THE LINDE GROUP Linde

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06-0284

January 6, 2015
Sent via Federal Express

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Tennessee Department of Environment & Conservation
401 Church Street
9th Floor, L&C Annex
Nashville, TN 37243-1531

Attention: Sunada Shajikumar

RE: Linde Gas North America, LLC – Extension of Construction Permit Application for a Minor Source

Dear Ms. Shajikumar:

Linde Gas North America, LLC (Linde) is proposing to construct and operate a hydrogen reformer in Charleston, TN. The reformer will be located on property leased from Wacker Polysilicon North America, LLC (Wacker) and will provide hydrogen to the Wacker facility for use in their processes. The address of the proposed hydrogen plant is 553 McBryant Road NW, Charleston, TN.

As background, Linde submitted an application on January 16, 2012 for the installation of two identical hydrogen reformer systems. Permit Number 965288P was issued on May 31, 2012 for Linde and expired on November 1, 2013. However, on September 27, 2013, Linde submitted an application to extend the construction permit for an additional 18 months. Linde received the amended permit on October 30, 2013, with a new expiration date of April 29, 2015. This permit application addresses Linde's request to extend the existing construction permit for an additional 18 months, and to request authorization to construct only a single hydrogen reformer system rather than the two systems currently permitted.

This letter/application also serves to notify the Department of a change in the person responsible to represent and bind the facility in environmental permitting affairs. Terry Phipps will be the new responsible official and his contact information is contained within the application on the appropriate signature page.

Please feel free to contact either myself of Justin Fickas of Trinity with questions about this application.

Sincerely,

Robin Callaghan
Air Quality Manager
LINDE NORTH AMERICA, INC.

Enclosure

cc:
Justin Fickas – Trinity Consultants
Jeremy Copeland, Wacker Polysilicon North America, LLC
Scott Boyd, Decatur, AL

CONSTRUCTION PERMIT APPLICATION

Linde Gas North America, LLC > Charleston, Tennessee

THE LINDE GROUP

Linde

Prepared By:

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53 Perimeter Center East
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January 2015

Project 141101.0135

Trinity Consultants

Environmental solutions delivered uncommonly well

TABLE OF CONTENTS

1. INTRODUCTION

Linde Gas North America, LLC (Linde) is proposing to install and operate a hydrogen reformer in Charleston, TN. The reformer is proposed to be located on property leased from Wacker Polysilicon North America, LLC (Wacker) and will provide hydrogen to the Wacker Facility for use in their processes. Both facilities are located at 553 McBryant Road NW, Charleston, TN. However, this application constitutes solely Linde's construction permit application for construction of the proposed hydrogen reformer process.

Linde submitted an application on January 16, 2012 for the installation of two identical hydrogen reformer systems. Permit Number 965288P was issued on May 31, 2012 for Linde and expired on November 1, 2013. However, on September 27, 2013, Linde submitted an application to extend the construction permit for an additional 18 months. Linde received the amended permit on October 30, 2013, with a new expiration date of April 29, 2015. This permit application addresses Linde's request to extend the existing construction permit for an additional 18 months, and to request authorization to construct only a single hydrogen reformer system rather than the two systems currently permitted. The combustion gas will consist of natural gas and PSA purge gas.

Linde would propose the following changes to Permit Condition S1-1.

Limitation or Standard – The maximum combined heat input for this source shall not exceed 25.09 MMBtu/hr (LHV). The combustion gas may consist of natural gas and PSA purge gas.

Parametric Monitoring – Calculate 24-hr block average based on the total natural gas as fuel rate and the PSA purge gas rate.

Other changes to the specific emission limitations in Conditions S1-5 (NOx emissions) are requested consistent with the revised emission calculations provided in Appendix B. [1]

This permit application is organized as follows[2]:

- Section 2 describes the process and proposed equipment;
- Section 3 quantifies the potential air emissions;
- Section 4 details the regulatory applicability analysis for the proposed operations;
- Appendix A contains an area map, process flow diagram, and site layout;
- Appendix B provides detailed emission calculations for the site; and
- Appendix C contains Tennessee Air Pollution Control Board, Department of Environment and Conservation (TDEC)'s State Implementation Plan (SIP) air permit application forms.

1.1. PERMITTING AND REGULATORY REQUIREMENTS

As stated above, Linde and Wacker operate on contiguous property owned by Wacker. Both facilities are considered one site for Title V applicability and for New Source Review (NSR) purposes. Therefore, within this application combined emissions are used to compare to the applicable Title V and NSR major source thresholds for the combined site.

