REGULATION 13 PERMIT APPLICATION FOR THE CONSTRUCTION OF A METHANOL PLANT IN KANAWHA COUNTY, WEST VIRGINIA

Prepared for:

US Methanol LLC
400 Capitol Street, Suite 200
Charleston, West Virginia 25301

Prepared by:

Potesta & Associates, Inc.
7012 MacCorkle Avenue, S.E.
Charleston, West Virginia 25304
Phone: (304) 342-1400 Fax: (304) 343-9031
Email: potesta@potesta.com

Project No. 0101-16-0166

November 2016

POTESTA

TABLE OF CONTENTS

Attachments not applicable to, and not included in, this application: Q, R and S

SECTION I - III

GENERAL APPLICANT INFORMATION

WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION

DIVISION OF AIR QUALITY

601 57th Street, SE
Charleston, WV 25304
(304) 926-0475
www.dep.wv.gov/daq

APPLICATION FOR NSR PERMIT AND TITLE V PERMIT REVISION (OPTIONAL)

PLEASE CHECK ALL THAT APPLY TO **NSR (45CSR13)** (IF KNOWN):

☒ **CONSTRUCTION** ☐ **MODIFICATION** ☐ **RELOCATION**
☐ **CLASS I ADMINISTRATIVE UPDATE** ☐ **TEMPORARY**
☐ **CLASS II ADMINISTRATIVE UPDATE** ☐ **AFTER-THE-FACT**

PLEASE CHECK TYPE OF **45CSR30 (TITLE V)** REVISION (IF ANY):

☐ **ADMINISTRATIVE AMENDMENT** ☐ **MINOR MODIFICATION**
☐ **SIGNIFICANT MODIFICATION**

IF ANY BOX ABOVE IS CHECKED, INCLUDE TITLE V REVISION INFORMATION AS **ATTACHMENT S** TO THIS APPLICATION

FOR TITLE V FACILITIES ONLY: Please refer to "Title V Revision Guidance" in order to determine your Title V Revision options (Appendix A, "Title V Permit Revision Flowchart") and ability to operate with the changes requested in this Permit Application.

Section I. General

1. Name of applicant *(as registered with the WV Secretary of State's Office):*
US Methanol LLC

2. Federal Employer ID No. ***(FEIN):***
811952040

3. Name of facility *(if different from above):*
Liberty ONE Methanol Plant

4. The applicant is the:
☐ **OWNER** ☐ **OPERATOR** ☒ **BOTH**

5A. Applicant's mailing address:
400 Capitol Street, Suite 200
Charleston, WV 25301

5B. Facility's present physical address: Proposed Location
Institute Chemical Plant
Institute, WV 25112

6. **West Virginia Business Registration.** Is the applicant a resident of the State of West Virginia? ☒ **YES** ☐ **NO**
- ➪ If **YES,** provide a copy of the **Certificate of Incorporation/Organization/Limited Partnership** (one page) including any name change amendments or other Business Registration Certificate as **Attachment A.**
- ➪ If **NO,** provide a copy of the **Certificate of Authority/Authority of L.L.C./Registration** (one page) including any name change amendments or other Business Certificate as **Attachment A.**

7. If applicant is a subsidiary corporation, please provide the name of parent corporation: Not Applicable

8. Does the applicant own, lease, have an option to buy or otherwise have control of the *proposed site?* ☒ **YES** ☐ **NO**
- ➪ If **YES,** please explain: Applicant leases the site.
- ➪ If **NO,** you are not eligible for a permit for this source.

9. Type of plant or facility (stationary source) to be **constructed, modified, relocated, administratively updated** or **temporarily permitted** (e.g., coal preparation plant, primary crusher, etc.): Methanol Production Plant

10. North American Industry Classification System **(NAICS)** code for the facility:
325199

11A. DAQ Plant ID No. (for existing facilities only):
NA

11B. List all current 45CSR13 and 45CSR30 (Title V) permit numbers associated with this process (for existing facilities only):
NA

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

12A.

- ➪ For **Modifications, Administrative Updates** or **Temporary permits** at an existing facility, please provide directions to the *present location* of the facility from the nearest state road;
- ➪ For **Construction** or **Relocation permits,** please provide directions to the *proposed new site location* from the nearest state road. Include a **MAP** as **Attachment B**.

The facility will be located adjacent to WV-25 in Institute in Kanawha County where WV Route 622 (Goff Mountain Road) intersects WV-25. The site is on the south side of WV-25.

12.B. New site address (if applicable):	12C. Nearest city or town:	12D. County:
Not Applicable	Institute	Kanawha
12.E. UTM Northing (KM): 4,249.108	12F. UTM Easting (KM): 431.696	12G. UTM Zone: 17

13. Briefly describe the proposed change(s) at the facility:
This application is for construction of a new facility.

14A. Provide the date of anticipated installation or change: 02/01/2017 ➪ If this is an **After-The-Fact** permit application, provide the date upon which the proposed change did happen: / /	14B. Date of anticipated Start-Up if a permit is granted: 07/01/2017

14C. Provide a **Schedule** of the planned **Installation** of/**Change** to and **Start-Up** of each of the units proposed in this permit application as **Attachment C** (if more than one unit is involved).

15. Provide maximum projected **Operating Schedule** of activity/activities outlined in this application:
Hours Per Day 24 Days Per Week 7 Weeks Per Year 52

16. Is demolition or physical renovation at an existing facility involved? ☐ **YES** ☒ **NO**

17. **Risk Management Plans.** If this facility is subject to 112(r) of the 1990 CAAA, or will become subject due to proposed changes (for applicability help see www.epa.gov/ceppo), submit your **Risk Management Plan (RMP)** to U. S. EPA Region III.

18. **Regulatory Discussion.** List all Federal and State air pollution control regulations that you believe are applicable to the proposed process *(if known)*. A list of possible applicable requirements is also included in Attachment S of this application (Title V Permit Revision Information). Discuss applicability and proposed demonstration(s) of compliance *(if known)*. Provide this information as **Attachment D.**

Section II. Additional attachments and supporting documents.

19. Include a check payable to WVDEP – Division of Air Quality with the appropriate **application fee** (per 45CSR22 and 45CSR13).

20. Include a **Table of Contents** as the first page of your application package.

21. Provide a **Plot Plan,** e.g. scaled map(s) and/or sketch(es) showing the location of the property on which the stationary source(s) is or is to be located as **Attachment E** (Refer to ***Plot Plan Guidance***) .
➪ Indicate the location of the nearest occupied structure (e.g. church, school, business, residence).

22. Provide a **Detailed Process Flow Diagram(s)** showing each proposed or modified emissions unit, emission point and control device as **Attachment F.**

23. Provide a **Process Description** as **Attachment G.**
➪ Also describe and quantify to the extent possible all changes made to the facility since the last permit review (if applicable).

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

24. Provide **Material Safety Data Sheets (MSDS)** for all materials processed, used or produced as **Attachment H.**

➪ For chemical processes, provide a MSDS for each compound emitted to the air.

25. Fill out the **Emission Units Table** and provide it as **Attachment I.**

26. Fill out the **Emission Points Data Summary Sheet (Table 1 and Table 2)** and provide it as **Attachment J.**

27. Fill out the **Fugitive Emissions Data Summary Sheet** and provide it as **Attachment K.**

28. Check all applicable **Emissions Unit Data Sheets** listed below:

☒ Bulk Liquid Transfer Operations	☐ Haul Road Emissions	☐ Quarry
☐ Chemical Processes	☐ Hot Mix Asphalt Plant	☐ Solid Materials Sizing, Handling and Storage Facilities
☐ Concrete Batch Plant	☐ Incinerator	
☐ Grey Iron and Steel Foundry	☐ Indirect Heat Exchanger	☒ Storage Tanks

☒ General Emission Unit, specify (See Section L)

Fill out and provide the **Emissions Unit Data Sheet(s)** as **Attachment L.**

29. Check all applicable **Air Pollution Control Device Sheets** listed below:

☐ Absorption Systems	☐ Baghouse	☒ Flare
☐ Adsorption Systems	☐ Condenser	☐ Mechanical Collector
☐ Afterburner	☐ Electrostatic Precipitator	☒ Wet Collecting System

☐ Other Collectors, specify

Fill out and provide the **Air Pollution Control Device Sheet(s)** as **Attachment M.**

30. Provide all **Supporting Emissions Calculations** as **Attachment N,** or attach the calculations directly to the forms listed in Items 28 through 31.

31. **Monitoring, Recordkeeping, Reporting and Testing Plans.** Attach proposed monitoring, recordkeeping, reporting and testing plans in order to demonstrate compliance with the proposed emissions limits and operating parameters in this permit application. Provide this information as **Attachment O.**

➢ Please be aware that all permits must be practically enforceable whether or not the applicant chooses to propose such measures. Additionally, the DAQ may not be able to accept all measures proposed by the applicant. If none of these plans are proposed by the applicant, DAQ will develop such plans and include them in the permit.

32. **Public Notice.** At the time that the application is submitted, place a **Class I Legal Advertisement** in a newspaper of general circulation in the area where the source is or will be located (See 45CSR§13-8.3 through 45CSR§13-8.5 and ***Example Legal Advertisement*** for details). Please submit the **Affidavit of Publication** as **Attachment P** immediately upon receipt.

33. **Business Confidentiality Claims.** Does this application include confidential information (per 45CSR31)?

☐ **YES** ☒ **NO**

➢ If **YES,** identify each segment of information on each page that is submitted as confidential and provide justification for each segment claimed confidential, including the criteria under 45CSR§31-4.1, and in accordance with the DAQ's ***"Precautionary Notice – Claims of Confidentiality"*** guidance found in the ***General Instructions*** as **Attachment Q.**

Section III. Certification of Information

34. **Authority/Delegation of Authority.** Only required when someone other than the responsible official signs the application. Check applicable **Authority Form** below:

☐ Authority of Corporation or Other Business Entity	☐ Authority of Partnership
☐ Authority of Governmental Agency	☐ Authority of Limited Partnership

Submit completed and signed **Authority Form** as **Attachment R.**

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

35A. **Certification of Information.** To certify this permit application, a Responsible Official (per 45CSR§13-2.22 and 45CSR§30-2.28) or Authorized Representative shall check the appropriate box and sign below.

Certification of Truth, Accuracy, and Completeness

I, the undersigned ☒ **Responsible Official** / ☐ **Authorized Representative,** hereby certify that all information contained in this application and any supporting documents appended hereto, is true, accurate, and complete based on information and belief after reasonable inquiry I further agree to assume responsibility for the construction, modification and/or relocation and operation of the stationary source described herein in accordance with this application and any amendments thereto, as well as the Department of Environmental Protection, Division of Air Quality permit issued in accordance with this application, along with all applicable rules and regulations of the West Virginia Division of Air Quality and W.Va. Code § 22-5-1 et seq. (State Air Pollution Control Act). If the business or agency changes its Responsible Official or Authorized Representative, the Director of the Division of Air Quality will be notified in writing within 30 days of the official change.

Compliance Certification

Except for requirements identified in the Title V Application for which compliance is not achieved, I, the undersigned hereby certify that, based on information and belief formed after reasonable inquiry, all air contaminant sources identified in this application are in compliance with all applicable requirements.

SIGNATURE _____ DATE: 11-23-16

(Please use blue ink) *(Please use blue ink)*

35B. Printed name of signee: Richard Wolfli		35C. Title: COO
35D. E-mail: richard.wolfli@usmeoh.com	36E. Phone: (681) 205-8511	36F. FAX: Use Email
36A. Printed name of contact person (if different from above):		36B. Title:
36C. E-mail:	36D. Phone:	36E. FAX:

PLEASE CHECK ALL APPLICABLE ATTACHMENTS INCLUDED WITH THIS PERMIT APPLICATION:

☒ **Attachment A: Business Certificate**
☒ **Attachment B: Map(s)**
☒ **Attachment C: Installation and Start Up Schedule**
☒ **Attachment D: Regulatory Discussion**
☒ **Attachment E: Plot Plan**
☒ **Attachment F: Detailed Process Flow Diagram(s)**
☒ **Attachment G: Process Description**
☒ **Attachment H: Material Safety Data Sheets (MSDS)**
☒ **Attachment I: Emission Units Table**
☒ **Attachment J: Emission Points Data Summary Sheet**
☒ **Attachment K: Fugitive Emissions Data Summary Sheet**
☒ **Attachment L: Emissions Unit Data Sheet(s)**
☒ **Attachment M: Air Pollution Control Device Sheet(s)**
☒ **Attachment N: Supporting Emissions Calculations**
☒ **Attachment O: Monitoring/Recordkeeping/Reporting/Testing Plans**
☒ **Attachment P: Public Notice**
☐ **Attachment Q: Business Confidential Claims**
☐ **Attachment R: Authority Forms**
☐ **Attachment S: Title V Permit Revision Information**
☒ **Application Fee**

Please mail an original and three (3) copies of the complete permit application with the signature(s) to the DAQ, Permitting Section, at the address listed on the first page of this application. Please DO NOT fax permit applications.

FOR AGENCY USE ONLY – IF THIS IS A TITLE V SOURCE:

☐ ***Forward 1 copy of the application to the Title V Permitting Group and:***
☐ ***For Title V Administrative Amendments:***
  ☐ ***NSR permit writer should notify Title V permit writer of draft permit,***
☐ ***For Title V Minor Modifications:***
  ☐ ***Title V permit writer should send appropriate notification to EPA and affected states within 5 days of receipt,***
  ☐ ***NSR permit writer should notify Title V permit writer of draft permit.***
☐ ***For Title V Significant Modifications processed in parallel with NSR Permit revision:***
  ☐ ***NSR permit writer should notify a Title V permit writer of draft permit,***
  ☐ ***Public notice should reference both 45CSR13 and Title V permits,***
  ☐ ***EPA has 45 day review period of a draft permit.***

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

ATTACHMENT A

BUSINESS CERTIFICATE

WEST VIRGINIA
STATE TAX DEPARTMENT
BUSINESS REGISTRATION CERTIFICATE

ISSUED TO:
US METHANOL LLC
DBA US METHANOL
400 CAPITOL ST 200
CHARLESTON, WV 25301-1717

BUSINESS REGISTRATION ACCOUNT NUMBER: **2330-9433**

This certificate is issued on: **04/21/2016**

This certificate is issued by
the West Virginia State Tax Commissioner
in accordance with Chapter 11, Article 12, of the West Virginia Code

The person or organization identified on this certificate is registered to conduct business in the State of West Virginia at the location above.

This certificate is not transferrable and must be displayed at the location for which issued

This certificate shall be permanent until cessation of the business for which the certificate of registration was granted or until it is suspended, revoked or cancelled by the Tax Commissioner.

Change in name or change of location shall be considered a cessation of the business and a new certificate shall be required.

TRAVELING/STREET VENDORS: Must carry a copy of this certificate in every vehicle operated by them. CONTRACTORS, DRILLING OPERATORS, TIMBER/LOGGING OPERATIONS: Must have a copy of this certificate displayed at every job site within West Virginia.

atL006 v.4
L1910265664

ATTACHMENT B

AREA MAP

POTESTA
Engineers and Environmental Consultants

DATE: July 2016

PROJECT NO. 0101-16-0166

MAPPING FOR VISUAL REPRESENTATION ONLY

SITE LOCATION MAP
US METHANOL LLC
METHANOL PLANT
INSTITUTE, KANAWHA COUNTY, WV
NOT TO SCALE

ATTACHMENT C

INSTALLATION AND STARTUP SCHEDULE

ATTACHMENT C

SCHEDULE OF INSTALLATION

US Methanol LLC anticipates construction to begin on February 1, 2017 and after approval of the permit. Start-up of process operations is anticipated to begin July 1, 2017. Allowable actions under Section 5 of Regulation 13 will be initiated on or around December 15, 2016.

ATTACHMENT D

REGULATORY DISCUSSION

ATTACHMENT D

REGULATORY DISCUSSION

This facility is being permitted under Regulation 13 as a minor source subject to Title V (Regulation 30). The facility will be constructed and operated under the Regulation 13 Permit. Facility qualifies as a minor source of emissions because criteria pollutants (nitrogen oxides, particulate matter, volatile organic compounds, sulfur dioxide, and carbon monoxide) are less than 100 tons per year and hazardous air pollutants (HAP) are less than 10 tons per year for individual HAP and less than 25 tons per year for total HAPs. Furthermore, this facility is not subject to prevention of significant deterioration (PSD) permitting under Regulation 14.

The facility proposed herein, or portions of the facility, may be subject to the following state and federal regulations:

1. State Regulations

   A. 45CSR2 – "To Prevent and Control Particulate Air Pollution from Combustion of Fuel in Indirect Heat Exchangers"

      Sets emission limits on particulate matter mass and opacity from indirect heat exchangers such as the proposed sulfur burner/boiler. Opacity is generally restricted to no more than 10% while the mass limit is set by the product of 0.09 and the unit's total design heat input (BTU/hr). Proposed indirect heat exchanger units are defined as "type b" units in accordance with 45CSR2.

   B. 45CSR2A – "Testing, Monitoring, Recordkeeping and Reporting Requirements Under 45CSR2"

      Provides guidance for complying with the requirements of 45CSR2.

   C. 45CSR4 – "To Prevent and Control the Discharge of Air Pollutants into the Open Air Which Causes or Contributes to an Objectionable Odor or Odors"

      The proposed facility will control the discharge of objectionable odors.

   D. 45CSR7 – "To Prevent and Control Particulate Matter Air Pollution from Manufacturing Processes and Associated Operations"

      Sets emission limits on particulate matter mass and opacity from manufacturing processes. Opacity is generally restricted to no more than 20% while the mass limit is a function of source type and process weight rate as established in Table 1 of the rule. Proposed manufacturing process units are defined as "type a" units in accordance with 45CSR7.

E. 45CSR7A – "Compliance Test Procedures for 45CSR7 – To Prevent and Control Particulate Matter Air Pollution from Manufacturing Process Operations"

Provides guidance for complying with the requirements of 45CSR7.

F. 45CSR10 – "To Prevent and Control Air Pollution from the Emission of Sulfur Oxides"

Sets emission limits on sulfur dioxide from fuel burning units, manufacturing processes, and combustion of process gas streams. Defined as "type b" units in the rule, proposed fuel burning units are restricted to the product of 3.1 and the total design heat input (BTU/hr) of the unit. Manufacturing process units generating sulfur dioxide emissions are restricted to an in-stack sulfur dioxide concentration of no more than 2,000 ppm.

G. 45CSR10A – "Testing, Monitoring, Recordkeeping and Reporting Requirements Under 45CSR10"

Provides guidance for complying with the requirements of 45CSR10.

H. 45CSR13 – "Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants, Notification Requirements, Temporary Permits, General Permits, and Procedures for Evaluation"

The applicant of the proposed facility is required to obtain a permit prior to the start of construction. This application is being submitted based on the requirements of 45CSR13 to obtain said permit.

I. 45CSR16 – "Standards of Performance for New Stationary Sources"

45CSR16 formally adopts NSPS of 45CFR60 which are the federal standards discussed below.

J. 45CSR20 – "Good Engineering Practice as Applies to Stack Heights"

Facility stack heights will meet the requirements 45CSR20.

K. 45SCR30 – "Requirements for Operation Permits"

Requires permitting under Title V of the Clean Air Act as needed. This facility is designed to be a minor source under Title V and is deferred from obtaining a Title V Permit at this time. The facility will pay operating fees under Title V since it is subject to NSPS.

2. Federal Regulations

A. 40CFR60 Subpart RRR – "Standards of Performance for Volatile Organic Compounds Emissions from Synthetic Organic Chemical Manufacturing Industry (SOCMI) Reactor Processes"

This facility makes methanol which is listed as a material in the regulation. The facility will have to comply with this regulation.

B. 40CFR60 Subpart NNN - "Standards of Performance for Volatile Organic Compound (VOC) Emissions From Synthetic Organic Chemical Manufacturing Industry (SOCMI) Distillation Operations"

This facility makes methanol which is listed as a material in the regulation. The facility will have to comply with this regulation.

C. 40CFR60 Subpart Kb - Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984

The fusel oil, slop, and methanol storage tanks will be subject to this rule. The engineering design for the tanks will incorporate these requirements.

D. 40CFR60 Subpart VVa - Standards of Performance for Equipment Leaks of VOC in the Synthetic Organic Chemicals Manufacturing Industry for Which Construction, Reconstruction, or Modification Commenced After November 7, 2006

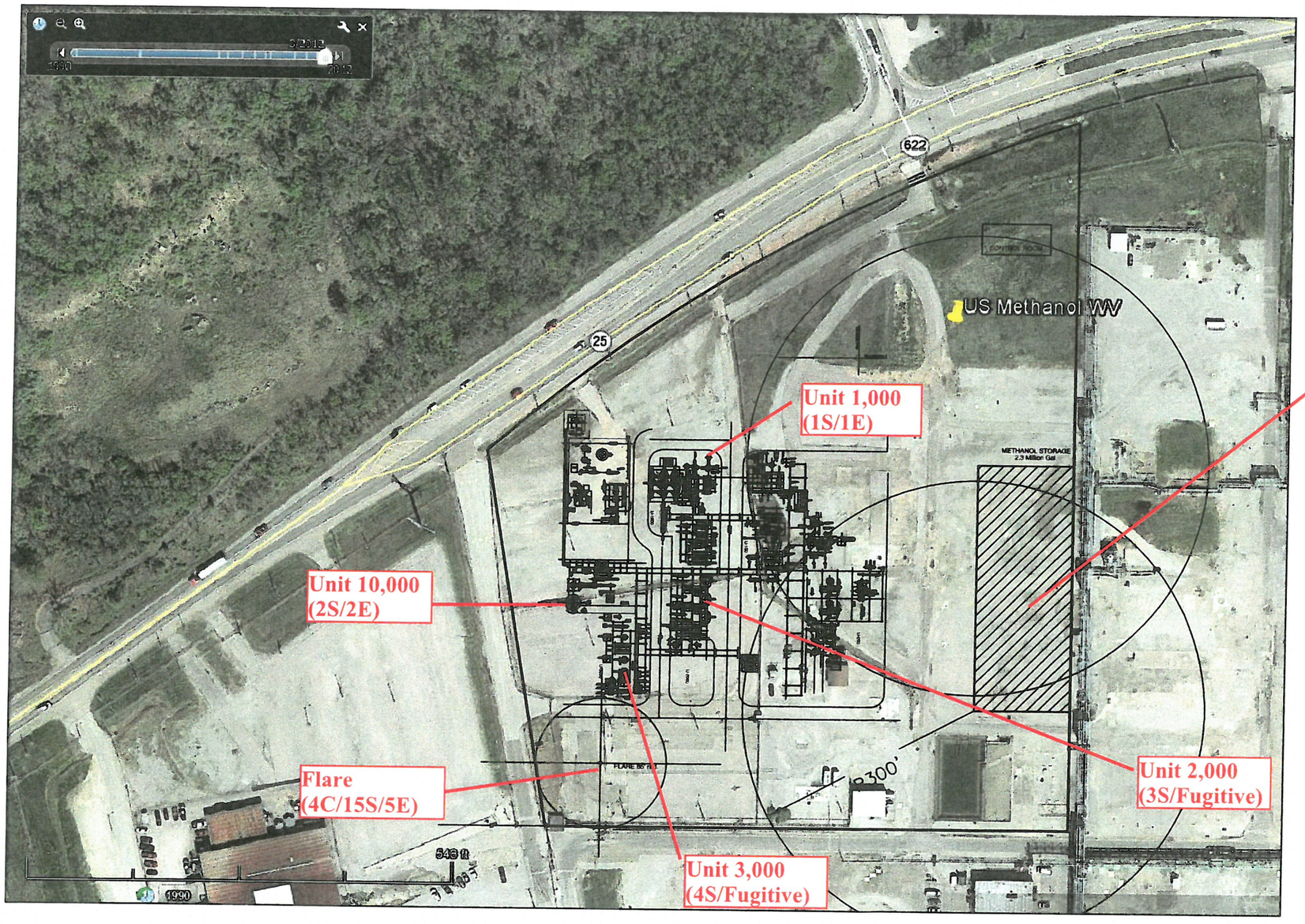
Product of this facility is methanol. Methanol is a listed material under the definition of synthetic organic chemical manufacturing industry before the facility will have to meet requirements of this subpart.

E. 40CFR60 – Standards of Performance for New Stationary Sources Subpart A – General Provisions Part 60.18-General Control Device Requirements.

This section defines what is required to have a control efficiency of the 98% for a flare. The flare utilized for this facility has a 98% control efficiency and the engineering design will incorporate the requirements of this subpart.

ATTACHMENT E

PLOT PLAN



N

NOTES:

SEE DRAWING TITLED "TANK FARM AREA ZONE 4" DRAWING NO. GA-02

NOTE: Information in red added by Potesta & Associates, Inc. for air permitting.

JE JACOBS

PROJECT NO. 58-S155-XX

USM – US METHANOL CORPORATION

INSTITUTE, WEST VIRGINIA

CONTRACT NO. 1604-H-USM-001 | DWG. NO. SKD-00-P-001 | REV. X | SCALE 1=1

DWG. TITLE
LIBERTY 1 METHANOL PLANT RELOCATION
ALL UNITS
X
X

DRAWN XX DATED XX
CHECKED:
APPROVED:
APPROVED:

SEAL:

REFERENCE DRAWINGS

DWG. NO.	TITLE	DWG. NO.	TITLE

MK	REVISION	BY	CHK	APP	DATE	MK	REVISION	BY	CHK	APP	DATE
A	ISSUED FOR	XX									

BLOCK NAME = DSIZE VER.03/08/89

05/10/16 15:24 LSTEIN USMbdr.dwg SCALE:1" = 1"

NOTE: Information in red added by Potesta & Associates, Inc. for air permitting.

NOTES:
1. HOLD ISBL HOUSTON FOR FINAL LOCATION
2. TYPICAL 3'X3' SUMP

TK5/95/3E

TK4/8S/3E

Scrubber 2C/3E

TK1/5S/3E

TK2/6S/3E

TK6/10S/3E

TK3/7S/3E

Truck Loading/11S/3E

SEE NOTE 1
15'-0"
140'-0"
70'-0"
70'-0"
50'-0"
EXISTING PIPERACK
SEE NOTE 2
69'-5 15/16"
℄ SALES TANK
20'-6" x 15'-8" PLATFORM
SEE NOTE 2
SEE NOTE 2
SCRUBBER
18" HIGH CURB
SAFETY SHOWER
SALES-PUMP-1
SALES-PUMP-2
120'-0"
370'-0"
℄ SALES TANK
30'-0"
NEW FENCE
EX. RACK
83'-3 1/16"
US METHANOL LIBERTY PLANT SITE BOUNDARY
SEE NOTE 1
SEE NOTE 2
18" HIGH CURB
SEE NOTE 2
32'-6" x 20'-6" PLATFORM
℄ NEW PIPERACK
SEE NOTE 2
RUN-PUMP-2
RUN-PUMP-1
SLOP-PUMP-1
SLOP-PUMP-2
FUSEL-PUMP-1
SAFETY SHOWER
℄ RUN TANKS
97'-3"
40'-0"
℄ SLOP TANK
SEE NOTE 2
ECR BLDG.
℄ FUSEL TANK
25'-0"
SEMI TRAILER (2)
63'-9"
34'-0"
9'-10"
10'-0"
FIRE SUPP. BLDG.
RAW WATER FILTERS
95'-10"
20'-0"
5'-2"
BOOSTER_PUMP_PAD
HOLD
DWR-POND-AREA
RE-USED TRUCK UNLOADING PDN
CARBS / TRUCK-UNLOADING
80'-0"
ZONE 4 AREA BENCHMARK ELEV. TBD
140'-0"
EXISTING SUB-4
ANALYZER BUILDING
HOLD
20'-0"
53'-2"
STA. 14+02 ½
G STREET

REV	DATE	DESCRIPTION	ORIG	CHKD	APP'D
A	07/19/16	ISSUED FOR PHASE III HAZOP	ALO		

	BY	DATE
ORIG	ALO	7/13/16
CHKD		
ENGR		
APPR		

JACOBS®

US METHANOL LIBERTY 1
GENERAL ARRANGEMENT PLAN
TANK FARM AREA ZONE 4

SCALE: 1"=20'-0" | PROJECT NO. | DRAWING NO. 6A-02 | REV. A

DRAWING NUMBER | DESCRIPTION

TK7/12S/4E

TK8/13S/4E

B STREET

EXIST PIPE RACK STA. S 264'3"

ZONE 12
PROJECT BENCHMARK

EXIST PIPE RACK STA W 1289'9

126'-3"

OUTSIDE DIKE WALL

345'-0"

OUTSIDE DIKE WALL

120'-0"

112'-6"

339'-7"

℄ PRODUCT TANK NO. 1

PRODUCT TANK NO. 2

EXIST RAILROAD TRACK
(3 SETS)

EXIST TUNNEL
UNDER TRACKS

MATCHLINE DWG GA-01 STA 325'-0"

SAFETY SHOWER

℄ NEW T-POLES

15'-0"

OUTSIDE DIKE WALL

48" SQ. SUMP 2 REQ'D
UNDER PLTF ON EACH
SIDE OF CURB

PRODUCT PUMP PLTF
20' X 14'
T/STL EL. 596'2

PRODUCT TANK PUMPS (2)

RIE BLDG
10' x 15'

80'-0"

PIPE BRIDGE
OVER ROADWAY

BOT./ TANK EL. 595'0
TYP.

FIRE SUPPRESSANT BLDG
10' x 20'

℄ PRODUCT TANKS

160'-0"

EXIST 54" UNDERGROUND WATER LINE

T/ DIKE WALL EL. 596'2

SCRUBBER
ABOVE T/TANK LEVEL

18" HIGH CURB

REMIDIATION AREA

OUTSIDE DIKE WALL

EXIST ROAD

EXIST FENCE

TANKS FEED BARGE LOADING (BL)/14S/4E)

PLAN

Scrubber/3C/4E

NOTES:

NOTE: Information in red added by Potesta & Associates, Inc. for air permitting.

REV	DATE	DESCRIPTION	DRWN	CHKD	APPD
A	07/19/16	ISSUED FOR PHASE III HAZOP	ALO		

	BY	DATE
DRAWN	ALO	7/13/16
CHKD		
ENGR		
APPR		

JACOBS®

US METHANOL LIBERTY 1
GENERAL ARRANGEMENT PLAN
PRODUCT TANK FARM ZONE 12

DRAWING NUMBER	DESCRIPTION

SCALE: 1"=30ft
CAD:

PROJECT NO.

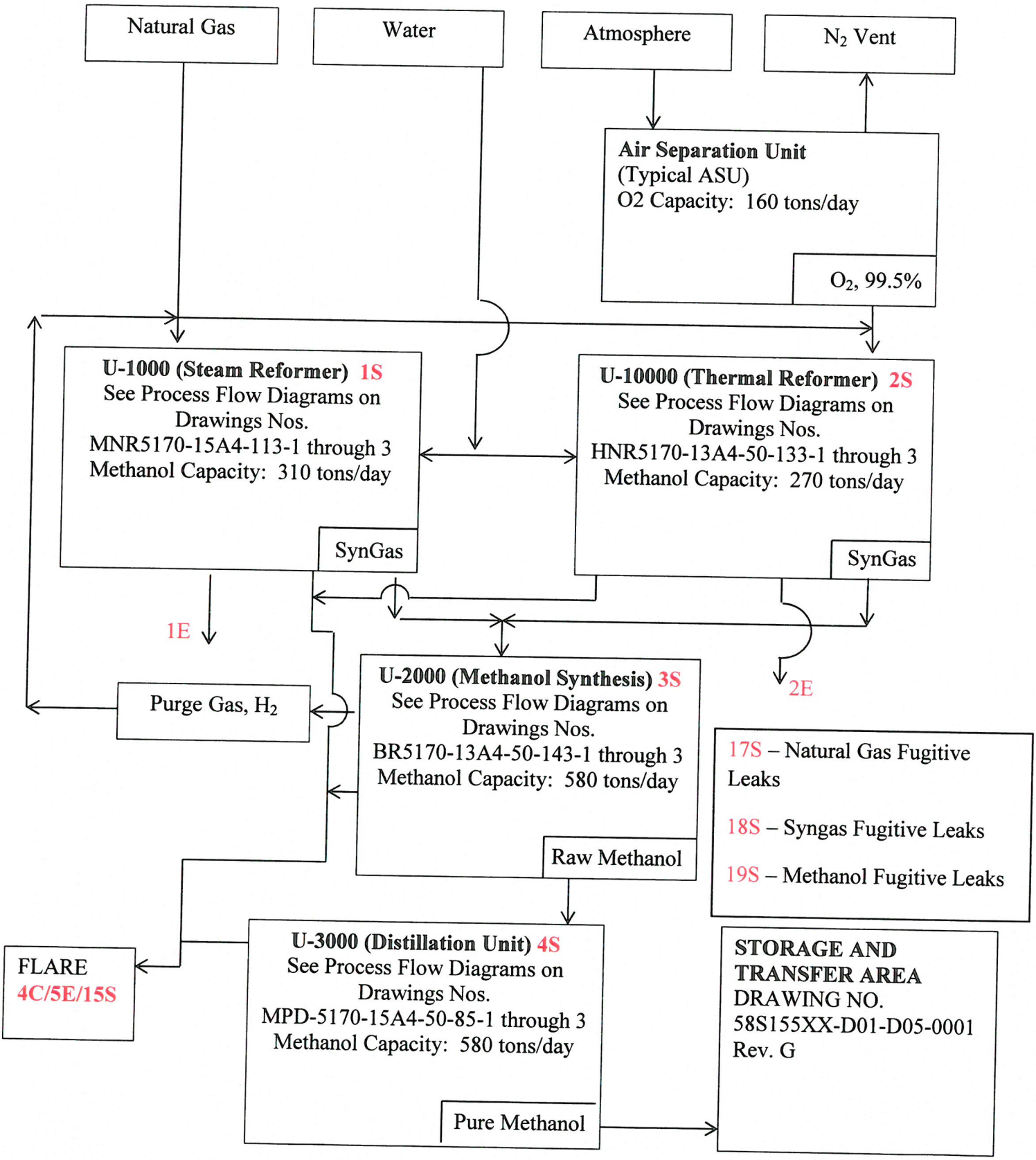
DRAWING NO. GA-04

REV. A

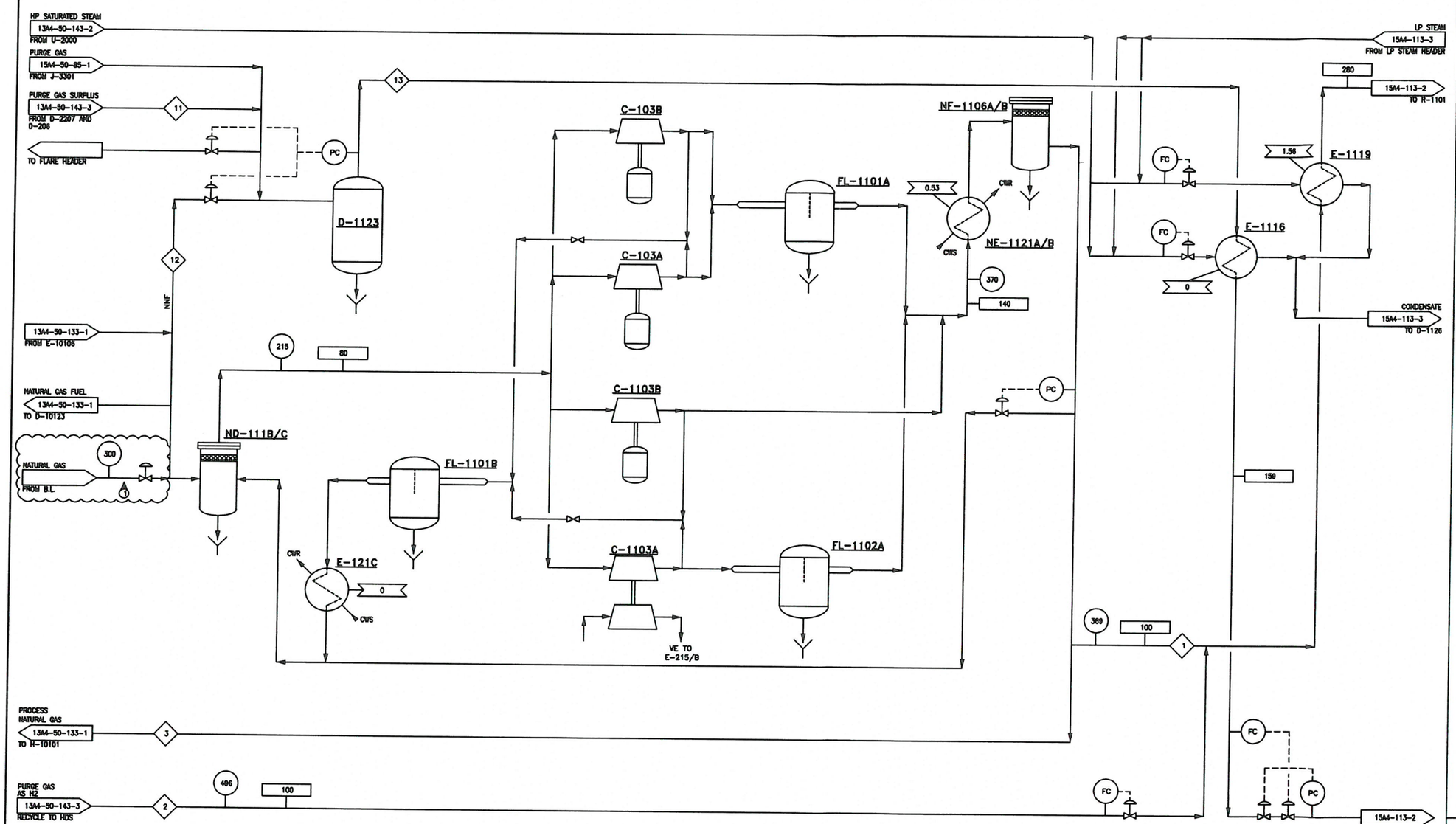
ATTACHMENT F

DETAILED PROCESS FLOW DIAGRAM

PLANT PROCESS FLOW DIAGRAM OVERVIEW



ND-111B/C NATURAL GAS DRUM | E-121C NATURAL GAS START-UP COOLER | D-1123 FUEL GAS DRUM | FL-1101B ON LINE START-UP OIL SEPARATOR | C-103A NATURAL GAS COMPRESSOR (MOTOR DRIVEN) | C-103B NATURAL GAS COMPRESSOR (MOTOR DRIVEN) | C-1103A NATURAL GAS COMPRESSOR (TURBINE DRIVEN) | C-1103B NATURAL GAS COMPRESSOR (MOTOR DRIVEN) | FL-1101A ON LINE OIL SEPARATOR (FOR C-103A/B) | FL-1102A ON LINE OIL SEPARATOR (FOR C-1103A) | NE-1121A/B NATURAL GAS COOLER | NF-1106A/B NATURAL GAS OIL FILTER | E-1116 FUEL GAS PREHEATER | E-1119 NATURAL GAS PREHEATER



NOTES:

1. UPGRADE SYSTEM FOR 300 PSIG NATURAL GAS SUPPLY PRESSURE.
2. PROCESS TEMPERATURES AND PRESSURES ARE BASED ON GPC QUIMICA SIMULATION ASPEN VI-CASO XX.

PFD LEGEND

- STREAM NUMBER
- TEMPERATURE, °F
- PRESSURE, PSIG
- DUTY, MMBtu/hr
- SCOPE CLOUD. CHANGE IN DESIGN FROM EXISTING PLANT DESIGN
- NOTE

A 07/11/16 ISSUED FOR APPROVAL

JACOBS®

PROJECT NO.: 58-SI55-XX

usmethanol™

REF. DWG. NO.	REFERENCE DRAWING TITLE
MNR5170-15A4-113	SYNTHESIS GAS PREPARATION SECTION 1000

REV	REVISION DESCRIPTION	BY	CHK	APP	DATE
A	ISSUED FOR APPROVAL	HMR	SPT	NMH	07/11/16

REV	REVISION DESCRIPTION	BY	CHK	APP	DATE

CONTRACT NO.

DWG. NO. MNR5170-15A4-113-1

REV. A

SCALE NONE

DWG. TITLE

PROCESS FLOW DIAGRAM
METHANOL PLANT
SYNTHESIS GAS PREPARATION
UNIT 1000

11/17/2016 1:44 PM GUNNC PC-10970 JPI/58SI55XX/US METHANOL CORPORATION/58SI55XX-US METHANOL PLANT RELOCATION PROJECT/ENGINEERING/ALL DOCUMENTS/CO-1 FLOWSHEETS/D065-PROCESS PFD AND HMB DRAWINGS/MNR5170-15A4-113-1.DWG

R-1101 H.D.S. REACTOR

S-1101 FLUE GAS STACK

C-1106A AIR PREHEATER FORCED DRAFT BLOWER (MOTOR DRIVEN OR TURBINE DRIVEN)

C-1106B FLUE GAS INDUCED DRAFT BLOWER (MOTOR DRIVEN OR TURBINE DRIVEN)

NEH-304A REFORMER AIR PREHEATER

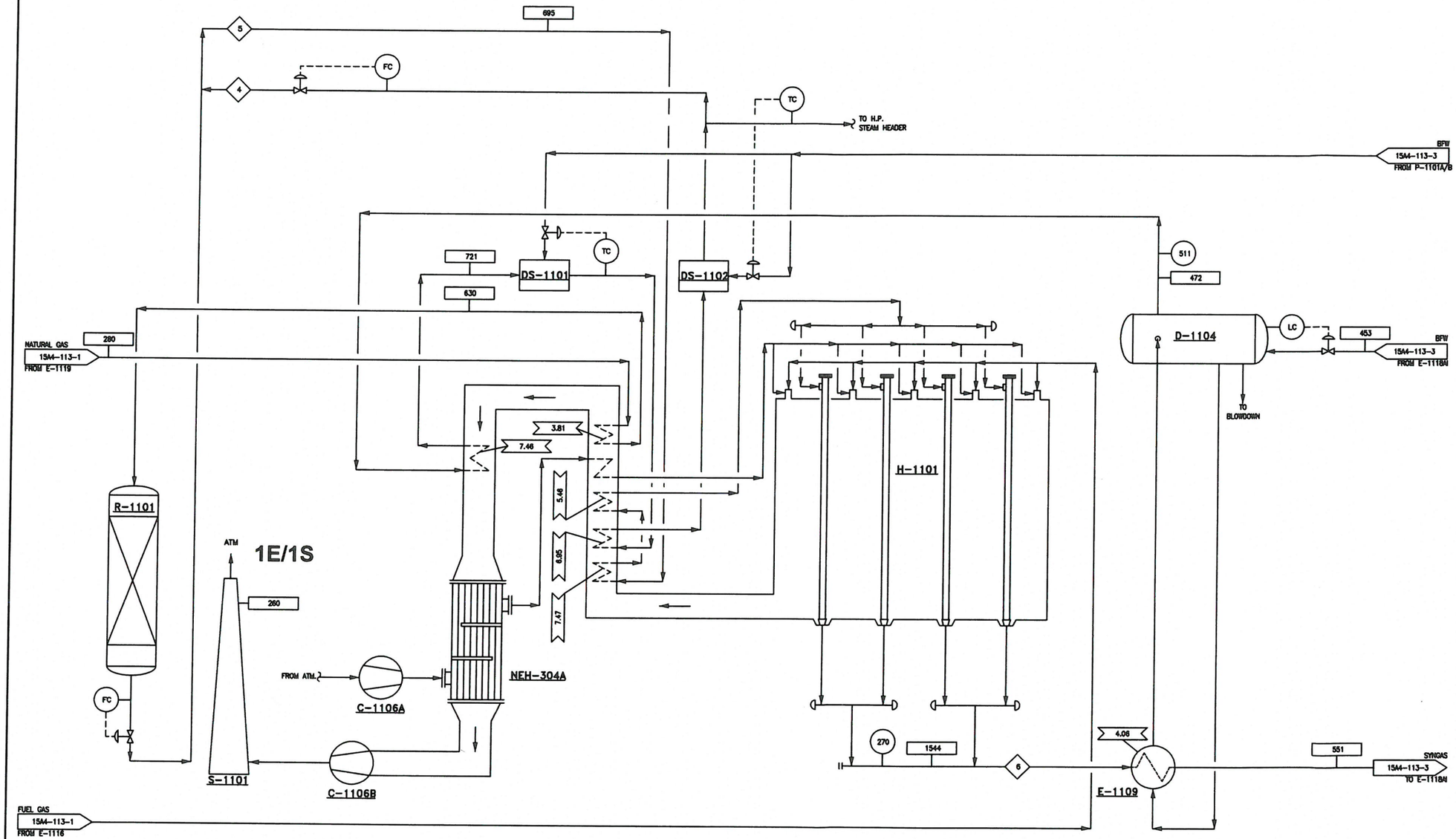
DS-1101 STEAM DESSUPERHEATER

DS-1102 SECOND STEAM DESSUPERHEATER

H-1101 DOWN FIRED TYPE REFORMER

D-1104 H.P. STEAM DRUM

E-1109 WASTE HEAT BOILER



NOTES:

1. PROCESS TEMPERATURES AND PRESSURES ARE BASED ON GPC QUIMICA SIMULATION ASPEN VI-CASO XX.

PFD LEGEND

- STREAM NUMBER
- TEMPERATURE, °F
- PRESSURE, PSIG
- DUTY, MMBtu/hr
- SCOPE CLOUD, CHANGE IN DESIGN FROM EXISTING PLANT DESIGN
- NOTE

A 07/11/16 ISSUED FOR APPROVAL

JACOBS

PROJECT NO.: 58-SI55-XX

us methanol

MNR5170-15A4-113	SYNTHESIS GAS PREPARATION SECTION 1000	A	ISSUED FOR APPROVAL	HMR	SPT	NMH	07/11/16						
REF. DWG. NO.	REFERENCE DRAWING TITLE	REV	REVISION DESCRIPTION	BY	CHK	APP	DATE	REV	REVISION DESCRIPTION	BY	CHK	APP	DATE

CONTRACT NO.	DWG. NO.	REV.	SCALE
	MNR5170-15A4-113-2	A	NONE

DWG. TITLE: PROCESS FLOW DIAGRAM
METHANOL PLANT
SYNTHESIS GAS PREPARATION
UNIT 1000

8/1/2016 11:58 AM GUNNC PC-10129 JPI/58SI55XX/US METHANOL CORPORATION/58SI55XX-US METHANOL PLANT RELOCATION PROJECT/ENGINEERING/ALL DOCUMENTS/CO-1 FLOWSHEETS/D065-PROCESS PFD AND HMB DRAWINGS/MNR5170-15A4-113-2.DWG

E-1118AI THIRD B.F.W. PREHEATER
E-1118AII SECOND B.F.W. PREHEATER
E-1118B L.P. SYNGAS STEAM GENERATOR
E-1118C FIRST B.F.W. PREHEATER
D-1102 DEAERATOR
D-1105 PROCESS CONDENSATE DRUM
NE-3304A INTERM. COLUMN U-10000 SYNGAS REBOILER
D-3305A U-1000 PROCESS CONDENSATE DRUM
D-1126 L.P. STEAM FLASH DRUM
NE-3301A ETHER COLUMN SYNGAS REBOILER
D-3306A U-1000 PROCESS CONDENSATE DRUM
E-1117 MAKE-UP B.F.W. PREHEATER
E-1110 FINAL SYNGAS COOLER
D-1109 PROCESS CONDENSATE DRUM
D-1114A SYNGAS COMPRESSORS K.O. DRUM

LP STEAM 15A4-113-1 TO E-1116/1119
LP STEAM FROM LP STEAM HEADER
15A4-50-85-1 TO E-3301
LP STEAM TO HEADER
TO ATMOSPHERE
PC
D-1102
LC
D-1126
CONDENSATE 15A4-113-1 FROM E-1116/1119
13A4-50-143-1 FROM P-315A/B/C/D
230
BFW 15A4-50-143-2 TO E-2208A/B
2.1
E-1117
9
219
NNF
MAKE-UP BFW FROM BL
453
BFW 15A4-113-2 TO D-1104
E-1118AI
450
SYNGAS 15A4-113-2 FROM E-1109
3.93
E-1118AII
385
285
4.95
321
E-1118B
3.47
E-1118C
398
5.41
LC
296
7
8
FROM T-3302
TO T-3302
NE-3304A
FROM T-3301
TO T-3301
NE-3301A
271
236
7.15
CWR
CWS
E-1110
101
10
15
SYNGAS 13A4-50-143-1 TO U-2000
D-1105
D-3305A
D-3306A
D-1109
D-1114A
BFW 15A4-113-2 TO DS-1101/2
P-1101A/B

P-1101A H.P. B.F.W. PUMPS (MOTOR DRIVEN)
P-1101B H.P. B.F.W. PUMPS (TURBINE DRIVEN)

NOTES:
1. SEE PFD MPD5170-15A4-50-85-1.
2. SEE PFD MPD5170-15A4-50-85-2.
3. PROCESS TEMPERATURES AND PRESSURES ARE BASED ON GPC QUIMICA SIMULATION ASPEN VI-CASO XX.

