillar Model 3608-RIC SN 4WF00062

1. Applicable Requirements: The applicable requirements for the engines were established by Construction Permit 97CY0207. The Construction Permit included a requirement for compliance testing of the engines which has been satisfactorily completed.

2. Emission Factors: Emissions from reciprocating engines are produced during the combustion process, and are dependent upon the fuel mixture, engine design specifications, and specific properties of the natural gas being burned. The pollutants of concern are Nitrogen Oxides (NOx), Carbon Monoxide (CO) and Volatile Organic Compounds (VOC). Small quantities of Hazardous Air Pollutants (HAPs) are also emitted when combustion is incomplete. Approval of emission factors for use with engines is necessary to the extent that accurate actual emissions are required to verify the need to submit Revised APENs to update the Division emission inventory, and for compliance determination and certification. The engines are designed for low nitrogen oxide emissions. Construction permit 97CY0207 required compliance testing to be performed on the engines to validate the proposed emission factors. The compliance testing has been completed and the Division accepts the use of the emission factors provided.

3. Monitoring Plan: The operating permit established a procedure for the calculation of the emissions based on fuel consumption and a fuel based emission factor. The fuel consumption is determined by prorating the total monthly fuel use based on the operating hours for each engine for the month. The emissions are to be calculated monthly to determine compliance with the annual (12-month rolling total) limit.

A copy of a monitoring guidance grid developed by the Division is included at the end of this document. The grid and the Title V application monitoring proposals were used to define the monitoring requirements for the internal combustion engines. The Division monitoring guidance grid requires more intensive and extensive portable monitoring of the emissions from internal combustion engines when the total facility emissions are near the major source threshold of 250 tons per year.

The Division has determined, based on AP-42 emission factors and engineering judgement, that there will be minimal particulate emissions from these type of internal combustion engines when

natural gas is exclusively used as the fuel. The use of natural gas will also satisfy the opacity monitoring requirement. Inspectors may verify this with EPA Method 9 opacity observations.

4. Compliance Status: The equipment at this site has been operating for an extended time. A current APEN reporting criteria emissions is on file with the Division. Duke certified in the application that natural gas has been used exclusively as the fuel for this unit. As noted previously, the Division accepts the compliance signature of the responsible official as evidence of compliance.

2550 HP Natural Gas Fired Combustion Turbines Powering Electrical Generators
TB001 - Solar Centaur Model 40-T4700 SN DCG0100
TB002 - Solar Centaur Model 40-T4700 SN DCG0101
TB003 - Solar Centaur Model 40-T4700 SN DCG0102

1. Applicable Requirements: The applicable requirements for the turbines were established by Construction Permit 97CY0207. The Construction Permit included a requirement for compliance testing of the turbines which has been satisfactorily completed. The turbines are subject to the provisions of 40 CFR Part 60, New Source Performance Standard (NSPS) Subpart A - "General Provisions, and Subpart GG - "Standards of Performance for Stationary Gas Turbines"and Regulation No. 6, Part A and B. The total electrical power generation is limited in order to keep the total facility emissions below the Prevention of Significant Deterioration (PSD) major source threshold of 250 tons per year of any pollutant. In other words, the plant is a synthetic minor for the PSD provisions.

NSPS Subpart GG sets a nitrogen oxides standard of 160 parts per million by volume at 15% oxygen and ISO conditions for the exhaust from each turbine.

Colorado Regulation No. 6 establishes combustion turbines as fuel-burning equipment. Regulation No. 6, Part B, Section II.C.2 uses the equation $0.5(24.7)^{-0.26}$ to set a limit of 0.217 pounds per million Btu of heat input, or 23.5 tons per year of emissions. When burning natural gas the particulate emissions are not significant enough to require regulation. There is no means by which the turbines could ever exceed the particulate limit. The Regulation No. 6, Part B, Section II.D.3.a for sulfur dioxide standard does apply and is included with the sulfur dioxide provisions from NSPS Subpart GG.