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[1] A NOx emissions change is requested based on a revised emission estimate for NOx emissions from the reformer of 0.06 lb/MMBtu.

[2] Note that while the process description and forms included with this application are for Linde's process equipment only, the site-wide potential emissions include Wacker and Linde's emissions summed together to compare against major source thresholds.

2. PROCESS DESCRIPTION

This section describes the proposed process for the Linde Facility.[3] A process flow diagram is provided in Appendix A, and the equipment number indicated below can be correlated with equipment on the process flow diagram.

2.1. FEED TREATMENT

Natural gas is supplied to Linde at approximately 240 psig and is split into two streams: one flowing to the reformer burner manifold, and the other stream as feed gas to the process. The feed gas is mixed with recycle hydrogen and compressed to 390 psig in the Feed Compressors. The feed gas is heated to 700°F in the Feed Preheater (111003E01), using process heat downstream of the Shift Converter (111203R01).

2.2. HYDRO-DESULFURIZATION

The natural gas feedstock contains sulfur compounds that can poison the reformer catalyst. Prior to reforming, these sulfur compounds are removed in the Hydrodesulfurizer (111003R04).

The first bed of the Hydrodesulfurizer contains a Cobalt-Molybdenum (Co-Mo) hydrotreating catalyst. This catalyst converts organic sulfur compounds to hydrogen sulfide (H_2S). The second bed contains zinc oxide catalyst which adsorbs hydrogen sulfide. The desulfurizer system is designed for a minimum catalyst life of one year (based on 5 ppmv sulfur in the natural gas feed).

2.3. REFORMING

The desulfurized feed is mixed with process steam and heated in the Feed Superheater (111101E03) to 700°F. The heated hydrocarbon-steam mixture is fed to the catalyst tubes in an upfired, upflow, cylindrical Reformer (111101F01).

The reformer contains a circular arrangement of tubes each packed with nickel catalyst. The following reactions occur:

$$C_nH_m + n\,H_2O = n\,CO + (m/2+n)\,H_2 \quad (1)$$

$$CO + H_2O = CO_2 + H_2 \quad (2)$$

Reaction (1) is reforming; reaction (2) is shift conversion. Both reactions are equilibrium limited based on the outlet temperature and pressure. The reformer exit conditions are 1,550°F and 350 psig.

The overall reaction is endothermic, requiring heat supplied by the burner. A mixture of vent gas from the PSA system and Hydrogen boil-off meets most of the fuel requirement for the burners. The rest is supplied by natural gas.

The flue gas leaving the furnace is used to superheat the reformer feed, to generate steam in the Flue Gas Steam Generator (111101E05), and to preheat boiler feed water, before being sent to the atmosphere.

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[3] Detailed process description provided by Linde to Trinity on November 11, 2014.

Deaerator Exchangers. The Steam Drum supplies water to the Fluegas Steam Generator (111101E05), the Reformer Effluent Steam Generator, and the Shift Effluent Steam Generator.

3. EMISSION QUANTIFICATION

The Linde Facility will generate emissions of regulated air pollutants in the course of its manufacturing operations. For example, the combustion of natural gas in the reformer will generate normal combustion by-product pollutants such as oxides of nitrogen (NO_X), carbon monoxide (CO), particulate matter (PM), particulate matter less than 10 microns in diameter (PM_{10}), particulate matter less than 2.5 microns in diameter ($PM_{2.5}$), sulfur dioxide (SO_2), volatile organic compounds (VOC), greenhouse gases (GHG), and hazardous air pollutants (HAP). Also, the shift conversion reaction will produce some carbon dioxide (CO_2) which is released to the stack. These emissions are provided in Table 1-1.

The specific GHG pollutants include CO_2 and methane (CH_4). Total GHG emissions are represented as carbon dioxide equivalents (CO_2e). CO_2 and CH_4 emissions are converted to CO_2e emissions based on each pollutant's global warming potential (GWP), from 40 CFR 98, Subpart A Table A-1, and the following equation:[4]

$$CO_2e = \sum_{i=1}^{n} GHG_i \; x \; GWP_i$$

3.1. EMISSIONS FROM THE LINDE FACILITY

Potential emissions of criteria pollutants from natural gas combustion in the Linde reformer are estimated based on a maximum total firing rate of 25.09 MMBtu/hr (LHV)[5] for all fuel burning equipment, maximum annual hours of operation (8,760 hrs/yr), and the manufacturer's guaranteed emission limits (lb/MMBtu).[6]

