

# Tritolyl phosphate

sc-237406



The Power is Question

Material Safety Data Sheet

Hazard Alert Code Key:

EXTREME

HIGH

MODERATE

LOW

## Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

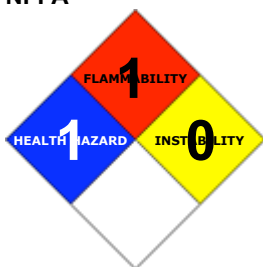
### PRODUCT NAME

Tritolyl phosphate

### STATEMENT OF HAZARDOUS NATURE

CONSIDERED A HAZARDOUS SUBSTANCE ACCORDING TO OSHA 29 CFR 1910.1200.

### NFPA



### SUPPLIER

Company: Santa Cruz Biotechnology, Inc.

Address:

2145 Delaware Ave

Santa Cruz, CA 95060

Telephone: 800.457.3801 or 831.457.3800

Emergency Tel: CHEMWATCH: From within the US and Canada:  
877-715-9305

Emergency Tel: From outside the US and Canada: +800 2436 2255  
(1-800-CHEMCALL) or call +613 9573 3112

### PRODUCT USE

As a plasticiser in lacquers and varnishes. Reagent

### SYNONYMS

C21-H21-O4-P, "phosphoric acid, tri-o-tolyl ester", "phosphoric acid, tri-o-tolyl ester", "phosphoric acid, tri-o-cresyl ester", "phosphoric acid, tri-o-cresyl ester", "phosphoric acid, tris(2-methylphenyl) ester", "o-cresyl phosphate", "o-cresyl phosphate", "o-tolyl phosphate", "o-tolyl phosphate", "tricresyl phosphate", "tri-o-cresyl phosphate", "tri-o-cresyl phosphate", "tri 2-methylphenyl phosphate", "tri 2-methylphenyl phosphate", "triorthocresyl phosphate", tris(o-methylphenyl)phosphate, tris(o-tolyl)-phosphate, "tri-o-tolyl phosphate", "tri-o-tolyl phosphate", tritolylphosphate, TOCP, TOFK, TOTP, "Phosflex 179-C", "triaryl phosphate", phosphate-ester

## Section 2 - HAZARDS IDENTIFICATION

### CANADIAN WHMIS SYMBOLS



### EMERGENCY OVERVIEW

#### RISK

Harmful in contact with skin.

Toxic: danger of very serious irreversible effects through inhalation, in contact with skin and if swallowed.

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Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

## POTENTIAL HEALTH EFFECTS

### ACUTE HEALTH EFFECTS

#### SWALLOWED

■ Oral toxicity due to tricresyl phosphate (TCP) is well documented in humans due mainly to accidental contamination of food and beverages. Autopsies consistently report degeneration in anterolateral spinal nerves, particularly along the long pathways. Skeletal muscle atrophy (muscle wastage) is a secondary manifestation of peripheral neuropathies. These symptoms are almost entirely due to the presence of a single isomer, tricresyl-o-phosphate (due in part to nerve demyelination - injury to the myelin sheath surrounding nerves).

TCP is usually produced by the reaction of cresols with phosphorus oxychloride. There are two industrial sources of cresols: "cresylic acid" obtained as a residue from coke ovens and petroleum refining; and "synthetic cresols" prepared from cymene via oxidation and degradation. As a result, TCP is a mixture of various triaryl phosphates.

The meta- and para-isomers of tricresyl phosphate do not produce demyelination as does the ortho-isomer nor do they appear to induce neurotoxic effects and thus are considered relatively non-toxic.

In 1960 approximately 10000 people in Morocco became ill (6000 suffering paraesthesia of the legs) following ingestion of cooking oil which had been adulterated with turbojet engine lubricating oil containing 3% TCP.

Restriction of the ortho isomer content of tricresyl phosphate to low levels reduces the toxicity hazard of tricresyl phosphate. However, the maximum hazard, that of tri-orthocresyl phosphate (TOCP) itself, is indicated here for safety, since commercial materials of relatively high TOCP content may be encountered. Use with special caution any tricresyl phosphate of unknown TOCP content.

Wistar rats fed a pellet diet containing a mixture of TCP isomers at a concentration of 5 g/kg diet for 9 weeks developed increases in absolute and relative liver weights. Haematological examination revealed no notable changes, but, in the plasma, total protein, urea, cholesterol and glutamate- pyruvate transaminase were significantly increased. Slight liver histopathology included cytoplasmic vacuolisation, increase in the number of binucleated cells, and enlargement of cell size. Male and female CD-1 mice exposed to diets containing 0, 0.437, 0.875, 1.75, 3.5, or 7.0% TCP (a mixture of ortho, meta, and para isomers) for 14 days. No clinical signs of toxicity were observed in the animals at doses up to 0.875%. All animals in the groups given 1.75, 3.5, or 7.0% exhibited piloerection, tremors, and diarrhoea, and were lethargic before death during the 14-day exposure.

■ Tri-o-cresyl phosphate (TOCP) first gained notoriety as the culpable neurotoxic agent of the "Ginger Jake" epidemic. Jamaican Ginger Extract (known in the United States by the slang name Jake) was an early 20th century patent medicine that provided a convenient way to bypass Prohibition laws, since it contained between 70-80% ethyl alcohol by weight. In 1930, large numbers of jake users began to lose the use of their hands and feet. Some victims could walk, but they had no control over the muscles which would normally have enabled them to point their toes upward. Therefore, they would raise their feet high with the toes flopping downward, which would touch the pavement first followed by their heels. The toe first, heel second pattern made a distinctive "tap-click, tap-click" sound as they walked. This very peculiar gait became known as the jake walk and those afflicted were said to have jake leg, jake foot, or jake paralysis. Additionally, the calves of the legs would soften and hang down and the muscles between the thumbs and fingers would atrophy. Within a few months, the TOCP adulterated jake was identified as the cause of the paralysis and the contaminated jake was recovered, but it was too late for many victims. Some users recovered full or partial use of their limbs, but for most, the loss was permanent.

Of the three isomers of tricresyl phosphate, the ortho-isomer (TOCP) is by far the most toxic in acute and short-term exposure. It is the only isomer that produces delayed neurotoxicity. Organophosphate-induced delayed neuropathy (OPIDN) has been produced with both single and repeated exposure regimes in a wide range of experimental species and it is classified as a "dying-back neuropathy". Degenerative changes occur in the distal axon and extends with time towards the cell body.

