Addivant
1000 Morgantown Industrial Park
Morgantown, WV 26501
Tel: 304-284-2214

March 7, 2017

Director
West Virginia Department of Environmental Protection
Division of Air Quality – Permitting Section
601 57th Street S.E.
Charleston, WV 25304

RE: Permit Determination Request – Addivant USA, LLC
North Plant – W430ZP Trial Process
DAQ Plant I.D. No.: 061-00061

Dear Director,

Addivant USA, LLC ("Addivant") is planning a three batch trail to add a new product to an existing chemical manufacturing unit at the North Plant facility. Addivant will be testing a new product called Weston 430 Zero Phenol (W430ZP) which is a variation of a current product W430. This trial product will utilize existing equipment (i.e. tanks, reactor, receiver, condenser, knock out pot, hot well, waste tote) with the exception of the two portable tanks that will only be used for this trial. The existing facility is true minor source under Federal and State regulations, and will remain a true minor source after the proposed changes.

Enclosed is the permit determination form (PDF) along with the following attachments:

- Attachment A – Map of Facility,
- Attachment B – Process Flow Diagram,
- Attachment C – Process Description,
- Attachment D – Safety Data Sheets, and
- Attachment E - Potential-to-Emit Estimates.

Based on the potential-to-emit calculations for the W430ZP trial process, the new modifications will not increase the emission above the permitting thresholds for modification as defined in 45 CSR 13: the reasonably calculated maximum potential emissions are under two (2) lb/hr OR five (5) tons/year of total Hazardous Air Pollutants (HAPs); six (6) lbs/hr and ten (10) tons per year or 144 pounds per calendar day of any regulated pollutant.

As requested for all permitting actions, one hardcopy and two electronic copies are included with this submittal. Should the department have any questions or need clarification on any part of this application package, please contact me via e-mail or at 304-284-2214.

Sincerely,

Julie Szymanek

Julie Szymanek
Environmental Engineer
Julie.Szymanek@addivant.com

Attachments: PDF and Attachment A, B, C, D, and E
Enclosures: 2 electronic copies

WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF AIR QUALITY
601 57th Street, SE
Charleston, WV 25304
Phone: (304) 926-0475
www.dep.wv.gov/daq

PERMIT DETERMINATION FORM (PDF)

FOR AGENCY USE ONLY: PLANT I.D. # _____

PDF # _____ PERMIT WRITER: _____

1. NAME OF APPLICANT (AS REGISTERED WITH THE WV SECRETARY OF STATE'S OFFICE):
Addivant USA, LLC

2. NAME OF FACILITY (IF DIFFERENT FROM ABOVE):
Morgantown North Plant

3. NORTH AMERICAN INDUSTRY CLASSIFICATION SYSTEM (**NAICS**) CODE:
325199

4A. MAILING ADDRESS:
1000 Morgantown Industrial Park,
Morgantown, WV 26501

4B. PHYSICAL ADDRESS:
1000 Morgantown Industrial Park,
Morgantown, WV 26501

5A. DIRECTIONS TO FACILITY (PLEASE PROVIDE **MAP** AS **ATTACHMENT A**): I-79 Exit 152. Proceed on Rt 19 N approximately ¾ miles. Turn right onto DuPont Road and proceed to first stop sign. Cross over County Road 45 and enter Morgantown Industrial Park. Take a left at the first stop sign, and then take the next immediate left.

5B. NEAREST ROAD:
County Road 45

5C. NEAREST CITY OR TOWN:
Morgantown

5D. COUNTY:
Monongalia

5E. UTM NORTHING (KM):
4384.842

5F. UTM EASTING (KM):
587.954

5G. UTM ZONE:
17

6A. INDIVIDUAL TO CONTACT IF MORE INFORMATION IS REQUIRED:
Julie Szymanek

6B. TITLE:
Environmental Engineer

6C. TELEPHONE:
(304) 284-2214

6D. FAX:
(304) 284-2363

6E. E-MAIL:
Julie.Szymanek@addivant.com

7A. DAQ PLANT I.D. NO. (FOR AN EXISTING FACILITY ONLY):
061-00061

7B. PLEASE LIST ALL CURRENT 45CSR13, 45CSR14, 45CSR19 AND/OR TITLE V (45CSR30) PERMIT NUMBERS ASSOCIATED WITH **THIS** PROCESS (FOR AN EXISTING FACILITY ONLY):
None

7C. IS THIS PDF BEING SUBMITTED AS THE RESULT OF AN ENFORCEMENT ACTION? IF YES, PLEASE LIST:
NA

8A. TYPE OF EMISSION SOURCE (CHECK ONE):
☐ **NEW SOURCE** ☐ **ADMINISTRATIVE UPDATE**
☒ **MODIFICATION** ☐ **OTHER** (PLEASE EXPLAIN IN 11B)

8B. IF ADMINISTRATIVE UPDATE, DOES DAQ HAVE THE APPLICANT'S CONSENT TO UPDATE THE EXISTING PERMIT WITH THE INFORMATION CONTAINED HEREIN?
☐ **YES** ☐ **NO**

9. IS *DEMOLITION* OR PHYSICAL *RENOVATION* AT AN EXISTING FACILITY INVOLVED? ☐ **YES** ☒ **NO**

10A. DATE OF ANTICIPATED INSTALLATION OR CHANGE:
03/20/2017

10B. DATE OF ANTICIPATED START-UP:
03/28/2017

11A. PLEASE PROVIDE A **DETAILED PROCESS FLOW DIAGRAM** SHOWING EACH PROPOSED OR MODIFIED PROCESS EMISSION POINT AS **ATTACHMENT B**.

11B. PLEASE PROVIDE A **DETAILED PROCESS DESCRIPTION** AS **ATTACHMENT C**.

12. PLEASE PROVIDE **MATERIAL SAFETY DATA SHEETS (MSDS)** FOR ALL MATERIALS PROCESSED, USED OR PRODUCED AS **ATTACHMENT D**. FOR CHEMICAL PROCESSE, PLEASE PROVIDE A MSDS FOR EACH COMPOUND EMITTED TO AIR.

13A. **REGULATED AIR POLLUTANT EMISSIONS:**

⇒ **FOR A NEW FACILITY,** PLEASE PROVIDE PLANT WIDE EMISSIONS BASED ON THE POTENTIAL TO EMIT (PTE) FOR THE FOLLOWING AIR POLLUTANTS INCLUDING ALL PROCESSES.

⇒ **FOR AN EXISTING FACILITY,** PLEASE PROVIDE THE PROPOSED CHANGE IN EMISSIONS BASED ON THE PTE OF ALL PROCESS CHANGES FOR THE FOLLOWING AIR POLLUTANTS.

PTE FOR A GIVEN POLLUTANT IS TYPICALLY BEFORE AIR POLLUTION CONTROL DEVICES AND IS COLLECTED BASED ON THE MAXIMUM DESIGN CAPACITY OF PROCESS EQUIPMENT.

POLLUTANT	**HOURLY PTE** (LB/HR)	**YEARLY PTE** (TON/YR) (HOURLY PTE MULTIPLIED BY 8760 HR/YR) DIVIDED BY 2000 LB/TON
PM		
PM_{10}		
VOCs	3.26	0.10
CO		
NO_x		
SO_2		
Pb		
HAPs (AGGREGATE AMOUNT)	1.04	0.02
TAPs (INDIVIDUALLY)*		
OTHER - Methanol	1.04	0.02

* ATTACH ADDITIONAL PAGES AS NEEDED

13B. PLEASE PROVIDE ALL **SUPPORTING CALCULATIONS** AS **ATTACHMENT E.**

CALCULATE AN HOURLY AND YEARLY PTE OF EACH PROCESS EMISSION POINT (SHOWN IN YOUR DETAILED PROCESS FLOW DIAGRAM) FOR ALL AIR POLLUTANTS LISTED ABOVE INCLUDING INDIVIDUAL HAP'S (LISTED IN SECTION 112[b] OF THE 1990 CAAA), TAP'S (LISTED IN 45CSR27), AND OTHER AIR POLLUTANTS (E.G. POLLUTANTS LISTED IN TABLE 45-13A OF 45CSR13, MINERAL ACIDS PER 45CSR7, ETC.).

14. **CERTIFICATION OF DATA**

I, JON KIMMEL, (*TYPE NAME*) ATTEST THAT ALL THE REPRESENTATIONS CONTAINED IN THIS APPLICATION, OR APPENDED HERETO, ARE TRUE, ACCURATE, AND COMPLETE TO THE BEST OF MY KNOWLEDGE BASED ON INFORMATION AND BELIEF AFTER REASONABLE INQUIRY, AND THAT I AM A ***RESPONSIBLE OFFICIAL**** (*PRESIDENT, VICE PRESIDENT, SECRETARY OR TREASURER, GENERAL PARTNER OR SOLE PROPRIETOR*) OF THE APPLICANT.

SIGNATURE OF RESPONSIBLE OFFICIAL: _____

TITLE: SITE DIRECTOR DATE: 03/02/2017

THE DEFINITION OF THE PHRASE '*RESPONSIBLE OFFICIAL***' CAN BE FOUND AT 45CSR13, SECTION 2.23.

NOTE: PLEASE CHECK ENCLOSED ATTACHMENTS:

☒ **ATTACHMENT A** ☒ **ATTACHMENT B** ☒ **ATTACHMENT C** ☒ **ATTACHMENT D** ☒ **ATTACHMENT E**

RECORDS ON ALL CHANGES ARE REQUIRED TO BE KEPT AND MAINTAINED ON-SITE FOR TWO (2) YEARS.

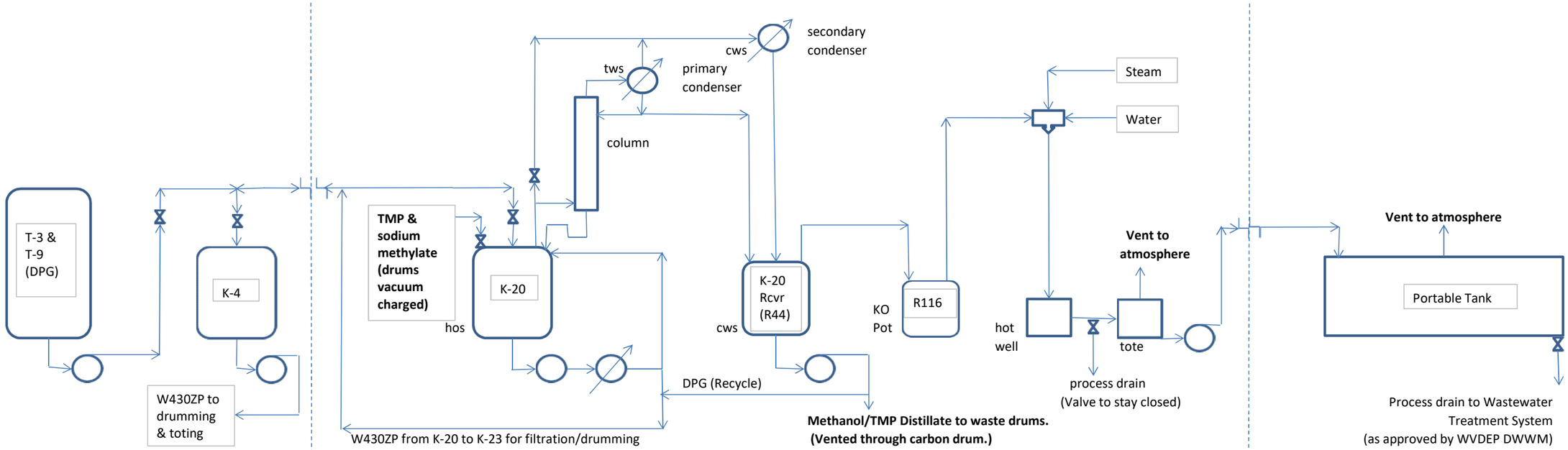
THE PERMIT DETERMINATION FORM WITH THE INSTRUCTIONS CAN BE FOUND ON DAQ'S PERMITTING SECTION WEB SITE:

www.dep.wv.gov/daq

Attachment A – Map of Facility

Attachment B – Process Flow Diagram

W430 (Zero Phenol) Process Flow Diagram for Plant Trial



(183 AREA) **(K-9 AREA)** **(Pilot Plant AREA)**

Attachment C – Process Description

Description of Proposed Plant Trial of W430ZP (Zero Phenol)

Currently, W430 is produced in the plant by reacting Triphenyl Phosphite (TPP) with Di Propylene Glycol (DPG) in the presence of catalyst (sodium methylate). Phenol and excess DPG are removed from the product, and the product is then cooled down, filtered, and transferred into plastic totes or drums. This operation is all performed at the 183 Production area, using the K-3 reactor and K-23 filtration vessel systems.

