



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

February 14, 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
South Plant – TTP NP Process
DAQ Plant I.D. No.: 061-00006**

Dear Director,

Addivant USA, LLC (“Addivant”) is planning to add a new product variant to an existing chemical manufacturing unit at the South Plant facility. A Permit Applicability Determination was submitted in April 2015 (Determination No. PD15-036) for the product Tri-Tolyl Phenylphosphite (TTP). Addivant will be manufacturing a variation of TTP called Tri-Tolyl Phenylphosphite No Phenol (TTP NP). This change will utilize the same existing reactor to make a slightly different product. The reactor is a grandfathered unit constructed in the 1970’s. 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 TTP NP process, the new modifications will not increase the emission above the permitting thresholds for modification as defined in 45 CSR 13: the reasonably calculated maximum potential emissions are under two (2) lb/hr OR five (5) tons/year of total Hazardous Air Pollutants (HAPs); six (6) lbs/hr and ten (10) tons per year or 144 pounds per calendar day of any regulated pollutant. The potential-to-emit calculations were based on the additional emissions as well as the reduction in emissions for the TT NP process in comparison to the original TTP calculations.

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
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 South 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 approx 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. Take a right at the second intersection and continue to entrance gate at the end of the road.		
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): 061-00006	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): <input type="checkbox"/> NEW SOURCE <input type="checkbox"/> ADMINISTRATIVE UPDATE <input checked="" type="checkbox"/> MODIFICATION <input type="checkbox"/> 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? <input type="checkbox"/> YES <input type="checkbox"/> NO
9. IS DEMOLITION OR PHYSICAL RENOVATION AT AN EXISTING FACILITY INVOLVED? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		
10A. DATE OF ANTICIPATED INSTALLATION OR CHANGE: <u>05/15/2017</u>	10B. DATE OF ANTICIPATED START-UP: <u>06/07/2017</u>	
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 PROCESSES, 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	-0.17	0.95
CO		
NO _x		
SO ₂		
Pb		
HAPs (AGGREGATE AMOUNT)	-0.35	0.85
TAPs (INDIVIDUALLY)*		
OTHER (INDIVIDUALLY)*		

* ATTACH ADDITIONAL PAGES AS NEEDED

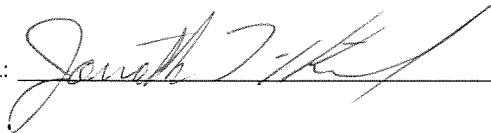
13B. PLEASE PROVIDE ALL SUPPORTING CALCULATIONS AS ATTACHMENT E.

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

14. CERTIFICATION OF DATA

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

SIGNATURE OF RESPONSIBLE OFFICIAL: _____



TITLE: SITE DIRECTOR

DATE: 02/14/2017

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

NOTE: PLEASE CHECK ENCLOSED ATTACHMENTS:

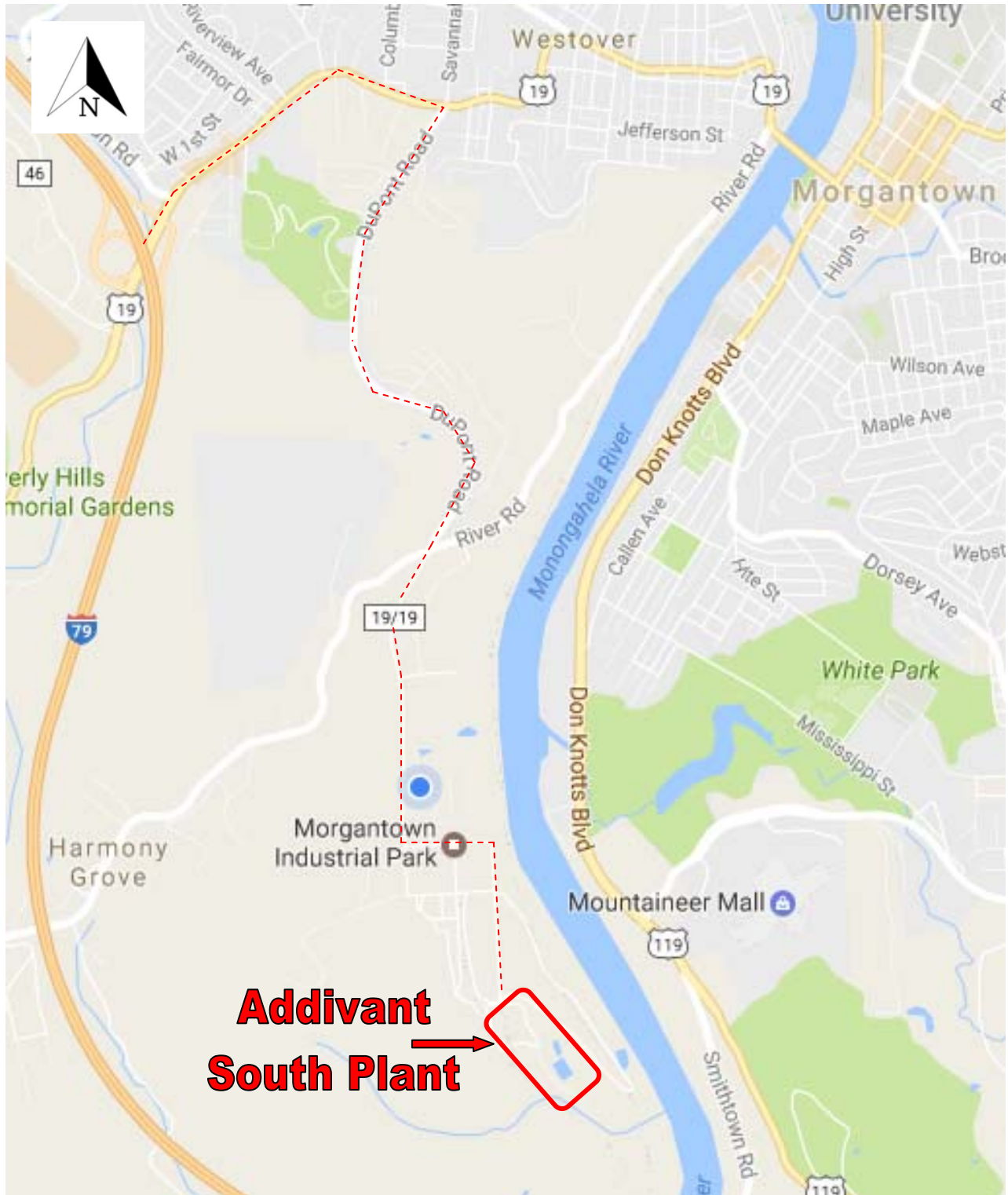
ATTACHMENT A ATTACHMENT B ATTACHMENT C ATTACHMENT D ATTACHMENT E

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

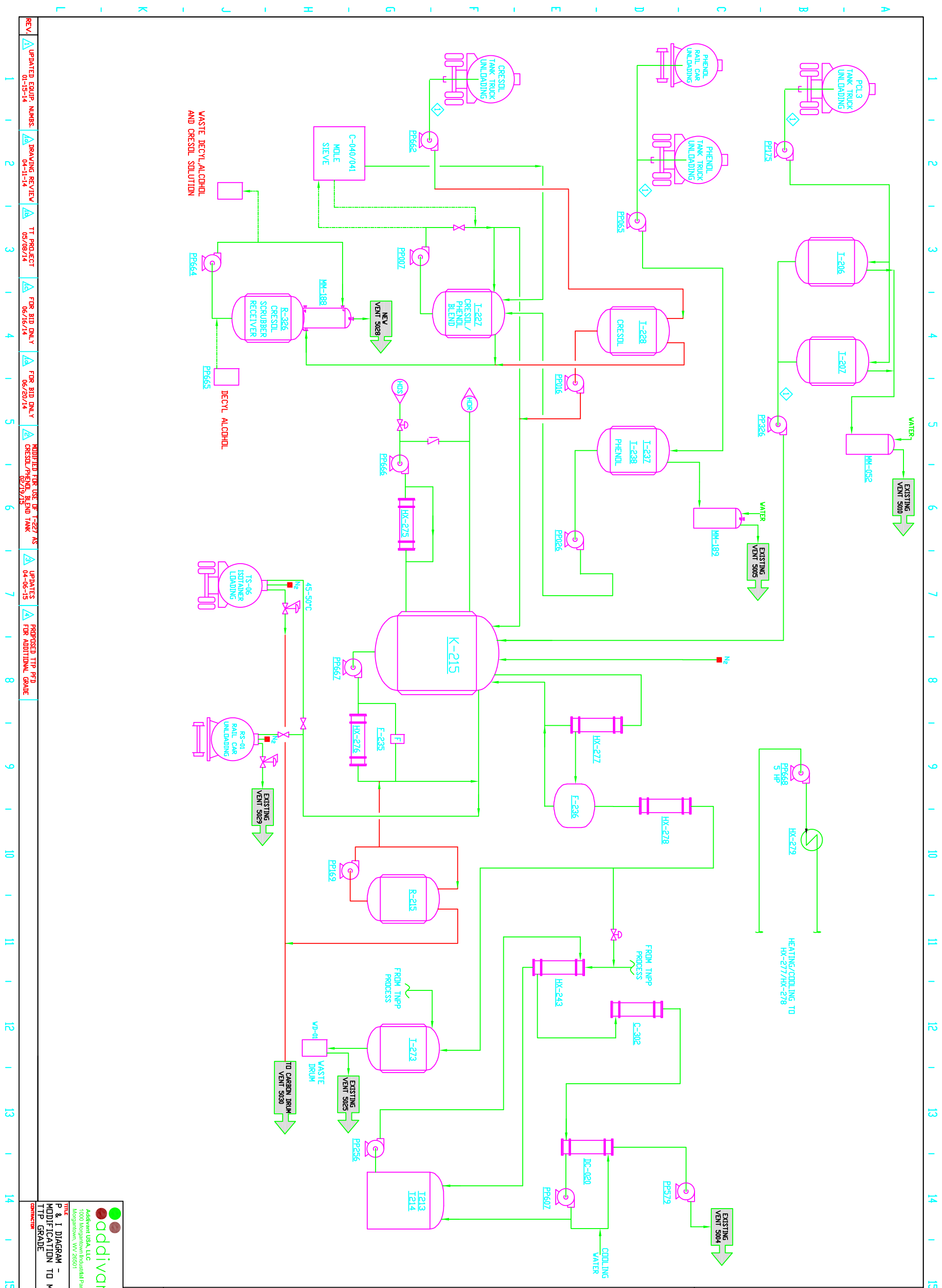
THE PERMIT DETERMINATION FORM WITH THE INSTRUCTIONS CAN BE FOUND ON DAQ'S PERMITTING SECTION WEB SITE:

www.dep.wv.gov/daq

Attachment A – Map of Facility



Attachment B – Process Flow Diagram



REFERENCE DRAWINGS

PID	DESCRIPTION
D493	PCI3 TRUCK UNLOADING
D494	PCI3 STORAGE (T-206/T-207)
D013	MONITOR/PHENOL STORAGE (T2365)
D492	K-215
D497	K-215
D243	R-213/214/215 RECEIVERS
D244	HCL ABSORPTION SYSTEM
D245	K.O. TANKS (R-223/R224/R225)
D249	VACUUM PUMP (VP076)
D859	TNPP MAKE-UP STORAGE (T1223/224)
D192	TNPP STORAGE (T1252/1253)
D192	TNPP STORAGE (T1254/1255)

SYMBOLS

TMP OPERATING TEMPERATURE (°C)

PSI OPERATING PRESSURE (PSIG)

STREAM NUMBER

CONFIDENTIAL - DO NOT DUPLICATE

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Addvantage USA, LLC
1100 Montgomery Industrial Park
Montgomery, NY 12531

P & I DIAGRAM -
MODIFICATION TO MAKE 2ND
TTP GRADE

CONTRACTOR

REV	DESCRIPTION	DATE	BY	APP
1	UPDATED EQUIP. NUMBERS	01-15-14		
2	DRAWING REVIEW	04-11-14		
3	TT PROJECT	05/08/14		
4	FOR BID ONLY	06/16/14		
5	FOR BID ONLY	06/20/14		
6	MODIFIED FOR USE OF T-227 AS CRESOL/PHENOL TANK	02/19/15		
7	UPDATES	04-06-15		
8	PROPOSED TTP PTD FOR ADDITIONAL GRADE			
9				
10				
11				
12				
13				
14				
15				
16				

Attachment C – Process Description

Appendix C

Description of Proposed Manufacturing of Other Grade of TTP (called TTNP)

Currently, TTP (Tri toyl phosphite) is manufactured at the South Plant factory building using a 2,000 gallon, glass-lined reactor, K-215. This grade of TTP consists of using an 85% MPC (meta/para cresol) and 15% phenol blend reacted with PCL3 (phosphorus trichloride). This material is then, nitrogen-sparged, cooled and filtered out to railcars. A maximum of 1,000 metric tons of this product is currently made. Recently, the customer has requested that another similar grade of TTP be manufactured, TTNP. This grade of TTP consists of using 100% m,p-cresol (MPC) and no phenol. The reaction would still be performed in K-215 using PCL3 and then nitrogen sparging. However, this product would be transferred into isocontainers at another product loading area instead of into railcars. The maximum expected volume for TTNP is 1,000 metric tons. The total maximum volume for both grades of TTP and TTNP would be 2,000 metric tons. The average cycle time is 16 hours.