PFD LEGEND
STREAM NUMBER
TEMPERATURE, °F
PRESSURE, PSIG
DUTY, MMBtu/hr
SCOPE CLOUD, CHANGE IN DESIGN FROM EXISTING PLANT DESIGN
NOTE

A ISSUED FOR APPROVAL 07/11/16

JACOBS
PROJECT NO.: 58-SI55-XX

us methanol

MNR5170-15A4-113	SYNTHESIS GAS PREPARATION SECTION 1000	A	ISSUED FOR APPROVAL	HMR	SPT	NHM	07/11/16						
REF. DWG. NO.	REFERENCE DRAWING TITLE	REV	REVISION DESCRIPTION	BY	CHK	APP	DATE	REV	REVISION DESCRIPTION	BY	CHK	APP	DATE

CONTRACT NO.
DWG. NO. MNR5170-15A4-113-3
REV. A
SCALE NONE

DWG. TITLE
PROCESS FLOW DIAGRAM
METHANOL PLANT
SYNTHESIS GAS PREPARATION
UNIT 1000

11/17/2016 1:52 PM GUNNC PC-10129 JPI/58SI55XX/US METHANOL CORPORATION/58SI55XX-US METHANOL PLANT RELOCATION PROJECT/ENGINEERING/ALL DOCUMENTS/CO-1 FLOWSHEETS/D065-PROCESS PFD AND HMB DRAWINGS/MNR5170-15A4-113-3.DWG

D-10123
ATR FUEL DRUM

C-10101
OXYGEN COMPRESSOR

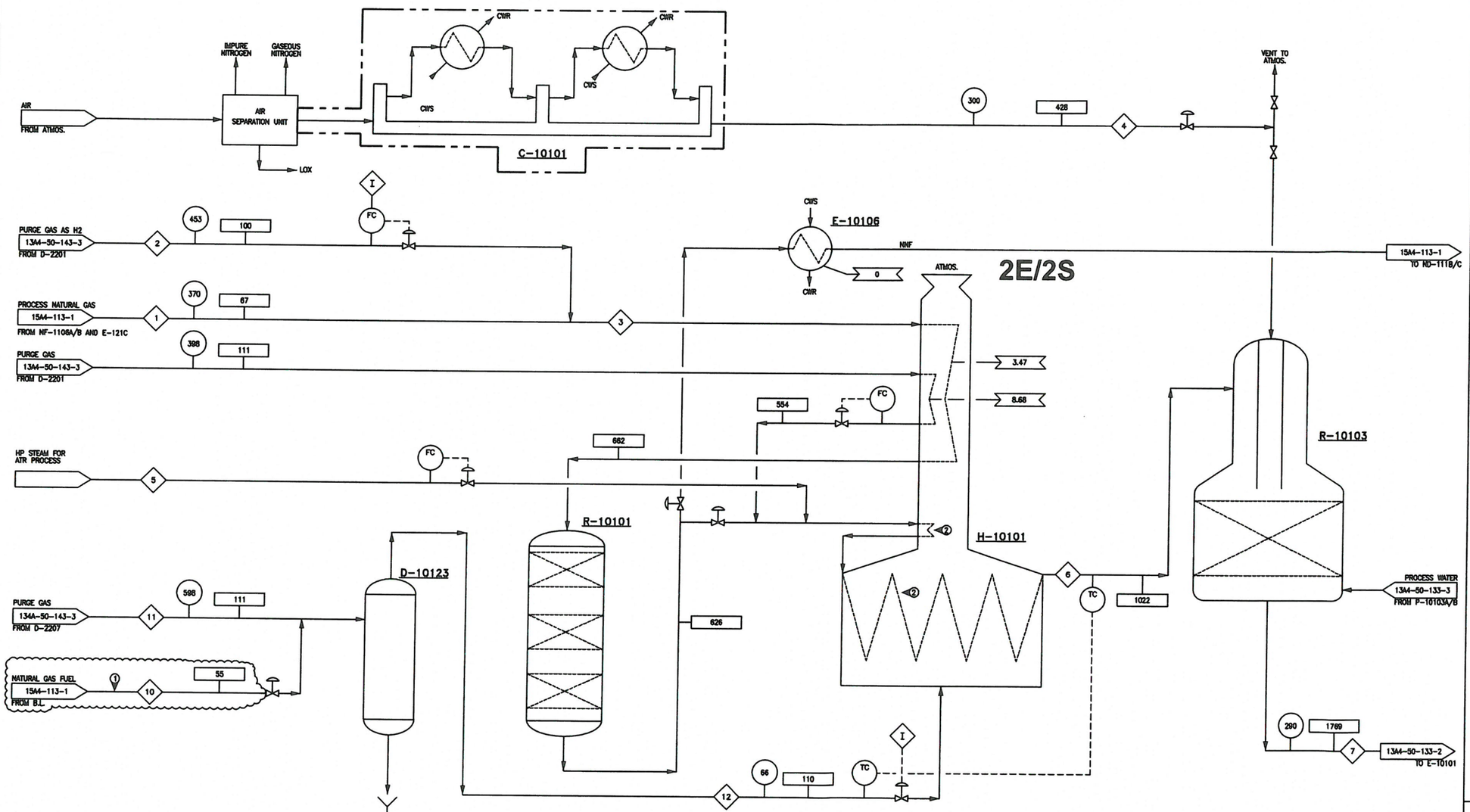
R-10101
ATR HDS REACTOR

E-10106
NATURAL GAS/
RECIRCULATION COOLER

H-10101
NATURAL GAS/
STEAM PREHEATER

R-10103
ATR REACTOR

NOTES:
1. UPGRADE SYSTEM FOR 300 PSIG NATURAL GAS SUPPLY PRESSURE.
2. COMBINED DUTY – 8.52 MMBTU/HR.
3. PROCESS TEMPERATURES AND PRESSURES ARE BASED ON GPC QUIMICA SIMULATION ASPEN VI–CASO XX.



PFD LEGEND
- STREAM NUMBER
- TEMPERATURE, °F
- PRESSURE, PSIG
- DUTY, MMBtu/hr
- SCOPE CLOUD, CHANGE IN DESIGN FROM EXISTING PLANT DESIGN
- NOTE

A 07/11/16 ISSUED FOR APPROVAL

JACOBS
PROJECT NO.: 58–SI55–XX

us methanol

REF. DWG. NO.	REFERENCE DRAWING TITLE	REV	REVISION DESCRIPTION	BY	CHK	APP	DATE
HNR5170–13A4–50–133	SYNGAS PREPARATION SECTION 10000	A	ISSUED FOR APPROVAL	HMR	SPT	NMH	07/11/16

REV	REVISION DESCRIPTION	BY	CHK	APP	DATE

CONTRACT NO.
DWG. NO. HNR5170–13A4–50–133–1
REV. A
SCALE NONE

DWG. TITLE
PROCESS FLOW DIAGRAM
METHANOL PLANT
SYNGAS PREPARATION
UNIT 10000

6/15/2016 7:15 AM GUNNC PC–10358 JPI/58SI55XX/US METHANOL CORPORATION/58SI55XX–US METHANOL PLANT RELOCATION PROJECT/ENGINEERING/ALL DOCUMENTS/CO–1 FLOWSHEETS/D065–PROCESS PFD AND HMB DRAWINGS/HNR5170–13A4–50–133–1.DWG

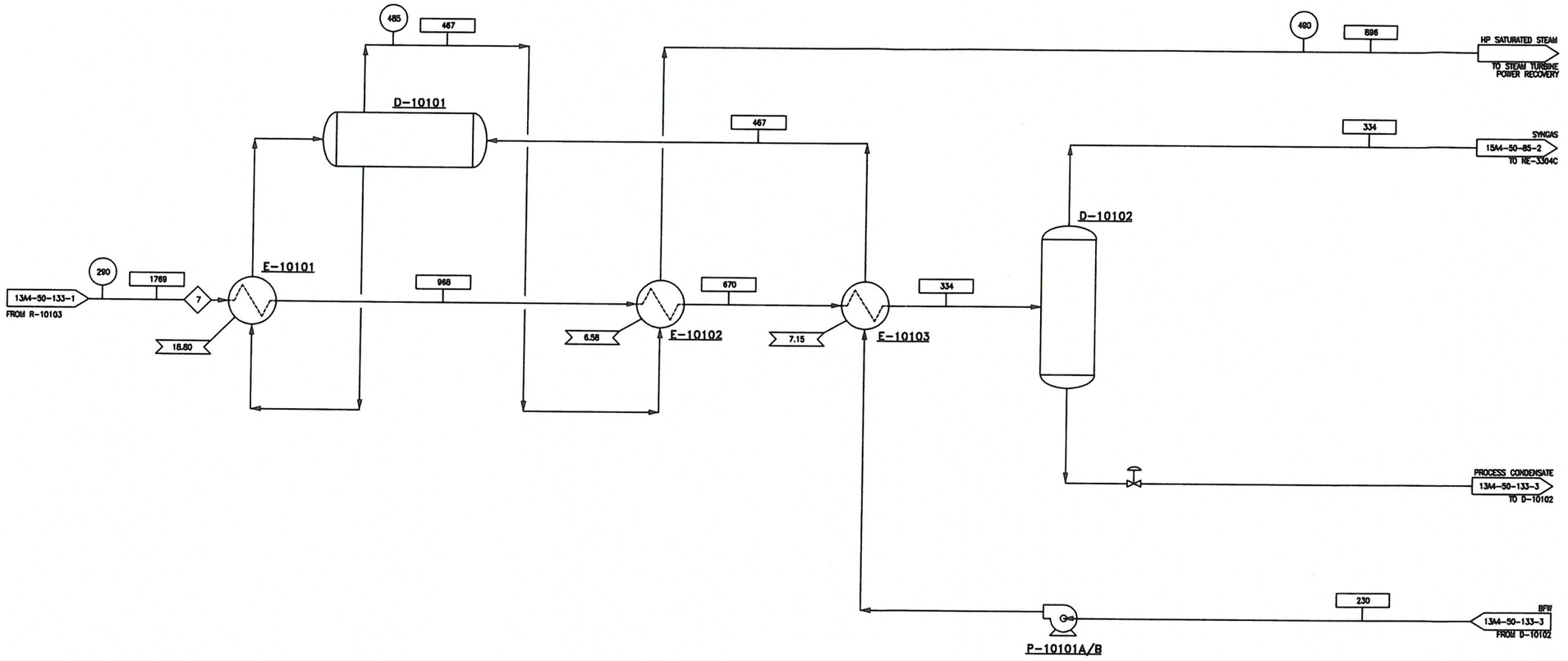
E-10101
ATR WASTE
HEAT BOILER

D-10101
ATR WHB HP
STEAM DRUM

E-10102
ATR SYNGAS
SUPERHEATER

E-10103
ATR SYNGAS
BFW PREHEATER

D-10122
ATR CONDENSATE
DRUM



P-10101A/B
ATR HP
BFW PUMPS

NOTES:

1. PROCESS TEMPERATURES AND PRESSURES ARE BASED ON GPC QUIMICA SIMULATION ASPEN VI-CASO XX.

PFD LEGEND

- STREAM NUMBER
- TEMPERATURE, °F
- PRESSURE, PSIG
- DUTY, MMBtu/hr
- SCOPE CLOUD, CHANGE IN DESIGN FROM EXISTING PLANT DESIGN
- NOTE

A 07/11/16 ISSUED FOR APPROVAL

JACOBS

PROJECT NO.: 58-SI55-XX

us methanol

HNR5170-13A4-50-133	SYNGAS PREPARATION SECTION 10000	A	ISSUED FOR APPROVAL	HMR	SPT	NMH	07/11/16						
REF. DWG. NO.	REFERENCE DRAWING TITLE	REV	REVISION DESCRIPTION	BY	CHK	APP	DATE	REV	REVISION DESCRIPTION	BY	CHK	APP	DATE

CONTRACT NO.	DWG. NO.	REV.	SCALE
	HNR5170-13A4-50-133-2	A	NONE

DWG. TITLE
PROCESS FLOW DIAGRAM
METHANOL PLANT
SYNGAS PREPARATION
UNIT 10000

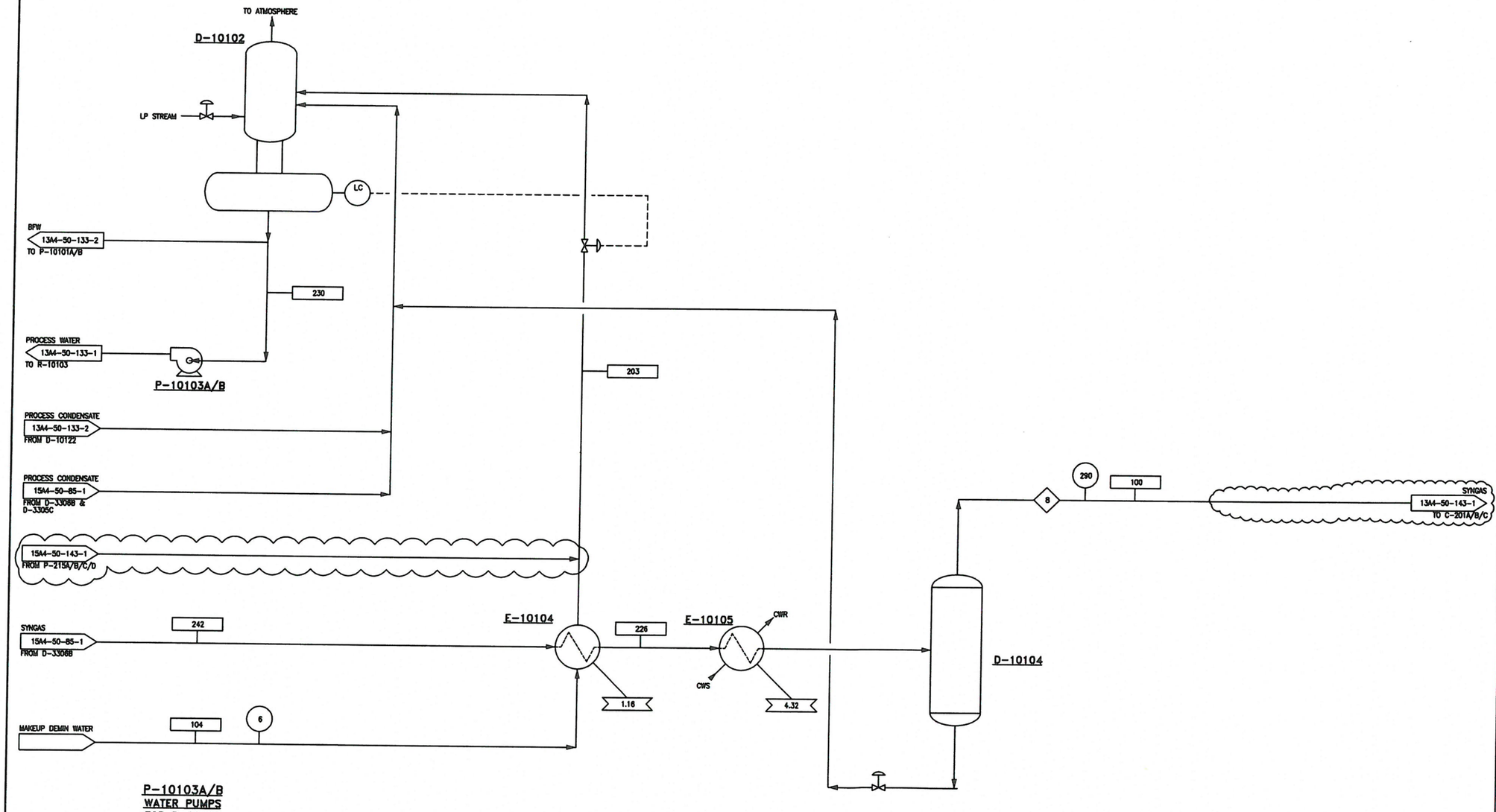
6/15/2016 7:15 AM GUNNC PC-10358 JPI/58SI55XX/US METHANOL CORPORATION/58SI55XX-US METHANOL PLANT RELOCATION PROJECT/ENGINEERING/ALL DOCUMENTS/CO-1 FLOWSHEETS/D065-PROCESS PFD AND HMB DRAWINGS/HNR5170-13A4-50-133-2.DWG

D-10102
ATR UNIT DEAERATOR

E-10104
ATR SYNGAS DEMIN. WATER PREHEATER

E-10105
ATR SYNGAS COOLER

D-10104
ATR COLD CONDENSATE SEPARATOR



P-10103A/B
WATER PUMPS
FOR R-10103

NOTES:
1. PROCESS TEMPERATURES AND PRESSURES ARE BASED ON GPC QUIMICA SIMULATION ASPEN VI-CASO XX.

PFD LEGEND
- STREAM NUMBER
- TEMPERATURE, °F
- PRESSURE, PSIG
- DUTY, MMBtu/hr
- SCOPE CLOUD, CHANGE IN DESIGN FROM EXISTING PLANT DESIGN
- NOTE
- A — ISSUED FOR APPROVAL — 07/11/16

JACOBS
PROJECT NO.: 58-SI55-XX

us methanol

REF. DWG. NO.	REFERENCE DRAWING TITLE	REV	REVISION DESCRIPTION	BY	CHK	APP	DATE
HNR5170-13A4-50-133	SYNGAS PREPARATION SECTION 10000	A	ISSUED FOR APPROVAL	HMR	SPT	NMI	07/11/16

REV	REVISION DESCRIPTION	BY	CHK	APP	DATE

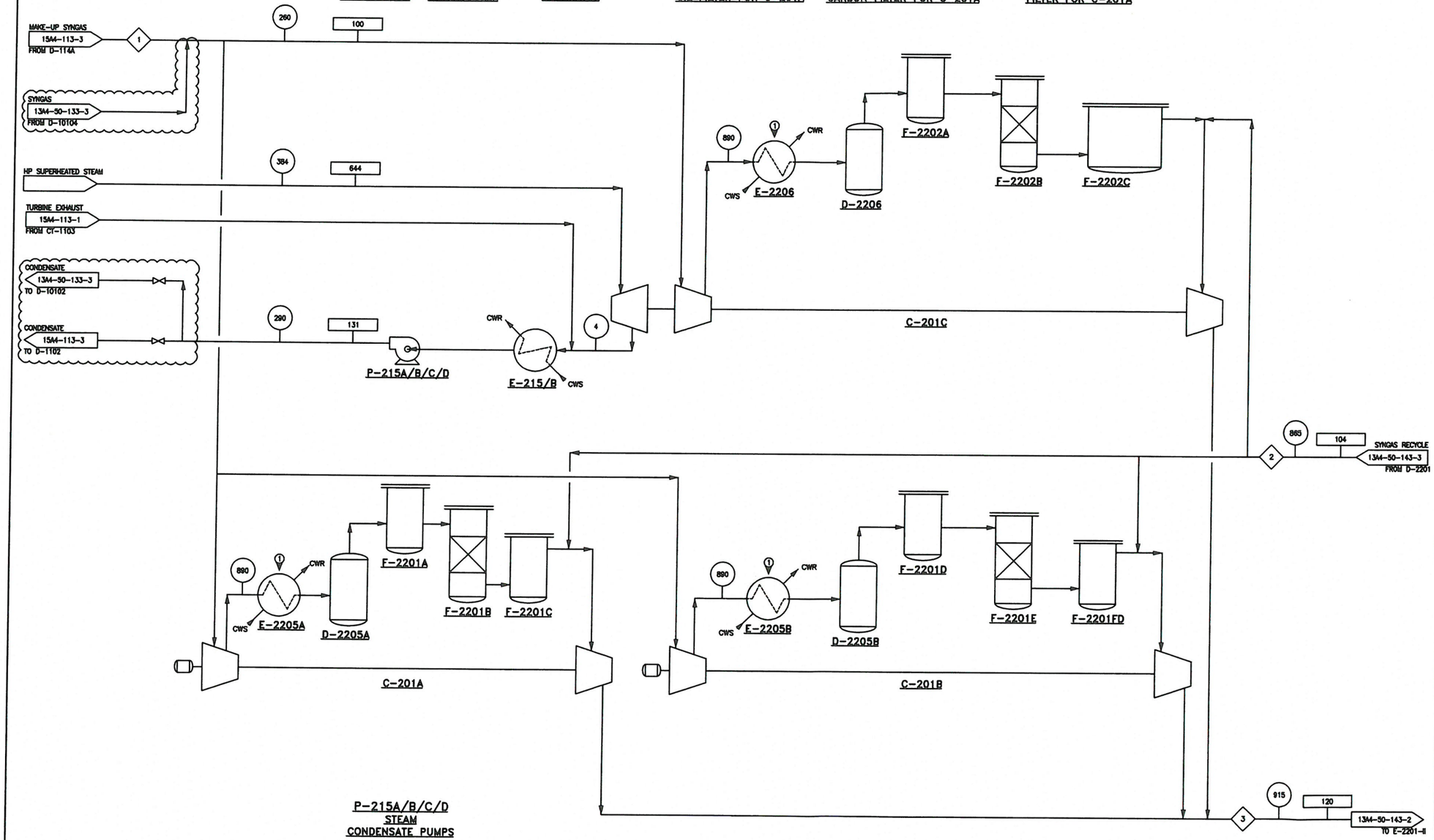
CONTRACT NO.	DWG. NO.	REV.	SCALE
	HNR5170-13A4-50-133-3	A	NONE

DWG. TITLE
PROCESS FLOW DIAGRAM
METHANOL PLANT
SYNGAS PREPARATION
UNIT 10000

6/15/2016 7:15 AM CPALMER PC-10358 JPI/58SI55XX/US METHANOL CORPORATION/58SI55XX-US METHANOL PLANT RELOCATION PROJECT/ENGINEERING/ALL DOCUMENTS/CO-1 FLOWSHEETS/D065-PROCESS PFD AND HMB DRAWINGS/HNR5170-13A4-50-133-3.DWG

C-201A/B/C SYNGAS COMPRESSORS | E-215/B STEAM TURBINE CONDENSERS | E-2206 C-201C AFTERCOOLER | D-2206 C-201C DISCHARGE SEPARATOR | F-2202A DISCHARGE COALESCING OIL FILTER FOR C-201C | F-2202B DISCHARGE ACTIVATED CARBON FILTER FOR C-201C | F-2202C DISCHARGE DUST FILTER FOR C-201C | D-2205B C-201B DISCHARGE SEPARATOR | F-2201D DISCHARGE COALESCING OIL FILTER FOR C-201B | F-2201E DISCHARGE ACTIVATED CARBON FILTER FOR C-201B | F-2201F DISCHARGE DUST FILTER FOR C-201B

E-2205A C-201A AFTERCOOLER | E-2205B C-201B AFTERCOOLER | D-2205A C-201A DISCHARGE SEPARATOR | F-2201A DISCHARGE COALESCING OIL FILTER FOR C-201A | F-2201B DISCHARGE ACTIVATED CARBON FILTER FOR C-201A | F-2201C DISCHARGE DUST FILTER FOR C-201A



NOTES:

1. COMBINED OPERATING DUTY 9.93 MMBtu/hr.
2. PROCESS TEMPERATURES AND PRESSURES ARE BASED ON GPC QUIMICA SIMULATION ASPEN VI-CASO XX.

PFD LEGEND

- STREAM NUMBER
- TEMPERATURE, °F
- PRESSURE, PSIG
- DUTY, MMBtu/hr
- SCOPE CLOUD, CHANGE IN DESIGN FROM EXISTING PLANT DESIGN
- NOTE

A — ISSUED FOR APPROVAL — 07/11/16

JACOBS

PROJECT NO.: 58-SI55-XX

us methanol

BR5170-13A4-50-143	LP METHANOL SYNTHESIS SECTION 2000	A	ISSUED FOR APPROVAL	HMR	SPT	NMH	07/11/16							
REF. DWG. NO.	REFERENCE DRAWING TITLE	REV	REVISION DESCRIPTION	BY	CHK	APP	DATE	REV	REVISION DESCRIPTION	BY	CHK	APP	DATE	

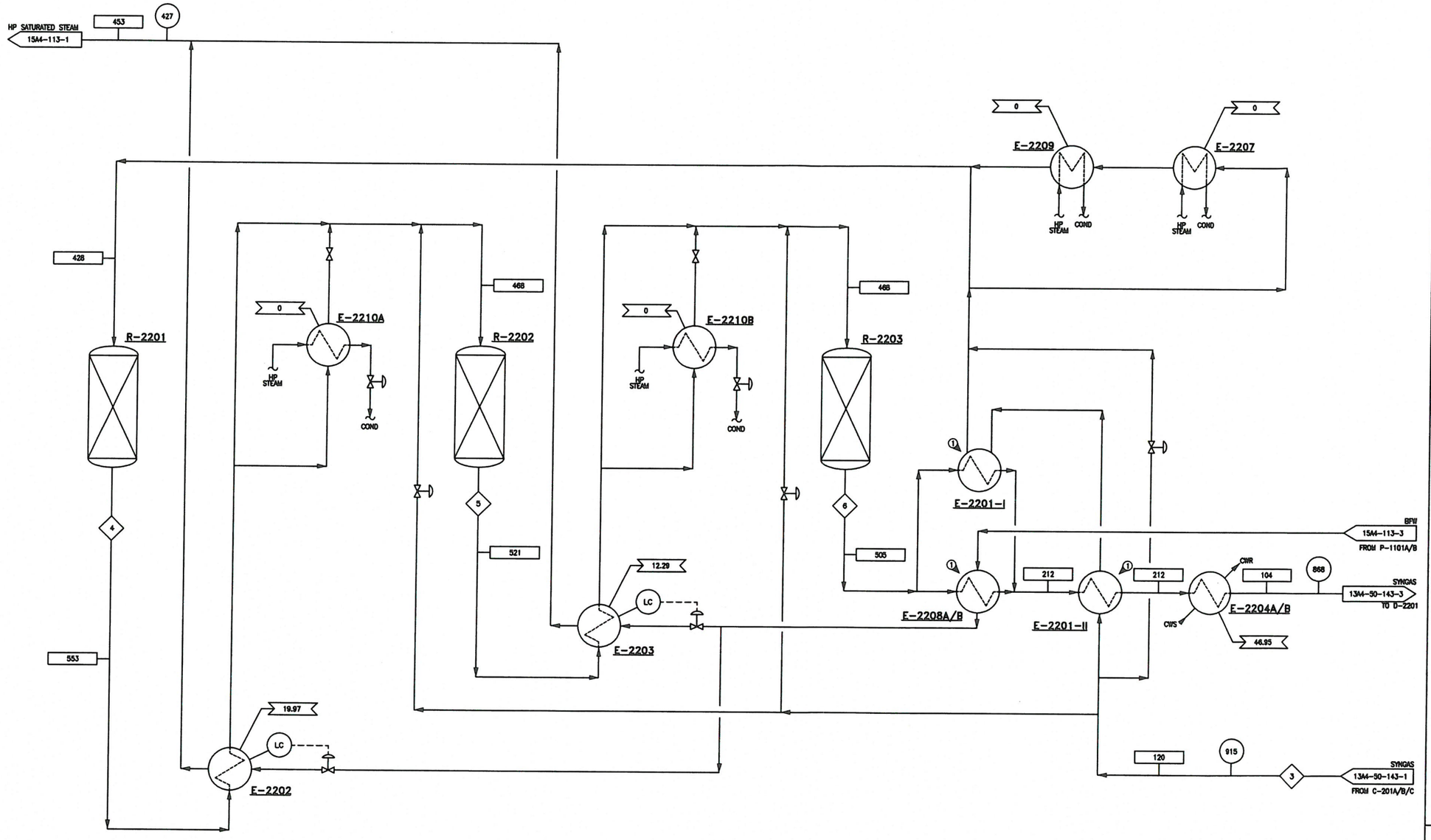
CONTRACT NO.	DWG. NO.	REV.	SCALE
	BR5170-13A4-50-143-1	A	NONE

DWG. TITLE

PROCESS FLOW DIAGRAM
METHANOL PLANT
LP. METHANOL SYNTHESIS - COMPRESSION
UNIT 2000

11/17/2016 1:33 PM GUNNC PC-10129 JPI/58SI55XX/US METHANOL CORPORATION/58SI55XX-US METHANOL PLANT RELOCATION PROJECT/ENGINEERING/ALL DOCUMENTS/CO-1 FLOWSHEETS/D065-PROCESS PFD AND HMB DRAWINGS/BR5170-13A4-50-143-1.DWG

R-2201 FIRST METHANOL CONVERTER | E-2202 FIRST CONVERTER OUTLET W.H.B. | E-2210A/B SECOND & THIRD REACTOR INLET SUPER HEATER | R-2202 SECOND METHANOL CONVERTER | E-2203 SECOND CONVERTER OUTLET W.H.B. | R-2203 THIRD METHANOL CONVERTER | E-2201-I FIRST FEED/EFFLUENT HEAT EXCHANGER | E-2208A/B B.F.W. PREHEATER | E-2201-II SECOND FEED/EFFLUENT HEAT EXCHANGER | E-2207 START-UP HEATER | E-2209 START-UP SUPER HEATER | E-2204A/B METHANOL CONDENSERS



NOTES:

1. COMBINED OPERATING DUTY OF E-2201-I/II AND E-2208A/B 71.3 MMBtu/hr.
2. PROCESS TEMPERATURES AND PRESSURES ARE BASED ON GPC QUIMICA SIMULATION ASPEN VI-CASO XX.

PFD LEGEND

- STREAM NUMBER
- TEMPERATURE, °F
- PRESSURE, PSIG
- DUTY, MMBtu/hr
- SCOPE CLOUD, CHANGE IN DESIGN FROM EXISTING PLANT DESIGN
- NOTE

A 07/11/16 ISSUED FOR APPROVAL

JACOBS

PROJECT NO.: 58-SI55-XX

us methanol

BR5170-13A4-50-143	LP.METHANOL SYNTHESIS SECTION 2000	A	ISSUED FOR APPROVAL	HMR	SPT	NMH	07/11/16

REF. DWG. NO.	REFERENCE DRAWING TITLE	REV	REVISION DESCRIPTION	BY	CHK	APP	DATE	REV	REVISION DESCRIPTION	BY	CHK	APP	DATE

CONTRACT NO.	DWG. NO.	REV.	SCALE
	BR5170-13A4-50-143-2	A	NONE

DWG. TITLE

PROCESS FLOW DIAGRAM
METHANOL PLANT
LP. METHANOL SYNTHESIS - REACTION
UNIT 2000

F-2203A/B
CRUDE
METHANOL FILTER

D-2201
METHANOL
SEPARATOR

T-2201
METHANOL
RECOVERY COLUMN

D-2207
PURGE
GAS DRUM

D-206
CRUDE
METHANOL VESSEL

13A4-50-143-1
TO C-201A/B/C

13A4-50-143-2
FROM E-2204A/B

D-2201

F-2203A/B

T-2201

D-2207

P-2201

D-206

PURGE GAS
13A4-50-133-1
TO H-10101

PURGE GAS
13A4-50-133-1
TO H-10101

15A4-50-85-1
TO D-3308

PURGE GAS
TO FUEL
15A4-113-1
TO D-1123

PURGE GAS
13A4-50-133-1
TO D-10123

DEMINERALIZED WATER

RAW METHANOL
15A4-50-85-1
TO E-3302

P-2201
DEMINERALIZED
WATER PUMP

NOTES:

1. PROCESS TEMPERATURES AND PRESSURES ARE BASED ON GPC QUIMICA SIMULATION ASPEN VI-CASO XX.

PFD LEGEND

- STREAM NUMBER
- TEMPERATURE, °F
- PRESSURE, PSIG
- DUTY, MMBtu/hr
- SCOPE CLOUD, CHANGE IN DESIGN FROM EXISTING PLANT DESIGN
- NOTE

A 07/11/16 ISSUED FOR APPROVAL

JACOBS

PROJECT NO.: 58-SI55-XX

us methanol

BR5170-13A4-50-143	LP. METHANOL SYNTHESIS SECTION 2000	A	ISSUED FOR APPROVAL	HMR	SPT	NMH	07/11/16

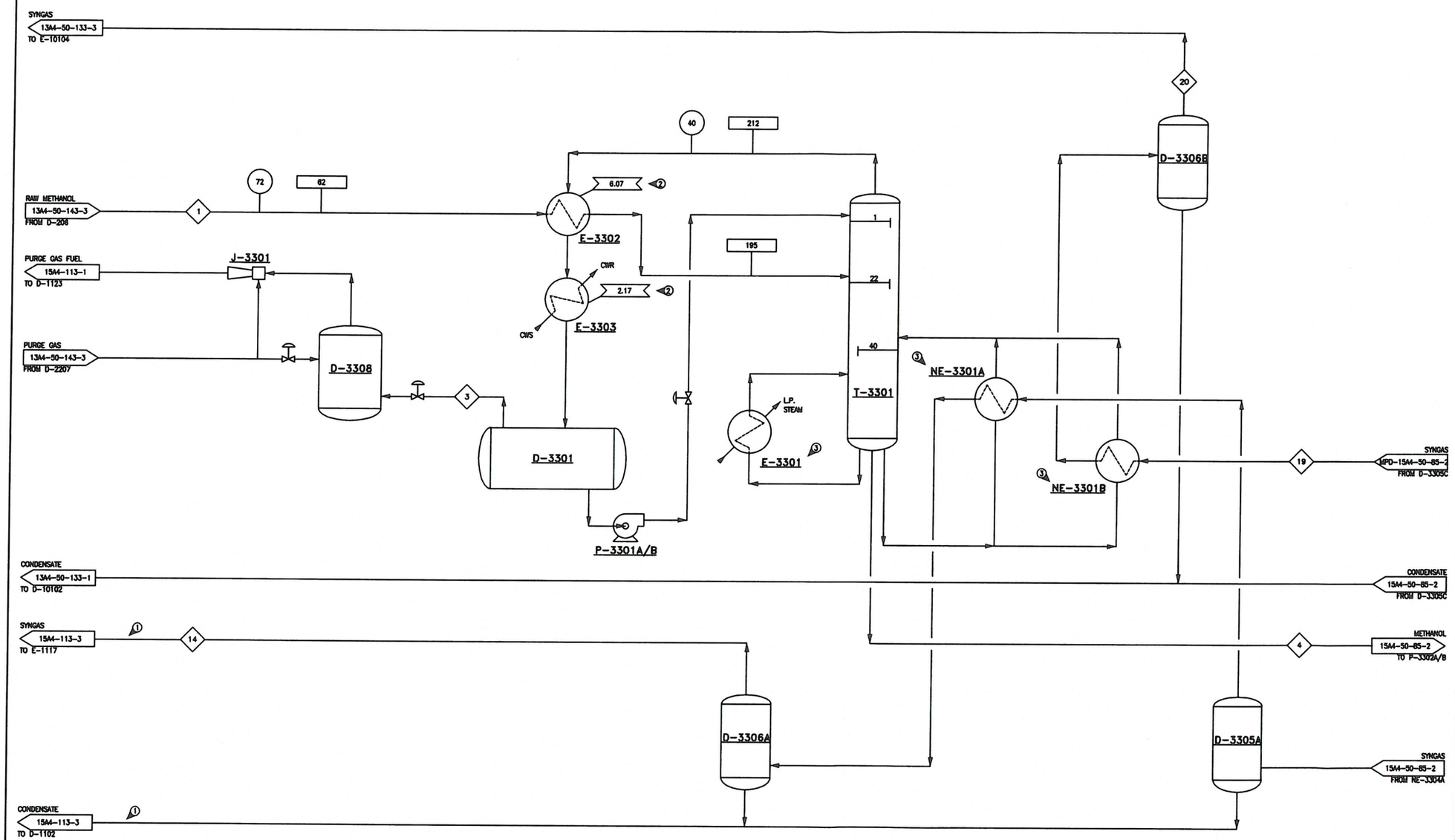
REF. DWG. NO.	REFERENCE DRAWING TITLE	REV	REVISION DESCRIPTION	BY	CHK	APP	DATE	REV	REVISION DESCRIPTION	BY	CHK	APP	DATE

CONTRACT NO.	DWG. NO.	REV.	SCALE
	BR5170-13A4-50-143-3	A	NONE

DWG. TITLE
PROCESS FLOW DIAGRAM
METHANOL PLANT
LP. METHANOL SYNTHESIS-CRUDE METHANOL
UNIT 2000

11/17/2016 1:30 PM GUNNC PC-10129 JPI/58SI55XX/US METHANOL CORPORATION/58SI55XX-US METHANOL PLANT RELOCATION PROJECT/ENGINEERING/ALL DOCUMENTS/CO-1 FLOWSHEETS/D065-PROCESS PFD AND HMB DRAWINGS/BR5170-13A4-50-143-3.DWG

J-3301 PURGE GAS EJECTOR	D-3308 PURGE GAS DRUM	E-3302 RAW METHANOL PREHEATER	E-3303 ETHER COLUMN O/H CONDENSER	D-3301 ETHER COLUMN O/H DRUM	E-3301 ETHER COLUMN STEAM REBOILER	T-3301 ETHER COLUMN	D-3306A U-1000 PROCESS CONDENSATE DRUM	NE-3301A/B ETHER COLUMN SYNGAS REBOILERS	D-3305A U-1000 PROCESS CONDENSATE DRUM	D-3306B ATR WARM CONDENSATE SEPARATOR



P-3301A/B
ETHER COLUMN REFLUX
PUMPS

NOTES:

1. SEE PFD MNR5170-15A4-113-3.
2. COMBINED OVERHEAD DUTY 8.24 MMBtu/hr.
3. COMBINED REBOILER DUTY 9.63 MMBtU/hr.
4. PROCESS TEMPERATURES AND PRESSURES ARE BASED ON GPC QUIMICA SIMULATION ASPEN VI-CASO XX.

PFD LEGEND

- STREAM NUMBER
- TEMPERATURE, °F
- PRESSURE, PSIG
- DUTY, MMBtu/hr
- SCOPE CLOUD, CHANGE IN DESIGN FROM EXISTING PLANT DESIGN
- NOTE

A 07/11/16 ISSUED FOR APPROVAL

JACOBS

PROJECT NO.: 58-SI55-XX

us methanol

MPD-5170-15A4-50-85	NEW DISTILLATION UNIT SECTION 3000	A	ISSUED FOR APPROVAL	HMR	SPT	NMH	07/11/16

REF. DWG. NO.	REFERENCE DRAWING TITLE	REV	REVISION DESCRIPTION	BY	CHK	APP	DATE	REV	REVISION DESCRIPTION	BY	CHK	APP	DATE

CONTRACT NO.	DWG. NO.	REV.	SCALE
	MPD-5170-15A4-50-85-1	A	NONE

DWG. TITLE
PROCESS FLOW DIAGRAM
METHANOL PLANT
DISTILLATION UNIT
UNIT 3000

6/15/2016 7:15 AM GUNNC PC-10129 JPI/58SI55XX/US METHANOL CORPORATION/58SI55XX-US METHANOL PLANT RELOCATION PROJECT/ENGINEERING/ALL DOCUMENTS/CO-1 FLOWSHEETS/D065-PROCESS PFD AND HMB DRAWINGS/MPD-5170-15A4-50-85-1.DWG

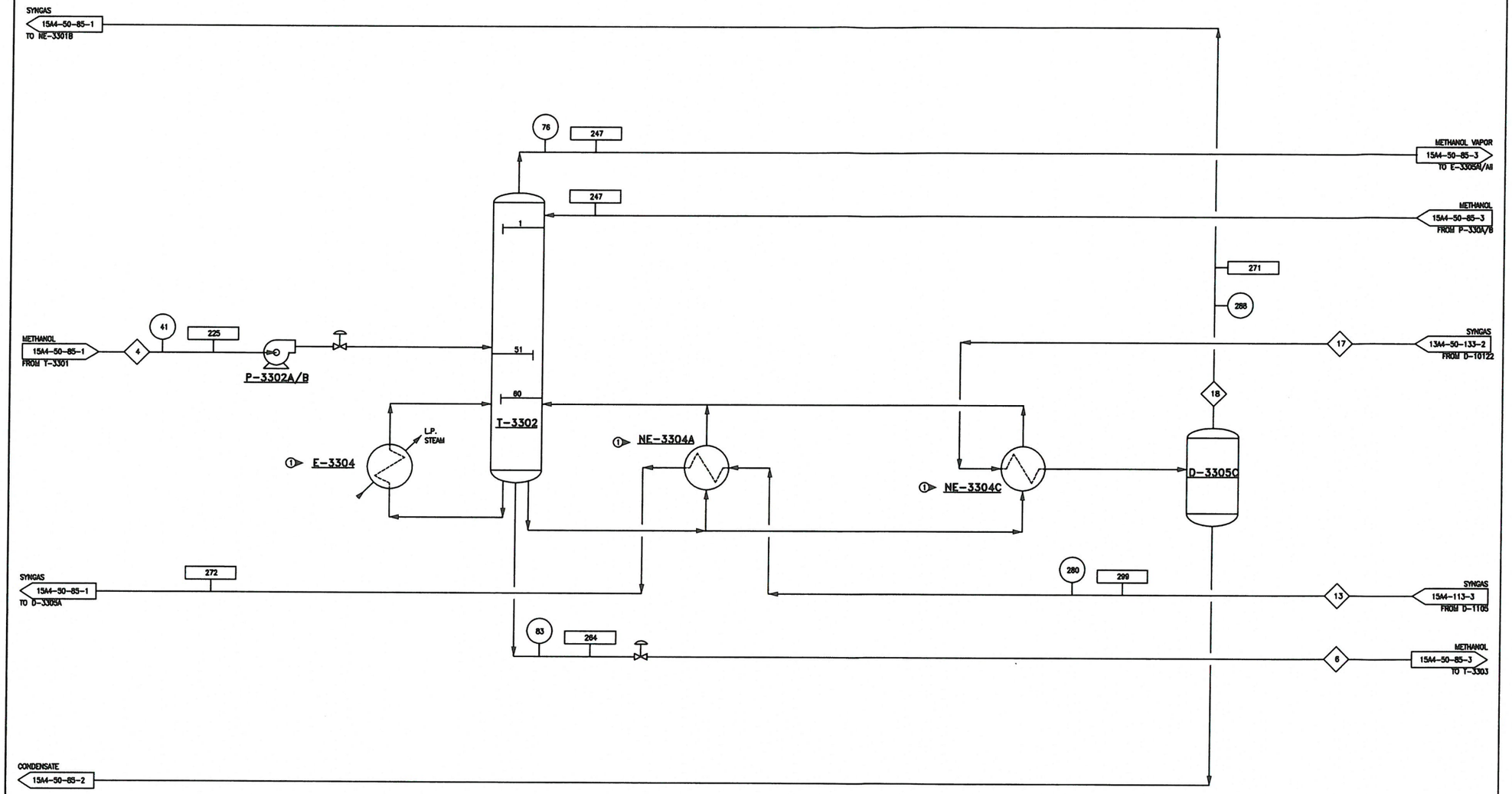
E-3304
INTERMEDIATE COLUMN
STEAM REBOILER

T-3302
INTERMEDIATE
COLUMN

NE-3304A/C
INTERMEDIATE COLUMN U-1000
SYNGAS REBOILERS

D-3305C
ART HOT CONDENSATE
SEPARATOR

NOTES:
1. TOTAL REBOILER DUTY 28.64 MMBtu/hr.
2. PROCESS TEMPERATURES AND PRESSURES ARE BASED ON GPC QUIMICA SIMULATION ASPEN VI-CASO XX.



PFD LEGEND

- STREAM NUMBER
- TEMPERATURE, °F
- PRESSURE, PSIG
- DUTY, MMBtu/hr
- SCOPE CLOUD, CHANGE IN DESIGN FROM EXISTING PLANT DESIGN
- NOTE

A 07/11/16 ISSUED FOR APPROVAL

P-3302A/B
INTERMEDIATE COLUMN
FEED PUMPS

JACOBS
PROJECT NO.: 58-SI55-XX

us methanol

MPD-5170-15A4-50-85	NEW DISTILLATION UNIT SECTION 3000	A	ISSUED FOR APPROVAL	HMR	SPT	NMH	07/11/16						
REF. DWG. NO.	REFERENCE DRAWING TITLE	REV	REVISION DESCRIPTION	BY	CHK	APP	DATE	REV	REVISION DESCRIPTION	BY	CHK	APP	DATE

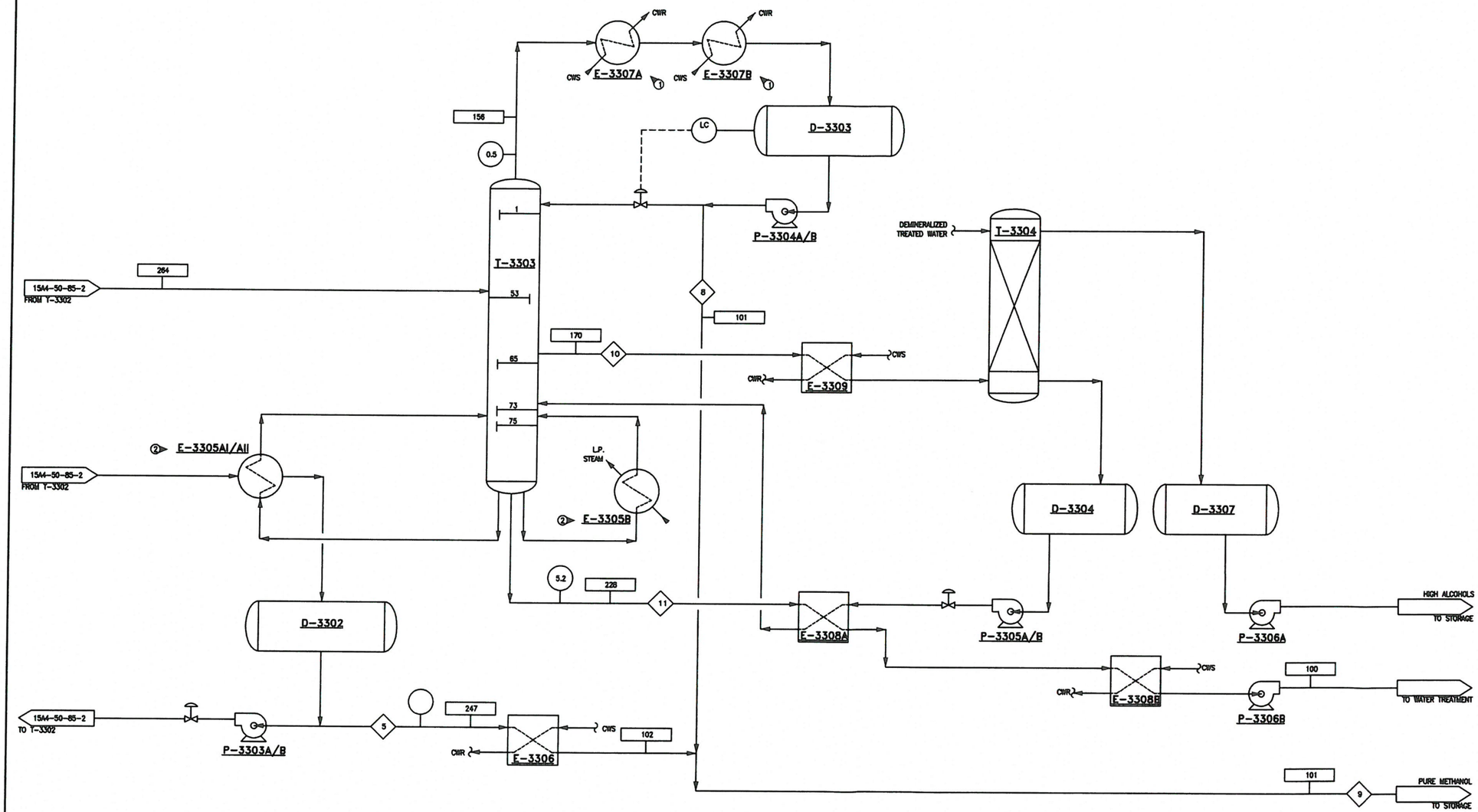
CONTRACT NO.	DWG. NO.	REV.	SCALE
	MPD-5170-15A4-50-85-2	A	NONE

DWG. TITLE
PROCESS FLOW DIAGRAM
METHANOL PLANT
DISTILLATION UNIT
UNIT 3000

6/15/2016 7:15 AM GUNNC PC-10129 JPI/58SI55XX/US METHANOL CORPORATION/58SI55XX-US METHANOL PLANT RELOCATION PROJECT/ENGINEERING/ALL DOCUMENTS/CO-1 FLOWSHEETS/D065-PROCESS PFD AND HMB DRAWINGS/MPD-5170-15A4-50-85-2.DWG

E-3305AI/AII RECTIFYING COLUMN REBOILERS	D-3302 INTERMEDIATE COLUMN O/H DRUM	T-3303 RECTIFYING COLUMN	E-3307A/B RECTIFYING COLUMN O/H CONDENSERS	E-3305B RECTIFYING COLUMN STEAM REBOILER	D-3303 RECTIFYING COLUMN O/H DRUM	E-3306 PURE METHANOL COOLER	E-3309 HIGHER ALCOHOLS COOLER	E-3308A FIRST WASTE WATER COOLER	E-3308B SECOND WASTE WATER COOLER	T-3304 EXTRACTION COLUMN	D-3304 LEAN METHANOL SOLUTION DRUM	D-3307 HIGHER ALCOHOLS DRUM

NOTES:
1. TOTAL OVERHEAD DUTY 33.01 MMBtu/hr.
2. TOTAL REBOILER DUTY 29.23 MMBtu/hr.
3. PROCESS TEMPERATURES AND PRESSURES ARE BASED ON GPC QUIMICA SIMULATION ASPEN VI-CASO XX.



PFD LEGEND
- STREAM NUMBER
- TEMPERATURE, °F
- PRESSURE, PSIG
- DUTY, MMBtu/hr
- SCOPE CLOUD, CHANGE IN DESIGN FROM EXISTING PLANT DESIGN
- NOTE

A 07/11/16 ISSUED FOR APPROVAL

JACOBS

PROJECT NO.:58-SI55-XX

us methanol

P-3303A/B INTERMEDIATE COLUMN REFLUX PUMPS	P-3304A/B RECTIFYING COLUMN REFLUX PUMPS	P-3305A/B LEAN METHANOL REFLUX PUMPS	P-3306A HIGHER ALCOHOLS STORAGE PUMP	P-3306B CONTAMINATED WATER PUMP

MPD-5170-15A4-50-85	NEW DISTILLATION UNIT SECTION 3000	A	ISSUED FOR APPROVAL	HMR	SPT	NMH	07/11/16

REF. DWG. NO.	REFERENCE DRAWING TITLE	REV	REVISION DESCRIPTION	BY	CHK	APP	DATE	REV	REVISION DESCRIPTION	BY	CHK	APP	DATE

CONTRACT NO.	DWG. NO.	REV.	SCALE
	MPD-5170-15A4-50-85-3	A	NONE

DWG. TITLE
PROCESS FLOW DIAGRAM
METHANOL PLANT
DISTILLATION UNIT
UNIT 3000

8/1/2016 12:01 PM GUNNC PC-10129 JPI/58SI55XX/US METHANOL CORPORATION/58SI55XX-US METHANOL PLANT RELOCATION PROJECT/ENGINEERING/ALL DOCUMENTS/CO-1 FLOWSHEETS/D065-PROCESS PFD AND HMB DRAWINGS/MPD-5170-15A4-50-85-3.DWG

T-XXXX
FUSEL OIL TANK
10' 6" Dia x 20' L
Nominal Capacity: 12,000 gal

T-XXXX
RUNDOWN TANK
24' Dia x 24' L
Nominal Capacity: 75,000 gal

T-XXXX
RUNDOWN TANK
24' Dia x 24' L
Nominal Capacity: 75,000 gal

T-XXXX
SLOP TANK
34' Dia x 24' L
Nominal Capacity: 150,000 gal

T-XXXX
SALES TANK
70' Dia x 40' L
Nominal Capacity: 1,000,000 gal

T-XXXX
SALES TANK
70' Dia x 40' L
Nominal Capacity: 1,000,000 gal

D-XXXX
SCRUBBER
__' Dia x __' L
Nominal Capacity: _____ gal

T-XXXX
PRODUCT TANK
70' Dia x 40'" L
Nominal Capacity: 1,000,000 gal

T-XXXX
PRODUCT TANK
70' Dia x 40' L
Nominal Capacity: 1,000,000 gal

D-XXXX
SCRUBBER
__' Dia x __' L
Nominal Capacity: _____ gal

P-XXXX
FUSEL OIL TANK PUMP
1 X 100%

P-XXXXA/B
RUNDOWN TANK PUMPS
2 X 100%

P-XXXXA/B
SLOP TANK PUMPS
2 X 100%

P-XXXXA/B
SALES TANK PUMPS
2 X 100%

P-XXXXA/B
PRODUCT TANK PUMPS
2 X 100%

3E
2C

4E
3C

ISBL | OSBL

OSBL | LOADING

MeOH PRODUCTION UNIT

N2

RUNDOWN TANK
TK1/5S/2C
T-XXXX

RUNDOWN TANK
TK2/6S/2C
T-XXXX

FUSEL OIL TANK
TK3/7S/2C
T-XXXX

P-XXXXA/B
RUNDOWN TANK PUMPS
(Note 2)

P-XXXX
FUSEL OIL TANK PUMP

SALES TANK
TK4/8S/2C
T-XXXX

SALES TANK
TK5/9S/2C
T-XXXX

SLOP TANK
TK6/10S/2C
T-XXXX

SALES TANK PUMPS
(Note 2)

P-XXXXA/B

P-XXXXA/B
SLOP TANK PUMPS
(Note 2)

ATM
WATER
D-XXXX SCRUBBER
TO WATER DISPOSAL

ATM
RIVER WATER
D-XXXX SCRUBBER
TO WATER DISPOSAL

PRODUCT TANK
(Note 4)
TK7/12S/3C
T-XXXX

PRODUCT TANK
(Note 1)
TK8/13S/3C
T-XXXX

Vapor Recovery Line from Barge

To #1 Barge Dock (Note 3)

P-XXXXA/B
PRODUCT TANK PUMPS
(Note 2)

Barge Loading
14S/3C

NNF

To Truck Loading

Truck Loading/11S/2C

NOTES:
1. Not needed for start-up
2. Spare pump to be installed for start-up
3. Provide loading proving meter
4. Contaminated product to be sent to barge

us methanol

JACOBS

LIBERTY 1 METHANOL PLANT RELOCATION
PROCESS FLOW DIAGRAM
STORAGE AND TRANSFER AREA

Drawn by: NH / 3-JUN-2016 SKETCH # 58SI55XX-D01-D050-0001 REV G

ATTACHMENT G

PROCESS DESCRIPTION

ATTACHMENT G

PROCESS DESCRIPTION

US Methanol LLC is proposing to relocate an existing facility to Institute, West Virginia. The process portions of the plant (i.e., reformers, air separation unit, methanol synthesis, and methanol distillation) are being moved from the Brazil location. These units are considered inside the battery limit of the facility. Outside the battery limit portions of the facility are the tanks for storage of low-grade methanol (slop tank), product methanol (rundown tanks), methanol storage (sales tanks and product tanks), byproduct (fusel oil storage tank), and material load out to truck or barge. This will be new equipment.