The regular W430 product contains residual phenol, and the customer for this product has now requested a phenol-free version of this product. The W430ZP grade uses Trimethyl Phosphite (TMP) instead of the TPP to react with the DPG. Methanol is generated instead of phenol, and excess DPG is still removed from the product at the end of the reaction. The product would then still need to be cooled down, filtered and transferred into plastic totes or drums.

A 3-batch plant trial is proposed to demonstrate the scale-up of the W430ZP process. The reaction would be done in the K-20 reactor, located in the K-9 Production Building. DPG would be metered into K-20, and drums of TMP would be vacuum transferred into the reactor. Catalyst would be added last. Methanol would be distilled through an existing, distillation column and condenser and would collect in a receiver. Chilled water would be used on the condenser and receiver jacket to collect the methanol. An existing water/steam jet utility would be used in the distillation process. The effluent from the water/steam jets will be collected into temporary portable holding tanks. Once the methanol is removed from the batch by a combination of atmospheric and vacuum distillation, the methanol from the receiver will be pumped into waste drums. Excess DPG would then be vacuum distilled into the same receiver to complete the distillation process for the batch. The collected DPG in the receiver will be re-used in the next batch of W430ZP produced. The resulting W430ZP product in K-20 would then be cooled down using an external product cooler and transferred to the K-4 filtration vessel, located at the 183 Production Building. The W430ZP will then be filtered in K-4, then transferred into plastic totes or drums after passing QC approval testing.

The modifications that will be performed for the plant trial include the following:

1. Piping tie-ins will be made to an existing 1-1/2” stainless steel transfer line that runs from the 183 Production Building to the K-9 Production Building to enable DPG to be transferred from the T-9 storage tank to the K-20 reactor; and also be able to get W430ZP product back through the line and into K-4 filter treatment vessel.
2. A Metering manifold will be fabricated and installed at the K-9 Building to allow metering of DPG from the storage tank and receiver into K-20 and also to allow metering of the W430ZP from K-20 to K-4.

3. Piping modifications will be done on the existing tempered water circulating system to keep the tempered water on K-20's primary condenser and keep the chilled water on K-20's secondary condenser.
4. A new level transmitter will be installed on K-20's receiver (R-44). Also, an amp meter will be installed on K-20's agitator motor.
5. A small exhaust blower and activated carbon drums will be installed at the methanol drumming area to reduce odor generation.
6. Piping modifications will be made at K-4's pump manifold to enable the W430 ZP product to be isolated from other product made in the adjacent K-3 reactor that also uses this manifold.

The plant used to make a similar product to W430ZP in the past called TIOP (Tri-iso octyl phosphite) where octyl alcohol and TMP where reacted in a similar fashion. It was made in the K-20 reactor using the water/steam jet system. Any vapors from the DPG & TMP charging operation and the methanol distillation operation will be scrubbed by the water/steam jet utility. Vapors from the methanol drumming operations will be exhausted though an activated carbon drum unit.

Upon a successful trial, a new vacuum system and other equipment would be installed for an improved, plant production process.

Attachment D – Safety Data Sheets

WESTON® 430ZP

Version	10
Revision Date	01/18/2017
Print Date	02/07/2017
Country	US
Language:	EN

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product code : 400000006372

Chemical nature : Polymer stabilizer

Details of the supplier of the safety data sheet

Company: Addivant USA, LLC
4 Mountainview Terrace
Suite 200
Danbury, CT
United States of America (USA)
06810
Telephone : 1-800-962-8641 (US) only

Prepared by msdsrequest@addivant.com

Further information for the safety data sheet :
msdsrequest@addivant.com

Emergency telephone number

Emergency telephone number: 866-928-0789
For additional emergency telephone numbers see section 16 of the Safety Data Sheet.

Disposal considerations : msdsrequest@addivant.com

Recommended use of the chemical and restrictions on use

Recommended use : Polymer
Stabilizer

Restrictions on use : For professional and industrial installation and use only.

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Appearance	liquid

Colour	clear, to, yellow
Odour	mild
Hazard Summary	No information available.

GHS Classification

Skin sensitisation : Category 1

GHS label elements

Hazard pictograms :

Signal word : Warning

Hazard statements : H317 May cause an allergic skin reaction.

Precautionary statements : **Prevention:**
P261 Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P272 Contaminated work clothing should not be allowed out of the workplace.
P280 Wear protective gloves.
Response:
P302 + P352 IF ON SKIN: Wash with plenty of soap and water.
P333 + P313 If skin irritation or rash occurs: Get medical advice/ attention.
P363 Wash contaminated clothing before reuse.
Disposal:
P501 Dispose of contents/ container to an approved waste disposal plant.

Potential Health Effects

Aggravated Medical Condition : None known.

Symptoms of Overexposure : Sensitisation

Carcinogenicity:

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Mixture

Chemical nature : Polymer stabilizer

Hazardous components

Chemical name	CAS-No.	Concentration (%)
7-[2-(2-hydroxymethylethoxy)methylethoxy]tetramethyl-3,6,8,11-tetraoxa-7-phosphatridecane-1,13-diol	36788-39-3	>= 90 - <= 100

SECTION 4. FIRST AID MEASURES

If inhaled	:	Move to fresh air in case of accidental inhalation of dust or fumes from overheating or combustion. If symptoms persist, call a physician.
In case of skin contact	:	Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water.
In case of eye contact	:	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
If swallowed	:	Clean mouth with water and drink afterwards plenty of water. Do not give milk or alcoholic beverages. Never give anything by mouth to an unconscious person.
Most important symptoms and effects, both acute and delayed	:	May cause an allergic skin reaction. Sensitisation
Notes to physician	:	The first aid procedure should be established in consultation with the doctor responsible for industrial medicine.

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Specific hazards during firefighting	:	No information available.
Specific extinguishing methods	:	
Further information	:	Standard procedure for chemical fires.
Special protective equipment for firefighters	:	In the event of fire, wear self-contained breathing apparatus.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Environmental precautions	:	No special environmental precautions required.

Methods and materials for containment and cleaning up	:	Wipe up with absorbent material (e.g. cloth, fleece). Keep in suitable, closed containers for disposal.

SECTION 7. HANDLING AND STORAGE

Advice on safe handling	:	For personal protection see section 8. No special handling advice required.
Materials to avoid	:	No special restrictions on storage with other products.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Contains no substances with occupational exposure limit values.
Hazardous components without workplace control parameters

Personal protective equipment

Respiratory protection	:	No personal respiratory protective equipment normally required.
Hand protection		
Remarks	:	For prolonged or repeated contact use protective gloves.
Eye protection	:	Safety glasses
Skin and body protection	:	Protective suit
Hygiene measures	:	General industrial hygiene practice.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	liquid
Colour	:	clear, to, yellow
Odour	:	mild
Odour Threshold	:	No data available
pH	:	No data available
Melting point/range	:	No data available
Boiling point/boiling range	:	No data available

Flash point	:	> 200 °C
Vapour pressure	:	No data available
Relative density	:	No data available
Density	:	No data available
Solubility(ies)		
Water solubility	:	No data available
Partition coefficient: n-octanol/water	:	No data available
Viscosity		
Viscosity, kinematic	:	Not applicable
Explosive properties	:	Not applicable
Oxidizing properties	:	No data available
Surface tension	:	not determined

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	Stable under recommended storage conditions.
Chemical stability	:	No decomposition if stored and applied as directed.
Possibility of hazardous reactions	:	No hazards to be specially mentioned.
Conditions to avoid	:	No data available
Incompatible materials	:	Water
Hazardous decomposition products	:	No hazardous decomposition products are known.

SECTION 11. TOXICOLOGICAL INFORMATION

Acute toxicity

Product:

Acute oral toxicity	:	Remarks: Not classified due to lack of data.
Acute dermal toxicity	:	Acute toxicity estimate : 2,778 mg/kg Method: Calculation method

Components:

7-[2-(2-hydroxymethylethoxy)methylethoxy]tetramethyl-3,6,8,11-tetraoxa-7-phosphatridecane-1,13-diol:

Acute oral toxicity : LD50 (Rat): > 5,000 mg/kg

Acute inhalation toxicity : LC50 (Rat): > 2 mg/l
Test atmosphere: dust/mist

Acute dermal toxicity : LD50 (Rabbit): > 2,000 mg/kg

Skin corrosion/irritation

Product:

Remarks: Not classified due to lack of data.

Serious eye damage/eye irritation

Product:

Remarks: According to the classification criteria of the European Union, the product is not considered as being an eye irritant.

Respiratory or skin sensitisation

Product:

Remarks: No data available

Germ cell mutagenicity

Product:

Genotoxicity in vitro : Remarks: No data available

Carcinogenicity

Product:

Remarks: This information is not available.

Reproductive toxicity

Product:

Effects on fertility : Remarks: No data available

Effects on foetal development : Remarks: No data available

Repeated dose toxicity

Product:

Remarks: No data available

Aspiration toxicity

Product:

No data available

Further information

Product:

Remarks: No data available

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Product:

Toxicity to fish : Remarks: No data is available on the product itself.

Toxicity to algae : Remarks: No data is available on the product itself.

Toxicity to bacteria : Remarks: No data is available on the product itself.

Persistence and degradability

Product:

Biodegradability : Remarks: No data available

Bioaccumulative potential

Product:

Bioaccumulation : Remarks: No data available

Components:

7-[2-(2-hydroxymethylethoxy)methylethoxy]tetramethyl-3,6,8,11-tetraoxa-7-phosphatridecane-1,13-diol:

Partition coefficient: n-octanol/water : log Pow: -1.56 (25 °C)

Mobility in soil

No data available

Other adverse effects

No data available

Product:

Regulation		40 CFR Protection of Environment; Part 82 Protection of Stratospheric Ozone - CAA Section 602 Class I Substances
Remarks		This product neither contains, nor was manufactured with a Class I or Class II ODS as defined by the U.S. Clean Air Act Section 602 (40 CFR 82, Subpt. A, App.A + B).
Additional ecological information	:	There is no data available for this product.

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues	:	Offer surplus and non-recyclable solutions to a licensed disposal company.
Contaminated packaging	:	Empty remaining contents. Empty containers should be taken to an approved waste handling site for recycling or disposal.

SECTION 14. TRANSPORT INFORMATION

DOT
Not dangerous goods

TDG
Not dangerous goods

ADR
Not dangerous goods

IATA
Not dangerous goods

IMDG
Not dangerous goods

RID
Not dangerous goods

SECTION 15. REGULATORY INFORMATION

TSCA list : No substances are subject to a Significant New Use Rule.