GHG emissions are based on 40 CFR 98 Subpart P for hydrogen production. Per 40 CFR § 98.162, the emissions quantified under this subpart include CO_2 from a hydrogen production process unit, which includes natural gas used as both fuel and feedstock in the reformer. This therefore includes CO_2 generated from combustion of fuel as well as process generated CO_2. Subpart P emissions were quantified according to the following equation:

$$CO_2e = \left(\sum_{n=1}^{k} \frac{44}{12} x \; Fdstk_n \; x \; CC_n \; x \; \frac{MW}{MVC} \right) x \; 0.001$$

In addition to greenhouse gases from combustion and reaction, a small amount of unburned methane exits the process through the stacks. Methane emissions were calculated using the maximum total firing rate (25.09 MMBtu/hr LHV), maximum annual hours of operation (8,760 hrs/yr), and the manufacturer's guaranteed emission limit for unburned hydrocarbons. It is conservatively assumed that all unburned hydrocarbons are emitted as methane. The methane emissions were converted to CO_2e using global warming potentials from 40 CFR 98 and added to the greenhouse gas emissions from combustion to give total CO_2e from the facility.

[4] 40 CFR 98.2(b)(4), effective January 1, 2014.

[5] Please note that the firing rate of 25.09 MMBtu/hr is a LHV value, and represents the capacity for the burner for the single hydrogen reformer system. Manufacturer's guaranteed emission limits were based on a LHV value.

[6] Manufacturer's guaranteed emissions (lb/MMBtu) provided by Linde to Trinity on October 11, 2011 and October 29, 2014. The only manufacturer's emission guarantee that has changed between the 2012 permit application for the two hydrogen reformer systems and this permit application is an increased NO_X emission factor.

4. REGULATORY APPLICABILITY REVIEW

The Linde Facility is potentially subject to both federal and state air regulations. This section of the application summarizes the air permitting requirements and the key air quality regulations that apply to the facility. Specifically, applicability of Title V of the 1990 Clean Air Act Amendments, New Source Performance Standards (NSPS), National Emission Standards for Hazardous Air Pollutants (NESHAP), and Tennessee Air Pollution Control Regulations are addressed.

4.1. NEW SOURCE REVIEW APPLICABILITY

The NSR permitting program generally requires that a stationary source obtain a permit and undertake other obligations prior to construction of any facility if the proposed project results in the potential to emit air pollution in excess of certain threshold levels. Two distinct NSR permitting programs apply depending on whether the facility is located in an attainment or nonattainment area for a particular pollutant, known as Prevention of Significant Deterioration (PSD) and Nonattainment New Source Review (NNSR), respectively. NNSR permitting applies to new construction or modifications that result in emission increases of a particular pollutant for which the area in which the facility is located is classified as "nonattainment". The PSD permitting program applies to projects with emissions increases of pollutants for which the area is classified as "attainment" or "unclassifiable".

TDEC administers its major NSR permitting program through Chapter 1200-03-09 *Construction and Operating Permits*, which establishes preconstruction, construction and operation requirements for new and modified sources.

The Linde Facility is co-located with Wacker. The facility location is in Bradley County, which is currently designated as "attainment" or "unclassifiable" for all criteria pollutants with respect to the National Ambient Air Quality Standards (NAAQS).[10] The governing New Source Review (NSR) regulation is, therefore, the PSD permitting program. Applicability of the PSD program is assessed against the potential emissions from both facilities, because raw material for the process at Wacker is obtained directly from Linde and the processes are hence co-dependent. Linde's operations are on the list of 28 named source categories; as such, the PSD major source thresholds are 100 tpy for all criteria pollutants. Therefore, within this application combined emissions are used to compare to the applicable Title V and NSR major source thresholds for the combined site. The facilities including the proposed project have a combined potential-to-emit (PTE) for all pollutants that are below the major source thresholds, as demonstrated in Table 1-1.

4.1.1. GHG Tailoring Rule Applicability

On June 3, 2010, EPA issued a final rule that "tailors" the applicability provisions of the PSD program to allow EPA and states to phase in permitting requirements for GHG emissions. This final rule is more commonly known as the "Tailoring Rule." The Tailoring Rule established PSD applicability for GHG emissions for a new stationary source to be 100,000 tpy, measured as CO_2e.