The minimal plant modifications to make this second grade of TTP would be the following:

1. Convert an existing phenol tank, T-228, to store MPC.
 - a. Tank T-227 currently stores the MPC/phenol blend for TTP. Tank T-228 would be converted to storing just MPC for the TTNP product. T-228 would also vent to the cresol vent scrubber, MM-188 and vent through existing emission point 5028. The scrubber will now use decyl alcohol to removed cresol form the cresol storage tank vent. The spent decyl alcohol/cresol solution would be drummed off as needed and sent out for waste disposal.
2. Vent TTNP isocontainer to a carbon drum.
 - a. The vent gas from the TTNP isocontainer loading operation will contain trace amounts of HCL. This will vent to the tanker truck carbon drum through the emission point 5030.
3. Perform improvements to existing isocontainer loading area.
 - a. Improve fall protection at isocontainer loading area. This will require a new gangway to be installed.
 - b. Improve access for staging isocontainer into this area. This will require new pipe bridge columns to be installed and two existing columns to be removed.
4. Use R-215 receiver for MPC flush, cleanup, between campaigns of the two grades of TTP. This receiver would also be vented to the carbon drum (vent 5030).

It is expected that the additional venting from making this very similar grade of TTP would be de minimus. The expected maximum volumes are also well below the volume used for the original permit determination review that was submitted in 2015. Modifications to the emissions points are highlighted in the following table.

Attachment C
Process Description / Emission Units Table
(includes all emission units and air pollution control devices
that will be part of this permit application review, regardless of permitting status)

Emission Unit ID ¹	Emission Point ID ²	Emission Unit Description	Year Installed/ Modified	Design Capacity	Type ³ and Date of Change	Control Device ⁴
T-206	5010	Phosphorous Trichloride (PCl ₃) Storage Tank	1973	10,000 Gallon	Existing	MM-052 Scrubber
T-207	5010	PCl ₃ Storage Tank	1973	10,000 Gallon	Existing	MM-052 Scrubber
T-255	5010	PCl ₃ Knock Out Tank	1973	300 Gallon	Existing	MM-052 Scrubber
T-227	5028	Cresol/Phenol Blend and Storage Tank	1973/2015	17,000 Gallon	Existing	MM-188 Scrubber
T-228	5028	Cresol Storage Tank	1973/2017	15,000 Gallon	Modification	MM-188 Scrubber
C-040/041	5028	Molecular Sieve	2000/2015	400 Gallon	Existing	MM-188 Scrubber
K-215	5004	Tri-Tolyl Phenylphosphite (TTP) Reactor	1969/2015	2,000 Gallon	Existing	DC-020 Scrubber
R-326	5028	Cresol Scrubber Receiver	2015	NA	Modification	MM-188 Scrubber
R-215	5030	TTNP Cresol Flush Receiver	2017	NA	Modification	Carbon Abs. Drum
F-236	5004	TriTolyl Phenylphosphite (TTP) Demister	2015	NA	Existing	DC-020 Scrubber
HX-275	No Vent	Hot Oil/Air Cooler	2015	NA	Existing	NA
HX-276	No Vent	TriTolyl Phenylphosphite (TTP) Aftercooler	2015	NA	Existing	NA
HX-277	5004	TriTolyl Phenylphosphite (TTP) Primary Gassing Condenser	2015	NA	Existing	DC-020 Scrubber
HX-278	5004	Condenser on Gas Line off Demister (F-236)	2015	NA	Existing	DC-020 Scrubber
HX-279	No Vent	Steam water heater for tempered water to HX-277	2015	NA	Existing	NA
HX-243	5004	Absorber	2002	NA	Existing	DC-020 Scrubber
C-302	5004	Tails Tower	1990	NA	Existing	DC-020 Scrubber
DC-020	5004	HCL Scrubber	2000/2015	165 Gallon	Existing	DC-020 Scrubber
T-273	5004	Condensate Collection Tank	1979	10 Gallon	Existing	DC-020 Scrubber
WD-01	5025	Waste Drum	1979	55 Gallon	Existing	NA
T-213	5004	HCl Storage Tank	1991	2500 Gallon	Existing	DC-020 Scrubber
T-214	5004	HCl Storage Tank	1991	2500 Gallon	Existing	DC-020 Scrubber
T-249	5004	Condensate Tank	1997	500 Gallon	Existing	NA
TS-06	5030	TTP Tank Truck Loading Station TTNP Isocontainer Loading Station	1973/2015	55 Gallon	Modification	Carbon Ads. Drum

RS-01	5029	TTP Rail Car Loading Station	1997/2015	55 Gallon	Existing	Carbon Ads. Drum
¹ For Emission Units (or Sources) use the following numbering system: 1S, 2S, 3S, or other appropriate designation. ² For Emission Points use the following numbering system: 1E, 2E, 3E, or other appropriate designation. ³ New, modification, removal ⁴ For Control Devices use the following numbering system: 1C, 2C, 3C, or other appropriate designation.						

Attachment D – Safety Data Sheets

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product code : 400000006203

Chemical nature : Antioxidant

Details of the supplier of the safety data sheet

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

Prepared by msdsrequest@addivant.com

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

Emergency telephone number

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

Disposal considerations : msdsrequest@addivant.com

Recommended use of the chemical and restrictions on use

Recommended use : Antioxidant

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

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

WARNING	
Appearance	liquid

Colour	amber, to, yellow
Odour	pungent
Hazard Summary	May cause allergic skin reaction. May cause skin irritation.

GHS Classification

Acute toxicity (Oral) : Category 4
 Skin irritation : Category 2
 Eye irritation : Category 2A
 Skin sensitisation : Category 1

GHS label elements

Hazard pictograms :



Signal word :

Warning

Hazard statements :

H302 Harmful if swallowed.
 H315 Causes skin irritation.
 H317 May cause an allergic skin reaction.
 H319 Causes serious eye irritation.

Precautionary statements :

Prevention:
 P261 Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
 P264 Wash skin thoroughly after handling.
 P270 Do not eat, drink or smoke when using this product.
 P272 Contaminated work clothing should not be allowed out of the workplace.
 P280 Wear eye protection/ face protection.
 P280 Wear protective gloves.
Response:
 P301 + P312 + P330 IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell. Rinse mouth.
 P302 + P352 IF ON SKIN: Wash with plenty of soap and water.
 P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
 P333 + P313 If skin irritation or rash occurs: Get medical advice/ attention.
 P337 + P313 If eye irritation persists: Get medical advice/ attention.
 P362 Take off contaminated clothing and wash before reuse.

Disposal:

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

Potential Health Effects

Inhalation	: Not expected to present a significant inhalation hazard under anticipated conditions of normal use.
Skin	: Causes moderate skin irritation.
Eyes	: Not expected to be a hazard in normal industrial use.
Ingestion	: Harmful if swallowed.
Aggravated Medical Condition	: None known.
Symptoms of Overexposure	: Sensitisation

Carcinogenicity:**IARC**

No se identifica ningún componente de este producto, que presente niveles mayores que o igual a 0,1% como agente carcinógeno humano probable, posible o confirmado por la (IARC) Agencia Internacional de Investigaciones sobre Carcinógenos.

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

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

ACGIH

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

OSHA

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

NTP

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

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Mixture

Chemical nature : Antioxidant

Hazardous components

Chemical name	CAS-No.	Concentration (%)
tris(methylphenyl) phosphite	25586-42-9	≥ 90 - ≤ 100
cresol	1319-77-3	≥ 1 - < 5

SECTION 4. FIRST AID MEASURES

- If inhaled : Move to fresh air.
Consult a physician after significant exposure.
- In case of skin contact : Take off contaminated clothing and shoes immediately.
Wash off with soap and plenty of water.
If symptoms persist, call a physician.
- In case of eye contact : If eye irritation persists, consult a specialist.
Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
IF IN EYES: Rinse cautiously with water for several minutes.
Remove contact lenses, if present and easy to do. Continue rinsing.
- If swallowed : Clean mouth with water and drink afterwards plenty of water.
Do not give milk or alcoholic beverages.
Never give anything by mouth to an unconscious person.
Obtain medical attention.
- Most important symptoms and effects, both acute and delayed : Harmful if swallowed.
Causes skin irritation.
May cause an allergic skin reaction.
Sensitisation
- Notes to physician : The first aid procedure should be established in consultation with the doctor responsible for industrial medicine.

SECTION 5. FIREFIGHTING MEASURES

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

firefighters

SECTION 6. ACCIDENTAL RELEASE MEASURES

- Personal precautions, protective equipment and emergency procedures : Use personal protective equipment.
Ensure adequate ventilation.
- Environmental precautions : Try to prevent the material from entering drains or water courses.
- Methods and materials for containment and cleaning up : Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust).
Keep in suitable, closed containers for disposal.

SECTION 7. HANDLING AND STORAGE

- Advice on safe handling : Avoid exceeding the given occupational exposure limits (see section 8).
Avoid contact with skin and eyes.
For personal protection see section 8.
Persons with a history of skin sensitisation problems or asthma, allergies, chronic or recurrent respiratory disease should not be employed in any process in which this mixture is being used.
Smoking, eating and drinking should be prohibited in the application area.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
cresol	1319-77-3	TWA	5 ppm 22 mg/m ³	OSHA Z-1
		TWA	5 ppm	ACGIH
		TWA (Fracción inhalable y vapor)	20 mg/m ³	ACGIH
		TWA	5 ppm 22 mg/m ³	OSHA Z-1
		TWA	5 ppm	ACGIH
		TWA (Inhalable fraction and vapor)	20 mg/m ³	ACGIH
		TWA	5 ppm	OSHA Z-1

			22 mg/m3	
		TWA	5 ppm	ACGIH
		TWA (Inhalable fraction and vapor)	20 mg/m3	ACGIH

Personal protective equipment

Respiratory protection : In the case of vapour formation use a respirator with an approved filter.

Hand protection

Remarks : Polyvinyl alcohol or nitrile- butyl-rubber gloves The selected protective gloves have to satisfy the specifications of EU Directive 89/686/EEC and the standard EN 374 derived from it. Before removing gloves clean them with soap and water.

Eye protection : Eye wash bottle with pure water
Tightly fitting safety goggles

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

Hygiene measures : Handle in accordance with good industrial hygiene and safety practice.
When using do not eat or drink.
When using do not smoke.
Wash hands before breaks and at the end of workday.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance : liquid

Colour : amber, to, yellow

Odour : pungent

Flash point : 400 °C
Decomposes
: 120 °C
Method: closed cup

Vapour pressure : 1.33 hPa (180 °C)

Density : 1.11 g/cm³ (20 °C)

Solubility(ies)
Water solubility : hydrolyses

SECTION 10. STABILITY AND REACTIVITY

Reactivity : Stable under recommended storage conditions.

Chemical stability : No decomposition if stored and applied as directed.