No substances are subject to TSCA 12(b) export notification requirements.

EPCRA - Emergency Planning and Community Right-to-Know Act

CERCLA Reportable Quantity

This material does not contain any components with a CERCLA RQ.

SARA 304 Extremely Hazardous Substances Reportable Quantity

This material does not contain any components with a section 304 EHS RQ.

SARA 311/312 Hazards : Acute Health Hazard

SARA 302 : No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 : This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

Clean Air Act

This product does not contain any hazardous air pollutants (HAP), as defined by the U.S. Clean Air Act Section 112 (40 CFR 61).
This product does not contain any chemicals listed under the U.S. Clean Air Act Section 112(r) for Accidental Release Prevention (40 CFR 68.130, Subpart F).
The following chemical(s) are listed under the U.S. Clean Air Act Section 111 SOCMI Intermediate or Final VOC's (40 CFR 60.489):

oxydipropanol	25265-71-8	50 %

Clean Water Act

This product does not contain any Hazardous Substances listed under the U.S. CleanWater Act, Section 311, Table 116.4A.
This product does not contain any Hazardous Chemicals listed under the U.S. CleanWater Act, Section 311, Table 117.3.
This product does not contain any toxic pollutants listed under the U.S. Clean Water Act Section 307

California Prop 65 : This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

The components of this product are reported in the following inventories:

REACH : Not in compliance with the inventory

:
:

DSL : This product contains the following components listed on the Canadian NDSL. All other components are on the Canadian

DSL.

AICS	:	On the inventory, or in compliance with the inventory
NZIoC	:	Not in compliance with the inventory
ENCS	:	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
PICCS	:	Not in compliance with the inventory
IECSC	:	On the inventory, or in compliance with the inventory
TCSI	:	Not in compliance with the inventory
TSCA	:	On TSCA Inventory

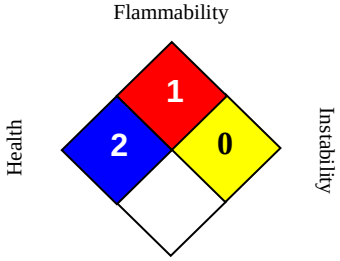
Inventories

AICS (Australia), DSL (Canada), IECSC (China), REACH (European Union), ENCS (Japan), ISHL (Japan), KECI (Korea), NZIoC (New Zealand), PICCS (Philippines), TCSI (Taiwan), TSCA (USA)

SECTION 16. OTHER INFORMATION

Further information

NFPA:



HMIS III:

HEALTH	2/
FLAMMABILITY	1
PHYSICAL HAZARD	0

0 = not significant, 1 =Slight,
2 = Moderate, 3 = High
4 = Extreme, * = Chronic

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Carechem24 International Worldwide Coverage - *Addivant*

Emergency Phone Numbers:

Europe:	All European Countries	+44 (0) 1235 239 670
Asia Pacific:	East / South East Asia	Regional Number : +65 3158 1074
	Australia	+61 2801 44558
	New Zealand	+64 9929 1483
	China Taiwan	+86 10 5100 3039
	Japan	+81 345 789 341
	Indonesia	00780 3011 0293
	:Malaysia	+60 3 6207 4347
	Thailand	001800 1 2066 6751
	Korea	+65 3158 1285
	Vietnam	+65 3158 1255
	India	+65 3158 1198
	Pakistan	+65 3158 1329
	Philippines	+65 31581203
	Sri Lanka	+65 3158 1195
	Bangladesh	+65 3158 1200
Middle East / Africa:	Arabic speaking countries	+44 (0) 1235 239 671
	All other countries	+44 (0) 1235 239 670
America	United States / Canada	001866 928 0789
Latin America:	Brazil	+55 113 711 9144
	All other countries	+44 (0) 1235 239 670
	Mexico	+52 555 004 8763

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

- Trade name TRIMETHYL PHOSPHITE HP

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

- no data available

1.3 Details of the supplier of the safety data sheet

Company

Solvay USA Inc.,
NOVECARE
504 Carnegie Center
Princeton, NJ, 08540, US
Telephone Number: 800-973-7873

1.4 Emergency telephone

FOR EMERGENCIES INVOLVING A SPILL, LEAK, FIRE, EXPOSURE OR ACCIDENT CONTACT: CHEMTREC 800-424-9300 within the United States and Canada, or 703-527-3887 for international collect calls.

SECTION 2: Hazards identification

Although OSHA has not adopted the environmental portion of the GHS regulations, this document may include information on environmental effects.

2.1 Classification of the substance or mixture

HCS 2012 (29 CFR 1910.1200)

Flammable liquids, Category 2	H225: Highly flammable liquid and vapor.
Acute toxicity, Category 4	H302: Harmful if swallowed.
Acute toxicity, Category 3	H311: Toxic in contact with skin.
Eye irritation, Category 2B	H320: Causes eye irritation.
Skin sensitization, Category 1	H317: May cause an allergic skin reaction.
Germ cell mutagenicity, Category 1B	H340: May cause genetic defects.
Carcinogenicity, Category 2	H351: Suspected of causing cancer.
Reproductive toxicity, Category 2	H361: Suspected of damaging fertility or the unborn child.
Specific target organ systemic toxicity - repeated exposure, Category 2	H373: May cause damage to organs through prolonged or repeated exposure if inhaled. (Respiratory Tract, Eyes), Inhalation

2.2 Label elements

HCS 2012 (29 CFR 1910.1200)

Pictogram

Signal Word

- Danger

Hazard Statements

- H225 Highly flammable liquid and vapor.

- H302 Harmful if swallowed.
- H311 Toxic in contact with skin.
- H317 May cause an allergic skin reaction.
- H320 Causes eye irritation.
- H340 May cause genetic defects.
- H351 Suspected of causing cancer.
- H361 Suspected of damaging fertility or the unborn child.
- H373 May cause damage to organs (Respiratory Tract, Eyes) through prolonged or repeated exposure if inhaled.

Precautionary Statements

Prevention

- P201 Obtain special instructions before use.
- P202 Do not handle until all safety precautions have been read and understood.
- P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.
- P233 Keep container tightly closed.
- P240 Ground/bond container and receiving equipment.
- P241 Use explosion-proof electrical/ ventilating/ lighting/ equipment.
- P242 Use only non-sparking tools.
- P243 Take precautionary measures against static discharge.
- P260 Do not breathe dust/ fume/ gas/ mist/ vapors/ spray.
- P264 Wash skin thoroughly after handling.
- P270 Do not eat, drink or smoke when using this product.
- P272 Contaminated work clothing must not be allowed out of the workplace.
- P280 Wear protective gloves/ eye protection/ face protection.
- P281 Use personal protective equipment as required.

Response

- P301 + P312 IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell.
- P303 + P361 + P353 IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
- P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- P308 + P313 IF exposed or concerned: Get medical advice/ attention.
- P330 Rinse mouth.
- P333 + P313 If skin irritation or rash occurs: Get medical advice/ attention.
- P337 + P313 If eye irritation persists: Get medical advice/ attention.
- P363 Wash contaminated clothing before reuse.
- P370 + P378 In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.

Storage

- P403 + P235 Store in a well-ventilated place. Keep cool.
- P405 Store locked up.

Disposal

- P501 Dispose of contents/ container to an approved waste disposal plant.

2.3 Other hazards which do not result in classification

- H402: Harmful to aquatic life.

- REACTS WITH WATER TO PRODUCE HEAT, FLAMMABLE METHANOL AND DIMETHYL HYDROGEN PHOSPHITE.

SECTION 3: Composition/information on ingredients

3.1 Substance

Hazardous Ingredients and Impurities

Chemical name	Identification number CAS-No.	Concentration [%]
Phosphorous acid, trimethyl ester	121-45-9	> 96
Phosphonic acid, dimethyl ester	868-85-9	< 1
Phosphoric acid, trimethyl ester	512-56-1	< 0.5
Methanol	67-56-1	< 0.5
Pentane	109-66-0	< 0.5
Phosphonic acid, P-methyl-, dimethyl ester	756-79-6	< 0.1

The specific chemical identity and/or exact percentage (concentration) of composition has been withheld as a trade secret.

3.2 Mixture

Not applicable, this product is a substance.

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice

- Show this material safety data sheet to the doctor in attendance.
- First responder needs to protect himself.
- Place affected apparel in a sealed bag for subsequent decontamination.

In case of inhalation

- Move to fresh air.
- If breathing is difficult, give oxygen.
- If not breathing, give artificial respiration.
- Consult a physician.

In case of skin contact

- Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes.
- Seek medical advice.
- Wash contaminated clothing before reuse.

In case of eye contact

- Flush eyes with water at least 15 minutes. Get medical attention if eye irritation develops or persists.

In case of ingestion

- Do NOT induce vomiting.
- Do not give anything to drink.
- Take victim immediately to hospital.

4.2 Most important symptoms and effects, both acute and delayed

Effects

- Inhalation of product may aggravate existing chronic respiratory problems such as asthma, emphysema or bronchitis
- Skin contact may aggravate existing skin disease

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician

- All treatments should be based on observed signs and symptoms of distress in the patient. Consideration should be given to the possibility that overexposure to materials other than this product may have occurred.

- Treat symptomatically.
- There is no specific antidote available.

SECTION 5: Firefighting measures

Flash point	59 °F (15 °C) Seta closed cup Flammability class: Extremely flammable
Autoignition temperature	no data available
Flammability / Explosive limit	Lower flammability/explosion limit : not determined Upper flammability/explosion limit : not determined

5.1 Extinguishing media

Suitable extinguishing media

- Dry chemical
- Water mist
- Water spray
- Carbon dioxide (CO2)
- Alcohol-resistant foam

Unsuitable extinguishing media

- None known.
- Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

5.2 Special hazards arising from the substance or mixture

- Flammable
- Flash back possible over considerable distance.
- Container may explode if heated.
- Highly irritating vapors are released.
- Hazardous decomposition products formed under fire conditions.
- Carbon oxides
- Oxides of phosphorus

5.3 Advice for firefighters

Special protective equipment for fire-fighters

- Firefighters should wear NIOSH/MSHA approved self-contained breathing apparatus and full protective clothing.

Specific fire fighting methods

- Fight fire with normal precautions from a reasonable distance.
- Evacuate personnel to safe areas.
- Stay upwind.
- Eliminate all ignition sources if safe to do so.
- Cool closed containers exposed to fire with water spray.

- Persons who may have been exposed to contaminated smoke should be immediately examined by a physician and checked for symptoms of poisoning. The symptoms should not be mistaken for heat exhaustion or smoke inhalation.

- Collect contaminated fire extinguishing water separately. This must not be discharged into drains.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

- Ventilate the area.
- Eliminate all ignition sources if safe to do so.
- Evacuate personnel to safe areas.
- Avoid contact with the skin and the eyes.
- Do not breathe vapor.
- Wear suitable protective equipment.
- For personal protection see section 8.
- Remove all incompatible materials as quickly as possible

6.2 Environmental precautions

- Do not let product enter drains.
- Do not flush into surface water or sanitary sewer system.
- Spills may be reportable to the National Response Center (800-424-8802) and to state and/or local agencies

6.3 Methods and materials for containment and cleaning up

Prohibition
- Never return spills in original containers for re-use.
- Use only non-sparking tools.

Recovery
- Stop leak if safe to do so.
- Dam up with sand or inert earth (do not use combustible materials).
- Cover spill area with foam to reduce vapors
- Pump or collect any free spillage into an appropriate closed container. (see Section 7: Handling and Storage)
- Soak up with inert absorbent material.
- Shovel into suitable container for disposal.