The facility will utilize pipeline quality natural gas, water, and electricity to produce intermediate syngas in the reformers. Syngas will be transformed to raw methanol in the methanol synthesis process and then distilled to purity in the distillation unit. The products will be stored in the tanks. The methanol will be loaded to barges on the Kanawha River for delivery to customers. Fusel oil will be loaded to trucks for shipment off-site.

Emissions from the process are generated through natural gas and purge gas combustion in the heaters of the reforming units, flare emissions from process vents which include both operational flaring and startup and shutdown flaring, tank emissions which are vented to scrubbers for control, vehicle activity (road dust), and barge and truck loading which is vented to scrubbers for control. There is no other combustion at this facility. Motors within the facility are either electric or steam driven.

The following is a brief description of the main processes within the facility. These main process units include the Steam Methane Reformer (Unit 1000), Auto Thermal Reformer (Unit 10,000), Methanol Synthesis (Unit 2000), and Methanol Distillation (Unit 3000). The 2 reformer units operate differently and are discussed below. General process flow diagrams are provided in this discussion. Detailed process flow diagrams are provided in Attachment F.

Steam Methane Reformer (Unit 1000)

The steam methane reforming unit (SMR) is a downfired steam-methane reformer equipped with 88 catalyst tubes laid out in four rows of 22 catalyst tubes. The 25-35 niobium alloy tubes run at 890°C and 20 bar.

This reformer has a high radiant efficiency due to the high inlet temperature of approximately 550°C to the radiant section and the use of high combustion air preheats at approximately 550°C. Prior to the natural gas entering into the reformer, a hydro-desulfurization unit removes trace amounts of sulfur in the natural gas. The SMR employs optimized heat transfer designs, advanced low-NO_x burners, and employs controlled excess air forced inlet flow and draft flows to minimize NO_x emissions eliminating the need for fuel gas treatment.

Steam is generated in the reformer outlet raw gas waste-heat boiler at about 64 bar. This steam is superheated in the reformer convection section. The rest of the syngas heat recovery train utilizes an economizer, reboilers for the methanol distillation section, make-up boiler feed-water pre-heater, and final syngas cooling exchangers.

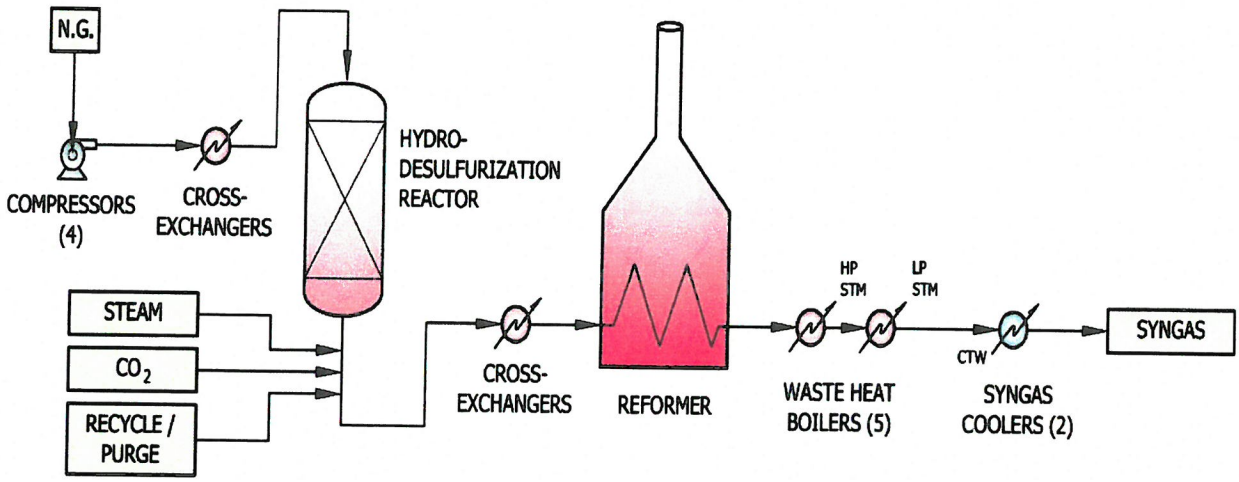


Figure 1 – Steam Methane Reformer Unit #1000 General Process Flow Diagram

The incoming natural gas is first compressed, and then routed through a hydrodesulfurization reactor. Steam, CO_2 (optional), and recycle/purge gases are then combined with the natural gas prior to feeding the steam-methane reformer. The reformed syngas is then routed to the waste heat boilers. The syngas pressure and temperature after heat recovery and final refrigerant cooling is about 18 bar and 10°C. Steam generated in the raw gas waste-heat boiler and the reformer is at about 64 bar and is superheated in the reformer's convection section.

The feed streams are combined with purge and recycle streams. The syngas production has the following approximate composition (mole %); 67% hydrogen, 14.5% CO, 7.4% CO_2, 3.1% methane, and the remainder as nitrogen and water with a methanol production capacity of 310 tons per day.

Auto Thermal Reformer (Unit 10,000)

The auto thermal reforming (ATR) unit has a hydrodesulfurization section for removing trace amounts of sulfur in the natural gas feed. The natural gas is then mixed with hydrogen and steam at 550°C before combining with oxygen in the ATR.

Steam is produced by a waste-heat boiler at 64 bar. This is followed by a steam superheater (480°C), an economizer, reboilers for the methanol distillation section, make-up boiler feed-water pre-heater, and final syngas cooling exchangers.

Oxygen for the ATR unit is provided by an air separation unit (ASU). The unit uses molecular sieve absorbers for trace water and CO_2 removal and two-column distillation to produce 99.5% pure oxygen at 6 bar. Front-end air compression is provided by a Demag four-stage centrifugal

compressor driven by a 3500 hp Westinghouse motor. Final pure oxygen compression is provided by an electrical driven three-stage Sulzer reciprocating compressor. This oxygen plant also produces about 390 mt/day of pure nitrogen at just above atmospheric pressure.

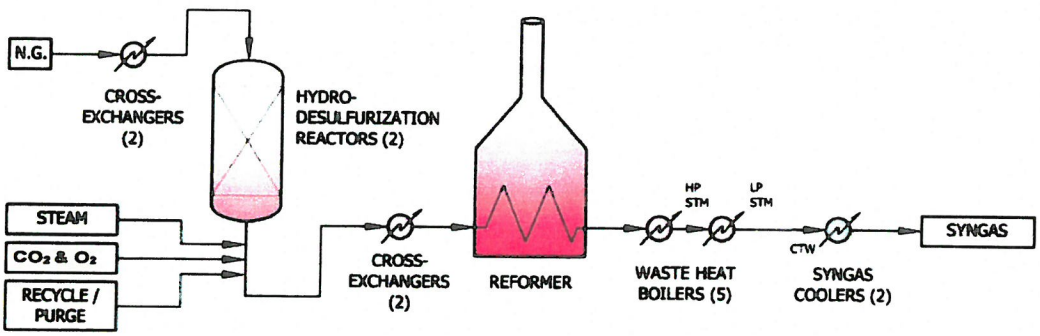


Figure 2 – Auto Thermal Reformer Unit #10,000 General Process Diagram

The incoming natural gas is first routed through two hydro-desulfurization reactors. Steam, CO_2 (optional), and recycle/purge gases are then combined with the natural gas prior to feeding the auto-thermal reformer. The reformed syngas is then routed to the waste heat boilers. The syngas pressure and temperature after heat recovery and final refrigerant cooling is about 17 bar and 9°C. Steam generated in the raw gas waste-heat boiler and the reformer is at about 64 bar and is superheated in the reformer's convection section to about 480°C.

The syngas from this unit has the following approximate composition (mole %); 74% hydrogen, 16% CO, 6.7% CO_2, 2.9% methane, and the remainder as nitrogen and water with a methanol production capacity of 270 tons per day.

Methanol Synthesis Unit (Unit 2000)

The low-pressure methanol synthesis unit with a capacity of 580 t/day is fed with syngas with the following approximate composition (mole %) from the reformers (Unit 1000 and 10,000); 70% hydrogen, 18% CO, 8.8% CO_2, 2.5% methane, and the remainder as nitrogen and water.

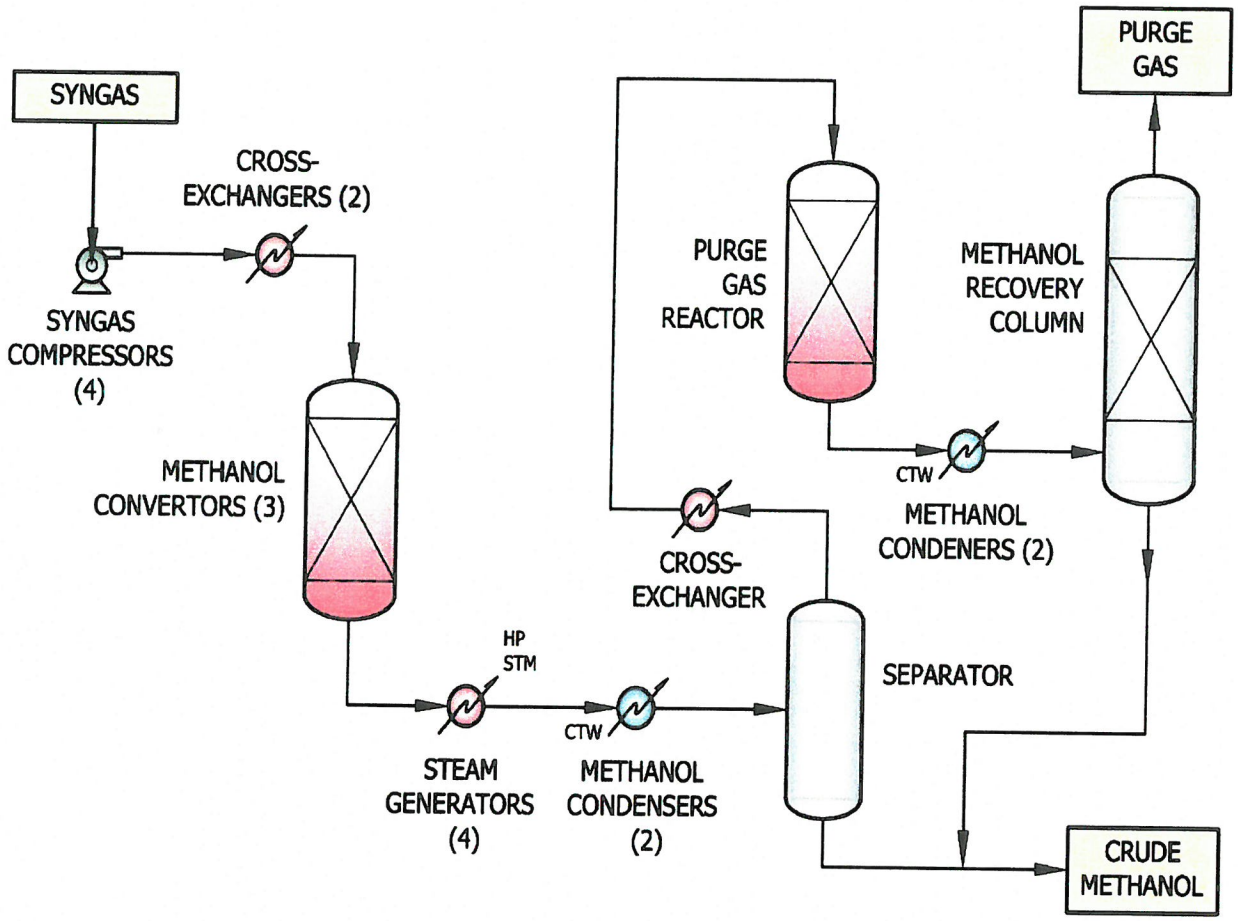


Figure 3 – Methanol Synthesis Unit #2000 General Process Flow Diagram

Syngas is compressed to about 65 bar using four syngas compressors before entering the three methanol converters (in series). Steam at 28 bar pressure is generated from the highly exothermic reaction in four waste heat boilers. The methanol stream is then condensed before entering the separator vessel. The overheads from the separator go to the purge gas reactor and methanol recovery column for recovery of the methanol carried overhead. The purge gas going overhead in the methanol recovery column is generally recycled back to the reformers. The crude methanol from the bottom of the separator is sent to the methanol distillation unit.

The unit design provides the maximum thermal efficiency and steam production using three single-bed reactors in series. Each reactor holds 17 cubic meters of methanol synthesis catalyst. There are waste-heat boilers located in between each reactor for generating 28 bar steam. The unit is operated at about 65 bar with a recycle gas to makeup gas ratio of 5.0 – 5.5.

Make-up gas and recycle gas compression for the unit is provided with three Dresser Rand reciprocating compressors in parallel. Each machine has three single-stage makeup gas cylinders and one recycle gas re-compression cylinder. The two 1800 hp machines are electric-motor

driven and the larger 2500 hp machine is driven with a steam-condensing turbine through a gear-reducer.

The crude methanol leaves the synthesis unit at an approximate composition of 75% methanol, 24% water, and some dissolved gases.

Methanol Distillation Unit (Unit 3000)

The methanol distillation unit is a high thermal-efficiency, three-column system capable of distilling approximately 580 t/day of methanol. The reboiler heat consumption for this unit is only 1.1 mt of steam per metric ton of methanol.

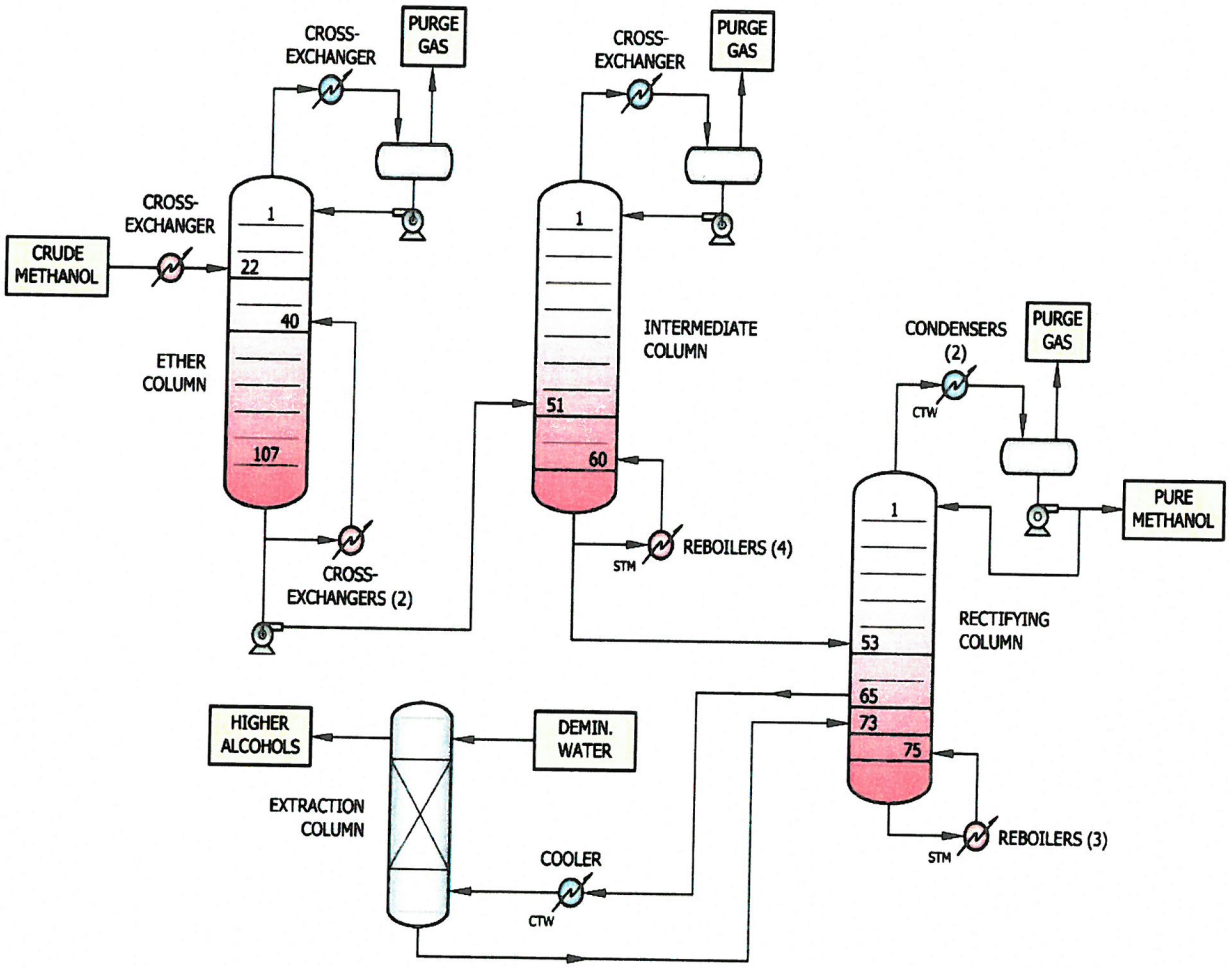


Figure 4 – Methanol Distillation Unit #3000 General Process Flow Diagram

Crude methanol enters the distillation unit with a composition of about 75% methanol, 24% water, and some dissolved gases. The crude methanol specifically enters the process at tray #22 in the 107-tray ether column. The overheads from this column are condensed and used for

reflux. The purge gas leaving the column overheads is generally sent back to the reformer feed stream.

The bottoms from the ether column are pumped to tray #51 of the 60-tray intermediate column. The overheads from this column are condensed and used for reflux. The purge gas leaving the column overheads is generally sent back to the reformer feed stream.

The bottoms from the intermediate column are pumped to tray #53 of the 75-tray rectifying column. The overheads from this column are the pure methanol stream which is condensed and used for reflux and also pumped out to the methanol storage tank. The purge gas leaving the column overheads is generally sent back to the reformer feed stream.

A side-stream from tray #65 of the rectifying column flows to the extraction column for removal of the higher alcohols. The extraction column uses demineralized water flowing counter-current to the rising higher alcohol vapors. Any remaining methanol absorbs into the water and is sent back to tray #73 of the rectifying column. The final pure methanol product leaves with a purity of 99.959% methanol with 0.028% water and 0.013% ethanol.

Air Separation Unit (ASU)

Oxygen for the ATR unit is provided by a 150 mt/day (oxygen) air separation unit (ASU). The unit uses molecular sieve absorbers for trace water and CO_2 removal and two-column distillation to produce 99.5% pure oxygen at 6 bar. Front-end air compression is provided by a Demag four-stage centrifugal compressor driven by a 3500 hp Westinghouse motor. Final pure oxygen compression is provided by a three-stage Sulzer reciprocating compressor. This oxygen plant also produces about 390 mt/day of pure nitrogen at just above atmospheric pressure.

Storage Tanks and Load Out

There are 10 storage tanks propose proposed with this installation. The tanks are located in two (2) distinct areas of the plant considered Area 4 which is storage at the plant proper area and Area 12 which is the barge loading storage area. Area 4 has the following tanks: two (2) 75,000 gallon run down tanks which are the tanks the methanol first enters after leaving the methanol distillation unit, a 12,000 gallon fusel oil tank, two (2) 1.2 million gallon floating roof tanks for methanol sales storage, and a 150,000 slop tank for off grade methanol. Area 12 has two (2) product loading tanks in the barge loading area which are 1.2 million gallon floating roof tanks for methanol. Area 4 has each tank venting to a main scrubber. Area 12 has both tanks venting to a main scrubber. The tanks in Area 12 will not be installed during the initial facility construction. The barges will be loaded directly from Area 4 tanks until Area 12 tanks are installed.

Methanol will be shipped via barge on the Kanawha River from Area 12. Product/sales methanol will be transferred to the barges. Fusel oil will be loaded to trucks for shipment off-site from Area 4. Loading of the trucks and barges are controlled by the scrubbers in the area.

Utilities Provided By Others

Startup steam, water, electric, and wastewater treatment activities will be purchased from others. Firewater service will be supplied by the existing water system; therefore, no fire pumps (with engines) are required. There are also no emergency generators proposed for the facility.

Brief Description of the Startup and Shutdown

Unit 1000 is started first. Unit 10,000 is started second. During the start-up of Unit 1000 there are emissions to atmosphere until the reformer reaches operating temperature and conditions. There are no emissions to atmosphere from Unit 2000 or Unit 3000 during start-ups. Once Unit 1000 is started the start-up of Unit 10,000 can be initiated. During the Unit 10,000 start-up, there are no emissions to atmosphere other than under normal operating conditions of the plant.

Startup of Unit 1000

The cold startup of Unit 1000 begins with the recirculation of nitrogen until the outlet of the tube reformers achieves 500°C. Then steam is introduced until the flow reaches 9,500 kg/h, at which point the N2 recirculation is stopped.

The natural gas control valve is then opened allowing 1,000 kg/h to the reformer and the produced syngas is sent to the flare via PIVC-1466. Samples are taken to analyze the methane/syngas conversion while the natural gas flow is increased by increments of 500 kg/h. When the flow achieves 3,000 kg/h and the methane content is low enough in the syngas such that it can be introduced in the Methanol Synthesis Unit (Unit 2000), valve PIVC-1466 is closed and normal operation conditions commence. Approximately 5 hours of time elapses during which PIVC-1466 is open.

Startup of Unit 10,000

Unit 10,000 can be started once Unit 1000 is running without the necessity of venting/flaring any natural gas or syngas.

Shutdown

During the shutdown, operating to a full cold stop, the natural gas flow rate is being reduced at a rate of 500 kg/h while sending the produced syngas to Unit 2000. When the natural gas flow drops to 600 kg/h, the natural gas control valve is completely closed. At this moment there is just steam flowing through the reformer. The pressure of the system is reduced sending the syngas to the flare until the pressure reaches 85 psi.

When the outlet temperature of the tube reformers reaches 500°C the nitrogen recirculation begins and the steam control valve is completely closed. The temperature of the reformer is decreased in a rate of 50°C/h. During this procedure the volume system of the system is vented to the flare several times employing nitrogen until samples do not show any amount of hydrocarbons.

During shut-down the maximum volume of syngas flared is equal to the contained volume of syngas in the plant.

Flaring

Flaring scenarios are identified and emissions associated with the flaring are shown in Attachment N. The flaring scenarios are as flaring from PIVC-1466 Cold Startup (based on natural gas flaring and a total of 15 hours per year), Shutdown (syngas flaring with a total of 9 hours per year), PRV-1323 (syngas flaring with a total of 15 hours per year), PRV-10505 (syngas flaring with a total of 15 hours per year), PRV-3301/2/3 (syngas flaring with a total of 15 hour per year), and PRV-1453 (syngas flaring with a total of 15 hours per year).

ATTACHMENT H

MATERIAL SAFETY DATA SHEETS

SAFETY DATA SHEET

Version 6.1

Revision Date 16.04.2013

Print Date 15.09.2013

1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1 Product identifiers

Product name : Methanol

Product Number : 494437
Brand : Sigma-Aldrich

1.2 Other means of identification

Methyl alcohol

1.3 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Manufacture of substances

1.4 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Pty. Ltd.
12 Anella Avenue
CASTLE HILL NSW 2154
AUSTRALIA

Telephone : +61 2 9841 0555 (1800 800 097)
Fax : +61 2 9841 0500 (1800 800 096)

1.5 Emergency telephone number

Emergency Phone # : +44 (0)8701 906777 (1800 448 465)

2. HAZARDS IDENTIFICATION

2.1 GHS Classification

Flammable liquids (Category 2)
Acute toxicity, Oral (Category 3)
Acute toxicity, Inhalation (Category 3)
Acute toxicity, Dermal (Category 3)
Specific target organ toxicity - single exposure (Category 1)

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H225 Highly flammable liquid and vapour.
H301 Toxic if swallowed.
H311 Toxic in contact with skin.
H331 Toxic if inhaled.
H370 Causes damage to organs.

Precautionary statement(s)

Prevention	
P210	Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P233	Keep container tightly closed.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
Response	
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P307 + P311	IF exposed: Call a POISON CENTER or doctor/ physician.
P361	Remove/Take off immediately all contaminated clothing.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
Storage	
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.

2.3 Other hazards

This substance is not considered to be persistent, bioaccumulating nor toxic (PBT)., This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	:	Methyl alcohol
Formula	:	CH_4O
Molecular Weight	:	32.04 g/mol
CAS-No.	:	67-56-1
EC-No.	:	200-659-6
Index-No.	:	603-001-00-X
Registration number	:	01-2119433307-44-XXXX

Component	Classification	Concentration
Methanol		
	Flam. Liq. 2; Acute Tox. 3; STOT SE 1; H225, H301, H311, H331, H370	-

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
no data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Carbon oxides

5.3 Advice for firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

5.4 Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Wear respiratory protection. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Keep away from sources of ignition - No smoking.Take measures to prevent the build up of electrostatic charge.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Store in cool place. Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

7.3 Specific end use(s)
A part from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Occupational Exposure Limits

Component	CAS-No.	Value	Control parameters	Basis
Methanol	67-56-1	STEL	250 ppm 328 mg/m3	Australia. Workplace Exposure Standards for Airborne Contaminants.
	Remarks	Skin absorption ACGIH is the documentation source		
		TWA	200 ppm 262 mg/m3	Australia. Workplace Exposure Standards for Airborne Contaminants.
		Skin absorption ACGIH is the documentation source		

8.2 Exposure controls

Appropriate engineering controls
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

The selected protective gloves have to satisfy the specifications of EU Directive 89/686/EEC and the standard EN 374 derived from it.

Full contact
Material: butyl-rubber
Minimum layer thickness: 0.3 mm
Break through time: 480 min
Material tested:Butoject® (KCL 897 / Aldrich Z677647, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.4 mm
Break through time: 31 min
Material tested:Camatril® (KCL 730 / Aldrich Z677442, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Complete suit protecting against chemicals, Flame retardant antistatic protective clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid Colour: colourless
b)	Odour	pungent
c)	Odour Threshold	no data available
d)	pH	no data available
e)	Melting point/freezing point	Melting point/range: -98 °C
f)	Initial boiling point and boiling range	64.7 °C
g)	Flash point	9.7 °C - closed cup
h)	Evapouration rate	no data available
i)	Flammability (solid, gas)	no data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 36 %(V) Lower explosion limit: 6 %(V)
k)	Vapour pressure	130.3 hPa at 20.0 °C 546.6 hPa at 50.0 °C 169.27 hPa at 25.0 °C
l)	Vapour density	1.11
m)	Relative density	0.791 g/mL at 25 °C
n)	Water solubility	completely miscible
o)	Partition coefficient: n-octanol/water	log Pow: -0.77
p)	Auto-ignition temperature	455.0 °C at 1,013 hPa
q)	Decomposition temperature	no data available
r)	Viscosity	no data available
s)	Explosive properties	Not explosive
t)	Oxidizing properties	The substance or mixture is not classified as oxidizing.

9.2 Other safety information

Minimum ignition energy	0.14 mJ
Conductivity	< 1 µS/cm
Relative vapour density	1.11

10. STABILITY AND REACTIVITY

10.1 Reactivity

no data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
no data available

10.4 Conditions to avoid
Heat, flames and sparks. Extremes of temperature and direct sunlight.

10.5 Incompatible materials
Acid chlorides, Acid anhydrides, Oxidizing agents, Alkali metals, Reducing agents, Acids

10.6 Hazardous decomposition products
Other decomposition products - no data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LDLO Oral - Human - 143 mg/kg
Remarks: Lungs, Thorax, or Respiration:Dyspnea. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea.

LD50 Oral - rat - 1,187 - 2,769 mg/kg

LC50 Inhalation - rat - 4 h - 128.2 mg/l

LC50 Inhalation - rat - 6 h - 87.6 mg/l

LD50 Dermal - rabbit - 17,100 mg/kg

Skin corrosion/irritation
Skin - rabbit
Result: No skin irritation

Serious eye damage/eye irritation
Eyes - rabbit
Result: No eye irritation

Respiratory or skin sensitisation
Maximisation Test - guinea pig
Does not cause skin sensitisation.
(OECD Test Guideline 406)

Germ cell mutagenicity
Ames test
S. typhimurium
Result: negative

in vitro assay
fibroblast
Result: negative
Mutation in mammalian somatic cells.

Mutagenicity (in vivo mammalian bone-marrow cytogenetic test, chromosomal analysis)
mouse - male and female
Result: negative

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

Reproductive toxicity
Damage to fetus not classifiable

Fertility classification not possible from current data.

Specific target organ toxicity - single exposure
Causes damage to organs.

Specific target organ toxicity - repeated exposure
The substance or mixture is not classified as specific target organ toxicant, repeated exposure.

Aspiration hazard
No aspiration toxicity classification

Additional Information
RTECS: PC1400000

Methyl alcohol may be fatal or cause blindness if swallowed.
Effects due to ingestion may include:, Headache, Dizziness, Drowsiness, metabolic acidosis, Coma, Seizures.
Symptoms may be delayed., Damage of the:, Liver, Kidney

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	mortality LC50 - Lepomis macrochirus (Bluegill) - 15,400.0 mg/l - 96 h
	NOEC - Oryzias latipes - 7,900 mg/l - 200 h
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - > 10,000.00 mg/l - 48 h
Toxicity to algae	Growth inhibition EC50 - Scenedesmus capricornutum (fresh water algae) - 22,000.0 mg/l - 96 h

12.2 Persistence and degradability

Biodegradability	aerobic - Exposure time 5 d Result: 72 % - rapidly biodegradable
Biochemical Oxygen Demand (BOD)	600 - 1,120 mg/g
Chemical Oxygen Demand (COD)	1,420 mg/g
Theoretical oxygen demand	1,500 mg/g

12.3 Bioaccumulative potential

Bioaccumulation	Cyprinus carpio (Carp) - 72 d at 20 °C - 5 mg/l Bioconcentration factor (BCF): 1.0

12.4 Mobility in soil
Will not adsorb on soil.

12.5 Results of PBT and vPvB assessment
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT)., This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

12.6 Other adverse effects

Additional ecological information	Avoid release to the environment.
Stability in water	at 19 °C83 - 91 % - 72 h Remarks: Hydrolyses on contact with water.Hydrolyses readily.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

14.1 UN number

ADR/RID: 1230	IMDG: 1230	IATA-DGR: 1230

14.2 UN proper shipping name

ADR/RID: METHANOL
IMDG: METHANOL
IATA-DGR: Methanol

14.3 Transport hazard class(es)

ADR/RID: 3 (6.1)	IMDG: 3 (6.1)	IATA-DGR: 3 (6.1)

14.4 Packaging group

ADR/RID: II	IMDG: II	IATA-DGR: II

14.5 Environmental hazards

ADR/RID: no	IMDG Marine pollutant: no	IATA-DGR: no

14.6 Special precautions for user
no data available

15. REGULATORY INFORMATION

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

Standard for the Uniform Scheduling of Medicines and Poisons
Schedule 6

Carcinogen classification under WHS Regulation 2011, Schedule 10
Not listed

Notification status

AICS:	On the inventory, or in compliance with the inventory
DSL:	All components of this product are on the Canadian DSL.
ENCS:	On the inventory, or in compliance with the inventory
IECSC:	On the inventory, or in compliance with the inventory
ISHL:	On the inventory, or in compliance with the inventory
KECI:	On the inventory, or in compliance with the inventory
NZIoC:	On the inventory, or in compliance with the inventory
PICCS:	On the inventory, or in compliance with the inventory

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Flam. Liq.	Flammable liquids
H225	Highly flammable liquid and vapour.
H301	Toxic if swallowed.
H311	Toxic in contact with skin.
H331	Toxic if inhaled.
H370	Causes damage to organs.
STOT SE	Specific target organ toxicity - single exposure

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Safety Data Sheet

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

Chevron Lubricating Oil FM 32, 46, 68

Product Use: Food grade lubricant
Product Number(s): 232103, 255110, 255150
Company Identification
Chevron Products Company
a division of Chevron U.S.A. Inc.
6001 Bollinger Canyon Rd.
San Ramon, CA 94583
United States of America
www.chevronlubricants.com

Transportation Emergency Response
CHEMTREC: (800) 424-9300 or (703) 527-3887
Health Emergency
Chevron Emergency Information Center: Located in the USA. International collect calls accepted. (800) 231-0623 or (510) 231-0623
Product Information
email : lubemsds@chevron.com
Product Information: 1 (800) 582-3835, LUBETEK@chevron.com

SECTION 2 HAZARDS IDENTIFICATION

CLASSIFICATION: Not classified as hazardous according to 29 CFR 1910.1200 (2012).

SECTION 3 COMPOSITION/ INFORMATION ON INGREDIENTS

COMPONENTS	CAS NUMBER	AMOUNT
White mineral oil	8042-47-5	70 - 99 %wt/wt

SECTION 4 FIRST AID MEASURES

Description of first aid measures
Eye: No specific first aid measures are required. As a precaution, remove contact lenses, if worn, and flush eyes with water.
Skin: No specific first aid measures are required. As a precaution, remove clothing and shoes if

contaminated. To remove the material from skin, use soap and water. Discard contaminated clothing and shoes or thoroughly clean before reuse.
Ingestion: No specific first aid measures are required. Do not induce vomiting. As a precaution, get medical advice.
Inhalation: No specific first aid measures are required. If exposed to excessive levels of material in the air, move the exposed person to fresh air. Get medical attention if coughing or respiratory discomfort occurs.

Most important symptoms and effects, both acute and delayed
IMMEDIATE SYMPTOMS AND HEALTH EFFECTS
Eye: Not expected to cause prolonged or significant eye irritation.
Skin: Contact with the skin is not expected to cause prolonged or significant irritation. Contact with the skin is not expected to cause an allergic skin response. Not expected to be harmful to internal organs if absorbed through the skin. High-Pressure Equipment Information: Accidental high-velocity injection under the skin of materials of this type may result in serious injury. Seek medical attention at once should an accident like this occur. The initial wound at the injection site may not appear to be serious at first; but, if left untreated, could result in disfigurement or amputation of the affected part.

Ingestion: Not expected to be harmful if swallowed.
Inhalation: Not expected to be harmful if inhaled. Contains a petroleum-based mineral oil. May cause respiratory irritation or other pulmonary effects following prolonged or repeated inhalation of oil mist at airborne levels above the recommended mineral oil mist exposure limit. Symptoms of respiratory irritation may include coughing and difficulty breathing.

DELAYED OR OTHER SYMPTOMS AND HEALTH EFFECTS: Not classified.

Indication of any immediate medical attention and special treatment needed
Note to Physicians: In an accident involving high-pressure equipment, this product may be injected under the skin. Such an accident may result in a small, sometimes bloodless, puncture wound. However, because of its driving force, material injected into a fingertip can be deposited into the palm of the hand. Within 24 hours, there is usually a great deal of swelling, discoloration, and intense throbbing pain. Immediate treatment at a surgical emergency center is recommended.

SECTION 5 FIRE FIGHTING MEASURES

Leaks/ruptures in high pressure system using materials of this type can create a fire hazard when in the vicinity of ignition sources (eg. open flame, pilot lights, sparks, or electric arcs).

EXTINGUISHING MEDIA: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

PROTECTION OF FIRE FIGHTERS:
Fire Fighting Instructions: This material will burn although it is not easily ignited. See Section 7 for proper handling and storage. For fires involving this material, do not enter any enclosed or confined fire space without proper protective equipment, including self-contained breathing apparatus.
Combustion Products: Highly dependent on combustion conditions. A complex mixture of airborne solids, liquids, and gases including carbon monoxide, carbon dioxide, and unidentified organic compounds will be evolved when this material undergoes combustion.

SECTION 6 ACCIDENTAL RELEASE MEASURES

Protective Measures: Eliminate all sources of ignition in vicinity of spilled material.
Spill Management: Stop the source of the release if you can do it without risk. Contain release to prevent further contamination of soil, surface water or groundwater. Clean up spill as soon as possible, observing precautions in Exposure Controls/Personal Protection. Use appropriate techniques such as applying non-combustible absorbent materials or pumping. Where feasible and appropriate, remove contaminated

soil. Place contaminated materials in disposable containers and dispose of in a manner consistent with applicable regulations.
Reporting: Report spills to local authorities as appropriate or required.

SECTION 7 HANDLING AND STORAGE

Precautionary Measures: Do not get in eyes, on skin, or on clothing. DO NOT USE IN HIGH PRESSURE SYSTEMS in the vicinity of flames, sparks and hot surfaces. Use only in well ventilated areas. Keep container closed.
Wash thoroughly after handling.
General Handling Information: Avoid contaminating soil or releasing this material into sewage and drainage systems and bodies of water.
Static Hazard: Electrostatic charge may accumulate and create a hazardous condition when handling this material. To minimize this hazard, bonding and grounding may be necessary but may not, by themselves, be sufficient. Review all operations which have the potential of generating and accumulating an electrostatic charge and/or a flammable atmosphere (including tank and container filling, splash filling, tank cleaning, sampling, gauging, switch loading, filtering, mixing, agitation, and vacuum truck operations) and use appropriate mitigating procedures. For more information, refer to OSHA Standard 29 CFR 1910.106, 'Flammable and Combustible Liquids', National Fire Protection Association (NFPA 77, 'Recommended Practice on Static Electricity', and/or the American Petroleum Institute (API) Recommended Practice 2003, 'Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents'.
Container Warnings: Container is not designed to contain pressure. Do not use pressure to empty container or it may rupture with explosive force. Empty containers retain product residue (solid, liquid, and/or vapor) and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, static electricity, or other sources of ignition. They may explode and cause injury or death. Empty containers should be completely drained, properly closed, and promptly returned to a drum reconditioner or disposed of properly.

SECTION 8 EXPOSURE CONTROLS/PERSONAL PROTECTION

GENERAL CONSIDERATIONS:
Consider the potential hazards of this material (see Section 3), applicable exposure limits, job activities, and other substances in the work place when designing engineering controls and selecting personal protective equipment. If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, the personal protective equipment listed below is recommended. The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances.

ENGINEERING CONTROLS:
Use in a well-ventilated area.

PERSONAL PROTECTIVE EQUIPMENT
Eye/Face Protection: No special eye protection is normally required. Where splashing is possible, wear safety glasses with side shields as a good safety practice.
Skin Protection: No special protective clothing is normally required. Where splashing is possible, select protective clothing depending on operations conducted, physical requirements and other substances in the workplace. Suggested materials for protective gloves include: Neoprene, Nitrile Rubber, Silver Shield, Viton.
Respiratory Protection: No respiratory protection is normally required.
If user operations generate an oil mist, determine if airborne concentrations are below the occupational exposure limit for mineral oil mist. If not, wear an approved respirator that provides adequate protection from the measured concentrations of this material. For air-purifying respirators use a particulate cartridge. Use a positive pressure air-supplying respirator in circumstances where air-purifying respirators may not provide adequate protection.

Occupational Exposure Limits:

Component	Agency	TWA	STEL	Ceiling	Notation
White mineral oil	ACGIH	5 mg/m3	10 mg/m3	--	--
White mineral oil	OSHA Z-1	5 mg/m3	--	--	--

Consult local authorities for appropriate values.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Attention: the data below are typical values and do not constitute a specification.

Color: Colorless
Physical State: Liquid
Odor: Petroleum odor
Odor Threshold: No data available
pH: Not Applicable
Vapor Pressure: <0.01 mmHg @ 37.8 °C (100 °F)
Vapor Density (Air = 1): >1
Initial Boiling Point: 315°C (599°F)
Solubility: Soluble in hydrocarbons; insoluble in water
Freezing Point: Not Applicable
Melting Point: No data available
Specific Gravity: 0.867 kg/l
Density: 0.867 kg/l @ 15.6°C (60.1°F) (Typical)
Viscosity: 61.2 mm2/s @ 40°C (104°F) Minimum
Evaporation Rate: No data available
Decomposition temperature: No Data Available
Octanol/Water Partition Coefficient: No data available

FLAMMABLE PROPERTIES:
Flammability (solid, gas): No Data Available
Flashpoint: (Cleveland Open Cup) 192 °C (378 °F) Minimum
Autoignition: No data available
Flammability (Explosive) Limits (% by volume in air): Lower: Not Applicable Upper: Not Applicable

SECTION 10 STABILITY AND REACTIVITY

Reactivity: This material is not expected to react.
Chemical Stability: This material is considered stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.
Incompatibility With Other Materials: May react with strong acids or strong oxidizing agents, such as chlorates, nitrates, peroxides, etc.
Hazardous Decomposition Products: None known (None expected)
Hazardous Polymerization: Hazardous polymerization will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

Information on toxicological effects
Serious Eye Damage/Irritation: The eye irritation hazard is based on evaluation of data for product components.

Skin Corrosion/Irritation: The skin irritation hazard is based on evaluation of data for product

components.

Skin Sensitization: The skin sensitization hazard is based on evaluation of data for product components.

Acute Dermal Toxicity: The acute dermal toxicity hazard is based on evaluation of data for product components.

Acute Oral Toxicity: The acute oral toxicity hazard is based on evaluation of data for product components.

Acute Inhalation Toxicity: The acute inhalation toxicity hazard is based on evaluation of data for product components.

Acute Toxicity Estimate: Not Determined

Germ Cell Mutagenicity: The hazard evaluation is based on data for components or a similar material.
Carcinogenicity: The hazard evaluation is based on data for components or a similar material.
Reproductive Toxicity: The hazard evaluation is based on data for components or a similar material.

Specific Target Organ Toxicity - Single Exposure: The hazard evaluation is based on data for components or a similar material.
Specific Target Organ Toxicity - Repeated Exposure: The hazard evaluation is based on data for components or a similar material.

SECTION 12 ECOLOGICAL INFORMATION

ECOTOXICITY
This material is not expected to be harmful to aquatic organisms. The ecotoxicity hazard is based on an evaluation of data for the components or a similar material. The product has not been tested. The statement has been derived from the properties of the individual components.

MOBILITY
No data available.

PERSISTENCE AND DEGRADABILITY
This material is not expected to be readily biodegradable. The biodegradability of this material is based on an evaluation of data for the components or a similar material.The product has not been tested. The statement has been derived from the properties of the individual components.

POTENTIAL TO BIOACCUMULATE
Bioconcentration Factor: No data available.
Octanol/Water Partition Coefficient: No data available

SECTION 13 DISPOSAL CONSIDERATIONS

Use material for its intended purpose or recycle if possible. Oil collection services are available for used oil recycling or disposal. Place contaminated materials in containers and dispose of in a manner consistent with applicable regulations. Contact your sales representative or local environmental or health authorities for approved disposal or recycling methods.

SECTION 14 TRANSPORT INFORMATION

The description shown may not apply to all shipping situations. Consult 49CFR, or appropriate Dangerous

Goods Regulations, for additional description requirements (e.g., technical name) and mode-specific or quantity-specific shipping requirements.

DOT Shipping Description: PETROLEUM LUBRICATING OIL, NOT REGULATED AS A HAZARDOUS MATERIAL FOR TRANSPORTATION UNDER 49 CFR

IMO/IMDG Shipping Description: PETROLEUM LUBRICATING OIL; NOT REGULATED AS DANGEROUS GOODS FOR TRANSPORT UNDER THE IMDG CODE

ICAO/IATA Shipping Description: PETROLEUM LUBRICATING OIL; NOT REGULATED AS DANGEROUS GOODS FOR TRANSPORT UNDER ICAO TI OR IATA DGR

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC code:
Not applicable

SECTION 15 REGULATORY INFORMATION

EPCRA 311/312 CATEGORIES:

1.	Immediate (Acute) Health Effects:	NO
2.	Delayed (Chronic) Health Effects:	NO
3.	Fire Hazard:	NO
4.	Sudden Release of Pressure Hazard:	NO
5.	Reactivity Hazard:	NO

REGULATORY LISTS SEARCHED:

01-1=IARC Group 1	03=EPCRA 313
01-2A=IARC Group 2A	04=CA Proposition 65
01-2B=IARC Group 2B	05=MA RTK
02=NTP Carcinogen	06=NJ RTK
	07=PA RTK

The following components of this material are found on the regulatory lists indicated.
White mineral oil 01-1, 02, 05, 06, 07

CHEMICAL INVENTORIES:
All components comply with the following chemical inventory requirements: AICS (Australia), DSL (Canada), EINECS (European Union), ENCS (Japan), IECSC (China), KECI (Korea), PICCS (Philippines), TSCA (United States).

NEW JERSEY RTK CLASSIFICATION:
Under the New Jersey Right-to-Know Act L. 1983 Chapter 315 N.J.S.A. 34:5A-1 et. seq., the product is to be identified as follows: PETROLEUM OIL

SECTION 16 OTHER INFORMATION

NFPA RATINGS: Health: 0 Flammability: 1 Reactivity: 0

HMIS RATINGS: Health: 0 Flammability: 1 Reactivity: 0
(0-Least, 1-Slight, 2-Moderate, 3-High, 4-Extreme, PPE:- Personal Protection Equipment Index recommendation, *- Chronic Effect Indicator). These values are obtained using the guidelines or published evaluations prepared by the National Fire Protection Association (NFPA) or the National Paint and Coating Association (for HMIS ratings).

LABEL RECOMMENDATION:
Label Category : INDUSTRIAL OIL 1 - IND1

REVISION STATEMENT: This revision updates the following sections of this Safety Data Sheet: 1-16
Revision Date: MAY 27, 2014

ABBREVIATIONS THAT MAY HAVE BEEN USED IN THIS DOCUMENT:

TLV - Threshold Limit Value	TWA - Time Weighted Average
STEL - Short-term Exposure Limit	PEL - Permissible Exposure Limit
GHS - Globally Harmonized System	CAS - Chemical Abstract Service Number
ACGIH - American Conference of Governmental Industrial Hygienists	IMO/IMDG - International Maritime Dangerous Goods Code
API - American Petroleum Institute	SDS - Safety Data Sheet
HMIS - Hazardous Materials Information System	NFPA - National Fire Protection Association (USA)
DOT - Department of Transportation (USA)	NTP - National Toxicology Program (USA)
IARC - International Agency for Research on Cancer	OSHA - Occupational Safety and Health Administration
NCEL - New Chemical Exposure Limit	EPA - Environmental Protection Agency
SCBA - Self-Contained Breathing Apparatus	

Prepared according to the 29 CFR 1910.1200 (2012) by Chevron Energy Technology Company, 6001 Bollinger Canyon Road San Ramon, CA 94583.

The above information is based on the data of which we are aware and is believed to be correct as of the date hereof. Since this information may be applied under conditions beyond our control and with which we may be unfamiliar and since data made available subsequent to the date hereof may suggest modifications of the information, we do not assume any responsibility for the results of its use. This information is furnished upon condition that the person receiving it shall make his own determination of the suitability of the material for his particular purpose.

ConocoPhillips

Natural Gas

Safety Data Sheet

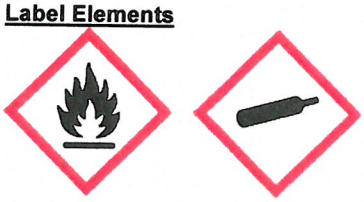
Section 1: Identification of the substance or mixture and of the supplier

Product Name:	Natural Gas
SDS Number:	724330
Synonyms/Other Means of Identification:	Fuel Gas Residue Gas Processed Gas Natural Gas, Dry Compressed Natural Gas
Intended Use:	Fuel
Manufacturer:	ConocoPhillips 600 N. Dairy Ashford Houston, Texas 77079-1175
Emergency Health and Safety Number:	Chemtrec: 800-424-9300 (24 Hours)
SDS Information:	Phone: 855-244-0762 Email: SDS@conocophillips.com URL: www.conocophillips.com

Section 2: Hazard(s) Identification

GHS Classification
H220 -- Flammable gases -- Category 1
H280 -- Gases under pressure -- Compressed gas

Label Elements



DANGER
Extremely flammable gas. (H220)*
Contains gas under pressure. May explode if heated. (H280)*
Gas may reduce oxygen in confined spaces.

Precautionary Statement(s):
Keep away from heat/sparks/open flames/hot surfaces. - No smoking. (P210)*
Leaking gas fire: Do not extinguish, unless leak can be stopped safely. (P377)*
Eliminate all ignition sources if safe to do so. (P381)*
Protect from sunlight. Store in a well ventilated place. (P410+P403)*

* *(Applicable GHS hazard code.)*

Section 3: Composition / Information on Ingredients

Component	CASRN	Concentration[1]
Natural gas, dried	68410-63-9	100

[1] All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

Section 4: First Aid Measures

Eye Contact: If irritation or redness develops from exposure, flush eyes with clean water. If symptoms persist, seek medical attention.

Skin Contact: First aid is not normally required. However, it is good practice to wash any chemical from the skin.

Inhalation (Breathing): If respiratory symptoms develop, move victim away from source of exposure and into fresh air in a position comfortable for breathing. If breathing is difficult, oxygen or artificial respiration should be administered by qualified personnel. If symptoms persist, seek medical attention.

Ingestion (Swallowing): This material is a gas under normal atmospheric conditions and ingestion is unlikely.

Most important symptoms and effects

Acute: Anesthetic effects at high concentrations.

