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

September 29, 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 – Weston TDP ZP Trial Process
DAQ Plant I.D. No.: 061-00061

Dear Director,

Addivant USA, LLC ("Addivant") is planning a trial of new product to an existing chemical manufacturing unit at the North Plant facility. The new product is a phenol-free version of our current product Weston TDP. The new product will be called Weston TDP Zero Phenol (WTDP ZP). Addivant is already completing a trial of a new product called Weston 430 Zero Phenol (W430ZP) which is a variation of a current product W430. The WTDP ZP will be produced in the same operational units as W430ZP except for a separate filtration system. Addivant plans a trial operation of 35 batches until a full-scale operation is constructed next year. This trial product will utilize existing equipment (i.e. tanks, reactor, receiver, condenser, knock out pot, hot well, waste tote) with the exception of additional piping, a new filtration system and two portable tanks. 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 WTDP ZP trial process, the production 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:
10/22/2017

10B. DATE OF ANTICIPATED START-UP:
10/30/2017

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	3.92	1.23
CO		
NO_x		
SO_2		
Pb		
HAPs (AGGREGATE AMOUNT)	1.15	0.39
TAPs (INDIVIDUALLY)*		
OTHER - Methanol	1.15	0.39

* 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: on behalf of Jon Kimmel

TITLE: SITE DIRECTOR DATE: 09/29/2017

** 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.

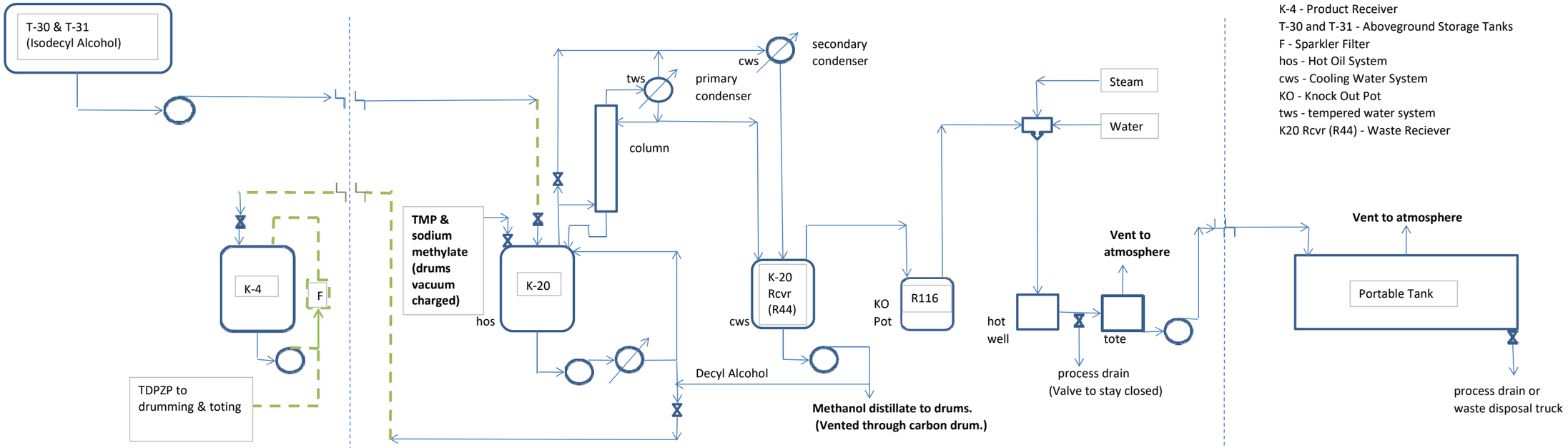
THE PERMIT DETERMINATION FORM WITH THE INSTRUCTIONS CAN BE FOUND ON DAQ'S PERMITTING SECTION WEB SITE:

www.dep.wv.gov/daq

Attachment A – Map of Facility

Attachment B – Process Flow Diagram

Process Flow Diagram for Plant Trials for TDPZP (9-27-2017)



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

Legend:
K-20 - Reactor
K-4 - Product Receiver
T-30 and T-31 - Aboveground Storage Tanks
F - Sparkler Filter
hos - Hot Oil System
cws - Cooling Water System
KO - Knock Out Pot
tws - tempered water system
K20 Rcvr (R44) - Waste Reciever

Note: Green Dashed lines represent new piping and equipment.

Attachment C – Process Description

Description of Plant Trial of Weston TDP ZP (Zero Phenol)

Currently, Weston TDP (WTDP) is produced in the plant by reacting a phenol containing organophosphite with an alcohol in the presence of a catalyst. Phenol and excess alcohol 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 WTDP product contains residual phenol, and one customer for this product has now requested a phenol-free version. The Weston TDP ZP grade uses a phenol-free organophosphite, TMP, to react with the alcohol. Methanol is generated instead of phenol, and excess alcohol 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 bulk trucks, plastic totes or drums.

A plant trial of a similar product, W430 ZP, was completed in June 2017 to demonstrate the ability to successfully produce the phenol-free version of the product. Now, a different customer desires a phenol-free version of WTDP. The same equipment that was used to produce the W430 ZP would also be used to produce the Weston TDP ZP, except that an additional filter would be installed to support the process and isodecycl alcohol will be used as a raw material in the place of dipropylene glycol (DPG). Addivant anticipates generating 35 batches for the trial until a full-scale production process is planned next year.