Decontamination / cleaning
- Clean contaminated surface thoroughly.
- Decontaminate tools, equipment and personal protective equipment in a segregated area.
- Recover the cleaning water for subsequent disposal.

Disposal
- Process the contaminated absorbent material as waste product.

6.4 Reference to other sections

- no data available

SECTION 7: Handling and storage

7.1 Precautions for safe handling

- Provide adequate ventilation.
- Ensure all equipment is electrically grounded before beginning transfer operations.

- Avoid the formation or spread of mists in the atmosphere.
- Avoid inhalation of vapor or mist.
- Avoid contact with skin and eyes.
- Avoid contact with hot surfaces.
- Prevent the build-up of electrostatic charge.
- Provide adequate ventilation.
- Do not use sparking tools.
- The product must only be handled by specifically trained employees.

- ** HAZARD WARNING: If this product is used in combination with Trimethylolpropane, Trimethylolpropane derived products or their corresponding Trimethylol alkane homologs, THERE IS A POSSIBILITY that bicyclic phosphates and/or phosphites may be produced as a result of thermal decomposition. Bicyclic phosphates and phosphites have acute neurotoxic properties and may cause convulsive seizures in laboratory test animals. Therefore, this product should not be used in conjunction with Trimethylolpropane or Trimethylolpropane derived products unless tested to determine their decomposition toxicity. Follow all precautionary measures outlined in this Material Safety Data Sheet and/or contact Solvay USA Inc.

Hygiene measures

- Personal hygiene is an important work practice exposure control measure and the following general measures should be taken when working with or handling this materials:
- 1) Do not store, use, and/or consume foods, beverages, tobacco products, or cosmetics in areas where this material is stored.
- 2) Wash hands and face carefully before eating, drinking, using tobacco, applying cosmetics, or using the toilet.
- 3) Wash exposed skin promptly to remove accidental splashes or contact with material.

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/Storage conditions

- Storage tanks must be:
- grounded and equipped with an adequate safety valve.
- Keep in a well-ventilated place.

- Keep in a dry, cool and well-ventilated place.
- Keep container tightly closed.
- Keep under nitrogen.
- Do not allow contact with air.

- Keep away from open flames, hot surfaces and sources of ignition.
- Keep away from incompatible materials to be indicated by the manufacturer

- Keep away from: Oxidizing materials., Avoid all contact with water or humidity.

Packaging material

Remarks

- Store in original container.

7.3 Specific end use(s)

- no data available

SECTION 8: Exposure controls/personal protection

Introductory Remarks: These recommendations provide general guidance for handling this product. Because specific work environments and material handling practices vary, safety procedures should be developed for each intended application. Assistance with selection, use and maintenance of worker protection equipment is generally available from equipment manufacturers.

8.1 Control parameters

Components with workplace occupational exposure limits

Ingredients	Value type	Value	Basis
Phosphorous acid, trimethyl ester	TWA	2 ppm 10 mg/m3	National Institute for Occupational Safety and Health
Phosphorous acid, trimethyl ester	TWA	2 ppm	American Conference of Governmental Industrial Hygienists
Pentane	TWA	120 ppm 350 mg/m3	National Institute for Occupational Safety and Health
Pentane	C	610 ppm 1,800 mg/m3	National Institute for Occupational Safety and Health
	15 minute ceiling value		
Pentane	TWA	1,000 ppm 2,950 mg/m3	Occupational Safety and Health Administration - Table Z-1 Limits for Air Contaminants
	The value in mg/m3 is approximate.		
Pentane	TWA	1,000 ppm	American Conference of Governmental Industrial Hygienists
Methanol	TWA	200 ppm 260 mg/m3	National Institute for Occupational Safety and Health
	Potential for dermal absorption		
Methanol	ST	250 ppm 325 mg/m3	National Institute for Occupational Safety and Health
	Potential for dermal absorption		
Methanol	TWA	200 ppm	American Conference of Governmental Industrial Hygienists
	Danger of cutaneous absorption		
Methanol	STEL	250 ppm	American Conference of Governmental Industrial Hygienists
	Danger of cutaneous absorption		
Methanol	TWA	200 ppm 260 mg/m3	Occupational Safety and Health Administration - Table Z-1 Limits for Air Contaminants

	The value in mg/m3 is approximate.

NIOSH IDLH (Immediately Dangerous to Life or Health Concentrations)

Ingredients	CAS-No.	Concentration
Methanol	67-56-1	6000 ppm
Pentane	109-66-0	1500 ppm

Biological Exposure Indices

Ingredients	Value type	Value	Basis
Methanol	BEI	15 mg/l Methanol Urine End of shift (As soon as possible after exposure ceases)	American Conference of Governmental Industrial Hygienists

8.2 Exposure controls

Control measures

Engineering measures

- Where engineering controls are indicated by use conditions or a potential for excessive exposure exists, the following traditional exposure control techniques may be used to effectively minimize employee exposures :

- Effective exhaust ventilation system
- Used in closed system

Individual protection measures

Respiratory protection

- When respirators are required, select NIOSH/MSHA approved equipment based on actual or potential airborne concentrations and in accordance with the appropriate regulatory standards and/or industrial recommendations.

Hand protection

- Impervious gloves
- Where there is a risk of contact with hands, use appropriate gloves
- Please observe the instructions regarding permeability and breakthrough time which are provided by the supplier of the gloves. Also take into consideration the specific local conditions under which the product is used, such as the danger of cuts, abrasion, and the contact time.
- Gloves must be inspected prior to use.
- Gloves should be discarded and replaced if there is any indication of degradation or chemical breakthrough.

Eye protection

- Eye and face protection requirements will vary dependent upon work environment conditions and material handling practices. Appropriate ANSI Z87 approved equipment should be selected for the particular use intended for this material.
- Eye contact should be prevented through the use of:

- Tightly fitting safety goggles
- Safety glasses with side-shields

Skin and body protection

- Impervious clothing
- Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures

- Personal hygiene is an important work practice exposure control measure and the following general measures should be taken when working with or handling this materials:
- 1) Do not store, use, and/or consume foods, beverages, tobacco products, or cosmetics in areas where this material is stored.
- 2) Wash hands and face carefully before eating, drinking, using tobacco, applying cosmetics, or using the toilet.
- 3) Wash exposed skin promptly to remove accidental splashes or contact with material.

Protective measures

- Ensure that eyewash stations and safety showers are close to the workstation location.

- The protective equipment must be selected in accordance with current local standards and in cooperation with the supplier of the protective equipment.
- Selection of appropriate personal protective equipment should be based on an evaluation of the performance characteristics of the protective equipment relative to the task(s) to be performed, conditions present, duration of use, and the potential hazards, and/or risks that may occur during use.

SECTION 9: Physical and chemical properties

Physical and Chemical properties here represent typical properties of this product. Contact the business area using the Product information phone number in Section 1 for its exact specifications.

9.1 Information on basic physical and chemical properties

Appearance	Form: similar to water Physical state: liquid Color: clear colorless
Odor	strong unpleasant
Odor Threshold	no data available
pH	Not applicable, reacts with water
Melting point/freezing point	Freezing point: -109.5 °F (-78.6 °C)
Initial boiling point and boiling range	Boiling point/boiling range: 232 - 234 °F (111 - 112 °C)
Flash point	59 °F (15 °C) Seta closed cup Flammability class: Extremely flammable
Evaporation rate (Butylacetate = 1)	no data available
Flammability (solid, gas)	no data available
Flammability (liquids)	no data available
Flammability / Explosive limit	Lower flammability/explosion limit: not determined Upper flammability/explosion limit: not determined

Autoignition temperature	no data available
Vapor pressure	24 mmHg (32 hPa) (68 °F (20 °C))
Vapor density	no data available
Density	1.046 g/cm3 (68 °F (20 °C))
Relative density	no data available
Solubility	no data available
Partition coefficient: n-octanol/water	Not applicable; reacts with water and / or octanol.
Decomposition temperature	no data available
Viscosity	Viscosity, kinematic : 0.58 mm2/s (77 °F (25 °C)) 0.52 mm2/s (100 °F (38 °C))
Explosive properties	no data available
Oxidizing properties	Not considered as oxidizing.

9.2 Other information

Reactions with water / air

Reacts violently with water.
Flammable gases:
Toxic gases:
Corrosive gases:

SECTION 10: Stability and reactivity

10.1 Reactivity

- no data available

10.2 Chemical stability

- Decomposes upon contact with air.
- Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

Polymerization

- Hazardous polymerization does not occur.

10.4 Conditions to avoid

- Keep away from heat and sources of ignition.
- Decomposes on heating.

10.5 Incompatible materials

- Air
- Water
- Strong oxidizing agents

- Reacts with:
- Water
- On hydrolysis, forms:
- Phosphorous acid
- Methanol
- Phosphonic acid, dimethyl ester
- with the release of heat.

10.6 Hazardous decomposition products

- On combustion or on thermal decomposition (pyrolysis), releases:
- Carbon oxides
- Oxides of phosphorus

Phosphonic acid, dimethyl ester

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Acute oral toxicity	LD50 : 1,350 mg/kg - Rat Harmful if swallowed. Unpublished internal reports
Acute inhalation toxicity	LC50 - 4 h > 45.7 mg/l - Rat Not classified as harmful by inhalation Unpublished internal reports
Acute dermal toxicity	LD50 934 mg/kg - Rabbit Harmful in contact with skin. Unpublished internal reports
Acute toxicity (other routes of administration)	no data available
Skin corrosion/irritation	Rabbit Mild skin irritation Unpublished internal reports
Serious eye damage/eye irritation	Rabbit Mild eye irritant Unpublished internal reports
Respiratory or skin sensitization	Magnusson and Kligman method - Guinea pig May cause sensitization by skin contact. By analogy Unpublished reports

Mutagenicity

Genotoxicity in vitro	Product is considered to be genotoxic Mutagenicity (Salmonella typhimurium - reverse mutation assay) with and without metabolic activation negative Unpublished internal reports Mouse lymphoma test / TK with and without metabolic activation positive Unpublished internal reports
Genotoxicity in vivo	no data available
Carcinogenicity	No information available.

