DIETHYL PHTHALATE

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME
DIETHYL PHTHALATE

PRODUCT USE
Used as a plasticizer component of resins, elastomers; and plastic products; perfume fixative.

SUPPLIER
Company: S D FINE - CHEM LIMITED
Address:
315- 317, T.V.IND.ESTATE
248, WORLI ROAD
MUMBAI- 400030, INDIA
Telephone: 91- 22 2495 9898
Telephone: 91- 22 2495 9899
Fax: 91- 22 24937232
Email: technical@sdfine.com

Section 2 - HAZARDS IDENTIFICATION

HAZARD RATINGS

GHS Classification

Acute Aquatic Hazard Category 2
Acute Toxicity (Oral) Category 4
Eye Irritation Category 2A
Reproductive Toxicity Category 2
Skin Corrosion/Irritation Category 2
STOT - SE (Resp. Irr.) Category 3

continued...

Section 2 - HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

HAZARD
WARNING

Determined by using GHS criteria

H302	Harmful if swallowed.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
H361	Suspected of damaging fertility or the unborn child.
H401	Toxic to aquatic life
H423	Harmful to the soil environment
H433	Harmful to terrestrial vertebrates

PRECAUTIONARY STATEMENTS

Prevention

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P261	Avoid breathing dust/fume/gas/mist/vapours/spray.
P264	Wash ... thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well- ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/protective clothing/eye protection/face protection.
P281	Use personal protective equipment as required.

Response

P301+P312	IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.
P304+P340	IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308+P313	IF exposed or concerned: Get medical advice/ attention.
P312	Call a POISON CENTER or doctor/physician if you feel unwell.
P330	Rinse mouth.
P337+P313	If eye irritation persists: Get medical advice/attention.

Storage

P403+P233	Store in a well- ventilated place. Keep container tightly closed.
P405	Store locked up.

Disposal

P501	Dispose of contents/container to ...

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
diethyl phthalate	84-66-2	>99

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Section 4 - FIRST AID MEASURES

SWALLOWED

- If swallowed do NOT induce vomiting.
- If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.
- Observe the patient carefully.
- Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious.
- Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink.
- Seek medical advice.

EYE

■ If this product comes in contact with the eyes:

- Wash out immediately with fresh 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.
- Seek medical attention without delay; if pain persists or recurs seek medical attention.
- Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

SKIN

■ If skin contact occurs:

- Immediately remove all contaminated clothing, including footwear.
- Flush skin and hair with running water (and soap if available).
- Seek medical attention in event of irritation.

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.

Section 5 - FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

- Water spray or fog.
- Alcohol stable foam.
- Dry chemical powder.
- Carbon dioxide.

FIRE FIGHTING

- Alert Fire Brigade 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 water delivered as a fine spray to control fire and cool adjacent area.
- Avoid spraying water onto liquid pools.
- 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.

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FIRE/EXPLOSION HAZARD
- 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_2), other pyrolysis products typical of burning organic material.
May emit poisonous fumes.
May emit corrosive fumes.

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

Personal Protective Equipment
Gloves, boots (chemical resistant).

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS
■ Environmental hazard - contain spillage.
- Remove all ignition sources.
- Clean up all spills immediately.
- Avoid breathing vapours 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, labelled container for waste disposal.

MAJOR SPILLS
■ Environmental hazard - contain spillage.
Moderate hazard.
- Clear area of personnel and move upwind.
- Alert Fire Brigade and tell them location and nature of hazard.
- Wear breathing apparatus plus protective gloves.
- Prevent, by any means available, spillage from entering drains or water course.
- No smoking, naked lights or ignition sources.
- Increase ventilation.
- Stop leak if safe to do so.
- Contain spill with sand, earth or vermiculite.
- Collect recoverable product into labelled containers for recycling.
- Absorb remaining product with sand, earth or vermiculite.
- Collect solid residues and seal in labelled drums for disposal.
- Wash area and prevent runoff into drains.
- If contamination of drains or waterways occurs, advise emergency services.

Personal Protective Equipment advice is contained in Section 8 of the MSDS.

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.

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- 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.
- Avoid smoking, naked lights or ignition sources.
- 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.
- 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.

SUITABLE CONTAINER

- Metal can or drum
- Packaging as recommended by manufacturer.
- Check all containers are clearly labelled and free from leaks.

