



*Rebecca Dalrymple
Environmental Engineer*

Addivant
1000 Morgantown Industrial Park
Morgantown, WV 26501

Tel: 304-284-2214

April 21, 2015

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 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 its South Plant facility located in Morgantown, West Virginia. This change will utilize an existing reactor to make a slightly different product. The reactor is a grandfathered unit constructed in the 1970’s. The existing facility is a true minor source under state and federal regulations, and will remain a true minor source after the proposed changes.

One of the products currently produced at the South Plant is TNPP (Tris-nonylphenyl phosphite), which is produced using a batch production process in three 2,000 gallon reactors. Addivant proposes to utilize one of these existing reactors to produce a new, but similar, product. The new product will be TTP, Tri-Tolyl Phenylphosphite.

The agency reviewed an earlier request to perform a trial production run of this material last year, Determination Number PD13-092, dated February 7, 2014.

Addivant used an engineering consulting company to complete ChemCad simulations of the process to evaluate air emissions, as well as to test engineering design principles. Attachment E provides a summary of the potential-to-emit estimates, and shows that the proposed TTP process emissions are below the modification permitting thresholds requirements of 45 CSR 13.

Enclosed is the permit determination request form for utilization of the existing process to produce TTP, along with the following attachments:

- Attachment A – Map of Facility,
- Attachment B – Process Flow Diagram,
- Attachment C – Process Description,
- Attachment D – Material Safety Data Sheets, and
- Attachment E – Supporting Calculations

Addivant USA, LLC
South Plant Operations
Permit Determination Request – TTP Process
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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 at 304-284-2214.

Sincerely,



Rebecca Dalrymple
Environmental Engineer

Enclosures: 2 electronic copies



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 and left into facility parking lot.		
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: Rebecca Dalrymple		6B. TITLE: Environmental Engineer
6C. TELEPHONE: (304) 284-2214	6D. FAX: (304) 284-2363	6E. E-MAIL: Rebecca.Dalrymple@addivant.com
7A. DAQ PLANT I.D. NO. (FOR AN EXISTING FACILITY ONLY): 061-00061		7B. PLEASE LIST ALL CURRENT 45CSR13, 45CSR14, 45CSR19 AND/OR TITLE V (45CSR30) PERMIT NUMBERS ASSOCIATED WITH THIS PROCESS (FOR AN EXISTING FACILITY ONLY): None
7C. IS THIS PDF BEING SUBMITTED AS THE RESULT OF AN ENFORCEMENT ACTION? IF YES, PLEASE LIST: NA		
8A. TYPE OF EMISSION SOURCE (CHECK ONE): <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>05/20/2015</u>		10B. DATE OF ANTICIPATED START-UP: <u>07/01/2015</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.		

NS:

⇒ 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	0.82	3.23
CO		
NO _x		
SO ₂		
Pb		
HAPs (AGGREGATE AMOUNT)	1.17	3.26
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, FELIPE DE LA MORA (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: 04/21/2015

**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

April 21, 2015



ATTACHMENT C – PROCESS DESCRIPTION

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This Permit Determination Request is being submitted for Addivant's South Plant facility (DAQ Facility ID# 061-00006), located within the Morgantown Industrial Park. Addivant's South Plant operations include grandfathered processes that do not have a Rule 13 permit. One of the products currently produced at the South Plant is TNPP (Tris-nonylphenyl phosphite), which is produced using a batch production process in three 2,000 gallon reactors. Addivant proposes to utilize one of these existing reactors to produce a new, but similar, product. The new product is TTP, Tri-Tolyl Phenylphosphite. A detailed description of the process is provided in the paragraphs below, which highlight the changes that will be needed to produce this new product. Also, see Table 1 entitled *Emission Units*, included at the end of this Process Description, which lists all new, modified or existing emission units, control devices and vent points that will comprise the proposed TTP process.

Two existing raw materials, Phenol and Phosphorous Trichloride (PCI3), will be stored in existing storage tanks (T-228, and T-206 / T-207). The PCI3 will have a small net annual increase in throughput due to more raw material being needed for the TTP production than for TNPP production; however, the maximum hourly unloading rate will not be increased resulting in no net hourly increase in emissions. PCI3 is unloaded under nitrogen pressure into one 10,000 gallon tank that vents to a knock out tank, T-255, prior to treatment in a water scrubber (MM-052). The water scrubber is used to remove the hazardous characteristics of the PCI3 vapors. The PCI3 converts to HCl as well as some phosphorus acid, generating HCl liquid and HCl vapor. The HCl vapors from this unit are included in the calculations, however the emissions were found to be de minimis on both hourly and annual basis.

The second existing raw material, phenol, will have an increase in throughput. One of the existing phenol tanks, T-228, will be dedicated for TTP production only. Due to the tank only being used for TTP production, the emission for unloading and storage of the phenol are included in the emission calculations. The phenol is not unloaded under a nitrogen blanket, but the unloading line is cleared with nitrogen after the unloading process. Note that the potential to emit calculations do not include any control efficiency for either the water scrubber MM-052 or the phenol scrubber MM-189.

To produce the new product, one new raw material, a mixture of m-cresol and p-cresol, will be shipped to the facility and received via either tank trucks or iso-tainers. The cresol mixture will be pumped to an existing tank T-227. Tank T-227 is a 17,000 gallon tank currently used for phenol storage, but will be converted to cresol storage. The cresol will be unloaded under a nitrogen blanket. Emissions from this unit will be vented to a new cresol scrubber MM-188 (which includes an associated scrubber liquor recycle tank R-326), which vents to new vent point 5028. The packed tower scrubber MM-188 will use a caustic solution to remove cresol from the cresol storage tank vent. Note that the potential to emit calculations do not include any control efficiency for scrubber MM-188.

Addivant also plans to move to the TTP process an existing molecular sieve unit (C-040/041) that is no longer used in another process. This molecular sieve will be utilized to remove moisture from the cresol mixture as needed. Details on the operation of this unit are provided with the emission estimate in Attachment E. The molecular sieve emissions will be vented back into the cresol storage tank, which vents to the previously described scrubber MM-188. Potential to emit calculations do not include any control efficiency for scrubber MM-188.

At the start of the batch production process, phenol is pumped to Tank T-227 and blended with the cresol mixture. The cresol/phenol mixture will be fed into existing reactor K-215, followed by PCI3. Reactor K-215 is currently used for TNPP production, but will be converted to produce only TTP. Once materials are in the reactor, heat is increased to begin the reaction. As the reaction occurs, Hydrochloric Acid (HCl) gas is formed. Some nitrogen sparging is performed prior to cooling the reactor to remove additional HCl. The vented gasses will pass through a vapor condenser, which condense organics in the gas and returns the condensate back to the reactor. The gas will then pass through a demister, and a secondary condenser, again returning condensed TTP and cresol back to the reactor. This is similar to the TNPP reactors, however, new condensers (HX-277, HX-278), a steam water heater (HX-279) and a demister (F-236) are needed to support the TTP reactor to avoid cross contamination with TNPP. Also utilized in the

ATTACHMENT C – PROCESS DESCRIPTION

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TTP production process will be a new hot oil/air cooler (HX-275) which provides temperature adjustment for reactor K-215.

From reactor K-215, the TTP product is cooled by utilizing a new aftercooler (HX-276), and then pumped under nitrogen pressure to either an existing tank truck loading station (TS-06) or to an existing rail car loading station (RS-01) for off-site transport.

The co-product HCl gas produced by the proposed TTP process will be combined with co-product HCl gases from the TNPP reactors, flowing through a series of existing condensers and into the existing Acid Absorption System (absorber HX-243, tails tower C-302, HCl storage tanks T-213 & T-214, and scrubber DC-020). The HCl gas is diluted and refined to sell as a co-product. No changes are being made to this system due to the new product generating less HCl. Existing emission points include gases flowing out of a final absorption unit, as well as emissions from draining a small condensate collection tank (T-273) into a waste drum (WD-01).

ATTACHMENT C – PROCESS DESCRIPTION

Table 1. Emission Units (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 (PCI3) Storage Tank	1973	10,000 Gallon	Existing	MM-052 Water Scrubber
T-207	5010	PCI3 Storage Tank	1973	10,000 Gallon	Existing	MM-052 Water Scrubber
T-255	5010	PCI3 Knock Out Tank	1973	300 Gallon	Existing	MM-052 Water Scrubber
T-227	5028	Cresol Storage Tank and Cresol/Phenol Blend Tank	1973 / 2015 modified usage	17,000 Gallon	Existing, modified usage	MM-188 Cresol Scrubber
T-228	5005	Phenol Storage Tank	1973	15,000 Gallon	Existing	MM-189 Phenol Scrubber
C-040/ 041	5028	Molecular Sieve	2000 / 2015 modified usage	400 Gallon	Existing, modified usage	MM-188 Cresol Scrubber
K-215	5004	Tri-Tolyl Phenylphosphite (TTP) Reactor	1969 / 2015 modified usage	2,000 Gallon	Existing, modified usage	DC-020 HCl Scrubber
R-326	5028	Cresol Scrubber Receiver	2015	500 Gallon	New	MM-188 Cresol Scrubber
F-236	5004	TriTolyl Phenylphosphite (TTP) Demister	2015	NA	New	DC-020 HCl Scrubber
HX-275	No vent	Hot Oil/Air Cooler	2015	NA	New	NA
HX-276	No vent	TriTolyl Phenylphosphite (TTP) Aftercooler	2015	NA	New	NA
HX-277	5004	TriTolyl Phenylphosphite (TTP) Primary Gassing Condenser	2015	NA	New	DC-020 HCl Scrubber
HX-278	5004	Condenser on Gas Line off Demister (F-236)	2015	NA	New	DC-020 HCl Scrubber
HX-279	No vent	Steam Water Heater for tempered water to HX-277 and HX-278	2015	NA	New	NA
HX-243	5004	Absorber	2002	NA	Existing	DC-020 HCl Scrubber
C-302	5004	Tails Tower	1990	NA	Existing	DC-020 HCl Scrubber
T-273	5004	Condensate Collection Tank	1979	10 Gallon	Existing	DC-020 HCl Scrubber
WD-01	5025	Waste Drum	1979	55 Gallon	Existing	NA
T-213	5004	HCl Storage Tank	1991	2,500 Gallon	Existing	DC-020 HCl Scrubber