The reaction is done in the K-20 reactor, located in the K-9 Production Building. The isodecyl alcohol would be metered into the K-20 reactor. The drums of TMP would be vacuum transferred into the reactor. Catalyst would also be added. 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. Any vapors from the isodecyl alcohol & TMP charging operation and the methanol distillation operation will be scrubbed by the water/steam jet utility. 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 K-20's receiver will be pumped into waste drums. Vapors from the methanol drumming operations will be exhausted though an activated carbon drum unit. Excess isodecyl alcohol would then be vacuum distilled into the same receiver to complete the distillation process for the batch. The collected isodecyl alcohol in the receiver will be transferred into drums after each campaign. (Note: When multiple batches are run in a campaign, this alcohol would be re-used in the next batch of produced.) The resulting 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 product will then be filtered in K-4, using a plate filter, and then transferred into bulk trucks, plastic totes or drums after passing QC approval testing.

New piping will include additional piping for metering isodecyl alcohol to K-20, the K-4 filtration system, and additional piping for the product transfer line to K-4 to K-20.

Attachment D – Safety Data Sheets

WESTON® TDP ZP

Version	10
Revision Date	03/20/2017
Print Date	03/20/2017
Country	US
Language:	Z8

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : WESTON® TDP ZP

Product code : 400000009277

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 material safety data sheet :
msdsrequest@addivant.com

Emergency telephone

Emergency telephone: 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 : Antioxidant

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

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Appearance	liquid

Color	colorless, to, light yellow
Odor	slight, alcohol-like
Hazard Summary	No information available.

GHS Classification

Skin sensitization : 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/ vapors/ spray.
P272 Contaminated work clothing must 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 : Sensitization

Carcinogenicity:

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Pure substance

Hazardous ingredients

Chemical name	CAS-No.	Concentration (%)

triisodecyl phosphite	25448-25-3	>= 90 - <= 100

SECTION 4. FIRST AID MEASURES

General advice	:	No hazards which require special 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. Flush eyes with water as a precaution. Remove contact lenses. Protect unharmed eye. Keep eye wide open while 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. Sensitization
Notes to physician	:	The first aid procedure should be established in consultation with the doctor responsible for industrial medicine.

SECTION 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media	:	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Specific hazards during fire fighting	:	No information available.
Specific extinguishing methods	:	
Further information	:	Standard procedure for chemical fires.
Special protective equipment for fire-fighters	:	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.
Conditions for safe storage	:	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.
Materials to avoid	:	No special restrictions on storage with other products.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Ingredients 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
Color	:	colorless, to, light yellow
Odor	:	slight, alcohol-like
Odor Threshold	:	No data available

pH	:	Not applicable
Melting point/range	:	No data available
Initial boiling point and boiling range	:	No data available
Flash point	:	160 °C
Evaporation rate	:	No data available
Upper explosion limit	:	No data available
Lower explosion limit	:	No data available
Vapor pressure	:	6.7 hPa (180 °C)
Relative vapor density	:	No data available
Density	:	0.89 g/cm3
Solubility(ies)		
Water solubility	:	insoluble, hydrolyzes
Partition coefficient: n-octanol/water	:	No data available
Autoignition temperature	:	No data available
Thermal decomposition	:	No data available
Viscosity		
Viscosity, kinematic	:	No data available
Explosive properties	:	No data available
Oxidizing properties	:	No data available
Surface tension	:	not determined
Oxidizing potential	:	No information available.
Molecular weight	:	502.8 g/mol

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	Stable under recommended storage conditions.
Chemical stability	:	No decomposition if stored and applied as directed.
Possibility of hazardous	:	No hazards to be specially mentioned.

reactions

Conditions to avoid	:	No data available
Incompatible materials	:	Water
Hazardous decomposition products	:	Carbon monoxide Carbon dioxide (CO_2) Oxides of phosphorus Phosphorus trihydride (phosphine)

SECTION 11. TOXICOLOGICAL INFORMATION

Acute toxicity

Ingredients:

triisodecyl phosphite:

Acute oral toxicity	:	LD50 Oral (Rat, male and female): 5,000 mg/kg
Acute inhalation toxicity	:	LC50 (Rat, male and female): > 12.6 mg/l Exposure time: 1 h GLP: yes
Acute dermal toxicity	:	LD50 (Rabbit, male and female): 5,000 mg/kg

Skin corrosion/irritation

Product:

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

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.

Ingredients:

triisodecyl phosphite:

Species: Rabbit
Result: No eye irritation

Respiratory or skin sensitization

Product:

Remarks: No data available

Germ cell mutagenicity

Product:

Genotoxicity in vitro : Remarks: No data available

Genotoxicity in vivo : Remarks: No data available

Ingredients:

triisodecyl phosphite:

Genotoxicity in vitro : Test Type: Ames test
Metabolic activation: with and without metabolic activation
Result: negative

Test Type: Chromosome aberration test in vitro
Method: Mutagenicity (micronucleus test)
Result: negative

Genotoxicity in vivo : Test Type: In vivo micronucleus test
Test species: Mouse
Application Route: Oral
Result: negative
GLP: yes

Germ cell mutagenicity-Assessment : Animal testing did not show any mutagenic effects.

Carcinogenicity

Product:

Remarks: This information is not available.

Reproductive toxicity

Product:

Effects on fertility : Remarks: No data available

Effects on fetal development : Remarks: No data available

Ingredients:

triisodecyl phosphite:

Reproductive toxicity - Assessment : No toxicity to reproduction
No effects on or via lactation

Ingredients:

triisodecyl phosphite:
Routes of exposure: Oral
Assessment: The substance or mixture is not classified as specific target organ toxicant, repeated exposure.

Repeated dose toxicity

Product:

Remarks: No data available

Aspiration toxicity

Product:

No aspiration toxicity classification

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

Ingredients:

triisodecyl phosphite:
Biodegradability : aerobic
Result: According to the results of tests of biodegradability this product is not readily biodegradable.
Biodegradation: 1.31 %

Exposure time: 28 d

Bioaccumulative potential

Product:

Bioaccumulation : Remarks: No data available

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

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 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).
This product does not contain any chemicals listed under the U.S. Clean Air Act Section 111 SOCMI Intermediate or Final VOC's (40 CFR 60.489).

