

# PLANT CO2 BOOSTER

Chemwatch Material Safety Data Sheet  
Aug-18-2010  
NB293TCP

Hazard Alert Code: MODERATE

CHEMWATCH 24-0141  
Version No:2.0  
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## Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

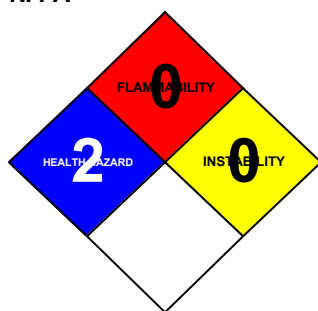
### PRODUCT NAME

Plant CO2 Booster

### STATEMENT OF HAZARDOUS NATURE

**CONSIDERED A HAZARDOUS SUBSTANCE ACCORDING TO OSHA 29 CFR 1910.1200.**

### NFPA



### SUPPLIER

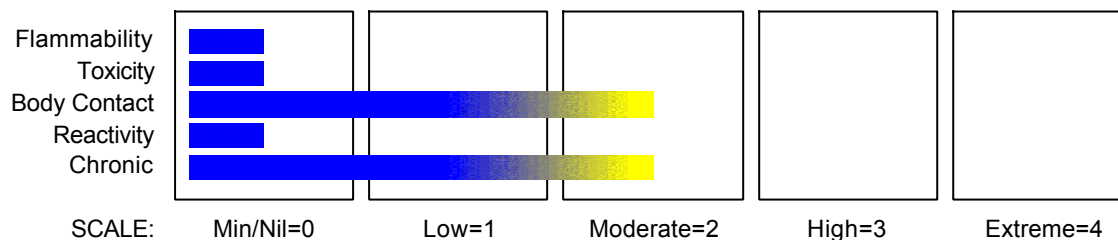
Company: Mars Fishcare Inc  
Address:  
50 East Hamilton Street  
Chalfont  
PA, 18914  
United States of America  
Telephone: +1 215 822 8181  
Fax: +1 215 822 1906  
Email: chemwatch@chemwatch.net

### PRODUCT USE

■ Used according to manufacturer's directions.  
For product 579C (8 oz) and 579E (16 oz).

## Section 2 - HAZARDS IDENTIFICATION

### CHEMWATCH HAZARD RATINGS



### CANADIAN WHMIS SYMBOLS

continued...

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Section 2 - HAZARDS IDENTIFICATION



## EMERGENCY OVERVIEW

### RISK

May cause SENSITIZATION by inhalation and skin contact.  
Irritating to eyes, respiratory system and skin.

## POTENTIAL HEALTH EFFECTS

### ACUTE HEALTH EFFECTS

#### SWALLOWED

■ The material has NOT been classified as "harmful by ingestion". This is because of the lack of corroborating animal or human evidence. The material may still be damaging to the health of the individual, following ingestion, especially where pre-existing organ (e.g. liver, kidney) damage is evident. Present definitions of harmful or toxic substances are generally based on doses producing mortality (death) rather than those producing morbidity (disease, ill-health). Gastrointestinal tract discomfort may produce nausea and vomiting. In an occupational setting however, unintentional ingestion is not thought to be cause for concern.

#### EYE

■ Evidence exists, or practical experience predicts, that the material may cause eye irritation in a substantial number of individuals. Prolonged eye contact may cause inflammation characterized by a temporary redness of the conjunctiva (similar to windburn).

#### SKIN

■ The material may cause mild but significant inflammation of the skin either following direct contact or after a delay of some time. Repeated exposure can cause contact dermatitis which is characterized by redness, swelling and blistering.  
■ 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.