The effects produced by TOCP poisoning are the same from various routes of absorption and are characterised by an unusual polyneuritis with flaccid paralysis. Early signs of poisoning are gastro-intestinal upset, nausea and diarrhoea. Later symptoms (peripheral neuropathies) include soreness of lower leg muscles, numbness of toes and fingers and bilateral foot drop (ginger paralysis). Delayed effects may appear in to 3 to 30 days. Peripheral neuropathy may also be characterised by sharp cramping pains together with tingling in the legs and feet, mild impairment of cutaneous sensations and possible impairment of vibratory sensation. Other symptoms may include defective circulation, coldness and sweating of the hands and feet, and non-tender enlargement of the right and left parotid glands. Sensory changes progress rapidly and appear to parallel motor system dysfunction. Symmetrical motor disorders do not extend above the elbow and thighs. The upper extremities may become involved after the elapse of several days. In some instances spastic paralysis may develop as indicated by a swinging, stepping gait. In most cases this paralysis regresses although residual effects may persist. Full recovery may be an example of an effective adaptation to permanent motor loss. the minimum paralytic dose of TOCP is estimated to be 6-7 mg/kg. Severe symptoms may be evident at 0.15 gm and the flaccid paralysis may affect pharyngeal, ocular and respiratory muscles.

Death may result from respiratory paralysis. The lethal dose in man of the ortho-isomer is about 1 gm/kg. Autopsy in humans shows damage to the anterior horn cells, fatty degeneration of the white substance of the cord, tigrolysis of nerve cells, displacement of the nucleus to the periphery, demyelination with marked fragmentation and fatty degeneration of the myelin sheath and increased protein concentration in the cerebrospinal fluid.

Inhibition of "neurotoxic esterase" is thought to be the biochemical lesion leading to OPIDN; inhibition by more than 65% shortly after exposure to TOCP presages sub- sequent neuropathy. Factors other than metabolism (e.g., route of exposure, age, sex, strain) influence variability in response to TOCP neurotoxicity. A clear no-observed- effect level for delayed neuropathy is not apparent from the data available. TOCP is metabolised via three pathways. The first is the hydroxylation of one or more of the methyl groups, and the second is dearylation of the o-cresyl groups. The third is further oxidation of the hydroxymethyl to aldehyde and carboxylic acid. The hydroxylation step is critical

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because the hydroxymethyl TOCP is cyclised to form saligenin cyclic o-tolyl phosphate, the relatively unstable neurotoxic metabolite. TOCP and its metabolites are eliminated via the urine and faeces, together with small amounts in the expired air.

■ Accidental ingestion of the material may be harmful; animal experiments indicate that ingestion of less than 150 gram may be fatal or may produce serious damage to the health of the individual.

## EYE

■ Although the liquid is not thought to be an irritant, direct contact with the eye may produce transient discomfort characterized by tearing or conjunctival redness (as with windburn).

## SKIN

■ There is strong evidence to suggest that this material, on a single contact with skin, can cause serious, irreversible damage of organs.

■ The liquid may be miscible with fats or oils and may decrease the skin, producing a skin reaction described as non-allergic contact dermatitis. The material is unlikely to produce an irritant dermatitis as described in EC Directives .

■ Open cuts, abraded or irritated skin should not be exposed to this material.

■ Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.

■ Absorption by skin may readily exceed vapor inhalation exposure. Symptoms for skin absorption are the same as for inhalation.

■ Skin contact with the material may be harmful; systemic effects may result following absorption.

■ Tricresyl-o-phosphate (TOCP) is readily absorbed through intact human skin. Only 0.1% to 0.4% of a topical dose appears in the urine after 3 days. Consequently poisoning by percutaneous absorption is at least as important as potential exposure by ingestion or inhalation.

## INHALED

■ The material is not thought to produce respiratory irritation (as classified using animal models). Nevertheless inhalation of vapors, fumes or aerosols, especially for prolonged periods, may produce respiratory discomfort and occasionally, distress.

■ Inhalation hazard is increased at higher temperatures.

■ Inhalation of aerosols (mists, fumes), generated by the material during the course of normal handling, may be harmful.

■ There is strong evidence to suggest that this material, on a single contact with skin, can cause serious, irreversible damage of organs.

■ Organic phosphates are very stable and highly hazardous. There are a number of effects they can have on the body, including excitement of the central nervous system, and irritation of the skin and respiratory tract. Some aryl phosphates cause effects similar to anticholinesterases.

## CHRONIC HEALTH EFFECTS

■ There is limited evidence that, skin contact with this product is more likely to cause a sensitization reaction in some persons compared to the general population.

Exposure to the material may cause concerns for human fertility, on the basis that similar materials provide some evidence of impaired fertility in the absence of toxic effects, or evidence of impaired fertility occurring at around the same dose levels as other toxic effects, but which are not a secondary non-specific consequence of other toxic effects.

Prolonged dermal exposure to tricresyl phosphate may produced an allergic condition described as "paper dermatitis".

Long term exposure to tricresyl phosphate may cause bilateral wrist drop, numbness of fingers. Recovery from symptoms is slow and some residual paralysis may remain. Symptoms of intoxication may become evident after some weeks. Syndromes associated with cholinesterase inhibition are not evident.

Reproductive disorders in female workers include anovulatory cycles and other menstrual cycle disorders resulting from high oestrogen levels following altered ovarian function. Reproductive disorders in mice and

rats in a two-year feeding study included decreased litter size and viability, histopathological damage of the ovaries with dose-dependent diffuse vacuolar cytoplasmic alteration of ovarian interstitial cells and

testes with seminiferous tubule atrophy, morphological changes and decreased motility of sperm, increased follicular and luteal activity in females and decreased fertility in both sexes.

A two-year feeding study with animals produced non-neoplastic lesions including cytoplasmic vacuolisation of the adrenal cortex and liver changes.

## Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

### HAZARD RATINGS

|               | Min | Max |
|---------------|-----|-----|
| Flammability: | 1   |     |
| Toxicity:     | 3   |     |
| Body Contact: | 3   |     |
| Reactivity:   | 1   |     |

Min/Nil=0  
Low=1  
Moderate=2  
High=3  
Extreme=4



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Chronic: 2 

| NAME                       | CAS RN  | %   |
|----------------------------|---------|-----|
| tri-ortho-cresyl phosphate | 78-30-8 | >95 |

## Section 4 - FIRST AID MEASURES

### SWALLOWED

- 
- IF SWALLOWED, REFER FOR MEDICAL ATTENTION, WHERE POSSIBLE, WITHOUT DELAY.
- Where Medical attention is not immediately available or where the patient is more than 15 minutes from a hospital or unless instructed otherwise:
  - For advice, contact a Poisons Information Center or a doctor.
  - Urgent hospital treatment is likely to be needed.
  - If conscious, give water to drink.
  - INDUCE vomiting with fingers down the back of the throat, ONLY IF CONSCIOUS. Lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.