Possibility of hazardous reactions : Stable under recommended storage conditions.
No decomposition if used as directed.

Conditions to avoid : No data available

Hazardous decomposition products : No hazardous decomposition products are known.

SECTION 11. TOXICOLOGICAL INFORMATION

Acute toxicity

Product:

Acute oral toxicity : Acute toxicity estimate : 471.7 mg/kg
Method: Calculation method

Acute dermal toxicity : Acute toxicity estimate : > 5,000 mg/kg
Method: Calculation method

Components:

tris(methylphenyl) phosphite:

Acute oral toxicity : (Rat, female): > 300 mg/kg
Method: OECD Test Guideline 423

Skin corrosion/irritation

Product:

Remarks: May cause skin irritation in susceptible persons.

Components:

tris(methylphenyl) phosphite:

Assessment: Irritating to skin.

cresol:

Assessment: Causes burns.

Serious eye damage/eye irritation

Product:

Remarks: Vapours may cause irritation to the eyes, respiratory system and the skin.

Respiratory or skin sensitisation

Product:

Remarks: Causes sensitisation.

Components:

tris(methylphenyl) phosphite:

Assessment: May cause an allergic skin reaction.

Germ cell mutagenicity

Carcinogenicity

Reproductive toxicity

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.

Components:

cresol:

Toxicity to fish : LC50 (Pimephales promelas (fathead minnow)): 12.8 mg/l
Exposure time: 96 h

LC50 (Lepomis macrochirus (Bluegill sunfish)): 10.0 - 13.6 mg/l
 Exposure time: 96 h

LC50 (Lepomis macrochirus (Bluegill sunfish)): 24.0 mg/l
 Exposure time: 96 h

Toxicity to daphnia and other aquatic invertebrates : LC50 (Gammarus fasciatus (freshwater shrimp)): 7.0 mg/l
 Exposure time: 48 h

LC50 (Gammarus fasciatus (freshwater shrimp)): 25.0 - 34.0 mg/l
 Exposure time: 48 h

LC50 (Gammarus salinus (seawater shrimp)): 10 - 100 mg/l
 Exposure time: 48 h

Persistence and degradability

Product:

Biodegradability : Remarks: No data available

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	: Do not dispose of waste into sewer. Do not contaminate ponds, waterways or ditches with chemical or used container. Offer surplus and non-recyclable solutions to a licensed disposal company.
Contaminated packaging	: Empty remaining contents. Dispose of as unused product. Do not re-use empty containers.

SECTION 14. TRANSPORT INFORMATION

DOT

UN number	: 3265
Description of the goods	: CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S. : (tris(methylphenyl) phosphite) :
Class	: 8
Packing group	: II
Labels	: 8
Emergency Response	: 153
Guidebook Number	
Environmentally hazardous	: yes

IATA

UN number	: 3265
Description of the goods	: CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S. (tris(methylphenyl) phosphite)
Class	: 8
Packing group	: II
Labels	: 8
Packing instruction (cargo aircraft)	: 812
Packing instruction (passenger aircraft)	: 808
Packing instruction (passenger aircraft)	: Y808
Marine pollutant	: no

IMDG

UN number	: 3265
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Description of the goods : CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S.
(tris(methylphenyl) phosphite)

Class : 8
Packing group : II
Labels : 8
EmS Number 1 : F-A
EmS Number 2 : S-B

Marine pollutant : no

SECTION 15. REGULATORY INFORMATION

TSCA list : Not relevant
Not relevant

OSHA Hazards : Toxic by ingestion, Toxic by skin absorption, Skin sensitiser,
Corrosive to skin, Corrosive to eyes, Corrosive to respiratory system.

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

CERCLA Reportable Quantity

Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
	1319-77-3	100	*

*: Calculated RQ exceeds reasonably attainable upper limit.

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 : The following components are subject to reporting levels established by SARA Title III, Section 313:

cresol 1319-77-3 1.5 %

Clean Air Act

This product does not contain any hazardous air pollutants (HAP), as defined by the U.S. Clean Air Act Section 112 (40 CFR 61).

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

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

cresol 1319-77-3 1.5 %

Clean Water Act

The following Hazardous Substances are listed under the U.S. CleanWater Act, Section 311, Table 116.4A:

cresol	1319-77-3	1.5 %
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The following Hazardous Chemicals are listed under the U.S. CleanWater Act, Section 311, Table 117.3:

cresol	1319-77-3	1.5 %
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This product does not contain any toxic pollutants listed under the U.S. Clean Water Act Section 307

Massachusetts Right To Know

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

Pennsylvania Right To Know

tris(methylphenyl) phosphite	25586-42-9	90 - 100 %
cresol	1319-77-3	1 - 5 %

New Jersey Right To Know

tris(methylphenyl) phosphite	25586-42-9	90 - 100 %
cresol	1319-77-3	1 - 5 %

California Prop 65

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

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

TSCA : On TSCA Inventory

DSL : This product contains one or several components listed in the Canadian NDSL.

AICS :
: On the inventory, or in compliance with the inventory

NZIoC : On the inventory, or in compliance with the inventory

ENCS : On the inventory, or in compliance with the inventory

ISHL : On the inventory, or in compliance with the inventory

KECI : Not in compliance with the inventory

PICCS :
: Not in compliance with the inventory

IECSC :
: On the inventory, or in compliance with the inventory

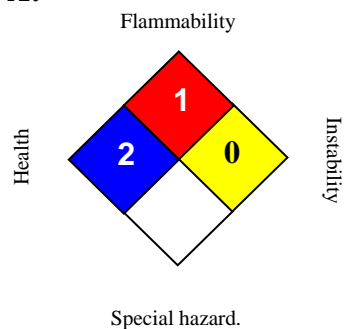
Inventories

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

SECTION 16. OTHER INFORMATION

Further information

NFPA:



HMIS III:

HEALTH	2
FLAMMABILITY	1
PHYSICAL HAZARD	0

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

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

Carechem24 International Worldwide Coverage - Addivant

Emergency Phone Numbers:

<u>Europe:</u>	All European Countries	+44 (0) 1235 239 670
<u>Asia Pacific:</u>	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

<u>Middle East / Africa:</u>	Arabic speaking countries	+44 (0) 1235 239 671
	All other countries	+44 (0) 1235 239 670
<u>America</u>	United States / Canada	001866 928 0789
<u>Latin America:</u>	Brazil	+55 113 711 9144
	All other countries	+44 (0) 1235 239 670
	Mexico	+52 555 004 8763

SAFETY DATA SHEET

Section 1. Identification

Product identifier : m-Cresol 70
Material Number : 00036943
Chemical name : m/p-cresol
Synonym : m-p Cresol; m-/p-Cresol
Chemical family : phenol and cresol
Identified uses : Polymerization. Intermediate.
Supplier/Manufacturer : LANXESS Corporation
Product Safety & Regulatory Affairs
111 RIDC Park West Drive
Pittsburgh, PA 15275-1112
USA

For information: US/Canada (800) LANXESS
International +1 412 809 1000

In case of emergency : Chemtrec (800) 424-9300
International (703) 527-3887
Lanxess Emergency Phone (800) 410-3063.

Section 2. Hazards identification

HAZCOM Standard Status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Physical state : Liquid.

Color : Red. [Light]

Classification of the substance or mixture : FLAMMABLE LIQUIDS - Category 4
ACUTE TOXICITY: ORAL - Category 3
ACUTE TOXICITY: SKIN - Category 3
SKIN CORROSION/IRRITATION - Category 1
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 1
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) [lungs] - Category 1
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) [Narcotic effects] - Category 3
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) [kidneys, liver, nervous system and spleen] - Category 2

Hazard pictograms :



Signal word : Danger

Hazard statements : Combustible liquid. Toxic if swallowed or in contact with skin. Causes severe skin burns and eye damage. Causes damage to organs. (lungs) May cause drowsiness and dizziness. May cause damage to organs through prolonged or repeated exposure. (kidneys, liver, nervous system, spleen)

Hazard Not Otherwise Classified (HNOC) : Causes digestive tract burns.

Precautionary statements

Prevention : Wear protective gloves/clothing and eye/face protection. Keep away from flames and hot surfaces. - No smoking. Use only in a well-ventilated area. Do not breathe vapor. Do not eat, drink or smoke when using this product. Wash hands thoroughly after handling.

Section 2. Hazards identification

- Response** : IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. IF ON SKIN: Wash with plenty of soap and water. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention immediately.
- Storage** : Store locked up. Store in a well-ventilated place. Keep cool.
- Disposal** : Dispose of contents and container in accordance with all local, regional, national and international regulations.
- Supplemental label elements** : Do not taste or swallow. Wash thoroughly after handling. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials and food and drink. Corrosive to digestive tract

Section 3. Composition/information on ingredients

- Substance/mixture** : Mixture
- Chemical name** : m/p-cresol

Ingredient name	%	CAS number
m-Cresol	60 - 66%	108-39-4
p-Cresol	<37%	106-44-5

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of first aid measures

- Eye contact** : Get medical attention immediately. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. In case of contact with eyes, flush eyes with plenty of water for at least 30 minutes. Chemical burns must be treated promptly by a physician.
- Inhalation** : Get medical attention immediately. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. If not breathing, if breathing is irregular or respiratory arrest occurs, provide artificial respiration, or oxygen by a trained professional, using a pocket type respirator.
- Skin contact** : In case of contact, flush skin with plenty of water for at least 30 minutes. Get medical attention immediately. Immediately remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Wash clothing before reuse. Clean shoes thoroughly before reuse. Wash off with polyethylene glycol and afterwards with plenty of water. If polyethylene glycol is not available, wash off with plenty of soap and water. Wash clothing and shoes before reuse.
- Ingestion** : Get medical attention immediately. Wash out mouth with water. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Chemical burns must be treated promptly by a physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Potential acute health effects

Section 4. First aid measures

- Eye contact** : Causes serious eye damage.
- Inhalation** : Inhalation is unlikely due to the low vapor pressure. Odor is detectable at low concentrations. Can cause central nervous system (CNS) depression. May give off gas, vapor or dust that is very irritating or corrosive to the respiratory system.
- Skin contact** : Causes severe burns. Toxic in contact with skin.
- Ingestion** : Toxic if swallowed. Corrosive to the digestive tract. Causes burns. Can cause central nervous system (CNS) depression. May cause burns to mouth, throat and stomach.

Over-exposure signs/symptoms

- Eye contact** : Corrosive with symptoms of reddening, tearing, swelling, burning and possible permanent damage.
- Inhalation** : Corrosive with symptoms of coughing, burning, ulceration, and pain. May cause nervous system effects which can include symptoms of dizziness, incoordination, headache, numbness, and/or confusion. Symptoms include: nausea, ringing in the ears, vision effects, muscle weakness, weak pulse, irregular respiration, circulatory effects, shock, respiratory failure, unconsciousness
- Skin contact** : Contact may cause prickling and intense burning followed by local anesthesia. Skin may initially show white discoloration.
- Ingestion** : Corrosive with symptoms of coughing, burning, ulceration, and pain. Abdominal pain, nausea, vomiting, diarrhoea. In extreme case it may cause serious damage to health. May cause nervous system effects which can include symptoms of dizziness, incoordination, headache, numbness, and/or confusion.

Potential chronic health effects

Readily absorbed by the gastrointestinal tract causing systemic effects. May cause damage to organs through prolonged or repeated exposure.

- Notes to physician** : Treat symptomatically. No specific treatment.
- Protection of first-aiders** : If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

- Suitable extinguishing media** : Use dry chemical, CO₂, water spray (fog) or foam.
- Unsuitable extinguishing media** : Do not use water jet.

Specific hazards arising from the chemical : Combustible liquid. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. Runoff to sewer may create fire or explosion hazard. Toxic and irritating gases/fumes may be given off during burning or thermal decomposition. Water runoff from fire fighting may be corrosive.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. If this is impossible, withdraw from area and allow fire to burn. Fight fire from protected location or maximum possible distance.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

- Personal precautions, protective equipment and emergency procedures** : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Do not breathe vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.
- Environmental precautions** : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).
- Methods and materials for containment and cleaning up** : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Approach release from upwind. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal. Prevent entry into sewers, water courses, basements or confined areas.