## CHRONIC HEALTH EFFECTS

■ Inhaling this product is more likely to cause a sensitization reaction in some persons compared to the general population.  
Skin contact with the material is more likely to cause a sensitization reaction in some persons compared to the general population.  
Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems.  
Activated glutaraldehyde retains the skin sensitising properties (allergic contact dermatitis) of pure glutaraldehyde. A well-conducted guinea pig maximisation test showed that both the 2% aqueous solution and

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Section 2 - HAZARDS IDENTIFICATION

the 2% alkalinised solution of glutaraldehyde are skin sensitisers, with the former the stronger sensitiser. The results of a mouse-ear swelling test confirmed that glutaraldehyde is a skin sensitiser. The skin sensitising properties of the chemical are also demonstrated by human evidence in the scientific literature. Dilute solutions of glutaraldehyde (0.1%, 0.2% and 0.5%) were applied under an occluded patch for 48 hours to the backs of 109 male and female persons, all 12 years of age or more. Ten patches were sequentially applied, followed by challenge at a fresh site on the back. With 0.5% solution, there were seven cases of erythema and nine of slight irritation. On challenge, one case of erythema and oedema and one case of slight irritation resulted. With both the 0.1% and 0.2% solutions, one case of erythema and two of slight irritation resulted, but there was no reaction on challenge. Under the conditions of the study, 0.5% glutaraldehyde was a skin irritant in humans, and a skin sensitiser in 1-2% of the test population. The more dilute solutions (0.1% and 0.2%) indicated signs of skin irritation but no sensitisation.

Occupational asthma is a respiratory disease characterised by variable bronchial obstruction and variable hyperactivity caused by specific agents inhaled at work and rhinitis is a disease that invokes inflammation of the nasal mucous membrane, characterised by periods of nasal discharge, sneezing and congestion. Respiratory sensitisation is an immune status resulting from an immune response to an antigen, which may be a finding in the diagnosis of occupational asthma and/or rhinitis. A number of cases of respiratory disease such as occupational asthma and rhinitis have been linked with exposure to glutaraldehyde in the workplace, with some cases concerning workers with no past history of allergic response. Difficulties have arisen in determining whether the response in each case is due to an irritant effect or to an allergic hypersensitivity. The type of allergic mechanism that causes asthma after exposure to glutaraldehyde is not yet known, and no specific antibody has been identified. From various cited case studies, there is sufficient evidence to conclude that occupational asthma and rhinitis can result from exposure to glutaraldehyde in the workplace. Whether the responses have been due to an irritant effect or to allergic hypersensitivity is less clear. Lung function measurements were carried out after provocation testing in several of the cases, with a delayed onset of asthma in four cases. Delayed nasal discharge and sneezing occurred in one case. As asthmatic reactions caused by irritation generally occur immediately after exposure and are transient, these cases provide some evidence for respiratory sensitisation and are therefore of concern. In several, but not all, of the cases, the affected workers were atopic. Atopy appears to be a significant risk factor in the onset of asthma after exposure to antigens that cause asthma by IgE-mediated mechanisms, for example, high molecular weight antigens, but there is no evidence that it is a risk factor in asthma caused by antigens which do not induce an IgE-mediated response, for example, low molecular weight antigens such as glutaraldehyde. A summary of cases and discussion above highlight the difficulty in determining whether the occupational asthma seen is a result of respiratory sensitisation.

Long term exposure has been reported to cause chronic fatigue.

In a 90-day study rats exposed to 49 ppb showed perinasal wetness and significantly reduced body weight gain. No damage of the nasal mucosa was evident at 49 ppb or 194 ppb although several serum enzyme levels were raised. In a second study lasting 13-weeks, rats and mice exposed to high levels of glutaraldehyde (1 ppm) for 6 hours daily, 5 days per week, showed nasal passage lesions.

No evidence of internal organ toxicity was produced in subchronic drinking water studies using rats, mice and dogs at concentrations up to 1000 ppm.