NOTE: Wear a protective glove when inducing vomiting by mechanical means.

- In the mean time, qualified first-aid personnel should treat the patient following observation and employing supportive measures as indicated by the patient's condition.
- If the services of a medical officer or medical doctor are readily available, the patient should be placed in his/her care and a copy of the MSDS should be provided. Further action will be the responsibility of the medical specialist.
- If medical attention is not available on the worksite or surroundings send the patient to a hospital together with a copy of the MSDS.

### EYE

- If this product comes in contact with the eyes:
  - Immediately hold eyelids apart and flush the eye continuously with running water.
  - Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.
  - Continue flushing until advised to stop by the Poisons Information Center or a doctor, or for at least 15 minutes.
  - Transport to hospital or doctor without delay.
  - Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

### SKIN

- If skin or hair contact occurs:
  - Quickly but gently, wipe material off skin with a dry, clean cloth.
  - Immediately remove all contaminated clothing, including footwear.
  - Wash skin and hair with running water. Continue flushing with water until advised to stop by the Poisons Information Center.
  - Transport to hospital, or doctor.

### INHALED

- 
- If fumes or combustion products are inhaled remove from contaminated area.
- Lay patient down. Keep warm and rested.
- Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.
- Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary.
- Transport to hospital, or doctor, without delay.

### NOTES TO PHYSICIAN

- Treat symptomatically.

TREATMENT for the ortho-isomer of tricresyl phosphate:

- In the absence of spontaneous vomiting administer a slurry of activated charcoal followed by gastric lavage.
- Saline cathartics, eg sodium and magnesium sulfate (15-20gm) in water.
- Daily doses of vitamin B1(300 mg) together with 1000 ug B12 by intramuscular injection over 45 days may have a protective effect on the nervous system if begun early but no effect on regeneration of peripheral motor neurons in controlled trials.
- Corticosteroids with the dose adjusted and tapered in accord with individual tolerances over a 30 day period may hasten regeneration.
- Pilocarpine (10-20 mg daily in divided doses by subcutaneous injection) resulted in temporary improvement in motor activity in some patients.

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- Aspirin or phenylbutazone for muscular pains.
- Physiotherapy, occupational therapy, sports and orthopedic programs

GOSSELIN, SMITH & HODGE: Clinical Toxicology of Commercial Products, 5th Ed.

Parent TOCP does not directly influence serum cholinesterase activity. Hepatic biotransformation to hydroxylated TOCP followed by albumin catalysed cyclisation results in the production of 2-o-(cresyl)-4H-1:3:2-benzodioxaphophoran-2-one (CBDP) and its hydroxylated congener; both inhibit cholinesterase activity and induce frank axonal pathology. It should be noted that cholinesterase inhibition is not associated with TOCP-induced peripheral neuropathy.

## Section 5 - FIRE FIGHTING MEASURES

|                             |                  |
|-----------------------------|------------------|
| Vapor Pressure (mmHg):      | 0.098 at 155 C.  |
| Upper Explosive Limit (%):  | 1.4 (estimated)  |
| Specific Gravity (water=1): | 1.16-1.18        |
| Lower Explosive Limit (%):  | 0.4 (calculated) |

### EXTINGUISHING MEDIA

- 
- Foam.
- Dry chemical powder.
- BCF (where regulations permit).
- Carbon dioxide.
- Water spray or fog - Large fires only.

### FIRE FIGHTING

- 
- Alert Emergency Responders and tell them location and nature of hazard.
- Wear full body protective clothing with breathing apparatus.
- Prevent, by any means available, spillage from entering drains or water course.
- Use fire fighting procedures suitable for surrounding area.
- DO NOT approach containers suspected to be hot.
- Cool fire exposed containers with water spray from a protected location.
- If safe to do so, remove containers from path of fire.
- Equipment should be thoroughly decontaminated after use.

### GENERAL FIRE HAZARDS/HAZARDOUS COMBUSTIBLE PRODUCTS

- - Combustible.
  - Slight fire hazard when exposed to heat or flame.
  - Heating may cause expansion or decomposition leading to violent rupture of containers.
  - On combustion, may emit toxic fumes of carbon monoxide (CO).
  - May emit acrid smoke.
  - Mists containing combustible materials may be explosive.
- Combustion products include: carbon dioxide (CO<sub>2</sub>), phosphorus oxides (PO<sub>x</sub>), other pyrolysis products typical of burning organic material. May emit poisonous fumes.

### FIRE INCOMPATIBILITY

- Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.

### PERSONAL PROTECTION

Glasses:

Chemical goggles.

Gloves:

1. BUTYL 2. NATURAL+NEOPRENE

Respirator:

Type A-P Filter of sufficient capacity

## Section 6 - ACCIDENTAL RELEASE MEASURES

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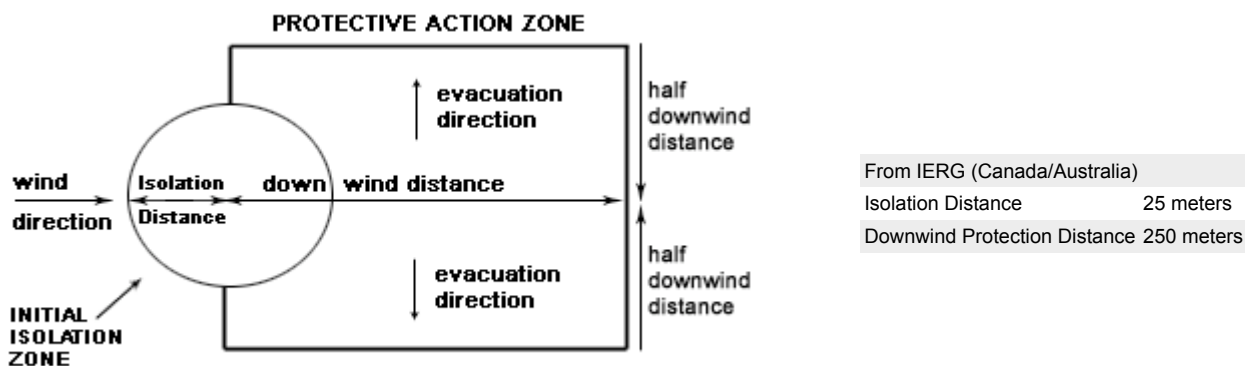
### MINOR SPILLS

- 
- Remove all ignition sources.
- Clean up all spills immediately.
- Avoid breathing vapors and contact with skin and eyes.
- Control personal contact by using protective equipment.
- Contain and absorb spill with sand, earth, inert material or vermiculite.
- Wipe up.
- Place in a suitable labeled container for waste disposal.