STORAGE INCOMPATIBILITY

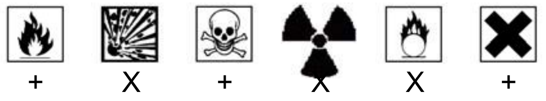
■ Phthalates:

- react with strong acids, strong oxidisers, permanganates and nitrates
- attack some form of plastics.
- Avoid reaction with oxidising agents.

STORAGE REQUIREMENTS

- Store in original containers.
- Keep containers securely sealed.
- No smoking, naked lights or ignition sources.
- Store in a cool, dry, well-ventilated area.
- Store away from incompatible materials and foodstuff containers.
- Protect containers against physical damage and check regularly for leaks.
- Observe manufacturer's storing and handling recommendations.

SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS



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

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

The following materials had no OELs on our records

• diethyl phthalate:	CAS:84- 66- 2

continued...

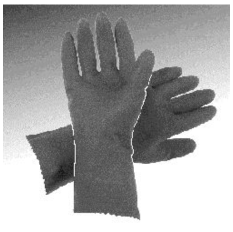
MATERIAL DATA

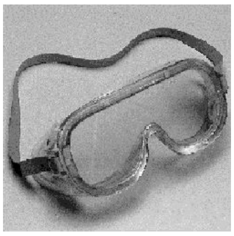
DIETHYL PHTHALATE:

■ For diethyl phthalate:

Exposure of workers to vapours of diethyl phthalate may cause transient irritation of the nose and throat. Exposure at or below the TLV-TWA is thought to protect the worker against the significant risks of polyneuritis and vestibular dysfunction which have been reported following exposure to mixtures of phthalates.

PERSONAL PROTECTION





EYE

- Safety glasses with side shields.
- Chemical goggles.
- Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lens or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59].

HANDS/FEET

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

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.

OTHER

- Overalls.
- P.V.C. apron.
- Barrier cream.
- Skin cleansing cream.
- Eye wash unit.

RESPIRATOR

- type a-p filter of sufficient capacity.

■ Cartridge respirators should never be used for emergency ingress or in areas of unknown vapour concentrations or oxygen content. The wearer must be warned to leave the contaminated area immediately on

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detecting any odours through the respirator. The odour may indicate that the mask is not functioning properly, that the vapour concentration is too high, or that the mask is not properly fitted. Because of these limitations, only restricted use of cartridge respirators is considered appropriate.
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- AUS p	-
1000	50	-	a- AUS p
5000	50	Airline *	-
5000	100	-	a- 2 p
10000	100	-	a- 3 p
	100+		Airline**

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

■ 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.

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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. For further information consult your Occupational Health and Safety Advisor.

ENGINEERING CONTROLS
■ General exhaust is adequate under normal operating conditions. Local exhaust ventilation may be required in special circumstances. If risk of overexposure exists, wear approved respirator. Supplied-air type respirator may be required in special circumstances. Correct fit is essential to ensure adequate protection. Provide adequate ventilation in warehouses and enclosed storage areas. 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, vapours, 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 favourable 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

APPEARANCE

Clear slightly viscous liquid; not soluble in water. Mild pleasant odour. Soluble in most solvents.

PHYSICAL PROPERTIES

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

State	Liquid	Molecular Weight	222.26
Melting Range (°C)	- 3	Viscosity	Not Available
Boiling Range (°C)	296	Solubility in water (g/L)	Immiscible
Flash Point (°C)	171	pH (1% solution)	Not applicable
Decomposition Temp (°C)	Not available	pH (as supplied)	Not applicable
Autoignition Temp (°C)	457	Vapour Pressure (kPa)	1 @ 150 deg C
Upper Explosive Limit (%)	Not available	Specific Gravity (water=1)	1.12 @ 20 deg C
Lower Explosive Limit (%)	0.75	Relative Vapour Density (air=1)	7.6
Volatile Component (%vol)	0.1	Evaporation Rate	Not available

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Material	Value
DIETHYL PHTHALATE:	
log Kow	2.47- 3.2

Section 10 - CHEMICAL STABILITY AND REACTIVITY INFORMATION

CONDITIONS CONTRIBUTING TO INSTABILITY

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

For incompatible materials - refer to Section 7 - Handling and Storage.