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 the State of California to cause cancer, birth, or any other reproductive defects.

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

DSL : All components of this product 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 : On the inventory, or 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

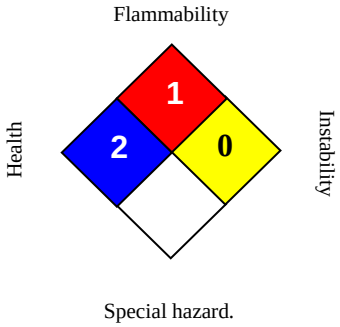
Inventories

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 Material 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

SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Name: Exxal™ 10
Product Description: Alcohol

Intended Use: Chemical feedstock

COMPANY IDENTIFICATION

Supplier: **EXXONMOBIL CHEMICAL COMPANY**
Chemicals PS&RA – SDSs
Mail Code: N1.1A.505
P.O. BOX 3272
HOUSTON, TX 77253-3272 USA

24 Hour Health Emergency	(800) 726-2015
Transportation Emergency Phone	(800) 424-9300 or (703) 527-3887 CHEMTREC
Product Technical Information	(832) 624-8500
Supplier General Contact	(832) 624-8500

SECTION 2 HAZARDS IDENTIFICATION

This material is not hazardous according to regulatory guidelines (see (M)SDS Section 15).

Other hazard information:

HAZARD NOT OTHERWISE CLASSIFIED (HNOC): None as defined under 29 CFR 1910.1200.

PHYSICAL / CHEMICAL HAZARDS

No significant hazards.

HEALTH HAZARDS

Mildly irritating to skin. May be irritating to the eyes, nose, throat, and lungs. If swallowed, may be aspirated and cause lung damage.

ENVIRONMENTAL HAZARDS

Expected to be toxic to aquatic organisms. Expected to be harmful to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

NFPA Hazard ID:	Health:	1	Flammability:	1	Reactivity:	0
HMIS Hazard ID:	Health:	1	Flammability:	1	Reactivity:	0

NOTE: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

This material is defined as a complex substance.

Hazardous Substance(s) or Complex Substance(s) required for disclosure

Name	CAS#	Concentration*	GHS Hazard Codes
ALCOHOLS, C9-C11 -ISO, C10-RICH	68526-85-2	100 %	H303, H305, H316, H401, H412

* All concentrations are percent by weight unless material is a gas. Gas concentrations are in percent by volume.

As per paragraph (i) of 29 CFR 1910.1200, formulation is considered a trade secret and specific chemical identity and exact percentage (concentration) of composition may have been withheld. Specific chemical identity and exact percentage composition will be provided to health professionals, employees, or designated representatives in accordance with applicable provisions of paragraph (i).

SECTION 4 FIRST AID MEASURES

INHALATION
Immediately remove from further exposure. Get immediate medical assistance. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. Give supplemental oxygen, if available. If breathing has stopped, assist ventilation with a mechanical device.

SKIN CONTACT
Wash contact areas with soap and water. Remove contaminated clothing. Launder contaminated clothing before reuse.

EYE CONTACT
Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION
Seek immediate medical attention. Do not induce vomiting.

NOTE TO PHYSICIAN
If ingested, material may be aspirated into the lungs and cause chemical pneumonitis. Treat appropriately.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA
Appropriate Extinguishing Media: Use water fog, alcohol-resistant foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight Streams of Water or Regular Foam

FIRE FIGHTING
Fire Fighting Instructions: Evacuate area. Prevent runoff from fire control or dilution from entering streams,

sewers, or drinking water supply. Firefighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Hazardous Combustion Products: Incomplete combustion products, Oxides of carbon, Smoke, Fume

FLAMMABILITY PROPERTIES

Flash Point [Method]: >94°C (201°F) [ASTM D-56]
Flammable Limits (Approximate volume % in air): LEL: N/D UEL: N/D
Autoignition Temperature: N/A

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations. US regulations require reporting releases of this material to the environment which exceed the applicable reportable quantity or oil spills which could reach any waterway including intermittent dry creeks. The National Response Center can be reached at (800)424-8802.

PROTECTIVE MEASURES

Avoid contact with spilled material. Warn or evacuate occupants in surrounding and downwind areas if required due to toxicity or flammability of the material. See Section 5 for fire fighting information. See the Hazard Identification Section for Significant Hazards. See Section 4 for First Aid Advice. See Section 8 for advice on the minimum requirements for personal protective equipment. Additional protective measures may be necessary, depending on the specific circumstances and/or the expert judgment of the emergency responders.

SPILL MANAGEMENT

Land Spill: Stop leak if you can do it without risk. Do not touch or walk through spilled material. Small Spills: Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. Recover by pumping or with suitable absorbent.

Water Spill: Stop leak if you can do it without risk. Confine the spill immediately with booms. Warn other shipping. Remove from the surface by skimming or with suitable absorbents. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Large Spills: Dike far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

Avoid all personal contact. Flammable levels of hydrogen may build up in the headspace during shipping. As a

precautionary measure, truck, rail and ISO container shipments may have been purged with nitrogen before loading. Nitrogen is a simple asphyxiant and containers should be opened in a well ventilated area. For marine shipments, procedures for closed gauging and sampling should be employed. Use proper bonding and/or ground procedures. However, bonding and grounds may not eliminate the hazard from static accumulation. Prevent small spills and leakage to avoid slip hazard. DO NOT handle, store or open near an open flame, sources of heat or sources of ignition. Protect material from direct sunlight.