Section 7. Handling and storage

Precautions for safe handling

- Protective measures** : Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Empty containers retain product residue and can be hazardous. Do not reuse container. Remove contaminated clothing and protective equipment before entering eating areas. Workers should wash hands and face before eating, drinking and smoking. Put on appropriate personal protection equipment. Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed.
- Conditions for safe storage** : Do not store below the following temperature: 10°C (50°F). Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. Empty containers retain product residue and can be hazardous. Do not reuse container. If the water content is below approximately 0.3% and the temperature exceeds 268 F (120 C), violent corrosion of aluminum and its alloys may occur.

Section 8. Exposure controls/personal protection

Occupational exposure limits

Ingredient name	Exposure limits
m-Cresol	ACGIH TLV (United States, 6/2013). Absorbed through skin. TWA: 20 mg/m ³ 8 hours. Form: Inhalable fraction and vapor
p-Cresol	OSHA PEL (United States, 2/2013). Absorbed through skin. TWA: 5 ppm 8 hours. TWA: 22 mg/m ³ 8 hours. ACGIH TLV (United States, 6/2013).

Section 8. Exposure controls/personal protection

Absorbed through skin.
TWA: 20 mg/m³ 8 hours. Form: Inhalable fraction and vapor
OSHA PEL (United States, 2/2013).
Absorbed through skin.
TWA: 5 ppm 8 hours.
TWA: 22 mg/m³ 8 hours.

If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Personal protection

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Respiratory protection : A NIOSH approved air purifying respirator with organic vapor cartridges and particulate prefilter can be used to minimize exposure. A NIOSH approved positive pressure air-supplied respirator is required whenever airborne concentrations are not known or exceed the recommended exposure limit.

Skin protection : Permeation resistant gloves. Neoprene gloves. Rubber gloves. Permeation resistant clothing and foot protection. Neoprene apron

Eye/face protection : Chemical splash goggles or face shield.

Medical Surveillance : Not available.

Section 9. Physical and chemical properties

Physical state : Liquid.
Color : Red. [Light]
Odor : Phenolic.
Odor threshold : Not available.
pH : 4.3 [Conc. (% w/w): 2.5%]
Boiling point : 200 °C (1013 hPa)
Melting point : 10°C (50°F)
Flash point : Closed cup: 86°C (186.8°F) [DIN 51758]
Evaporation rate : Not available.
Explosion limits : Not available.
Vapor pressure : 0,147 hPa (25°C)
Density : 1.04 g/cm³
Specific gravity (Relative density) : Not available.
Solubility : 24.4 g/l (water)
Partition coefficient: n-octanol/water : (measured)
Vapor density : Not available.
Viscosity : Kinematic: 0.186 cm²/s

Section 9. Physical and chemical properties

- Ignition temperature : >500°C
Auto-ignition temperature : Not available.
Decomposition temperature : Not available.

Section 10. Stability and reactivity

- Reactivity : No specific test data related to reactivity available for this product or its ingredients.
Chemical stability : The product is stable.
Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.
Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.
Incompatible materials : strong acids and oxidizing agents, Active metals, Nitric acid, oleum
Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

- Information on the likely routes of exposure : Dermal contact. Eye contact. Inhalation. Ingestion.

Potential acute health effects

- Eye contact : Causes serious eye damage.
Inhalation : Inhalation is unlikely due to the low vapor pressure. Odor is detectable at low concentrations. Can cause central nervous system (CNS) depression. May give off gas, vapor or dust that is very irritating or corrosive to the respiratory system.
Skin contact : Causes severe burns. Toxic in contact with skin.
Ingestion : Toxic if swallowed. Corrosive to the digestive tract. Causes burns. Can cause central nervous system (CNS) depression. May cause burns to mouth, throat and stomach.

Symptoms related to the physical, chemical and toxicological characteristics

- Eye contact : Corrosive with symptoms of reddening, tearing, swelling, burning and possible permanent damage.
Inhalation : Corrosive with symptoms of coughing, burning, ulceration, and pain. May cause nervous system effects which can include symptoms of dizziness, incoordination, headache, numbness, and/or confusion. Symptoms include: nausea, ringing in the ears, vision effects, muscle weakness, weak pulse, irregular respiration, circulatory effects, shock, respiratory failure, unconsciousness
Skin contact : Contact may cause prickling and intense burning followed by local anesthesia. Skin may initially show white discoloration.
Ingestion : Corrosive with symptoms of coughing, burning, ulceration, and pain. Abdominal pain, nausea, vomiting, diarrhoea. In extreme case it may cause serious damage to health. May cause nervous system effects which can include symptoms of dizziness, incoordination, headache, numbness, and/or confusion.

Potential chronic health effects

Short term exposure

- Potential immediate effects : Not available.

Long term exposure

- Potential delayed effects : Not available.
General : Readily absorbed by the gastrointestinal tract causing systemic effects. May cause damage to organs through prolonged or repeated exposure.
Carcinogenicity : No known significant effects or critical hazards.
Mutagenicity : No known significant effects or critical hazards.
Teratogenicity : No known significant effects or critical hazards.

Section 11. Toxicological information

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure	Test
m-Cresol	LD50 Oral	Rat - Male	242 mg/kg	-	OECD 401 Acute Oral Toxicity
p-Cresol	LD50 Oral	Rat - Male	207 mg/kg	-	-
m-Cresol	LD50 Dermal	Rabbit	2050 mg/kg	-	-
	LD50 Dermal	Rat	1100 mg/kg	-	-
p-Cresol	LD50 Dermal	Rabbit	301 mg/kg	-	-
m-Cresol	LC50 Inhalation Dusts and mists	Rat - Male	>710 mg/m ³	1 hours	*
p-Cresol	LC50 Inhalation Dusts and mists	Rat - Male	>710 mg/m ³	1 hours	*

Conclusion/Summary : m-Cresol:* Dosage caused no mortality
p-Cresol:* Dosage caused no mortality

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
m-Cresol	Skin - Erythema/Eschar	Rabbit	4	-	72 hours
	Skin - Edema	Rabbit	4	-	72 hours
p-Cresol	Eyes - Cornea opacity	Rabbit	4	-	72 hours
	Eyes - Iris lesion	Rabbit	2	-	72 hours
	Skin - Erythema/Eschar	Rabbit	4	-	72 hours
	Skin - Edema	Rabbit	4	-	72 hours
	Eyes - Redness of the conjunctivae	Rabbit	3	-	72 hours

Conclusion/Summary

Skin : m-Cresol:corrosive
p-Cresol:Corrosive.

Eyes : m-Cresol:Corrosive.
p-Cresol:Severe irritant

Sensitization

Product/ingredient name	Route of exposure	Species	Result
p-Cresol	skin	Guinea pig	Not sensitizing

Chronic toxicity

Product/ingredient name	Result	Species	Dose	Exposure
m-Cresol	Sub-chronic NOAEL Oral	Rat	>50 mg/kg	13 weeks; 7 days per week
p-Cresol	Sub-chronic NOAEL Oral	Rat	>50 mg/kg	13 weeks; 7 days per week

Mutagenicity

Section 11. Toxicological information

Product/ingredient name	Test	Experiment	Result
m-Cresol	OECD 471 Bacterial Reverse Mutation Test	Experiment: In vitro Subject: Bacteria	Negative
p-Cresol	OECD 471 Bacterial Reverse Mutation Test	Experiment: In vitro Subject: Bacteria	Negative
	OECD 478 Genetic Toxicology: Rodent Dominant Lethal Test	Experiment: In vivo Subject: Mammalian-Animal	Negative

Carcinogenicity

Conclusion/Summary : There was equivocal evidence of carcinogenic activity of 60:40 m-/p-cresol in male rats based on marginally increased incidence of renal tubule adenoma. There was some evidence of carcinogenic activity of 60:40 m-/p-cresol in female mice.

Product/ingredient name	CAS #	IARC	NTP	OSHA
m-p Cresol; m-/p-Cresol		Not classified.	Not classified.	Not classified.
m-Cresol	108-39-4	Not classified.	Not classified.	Not classified.
p-Cresol	106-44-5	Not classified.	Not classified.	Not classified.

Reproductive toxicity

Conclusion/Summary : m-Cresol:NOAEL Developmental toxicity: 450 mg/kg bw/day
NOAEL Maternal toxicity: 175 mg/kg bw/day

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
m-p Cresol; m-/p-Cresol	Category 1 Category 3	Not determined Not applicable.	lungs Narcotic effects
m-Cresol	Category 1 Category 3	Not determined Not applicable.	lungs Narcotic effects
p-Cresol	Category 1	Not determined	lungs

Specific target organ toxicity (repeated exposure)

Name	Category	Route of exposure	Target organs
m-p Cresol; m-/p-Cresol	Category 2	Not determined	kidneys, liver, nervous system and spleen
m-Cresol	Category 2	Not determined	kidneys, liver, nervous system and spleen

Acute toxicity estimates

Route	ATE value (Acute Toxicity Estimates)
Oral	227.9 mg/kg
Dermal	558.4 mg/kg

Section 12. Ecological information

Toxicity

Product/ingredient name	Test	Result	Species	Exposure
m-Cresol	-	NOEC 13 mg/l	Algae - Microcystis aeruginosa	8 days
	-	Acute EC50 >99.5 mg/l	Daphnia - Daphnia pulicaria	24 hours
	OECD 209 Activated Sludge, Respiration Inhibition Test	Acute IC50 461.4 mg/l	Bacteria	3 hours
	-	Acute LC50 7.6 mg/l	Fish - Salvelinus	96 hours

Section 12. Ecological information

p-Cresol	-	Acute LC50 7.6 mg/l	fontinalis Fish - Salvelinus fontinalis	96 hours
	*	Chronic NOEC 1 mg/l	Daphnia - Daphnia magna	21 days
	OECD 210 Fish, Early-Life Stage Toxicity Test	Chronic NOEC 3 mg/l Marine water	Fish - Pimephales promelas	32 days
	DIN 38412, part 9 (growth rate)	NOEC 4.6 mg/l	Algae - Scenedesmus subspicatus	48 hours
	DIN 38412, part 11	Acute EC50 7.7 mg/l	Daphnia - Daphnia magna	48 hours
	DIN 38412, part 9 (growth rate)	Acute IC50 21 mg/l	Algae - Scenedesmus subspicatus	48 hours
	OECD 209 Activated Sludge, Respiration Inhibition Test	Acute IC50 439 mg/l	Bacteria	2 hours
	- -	Acute LC50 4.4 mg/l Chronic NOEC 1 mg/l	Fish - Salmo trutta Daphnia - Daphnia magna	96 hours 21 days
OECD 210 Fish, Early-Life Stage Toxicity Test	Chronic NOEC 1.35 mg/l	Fish - Pimephales promelas	32 days	

Conclusion/Summary : *Test results on an analogous product

Persistence and degradability

Product/ingredient name	Test	Result	Dose	Inoculum
m-Cresol	OECD 302B Inherent Biodegradability: Zahn-Wellens/EMPA Test	96 % - Readily - 10 days	-	-
	OECD 301D Ready Biodegradability - Closed Bottle Test	90 % - Readily - 28 days	-	-
	OECD 301C Ready Biodegradability - Modified MITI Test (I)	80 to 95 % - Readily - 40 days	-	-
p-Cresol	OECD 302B Inherent Biodegradability: Zahn-Wellens/EMPA Test	96 % - Inherent - 5 days	-	-
	OECD 301C Ready Biodegradability - Modified MITI Test (I)	80 to 95 % - Readily - 40 days	-	-

Conclusion/Summary : Not available.

Product/ingredient name	Aquatic half-life	Photolysis	Biodegradability
m-Cresol	-	50%; 0.25 day(s)	Readily
p-Cresol	-	50%; 0.25 day(s)	Readily

Section 12. Ecological information

Bioaccumulative potential

Product/ingredient name	LogP _{ow}	BCF	Potential
m-Cresol	1.96	17 to 20	low
p-Cresol	1.94	17 to 20	low

Mobility in soil

Soil/water partition coefficient (K_{oc}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Vapor from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Waste disposal should be in accordance with existing federal state, provincial and or local environmental controls laws.