Genotoxicity studies using several assays have generally given varying results. Developmental toxicity studies appear to demonstrate that glutaraldehyde does not produce foetal toxicity, embryotoxicity or teratogenic effects at maternally nontoxic doses. In a chronic 2-year study using rats exposed to glutaraldehyde in drinking water there was some evidence of oncogenic potential in female rats only as evidenced by an increased incidence of larger granular cell lymphocytic leukaemia. The pattern of response was indicative of a modifying influence on the expression of spontaneous and commonly occurring neoplasms. There was no evidence for non-oncogenic large organ toxicity.

Repeated application of aqueous solutions to rat skin (20 applications) over 28 days at concentrations of up to 150 mg/kg/day produced mild inflammatory effects without producing systemic toxicity.

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## Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
glutaraldehyde	111-30-8	1.6
water	7732-18-5	98.4

## Section 4 - FIRST AID MEASURES

### SWALLOWED

- Immediately give a glass of water.
- First aid is not generally required. If in doubt, contact a Poisons Information Center or a doctor.

### 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.
  - 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.
- Prosthesis 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

Vapour Pressure (mmHG): Not Available  
Upper Explosive Limit (%): Not Applicable  
Specific Gravity (water=1): 1.0  
Lower Explosive Limit (%): Not Applicable

### EXTINGUISHING MEDIA

- The product contains a substantial proportion of water, therefore there are no restrictions on the type of extinguishing media which may be used. Choice of extinguishing media should take into account surrounding areas.

Though the material is non-combustible, evaporation of water from the mixture, caused by the heat of nearby fire, may produce floating layers of combustible substances.

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Section 5 - FIRE FIGHTING MEASURES

In such an event consider:

- foam.
- dry chemical powder.
- carbon dioxide.

### FIRE FIGHTING

- 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

- The material is not readily combustible under normal conditions.
- However, it will breakdown under fire conditions and the organic component may burn.
- Not considered to be a significant fire risk.
- Heat may cause expansion or decomposition with violent rupture of containers
- Decomposes on heating and may produce toxic fumes of carbon monoxide (CO).
- May emit acrid smoke.

Decomposes on heating and produces toxic fumes of: carbon dioxide (CO<sub>2</sub>), other pyrolysis products typical of burning organic material.

May emit poisonous fumes.

May emit corrosive fumes.

### FIRE INCOMPATIBILITY

- None known.

### Personal Protective Equipment

Gas tight chemical resistant suit.

Limit exposure duration to 1 BA set 30 mins.

## Section 6 - ACCIDENTAL RELEASE MEASURES

### MINOR SPILLS

- 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 breathing apparatus plus protective gloves.
- 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 residue 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

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Section 6 - ACCIDENTAL RELEASE MEASURES

- and re-using.
- If contamination of drains or waterways occurs, advise emergency services.

## Section 7 - HANDLING AND STORAGE

### PROCEDURE FOR HANDLING

- DO NOT allow clothing wet with material to stay in contact with skin.
- Limit all unnecessary personal contact.
- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- When handling DO NOT eat, drink or smoke.
- Always wash hands with soap and water after handling.
- Avoid physical damage to containers.
- Use good occupational work practice.
- Observe manufacturer's storing and handling recommendations.

### RECOMMENDED STORAGE METHODS

- Polyethylene or polypropylene container.
- Packing as recommended by manufacturer
- Check all containers are clearly labeled and free from leaks.

### 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.
- 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

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>	Notes
_____	_____	_____	_____	_____	_____	_____	_____	_____

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## Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

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>	Notes
Canada - British Columbia Occupational Exposure Limits	glutaraldehyde (Glutaraldehyde, Activated & inactivated)					0.05		S
Canada - Ontario Occupational Exposure Limits	glutaraldehyde (Glutaraldehyde, activated and inactivated)					0.05		
Canada - Alberta Occupational Exposure Limits	glutaraldehyde (Glutaraldehyde, activated and inactivated)					0.05	0.2	
US ACGIH Threshold Limit Values (TLV)	glutaraldehyde (Glutaraldehyde)					0.05		TLV Basis: upper respiratory tract & eye irritation; central nervous system impairment; skin irritation
US NIOSH Recommended Exposure Limits (RELs)	glutaraldehyde (Glutaraldehyde)					0.2	0.8	See Appendix C (Aldehydes)
US - Minnesota Permissible Exposure Limits (PELs)	glutaraldehyde (Glutaraldehyde)					0.2	0.8	
US - Vermont Permissible Exposure Limits Table Z- 1- A Final Rule Limits for Air Contaminants	glutaraldehyde (Glutaraldehyde)					0.2	0.8	
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	glutaraldehyde (Glutaraldehyde)					0.2	0.8	