On June 23, 2014, the Supreme Court of the United States issued a decision with respect to GHG applicability to the PSD program as well as the Title V operating permit program. The decision stated that, "EPA exceeded its statutory authority when it interpreted the Clean Air Act to require PSD and Title V permitting for stationary sources based on their greenhouse gas emissions. Specifically, the Agency may not treat greenhouse gases as a pollutant for purposes of defining a 'major emitting facility' (or a 'modification' thereof) in the PSD context or a

[10] 40 CFR § 81.343

"Steam generating unit means a device that combusts any fuel and produces steam or heats water or any other heat transfer medium. This term includes any duct burner that combusts fuel and is part of a combined cycle system. This term does not include process heaters as defined in this subpart."[12]

The Linde Facility operates natural gas burners associated with the hydrogen reformer. These burners meet the definition of process heaters in NSPS Subpart Dc, as "*a device that is primarily used to heat a material to initiate or promote a chemical reaction in which the material participates as a reactant or catalyst.*" The burners used in Linde's process have the primary purpose of driving the reformer reaction, and thus qualify as a process heater, not a steam generating unit under the rule. Steam generated from latent heat in the waste gas from the reformer is secondary to the operation of the reformer. Therefore, the burners are not subject to Subpart Dc. This determination for Subpart Dc applicability is consistent with a similar EPA determination in the Applicability Determination Index (ADI) database, Control Number: 9900003.[13]

4.3.3. Non-Applicability of All Other NSPS

NSPS standards are developed for particular industrial source categories and the applicability of a particular NSPS to a facility can be readily ascertained based on the industrial source category covered. All other NSPS are categorically not applicable to the Linde portion of the overall facility operations.

4.4. NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS

The Clean Air Act Amendments of 1990 require that U.S. EPA list and promulgate National Emission Standards for Hazardous Air Pollutants (NESHAP)[14] in order to control, reduce, or otherwise limit the emissions of HAP from categories of major and area sources. NESHAP apply to sources in specifically regulated industrial source classifications (Clean Air Act Section 112(d)) or on a case-by-case basis (Clean Air Act Section 112(g)) for facilities not regulated as a specific industrial source type. The Linde/Wacker combined site will have total HAP emissions of less than 25 tpy, and the largest individual HAP emissions will be 9.9 tpy; therefore, it will be an *area* source for HAPs.

4.4.1. NESHAP Subpart JJJJJJ - Industrial, Commercial, and Institutional Boilers Area Sources

NESHAP Subpart JJJJJJ regulates HAP emissions from new, reconstructed and existing industrial, commercial, and institutional boilers and process heaters at area sources of HAP. This subpart also establishes requirements to demonstrate initial and continuous compliance with the emission limits and work practice standards and is intended to cover all subject emission units not elsewhere covered by the NESHAPs. However, 40 CFR § 63.11195 specifically exempts gas-fired boilers from being subject to this Subpart. Gas-fired boiler is defined as:

"includes any boiler that burns gaseous fuels not combined with any solid fuels, burns liquid fuel only during periods of gas curtailment, gas supply emergencies, or periodic testing on liquid fuel. Periodic testing of liquid fuel shall not exceed a combined total of 48 hours during any calendar year."

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[12] 40 CFR 60.41(c)

[13] Applicability Determination Index database, http://cfpub.epa.gov/adi/ (accessed November 24, 2014)

[14] 40 CFR Part 63.

will take reasonable precautions during construction and operations to limit fugitive dust emissions from the facility.

4.5.4. APCR 1200-03-14-.02(2)(a) - Control of Sulfur Dioxide Emissions

This regulation limits emissions of sulfur dioxide from fuel burning units based on county and heat input rating. The Linde Facility will be located in Charleston, TN, which is a part of Bradley County. Bradley County is defined in the rule as a Class VI county. The maximum heat input rating for fuel burning equipment will be 25.09 MMBtu/hr (LHV basis). Since the facility will be constructed after April 3, 1972, the sulfur dioxide emissions from the Linde Facility will be limited to 5.0 lb/MMBtu. The SO_2 emissions for the Linde Facility are estimated to be 0.01 lb/hr, or 0.0004 lb/MMBtu. Thus, the fuel-burning equipment at the Linde Facility will be in compliance with this rule.