Section 11 - TOXICOLOGICAL INFORMATION

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

■ Accidental ingestion of the material may be damaging to the health of the individual.
■ Diethyl phthalate produced no adverse effect at levels of 2.5 g/kg/day for rats, 1.28 g/kg/day for dogs as determined from feeding studies of 6-weeks duration. About half of the level was safe to produce no effect when administered over one or more years.
■ The toxicity of phthalates is not excessive due to slow oral absorption and metabolism. Absorption is affected by fat in the diet. Repeated doses can cause cumulative toxic effects, and symptoms include an enlarged liver which often reverses if exposure is maintained. Carbohydrate metabolism is disrupted, and cholesterol and triglyceride levels in the blood falls. There can also be withering of the testicles. Some phthalates can increase the effects of antibiotics, thiamine (vitamin B1) and sulfonamides.

EYE

■ This material can cause eye irritation and damage in some persons.

SKIN

■ This material can cause inflammation of the skin oncontact in some persons.
■ The material may accentuate any pre-existing dermatitis condition.
■ Skin contact is not thought to have harmful health effects (as classified under EC Directives); the material may still produce health damage following entry through wounds, lesions or abrasions.
■ 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.

INHALED

■ The material can cause respiratory irritation in some persons. The body's response to such irritation can cause further lung damage.
■ Exposure to the heated vapour of diethyl phthalate produces transient irritation in the nose and throat. To date there have been no reports implicating diethyl phthalate in cumulative adverse health effects.
■ Inhalation hazard is increased at higher temperatures.
■ Not normally a hazard due to non-volatile nature of product.

CHRONIC HEALTH EFFECTS

■ Long-term exposure to respiratory irritants may result in disease of the airways involving difficult breathing and related systemic problems.
Ample evidence from experiments exists that there is a suspicionthis material directly reduces fertility.
Based on experience with animal studies, exposure to the material may result in toxic effects to the

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development of the foetus, at levels which do not cause significant toxic effects to the mother.
There has been some concern that this material can cause cancer or mutations but there is not enough data to make an assessment.
Substance accumulation, in the human body, may occur and may cause some concern following repeated or long-term occupational exposure.
Animal testing on mice who were exposed to a diet containing diethyl phthalate showed decreased weight gain, but no adverse effects on reproduction.
Exposure to phthalates over years leads to pain, numbness and spasms in the hands and feet. Many people have developed multiple disorders in the nervous system and the balancing system. Levels of sex hormones are reduced in women, leading to missed ovulations and miscarriages. They also reduce sperm counts and fertility in men. They mimic certain sex hormones and can damage the foetus. Phthalates are found in paints, inks and glues.

TOXICITY AND IRRITATION
DIETHYL PHTHALATE:
■ unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

TOXICITY	IRRITATION
Oral (rat) LD50: 8600 mg/kg	Eye (rabbit): 112 mg - Mild
Inhalation (human) TDLo: 1000 mg/m^3	Skin (g. pig): slight *
Inhalation (rat) LC50: 511 ppm/6h * [Eastman]	
Inhalation (Human) TCLo: 1000 mg/m^3/4h	
Intraperitoneal (Mouse) LD50: 2749 mg/kg	
Intravenous (Rabbit) LD: 100 mg/kg	
Oral (Guinea pig) LD50: 8600 mg/kg	
Oral (Mouse) LD50: 6172 mg/kg	

■ Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound. Key criteria for the diagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abrupt onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. A reversible airflow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have also been included in the criteria for diagnosis of RADS. RADS (or asthma) following an irritating inhalation is an infrequent disorder with rates related to the concentration of and duration of exposure to the irritating substance. Industrial bronchitis, on the other hand, is a disorder that occurs as result of exposure due to high concentrations of irritating substance (often particulate in nature) and is completely reversible after exposure ceases. The disorder is characterised by dyspnea, cough and mucus production.
For diethyl phthalate:
Dermally applied diethyl phthalate penetrates the skin and can be widely distributed in the body, but it does not accumulate in tissue. Diethyl phthalate is hydrolysed in the body to the monoester derivative. Hydrolytic metabolism of diethyl phthalate is qualitatively similar in rodents and humans.
LD50s for diethyl phthalate were 8600 mg/kg body weight and above following oral administration. Diethyl phthalate was a minimal to mild skin and eye irritant in experimental animals. Few cases of dermal irritation in humans after patch testing have been described; dermal sensitization has been described in humans, but seems to be rare. Slight increases in liver and kidney weights in rodents were observed following oral administration for up to 16 weeks. However, no adverse clinical chemical or histopathological changes were detected in the liver, kidney, or other organs in most studies. One 3-week study in rats showed an increase in liver weight at 1753 mg/kg body weight per day, which might be related to peroxisome proliferation.
No carcinogenic effect was detected after dermal exposure in rats, and an equivocal response was observed in mice exposed dermally. No initiation or promotion activity of diethyl phthalate was detected in mice in a 1-year initiation/promotion study. Results of in vitro mutagenicity and clastogenicity studies were equivocal.
No malformations but skeletal (rib) number variations were caused by an oral dose of 3215 mg/kg body weight per day in rats and a percutaneous dose of 5600 mg/kg body weight per day in mice - dose levels that also induced toxicity in the dams. No-observed-adverse-effect levels (NOAELs) of 1600 and 1900 mg/kg body weight per day were identified for mice and rats, respectively. A perinatal exposure to diethyl phthalate at 750 mg/kg body weight per day by gavage did not induce adverse effects in mothers or offspring and did not induce the malformations in male reproductive organs or the decreases in testis weights that were observed after exposure to other phthalates in the same study.