ATTACHMENT C – PROCESS DESCRIPTION

T-214	5004	HCl Storage Tank	1991	2,500 Gallon	Existing	DC-020 HCl Scrubber
TS-06	5030	TTP Tank Truck Loading Station	1973 / 2015 modified usage	NA	Existing	NA
RS-01	5029	TTP Rail Car Loading Station	1997 / 2015 modified usage	NA	Existing	NA
F-235	No vent (fugitive)	Bag Filter	2015	3 Gallon	New	NA

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 – MATERIAL SAFETY DATA SHEETS

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Material Safety Data Sheets (MSDS) for the following chemicals are inserted as pages D-1 – D-51:

TRITOLYL PHOSPHITE

CRESOL

PHOSPHOROUS TRICHLORIDE

PHENOL

ATTACHMENT E – SUPPORTING CALCULATIONS

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The enclosed Excel workbook sheets provide the proposed change in emissions based on the potential to emit (PTE) of all proposed process changes for all regulated air pollutants. The calculated PTE is based on the maximum design capacity of process equipment operating at 8,760 hours per year.

The new TTP product will utilize one of three existing TNPP production reactors, resulting in a reduction of TNPP production capacity. The co-product HCl gas produced by the proposed TTP process will be combined with co-product HCl gases produced by the TNPP reactors, flowing through a series of existing condensers and into the existing Acid Absorption System (absorber HX-243, tails tower C-302, HCl storage tanks T-213 & T-214, and scrubber DC-020). Since the new TTP process will generate less HCl gas, and therefore less HCl air emissions, than does the existing TNPP process, Addivant did not calculate HCl emissions from the existing emission point at the final absorption unit (vent 5004), as well as emissions from draining a small condensate collection tank (T-273) into a waste drum (WD-01, vent 5025) because there was no increase in waste compared to the current process.

Note that the PTE calculations do not include any control efficiency for the water scrubber MM-052, the cresol scrubber MM-188, or the phenol scrubber MM-189.

The worksheets are numbered pages E-1 through E-11.

Process Data

TTP produced per 16-hour batch	15,000 lbs / batch	
Annual Potential Batches for TTP	548 batches	(8760 hr / 16 hrs per batch)
Total Potential Production of TTP	8,212,500 lbs	(15000 lbs * 548 batches)
Amount of Cresol consumed per batch TTP	11,798 lbs/ batch	
Total lb Cresol consumed per year TTP	6,459,405 lb/year	
Amount of Phenol consumed per batch TTP	2,069 lbs/ batch	
Total lb Phenol consumed per year TTP	1,132,778 lb/year	
Amount of Phosphorous Trichloride consumed per batch TTP	5,964 lbs/batch	
Total Phosphorous Trichloride consumed per year TPP	3,265,290 lbs/year	
Phenol lb consumed per lb TTP Produced	0.14 lb phenol consumed per lb of TTP produced	
Cresol lb consumed per lb of TTP Produced	0.79 lb cresol consumed per lb of TTP produced	
Amount of Phosphorous Trichloride consumed per TNPP batch	2,100 lbs / batch	Process Data
Annual Potential Batches of TNPP (7 hr cycle time)	1,251 batches	(8760/7 hrs per batch)
Total Phosphorous Chloride consumed per year TNPP	2,628,000 lbs/year	
Annual Potential Increase in Phosphorous Trichloride TTP	637,290 lbs / year	(Total Phosphorous Trichloride TTP - Total Phosphorous Trichloride TNPP)

PCI3 Unloading and Tank Emissions

Phosphorous Trichloride (PCI3) is an existing raw material used in the South Plant for TNPP 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 increases by 678,510 lbs due to the new TTP production when compared to the existing TNPP utilization (as shown on page E-1). The unloading and storage operations emit PCI3 vapors to water scrubber MM052, which subsequently reacts with water to generate hydrochloric and phosphorous acid. A ChemCad modeling program was used to estimate potential hydrochloric acid vapors from the water scrubber MM052 to be included in the potential to emit calculations, however the emissions were found to be de minimis

Addivant's PCI3 unloading and storage operations were designed and constructed such that the vapor spaces of the delivery vessel (tanker truck or isotainer) and storage tanks (T-206 and T-207) are interconnected, minimizing the chance of air or moisture in-leakage during delivery and unloading (not depicted in process flow diagram D-1450(A)). The storage tanks are located in a building and each tank utilizes a nitrogen blanketing system that maintains a pressure of 2.5 - 5 psig. One of the two tanks is always kept empty for emergency purposes. During delivery, the vapor displaced by the liquid entering the storage tank is returned to the delivery vehicle in equal volume. In theory, there is no excess vapor to discharge through scrubber MM052.

Should the volume of nitrogen and PCI3 vapor mixture displaced from the storage tanks exceed the volume in the tanker, the excess vapor is discharged, through pressure control valve PSV-235 at 5 psig, through knock-out tank T-255 (serves to separate any liquid droplet carry-over for return to the storage tank) to water scrubber MM-052.

Two ChemCad Simulations were performed to provide conservative emission estimates for the PCI3 unloading and storage operations. The first assumed that the vapor is not returned to the tanker or isotainer (Case 1); the second modeled a scenario where pressure from the tanker or isotainer is vented to the tank system at the end of the transfer. Case 1 showed maximum emissions from the scrubber at 4 X 10-6 lbs/hr of HCl vapors being emitted from scrubber MM-052. Case 2 showed a maximum of 2.1 X 10-6 lbs/hr of HCl vapors being emitted from the scrubber.

The calculations below convert the maximum lb/hr HCl emission from Case 1 to tons per year for the annual increase in PCI3 throughput for this process. Both values lb per hour and ton per year emissions are de minimis and shown as NA in the emissions summary presented on page E-11.

Emission Losses of PCI3 are determined from ChemCad Simulations noted above.

Calculation of Annual Emissions

Annual PCI3 throughput increase	637,290 lbs
Gallons PCI3 throughput increase	48,549 gallons
Average gallons in a single delivery	3,352 Gallons
Number of Deliveries for incr throughput	14 Trucks per year (throughput gallons/ gallons in delivery)
Conservative Unloading pump rating	70 gallons per minute (Pump PP175)
Time to unload 1 truck	48 minutes
Assuming 60 minutes of unloading time per truck:	
Annual minutes for increased PCI3	869 minutes/ year (14*60)
Annual unloading hours	14 hours per year
HCl lb/hr emissions from Scrubber MM052	4.E-06 lbs HCl / hr (ChemCad Simulation data - 4/19/2015 report)
Annual HCl lb/year emission	6.E-05 lbs HCl / year

Physical Property Data

Component	Vapor Pressure (mmHg)	Known Vapor Pressure (psia) P _{v1}	Specific Gravity	Density (lb/gal)	Molecular Weight (lb/lb-mole)
PCI3	100	1.93	1.573	13.13	137.3

Physical property data obtained from Perry's Chemical Engineer's Handbook, 7th Ed.

Phenol Unloading and Tank Emissions

Phenol is a raw material already used at the South Plant and part of the original air permitting.
 Phenol used in the production of TTP is considered additional volume to the potential emissions from the nonylphenol production.
 Phenol is typically received in rail cars and tanker trucks.
 Emissions generated during the unloading of this additional volume of phenol is presented below.

Maximum TTP Production	8,212,500 lbs
Maximum number of TTP batches	548 batches
Amount of Phenol per batch TTP	
ChemCAD simulation Phenol Consumed	590 lbs
ChemCAD simulation TTP Produced	4236 lbs
Phenol consumed per TTP Produced	0.139282342 lb phenol consumed per lb of TTP produced
Maximum amount of phenol consumed for TTP	1,143,856 lb phenol consumed / year
Density	8.763 lb/gal
Conversion to gallons	130,532 maximum gallons of phenol per year for TTP

Objective
 Estimate the phenol emissions from phenol Tanker Truck Unloading

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

Emission Calculation

TANK TRUCK UNLOADING

Calculations Variables:		
TEMPERATURE	158	°F
MOLECULAR WEIGHT	94	lb/lbmol
VAPOR PRESSURE	0.019	psi
SATURATION FACTOR	0.5	
THROUGHPUT	130,532	gallons per year

Using equation from AP-42 Chapter 5.2

Loading Losses	0.00002	lb/gal	$(12.46 * \text{SaturationFactor} * \text{MolecularWt} * \text{VaporP} / ((\text{Temp}(F) + 460.67) / 1000))$
Total Losses (lb/yr)	2	lb/yr	Throughput gal/yr * lb/gal
Phenol Unloading, annual potential	0.0012	tons/yr	

Unloading pump speed	75 gpm
Unloading hours	29 hours per year
Phenol Unloading, hourly potential	0.081 lbs / hr

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 also modeled a caustic scrubber for cresol removal. The caustic scrubber is used due to Irritant properties of the cresol. The reduction of emissions from the scrubber are not considered in the permit determination analysis and are not included here.