This product does not contain any ingredient designated as probable or suspected human carcinogens by:

NTP
IARC
OSHA
ACGIH

Toxicity for reproduction and development

Toxicity to reproduction / fertility	no data available
Developmental Toxicity/Teratogenicity	Rat Oral exposure NOAEL maternal: 49 mg/kg Unpublished internal reports LOAEL teratogenicity: 49 mg/kg Possible risk of harm to the unborn child. Unpublished internal reports

STOT

STOT-single exposure	no data available
STOT-repeated exposure	
Phosphorous acid, trimethyl ester	Routes of exposure: Inhalation Target Organs: Respiratory Tract, Eyes The substance or mixture is classified as specific target organ toxicant, repeated exposure, category 2 according to GHS criteria. If inhaled 28 Days - Rat LOAEL: 0.53 mg/l Ocular toxicity effects Pulmonary toxicity effects Unpublished internal reports Dermal exposure 21 Days - Rabbit LOAEL: 300 mg/kg Liver toxicity Pulmonary toxicity effects Unpublished internal reports

	Oral exposure 90 Days - Rat LOAEL: 80 mg/kg effects on the reproductive system Unpublished internal reports
Neurological effects	No neurotoxic effects observed., Acute test for inhibition of the enzymatic activity of cerebral esterases, Acute test for inhibition of the enzymatic activity of blood esterases, Unpublished internal reports
Aspiration toxicity	no data available

SECTION 12: Ecological information

12.1 Toxicity

Aquatic Compartment

Acute toxicity to fish	LC50 - 96 h : > 100 mg/l - Danio rerio (zebra fish) Hydrolysis products Unpublished reports
Acute toxicity to daphnia and other aquatic invertebrates.	EC50 - 48 h : 25 mg/l - Daphnia magna (Water flea) Hydrolysis products Unpublished reports
Toxicity to aquatic plants	EC50 - 72 h : > 100 mg/l - Algae Hydrolysis products Unpublished reports
Toxicity to microorganisms	no data available
Chronic toxicity to fish	no data available
Chronic toxicity to daphnia and other aquatic invertebrates.	no data available
Chronic Toxicity to aquatic plants	no data available

12.2 Persistence and degradability

Abiotic degradation

Stability in water	Half-life value: 0.4 h (25 °C) pH: 10.0 Unpublished internal reports, Half-life value: < 0.1 h (0 °C) pH: 6.0 Unpublished internal reports,
Physical- and photo-chemical elimination	no data available

Biodegradation

Biodegradability	Ultimate aerobic biodegradability 50 % - 28 d Unpublished reports

12.3 Bioaccumulative potential

Partition coefficient: n-octanol/water	Not applicable; reacts with water and / or octanol.
Bioconcentration factor (BCF)	no data available

12.4 Mobility in soil

Adsorption potential (Koc)	no data available
Known distribution to environmental compartments	Ultimate destination of the product: Water Hydrolysis products Ultimate destination of the product: Soil Hydrolysis products

12.5 Results of PBT and vPvB assessment	no data available
12.6 Other adverse effects	no data available

Ecotoxicity assessment

Acute aquatic toxicity	Harmful to aquatic organisms.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product Disposal

- Chemical additions, processing or otherwise altering this material may make the waste management information presented in this SDS incomplete, inaccurate or otherwise inappropriate. Please be advised that state and local requirements for waste disposal may be more restrictive or otherwise different from federal laws and regulations. Consult state and local regulations regarding the proper disposal of this material.

Waste Code

- RCRA Hazardous Waste (40 CFR 302)
- D001 - Ignitable waste – (I)
- Environmental Protection Agency
- Hazardous Waste – YES

Advice on cleaning and disposal of packaging

- Rinse with an appropriate solvent.
- Allow it to drain thoroughly.
- After recovery of solvent dispose of by special waste incineration.
- Re-use or recycle following decontamination.
- Dispose of in accordance with local regulations.

Measure for waste avoidance or recovery

- Do not dispose of together with household waste.

SECTION 14: Transport information

Transportation status: IMPORTANT! Statements below provide additional data on listed transport classification.
The listed Transportation Classification does not address regulatory variations due to changes in package size, mode of shipment or other regulatory descriptors.

DOT

14.1 UN number	UN 2329
14.2 Proper shipping name	TRIMETHYL PHOSPHITE
14.3 Transport hazard class Label(s)	3 3
14.4 Packing group Packing group ERG No	 III 130
14.5 Environmental hazards **Marine pollutant**	NO

TDG

14.1 UN number	UN 2329
14.2 Proper shipping name	TRIMETHYL PHOSPHITE
14.3 Transport hazard class Label(s)	3 3
14.4 Packing group	

Packing group	III
ERG No	130
14.5 Environmental hazards	NO
Marine pollutant	

IMDG

14.1 UN number	UN 2329
14.2 Proper shipping name	TRIMETHYL PHOSPHITE
14.3 Transport hazard class	3
Label(s)	3
14.4 Packing group	
Packing group	III
14.5 Environmental hazards	NO
Marine pollutant	
14.6 Special precautions for user	
EmS	F-E , S-D

For personal protection see section 8.

IATA

14.1 UN number	UN 2329
14.2 Proper shipping name	TRIMETHYL PHOSPHITE
14.3 Transport hazard class	3
Label(s):	3
14.4 Packing group	
Packing group	III
Packing instruction (cargo aircraft)	366
Max net qty / pkg	220.00 L
Packing instruction (passenger aircraft)	355
Max net qty / pkg	60.00 L
14.5 Environmental hazards	NO
14.6 Special precautions for user	

For personal protection see section 8.

Note: The above regulatory prescriptions are those valid on the date of publication of this sheet. Given the possible evolution of transportation regulations for hazardous materials, it would be advisable to check their validity with your sales office.

SECTION 15: Regulatory information

15.1 Notification status

Inventory Information	Status
United States TSCA Inventory	- On TSCA Inventory
Canadian Domestic Substances List (DSL)	- All components of this product are on the Canadian DSL
Australia Inventory of Chemical Substances (AICS)	- On the inventory, or in compliance with the inventory
Japan. CSCL - Inventory of Existing and New Chemical Substances	- On the inventory, or in compliance with the inventory
Korea. Korean Existing Chemicals Inventory (KECI)	- On the inventory, or in compliance with the inventory
China. Inventory of Existing Chemical Substances in China (IECSC)	- On the inventory, or in compliance with the inventory

15.2 Federal Regulations

US. EPA EPCRA SARA Title III

SARA Hazard Designation Sections 311/312 (40 CFR 370)

Fire Hazard	yes
Reactivity Hazard	no
Sudden Release of Pressure Hazard	no
Acute Health Hazard	yes
Chronic Health Hazard	yes

Section 313 Toxic Chemicals (40 CFR 372.65)
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

Section 302 Emergency Planning Extremely Hazardous Substance Threshold Planning Quantity (40 CFR 355)
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

Section 302 Emergency Planning Extremely Hazardous Substance Reportable Quantity (40 CFR 355)
This material does not contain any components with a SARA 302 RQ.

Section 304 Emergency Release Notification Reportable Quantity (40 CFR 355)
This material does not contain any components with a section 304 EHS RQ.

US. EPA CERCLA Hazardous Substances and Reportable Quantities (40 CFR 302.4)

Ingredients	CAS-No.	Reportable quantity
Methanol	67-56-1	5000 lb

Other regulations

Weapons Precursor Regulations

- This product is regulated by the U.S. Department of Commerce under the provisions of the Chemical Weapons Convention (15 CFR Parts 730-774).

15.3 State Regulations

US. California Safe Drinking Water & Toxic Enforcement Act (Proposition 65)

WARNING! This product contains a chemical known in the State of California to cause cancer.

Ingredients	CAS-No.
Phosphoric acid, trimethyl ester	512-56-1

WARNING: This product contains a chemical known in the State of California to cause birth defects or other reproductive harm.

Ingredients	CAS-No.
Methanol	67-56-1

SECTION 16: Other information

NFPA (National Fire Protection Association) - Classification

Health	2 moderate
Flammability	3 serious
Instability or Reactivity	1 slight

HMIS (Hazardous Materials Identification System (Paint & Coating)) - Classification

Health	2 moderate
Flammability	3 serious
Reactivity	1 slight
PPE	Determined by User; dependent on local conditions

Further information

- Product evaluated under the US GHS format.

Date Prepared: 07/05/2016

Key or legend to abbreviations and acronyms used in the safety data sheet

- C	Ceiling value not be exceeded at any time.
- ST	STEL - 15-minute TWA exposure that should not be exceeded at any time during a workday
- STEL	Short-term exposure limit
- TWA	8-hour, time-weighted average
- ACGIH	American Conference of Governmental Industrial Hygienists
- OSHA	Occupational Safety and Health Administration
- NTP	National Toxicology Program
- IARC	International Agency for Research on Cancer
- NIOSH	National Institute for Occupational Safety and Health

Safety Data Sheet
Dipropylene glycol

Version 1.1 Revision Date: 10/17/2016

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : Dipropylene glycol

Recommended use of the chemical and restrictions on use

Recommended use : Intermediate
Binding agent
Release agent

Manufacturer or supplier's details

Company : Nexeo Solutions, LLC.
Address 3 Waterway Square Place Suite 1000
The Woodlands, TX. 77380
United States of America

Emergency telephone number:
Health North America: 1-855-NEXEO4U (1-855-639-3648)
Health International: 1-855-NEXEO4U (1-855-639-3648)
Transport North America: CHEMTREC (1-800-424-9300)

Additional Information: : Responsible Party: Product Safety Group
E-Mail: msds@nexeosolutions.com
SDS Requests: 1-855-429-2661
SDS Requests Fax: 1-281-500-2370
Website: www.nexeosolutions.com

SECTION 2. HAZARDS IDENTIFICATION

GHS Classification

Not a hazardous substance or mixture.

GHS Label element

Not a hazardous substance or mixture.

Other hazards

None known.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Substance

Hazardous components

No hazardous ingredients

Molecular formula : C6-H14-O3

SECTION 4. FIRST AID MEASURES

General advice : Move out of dangerous area.
Show this safety data sheet to the doctor in attendance.
Do not leave the victim unattended.

If inhaled	:	Consult a physician after significant exposure. If unconscious place in recovery position and seek medical advice.
In case of skin contact	:	If skin irritation persists, call a physician. If on skin, rinse well with water. If on clothes, remove clothes.
In case of eye contact	:	Immediately flush eye(s) with plenty of water. Keep eye wide open while rinsing. If eye irritation persists, consult a specialist.
If swallowed	:	Clean mouth with water and drink afterwards plenty of water. Keep respiratory tract clear. Never give anything by mouth to an unconscious person. If symptoms persist, call a physician. Do not induce vomiting without medical advice.

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Dry chemical Water spray Foam Carbon dioxide (CO2)
Unsuitable extinguishing media	:	High volume water jet
Specific hazards during fire-fighting	:	Do not allow run-off from fire fighting to enter drains or water courses.
Hazardous combustion products	:	Carbon oxides
Specific extinguishing methods	:	Use a water spray to cool fully closed containers.
Further information	:	Standard procedure for chemical fires. Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Special protective equipment for firefighters	:	Wear self-contained breathing apparatus for firefighting if necessary. Use personal protective equipment.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Use personal protective equipment. Ensure adequate ventilation.

Environmental precautions	:	Prevent product from entering drains. Prevent further leakage or spillage if safe to do so. If the product contaminates rivers and lakes or drains inform respective authorities.
Methods and materials for containment and cleaning up	:	Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust). Keep in suitable, closed containers for disposal.

SECTION 7. HANDLING AND STORAGE

Advice on protection against fire and explosion	:	Normal measures for preventive fire protection.
Advice on safe handling	:	Avoid formation of aerosol. Do not breathe vapours/dust. Avoid contact with skin and eyes. For personal protection see section 8. Smoking, eating and drinking should be prohibited in the application area. Provide sufficient air exchange and/or exhaust in work rooms. Dispose of rinse water in accordance with local and national regulations.
Conditions for safe storage	:	Keep container tightly closed in a dry and well-ventilated place. Electrical installations / working materials must comply with the technological safety standards.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

Personal protective equipment

Respiratory protection	:	No personal respiratory protective equipment normally required. In the case of vapour formation use a respirator with an approved filter.