RCRA classification : U052: When discarded in its purchased form, this product is a listed RCRA hazardous waste and should be managed as a hazardous waste. (40 CFR 261.20-24) Under RCRA, it is the responsibility of the product user to determine at the time of disposal, whether a material containing the product or derived from the product, should be classified as a hazardous waste. (40 CFR 261.20-24)

Section 14. Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
DOT Classification	UN2076	CRESOLS, LIQUID	6.1 (8)	II	 	IB8, IP2, IP4, T7, TP2, T3
IMDG Class	UN2076	CRESOLS, LIQUID	6.1 (8)	II	 	Emergency schedules (EmS) F-A, S-B
IATA-DGR Class	UN2076	CRESOLS, LIQUID	6.1 (8)	II	 	Passenger aircraft 653: 1 L Cargo aircraft 660: 30 L

PG* : Packing group

RQ : 157 lbs

Section 15. Regulatory information

SARA 311/312 : Fire hazard
 Immediate (acute) health hazard
 Delayed (chronic) health hazard

SARA Title III Section 302 : None
 Extremely Hazardous Substances

SARA Title III Section 313 Toxic Chemicals	Ingredient name	CAS number	Concentration (%)
	m-Cresol	108-39-4	60 - 66%
	p-Cresol	106-44-5	<37%

US EPA CERCLA Hazardous Substances (40 CFR 302)	Ingredient name	CAS number	RQ
	m-Cresol	108-39-4	100 lbs. (45.4 kg)
	p-Cresol	106-44-5	100 lbs. (45.4 kg)

State regulations

The following chemicals are specifically listed by individual states; other product specific health and safety data in other sections on the SDS may also be applicable for state requirements. For details on your regulatory requirements you should contact the appropriate agency in your state.

Ingredient name	CAS number	State Code	Concentration (%)
m-Cresol	108-39-4	MA - S, NJ - HS, PA - RTK HS	60 - 66%
p-Cresol	106-44-5	MA - S, NJ - HS, PA - RTK HS	<37%

Massachusetts Substances: MA - S

Massachusetts Extraordinary Hazardous Substances: MA - Extra HS

New Jersey Hazardous Substances: NJ - HS

Pennsylvania RTK Hazardous Substances: PA - RTK HS

Pennsylvania Special Hazardous Substances: PA - Special HS

California Prop. 65

To the best of our knowledge, this product does not contain any of the listed chemicals, which the state of California has found to cause cancer, birth defects or other reproductive harm.

U.S. Toxic Substances Control Act : Listed on the TSCA Inventory.

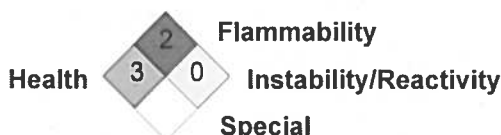
Section 16. Other information

Hazardous Material Information System	Health	3
	Flammability	2
	Physical hazards	0

0=Insignificant 1=Slight 2=Moderate 3=High 4=Extreme
 *=Chronic

The customer is responsible for determining the PPE code for this material. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

National Fire Protection Association (U.S.A.) :



Section 16. Other information

0= Minimal 1=Slight 2=Moderate 3=Serious 4=Severe

LANXESS' method of hazard communication is comprised of Product Labels and Safety Data Sheets. HMIS and NFPA ratings are provided by LANXESS as a customer service.


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Date of issue : 02-20-2014
Date of previous issue : No previous validation
Version : 1
Product Safety and Regulatory Affairs

Indicates information that has changed from previously issued version.

Notice to reader

This information is furnished without warranty, express or implied. This information is believed to be accurate to the best knowledge of LANXESS Corporation. The information in this SDS relates only to the specific material designated herein. LANXESS Corporation assumes no legal responsibility for use of or reliance upon the information in this SDS.

Material Safety Data Sheet		
ALBRITE PCL3		
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SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Trade name : ALBRITE PCL3

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
8 Cedar Brook Drive
Cranbury, NJ, 08512-7500, US
Telephone number: 800-973-7873

1.4 Emergency telephone

USA: FOR EMERGENCIES INVOLVING A SPILL, LEAK, FIRE, EXPOSURE OR ACCIDENT CONTACT:
CHEMTREC (800-424-9300 within the United States or 703-527-3887 for International collect calls) or
Solvay CAERS (Communication and Emergency Response System at 800-916-3232)

SECTION 2: Hazards identification

2.1 Emergency overview

Appearance : Form : fuming
Physical state: liquid
Color: colorless
Odor: pungent

Warning statements : DANGER!
MAY BE FATAL IF INHALED. HIGHLY TOXIC IF SWALLOWED. HARMFUL IF ABSORBED THROUGH SKIN. CORROSIVE. CAUSES SEVERE BURNS. REACTS WITH WATER OR MOIST AIR RELEASING HYDROCHLORIC AND PHOSPHORIC ACIDS. MAY CAUSE FLASH FIRES.

2.2 Potential Health Effects

Inhalation effect : Highly toxic if inhaled. May cause a burning sensation, coughing, wheezing, shortness of breath, laryngitis, lung irritation, headache, dizziness, nausea, vomiting, fluid in lungs, death.

Skin effect : Corrosive. Causes burns.

Eye effect : Corrosive. Causes permanent damage to the cornea, irreversible eye damage. Vapor can cause redness, irritation.

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Ingestion effect : Highly toxic if ingested. Causes corrosion, burns to mouth and esophagus, nausea, vomiting, abdominal pain, chest pain.

Chronic effects : Prolonged contact can cause kidney damage.


This product does not contain any ingredient designated by IARC, NTP, ACGIH or OSHA as probable or suspected human carcinogens.

SECTION 3: Composition/information on ingredients**3.1 Information on Components and Impurities****OSHA Hazardous Ingredients and Impurities**

Chemical Name	Identification number CAS-No.	Concentration [%]
Phosphorous trichloride	7719-12-2	> 99.5
Phosphoryl Chloride	10025-87-3	< 0.5

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.
- If inhaled : Move to fresh air.
If breathing is difficult, give oxygen.
If breathing has stopped, apply artificial respiration.
Immediate medical attention is required.
- Skin contact : After contact with skin, first remove product with a dry cloth and then wash the skin with plenty of water.
Seek medical advice.
Remove contaminated clothing and shoes.
- Eye contact : Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
Get immediate medical advice/ attention.
Continue the irrigation for an additional 15 minutes if a physician is not immediately available
- Ingestion : Do NOT induce vomiting.
Do not give anything to drink.
Take victim immediately to hospital.

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4.2 Most important symptoms and effects, both acute and delayed

Risks : 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 : not applicable

Autoignition temperature : no data available

Flammability / Explosive limit : no data available

5.1 Extinguishing media

Suitable extinguishing media : Dry sand
Carbon dioxide (CO₂)
Dry chemical

Unsuitable extinguishing media : Water
Water mist
Water spray
Foam


5.2 Special hazards arising from the substance or mixture

Specific hazards during fire fighting : Not combustible.
Reacts violently with water.
Under fire conditions:
Corrosive or suffocating vapors are released.
Highly toxic gases are released.
Hazardous decomposition products formed under fire conditions.
Phosphorus trihydride (phosphine)

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 : Evacuate personnel to safe areas.
Stay upwind.
Collect contaminated fire extinguishing water separately. This must not be discharged into drains.

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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.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Personal precautions, protective equipment and emergency procedures : Evacuate personnel to safe areas.
 Stay upwind.
 Ventilate the area.
 Remove all incompatible materials as quickly as possible
 Avoid contact with the skin and the eyes.
 Do not breathe vapor.
 Use personal protective equipment.
 For personal protection see section 8.
 The product must only be handled by specifically trained employees.
 If spillage occurs on the public highway, indicate the danger and notify the authorities (police, fire service).

6.2 Environmental precautions

Environmental precautions : Do not let product enter drains.
 Do not flush into surface water or sanitary sewer system.
 Collect contaminated fire extinguishing water separately. This must not be discharged into drains.
 Spills may be reportable to the National Response Center (800-424-8802) and to state and/or local agencies

Risk Management Measures to control release to soil : Pick up contaminated soil.


6.3 Methods and materials for containment and cleaning up

Recovery : Stop leak if safe to do so.
 Dam up with sand or inert earth (do not use combustible materials).
 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 : Wash with sodium carbonate solution (5% Na₂CO₃).
 Recover the cleaning water for subsequent disposal.
 Decontaminate tools, equipment and personal protective equipment in a segregated area.

Disposal : Dispose of in accordance with local regulations.

Prohibition : Never return spills in original containers for re-use.

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6.4 Reference to other sections

no data available

SECTION 7: Handling and storage

7.1 Precautions for safe handling

- Technical measures : Vapor extraction at source
Use product only in closed system.
Blanket with inert gas.
acid resisting floor
- Advice on safe handling and usage : Keep away from heat and flame.
Avoid the formation or spread of mists in the atmosphere.
All pipes used to transfer the product must not contain any water or oxygen.
Never add water to this product.
Do not use compressed air for filling, discharging or handling.
- The product must only be handled by specifically trained employees.
Avoid inhalation, ingestion and contact with skin and eyes.
Avoid all contact with water or humidity.
Handle under nitrogen, protect from moisture.
- ** 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.

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7.2 Conditions for safe storage, including any incompatibilities

Technical Measures for storage : The floor of the storage area should be impermeable and designed to form a water-tight basin.

Storage conditions

Recommended : Keep in a dry, cool and well-ventilated place.
Keep only in the original container.
Keep tightly closed.
Keep under nitrogen.
Protect from moisture.
Store at room temperature.

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

Incompatible products : humid air and water
Metals
Strong oxidizing agents
Alkalis and caustic products.
Organic materials

Packaging Measures

Packaging conditions : Steel drum varnished with an epoxyphenolic resin.

Packaging materials—Recommended : Keep only in the original container.


Packaging materials—To be avoided : Plastic materials., All other materials.

Storage stability

Storage temperature : no data available

7.3 Specific end use(s)

no data available

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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. While developing safe handling procedures, do not overlook the need to clean equipment and piping systems for maintenance and repairs. Waste resulting from these procedures should be handled in accordance with Section 13: Disposal Considerations.

Assistance with selection, use and maintenance of worker protection equipment is generally available from equipment manufacturers.

8.1 Control parameters

Ingredients with workplace control parameters

Ingredients	Value type	Value	Basis
Phosphorous trichloride	TWA	0.2 ppm 1.5 mg/m ³	NIOSH
Phosphorous trichloride	ST	0.5 ppm 3 mg/m ³	NIOSH
Phosphorous trichloride	TWA	0.2 ppm	ACGIH
	Eye, skin, & Upper Respiratory Tract irritation		
Phosphorous trichloride	STEL	0.5 ppm	ACGIH
	Eye, skin, & Upper Respiratory Tract irritation		
Phosphorous trichloride	TWA	0.5 ppm 3 mg/m ³	OSHA Z-1
	The value in mg/m ³ is approximate.		
Phosphorous trichloride	TWA	0.2 ppm 1.5 mg/m ³	OSHA Z-1-A
Phosphorous trichloride	STEL	0.5 ppm 3 mg/m ³	OSHA Z-1-A
Phosphoryl Chloride	TWA	0.1 ppm 0.6 mg/m ³	NIOSH
Phosphoryl Chloride	ST	0.5 ppm 3 mg/m ³	NIOSH
Phosphoryl Chloride	TWA	0.1 ppm	ACGIH
	Upper Respiratory Tract irritation		

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Phosphoryl Chloride	TWA	0.1 ppm 0.6 mg/m3	OSHA Z-1-A

NIOSH IDLH (Immediately Dangerous to Life or Health Concentrations)

Ingredients	CAS-No.	Concentration
Phosphorous trichloride	7719-12-2	25 parts per million

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 :

Used in closed system
Vapor extraction at source
effective ventilation in all processing areas

Personal protective equipment

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.

Always wear a self-contained breathing apparatus or full-face airline respirator when using this chemical.
Use NIOSH approved respiratory protection.
Have available emergency self-contained breathing apparatus or full-face airline respirator when using this chemical.