### MAJOR SPILLS

- 
- Clear area of personnel and move upwind.
- Alert Emergency Responders and tell them location and nature of hazard.
- Wear full body protective clothing with breathing apparatus.
- Prevent, by any means available, spillage from entering drains or water course.
- Stop leak if safe to do so.
- Contain spill with sand, earth or vermiculite.
- Collect recoverable product into labeled containers for recycling.
- Neutralize/decontaminate residue.
- Collect solid residues and seal in labeled drums for disposal.
- Wash area and prevent runoff into drains.
- After clean up operations, decontaminate and launder all protective clothing and equipment before storing and re-using.
- If contamination of drains or waterways occurs, advise emergency services.

### PROTECTIVE ACTIONS FOR SPILL



### FOOTNOTES

- 1 PROTECTIVE ACTION ZONE is defined as the area in which people are at risk of harmful exposure. This zone assumes that random changes in wind direction confines the vapour plume to an area within 30 degrees on either side of the predominant wind direction, resulting in a crosswind protective action distance equal to the downwind protective action distance.
- 2 PROTECTIVE ACTIONS should be initiated to the extent possible, beginning with those closest to the spill and working away from the site in the downwind direction. Within the protective action zone a level of vapour concentration may exist resulting in nearly all unprotected persons becoming incapacitated and unable to take protective action and/or incurring serious or irreversible health effects.
- 3 INITIAL ISOLATION ZONE is determined as an area, including upwind of the incident, within which a high probability of localised wind reversal may expose nearly all persons without appropriate protection to life-threatening concentrations of the material.
- 4 SMALL SPILLS involve a leaking package of 200 litres (55 US gallons) or less, such as a drum (jerrican or box with inner containers). Larger packages leaking less than 200 litres and compressed gas leaking from a small cylinder are also considered "small spills". LARGE SPILLS involve many small leaking packages or a leaking package of greater than 200 litres, such as a cargo tank, portable tank or a "one-tonne" compressed gas cylinder.
- 5 Guide 151 is taken from the US DOT emergency response guide book.
- 6 IERG information is derived from CANUTEC - Transport Canada.

### ACUTE EXPOSURE GUIDELINE LEVELS (AEGL) (in ppm)

AEGL 1: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could

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experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL 2: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

AEGL 3: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

## Section 7 - HANDLING AND STORAGE

### PROCEDURE FOR HANDLING

- DO NOT allow clothing wet with material to stay in contact with skin
- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- Prevent concentration in hollows and sumps.
- DO NOT enter confined spaces until atmosphere has been checked.
- DO NOT allow material to contact humans, exposed food or food utensils.
- Avoid contact with incompatible materials.
- When handling, DO NOT eat, drink or smoke.
- Keep containers securely sealed when not in use.
- Avoid physical damage to containers.
- Always wash hands with soap and water after handling.
- Work clothes should be laundered separately.
- Launder contaminated clothing before re-use.
- Use good occupational work practice.
- Observe manufacturer's storing and handling recommendations.
- Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

### RECOMMENDED STORAGE METHODS

- Lined metal can, Lined metal pail/drum
- Plastic pail
- Polyliner drum
- Packing as recommended by manufacturer.
- Check all containers are clearly labeled and free from leaks.

For low viscosity materials

- Drums and jerricans must be of the non-removable head type.
- Where a can is to be used as an inner package, the can must have a screwed enclosure.

For materials with a viscosity of at least 2680 cSt. (23 deg. C) and solids (between 15 C deg. and 40 deg C.):

- Removable head packaging;
- Cans with friction closures and
- low pressure tubes and cartridges may be used.

- Where combination packages are used, and the inner packages are of glass, there must be sufficient inert cushioning material in contact with inner and outer packages \* - In addition, where inner packagings are glass and contain liquids of packing group I and II there must be sufficient inert absorbent to absorb any spillage \*. - \* unless the outer packaging is a close fitting molded plastic box and the substances are not incompatible with the plastic. All inner and sole packagings for substances that have been assigned to Packaging Groups I or II on the basis of inhalation toxicity criteria, must be hermetically sealed.

### STORAGE REQUIREMENTS

- Store in original containers.
- Keep containers securely sealed.
- Store in a cool, dry, well-ventilated area.
- Store away from incompatible materials and foodstuff containers.

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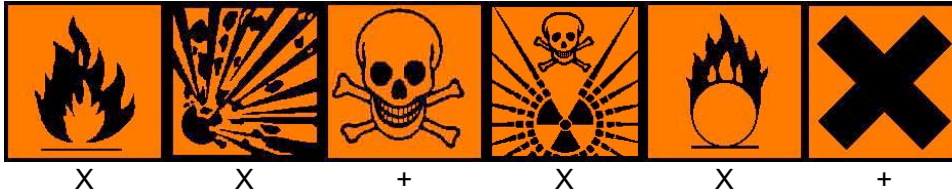
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- Protect containers against physical damage and check regularly for leaks.
- Observe manufacturer's storing and handling recommendations.

### SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS



X: Must not be stored together  
 O: May be stored together with specific preventions  
 +: May be stored together

## Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

### EXPOSURE CONTROLS

| Source                                                                                        | Material                                                | TWA ppm | TWA mg/m <sup>3</sup> | STEL ppm | STEL mg/m <sup>3</sup> | Peak ppm | Peak mg/m <sup>3</sup> | TWA F/CC | Notes                                         |
|-----------------------------------------------------------------------------------------------|---------------------------------------------------------|---------|-----------------------|----------|------------------------|----------|------------------------|----------|-----------------------------------------------|
| Canada - Alberta Occupational Exposure Limits                                                 | tri-ortho-cresyl phosphate (Triorthocresyl phosphate)   |         | 0.1                   |          |                        |          |                        |          |                                               |
| Canada - British Columbia Occupational Exposure Limits                                        | tri-ortho-cresyl phosphate (Triorthocresyl phosphate)   |         | 0.1                   |          |                        |          |                        |          | Skin                                          |
| Canada - Ontario Occupational Exposure Limits                                                 | tri-ortho-cresyl phosphate (Tri-ortho-cresyl phosphate) |         | 0.1                   |          |                        |          |                        |          | Skin                                          |
| US OSHA Permissible Exposure Levels (PELs) - Table Z1                                         | tri-ortho-cresyl phosphate (Triorthocresyl phosphate)   |         | 0.1                   |          |                        |          |                        |          |                                               |
| US ACGIH Threshold Limit Values (TLV)                                                         | tri-ortho-cresyl phosphate (Triorthocresyl phosphate)   |         | 0.1                   |          |                        |          |                        |          | TLV Basis: cholinesterase inhibition. BEI-Aon |
| US NIOSH Recommended Exposure Limits (RELs)                                                   | tri-ortho-cresyl phosphate (Triorthocresyl phosphate)   |         | 0.1                   |          |                        |          |                        |          |                                               |
| US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants                     | tri-ortho-cresyl phosphate (Triorthocresyl phosphate)   |         | 0.1                   |          |                        |          |                        |          |                                               |
| US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants | tri-ortho-cresyl phosphate (Triorthocresyl phosphate)   |         | 0.1                   |          |                        |          |                        |          |                                               |



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|---------------------------------------------------------------------------------------------|---------------------------------------------------------|------|----------|-------|-----------------------------------------------|
| US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants | tri-ortho-cresyl phosphate (Triorthocresyl phosphate)   | 0.1  |          |       |                                               |
| US - Minnesota Permissible Exposure Limits (PELs)                                           | tri-ortho-cresyl phosphate (Triorthocresyl phosphate)   | 0.1  |          |       |                                               |
| US - California Permissible Exposure Limits for Chemical Contaminants                       | tri-ortho-cresyl phosphate (Triorthocresyl phosphate)   | 0.1  |          |       |                                               |
| US - Idaho - Limits for Air Contaminants                                                    | tri-ortho-cresyl phosphate (Triorthocresyl phosphate)   | 0.1  |          |       |                                               |
| US - Hawaii Air Contaminant Limits                                                          | tri-ortho-cresyl phosphate (Triorthocresyl phosphate)   | 0.1  |          |       |                                               |
| US - Alaska Limits for Air Contaminants                                                     | tri-ortho-cresyl phosphate (Tri-ortho-cresyl phosphate) | 0.1  |          |       |                                               |
| US - Michigan Exposure Limits for Air Contaminants                                          | tri-ortho-cresyl phosphate (Triorthocresyl phosphate)   | 0.1  |          |       |                                               |
| Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances               | tri-ortho-cresyl phosphate (Triorthocresyl phosphate)   | -    | 0.1      | - 0.3 |                                               |
| US - Washington Permissible exposure limits of air contaminants                             | tri-ortho-cresyl phosphate (Triorthocresyl phosphate)   |      | 0.1      | 0.3   |                                               |
| Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits     | tri-ortho-cresyl phosphate (Triorthocresyl phosphate)   |      | 0.1      | 0.3   | Skin                                          |
| Canada - Prince Edward Island Occupational Exposure Limits                                  | tri-ortho-cresyl phosphate (Triorthocresyl phosphate)   |      | 0.1      |       | TLV Basis: cholinesterase inhibition. BEI-Aon |
| US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants            | tri-ortho-cresyl phosphate (Triorthocresyl phosphate)   |      | 0.1      |       |                                               |
| Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)             | tri-ortho-cresyl phosphate (Tri-o-cresyl phosphate)     |      | 0.1      |       |                                               |
| US - Oregon Permissible Exposure Limits (Z1)                                                | tri-ortho-cresyl phosphate (Triorthocresyl phosphate)   |      | 0.1      |       |                                               |

# Tritolyl phosphate

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## Material Safety Data Sheet

| Hazard Alert Code Key:                                                | EXTREME                                               | HIGH | MODERATE | LOW                                           |
|-----------------------------------------------------------------------|-------------------------------------------------------|------|----------|-----------------------------------------------|
| Canada - Northwest Territories Occupational Exposure Limits (English) | tri-ortho-cresyl phosphate (Triorthocresyl phosphate) | 0.1  | 0.3      |                                               |
| Canada - Nova Scotia Occupational Exposure Limits                     | tri-ortho-cresyl phosphate (Triorthocresyl phosphate) | 0.1  |          | TLV Basis: cholinesterase inhibition. BEI-Aon |

### EMERGENCY EXPOSURE LIMITS

| Material                   | Revised IDLH Value (mg/m3) | Revised IDLH Value (ppm) |
|----------------------------|----------------------------|--------------------------|
| tri-ortho-cresyl phosphate | 40 [Unch]                  |                          |

### MATERIAL DATA

#### TRI-ORTHO-CRESYL PHOSPHATE:

■ Exposure to TOCP causes central and peripheral neuropathies with paralysis of the distal muscles of the lower and upper extremities. Air concentrations between 0.55 and 1.7 mg/m<sup>3</sup> have been associated with polyneuritis, reduced cholinesterase activity has been related to air concentrations of 0.27 - > 3 mg/m<sup>3</sup>.

### PERSONAL PROTECTION



Consult your EHS staff for recommendations

#### EYE

- 
- Safety glasses with side shields.
- Chemical goggles.
- Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them. DO NOT wear contact lenses.

#### HANDS/FEET

■ Wear chemical protective gloves, eg. PVC.  
Wear safety footwear or safety gumboots, eg. Rubber.

NOTE: The material may produce skin sensitization in predisposed individuals. Care must be taken, when removing gloves and other protective equipment, to avoid all possible skin contact.

Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include: such as:

- frequency and duration of contact,
- chemical resistance of glove material,
- glove thickness and
- dexterity

Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739).

- When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes according to EN 374) is recommended.
- When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374) is recommended.
- Contaminated gloves should be replaced.

Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturiser is recommended.

- Neoprene rubber gloves

#### OTHER

- 
- Overalls.
- Eyewash unit.
- Barrier cream.

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|                               |                |             |                 |            |
|-------------------------------|----------------|-------------|-----------------|------------|
| <b>Hazard Alert Code Key:</b> | <b>EXTREME</b> | <b>HIGH</b> | <b>MODERATE</b> | <b>LOW</b> |
|-------------------------------|----------------|-------------|-----------------|------------|

- Skin cleansing cream.

**GLOVE SELECTION INDEX**

■ Glove selection is based on a modified presentation of the:

"Forsberg Clothing Performance Index".