Hand protection

Remarks	:	The suitability for a specific workplace should be discussed with the producers of the protective gloves.
Eye protection	:	Eye wash bottle with pure water Tightly fitting safety goggles
Skin and body protection	:	Impervious clothing Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures	:	When using do not eat or drink. When using do not smoke. Wash hands before breaks and at the end of workday.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	liquid
Colour	:	Clear, Colorless
Odour	:	slight
Odour Threshold	:	No data available
pH	:	6 - 7.4 @ 20 - 25 °C (68 - 77 °F)
Freezing Point (Melting point/freezing point)	:	< -20 °C (-4 °F)
Boiling Point (Boiling point/boiling range)	:	222 - 236 °C (432 - 457 °F)
Flash point	:	128 - 132 °C (262 - 270 °F) Method: Pensky-Martens closed cup
Evaporation rate	:	< 0.05 (Butyl Acetate = 1)
Flammability (solid, gas)	:	No data available
Upper explosion limit	:	12.6 %(V)
Lower explosion limit	:	2.2 %(V)
Vapour pressure	:	0.0097 - 0.01 mmHg @ 25 °C (77 °F)
Relative vapour density	:	< 4.63 @ 15 - 20 °C (59 - 68 °F) (Air = 1.0)
Relative density	:	1.02 - 1.04 @ 20 - 25 °C (68 - 77 °F) Reference substance: (water = 1)
Density	:	1.02 - 1.03 g/cm3 @ 20 - 25 °C (68 - 77 °F)
Solubility(ies) Water solubility	:	completely miscible
Solubility in other solvents	:	No data available
Partition coefficient: n-octanol/water	:	log Pow: -0.462

Auto-ignition temperature	:	310 - 337 °C
Thermal decomposition	:	No data available
Viscosity		
Viscosity, dynamic	:	75 - 118 mPa.s @ 25 °C (77 °F)
Viscosity, kinematic	:	98 - 118 mm2/s @ 20 °C (68 °F)
Surface tension	:	71.4 mN/m, 22 °C

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	No dangerous reaction known under conditions of normal use.
Chemical stability	:	Stable under normal conditions.
Possibility of hazardous reactions	:	No hazards to be specially mentioned.
Conditions to avoid	:	Keep away from heat, flame, sparks and other ignition sources. Exposure to moisture Exposure to sunlight.
Incompatible materials	:	Acids Bases Metals Oxidizing agents Reducing agents metal salts isocyanates
Hazardous decomposition products	:	Carbon oxides Aldehydes Alcohols ethers Organic acids

SECTION 11. TOXICOLOGICAL INFORMATION

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.
OSHA	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcino-

gen by OSHA.

NTP	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
ACGIH	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

Further information

Product:

Remarks: No data available

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

No data available

Persistence and degradability

No data available

Bioaccumulative potential

No data available

Mobility in soil

No data available

Other adverse effects

Product:

Ozone-Depletion Potential	:	Regulation: 40 CFR Protection of Environment; Part 82 Protection of Stratospheric Ozone - CAA Section 602 Class I Substances Remarks: This product neither contains, nor was manufactured with a Class I or Class II ODS as defined by the U.S. Clean Air Act Section 602 (40 CFR 82, Subpt. A, App.A + B).
Additional ecological information	:	No data available

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues	:	Dispose of in accordance with all applicable local, state and federal regulations. For assistance with your waste management needs - including

disposal, recycling and waste stream reduction, contact NEXEO's Environmental Services Group at 800-637-7922.

Contaminated packaging : Empty remaining contents.
Dispose of as unused product.
Do not re-use empty containers.

SECTION 14. TRANSPORT INFORMATION

DOT (Department of Transportation): Not regulated as a dangerous good

IATA (International Air Transport Association): Not regulated as a dangerous good

IMDG-Code: Not regulated as a dangerous good

SECTION 15. REGULATORY INFORMATION

WHMIS Classification : : Not controlled.

EPCRA - Emergency Planning and Community Right-to-Know Act

CERCLA Reportable Quantity

This material does not contain any components with a CERCLA RQ.

SARA 304 Extremely Hazardous Substances Reportable Quantity

This material does not contain any components with a section 304 EHS RQ.

SARA 311/312 Hazards : Immediate (Acute) Health Hazard
Chronic (Delayed) Health Hazard
No SARA Hazards

SARA 302 : No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 : This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

Clean Air Act

This product does not contain any hazardous air pollutants (HAP), as defined by the U.S. Clean Air Act Section 12 (40 CFR 61).

This product does not contain any chemicals listed under the U.S. Clean Air Act Section 112(r) for Accidental Release Prevention (40 CFR 68.130, Subpart F).

The following chemical(s) are listed under the U.S. Clean Air Act Section 111 SOCMI Intermediate or Final VOC's (40 CFR 60.489):

25265-71-8 Dipropylene glycol

Clean Water Act

This product does not contain any Hazardous Substances listed under the U.S. CleanWater Act, Section 311, Table 116.4A.
This product does not contain any Hazardous Chemicals listed under the U.S. CleanWater Act, Section 311, Table 117.3.
This product does not contain any toxic pollutants listed under the U.S. Clean Water Act Section 307

US State Regulations

Massachusetts Right To Know

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know

25265-71-8	Dipropylene glycol	90 - 100 %

New Jersey Right To Know

25265-71-8	Dipropylene glycol	90 - 100 %

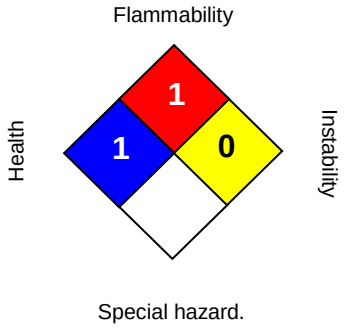
California Prop 65 This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

The components of this product are reported in the following inventories:

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

SECTION16. OTHER INFORMATION

NFPA:



HMIS III:

HEALTH	1*
FLAMMABILITY	1
PHYSICAL HAZARD	0

0 = not significant, 1 =Slight,
2 = Moderate, 3 = High
4 =Extreme, * = Chronic

The information accumulated 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 become available subsequently to the date hereof, we do not assume any responsibility for the results of its use. Recipients are advised to confirm in advance of need that the information is current, applicable, and suitable to their circumstances. This MSDS has been prepared by NEXEO™ Solutions EHS Product Safety Department (1-855-429-2661) MSDS@nexeosolutions.com.

Revision Date : 10/17/2016

Legacy SDS: : R0003556

Material number:
16109912, 16067272, 16065272, 16043948, 16039043, 16038958, 16035128, 655451, 634971, 554031, 158626, 70854, 87246, 69107, 86754, 54483, 87845, 153644, 504116, 20337, 20336, 20335, 20334, 20332, 20333

Key or legend to abbreviations and acronyms used in the safety data sheet			
ACGIH	American Conference of Gov-ernment Industrial Hygienists	LD50	Lethal Dose 50%
AICS	Australia, Inventory of Chemical Substances	LOAEL	Lowest Observed Adverse Effect Level
DSL	Canada, Domestic Substances List	NFPA	National Fire Protection Agency
NDSL	Canada, Non-Domestic Sub-stances List	NIOSH	National Institute for Occupational Safety & Health
CNS	Central Nervous System	NTP	National Toxicology Program
CAS	Chemical Abstract Service	NZIoC	New Zealand Inventory of Chemicals
EC50	Effective Concentration	NOAEL	No Observable Adverse Effect Level
EC50	Effective Concentration 50%	NOEC	No Observed Effect Concentration
EGEST	EOSCA Generic Exposure Sce-nario Tool	OSHA	Occupational Safety & Health Administra-tion
EOSCA	European Oilfield Specialty Chemicals Association	PEL	Permissible Exposure Limit

EINECS	European Inventory of Existing Chemical Substances	PICCS	Philippines Inventory of Commercial Chemical Substances
MAK	Germany Maximum Concentration Values	PRNT	Presumed Not Toxic
GHS	Globally Harmonized System	RCRA	Resource Conservation Recovery Act
>=	Greater Than or Equal To	STEL	Short-term Exposure Limit
IC50	Inhibition Concentration 50%	SARA	Superfund Amendments and Reauthorization Act.
IARC	International Agency for Research on Cancer	TLV	Threshold Limit Value
IECSC	Inventory of Existing Chemical Substances in China	TWA	Time Weighted Average
ENCS	Japan, Inventory of Existing and New Chemical Substances	TSCA	Toxic Substance Control Act
KECI	Korea, Existing Chemical Inventory	UVCB	Unknown or Variable Composition, Complex Reaction Products, and Biological Materials
<=	Less Than or Equal To	WHMIS	Workplace Hazardous Materials Information System
LC50		Lethal Concentration 50%	

Attachment E - Potential-to-Emit Estimates

Addivant; W430ZP Trial Process
W430ZP Trial Process Emission Summary Table

	W430ZP Process Emission Levels					
	VOCs		HAPs		Methanol	
Emission Source	**lb/hr**	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**
T-3 & T-9 Storage Tanks	<0.01	<0.01	--	--	--	--
K-20 Reactor	0.42	<0.01	--	--	--	--
K-4	<0.01	0.04	--	--	--	--
Methanol Loading	0.04	<0.01	0.04	<0.01	0.04	<0.01
W430ZP Loading	0.30	<0.01	--	--	--	--
Hot Well	0.05	<0.01	0.05	<0.01	0.05	<0.01
Wastewater Tote	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Wastewater Portable Tank	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
W430ZP Process Equipment Leaks	2.44	0.04	0.95	0.02	0.95	0.02
W430ZP Process Totals	3.26	0.10	1.04	0.02	1.04	0.02
Permit Thresholds	**10.00**	**6.00**	**2.00**	**5.00**	**2.00**	**5.00**

Addivant; W430ZP Trial Process
T-3 & T-9 Dipropylene glycol (DPG) Working and Breathing Emissions Detail Sheet

Pollutant	Losses (lbs/yr)[1]			Losses (lb/hr)			Losses (tpy)		
	Working Loss	Breathing Loss	Total Emissions	Working Loss	Breathing Loss	Total Emissions	Working Loss	Breathing Loss	Total Emissions
VOC	0.0043	0.0000	0.0043	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Note:

[1]Losses from EPA TANKs Report - T-3 and T-9

[2]EPA TANKs Report - T-3 and T-9 uses Theoretical Yield of Dipropylene Glycol (DPG) from W430 in K-20 Process Description dated 11/9/16 to estimate tank throughput in gallons/year - (1500 gal/trial) x (3 trial/yr) = 4500 gal/yr

Addivant; W430ZP Trial Process
W430ZP Process Emissions - Reactor K-20

Emission Points
W430ZP Initial Preparation using DPG
W430ZP - Normal Operations

Note:
Reactor K-20 Area (A), Volumetric Flowrate (V), Gas Velocity over Liquid (U), and Equivalent Tank Diameter (Deq) assumed to be equal to Reactor K-20 specifications in OS PTE Calcs_120212 workbook provided by Addivant.

References:

US EPA Guideline Series: Control of Volatile Organic Compound Emissions from Batch Processes, 1993.