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## Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

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>	Notes
US - California Permissible Exposure Limits for Chemical Contaminants	glutaraldehyde (Glutaraldehyde)	0.05	0.2			C		(t)
US - Hawaii Air Contaminant Limits	glutaraldehyde (Glutaraldehyde)					0.2	0.7	
US - Alaska Limits for Air Contaminants	glutaraldehyde (Glutaraldehyde)					0.2	0.8	
Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits	glutaraldehyde (Glutaraldehyde, activated and inactivated)					0.05		SEN
Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances	glutaraldehyde (Glutaraldehyde, activated or unactivated)	-	0.25	-	-			
US - Washington Permissible exposure limits of air contaminants	glutaraldehyde (Glutaraldehyde)					0.2		
US - Michigan Exposure Limits for Air Contaminants	glutaraldehyde (Glutaraldehyde)					0.2	0.8	
Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)	glutaraldehyde (Glutaraldehyde)					0.1	0.41	

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## Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

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>	Notes
Canada - Prince Edward Island Occupational Exposure Limits	glutaraldehyde (Glutaraldehyde)					0.05		TLV Basis: upper respiratory tract & eye irritation; central nervous system impairment; skin irritation
Canada - Northwest Territories Occupational Exposure Limits (English)	glutaraldehyde (Glutaraldehyde)					0.2	0.82	
Canada - Nova Scotia Occupational Exposure Limits	glutaraldehyde (Glutaraldehyde)					0.05		TLV Basis: upper respiratory tract & eye irritation; central nervous system impairment; skin irritation

The following materials had no OELs on our records  
 • water:

CAS:7732- 18- 5

### MATERIAL DATA

GLUTARALDEHYDE:  
 PLANT CO2 BOOSTER:

■ Sensory irritants are chemicals that produce temporary and undesirable side-effects on the eyes, nose or throat. Historically occupational exposure standards for these irritants have been based on observation of workers' responses to various airborne concentrations. Present day expectations require that nearly every individual should be protected against even minor sensory irritation and exposure standards are established using uncertainty factors or safety factors of 5 to 10 or more. On occasion animal no-observable-effect-

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## Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

levels (NOEL) are used to determine these limits where human results are unavailable. An additional approach, typically used by the TLV committee (USA) in determining respiratory standards for this group of chemicals, has been to assign ceiling values (TLV C) to rapidly acting irritants and to assign short-term exposure limits (TLV STELs) when the weight of evidence from irritation, bioaccumulation and other endpoints combine to warrant such a limit. In contrast the MAK Commission (Germany) uses a five-category system based on intensive odour, local irritation, and elimination half-life. However this system is being replaced to be consistent with the European Union (EU) Scientific Committee for Occupational Exposure Limits (SCOEL); this is more closely allied to that of the USA.

OSHA (USA) concluded that exposure to sensory irritants can:

- cause inflammation
- cause increased susceptibility to other irritants and infectious agents
- lead to permanent injury or dysfunction
- permit greater absorption of hazardous substances and
- acclimate the worker to the irritant warning properties of these substances thus increasing the risk of overexposure.

GLUTARALDEHYDE:

PLANT CO2 BOOSTER:

- Odour threshold for glutaraldehyde: 0.04 ppm.