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In a continuous-breeding study, no adverse effects were detected in the F0 generation of mice following dietary administration of 3640 mg/kg body weight per day. However, decreased epididymal sperm concentration of the F1 generation and decreased number of live F2 pups per litter were caused by the administration of 3640 mg/kg body weight per day, together with mild inhibition of body weight gain and moderate increases in liver and prostate weights. Ultrastructural changes in the Leydig cells of rats were observed at an oral dose of 2000 mg/kg body weight per day administered for 2 days.
No adverse immunological or neurological effects were reported in general toxicity studies.
A tolerable intake of 5 mg/kg body weight was estimated from a NOAEL of 1600 mg/kg body weight per day for developmental effects to which an uncertainty factor of 300 was applied. The average daily intake of 0.35 ug/person (0.007 ug/kg body weight per day for a 50-kg person) derived in a hospital diet study in Japan is about 6 orders of magnitude lower than the tolerable intake. Exposure of the general population in the USA, estimated at 12 ug/kg body weight per day from monoethyl phthalate concentrations in urine, corresponds to 0.3% of the tolerable intake. The 95th-percentile value derived from the same study (110 ug/kg body weight per day) corresponds to 2% of the tolerable intake.
The material may produce peroxisome proliferation. Peroxisomes are single, membrane limited organelles in the cytoplasm that are found in the cells of animals, plants, fungi, and protozoa. Proxisome proliferators include certain hypolipidaemic drugs, phthalate ester plasticisers, industrial solvents, herbicides, food flavours, leukotriene D4 antagonists and hormones. Animal studies have shown that peroxisome proliferators clearly cause cancer, especially of the liver.

Section 12 - ECOLOGICAL INFORMATION

diethyl phthalate 72 or 96hr ErC50 (6.1) mg/L Dinoflagellate Plant Source: Experimental

DIETHYL PHTHALATE:
■ On the basis of available evidence concerning either toxicity, persistence, potential to accumulate and or observed environmental fate and behaviour, the material may present a danger, immediate or long-term and /or delayed, to the structure and/ or functioning of natural ecosystems.
For diethyl phthalate:
COD: 1.66-2.10 g O2/g
BOD-5: 2.0 g O2/g
log Kow: 2.47-3.2
log Koc: 94-526
Half-life (hr) air: 22.2
Half-life (hr) H2O surface water: 48->336
BCF: 12-117
Environmental fate:
Diethyl phthalate is likely to undergo biodegradation in the environment. Compared with other phthalates, it has a much lower capacity for binding to aquatic sediments, with between 70% and 90% of diethyl phthalate estimated to be found in the water column. Diethyl phthalate was detected in surface water at concentrations ranging from <1 to 10 ug/litre and in drinking-water at concentrations ranging from 0.01 to 1.0 ug/litre.
Fish collected from the Great Lakes area in the USA contained diethyl phthalate at concentrations up to 1.7 mg/kg. Diethyl phthalate is not likely to biomagnify through the food-chain.
Ecotoxicity:
Available data suggest that organisms in the freshwater aquatic environment are not likely to be at significant risk from exposure to diethyl phthalate, with measured concentrations in wastewater and surface water at least 1 order of magnitude lower than the predicted no-effect concentration (PNEC) of 0.9 mg/litre.
There are insufficient data available to estimate risk to marine organisms. Risk to soil organisms is also expected to be low, but data are inadequate to make a quantitative estimate.
Fish toxicity LC50 (96 h): rainbow trout 12 mg/l, NOEC: 3.8 mg/l; LC50: bluegill sunfish* 17 mg/l, NOEC: 1.6 mg/l *; LC50 sheepshead minnow 29 mg/l, NOEC: 20 mg/l *; LC50: fathead minnow 17 mg/l, NOEC: 4 mg/l *
Fish toxicity (golden orfe) LC50 (48 h): 53-61 mg/l *
Bacterial toxicity (daphnid) LC50 (48 h): 86 mg/l, NOEC: 38 mg/l *
Algal toxicity (Selenastrum capricornutum) LC50 (96 h): 16 mg/l *
Toxicity invertebrate: protozoa deterioration 100 mg/L
Effects on algae and plankton: algae deterioration 250 mg/L