W430ZP Initial Preparation using DPG

K-20 Vacuum System

Variable	Definition	Value	Basis
u	Gas Viscosity (g/cm-s)	0.65	Viscosity of air from Perry's Chemical Engineers' Handbook
p	Gas Density (g/cm^3)	1	Density of air from Perry's Chemical Engineers' Handbook
Dv	Gas Diffusivity (cm^2/s)	0.05	VOC diffusivity in air
Nsc	Schmidt Number	13	Nsc = u/(p*Dv)
A	Cross-sectional Area of Liquid Surface (ft^2)	15	Tank Area provided by Addivant
V	Volumetric Flowrate of Gas (ft^3/min)	440	Volumetric Flowrate provided by Addivant
U	Gas Velocity over Liquid (m/hr)	536	U = Q/A
			U = V ft^3/min x 60 min/hr x 1/15 ft^2 x 0.3048 m/ft
Deq	Equivalent Tank Diameter (m)	1.1	Deq = 4 x cross-sectional area/perimeter
			Deq = 4 x 15 ft^2/16 ft x 0.3048 m/ft
k	Mass Transfer Coefficient (ft/hr)	2.3	k = 0.0958 * U^0.78 * Deq^-0.11 * Nsc^-0.67
MW	Molecular Weight (lb/lb-mol)	134.113	Molecular weight of DPG
P	Vapor Pressure (atm)	2.10E-05	DPG vapor pressure = 0.016 mmHg * (1 atm/760 mm Hg)
H	Emission Hours (hr/batch)	1.00	Assume each trial preparation takes 1 hr, 3 trials/yr
R	Universal Gas Constant (atm-ft^3/lbmol-R)	0.7302	Engineering constant
T	Temperature (R)	527.67	Assume Temperature = 20°C (ambient conditions)
E	**Emission Rate (lb per batch)**	**2.50E-04**	E = (MW * k * P * A * H)/(R * T), US EPA open top tank equation
	Emission Rate (lb/hr)	**2.50E-04**	lb/batch ÷ hours/batch
n	Efficiency of control equipment	0%	Assumed 0% control efficiency for potential to emit calculations
	Estimated Potential Emissions (ton per batch)	**1.25E-07**	Emissions (lb/yr) * 1 ton/2,000 lb * (1-n)
	Batches per year	**3**	
	Estimated Potential Emissions (tpy)	**3.75E-07**	Emissions (lb/yr) * 1 ton/2,000 lb * (1-n)

W430ZP - Normal Operations

K-20 Vacuum System

Variable	Definition	Value	Basis
u	Gas Viscosity (g/cm-s)	0.65	Viscosity of air from Perry's Chemical Engineers' Handbook
p	Gas Density (g/cm^3)	1	Density of air from Perry's Chemical Engineers' Handbook
Dv	Gas Diffusivity (cm^2/s)	0.05	VOC diffusivity in air
Nsc	Schmidt Number	13	Nsc = u/(p*Dv)
A	Cross-sectional Area of Liquid Surface (ft^2)	15	Tank Area provided by Addivant
V	Volumetric Flowrate of Gas (ft^3/min)	440	Volumetric Flowrate provided by Addivant
U	Gas Velocity over Liquid (m/hr)	536	U = Q/A
			U = V ft^3/min x 60 min/hr x 1/15 ft^2 x 0.3048 m/ft
Deq	Equivalent Tank Diameter (m)	1.1	Deq = 4 x cross-sectional area/perimeter
			Deq = 4 x 15 ft^2/16 ft x 0.3048 m/ft
k	Mass Transfer Coefficient (ft/hr)	2.3	k = 0.0958 * U^0.78 * Deq^-0.11 * Nsc^-0.67
MW	Molecular Weight (lb/lb-mol)	430.47	Molecular weight of W430 from TMP Mass Balance
P	Vapor Pressure (atm)	0.0132	Vapor Pressure of W430 = 10 mmHg * (1 atm/760 mmHg)
H	Emission Hours (hrs/batch)	14.00	Assume 14 hr run time per batch
R	Universal Gas Constant (atm-ft^3/lbmol-R)	0.7302	Engineering constant
T	Temperature (R)	631.67	Temperature = 140°C from WESTON 430 in K-20 Procedure
E	**Emission Rate (lb per batch)**	**5.88**	E = (MW * k * P * A * H)/(R * T), US EPA open top tank equation
	Emission Rate (lb/hr)	**0.42**	lb/batch ÷ hours/batch
n	Efficiency of control equipment	0%	Assumed 0% control efficiency for potential to emit calculations
	Estimated Potential Emissions (ton per batch)	**2.94E-03**	Emissions (lb/yr) * 1 ton/2,000 lb * (1-n)
	Batches per year	**3**	
	Estimated Potential Emissions (tpy)	**8.81E-03**	Emissions (lb/yr) * 1 ton/2,000 lb * (1-n)

Addivant; W430ZP Trial Process
K-4 (W430ZP Product) Tank Working and Breathing Emissions Detail Sheet

Pollutant	Losses (lbs/yr)[1]			Losses (lb/hr)			Losses (tpy)		
	Working Loss	Breathing Loss	Total Emissions	Working Loss	Breathing Loss	Total Emissions	Working Loss	Breathing Loss	Total Emissions
VOC	10.68	62.33	73.01	0.001	0.007	0.008	0.005	0.03	0.04

Note:
[1]Losses from EPA TANKs Report - K-4 W430ZP Product

[2]EPA TANKs Report - K-4 W430ZP Product uses weighted average of Dipropylene glycol and Trimethyl phosphite inputs as a conservative representative of W430ZP Product so that EPA TANKs run could be completed

[3]EPA TANKs Report - K-4 W430ZP Product uses W430ZP density from Chemical/Physical Data for W430ZP and Theoretical Yield of W430 Product from W430ZP in K-20 Process Description dated 11/9/2016 to estimate tank throughput in gallons/year - (1225 gal/trial) x (3 trial/yr) = 3675 gal/yr

Addivant; W430ZP Trial Process
Methanol Loading Losses

Methanol Loading Losses

Compound	Molecular Weight (lb/lbmol)	True Vapor Pressure of Liquid (psia)	Saturation Factor	Temperature (°R)	Loading Loss Rate (lb/10^3 gal)	Methanol Recovery Rate (gal/batch)	Number of W430 Trial Runs (batches)	Methanol Recovery (gal/yr)	Annual Loading Losses (tpy)	Annual Loading Losses (lb/hr)
Methanol	32.04	1.16	1.45	513.27	1.31	403.00	3.00	1209.00	7.92E-04	4.40E-02

Note:
[1]Emission calculation from AP 42 5.2-4 Equation (1) - Loading Loss (lb/10^3 gal) of liquid loaded

[2]Methanol Recovery Rate from W430ZP Production Theoretical Yields in W430ZP in K-20 Process Description dated 11/9/16
[3]Methanol Receiver (R44) chilled to 12°C (53.6°F). According to the Clausius–Clapeyron equation, vapor pressure of methanol at 12° C is 60.54 mmHg (1.161 psia).

Saturated Vapor Pressure for Methanol	
Temp (°F)	Pressure (psia)
53.6	1.161

Addivant; W430ZP Trial Process
W430ZP Drumming and Toting Losses

W430ZP Loading Losses

Compound	Molecular Weight (lb/lbmol)	True Vapor Pressure of Liquid (psia)	Saturation Factor	Temperature (°R)	Loading Loss Rate ($lb/10^3$ gal)	W430 Production Rate (gal/batch)	Number of W430 Trial Runs (batches)	W430 Production (gal/yr)	Annual Loading Losses (tpy)	Annual Loading Losses (lb/hr)
W430ZP	430.47	0.19	1.45	511.61	2.93	1225.00	3.00	3675.00	5.39E-03	3.00E-01

Note:
[1]Emission calculation from AP 42 5.2-4 Equation (1) - Loading Loss ($lb/10^3$ gal) of liquid loaded

[2]Temperature and W430ZP production rate based off of values calculated or used in EPA TANKs Report - K-4 W430ZP Product
[3]True Vapor Pressure of Liquid provided by Addivant - 10 mmHg at 145°C. Using this vapor pressure at ambient temperatures will provide a conservative estimate of W430 Loading Losses. (10 mmHg) x (14.7 psia/760 mmHg) = 0.193 psia)

Saturated Vapor Pressure for W430ZP	
Temp (°F)	Pressure (psia)
51.94	0.193

Addivant; W430ZP Trial Process
Hot Well Loading Losses - Wastewater

Hot Well Flashing Losses

Compound	Molecular Weight (lb/lbmol)	True Vapor Pressure of Liquid (psia)	Saturation Factor	Temperature (°R)	Loading Loss Rate ($lb/10^3$ gal)	Wastewater Recovery Rate (gal/trial)	Number of W430 Trial Runs (trials)	Methanol Recovery (gal/yr)	Annual Loading Losses (tpy)	Annual Loading Losses (lb/hr)
Methanol	32.04	12.27	1.45	599.67	11.84	12000.00	3.00	141.48	8.38E-04	4.65E-02

Note:
[1]Emission calculation methodology from AP 42 5.2-4 Equation (1) - Loading Loss ($lb/10^3$ gal) of liquid loaded
[2]Methanol is assumed to be a maximum of 0.393% of the wastewater recovered. (27.57 lb MeOH/1000 lbs W430) x (11211 lbs W430/trial) x (1 gal Methanol/6.564 lb Methanol) = 47.1 gal MeOH/trial
Percent Methanol in Wastewater = (47.1 gal MeOH/trial) ÷ (12,000 gal wastewater/trial) x 100 = 0.393%

Saturated Vapor Pressure for Methanol	
Temp (°F)	Pressure (psia)
140	12.269

Addivant; W430ZP Trial Process
Wastewater Tote Working and Breathing Emissions Detail Sheet

Pollutant	Losses (lbs/yr)[1]			Losses (lb/hr)			Losses (tpy)		
	Working Loss	Breathing Loss	Total Emissions	Working Loss	Breathing Loss	Total Emissions	Working Loss	Breathing Loss	Total Emissions
VOC	0.29	0.000	0.29	0.000	0.000	0.000	0.000	0.000	0.000
Methanol	0.29	0.000	0.29	0.000	0.000	0.000	0.000	0.000	0.000

Note:

[1]Losses from EPA TANKs Report - W430ZP Wastewater Tote

[2]Wastewater is an estimated 0.393% methanol and 99.607% water and is based of a throughput of 36,000 gal wastewater/yr (12,000 gal wastewater/trial x 3 trials)

Addivant; W430ZP Trial Process
Wastewater Portable Tank Working and Breathing Emissions Detail Sheet

Pollutant	Losses (lbs/yr)[1]			Losses (lb/hr)			Losses (tpy)		
	Working Loss	Breathing Loss	Total Emissions	Working Loss	Breathing Loss	Total Emissions	Working Loss	Breathing Loss	Total Emissions
VOC	0.21	9.28	9.49	0.000	0.001	0.001	0.000	0.005	0.005
Methanol	0.21	9.28	9.49	0.000	0.001	0.001	0.000	0.005	0.005

Note:

[1]Losses from EPA TANKs Report - W430ZP Wastewater Portable Tank

[2]Wastewater is an estimated 0.393% methanol and 99.607% water and is based of a throughput of 36,000 gal wastewater/yr (12,000 gal wastewater/trial x 3 trials)

Addivant; W430ZP Trial Process
W430ZP (VOC) Equipment Leaks

Calculation Methodology

Emission factors are SOCMI factors - US EPA. Emissions are calculated using the number of components and the maximum hours in a year.

Input Data

	Value		Basis
Heavy Liquid Valves EF:	0.00023	kg/hr	SOCMI Factors - US EPA.
	0.00051	lbs VOC/valve/hr	Protocol for Equipment
Gas Valves EF:	0.00597	kg/hr	Leak Emission Estimates,
	0.01316	lbs VOC/valve/hr	(EPA-453/R-95-017)
Heavy Liquid Flanges EF[1]:	0.00183	kg/hr	November 1995, Table 2-1.
	0.00403	lbs VOC/flange/hr	
Gas Flanges EF[1]:	0.00183	kg/hr	
	0.00403	lbs VOC/flange/hr	
Heavy Liquid Pump Seals EF:	0.00862	kg/hr	
	0.019	lbs VOC/pump seal/hr	
Sampling Connections EF:	0.015	kg/hr	
	0.033	lbs VOC/sampling connection/hr	
Gas Pressure Relief Valves EF[2]:	0.104	kg/hr	
	0.2293	lbs VOC/relief valve/hr	
Hours:	36		Maximum hours in a year.