The recommended ceiling of exposure, for both the activated and unactivated forms, is based on the reported irritation threshold of glutaraldehyde in humans. A significant risk of irritation to the eyes, skin and throat has been demonstrated for exposures of 0.3 ppm. Ongoing subchronic inhalation studies are presently being reviewed.

Animal experiments demonstrate that solutions containing 25% or more of glutaraldehyde cause a significant degree of skin irritation and eye injury.

WATER:

- No exposure limits set by NOHSC or ACGIH.

### 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:

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## Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

- 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

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.)
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.)

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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

- 1: Room air currents minimal or favorable to capture
- 2: Contaminants of low toxicity or of nuisance value only.
- 3: Intermittent, low production.
- 4: Large hood or large air mass in motion

Upper end of the range

- 1: Disturbing room air currents
- 2: Contaminants of high toxicity
- 3: High production, heavy use
- 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.  
Mixes with water.

State	Liquid	Molecular Weight	Not Applicable
Melting Range (°F)	Not Available	Viscosity	Not Available
Boiling Range (°F)	Not Available	Solubility in water (g/L)	Miscible
Flash Point (°F)	Not Applicable	pH (1% solution)	Not Available
Decomposition Temp (°F)	Not Available	pH (as supplied)	Not Available
Autoignition Temp (°F)	Not Applicable	Vapour Pressure (mmHG)	Not Available
Upper Explosive Limit (%)	Not Applicable	Specific Gravity (water=1)	1.0
Lower Explosive Limit (%)	Not Applicable	Relative Vapor Density (air=1)	Not Available
Volatile Component (%vol)	Not Available	Evaporation Rate	Not Available

### APPEARANCE

Colorless liquid with a faint characteristic odor; mixes with water.

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## Section 10 - CHEMICAL STABILITY

### CONDITIONS CONTRIBUTING TO INSTABILITY

- Product is considered stable and hazardous polymerization will not occur.

### STORAGE INCOMPATIBILITY

- None known.

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

## Section 11 - TOXICOLOGICAL INFORMATION

### PLANT CO2 BOOSTER

#### TOXICITY AND IRRITATION

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

WATER:

PLANT CO2 BOOSTER:

- No significant acute toxicological data identified in literature search.

- 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.

PLANT CO2 BOOSTER:

- Allergic reactions involving the respiratory tract are usually due to interactions between IgE antibodies and allergens and occur rapidly. Allergic potential of the allergen and period of exposure often determine the severity of symptoms. Some people may be genetically more prone than others, and exposure to other irritants may aggravate symptoms. Allergy causing activity is due to interactions with proteins. Attention should be paid to atopic diathesis, characterized by increased susceptibility to nasal inflammation, asthma and eczema.

Exogenous allergic alveolitis is induced essentially by allergen specific immune-complexes of the IgG type; cell-mediated reactions (T lymphocytes) may be involved. Such allergy is of the delayed type with onset up to four hours following exposure.

Contact allergies quickly manifest themselves as contact eczema, more rarely as urticaria or Quincke's edema. The pathogenesis of contact eczema involves a cell-mediated (T lymphocytes) immune reaction of the delayed type. Other allergic skin reactions, e.g. contact urticaria, involve antibody-mediated immune reactions. The significance of the contact allergen is not simply determined by its sensitization potential: the distribution of the substance and the opportunities for contact with it are equally important. A weakly sensitizing substance which is widely distributed can be a more important allergen than one with stronger sensitizing potential with which few individuals come into contact. From a clinical point of view, substances

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## Section 11 - TOXICOLOGICAL INFORMATION

are noteworthy if they produce an allergic test reaction in more than 1% of the persons tested.

The material may be irritating to the eye, with prolonged contact causing inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

The material may cause skin irritation after prolonged or repeated exposure and may produce on contact skin redness, swelling, the production of vesicles, scaling and thickening of the skin.