Hand protection : Acid-resistant protective 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:

Safety glasses with side-shields
In case of contact through splashing:
Face-shield

Skin and body protection : Acid resistant boots.

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Acid resistant apparel.
 Complete head face and neck protection
 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.

Always have on hand a first-aid kit, together with proper instructions.
 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 : fuming
 Physical state: liquid
 Color: colorless

Odor : pungent

Odor Threshold : no data available

pH : no data available

Freezing point : -170 °F (-112 °C)

Boiling point/boiling range : 167 °F (75 °C) (760 mmHg (1,013.25 hPa))

Flash point : not applicable

Evaporation rate (Butylacetate = 1) : no data available

Flammability (solid, gas) : no data available

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Flammability (liquids)	:	no data available
Flammability / Explosive limit	:	no data available
Autoignition temperature	:	no data available
Vapor pressure	:	100.00 mmHg (133.32 hPa) (77 °F (25 °C))
Vapor density	:	4.75
Density	:	1.58 g/cm ³ (140 °F (60 °C)) Relative density : 1.58 (140 °F (60 °C))
Solubility	:	Water solubility : Reacts violently with water.
Partition coefficient: n-octanol/water	:	no data available
Thermal decomposition	:	no data available
Viscosity	:	no data available
Explosive properties	:	no data available
Oxidizing properties	:	no data available

9.2 Other information

Molecular weight	:	137.32 g/mol
Reactions with water / air	:	Reacts violently with water.

SECTION 10: Stability and reactivity**10.1 Reactivity**

no data available

10.2 Chemical stability

Chemical stability : Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

Polymerization : Hazardous polymerization does not occur.

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10.4 Conditions to avoid

Conditions to avoid : Keep away from heat and sources of ignition.
Exposure to moisture.

10.5 Incompatible materials

Materials to avoid : Acids
Air
Alcohols
Alkali metals
Amines
Bases
Combustible material
Humid air
Ketones
Metals
Organic materials
Strong oxidizing agents
Water

10.6 Hazardous decomposition products

Decomposition products : On combustion or on thermal decomposition (pyrolysis), releases:
acids
PHOSPHINE

On contact with water, forms:
harmful and corrosive vapors.
Phosphoric acid
Oxides of phosphorus
hydrochloric acid

SECTION 11: Toxicological information**11.1 Information on toxicological effects****Acute toxicity**

Acute oral toxicity : LD50 : 18 mg/kg - rat

Acute inhalation toxicity : LC50 - 4 h : 0.226 mg/l - rat

Acute dermal toxicity : no data available

Acute toxicity (other routes of administration) : no data available

Skin corrosion/irritation

Skin irritation : rabbit
Corrosive

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Serious eye damage/eye irritationEye irritation : rabbit
Corrosive**Respiratory or skin sensitization**

Sensitization : no data available

MutagenicityGenotoxicity in vitro : Ames test
negative

Genotoxicity in vivo : no data available

Carcinogenicity

Carcinogenicity : no data 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 : no data available

STOT

STOT-single exposure : no data available

STOT-repeated exposure : no data available

Aspiration toxicity


Aspiration toxicity : no data available

SECTION 12: Ecological information**12.1 Toxicity**

no data available

12.2 Persistence and degradability

no data available

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12.3 Bioaccumulative potential

no data available

12.4 Mobility in soil

no data available

12.5 Results of PBT and vPvB assessment

no data available

12.6 Other adverse effects

no data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product Disposal

Advice on Disposal : Chemical additions, processing or otherwise altering this material may make the waste management information presented in this MSDS 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 : EPA:
Hazardous Waste – YES

RCRA:
D002 - Corrosive waste – (C)
D003 - Reactive waste – (R)
D004

Advice on cleaning and disposal of packaging

Advice : Empty the packaging completely prior to disposal.

Other data : Dispose of in accordance with local regulations.

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 1809

14.2 Dangerous Good Description UN 1809 PHOSPHORUS TRICHLORIDE, 6.1 (8), I

14.3 Transport hazard class 6.1

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Subsidiary hazard class 8

14.4 Packing group

Packing group I
 Label(s) 6.1 - TOXIC INHALATION HAZARD (8)
 ERG No 137

14.5 Environmental hazards

Marine pollutant NO

14.6 Special precautions for user

This product contains one or more ingredients identified as a hazardous substance in Appendix A of 49 CFR 172.101. The product quantity, in one package, which triggers the RQ requirements under 49 CFR for each hazardous substance is shown.

Reportable quantities : RQ substance: Phosphorus Trichloride
 RQ limit for substance: 1,000 lb
 RQ limit for product: 1,005 lb

TDG**14.1 UN number** UN 1809**14.2 Dangerous Good Description** UN 1809 PHOSPHORUS TRICHLORIDE, 6.1 (8), I**14.3 Transport hazard class** 6.1

Subsidiary hazard class 8

14.4 Packing group

Packing group I
 Label(s) 6.1 (8)
 ERG No 137

14.5 Environmental hazards

Marine pollutant NO

14.6 Special precautions for user

For personal protection see section 8.

IMDG**14.1 UN number** UN 1809**14.2 Dangerous Good Description** UN 1809 PHOSPHORUS TRICHLORIDE, 6.1 (8), I**14.3 Transport hazard class** 6.1


Subsidiary hazard class 8

14.4 Packing group

Packing group I
 Label(s) 6.1 (8)
 EmS F-A , S-B

14.5 Environmental hazards

Marine pollutant NO

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14.6 Special precautions for user

For personal protection see section 8.


IATA

<u>14.1 UN number</u>	UN 1809
<u>14.2 Dangerous Good Description</u>	Not permitted for transport
<u>14.3 Transport hazard class</u>	Not permitted for transport
<u>14.4 Packing group</u>	
Packing instruction (cargo aircraft)	Not permitted for transport
Packing instruction (passenger aircraft)	Not permitted for transport
<u>14.5 Environmental hazards</u>	NO
Marine pollutant	

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.

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SECTION 15: Regulatory information

15.1 Notification status

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

15.2 Federal Regulations


SARA 311/312 Hazards

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

SARA 313 : 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.

SARA 302 : The following components are subject to reporting levels established by SARA Title III, Section 302:

Ingredients	CAS-No.	Threshold planning quantity	Remarks
Phosphorous trichloride	7719-12-2	1000 lb	
Phosphoryl Chloride	10025-87-3	500 lb	

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EPCRA - Emergency Planning and Community Right-to-Know

CERCLA Reportable Quantity

Ingredients	CAS-No.	Reportable quantity
Arsenic	7440-38-2	1 lb
Unlisted hazardous wastes - Characteristic of Corrosivity		100 lb
Unlisted hazardous wastes - Characteristic of Reactivity		100 lb
Phosphorous trichloride	7719-12-2	1000 lb
Phosphoryl Chloride	10025-87-3	1000 lb

SARA 304 Reportable Quantity

Ingredients	CAS-No.	Reportable quantity
Phosphorous trichloride	7719-12-2	1000 lb
Phosphoryl Chloride	10025-87-3	1000 lb

SARA 302 Reportable Quantity

Ingredients	CAS-No.	Reportable quantity
Phosphorous trichloride	7719-12-2	1000 lb
Phosphoryl Chloride	10025-87-3	1000 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

California Prop 65 : WARNING! This product contains a chemical known in the State of California to cause cancer.
 Arsenic
 No Significant Risk Levels (NSRLs) have been established for the following:
 Arsenic
 Value : 0.06 micrograms per day Form of exposure : Inhalation
 Arsenic
 Value : 10 micrograms per day


SECTION 16: Other information

NFPA-Classification

Health : 3 serious
 Flammability : 0 minimal
 Instability or Reactivity : 2 moderate

HMIS-Classification

Health : 3 serious
 Flammability : 0 minimal
 Reactivity : 2 moderate

Material Safety Data Sheet		
ALBRITE PCL3		
Revision: 1.00 US (EN)	Issuing date: 03/19/2014	

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

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
WHMIS	: Workplace Hazardous Materials Information System
NTP	: National Toxicology Program
IARC	: International Agency for Research on Cancer
Solvay OEL	: SAEL (Solvay Acceptable Exposure Limit)
NIOSH	: National Institute for Occupational Safety and Health
NFPA	: National Fire Protection Association
HMIS	: Hazardous Materials Identification System (Paint & Coating)

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information, and belief at the date of its publication. Such information is only given as a guidance to help the user handle, use, process, store, transport, dispose, and release the product in satisfactory safety conditions and is not to be considered as a warranty or quality specification. It should be used in conjunction with technical sheets but do not replace them. Thus, the information only relates to the designated specific product and may not be applicable if such product is used in combination with other materials or in another manufacturing process, unless otherwise specifically indicated. It does not release the user from ensuring he is in conformity with all regulations linked to its activity.

Attachment E - Potential-to-Emit Estimates

Project Description

Addivant USA, LLC ("Addivant") is planning to add a new product variant to an existing chemical manufacturing unit at the South Plant facility. Addivant will be manufacturing a variation of TTP called Tri-Tolyl Phenylphosphite No Phenol (TTP NP). This change will utilize the same existing reactor and much of the same equipment to make a slightly different product. TTP consumed a mixture of 85% Cresol and 15% Phenol, while TTP NP will consume 100% Cresol.

Emission calculations were conducted for equipment affected by the change from TTP to TTP NP; these include PCI3 unloading and storage, cresol unloading, tank T-228, molecular sieve, reactor, product loading, and fugitive emissions.

Further description of the changes in emissions, if any, within each step are included within each tab. In general, the purpose of this calculation spreadsheet is to determine the change in emissions from the production of TTP to TTP NP. Emission calculations were conducted assuming a maximum annual throughput of TTP NP, based on the limiting factors of a 16 hour batch time and a reactor capacity of 15,000 pounds of TTP NP per batch.

Process Data

TTPNP produced per 16-hour batch	15,000 lbs / batch	
Annual Potential Batches for TTPNP	548 batches	(8760 hr / 16 hrs per batch)
Total Potential Production of TTPNP	8,212,500 lbs	(15000 lbs * 548 batches)
Amount of Cresol consumed per batch TTPNP	13,758 lbs/ batch	
Total lb Cresol consumed per year TTPNP	7,532,231 lb/year	
Amount of Phosphorous Trichloride consumed per batch TTPNP	5,880 lbs/batch	
Total Phosphorous Trichloride consumed per year TTPNP	3,219,229 lbs/year	
Cresol lb consumed per lb of TTPNP Produced	0.92 lb cresol consumed per lb of TTPNP produced	