The effect(s) of the following substance(s) are taken into account in the computer-generated selection: tri-ortho-cresyl phosphate

■ Protective Material CPI \*

|                  |   |
|------------------|---|
| BUTYL            | A |
| NATURAL+NEOPRENE | A |
| NEOPRENE         | A |
| NEOPRENE/NATURAL | A |
| NITRILE          | A |
| PVA              | A |
| PVC              | A |
| VITON            | A |
| NATURAL RUBBER   | A |

■ \* CPI - Chemwatch Performance Index

A: Best Selection

B: Satisfactory; may degrade after 4 hours continuous immersion

C: Poor to Dangerous Choice for other than short term immersion

NOTE: As a series of factors will influence the actual performance of the glove, a final selection must be based on detailed observation. -

\* Where the glove is to be used on a short term, casual or infrequent basis, factors such as "feel" or convenience (e.g. disposability), may dictate a choice of gloves which might otherwise be unsuitable following long-term or frequent use. A qualified practitioner should be consulted.

**RESPIRATOR**

■ Selection of the Class and Type of respirator will depend upon the level of breathing zone contaminant and the chemical nature of the contaminant. Protection Factors (defined as the ratio of contaminant outside and inside the mask) may also be important.

| Breathing Zone Level ppm (volume) | Maximum Protection Factor | Half-face Respirator | Full-Face Respirator |
|-----------------------------------|---------------------------|----------------------|----------------------|
| 1000                              | 10                        | A-1 P                | -                    |
| 1000                              | 50                        | -                    | A-1 P                |
| 5000                              | 50                        | Airline*             | -                    |
| 5000                              | 100                       | -                    | A-2 P                |
| 10000                             | 100                       | -                    | A-3 P                |
|                                   | 100+                      |                      | Airline* *           |

\* - Continuous Flow \*\* - Continuous-flow or positive pressure demand.

The local concentration of material, quantity and conditions of use determine the type of personal protective equipment required.

Use appropriate NIOSH-certified respirator based on informed professional judgement. In conditions where no reasonable estimate of exposure can be made, assume the exposure is in a concentration IDLH and use NIOSH-certified full face pressure demand SCBA with a minimum service life of 30 minutes, or a combination full facepiece pressure demand SAR with auxiliary self-contained air supply. Respirators provided only for escape from IDLH atmospheres shall be NIOSH-certified for escape from the atmosphere in which they will be used.

**ENGINEERING CONTROLS**

■ Local exhaust ventilation usually required. If risk of overexposure exists, wear an approved respirator. Correct fit is essential to obtain adequate protection an approved self contained breathing apparatus (SCBA) may be required in some situations. Provide adequate ventilation in warehouse or closed storage area.

Air contaminants generated in the workplace possess varying "escape" velocities which, in turn, determine the "capture velocities" of fresh circulating air required to effectively remove the contaminant.

|                                                                         |                              |
|-------------------------------------------------------------------------|------------------------------|
| Type of Contaminant:                                                    | Air Speed:                   |
| solvent, vapors, degreasing etc., evaporating from tank (in still air). | 0.25-0.5 m/s (50-100 f/min.) |

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aerosols, fumes from pouring operations, intermittent container filling, low speed conveyer transfers, welding, spray drift, plating acid fumes, pickling (released at low velocity into zone of active generation) 0.5-1 m/s (100-200 f/min.)

direct spray, spray painting in shallow booths, drum filling, conveyer loading, crusher dusts, gas discharge (active generation into zone of rapid air motion) 1-2.5 m/s (200-500 f/min.)

grinding, abrasive blasting, tumbling, high speed wheel generated dusts (released at high initial velocity into zone of very high rapid air motion). 2.5-10 m/s (500-2000 f/min.)

Within each range the appropriate value depends on:

| Lower end of the range                                     | Upper end of the range           |
|------------------------------------------------------------|----------------------------------|
| 1: Room air currents minimal or favorable to capture       | 1: Disturbing room air currents  |
| 2: Contaminants of low toxicity or of nuisance value only. | 2: Contaminants of high toxicity |
| 3: Intermittent, low production.                           | 3: High production, heavy use    |
| 4: Large hood or large air mass in motion                  | 4: Small hood-local control only |

Simple theory shows that air velocity falls rapidly with distance away from the opening of a simple extraction pipe. Velocity generally decreases with the square of distance from the extraction point (in simple cases). Therefore the air speed at the extraction point should be adjusted, accordingly, after reference to distance from the contaminating source. The air velocity at the extraction fan, for example, should be a minimum of 1-2 m/s (200-400 f/min) for extraction of solvents generated in a tank 2 meters distant from the extraction point. Other mechanical considerations, producing performance deficits within the extraction apparatus, make it essential that theoretical air velocities are multiplied by factors of 10 or more when extraction systems are installed or used.

## Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

### PHYSICAL PROPERTIES

Liquid.  
Does not mix with water.  
Sinks in water.

|                           |                  |                                |                 |
|---------------------------|------------------|--------------------------------|-----------------|
| State                     | Liquid           | Molecular Weight               | 368.37          |
| Melting Range (°F)        | -27.4            | Viscosity                      | Not Available   |
| Boiling Range (°F)        | 770 (decomp)     | Solubility in water (g/L)      | Immiscible      |
| Flash Point (°F)          | 410              | pH (1% solution)               | Not applicable. |
| Decomposition Temp (°F)   | Not Available    | pH (as supplied)               | Not applicable  |
| Autoignition Temp (°F)    | 725              | Vapor Pressure (mmHg)          | 0.098 at 155 C. |
| Upper Explosive Limit (%) | 1.4 (estimated)  | Specific Gravity (water=1)     | 1.16-1.18       |
| Lower Explosive Limit (%) | 0.4 (calculated) | Relative Vapor Density (air=1) | 12.7            |
| Volatile Component (%vol) | Negligible       | Evaporation Rate               | Not available   |

### APPEARANCE

Pale brown to colourless oily liquid with a faint odour or no odour. Immiscible with water. Miscible with all the common organic solvents and thinners, linseed oil, china wood oil, castor oil. Pour point: -28 C.

## Section 10 - CHEMICAL STABILITY

### CONDITIONS CONTRIBUTING TO INSTABILITY

- 
- Presence of incompatible materials.
- Product is considered stable.
- Hazardous polymerization will not occur.