Delayed: None known or anticipated. See Section 11 for information on effects from chronic exposure, if any.

Notes to Physician: Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations of hydrocarbon solvents (e.g., in enclosed spaces or with deliberate abuse). The use of other drugs with less arrhythmogenic potential should be considered. If sympathomimetic drugs are administered, observe for the development of cardiac arrhythmias.

Section 5: Fire-Fighting Measures

NFPA 704 Hazard Class

Health: 1 **Flammability:** 4 **Instability:** 0 (0-Minimal, 1-Slight, 2-Moderate, 3-Serious, 4-Severe)

Unusual Fire & Explosion Hazards: Extremely flammable. This material can be ignited by heat, sparks, flames, or other sources of ignition (e.g., static electricity, pilot lights, mechanical/electrical equipment, and electronic devices such as cell phones, computers, calculators, and pagers which have not been certified as intrinsically safe). Vapors may travel considerable distances to a source of ignition where they can ignite, flash back, or explode. May create vapor/air explosion hazard indoors, in confined spaces, outdoors, or in sewers. If container is not properly cooled, it can rupture in the heat of a fire. Contents under pressure.

Extinguishing Media: Dry chemical or carbon dioxide is recommended. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces.

Fire Fighting Instructions: For fires beyond the initial stage, emergency responders in the immediate hazard area should wear protective clothing. When the potential chemical hazard is unknown, in enclosed or confined spaces, a self contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8).

Isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done safely. If this cannot be done, allow fire to burn. Move undamaged containers from immediate hazard area if it can be done safely. Stay away from ends of container. Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water, if it can be done safely.

Hazardous Combustion Products: Combustion may yield smoke, carbon monoxide, and other products of incomplete combustion. Oxides of nitrogen and sulfur may also be formed.

See Section 9 for Flammable Properties including Flash Point and Flammable (Explosive) Limits

Section 6: Accidental Release Measures

Personal Precautions: Extremely flammable. Spillages of liquid product will create a fire hazard and may form an explosive atmosphere. Keep all sources of ignition and hot metal surfaces away from spill/release if safe to do so. The use of explosion-proof electrical equipment is recommended. Beware of accumulation of gas in low areas or contained areas, where explosive concentrations may occur. Prevent from entering drains or any place where accumulation may occur. Ventilate area and allow to evaporate. Stay upwind and away from spill/release. Avoid direct contact with material. For large spillages, notify persons down wind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Wear appropriate protective equipment, including respiratory protection, as conditions warrant (see Section 8). See Sections 2 and 7 for additional information on hazards and precautionary measures.

Environmental Precautions: Stop spill/release if it can be done safely. Water spray may be useful in minimizing or dispersing vapors. If spill occurs on water notify appropriate authorities and advise shipping of any hazard.

Methods for Containment and Clean-Up: Notify relevant authorities in accordance with all applicable regulations.

Recommended measures are based on the most likely spillage scenarios for this material; however local conditions and regulations may influence or limit the choice of appropriate actions to be taken.

Section 7: Handling and Storage

Precautions for safe handling: Keep away from ignition sources such as heat/sparks/open flame – No smoking. Take precautionary measures against static discharge. Use good personal hygiene practices and wear appropriate personal protective equipment (see section 8).

Contents under pressure. Gas can accumulate in confined spaces and limit oxygen available for breathing. Use only with adequate ventilation. The use of explosion-proof electrical equipment is recommended and may be required (see appropriate fire codes). Refer to NFPA-70 and/or API RP 2003 for specific bonding/grounding requirements. Electrostatic charge may accumulate and create a hazardous condition when handling or processing this material. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. Cold burns may occur during filling operations. Containers and delivery lines may become cold enough to present cold burn hazard.

The use of hydrocarbon fuel in an area without adequate ventilation may result in hazardous levels of incomplete combustion products (e.g. carbon monoxide, oxides of sulfur and nitrogen, benzene and other hydrocarbons) and/or dangerously low oxygen levels.

Conditions for safe storage: Keep container(s) tightly closed and properly labeled. Use and store this material in cool, dry, well-ventilated areas away from heat, direct sunlight, hot metal surfaces, and all sources of ignition. Store only in approved containers. Post area "No Smoking or Open Flame." Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage. Outdoor or detached storage is preferred. Indoor storage should meet OSHA standards and appropriate fire codes.

"Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. Avoid exposing any part of a compressed-gas cylinder to temperatures above 125F(51.6C). Gas cylinders should be stored outdoors or in well ventilated storerooms at no lower than ground level and should be quickly removable in an emergency.

Section 8: Exposure Controls / Personal Protection

Component	ACGIH	OSHA	Other
Natural gas, dried	1000 ppm TWA as Aliphatic Hydrocarbons C1-4	---	---

Note: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

Engineering controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional engineering controls may be required.

Eye/Face Protection: The use of eye/face protection is not normally required; however, good industrial hygiene practice suggests the use of eye protection that meets or exceeds ANSI Z.87.1 whenever working with chemicals.

Skin/Hand Protection: The use of skin protection is not normally required; however, good industrial hygiene practice suggests the use of gloves or other appropriate skin protection whenever working with chemicals.

Respiratory Protection: A NIOSH approved, self-contained breathing apparatus (SCBA) or equivalent operated in a pressure demand or other positive pressure mode should be used in situations of oxygen deficiency (oxygen content less than 19.5 percent), unknown exposure concentrations, or situations that are immediately dangerous to life or health (IDLH).

A respiratory protection program that meets or is equivalent to OSHA 29 CFR 1910.134 and ANSI Z88.2 should be followed whenever workplace conditions warrant a respirator's use.

Suggestions provided in this section for exposure control and specific types of protective equipment are based on readily available information. Users should consult with the specific manufacturer to confirm the performance of their protective equipment. Specific situations may require consultation with industrial hygiene, safety, or engineering professionals.

Section 9: Physical and Chemical Properties

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm). Data represent typical values and are not intended to be specifications.

Appearance:	Colorless
Physical Form:	Compressed Gas
Odor:	Slight hydrocarbon
Odor Threshold:	No data
pH:	Not applicable
Vapor Density (air=1):	0.5
Initial Boiling Point/Range:	No data
Melting/Freezing Point:	No data
Solubility in Water:	Slight
Partition Coefficient (n-octanol/water) (Kow):	No data
Percent Volatile:	100%
Flammability (solid, gas):	Extremely Flammable
Evaporation Rate (nBuAc=1):	No data
Flash Point:	-299 °F / -184 °C
Test Method:	(estimate)
Lower Explosive Limits (vol % in air):	2.0
Upper Explosive Limits (vol % in air):	10.0
Auto-ignition Temperature:	999 °F / 537 °C

Section 10: Stability and Reactivity

Stability: Stable under normal ambient and anticipated conditions of use.

Conditions to Avoid: Avoid all possible sources of ignition. Heat will increase pressure in the storage tank.

Materials to Avoid (Incompatible Materials): Avoid contact with acids, aluminum chloride, chlorine, chlorine dioxide, halogens and oxidizing agents.

Hazardous Decomposition Products: Not anticipated under normal conditions of use.

Hazardous Polymerization: Not known to occur.

Section 11: Toxicological Information

Information on Toxicological Effects of Substance/Mixture

Acute Toxicity	Hazard	Additional Information	LC50/LD50 Data
Inhalation	Unlikely to be harmful	Asphyxiant. High concentrations in confined spaces may limit oxygen available for breathing. See Signs and Symptoms.	> 20,000 ppm (gas)
Skin Absorption	Skin absorption is not anticipated		Not Applicable
Ingestion (Swallowing)	Ingestion is not anticipated		Not Applicable

Aspiration Hazard: Not applicable

Skin Corrosion/Irritation: Skin exposure is not anticipated.

Serious Eye Damage/Irritation: Not expected to be irritating.

Signs and Symptoms: Light hydrocarbon gases are simple asphyxiants and can cause anesthetic effects at high concentrations. Symptoms of overexposure, which are reversible if exposure is stopped, can include shortness of breath, drowsiness, headaches, confusion, decreased coordination, visual disturbances and vomiting. Continued exposure can lead to hypoxia (inadequate oxygen), rapid breathing, cyanosis (bluish discoloration of the skin), numbness of the extremities, unconsciousness and death.

Skin Sensitization: Skin contact is not anticipated.

Respiratory Sensitization: Not expected to be a respiratory sensitizer.

Specific Target Organ Toxicity (Single Exposure): Not expected to cause organ effects from single exposure.

Specific Target Organ Toxicity (Repeated Exposure): Not expected to cause organ effects from repeated exposure.

Carcinogenicity: Not expected to cause cancer. This substance is not listed as a carcinogen by IARC, NTP or OSHA.

Germ Cell Mutagenicity: Not expected to cause heritable genetic effects.

Reproductive Toxicity: Not expected to cause reproductive toxicity.

Other Comments: High concentrations may reduce the amount of oxygen available for breathing, especially in confined spaces. Hypoxia (inadequate oxygen) during pregnancy may have adverse effects on the developing fetus.

Section 12: Ecological Information

Toxicity: Petroleum gases will readily evaporate from the surface and would not be expected to have significant adverse effects in the aquatic environment. Classification: No classified hazards.

Persistence and Degradability: The hydrocarbons in this material are expected to be inherently biodegradable. In practice, hydrocarbon gases are not likely to remain in solution long enough for biodegradation to be a significant loss process. Hydrogen sulfide, if present in refinery gas streams, will be rapidly oxidized in water and insoluble sulfides precipitated from water when metallic radicals are present.

Bioaccumulative Potential: Since the log Kow values measured for refinery gas constituents are below 3, they are not regarded as having the potential to bioaccumulate.

Mobility in Soil: Due to the extreme volatility of petroleum gases, air is the only environmental compartment in which they will be found. In air, these hydrocarbons undergo photodegradation by reaction with hydroxyl radicals with half-lives ranging from 3.2 days for n-butane to 7 days for propane.

Other Adverse Effects: None anticipated.

Section 13: Disposal Considerations

This material is a gas and would not typically be managed as a waste.

Section 14: Transport Information

U.S. Department of Transportation (DOT)

Shipping Description:	UN1971, Natural gas, compressed, 2.1
Non-Bulk Package Marking:	Natural gas, compressed, UN1971
Non-Bulk Package Labeling:	Flammable gas
Bulk Package/Placard Marking:	Flammable gas / 1971
Packaging - References:	49 CFR 173.306; 173.302; 173.302 ***(Exceptions; Non-bulk; Bulk)***
Hazardous Substance:	None
Emergency Response Guide:	115

Note: ***Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code:*** *Not applicable*

International Maritime Dangerous Goods (IMDG)

Shipping Description:	UN1971, Natural gas, compressed, 2.1
Non-Bulk Package Marking:	Natural gas, compressed, UN1971
Labels:	Flammable gas
Placards/Marking (Bulk):	Flammable gas / 1971
Packaging - Non-Bulk:	P200
EMS:	F-D, S-U

International Civil Aviation Org. / International Air Transport Assoc. (ICAO/IATA)

UN/ID #:	UN1971
Proper Shipping Name:	Natural gas, compressed
Hazard Class/Division:	2.1
Subsidiary risk:	None
Packing Group:	None
Non-Bulk Package Marking:	Natural gas, compressed, UN1971
Labels:	Flammable gas , Cargo Aircraft Only
ERG Code:	10L

	LTD. QTY	Passenger Aircraft	Cargo Aircraft Only
Packaging Instruction #:	*Forbidden*	*Forbidden*	200
Max. Net Qty. Per Package:	*Forbidden*	*Forbidden*	150 kg

Section 15: Regulatory Information

CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs (in pounds):
This material does not contain any chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372.

CERCLA/SARA - Section 311/312 (Title III Hazard Categories)

Acute Health:	Yes
Chronic Health:	No
Fire Hazard:	Yes
Pressure Hazard:	Yes
Reactive Hazard:	No

CERCLA/SARA - Section 313 and 40 CFR 372:
This material does not contain any chemicals subject to the reporting requirements of SARA 313 and 40 CFR 372.

EPA (CERCLA) Reportable Quantity (in pounds):
EPA's Petroleum Exclusion applies to this material - (CERCLA 101(14)).

California Proposition 65:
This material does not contain any chemicals which are known to the State of California to cause cancer, birth defects or other reproductive harm at concentrations that trigger the warning requirements of California Proposition 65.

International Hazard Classification

Canada:
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the Regulations.

WHMIS Hazard Class:
A - Compressed Gas
B1 - Flammable Gases

National Chemical Inventories
All components are either listed on the US TSCA Inventory, or are not regulated under TSCA
All components are either on the DSL, or are exempt from DSL listing requirements

U.S. Export Control Classification Number: EAR99

Section 16: Other Information

Date of Issue:	02-Apr-2012
Status:	FINAL
Previous Issue Date:	09-Feb-2012
Revised Sections or Basis for Revision:	Identified Hazards (Section 2) Precautionary Statement(s) (Section 2) First Aid (Section 4) Shipping information (Section 14) Regulatory information (Section 15)
SDS Number:	724330

Guide to Abbreviations:
ACGIH = American Conference of Governmental Industrial Hygienists; CASRN = Chemical Abstracts Service Registry Number; CEILING = Ceiling Limit (15 minutes); CERCLA = The Comprehensive Environmental Response, Compensation, and Liability Act; EPA = Environmental Protection Agency; GHS = Globally Harmonized System; IARC = International Agency for Research on Cancer; INSHT = National Institute for Health and Safety at Work; IOPC = International Oil Pollution Compensation; LEL = Lower Explosive Limit; NE = Not Established; NFPA = National Fire Protection Association; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; PEL = Permissible Exposure Limit (OSHA); SARA = Superfund Amendments and Reauthorization Act; STEL = Short Term Exposure Limit (15 minutes); TLV = Threshold Limit Value (ACGIH); TWA = Time Weighted Average (8 hours); UEL = Upper Explosive Limit; WHMIS = Worker Hazardous Materials Information System (Canada)

Disclaimer of Expressed and implied Warranties:
The information presented in this Material Safety Data Sheet is based on data believed to be accurate as of the date this Material Safety Data Sheet was prepared. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. No responsibility is assumed for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices. The information provided above, and the product, are furnished on the condition that the person receiving them shall make their own determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk of their use. In addition, no authorization is given nor implied to practice any patented invention without a license.

ATTACHMENT I

EMISSION UNITS TABLE

Attachment I

Emission Units Table

(includes all emission units and air pollution control devices that will be part of this permit application review, regardless of permitting status)

• - Finished Methanol Capacity

Emission Unit ID[1]	Emission Point ID[2]	Emission Unit Description	Year Installed/ Modified	Design Capacity	Type[3] and Date of Change	Control Device[4]
1S	1E	Steam Methane Natural Gas Reformer (Unit 1000)	2016	310* ton/day	New	None
2S	2E	Auto Thermal Natural Gas Reformer (Unit 10,000)	2016	270* ton/day	New	None
3S	Fugitive (See 17S-19S)	Methanol Synthesis (Unit 2000) - Not an emissions source except for fugitive leaks.	2016	580* ton/day	New	None
4S	Fugitive (See 17S-19S)	Methanol Distillation (Unit 3000) - Not an emissions source except for fugitive leaks.	2016	580* ton/day	New	None
NA	NA	Air Separation Unit - Not an emissions source.	2016	NA	New	NA
5S	3E	TK1 – Rundown Tank 1	2016	75,000 gallons	New	2C
6S	3E	TK2 – Rundown Tank 2	2016	75,000 gallons	New	2C
7S	3E	TK3 – Fusel Oil Tank	2016	12,000 gallons	New	2C
8S	3E	TK4 – Sales Tank 1	2016	1.2 MM gallons	New	2C
9S	3E	TK5 – Sales Tank 2	2016	1.2 MM gallons	New	2C
10S	3E	TK6 – Slop Tank	2016	150,000 gallons	New	2C
11S	3E	Truck Loading	2016	100 gpm	New	2C
12S	4E	TK7 – Product Tank 1	2016	1.2 MM gallons	New	3C
13S	4E	TK 8 – Product Tank 2	2016	1.2 MM gallons	New	3C
14S	4E	Barge Loading	2016	1,000 gpm	New	3C

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Emission Units Table

(includes all emission units and air pollution control devices that will be part of this permit application review, regardless of permitting status)

Emission Unit ID[1]	Emission Point ID[2]	Emission Unit Description	Year Installed/ Modified	Design Capacity	Type[3] and Date of Change	Control Device[4]
15S	5E	Flare 4C	2016	NA	New	NA
16S	Fugitive	Vehicle Activity	2016	NA	New	NA
17S	Fugitive Leaks	Natural Gas System Fugitive Leaks	2016	NA	New	4C*
18S	Fugitive Leaks	Syngas Systems Fugitive Leaks	2016	NA	New	4C*
19S	Fugitive Leaks	Methanol System Fugitive Leaks	2016	NA	New	4C*

*4C – Flare is used to control leaks from Vapor Relief Valves (Pressure Relief Valves). Other leaks are uncontrolled.

[1] For Emission Units (or Sources) use the following numbering system: 1S, 2S, 3S, or other appropriate designation.
[2] For Emission Points use the following numbering system: 1E, 2E, 3E, or other appropriate designation.
[3] New, modification, removal
[4] For Control Devices use the following numbering system: 1C, 2C, 3C, or other appropriate designation.

ATTACHMENT J

EMISSION POINTS DATA SUMMARY SHEET

Attachment J
EMISSION POINTS DATA SUMMARY SHEET

Table 1: Emissions Data

Emission Point ID No. *(Must match Emission Units Table & Plot Plan)*	Emission Point Type[1]	Emission Unit Vented Through This Point *(Must match Emission Units Table & Plot Plan)*		Air Pollution Control Device *(Must match Emission Units Table & Plot Plan)*		Vent Time for Emission Unit *(chemical processes only)*		All Regulated Pollutants - Chemical Name/CAS[3] *(Speciate VOCs & HAPS)*	Maximum Potential Uncontrolled Emissions[4]		Maximum Potential Controlled Emissions[5]		Emission Form or Phase *(At exit conditions, Solid, Liquid or Gas/ Vapor)*	Est. Method Used[6]	Emission Concentration[7] (ppmv or mg/m^4)
		ID No.	Source	ID No.	Device Type	Short Term[2]	Max (hr/yr)		lb/hr	ton/yr	lb/hr	ton/yr			
1E	Upward Vertical Stack	1S	Steam Reformer Startup-Natural Gas	None	NA	NA	NA	NOX CO SO_2 PM/PM10/PM2.5 VOC Total HAPs	10.10 8.48 0.06 0.77 0.56 0.1903	0.08 0.06 0.01 0.01 0.01 0.0014	10.10 8.48 0.06 0.77 0.56 0.1903	0.08 0.06 0.01 0.01 0.01 0.0014	Gas Gas Gas Solid Gas Gas	EE	NA
1E	Upward Vertical Stack	1S	Steam Reformer Normal Operation -Syngas	None	NA	NA	NA	NOX CO SO_2 PM/PM10/PM2.5 VOC	16.00 1.77 0 0.36 0.36	70.04 7.75 0 1.55 1.55	16.00 1.77 0 0.36 0.36	70.04 7.75 0 1.55 1.55	Gas Gas Gas Solid Gas Gas	EE	NA
2E	Upward Vertical Stack	2S	Auto Thermal Natural Gas Reformer	None	NA	NA	NA	NOX CO SO_2 PM/PM10/PM2.5 VOC Total HAPs	0.33 0.27 0.01 0.02 0.02 0.0062	1.43 1.20 0.04 0.11 0.08 0.0270	0.33 0.27 0.01 0.02 0.02 0.0062	1.43 1.20 0.04 0.11 0.08 0.0270	Gas Gas Gas Solid Gas Gas	EE	NA
3E	Upward Vertical Stack	5S	TK1	2C	Scrubber	NA	NA	VOC HAPs	16.26 16.26	6.71 6.71	0.34 0.34	0.14 0.14	Gas Gas	EE	NA
3E	Upward Vertical Stack	6S	TK2	2C	Scrubber	NA	NA								
3E	Upward Vertical Stack	7S	TK3	2C	Scrubber	NA	NA	VOC HAPs	3.06 3.06	0.03 0.03	0.07 0.07	0.01 0.01	Gas Gas	EE	NA

The EMISSION POINTS DATA SUMMARY SHEET provides a summation of emissions by emission unit. Note that uncaptured process emission unit emissions are not typically considered to be fugitive and must be accounted for on the appropriate EMISSIONS UNIT DATA SHEET and on the EMISSION POINTS DATA SUMMARY SHEET. Please note that total emissions from the source are equal to all vented emissions, all fugitive emissions, plus all other emissions (e.g. uncaptured emissions). Please complete the FUGITIVE EMISSIONS DATA SUMMARY SHEET for fugitive emission activities.

[1] Please add descriptors such as upward vertical stack, downward vertical stack, horizontal stack, relief vent, rain cap, etc.

[2] Indicate by "C" if venting is continuous. Otherwise, specify the average short-term venting rate with units, for intermittent venting (ie., 15 min/hr). Indicate as many rates as needed to clarify frequency of venting (e.g., 5 min/day, 2 days/wk).

[3] List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. **LIST** Acids, CO, CS_2, VOCs, H_2S, Inorganics, Lead, Organics, O_3, NO, NO_2, SO_2, SO_3, all applicable Greenhouse Gases (including CO_2 and methane), etc. **DO NOT LIST** H_2, H_2O, N_2, O_2, and Noble Gases.

[4] Give maximum potential emission rate with no control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

[5] Give maximum potential emission rate with proposed control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

[6] Indicate method used to determine emission rate as follows: MB = material balance; ST = stack test (give date of test); EE = engineering estimate; O = other (specify).

[7] Provide for all pollutant emissions. Typically, the units of parts per million by volume (ppmv) are used. If the emission is a mineral acid (sulfuric, nitric, hydrochloric or phosphoric) use units of milligram per dry cubic meter (mg/m^3) at standard conditions (68 °F and 29.92 inches Hg) (see 45CSR7). If the pollutant is SO_2, use units of ppmv (See 45CSR10)

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Table 1: Emissions Data

Emission Point ID No. *(Must match Emission Units Table & Plot Plan)*	Emission Point Type[1]	Emission Unit Vented Through This Point *(Must match Emission Units Table & Plot Plan)*		Air Pollution Control Device *(Must match Emission Units Table & Plot Plan)*		Vent Time for Emission Unit *(chemical processes only)*		All Regulated Pollutants - Chemical Name/CAS[3] *(Speciate VOCs & HAPS)*	Maximum Potential Uncontrolled Emissions[4]		Maximum Potential Controlled Emissions[5]		Emission Form or Phase *(At exit conditions, Solid, Liquid or Gas/ Vapor)*	Est. Method Used[6]	Emission Concentration[7] (ppmv or mg/m^4)
		ID No.	Source	ID No.	Device Type	Short Term[2]	Max (hr/yr)		lb/hr	ton/yr	lb/hr	ton/yr			
3E	Upward Vertical Stack	8S	TK4	2C	Scrubber	NA	NA	VOC HAPs	16.87 16.87	0.43 0.43	0.34 0.34	0.01 0.01	Gas Gas	EE	NA
3E	Upward Vertical Stack	9S	TK5	2C	Scrubber	NA	NA								
3E	Upward Vertical Stack	10S	TK6	2C	Scrubber	NA	NA	VOC HAPs	158.56 158.56	3.26 3.26	3.18 3.18	0.07 0.07	Gas Gas	EE	NA
3E	Upward Vertical Stack	11S	Truck Loading	2C	Scrubber	NA	NA	VOC HAPs	10.88 10.88	0.20 0.20	0.33 0.33	0.02 0.02	Gas Gas	EE	NA
4E	Upward Vertical Stack	12S	TK7	3C	Scrubber	NA	NA	VOC HAPs	16.87 16.87	0.43 0.43	0.34 0.34	0.01 0.01	Gas Gas	EE	NA
4E	Upward Vertical Stack	13S	TK8	3C	Scrubber	NA	NA								
4E	Upward Vertical Stack	14S	Barge Loading	3C	Scrubber	NA	NA	VOC HAPs	54.42 54.42	27.89 27.89	1.63 1.63	0.84 0.84	Gas Gas	EE	NA

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		ID No.	Source	ID No.	Device Type	Short Term[2]	Max (hr/yr)		lb/hr	ton/yr	lb/hr	ton/yr			
5E	Upward Vertical Stack	15S	Flare Pilot Light	4C	Flare	NA	NA	NOX CO SO_2 PM/PM10/PM2.5 VOC Total HAPs	0.0025 0.0021 0.0001 0.0002 0.0001 0.00005	0.0110 0.0092 0.0004 0.0008 0.0006 0.00021	0.0025 0.0021 0.0001 0.0002 0.0001 0.00005	0.0110 0.0092 0.0004 0.0008 0.0006 0.00021	Gas Gas Gas Solid Gas Gas/PM	EE	NA
Flaring of PICV-1466 Cold Startup								NOX CO SO_2 PM/PM10/PM2.5 VOC Total HAPs	20.81 94.86 0.18 0.75 174.42 0.57	0.16 0.71 0.01 0.01 1.31 0.01	20.81 94.86 0.18 0.75 174.42 0.57	0.16 0.71 0.01 0.01 1.31 0.01	Gas Gas Gas Solid Gas Gas/PM	EE	NA
Flaring Shutdown								NOX CO SO_2 PM/PM10/PM2.5 VOC	5.57 25.39 0.18 0.75 46.68	0.03 0.11 0.01 0.01 0.21	5.57 25.39 0.18 0.75 46.68	0.03 0.11 0.01 0.01 0.21	Gas Gas Gas Solid Gas	EE	NA

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Table 1: Emissions Data

Emission Point ID No. *(Must match Emission Units Table & Plot Plan)*	Emission Point Type[1]	Emission Unit Vented Through This Point *(Must match Emission Units Table & Plot Plan)*		Air Pollution Control Device *(Must match Emission Units Table & Plot Plan)*		Vent Time for Emission Unit *(chemical processes only)*		All Regulated Pollutants - Chemical Name/CAS[3] *(Speciate VOCs & HAPS)*	Maximum Potential Uncontrolled Emissions[4]		Maximum Potential Controlled Emissions[5]		Emission Form or Phase *(At exit conditions, Solid, Liquid or Gas/ Vapor)*	Est. Method Used[6]	Emission Concentration[7] (ppmv or mg/m^4)
		ID No.	Source	ID No.	Device Type	Short Term[2]	Max (hr/yr)		lb/hr	ton/yr	lb/hr	ton/yr			
Flaring (Continued)															
Flaring of PRV-1323								NOX CO SO_2 PM/PM10/PM2.5 VOC	25.03 114.12 1.12 4.68 209.83	0.19 0.86 0.01 0.04 1.57	25.03 114.12 1.12 4.68 209.83	0.19 0.86 0.01 0.04 1.57	Gas Gas Gas Solid Gas	EE	NA
Flaring of PRV-10505								NOX CO SO_2 PM/PM10/PM2.5 VOC	12.91 58.85 0.62 2.60 108.21	0.10 0.44 0.01 0.02 0.81	12.91 58.85 0.62 2.60 108.21	0.10 0.44 0.01 0.02 0.81	Gas Gas Gas Solid Gas	EE	NA
Flaring of PRV-3301/2/3								NOX CO SO_2 PM/PM10/PM2.5 VOC	47.89 218.30 0.55 2.30 401.40	0.36 1.64 0.01 0.02 3.01	47.89 218.30 0.55 2.30 401.40	0.36 1.64 0.01 0.02 3.01	Gas Gas Gas Solid Gas	EE	NA
Flaring of PRV-1453								NOX CO SO_2 PM/PM10/PM2.5 VOC	37.86 172.62 1.22 5.09 317.39	0.28 1.29 0.01 0.04 2.38	37.86 172.62 1.22 5.09 317.39	0.28 1.29 0.01 0.04 2.38	Gas Gas Gas Solid Gas	EE	NA

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EMISSION POINTS DATA SUMMARY SHEET

Table 1: Emissions Data

Emission Point ID No. *(Must match Emission Units Table & Plot Plan)*	Emission Point Type[1]	Emission Unit Vented Through This Point *(Must match Emission Units Table & Plot Plan)*		Air Pollution Control Device *(Must match Emission Units Table & Plot Plan)*		Vent Time for Emission Unit *(chemical processes only)*		All Regulated Pollutants - Chemical Name/CAS[3] *(Speciate VOCs & HAPS)*	Maximum Potential Uncontrolled Emissions[4]		Maximum Potential Controlled Emissions[5]		Emission Form or Phase *(At exit conditions, Solid, Liquid or Gas/ Vapor)*	Est. Method Used[6]	Emission Concentration[7] (ppmv or mg/m^4)
		ID No.	Source	ID No.	Device Type	Short Term[2]	Max (hr/yr)		lb/hr	ton/yr	lb/hr	ton/yr			
Fugitive Leaks	Fugitive	17S	Natural Gas System Fugitive Leaks	4C*	Flare	NA	NA	VOC HAPs	0.04 0.010	0.16 0.043	0.02 0.004	0.07 0.018	Gas Gas	EE	NA
Fugitive Leaks	Fugitive	18S	Syngas System Fugitive Leaks	4C*	Flare	NA	NA	CO	0.47	2.05	0.47	2.05	Gas	EE	NA
Fugitive Leaks	Fugitive	19S	Methanol System Fugitive Leaks	4C*	Flare	NA	NA	VOC HAPs	6.30 6.30	27.60 27.60	1.38 1.38	6.03 6.03	Gas Gas	EE	NA

*4C – Flare is used to control leaks from Vapor Relief Valves (Pressure Relief Valves). Other leaks are uncontrolled.

Attachment J Continued
EMISSION POINTS DATA SUMMARY SHEET

Table 2: Release Parameter Data

Emission Point ID No. *(Must match Emission Units Table)*	Inner Diameter (ft.)	Exit Gas			Emission Point Elevation (ft)		UTM Coordinates (km)	
		Temp. (°F)	Volumetric Flow [1] (acfm) *at operating conditions*	Velocity (fps)	Ground Level *(Height above mean sea level)*	Stack Height [2] *(Release height of emissions above ground level)*	Northing	Easting
1E	6.1	260	NA	NA	603	98	4,249.108	431.696
2E	3.2	NA	NA	NA	603	82		
3E	NA	77	NA	NA	603	18		
4E	1	77	NA	NA	603	23		
5E	1.33	NA	NA	NA	603	145		

[1] Give at operating conditions. Include inerts.
[2] Release height of emissions above ground level.
*See design details in the Appendix.

ATTACHMENT K

FUGITIVE EMISSIONS DATA SUMMARY SHEET

Attachment K

FUGITIVE EMISSIONS DATA SUMMARY SHEET

The FUGITIVE EMISSIONS SUMMARY SHEET provides a summation of fugitive emissions. Fugitive emissions are those emissions which could not reasonably pass through a stack, chimney, vent or other functionally equivalent opening. Note that uncaptured process emissions are not typically considered to be fugitive, and must be accounted for on the appropriate EMISSIONS UNIT DATA SHEET and on the EMISSION POINTS DATA SUMMARY SHEET.

Please note that total emissions from the source are equal to all vented emissions, all fugitive emissions, plus all other emissions (e.g. uncaptured emissions).

APPLICATION FORMS CHECKLIST - FUGITIVE EMISSIONS
1.) Will there be haul road activities? ☐ Yes ☒ No ☐ If YES, then complete the HAUL ROAD EMISSIONS UNIT DATA SHEET.
2.) Will there be Storage Piles? ☐ Yes ☒ No ☐ If YES, complete Table 1 of the NONMETALLIC MINERALS PROCESSING EMISSIONS UNIT DATA SHEET.
3.) Will there be Liquid Loading/Unloading Operations? ☒ Yes ☐ No ☐ If YES, complete the BULK LIQUID TRANSFER OPERATIONS EMISSIONS UNIT DATA SHEET.
4.) Will there be emissions of air pollutants from Wastewater Treatment Evaporation? ☐ Yes ☒ No ☐ If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET.
5.) Will there be Equipment Leaks (e.g. leaks from pumps, compressors, in-line process valves, pressure relief devices, open-ended valves, sampling connections, flanges, agitators, cooling towers, etc.)? ☒ Yes ☐ No ☐ If YES, complete the LEAK SOURCE DATA SHEET section of the CHEMICAL PROCESSES EMISSIONS UNIT DATA SHEET.
6.) Will there be General Clean-up VOC Operations? ☐ Yes ☒ No ☐ If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET.
7.) Will there be any other activities that generate fugitive emissions? ☐ Yes ☒ No ☐ If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET or the most appropriate form.
If you answered "NO" to all of the items above, it is not necessary to complete the following table, "Fugitive Emissions Summary."

FUGITIVE EMISSIONS SUMMARY	All Regulated Pollutants - Chemical Name/CAS [1]	Maximum Potential Uncontrolled Emissions [2]		Maximum Potential Controlled Emissions [3]		Est. Method Used [4]
		lb/hr	ton/yr	lb/hr	ton/yr	
Haul Road/Road Dust Emissions Paved Haul Roads	PM/PM10/PM2.5	3.45/0.69/0.18	0.22/0.04/0.01	3.45/0.69/0.18	0.22/0.04/0.01	AP-42
Unpaved Haul Roads						
Storage Pile Emissions						
Loading/Unloading Operations	See Attachment J, Emission Points 3E and 4E for emissions which include truck and barge loading respectively.					
Wastewater Treatment Evaporation & Operations						
Equipment Leaks	See Attachment J, Emission Sources, 17S – Natural Gas System Fugitive Leaks, 18S – Syngas System Fugitive Leaks, and 19S – Methanol System Fugitive Leaks.					
General Clean-up VOC Emissions						
Other						

[1] List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. LIST Acids, CO, CS_2, VOCs, H_2S, Inorganics, Lead, Organics, O_3, NO, NO_2, SO_2, SO_3, etc. DO NOT LIST CO_2, H_2, H_2O, N_2, O_2, and Noble Gases.

[2] Give rate with no control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

[3] Give rate with proposed control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

[4] Indicate method used to determine emission rate as follows: MB = material balance; ST = stack test (give date of test); EE = engineering estimate; O = other (specify).

ATTACHMENT L

EMISSION UNIT DATA SHEETS

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

To be used for affected sources other than asphalt plants, foundries, incinerators, indirect heat exchangers, and quarries.

Identification Number (as assigned on *Equipment List Form*): 1S

1. Name or type and model of proposed affected source:

Steam Methane Natural Gas Reformer System (Unit 1000) includes a compilation of equipment which is shown on Process Flow Diagrams Drawings Nos. MNR5170-15A4-113-1 through 3. This unit heats the natural gas feed to produce syngas. The point source emissions from this process group are the heating system which uses natural gas combustion.

2. On a separate sheet(s), furnish a sketch(es) of this affected source. If a modification is to be made to this source, clearly indicated the change(s). Provide a narrative description of all features of the affected source which may affect the production of air pollutants.

3. Name(s) and maximum amount of proposed process material(s) charged per hour:

Natural Gas and Water

4. Name(s) and maximum amount of proposed material(s) produced per hour:

Syngas with a methanol production capacity of 310 tons per day.

5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants:

Natural gas reforming to syngas with an expected composition of 67% hydrogen, 14.5% CO, 7.4% CO_2, 3.1% methane and the remainder of nitrogen and water.

* The identification number which appears here must correspond to the air pollution control device identification number appearing on the *List Form*.

6. Combustion Data (if applicable):

(a) Type and amount in appropriate units of fuel(s) to be burned:

Started on natural gas (110,980 cf/hr based on 1,020 Btu/cf) and operated on syngas (316,134 cf/hr based on 326 Btu/cf).

(b) Chemical analysis of proposed fuel(s), excluding coal, including maximum percent sulfur and ash:

Pipeline quality natural gas is used for startup. The constituents of the natural gas will fluctuate. Syngas for operations.

(c) Theoretical combustion air requirement (ACF/unit of fuel): NA

@ °F and psia.

(d) Percent excess air: 10%

(e) Type and BTU/hr of burners and all other firing equipment planned to be used:

35 burners at 2.94 MMBtu/hr each

(f) If coal is proposed as a source of fuel, identify supplier and seams and give sizing of the coal as it will be fired:

NA

(g) Proposed maximum design heat input: 103 × 10^6 BTU/hr.

7. Projected operating schedule:

Hours/Day	24	Days/Week	7	Weeks/Year	52

8. Projected amount of pollutants that would be emitted from this affected source if no control devices were used:					
@		°F and			psia
a.	NO_X	Normal (Startup) 16.00 (10.10)	lb/hr	NA	grains/ACF
b.	SO_2	NA (0.06)	lb/hr	NA	grains/ACF
c.	CO	1.77 (8.48)	lb/hr	NA	grains/ACF
d.	PM_{10}	0.36 (0.77)	lb/hr	NA	grains/ACF
e.	Hydrocarbons	NA	lb/hr	NA	grains/ACF
f.	VOCs	0.36 (0.56)	lb/hr	NA	grains/ACF
g.	Pb	NA	lb/hr	NA	grains/ACF
h.	Specify other(s)				
	Total HAPS	NA (0.1903)	lb/hr	NA	grains/ACF
			lb/hr		grains/ACF
			lb/hr		grains/ACF

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING	RECORDKEEPING
Monitor opacity and visible emissions from emission point.	Maintain records of opacity and visible emissions.
REPORTING	**TESTING**
None Proposed	Initial stack testing to be completed within 180 days after startup. With report of results provided to Division of Air Quality.

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty

The process equipment will be operated as required based on the design.

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

To be used for affected sources other than asphalt plants, foundries, incinerators, indirect heat exchangers, and quarries.

Identification Number (as assigned on *Equipment List Form*): 2S

1. Name or type and model of proposed affected source:

Auto Thermal Natural Gas Reformer (Unit 10,000) includes a compilation of equipment which is shown on Process Flow Diagram Drawings Nos. HNR5170-13A4-50-133-1 through 3. This unit heats natural gas feed to produce syngas. The point source emission from this process group is the heating system.

2. On a separate sheet(s), furnish a sketch(es) of this affected source. If a modification is to be made to this source, clearly indicated the change(s). Provide a narrative description of all features of the affected source which may affect the production of air pollutants.

3. Name(s) and maximum amount of proposed process material(s) charged per hour:

Natural Gas and Water

4. Name(s) and maximum amount of proposed material(s) produced per hour:

Syngas with a methanol production capacity of 270 tons per day.

5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants:

Natural gas reforming to syngas with an expected composition of 74% hydrogen, 16% CO, 6.7% CO_2, 2.9% methane and the remainder of nitrogen and water.

* The identification number which appears here must correspond to the air pollution control device identification number appearing on the *List Form*.

6. Combustion Data (if applicable):

(a) Type and amount in appropriate units of fuel(s) to be burned:

Natural gas at 3,266 cf/hr based on 1,020 Btu/hr.

(b) Chemical analysis of proposed fuel(s), excluding coal, including maximum percent sulfur and ash:

Pipeline quality natural gas is used for combustion. The constituents of the natural gas will fluctuate. A sample analysis is included in Appendix 3.

(c) Theoretical combustion air requirement (ACF/unit of fuel): NA

@ °F and psia.

(d) Percent excess air:

(e) Type and BTU/hr of burners and all other firing equipment planned to be used:

Typical gas burner 3.331 MMBtu/hr

(f) If coal is proposed as a source of fuel, identify supplier and seams and give sizing of the coal as it will be fired:

NA

(g) Proposed maximum design heat input: 3.331 × 10^6 BTU/hr.

7. Projected operating schedule:

Hours/Day	24	Days/Week	7	Weeks/Year	52

8. Projected amount of pollutants that would be emitted from this affected source if no control devices were used				
@	°F and			psia
a. NO_X	0.33	lb/hr	NA	grains/ACF
b. SO_2	0.01	lb/hr	NA	grains/ACF
c. CO	0.27	lb/hr	NA	grains/ACF
d. PM_{10}	0.02	lb/hr	NA	grains/ACF
e. Hydrocarbons	NA	lb/hr	NA	grains/ACF
f. VOCs	0.02	lb/hr	NA	grains/ACF
g. Pb	NA	lb/hr	NA	grains/ACF
h. Specify other(s)				
Total HAPS	0.0062	lb/hr	NA	grains/ACF
		lb/hr		grains/ACF
		lb/hr		grains/ACF

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING	RECORDKEEPING
Monitor opacity and visible emissions from emissions point.	Maintain record of opacity and visible emissions.
REPORTING	**TESTING**
None Proposed	Initial stack test to be conducted within 180 days after startup with report to Division of Air Quality.

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty

The process equipment will be operated as required based on the design.

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

To be used for affected sources other than asphalt plants, foundries, incinerators, indirect heat exchangers, and quarries.

Identification Number (as assigned on *Equipment List Form*): 3S

1. Name or type and model of proposed affected source:

   Methanol Synthesis (Unit 2000). This unit utilizes the syngas and produces crude methanol. See Process Flow Diagrams Drawings Nos. BR5170-13A4-50-143-1 through 3.

2. On a separate sheet(s), furnish a sketch(es) of this affected source. If a modification is to be made to this source, clearly indicated the change(s). Provide a narrative description of all features of the affected source which may affect the production of air pollutants.

3. Name(s) and maximum amount of proposed process material(s) charged per hour:

   Syngas produced in 1S and 2S.

4. Name(s) and maximum amount of proposed material(s) produced per hour:

   Crude Methanol with a methanol production capacity of 580 tons per day.

5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants:

* The identification number which appears here must correspond to the air pollution control device identification number appearing on the *List Form*.

6. Combustion Data (if applicable): NA

(a) Type and amount in appropriate units of fuel(s) to be burned:

(b) Chemical analysis of proposed fuel(s), excluding coal, including maximum percent sulfur and ash:

(c) Theoretical combustion air requirement (ACF/unit of fuel): NA

@ °F and psia.

(d) Percent excess air:

(e) Type and BTU/hr of burners and all other firing equipment planned to be used:

(f) If coal is proposed as a source of fuel, identify supplier and seams and give sizing of the coal as it will be fired:

(g) Proposed maximum design heat input: $\times 10^6$ BTU/hr.

7. Projected operating schedule:

Hours/Day	24	Days/Week	7	Weeks/Year	52

8. Projected amount of pollutants that would be emitted from this affected source if no control devices were used: Per Booth

@ °F and psia

a. NO_X	lb/hr		grains/ACF
b. SO_2	lb/hr		grains/ACF
c. CO	lb/hr		grains/ACF
d. PM_{10}	lb/hr		grains/ACF
e. Hydrocarbons	lb/hr		grains/ACF
f. VOCs	lb/hr		grains/ACF
g. Pb	lb/hr		grains/ACF
h. Specify other(s)			
	lb/hr		grains/ACF
	lb/hr		grains/ACF

This source does not have point source emissions, only fugitive leaks from equipment. Fugitive leaks are identified as 17S, 18S, and 19S.

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING	RECORDKEEPING
None Proposed	None Proposed
REPORTING	**TESTING**
None Proposed	None Proposed

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty

This equipment will be operated as required based on the design.

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

To be used for affected sources other than asphalt plants, foundries, incinerators, indirect heat exchangers, and quarries.

Identification Number (as assigned on *Equipment List Form*): 4S

1. Name or type and model of proposed affected source:

   Methanol Distillation (Unit 3000). This unit distills the crude methanol to the final product. See Process Flow Diagrams Drawings Nos. MPD-5170-15A4-50-85-1 through 3.

2. On a separate sheet(s), furnish a sketch(es) of this affected source. If a modification is to be made to this source, clearly indicated the change(s). Provide a narrative description of all features of the affected source which may affect the production of air pollutants.

3. Name(s) and maximum amount of proposed process material(s) charged per hour:

   Crude Methanol

4. Name(s) and maximum amount of proposed material(s) produced per hour:

   Product Methanol with a methanol production capacity of 580 tons per day.

5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants:

   Distillation Only

* The identification number which appears here must correspond to the air pollution control device identification number appearing on the *List Form*.

6. Combustion Data (if applicable): NA

(a) Type and amount in appropriate units of fuel(s) to be burned:

(b) Chemical analysis of proposed fuel(s), excluding coal, including maximum percent sulfur and ash:

(c) Theoretical combustion air requirement (ACF/unit of fuel): NA

@ °F and psia.

(d) Percent excess air:

(e) Type and BTU/hr of burners and all other firing equipment planned to be used:

(f) If coal is proposed as a source of fuel, identify supplier and seams and give sizing of the coal as it will be fired:

(g) Proposed maximum design heat input: $\times 10^6$ BTU/hr.

7. Projected operating schedule:

Hours/Day	24	Days/Week	7	Weeks/Year	52

8. Projected amount of pollutants that would be emitted from this affected source if no control devices were used

@ °F and psia

a.	NO_X	lb/hr	grains/ACF
b.	SO_2	lb/hr	grains/ACF
c.	CO	lb/hr	grains/ACF
d.	PM_{10}	lb/hr	grains/ACF
e.	Hydrocarbons	lb/hr	grains/ACF
f.	VOCs	lb/hr	grains/ACF
g.	Pb	lb/hr	grains/ACF
h.	Specify other(s)		
		lb/hr	
		lb/hr	grains/ACF
		lb/hr	grains/ACF

This source does not have point source emissions, only fugitive leaks from equipment. Fugitive leaks are identified as 17S, 18S, and 19S.

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING	RECORDKEEPING
None Proposed	None Proposed
REPORTING	**TESTING**
None Proposed	None Proposed

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty

This equipment will be operated as required based on the design.

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

To be used for affected sources other than asphalt plants, foundries, incinerators, indirect heat exchangers, and quarries.

Identification Number (as assigned on *Equipment List Form*): NA

1. Name or type and model of proposed affected source:

   The Air Separation Units include Air Compressors, Air Conditioners, Multipass Heat Exchangers, Distillation Columns, Expansion Turbines, Oxygen Pumps, Oxygen Evaporizers, and Nitrogen Compressors.

2. On a separate sheet(s), furnish a sketch(es) of this affected source. If a modification is to be made to this source, clearly indicated the change(s). Provide a narrative description of all features of the affected source which may affect the production of air pollutants.

   See the process flow diagram.

3. Name(s) and maximum amount of proposed process material(s) charged per hour:

   Ambient Air for Separation

4. Name(s) and maximum amount of proposed material(s) produced per hour:

   Oxygen and Nitrogen

5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants:

   Air Separation Only

* The identification number which appears here must correspond to the air pollution control device identification number appearing on the *List Form*.

6. Combustion Data (if applicable): NA

(a) Type and amount in appropriate units of fuel(s) to be burned:

(b) Chemical analysis of proposed fuel(s), excluding coal, including maximum percent sulfur and ash:

(c) Theoretical combustion air requirement (ACF/unit of fuel): NA

@ °F and psia.

(d) Percent excess air:

(e) Type and BTU/hr of burners and all other firing equipment planned to be used:

(f) If coal is proposed as a source of fuel, identify supplier and seams and give sizing of the coal as it will be fired:

(g) Proposed maximum design heat input: $\times 10^6$ BTU/hr.

7. Projected operating schedule:

Hours/Day	24	Days/Week	7	Weeks/Year	52

8. Projected amount of pollutants that would be emitted from this affected source if no control devices were used: **These units do not release air pollutants.**

@ °F and psia

a.	NO_X	This unit is not a source of regulated air pollutants. lb/hr		grains/ACF
b.	SO_2	lb/hr		grains/ACF
c.	CO	lb/hr		grains/ACF
d.	PM_{10}	lb/hr		grains/ACF
e.	Hydrocarbons	lb/hr		grains/ACF
f.	VOCs	lb/hr		grains/ACF
g.	Pb	lb/hr		grains/ACF
h.	Specify other(s)			
		lb/hr		grains/ACF
		lb/hr		grains/ACF

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING	RECORDKEEPING
None Proposed	None Proposed
REPORTING	**TESTING**
None Proposed	None Proposed

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty

The process equipment will be operated as required based on the design.

Attachment L
EMISSIONS UNIT DATA SHEET
STORAGE TANKS

Provide the following information for each new or modified bulk liquid storage tank as shown on the *Equipment List Form* and other parts of this application. A tank is considered modified if the material to be stored in the tank is different from the existing stored liquid.

IF USING US EPA'S TANKS EMISSION ESTIMATION PROGRAM (AVAILABLE AT www.epa.gov/tnn/tanks.html), APPLICANT MAY ATTACH THE SUMMARY SHEETS IN LIEU OF COMPLETING SECTIONS III, IV, & V OF THIS FORM. HOWEVER, SECTIONS I, II, AND VI OF THIS FORM MUST BE COMPLETED. US EPA'S AP-42, SECTION 7.1, "ORGANIC LIQUID STORAGE TANKS," MAY ALSO BE USED TO ESTIMATE VOC AND HAP EMISSIONS (http://www.epa.gov/tnn/chief/).

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name Zone 4 Tank Farm	2. Tank Name Rundown Tanks
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) TK-4100 and TK-4200 (TK1 and TK2)	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 3E
5. Date of Commencement of Construction (for existing tanks)	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable) N/A	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) ☐ Yes ☒ No	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode). N/A	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): N/A	

II. TANK INFORMATION (required)

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height.	
9A. Tank Internal Diameter (ft) 24	9B. Tank Internal Height (or Length) (ft) 27
10A. Maximum Liquid Height (ft) 22	10B. Average Liquid Height (ft) 13
11A. Maximum Vapor Space Height (ft) 23	11B. Average Vapor Space Height (ft) 14
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights. 75,000 gal	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
61,500,000	216,000

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume): 826.05

15. Maximum tank fill rate (gal/min): 200

16. Tank fill method: ☒ Submerged ☐ Splash ☐ Bottom Loading

17. Complete 17A and 17B for Variable Vapor Space Tank Systems ☒ Does Not Apply

17A. Volume Expansion Capacity of System (gal)	17B. Number of transfers into system per year

18. Type of tank (check all that apply):
- ☒ Fixed Roof X vertical ___ horizontal ___ flat roof X cone roof ___ dome roof ___ other (describe)
- ☐ External Floating Roof ___ pontoon roof ___ double deck roof
- ☐ Domed External (or Covered) Floating Roof
- ☐ Internal Floating Roof ___ vertical column support ___ self-supporting
- ☐ Variable Vapor Space ___ lifter roof ___ diaphragm
- ☐ Pressurized ___ spherical ___ cylindrical
- ☐ Underground
- ☐ Other (describe)

III. TANK CONSTRUCTION & OPERATION INFORMATION (optional if providing TANKS Summary Sheets)

19. Tank Shell Construction:
☐ Riveted ☐ Gunite lined ☐ Epoxy-coated rivets ☐ Other (describe)

20A. Shell Color	20B. Roof Color	20C. Year Last Painted

21. Shell Condition (if metal and unlined):
☐ No Rust ☐ Light Rust ☐ Dense Rust ☐ Not applicable

22A. Is the tank heated? ☐ YES ☐ NO

22B. If YES, provide the operating temperature (°F)

22C. If YES, please describe how heat is provided to tank.