		Emissions from TTP Production	Emissions from TTPNP Production	Difference of emissions
PCI3 Unloading and Storage	HCl (lb/hr)	NA	NA	NA
	HCl (ton/yr)	NA	NA	NA
Phenol Unloading	Phenol (lb/hr)	0.08	0.00	-0.08
	Phenol (ton/yr)	1.17E-03	0.00	-1.17E-03
Cresol Unloading	Cresol (lb/hr)	0.05	0.05	0.00
	Cresol (ton/yr)	0.004	0.005	0.001
Tank (T-228)	Phenol (lb/hr)	0.48	0.00	-0.48
	Phenol (ton/yr)	0.01	0.00	-0.01
	Cresol (lb/hr)	0.00	3.22E-06	3.22E-06
	Cresol (ton/yr)	0.00	3.13E-07	3.13E-07
Molecular Sieve	Cresol (lb/hr)	2.14E-02	2.14E-02	0.00
	Cresol (ton/yr)	1.46E-04	1.46E-04	0.00
Reaction	Cresol (lb/hr)	1.25E-04	0.11	0.11
	Cresol (ton/yr)	5.01E-04	0.49	0.49
	HCl (lb/hr)	1.29E-03	0.05	0.05
	HCl (ton/yr)	4.91E-07	0.13	0.13
	Phenol (lb/hr)	2.30E-07	0.00	-2.30E-07
	Phenol (ton/yr)	9.94E-07	0.00	-9.94E-07
	Other VOCs (lb/hr)	2.86E-05	2.86E-05	0.00
	Other VOCs (ton/yr)	2.00E-05	2.00E-05	0.00
Loading Emissions	HCl (lb/hr)	0.38	0.38	0.00
	HCl (ton/yr)	0.12	0.12	0.00
	Other VOCs (lb/hr)	0.03	0.26	0.23
	Other VOCs (ton/yr)	0.01	0.24	0.23
	Phenol(lb/hr)	1.44E-04	0.00	-1.44E-04
	Phenol (ton/yr)	4.41E-05	0.00	-4.41E-05
Fugitive Emissions	HCl (lb/hr)	0.03	0.03	0.00
	HCl (ton/yr)	0.12	0.12	0.00
	Phenol(lb/hr)	0.11	0.00	-0.11
	Phenol (ton/yr)	0.50	0.00	-0.50
	Other VOCs (lb/hr)	0.01	0.02	0.00
	Other VOCs (ton/yr)	0.06	0.07	0.01
	Cresol (lb/hr)	0.35	0.52	0.17
	Cresol (ton/yr)	1.52	2.26	0.74
Total Emissions	Cresol (lb/hr)	0.42	0.70	0.28
	Cresol (ton/yr)	1.52	2.76	1.23
	HCl (lb/hr)	0.41	0.46	0.05
	HCl (ton/yr)	0.24	0.37	0.13
	Phenol (lb/hr)	0.67	0.00	-0.67
	Phenol (ton/yr)	0.51	0.00	-0.51
	Other VOCs (lb/hr)	0.05	0.28	0.23
	Other VOCs (ton/yr)	0.07	0.31	0.23
	Total VOCs (lb/hr)	1.14	0.98	-0.17
	Total VOCs (ton/yr)	2.11	3.06	0.95
	HAPs (lb/hr)	1.09	0.70	-0.35
HAPs (tons/yr)	2.03	2.76	0.85	

Emissions from PCI3 Unloading will not change.

** Other VOCs refers to TTP and DTP for the TTP process, and for the TTPNP process Other VOCs refers to TTPNP.

	Permit Determination				
	Total VOCs (lb/hr)	Total VOCs (ton/yr)	Total VOCs (lbs/day)	Total HAPs (lb/hr)	Total HAPs (tons/yr)
West Virginia Air Permitting Threshold	6.0	10.0	144.0	2.0	5.0
TTPNP Emission Increase	-0.17	0.95	5.21	-0.35	0.85

West Virginia permitting thresholds are 6 (lbs/hr) AND 10 (tons/yr) of any regulated air pollutant OR 144 (lbs/day) of any regulated air pollutant OR 2 (lbs/hr) OR 5 (tons/yr) of aggregated HAP. Total VOCs include Cresol, Phenol, and Other VOC emissions. Total HAPs include Cresol, Phenol, and HCl emissions.

PCl3 Unloading and Tank Emissions

Phosphorous Trichloride (PCl₃) is an existing raw material used in the South Plant for TTP production. Hourly emissions from unloading are de minimis and do not change due all the equipment remaining the same (eg. pump, piping, tanks, and unloading rate). **The annual potential throughput of phosphorous trichloride will not increase due to the new production of TTPNP.** The unloading and storage operations emit PCl₃ vapors to water scrubber MM052, which subsequently reacts with water to generate hydrochloric and phosphorous acid. There is no expected increase in emissions from PCl₃ unloading and storage from the production of TTPNP.

Cresol Unloading

ChemCAD modeling analysis was utilized to simulate the unloading from tanker trucks into the storage tank for a mixture of 60% m-Cresol and 40% p-Cresol. The loading rate is based on a pump capacity of **75 gpm (10 cfm)**, equivalent to **38,062 lb/hr Cresol**. A nitrogen gas blanket on the storage tank is used to maintain a low moisture content of the cresol. The Nitrogen has a flow rate of **2 cfm**. The vapor displacement from the storage tank is roughly equivalent to the volumetric flow rate of Cresol loading into the storage tank, which the flash analysis showed to be on average 11.7 cfm of displaced Cresol saturated nitrogen vapors.

The ChemCAD analysis was on a per hour basis. The mass flow rates for the contaminant vapor input and vapor exit from the scrubber is summarized below.

Key Assumptions:

1. Each volume of m,p-cresol pumped into T-228 will displace an equal volume of vapor from the head space of the tank.
2. The vapor displacement exits the tank saturated in m,p-cresol vapor.
3. The vapor will be scrubbed in a packed tower, with a scrubbing efficiency of 80%.
4. Potential to Emit based upon emissions without the scrubber; scrubber only being added for potential irritant properties associated with m-cresol.

Product transfers to T-228 (truck/container unloading)

Annual quantity of Cresol consumed	7,532,231 lbs	
Cresol unloading rate - gpm	75 gal per minute	
Cresol unloading rate - lb/hr	38,844 lbs per hour (1.035 specific gravity of m,p-cresol mixture per MSDS)	
Hours of Cresol unloading per year	193.91 hours	
Nitrogen sparge	2 cfm	
Vapor displaced	722 ACFH	(sum of Unloading rate and sparge, converted to CFH)
m-cresol in saturated vapor to scrubber	0.0299 lb/hr	(ChemCAD run)
p-cresol in saturated vapor to scrubber	0.0217 lb/hr	(ChemCAD run)
Total std V ft3/hr	634.55 scfh	(ChemCAD run)
Cresol Emission to scrubber - hourly potential	0.0516 lb/hr	(Sum of m-cresol and p-cresol flows)
Cresol to scrubber - annual potential	10.01 lb/yr	(Sum of m,p-cresol emissions * hours to unload max of cresol)
Cresol to scrubber - annual potential	0.0050 tons/yr	(Divide by 2000 to convert lbs to tons)

Cresol Tank Emissions

Phenol is a raw material used at the South Plant to produce nonylphenol. One of the existing phenol tanks, T-228, will converted to store cresol for TTPNP production use.

TANKS 4.0 is used to estimate emissions.

Maximum amount of cresol consumed for TTPNP 7,532,231 lbs
 Density of cresol product 1.035 specific gravity provided on MSDS
 Conversion to gallons 872,604 maximum gallons of phenol per year for TTP

Input Data

Vapor Pressure of Cresol @ 20 C	0.0145	psi
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Tank	Capacity (gal)	Height (ft)	Diameter (ft)	Max Height[2] (ft)	Avg Height[2] (ft)
T-228 (Cresol)	15,000	17	12	15.3	11.9

Emissions calculated by TANKS 4.0

Tank	Working Losses (lb/yr)	Breathing Losses (lb/yr)	Total Emissions (lb/yr)	Total Emissions (ton/yr)
T-228 (Cresol)	1.09	0.16	1.25	0.001

Molecular Sieve Operating Emissions

The molecular sieve will only be used when the incoming cresol does not meet product specifications for low water content, which significantly affects product quality. The cresol will be received in Isotainers, which will be offloaded into a 15,000 gallon tank. If the water content is high the cresol will be processed through the molecular sieve unit. An Isotainer typically contains 5,000 gallons.

The molecular sieve unit contains 2500 lbs. of desiccant per tower and the unit contains two towers. The desiccant can adsorb 5% of its weight in water (conservative), so about 125 pound of water can be adsorbed before the desiccant is spent and needs reactivated.

The cresol manufacturer's data shows the cresol upper control limit is below the 200 ppm water content required for the process. Even so, Addivant is assuming that 10% of the loads will arrive with 250 ppm of water content. We also assume an existing tank volume of 10,000 gallons of cresol at 200 ppm (the upper control limit) when the 250 ppm delivery arrives. This creates a mixture in the tank of 130,400 lbs of cresol with a total water content of 220 ppm. The molecular sieve can only dry liquids to a 50 ppm water content. Assuming that the process is run to the lowest achievable water content of 50 ppm, 170 ppm of the water content is targeted to be removed. Drying the full tank (130,400 lbs of cresol) to a moisture content of 50 ppm, the dessicant would contain approximately 23 lbs of water. The dessicant does not need generated until it adsorbes 125 lbs of water. It is therefore estimated that regeneration would only need to occur 3 times per year based upon 10% of the loads coming in with 250 ppm of water.

The only emissions from the molecular sieve is during the regeneration cycle. The unit has a four-hour warm purge and an eight-hour hot heat cycle, and four-hour cooling cycle.

During the reactivation step, nitrogen saturated in cresol vapors are exhausted, and in this case the emissions will vent back to the cresol tank, which is vented to the same scrubber referenced in the Cresol unloading process. The emission reduction of the scrubber is not considered in calculating emissions for the process. Following reactivation, the remaining vapor in the Molecular Sieve vessel is displaced to the cresol storage tank, and the subsequent scrubber, as the unit is refilled with liquid. This creates two venting conditions.

Addivant contracted an engineering company to model the two venting conditions for the molecular sieve for the worst case of nitrogen saturated with the Cresol mixture. The first volumetric flow rate analyzed was venting during warm purge cycle of the reactivation at 1.9 cfm for four hours. The second volumetric flow rate analyzed was for the venting that occurs following the reactivation step, as the process liquid fills the vessel. This venting rate was estimated by the manufacturer to be a maximum of 24 cfm, and a total of 189 ft³. It is assumed that the nitrogen is saturated with cresol vapor and utilizes flash analysis.

The maximum hourly emission rate occurred during the venting that occurs following the reactivation step and is the value used in the lb/hr potential to emit calculation.

Annual emission rates presented below are based on a conservative five regeneration cycles per year.

Warm Purge Cycle Venting

Reactivation venting rate	1.9	SCFM
Volumetric Flow Rate	114	SCF
Saturated weight cresol	0.00008	lb Cresol / SCF
Reactivation Time per Cycle	4.0	hrs
Cresol lb/hr Emission Rate	0.00927	lb/hr Cresol

Vessel Filling after Reactivation Venting

Purge volume	189	SCF
Peak purge rate	24	SCFM
Average purge rate	15	SCFM
Saturated weight cresol	0.00008	lb Cresol / SCF
Emissions during purge	0.0153657	total lbs or cresol during purge process
Total volume vented per reactivation cycle	645	SCF
Total time for purge volume venting	43	min
Cresol lb/hr Emission Rate	0.021440512	lb Cresol / hr

Based upon maximum lb/hr emission rate during reactivation of molecular sieve. Unit cannot do both parts of the cycle at the same time, so maximum emission rate used.

Maximum Cresol Emission from Reactivation	0.02144	lb/hr
Cresol Emission - Annual Potential	0.29	lb/yr
Cresol Emission - Annual Potential	0.0001	tons / yr

4 hr venting cycle total emissions + total purging emissions multiplied by 5 molecular sieve reactivation cycles per year.

TTPNP Potential to Emit Calculations

Objective

To calculate the potential to emit (PTE) for Cresol and Hydrochloric Acid (HCl) from reactor (K-215).

Vacuum System Emissions

Assumptions: Calculated emissions as Cresol

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	$N_{sc} = u / (p * D_v)$
D	Diameter of tank (ft)	6.5	Based on a 2,000 gal reactor
A	Cross-sectional Area of Liquid Surface (ft ²)	33.2	Based on 2,000 gal reactor, $A = p r^2$
V	Volumetric Flowrate of Gas (ft ³ /min)	105	Flowrate based on information provided by Addivant.
U	Gas Velocity over Liquid (m/hr)	58	$U = V / A$
Deq	Equivalent Tank Diameter (m)	2.0	$U = V \text{ ft}^3/\text{min} \times 60 \text{ min/hr} \times 1/15 \text{ ft}^2 \times 0.3048 \text{ m/ft}$ $Deq = 4 \times A / \text{perimeter} = 4 \times A / (p * \text{diameter})$ $Deq = (4 \times 33.2 \text{ ft}^2) / (6.5 \text{ ft} * p) * 0.3048 \text{ m/ft}$
k	Mass Transfer Coefficient (ft/hr)	0.4	$k = 0.0958 * U^{0.78} * Deq^{-0.11} * N_{sc}^{-0.67}$
MW	Molecular Weight (lb/lb-mol)	108.14	Molecular weight for Cresol
P	Vapor Pressure (atm)	3.0552	$\log_{10}(P) = A - (B / (T + C))$ Vapor pressure information for cresol, estimated using Antoine's constants for Cresol obtained from the National Institute of Science and technology.
H	Emission Hours (hr/batch)	10.0	Worst-case estimate, considering vacuum during entire batch reaction
R	Universal Gas Constant (atm-ft ³ /lbmol-R)	0.7302	Engineering constant
T	Temperature (R)	941.67	Conservative estimate - worst case temperature of process (250 C)
Ex _b	Exhaust Rate (lb/batch)	60.21	$E_b = (MW * k * P * A * H) / (R * T)$, US EPA open top vessel equation
Eff	Recovery efficiency of condenser receiver system	0.97	Recovery efficiency Cresol, information provided by Addivant
N	Maximum number of batches	548	Based on maximum production values (8760 hours per year/ 16 hour cycle time)
E _{p_{pph}}	VOC Emission Rate (lb/hr)	0.11	$E_{pph} = Ex_{pph} * N$
E _{ppy}	VOC Emission Rate (lb/yr)	988.94	$E_{ppy} = Ex_b * N$
E _{tpy}	VOC Emission Rate (ton/yr)	0.49	$E_{ppt} = E_{ppy} / 2000$

** TTPNP emissions (Other VOCs) from the reaction are assumed to be equal to TTP emissions (Other VOCs) from the TTP reaction.