### GLUTARALDEHYDE:

#### TOXICITY

Oral (rat) LD50: 134 mg/kg

Inhalation (rat) LC50: 480 mg/m<sup>3</sup>/4h

Dermal (rabbit) LD50: 403 mg/kg

#### IRRITATION

Skin (human): 6 mg/3d- int- SEVERE

Skin (rabbit): 13 mg open- Mild

Skin (rabbit): 2 mg/24h- SEVERE

Eye (rabbit): 1 mg- SEVERE

Eye (rabbit): 0.25mg/24h- SEVERE

■ The material may cause severe skin irritation after prolonged or repeated exposure and may produce on contact skin redness, swelling, the production of vesicles, scaling and thickening of the skin. Repeated exposures may produce severe ulceration.

Animal studies indicate that the oral LD50 of glutaraldehyde in rats, mice and guinea pigs, is approximately 50-250 mg/kg, and that the acute dermal toxicity in rabbits, rats and mice is approximately 1000-4500 mg/kg, with skin absorption at high concentrations. Glutaraldehyde has a high acute inhalational toxicity in rats and mice and lung damage has been reported. Four-hour LC50 values of 23.5 and 40.1 ppm have been obtained for the male and female rat respectively, but the glutaraldehyde solution had to be heated in order to generate glutaraldehyde vapour at high enough concentrations. Repeat acute inhalational toxicity studies at both ambient and elevated temperatures are being carried out.

Glutaraldehyde is corrosive to the skin and eyes of rabbits at high concentrations, with signs of skin irritation evident at 2%, and eye irritation at 0.2%. Exposure to glutaraldehyde vapours in acute inhalational studies resulted in nasal irritation and respiratory difficulties. Joint irritation was seen in rabbits after intra-articular administration. The skin sensitisation effect of glutaraldehyde was demonstrated in tests with guinea pigs.

Short term (nine day or two-week) repeated dose inhalational rat studies resulted in significant mortality at approximately 2 ppm v/v, and nasal irritation at levels down to approximately 0.2 ppm. Lesions of the nasal cavity and larynx were observed at 0.5 ppm and, in a nine-day study, atrophy of the liver was observed at 3.1 ppm. Signs of irritation included laboured breathing and discharge and encrustation around the eyes and nose. The results of the material balance and pharmacokinetic studies with solutions of glutaraldehyde up to 7.5% showed that prolonged skin contact can lead to absorption via the skin. This is supported by the results of in vitro testing with human skin tissue.

The pharmacokinetic studies indicated that the dermal absorption rates were low and that the elimination times of absorbed glutaraldehyde were long. The material balance studies did not identify any specific target site for distribution.

Glutaraldehyde is metabolised principally to CO<sub>2</sub> via oxidation to glutaric acid, but the mechanism for complete metabolism and the identification of all metabolites is yet to be determined.

As a cross-linking agent, glutaraldehyde reacts readily with proteins, with a number of complex reaction products formed by a mechanism not yet fully understood.

The metabolism of glutaraldehyde probably involves initial oxidation to the corresponding carboxylic acids by aldehyde dehydrogenase, and then further oxidation via an acidic intermediate to CO<sub>2</sub>.

The glutaric acid formed by oxidation is probably metabolised by synthesis of a Coenzyme A thioester to give glutaryl CoA, which is then oxidised by glutaryl CoA dehydrogenase to give glutaconyl CoA, leading to eventual degradation to acetate and then to CO<sub>2</sub>.

Glutaraldehyde reacts readily with proteins as a cross-linking agent, the reaction being rapid and pH-dependent (rate increases at pH > 9). Glutaraldehyde initially reacts with amino acids to give Schiff bases with reactive amino groups. Further reaction occurs to give a number of complex reaction products, with the mechanism of the cross-linking process not yet fully understood.

Little information is available on the interaction between glutaraldehyde and DNA. It has been reported that glutaraldehyde only reacts with DNA at >60°C. It has also been reported that only some components of DNA react with glutaraldehyde.

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## Section 12 - ECOLOGICAL INFORMATION

Refer to data for ingredients, which follows:

GLUTARALDEHYDE:

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- DO NOT discharge into sewer or waterways.