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-227 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-227 (truck/container unloading)

Annual quantity of Cresol consumed	6,459,405 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	166.29 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	8.58 lb/yr	(Sum of m,p-cresol emissions * hours to unload max of cresol)
Cresol to scrubber - annual potential	0.0043 tons/yr	(Divide by 2000 to convert lbs to tons)

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 desiccant would contain approximately 23 lbs of water. The desiccant 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	0.0214405	lb Cresol / hr

Maximum Cresol Emission from Reactivation 0.02144 lb/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.

Cresol Emission - Annual Potential 0.29 lb/yr

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

Cresol Emission - Annual Potential 0.0001 tons / yr

TTP Reaction

Arco's South Plant manufactures organophosphite products in batch quantities. Grandfathered processes include the use of three reactors for Tri-tolyl(phenyl) phosphite, also known as Weston ® TNPP, as well as a Grandfathered Hydrochloric Acid scrubber. Hydrochloric Acid is co-produced at the site from the TNPP process.

Addivant is dedicating one of three TNPP reactors, K215, for use for a new product, Tri-tolylphenol or TTP.

Addivant utilized an engineering firm to perform emissions modeling for the TTP reaction. The ChemCAD results were scaled so that the entire batch is represented as a single hour in ChemCAD, a common simulation approach used when flow rates and compositions vary over the entire batch reaction time leading to fluctuations in lb/hr emission values. So the emission rate is a lb/hr value representing the entire 16-hour batch time. The engineering firm also assesses the various stages of the reaction to provide maximum lb/hr emission rates for the air pollutants prior to entering a final hydrochloric acid scrubber.

Assumptions for the modeling are presented in the engineering firms final report, as well as assuming that the process runs 365 days per year, although that is very unlikely to occur due to downtime for maintenance.

No changes are being made to the Hydrochloric Acid System that includes an absorber, tails tower, and a final water scrubber. The emissions numbers below are from the ChemCAD simulation for the TTP reaction prior to entering the final water scrubber.

TTP produced per 16-hour batch	15000	lbs / batch	
Annual Potential Batches	548	batches	(8760 hr / 16 hrs per batch)
Total Potential Production of TTP	8,212,500	lbs	(15000 lbs * 548 batches)

Maximum pound per hour Emission prior to HCl Scrubber - Unit ID DC-020

Hydrochloric Acid entering Scrubber	0.001290	lb/hr	
Phenol entering Scrubber	0.0000002	lb/hr	
M-Cresol entering Scrubber	0.000125	lb/hr	
P-Cresol entering Scrubber	0.0000003	lb/hr	
TTP entering Scrubber	0.000015	lb/hr	
DTP entering Scrubber	0.000014	lb/hr	
Total VOC entering Scrubber	0.000154	lb/hr	
Total HAP entering Scrubber	0.001415	lb/hr	

Maximum pound per day Emission prior to HCl Scrubber (16 hour cycle time / 1.5 batches per day)

Hydrochloric Acid entering Scrubber	0.000003	lb/day	
Phenol entering Scrubber	0.000006	lb/day	
M-Cresol entering Scrubber	0.003000	lb/day	
P-Cresol entering Scrubber	0.000006	lb/day	
TTP entering Scrubber	0.000053	lb/day	
DTP entering Scrubber	0.000051	lb/day	
Total VOC entering Scrubber	0.003116	lb/day	
Total HAP entering Scrubber	0.003014	lb/day	

Pounds per Year Emissions

Hydrochloric Acid entering Scrubber	0.0010	lb/year		
Phenol entering Scrubber	0.0020	lb/yr		
M-Cresol entering Scrubber	1.0800	lb/yr		
P-Cresol entering Scrubber	0.0022	lb/yr		
TTP entering Scrubber	0.0192	lb/yr		
DTP entering Scrubber	0.0184	lb/yr		
Total VOC entering Scrubber	1.12	lb/yr	0.0006	Tons / year
Total HAP entering Scrubber	1.09	lb/yr	0.0005	Tons / year

Railcar Loading

Because TTP is a new product, Addivant utilized an engineering firm to perform emission modeling for loading TTP into railcars. Addivant anticipates shipping this product in railcars 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. In either case, a nitrogen gas blanket at 2.2 cfm is used to maintain product quality.

ChemCad software was used to simulate the loading and assumed (1) each volume of product pumped into a railcar will displace an equal volume from the head space of the rail car; (2) the vapor displaced exits the railcar 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.

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.

Railcar Loading TTP Air Emissions	
TTP	0.0478 lb/hr
DTP	0.0459 lb/hr
Cresol	0.0006 lb/hr
Phenol	0.0004 lb/hr
HCl	1.0627 lb/hr

Hourly PTE Calculations

Simulation using the pump flow rate as basis.

The TTP is pumped into an inerted rail car that is full of nitrogen.

The simulation calculates the lb/hr emissions relative to the flow rate of 75 gpm for 60 min

75 gpm
4500 gallons
1.11
41658 lbs TTP

Maximum flow rate of the pump
Maximum amount that can be transferred in an hour (75 gpm * 60 min)
Density of TTP at 20 C
Amount transferred in an hour.

Only 1 batch will be transferred at a time - so emission rates are adjusted below to actual batch size.

15000 lbs TTP
1620 gal TTP
21.60 min
0.36 hrs of transfer

Amount of TTP in 1 batch
Conversion to Gallons
Minutes to transfer 1 batch flowing at 75 gpm
Converted from min to hrs.

Emissions for transferring 15,000 lb batch

TTP	0.017208 lb/hr	ChemCad Simulation lb/hr emission * 0.36 hrs for transfer of one batch
DTP	0.016524 lb/hr	ChemCad Simulation lb/hr emission * 0.36 hrs for transfer of one batch
Cresol	0.000216 lb/hr	ChemCad Simulation lb/hr emission * 0.36 hrs for transfer of one batch
Phenol	0.000144 lb/hr	ChemCad Simulation lb/hr emission * 0.36 hrs for transfer of one batch
HCl	0.382572 lb/hr	ChemCad Simulation lb/hr emission * 0.36 hrs for transfer of one batch

Annual Emission Calculations

Total potential TTP production	8,212,500 lb/yr
Liquid Density	65.95 lb/cf
Annual product volume	124,526.16 cf/yr
Conversion to gal per year	931,441.83 gal/yr
Loading rate	75 gpm
Annual loading time (min)	12,419.22 minutes / yr
Annual loading time (hr)	206.99 hr/yr

Annual Emissions

TTP	9.89 lb/yr
DTP	10.11 lb/yr
Cresol	0.13 lb/yr
Phenol	0.09 lb/yr
HCl	234.17 lb/yr

Totals for TTP loading	lb/hr	lb/yr	ton / yr
Total VOC lb/hr uncontrolled emissions	0.09	20.23	0.01
Total HCl uncontrolled emissions	1.0627	234.17	0.12

Proposed TTP Process -- New Streams with Component Fugitive Leak Potential Emissions

The table below presents the additional valves, flanges, pumps, sample points and PSVs due to upgrading the existing system for TTP production. Fugitive emission calculations are presented below in the initial table.

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	Vapor Pressure at 20C (kPa)	Stream Service Category
1	Cresol Unloading from Pump to T-227	9	0	27	0	1	0	0	182	Unloading lines purged with Nitrogen after each truck is unloaded. See cresol unloading emissions.	0.0001	Heavy liquid
2	T-227 Tank System (Cresol / Phenol Mixture)	13	3	30	6	1	1	0	8,760	NA	cresol - 0.0001 kPa; phenol 0.09997 kPa	Vapor and Heavy liquid
3	T-227 to K-215 (Cresol Phenol Mixture)	8	0	26	0	0	0	0	8,760	NA	cresol - 0.0001 kPa; phenol 0.09997 kPa	Heavy liquid
4	K215 Bottom of the reactor where the liquid will be	16	0	60	0	1	2	1	220	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 Railcar Loading emissions calculation.	TPP - 0.0133 kPa @ 155C	Vapor and Heavy liquid
5	K-215 Top of the reactor where the gas phase will be	0	11	0	35	0	0	0	8,760	NA	HCl = 15 kPa	Vapor
6	K-215 Gassing Line to Adsorber (vapor)	0	6	0	95	0	1	0	8,760	NA	HCl = 15 kPa	Vapor
	TTP Loading Line from K-215 from K-215 to Railcar	8	0	45	0	0	0	0	220	Line is purged with nitrogen after loading. Hours calculated on Railcar loading emissions table.	TPP - 0.0133 kPa @ 155C	Heavy liquid
	Railcar Loading Vent line to carbon drums	0	6	0	20	0	0	0	220	Same as above.	TPP - 0.0133 kPa @ 155C	Vapor and Heavy liquid
9	TTP Loading line from K-215 to Tank Truck Loading	3	0	20	0	0	0	0	0	The railcar loading generates more fugitive emissions, thus the worse case assumption is all the loading is done into railcars.	TPP - 0.0133 kPa @ 155C	Heavy liquid
10	Mole Sieve Unit	32	10	75	30	2	0	5	432	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.	0.0001	Vapor and Heavy liquid
11	Cresol Scrubber and vent lines from T-227 and Mole Sieve Unit	6	5	15	21	1	1	0	8,760	NA	0.0001	Vapor and Heavy liquid

VOC Equipment Leaks

Objective

To estimate VOC emissions from equipment leaks for the new organic streams due to manufacture of TTP.