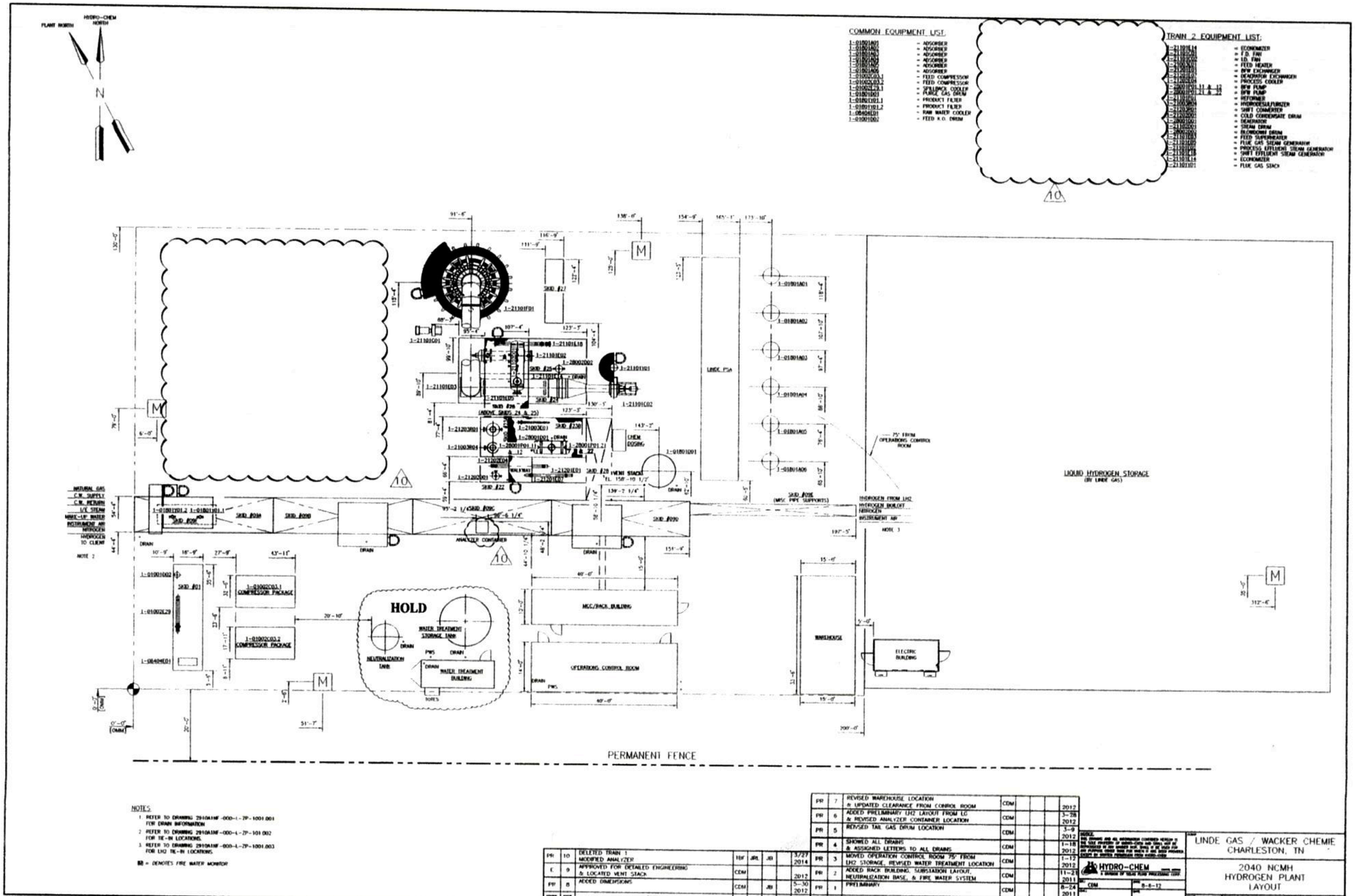
4.5.5. APCR 1200-03-27 - Nitrous Oxides

This regulation limits emissions of nitrous oxides from stationary sources in certain Tennessee counties. Bradley County is not on the list of counties subject to this regulation; therefore, this rule does not apply to the Linde Facility.

4.5.6. Non-Applicability of Other TDEC APCR

A thorough examination of the Tennessee APCR applicability to the Linde Facility reveals many APCR regulations that do not apply and do not impose additional requirements on operations. Such APCR rules include those specific to a particular type of industrial operation, which will not be performed at the Linde Facility.