GLUTARALDEHYDE:

Marine Pollutant: Yes

- Very toxic to aquatic organisms.

■ 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.

■ Glutaraldehyde is a hydrophilic substance that will be mainly associated with the aquatic compartment, with minor amounts partitioning to the atmosphere, following release to the environment. Hydrolysis is slow, but glutaraldehyde, like other aldehydes, undergoes aerial oxidation in solution. It biodegrades rapidly in aerobic and anaerobic aquatic environments at sublethal concentrations (below 10 mg/L) and will not bioaccumulate. Tropospheric degradation is also rapid.

Glutaraldehyde is moderately to highly toxic to algae and has a moderately toxic effect on Daphnia reproduction. Glutaraldehyde is not expected to bioconcentrate in the food chain. In water glutaraldehyde undergoes moderate biodegradation to produce glutamic acid. Much of glutaraldehyde releases are to water. In the water it fully dissolves and disperses. In the water it is broken down by bacteria (unless very high concentrations) within a few days. When glutaraldehyde is released to the air it is quickly reacted by photochemical processes to be broken down within hours. Since it is very water soluble, any unreacted material will be removed from the atmosphere by rain and fog.

Environmental Transport

Industrial emissions of glutaraldehyde can produce elevated, concentrations in the atmosphere around the source. Because of its short life expectancy in the atmosphere glutaraldehyde is expected to be confined to the local area within which it is emitted. Glutaraldehyde that makes its way into the ground or water is degraded within days. Most glutaraldehyde that is released to the water goes into a public sewage facility. At the public sewage facilities it is very diluted, and the microorganisms are able to digest it, with out any impact.

Hydrolysis

The hydrolysis of [1,5-<sup>14</sup>C]-glutaraldehyde has been examined in sterile aqueous solutions at pH 5, 7 and 9.3. The study was conducted at 25°C in the dark at a nominal concentration of 10 mg/L. The parent compound degraded slowly in pH 5 and 7 buffer solutions during the 31 day study, with extrapolated half-lives of 508 and 102 days respectively. At pH 9, degradation proceeded more rapidly (half-life 46 days) with the formation of a cyclic dimer of glutaraldehyde.

Photodegradation

Photochemical processes will be important in removing glutaraldehyde from the atmosphere. Formaldehyde vapours are reported to undergo direct photochemical transformation in the troposphere, as well as photo-oxidative degradation (reaction with hydroxyl radicals). Half-life in the sunlit troposphere is a few hours. Hydrophilicity of glutaraldehyde will ensure removal of unreacted residues from the atmosphere by dissolution in rain.

Metabolism in soils and aquatic systems

The behaviour of glutaraldehyde in soil adsorption tests indicates ready metabolism in soils, with half-lives of a few days. Aerobic studies in aquatic systems confirm the limited persistence. Radiolabelled glutaraldehyde (10 ppm) was incubated in Sacramento River water/sediment (ratio 5) for 30 days. The sediment

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was the same as that used in the adsorption test. Radiocarbon was mainly found in the aqueous phase (at least 90%) in the first four hours of the study, but declined to below 20% by 14 days, when about 20% of applied radiocarbon was in the sediment and 48% had been liberated as carbon dioxide. At termination, about 10% remained substantially bound to sediment and 80% could be accounted for as carbon dioxide in headspace and water. Analysis by HPLC indicated that glutaraldehyde was oxidised rapidly to glutaric acid, which mineralises. The pseudo first-order half-life was 10.6 hours.

Relative hazard to the environment

On an environmental spectrum of 0 - 3 Glutaraldehyde registers 1.5. A score of 3 represents a very high hazard to the environment and 0 a negligible hazard.

- Prevent, by any means available, spillage from entering drains or watercourses.