Calculation Methodology

Emission factors are SOCM 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	SOCMI Factors - US EPA. Protocol for Equipment Leak Emission Estimates, (EPA-453/R-95-017) November 1995, Table 2-1. SOCM! Average Emission Factors
Gas/Vapor Valves EF:	0.00051 lb/valve/hr	
Flanges EF:	0.00597 kg/hr/source	
Heavy Liquid Pump Seals EF:	0.01316 lb/valve/hr	
Sampling Connections EF:	0.00183 kg/hr/source	
Safety Relief Valves EF:	0.00403 lb/flange/hr	
	0.00862 kg/hr/source	
	0.019 lb/pump seal/hr	
	0.015 kg/hr/source	
	0.033 lb/sampling connection/hr	
	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	
1	Cresol Unloading from Pump to T-227	Heavy liquid	100%	0.005	0.000	0.109	0.019	0.000	0.000	24.1
2	T-227 Tank System (Cresol / Phenol Mixture)	Vapor and Heavy liquid	100%	0.007	0.039	0.145	0.019	0.033	0.000	2,132.1
3	T-227 to K-215 (Cresol Phenol Mixture)	Heavy liquid	100%	0.004	0.000	0.105	0.000	0.000	0.000	954.4
4	K215 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
7	TTP Loading Line from K-215 from K-215 to Railcar	Heavy liquid	100%	0.004	0.000	0.182	0.000	0.000	0.000	40.8
8	Railcar Loading Vent line to carbon drums	Vapor and Heavy liquid	100%	0.000	0.079	0.081	0.000	0.000	0.000	35.1
9	TTP 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-227 and Mole Sieve Unit	Vapor and Heavy liquid	100%	0.003	0.066	0.145	0.019	0.033	0.000	2,331.6

Total VOC Emissions from Equipment Leaks
6,401 lb/yr
3.20 tpy

HAP Emissions from Equipment Leaks

HAP Species	wt% of VOC	lb/yr	tpy
Cresol	73%	4,673	2.34
Phenol	24%	1,536	0.77
Total HAP	97%	6,209	3.10

HCl Equipment Leaks

Objective
To estimate HCl emissions from equipment leaks; there will be two new streams due to the TTP having a new gassing line to keep the condensate clear of TNPP.

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

Calculations/Emissions Summary

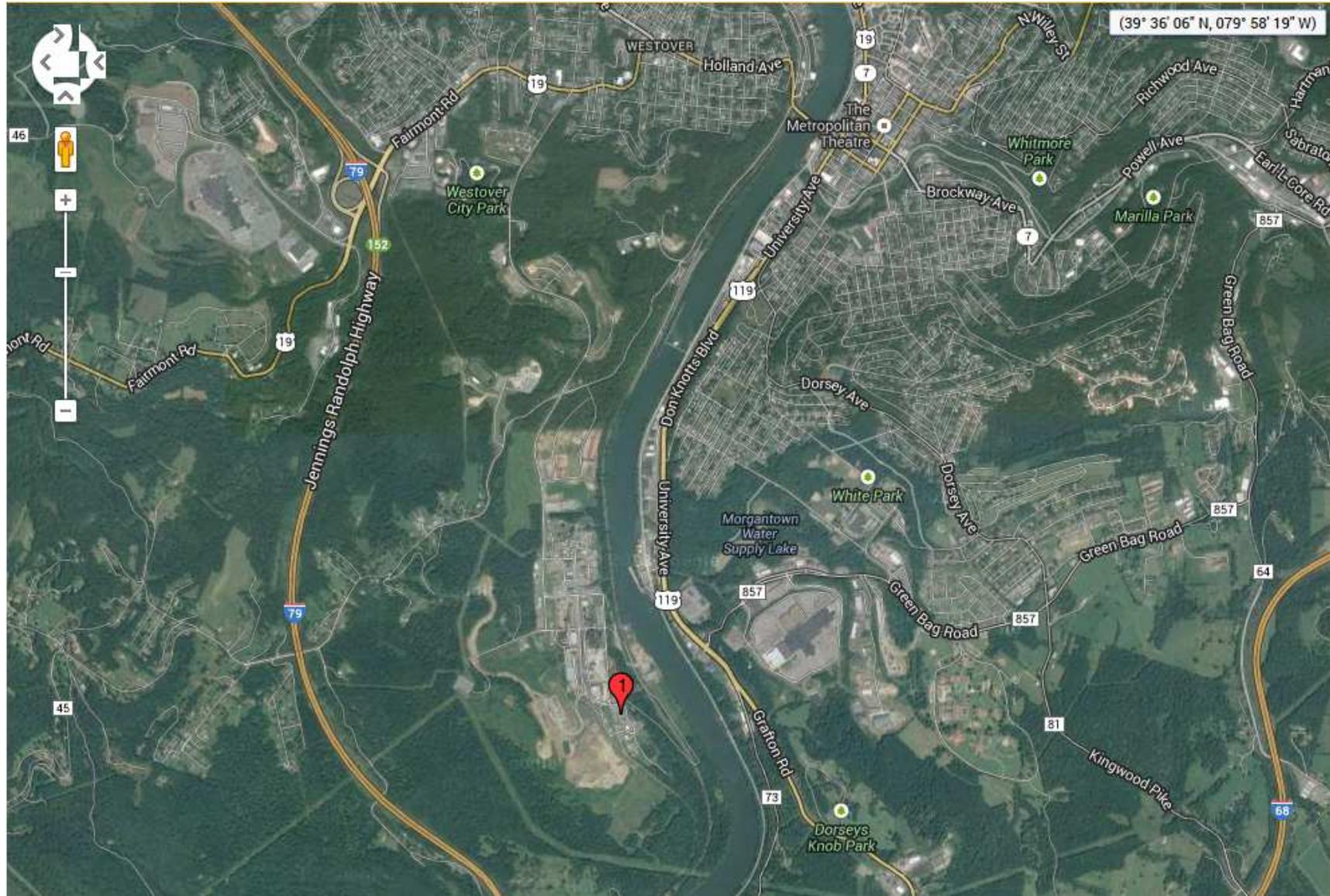
Stream#	Line Description	Stream Service Category	Assumed %HCl In Stream	Emissions from Leaking Components not in Vacuum Service (lb/hr)						Stream Total (lb/yr)
				Valves Liq Service	Valves Gas Service	Flanges	Pumps	Sample Points	PSV's	
5	K-215 Top of the reactor where the gas phase will be	Vapor	100%	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

Emissions Summary for TTP Production

Uncontrolled Emissions

	lb/hr	tons/yr
Phosphorous Trichloride Unloading / Storage Process		
Increase of Hydrochlorid Acid from PCI3 Scrubber	NA	NA
Phenol Unloading Process		
Phenol emissions	0.081	0.0012
Cresol Unloading Process		
Cresol emissions	0.052	0.0043
Molecular Sieve Operation		
Cresol Emissions	0.021	0.0001
Tank Emissions		
Phenol	0.477	0.008
Cresol	0.157	0.015
TTP Reaction and HCl System		
Hydrochloric Acid to Scrubber System	0.00129	0.001 0.0000005
Phenol to Absorption System	0.0000002	0.002 0.000001
M-Cresol to Absorption System	0.00013	1.080 0.0005
P-Cresol to Absorption System	0.0000003	0.002 0.000001
TTP to Absorption System	0.000015	0.019 0.00001
DTP to Absorption System	0.000014	0.018 0.00001
Total VOC to Scrubber System	0.0002	1.122 0.0006
Railcar Loading		
Hydrochloric Acid	0.3826	0.00
TTP	0.0172	0.000
DTP	0.0165	0.000
Cresol	0.0002	0.0000
Phenol	0.0001	0.00000
Total TTP Point Source Emissions		
Hydrochloric Acid	0.384	0.000
Phenol	0.558	0.009
Cresols	0.2303939	0.020
TTP	0.017	0.000
DTP	0.017	0.000
Total HAP	1.172	0.030
Total VOC	0.822	0.030
Total TTP Fugitive Emissions		
Hydrochloric Acid	NA	0.12
Phenol	NA	0.77
Cresols	NA	2.34
Total HAP	NA	3.23
Total VOC	NA	3.20
Total TTP Process Emissions		
Hydrochloric Acid	0.384	0.12
Phenol	0.558	0.78
Cresols	0.230	2.36
TTP	0.017	0.000
DTP	0.017	0.000
Total HAP	1.172	3.26
Total VOC	0.822	3.23





Tri-Tolyl Phosphite

Version	10
Revision Date	03/17/2015
Print Date	03/17/2015
Country	US
Language:	Z8

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : Tri-Tolyl Phosphite

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
06810
Telephone : 1-800-962-8641 (US) only

Prepared by msdsrequest@addivant.com

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

Emergency telephone

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

Disposal considerations : msdsrequest@addivant.com

Recommended use of the chemical and restrictions on use

Recommended use : Antioxidant

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



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SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

WARNING	
Appearance	liquid
Color	amber, to, yellow
Odor	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 sensitization : Category 1

GHS Label element

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/ vapors/ 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 or doctor/ physician 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



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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 : Sensitization

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 ingredient 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 ingredient 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 ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen



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by NTP.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Mixture
Chemical nature : Antioxidant

Hazardous ingredients

Chemical Name	CAS-No.	Concentration (%)
tris(methylphenyl) phosphite	25586-42-9	$\geq 90 - \leq 100$
cresol	1319-77-3	$\geq 1 - < 5$

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.
Sensitization

Notes to physician : The first aid procedure should be established in consultation with the doctor responsible for industrial medicine.

SECTION 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media : Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.



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- Specific hazards during fire fighting : No information available.
- Specific extinguishing methods :
- Further information : Standard procedure for chemical fires.
- Special protective equipment for fire-fighters : In the event of fire, wear self-contained breathing apparatus.