23. Operating Pressure Range (psig): to

24. Complete the following section for **Vertical Fixed Roof Tanks** ☐ Does Not Apply

24A. For dome roof, provide roof radius (ft)

24B. For cone roof, provide slope (ft/ft)

25. Complete the following section for **Floating Roof Tanks** ☐ Does Not Apply

25A. Year Internal Floaters Installed:

25B. Primary Seal Type: (check one)
☐ Metallic (Mechanical) Shoe Seal ☐ Liquid Mounted Resilient Seal
☐ Vapor Mounted Resilient Seal ☐ Other (describe):

25C. Is the Floating Roof equipped with a Secondary Seal? ☐ YES ☐ NO

25D. If YES, how is the secondary seal mounted? (check one) ☐ Shoe ☐ Rim ☐ Other (describe):

25E. Is the Floating Roof equipped with a weather shield? ☐ YES ☐ NO

25F. Describe deck fittings; indicate the number of each type of fitting:		
ACCESS HATCH		
BOLT COVER, GASKETED:	UNBOLTED COVER, GASKETED:	UNBOLTED COVER, UNGASKETED:
AUTOMATIC GAUGE FLOAT WELL		
BOLT COVER, GASKETED:	UNBOLTED COVER, GASKETED:	UNBOLTED COVER, UNGASKETED:
COLUMN WELL		
BUILT-UP COLUMN – SLIDING COVER, GASKETED:	BUILT-UP COLUMN – SLIDING COVER, UNGASKETED:	PIPE COLUMN – FLEXIBLE FABRIC SLEEVE SEAL:
LADDER WELL		
PIP COLUMN – SLIDING COVER, GASKETED:	PIPE COLUMN – SLIDING COVER, UNGASKETED:	
GAUGE-HATCH/SAMPLE PORT		
SLIDING COVER, GASKETED:	SLIDING COVER, UNGASKETED:	
ROOF LEG OR HANGER WELL		
WEIGHTED MECHANICAL ACTUATION, GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	SAMPLE WELL-SLIT FABRIC SEAL (10% OPEN AREA)
VACUUM BREAKER		
WEIGHTED MECHANICAL ACTUATION, GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	
RIM VENT		
WEIGHTED MECHANICAL ACTUATION GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	
DECK DRAIN (3-INCH DIAMETER)		
OPEN:	90% CLOSED:	
STUB DRAIN		
1-INCH DIAMETER:		
OTHER (DESCRIBE, ATTACH ADDITIONAL PAGES IF NECESSARY)		

26. Complete the following section for Internal Floating Roof Tanks ☐ Does Not Apply	
26A. Deck Type: ☐ Bolted ☐ Welded	
26B. For Bolted decks, provide deck construction:	
26C. Deck seam: ☐ Continuous sheet construction 5 feet wide ☐ Continuous sheet construction 6 feet wide ☐ Continuous sheet construction 7 feet wide ☐ Continuous sheet construction 5 × 7.5 feet wide ☐ Continuous sheet construction 5 × 12 feet wide ☐ Other (describe)	
26D. Deck seam length (ft)	26E. Area of deck (ft^2)
For column supported tanks: 26F. Number of columns:	26G. Diameter of each column:

IV. SITE INFORMANTION (optional if providing TANKS Summary Sheets)

27. Provide the city and state on which the data in this section are based.
28. Daily Average Ambient Temperature (°F)
29. Annual Average Maximum Temperature (°F)
30. Annual Average Minimum Temperature (°F)
31. Average Wind Speed (miles/hr)
32. Annual Average Solar Insulation Factor (BTU/(ft^2·day))
33. Atmospheric Pressure (psia)

V. LIQUID INFORMATION (optional if providing TANKS Summary Sheets)

34. Average daily temperature range of bulk liquid:	
34A. Minimum (°F)	34B. Maximum (°F)
35. Average operating pressure range of tank:	
35A. Minimum (psig)	35B. Maximum (psig)
36A. Minimum Liquid Surface Temperature (°F)	36B. Corresponding Vapor Pressure (psia)
37A. Average Liquid Surface Temperature (°F)	37B. Corresponding Vapor Pressure (psia)
38A. Maximum Liquid Surface Temperature (°F)	38B. Corresponding Vapor Pressure (psia)

39. Provide the following for <u>each</u> liquid or gas to be stored in tank. Add additional pages if necessary.			
39A. Material Name or Composition			
39B. CAS Number			
39C. Liquid Density (lb/gal)			
39D. Liquid Molecular Weight (lb/lb-mole)			
39E. Vapor Molecular Weight (lb/lb-mole)			

Maximum Vapor Pressure 39F. True (psia) 39G. Reid (psia)			
Months Storage per Year 39H. From 39I. To			

VI. EMISSIONS AND CONTROL DEVICE DATA (required)

40. Emission Control Devices (check as many as apply): ☐ Does Not Apply

- ☐ Carbon Adsorption[1]
- ☐ Condenser[1]
- ☒ Conservation Vent (psig)
  - Vacuum Setting -0.5" H2O Pressure Setting 5" H2O
- ☐ Emergency Relief Valve (psig)
- ☒ Inert Gas Blanket of Nitrogen
- ☐ Insulation of Tank with
- ☒ Liquid Absorption (scrubber)[1]
- ☐ Refrigeration of Tank
- ☐ Rupture Disc (psig)
- ☐ Vent to Incinerator[1]
- ☐ Other[1] (describe):

[1] Complete appropriate Air Pollution Control Device Sheet.

41. Expected Emission Rate (submit Test Data or Calculations here or elsewhere in the application).

Material Name & CAS No.	Breathing Loss (lb/hr)	Working Loss Amount	Working Loss Units	Annual Loss (lb/yr)	Estimation Method[1]
VOC/Methanol 67-56-1	21.41 lb/yr	247.16	lb/yr	0.14 tpy	Tanks

[1] EPA = EPA Emission Factor, MB = Material Balance, SS = Similar Source, ST = Similar Source Test, Throughput Data, O = Other (specify)

☐ Remember to attach emissions calculations, including TANKS Summary Sheets if applicable.

Attachment L
EMISSIONS UNIT DATA SHEET
STORAGE TANKS

Provide the following information for each new or modified bulk liquid storage tank as shown on the *Equipment List Form* and other parts of this application. A tank is considered modified if the material to be stored in the tank is different from the existing stored liquid.

IF USING US EPA'S TANKS EMISSION ESTIMATION PROGRAM (AVAILABLE AT www.epa.gov/tnn/tanks.html), APPLICANT MAY ATTACH THE SUMMARY SHEETS IN LIEU OF COMPLETING SECTIONS III, IV, & V OF THIS FORM. HOWEVER, SECTIONS I, II, AND VI OF THIS FORM MUST BE COMPLETED. US EPA'S AP-42, SECTION 7.1, "ORGANIC LIQUID STORAGE TANKS," MAY ALSO BE USED TO ESTIMATE VOC AND HAP EMISSIONS (http://www.epa.gov/tnn/chief/).

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name Zone 4 Tank Farm	2. Tank Name Fusel Oil Tank
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) TK-4600 (TK3)	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 3E
5. Date of Commencement of Construction (for existing tanks)	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable) N/A	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) ☐ Yes ☒ No	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode). N/A	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): N/A	

II. TANK INFORMATION (required)

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height.	
9A. Tank Internal Diameter (ft) 10.5	9B. Tank Internal Height (or Length) (ft) 23
10A. Maximum Liquid Height (ft) 19	10B. Average Liquid Height (ft) 10
11A. Maximum Vapor Space Height (ft) 19	11B. Average Vapor Space Height (ft) 13
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights.	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
225,000	750

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume): 18.3

15. Maximum tank fill rate (gal/min): 100

16. Tank fill method: ☒ Submerged ☐ Splash ☐ Bottom Loading

17. Complete 17A and 17B for Variable Vapor Space Tank Systems ☒ Does Not Apply

17A. Volume Expansion Capacity of System (gal)	17B. Number of transfers into system per year

18. Type of tank (check all that apply):

☒ Fixed Roof ___ vertical ___ horizontal ___ flat roof X cone roof ___ dome roof
___ other (describe)

☐ External Floating Roof ___ pontoon roof ___ double deck roof

☐ Domed External (or Covered) Floating Roof

☐ Internal Floating Roof __ vertical column support ___ self-supporting

☐ Variable Vapor Space ___ lifter roof ___ diaphragm

☐ Pressurized ___ spherical ___ cylindrical

☐ Underground

☐ Other (describe)

III. TANK CONSTRUCTION & OPERATION INFORMATION (optional if providing TANKS Summary Sheets)

19. Tank Shell Construction:

☐ Riveted ☐ Gunite lined ☐ Epoxy-coated rivets ☐ Other (describe)

20A. Shell Color	20B. Roof Color	20C. Year Last Painted

21. Shell Condition (if metal and unlined):

☐ No Rust ☐ Light Rust ☐ Dense Rust ☐ Not applicable

22A. Is the tank heated? ☐ YES ☐ NO

22B. If YES, provide the operating temperature (°F)

22C. If YES, please describe how heat is provided to tank.

23. Operating Pressure Range (psig): to

24. Complete the following section for **Vertical Fixed Roof Tanks** ☐ Does Not Apply

24A. For dome roof, provide roof radius (ft)

24B. For cone roof, provide slope (ft/ft)

25. Complete the following section for **Floating Roof Tanks** ☐ Does Not Apply

25A. Year Internal Floaters Installed:

25B. Primary Seal Type: (check one) ☐ Metallic (Mechanical) Shoe Seal ☐ Liquid Mounted Resilient Seal ☐ Vapor Mounted Resilient Seal ☐ Other (describe):

25C. Is the Floating Roof equipped with a Secondary Seal? ☐ YES ☐ NO

25D. If YES, how is the secondary seal mounted? (check one) ☐ Shoe ☐ Rim ☐ Other (describe):

25E. Is the Floating Roof equipped with a weather shield? ☐ YES ☐ NO

25F. Describe deck fittings; indicate the number of each type of fitting:		
ACCESS HATCH		
BOLT COVER, GASKETED:	UNBOLTED COVER, GASKETED:	UNBOLTED COVER, UNGASKETED:
AUTOMATIC GAUGE FLOAT WELL		
BOLT COVER, GASKETED:	UNBOLTED COVER, GASKETED:	UNBOLTED COVER, UNGASKETED:
COLUMN WELL		
BUILT-UP COLUMN – SLIDING COVER, GASKETED:	BUILT-UP COLUMN – SLIDING COVER, UNGASKETED:	PIPE COLUMN – FLEXIBLE FABRIC SLEEVE SEAL:
LADDER WELL		
PIP COLUMN – SLIDING COVER, GASKETED:	PIPE COLUMN – SLIDING COVER, UNGASKETED:	
GAUGE-HATCH/SAMPLE PORT		
SLIDING COVER, GASKETED:	SLIDING COVER, UNGASKETED:	
ROOF LEG OR HANGER WELL		
WEIGHTED MECHANICAL ACTUATION, GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	SAMPLE WELL-SLIT FABRIC SEAL (10% OPEN AREA)
VACUUM BREAKER		
WEIGHTED MECHANICAL ACTUATION, GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	
RIM VENT		
WEIGHTED MECHANICAL ACTUATION GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	
DECK DRAIN (3-INCH DIAMETER)		
OPEN:	90% CLOSED:	
STUB DRAIN		
1-INCH DIAMETER:		
OTHER (DESCRIBE, ATTACH ADDITIONAL PAGES IF NECESSARY)		

26. Complete the following section for Internal Floating Roof Tanks ☐ Does Not Apply	
26A. Deck Type: ☐ Bolted ☐ Welded	
26B. For Bolted decks, provide deck construction:	
26C. Deck seam: ☐ Continuous sheet construction 5 feet wide ☐ Continuous sheet construction 6 feet wide ☐ Continuous sheet construction 7 feet wide ☐ Continuous sheet construction 5 × 7.5 feet wide ☐ Continuous sheet construction 5 × 12 feet wide ☐ Other (describe)	
26D. Deck seam length (ft)	26E. Area of deck (ft^2)
For column supported tanks: 26F. Number of columns:	26G. Diameter of each column:

IV. SITE INFORMANTION (optional if providing TANKS Summary Sheets)

27. Provide the city and state on which the data in this section are based.
28. Daily Average Ambient Temperature (°F)
29. Annual Average Maximum Temperature (°F)
30. Annual Average Minimum Temperature (°F)
31. Average Wind Speed (miles/hr)
32. Annual Average Solar Insulation Factor (BTU/(ft^2·day))
33. Atmospheric Pressure (psia)

V. LIQUID INFORMATION (optional if providing TANKS Summary Sheets)

34. Average daily temperature range of bulk liquid:	
34A. Minimum (°F)	34B. Maximum (°F)
35. Average operating pressure range of tank:	
35A. Minimum (psig)	35B. Maximum (psig)
36A. Minimum Liquid Surface Temperature (°F)	36B. Corresponding Vapor Pressure (psia)
37A. Average Liquid Surface Temperature (°F)	37B. Corresponding Vapor Pressure (psia)
38A. Maximum Liquid Surface Temperature (°F)	38B. Corresponding Vapor Pressure (psia)

39. Provide the following for <u>each</u> liquid or gas to be stored in tank. Add additional pages if necessary.			
39A. Material Name or Composition			
39B. CAS Number			
39C. Liquid Density (lb/gal)			
39D. Liquid Molecular Weight (lb/lb-mole)			
39E. Vapor Molecular Weight (lb/lb-mole)			

Maximum Vapor Pressure 39F. True (psia) 39G. Reid (psia)			
Months Storage per Year 39H. From 39I. To			

VI. EMISSIONS AND CONTROL DEVICE DATA (required)

40. Emission Control Devices (check as many as apply): ☐ Does Not Apply

- ☐ Carbon Adsorption[1]
- ☐ Condenser[1]
- ☒ Conservation Vent (psig)
  - Vacuum Setting -0.5" H2O Pressure Setting 5" H2O
- ☐ Emergency Relief Valve (psig)
- ☒ Inert Gas Blanket of Nitrogen
- ☐ Insulation of Tank with
- ☒ Liquid Absorption (scrubber)[1]
- ☐ Refrigeration of Tank
- ☐ Rupture Disc (psig)
- ☐ Vent to Incinerator[1]
- ☐ Other[1] (describe):

[1] Complete appropriate Air Pollution Control Device Sheet.

41. Expected Emission Rate (submit Test Data or Calculations here or elsewhere in the application).

Material Name & CAS No.	Breathing Loss (lb/hr)	Working Loss Amount	Working Loss Units	Annual Loss (lb/yr)	Estimation Method[1]
VOC/Methanol 67-56-1	0.31 lb/yr	0.81	lb/yr	0.01 tpy	Tanks

[1] EPA = EPA Emission Factor, MB = Material Balance, SS = Similar Source, ST = Similar Source Test, Throughput Data, O = Other (specify)

☐ Remember to attach emissions calculations, including TANKS Summary Sheets if applicable.

Attachment L
EMISSIONS UNIT DATA SHEET
STORAGE TANKS

Provide the following information for each new or modified bulk liquid storage tank as shown on the *Equipment List Form* and other parts of this application. A tank is considered modified if the material to be stored in the tank is different from the existing stored liquid.

IF USING US EPA'S TANKS EMISSION ESTIMATION PROGRAM (AVAILABLE AT www.epa.gov/tnn/tanks.html), APPLICANT MAY ATTACH THE SUMMARY SHEETS IN LIEU OF COMPLETING SECTIONS III, IV, & V OF THIS FORM. HOWEVER, SECTIONS I, II, AND VI OF THIS FORM MUST BE COMPLETED. US EPA'S AP-42, SECTION 7.1, "ORGANIC LIQUID STORAGE TANKS," MAY ALSO BE USED TO ESTIMATE VOC AND HAP EMISSIONS (http://www.epa.gov/tnn/chief/).

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name Zone 4 Tank Farm	2. Tank Name Slop Tank
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) TK-4500 (TK6)	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 3E
5. Date of Commencement of Construction (for existing tanks)	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable) N/A	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) ☐ Yes ☒ No	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode). N/A	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): N/A	

II. TANK INFORMATION (required)

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height.	
9A. Tank Internal Diameter (ft) 34	9B. Tank Internal Height (or Length) (ft) 27
10A. Maximum Liquid Height (ft) 22	10B. Average Liquid Height (ft) 13
11A. Maximum Vapor Space Height (ft) 23	11B. Average Vapor Space Height (ft) 14
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights.	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
6,150,000	300,000

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume)
41.16

15. Maximum tank fill rate (gal/min) 400

16. Tank fill method ☒ Submerged ☐ Splash ☐ Bottom Loading

17. Complete 17A and 17B for Variable Vapor Space Tank Systems ☒ Does Not Apply

17A. Volume Expansion Capacity of System (gal)	17B. Number of transfers into system per year

18. Type of tank (check all that apply):
☒ Fixed Roof ___ vertical ___ horizontal ___ flat roof X cone roof ___ dome roof
___ other (describe)
☐ External Floating Roof ___ pontoon roof ___ double deck roof
☐ Domed External (or Covered) Floating Roof
☐ Internal Floating Roof __ vertical column support ___ self-supporting
☐ Variable Vapor Space ___ lifter roof ___ diaphragm
☐ Pressurized ___ spherical ___ cylindrical
☐ Underground
☐ Other (describe)

III. TANK CONSTRUCTION & OPERATION INFORMATION (optional if providing TANKS Summary Sheets)

19. Tank Shell Construction:
☐ Riveted ☐ Gunite lined ☐ Epoxy-coated rivets ☐ Other (describe)

20A. Shell Color	20B. Roof Color	20C. Year Last Painted

21. Shell Condition (if metal and unlined):
☐ No Rust ☐ Light Rust ☐ Dense Rust ☐ Not applicable

22A. Is the tank heated? ☐ YES ☐ NO

22B. If YES, provide the operating temperature (°F)

22C. If YES, please describe how heat is provided to tank.

23. Operating Pressure Range (psig): to

24. Complete the following section for **Vertical Fixed Roof Tanks** ☐ Does Not Apply

24A. For dome roof, provide roof radius (ft)

24B. For cone roof, provide slope (ft/ft)

25. Complete the following section for **Floating Roof Tanks** ☐ Does Not Apply

25A. Year Internal Floaters Installed:

25B. Primary Seal Type: (check one)
☐ Metallic (Mechanical) Shoe Seal ☐ Liquid Mounted Resilient Seal
☐ Vapor Mounted Resilient Seal ☐ Other (describe):

25C. Is the Floating Roof equipped with a Secondary Seal? ☐ YES ☐ NO

25D. If YES, how is the secondary seal mounted? (check one) ☐ Shoe ☐ Rim ☐ Other (describe):

25E. Is the Floating Roof equipped with a weather shield? ☐ YES ☐ NO

25F. Describe deck fittings; indicate the number of each type of fitting:		
ACCESS HATCH		
BOLT COVER, GASKETED:	UNBOLTED COVER, GASKETED:	UNBOLTED COVER, UNGASKETED:
AUTOMATIC GAUGE FLOAT WELL		
BOLT COVER, GASKETED:	UNBOLTED COVER, GASKETED:	UNBOLTED COVER, UNGASKETED:
COLUMN WELL		
BUILT-UP COLUMN – SLIDING COVER, GASKETED:	BUILT-UP COLUMN – SLIDING COVER, UNGASKETED:	PIPE COLUMN – FLEXIBLE FABRIC SLEEVE SEAL:
LADDER WELL		
PIP COLUMN – SLIDING COVER, GASKETED:	PIPE COLUMN – SLIDING COVER, UNGASKETED:	
GAUGE-HATCH/SAMPLE PORT		
SLIDING COVER, GASKETED:	SLIDING COVER, UNGASKETED:	
ROOF LEG OR HANGER WELL		
WEIGHTED MECHANICAL ACTUATION, GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	SAMPLE WELL-SLIT FABRIC SEAL (10% OPEN AREA)
VACUUM BREAKER		
WEIGHTED MECHANICAL ACTUATION, GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	
RIM VENT		
WEIGHTED MECHANICAL ACTUATION GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	
DECK DRAIN (3-INCH DIAMETER)		
OPEN:	90% CLOSED:	
STUB DRAIN		
1-INCH DIAMETER:		
OTHER (DESCRIBE, ATTACH ADDITIONAL PAGES IF NECESSARY)		

26. Complete the following section for Internal Floating Roof Tanks ☐ Does Not Apply	
26A. Deck Type: ☐ Bolted ☐ Welded	
26B. For Bolted decks, provide deck construction:	
26C. Deck seam: ☐ Continuous sheet construction 5 feet wide ☐ Continuous sheet construction 6 feet wide ☐ Continuous sheet construction 7 feet wide ☐ Continuous sheet construction 5 × 7.5 feet wide ☐ Continuous sheet construction 5 × 12 feet wide ☐ Other (describe)	
26D. Deck seam length (ft)	26E. Area of deck (ft^2)
For column supported tanks: 26F. Number of columns:	26G. Diameter of each column:

IV. SITE INFORMANTION (optional if providing TANKS Summary Sheets)

27. Provide the city and state on which the data in this section are based.
28. Daily Average Ambient Temperature (°F)
29. Annual Average Maximum Temperature (°F)
30. Annual Average Minimum Temperature (°F)
31. Average Wind Speed (miles/hr)
32. Annual Average Solar Insulation Factor (BTU/(ft^2·day))
33. Atmospheric Pressure (psia)

V. LIQUID INFORMATION (optional if providing TANKS Summary Sheets)

34. Average daily temperature range of bulk liquid:	
34A. Minimum (°F)	34B. Maximum (°F)
35. Average operating pressure range of tank:	
35A. Minimum (psig)	35B. Maximum (psig)
36A. Minimum Liquid Surface Temperature (°F)	36B. Corresponding Vapor Pressure (psia)
37A. Average Liquid Surface Temperature (°F)	37B. Corresponding Vapor Pressure (psia)
38A. Maximum Liquid Surface Temperature (°F)	38B. Corresponding Vapor Pressure (psia)

39. Provide the following for <u>each</u> liquid or gas to be stored in tank. Add additional pages if necessary.			
39A. Material Name or Composition			
39B. CAS Number			
39C. Liquid Density (lb/gal)			
39D. Liquid Molecular Weight (lb/lb-mole)			
39E. Vapor Molecular Weight (lb/lb-mole)			

Maximum Vapor Pressure 39F. True (psia) 39G. Reid (psia)			
Months Storage per Year 39H. From 39I. To			

VI. EMISSIONS AND CONTROL DEVICE DATA (required)

40. Emission Control Devices (check as many as apply): ☐ Does Not Apply

- ☐ Carbon Adsorption[1]
- ☐ Condenser[1]
- ☒ Conservation Vent (psig)
  - Vacuum Setting -0.5" H2O Pressure Setting 5" H2O
- ☐ Emergency Relief Valve (psig)
- ☒ Inert Gas Blanket of Nitrogen
- ☐ Insulation of Tank with
- ☒ Liquid Absorption (scrubber)[1]
- ☐ Refrigeration of Tank
- ☐ Rupture Disc (psig)
- ☐ Vent to Incinerator[1]
- ☐ Other[1] (describe):

[1] Complete appropriate Air Pollution Control Device Sheet.

41. Expected Emission Rate (submit Test Data or Calculations here or elsewhere in the application).

Material Name & CAS No.	Breathing Loss (lb/hr)	Working Loss Amount	Working Loss Units	Annual Loss (lb/yr)	Estimation Method[1]
VOC/Methanol 67-56-1	21.49 lb/yr	109.04	lb/h	0.07 tpy	Tanks

[1] EPA = EPA Emission Factor, MB = Material Balance, SS = Similar Source, ST = Similar Source Test, Throughput Data, O = Other (specify)

☐ Remember to attach emissions calculations, including TANKS Summary Sheets if applicable.

Attachment L
EMISSIONS UNIT DATA SHEET
STORAGE TANKS

Provide the following information for each new or modified bulk liquid storage tank as shown on the *Equipment List Form* and other parts of this application. A tank is considered modified if the material to be stored in the tank is different from the existing stored liquid.

IF USING US EPA'S TANKS EMISSION ESTIMATION PROGRAM (AVAILABLE AT www.epa.gov/tnn/tanks.html), APPLICANT MAY ATTACH THE SUMMARY SHEETS IN LIEU OF COMPLETING SECTIONS III, IV, & V OF THIS FORM. HOWEVER, SECTIONS I, II, AND VI OF THIS FORM MUST BE COMPLETED. US EPA'S AP-42, SECTION 7.1, "ORGANIC LIQUID STORAGE TANKS," MAY ALSO BE USED TO ESTIMATE VOC AND HAP EMISSIONS (http://www.epa.gov/tnn/chief/).

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name Zone 4 Tank Farm	2. Tank Name Sales Tanks
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) TK-4300 and TK-4400 (TK4 and TK5)	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 3E
5. Date of Commencement of Construction (for existing tanks)	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable) N/A	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) ☐ Yes ☒ No	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode). N/A	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): N/A	

II. TANK INFORMATION (required)

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height.	
9A. Tank Internal Diameter (ft) 70	9B. Tank Internal Height (or Length) (ft) 40
10A. Maximum Liquid Height (ft) 35	10B. Average Liquid Height (ft) 20
11A. Maximum Vapor Space Height (ft) 35	11B. Average Vapor Space Height (ft) 20
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights.	

13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
61,500,000	216,000

14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume)
51.25

15. Maximum tank fill rate (gal/min) 400

16. Tank fill method ☒ Submerged ☐ Splash ☐ Bottom Loading

17. Complete 17A and 17B for Variable Vapor Space Tank Systems ☒ Does Not Apply

17A. Volume Expansion Capacity of System (gal)	17B. Number of transfers into system per year

18. Type of tank (check all that apply):
- ☒ Fixed Roof ___ vertical ___ horizontal ___ flat roof ___ cone roof ___ dome roof
  ___ other (describe) Umbrella external roof
- ☐ External Floating Roof ___ pontoon roof ___ double deck roof
- ☐ Domed External (or Covered) Floating Roof
- ☒ Internal Floating Roof _X_ vertical column support ___ self-supporting
- ☐ Variable Vapor Space ___ lifter roof ___ diaphragm
- ☐ Pressurized ___ spherical ___ cylindrical
- ☐ Underground
- ☐ Other (describe)

III. TANK CONSTRUCTION & OPERATION INFORMATION (optional if providing TANKS Summary Sheets)

19. Tank Shell Construction:
☐ Riveted ☐ Gunite lined ☐ Epoxy-coated rivets ☐ Other (describe)

20A. Shell Color	20B. Roof Color	20C. Year Last Painted

21. Shell Condition (if metal and unlined):
☐ No Rust ☐ Light Rust ☐ Dense Rust ☐ Not applicable

22A. Is the tank heated? ☐ YES ☐ NO

22B. If YES, provide the operating temperature (°F)

22C. If YES, please describe how heat is provided to tank.

23. Operating Pressure Range (psig): to

24. Complete the following section for **Vertical Fixed Roof Tanks** ☐ Does Not Apply

24A. For dome roof, provide roof radius (ft)

24B. For cone roof, provide slope (ft/ft)

25. Complete the following section for **Floating Roof Tanks** ☐ Does Not Apply

25A. Year Internal Floaters Installed:

25B. Primary Seal Type: (check one)
☐ Metallic (Mechanical) Shoe Seal ☐ Liquid Mounted Resilient Seal
☐ Vapor Mounted Resilient Seal ☐ Other (describe):

25C. Is the Floating Roof equipped with a Secondary Seal? ☐ YES ☐ NO

25D. If YES, how is the secondary seal mounted? (check one) ☐ Shoe ☐ Rim ☐ Other (describe):

25E. Is the Floating Roof equipped with a weather shield? ☐ YES ☐ NO

25F. Describe deck fittings; indicate the number of each type of fitting:		
ACCESS HATCH		
BOLT COVER, GASKETED:	UNBOLTED COVER, GASKETED:	UNBOLTED COVER, UNGASKETED:
AUTOMATIC GAUGE FLOAT WELL		
BOLT COVER, GASKETED:	UNBOLTED COVER, GASKETED:	UNBOLTED COVER, UNGASKETED:
COLUMN WELL		
BUILT-UP COLUMN – SLIDING COVER, GASKETED:	BUILT-UP COLUMN – SLIDING COVER, UNGASKETED:	PIPE COLUMN – FLEXIBLE FABRIC SLEEVE SEAL:
LADDER WELL		
PIP COLUMN – SLIDING COVER, GASKETED:	PIPE COLUMN – SLIDING COVER, UNGASKETED:	
GAUGE-HATCH/SAMPLE PORT		
SLIDING COVER, GASKETED:	SLIDING COVER, UNGASKETED:	
ROOF LEG OR HANGER WELL		
WEIGHTED MECHANICAL ACTUATION, GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	SAMPLE WELL-SLIT FABRIC SEAL (10% OPEN AREA)
VACUUM BREAKER		
WEIGHTED MECHANICAL ACTUATION, GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	
RIM VENT		
WEIGHTED MECHANICAL ACTUATION GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	
DECK DRAIN (3-INCH DIAMETER)		
OPEN:	90% CLOSED:	
STUB DRAIN		
1-INCH DIAMETER:		
OTHER (DESCRIBE, ATTACH ADDITIONAL PAGES IF NECESSARY)		

26. Complete the following section for Internal Floating Roof Tanks ☐ Does Not Apply	
26A. Deck Type: ☐ Bolted ☐ Welded	
26B. For Bolted decks, provide deck construction:	
26C. Deck seam: ☐ Continuous sheet construction 5 feet wide ☐ Continuous sheet construction 6 feet wide ☐ Continuous sheet construction 7 feet wide ☐ Continuous sheet construction 5 × 7.5 feet wide ☐ Continuous sheet construction 5 × 12 feet wide ☐ Other (describe)	
26D. Deck seam length (ft)	26E. Area of deck (ft^2)
For column supported tanks: 26F. Number of columns:	26G. Diameter of each column:

IV. SITE INFORMANTION (optional if providing TANKS Summary Sheets)

27. Provide the city and state on which the data in this section are based.
28. Daily Average Ambient Temperature (°F)
29. Annual Average Maximum Temperature (°F)
30. Annual Average Minimum Temperature (°F)
31. Average Wind Speed (miles/hr)
32. Annual Average Solar Insulation Factor (BTU/(ft^2·day))
33. Atmospheric Pressure (psia)

V. LIQUID INFORMATION (optional if providing TANKS Summary Sheets)

34. Average daily temperature range of bulk liquid:	
34A. Minimum (°F)	34B. Maximum (°F)
35. Average operating pressure range of tank:	
35A. Minimum (psig)	35B. Maximum (psig)
36A. Minimum Liquid Surface Temperature (°F)	36B. Corresponding Vapor Pressure (psia)
37A. Average Liquid Surface Temperature (°F)	37B. Corresponding Vapor Pressure (psia)
38A. Maximum Liquid Surface Temperature (°F)	38B. Corresponding Vapor Pressure (psia)

39. Provide the following for <u>each</u> liquid or gas to be stored in tank. Add additional pages if necessary.			
39A. Material Name or Composition			
39B. CAS Number			
39C. Liquid Density (lb/gal)			
39D. Liquid Molecular Weight (lb/lb-mole)			
39E. Vapor Molecular Weight (lb/lb-mole)			

Maximum Vapor Pressure 39F. True (psia) 39G. Reid (psia)			
Months Storage per Year 39H. From 39I. To			

VI. EMISSIONS AND CONTROL DEVICE DATA (required)

40. Emission Control Devices (check as many as apply): ☐ Does Not Apply

- ☐ Carbon Adsorption[1]
- ☐ Condenser[1]
- ☒ Conservation Vent (psig)
  - Vacuum Setting -0.5" H2O Pressure Setting 5" H2O
- ☐ Emergency Relief Valve (psig)
- ☒ Inert Gas Blanket of Nitrogen
- ☐ Insulation of Tank with
- ☒ Liquid Absorption (scrubber)[1]
- ☐ Refrigeration of Tank
- ☐ Rupture Disc (psig)
- ☐ Vent to Incinerator[1]
- ☐ Other[1] (describe):

[1] Complete appropriate Air Pollution Control Device Sheet.

41. Expected Emission Rate (submit Test Data or Calculations here or elsewhere in the application).

Material Name & CAS No.	Breathing Loss (lb/hr)	Working Loss Amount	Working Loss Units	Annual Loss (lb/yr)	Estimation Method[1]
VOC/Methanol 67-56-1				0.01 tpy	Tanks

[1] EPA = EPA Emission Factor, MB = Material Balance, SS = Similar Source, ST = Similar Source Test, Throughput Data, O = Other (specify)

☐ Remember to attach emissions calculations, including TANKS Summary Sheets if applicable.

Attachment L
EMISSIONS UNIT DATA SHEET
STORAGE TANKS

Provide the following information for each new or modified bulk liquid storage tank as shown on the *Equipment List Form* and other parts of this application. A tank is considered modified if the material to be stored in the tank is different from the existing stored liquid.

IF USING US EPA'S TANKS EMISSION ESTIMATION PROGRAM (AVAILABLE AT www.epa.gov/tnn/tanks.html), APPLICANT MAY ATTACH THE SUMMARY SHEETS IN LIEU OF COMPLETING SECTIONS III, IV, & V OF THIS FORM. HOWEVER, SECTIONS I, II, AND VI OF THIS FORM MUST BE COMPLETED. US EPA'S AP-42, SECTION 7.1, "ORGANIC LIQUID STORAGE TANKS," MAY ALSO BE USED TO ESTIMATE VOC AND HAP EMISSIONS (http://www.epa.gov/tnn/chief/).

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name Zone 12 Tank Farm	2. Tank Name Product Tanks
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) TK-12100 and TK-12200(TK7 and TK8)	4. Emission Point Identification No. (as assigned on *Equipment List Form*) 4E
5. Date of Commencement of Construction (for existing tanks)	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable) N/A	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) ☐ Yes ☒ No	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode). N/A	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): N/A	

II. TANK INFORMATION (required)

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height.	
9A. Tank Internal Diameter (ft) 70	9B. Tank Internal Height (or Length) (ft) 40
10A. Maximum Liquid Height (ft) 35	10B. Average Liquid Height (ft) 20
11A. Maximum Vapor Space Height (ft) 35	11B. Average Vapor Space Height (ft) 20
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights.	

13A. Maximum annual throughput (gal/yr) 61,500,000	13B. Maximum daily throughput (gal/day) 216,000
14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume) 51.25	
15. Maximum tank fill rate (gal/min) 400	
16. Tank fill method ☒ Submerged ☐ Splash ☐ Bottom Loading	
17. Complete 17A and 17B for Variable Vapor Space Tank Systems ☒ Does Not Apply	
17A. Volume Expansion Capacity of System (gal)	17B. Number of transfers into system per year

18. Type of tank (check all that apply):

☒ Fixed Roof ___ vertical ___ horizontal ___ flat roof ___ cone roof ___ dome roof
___ other (describe) Umbrella external roof

☐ External Floating Roof ___ pontoon roof ___ double deck roof

☐ Domed External (or Covered) Floating Roof

☒ Internal Floating Roof _X_ vertical column support ___ self-supporting

☐ Variable Vapor Space ___ lifter roof ___ diaphragm

☐ Pressurized ___ spherical ___ cylindrical

☐ Underground

☐ Other (describe)

III. TANK CONSTRUCTION & OPERATION INFORMATION (optional if providing TANKS Summary Sheets)

19. Tank Shell Construction: ☐ Riveted ☐ Gunite lined ☐ Epoxy-coated rivets ☐ Other (describe)		
20A. Shell Color	20B. Roof Color	20C. Year Last Painted
21. Shell Condition (if metal and unlined): ☐ No Rust ☐ Light Rust ☐ Dense Rust ☐ Not applicable		
22A. Is the tank heated? ☐ YES ☐ NO		
22B. If YES, provide the operating temperature (°F)		
22C. If YES, please describe how heat is provided to tank.		
23. Operating Pressure Range (psig): to		
24. Complete the following section for **Vertical Fixed Roof Tanks** ☐ Does Not Apply		
24A. For dome roof, provide roof radius (ft)		
24B. For cone roof, provide slope (ft/ft)		
25. Complete the following section for **Floating Roof Tanks** ☐ Does Not Apply		
25A. Year Internal Floaters Installed:		
25B. Primary Seal Type: (check one) ☐ Metallic (Mechanical) Shoe Seal ☐ Vapor Mounted Resilient Seal	☐ Liquid Mounted Resilient Seal ☐ Other (describe):	
25C. Is the Floating Roof equipped with a Secondary Seal? ☐ YES ☐ NO		
25D. If YES, how is the secondary seal mounted? (check one) ☐ Shoe ☐ Rim ☐ Other (describe):		
25E. Is the Floating Roof equipped with a weather shield? ☐ YES ☐ NO		

25F. Describe deck fittings; indicate the number of each type of fitting:		
ACCESS HATCH		
BOLT COVER, GASKETED:	UNBOLTED COVER, GASKETED:	UNBOLTED COVER, UNGASKETED:
AUTOMATIC GAUGE FLOAT WELL		
BOLT COVER, GASKETED:	UNBOLTED COVER, GASKETED:	UNBOLTED COVER, UNGASKETED:
COLUMN WELL		
BUILT-UP COLUMN – SLIDING COVER, GASKETED:	BUILT-UP COLUMN – SLIDING COVER, UNGASKETED:	PIPE COLUMN – FLEXIBLE FABRIC SLEEVE SEAL:
LADDER WELL		
PIP COLUMN – SLIDING COVER, GASKETED:	PIPE COLUMN – SLIDING COVER, UNGASKETED:	
GAUGE-HATCH/SAMPLE PORT		
SLIDING COVER, GASKETED:	SLIDING COVER, UNGASKETED:	
ROOF LEG OR HANGER WELL		
WEIGHTED MECHANICAL ACTUATION, GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	SAMPLE WELL-SLIT FABRIC SEAL (10% OPEN AREA)
VACUUM BREAKER		
WEIGHTED MECHANICAL ACTUATION, GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	
RIM VENT		
WEIGHTED MECHANICAL ACTUATION GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	
DECK DRAIN (3-INCH DIAMETER)		
OPEN:	90% CLOSED:	
STUB DRAIN		
1-INCH DIAMETER:		
OTHER (DESCRIBE, ATTACH ADDITIONAL PAGES IF NECESSARY)		

26. Complete the following section for Internal Floating Roof Tanks ☐ Does Not Apply	
26A. Deck Type: ☐ Bolted ☐ Welded	
26B. For Bolted decks, provide deck construction:	
26C. Deck seam: ☐ Continuous sheet construction 5 feet wide ☐ Continuous sheet construction 6 feet wide ☐ Continuous sheet construction 7 feet wide ☐ Continuous sheet construction 5 × 7.5 feet wide ☐ Continuous sheet construction 5 × 12 feet wide ☐ Other (describe)	
26D. Deck seam length (ft)	26E. Area of deck (ft^2)
For column supported tanks: 26F. Number of columns:	26G. Diameter of each column:

IV. SITE INFORMANTION (optional if providing TANKS Summary Sheets)

27. Provide the city and state on which the data in this section are based.
28. Daily Average Ambient Temperature (°F)
29. Annual Average Maximum Temperature (°F)
30. Annual Average Minimum Temperature (°F)
31. Average Wind Speed (miles/hr)
32. Annual Average Solar Insulation Factor (BTU/(ft^2·day))
33. Atmospheric Pressure (psia)

V. LIQUID INFORMATION (optional if providing TANKS Summary Sheets)

34. Average daily temperature range of bulk liquid:	
34A. Minimum (°F)	34B. Maximum (°F)
35. Average operating pressure range of tank:	
35A. Minimum (psig)	35B. Maximum (psig)
36A. Minimum Liquid Surface Temperature (°F)	36B. Corresponding Vapor Pressure (psia)
37A. Average Liquid Surface Temperature (°F)	37B. Corresponding Vapor Pressure (psia)
38A. Maximum Liquid Surface Temperature (°F)	38B. Corresponding Vapor Pressure (psia)

39. Provide the following for <u>each</u> liquid or gas to be stored in tank. Add additional pages if necessary.			
39A. Material Name or Composition			
39B. CAS Number			
39C. Liquid Density (lb/gal)			
39D. Liquid Molecular Weight (lb/lb-mole)			
39E. Vapor Molecular Weight (lb/lb-mole)			

Maximum Vapor Pressure 39F. True (psia) 39G. Reid (psia)			
Months Storage per Year 39H. From 39I. To			

VI. EMISSIONS AND CONTROL DEVICE DATA (required)

40. Emission Control Devices (check as many as apply): ☐ Does Not Apply

- ☐ Carbon Adsorption[1]
- ☐ Condenser[1]
- ☒ Conservation Vent (psig)
  - Vacuum Setting -0.5" H2O Pressure Setting 5" H2O
- ☐ Emergency Relief Valve (psig)
- ☒ Inert Gas Blanket of Nitrogen
- ☐ Insulation of Tank with
- ☒ Liquid Absorption (scrubber)[1]
- ☐ Refrigeration of Tank
- ☐ Rupture Disc (psig)
- ☐ Vent to Incinerator[1]
- ☐ Other[1] (describe):

[1] Complete appropriate Air Pollution Control Device Sheet.

41. Expected Emission Rate (submit Test Data or Calculations here or elsewhere in the application).

Material Name & CAS No.	Breathing Loss (lb/hr)	Working Loss Amount	Working Loss Units	Annual Loss (lb/yr)	Estimation Method[1]
VOC/Methanol 67-56-1				0.01 tpy	Tanks

[1] EPA = EPA Emission Factor, MB = Material Balance, SS = Similar Source, ST = Similar Source Test, Throughput Data, O = Other (specify)

☐ Remember to attach emissions calculations, including TANKS Summary Sheets if applicable.

Attachment L
EMISSIONS UNIT DATA SHEET
BULK LIQUID TRANSFER OPERATIONS

Furnish the following information for each new or modified bulk liquid transfer area or loading rack, as shown on the *Equipment List Form* and other parts of this application. This form is to be used for bulk liquid transfer operations such as to and from drums, marine vessels, rail tank cars, and tank trucks.

Identification Number (as assigned on *Equipment List Form*): 11S	
1. Loading Area Name: Truck Loading	
2. Type of cargo vessels accommodated at this rack or transfer point (check as many as apply): ☐ Drums ☐ Marine Vessels ☐ Rail Tank Cars ☒ Tank Trucks	
3. Loading Rack or Transfer Point Data:	
Number of pumps	1
Number of liquids loaded	1
Maximum number of marine vessels, tank trucks, tank cars, and/or drums loading at one time	1
4. Does ballasting of marine vessels occur at this loading area? ☐ Yes ☐ No ☒ Does not apply	
5. Describe cleaning location, compounds and procedure for cargo vessels using this transfer point: Tanks are cleaned at a remote service location and/or are dedicated trucks.	
6. Are cargo vessels pressure tested for leaks at this or any other location? ☒ Yes ☐ No If YES, describe: Pressure tests as required will be conducted at a remote service location.	

7. Projected Maximum Operating Schedule (for rack or transfer point as a whole):

Maximum	Jan. - Mar.	Apr. - June	July - Sept.	Oct. - Dec.
hours/day	24	24	24	24
days/week	7	7	7	7
weeks/quarter	13	13	13	13

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification		
User Identification:	Rundown Tanks	
City:	Charleston	
State:	West Virginia	
Company:	USM	
Type of Tank:	Vertical Fixed Roof Tank	
Description:		
Tank Dimensions		
Shell Height (ft):		27.00
Diameter (ft):		24.00
Liquid Height (ft) :		22.00
Avg. Liquid Height (ft):		13.00
Volume (gallons):		74,450.61
Turnovers:		826.05
Net Throughput(gal/yr):		61,500,000.00
Is Tank Heated (y/n):	N	
Paint Characteristics		
Shell Color/Shade:	White/White	
Shell Condition	Good	
Roof Color/Shade:	White/White	
Roof Condition:	Good	
Roof Characteristics		
Type:	Cone	
Height (ft)		0.00
Slope (ft/ft) (Cone Roof)		0.00
Breather Vent Settings		
Vacuum Settings (psig):		-0.02
Pressure Settings (psig)		0.18

Meterological Data used in Emissions Calculations: Charleston, West Virginia (Avg Atmospheric Pressure = 14.25 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

Rundown Tanks - Vertical Fixed Roof Tank
Charleston, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Methyl alcohol	All	56.67	51.31	62.04	55.00	1.2977	1.0908	1.5373	32.0400			32.04	Option 2: A=7.897, B=1474.08, C=229.13

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

Rundown Tanks - Vertical Fixed Roof Tank
Charleston, West Virginia

Annual Emission Calcaulations	
Standing Losses (lb):	535.3606
Vapor Space Volume (cu ft):	6,333.4508
Vapor Density (lb/cu ft):	0.0075
Vapor Space Expansion Factor:	0.0606
Vented Vapor Saturation Factor:	0.5095
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	6,333.4508
Tank Diameter (ft):	24.0000
Vapor Space Outage (ft):	14.0000
Tank Shell Height (ft):	27.0000
Average Liquid Height (ft):	13.0000
Roof Outage (ft):	0.0000
Roof Outage (Cone Roof)	
Roof Outage (ft):	0.0000
Roof Height (ft):	0.0000
Roof Slope (ft/ft):	0.0000
Shell Radius (ft):	12.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0075
Vapor Molecular Weight (lb/lb-mole):	32.0400
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	1.2977
Daily Avg. Liquid Surface Temp. (deg. R):	516.3441
Daily Average Ambient Temp. (deg. F):	54.9833
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	514.6733
Tank Paint Solar Absorptance (Shell):	0.1700
Tank Paint Solar Absorptance (Roof):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,250.5726
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0606
Daily Vapor Temperature Range (deg. R):	21.4567
Daily Vapor Pressure Range (psia):	0.4465
Breather Vent Press. Setting Range(psia):	0.2000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	1.2977
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	1.0908
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	1.5373
Daily Avg. Liquid Surface Temp. (deg R):	516.3441
Daily Min. Liquid Surface Temp. (deg R):	510.9799
Daily Max. Liquid Surface Temp. (deg R):	521.7082

Daily Ambient Temp. Range (deg. R):	21.5333
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.5095
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	1.2977
Vapor Space Outage (ft):	14.0000
Working Losses (lb):	12,357.8035
Vapor Molecular Weight (lb/lb-mole):	32.0400
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	1.2977
Annual Net Throughput (gal/yr.):	61,500,000.0000
Annual Turnovers:	826.0510
Turnover Factor:	0.2030
Maximum Liquid Volume (gal):	74,450.6068
Maximum Liquid Height (ft):	22.0000
Tank Diameter (ft):	24.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	12,893.1642

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

Rundown Tanks - Vertical Fixed Roof Tank
Charleston, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Methyl alcohol	12,357.80	535.36	12,893.16

Working Losses are for both tanks where the Breathing Losses are for one tank only.