Loading/Unloading Temperature: [Ambient]

Transport Temperature: [Ambient]
Transport Pressure: [Ambient]

Static Accumulator: This material is not a static accumulator.

STORAGE

Do not store in open or unlabelled containers. Keep container closed. Handle containers with care. Open slowly in order to control possible pressure release. Store in a cool, well-ventilated area. Storage containers should be grounded and bonded.
Storage Temperature: [Ambient]
Storage Pressure: [Ambient]

Suitable Containers/Packing: Tank Trucks; Tank Cars; Drums
Suitable Materials and Coatings (Chemical Compatibility): Carbon Steel; Stainless Steel; Polyethylene; Aluminum; Amine Epoxy; Epoxy Phenolic; Zinc; Nitrile Rubber; Polypropylene
Unsuitable Materials and Coatings: Butyl Rubber; Vinyls; Rubber

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE LIMIT VALUES

Exposure limits/standards (Note: Exposure limits are not additive)

Substance Name	Form	Limit / Standard			NOTE	Source
ALCOHOLS, C9-C11 -ISO, C10-RICH		TWA	50 ppm		N/A	ExxonMobil

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

No biological limits allocated.

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:
Adequate ventilation should be provided so that exposure limits are not exceeded.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use

with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

Half-face filter respirator

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapor warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

Chemical resistant gloves are recommended.

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

Chemical/oil resistant clothing is recommended.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

ENVIRONMENTAL CONTROLS

Comply with applicable environmental regulations limiting discharge to air, water and soil. Protect the environment by applying appropriate control measures to prevent or limit emissions.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Note: Physical and chemical properties are provided for safety, health and environmental considerations only and may not fully represent product specifications. Contact the Supplier for additional information.

GENERAL INFORMATION

Physical State: Liquid
Form: Clear
Color: Colorless
Odor: Alcohol
Odor Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 20 °C): 0.838
Flammability (Solid, Gas): N/A
Flash Point [Method]: >94°C (201°F) [ASTM D-56]

Flammable Limits (Approximate volume % in air): LEL: N/D UEL: N/D
Autoignition Temperature: N/A
Boiling Point / Range: 217°C (423°F) - 224°C (435°F)
Decomposition Temperature: N/D
Vapor Density (Air = 1): > 1 at 101 kPa
Vapor Pressure: 0.002 kPa (0.02 mm Hg) at 20 °C | 1.08 kPa (8.1 mm Hg) at 100°C | 0.036 kPa (0.27 mm Hg) at 50°C
Evaporation Rate (n-butyl acetate = 1): < 0.01
pH: N/D
Log Pow (n-Octanol/Water Partition Coefficient): 3.2
Solubility in Water: Negligible
Viscosity: 9 cSt (9 mm2/sec) at 40 °C | 21 cSt (21 mm2/sec) at 20°C
Oxidizing Properties: See Hazards Identification Section.

OTHER INFORMATION

Freezing Point: <-65°C (-85°F)
Melting Point: N/D
Molecular Weight: 158
Hygroscopic: No
Coefficient of Thermal Expansion: 0.00081 V/VDEGC

SECTION 10 STABILITY AND REACTIVITY

REACTIVITY: See sub-sections below.

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Excessive heat. High energy sources of ignition.

MATERIALS TO AVOID: Acid Anhydrides, Alkylene Oxides, Halogens, Polymerizable esters

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

POSSIBILITY OF HAZARDOUS REACTIONS: Hazardous polymerization will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

INFORMATION ON TOXICOLOGICAL EFFECTS

Hazard Class	Conclusion / Remarks
Inhalation	
Acute Toxicity: (Rat) 6 hour(s) LC50 > 95.3 ppm (Max attainable vapor conc.)	Minimally Toxic. Based on test data for the material. Test(s) equivalent or similar to OECD Guideline 403
Irritation: No end point data for material.	Elevated temperatures or mechanical action may form vapors, mist, or fumes which may be irritating to the eyes, nose, throat, or lungs.
Ingestion	
Acute Toxicity (Rat): LD50 > 2648 mg/kg	Minimally Toxic. Based on test data for the material. Test(s) equivalent or similar to OECD Guideline 420
Skin	
Acute Toxicity (Rabbit): LD50 > 2648 mg/kg	Minimally Toxic. Based on test data for the material. Test(s)

	equivalent or similar to OECD Guideline 402
Skin Corrosion/Irritation: Data available.	Mildly irritating to skin with prolonged exposure. Based on test data for the material. Test(s) equivalent or similar to OECD Guideline 404
Eye	
Serious Eye Damage/Irritation: Data available.	May cause mild, short-lasting discomfort to eyes. Based on test data for the material. Test(s) equivalent or similar to OECD Guideline 405
Sensitization	
Respiratory Sensitization: No end point data for material.	Not expected to be a respiratory sensitizer.
Skin Sensitization: Data available.	Not expected to be a skin sensitizer. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 406
Aspiration: Data available.	May be harmful if swallowed and enters airways. Based on physico-chemical properties of the material.
Germ Cell Mutagenicity: Data available.	Not expected to be a germ cell mutagen. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 471 473 476
Carcinogenicity: No end point data for material.	Not expected to cause cancer.
Reproductive Toxicity: Data available.	Not expected to be a reproductive toxicant. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 414
Lactation: No end point data for material.	Not expected to cause harm to breast-fed children.
Specific Target Organ Toxicity (STOT)	
Single Exposure: No end point data for material.	Not expected to cause organ damage from a single exposure.
Repeated Exposure: Data available.	Not expected to cause organ damage from prolonged or repeated exposure. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 407 410 422

OTHER INFORMATION

For the product itself:

Small amounts of liquid aspirated into the lungs during ingestion or from vomiting may cause chemical pneumonitis or pulmonary edema.