APPENDIX A: FIGURES


PLANT NORTH
HYDRO-CHEM NORTH
N
COMMON EQUIPMENT LIST:
TRAIN 2 EQUIPMENT LIST:
HOLD
WATER TREATMENT STORAGE TANK
NEUTRALIZATION TANK
WATER TREATMENT BUILDING
MCC/RACK BUILDING
OPERATIONS CONTROL ROOM
WAREHOUSE
ELECTRIC BUILDING
LIQUID HYDROGEN STORAGE
(BY LINDE GAS)
LINDE PSA
ANALYZER CONTAINER
CHEM DOSING
COMPRESSOR PACKAGE
NATURAL GAS
C.W. SUPPLY
C.W. RETURN
L/E STEAM
MAKE-UP WATER
INSTRUMENT AIR
NITROGEN
HYDROGEN TO CLIENT
NOTE 2
HYDROGEN FROM LH2
HYDROGEN BOILOFF
NITROGEN
INSTRUMENT AIR
NOTE 3
PERMANENT FENCE
NOTES
LINDE GAS / WACKER CHEMIE
CHARLESTON, TN
2040 NCMH
HYDROGEN PLANT
LAYOUT
HYDRO-CHEM
2910A1NF-000-L-ZP-1000
10

APPENDIX B: EMISSION CALCULATIONS

Table B-2. Total Firing Rate for the Reformer

Maximum Firing Rate (LHV)[1] (MMBtu/hr)	Maximum Firing Rate (HHV)[1] (MMBtu/hr)
25.09	27.60

1. Firing rate, provided by Linde, is in LHV. The firing rate is converted to HHV as LHV * 1.1, resulting in 27.6 MMBtu/hr.

Table B-3. Potential Emissions - Reformer Stack Flue Gas

Pollutant	Emission Factor[1] (lb/MMBtu)	Hourly Emissions[2] (lb/hr)	Annual Emissions[3] (tpy)
NO_X	0.060	1.51	6.59
CO	0.039	0.98	4.29
VOC	0.018	0.45	1.98
$PM/PM_{10}/PM_{2.5}$	0.012	0.30	1.32

1. Guaranteed emission factors provided by manufacturer are based on LHV.
2. Calculated using a maximum firing rate of 25.09 MMBtu/hr for the reformer.
3. Annual emissions were calculated with the assumption that the reformer will operate continuously at 8,760 hours/year.

Table B-4. Potential SO_2 Emissions - Reformer Stack Flue Gas

Pollutant	Emission Factor[1] (ppmv)	Exhaust Flow Rate[2] (scfh)	Hourly Emissions[3] (lb/hr)	Annual Emissions[4] (tpy)
SO_2	0.13	276,820	0.01	0.03

1. Emission factor provided by Linde for SO_X and is conservatively assumed to be equal to SO_2.
2. Exhaust flow rate provided by Linde, as part of e-mail documentation on December 17, 2014.
3. Hourly emissions were calculated using the following formula:
   SO_2 emissions [lb/hr] = SO_2 emission factor [ppmv] * Exhaust Flow Rate [scfh] * MW [lb/lb-mol] / D [scf/lb-mol] / 10^6
   where

   D is the volume of gas (scf) per lb-mole at standard conditions: 385.4
   MW is the molecular weight of SO_2: 64.0638
   The value for D was found at: http://www.epa.gov/apti/bces/reference/reference.htm.
4. Annual emissions were calculated with the assumption that the reformer will operate continuously at 8,760 hours/year.

Table B-6. Greenhouse Gas Global Warming Potentials[1]

Pollutant	Global Warming Potential
CO_2	1
CH_4	25

1. Global warming potential (GWP) for each pollutant are from 40 CFR 98, Subpart A, Table A-1, effective January 1, 2014.

Table B-7. Unburned Methane Emissions

Maximum Heat Input for the Reformer (LHV)		25.09	MMBtu/hr
Maximum Heat Input for the Reformer (HHV)		27.60	MMBtu/hr
Unburned Hydrocarbon Emission Factor (UBHC)[1]		0.007	lb/MMBtu
Hydrogen Reformer Unburned CH_4 Emissions	Maximum Hourly	0.18	lb/hr
	Maximum Annual	0.77	tpy
CO_2e Emissions		19.23	tpy

1. Guaranteed emission factor provided by the manufacturer. It is assumed that all UBHC is methane.
2. Maximum hourly CH_4 emissions (lb/hr) = UBHC Emission Factor [lb/MMBtu] x Maximum Heat Input [MMBtu/hr].