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	Fusel Oil
City:	Charleston
State:	West Virginia
Company:	US Methanol
Type of Tank:	Vertical Fixed Roof Tank
Description:	

Tank Dimensions

Shell Height (ft):	23.00
Diameter (ft):	10.50
Liquid Height (ft) :	19.00
Avg. Liquid Height (ft):	10.00
Volume (gallons):	12,307.09
Turnovers:	18.28
Net Throughput(gal/yr):	225,000.00
Is Tank Heated (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Roof Characteristics

Type:	Cone
Height (ft)	0.00
Slope (ft/ft) (Cone Roof)	0.00

Breather Vent Settings

Vacuum Settings (psig):	-0.02
Pressure Settings (psig)	0.20

Meterological Data used in Emissions Calculations: Charleston, West Virginia (Avg Atmospheric Pressure = 14.25 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

Fusel Oil - Vertical Fixed Roof Tank
Charleston, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Fusel Oil	All	56.67	51.31	62.04	55.00	0.3243	0.2678	0.3890	23.1959			19.45	
Butyl alcohol (-tert)						0.3801	0.3077	0.4684	74.1200	0.0110	0.0108	74.12	Option 1: VP50 = .29 VP60 = .425
Ethyl alcohol						0.5863	0.4853	0.7052	46.0700	0.0060	0.0091	46.07	Option 2: A=8.321, B=1718.21, C=237.52
Methyl alcohol						1.2977	1.0908	1.5373	32.0400	0.1430	0.4799	32.04	Option 2: A=7.897, B=1474.08, C=229.13
Water						0.2303	0.1884	0.2781	18.0000	0.8400	0.5002	18.00	Option 1: VP50 = .17811 VP60 = .2563

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

Fusel Oil - Vertical Fixed Roof Tank
Charleston, West Virginia

Annual Emission Calcaulations	
Standing Losses (lb):	15.7130
Vapor Space Volume (cu ft):	1,125.6719
Vapor Density (lb/cu ft):	0.0014
Vapor Space Expansion Factor:	0.0345
Vented Vapor Saturation Factor:	0.8174
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	1,125.6719
Tank Diameter (ft):	10.5000
Vapor Space Outage (ft):	13.0000
Tank Shell Height (ft):	23.0000
Average Liquid Height (ft):	10.0000
Roof Outage (ft):	0.0000
Roof Outage (Cone Roof)	
Roof Outage (ft):	0.0000
Roof Height (ft):	0.0000
Roof Slope (ft/ft):	0.0000
Shell Radius (ft):	5.2500
Vapor Density	
Vapor Density (lb/cu ft):	0.0014
Vapor Molecular Weight (lb/lb-mole):	23.1959
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.3243
Daily Avg. Liquid Surface Temp. (deg. R):	516.3441
Daily Average Ambient Temp. (deg. F):	54.9833
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	514.6733
Tank Paint Solar Absorptance (Shell):	0.1700
Tank Paint Solar Absorptance (Roof):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,250.5726
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0345
Daily Vapor Temperature Range (deg. R):	21.4567
Daily Vapor Pressure Range (psia):	0.1212
Breather Vent Press. Setting Range(psia):	0.2200
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.3243
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.2678
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.3890
Daily Avg. Liquid Surface Temp. (deg R):	516.3441
Daily Min. Liquid Surface Temp. (deg R):	510.9799
Daily Max. Liquid Surface Temp. (deg R):	521.7082
Daily Ambient Temp. Range (deg. R):	21.5333
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.8174
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	0.3243
Vapor Space Outage (ft):	13.0000
Working Losses (lb):	40.2982
Vapor Molecular Weight (lb/lb-mole):	23.1959
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.3243
Annual Net Throughput (gal/yr.):	225,000.0000
Annual Turnovers:	18.2821
Turnover Factor:	1.0000
Maximum Liquid Volume (gal):	12,307.0872
Maximum Liquid Height (ft):	19.0000
Tank Diameter (ft):	10.5000
Working Loss Product Factor:	1.0000
Total Losses (lb):	56.0112

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

Fusel Oil - Vertical Fixed Roof Tank
Charleston, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Fusel Oil	40.30	15.71	56.01
Methyl alcohol	19.34	7.54	26.88
Ethyl alcohol	0.37	0.14	0.51
Butyl alcohol (-tert)	0.44	0.17	0.61
Water	20.16	7.86	28.02

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification		
User Identification:	Slops Tank	
City:	Charleston	
State:	West Virginia	
Company:	USM	
Type of Tank:	Vertical Fixed Roof Tank	
Description:		
Tank Dimensions		
Shell Height (ft):		27.00
Diameter (ft):		34.00
Liquid Height (ft) :		22.00
Avg. Liquid Height (ft):		13.00
Volume (gallons):		149,418.23
Turnovers:		41.16
Net Throughput(gal/yr):		6,150,000.00
Is Tank Heated (y/n):	N	
Paint Characteristics		
Shell Color/Shade:	White/White	
Shell Condition	Good	
Roof Color/Shade:	White/White	
Roof Condition:	Good	
Roof Characteristics		
Type:	Cone	
Height (ft)		0.00
Slope (ft/ft) (Cone Roof)		0.00
Breather Vent Settings		
Vacuum Settings (psig):		-0.02
Pressure Settings (psig)		0.18

Meterological Data used in Emissions Calculations: Charleston, West Virginia (Avg Atmospheric Pressure = 14.25 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

Slops Tank - Vertical Fixed Roof Tank
Charleston, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Methyl alcohol	All	56.67	51.31	62.04	55.00	1.2977	1.0908	1.5373	32.0400			32.04	Option 2: A=7.897, B=1474.08, C=229.13

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

Slops Tank - Vertical Fixed Roof Tank
Charleston, West Virginia

Annual Emission Calcaulations	
Standing Losses (lb):	1,074.4391
Vapor Space Volume (cu ft):	12,710.8839
Vapor Density (lb/cu ft):	0.0075
Vapor Space Expansion Factor:	0.0606
Vented Vapor Saturation Factor:	0.5095
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	12,710.8839
Tank Diameter (ft):	34.0000
Vapor Space Outage (ft):	14.0000
Tank Shell Height (ft):	27.0000
Average Liquid Height (ft):	13.0000
Roof Outage (ft):	0.0000
Roof Outage (Cone Roof)	
Roof Outage (ft):	0.0000
Roof Height (ft):	0.0000
Roof Slope (ft/ft):	0.0000
Shell Radius (ft):	17.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0075
Vapor Molecular Weight (lb/lb-mole):	32.0400
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	1.2977
Daily Avg. Liquid Surface Temp. (deg. R):	516.3441
Daily Average Ambient Temp. (deg. F):	54.9833
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	514.6733
Tank Paint Solar Absorptance (Shell):	0.1700
Tank Paint Solar Absorptance (Roof):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,250.5726
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0606
Daily Vapor Temperature Range (deg. R):	21.4567
Daily Vapor Pressure Range (psia):	0.4465
Breather Vent Press. Setting Range(psia):	0.2000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	1.2977
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	1.0908
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	1.5373
Daily Avg. Liquid Surface Temp. (deg R):	516.3441
Daily Min. Liquid Surface Temp. (deg R):	510.9799
Daily Max. Liquid Surface Temp. (deg R):	521.7082

Daily Ambient Temp. Range (deg. R):	21.5333
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.5095
Vapor Pressure at Daily Average Liquid:	
Surface Temperature (psia):	1.2977
Vapor Space Outage (ft):	14.0000
Working Losses (lb):	5,452.0834
Vapor Molecular Weight (lb/lb-mole):	32.0400
Vapor Pressure at Daily Average Liquid	
Surface Temperature (psia):	1.2977
Annual Net Throughput (gal/yr.):	6,150,000.0000
Annual Turnovers:	41.1596
Turnover Factor:	0.8955
Maximum Liquid Volume (gal):	149,418.2317
Maximum Liquid Height (ft):	22.0000
Tank Diameter (ft):	34.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	6,526.5225

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

Slops Tank - Vertical Fixed Roof Tank
Charleston, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Methyl alcohol	5,452.08	1,074.44	6,526.52

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Identification and Physical Characteristics

Identification		
User Identification:	Sales Tanks	
City:	Charleston	
State:	West Virginia	
Company:	USM	
Type of Tank:	Internal Floating Roof Tank	
Description:		
Tank Dimensions		
Diameter (ft):		70.00
Volume (gallons):		1,200,000.00
Turnovers:		51.25
Self Supp. Roof? (y/n):	Y	
No. of Columns:		0.00
Eff. Col. Diam. (ft):		0.00
Paint Characteristics		
Internal Shell Condition:	Light Rust	
Shell Color/Shade:	White/White	
Shell Condition	Good	
Roof Color/Shade:	White/White	
Roof Condition:	Good	
Rim-Seal System		
Primary Seal:	Mechanical Shoe	
Secondary Seal	None	
Deck Characteristics		
Deck Fitting Category:	Typical	
Deck Type:	Welded	

Deck Fitting/Status	**Quantity**
Access Hatch (24-in. Diam.)/Unbolted Cover, Ungasketed	2
Automatic Gauge Float Well/Unbolted Cover, Ungasketed	2
Roof Leg or Hanger Well/Adjustable	42
Sample Pipe or Well (24-in. Diam.)/Slit Fabric Seal 10% Open	2
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	2

Meteorological Data used in Emissions Calculations: Charleston, West Virginia (Avg Atmospheric Pressure = 14.25 psia)

The fitting count above is for two floating roof tanks to account for the fitting losses for each tank.

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

Sales Tanks - Internal Floating Roof Tank
Charleston, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Methyl alcohol	All	56.67	51.31	62.04	55.00	1.2977	N/A	N/A	32.0400			32.04	Option 2: A=7.897, B=1474.08, C=229.13

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

Sales Tanks - Internal Floating Roof Tank
Charleston, West Virginia

Annual Emission Calcaulations	
Rim Seal Losses (lb):	310.3693
Seal Factor A (lb-mole/ft-yr):	5.8000
Seal Factor B (lb-mole/ft-yr (mph)^n):	0.3000
Value of Vapor Pressure Function:	0.0239
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	1.2977
Tank Diameter (ft):	70.0000
Vapor Molecular Weight (lb/lb-mole):	32.0400
Product Factor:	1.0000
Withdrawal Losses (lb):	196.1753
Number of Columns:	0.0000
Effective Column Diameter (ft):	0.0000
Annual Net Throughput (gal/yr.):	61,500,000.0000
Shell Clingage Factor (bbl/1000 sqft):	0.0015
Average Organic Liquid Density (lb/gal):	6.6300
Tank Diameter (ft):	70.0000
Deck Fitting Losses (lb):	357.9185
Value of Vapor Pressure Function:	0.0239
Vapor Molecular Weight (lb/lb-mole):	32.0400
Product Factor:	1.0000
Tot. Roof Fitting Loss Fact.(lb-mole/yr):	468.2000
Deck Seam Losses (lb):	0.0000
Deck Seam Length (ft):	0.0000
Deck Seam Loss per Unit Length Factor (lb-mole/ft-yr):	0.0000
Deck Seam Length Factor(ft/sqft):	0.0000
Tank Diameter (ft):	70.0000
Vapor Molecular Weight (lb/lb-mole):	32.0400
Product Factor:	1.0000
Total Losses (lb):	864.4631

Roof Fitting/Status	Quantity	Roof Fitting Loss Factors KFa(lb-mole/yr)	KFb(lb-mole/(yr mph^n))	m	Losses(lb)
Access Hatch (24-in. Diam.)/Unbolted Cover, Ungasketed	2	36.00	5.90	1.20	55.0409
Automatic Gauge Float Well/Unbolted Cover, Ungasketed	2	14.00	5.40	1.10	21.4048
Roof Leg or Hanger Well/Adjustable	42	7.90	0.00	0.00	253.6466
Sample Pipe or Well (24-in. Diam.)/Slit Fabric Seal 10% Open	2	12.00	0.00	0.00	18.3470
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	2	6.20	1.20	0.94	9.4793

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

Sales Tanks - Internal Floating Roof Tank
Charleston, West Virginia

	Losses(lbs)				
Components	Rim Seal Loss	Withdrawl Loss	Deck Fitting Loss	Deck Seam Loss	Total Emissions
Methyl alcohol	310.37	196.18	357.92	0.00	864.46

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	Product Tank
City:	Charleston
State:	West Virginia
Company:	USM
Type of Tank:	Internal Floating Roof Tank
Description:	

Tank Dimensions

Diameter (ft):	70.00
Volume (gallons):	1,200,000.00
Turnovers:	51.25
Self Supp. Roof? (y/n):	Y
No. of Columns:	0.00
Eff. Col. Diam. (ft):	0.00

Paint Characteristics

Internal Shell Condition:	Light Rust
Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Rim-Seal System

Primary Seal:	Mechanical Shoe
Secondary Seal	None

Deck Characteristics

Deck Fitting Category:	Typical
Deck Type:	Welded

Deck Fitting/Status

	Quantity
Access Hatch (24-in. Diam.)/Unbolted Cover, Ungasketed	2
Automatic Gauge Float Well/Unbolted Cover, Ungasketed	2
Roof Leg or Hanger Well/Adjustable	42
Sample Pipe or Well (24-in. Diam.)/Slit Fabric Seal 10% Open	2
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	2

Meterological Data used in Emissions Calculations: Charleston, West Virginia (Avg Atmospheric Pressure = 14.25 psia)

The fitting count above is for two floating roof tanks to account for the fitting losses for each tank.

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

Product Tank - Internal Floating Roof Tank
Charleston, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Methyl alcohol	All	56.67	51.31	62.04	55.00	1.2977	N/A	N/A	32.0400			32.04	Option 2: A=7.897, B=1474.08, C=229.13

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

Product Tank - Internal Floating Roof Tank
Charleston, West Virginia

Annual Emission Calcaulations

Rim Seal Losses (lb):	310.3693
Seal Factor A (lb-mole/ft-yr):	5.8000
Seal Factor B (lb-mole/ft-yr (mph)^n):	0.3000
Value of Vapor Pressure Function:	0.0239
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	1.2977
Tank Diameter (ft):	70.0000
Vapor Molecular Weight (lb/lb-mole):	32.0400
Product Factor:	1.0000
Withdrawal Losses (lb):	196.1753
Number of Columns:	0.0000
Effective Column Diameter (ft):	0.0000
Annual Net Throughput (gal/yr.):	61,500,000.0000
Shell Clingage Factor (bbl/1000 sqft):	0.0015
Average Organic Liquid Density (lb/gal):	6.6300
Tank Diameter (ft):	70.0000
Deck Fitting Losses (lb):	357.9185
Value of Vapor Pressure Function:	0.0239
Vapor Molecular Weight (lb/lb-mole):	32.0400
Product Factor:	1.0000
Tot. Roof Fitting Loss Fact.(lb-mole/yr):	468.2000
Deck Seam Losses (lb):	0.0000
Deck Seam Length (ft):	0.0000
Deck Seam Loss per Unit Length Factor (lb-mole/ft-yr):	0.0000
Deck Seam Length Factor(ft/sqft):	0.0000
Tank Diameter (ft):	70.0000
Vapor Molecular Weight (lb/lb-mole):	32.0400
Product Factor:	1.0000
Total Losses (lb):	864.4631

Roof Fitting/Status	Quantity	Roof Fitting Loss Factors KFa(lb-mole/yr)	KFb(lb-mole/(yr mph^n))	m	Losses(lb)
Access Hatch (24-in. Diam.)/Unbolted Cover, Ungasketed	2	36.00	5.90	1.20	55.0409
Automatic Gauge Float Well/Unbolted Cover, Ungasketed	2	14.00	5.40	1.10	21.4048
Roof Leg or Hanger Well/Adjustable	42	7.90	0.00	0.00	253.6466
Sample Pipe or Well (24-in. Diam.)/Slit Fabric Seal 10% Open	2	12.00	0.00	0.00	18.3470
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	2	6.20	1.20	0.94	9.4793

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

Product Tank - Internal Floating Roof Tank
Charleston, West Virginia

	Losses(lbs)				
Components	Rim Seal Loss	Withdrawl Loss	Deck Fitting Loss	Deck Seam Loss	Total Emissions
Methyl alcohol	310.37	196.18	357.92	0.00	864.46

8. Bulk Liquid Data *(add pages as necessary):*								
Pump ID No.		P-4600						
Liquid Name		Fusel Oil						
Max. daily throughput (1000 gal/day)		12						
Max. annual throughput (1000 gal/yr)		225						
Loading Method [1]		SUB						
Max. Fill Rate (gal/min)		100						
Average Fill Time (min/loading)		120						
Max. Bulk Liquid Temperature (°F)		62						
True Vapor Pressure [2]		0.46						
Cargo Vessel Condition [3]		U						
Control Equipment or Method [4]		VB-SC						
Minimum control efficiency (%)		98						
Maximum Emission Rate	Loading (lb/hr)	0.33 lb/hr						
	Annual (lb/yr)	0.02 tpy						
Estimation Method [5]		EPA						

[1] BF = Bottom Fill SP = Splash Fill SUB = Submerged Fill

[2] At maximum bulk liquid temperature

[3] B = Ballasted Vessel, C = Cleaned, U = Uncleaned (dedicated service), O = other (describe)

[4] List as many as apply (complete and submit appropriate *Air Pollution Control Device Sheets*):CA = Carbon Adsorption LOA = Lean Oil Adsorption CO = Condensation SC = Scrubber (Absorption) CRA = Compressor-Refrigeration-Absorption TO = Thermal Oxidation or Incineration CRC = Compression-Refrigeration-Condensation VB = Dedicated Vapor Balance (closed system) VR = Vapor Recovery O = other (descibe)

[5] EPA = EPA Emission Factor as stated in AP-42
MB = Material Balance
TM = Test Measurement based upon test data submittal
O = other (describe)

9. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING	RECORDKEEPING
None Proposed	Track Daily and Yearly Throughput
REPORTING	**TESTING**
None Proposed	None Proposed

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty
Manufacturer's operating ranges and maintenance procedures will be followed as recommended upon selection/design of the system.

Attachment L
EMISSIONS UNIT DATA SHEET
BULK LIQUID TRANSFER OPERATIONS

Furnish the following information for each new or modified bulk liquid transfer area or loading rack, as shown on the *Equipment List Form* and other parts of this application. This form is to be used for bulk liquid transfer operations such as to and from drums, marine vessels, rail tank cars, and tank trucks.

Identification Number (as assigned on *Equipment List Form*): 14S

1. Loading Area Name: Barge Loading

2. Type of cargo vessels accommodated at this rack or transfer point (check as many as apply):
☐ Drums ☒ Marine Vessels ☐ Rail Tank Cars ☐ Tank Trucks

3. Loading Rack or Transfer Point Data:

Number of pumps	2
Number of liquids loaded	1
Maximum number of marine vessels, tank trucks, tank cars, and/or drums loading at one time	1

4. Does ballasting of marine vessels occur at this loading area?
☐ Yes ☒ No ☐ Does not apply

5. Describe cleaning location, compounds and procedure for cargo vessels using this transfer point:
Barges are cleaned at a remote service location and/or are dedicated barges.

6. Are cargo vessels pressure tested for leaks at this or any other location?
☐ Yes ☒ No
If YES, describe: Pressure tests as required will be conducted at a remote service location.

7. Projected Maximum Operating Schedule (for rack or transfer point as a whole):

Maximum	Jan. - Mar.	Apr. - June	July - Sept.	Oct. - Dec.
hours/day	24	24	24	24
days/week	7	7	7	7
weeks/quarter	13	13	13	13

8. Bulk Liquid Data *(add pages as necessary)*:								
Pump ID No.		P-12100A and P-12100B						
Liquid Name		Methanol						
Max. daily throughput (1000 gal/day)		500						
Max. annual throughput (1000 gal/yr)		61,500						
Loading Method [1]		SUB						
Max. Fill Rate (gal/min)		1,000						
Average Fill Time (min/loading)		480						
Max. Bulk Liquid Temperature (°F)		62						
True Vapor Pressure [2]		1.5						
Cargo Vessel Condition [3]		U						
Control Equipment or Method [4]		VB-SC						
Minimum control efficiency (%)		98					Ĉ	
Maximum Emission Rate	Loading (lb/hr)	1.63 lb/hr						
	Annual (lb/yr)	0.84 tpy						
Estimation Method [5]		EPA						

[1] BF = Bottom Fill SP = Splash Fill SUB = Submerged Fill

[2] At maximum bulk liquid temperature

[3] B = Ballasted Vessel, C = Cleaned, U = Uncleaned (dedicated service), O = other (describe)

[4] List as many as apply (complete and submit appropriate *Air Pollution Control Device Sheets*):CA = Carbon Adsorption LOA = Lean Oil Adsorption CO = Condensation SC = Scrubber (Absorption) CRA = Compressor-Refrigeration-Absorption TO = Thermal Oxidation or Incineration CRC = Compression-Refrigeration-Condensation VB = Dedicated Vapor Balance (closed system) VR = Vapor Recovery O = other (descibe)

[5] EPA = EPA Emission Factor as stated in AP-42
MB = Material Balance
TM = Test Measurement based upon test data submittal
O = other (describe)

9. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING	RECORDKEEPING
None Proposed	Track Daily and Yearly Throughput
REPORTING	TESTING
None Proposed	None Proposed

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty
Manufacturer's operating ranges and maintenance procedures will be followed as recommended upon selection/design of the system.

ATTACHMENT M

AIR POLLUTION CONTROL DEVICE SHEETS

Attachment M
Air Pollution Control Device Sheet
(FLARE SYSTEM)

Control Device ID No. (must match Emission Units Table): 4C - Flare

Equipment Information

1. Manufacturer: Manufacturer Not Selected (G)

   Model No. See additional information attached to this form.

2. Method: ☒ Elevated flare ☐ Ground flare ☐ Other Describe

3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.

   Manufacturer Not Selected

4. Method of system used:
   ☐ Steam-assisted ☐ Air-assisted ☐ Pressure-assisted ☒ Non-assisted

5. Maximum capacity of flare:
   38.05 scf/min
   2,283 scf/hr

6. Dimensions of stack:
   Diameter 16 inches ft.
   Height 145 ft.

7. Estimated combustion efficiency:
   (Waste gas destruction efficiency)
   Estimated: 98 %
   Minimum guaranteed: 98 %

8. Fuel used in burners:
   ☒ Natural Gas
   ☐ Fuel Oil, Number
   ☐ Other, Specify:

9. Number of burners:
   Rating: BTU/hr

10. Will preheat be used? ☐ Yes ☒ No

11. Describe method of controlling flame:

12. Flare height: 145 ft

13. Flare tip inside diameter: 16 inches ft

14. Natural gas flow rate to flare pilot flame per pilot light: 0.42 scf/min
    25 scf/hr

15. Number of pilot lights: 1
    Total 25,500 (at 1,020 BTU/CF) BTU/hr

16. Will automatic re-ignition be used?
    ☒ Yes ☐ No

17. If automatic re-ignition will be used, describe the method:
    Tornado Pilot Monitoring and Auto – Relight (T P MR) System for relight of flare pilot flame. See page 3 of Appendix 1.

18. Is pilot flame equipped with a monitor? ☒ Yes ☐ No
    If yes, what type? ☒ Thermocouple ☐ Infra-Red
    ☐ Ultra Violet ☐ Camera with monitoring control room
    ☐ Other, Describe:

19. Hours of unit operation per year: 8,760

Steam Injection

20. Will steam injection be used? ☐ Yes ☒ No	21. Steam pressure PSIG Minimum Expected: Design Maximum:
22. Total Steam flow rate: LB/hr	23. Temperature: °F
24. Velocity ft/sec	25. Number of jet streams
26. Diameter of steam jets: in	27. Design basis for steam injected: LB steam/LB hydrocarbon
28. How will steam flow be controlled if steam injection is used?	

Characteristics of the Waste Gas Stream to be Burned

29. Name	Quantity Grains of H_2S/100 ft^3	Quantity (LB/hr, ft^3/hr, etc)	Source of Material
See additional information attached to this form.			

30. Estimate total combustible to flare: See Appendix 2 LB/hr or ACF/hr (Maximum mass flow rate of waste gas) scfm	
31. Estimated total flow rate to flare including materials to be burned, carrier gases, auxiliary fuel, etc.: See Appendix 2 LB/hr or ACF/hr	
32. Give composition of carrier gases: See Appendix 2	
33. Temperature of emission stream: °F Heating value of emission stream: BTU/ft^3 Mean molecular weight of emission stream: MW = lb/lb-mole	34. Identify and describe all auxiliary fuels to be burned. None BTU/scf BTU/scf BTU/scf BTU/scf BTU/scf
35. Temperature of flare gas: °F	36. Flare gas flow rate: scf/min
37. Flare gas heat content: BTU/ft^3	38. Flare gas exit velocity: scf/min
39. Maximum rate during emergency for one major piece of equipment or process unit: scf/min	
40. Maximum rate during emergency for one major piece of equipment or process unit: BTU/min	
41. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification): None	
42. Describe the collection material disposal system: There is no material disposal system for this flare.	
43. Have you included ***Flare Control Device*** in the Emissions Points Data Summary Sheet? Yes	

44. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING: Monitor the emission point for opacity via Method 9 and Method 22.	RECORDKEEPING: Recordkeeping as required in 40CFR60, Subpart A, Section 60.18.
REPORTING: None Proposed	TESTING: None Proposed

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

45. Manufacturer's Guaranteed Capture Efficiency for each air pollutant.
Capture efficiency is based on facility design and is anticipated to be 100% for vents and emission sources that are vented to the flare.

46. Manufacturer's Guaranteed Control Efficiency for each air pollutant.
98%

47. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.
This unit is specifically designed for each process and the final design has not been completed. Operating ranges and maintenance procedures will be identified during final design or purchase of the flare system. The procedures as identified will be followed.

June 27, 2016 **Reference: Jacb0616**

US Methanol Corporation
16B Journey, Suite 260
Aliso Viejo, CA 92656

Attention: **Cameron Gunn, VP Engineering**

Subject: **16-Inch by 12-Foot Utility Flare Tip**

Tornado Combustion Technologies Inc. is pleased to provide you with a quotation for the following flare tip and ignition system specifically designed to meet your project requirements as specified.

The pricing within this quotation includes the following furnished by Tornado:

- Engineering related to general arrangement drawings for approval.
- Fabrication and packaging of all vendor supplied items.
- Procurement of critical long lead items.

Tornado Combustion Technologies has provided engineered combustion solutions for over 25 years that have exceeded our customer expectations for long term reliability and performance in the most severe operating conditions. Not only has Tornado equipment exceeded engineering expectations but it has also been widely accepted by operations personnel.

The flare tip and ignition system quoted will increase the weight and wind loads on the flare stack. It is incumbent upon US Methanol or designates to ensure that the existing flare and foundation are suitable for these loads.

1.0 FLARE STACK – GENERAL DESCRIPTION

Tornado is quoting a flare tip and ignition system for an existing guyed utility vent stack described as follows:

New Stack Tip: 12-feet of standard 16-inch 304L SS pipe welded to the existing stack flue (riser);

Stack Flue: Existing. 16-inch pipe from grade to 133-feet above grade where it will be flanged to the new flare tip;

Stack Inlet: Existing;

New Wind Shroud: Tornado standard 304L SS pilot shroud and waste gas stripper;

Base Plate: Existing;

Guy Wire Package: Existing;

Velocity Arrestor (purge reducer): 16-inch, 304L SS weld-in dynamic purge gas reducing seal. Minimum purge gas requirement is 2,283 SCFH.

1.1 FLARE STACK – DIMENSIONS

The flare will have the following physical dimensions:

Description	16-inch Flare
Overall height	145-feet
Tip Section (Supplied by Tornado)	
Diameter	16-inch
Length	12-feet
Bottom Section (Existing)	
Diameter	16-inch
Length	133-feet

1.2 RETRACTING PACKAGE

The original Tornado innovation. Allows pilots/ignitors to be installed or serviced from ground level without ladders, platforms or riggers. Flexible fuel hose coils at the base of stack upon retraction.

The patented Tornado retractable package includes: 2-inch x 1-inch HSS tracking, ¼-inch x 3-inch flat bar tracking supports, double-acting retracting winch, SS retracting cable, and SS retracting pulley.

This tracking system will require field welding to install on to the existing flare stack.

2.0 CONSTANT PILOT and AUTO-RELIGHT

One (1) Tornado pilot will be used to ignite the waste gas stream.

***Tornado Retractable Constant-Ignition Pilot (TSI #6)*:**
Fuel consumption of 25 SCFH at 15 PSIg, pilot head made of silicon carbide, body is 304L SS and 316L SS construction, c/w HSR pilot tracking, AQP 1503-4 fuel hose, fuel hose stabilizers, regulator, strainer, isolation valve and ¼-inch NPT dry CS gauge.

Note: Minimum fuel supply pressure is 60 PSIg, Maximum is 165 PSIg

***Tornado Pilot Monitoring and Auto-Relight* (TPMR) System:**
Model: TPMR-24 VDC **or** 120 VAC
Mounts directly on the *Tornado Retractable Constant-Ignition Pilot* c/w 24 VDC, 120 VAC or 12 VDC temperature controller and timer delay to alarm mode, Type K thermocouple, NEMA 4X **CSA**-approved control enclosure c/w ON/OFF switch, alarm terminal, mounting brackets, flexible SOOW cable from the ignition transformer near the pilot to a Tornado supplied junction box at the base of the stack.

TPMR System – Operating Information:
The ultimate in fail-safe reliability. The TPMR operates as follows:

At initial start-up (with power turned ON at the control panel), the thermocouple housed inside the ceramic nozzle is cool. This automatically triggers the RELIGHT system. The pilot is ignited and the thermocouple heats up until the system senses that the pilot is operational. The signal from the thermocouple then shuts down the RELIGHT mechanism and enters a continuous MONITOR mode.

The thermocouple is housed directly inside the pilot nozzle (Tornado innovation) and monitors the ambient temperature of the nozzle itself. This prevents false alarms from shifting winds and protects the thermocouple from premature breakdown. If a loss of pilot flame occurs, the silicon carbide nozzle (and thermocouple) rapidly cools down. Once the low-temperature factory set point is reached (adjustable), the RELIGHT system automatically activates. A solenoid valve opens, a fuel-air mixture is ignited, and a flame front is sent to relight the pilot. The system remains engaged until the pilot re-ignites and heats the thermocouple to above its temperature set point. At this time the RELIGHT function switches back to the MONITOR mode. Should the pilot fail to re-ignite within 10 minutes after loss of flame (adjustable factory setting), the RELIGHT system will time-out, and trip a set of alarm contacts for the operator.

The Tornado TPMR is the premier pilot/auto-relight ignition system available on the market today. Tornado incorporates superior quality parts and components which means the longest life and ultimate reliability of our systems. The Type K 310SS thermocouples are far superior to "flame rods" for reliable flame source detection (ask operators in the field for their unbiased feedback). The TPMR can be easily adapted to any existing flare.

Note: All electrical components are suitable for operation in a general purpose area.

Note: Tornado recommends that the customer orientates the flare stack in a direction so the ignition system is installed downwind from the flare tip and waste gas.

3.0 FLARE PRICING

Flare as described above: **$18,300.00**

Note: Please identify required voltage for ignition system on Purchase Order.

FLARE COSTING OPTIONS:

Drill-Driven Winch: Modification to Tornado's over height winch to allow for operation by electric drill. The client must supply a ½-inch two speed electric drill, Tornado recommends the DeWalt DW124 ½-inch Right Angle Drill set to 300 RPM.
Cost: **$300.00 each pilot**

4.0 MATERIALS & SERVICES PROVIDED BY OTHERS

This equipment quotation is for the supply of materials only, the Purchaser will be responsible for the following:

- Foundation design and placement (loads from the quoted equipment will be supplied by Tornado);
- Transportation of the quoted equipment to site from Tornado's fabrication facility;
- Manpower and equipment to install quoted components and their accessories;
- Site electrical connections including supply of wire between the base of the flare and the local control panel as may be applicable;
- Supply installation and connection of fuel piping as may be applicable;
- Approval of fuel piping components by the authority having jurisdiction as may be applicable (optional support can be offered);
- Initial systems start, debugging and operator training (optional support can be offered); and
- Supply and install of waste gas piping to a flanged installation connection.

5.0 DELIVERY SCHEDULE

- Drawings Issued for Reference: 5 working days *after receipt (and acceptance) of order* (ARO)
- Notice of Readiness to Pick-up:
  - 2 weeks *after receipt of approved drawings* (ARAD).
  - Any design changes (options) after fabrication has started will affect price and delivery.
- This flare is quoted as "in stock". The delivery time is based on current stock levels and subject to change without notice. Stock flares are sold on a "first come first serve" basis.

6.0 WARRANTY AND GUARANTEE

- Warranty applies to fabrication, defective workmanship or materials, assembly and manufactured components. Tornado Combustion Technologies Inc. warrants all fabrication and assembly for one (1) year from successful commissioning, or eighteen (18) months maximum from date of notification of readiness to pick-up, whichever occurs first if commissioning is delayed to the extent that Tornado Combustion Technologies Inc. shall replace defective parts or correct and such defects that may develop within the stated period due to faulty workmanship. The obligation of Tornado Combustion Technologies Inc. under this agreement shall be strictly limited to Tornado Combustion Technologies Inc. costs to repair or replace the defects as herein specified. Tornado Combustion Technologies Inc. will not be responsible for costs or damages caused by equipment being out of service or taken out of service.
- Warrantee does not cover removal reinstallation or modification of equipment. Tornado Combustion Technologies Inc. liability hereunder shall be limited to the obligation to repair or replace only those products proven to have been defective in material and workmanship at the time of delivery.
- All manufacturers' warranties for third party components installed are passed on and these items are not underwritten by Tornado Combustion Technologies Inc. Any defective component must be returned to Tornado for replacement under warranty. Shipping costs and labor to replace the items are not covered by warranty.
- Tornado Combustion Technologies Inc. guarantees and warrants that the environmental control equipment supplied will effectively thermally oxidize the waste gas for the process conditions specified herein. Tornado Combustion Technologies Inc. does not provide any performance guarantee if the operating conditions differ from the client specified design conditions as detailed in this proposal or if the sizing and design of the equipment has been provided to Tornado by others.
- Warranty does not cover attack on the materials of construction because of damaging service conditions encountered, including but not limited to thermal, electrolytic, chemical, corrosive or abrasive action, nor does it apply to defects which are due to faulty operation, maintenance or upkeep, ordinary wear and tear, or unusual or abnormal operating conditions.
- Tornado Combustion Technologies Inc. total cumulative liability in any way arising from or pertaining to any product sold or required to be sold under this contract shall NOT in any case exceed the purchase price paid by Buyer for such products. IN NO EVENT SHALL TORNADO COMBUSTION TECHNOLOGIES INC. HAVE ANY LIABILITY FOR COMMERCIAL LOSS, LOST PROFITS, CLAIMS FOR LABOR, OR CONSEQUENTIAL OR INCIDENTAL DAMAGES OF ANY TYPE, WHETHER BUYER'S CLAIM BE BASED IN CONTRACT, TORT, WARRANTY, STRICT LIABILITY, NEGLIGENCE, OR OTHERWISE. IT IS EXPRESSLY AGREED THAT BUYER'S REMEDIES EXPRESSED HEREIN ARE BUYER'S SOLE AND EXCLUSIVE REMEDIES. In no event shall Tornado combustion Technologies Inc. be liable for any consequential or indirect damages resulting from, growing out of or in any manner based upon warranty by Tornado Combustion Technologies Inc. contained herein, or any failure of Tornado Combustion Technologies Inc. to keep, perform of observe an of the terms and conditions of the agreement.
- The above warrantee, which is given expressly in lieu of all other warranties, expressed or implied by the customer, trade usage or law, including warranties of merchantability and fitness for particular purpose, constitutes the only warranty made by Tornado Combustion Technologies Inc.

7.0 TERMS AND CONDITIONS

Terms of Payment

Equipment is quoted in US funds (USD).
All payments shall be in US funds.
Quote is valid for 20 days from date of issue.
Equipment is quoted EXWORKS (EXW) Tornado Combustion Technologies Inc., Yard (411160 Range Road 17-2, 24 km North and 24 km East of Stettler, Alberta, Canada).

- 100% upon completion of unit (net thirty (30) days).

If credit has not been previously established or properly maintained, payment in full will be required prior to release of goods.
2% interest per month will be charged on all overdue accounts.
A security interest is taken and reserved in the goods supplied by Tornado, as described in this quote, in order to secure payment of all or part of the invoice total.

Customer Responsibilities

1. Customer assumes all responsibility for purchased goods including, but not limited to, obtaining adequate insurance from the point of sale/invoicing, or from the point when goods are loaded on truck, whichever is sooner.
2. Purchased goods are packaged suitable for ground transport within the province of Alberta ***or*** State of Texas. Customer is responsible for arrangement and charges associated with suitable crating and/or packaging for international shipments, unless otherwise stated above.
3. Tornado Combustion Technologies Inc. assumes no liability for products that may become damaged, lost or stolen during the storage period or during shipment to purchaser including, but not limited to, consequential damages or loss of use.
4. A minimum monthly storage fee will be charged per completed unit on the first day of each month, starting 2 full months after completion/invoicing (free grace period). Storage is charged on a case by case monthly basis and will be subject to yard availability and must be considered in the original purchase order.

Stop Work or Cancellation Orders

Stop work or cancellation order shall only be acknowledged in writing. In the event that the customer, after initial issuance of the purchase order, elects to cancel the purchase order or issue a temporary stop work, the client shall be invoiced for the following:

1. All hard costs related to the project up to and including the date of the customer's written notification.
2. List cost for all materials ordered or inventoried which cannot be returned for credit.
3. Restocking charges for any materials returned to suppliers
4. A 15% restocking charge against the entire value of the original purchase order if the equipment is of stock design and resalable.
5. Total charges will be the summation of items 1 through 4 above.
6. Appliances/Equipment which has been custom designed for a specific application and hence not suitable in a standard application are subject to additional cancellation charges. The full amount of the order will be payable if equipment is fully complete and ready for shipment. If equipment is not complete, 70% of the total order will be payable to Tornado Combustion Technologies Inc.

Quote Price Escalation

The price offered for the product(s) described herein is valid for a period of twenty (20) days from the submission date of this proposal. After said period, the price quoted is no longer valid and subject to escalation. A revised quote will be supplied upon request should a purchase order not be issued within the quotation validity period.

Project Price Escalation

Subject to receipt of a valid purchase order, Tornado Combustion Technologies Inc. retains escalation rights based upon delays imposed by the buyer and/or the buyer's engineering representative. In the event that the proposed delivery schedule is delayed due to drawing approvals, change order requests, or other intangible circumstances outside of Tornado's direct control, Tornado may at its discretion issue a stop work order pending negotiation and settlement of an escalated agreed upon price and revision to the existing purchase order.

Change Orders

Revisions and/or additions following award of the contract shall be reviewed by Tornado Combustion Technologies Inc. to ensure compatibility with the existing design. Agreed to changes shall be dually endorsed by both parties. The quoted price and revised delivery schedule shall be adjusted accordingly and submitted for approval prior to the commencement of any manufacturing activities.

Taxes

Contractor shall not be liable for any federal, state, foreign or local sales, excise, use or other taxes associated with the sale or use of goods hereunder.

Should we have the successful Tender please make any Purchase Order Payable to:
Tornado Combustion Technologies Inc.
200 – 261200 Wagon Wheel Way
MD of Rocky View, AB, T4A 0E3

Tornado Combustion Technologies Inc. is pleased to provide this quotation to your company. Thank you for the opportunity, and we look forward to working with you in the future. Should you have any questions or concerns, please feel free to contact us at your earliest convenience.

Regards,
Tornado Combustion Technologies Inc.

Ian Burge

Combustion Engineering
Direct: (403) 567-2230
Email: iburge@tornadotech.com

August 9, 2016 **Reference: USM0816**

US Methanol Corporation
16B Journey, Suite 260
Aliso Viejo, CA 92656

Attention: **Cameron Gunn, VP Engineering**

Subject: **16-Inch by 12-Foot Utility Flare Tip**

Tornado Combustion Technologies Inc. is pleased to provide you with a quotation for the following flare tip and ignition system specifically designed to meet your project requirements as specified.

The pricing within this quotation includes the following furnished by Tornado:

- Engineering related to general arrangement drawings for approval.
- Fabrication and packaging of all vendor supplied items.
- Procurement of critical long lead items.

Tornado Combustion Technologies has provided engineered combustion solutions for over 25 years that have exceeded our customer expectations for long term reliability and performance in the most severe operating conditions. Not only has Tornado equipment exceeded engineering expectations but it has also been widely accepted by operations personnel.

The flare tip and ignition system quoted will increase the weight and wind loads on the flare stack. The pilot, as well as the tracking, is responsible for this increase. It is incumbent upon US Methanol or designates to ensure that the existing flare and foundation are suitable for these loads.

The hydrogen present in the gas poses an increased possibility of flash back due to hydrogen's larger flammability region. Tornado has included a velocity arrestor in the flare tip and the required purge gas flow rate is 2,283 SCFH. It is imperative that the flare be properly purged at all times. If there is any possibility that the waste gas contains oxygen, please evaluate the flare system in accordance with NFPA 69, to determine the safest possible method of preventing flashback per the upstream process.

1.0 FLARE STACK – DESIGN SPECIFICATIONS

Flare Application	Unit 1,000	Unit 10,000	Cooling WTR Failure	Unit 1000
Case Number	PRV-1323	PRV-10505	PRV-3301/2/3	PRV-1453
Design Maximum Flow	44,959,000 SCFD	24,965,000 SCFD	22,061,000 SCFD	48,933,000 SCFD
Design Temperature	551 ℉	670 ℉	247.49 ℉	98.6 ℉
Allowable Pressure Drop	3.97 psig	1.78 psig	1.88 psig	2.46 psig
Total Pressure Drop[1]	3.99 psig	1.63 psig	1.86 psig	2.31 psig
Maximum Ground Level Radiation Including Solar	394 BTU/hr/ft^2	334 BTU/hr/ft^2	572 BTU/hr/ft^2	452 BTU/hr/ft^2
Flare Support	By Others			
Max. Peak Design Wind Load	By Others			
Stack Location	Charleston, West Virginia			
Atmospheric Pressure	14.4 psi			
Corrosion Allowance	1/16-inch			
Composition	As Provided			
Stack Sizing By	Customer			

1 Note – Pressure drop for Unit 1,000 (PRV-1323) exceeds the allowable 3.97 psig (18.4 psia) listed on the datasheet.

1.1 FLARE STACK/TIP – GENERAL DESCRIPTION

Tornado is quoting a flare tip and ignition system for an existing guyed utility vent stack described as follows:

New Stack Tip: 12-feet of standard 16-inch 304L SS pipe welded to an A105N 150# RFWN flange;

Stack Flue: Existing. 16-inch pipe from grade to 133-feet above grade where it will be flanged to the new flare tip;

Stack Inlet: Existing;

New Wind Shroud: Tornado standard 304L SS pilot shroud and waste gas stripper;

Base Plate: Existing;

Guy Wire Package: Existing;

Velocity Arrestor (purge reducer): 16-inch, 304L SS weld-in dynamic purge gas reducing seal. Minimum purge gas requirement is 2,283 SCFH.

1.2 FLARE STACK – DIMENSIONS

The flare will have the following physical dimensions:

Description	16-inch Flare
Overall height	145-feet
Tip Section (Supplied by Tornado)	
Diameter	16-inch
Length	12-feet
Bottom Section (Existing)	
Diameter	16-inch
Length	133-feet

1.3 RETRACTING PACKAGE

The original Tornado innovation. Allows pilots/ignitors to be installed or serviced from ground level without ladders, platforms or riggers. Flexible fuel hose coils at the base of stack upon retraction.

The patented Tornado retractable package includes: 2-inch x 1-inch HSS tracking, ¼-inch x 3-inch flat bar tracking supports, double-acting retracting winch, SS retracting cable, and SS retracting pulley.

This tracking system will require field welding to install on to the existing flare stack. It has been assumed that there is a clear route for the pilot tracking up the side of the flare stack. This means approximately 6-inches along the circumference of the shell will be required for the tracking, from the base to the tip of the flare stack.

2.0 CONSTANT PILOT and AUTO-RELIGHT

One (1) Tornado pilot will be used to ignite the waste gas stream.

***Tornado Retractable Constant-Ignition Pilot (TSI #6)*:**
Fuel consumption of 25 SCFH at 15 PSIg, pilot head made of silicon carbide, body is 304L SS and 316L SS construction, c/w HSR pilot tracking, AQP 1503-4 fuel hose, fuel hose stabilizers, regulator, strainer, isolation valve and ¼-inch NPT dry CS gauge.

Note: Minimum fuel supply pressure is 60 PSIg, Maximum is 165 PSIg

***Tornado Pilot Monitoring and Auto-Relight* (TPMR) System:**
Model: TPMR-24 VDC **or** 120 VAC
Mounts directly on the *Tornado Retractable Constant-Ignition Pilot* c/w 24 VDC, 120 VAC or 12 VDC temperature controller and timer delay to alarm mode, Type K thermocouple, NEMA 4X approved control enclosure c/w ON/OFF switch, alarm terminal, mounting brackets, flexible SOOW cable from the ignition transformer near the pilot to a Tornado supplied junction box at the base of the stack.

TPMR System – Operating Information:
The ultimate in fail-safe reliability. The TPMR operates as follows:

At initial start-up (with power turned ON at the control panel), the thermocouple housed inside the ceramic nozzle is cool. This automatically triggers the RELIGHT system. The pilot is ignited and the thermocouple heats up until the system senses that the pilot is operational. The signal from the thermocouple then shuts down the RELIGHT mechanism and enters a continuous MONITOR mode.

The thermocouple is housed directly inside the pilot nozzle (Tornado innovation) and monitors the ambient temperature of the nozzle itself. This prevents false alarms from shifting winds and protects the thermocouple from premature breakdown. If a loss of pilot flame occurs, the silicon carbide nozzle (and thermocouple) rapidly cools down. Once the low-temperature factory set point is reached (adjustable), the RELIGHT system automatically activates. A solenoid valve opens, a fuel-air mixture is ignited, and a flame front is sent to relight the pilot. The system remains engaged until the pilot re-ignites and heats the thermocouple to above its temperature set point. At this time the RELIGHT function switches back to the MONITOR mode. Should the pilot fail to re-ignite within 10 minutes after loss of flame (adjustable factory setting), the RELIGHT system will time-out, and trip a set of alarm contacts for the operator.

The Tornado TPMR is the premier pilot/auto-relight ignition system available on the market today. Tornado incorporates superior quality parts and components which means the longest life and ultimate reliability of our systems. The Type K 310SS thermocouples are far superior to "flame rods" for reliable flame source detection (ask operators in the field for their unbiased feedback). The TPMR can be easily adapted to any existing flare.

Note: All electrical components are suitable for operation in a general purpose area.

Note: Tornado recommends that the customer orientates the flare stack in a direction so the ignition system is installed downwind from the flare tip and waste gas.

3.0 FLARE PRICING

Flare as described above: **$35,800.00**

Note: Please identify required voltage for ignition system on Purchase Order.

FLARE COSTING OPTIONS:

Drill-Driven Winch: Modification to Tornado's over height winch to allow for operation by electric drill. The client must supply a ½-inch two speed electric drill, Tornado recommends the DeWalt DW124 ½-inch Right Angle Drill set to 300 RPM.
Cost: **$300.00 each pilot**

Mating Flange: Supply of an additional 16-inch flange to be field welded onto existing stack to allow flare tip to be removed. Tornado will supply A105N 150# RFWN flanges, A193-B7M studs, A194-2HM nuts and 1/8-inch 316L SS gasket. This option should be chosen if the existing flare does not use a flanged tip.
Cost: **$900.00**

4.0 MATERIALS & SERVICES PROVIDED BY OTHERS

This equipment quotation is for the supply of materials only, the Purchaser will be responsible for the following:

- Foundation design and placement (loads from the quoted equipment will be supplied by Tornado);
- Transportation of the quoted equipment to site from Tornado's fabrication facility;
- Manpower and equipment to install quoted components and their accessories;
- Site electrical connections including supply of wire between the base of the flare and the local control panel as may be applicable;
- Supply installation and connection of fuel piping as may be applicable;
- Approval of fuel piping components by the authority having jurisdiction as may be applicable (optional support can be offered);
- Initial systems start, debugging and operator training (optional support can be offered); and
- Supply and install of waste gas piping to a flanged installation connection.

5.0 DELIVERY SCHEDULE

- Drawings Issued for Reference: 5 working days *after receipt (and acceptance) of order* (ARO)
- Notice of Readiness to Pick-up:
  - 4 weeks *after receipt of approved drawings* (ARAD).
  - Any design changes (options) after fabrication has started will affect price and delivery.
- Tornado Combustion Technologies Inc. strives to provide the customer with the most efficient service possible. Please contact Tornado if a more expeditious delivery schedule is required.

6.0 WARRANTY AND GUARANTEE

- Warranty applies to fabrication, defective workmanship or materials, assembly and manufactured components. Tornado Combustion Technologies Inc. warrants all fabrication and assembly for one (1) year from successful commissioning, or eighteen (18) months maximum from date of notification of readiness to pick-up, whichever occurs first if commissioning is delayed to the extent that Tornado Combustion Technologies Inc. shall replace defective parts or correct and such defects that may develop within the stated period due to faulty workmanship. The obligation of Tornado Combustion Technologies Inc. under this agreement shall be strictly limited to Tornado Combustion Technologies Inc. costs to repair or replace the defects as herein specified. Tornado Combustion Technologies Inc. will not be responsible for costs or damages caused by equipment being out of service or taken out of service.
- Warrantee does not cover removal reinstallation or modification of equipment. Tornado Combustion Technologies Inc. liability hereunder shall be limited to the obligation to repair or replace only those products proven to have been defective in material and workmanship at the time of delivery.
- All manufacturers' warranties for third party components installed are passed on and these items are not underwritten by Tornado Combustion Technologies Inc. Any defective component must be returned to Tornado for replacement under warranty. Shipping costs and labor to replace the items are not covered by warranty.
- Tornado Combustion Technologies Inc. guarantees and warrants that the environmental control equipment supplied will effectively thermally oxidize the waste gas for the process conditions specified herein. Tornado Combustion Technologies Inc. does not provide any performance guarantee if the operating conditions differ from the client specified design conditions as detailed in this proposal or if the sizing and design of the equipment has been provided to Tornado by others.
- Warranty does not cover attack on the materials of construction because of damaging service conditions encountered, including but not limited to thermal, electrolytic, chemical, corrosive or abrasive action, nor does it apply to defects which are due to faulty operation, maintenance or upkeep, ordinary wear and tear, or unusual or abnormal operating conditions.
- Tornado Combustion Technologies Inc. total cumulative liability in any way arising from or pertaining to any product sold or required to be sold under this contract shall NOT in any case exceed the purchase price paid by Buyer for such products. IN NO EVENT SHALL TORNADO COMBUSTION TECHNOLOGIES INC. HAVE ANY LIABILITY FOR COMMERCIAL LOSS, LOST PROFITS, CLAIMS FOR LABOR, OR CONSEQUENTIAL OR INCIDENTAL DAMAGES OF ANY TYPE, WHETHER BUYER'S CLAIM BE BASED IN CONTRACT, TORT, WARRANTY, STRICT LIABILITY, NEGLIGENCE, OR OTHERWISE. IT IS EXPRESSLY AGREED THAT BUYER'S REMEDIES EXPRESSED HEREIN ARE BUYER'S SOLE AND EXCLUSIVE REMEDIES. In no event shall Tornado combustion Technologies Inc. be liable for any consequential or indirect damages resulting from, growing out of or in any manner based upon warranty by Tornado Combustion Technologies Inc. contained herein, or any failure of Tornado Combustion Technologies Inc. to keep, perform of observe an of the terms and conditions of the agreement.
- The above warrantee, which is given expressly in lieu of all other warranties, expressed or implied by the customer, trade usage or law, including warranties of merchantability and fitness for particular purpose, constitutes the only warranty made by Tornado Combustion Technologies Inc.

7.0 TERMS AND CONDITIONS

Terms of Payment

Equipment is quoted in US funds (USD).
All payments shall be in US funds.
Quote is valid for 20 days from date of issue.
Equipment is quoted EXWORKS (EXW) Tornado Combustion Technologies Inc., Yard (4831 US HWY 90 Alleyton, Texas 78935).

- 50% due upon acceptance of order and issuance of invoice prior to starting drawings, purchasing or production.
- 50% after completion of unit (net thirty (30) days).

If credit has not been previously established or properly maintained, payment in full will be required prior to release of goods.
2% interest per month will be charged on all overdue accounts.
A security interest is taken and reserved in the goods supplied by Tornado, as described in this quote, in order to secure payment of all or part of the invoice total.

Customer Responsibilities

1. Customer assumes all responsibility for purchased goods including, but not limited to, obtaining adequate insurance from the point of sale/invoicing, or from the point when goods are loaded on truck, whichever is sooner.
2. Purchased goods are packaged suitable for ground transport within the State of Texas. Customer is responsible for arrangement and charges associated with suitable crating and/or packaging for international shipments, unless otherwise stated above.
3. Tornado Combustion Technologies Inc. assumes no liability for products that may become damaged, lost or stolen during the storage period or during shipment to purchaser including, but not limited to, consequential damages or loss of use.
4. A minimum monthly storage fee will be charged per completed unit on the first day of each month, starting 2 full months after completion/invoicing (free grace period). Storage is charged on a case by case monthly basis and will be subject to yard availability and must be considered in the original purchase order.

Stop Work or Cancellation Orders

Stop work or cancellation order shall only be acknowledged in writing. In the event that the customer, after initial issuance of the purchase order, elects to cancel the purchase order or issue a temporary stop work, the client shall be invoiced for the following:

1. All hard costs related to the project up to and including the date of the customer's written notification.
2. List cost for all materials ordered or inventoried which cannot be returned for credit.
3. Restocking charges for any materials returned to suppliers
4. A 15% restocking charge against the entire value of the original purchase order if the equipment is of stock design and resalable.
5. Total charges will be the summation of items 1 through 4 above.
6. Appliances/Equipment which has been custom designed for a specific application and hence not suitable in a standard application are subject to additional cancellation charges. The full amount of the order will be payable if equipment is fully complete and ready for shipment. If equipment is not complete, 70% of the total order will be payable to Tornado Combustion Technologies Inc.

Quote Price Escalation

The price offered for the product(s) described herein is valid for a period of twenty (20) days from the submission date of this proposal. After said period, the price quoted is no longer valid and subject to escalation. A revised quote will be supplied upon request should a purchase order not be issued within the quotation validity period.

Project Price Escalation

Subject to receipt of a valid purchase order, Tornado Combustion Technologies Inc. retains escalation rights based upon delays imposed by the buyer and/or the buyer's engineering representative. In the event that the proposed delivery schedule is delayed due to drawing approvals, change order requests, or other intangible circumstances outside of Tornado's direct control, Tornado may at its discretion issue a stop work order pending negotiation and settlement of an escalated agreed upon price and revision to the existing purchase order.

Change Orders

Revisions and/or additions following award of the contract shall be reviewed by Tornado Combustion Technologies Inc. to ensure compatibility with the existing design. Agreed to changes shall be dually endorsed by both parties. The quoted price and revised delivery schedule shall be adjusted accordingly and submitted for approval prior to the commencement of any manufacturing activities.

Taxes

Contractor shall not be liable for any federal, state, foreign or local sales, excise, use or other taxes associated with the sale or use of goods hereunder.