The following ingredients are cited on the lists below: None.

--REGULATORY LISTS SEARCHED--

1 = NTP CARC	3 = IARC 1	5 = IARC 2B
2 = NTP SUS	4 = IARC 2A	6 = OSHA CARC

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Material -- Expected to be toxic to aquatic organisms.
Material -- Expected to be harmful to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

MOBILITY

Material -- Expected to remain in water or migrate through soil.

PERSISTENCE AND DEGRADABILITY

Biodegradation:

Material -- Expected to be readily biodegradable.

Hydrolysis:

Material -- Transformation due to hydrolysis not expected to be significant.

Photolysis:

Material -- Transformation due to photolysis not expected to be significant.

Atmospheric Oxidation:

Material -- Expected to degrade rapidly in air

BIOACCUMULATION POTENTIAL

Material -- Potential to bioaccumulate is low.

ECOLOGICAL DATA

Ecotoxicity

Test	Duration	Organism Type	Test Results
Aquatic - Acute Toxicity	72 hour(s)	Alga	EC50 2.4 mg/l: Model prediction
Aquatic - Acute Toxicity	48 hour(s)	Daphnia magna	EL50 6.2 mg/l: data for the material
Aquatic - Acute Toxicity	96 hour(s)	Oncorhynchus mykiss	LC50 3.1 mg/l: data for the material
Aquatic - Chronic Toxicity	72 hour(s)	Alga	NOEC 0.89 mg/l: Model prediction
Aquatic - Chronic Toxicity	30 day(s)	Fish	NOEC 0.26 mg/l: Model prediction
Aquatic - Chronic Toxicity	16 day(s)	Invertebrate	NOEC 0.26 mg/l: Model prediction

Persistence, Degradability and Bioaccumulation Potential

Media	Test Type	Duration	Test Results
Water	Bioaccumulation	16 day(s)	BCF 21 L/kg: material
Water	Ready Biodegradability	28 day(s)	Percent Degraded 83 : material
Feed	Dietary Bioaccumulation	22 day(s)	BMF 0.016 : material

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Suitable routes of disposal are supervised incineration, preferentially with energy recovery, or appropriate recycling methods in accordance with applicable regulations and material characteristics at the time of disposal.

REGULATORY DISPOSAL INFORMATION

RCRA Information: The unused product, in our opinion, is not specifically listed by the EPA as a hazardous waste (40 CFR, Part 261D), nor is it formulated to contain materials which are listed as hazardous wastes. It does not exhibit the hazardous characteristics of ignitability, corrositivity or reactivity and is not formulated with contaminants as determined by the Toxicity Characteristic Leaching Procedure (TCLP). However, used product may be regulated.

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, 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.

SECTION 14 TRANSPORT INFORMATION

LAND (DOT): Not Regulated for Land Transport

LAND (TDG): Not Regulated for Land Transport

SEA (IMDG): Not Regulated for Sea Transport according to IMDG-Code

Marine Pollutant: No

AIR (IATA): Not Regulated for Air Transport

SECTION 15 REGULATORY INFORMATION

OSHA HAZARD COMMUNICATION STANDARD: This material is not considered hazardous in accordance with OSHA HazCom 2012, 29 CFR 1910.1200.

Listed or exempt from listing/notification on the following chemical inventories: AICS, DSL, ENCS, IECSC, KECI, PICCS, TCSI, TSCA

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

SARA (311/312) REPORTABLE HAZARD CATEGORIES: None.

SARA (313) TOXIC RELEASE INVENTORY: This material contains no chemicals subject to the supplier notification requirements of the SARA 313 Toxic Release Program.

The following ingredients are cited on the lists below: None.

--REGULATORY LISTS SEARCHED--

1 = ACGIH ALL	6 = TSCA 5a2	11 = CA P65 REPRO	16 = MN RTK
2 = ACGIH A1	7 = TSCA 5e	12 = CA RTK	17 = NJ RTK
3 = ACGIH A2	8 = TSCA 6	13 = IL RTK	18 = PA RTK
4 = OSHA Z	9 = TSCA 12b	14 = LA RTK	19 = RI RTK
5 = TSCA 4	10 = CA P65 CARC	15 = MI 293	

Code key: CARC=Carcinogen; REPRO=Reproductive

SECTION 16 OTHER INFORMATION

N/D = Not determined, N/A = Not applicable

KEY TO THE H-CODES CONTAINED IN SECTION 3 OF THIS DOCUMENT (for information only):
H303: May be harmful if swallowed; Acute Tox Oral, Cat 5
H305: May be harmful if swallowed and enters airways; Aspiration, Cat 2
H316: Causes mild skin irritation; Skin Corr/Irritation, Cat 3
H401: Toxic to aquatic life; Acute Env Tox, Cat 2
H412: Harmful to aquatic life with long lasting effects; Chronic Env Tox, Cat 3

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:

Composition: Component Table information was modified.
Hazard Identification: Physical/Chemical Hazard information was added.
Hazard Identification: Physical/Chemical Hazard information was deleted.
Section 01: Company Mailing Address information was modified.
Section 01: Product Identification Product Name information was modified.
Section 04: First Aid Inhalation information was modified.
Section 07: Handling and Storage - Handling information was modified.
Section 07: Materials/Coatings - Suitable information was modified.
Section 07: Materials/Coatings - Unsuitable information was modified.
Section 07: Suitable Containers information was modified.
Section 09: n-Octanol/Water Partition Coefficient information was modified.
Section 09: VAPOR PRESSURE information was modified.
Section 10: Materials to Avoid information was modified.
Section 12: Ecological Information - Acute Aquatic Toxicity information was added.
Section 12: Ecological Information - Acute Aquatic Toxicity information was deleted.
Section 12: Ecological Information - Acute Aquatic Toxicity information was modified.
Section 12: Ecological Information - Mobility information was added.
Section 12: Ecological Information - Mobility information was deleted.
Section 12: Environmental fate table in section 12 information was modified.
Section 12: Environmental tox table in section 12 information was modified.