### Ecotoxicity

Ingredient	Persistence: Water/Soil	Persistence: Air	Bioaccumulation	Mobility
glutaraldehyde	LOW		LOW	HIGH

## Section 13 - DISPOSAL CONSIDERATIONS

### Disposal Instructions

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

! Puncture containers to prevent re-use and bury at an authorized landfill.

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.

- Recycle wherever possible.
- Consult manufacturer for recycling options or consult Waste Management Authority for disposal if no suitable treatment or disposal facility can be identified.
- Dispose of by: Burial in a licensed land-fill or Incineration in a licensed apparatus (after admixture with suitable combustible material)
- Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.

## Section 14 - TRANSPORTATION INFORMATION

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

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## Section 15 - REGULATORY INFORMATION



### REGULATIONS

Regulations for ingredients

**glutaraldehyde (CAS: 111-30-8) 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 - Prince Edward Island Occupational Exposure Limits - Carcinogens", "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)", "GESAMP/EHS Composite List - GESAMP Hazard Profiles", "IMO IBC Code Chapter 17: Summary of minimum requirements", "IMO MARPOL 73/78 (Annex II) - List of Noxious Liquid Substances Carried in Bulk", "OECD Representative List of High Production Volume (HPV) Chemicals", "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 OEHHA/ARB - Chronic Reference Exposure Levels and Target Organs (CRELs)", "US - California Permissible Exposure Limits for Chemical Contaminants", "US - California Toxic Air Contaminant List Category II", "US - Connecticut Hazardous Air Pollutants", "US - Hawaii Air Contaminant Limits", "US - Michigan Exposure Limits for Air Contaminants", "US - Minnesota Hazardous Substance List", "US - Minnesota Permissible Exposure Limits (PELs)", "US - New Jersey Right to Know Hazardous Substances", "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 ACGIH Threshold Limit Values (TLV)", "US ACGIH Threshold Limit Values (TLV) - Carcinogens", "US Cosmetic Ingredient Review (CIR) Cosmetic ingredients found safe, with qualifications", "US DOE Temporary Emergency Exposure Limits (TEELs)", "US EPA High Production Volume Program Chemical List", "US EPA Master Testing List - Index I Chemicals Listed", "US FDA Indirect Food Additives: Adhesives and Components of Coatings - Substances for Use Only as Components of Adhesives - Adhesives", "US Food Additive Database", "US NIOSH Recommended Exposure Limits (RELs)", "US Spacecraft Maximum Allowable Concentrations (SMACs) for Airborne Contaminants", "US Toxic Substances Control Act (TSCA) - Inventory", "US TSCA Section 8 (a) - Preliminary Assessment Information Rules (PAIR) - Reporting List", "US TSCA Section 8 (d) - Health and Safety Data Reporting"

**water (CAS: 7732-18-5) is found on the following regulatory lists;**

"Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)", "IMO IBC Code Chapter 18: List of products to which the Code does not apply", "International Fragrance Association (IFRA) Survey: Transparency List", "OECD Representative List of High Production Volume (HPV) Chemicals", "US - Pennsylvania - Hazardous Substance List", "US DOE Temporary Emergency Exposure Limits (TEELs)", "US NFPA 30B Manufacture and Storage of Aerosol Products - Chemical Heat of Combustion", "US Toxic Substances Control Act (TSCA) - Inventory", "US TSCA Section 8 (a) Inventory Update Rule (IUR) - Partial

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Exemptions"

No data for Plant CO2 Booster (CW: 24-0141)

## Section 16 - OTHER INFORMATION

■ 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.

■ For detailed advice on Personal Protective Equipment, refer to the following U.S. Regulations and Standards:  
OSHA Standards - 29 CFR:  
1910.132 - Personal Protective Equipment - General requirements  
1910.133 - Eye and face protection  
1910.134 - Respiratory Protection  
1910.136 - Occupational foot protection  
1910.138 - Hand Protection  
Eye and face protection - ANSI Z87.1  
Foot protection - ANSI Z41  
Respirators must be NIOSH approved.

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