SECTION 6. ACCIDENTAL RELEASE MEASURES

- 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 sensitization 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

Ingredients with workplace control parameters

Ingredients	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
cresol	1319-77-3	TWA	5 ppm 22 mg/m3	OSHA Z-1
		TWA	5 ppm	ACGIH
		TWA (Fracción inhalable y vapor)	20 mg/m3	ACGIH



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		TWA	5 ppm 22 mg/m3	OSHA Z-1
		TWA	5 ppm	ACGIH
		TWA (Inhalable fraction and vapor)	20 mg/m3	ACGIH
		TWA	5 ppm 22 mg/m3	OSHA Z-1
		TWA	5 ppm	ACGIH
		TWA (Inhalable fraction and vapor)	20 mg/m3	ACGIH

Personal protective equipment

Respiratory protection : In the case of vapor 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 89/689/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
Color : amber, to, yellow



Tri-Tolyl Phosphite

Version	10
Revision Date	03/17/2015
Print Date	03/17/2015
Country	US
Language:	Z8

Odor : pungent

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

Vapor pressure : 1.33 hPa (180 °C)

Density : 1.11 g/cm³ (20 °C)

Solubility(ies)
Water solubility : hydrolyzes

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

Ingredients:

tris(methylphenyl) phosphite:

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



Tri-Tolyl Phosphite

Version	10
Revision Date	03/17/2015
Print Date	03/17/2015
Country	US
Language:	Z8

Skin corrosion/irritation

Product:

Remarks: May cause skin irritation in susceptible persons.

Ingredients:

tris(methylphenyl) phosphite:

Assessment: Irritating to skin.

cresol:

Assessment: Causes burns.

Serious eye damage/eye irritation

Product:

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

Respiratory or skin sensitization

Product:

Remarks: Causes sensitization.

Ingredients:

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.



Tri-Tolyl Phosphite

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Country	US
Language:	Z8

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

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

Ingredients:

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).



Tri-Tolyl Phosphite

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Country	US
Language:	Z8

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

Not dangerous goods

TDG

Not dangerous goods

ADR

Not dangerous goods

IATA

Not dangerous goods

IMDG

Not dangerous goods

RID

Not dangerous goods

SECTION 15. REGULATORY INFORMATION

TSCA list : Not relevant



Tri-Tolyl Phosphite

Version	10
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Country	US
Language:	Z8

Not relevant

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

EPCRA - Emergency Planning and Community Right-to-Know

CERCLA Reportable Quantity

Ingredients	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 12 (40 CFR 61).

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

The following chemical(s) are listed under the U.S. Clean Air Act Section 111 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 %
--------	-----------	-------

The following Hazardous Chemicals are listed under the U.S. CleanWater Act, Section 311, Table 117.3:

cresol	1319-77-3	1.5 %
--------	-----------	-------

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



Tri-Tolyl Phosphite

Version	10
Revision Date	03/17/2015
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Country	US
Language:	Z8

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

The ingredients 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), TSCA (USA)



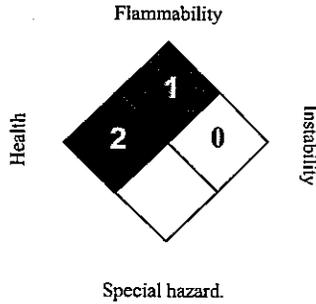
Tri-Tolyl Phosphite

Version	10
Revision Date	03/17/2015
Print Date	03/17/2015
Country	US
Language:	Z8

SECTION 16. OTHER INFORMATION

Further information

NFPA:



HMIS III:

HEALTH	2
FLAMMABILITY	1
PHYSICAL HAZARD	0

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

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

Carechem24 International Worldwide Coverage - Addivant

Emergency Phone Numbers:

<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



Tri-Tolyl Phosphite

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Country	US
Language:	Z8

<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

MATERIAL SAFETY DATA SHEET

LANXESS

Energizing Chemistry

LANXESS Corporation
Product Safety & Regulatory Affairs
111 RIDC Park West Drive
Pittsburgh, PA 15275-1112
USA

TRANSPORTATION EMERGENCY
CALL CHEMTREC: (800) 424-9300
INTERNATIONAL: (703) 527-3887

NON-TRANSPORTATION
LANXESS Emergency Phone: (800) 410-3063
LANXESS Information Phone: (800) LANXESS

1. Product and Company Identification

Product Name: m-Cresol 70
Material Number: 36943

2. Hazards Identification

Emergency Overview

DANGER! Color: Colorless, Red .Form: liquid Odor: phenolic.
Toxic. Corrosive. Combustible. Use cold water spray to cool fire-exposed containers to minimize the risk of rupture. Ground containers and equipment before transferring to avoid static sparks. May cause nausea or dizziness. Toxic if swallowed. Toxic in contact with skin. Causes respiratory tract irritation. Causes skin burns. Causes eye burns. May cause liver damage. May cause kidney damage.

Potential Health Effects

HUMAN EFFECTS AND SYMPTOMS OF OVEREXPOSURE

Inhalation

Acute Inhalation

For Component: m-Cresol

Inhalation is unlikely due to the low vapor pressure. Odor is detectable at low concentrations. Causes respiratory tract irritation with symptoms of coughing, sore throat and runny nose. 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,

Chronic Inhalation

For Component: m-Cresol

May cause nervous system damage with symptoms of numbness, incoordination, headache, and confusion. May cause kidney damage. May cause liver damage.

Material Name: m-Cresol 70

Article Number: 36943

Skin

Acute Skin

For Component: m-Cresol

Moderately toxic by skin absorption. Corrosive with symptoms of reddening, itching, swelling, burning and possible permanent damage. Contact may cause prickling and intense burning followed by local anesthesia. Skin may initially show white discoloration.

Chronic Skin

For Component: m-Cresol

Repeated and prolonged contact may cause an allergic skin reaction in sensitive individuals.

Eye

Acute Eye

For Component: m-Cresol

Corrosive with symptoms of reddening, tearing, swelling, burning and possible permanent damage.

Ingestion

Acute Ingestion

For Component: m-Cresol

Toxic by ingestion. Corrosive to the digestive tract with symptoms of burning and ulceration.

Chronic Ingestion

For Component: m-Cresol

Readily absorbed by the gastrointestinal tract causing systemic effects. May cause kidney damage. May cause liver damage. May cause damage to the spleen.

Carcinogenicity:

No Carcinogenic substances as defined by IARC, NTP and/or OSHA.

3. Composition/Information on Ingredients

Hazardous Components

<u>Weight %</u>	<u>Components</u>	<u>CAS-No.</u>
50 - 100%	m-Cresol	108-39-4
25 - 35%	p-Cresol	106-44-5

4. First Aid Measures

Eye Contact

Immediately flush eye(s) with plenty of water. Use fingers to ensure that eyelids are separated and that the eye is being irrigated. Call a physician immediately.

Skin Contact

Immediately remove contaminated clothing and shoes. Wash affected areas, including hair, beneath nails and other concealed areas with Polyethylene Glycol 400. Repeat the washing with soap and water. If Polyethylene Glycol 400 is not available, wash immediately with soap and plenty of cold water. Call a physician immediately. Wash contaminated clothing before re-use. Thoroughly clean shoes before reuse.

Inhalation

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion

Material Name: m-Cresol 70

Article Number: 36943

Call a physician immediately.

5. Fire-Fighting Measures

Suitable Extinguishing Media: carbon dioxide (CO₂), dry chemical, foam, water spray for large fires.

Special Fire Fighting Procedures

Firefighters should be equipped with self-contained breathing apparatus to protect against potentially toxic and irritating fumes.

Unusual Fire/Explosion Hazards

Combustible Liquid. Vapors or mist may be a fire and explosion hazards when exposed to high temperature or ignition. Toxic and irritating gases/fumes may be given off during burning or thermal decomposition.

6. Accidental release measures

Spill and Leak Procedures

Evacuate and keep unnecessary people out of spill area. Remove all sources of ignition, including flames, heat, and sparks. Use appropriate personal protective equipment during clean up. Dike or dam spilled material and control further spillage, if possible. Soak up with inert absorbent material. Collect and place in appropriately marked sealable containers for disposal.

7. Handling and Storage

Storage Temperature:
minimum:

10 °C (50 °F)

Storage Period

12 Months: When stored in original sealed container.

Handling/Storage Precautions

Avoid contact with eyes. Avoid contact with skin or clothing. Avoid breathing dust, vapor, or mist. Wash thoroughly after handling. Use only with adequate ventilation/personal protection. Ground and bond containers and equipment before transferring to avoid static sparks. Store separate from food products. Keep away from heat, sparks and open flames. Store in a dry place away from excessive heat.

Further Info on Storage Conditions

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.

8. Exposure Controls / Personal Protection

m-Cresol (108-39-4)

US. ACGIH Threshold Limit Values

Material Name: m-Cresol 70

Time Weighted Average (TWA): 5 ppm
US. ACGIH Threshold Limit Values
Skin designation: Can be absorbed through the skin.
US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)
PEL: 5 ppm, 22 mg/m³
US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)
Skin designation: Can be absorbed through the skin.

p-Cresol (106-44-5)
US. ACGIH Threshold Limit Values
Time Weighted Average (TWA): 5 ppm
US. ACGIH Threshold Limit Values
Skin designation: Can be absorbed through the skin.
US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)
PEL: 5 ppm, 22 mg/m³
US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)
Skin designation: Can be absorbed through the skin.

Industrial Hygiene/Ventilation Measures

Use local and general exhaust ventilation to control levels of exposure.

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.

Hand Protection

Permeation resistant gloves., Neoprene gloves, rubber gloves

Eye Protection

goggles., face-shield.