Section 15: SARA (311/312) REPORTABLE HAZARD CATEGORIES information was modified.
Section 16: HCode Key information was modified.

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Internal Use Only
MHC: 2A, 0, 0, 0, 2, 1

DGN: 4400616OUS (1004794)

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

Attachment E - Potential-to-Emit Estimates

Addivant; Weston TDP ZP Trial Process
Weston TDP ZP Trial Process Emission Summary Table

	Weston TDP ZP Process Emission Levels					
	VOCs		HAPs		Methanol	
Emission Source	**lb/hr**	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**
T-30 & T-31 Storage Tanks	<0.01	<0.01	--	--	--	--
K-20 Reactor	1.19	<0.01	--	--	--	--
K-4 Storage	<0.01	<0.01	--	--	--	--
Methanol Waste Loading	0.34	<0.01	0.34	<0.01	0.34	<0.01
TDP ZP Loading	<0.01	<0.01	--	--	--	--
Hot Well	0.08	<0.01	0.08	<0.01	0.08	<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
Process Equipment Leaks	2.30	1.22	0.72	0.38	0.72	0.38
Process Totals	3.92	1.23	1.15	0.39	1.15	0.39
Permit Thresholds	**10.00**	**6.00**	**2.00**	**5.00**	**2.00**	**5.00**

Addivant; WTDPZP Trial Process
T-30 & T-31 Storage Tanks - Alcohol 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	2.80E-03	0.00E+00	2.80E-03	3.20E-07	0.00E+00	3.20E-07	1.40E-06	0.00E+00	1.40E-06

Note:

[1]Losses from EPA TANKs Report - T-30 and T-31

[2] T-30 and T-31 stores Alcohol for the WTDPZP in K-20 Process. Tank throughput in gallons/year - (1406 gal/batch) x (35 batch/trial) = 49,225 gal/trial

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

Emission Points

WTDPZP Initial Preparation using Alcohol for Cleaning
WTDPZP - 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 W430ZP provided by Addivant.

Initial Preparation only needed after each campaign. One campaign per month for seven months.

References:

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

WTDPZP Initial Preparation using Alcohol for Cleaning

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)	33	Tank dimensions for 2,000-gal reactor with 78"ID (Area of circle= pi*radius squared)
V	Volumetric Flowrate of Gas (ft^3/min)	440	Volumetric Flowrate provided by Addivant
U	Gas Velocity over Liquid (m/hr)	244	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)	2.5	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)	1.1	k = 0.0958 * U^0.78 * Deq^-0.11 * Nsc^-0.67
MW	Molecular Weight (lb/lb-mol)	158.28	Molecular weight of Alcohol
P	Vapor Pressure (atm)	1.07E-01	Alcohol vapor pressure = 81.4 mmHg * (1 atm/760 mm Hg)
H	Emission Hours (hr/campaign)	1.00	Assume each initial preparation takes 1 hr
R	Universal Gas Constant (atm-ft^3/lbmol-R)	0.7302	Engineering constant
T	Temperature (R)	725.67	Max Cleaning Temperature = 130°C
E	**Emission Rate (lb/campaign)**	**1.19E+00**	E = (MW * k * P * A * H)/(R * T), US EPA open top tank equation
	Emission Rate (lb/hr)	**1.19E+00**	lb/campaign ÷ hours/campaign
n	Efficiency of control equipment	0%	Assumed 0% control efficiency for potential to emit calculations
	Estimated Potential Emissions (tons/trial)	**5.96E-04**	Emissions (lb/campaign) * 1 ton/2,000 lb * (1-n)
	Campaigns through April 2018	**7**	
	Estimated Potential Emissions (tpy)	**4.17E-03**	Emissions (lb/yr) * 1 ton/2,000 lb * (1-n)

WTDPZP - 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)	33	Tank dimensions for 2,000-gal reactor with 78"ID (Area of circle= pi*radius squared)
V	Volumetric Flowrate of Gas (ft^3/min)	440	Volumetric Flowrate provided by Addivant
U	Gas Velocity over Liquid (m/hr)	244	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)	2.5	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)	1.1	k = 0.0958 * U^0.78 * Deq^-0.11 * Nsc^-0.67
MW	Molecular Weight (lb/lb-mol)	502	Molecular weight of TDP ZP
P	Vapor Pressure (atm)	0.0000	Vapor Pressure of TDP ZP= 0.0013 mmHg * (1 atm/760 mmHg)
H	Emission Hours (hrs/batch)	20.00	Assume 20 hr run time per batch
R	Universal Gas Constant (atm-ft^3/lbmol-R)	0.7302	Engineering constant
T	Temperature (R)	682.47	Average Temperature = 106°C (Initial 80, Stripping 200, Cooling 40)
E	**Emission Rate (lb per batch)**	**0.00**	E = (MW * k * P * A * H)/(R * T), US EPA open top tank equation
	Emission Rate (lb/hr)	**0.00**	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)	**6.42E-07**	Emissions (lb/yr) * 1 ton/2,000 lb * (1-n)
	Batches through April 2018	**35**	
	Estimated Potential Emissions (tpy)	**2.25E-05**	Emissions (lb/yr) * 1 ton/2,000 lb * (1-n)