HCl byproduct emission calculation

Amount of PCI3 added to reactor (K-215) (lbs/yr)	Molecular weight PCI3 (lb/lb-mole)	Moles of PCI3 added per year	Moles of HCl produced from reaction per year	Molecular weight HCl (lb/lb-mole)	Pounds of HCl produced from reaction per year	Acid recovery system efficiency	Amount of HCl released to the scrubber (lbs/yr)	Amount of HCl released to the scrubber (tons/yr)
3,219,228.83	137.33	23,441.56	70,324.67	36.461	2,564,107.67	99.99%	256.41	0.13

Assumptions:

- 1) PCI3 was reacted to completion. No residual PCI3 remains.
- 2) Acid recovery efficiency provided by Addivant
- 3) Approximately 4879.87 pounds of PCI3 used per batch, 548 batches per year.

HCl byproduct emission calculation per batch

Amount of PCI3 added to reactor (lbs/batch)	Molecular weight PCI3 (lb/lb-mole)	Moles of PCI3 added per batch	Moles of HCl produced from reaction per batch	Molecular weight HCl (lb/lb-mole)	Pounds of HCl produced from reaction per batch	Acid recovery system efficiency	Amount of HCl released to the scrubber (lbs/batch)	Amount of HCl released to the scrubber (lbs/hr)
5,879.87	137.33	42.82	128.45	36.461	4,683.30	99.99%	0.47	0.05

Assumptions:

- 1) PCI3 was reacted to completion. No residual PCI3 remains.
- 2) Acid recovery efficiency provided by Addivant
- 3) Approximately 5879.87 pounds of PCI3 used per batch, 548 batches per year.
- 4) Assumed HCL emissions occur over total 10 hour batch time.

Isotainer Loading

Because TTPNP is a new product, emission modeling was performed for loading TTPNP into Isotainers. Addivant anticipates shipping this product in Isotainers the majority of the time, however, tanker trucks may also be loaded. The same pump will be used in either case, therefore the rate of loading, 75 gpm, will be the same making the emission rates similar.

Calculation Methodology

Emissions estimated using AP-42, Chapter 5.2, Transportation and Marketing of Petroleum Liquids .

Emission Calculations

TTPNP Emissions

Calculations Variables:			
TEMPERATURE	122	°F	
MOLECULAR WEIGHT	352.4	lb/lbmol	
VAPOR PRESSURE	0.015309544	psi	(*Cresol vapor pressure)
SATURATION FACTOR	0.5		(Submerged loading of a clean cargo tank)
THROUGHPUT	8,212,500	gallons per year	
Using equation from AP-42 Chapter 5.2			
Loading Losses	0.0000577	lb/gal	(12.46*SaturationFactor*MolecularWt*VaporP/(Temp(F)+460.67)/1000)
Total Losses (lb/yr)	474	lb/yr	Throughput gal/yr * lb/gal
TTPNP Unloading, annual pc	0.2369	tons/yr	
Unloading pump speed 75 gpm			
Unloading hours 1825 hours per year			
TTPNP Unloading, hourly po	0.260	lbs / hr	

**Cresol is assumed to be completely consumed during the reaction, therefore there will be no Cresol emissions from final product unloading.

HCl Emissions

During the evaluation of TTP, ChemCad software was used to simulate emissions from loading TTP. These calculations assumed (1) each volume of product pumped into a vessel will displace an equal volume from the head space of the vessel; (2) the vapor displaced exits the vessel saturated in organic vapor; (3) transfer done at a maximum pump speed of 75 gpm equivalent to 10 cfm transferring TTP for the entire hour; and (4) conservative assumption that bound HCl will be emitted from the TTP during the transfer.

TTPNP is expected to have similar emissions from bound HCl, therefore as a conservative assumption the same HCl emission rate will be assumed.

The lb/hr emissions resulting from the simulation are provide below with calculations to adjust the hourly emissions to the 15,000 lb maximum batch size of the process (the batch will transfer in 22 minutes making the hourly emissions less).

Hourly Emission from ChemCad simulation at a loading rate of 75 gpm.			
Loading Air Emissions			
HCl		1.0627	lb/hr
Hourly PTE Calculations			
Simulation using the pump flow rate as basis.			
The simulation calculates the lb/hr emissions relative to the flow rate of 75 gpm for 60 min			
	75 gpm		Maximum flow rate of the pump
	4500 gallons		Maximum amount that can be transferred in an hour (75 gpm * 60 min)
Emissions for transferring 15,000 lb batch			
HCl		0.382572	lb/hr
ChemCad Simulation lb/hr emission * 0.36 hrs for transfer of one batch			
Annual Emissions			
HCl		234.17	lb/yr
Totals for TTPNP loading			
Total HCl uncontrolled emissions		1.0627	lb/hr
		234.17	lb/yr
			ton / yr
			0.12

Component Fugitive Leak Potential Emissions

Objective

To estimate emissions from equipment leaks for the new piping due to manufacturing of TTPNP as well as the related TTP fugitive emissions that are associated with TTPNP.

Stream#	Line Description	Valves Liq Service	Valves Gas Service	Flanges Liq Serv	Flanges Gas Serv	Pumps	Sample Points	PSV's	Annual Max In-Service Hours	Annual Maximum In-Service Hours Assumption	Stream Service Category	Comment
3	T-228 to K-215 (Cresol)	8	0	26	0	0	0	0	8,760	NA	Heavy liquid	
4	K-215 Bottom of the reactor where the liquid will be	16	0	60	0	1	2	1	220		Vapor and Heavy liquid	The product transfer lines from the bottom of the reactor to the railcar / tanker truck loading station is purged with Nitrogen after each transfer. Hrs calculated on Loading emissions calculation.
5	K-215 Top of the reactor where the gas phase will be	0	11	0	35	0	0	0	8,760	NA	Vapor	On top of the reactor there is an agitator seal
6	K-215 Gassing Line to Adsorber (vapor)	0	6	0	95	0	1	0	8,760	NA	Vapor	Includes a gassing line drain, condenser, drain, demister, demister drain.
9	Loading line from K-215 to Tank Truck Loading	3	0	20	0	0	0	0	0		Heavy liquid	The railcar loading generates more fugitive emissions, thus the worse case assumption is all the loading is done into railcars.
10	Mole Sieve Unit	32	10	75	30	2	0	5	432		Vapor and Heavy liquid	Estimating that the mole sieve will only be run 11 times at a cycle time of 32 hours with 5 regeneration cycles a year at 16 hours each.
11	Cresol Scrubber and vent lines from T-228 and Mole Sieve Unit	6	5	15	21	1	1	0	8,760	NA	Vapor and Heavy liquid	Pump is an Ansimag Magnetic Drive Sealless Pump PP664
12	Additional components related to the conversion of T-228 to cresol	4	1	8	2	0	0	0	8,760	NA	Vapor and Heavy liquid	

VOC Equipment Leaks

Objective

To estimate VOC emissions from equipment leaks for the manufacture of TTPNP.

Calculation Methodology

Emission factors are SOCMF 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/source 0.00051 lb/valve/hr	SOCMI Factors - US EPA. Protocol for Equipment Leak Emission Estimates, (EPA-453/R-95-017) November 1995, Table 2-1. SOCMF Average Emission Factors
Gas/Vapor Valves EF:	0.00597 kg/hr/source 0.01316 lb/valve/hr	
Flanges EF:	0.00183 kg/hr/source 0.00403 lb/flange/hr	
Heavy Liquid Pump Seals EF:	0.00862 kg/hr/source 0.019 lb/pump seal/hr	
Sampling Connections EF:	0.015 kg/hr/source 0.033 lb/sampling connection/hr	
Safety Relief Valves EF:	0.104 kg/hr/source 0.2293 lb/relief valve/hr	

Calculations/Emissions Summary

Stream#	Line Description	Stream Service Category	Assumed %VOC in Stream	Emissions from Leaking Components not in Vacuum Service (lb/hr)						Stream Total (lb/yr)
				Valves Liq Service	Valves Gas Service	Flanges	Pumps	Sample Points	PSV's	
3	T-228 to K-215 (Cresol)	Heavy liquid	100%	0.004	0.000	0.105	0.000	0.000	0.000	954.4
4	K-215 Bottom of the reactor where the liquid will be	Vapor and Heavy liquid	100%	0.008	0.000	0.242	0.019	0.066	0.229	124.2
9	Loading line from K-215 to Tank Truck Loading	Heavy liquid	100%	0.002	0.000	0.081	0.000	0.000	0.000	0.0
10	Mole Sieve Unit	Vapor and Heavy liquid	100%	0.016	0.132	0.424	0.038	0.000	1.146	758.5
11	Cresol Scrubber and vent lines from T-228 and Mole Sieve Unit	Vapor and Heavy liquid	100%	0.003	0.066	0.145	0.019	0.033	0.000	2,331.6
12	Additional components related to the conversion of T-228 to cresol	Vapor and Heavy liquid	100%	0.002	0.013	0.040	0.000	0.000	0.000	486.5

Total VOC Emissions from Equipment Leaks
4,655 lb/yr
2.33 tpy

HAP Emissions from Equipment Leaks

HAP Species	wt% of VOC	lb/yr	tpy
Cresol	97%	4,516	2.26
Total HAP	97%	4,516	2.26

HCl Equipment Leaks

Calculation Methodology

Emission factors are SOCMl screening-range factors from Table 2-5 from Protocol for Equipment Leak Emission Estimates. Emissions are calculated using the number of components and the maximum hours in a year.

Input Data

	Value	Basis
Gas/Vapor Valves EF:	0.000131 kg/hr/source 0.00029 lb/valve/hr	SOCMI Factors - US EPA.
Flanges EF:	0.000081 kg/hr/source 0.0002 lb/flange/hr	Protocol for Equipment Leak Emission Estimates, (EPA-453/R-95-017)
Sampling Connections EF:	0.000081 kg/hr/source 0.0002 lb/sampling connection/hr	November 1995, Table 2-5.
Safety Relief Valves EF:	0.0447 kg/hr/source 0.099 lb/relief valve/hr	SOCMI Screening Ranges Emission Factors < 10,000 ppmv

Calculations/Emissions Summary

Stream#	Line Description	Stream Service Category	Assumed %HCl in Stream	Emissions from Leaking Components not in Vacuum Service (lb/hr)						Stream Total (lb/yr)
				Valves Liq Service	Valves Gas Service	Flanges	Pumps	Sample Points	PSV's	
5	K-215 Top of the reactor where the gas phase will be	Vapor	100%	NA	0.003	0.006	NA	0.000	0.000	82.6
6	K-215 Gassing Line to Adsorber (vapor)	Vapor	100%	NA	0.002	0.017	NA	0.000	0.000	165.4

Total HCl Emissions from Equipment Leaks

248 lb/yr

HCl Emissions from Eq Leaks 0.12 tons/yr