Skin and body protection

Wear cloth work clothing including long pants and long-sleeved shirts., Neoprene apron

Additional Protective Measures

Emergency showers and eye wash stations must be available. Educate and train employees in the safe use and handling of this product. Employees should wash their hands and face before eating, drinking, or using tobacco products.

9. Physical and chemical properties

Form:	liquid
Color:	Colorless, Red
Odor:	phenolic
pH:	approximately 4.8 @ 20 g/l
Freezing Point:	approximately 10 °C (50 °F)
Boiling Point/Range:	approximately 200 °C (392 °F)
Flash Point:	87.67 °C (189.8 °F) (DIN 51758)
Lower Explosion Limit:	1.1 %(V)
Upper Explosion Limit:	7.6 %(V)
Vapor Pressure:	approximately 1 mbar @ 20 °C (68 °F) approximately 6 mbar @ 44.44 °C (112 °F) approximately 8 mbar @ 55 °C (131 °F)
Specific Gravity:	approximately 1.035 @ 20 °C (68 °F)

Solubility in Water: Very low solubility
Autoignition Temperature: > 500 °C (> 932 °F)
Molecular Weight: 108.2

10. Stability and Reactivity

Stability
Stable

Materials to avoid
Strong oxidizing agents, strong acids, Active metals, Nitric acid, Oleum

Hazardous decomposition products
By Thermal Decomposition: Thermal decomposition may produce CO, CO₂, and other potentially toxic fumes.

11. Toxicological Information

Toxicity Data for m-Cresol

Acute Oral Toxicity
LD50: 242 mg/kg (rat)
LD50: 828 mg/kg (mouse)

Acute Inhalation Toxicity
LC50: > 0.71 mg/l, 1 h (rat)

Acute dermal toxicity
LD50: 1,100 mg/kg (rabbit)
LD50: 2,050 mg/kg (rabbit)

Skin Irritation
rabbit, Corrosive
rabbit, Exposure Time: 24 h, Severely irritating

Eye Irritation
rabbit, Severely irritating

Repeated Dose Toxicity
100 d to 4 m, inhalation: (Rat, female, daily)
28 d, oral: NOAEL: 45.8 mg/kg, (rat, male, daily)

Mutagenicity

Genetic Toxicity in Vitro:
Ames: negative (Salmonella typhimurium, Metabolic Activation: with/without)
Genetic Toxicity in Vivo:
Sister Chromatid Exchange: Negative results were reported in various in vivo studies. (mouse, male, intraperitoneal)

Carcinogenicity

mouse, female, dermal, 12 - 20 w,
No carcinogenic effects observed at the doses tested.
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.

Developmental Toxicity/Teratogenicity

Rat, female, oral, daily, NOAEL (teratogenicity): 450 mg/kg, NOAEL (maternal): 175 mg/kg,

12. Ecological Information

Ecological Data for m-Cresol

Biodegradation

aerobic, > 90 %, Exposure time: 28 d, Readily biodegradable.

Biological Oxygen Demand (BOD)

68 %

Theoretical Biological Oxygen Demand (ThBOD)

2,520 mg/g

Bioaccumulation

Golden orfe, Exposure time: 3 d, 20 BCF

Acute and Prolonged Toxicity to Fish

LC50: 15.9 mg/l (Zebra fish (Brachydanio rerio), 96 h)

LC50: 17 - 19 mg/l (Golden orfe (Leuciscus idus))

Acute Toxicity to Aquatic Invertebrates

EC50: 19.2 mg/l (Water flea (Daphnia magna), 24 h)

Toxicity to Aquatic Plants

40 mg/l, End Point: other (Green algae (Scenedesmus subspicatus))

Toxicity to Microorganisms

EC50: 461.4 mg/l, (Activated sludge microorganisms, 3 h)

13. Disposal considerations

Waste Disposal Method

Waste disposal should be in accordance with existing federal, state, provincial, and/or local environmental control laws.

14. Transport information

Land transport (DOT)

Proper Shipping Name:	Cresols, liquid
Hazard Class or Division:	6.1
UN/NA Number:	UN2076
Packaging Group:	II
Hazard Label(s):	Toxic, Corrosive

RSPA/DOT Regulated Components:

Material Name: m-Cresol 70

Article Number: 36943

m-Cresol
p-Cresol

Reportable Quantity: 142 lb

Sea transport (IMDG)

Proper Shipping Name: CRESOLS, LIQUID
Hazard Class or Division: 6.1
UN-No: UN2076
Packaging Group: II
Hazard Label(s): Toxic, Corrosive

Air transport (ICAO/IATA)

Proper Shipping Name: Cresols, liquid
Hazard Class or Division: 6.1
UN-No: UN2076
Packaging Group: II
Hazard Label(s): Toxic, Corrosive

15. Regulatory Information

United States Federal Regulations

OSHA Hazcom Standard Rating: Hazardous

US. Toxic Substances Control Act: Listed on the TSCA Inventory.

US. EPA CERCLA Hazardous Substances (40 CFR 302):

Components

m-Cresol Reportable quantity: 100 lbs
p-Cresol Reportable quantity: 100 lbs

SARA Section 311/312 Hazard Categories:

Acute Health Hazard, Chronic Health Hazard, Fire Hazard

US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III
Section 302 Extremely Hazardous Substance (40 CFR 355, Appendix A):

Components

None

US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III
Section 313 Toxic Chemicals (40 CFR 372.65) - Supplier Notification Required:

Components

m-Cresol
p-Cresol

US. EPA Resource Conservation and Recovery Act (RCRA) Composite List of Hazardous Wastes
and Appendix VIII Hazardous Constituents (40 CFR 261):

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)

RCRA Regulated Components

m-Cresol U052

State Right-To-Know Information

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

Massachusetts, New Jersey or Pennsylvania Right to Know Substance Lists:

<u>Weight %</u>	<u>Components</u>	<u>CAS-No.</u>
60 - 100%	m-Cresol	108-39-4
25 - 35%	p-Cresol	106-44-5

New Jersey Environmental Hazardous Substances List and/or New Jersey RTK Special Hazardous Substances Lists:

<u>Weight %</u>	<u>Components</u>	<u>CAS-No.</u>
60 - 100%	m-Cresol	108-39-4
25 - 35%	p-Cresol	106-44-5

MA Right to Know Extraordinarily Hazardous Substance List:

<u>Weight %</u>	<u>Components</u>	<u>CAS-No.</u>
0.05%	Phenol, 2-methyl-	95-48-7

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:

16. Other Information

NFPA 704M Rating

Health	3
Flammability	2
Reactivity	0
Other	

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

HMIS Rating

Health	3*
Flammability	2
Physical Hazard	0

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

* = Chronic Health Hazard

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

Contact Person: Product Safety Department
Telephone: (800) LANXESS
MSDS Number: 00000003770
Version Date: 12/31/2008
Report Version: 3.5

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 MSDS relates only to the specific material designated herein. LANXESS Corporation assumes no legal responsibility for use of or reliance upon the information in this MSDS.

|| Changes since the last version will be highlighted in the margin. This version replaces all previous versions.

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

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.

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

- 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

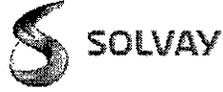
OSHA Hazardous Ingredients and Impurities

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

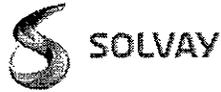
5.2 Special hazards arising from the substance or mixture

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.

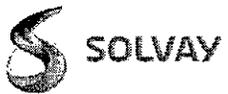
6.3 Methods and materials for containment and cleaning up

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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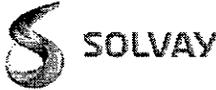
6.4 Reference to other sections

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:

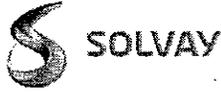
These recommendations provide general guidance for handling this product. Because specific work environments and material handling practices vary, safety procedures should be developed for each intended application. While developing safe handling procedures, do not overlook the need to clean equipment 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/m3	NIOSH
Phosphorous trichloride	ST	0.5 ppm 3 mg/m3	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/m3	OSHA Z-1
		The value in mg/m3 is approximate.	
Phosphorous trichloride	TWA	0.2 ppm 1.5 mg/m3	OSHA Z-1-A
Phosphorous trichloride	STEL	0.5 ppm 3 mg/m3	OSHA Z-1-A
Phosphoryl Chloride	TWA	0.1 ppm 0.6 mg/m3	NIOSH
Phosphoryl Chloride	ST	0.5 ppm 3 mg/m3	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.

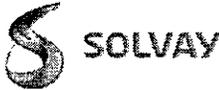
Hand protection : Acid-resistant protective gloves.
 Where there is a risk of contact with hands, use appropriate gloves
 Please observe the instructions regarding permeability and breakthrough time which are provided by the supplier of the gloves. Also take into consideration the specific local conditions 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/cm3 (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

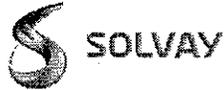
no data available

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

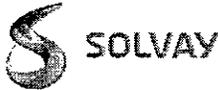
11.1 Information on toxicological effects

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 irritation

Eye irritation : rabbit
Corrosive

Respiratory or skin sensitization

Sensitization : no data available

Mutagenicity

Genotoxicity 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

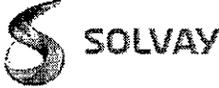
SECTION 12: Ecological information

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 NO
Marine pollutant

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 NO
Marine pollutant

14.6 Special precautions for user
 For personal protection see section 8.

IMDG

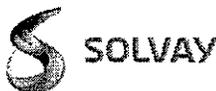
14.1 UN number UN 1809

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 NO
Marine pollutant

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14.6 Special precautions for user

For personal protection see section 8.