2. Emission Factors: The emission factors are from AP-42 or are greater than AP-42. The particulate matter emission factor provided in the Title V application is higher than the AP-42 emission factor which required the permit particulate matter emission limits to be increased. This limit modification was made directly in the Title V permit.

The Title V permit provided a relationship of 2851 kiloWatts (kW) per 36.47 million Btu of turbine heat input. This relationship allows compliance with the electrical generation output to be estimated from the fuel consumption.

For Construction Permit 97CY0207 the previous facility owner considered all the volatile organic compound emissions from the turbines were formaldehyde. This resulted in the permit noting a total of 73,000 pounds of formaldehyde per year from the turbines. APENs submitted with the Title V application estimated no formaldehyde emissions from the turbines. The Title V APENs were subsequently revised, based on information provided in AP-42, to provide an estimated total of 2,145 pounds per year of formaldehyde from the turbines.

3. Monitoring Plan: The NSPS Subpart GG provisions require the monitoring of the fuel (natural gas) sulfur content. The testing will be accomplished with a "length of stain" test. The testing frequency has been slightly modified from that prescribed by EPA. The Division believes there is limited variability in the sulfur content of pipeline quality natural gas. On that basis, the monitoring will start at a twice per month frequency rather than a daily basis for six (6) months. If the testing identifies a stable sulfur content in compliance with the permit limit, the monitoring frequency will progress to once per quarter, and then twice per annum. If there is a change in the fuel supply, or the testing identifies variability in the sulfur content, or non-compliance with the sulfur content limit, the frequency will immediately revert to a weekly basis until a revised monitoring schedule has been established.

Because there are no continuous emission monitoring systems on the turbine exhausts, the Division requires a compliance stack test within one year of the issuance of this permit and within one year of the expiration of the permit.

Each turbine powered generator has a rated output of 2851 kW. The permitted electrical power generation limit allows two of the generators to be operated continuously. The third turbine may operate intermittently as long as the total electrical power generation limit is not exceeded.

The Division expects the combustion of natural gas will not result in a violation of the 20% opacity standard. Inspectors may verify this with EPA Method 9 opacity observations.

4. Compliance Status: The equipment at this site has been operating for an extended time. A current APEN reporting criteria emissions is on file with the Division. Duke Energy certified in the application that natural gas has been used exclusively as the fuel for this unit. As noted above, the Division accepts the compliance signature of the responsible official as evidence of compliance.

Natural Gas Fired Process Heaters
H001 - 5.56 MMBtu/hr Amine Regenerator Heater
H002 - 7.56 MMBtu/hr Process Heater

1. Applicable Requirements: The permit limits of 97CY0207 for the two heaters was established from the information provided by the previous owner of the facility. The Title V application provided different design capacity information for each heater. The permit limits are being directly modified in the Title V permit to reflect the modified information. The heaters are subject to the particulate emission limits set by the equation in Regulation No. 6, Part B, Section II, §C.2. The Construction Permit inadvertently failed to identify the opacity standard as an applicable requirement for the heaters. This standard is being established directly in the Title V permit.

2. Emission Factors: The emission factors are from AP-42.

3. Monitoring Plan: The emissions are estimated from the fuel use and the emission factors identified. The following calculation demonstrates the particulate emission limit can not be exceeded while burning natural gas with a heating value of 900 Btu per standard cubic foot. Inspection of the calculation demonstrates the limit can not be exceeded for the normal heat content range of pipeline quality natural gas.

$$\frac{6.71\,\text{lb PM}}{\text{MMscf}} \text{ x } \frac{\text{scf}}{900\,\text{Btu}} = 0.008\,\frac{\text{lb PM}}{\text{MMBtu}} << \frac{0.30\,\text{lb}}{\text{MMBtu}}$$

The Division expects the combustion of natural gas will not result in a violation of the 20% opacity standard. Inspectors may verify this with EPA Method 9 opacity observations.

4. Compliance Status: The equipment at this site has been operating for an extended time. A current APEN reporting criteria emissions is on file with the Division. Duke Energy certified in the application that natural gas has been used exclusively as the fuel for this unit. As noted above, the Division accepts the compliance signature of the responsible official as evidence of compliance.