3. Maximum annual CH_4 emissions (tpy) = Hourly CH_4 Emissions [lb/hr] x [8,760 hr/yr] / [2,000 lb/ton].
4. Carbon dioxide equivalent emissions (tpy) = Annual CH_4 Emissions [tpy] x CH_4 GWP [25].

APPENDIX C: CONSTRUCTION APPLICATION FORMS

TYPE OF PERMIT REQUESTED

13. Operating permit ( )	Date construction started	Date completed	Last permit no.	Emission source reference number
Construction permit (X)	Last permit no.		Emission source reference number 111101	
If you choose Construction permit, then choose either New Construction, Modification, or Location transfer				
	New Construction (X)	Starting date April 2015	Completion date September 2015	
	Modification ( )	Date modification started or will start	Date completed or will complete	
	Location transfer ( )	Transfer date	Address of last location	

14. Describe changes that have been made to this equipment or operation since the last construction or operating permit application:

See permit application narrative

SIGNATURE

Based upon information and belief formed after a reasonable inquiry, I, as the responsible person of the above mentioned facility, certify that the information contained in this application and any attached application(s) is accurate and true to the best of my knowledge. As specified in TCA Section 39-16-702(a)(4), this declaration is made under penalty of perjury.

15. **Signature** (application must be signed before it will be processed) T Phipps		**Date** 01/05/15
Signer's name (type or print) Terry Phipps	**Title** HYCO NA SMR Operations ROC Head	**Phone number with area code** 713 767 4149

Table of Pollution Reduction Device or Method Codes

Note: For cyclones, settling chambers, wet scrubbers, and electrostatic precipitators; the efficiency ranges correspond to the following percentages:
High: 95-99+%. Medium: 80-95% And Low: Less than 80%.
If the system has several pieces of connected control equipment, indicate the sequence. For example: 008'010.97%
If none of the below codes fit, use 999 as a code for other and specify in the comments.

No Equipment	000
Activated Carbon Adsorption	048
Afterburner – Direct Flame	021
Afterburner – Direct Flame with Heat Exchanger	022
Afterburner – Catalytic	019
Afterburner – Catalytic with Heat Exchanger	020
Alkalized Alumina	040
Catalytic Oxidation – Flue Gas Desulfurization	039
Cyclone – High Efficiency	007
Cyclone – Medium Efficiency	008
Cyclone – Low Efficiency	009
Dust Suppression by Chemical Stabilizers or Wetting Agents	062
Electrostatic Precipitator – High Efficiency	010
Electrostatic Precipitator – Medium Efficiency	011
Electrostatic Precipitator – Low Efficiency	012
Fabric Filter – High Temperature	016
Fabric Filter – Medium Temperature	017
Fabric Filter – Low Temperature	018
Fabric Filter – Metal Screens (Cotton Gins)	059
Flaring	023
Gas Adsorption Column -- Packed	050
Gas Adsorption Column – Tray Type	051
Gas Scrubber (General: Not Classified)	013
Limestone Injection – Dry	041
Limestone Injection – Wet	042
Liquid Filtration System	049
Mist Eliminator – High Velocity	014
Mist Eliminator – Low Velocity	015
Process Change	046
Process Enclosed	054
Process Gas Recovery	060
Settling Chamber – High Efficiency	004
Settling Chamber – Medium Efficiency	005
Settling Chamber – Low Efficiency	006
Spray Tower (Gaseous Control Only)	052
Sulfuric Acid Plant – Contact Process	043
Sulfuric Acid Plant – Double Contact Process	044
Sulfur Plant	045
Vapor Recovery System (Including Condensers, Hooding and Other Enclosures)	047
Venturi Scrubber (Gaseous Control Only)	053
Wet Scrubber – High Efficiency	001
Wet Scrubber – Medium Efficiency	002
Wet Scrubber – Low Efficiency	003
Wet Suppression by Water Sprays	061

Table of Emission Estimation Method Codes

Not application / Emissions are known to be zero	0
Emissions based on source testing	1
Emissions based on material balance using engineering expertise and knowledge of process	2
Emissions calculated using emission factors from EPA publications No. AP-42 Compilation of Air Pollution Emissions Factors	3
Judgment	4
Emissions calculated using a special emission factor different from that in AP-42	5
Other (Specify in comments)	6

6. Check types of monitoring and recording instruments that are attached: Opacity monitor ( ), SO_2 monitor (X), NO_X monitor ( ), Other (specify in comments) (X)	
7. Comments N/A	
8. Control device or Method code description:	Description of operating parameters of device (flow rate, temperature, pressure drop, etc.): N/A

* Refer to the tables below for estimation method and control device codes.