IATA

14.1 UN number

UN 1809

14.2 Dangerous Good Description

Not permitted for transport

14.3 Transport hazard class

Not permitted for transport

14.4 Packing group

Packing instruction (cargo aircraft)

Not permitted for transport

Packing instruction (passenger aircraft)

Not permitted for transport

14.5 Environmental hazards

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

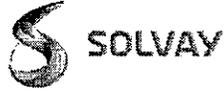
SARA 311/312 Hazards

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

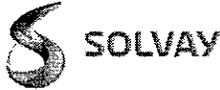
SECTION 16: Other information

NFPA-Classification

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

HMIS-Classification

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

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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.



Material Safety Data Sheet: Phenol

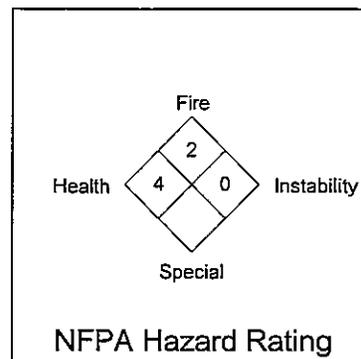
1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product name

Phenol

Effective date

January 28, 2013



Synonyms

Carbolic acid, hydroxybenzene, monohydroxybenzene, oxybenzene, phenic acid, phenyl hydrate, phenyl hydroxide, phenylic acid, phenylic alcohol

Chemical formula

C_6H_5OH

CAS name & no.

Phenol, 108-95-2

Name and Address

Axiall, LLC
P.O. Box 629
Plaquemine, LA USA 70765-0629

Emergency telephone number

For transportation emergencies:
CHEMTREC (800) 424-9300
For all other emergencies: (225) 685-2500

MSDS contact

Corporate Health & Safety Department
P.O. Box 629
Plaquemine, LA USA 70765-0629
Phone Number (225) 685-2500



Material Safety Data Sheet: Phenol

2. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS No.	Wt. %.
Phenol	108-95-2	99.9

3. HAZARDS IDENTIFICATION

PRECAUTIONARY INFORMATION

Combustible liquid can be fatal by inhalation, ingestion and by skin absorption. Highly toxic by skin absorption. Severe eye and skin burns. Known liver toxin.

Primary Routes of Entry

Inhalation, ingestion, skin absorption, and eye contact.

HAZARD CLASSIFICATION

Acute Effects

Phenol is an irritant of the eyes, mucous membranes, and skin. Absorption is very rapid by any route of exposure, and can result in severe toxicity including death. Phenol acts upon the central nervous system causing excitation and convulsions followed by sudden collapse and unconsciousness. Death can be very rapid and is due to toxic effects on the central nervous system, the heart, lungs, kidneys, and blood vessels. Ingestion quickly results in burning of the mouth, mouth sores, diarrhea, and marked abdominal pain. Inhalation can result in lung irritation and pulmonary edema. Phenol may form methemoglobin which can result in a bluish tint (cyanosis) to the skin. Skin and eye exposure results in pain, then numbness, severe burns, and eschar formation. Contact with the eyes can cause severe corneal injury with permanent blindness.

Chronic Effects

Symptoms of chronic phenol poisoning include vomiting, difficulty in swallowing, diarrhea, lack of appetite, headache, fainting, dizziness, dark urine, and mental disturbances. Major damage to the liver, kidneys, and eyes can occur. Skin rashes and changes in skin pigmentation, especially over the knuckles of the hand, have been noted.

Potential Adverse Chemical Interactions

Persons with liver or kidney diseases should not be exposed to phenol for any length of time, even intermittently, since this chemical can damage these organs. Ethanol use may increase the liver damage caused by phenol. The combination of phenol and hydroquinone should be avoided since it has been found to be toxic to the blood-forming organs (in a manner similar to that of benzene) in experiments with animals.

Carcinogen Status

Phenol was found to induce skin tumors in mice exposed dermally (Cancer Research, Vol. 19, p. 413, 1959). However, this chemical is not considered to be carcinogenic by OSHA, NIOSH, NTP, IARC or EPA. IARC lists phenol in their Group 3 which is a category for substance unclassifiable as to their carcinogenicity.



Material Safety Data Sheet: Phenol

4. FIRST AID MEASURES

Inhalation

If a person breathes large amounts of this chemical, move the exposed person to fresh air at once. Monitor the individual for respiratory distress. Emergency airway support and 100% humidified supplemental oxygen with assisted ventilation may be needed. If cough or respiratory distress ensues, evaluate for respiratory tract irritation, bronchitis, or pneumonitis. Get medical attention immediately.

Skin Contact

Phenol spills on the skin, especially in high concentrations, are immediately life threatening and speed is essential for treatment. Immediately flush with large volumes of water while removing contaminated clothing. Continue to thoroughly wash with water for at least 15 minutes after clothing is removed. For additional treatment, an undiluted solution of polyethylene glycol (PEG) 300 or 400 can be dabbed on the skin. Emergency first aid personnel should wear butyl, viton or neoprene gloves. Dispose of all contaminated clothing, avoiding additional skin contact. Get medical attention at once.

Eye Contact

If this chemical contacts the eyes, immediately wash the eyes with large amounts of water for at least 15 minutes, occasionally lifting the lower and upper lids. Get medical attention by an ophthalmologist immediately.

Ingestion

Ingestion is immediately life threatening and speed is essential in treatment. Gastric lavage may be used if performed soon after ingestion. If used, activated charcoal should be administered as a slurry either aqueous or mixed with saline cathartic or sorbitol. Administer one dose of a cathartic, mixed with charcoal or given separately. Get medical attention immediately.

5. FIRE FIGHTING MEASURES

Flash Point	79°C (Closed cup)
Flammable Limits (% by Vol)	
Lower Explosive Limit (LEL)	1.7
Upper Explosive Limit (UEL)	8.6
Auto-ignition Temperature	715° C

Fire Fighting Procedures/Fire Extinguishing Media

Keep unnecessary people away; isolate hazard area and deny entry. Avoid breathing vapors, stay upwind, out of low areas and ventilate closed spaces before entering. Use NIOSH approved self-contained respirators in the positive pressure mode, and chemical protective clothing. No skin areas should be exposed. Do not enter fire area without full bunker gear (helmet with face shield, bunker coats, gloves, and rubber boots). Use halon replacement or carbon dioxide extinguishers and water spray or alcohol foam for small fires. Large fires should be extinguished with alcohol foam, water spray, and fog. Fight fire from maximum distance. Use water spray to cool containers exposed to fire. Water containing phenol can cause chemical burns to personnel. Stay away from ends of tanks.



Material Safety Data Sheet: Phenol

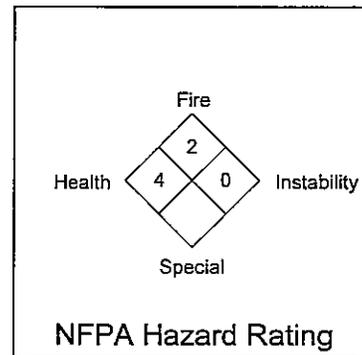
5. FIRE FIGHTING MEASURES (continued)

Unusual Fire and Explosion Hazards

Phenol containers may explode violently in heat or flame. Phenol produces toxic and corrosive gases during combustion.

National Fire Protection Association Hazard Rating

- 4 = Extreme
- 3 = High
- 2 = Moderate
- 1 = Slight
- 0 = Insignificant



6. ACCIDENTAL RELEASE MEASURES

Shut off all sources of ignition. Restrict access to spill area. Allow only trained personnel with appropriate respirator and full body protective clothing in the spill area. Highly toxic, do not touch spilled material; stop leak if you can do so without risk. Prevent phenol from entering water bodies, drains, or any sewage collection systems. For small spills take up with sand or other non-combustible absorbent material and place into containers for later disposal. Control large spills by diking and pump to salvage vessels. If material solidifies, shovel it into steel containers, or melt it with water and pump to tankage. Dispose all spill material in accordance with federal, state, and local regulations. Phenol spills over the reportable quantity (1,000 lbs.) should be reported to the National Response Center (800-424-8802).

7. HANDLING AND STORAGE

Store in accordance with 29 CFR 1910.106. Store away from sources of ignition and strong oxidizers in an area equipped with automatic sprinklers or fire extinguishing system. Ground and bond shipping container and transfer equipment to prevent possible ignition from static sparks. Wear appropriate protective equipment when handling phenol. Follow all federal, state, and local regulations as well as all insurance codes when storing and handling phenol.



Material Safety Data Sheet: Phenol

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Respiratory Protection

Use appropriate NIOSH approved respirator in accordance with 29 CFR 1910.132 and 1910.134, to prevent overexposure. Respirators must be selected based on the airborne levels found in the workplace and must not exceed the working limits of the respirator.

Eye Protection

Use splash proof chemical safety goggles or appropriate full-face respirator. Follow eye and face protection guidelines of 29 CFR 1910.132 and 1910.133. Where there is any possibility that an individual's eyes may be exposed to phenol, an eye wash fountain (in accordance with 29 CFR 1910.151) should be within the immediate work area for emergency use.

Protective Gloves

Use gloves in accordance with 29 CFR 1910.132 and 29 CFR 1910.138. Butyl, neoprene or Viton chemical protective gloves are recommended.

Ventilation

Provide general and/or local ventilation to control airborne levels below exposure guidelines. Local exhaust ventilation should comply with OSHA regulations and the American Conference of Governmental Industrial Hygienists, Industrial Ventilation - A Manual of Recommended Practice.