Amine Regeneration Still Vent

1. Applicable Requirements: The applicable requirements were established by Construction Permit 97CY0207. The requirements included the need for a compliance test. The initial compliance test found the volatile organic compound emissions exceeded the permit limit. A second test confirmed the emissions were significantly higher than estimated when developing the permit limits. The Title V application included a request to increase the volatile organic compound emission limit.

2. Emission Factors: The emission factor was calculated from the permit limit for the processing rate and the volatile organic compound emissions. The emission factor is higher than the emission factor from the actual emissions measured during the compliance testing.

3. Monitoring Plan: The compliance tests indicated variability in the volatile organic compound emissions and the hazardous air pollutants from the still vent. The low gas flow rate from the vent makes stack testing difficult. Quarterly testing of the amine unit inlet gas is required to identify the variability in the gas composition and to provide a basis for estimating the emissions. If the testing identifies the volatile organic compound and hazardous air pollutant emissions do not vary by three percent (3.0 %) or more, the testing frequency may be changed to once per calendar year. The testing reverts to a quarterly frequency if the emissions begin to fluctuate.

4. Compliance Status: The equipment at this site has been operating for an extended time. A current APEN reporting criteria emissions is on file with the Division. Duke Energy certified in the application that natural gas has been used exclusively as the fuel for this unit. As noted above, the Division accepts the compliance signature of the responsible official as evidence of compliance.

Fugitive Emissions of Volatile Organic Compounds from Equipment Leaks

1. Applicable Requirements: The Division has made the determination that fugitive volatile organic compound (VOC) emissions from equipment leaks at gas compression or processing facilities must be calculated and evaluated for the appropriate permitting requirements. The piping and equipment at this plant is subject to the New Source Performance Standards, 40 CFR Part 60, Subpart A and Subpart KKK and Regulation No 6, Part A. The provisions of Subpart KKK identify leak testing requirements and corrective actions to be taken.

2. Emission Factors: The fugitive leak emissions are calculated based on emission factors from EPA's Protocol for Emission Leak Estimates. These factors have changed several times in the recent past. The factors used were current at the time the construction permit was prepared. The EPA factors estimate the total organic compounds. The factors are multiplied by the number of

components of each type (e.g. compressor seals, flanges, etc) and the VOC weight percentage in the gas stream as determined in the most recent gas analysis.

Because of the numerous options and alternatives provided by the provisions of Subpart KKK, a document is to be prepared and submitted to the Division. The document will outline the details and actions required for leak testing and repair of the piping and equipment.

3. Monitoring Plan: Equipment and piping modifications at a facility are an on-going process. Sufficient time has lapsed since the Construction Permit component count was performed for modifications to have changed the component count. The permittee must perform an initial count of the components within ninety (90) days of the issuance of the Operating Permit. The permittee is then required to maintain a running tally of the component count in order to perform the fugitive leak emissions estimate. The count must be re-established in order to provide the correct base for the running tally. An actual physical count of the number of process valves, relief valves, pump seals, compressor seals and flanges/connections is to be performed at least once every five (5) years to verify the tally has been correctly and currently maintained. The natural gas will be analyzed on a quarterly basis until the consistency of the gas composition is determined. If the values for the VOC and hazardous air pollutants do not change by three percent (3.0%) or more, the gas will be considered to have a consistent composition and the testing frequency may be reduced to once per year. The testing will revert to a quarterly basis at any time the gas quality is detected to fluctuate by 3.0% or more.

4. Compliance Status: The equipment at this site has been operating for an extended time. A current APEN reporting criteria emissions is on file with the Division. Duke Energy certified in the application that natural gas has been used exclusively as the fuel for this unit. As noted above, the Division accepts the compliance signature of the responsible official as evidence of compliance.