Should we have the successful Tender please make any Purchase Order Payable to:

Tornado Combustion Technologies, Inc.
4831 US HWY 90
Alleyton, Texas 78935

Tornado Combustion Technologies Inc. is pleased to provide this quotation to your company. Thank you for the opportunity, and we look forward to working with you in the future. Should you have any questions or concerns, please feel free to contact us at your earliest convenience.

Regards,
Tornado Combustion Technologies Inc.

Ian Burge

Combustion Engineering
Direct: (403) 567-2230
Email: iburge@tornadotech.com

APPENDIX

FLARE DESIGN DATA SHEET

VENDOR:	**Tornado Combustion Technologies Inc.**
CLIENT:	**US Methanol**
PROJECT:	**Flare Evaluation**
QUOTE #:	**USM0816**
DESIGN CASE:	**PRV-1323**
SERVICE:	**Hydrogen**
DATE:	**August 9, 2016**

FLARE DESIGN CRITERIA USED				
[1] - Waste Gas Flow Rate	44,959,156.62	[SCFD]	1,273,101.54	[SCMD]
[2] - Fuel Gas Flow Rate	0.00	[SCFH]	0.00	[SCMH]
[3] - Waste Gas Inlet Temperature	551.00	[°F]	288.33	[°C]
[4] - Waste Gas Allowable Pressure Drop	3.97	[psig]	27.37	[kPa]
[5] - Ambient Air Temperature	65.00	[°F]	18.33	[°C]
[6] - Ambient Air Relative Humidity	50.00	[%]	50.00	[%]
[7] - Atmospheric Pressure	14.43	[psi]	99.50	[kPa]
[8] - Wind Speed for Radiation	29.33	[ft/s]	8.94	[m/s]
[9] - Flare Design Exit Mach Rating (as per API 521)	0.20	[-]	0.20	[-]

FLARE GAS CHARACTERISTICS				
[10] - Flare Gas Molecular Weight	12.04	[lb/lb-mol]	12.04	[g/g-mol]
[11] - Waste Gas Lower Heating Value	196.51	[BTU/SCF]	7.3	[MJ/SCM]
[12] - Net Heat Release	368,125,761.71	[BTU/hr]	388,393	[MJ/hr]

FLARE GEOMETRY				
[13] - Flare Height	145.00	[ft]	44.2	[m]
[14] - Tip Nominal Pipe Size	16.00	[in]	0.406	[m]
[15] - Purge Reducer	Installed:	Velocity Seal		
[16] - Recommended Purge Flow Rate	190	[SCFH]	5.4	[SCMH]

CALCULATED FLARE VALUES				
[17] - Flare Tip Velocity	756.59	[ft/s]	230.61	[m/s]
[18] - Actual Flare Tip Exit Mach	0.32	[-]	0.32	[-]
[19] - Maximum Ground Level Radiation	394	[BTU/hr/ft^2]	1.24	[kW/m^2]
[20] - Radial Distance to Maximum Radiation	21.73	[ft]	6.62	[m]
[21] - Customer Specified Radial Distance to Determine Radiation	300.00	[ft]	91.44	[m]
[22] - Solar Radiation	250.00	[BTU/hr/ft^2]	0.79	[kW/m^2]
[23] - Radiation at Above Customer Specified Radial Distance	288.78	[BTU/hr/ft^2]	0.91	[kW/m^2]
[24] - Tip Pressure Drop at the Above Waste Gas Flow Rate	33.61	[in WC]	8.36	[kPa]
[25] - Purge Reducer Pressure Drop at the Above Waste Gas Flow Rate	30.64	[in WC]	7.62	[kPa]
[26] - Flare Riser Pressure Drop at the Above Waste Gas Flow Rate	46.21	[in WC]	11.50	[kPa]
[27] - Total Pressure Drop at the Above Waste Gas Flow Rate	110.45	[in. WC]	27.48	[kPa]

FLARE CHEMICAL COMPOSITION SHEET

VENDOR:	**Tornado Combustion Technologies Inc.**
CLIENT:	**US Methanol**
PROJECT:	**Flare Evaluation**
QUOTE #:	**USM0816**
DESIGN CASE:	**PRV-1323**
SERVICE:	**Hydrogen**
DATE:	**August 9, 2016**

WASTE GAS CHEMICAL COMPOSITION		
Compound	**Mole Fraction**	**Mole Percent [%]**
C1 Methane	**0.02**	**1.9**
Carbon Monoxide	**0.12**	**11.5**
C02 Carbon Dioxide	**0.05**	**4.7**
H2 Hydrogen	**0.52**	**52**
Nitrogen	**0.00**	**0.1**
H2O Water	**0.30**	**29.8**
Total	**1.00**	**100.00**

FLARE DESIGN DATA SHEET

VENDOR:	**Tornado Combustion Technologies Inc.**
CLIENT:	**US Methanol**
PROJECT:	**Flare Evaluation**
QUOTE #:	**USM0816**
DESIGN CASE:	**PRV-10505**
SERVICE:	**Hydrogen**
DATE:	**August 9, 2016**

FLARE DESIGN CRITERIA USED				
[1] - Waste Gas Flow Rate	24,965,467.75	[SCFD]	706,943.32	[SCMD]
[2] - Fuel Gas Flow Rate	0.00	[SCFH]	0.00	[SCMH]
[3] - Waste Gas Inlet Temperature	670.00	[°F]	354.44	[°C]
[4] - Waste Gas Allowable Pressure Drop	1.78	[psig]	12.27	[kPa]
[5] - Ambient Air Temperature	65.00	[°F]	18.33	[°C]
[6] - Ambient Air Relative Humidity	50.00	[%]	50.00	[%]
[7] - Atmospheric Pressure	14.43	[psi]	99.50	[kPa]
[8] - Wind Speed for Radiation	29.33	[ft/s]	8.94	[m/s]
[9] - Flare Design Exit Mach Rating (as per API 521)	0.20	[-]	0.20	[-]

FLARE GAS CHARACTERISTICS				
[10] - Flare Gas Molecular Weight	13.66	[lb/lb-mol]	13.66	[g/g-mol]
[11] - Waste Gas Lower Heating Value	182.50	[BTU/SCF]	6.8	[MJ/SCM]
[12] - Net Heat Release	189,838,040.90	[BTU/hr]	200,290	[MJ/hr]

FLARE GEOMETRY				
[13] - Flare Height	145.00	[ft]	44.2	[m]
[14] - Tip Nominal Pipe Size	16.00	[in]	0.406	[m]
[15] - Purge Reducer	Installed:	Velocity Seal		
[16] - Recommended Purge Flow Rate	190	[SCFH]	5.4	[SCMH]

CALCULATED FLARE VALUES				
[17] - Flare Tip Velocity	489.46	[ft/s]	149.19	[m/s]
[18] - Actual Flare Tip Exit Mach	0.21	[-]	0.21	[-]
[19] - Maximum Ground Level Radiation	334	[BTU/hr/ft^2]	1.05	[kW/m^2]
[20] - Radial Distance to Maximum Radiation	18.99	[ft]	5.79	[m]
[21] - Customer Specified Radial Distance to Determine Radiation	300.00	[ft]	91.44	[m]
[22] - Solar Radiation	250.00	[BTU/hr/ft^2]	0.79	[kW/m^2]
[23] - Radiation at Above Customer Specified Radial Distance	270.64	[BTU/hr/ft^2]	0.85	[kW/m^2]
[24] - Tip Pressure Drop at the Above Waste Gas Flow Rate	13.70	[in WC]	3.41	[kPa]
[25] - Purge Reducer Pressure Drop at the Above Waste Gas Flow Rate	12.49	[in WC]	3.11	[kPa]
[26] - Flare Riser Pressure Drop at the Above Waste Gas Flow Rate	18.84	[in WC]	4.69	[kPa]
[27] - Total Pressure Drop at the Above Waste Gas Flow Rate	45.03	[in. WC]	11.20	[kPa]

FLARE CHEMICAL COMPOSITION SHEET

VENDOR:	**Tornado Combustion Technologies Inc.**
CLIENT:	**US Methanol**
PROJECT:	**Flare Evaluation**
QUOTE #:	**USM0816**
DESIGN CASE:	**PRV-10505**
SERVICE:	**Hydrogen**
DATE:	**August 9, 2016**

WASTE GAS CHEMICAL COMPOSITION		
Compound	**Mole Fraction**	**Mole Percent [%]**
C1 Methane	**0.01**	**0.5**
Carbon Monoxide	**0.15**	**15.2**
C02 Carbon Dioxide	**0.07**	**6.5**
H2 Hydrogen	**0.47**	**47.2**
H2O Water	**0.31**	**30.6**
Total	**1.00**	**100.00**

FLARE DESIGN DATA SHEET

VENDOR:	**Tornado Combustion Technologies Inc.**
CLIENT:	**US Methanol**
PROJECT:	**Flare Evaluation**
QUOTE #:	**USM0816**
DESIGN CASE:	**PRV-3301/2/3**
SERVICE:	**Methanol**
DATE:	**August 9, 2016**

FLARE DESIGN CRITERIA USED				
[1] - Waste Gas Flow Rate	22,061,004.87	[SCFD]	624,698.09	[SCMD]
[2] - Fuel Gas Flow Rate	0.00	[SCFH]	0.00	[SCMH]
[3] - Waste Gas Inlet Temperature	247.49	[°F]	119.72	[°C]
[4] - Waste Gas Allowable Pressure Drop	1.88	[psig]	12.96	[kPa]
[5] - Ambient Air Temperature	65.00	[°F]	18.33	[°C]
[6] - Ambient Air Relative Humidity	50.00	[%]	50.00	[%]
[7] - Atmospheric Pressure	14.43	[psi]	99.50	[kPa]
[8] - Wind Speed for Radiation	29.33	[ft/s]	8.94	[m/s]
[9] - Flare Design Exit Mach Rating (as per API 521)	0.20	[-]	0.20	[-]

FLARE GAS CHARACTERISTICS				
[10] - Flare Gas Molecular Weight	32.04	[lb/lb-mol]	32.04	[g/g-mol]
[11] - Waste Gas Lower Heating Value	766.10	[BTU/SCF]	28.6	[MJ/SCM]
[12] - Net Heat Release	704,205,659.66	[BTU/hr]	742,976	[MJ/hr]

FLARE GEOMETRY				
[13] - Flare Height	145.00	[ft]	44.2	[m]
[14] - Tip Nominal Pipe Size	16.00	[in]	0.406	[m]
[15] - Purge Reducer	Installed:	Velocity Seal		
[16] - Recommended Purge Flow Rate	190	[SCFH]	5.4	[SCMH]

CALCULATED FLARE VALUES				
[17] - Flare Tip Velocity	269.68	[ft/s]	82.20	[m/s]
[18] - Actual Flare Tip Exit Mach	Not Calculated	[-]	Not Calculated	[-]
[19] - Maximum Ground Level Radiation	572	[BTU/hr/ft^2]	1.80	[kW/m^2]
[20] - Radial Distance to Maximum Radiation	42.21	[ft]	12.87	[m]
[21] - Customer Specified Radial Distance to Determine Radiation	300.00	[ft]	91.44	[m]
[22] - Solar Radiation	250.00	[BTU/hr/ft^2]	0.79	[kW/m^2]
[23] - Radiation at Above Customer Specified Radial Distance	345.00	[BTU/hr/ft^2]	1.09	[kW/m^2]
[24] - Tip Pressure Drop at the Above Waste Gas Flow Rate	15.64	[in WC]	3.89	[kPa]
[25] - Purge Reducer Pressure Drop at the Above Waste Gas Flow Rate	14.26	[in WC]	3.55	[kPa]
[26] - Flare Riser Pressure Drop at the Above Waste Gas Flow Rate	21.51	[in WC]	5.35	[kPa]
[27] - Total Pressure Drop at the Above Waste Gas Flow Rate	51.42	[in. WC]	12.79	[kPa]

FLARE CHEMICAL COMPOSITION SHEET

VENDOR:	**Tornado Combustion Technologies Inc.**
CLIENT:	**US Methanol**
PROJECT:	**Flare Evaluation**
QUOTE #:	**USM0816**
DESIGN CASE:	**PRV-3301/2/3**
SERVICE:	**Methanol**
DATE:	**August 9, 2016**

WASTE GAS CHEMICAL COMPOSITION		
Compound	**Mole Fraction**	**Mole Percent [%]**
Methyl alcohol (Methanol)	**1.00**	**100**
Total	**1.00**	**100.00**

FLARE DESIGN DATA SHEET

VENDOR:	**Tornado Combustion Technologies Inc.**
CLIENT:	**US Methanol**
PROJECT:	**Flare Evaluation**
QUOTE #:	**USM0816**
DESIGN CASE:	**PRV-1453**
SERVICE:	**Hydrogen**
DATE:	**August 9, 2016**

FLARE DESIGN CRITERIA USED				
[1] - Waste Gas Flow Rate	48,932,915.67	[SCFD]	1,385,625.87	[SCMD]
[2] - Fuel Gas Flow Rate	0.00	[SCFH]	0.00	[SCMH]
[3] - Waste Gas Inlet Temperature	98.60	[°F]	37.00	[°C]
[4] - Waste Gas Allowable Pressure Drop	2.46	[psig]	16.96	[kPa]
[5] - Ambient Air Temperature	65.00	[°F]	18.33	[°C]
[6] - Ambient Air Relative Humidity	50.00	[%]	50.00	[%]
[7] - Atmospheric Pressure	14.43	[psi]	99.50	[kPa]
[8] - Wind Speed for Radiation	29.33	[ft/s]	8.94	[m/s]
[9] - Flare Design Exit Mach Rating (as per API 521)	0.20	[-]	0.20	[-]

FLARE GAS CHARACTERISTICS				
[10] - Flare Gas Molecular Weight	10.34	[lb/lb-mol]	10.34	[g/g-mol]
[11] - Waste Gas Lower Heating Value	273.11	[BTU/SCF]	10.2	[MJ/SCM]
[12] - Net Heat Release	556,831,153.11	[BTU/hr]	587,488	[MJ/hr]

FLARE GEOMETRY				
[13] - Flare Height	145.00	[ft]	44.2	[m]
[14] - Tip Nominal Pipe Size	16.00	[in]	0.406	[m]
[15] - Purge Reducer	Installed:	Velocity Seal		
[16] - Recommended Purge Flow Rate	190	[SCFH]	5.4	[SCMH]

CALCULATED FLARE VALUES				
[17] - Flare Tip Velocity	468.52	[ft/s]	142.80	[m/s]
[18] - Actual Flare Tip Exit Mach	0.24	[-]	0.24	[-]
[19] - Maximum Ground Level Radiation	452	[BTU/hr/ft^2]	1.42	[kW/m^2]
[20] - Radial Distance to Maximum Radiation	31.63	[ft]	9.64	[m]
[21] - Customer Specified Radial Distance to Determine Radiation	300.00	[ft]	91.44	[m]
[22] - Solar Radiation	250.00	[BTU/hr/ft^2]	0.79	[kW/m^2]
[23] - Radiation at Above Customer Specified Radial Distance	308.13	[BTU/hr/ft^2]	0.97	[kW/m^2]
[24] - Tip Pressure Drop at the Above Waste Gas Flow Rate	19.45	[in WC]	4.84	[kPa]
[25] - Purge Reducer Pressure Drop at the Above Waste Gas Flow Rate	17.73	[in WC]	4.41	[kPa]
[26] - Flare Riser Pressure Drop at the Above Waste Gas Flow Rate	26.74	[in WC]	6.65	[kPa]
[27] - Total Pressure Drop at the Above Waste Gas Flow Rate	63.92	[in. WC]	15.90	[kPa]

FLARE CHEMICAL COMPOSITION SHEET

VENDOR:	**Tornado Combustion Technologies Inc.**
CLIENT:	**US Methanol**
PROJECT:	**Flare Evaluation**
QUOTE #:	**USM0816**
DESIGN CASE:	**PRV-1453**
SERVICE:	**Hydrogen**
DATE:	**August 9, 2016**

WASTE GAS CHEMICAL COMPOSITION		
Compound	**Mole Fraction**	**Mole Percent [%]**
C1 Methane	**0.02**	**2.002**
Carbon Monoxide	**0.18**	**18.2182**
C02 Carbon Dioxide	**0.08**	**7.7077**
H2 Hydrogen	**0.72**	**71.7721**
Nitrogen	**0.00**	**0.2**
H2O Water	**0.00**	**0.1**
Total	**1.00**	**100.00**

Sample Natural Gass Composition at Institute site

Gas Composition Key	Production Date	BTU	Gravity	Wobbe	Cricondentherm deg F	Carbon Dioxide	Nitrogen	Methane	Ethane	Propane	N Butane	Iso Butane	Pentane	Iso Pentane	Neo Pentane	Hexane
Institute Line 1 Service	8/3/2016 0:00	1066.7	0.5966	1381.0	-71.5	0.2037	0.4956	91.7979	7.2752	0.2085	0.0100	0.0063	0.0001	0.0012	0.0000	0.0014
Institute Line 1 Service	8/2/2016 0:00	1065.1	0.5956	1380.1	-61.3	0.2132	0.4817	92.0190	7.0705	0.1892	0.0119	0.0092	0.0006	0.0021	0.0000	0.0025
Institute Line 1 Service	8/1/2016 0:00	1058.7	0.5913	1376.8	-52.2	0.2256	0.4431	92.9815	6.0919	0.2178	0.0183	0.0116	0.0025	0.0037	0.0000	0.0041
Institute Line 1 Service	7/31/2016 0:00	1058.2	0.5910	1376.5	-52.2	0.2275	0.4417	93.0388	6.0333	0.2187	0.0183	0.0116	0.0024	0.0037	0.0000	0.0040
Institute Line 1 Service	7/30/2016 0:00	1058.5	0.5912	1376.7	-54.5	0.2289	0.4433	93.0196	6.0175	0.2545	0.0168	0.0105	0.0021	0.0033	0.0000	0.0036
Institute Line 1 Service	7/29/2016 0:00	1063.2	0.5945	1378.9	-54.9	0.2211	0.4867	92.2522	6.8203	0.1877	0.0144	0.0094	0.0019	0.0030	0.0000	0.0034
Institute Line 1 Service	7/28/2016 0:00	1065.7	0.5962	1380.2	-62.2	0.2103	0.5038	91.8669	7.2257	0.1719	0.0108	0.0063	0.0004	0.0018	0.0000	0.0022

Start-Up Emissions Analysis			Shutdown Emissions Analysis	
Emission Point	1		1	
Emission Source	U-1000		All Units Various	
Emission Point	PICV 1466		manual	
Emission Description	Syngas		Syngas	
Composition,%				
CH4	2,886		2,886	
CO	16,045		16,045	
H2	73,981		73,981	
CO2	6,691		6,691	
H2O	0.397		0.397	
Emission Release Point	Flare System		Flare System	
Emission State	Flared		Flared	
Emission Location	Flare Stack		Flare Stack	
Mass Flow, Avg. kg/hr	4675.4	(Note 2)	794.8	
Hours of flow	5	(Note 1)	3	
Emissions Total, kg	23377.1		3974.1	

Note:

1. Total time of flow during start-up
2. Average mass flow rate during start-up process

Attachment M
Air Pollution Control Device Sheet
(WET COLLECTING SYSTEM-SCRUBBER)

Control Device ID No. (must match Emission Units Table): 2C – Scrubber Plant/Area 4 Tanks and Truck Loadout.

Equipment Information

1. Manufacturer: TBD Model No. See additional information attached to this form.	2. Method: ☒ Packed Bed ☐ Venturi ☐ Spray Tower ☐ Cyclone ☐ Mechanical ☐ Orifice ☐ Other, specify
3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
4. Provide a scale diagram of the scrubber showing internal construction. Please include packing type and size, spray configurations, baffle plates, and mist eliminators.	
5. What type of liquid entrainment eliminators or system will be used? Submit a schematic diagram showing thickness, mesh, and material of construction.	
6. Describe the scrubber's construction material: SS 316	
7. What will be the power requirements of the collector? Fan NA HP Inlet scrubbing liquid pump: HP	
8. What type of fan(s) will be used? Type of fan blade: Number of blades: Diameter of blade: in. Also supply a fan curve for each fan to be used.	
9. Estimated gas pressure drop at maximum flow rate: 3.5 inches H_2O	

Scrubbing Liquor Characteristics

10. Scrubbing Liquor

Composition	Weight %
1 Water	100
2	
3	
4	

11. Scrubbing liquor losses (evaporation, etc.): 0.2 gal/1000 ACF gas

12. Liquor pressure to scrubber: 35 PSIA

13. Pressure drop through scrubber: 3.5 in. H_2O

14. Source of liquor (explain):
River Water

15. Liquor flow rates to scrubber:
Design maximum: 40 gal/min
Average expected: 36 gal/min

16. Describe system to be used to supply liquor to collector:
Filtered river water will be pumped to the scrubber top and will be sprayed on the packing through spray nozzle.

17. Give the expected solids content of the liquor:
0.001 and less than 300 micron particle size.

18. If the liquor is to be recirculated, describe any treatment performed:
Water will not be recirculated and it will once through system

19. Data for Venturi Scrubber:	20. Data for Packed Towers:
Throat Dimensions: (Specify Units)	Type of Packing: 1"Tripack , or equivalent
Throat Velocity: ft/sec	Superficial Gas Velocity through Bed: 0.8 ft/sec

Gas Stream Characteristics

21. Gas flow into the collector:	22. Gas stream temperature:
ACF @ °F and PSIA	Inlet: 77 °F
	Outlet: 77 °F
23. Gas flow rate:	24. Particulate Grain Loading in grains/scf:
Design Maximum: 266.6 ACFM	Inlet:
Average Expected: 130 ACFM	Outlet:

25. Emission rate of each pollutant (specify) into and out of collector:

Pollutant	IN		OUT		Guaranteed Minimum Collection Efficiency
	lb/hr	grains/acf	lb/hr	grains/acf	
A Methanol	205		4.3		98%
B					
C					
D					
E					

26. Type of pollutant(s) controlled: ☐ SO_x ☐ Odor
☐ Particulate (type): ☒ Other: Methanol

27. By what method were the uncontrolled emissions calculated? ☒ Material Balance ☐ Stack Test
☐ Pilot Test ☐ Other:

28. Dimensions of stack: Height 18 ft. Diameter 0.5 ft

29. Supply an equilibrium curve and/or solubility data (at various temperatures) for the proposed system.

30. Supply a curve showing proposed collection efficiency versus gas volume from 25 to 100 percent of design rating of collector.

Particulate Distribution

31. Complete the table:	Particle Size Distribution at Inlet to Collector	Fraction Efficiency of Collector
Particulate Size Range (microns)	**Weight % for Size Range**	**Weight % for Size Range**
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10		
10 – 12		
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

32. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):

33. Describe the collection material disposal system:
Waste water will be sent to on-site waste water treatment plant.

34. Have you included ***Wet Collecting (Scrubber) Control Device*** in the Emissions Points Data Summary Sheet?

35. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING:	RECORDKEEPING:
The water flow rate to the scrubber will be continuously measured by FT-4313, and recorded by the plant digital control system. An alarm will alert the plant operators if the water flow to the scrubber drops below the design conditions.	The plant digital control system will historize the data recorded from FT-4313 and store that data for the required timeframe.
REPORTING:	TESTING:
None Proposed	None Proposed

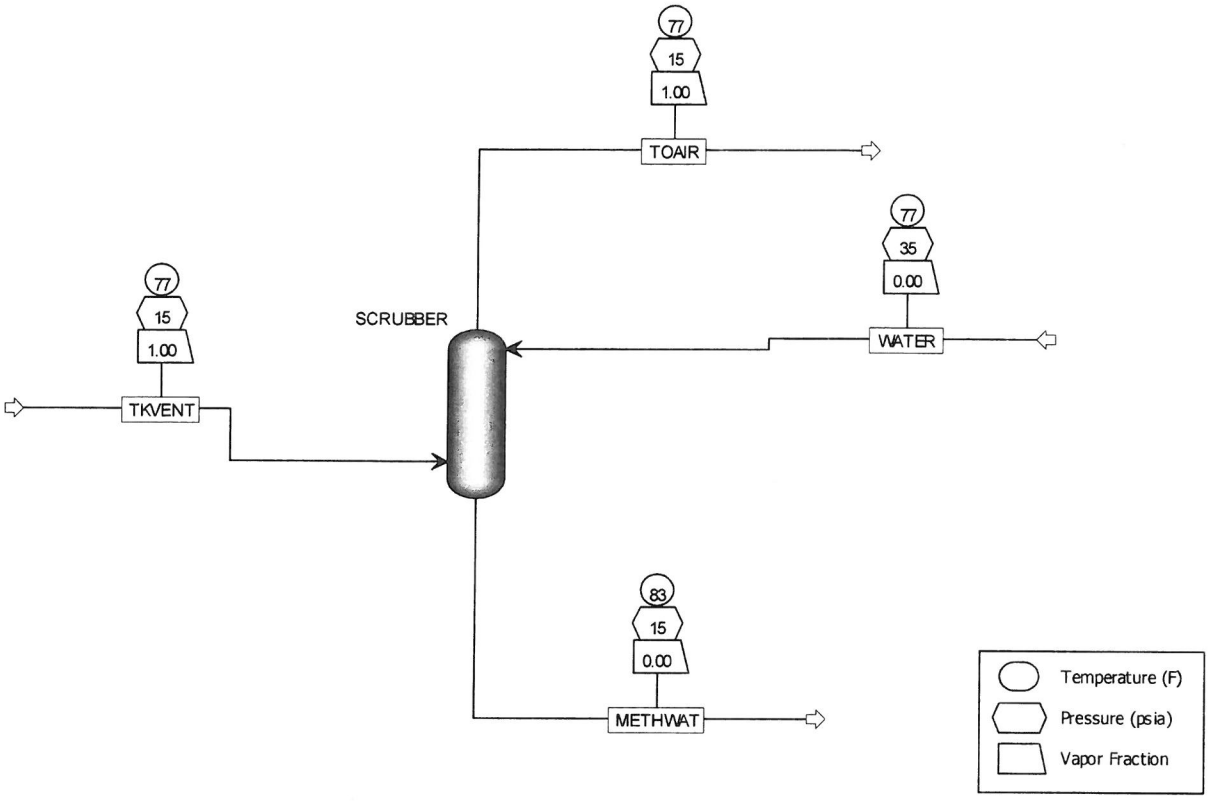
MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

36. Manufacturer's Guaranteed Capture Efficiency for each air pollutant.
TBD

37. Manufacturer's Guaranteed Control Efficiency for each air pollutant.
TBD

38. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.
TBD

T-4301 Methanol Scrubber PFD and Details (Attachment M Sections 3, 4, and 5)



Design Basis

Feed to Scrubber= 16,000 SCFH vapor containing max 16.4 mole % Methanol at the bottom of the scrubber
Scrubbing liquid - Water 36 gpm at the top of scrubber
Material of construction – SS 316
Packing 1" Tri Pack from Kemflow or equivalent
Plastic, Packing support plate- Plastic
Scrubber Dimensions- 16" dia x 15 ft packed height. Total height 18 ft
Collection Efficiency = 98 %
Vapor Inlet Line 6", Vapor Outlet Line 6"
Water (Scrubbing medium) Line 3"

NOTE: Additional mechanical details, including dimensions and design of entrainment separation, will be provided per manufacturer's drawings.

Attachment for Section 25

Material Balance

	WATER	TKVENT	TOAIR	METHWAT
Temperature F	77	77	77	82.5
Pressure psia	34.7	14.88	14.7	14.7
Vapor Frac	0	1	1	0
Mass VFrac	0	1	1	0
Mole Flow lbmol/hr	999.152	41.334	34.662	1005.824
Mass Flow lb/hr	18000	1185.231	960.167	18225.064
Mass Flow TOTAL kg/sec	2.268	0.149	0.121	2.296
Mass Flow VAPOR kg/sec		0.149	0.121	
Mass Flow LIQUID kg/sec	2.268	< 0.001		2.296
Volume Flow cuft/hr	290.085	16000	13576.92	295.73
Enthalpy MMBtu/hr	-122.768	-0.586	-0.113	-123.241
Density lb/cuft	62.051	0.074	0.071	61.627
Mass Flow lb/hr				
METHANOL		217.209	0.076	217.133
NITROGEN		968.022	940.559	27.463
WATER	18000		19.532	17980.468
Mass Frac				
METHANOL		0.183	200 PPM	0.012
NITROGEN		0.817	0.98	0.002
WATER	1		0.02	0.987
Mole Flow lbmol/hr				
METHANOL		6.779	0.002	6.776
NITROGEN		34.556	33.575	0.98
WATER	999.152		1.084	998.068
Mole Frac				
METHANOL		0.164	68 PPM	0.007
NITROGEN		0.836	0.969	975 PPM
WATER	1		0.031	0.992
HMX J/kg	-15864000	-1149400	-273520	-15729000
CPMX J/kg-K	4119.66	1101.061	1056.504	4112.038
PCMX N/sqm	22064000	4168180	3984100	21951600
MWMX	18.015	28.674	27.701	18.12

Attachment for Sections 29 and 30

Equilibrium Data for vapor and liquid phase.

Vapor Phase- Basis Mass

Stage	METHANOL	NITROGEN	WATER
1	7.91436241E-05	0.979578949	0.0203419077
2	0.000189991325	0.979450049	0.0203599592
3	0.000456203096	0.979154544	0.0203892526
4	0.00109545818	0.978463899	0.0204406427
5	0.00262918121	0.976848991	0.020521828
6	0.00630045276	0.97309282	0.0206067274
7	0.0150400483	0.96444499	0.020514962
8	0.0355816084	0.944912365	0.0195060266
9	0.0824987342	0.902426732	0.0150745339

Liquid Phase Basis- Mass

Stage	METHANOL	NITROGEN	WATER
1	6.06730224E-06	0.000814107962	0.999179825
2	2.06578222E-05	0.00119983586	0.998779506
3	5.57463104E-05	0.00138235536	0.998561898
4	0.000140141033	0.00146846005	0.998391399
5	0.000343222541	0.00150854963	0.998148228
6	0.00083246359	0.00152602319	0.997641513
7	0.00201404561	0.00153092693	0.996455027
8	0.00488248324	0.00152577135	0.993591745
9	0.0119139744	0.0015068848	0.986579141

NOTE: Minimum collection efficiency between 25% and 100% of capacity will be 98%.

Attachment M
Air Pollution Control Device Sheet
(WET COLLECTING SYSTEM-SCRUBBER)

Control Device ID No. (must match Emission Units Table): 3C – Scrubber Plant/Area 12 Tanks and Barge Loading

Equipment Information

1. Manufacturer: TBD

   Model No. See additional information attached to this form.

2. Method: ☒ Packed Bed ☐ Venturi ☐ Spray Tower ☐ Cyclone ☐ Mechanical ☐ Orifice ☐ Other, specify

3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.

4. Provide a scale diagram of the scrubber showing internal construction. Please include packing type and size, spray configurations, baffle plates, and mist eliminators.

5. What type of liquid entrainment eliminators or system will be used? Submit a schematic diagram showing thickness, mesh, and material of construction.

6. Describe the scrubber's construction material:
   304LSS

7. What will be the power requirements of the collector?
   Fan NA HP Inlet scrubbing liquid pump: HP

8. What type of fan(s) will be used?
   Type of fan blade: Number of blades: Diameter of blade: in.
   Also supply a fan curve for each fan to be used.

9. Estimated gas pressure drop at maximum flow rate: 4 inches H_2O

Scrubbing Liquor Characteristics

10. Scrubbing Liquor

Composition	Weight %
1 Water	100
2	
3	
4	

11. Scrubbing liquor losses (evaporation, etc.):
    0.2 gal/1000 ACF gas

12. Liquor pressure to scrubber: PSIA

13. Pressure drop through scrubber: in. H_2O

14. Source of liquor (explain):
    River Water

15. Liquor flow rates to scrubber:
    Design maximum: gal/min
    Average expected: gal/min

16. Describe system to be used to supply liquor to collector:
    Filtered river water will be pumped to the scrubber top and will be sprayed on the packing through spray nozzle.

17. Give the expected solids content of the liquor:
    0.001 and less than 300 micron particle size.

18. If the liquor is to be recirculated, describe any treatment performed:
Water will not be recirculated and it will once through system

19. Data for Venturi Scrubber:

Throat Dimensions:
(Specify Units)

Throat Velocity: ft/sec

20. Data for Packed Towers:

Type of Packing: Polypropylene

Superficial Gas Velocity through Bed:
1.8 ft/sec

Gas Stream Characteristics

21. Gas flow into the collector:

ACF @ °F and PSIA

22. Gas stream temperature:

Inlet: 85 °F

Outlet: 85 °F

23. Gas flow rate:

Design Maximum: 184 ACFM

Average Expected: 30 ACFM

24. Particulate Grain Loading in grains/scf:

Inlet:

Outlet:

25. Emission rate of each pollutant (specify) into and out of collector:

Pollutant	IN		OUT		Guaranteed Minimum Collection Efficiency
	lb/hr	grains/acf	lb/hr	grains/acf	
A Methanol	71.26		1.97		98 %
B					
C					
D					
E					

26. Type of pollutant(s) controlled: ☐ SO_x ☐ Odor
☐ Particulate (type): ☒ Other: Methanol

27. By what method were the uncontrolled emissions calculated? ☒ Material Balance ☐ Stack Test
☐ Pilot Test ☐ Other:

28. Dimensions of stack: Height 8 ft. Diameter 0.33 ft

29. Supply an equilibrium curve and/or solubility data (at various temperatures) for the proposed system.

30. Supply a curve showing proposed collection efficiency versus gas volume from 25 to 100 percent of design rating of collector.

Particulate Distribution

31. Complete the table:	Particle Size Distribution at Inlet to Collector	Fraction Efficiency of Collector
Particulate Size Range (microns)	**Weight % for Size Range**	**Weight % for Size Range**
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10		
10 – 12		
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

32. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):

33. Describe the collection material disposal system:
Waste water will be sent to on-site waste water treatment plant.

34. Have you included ***Wet Collecting (Scrubber) Control Device*** in the Emissions Points Data Summary Sheet?

35. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING:	RECORDKEEPING:
The water flow rate to the scrubber will be continuously measured by FT-12113, and recorded by the plant digital control system. An alarm will alert the plant operators if the water flow to the scrubber drops below the design conditions.	The plant digital control system will historize the data recorded from FT-12113 and store that data for the required timeframe
REPORTING: None Proposed	TESTING: None Proposed

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

36. Manufacturer's Guaranteed Capture Efficiency for each air pollutant.
TBD

37. Manufacturer's Guaranteed Control Efficiency for each air pollutant.
TBD

38. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.
TBD

Client/Inquiry: Jacobs / PU-02 Vent Scrubbers
S&K Ref. No.: 1603053
Date: September 12, 2016

PACKED TOWER SCRUBBER DATA SHEET

TYPE: 12" Fig. 7055 (Zone 12 Scrubber)

EQUIPMENT DIMENSIONS (approximate)

Gas Inlet: 6" Gas Outlet: 6" Scrubbing Liquid Inlet: 1"
Tower Diameter: 12" Height: 23'-3" Liquid Storage Capacity: --- U.S. Gallons
Vessel Connections: Drain 2", Liquid Outlet 2", Access (2) 6"

INTERNALS

Packing Type: 1" Tri-Pack or eq.
Mist Eliminator Type: Mesh Pad

CONSTRUCTION MATERIALS

Tower Shell: 304LSS
Packing: Polypropylene
Spray Nozzle: 316SS
Mist Eliminator: 304SS

CONSTRUCTION DESIGN

In general accordance with: S&K Standards & ASME Section VIII, Div. 1 (unstamped)
Design Pressure: 15 psig
Design Temperature: 125 F
Type of Support: Legs & Lifting Lugs

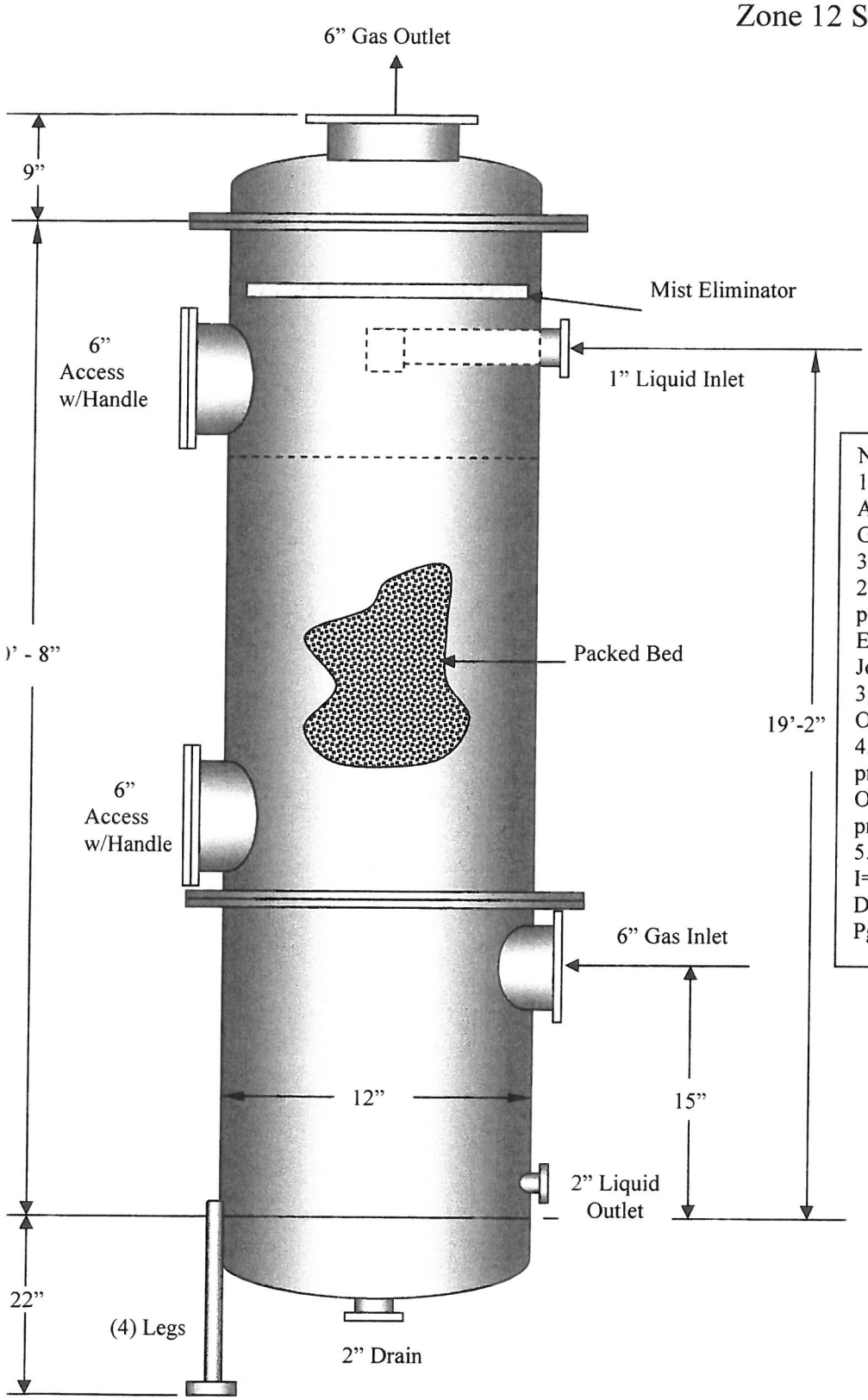
CONDITIONS OF OPERATION

Gas Inlet Rate Capacity: 184 Acfm
Gas Inlet Temperature: 85 F
Gas Inlet Pressure: 0.2 psig (14.89 psia)
Gas Inlet Composition: 83.6% N2, 16.4% CH3OH (by volume)
Liquid Inlet Rate: 6 U.S. gpm
Spray Nozzle Differential Pressure: 7 psi x s.g.
Liquid Composition: Once-through strained river water
Maximum Liquid Inlet Temperature: 82 F
Pressure Drop Across Tower: approx. 4 inches w.c.

PERFORMANCE

99.9 % Removal efficiency of CH3OH
Based upon above listed operating conditions.

Zone 12 Scrubber



Notes:
1. Material: ASTM SA-240 304LSS with ASME A193 Gr. B8 bolts and ASME A194 Gr. 8 Nuts except internal hardware to be 304LSS, Gaskets to be 1/8" thick EPDM.
2. Designed, Built, Tested, but no Stamp per ASME Code Sect. VIII, Div. 1, 2015 Ed. for 15 psig @ 125 F. Min. T = -20 F. Joint effic. = 85%; RT3 radiography.
3. Vortex breakers included for "Liquid Outlet" and "Drain".
4. All nozzles to be RFSO with 4" projections except for Gas Inlet, Gas Outlet, & Access connections with 6" projections.
5. Wind load speed = 120 MPH; I=1.15;Wind exposure = C. Seismic site Cl. D; Design category: B; I = 1.25. Snowload: Pg=30;Ce=0.9;Ct=1.2, I=1.15.

ALL DIMENSIONS ARE APPROXIMATE

SCHUTTE & KOERTING

TREVOSE, PENNSYLVANIA, USA

Description: 12" Fig. 7055 Packed Tower Scrubber
Ref. No.: 1603053
Scale: None Date: 9-12-16

ATTACHMENT N

SUPPORTING EMISSIONS CALCULATIONS

Facility Total

Emission Type	Uncontrolled	Controlled
	tpy	tpy
PM	2.01	2.01
PM10	1.83	1.83
PM2.5	1.80	1.80
SO2	0.11	0.11
NOx	72.67	72.67
CO	16.13	16.13
VOC	72.69	13.16
Methanol	66.57	7.13
Total HAPS	66.60	7.16

Heater H-1101 - Normal Operations on Syngas

The yearly emissions were provided by Paul Collier, Managing Director of Lanemark Combustion Engineering Limited. Hourly emissions are based on the yearly emissions divided by 8,760 hours per year.

Burner Rating =	2.94	MMBTU/HR
Number of Burners =	35	
Total Burner Rating =	103	MMBTU/HR

Reformer Flue Gas Flow Rate:

For 103 mmBTU/h and the below fuel the following calculations have been made:

- Capacity per burner 2.94 mmBtu/h or 0.863 MW.
- (100% CPG rate – see attached case) per burner 917 x 35 = Total 32,095 Nm3/h.
- Total Flue Gas generated per year (assuming 24 hour, 365 day per year operation at above load) 32,095 x 24 x 365 = 281,152,200 Nm3/year.
- 1,000 kg = 1.10231 US Ton.

Lower NOx design Burner Head & currently as installed Burner Tile:

- NOx prediction for Lower NOx design Burner head and as installed Burner Tile design based on 10% excess air ≤ 110 ppmv / 226 mg/Nm3 (corrected to 3% volume dry flue gas) which is ≤ 63,541 kg/year or 70.04 US Ton/year.

Yearly Emissions =	70.04	tpy
Hourly Emissions =	16.00	lb/hr

- CO emissions would be ≤ 20 ppm or 25 mg/Nm3 which is ≤ 7,0249kg/year or 7.75 US Ton/year.

Yearly Emissions =	7.75	tpy
Hourly Emissions =	1.77	lb/hr

- SO2 – there are no Sulphur compounds (namely H2S) in the Purge Gas, therefore would be zero.
- Particulate Matter (PM/PM10/PM2.5) from gas burner combustion would be near zero so ≤ 5 mg/Nm3 which is ≤ 1,406 kg/year or 1.55 US Ton/year.

Yearly Emissions =	1.55	tpy
Hourly Emissions =	0.36	lb/hr

- VOC would be near zero so ≤ 5 mg/Nm3 ≤ 5 mg/Nm3 which is ≤ 1,406 kg/year or 1.55 US Ton/year.

Yearly Emissions =	1.55	tpy
Hourly Emissions =	0.36	lb/hr

- Lead – no lead present in combustion so zero.
- N2O – will be near zero so ≤ 5 mg/Nm3 ≤ 5 mg/Nm3 which is ≤ 1,406 kg/year or 1.55 US Ton/year.

Yearly Emissions =	1.55	tpy
Hourly Emissions =	0.36	lb/hr

The "Hazardous Air Pollutants" on your list are not produced as products of combustion and are not listed in the Purge Gas composition so as far as the burners and combustion is concerned these are not applicable.

By: PEW
Date: 11/20/2016

Checked By: JJD
Date: 11/21/2016

Heater H-1101 Startup on Natural Gas

Burner Rating =	103	MMBTU/HR
	1,020	BTU/CF
	100,980.392	SCFH
	0.100980	MMSCF/HR
	15	HR/YR
	1.515	MMSCF/YR

Emission Type	Emissions lb/MMSCF[2]	Uncontrolled		Controlled	
		lb/hr	tpy	lb/hr	tpy
PM	7.6	0.77	0.01	0.77	0.01
PM10[1]	7.6	0.77	0.01	0.77	0.01
PM2.5[1]	7.6	0.77	0.01	0.77	0.01
PM Condensable	5.7	0.58	0.01	0.58	0.01
PM Filterable	1.9	0.19	0.01	0.19	0.01
SO2	0.6	0.06	0.01	0.06	0.01
NOx	100	10.10	0.08	10.10	0.08
CO	84	8.48	0.06	8.48	0.06
VOC	5.5	0.56	0.01	0.56	0.01
Total HAPS	See next page	0.1906	0.0015	0.1906	0.0015
				Rounding =	3

1. It is assumed that PM and PM2.5 are equal to PM10. 2
2. Emission factors from AP-42, Section 1.4., Table 1.4-1 and 1.4-2.

By: PEW
Date: 11/20/2016

Checked By: JJD
Date: 11/21/2016

Heater H-1101 Startup on Natural Gas

Burner Rating = 103 MMBTU/HR
Operating Hours = 15 HR/YR
Conversion from lb/10^6 scf to lb/MMBtu (divide by)[1] = 1,020 BTU/CF

CAS No.	Hazardous Air Pollutants	EF[1]		Uncontrolled		Controlled	
		lb/10^6 scf	lb/MMBtu	lb/hr	tpy	lb/hr	tpy
91-57-6	2-Methylnaphthalene	2.40E-05	2.35E-08	2.42E-06	1.82E-08	2.42E-06	1.82E-08
56-49-5	3-Methylchloranthrene	1.80E-06	1.76E-09	1.82E-07	1.36E-09	1.82E-07	1.36E-09
57-97-6	7,12-Dimethylbenz(a)anthracene	1.60E-05	1.57E-08	1.62E-06	1.21E-08	1.62E-06	1.21E-08
83-32-9	Acenaphthene	1.80E-06	1.76E-09	1.82E-07	1.36E-09	1.82E-07	1.36E-09
203-96-8	Acenaphthylene	1.80E-06	1.76E-09	1.82E-07	1.36E-09	1.82E-07	1.36E-09
120-12-7	Anthracene	2.40E-06	2.35E-09	2.42E-07	1.82E-09	2.42E-07	1.82E-09
56-55-3	Benz(a)anthracene	1.80E-06	1.76E-09	1.82E-07	1.36E-09	1.82E-07	1.36E-09
71-43-2	Benzene	2.10E-03	2.06E-06	2.12E-04	1.59E-06	2.12E-04	1.59E-06
50-32-8	Benzo(a)pyrene	1.20E-06	1.18E-09	1.21E-07	9.09E-10	1.21E-07	9.09E-10
205-99-2	Benzo(b)fluoranthene	1.80E-06	1.76E-09	1.82E-07	1.36E-09	1.82E-07	1.36E-09
191-24-2	Benzo(g,h,i)perylene	1.20E-06	1.18E-09	1.21E-07	9.09E-10	1.21E-07	9.09E-10
207-08-9	Benzo(k)fluoranthene	1.80E-06	1.76E-09	1.82E-07	1.36E-09	1.82E-07	1.36E-09
218-01-9	Chrysene	1.80E-06	1.76E-09	1.82E-07	1.36E-09	1.82E-07	1.36E-09
53-70-3	Dibenzo(a,h)anthracene	1.20E-06	1.18E-09	1.21E-07	9.09E-10	1.21E-07	9.09E-10
25321-22-6	Dichlorobenzene	1.20E-03	1.18E-06	1.21E-04	9.09E-07	1.21E-04	9.09E-07
206-44-0	Fluoranthene	3.00E-06	2.94E-09	3.03E-07	2.27E-09	3.03E-07	2.27E-09
86-73-7	Fluorene	2.80E-06	2.75E-09	2.83E-07	2.12E-09	2.83E-07	2.12E-09
50-00-0	Formaldehyde	7.50E-02	7.35E-05	7.57E-03	5.68E-05	7.57E-03	5.68E-05
110-54-3	Hexane	1.80E+00	1.76E-03	1.82E-01	1.36E-03	1.82E-01	1.36E-03
193-39-5	Indeno(1,2,3-cd)pyrene	1.80E-06	1.76E-09	1.82E-07	1.36E-09	1.82E-07	1.36E-09
91-20-3	Naphthalene	6.10E-04	5.98E-07	6.16E-05	4.62E-07	6.16E-05	4.62E-07
85-01-8	Phenanathrene	1.70E-05	1.67E-08	1.72E-06	1.29E-08	1.72E-06	1.29E-08
129-00-0	Pyrene	5.00E-06	4.90E-09	5.05E-07	3.79E-09	5.05E-07	3.79E-09
108-88-3	Toluene	3.40E-03	3.33E-06	3.43E-04	2.58E-06	3.43E-04	2.58E-06
7440-38-2	Arsenic	2.00E-04	1.96E-07	2.02E-05	1.51E-07	2.02E-05	1.51E-07
7440-41-7	Beryllium	1.20E-05	1.18E-08	1.21E-06	9.09E-09	1.21E-06	9.09E-09
7440-43-9	Cadmium	1.10E-03	1.08E-06	1.11E-04	8.33E-07	1.11E-04	8.33E-07
7440-47-3	Chromium	1.40E-03	1.37E-06	1.41E-04	1.06E-06	1.41E-04	1.06E-06
7440-48-4	Cobalt	8.40E-05	8.24E-08	8.48E-06	6.36E-08	8.48E-06	6.36E-08
7439-96-5	Manganese	3.80E-04	3.73E-07	3.84E-05	2.88E-07	3.84E-05	2.88E-07
7439-97-6	Mercury	2.60E-04	2.55E-07	2.63E-05	1.97E-07	2.63E-05	1.97E-07
7440-02-0	Nickel	2.10E-03	2.06E-06	2.12E-04	1.59E-06	2.12E-04	1.59E-06
7782-49-2	Selenium	2.40E-05	2.35E-08	2.42E-06	1.82E-08	2.42E-06	1.82E-08
			VOC HAPs Subtotal	0.1901	0.0014	0.1901	0.0014
			Metal HAPs Subtotal	0.0006	0.0001	0.0006	0.0001
			Total HAPs	0.1906	0.0015	0.1906	0.0015

References:
[1] AP42 Table 1.4-3 and Table 1.4-4

By: PEW
Date: 11/20/2016

Checked By: JJD
Date: 11/21/2016

Heater H-10101 - Normal Operations and Startup on Natural Gas

Burner Rating =	3.3310	MMBTU/HR
	1,020	BTU/CF
	3,266	SCFH
	0.003266	MMSCF/HR
	8760	HR/YR
	28.607	MMSCF/YR

Emission Type	Emissions lb/MMSCF[2]	Uncontrolled		Controlled	
		lb/hr	tpy	lb/hr	tpy
PM	7.6	0.02	0.11	0.02	0.11
PM10[1]	7.6	0.02	0.11	0.02	0.11
PM2.5[1]	7.6	0.02	0.11	0.02	0.11
PM Condensable	5.7	0.02	0.08	0.02	0.08
PM Filterable	1.9	0.01	0.03	0.01	0.03
SO2	0.6	0.01	0.04	0.01	0.04
NOx	100	0.33	1.43	0.33	1.43
CO	84	0.27	1.20	0.27	1.20
VOC	5.5	0.02	0.08	0.02	0.08
Total HAPS	See next page	0.0062	0.0274	0.0062	0.0274
				Rounding =	3
					2

1. It is assumed that PM and PM2.5 are equal to PM10.
2. Emission factors from AP-42, Section 1.4., Table 1.4-1 and 1.4-2.