Description of Streams and Number of Equipment Components

Stream ID	Vapor/ Liquid Service?	Number of Equipment Components not in Vacuum Service						
		Liquid Service Valves	Liquid Service Flanges	Vapor Service Valves	Vapor Service Flanges	Pump Seals	Sampling Connections	Safety Relief Valves
T-3 & T-9 to K-20 Reactor - DPG	Liquid	31	60			4		2
K-20 Reactor to K-4	Liquid	18	35			2	3	1
K-20 Reactor to column	Vapor			5	11		1	
Primary condensor to K-20 Receiver (R44)	Liquid	3	7					1
Primary condensor to secondary condensor	Vapor				2			
Secondary condensor to K-20 Receiver (R44)	Vapor			3	6			
K-20 Receiver (R44) to K-20 Charge Meter - DPG	Liquid	8	17			2	1	
K-20 Charge Metering Manifold at K-20 - DPG	Liquid	5	8					
K-20 Receiver (R44) to Methanol drumming	Liquid	4	8				2	
K-20 Receiver (R44) to KO Pot R116	Vapor			1	4			
KO Pot R116 to Water Jet	Vapor			5	12			1
Water Jet to hot well	Liquid							
Hot Well to Wastewater Tote	Liquid	2	4					
Wastewater Tote to Frac Tank	Liquid	9	18					
	Totals:	80	157	14	35	8	7	5

Calculation

Streams	Emissions from Leaking Components not in Vacuum Service							
	Percent VOC in Stream	Valves Liquid (lbs/yr)	Valves Gas (lbs/yr)	Flanges Liquid (lbs/yr)	Flanges Gas (lbs/yr)	Pump Seals (lbs/yr)	Sampling Connections (lbs/yr)	Pressure Relief Valves (lbs/yr)
T-3 & T-9 to K-20 Reactor - DPG	100%	0.57	0.00	8.71	0.00	2.74	0.00	16.51
K-20 Reactor to K-4	100%	0.33	0.00	5.08	0.00	1.37	3.57	8.25
K-20 Reactor to column	100%	0.00	2.37	0.00	1.60	0.00	1.19	0.00
Primary condensor to K-20 Receiver (R44)	100%	0.05	0.00	1.02	0.00	0.00	0.00	8.25
Primary condensor to secondary condensor	100%	0.00	0.00	0.00	0.29	0.00	0.00	0.00
Secondary condensor to K-20 Receiver (R44)	100%	0.00	1.42	0.00	0.87	0.00	0.00	0.00
K-20 Receiver (R44) to K-20 Charge Meter - DPG	100%	0.15	0.00	2.47	0.00	1.37	1.19	0.00
K-20 Charge Metering Manifold at K-20 - DPG	100%	0.09	0.00	1.16	0.00	0.00	0.00	0.00
K-20 Receiver (R44) to Methanol drumming	100%	0.07	0.00	1.16	0.00	0.00	2.38	0.00
K-20 Receiver (R44) to KO Pot R116	100%	0.00	0.47	0.00	0.58	0.00	0.00	0.00
KO Pot R116 to Water Jet	100%	0.00	2.37	0.00	1.74	0.00	0.00	8.25
Water Jet to hot well	1%	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hot Well to Wastewater Tote	1%	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Wastewater Tote to Frac Tank	1%	0.00	0.00	0.03	0.00	0.00	0.00	0.00
	Total	1.26	6.63	19.64	5.08	5.47	8.33	41.27

Total VOC Emissions from Equipment Leaks

88 lbs/yr

0.04 tpy

W430ZP (VOC) Equipment Leaks

Streams	Emissions from Leaking Components not in Vacuum Service							
	Percent VOC in Stream	Valves Liquid (lbs/hr)	Valves Gas (lbs/hr)	Flanges Liquid (lbs/hr)	Flanges Gas (lbs/hr)	Pump Seals (lbs/hr)	Sampling Connections (lbs/hr)	Pressure Relief Valves (lbs/hr)
T-3 & T-9 to K-20 Reactor - DPG	100%	1.57E-02	0.00E+00	2.42E-01	0.00E+00	0.08	0.00E+00	4.59E-01
K-20 Reactor to K-4	100%	9.13E-03	0.00E+00	1.41E-01	0.00E+00	0.04	9.92E-02	2.29E-01
K-20 Reactor to column	100%	0.00E+00	6.58E-02	0.00E+00	4.44E-02	0.00	3.31E-02	0.00E+00
Primary condensor to K-20 Receiver (R44)	100%	1.52E-03	0.00E+00	2.82E-02	0.00E+00	0.00	0.00E+00	2.29E-01
Primary condensor to secondary condensor	100%	0.00E+00	0.00E+00	0.00E+00	8.07E-03	0.00	0.00E+00	0.00E+00
Secondary condensor to K-20 Receiver (R44)	100%	0.00E+00	3.95E-02	0.00E+00	2.42E-02	0.00	0.00E+00	0.00E+00
K-20 Receiver (R44) to K-20 Charge Meter - DPG	100%	4.06E-03	0.00E+00	6.86E-02	0.00E+00	0.04	3.31E-02	0.00E+00
K-20 Charge Metering Manifold at K-20 - DPG	100%	2.54E-03	0.00E+00	3.23E-02	0.00E+00	0.00	0.00E+00	0.00E+00
K-20 Receiver (R44) to Methanol drumming	100%	2.03E-03	0.00E+00	3.23E-02	0.00E+00	0.00	6.61E-02	0.00E+00
K-20 Receiver (R44) to KO Pot R116	100%	0.00E+00	1.32E-02	0.00E+00	1.61E-02	0.00	0.00E+00	0.00E+00
KO Pot R116 to Water Jet	100%	0.00E+00	6.58E-02	0.00E+00	4.84E-02	0.00	0.00E+00	2.29E-01
Water Jet to hot well	1%	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
Hot Well to Wastewater Tote	1%	1.01E-05	0.00E+00	1.61E-04	0.00E+00	0.00	0.00E+00	0.00E+00
Wastewater Tote to Frac Tank	1%	4.56E-05	0.00E+00	7.26E-04	0.00E+00	0.00	0.00E+00	0.00E+00
	Total	3.50E-02	1.84E-01	5.46E-01	1.41E-01	0.15	2.31E-01	1.15E+00

Total VOC Emissions from Equipment Leaks

2.44 lbs/hr

Addivant; W430ZP Trial Process
Methanol (HAP) Equipment Leaks

Calculation Methodology

Emission factors are SOCMI factors - US EPA. Emissions are calculated using the number of components and the maximum hours in a year.

Input Data

	Value		Basis
Heavy Liquid Valves EF:	0.00023	kg/hr	SOCMI Factors - US EPA.
	0.00051	lbs VOC/valve/hr	Protocol for Equipment
Gas Valves EF:	0.00597	kg/hr	Leak Emission Estimates,
	0.01316	lbs VOC/valve/hr	(EPA-453/R-95-017)
Heavy Liquid Flanges EF[1]:	0.00183	kg/hr	November 1995, Table 2-1.
	0.00403	lbs VOC/flange/hr	
Gas Flanges EF[1]:	0.00183	kg/hr	
	0.00403	lbs VOC/flange/hr	
Heavy Liquid Pump Seals EF:	0.00862	kg/hr	
	0.019	lbs VOC/pump seal/hr	
Sampling Connections EF:	0.015	kg/hr	
	0.033	lbs VOC/sampling connection/hr	
Gas Pressure Relief Valves EF[2]:	0.104	kg/hr	
	0.2293	lbs VOC/relief valve/hr	

Hours: 36 Maximum hours in a year.

Description of Streams and Number of Equipment Components

Stream ID	Vapor/ Liquid Service?	Number of Equipment Components not in Vacuum Service						
		Liquid Service Valves	Liquid Service Flanges	Vapor Service Valves	Vapor Service Flanges	Pump Seals	Sampling Connections	Safety Relief Valves
K-20 Reactor to column	Vapor			5	11		1	
Primary condensor to K-20 Receiver (R44)	Liquid	3	7					1
Primary condensor to secondary condensor	Vapor				2			
Secondary condensor to K-20 Receiver (R44)	Vapor			3	6			
K-20 Receiver (R44) to Methanol drumming	Liquid	4	8				2	
K-20 Receiver (R44) to KO Pot R116	Vapor			1	4			
KO Pot R116 to Water Jet	Vapor			5	12			1
Water Jet to hot well	Liquid							
Hot Well to Wastewater Tote	Liquid	2	4					
Wastewater Tote to Frac Tank	Liquid	9	18					
	Totals:	18	37	14	35	0	3	2

Calculation

Streams	Percent VOC in Stream	Emissions from Leaking Components not in Vacuum Service						
		Valves Liquid (lbs/yr)	Valves Gas (lbs/yr)	Flanges Liquid (lbs/yr)	Flanges Gas (lbs/yr)	Pump Seals (lbs/yr)	Sampling Connections (lbs/yr)	Pressure Relief Valves (lbs/yr)
K-20 Reactor to column	100%	0.00	2.37	0.00	1.60	0.00	1.19	0.00
Primary condensor to K-20 Receiver (R44)	100%	0.05	0.00	1.02	0.00	0.00	0.00	8.25
Primary condensor to secondary condensor	100%	0.00	0.00	0.00	0.29	0.00	0.00	0.00
Secondary condensor to K-20 Receiver (R44)	100%	0.00	1.42	0.00	0.87	0.00	0.00	0.00
K-20 Receiver (R44) to Methanol drumming	100%	0.07	0.00	1.16	0.00	0.00	2.38	0.00
K-20 Receiver (R44) to KO Pot R116	100%	0.00	0.47	0.00	0.58	0.00	0.00	0.00
KO Pot R116 to Water Jet	100%	0.00	2.37	0.00	1.74	0.00	0.00	8.25
Water Jet to hot well	1%	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hot Well to Wastewater Tote	1%	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Wastewater Tote to Frac Tank	1%	0.00	0.00	0.03	0.00	0.00	0.00	0.00
	Total	0.13	6.63	2.21	5.08	0.00	3.57	16.51

Total VOC Emissions from Equipment Leaks

34 lbs/yr

0.02 tpy

Methanol (HAP) Equipment Leaks

Streams	Emissions from Leaking Components not in Vacuum Service							
	Percent VOC in Stream	Valves Liquid (lbs/hr)	Valves Gas (lbs/hr)	Flanges Liquid (lbs/hr)	Flanges Gas (lbs/hr)	Pump Seals (lbs/hr)	Sampling Connections (lbs/hr)	Pressure Relief Valves (lbs/hr)
K-20 Reactor to column	100%	0.00E+00	6.58E-02	0.00E+00	4.44E-02	0.00	3.31E-02	0.00E+00
Primary condensor to K-20 Receiver (R44)	100%	1.52E-03	0.00E+00	2.82E-02	0.00E+00	0.00	0.00E+00	2.29E-01
Primary condensor to secondary condensor	100%	0.00E+00	0.00E+00	0.00E+00	8.07E-03	0.00	0.00E+00	0.00E+00
Secondary condensor to K-20 Receiver (R44)	100%	0.00E+00	3.95E-02	0.00E+00	2.42E-02	0.00	0.00E+00	0.00E+00
K-20 Receiver (R44) to Methanol drumming	100%	2.03E-03	0.00E+00	3.23E-02	0.00E+00	0.00	6.61E-02	0.00E+00
K-20 Receiver (R44) to KO Pot R116	100%	0.00E+00	1.32E-02	0.00E+00	1.61E-02	0.00	0.00E+00	0.00E+00
KO Pot R116 to Water Jet	100%	0.00E+00	6.58E-02	0.00E+00	4.84E-02	0.00	0.00E+00	2.29E-01
Water Jet to hot well	1%	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
Hot Well to Wastewater Tote	1%	1.01E-05	0.00E+00	1.61E-04	0.00E+00	0.00	0.00E+00	0.00E+00
Wastewater Tote to Frac Tank	1%	4.56E-05	0.00E+00	7.26E-04	0.00E+00	0.00	0.00E+00	0.00E+00
	Total	3.61E-03	1.84E-01	6.14E-02	1.41E-01	0.00	9.92E-02	4.59E-01

Total VOC Emissions from Equipment Leaks

0.95 lbs/hr