** Exit gas particulate matter concentration units: Process – Grains/Dry Standard Ft^3 (70^0F), Wood fired boilers - Grains/Dry Standard Ft^3 (70^0F), all other boilers – Lbs. /Million BTU heat input.

*** Exit gas sulfur dioxide concentrations units: Process – PPM by volume, dry bases, and boilers – Lbs. /Million BTU heat input

Table of Pollution Reduction Device or Method Codes
(Alphabetical listing)

Note: For cyclones, settling chambers, wet scrubbers, and electrostatic precipitators; the efficiency ranges correspond to the following percentages:
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Electrostatic Precipitator – Low Efficiency	012
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Flaring	023
Gas Adsorption Column -- Packed	050
Gas Adsorption Column – Tray Type	051
Gas Scrubber (General: Not Classified)	013
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Limestone Injection – Wet	042
Liquid Filtration System	049
Mist Eliminator – High Velocity	014
Mist Eliminator – Low Velocity	015
Process Change	046
Process Enclosed	054
Process Gas Recovery	060
Settling Chamber – High Efficiency	004
Settling Chamber – Medium Efficiency	005
Settling Chamber – Low Efficiency	006
Spray Tower (Gaseous Control Only)	052
Sulfuric Acid Plant – Contact Process	043
Sulfuric Acid Plant – Double Contact Process	044
Sulfur Plant	045
Vapor Recovery System (Including Condensers, Hooding and Other Enclosures)	047
Venturi Scrubber (Gaseous Control Only)	053
Wet Scrubber – High Efficiency	001
Wet Scrubber – Medium Efficiency	002
Wet Scrubber – Low Efficiency	003
Wet Suppression by Water Sprays	061

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Emissions based on source testing	1
Emissions based on material balance using engineering expertise and knowledge of process	2
Emissions calculated using emission factors from EPA publications No. AP-42 Compilation of Air Pollution Emissions Factors	3
Judgment	4
Emissions calculated using a special emission factor different from that in AP-42	5
Other (Specify in comments)	6

BOILER, BURNER, GENERATOR, OR SIMILAR FUEL BURNING PROCESS DESCRIPTION

7. Boiler or burner data: (Complete lines 7 to 11 using a separate form for each boiler, burner, etc.)

Number	Stack number**	Type of firing***	Rated horsepower	Rated input capacity (10^6 BTU/Hr.)	Other rating (specify capacity and units)

Serial no.	Date constructed	Date manufactured	Date of last modification (explain in comments below)

** Source with a common stack will have the same stack number.
*** Cyclone, spreader (with or without reinjection), pulverized (wet or dry bottom, with or without reinjection), other stoker (specify type, hand fired, automatic, or other type (describe below in comments).

FUEL USED IN BOILER, BURNER, GENERATOR, OR SIMILAR FUEL BURNING SOURCE

8. Fuel data: (Complete for a process source with in process fuel or a non-process fuel burning source)

Primary fuel type (specify) Natural gas

Standby fuel type(s) (specify) N/A

Fuels used	Annual usage	Hourly usage		%	%	BTU value		(For APC use only)
		Design	Average	Sulfur	Ash	of fuel		SCC code
Natural gas:	10^6 Cu. Ft. 64.89	Cu. Ft. 7,407	Cu. Ft. 7,407	/ / / / / / / /	/ / / / /	1,000		
#2 Fuel oil:	10^3 Gal.	Gal.	Gal.		/ / / / /			
#5 Fuel oil:	10^3 Gal.	Gal.	Gal.		/ / / / /			
#6 Fuel oil:	10^3 Gal.	Gal.	Gal.		/ / / / /			
Coal:	Tons	Lbs.	Lbs.					
Wood:	Tons	Lbs.	Lbs.	/ / / / / / / /	/ / / / /			
Liquid propane:	10^3 Gal.	Gal.	Gal.	/ / / / / / / /	/ / / / /	85,000		
Other (specify type & units): PSA Purge Gas	10^6 Cu. Ft.	Cu. Ft. 51,710	Cu. Ft. 51,710			273		

9. If Wood is used as a fuel, specify types and estimate percent by weight of bark

N/A

10. If Wood is used with other fuels, specify percent by weight of wood charged to the burner.

N/A

11. Comments

Btu of natural gas estimated at 904 Btu/scf