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**STORAGE INCOMPATIBILITY**

- Aryl phosphates will hydrolyse with water at elevated temperatures. Hydrolysis is accelerated by acids or bases.
  - Vinyl-based resins may be degraded by aryl phosphates
- Tricresyl phosphate:
- hydrolyses in water to produce phosphoric acid
  - reacts violently with strong oxidisers
  - will explode in contact with magnesium
  - aqueous solutions are incompatible with sulfuric acid, caustics, ammonia, aliphatic amines, alkanolamines, isocyanates, alkylene oxides, epichlorohydrin, nitromethane
  - attacks some plastics, rubber and coatings.
  - Avoid strong acids, bases.
- Avoid reaction with oxidizing agents.
- For incompatible materials - refer to Section 7 - Handling and Storage.

**Section 11 - TOXICOLOGICAL INFORMATION**

tri-ortho-cresyl phosphate

**TOXICITY AND IRRITATION**

■ unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

| TOXICITY                       | IRRITATION   |
|--------------------------------|--------------|
| Oral (rat) LD50: 1160 mg/kg    | Nil Reported |
| Reproductive effector in rats. |              |

**CARCINOGEN**

| Triorthocresyl phosphate | US ACGIH Threshold Limit Values (TLV) - Carcinogens | Carcinogen Category | A4 |
|--------------------------|-----------------------------------------------------|---------------------|----|
|--------------------------|-----------------------------------------------------|---------------------|----|

**SKIN**

|                            |                                                                                                    |                  |      |
|----------------------------|----------------------------------------------------------------------------------------------------|------------------|------|
| tri-ortho-cresyl phosphate | Canada - Ontario Occupational Exposure Limits - Skin                                               | Notes            | Skin |
| tri-ortho-cresyl phosphate | US AIHA Workplace Environmental Exposure Levels (WEELs) - Skin                                     | Notes            | Skin |
| tri-ortho-cresyl phosphate | US NIOSH Recommended Exposure Limits (RELs) - Skin                                                 | Skin             | Yes  |
| tri-ortho-cresyl phosphate | Canada - Quebec Permissible Exposure Values for Airborne Contaminants - Skin (French)              | Notes            | Skin |
| tri-ortho-cresyl phosphate | US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants - Skin                   | Skin Designation | X    |
| tri-ortho-cresyl phosphate | US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants - Skin | Skin Designation | X    |
| tri-ortho-cresyl phosphate | US - Washington Permissible exposure limits of air contaminants - Skin                             | Skin             | X    |
| tri-ortho-cresyl phosphate | US ACGIH Threshold Limit Values (TLV) - Skin                                                       | Skin Designation | Yes  |
| tri-ortho-cresyl phosphate | Canada - British Columbia Occupational Exposure Limits - Skin                                      | Notation         | Skin |
| tri-ortho-cresyl phosphate | US - Minnesota Permissible Exposure Limits (PELs) - Skin                                           | Skin Designation | X    |
| tri-ortho-cresyl phosphate | US - Hawaii Air Contaminant Limits - Skin Designation                                              | Skin Designation | X    |
| tri-ortho-cresyl phosphate | ND                                                                                                 | Skin Designation | X    |

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| Hazard Alert Code Key:     |                                                                              | EXTREME | HIGH | MODERATE | LOW                     |
|----------------------------|------------------------------------------------------------------------------|---------|------|----------|-------------------------|
| tri-ortho-cresyl phosphate | US OSHA Permissible Exposure Levels (PELs) - Skin                            |         |      |          | Skin Designation X      |
| tri-ortho-cresyl phosphate | US - California Permissible Exposure Limits for Chemical Contaminants - Skin |         |      |          | Skin X                  |
| tri-ortho-cresyl phosphate | US - California Permissible Exposure Limits for Chemical Contaminants - Skin |         |      |          | Skin S                  |
| tri-ortho-cresyl phosphate | Canada - Alberta Occupational Exposure Limits - Skin                         |         |      |          | Substance Interaction 1 |

## Section 12 - ECOLOGICAL INFORMATION

Refer to data for ingredients, which follows:

TRI-ORTHO-CRESYL PHOSPHATE:

|                   |        |
|-------------------|--------|
| Marine Pollutant: | Severe |
|-------------------|--------|

■ Fish LC50 (96hr.) (mg/l): 7000- 8700

- Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
  - Do NOT allow product to come in contact with surface waters or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment wash-waters.
- Wastes resulting from use of the product must be disposed of on site or at approved waste sites.

■ for tricresyl phosphate (TCP):

Environmental fate:

Because of its low water solubility and high adsorption to particulates, TCP is rapidly adsorbed onto river or lake sediment and soil. The ortho isomer is degraded slightly faster than the meta or para isomers. TCP is readily biodegraded in sewage sludge with a half-life of 7.5 h, the degradation within 24 h being up to 99%. The major metabolite extracted with ethyl ether from the aqueous phase was identified as p-hydroxybenzoic acid.

Abiotic degradation is slower with a half-life of 96 days. Bioconcentration factors (BCF) of 165-2768 were measured for several fish species in the laboratory using radiolabelled TCP. The radioactivity was lost rapidly on cessation of exposure, depuration half-lives ranging between 25.8 and 90 h.

The clearance of tri-m-cresyl phosphate has been shown to be biphasic, with higher rates of clearance in the first 6 days after transfer to clean water, especially for rainbow trout. The clearance rate constants for rainbow trout were about 50% more than those for fathead minnows

The uptake and translocation of tri-p-cresyl phosphate by soybean plants has been studied; the initial concentration in soil being 10 mg per kg. Approximately 70% of the compound had disappeared from the soil within 90 days (when the plants were harvested). At that time, the amount per plant was 34 ug (0.17% of the applied TCP). Of this total plant content, 74% was found in the stem, 24% in the leaves, and 2% in the pods. The seeds contained no detectable tri-p- cresyl phosphate.

For alkyl-aryl and triaryl phosphates, increasing the number and size of substituent groups on the phenyl molecule decreases the biodegradability. The degradation pathway for TCP most probably involves stepwise enzymatic hydrolysis to orthophosphate and phenolic moieties. The phenol would then be expected to undergo further degradation. p-Cresol is oxidized to p-hydroxybenzoic acid by a species of Pseudomonas.

Ecotoxicity:

Owing to the high biodegradation rate of TCP in aqueous environment, it is not considered to affect aquatic organisms adversely.

Freshwater algae are relatively sensitive to TCP, the 50% growth inhibitory concentration ranging from 1.5 to 5.0 mg/litre. Among fish species, the rainbow trout is adversely affected by TCP concentrations below 1 mg/litre (0.3-0.9 mg/litre), with sign of chronic poisoning, but the tidewater silverside is more resistant (LC50 is 8700 mg/litre). TCP does not inhibit cholinesterase activity in fish or frogs, but it has a synergistic effect on organophosphorus insecticide activity.