continued...

* [Eastman].
for phthalate esters:
Environmental fate;
Under aerobic and anaerobic conditions, studies reveal that many phthalate esters are degraded by a wide range of bacteria and actinomycetes. Standardized aerobic biodegradation tests with sewage sludge inocula show that within 28 days approximately 50% ultimate degradation occurs. Biodegradation is, therefore, expected to be the dominant pathway in surface soils and sediments. In the atmosphere, photodegradation via free radical attack is the anticipated dominant pathway. The half-life of many phthalate esters is ca. 1 day in the air, from < 1 day to 2 weeks in surface and marine waters, and from < 1 week to several months in soils.
Phthalates are high molecular weight chemicals, and are not expected to partition significantly to air. However for the minor amount that may partition to air, modelled predictions indicate that they would be rapidly oxidised: with a predicted atmospheric oxidation half-life of around 0.52 days . They are expected to react appreciably with other photo oxidative species in the atmosphere, such as O3. Therefore, it is expected that reactions with hydroxyl radicals will be the most important fate process in the atmosphere for phthalates.
Bioaccumulation of phthalate esters in the aquatic and terrestrial food chain is limited by biotransformation. Most phthalates have experimental bioaccumulation factor (BCFs) and bioconcentration factor (BAFs) below 5000 L/kg, as they are readily metabolised by fish
A study of 18 commercial phthalate esters with alkyl chains ranging from one to 13 carbons found an eight order of magnitude increase in octanol-water coefficients (Kow) and a four order of magnitude decrease in vapor pressure with increasing length. This increase in Kow and decrease in vapor pressure results in increased partitioning of the phthalate esters to suspended solids, soils, sediments, and aerosols
The phthalate esters are distributed throughout the environment ubiquitously. They are found complexed with fulvic acid components of the humic substances in soil and marine and estuarine waters. Fulvic acid appears to act as a solubiliser for the otherwise insoluble ester and serves to mediate its transport and mobilisation in water or immobilisation in soil. Phthalate esters have been found in open ocean environments, in deep sea jelly fish, Atlantic herring and in mackerel. Phthalic ester plasticisers are clearly recognised as general contaminants of almost every soil and water ecosystem. In general they have low acute toxicity but the weight of evidence supporting their carcinogenicity is substantial. Other subtle chronic effects have also been reported. As little as 4 ug/ml in culture medium is lethal to chick embryo heart cells. This concentration is similar to that reached in human blood stored in vinyl plastic bags for as little as one day. As phthalates are present in drinking water and food, concerns have been raised about their long term effects on humans.
Ecotoxicity:
Some phthalates (notably di-2-ethylhexyl phthalate and dibutyl phthalate) may be detrimental to the reproduction of the water flea (Daphnia magna), zebra fish and guppies
While phthalates may have very low true water solubilities, they possess the ability to form suspensions which may cause adverse effects through physical contact with Daphnia at very low concentrations. Available toxicity and water solubility information suggest that the high molecular weight phthalates, form these suspensions and are able to elicit chronic toxic effects at concentrations of approximately 0.05 mg/L . Therefore, these substances are considered to have the potential to harm aquatic organisms at relatively low concentrations.
DO NOT discharge into sewer or waterways.

Ecotoxicity

Ingredient	Persistence: Water/Soil	Persistence: Air	Bioaccumulation	Mobility
diethyl phthalate	LOW	HIGH	LOW	MED

GESAMP/EHS COMPOSITE LIST - GESAMP Hazard Profiles

Name / Cas No / RTECS No	EHS	TRN	A1a	A1b	A1	A2	B1	B2	C1	C2	C3	D1	D2	D3	E1	E2	E3
Diethyl phthalate /	648	238	3		3	R	2	0	0	0	(1)	1	1			S	1

continued...