Heater H-10101 - Normal Operations and Startup on Natural Gas

Burner Rating =	3.33097	MMBTU/HR
Operating Hours =	8,760	HR/YR
Conversion from lb/10^6 scf to lb/MMBtu (divide by)[1] =	1,020	BTU/CF

CAS No.	Hazardous Air Pollutants	EF[1]		Uncontrolled		Controlled	
		lb/10^6 scf	lb/MMBtu	lb/hr	tpy	lb/hr	tpy
91-57-6	2-Methylnaphthalene	2.40E-05	2.35E-08	7.84E-08	3.43E-07	7.84E-08	3.43E-07
56-49-5	3-Methylchloranthrene	1.80E-06	1.76E-09	5.88E-09	2.57E-08	5.88E-09	2.57E-08
57-97-6	7,12-Dimethylbenz(a)anthracene	1.60E-05	1.57E-08	5.23E-08	2.29E-07	5.23E-08	2.29E-07
83-32-9	Acenaphthene	1.80E-06	1.76E-09	5.88E-09	2.57E-08	5.88E-09	2.57E-08
203-96-8	Acenaphthylene	1.80E-06	1.76E-09	5.88E-09	2.57E-08	5.88E-09	2.57E-08
120-12-7	Anthracene	2.40E-06	2.35E-09	7.84E-09	3.43E-08	7.84E-09	3.43E-08
56-55-3	Benz(a)anthracene	1.80E-06	1.76E-09	5.88E-09	2.57E-08	5.88E-09	2.57E-08
71-43-2	Benzene	2.10E-03	2.06E-06	6.86E-06	3.00E-05	6.86E-06	3.00E-05
50-32-8	Benzo(a)pyrene	1.20E-06	1.18E-09	3.92E-09	1.72E-08	3.92E-09	1.72E-08
205-99-2	Benzo(b)fluoranthene	1.80E-06	1.76E-09	5.88E-09	2.57E-08	5.88E-09	2.57E-08
191-24-2	Benzo(g,h,i)perylene	1.20E-06	1.18E-09	3.92E-09	1.72E-08	3.92E-09	1.72E-08
207-08-9	Benzo(k)fluoranthene	1.80E-06	1.76E-09	5.88E-09	2.57E-08	5.88E-09	2.57E-08
218-01-9	Chrysene	1.80E-06	1.76E-09	5.88E-09	2.57E-08	5.88E-09	2.57E-08
53-70-3	Dibenzo(a,h)anthracene	1.20E-06	1.18E-09	3.92E-09	1.72E-08	3.92E-09	1.72E-08
25321-22-6	Dichlorobenzene	1.20E-03	1.18E-06	3.92E-06	1.72E-05	3.92E-06	1.72E-05
206-44-0	Fluoranthene	3.00E-06	2.94E-09	9.80E-09	4.29E-08	9.80E-09	4.29E-08
86-73-7	Fluorene	2.80E-06	2.75E-09	9.14E-09	4.01E-08	9.14E-09	4.01E-08
50-00-0	Formaldehyde	7.50E-02	7.35E-05	2.45E-04	1.07E-03	2.45E-04	1.07E-03
110-54-3	Hexane	1.80E+00	1.76E-03	5.88E-03	2.57E-02	5.88E-03	2.57E-02
193-39-5	Indeno(1,2,3-cd)pyrene	1.80E-06	1.76E-09	5.88E-09	2.57E-08	5.88E-09	2.57E-08
91-20-3	Naphthalene	6.10E-04	5.98E-07	1.99E-06	8.73E-06	1.99E-06	8.73E-06
85-01-8	Phenanathrene	1.70E-05	1.67E-08	5.55E-08	2.43E-07	5.55E-08	2.43E-07
129-00-0	Pyrene	5.00E-06	4.90E-09	1.63E-08	7.15E-08	1.63E-08	7.15E-08
108-88-3	Toluene	3.40E-03	3.33E-06	1.11E-05	4.86E-05	1.11E-05	4.86E-05
7440-38-2	Arsenic	2.00E-04	1.96E-07	6.53E-07	2.86E-06	6.53E-07	2.86E-06
7440-41-7	Beryllium	1.20E-05	1.18E-08	3.92E-08	1.72E-07	3.92E-08	1.72E-07
7440-43-9	Cadmium	1.10E-03	1.08E-06	3.59E-06	1.57E-05	3.59E-06	1.57E-05
7440-47-3	Chromium	1.40E-03	1.37E-06	4.57E-06	2.00E-05	4.57E-06	2.00E-05
7440-48-4	Cobalt	8.40E-05	8.24E-08	2.74E-07	1.20E-06	2.74E-07	1.20E-06
7439-96-5	Manganese	3.80E-04	3.73E-07	1.24E-06	5.44E-06	1.24E-06	5.44E-06
7439-97-6	Mercury	2.60E-04	2.55E-07	8.49E-07	3.72E-06	8.49E-07	3.72E-06
7440-02-0	Nickel	2.10E-03	2.06E-06	6.86E-06	3.00E-05	6.86E-06	3.00E-05
7782-49-2	Selenium	2.40E-05	2.35E-08	7.84E-08	3.43E-07	7.84E-08	3.43E-07
	VOC HAPs Subtotal			0.0061	0.0269	0.0061	0.0269
	Metal HAPs Subtotal			0.0001	0.0001	0.0001	0.0001
	Total HAPs			0.0062	0.0270	0.0062	0.0270

References:

[1] AP42 Table 1.4-3 and Table 1.4-4

Flare Total - All Flaring Events

Emission Type	Uncontrolled		Controlled	
	lb/hr	tpy	lb/hr	tpy
PM	16.16	0.13	16.16	0.13
PM10 (1)	16.16	0.13	16.16	0.13
PM2.5 (1)	16.16	0.13	16.16	0.13
PM Condensable (4)	12.12	0.10	12.12	0.10
PM Filterable (4)	4.04	0.06	4.04	0.06
SO2	3.88	0.06	3.88	0.06
NOx	150.07	1.11	150.07	1.11
CO	684.14	5.05	684.14	5.05
VOC	575.82	4.32	575.82	4.32
HAPS	0.566	0.004	0.566	0.004

By: PEW
Date: 11/20/2016

Checked By: JJD
Date: 11/21/2016

Flare Total HAPS

CAS No.	Hazardous Air Pollutants	Uncontrolled		Controlled	
		lb/hr	tpy	lb/hr	tpy
91-57-6	2-Methylnaphthalene	7.20E-06	5.40E-08	7.20E-06	5.40E-08
56-49-5	3-Methylchloranthrene	5.40E-07	4.05E-09	5.40E-07	4.05E-09
57-97-6	,12-Dimethylbenz(a)anthracen	4.80E-06	3.60E-08	4.80E-06	3.60E-08
83-32-9	Acenaphthene	5.40E-07	4.05E-09	5.40E-07	4.05E-09
203-96-8	Acenaphthylene	5.40E-07	4.05E-09	5.40E-07	4.05E-09
120-12-7	Anthracene	7.20E-07	5.40E-09	7.20E-07	5.40E-09
56-55-3	Benz(a)anthracene	5.40E-07	4.05E-09	5.40E-07	4.05E-09
71-43-2	Benzene	6.30E-04	4.73E-06	6.30E-04	4.73E-06
50-32-8	Benzo(a)pyrene	3.60E-07	2.70E-09	3.60E-07	2.70E-09
205-99-2	Benzo(b)fluoranthene	5.40E-07	4.05E-09	5.40E-07	4.05E-09
191-24-2	Benzo(g,h,i)perylene	3.60E-07	2.70E-09	3.60E-07	2.70E-09
207-08-9	Benzo(k)fluoranthene	5.40E-07	4.05E-09	5.40E-07	4.05E-09
218-01-9	Chrysene	5.40E-07	4.05E-09	5.40E-07	4.05E-09
53-70-3	Dibenzo(a,h)anthracene	3.60E-07	2.70E-09	3.60E-07	2.70E-09
25321-22-6	Dichlorobenzene	3.60E-04	2.70E-06	3.60E-04	2.70E-06
206-44-0	Fluoranthene	9.00E-07	6.75E-09	9.00E-07	6.75E-09
86-73-7	Fluorene	8.40E-07	6.30E-09	8.40E-07	6.30E-09
50-00-0	Formaldehyde	2.25E-02	1.69E-04	2.25E-02	1.69E-04
110-54-3	Hexane	5.40E-01	4.05E-03	5.40E-01	4.05E-03
193-39-5	Indeno(1,2,3-cd)pyrene	5.40E-07	4.05E-09	5.40E-07	4.05E-09
91-20-3	Naphthalene	1.83E-04	1.37E-06	1.83E-04	1.37E-06
85-01-8	Phenanathrene	5.10E-06	3.83E-08	5.10E-06	3.83E-08
129-00-0	Pyrene	1.50E-06	1.13E-08	1.50E-06	1.13E-08
108-88-3	Toluene	1.02E-03	7.65E-06	1.02E-03	7.65E-06
7440-38-2	Arsenic	6.00E-05	4.50E-07	6.00E-05	4.50E-07
7440-41-7	Beryllium	3.60E-06	2.70E-08	3.60E-06	2.70E-08
7440-43-9	Cadmium	3.30E-04	2.48E-06	3.30E-04	2.48E-06
7440-47-3	Chromium	4.20E-04	3.15E-06	4.20E-04	3.15E-06
7440-48-4	Cobalt	2.52E-05	1.89E-07	2.52E-05	1.89E-07
7439-96-5	Manganese	1.14E-04	8.55E-07	1.14E-04	8.55E-07
7439-97-6	Mercury	7.80E-05	5.85E-07	7.80E-05	5.85E-07
7440-02-0	Nickel	6.30E-04	4.73E-06	6.30E-04	4.73E-06
7782-49-2	Selenium	7.20E-06	5.40E-08	7.20E-06	5.40E-08
	VOC HAPs Subtotal	0.5647	0.0042	0.5647	0.0042
	Metal HAPs Subtotal	0.0017	0.0001	0.0017	0.0001
	Total HAPs	0.5664	0.0043	0.5664	0.0043

US Methanol LLC
Institute Site

Potesta & Associates, Inc.
Project No. 0101-16-0166

By: PEW
Date: 11/20/2016

Checked By: JJD
Date: 11/21/2016

Flare-PICV-1466 during Cold Startup

Flaring will start with natural gas and then convert to syngas as the thermoformer starts to produce syngas. For emission purposes it is assumed that all flaring is of natural gas. Typical cold startup takes five (5) hours of flaring and will occur no more than three (3) times a year.

Net Heat Release =	306,000,000	BTU/HR	
	306	MM BTU/HR	
Gas Heat Rate =	1,020	Btu/cf	
Gas Flow Rate =	300,000	SCFH	1 cf = 28.3168 Liters
	0.3	MM SCFH	1 ug = 2.2046e-9 lb
	8,495,040.00	Liters Per Hour	
Flaring Hours Per Year =	15	HRS/YR	

Emission Type	Emissions lb/MMBtu (3)	Emissions lb/MMSCF (2)	Emissions (ug/l) (1,3&4)	Uncontrolled		Controlled	
				lb/hr	tpy	lb/hr	tpy
PM		7.6	40	0.75	0.01	0.75	0.01
PM10 (1)		7.6	40	0.75	0.01	0.75	0.01
PM2.5 (1)		7.6	40	0.75	0.01	0.75	0.01
PM Condensable		5.7	30	0.56	0.01	0.56	0.01
PM Filterable		1.9	10	0.19	0.01	0.19	0.01
SO2		0.6		0.18	0.01	0.18	0.01
NOx	0.068	100		20.81	0.16	20.81	0.16
CO	0.31	84		94.86	0.71	94.86	0.71
VOC	0.57	5.5		174.42	1.31	174.42	1.31
HAPS	See Next Page			0.57	0.01	0.57	0.01
					Rounding =	2	

1. It is assumed that PM and PM2.5 are equal to PM10.
2. Emission factors from AP-42, Section 1.4., Table 1.4-1 and 1.4-2.
3. Emission factors from AP-42, Section 13.5, Table 13.5-1 (including Footnote C) and Table 13.5-2.
4. PM Condensable and Filterable prorated from AP-42, Section 1.4 (5.7/7.6 for PMC and 1.9/7.6 for PMF).

By: PEW
Date: 11/20/2016

Checked By: JJD
Date: 11/21/2016

Flare-PICV-1466 during Cold Startup

Burner Rating = 306 MMBTU/HR
Operating Hours = 15 HR/YR
Conversion from lb/10^6 scf to lb/MMBtu (divide by)[(1)] = 1,020 BTU/CF

CAS No.	Hazardous Air Pollutants	EF[1]		Uncontrolled		Controlled	
		lb/10^6 scf	lb/MMBtu	lb/hr	tpy	lb/hr	tpy
91-57-6	2-Methylnaphthalene	2.40E-05	2.35E-08	7.20E-06	5.40E-08	7.20E-06	5.40E-08
56-49-5	3-Methylchloranthrene	1.80E-06	1.76E-09	5.40E-07	4.05E-09	5.40E-07	4.05E-09
57-97-6	,12-Dimethylbenz(a)anthracen	1.60E-05	1.57E-08	4.80E-06	3.60E-08	4.80E-06	3.60E-08
83-32-9	Acenaphthene	1.80E-06	1.76E-09	5.40E-07	4.05E-09	5.40E-07	4.05E-09
203-96-8	Acenaphthylene	1.80E-06	1.76E-09	5.40E-07	4.05E-09	5.40E-07	4.05E-09
120-12-7	Anthracene	2.40E-06	2.35E-09	7.20E-07	5.40E-09	7.20E-07	5.40E-09
56-55-3	Benz(a)anthracene	1.80E-06	1.76E-09	5.40E-07	4.05E-09	5.40E-07	4.05E-09
71-43-2	Benzene	2.10E-03	2.06E-06	6.30E-04	4.73E-06	6.30E-04	4.73E-06
50-32-8	Benzo(a)pyrene	1.20E-06	1.18E-09	3.60E-07	2.70E-09	3.60E-07	2.70E-09
205-99-2	Benzo(b)fluoranthene	1.80E-06	1.76E-09	5.40E-07	4.05E-09	5.40E-07	4.05E-09
191-24-2	Benzo(g,h,i)perylene	1.20E-06	1.18E-09	3.60E-07	2.70E-09	3.60E-07	2.70E-09
207-08-9	Benzo(k)fluoranthene	1.80E-06	1.76E-09	5.40E-07	4.05E-09	5.40E-07	4.05E-09
218-01-9	Chrysene	1.80E-06	1.76E-09	5.40E-07	4.05E-09	5.40E-07	4.05E-09
53-70-3	Dibenzo(a,h)anthracene	1.20E-06	1.18E-09	3.60E-07	2.70E-09	3.60E-07	2.70E-09
25321-22-6	Dichlorobenzene	1.20E-03	1.18E-06	3.60E-04	2.70E-06	3.60E-04	2.70E-06
206-44-0	Fluoranthene	3.00E-06	2.94E-09	9.00E-07	6.75E-09	9.00E-07	6.75E-09
86-73-7	Fluorene	2.80E-06	2.75E-09	8.40E-07	6.30E-09	8.40E-07	6.30E-09
50-00-0	Formaldehyde	7.50E-02	7.35E-05	2.25E-02	1.69E-04	2.25E-02	1.69E-04
110-54-3	Hexane	1.80E+00	1.76E-03	5.40E-01	4.05E-03	5.40E-01	4.05E-03
193-39-5	Indeno(1,2,3-cd)pyrene	1.80E-06	1.76E-09	5.40E-07	4.05E-09	5.40E-07	4.05E-09
91-20-3	Naphthalene	6.10E-04	5.98E-07	1.83E-04	1.37E-06	1.83E-04	1.37E-06
85-01-8	Phenanathrene	1.70E-05	1.67E-08	5.10E-06	3.83E-08	5.10E-06	3.83E-08
129-00-0	Pyrene	5.00E-06	4.90E-09	1.50E-06	1.13E-08	1.50E-06	1.13E-08
108-88-3	Toluene	3.40E-03	3.33E-06	1.02E-03	7.65E-06	1.02E-03	7.65E-06
7440-38-2	Arsenic	2.00E-04	1.96E-07	6.00E-05	4.50E-07	6.00E-05	4.50E-07
7440-41-7	Beryllium	1.20E-05	1.18E-08	3.60E-06	2.70E-08	3.60E-06	2.70E-08
7440-43-9	Cadmium	1.10E-03	1.08E-06	3.30E-04	2.48E-06	3.30E-04	2.48E-06
7440-47-3	Chromium	1.40E-03	1.37E-06	4.20E-04	3.15E-06	4.20E-04	3.15E-06
7440-48-4	Cobalt	8.40E-05	8.24E-08	2.52E-05	1.89E-07	2.52E-05	1.89E-07
7439-96-5	Manganese	3.80E-04	3.73E-07	1.14E-04	8.55E-07	1.14E-04	8.55E-07
7439-97-6	Mercury	2.60E-04	2.55E-07	7.80E-05	5.85E-07	7.80E-05	5.85E-07
7440-02-0	Nickel	2.10E-03	2.06E-06	6.30E-04	4.73E-06	6.30E-04	4.73E-06
7782-49-2	Selenium	2.40E-05	2.35E-08	7.20E-06	5.40E-08	7.20E-06	5.40E-08
		VOC HAPs Subtotal		0.5647	0.0042	0.5647	0.0042
		Metal HAPs Subtotal		0.0017	0.0001	0.0017	0.0001
			Total HAPs	0.5664	0.0043	0.5664	0.0043

References:

(1) AP42 Table 1.4-3 and Table 1.4-4

By: PEW
Date: 11/20/2016

Checked By: JJD
Date: 11/21/2016

Flare- Shutdown

Shutdown flaring will be syngas. Typical shutdown takes three (3) hours of flaring and will occur no more than three (3) times a year.

Net Heat Release =	81,900,000	BTU/HR	
	82	MM BTU/HR	
Gas Heat Rate =	273	Btu/cf	
Gas Flow Rate =	300,000	SCFH	1 cf = 28.3168 Liters
	0.3	MM SCFH	1 ug = 2.2046e-9 lb
	8,495,040.00	Liters Per Hour	
Flaring Hours Per Year =	9	HRS/YR	

Emission Type	Emissions lb/MMBtu (3)	Emissions lb/MMSCF (2)	Emissions (ug/l) (1,3&4)	Uncontrolled		Controlled	
				lb/hr	tpy	lb/hr	tpy
PM		7.6	40	0.75	0.01	0.75	0.01
PM10 (1)		7.6	40	0.75	0.01	0.75	0.01
PM2.5 (1)		7.6	40	0.75	0.01	0.75	0.01
PM Condensable		5.7	30	0.56	0.01	0.56	0.01
PM Filterable		1.9	10	0.19	0.01	0.19	0.01
SO2		0.6		0.18	0.01	0.18	0.01
NOx	0.068	100		5.57	0.03	5.57	0.03
CO	0.31	84		25.39	0.11	25.39	0.11
VOC	No VOC in Syngas						

Rounding = 2

1. It is assumed that PM and PM2.5 are equal to PM10.
2. Emission factors from AP-42, Section 1.4., Table 1.4-1 and 1.4-2.
3. Emission factors from AP-42, Section 13.5, Table 13.5-1 (including Footnote C) and Table 13.5-2.
4. PM Condensable and Filterable prorated from AP-42, Section 1.4 (5.7/7.6 for PMC and 1.9/7.6 for PMF).

By: PEW
Date: 11/20/2016

Checked By: JJD
Date: 11/21/2016

Flare-PRV-1323

PVR-1323 flaring of syngas with an estimated yearly flaring time of 15 hours.

Net Heat Release =	368,125,761.71	BTU/HR	
	368.13	MM BTU/HR	
Gas Flow Rate =	44,959,156.62	SCFD	1 cf = 28.3168 Liters
	1,873,298.19	SCFH	1 ug = 2.2046e-9 lb
	1.87	MM SCFH	
	53,045,810.26	Liters Per Hour	
Flaring Hours Per Year =	15	HRS/YR	

Emission Type	Emissions lb/MMBtu (3)	Emissions lb/MMSCF (2)	Emissions (ug/l) (1,3&4)	Uncontrolled		Controlled	
				lb/hr	tpy	lb/hr	tpy
PM		7.6	40	4.68	0.04	4.68	0.04
PM10 (1)		7.6	40	4.68	0.04	4.68	0.04
PM2.5 (1)		7.6	40	4.68	0.04	4.68	0.04
PM Condensable		5.7	30	3.51	0.03	3.51	0.03
PM Filterable		1.9	10	1.17	0.01	1.17	0.01
SO2		0.6		1.12	0.01	1.12	0.01
NOx	0.068	100		25.03	0.19	25.03	0.19
CO	0.31	84		114.12	0.86	114.12	0.86
VOC	No VOC in Syngas						

Rounding = 2

1. It is assumed that PM and PM2.5 are equal to PM10.
2. Emission factors from AP-42, Section 1.4., Table 1.4-1 and 1.4-2.
3. Emission factors from AP-42, Section 13.5, Table 13.5-1 (including Footnote C) and Table 13.5-2.
4. PM Condensable and Filterable prorated from AP-42, Section 1.4 (5.7/7.6 for PMC and 1.9/7.6 for PMF).

By: PEW
Date: 11/20/2016

Checked By: JJD
Date: 11/21/2016

Flare-PRV-10505

PVR-10505 flaring of syngas with an estimated yearly flaring time of 15 hours.

Net Heat Release =	189,838,040.90	BTU/HR	
	189.84	MM BTU/HR	
Gas Flow Rate =	24,965,467.75	SCFD	1 cf = 28.3168 Liters
	1,040,227.82	SCFH	1 ug = 2.2046e-9 lb
	1.04	MM SCFH	
	29,455,923.22	LPH	
Flaring Hours Per Year =	15	HPY	

Emission Type	Emissions lb/MMBtu (3)	Emissions lb/MMSCF (2)	Emissions (ug/l) (3&4)	Uncontrolled		Controlled	
				lb/hr	tpy	lb/hr	tpy
PM		7.6	40	2.60	0.02	2.60	0.02
PM10 (1)		7.6	40	2.60	0.02	2.60	0.02
PM2.5 (1)		7.6	40	2.60	0.02	2.60	0.02
PM Condensable (4)		5.7	30	1.95	0.01	1.95	0.01
PM Filterable (4)		1.9	10	0.65	0.01	0.65	0.01
SO2		0.6		0.62	0.01	0.62	0.01
NOx	0.068	100		12.91	0.10	12.91	0.10
CO	0.31	84		58.85	0.44	58.85	0.44
VOC	No VOC in Syngas						

Rounding = 2

1. It is assumed that PM and PM2.5 are equal to PM10.
2. Emission factors from AP-42, Section 1.4., Table 1.4-1 and 1.4-2.
3. Emission factors from AP-42, Section 13.5, Table 13.5-1 (including Footnote C) and Table 13.5-2.
4. PM Condensable and Filterable prorated from AP-42, Section 1.4 (5.7/7.6 for PMC and 1.9/7.6 for PMF).

By: PEW
Date: 11/20/2016

Checked By: JJD
Date: 11/21/2016

Flare-PRV-3301/2/3

PVR-3301/2/3 flaring of syngas with an estimated yearly flaring time of 15 hours.

Net Heat Release =	704,205,659.66	BTU/HR	
	704.21	MM BTU/HR	
Gas Flow Rate =	22,061,004.87	SCFD	1 cf = 28.3168 Liters
	919,208.54	SCFH	1 ug = 2.2046e-9 lb
	0.92	MM SCFH	
	26,029,044.28	LPH	
Flaring Hours Per Year =	15.00	HPY	

Emission Type	Emissions lb/MMBtu (3)	Emissions lb/MMSCF (2)	Emissions (ug/l) (3&4)	Uncontrolled		Controlled	
				lb/hr	tpy	lb/hr	tpy
PM		7.6	40	2.30	0.02	2.30	0.02
PM10 (1)		7.6	40	2.30	0.02	2.30	0.02
PM2.5 (1)		7.6	40	2.30	0.02	2.30	0.02
PM Condensable (4)		5.7	30	1.72	0.01	1.72	0.01
PM Filterable (4)		1.9	10	0.57	0.01	0.57	0.01
SO2		0.6		0.55	0.01	0.55	0.01
NOx	0.068	100		47.89	0.36	47.89	0.36
CO	0.31	84		218.30	1.64	218.30	1.64
VOC	0.57	5.5		401.40	3.01	401.40	3.01
					Rounding =	2	

1. It is assumed that PM and PM2.5 are equal to PM10.
2. Emission factors from AP-42, Section 1.4., Table 1.4-1 and 1.4-2.
3. Emission factors from AP-42, Section 13.5, Table 13.5-1 (including Footnote C) and Table 13.5-2.
4. PM Condensable and Filterable prorated from AP-42, Section 1.4 (5.7/7.6 for PMC and 1.9/7.6 for PMF).

By: PEW
Date: 11/20/2016

Checked By: JJD
Date: 11/21/2016

Flare-PRV-1453

PVR-1453 flaring of syngas with an estimated yearly flaring time of 15 hours.

Net Heat Release =	556,831,153.11	BTU/HR	
	556.83	MM BTU/HR	
Gas Flow Rate =	48,932,915.67	SCFD	1 cf = 28.3168 Liters
	2,038,871.49	SCFH	1 ug = 2.2046e-9 lb
	2.04	MM SCFH	
	57,734,316.10	LPH	
Flaring Hours Per Year =	15	HPY	

Emission Type	Emissions lb/MMBtu (3)	Emissions lb/MMSCF (2)	Emissions (ug/l) (3&4)	Uncontrolled		Controlled	
				lb/hr	tpy	lb/hr	tpy
PM		7.6	40	5.09	0.04	5.09	0.04
PM10 (1)		7.6	40	5.09	0.04	5.09	0.04
PM2.5 (1)		7.6	40	5.09	0.04	5.09	0.04
PM Condensable (4)		5.7	30	3.82	0.03	3.82	0.03
PM Filterable (4)		1.9	10	1.27	0.01	1.27	0.01
SO2		0.6		1.22	0.01	1.22	0.01
NOx	0.068	100		37.86	0.28	37.86	0.28
CO	0.31	84		172.62	1.29	172.62	1.29
VOC	No VOC in Syngas						

Rounding = 2

1. It is assumed that PM and PM2.5 are equal to PM10.
2. Emission factors from AP-42, Section 1.4., Table 1.4-1 and 1.4-2.
3. Emission factors from AP-42, Section 13.5, Table 13.5-1 (including Footnote C) and Table 13.5-2.
4. PM Condensable and Filterable prorated from AP-42, Section 1.4 (5.7/7.6 for PMC and 1.9/7.6 for PMF).

Flare Pilot Flame

Burner Rating =	0.0255	MMBTU/HR
	1,020	BTU/CF
	25	SCFH
	0.000025	MMSCF/HR
	8,760	HR/YR
	0.219	MMSCF/YR

Emission Type	Emissions lb/MMSCF[2]	Uncontrolled		Controlled	
		lb/hr	tpy	lb/hr	tpy
PM	7.6	0.0002	0.0008	0.0002	0.0008
PM10[1]	7.6	0.0002	0.0008	0.0002	0.0008
PM2.5[1]	7.6	0.0002	0.0008	0.0002	0.0008
PM Condensable	5.7	0.0001	0.0006	0.0001	0.0006
PM Filterable	1.9	0.0001	0.0004	0.0001	0.0004
SO2	0.6	0.0001	0.0004	0.0001	0.0004
NOx	100	0.0025	0.0110	0.0025	0.0110
CO	84	0.0021	0.0092	0.0021	0.0092
VOC	5.5	0.0001	0.0006	0.0001	0.0006
HAPS	See Next Page	0.00005	0.00021	0.00005	0.00021

1. It is assumed that PM and PM2.5 are equal to PM10.
2. Emission factors from AP-42, Section 1.4., Table 1.4-1 and 1.4-2.

US Methanol LLC
Institute Site

Potesta & Associates, Inc.
Project No. 0101-16-0166

By: PEW
Date: 11/20/2016

Checked By: JJD
Date: 11/21/2016

Burner Rating = 0.02550 MMBTU/HR
Operating Hours = 8,760 HR/YR
Conversion from lb/10^6 scf to lb/MMBtu (divide by)[1] = 1,020 BTU/CF

CAS No.	Hazardous Air Pollutants	EF[1]		Uncontrolled		Controlled	
		lb/10^6 scf	lb/MMBtu	lb/hr	tpy	lb/hr	tpy
91-57-6	2-Methylnaphthalene	2.40E-05	2.35E-08	6.00E-10	2.63E-09	6.00E-10	2.63E-09
56-49-5	3-Methylchloranthrene	1.80E-06	1.76E-09	4.50E-11	1.97E-10	4.50E-11	1.97E-10
57-97-6	7,12-Dimethylbenz(a)anthracene	1.60E-05	1.57E-08	4.00E-10	1.75E-09	4.00E-10	1.75E-09
83-32-9	Acenaphthene	1.80E-06	1.76E-09	4.50E-11	1.97E-10	4.50E-11	1.97E-10
203-96-8	Acenaphthylene	1.80E-06	1.76E-09	4.50E-11	1.97E-10	4.50E-11	1.97E-10
120-12-7	Anthracene	2.40E-06	2.35E-09	6.00E-11	2.63E-10	6.00E-11	2.63E-10
56-55-3	Benz(a)anthracene	1.80E-06	1.76E-09	4.50E-11	1.97E-10	4.50E-11	1.97E-10
71-43-2	Benzene	2.10E-03	2.06E-06	5.25E-08	2.30E-07	5.25E-08	2.30E-07
50-32-8	Benzo(a)pyrene	1.20E-06	1.18E-09	3.00E-11	1.31E-10	3.00E-11	1.31E-10
205-99-2	Benzo(b)fluoranthene	1.80E-06	1.76E-09	4.50E-11	1.97E-10	4.50E-11	1.97E-10
191-24-2	Benzo(g,h,i)perylene	1.20E-06	1.18E-09	3.00E-11	1.31E-10	3.00E-11	1.31E-10
207-08-9	Benzo(k)fluoranthene	1.80E-06	1.76E-09	4.50E-11	1.97E-10	4.50E-11	1.97E-10
218-01-9	Chrysene	1.80E-06	1.76E-09	4.50E-11	1.97E-10	4.50E-11	1.97E-10
53-70-3	Dibenzo(a,h)anthracene	1.20E-06	1.18E-09	3.00E-11	1.31E-10	3.00E-11	1.31E-10
25321-22-6	Dichlorobenzene	1.20E-03	1.18E-06	3.00E-08	1.31E-07	3.00E-08	1.31E-07
206-44-0	Fluoranthene	3.00E-06	2.94E-09	7.50E-11	3.29E-10	7.50E-11	3.29E-10
86-73-7	Fluorene	2.80E-06	2.75E-09	7.00E-11	3.07E-10	7.00E-11	3.07E-10
50-00-0	Formaldehyde	7.50E-02	7.35E-05	1.88E-06	8.21E-06	1.88E-06	8.21E-06
110-54-3	Hexane	1.80E+00	1.76E-03	4.50E-05	1.97E-04	4.50E-05	1.97E-04
193-39-5	Indeno(1,2,3-cd)pyrene	1.80E-06	1.76E-09	4.50E-11	1.97E-10	4.50E-11	1.97E-10
91-20-3	Naphthalene	6.10E-04	5.98E-07	1.53E-08	6.68E-08	1.53E-08	6.68E-08
85-01-8	Phenanathrene	1.70E-05	1.67E-08	4.25E-10	1.86E-09	4.25E-10	1.86E-09
129-00-0	Pyrene	5.00E-06	4.90E-09	1.25E-10	5.48E-10	1.25E-10	5.48E-10
108-88-3	Toluene	3.40E-03	3.33E-06	8.50E-08	3.72E-07	8.50E-08	3.72E-07
7440-38-2	Arsenic	2.00E-04	1.96E-07	5.00E-09	2.19E-08	5.00E-09	2.19E-08
7440-41-7	Beryllium	1.20E-05	1.18E-08	3.00E-10	1.31E-09	3.00E-10	1.31E-09
7440-43-9	Cadmium	1.10E-03	1.08E-06	2.75E-08	1.20E-07	2.75E-08	1.20E-07
7440-47-3	Chromium	1.40E-03	1.37E-06	3.50E-08	1.53E-07	3.50E-08	1.53E-07
7440-48-4	Cobalt	8.40E-05	8.24E-08	2.10E-09	9.20E-09	2.10E-09	9.20E-09
7439-96-5	Manganese	3.80E-04	3.73E-07	9.50E-09	4.16E-08	9.50E-09	4.16E-08
7439-97-6	Mercury	2.60E-04	2.55E-07	6.50E-09	2.85E-08	6.50E-09	2.85E-08
7440-02-0	Nickel	2.10E-03	2.06E-06	5.25E-08	2.30E-07	5.25E-08	2.30E-07
7782-49-2	Selenium	2.40E-05	2.35E-08	6.00E-10	2.63E-09	6.00E-10	2.63E-09
			VOC HAPs Subtotal	4.71E-05	2.06E-04	4.71E-05	2.06E-04
			Metal HAPs Subtotal	1.39E-07	6.09E-07	1.39E-07	6.09E-07
			Total HAPs	4.72E-05	2.07E-04	4.72E-05	2.07E-04

References:

[1] AP42 Table 1.4-3 and Table 1.4-4

Natural Gas (Vapor Sources)

					Uncontrolled			Controlled	
Source Type	**Number of Sources**	**Emission Factor(1) (kg/hr/source)**	**TOC Emissions (lb/hr)**	**TOC Emissions (ton/yr)**	**VOC Emissions (lb/hr)**	**VOC Emissions (ton/yr)**	**Control Efficiency (%)**	**VOC Emissions (lb/hr)**	**VOC Emissions (ton/yr)**
Valves	346	0.000131	0.099926	0.437675	0.001538	0.006737	0	0.001538	0.006737
Pressure Relief Valves	14	0.0447	1.379639	6.042817	0.021235	0.093011	98	0.000425	0.001860
Connectors (Flanges)	229	0.0000810	0.040893	0.179112	0.000629	0.002757	0	0.000629	0.002757
Compressor Seals	4	0.089	0.788365	3.453039	0.012135	0.053149	0	0.012135	0.053149
Light Liquid Pumps	0	0.0019	0.000000	0.000000	0.000000	0.000000	0	0.000000	0.000000
Sample Connections (2)	2	0.0150	0.066138	0.289684	0.001018	0.004459	0	0.001018	0.004459
				Total VOC =	0.04	0.16		0.02	0.07

Uncontrolled			Controlled	
Hexane Emissions (lb/hr)	**Hexane Emissions (ton/yr)**	**Control Efficiency (%)**	**Hexane Emissions (lb/hr)**	**Hexane Emissions (ton/yr)**
0.000410	0.001794	0	0.000410	0.001794
0.005657	0.024776	98	0.000113	0.000496
0.000168	0.000734	0	0.000168	0.000734
0.003232	0.014157	0	0.003232	0.014157
0.000000	0.000000	0	0.000000	0.000000
0.000271	0.001188	0	0.000271	0.001188
0.010	0.043		0.004	0.018

Sample Natural Gas Composition at Institute site							
Gas Composition Key	Production Date	BTU	Gravity	Non-VOC	Non-VOC	Non-VOC	Non-VOC
				Carbon Dioxide	Nitrogen	Methane	Ethane
Institute Line 1 Service	8/3/2016 0:00	1066.7	0.5966	0.2037	0.4956	91.7979	7.2752
Institute Line 1 Service	8/2/2016 0:00	1065.1	0.5956	0.2132	0.4817	92.0190	7.0705
Institute Line 1 Service	8/1/2016 0:00	1058.7	0.5913	0.2256	0.4431	92.9815	6.0919
Institute Line 1 Service	7/31/2016 0:00	1058.2	0.5910	0.2275	0.4417	93.0388	6.0333
Institute Line 1 Service	7/30/2016 0:00	1058.5	0.5912	0.2289	0.4433	93.0196	6.0175
Institute Line 1 Service	7/29/2016 0:00	1063.2	0.5945	0.2211	0.4867	92.2522	6.8203
Institute Line 1 Service	7/28/2016 0:00	1065.7	0.5962	0.2103	0.5038	91.8669	7.2257
Min Value				0.2037	0.4417	91.7979	6.0175
						Total Non-VOC =	98.4608

Sample Natural Gas Composition at Institute site							
Gas Composition Key	VOC	VOC	VOC	VOC	VOC	VOC	VOC/HAP
	Propane	N Butane	Iso Butane	Pentane	Iso Pentane	Neo Pentane	Hexane
Institute Line 1 Service	0.2085	0.0100	0.0063	0.0001	0.0012	0.0000	0.0014
Institute Line 1 Service	0.1892	0.0119	0.0092	0.0006	0.0021	0.0000	0.0025
Institute Line 1 Service	0.2178	0.0183	0.0116	0.0025	0.0037	0.0000	0.0041
Institute Line 1 Service	0.2187	0.0183	0.0116	0.0024	0.0037	0.0000	0.0040
Institute Line 1 Service	0.2545	0.0168	0.0105	0.0021	0.0033	0.0000	0.0036
Institute Line 1 Service	0.1877	0.0144	0.0094	0.0019	0.0030	0.0000	0.0034
Institute Line 1 Service	0.1719	0.0108	0.0063	0.0004	0.0018	0.0000	0.0022
Max value	0.2545	0.0183	0.0116	0.0025	0.0037	0.0000	0.0041

1. AP42, Chapter 5, Protocol for Equipment Leak Emission Estimates, Table 2-1.
2. Sight Glass

Syngas (Vapor Sources)

Source Type	Number of Sources	Emission Factor(1) (kg/hr/source)	TOC Emissions (lb/hr)	TOC Emissions (ton/yr)	Uncontrolled CO Emissions (lb/hr)	Uncontrolled CO Emissions (ton/yr)	Control Efficiency (%)	Controlled CO Emissions (lb/hr)	Controlled CO Emissions (ton/yr)
Valves	774	0.000131	0.223533	0.979075	0.032412	0.141966	0	0.032412	0.141966
Pressure Relief Valves	22	0.0447	2.168004	9.495856	0.314361	1.376899	0	0.314361	1.376899
Connectors (Flanges)	251	0.0000810	0.044822	0.196319	0.006499	0.028466	0	0.006499	0.028466
Compressor Seals	2	0.089	0.394182	1.726519	0.057156	0.250345	0	0.057156	0.250345
Light Liquid Pumps	0	0.0019	0.000000	0.000000	0.000000	0.000000	0	0.000000	0.000000
Sample Connections (2)	12	0.0150	0.396828	1.738107	0.057540	0.252025	0	0.057540	0.252025
				CO Emissions	0.47	2.05		0.47	2.05

Syngas Makeup	
Hydrogen	67.0
CO	14.5
CO2	7.4
CH4	3.1
Nitrogen and Water	8.0

Methanol System (Vapor Sources) - Process Systems

Source Type	Number of Sources	Emission Factor(1) (kg/hr/source)	TOC Emissions (lb/hr)	TOC Emissions (ton/yr)	Uncontrolled VOC Emissions (lb/hr)	Uncontrolled VOC Emissions (ton/yr)	Control Efficiency (%)	Controlled VOC Emissions (lb/hr)	Controlled VOC Emissions (ton/yr)
Valves	201	0.000131	0.058049	0.254256	0.058049	0.254256	0	0.058049323	0.254256033
Pressure Relief Valves	32	0.0447	3.153460	13.812154	3.153460	13.812154	98	0.063069197	0.276243082
Connectors (Flanges)	175	0.0000810	0.031250	0.136876	0.031250	0.136876	0	0.031250205	0.136875898
Compressor Seals	0	0.089	0.000000	0.000000	0.000000	0.000000	0	0	0
Light Liquid Pumps	13	0.0019	0.053594	0.234741	0.053594	0.234741	0	0.053593826	0.234740958
Sample Connections (2)	6	0.0150	0.198414	0.869053	0.198414	0.869053	0	0.198414	0.86905332
				Total VOC = TOC Emissions	3.495	15.307		0.40437655	1.771169291

Methanol System (Vapor Sources) – Tanks

Source Type	Number of Sources	Emission Factor(1) (kg/hr/source)	TOC Emissions (lb/hr)	TOC Emissions (ton/yr)	Uncontrolled VOC Emissions (lb/hr)	Uncontrolled VOC Emissions (ton/yr)	Control Efficiency (%)	Controlled VOC Emissions (lb/hr)	Controlled VOC Emissions (ton/yr)
Valves	170	0.000131	0.049096	0.215042	0.049096	0.215042	0	0.049096442	0.215042416
Pressure Relief Valves	19	0.0447	1.872367	8.200966	1.872367	8.200966	98	0.037447336	0.16401933
Emergency Pressure Relief Valves	8	0.0447	0.788365	3.453039	0.788365	3.453039	0	0.78836496	3.453038525
Connectors (Flanges)	340	0.0000810	0.060715	0.265930	0.060715	0.265930	0	0.060714684	0.265930316
Compressor Seals	0	0.089	0.000000	0.000000	0.000000	0.000000	0	0	0
Light Liquid Pumps	9	0.0019	0.037103	0.162513	0.037103	0.162513	0	0.037103418	0.162512971
Sample Connections (2)	0	0.0150	0.000000	0.000000	0.000000	0.000000	0	0	0
				Total VOC = TOC Emissions	2.808	12.297		0.97272684	4.260543557

	Uncontrolled		Controlled	
	lb/hr	ton/yr	lb/hr	ton/yr
Total VOC	**6.30**	**27.60**	**1.38**	**6.03**
Total Methanol	**6.30**	**27.60**	**1.38**	**6.03**

1. AP42,Chapter 5, Protocol for Equipment Leak Emission Estimates, Table 2-1.
2. Sight Glass

lb/kg = 2.2046

US Methanol LLC
Institute Site

Potesta & Associates, Inc.
Project No. 0101-16-0166

By: PEW
Date: 11/20/2016

Checked By: JJD
Date: 11/21/2016

Tanks

Tank	I.D.	Volume	Turnovers	Yearly Throughput	Fixed Roof Losses		Floating Roof Losses				VOC Emissions				
					Working	Breathing	Rim Seal	Withdrawl	Deck Fitting	Deck Seam	Uncontrolled			Controlled	
		(gal)	(No.)	(gal/yr)	(lbs/yr)	(lbs/yr)	(lbs/yr)	(lbs/yr)	(lbs/yr)	(lbs/yr)	(lbs/yr)	(lbs/hr)(1)	(tpy)	(lbs/hr)(1)	(tpy)
Rundown Tank	TK1	74,450.61	826.05	61,500,000	12,357.80	535.36	NA	NA	NA	NA	12,893.16	15.61	6.45	0.32	0.13
Rundown Tank	TK2	74,450.61				535.36	NA	NA	NA	NA	535.36	0.65	0.27	0.02	0.01
Total for Rudown Tanks (Controlled)					247.16	21.41	NA	NA	NA	NA	13,428.52	16.26	6.71	0.34	0.14
Fusel Oil Tank	TK3	12,307.09	18.28	225,000	40.30	15.71	NA	NA	NA	NA	56.01	3.06	0.03	0.07	0.01
Controlled for Fusel Oil Tank					0.81	0.31									
Sales Tank	TK4	1,200,000	51.25	61,500,000	NA	NA	310.37	196.18	357.92	0.00	864.47	16.87	0.43	0.34	0.01
Sales Tank	TK5	1,200,000			NA	NA									
Slop Tank	TK6	149,418.23	41.16	6,150,000	5,452.08	1,074.44					6,526.52	158.56	3.26	3.18	0.07
					109.04	21.49									
Product Tank	TK7	1,200,000	51.25	61,500,000	NA	NA	310.37	196.18	357.92	0.00	864.47	16.87	0.43	0.34	0.01
Product Tank	TK8	1,200,000			NA	NA									
										Total VOC =	211.62	10.87	4.27	0.24	
										Total Methanol (2) =	211.62	10.87	4.27	0.24	

Scrubber Control at Area 4 and Plant Tanks (%) = 98
Scrubber Control at Area 12 (%) = 98

Notes:

1. Emissions based on one full turnover of the tank.
2. Assumes total VOC emissions are also Methanol including for Fusel Oil Tank which is part water, ethyl alcohol, and butyl alcohol in addition to methanol.
3. Uncontrolled losses are estimated with Tanks 4.0.9d and the Emissions Report - Detail Format is attached to this application.

US Methanol LLC
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Barge Loading of Methanol

VOC losses from loading methanol to barge with the control of the scrubber system. AP-42, Section 5.2, Transportation and Marketing of Petroleum Liquids.

L =	12.46	SPM/T lb/1,000 gallons
S=	0.5	Saturation Factor (5.2-1)
P=	2.44	psia
M=	32.04	MW lb/lb-mole
T=	77	Degrees F
T=	537	Degrees R (f + 460)
L uncontrolled =	0.91	lb/1,000 gallons
Loading Rate =	1,000	gpm
Total Gallons Per Hour =	60,000	gph
Total Gallons Per Year =	61,500,000	gpy
Collection Efficiency =	99	%
Vapor Losses =	0.54	lbs/hr
	0.28	tpy
Control Efficiency =	98	%
L controlled =	0.0181	lb/1,000 gallons
VOC/Methanol (uncontrolled) =	54.42	lbs/hr
VOC/Methanol (uncontrolled) =	27.89	tpy
VOC/Methanol (controlled) =	1.09	lbs/hr
VOC/Methanol (controlled) =	0.56	tpy
Total (point and fugitive) =	1.63	lbs/hr
	0.84	tpy

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By: PEW
Date: 11/20/2016

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Date: 11/21/2016

Truck Loading of Fusel Oil

VOC/Methanol losses from loading fusel oil to truck with the control of the scrubber system. Assumes the material is all Methanol. AP-42, Section 5.2, Transportation and Marketing of Petroleum Liquids.

L =	12.46	SPM/T lb/1,000 gallons
S=	1	Saturation Factor (5.2-1)
P=	2.44	psia
M=	32.04	MW lb/lb-mole
T=	77	Degrees F
T=	537	Degrees R (f + 460)
L uncontrolled =	1.81	lb/1,000 gallons
Loading Rate =	100	gpm
Total Gallons Per Hour =	6,000	gph
Total Gallons Per Year =	225,000	gpy
Collection Efficiency =	99	%
Vapor Losses =	0.11	lbs/hr
	0.01	tpy
Control Efficiency =	98	%
L controlled =	0.0363	lb/1,000 gallons
VOC/Methanol (uncontrolled) =	10.88	lbs/hr
VOC/Methanol (uncontrolled) =	0.20	tpy
VOC/Methanol (controlled) =	0.22	lbs/hr
VOC/Methanol (controlled) =	0.01	tpy
Total (point and fugitive) =	0.33	lbs/hr
	0.02	tpy

Vehicle Activity (VA)

Paved Roadway: Trucks removing fusel oil from site and miscellaneous trucking (estimated).

Emission Factor Equation from AP-42 Section 13.2.1, Paved Roads (January 2011):
E = [k * (sL/2)^0.91 * (W)^1.02] * (1 - 1.2P/4N) = lb / Vehicle Mile Traveled (VMT)

	PM	PM10	PM2.5	
k =	0.011	0.0022	0.00054	dimensionless, particle size multiplier
sL =	9.7	9.7	9.7	surface material silt content (g/m^2)
W =	26.8	26.8	26.8	tons, mean vehicle weight
P =	157	157	157	no. days/year with 0.01 in of rain
e =	1.15	0.23	0.06	lb/VMT

Rounding to 3

Pollutant	No. of Vehicles		Miles Per Trip	Control Device		Emissions			
						Uncontrolled		Controlled	
	Per Hour	Per Year	(mi)	Type	Effic(%)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
PM	3	382	1.00	N	0	3.45	0.22	3.45	0.22
PM10	3	382	1.00	N	0	0.69	0.04	0.69	0.04
PM2.5	3	382	1.00	N	0	0.18	0.01	0.18	0.01

Tankers/Trucks								
Product	Empty Weight lbs	Loaded Weight lbs	Gallons Per Load	Average Weight tons	Gallons Per Hour	Gallons Per Year	Trucks Per Hour	Trucks Per Year
Fusel Oil	27,000	80,000	13,800	26.750	12,000	225,000	1	17
Miscellaneous Trucking (estimated and assumed to have the same mean weight as fusel oil trucking)							2	365
						Total =	3	382

ATTACHMENT O

MONITORING, RECORDKEEPING, REPORTING, TESTING PLANS

ATTACHMENT O

MONITORING/RECORDKEEPING/REPORTING/TESTING PLANS

US Methanol LLC requests monitoring, recordkeeping, reporting and testing as stated in the Emissions Unit Data Sheets contained in Attachment L.

ATTACHMENT P

PUBLIC NOTICE

LEGAL ADVERTISEMENT

AIR QUALITY PERMIT NOTICE
Notice of Application

Notice is given that US Methanol LLC has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a Regulation 13 Permit Application for the construction of a methanol plant in Kanawha County, West Virginia. The latitude and longitude coordinates are: 38.387661 and -81.781221.

The applicant estimates the potential increase to discharge the following Regulated Air Pollutants will be: NOx of 72.67 tons per year (tpy), VOC of 13.16 tpy, CO of 16.13 tpy, PM of 2.01 tpy, PM10 of 1.83 tpy, PM2.5 of 1.80 tpy, SO2 of 0.11 tpy, methanol of 7.13 tpy and total hazardous air pollutants of 7.16 tpy.

Startup of operation is planned to begin on or about the 1st day of July, 2017. Written comments will be received by the West Virginia Department of Environmental Protection, Division of Air Quality, 601 57th Street, Charleston, WV 25304, for at least 30 calendar days from the date of publication of this notice.

Any questions regarding this permit application should be directed to the DAQ at (304) 926-0499, Extension 1250, during normal business hours.

Dated this the (PLEASE INSERT DATE) day of November, 2016.

By: US Methanol LLC
Richard Wolfli
COO
400 Capitol Street, Suite 200
Charleston, WV 25301