■ The principal problems of phosphate contamination of the environment relates to eutrophication processes in lakes and ponds. Phosphorus is an essential plant nutrient and is usually the limiting nutrient for blue-green algae. A lake undergoing eutrophication shows a rapid growth of algae in surface waters. Planktonic algae cause turbidity and flotation films. Shore algae cause ugly muddying, films and damage to reeds. Decay of these algae causes oxygen depletion in the deep water and shallow water near the shore. The process is self-perpetuating because anoxic conditions at the sediment/ water interface causes the release of more adsorbed phosphates from the sediment. The growth of algae produces undesirable effects on the treatment of water for drinking purposes, on fisheries, and on the use of lakes for recreational purposes.

■ For alkyl-aryl and triaryl phosphates, increasing the number and size of substituent groups on the phenyl molecule decreases the biodegradability.

### Ecotoxicity

| Ingredient                 | Persistence: Water/Soil | Persistence: Air | Bioaccumulation | Mobility |
|----------------------------|-------------------------|------------------|-----------------|----------|
| tri-ortho-cresyl phosphate | HIGH                    |                  | LOW             | LOW      |

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Hazard Alert Code Key: **EXTREME** **HIGH** **MODERATE** **LOW**

## Section 13 - DISPOSAL CONSIDERATIONS

### Disposal Instructions

All waste must be handled in accordance with local, state and federal regulations.

! Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked.

A Hierarchy of Controls seems to be common - the user should investigate:

- Reduction
- Reuse
- Recycling
- Disposal (if all else fails)

This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. If it has been contaminated, it may be possible to reclaim the product by filtration, distillation or some other means. Shelf life considerations should also be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate.

DO NOT allow wash water from cleaning equipment to enter drains. Collect all wash water for treatment before disposal.

- Recycle wherever possible or consult manufacturer for recycling options.
- Consult Waste Management Authority for disposal.
- Bury or incinerate residue at an approved site.
- Recycle containers if possible, or dispose of in an authorized landfill.

## Section 14 - TRANSPORTATION INFORMATION



DOT:

|                                            |        |                                                |                            |
|--------------------------------------------|--------|------------------------------------------------|----------------------------|
| Symbols:                                   | None   | Hazard class or Division:                      | 6.1                        |
| Identification Numbers:                    | UN2574 | PG:                                            | II                         |
| Label Codes:                               | 6.1    | Special provisions:                            | A3, IB2, N33, N34, T7, TP2 |
| Packaging: Exceptions:                     | 153    | Packaging: Non-bulk:                           | 202                        |
| Packaging: Exceptions:                     | 153    | Quantity limitations: Passenger aircraft/rail: | 5 L                        |
| Quantity Limitations: Cargo aircraft only: | 60 L   | Vessel stowage: Location:                      | A                          |
| Vessel stowage: Other:                     | None   | S.M.P.:                                        | YES                        |

Hazardous materials descriptions and proper shipping names:

Tricresyl phosphate with more than 3 percent ortho isomer

### Air Transport IATA:

|                     |      |                    |      |
|---------------------|------|--------------------|------|
| ICAO/IATA Class:    | 6.1  | ICAO/IATA Subrisk: | None |
| UN/ID Number:       | 2574 | Packing Group:     | II   |
| Special provisions: | None |                    |      |

Shipping Name: TRICRESYL PHOSPHATE

### Maritime Transport IMDG:

|             |      |                |      |
|-------------|------|----------------|------|
| IMDG Class: | 6.1  | IMDG Subrisk:  | None |
| UN Number:  | 2574 | Packing Group: | II   |

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The Power is Question

| Hazard Alert Code Key:                                            | EXTREME | HIGH | MODERATE            | LOW    |
|-------------------------------------------------------------------|---------|------|---------------------|--------|
| EMS Number:                                                       | F-A,S-A |      | Special provisions: | None   |
| Limited Quantities:                                               | 100 ml  |      | Marine Pollutant:   | Severe |
| Shipping Name: TRICRESYL PHOSPHATE with more than 3% ortho-isomer |         |      |                     |        |

## Section 15 - REGULATORY INFORMATION

### tri-ortho-cresyl phosphate (CAS: 78-30-8) is found on the following regulatory lists;

"Canada - Alberta Occupational Exposure Limits", "Canada - British Columbia Occupational Exposure Limits", "Canada - Northwest Territories Occupational Exposure Limits (English)", "Canada - Nova Scotia Occupational Exposure Limits", "Canada - Ontario Occupational Exposure Limits", "Canada - Prince Edward Island Occupational Exposure Limits", "Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)", "Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits", "Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances", "Canada Ingredient Disclosure List (SOR/88-64)", "Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)", "Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (French)", "US - Alaska Limits for Air Contaminants", "US - California Air Toxics ""Hot Spots"" List (Assembly Bill 2588) Substances for which emissions must be quantified", "US - California Occupational Safety and Health Regulations (CAL/OSHA) - Hazardous Substances List", "US - California Permissible Exposure Limits for Chemical Contaminants", "US - Hawaii Air Contaminant Limits", "US - Idaho - Limits for Air Contaminants", "US - Michigan Exposure Limits for Air Contaminants", "US - Minnesota Hazardous Substance List", "US - Minnesota Permissible Exposure Limits (PELs)", "US - Oregon Permissible Exposure Limits (Z1)", "US - Pennsylvania - Hazardous Substance List", "US - Rhode Island Hazardous Substance List", "US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants", "US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants", "US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants", "US - Washington Permissible exposure limits of air contaminants", "US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants", "US ACGIH Threshold Limit Values (TLV)", "US ACGIH Threshold Limit Values (TLV) - Carcinogens", "US DOE Temporary Emergency Exposure Limits (TEELs)", "US NIOSH Recommended Exposure Limits (RELs)", "US OSHA Permissible Exposure Levels (PELs) - Table Z1", "US Toxic Substances Control Act (TSCA) - Inventory", "US TSCA Section 8 (d) - Health and Safety Data Reporting"

## Section 16 - OTHER INFORMATION

### LIMITED EVIDENCE

- Cumulative effects may result following exposure\*.
- Possible skin sensitizer\*.
- May possibly affect fertility\*.

\* (limited evidence).

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- Classification of the mixture and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.

A list of reference resources used to assist the committee may be found at:  
[www.chemwatch.net/references](http://www.chemwatch.net/references).

- The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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Issue Date: Jun-7-2008

Print Date: May-8-2010