Insignificant Activities

The permittee needs to periodically review the insignificant activities to determine if they are still insignificant and in compliance with all applicable requirements. A record of review, the compliance determination, and any additions, deletions or changes to the insignificant source inventory should be maintained. The record will support the annual compliance certification for the insignificant sources. The inventory of insignificant sources provided in the permit application is included in Appendix A of the operating permit as a starting reference.

The condensate storage tanks are eligible candidates for a construction permit because they satisfy the applicability provisions of 40 CFR Part 60 Subpart Kb based on capacity and installation date. The tanks are, however, exempt from Subpart Kb, based on §60.110.b.d.4 which states “Vessels with

a design capacity of less than or equal to 1,589.874 m^3 used for petroleum or condensate stored, processed, or treated prior to custody transfer."

Alternative Operating Scenario

Engine and Turbine Replacement

The permittee requested that both temporary and permanent replacements of the internal combustion engines and combustion turbines be considered an Alternative Operating Scenario. A temporary engine or turbine would operate for less than three (3) months in the same service while an existing engine or turbine was being repaired or overhauled. The Division acceptance of the operation of either a temporary or permanent engine or turbine is contingent upon emissions testing of the engine or turbine to demonstrate the emissions comply with the permit limits. Testing must be conducted under representative conditions for the engine or turbine being replaced. The permittee must be willing to accept a determination of non-compliance should the emissions testing determine the emissions from the engine or turbine in question exceed those defined in the Operating Permit. Any non-compliance will be considered to exist from the day the replacement engine or turbine started operation.

Hazardous Air Pollutants

The applicable requirement is for the reporting of estimated emissions above the appropriate bin thresholds established in Appendix D of Regulation No. 3. Hazardous air pollutant emissions for each source are estimated from manufacturer's information, AP-42 and GRI technical reports. A Revised APEN must be submitted when there is an increase in hazardous air pollutants of 50 percent (%) or five (5) tons per year, whichever is less, above the level of the last APEN submitted. The Division accepts this source was in compliance at the time the Title V application was submitted.

Permit Shield

The intent of the permit shield is to provide limited protection to the plant in the event of an error in the evaluation of whether a regulation, or portion of a regulation applies. The plant identifies the issue and presents its position. The Division reviews the position. If the Division and the plant mutually agree on the position, the issue is recorded in the permit. If, at a later date, it is determined that an error was made in the mutual decision, the plant is protected from enforcement action until the permit can be reopened and the correct requirements and a compliance schedule inserted.

In this application, an extensive list of non-applicable sections of the Federal and State regulations are identified for the sources, and the request for the shield justified.

Miscellaneous

From time to time published emission factors are changed based on new or improved data. A logical concern is what happens if the use of the new emission factor in a calculation results in a source being out of compliance with a permit limit. For this operating permit, the emission factors or emission factor equations included in the permit are considered to be fixed until changed by the permit. Obviously, factors dependent on the fuel sulfur content or heat content can not be fixed and will vary with the test results. The formula for determining the emission factors is, however, fixed. It is the responsibility of the permittee to be aware of changes in the factors, and to notify the Division in writing of impacts on the permit requirements when there is a change in factors. Upon notification, the Division will work with the permittee to address the situation.

Short Term Limits

As noted at the start of this review document, new procedures resulted in the removal of short term emission and production/throughput limits from Construction Permits. The table below documents existing short term Construction Permit limits that were not incorporated in the Operating Permit.

Construction Permit	Emission Point	NOx, lb/hr	CO, lb/hr	Particulate, lb/hr	VOC, lb/hr	Fuel Use or Process rate
97CY0207	TB001, TB002 & TB003 - 2550 Turbines	38.8	8.5	2.6	8.5	82,443 scf/hr
	C001 & C002 - 2400 HP IC Engines - Each engine	4.8	14.9	1.0	2.7	20,000 scf/hr
	H001- 5.56 MMBtu/hr heater	0.6	0.13			6,667 scf/hr
	H002 - 7.56 MMBtu/hr heater	1.7	0.41			13,000 scf/hr
	AM001 - Amine Regen Still Vent				2.3	50 million scf/day
	Total Station Emissions	51.0	39.0	4.8	18.0	