Occupational Exposure Guidelines for Phenol

OSHA	PEL	5 ppm (skin)
ACGIH	TLV-TWA	5 ppm (skin)
NIOSH	REL (10hr TWA)	5 ppm (skin)
	IDLH	250 ppm

Other

Where there is a possibility of exposure of an individual's body to phenol, facilities for quick drenching of the body should be provided (in accordance with 29 CFR 1910.151). Such individuals should be provided with and required to use impervious clothing in accordance with 29 CFR 1910.132.



Material Safety Data Sheet: Phenol

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Colorless solid or clear liquid
Odor	Sweet odor
Molecular Weight	94.1
Boiling Point	182° C
Melting Point	41° C
Solubility	Moderately soluble in water (8.4% @ 20°C), alcohol, ether, chloroform, ethyl acetate, toluene, and glycerol
Specific Gravity (Water = 1.0)	1.07 at 25/4° C
Vapor Density (Air = 1.0)	3.24
Vapor Pressure	0.357 mm Hg @ 20 °C 1 mm Hg @ 40° C
pH	<6 in 1/1 volume with water @ 25° C

NOTE: Phenol is shipped as a liquid. Phenol begins to solidify below 41° C.

10. STABILITY AND REACTIVITY

Stability

Stable under normal conditions.

Polymerization

Hazardous polymerization does not occur.

Hazardous Decomposition Products

Carbon monoxide, irritating aldehydes, ketones and unidentified organic compounds may be formed during combustion.

Incompatible Materials

Strong oxidizers, acid chlorides and acid anhydrides, halogens, especially calcium hypochlorite (contact with it may cause fires and explosions). Hot phenol attacks copper, aluminum, magnesium, lead, and zinc.

11. TOXICOLOGICAL INFORMATION

Animal Toxicity

Oral:	Rat LD ₅₀	530 mg/kg
	Cat LD ₅₀	100 mg/kg
	Dog LD ₅₀	500 mg/kg
	Human LD _{LO}	140 mg/kg
	Infant LD _{LO}	10 mg/kg



Material Safety Data Sheet: Phenol

11. TOXICOLOGICAL INFORMATION (continued)

Dermal:	Rat LD ₅₀	669 mg/kg
	Rabbit LD ₅₀	850 mg/kg

LD_{LO} = Lowest lethal dose in a given species by a given route of exposure.

LD₅₀ = Dose that is lethal to 50% of a given species by a given route of exposure.

12. ECOLOGICAL INFORMATION

Environmental Fate: The following information on phenol is extracted from the TOXNET database maintained by the National Library of Medicine.

Atmosphere: According to a model of gas/particle partitioning of semivolatile organic compounds in the atmosphere, phenol, which has a vapor pressure of 0.350 mm Hg at 25 deg C will exist in the vapor phase in the ambient atmosphere. Vapor-phase phenol is degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals during the day and nitrate radicals at night; the half-lives for these reactions in air is estimated as 14.6 hours and 12 minutes, respectively. Phenol has a low Henry's Law constant which explains why it is so effectively scavenged from the air by rain.

Terrestrial: Based on a recommended classification scheme, experimentally determined Koc values for phenol indicate that it would be highly mobile in soil and may leach. Phenol's vapor pressure, 0.350 mm Hg at 25 deg C and low adsorptivity to soil indicate that volatilization from dry soil and other surfaces may occur. Phenol will be primarily removed from soil as a result of biodegradation. Despite its high mobility in soil, biodegradation is sufficiently rapid that most groundwater is generally free of phenol. The half-lives of phenol in soil is usually <5 days, even in subsurface soil and aquifer material, although for acid soils and some surface soils the half-life may be of the order of 20-25 days and in the case of a till subsoil, 116 days.

Aquatic: Because the pKa of phenol is 9.994, it will be partially dissociated at higher pHs and therefore, its transport and reactivity may be pH dependent. Based on a recommended classification scheme, experimentally determined Koc values for phenol indicate that it would not adsorb to sediment and particulate matter in the water column. Phenol would not volatilize from water based on its Henry's Law constant of 3.33X10⁻⁷ atm-cu m/mole. Its estimated volatilization half-life in a model river is 107 days. Removal will be primarily a result of biodegradation with complete degradation occurring in a few days. Degradation is slower in salt water; the degradation half-life in an estuarine river was 9 days.

Biodegradation: If released to the environment, phenol's primary removal mechanism is biodegradation which is generally rapid (days). Since phenol is a benchmark chemical for biodegradability studies, there is a large body of information on its degradation, which concludes that phenol rapidly degrades in sewage, soil, fresh water and seawater. Under anaerobic conditions degradation is slower and microbial adaptation periods longer.



Material Safety Data Sheet: Phenol

12. ECOLOGICAL INFORMATION (continued)

Ecotoxicity:

TDLO Minnow 30 min 79 ug/l

LC50 Rainbow trout 5.6-11.3 mg/l/24 hr in a static bioassay.

LC50 Goldfish 60-200 mg/l/24 hr in a static bioassay.

LD0 Daphnia magna 16 mg/l /Conditions of bioassay not specified.

13. DISPOSAL CONSIDERATIONS

Waste Management Information: Any disposal practice must be in compliance with local, state and federal laws and regulations (contact local or state environmental agency for specific rules).

14. TRANSPORTATION INFORMATION

Proper Shipping Name	Phenol, Solid	Phenol, Molten	Phenol, Solutions
DOT Hazard class	6.1, (Poison)	6.1, (Poison)	6.1, (Poison)
DOT Shipping I.D. No.	UN 1671	UN 2312	UN 2821
PG	II	II	II
DOT Labeling	Poison	Poison	Poison
DOT Placard	Poison	Poison	Poison

15. REGULATORY INFORMATION

SARA Title III

Section 302 and 304 of the Act; Extremely Hazardous Substances (40 CFR 355)

COMPONENT	CAS No.	TPQ (lbs)	RQ (lbs)
Phenol	108-95-2	500*/10,000	1,000

*TPQ = 500 lbs. if phenol is in powder form and has a particle size of less than 100 microns or is handled in solution or molten form or meets the criteria for a NFPA rating of 2, 3, or 4 for reactivity.

Note: TPQ-Threshold Planning Quantity RQ - Reportable Quantity

Section 311 Hazard Categorization (40 CFR 370)

ACUTE	CHRONIC	FIRE	PRESSURE	REACTIVE
X	X	X		



Material Safety Data Sheet: Phenol

15. REGULATORY INFORMATION (continued)

Section 313 Toxic Chemicals (40 CFR 372.65)

COMPONENT	CAS No.	WT. %
Phenol	108-95-2	99.9

CERCLA

Section 102(a) Hazardous Substances (40 CFR 302.4)

COMPONENT	CAS No.	WT. %	RQ (lbs)
Phenol	108-95-2	99.9	1,000

RCRA

40 CFR 261.33 hazardous waste number:

Unused phenol product or phenol product that cannot meet specifications because of contamination would, when disposed of, be managed as a hazardous waste with the hazardous waste number U188.

TSCA

Phenol is listed on the TSCA inventory.

Proposition 65

Phenol is not listed on the California Proposition 65 list.

Canada Regulations (WHMIS)

This product has been classified according to the hazard criteria of the Canadian Controlled Products Regulations, Section 33 and the MSDS contains all information required by this regulation.

Class B Division 3- Combustible Liquid; Class D Division 1 Subdivision A- Very Toxic Material

WHMIS Ingredient Disclosure List

Phenol	CAS 108-95-2	Cutoff- 1%
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Canadian Environmental Protection Act (CEPA)

All substances in this product are listed on the Canadian Domestic Substances (DSL) list or are not required to be listed.

16. OTHER INFORMATION

IMPORTANT: The information and data herein are believed to be accurate and have been compiled from sources believed to be reliable. It is offered for your consideration, investigation and verification. Buyer assumes all risk of use, storage and handling of the product in compliance with applicable federal, state and local laws and regulations. **AXIAL, LLC MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, CONCERNING THE ACCURACY OR COMPLETENESS OF THE INFORMATION AND DATA HEREIN.** Axiall will not be liable for claims relating to any party's use of or reliance on information and data contained herein regardless of whether it is claimed that the information and data are inaccurate, incomplete or otherwise misleading. This information relates to the material designated and may not be valid for such material used in combination with any other materials nor in any process.

MSDS Revision: 1/28/13 Company name change

Supersedes 08/22/07

Process Data

TTP produced per 16-hour batch	15,000 lbs / batch	
Annual Potential Batches for TTP	548 batches	(8760 hr / 16 hrs per batch)
Total Potential Production of TTP	8,212,500 lbs	(15000 lbs * 548 batches)
Amount of Cresol consumed per batch TTP	11,798 lbs/ batch	
Total lb Cresol consumed per year TTP	6,459,405 lb/year	
Amount of Phenol consumed per batch TTP	2,069 lbs/ batch	
Total lb Phenol consumed per year TTP	1,132,778 lb/year	
Amount of Phosphorous Trichloride consumed per batch TTP	5,964 lbs/batch	
Total Phosphorous Trichloride consumed per year TPP	3,265,290 lbs/year	
Phenol lb consumed per lb TTP Produced	0.14 lb phenol consumed per lb of TTP produced	
Cresol lb consumed per lb of TTP Produced	0.79 lb cresol consumed per lb of TTP produced	
Amount of Phosphorous Trichloride consumed per TNPP batch	2,100 lbs / batch	Process Data
Annual Potential Batches of TNPP (7 hr cycle time)	1,251 batches	(8760/7 hrs per batch)
Total Phosphorous Chloride consumed per year TNPP	2,628,000 lbs/year	
Annual Potential Increase in Phosphorous Trichloride TTP	637,290 lbs / year	(Total Phosphorous Trichloride TTP - Total Phosphorous Trichloride TNPP)