Addivant; WTDPZP Trial Process
K-4 (WTDPZP 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	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Note:

[1]Losses from EPA TANKs Report - K-4 WTDPZP Product

[2]EPA TANKs Report - K-4 WTDPZP Product uses WTDPZP density from Chemical/Physical Data for WTDPZP and Theoretical Yield of WTDP Product from WTDPZP in K-20 Process to estimate tank throughput in gallons/year - (1224 gal/batch) x (35 batches/trial) = 42,839 gal/trial

Addivant; WTDPZP Trial Process
Methanol Loading Losses to Waste Drums

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 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	268.15	35.00	9385.38	6.14E-03	3.41E-01

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 Production Theoretical Yields

[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; WTDPZP Trial Process
WTDPZP Drumming and Toting Losses

WTDPZP Loading Losses

Compound	Molecular Weight (lb/lbmol)	True Vapor Pressure of Liquid (psia)	Saturation Factor	Temperature (°R)	Loading Loss Rate ($lb/10^3$ gal)	WTDPZP Production Rate (gal/batch)	Number of Trial Runs (batches)	WTDPZP Production (gal/yr)	Annual Loading Losses (tpy)	Annual Loading Losses (lb/hr)
WTDPZP	502.00	3.22E-07	1.45	599.67	0.00	1223.97	35.00	42839.04	1.04E-07	5.80E-06

Note:

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

[2]Temperature and WTDPZP production rate based off of values calculated or used in EPA TANKs Report - K-4 WTDPZP Product

[3]True Vapor Pressure of Liquid provided by Addivant - 0.0294 mmHg at 130°C. Using this vapor pressure at ambient temperatures will provide a conservative estimate of WTDP ZP Loading Losses. (0.0294 mmHg) x (14.7 psia/760 mmHg) = 0.000569 psia)

Saturated Vapor Pressure for WTDPZP	
Temp (°F)	Pressure (psia)
140	0.0000003

Addivant; WTDP ZP 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/batches)	Number of Trial Runs (batches)	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	35.00	252.00	1.49E-03	8.29E-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 0.06% of the wastewater recovered.

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

Addivant; WTDPZP 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	1.20E-01	0.00E+00	1.20E-01	1.37E-05	0.00E+00	1.37E-05	6.00E-05	0.00E+00	6.00E-05
Methanol	1.20E-01	0.00E+00	1.20E-01	1.37E-05	0.00E+00	1.37E-05	6.00E-05	0.00E+00	6.00E-05

Note:
[1]Losses from EPA TANKs Report - WTDPZP Wastewater Tote
[2]Wastewater is an estimated 0.06% methanol and 99.94% water and is based of a throughput of 420,000 gal wastewater/yr (12,000 gal wastewater/batch x 35 batches)

Addivant; WTDPZP 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	6.60E-01	0.00E+00	6.60E-01	7.53E-05	0.00E+00	7.53E-05	3.30E-04	0.00E+00	3.30E-04
Methanol	6.60E-01	0.00E+00	6.60E-01	7.53E-05	0.00E+00	7.53E-05	3.30E-04	0.00E+00	3.30E-04

Note:
[1]Losses from EPA TANKs Report - WTDPZP Wastewater Portable Tank
[2]Wastewater is an estimated 0.06% methanol and 99.94% water and is based of a throughput of 420,000 gal wastewater/yr (12,000 gal wastewater/batch x 35 batches)

Addivant; WTDPZP Trial Process

WTDPZP (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
Light Liquid Valves EF:	0.00403	kg/hr	Leak Emission Estimates,
	0.00888	lbs VOC/valve/hr	(EPA-453/R-95-017)
Gas Valves EF:	0.00597	kg/hr	November 1995, Table 2-1.
	0.01316	lbs VOC/valve/hr	
Heavy Liquid Flanges EF[1]:	0.00183	kg/hr	
	0.00403	lbs VOC/flange/hr	
Light Liquid Flanges EF:	0.00183	kg/hr	
	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	
Light Liquid Pump Seals EF:	0.020	kg/hr	
	0.044	lbs VOC/pump seal/hr	
Sampling Connections EF:	0.015	kg/hr	
	0.033	lbs VOC/sampling connection/hr	
Gas Pressure Relief Valves EF[1]:	0.104	kg/hr	
	0.2293	lbs VOC/relief valve/hr	
Hours:	1,060		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-30 & T-31 to K-20 Reactor - Alcohol	Liquid	31	60			4		2
K-20 Reactor to K-4 - Product	Liquid	18	35			2	3	1
K-20 Reactor to column	Vapor			5	11		1	
Primary condensor to secondary condensor	Vapor				2			
Secondary condensor to K-20 Receiver (R44) - Methanol	Liquid	3	6					
K-20 Receiver (R44) to K-20 Charge Meter - Alcohol	Liquid	8	17			2	1	
K-20 Charge Metering Manifold at K-20 - Alcohol	Liquid	5	8					
K-20 Receiver (R44) to Methanol drumming	Liquid	4	8				2	
K-20 Receiver (R44) to KO Pot R116 - Methanol	Vapor			1	4			
KO Pot R116 to Water Jet - Methanol	Vapor			5	12			1
K-4 Filtration - Product	Liquid	10	20			1		
Hot Well to Wastewater Tote - Methanol	Liquid	2	4					
Wastewater Tote to Portable Tank - Methanol	Liquid	9	18					
	Totals:	90	176	11	29	9	7	4