CAS:84-
66- 2 /

Legend:
EHS=EHS Number (EHS=GESAMP Working Group on the Evaluation of the Hazards of Harmful Substances Carried by Ships) NRT=Net Register Tonnage, A1a=Bioaccumulation log Pow, A1b=Bioaccumulation BCF, A1=Bioaccumulation, A2=Biodegradation, B1=Acuteaquatic toxicity LC/ECIC50 (mg/l), B2=Chronic aquatic toxicity NOEC (mg/l), C1=Acute mammalian oral toxicity LD50 (mg/kg), C2=Acutemammalian dermal toxicity LD50 (mg/kg), C3=Acute mammalian inhalation toxicity LC50 (mg/kg), D1=Skin irritation & corrosion, D2=Eye irritation& corrosion, D3=Long-term health effects, E1=Tainting, E2=Physical effects on wildlife & benthic habitats, E3=Interference with coastal amenities,
For column A2: R=Readily biodegradable, NR=Not readily biodegradable.
For column D3: C=Carcinogen, M=Mutagenic, R=Reprotoxic, S=Sensitising, A=Aspiration hazard, T=Target organ systemic toxicity, L=Lunginjury, N=Neurotoxic, I=Immunotoxic.
For column E1: NT=Not tainting (tested), T=Tainting test positive.
For column E2: Fp=Persistent floater, F=Floater, S=Sinking substances.
The numerical scales start from 0 (no hazard), while higher numbers reflect increasing hazard.
(GESAMP/EHS Composite List of Hazard Profiles - Hazard evaluation of substances transported by ships)

Section 13 - DISPOSAL CONSIDERATIONS

■ 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 or process equipment to enter drains.
- It may be necessary to collect all wash water for treatment before disposal.
- In all cases disposal to sewer may be subject to local laws and regulations and these should be considered first.
- Where in doubt contact the responsible authority.
- Recycle wherever possible or consult manufacturer for recycling options.
- Consult State Land Waste Authority for disposal.
- Bury or incinerate residue at an approved site.
- Recycle containers if possible, or dispose of in an authorised landfill.

Section 14 - TRANSPORTATION INFORMATION

HAZCHEM:
None

NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS: UN, IATA, IMDG

GESAMP hazard profiles for this material can be found in section 12 of the MSDS.

continued...

Section 15 - REGULATORY INFORMATION

Section 16 - OTHER INFORMATION

MSDS SECTION CHANGES

The following table displays the version number of and date on which each section was last changed.

Section Name	Version	Date	Section Name	Version	Date	Section Name	Version	Date
First Aid (eye)	5	11- May- 2009	Storage (storage incompatibility)	5	11- May- 2009	Acute Health (eye)	5	11- May- 2009
First Aid (inhaled)	5	11- May- 2009	Storage (suitable container)	4	8- Mar- 2007	Acute Health (inhaled)	5	11- May- 2009
First Aid (skin)	5	11- May- 2009	Engineering Control	5	11- May- 2009	Acute Health (skin)	5	11- May- 2009
First Aid (swallowed)	5	11- May- 2009	Exposure Standard	5	11- May- 2009	Acute Health (swallowed)	5	11- May- 2009
Fire Fighter (fire fighting)	4	8- Mar- 2007	Personal Protection (eye)	5	11- May- 2009	Chronic Health	5	11- May- 2009
Fire Fighter (fire incompatibility)	4	8- Mar- 2007	Personal Protection (hands/feet)	5	11- May- 2009	Toxicity and Irritation (Other)	5	11- May- 2009
Fire Fighter (fire/explosion hazard)	5	11- May- 2009	Personal Protection (other)	5	11- May- 2009	Toxicity and Irritation (Toxicity Figure)	4	8- Mar- 2007
Spills (major)	5	11- May- 2009	Physical Properties	4	8- Mar- 2007	Environmental	5	11- May- 2009
Spills (minor)	5	11- May- 2009	Instability Condition	5	11- May- 2009	Disposal	5	11- May- 2009
Handling Procedure	5	11- May- 2009						

■ Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review byusing available literature 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.

The above information is believed to be accurate and represent the best information currently available to us, but does not represent any warranty expressed or implied of the properties of the product. User should make their own investigation to determine the suitability of the information for their particular purpose.

Issue Date: 11-May-2018