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-30 & T-31 to K-20 Reactor - Alcohol	100%	16.66	0.00	256.59	0.00	80.58	0.00	486.08
K-20 Reactor to K-4 - Product	100%	9.67	0.00	149.68	0.00	40.29	105.16	243.04
K-20 Reactor to column	100%	0.00	69.76	0.00	47.04	0.00	35.05	0.00
Primary condensor to secondary condensor	100%	0.00	0.00	0.00	8.55	0.00	0.00	0.00
Secondary condensor to K-20 Receiver (R44) - Methanol	100%	28.25	0.00	25.66	0.00	0.00	0.00	0.00
K-20 Receiver (R44) to K-20 Charge Meter - Alcohol	100%	4.30	0.00	72.70	0.00	40.29	35.05	0.00
K-20 Charge Metering Manifold at K-20 - Alcohol	100%	2.69	0.00	34.21	0.00	0.00	0.00	0.00
K-20 Receiver (R44) to Methanol drumming	100%	37.67	0.00	34.21	0.00	0.00	70.11	0.00
K-20 Receiver (R44) to KO Pot R116 - Methanol	100%	0.00	13.95	0.00	17.11	0.00	0.00	0.00
KO Pot R116 to Water Jet - Methanol	100%	0.00	69.76	0.00	51.32	0.00	0.00	243.04
K-4 Filtration - Product	100%	5.37	0.00	85.53	0.00	20.14	0.00	0.00
Hot Well to Wastewater Tote - Methanol	1%	0.19	0.00	0.17	0.00	0.00	0.00	0.00
Wastewater Tote to Portable Tank - Methanol	1%	0.85	0.00	0.77	0.00	0.00	0.00	0.00
	Total	105.66	153.47	659.53	124.02	181.30	245.38	972.16

Total VOC Emissions from Equipment Leaks
2,442 lbs/yr
1.22 tpy

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-30 & T-31 to K-20 Reactor - Alcohol	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 - Product	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 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) - Methanol	100%	2.67E-02	0.00E+00	2.42E-02	0.00E+00	0.00	0.00E+00	0.00E+00
K-20 Receiver (R44) to K-20 Charge Meter - Alcohol	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 - Alcohol	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%	3.55E-02	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 - Methanol	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 - Methanol	100%	0.00E+00	6.58E-02	0.00E+00	4.84E-02	0.00	0.00E+00	2.29E-01
K-4 Filtration - Product	100%	5.07E-03	0.00E+00	8.07E-02	0.00E+00	0.02	0.00E+00	0.00E+00
Hot Well to Wastewater Tote - Methanol	1%	1.78E-04	0.00E+00	1.61E-04	0.00E+00	0.00	0.00E+00	0.00E+00
Wastewater Tote to Portable Tank - Methanol	1%	8.00E-04	0.00E+00	7.26E-04	0.00E+00	0.00	0.00E+00	0.00E+00
	Total	9.97E-02	1.45E-01	6.22E-01	1.17E-01	0.17	2.31E-01	9.17E-01

Total VOC Emissions from Equipment Leaks
2.30 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**
Light Liquid Valves EF:	0.00403 kg/hr 0.00888 lbs VOC/valve/hr	SOCMI Factors - US EPA. Protocol for Equipment
Gas Valves EF:	0.00597 kg/hr 0.01316 lbs VOC/valve/hr	Leak Emission Estimates, (EPA-453/R-95-017)
Light Liquid Flanges EF[1]:	0.00183 kg/hr 0.00403 lbs VOC/flange/hr	November 1995, Table 2-1.
Gas Flanges EF[1]:	0.00183 kg/hr 0.00403 lbs VOC/flange/hr	
Light Liquid Pump Seals EF:	0.020 kg/hr 0.044 lbs VOC/pump seal/hr	
Sampling Connections EF:	0.015 kg/hr 0.033 lbs VOC/sampling connection/hr	
Gas Pressure Relief Valves EF[1]:	0.104 kg/hr 0.2293 lbs VOC/relief valve/hr	
Hours:	1,060	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 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
Hot Well to Wastewater Tote	Liquid	2	4					
Wastewater Tote to Portable Tank - Methanol	Liquid	9	18					
	Totals:	15	30	14	35	0	3	1

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)
K-20 Reactor to column	100%	0.00	69.76	0.00	47.04	0.00	35.05	0.00
Primary condensor to secondary condensor	100%	0.00	0.00	0.00	8.55	0.00	0.00	0.00
Secondary condensor to K-20 Receiver (R44)	100%	0.00	41.85	0.00	25.66	0.00	0.00	0.00
K-20 Receiver (R44) to Methanol drumming	100%	37.67	0.00	34.21	0.00	0.00	70.11	0.00
K-20 Receiver (R44) to KO Pot R116	100%	0.00	13.95	0.00	17.11	0.00	0.00	0.00
KO Pot R116 to Water Jet	100%	0.00	69.76	0.00	51.32	0.00	0.00	243.04
Hot Well to Wastewater Tote	1%	0.19	0.00	0.17	0.00	0.00	0.00	0.00
Wastewater Tote to Portable Tank - Methanol	1%	0.85	0.00	0.77	0.00	0.00	0.00	0.00
	Total	38.71	195.32	35.15	149.68	0.00	105.16	243.04

Total VOC Emissions from Equipment Leaks

767 lbs/yr

0.38 tpy

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 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%	3.55E-02	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
Hot Well to Wastewater Tote	1%	1.78E-04	0.00E+00	1.61E-04	0.00E+00	0.00	0.00E+00	0.00E+00
Wastewater Tote to Portable Tank - Methanol	1%	8.00E-04	0.00E+00	7.26E-04	0.00E+00	0.00	0.00E+00	0.00E+00
	Total	3.65E-02	1.84E-01	3.32E-02	1.41E-01	0.00	9.92E-02	2.29E-01

Total VOC Emissions from Equipment Leaks

0.72 lbs/hr