Plant CO2 Booster

Mars (Mars Fishcare)

Chemwatch Hazard Alert Code: **2**

Chemwatch: **24-0141**
Version No: **2.1.1.1**
Safety Data Sheet according to OSHA HazCom Standard (2012) requirements

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L.GHS.USA.EN

SECTION 1 IDENTIFICATION OF THE SUBSTANCE / MIXTURE AND OF THE COMPANY / UNDERTAKING

Product Identifier

Product name	Plant CO2 Booster
Chemical Name	Not Applicable
Synonyms	Not Available
Proper shipping name	Not Applicable
Chemical formula	Not Applicable
Other means of identification	Not Available
CAS number	Not Applicable

Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses	Use according to manufacturer's directions. , For product 579C (8 oz) and 579E (16 oz).

Details of the supplier of the safety data sheet

Registered company name	Mars (Mars Fishcare)		
Address	50 East Hamilton Street Chalfont 18914 PA United States		
Telephone	+1 215 822 8181		
Fax	+1 215 822 1906		
Website	Not Available		
Email	Not Available		

Emergency telephone number

Association / Organisation	Not Available		
Emergency telephone numbers	Not Available		
Other emergency telephone numbers	Not Available		

SECTION 2 HAZARDS IDENTIFICATION

Classification of the substance or mixture

CHEMWATCH HAZARD RATINGS

	Min	Max
Flammability	0	
Toxicity	0	
Body Contact	2	
Reactivity	0	
Chronic	2	

0 = Minimum
1 = Low
2 = Moderate
3 = High
4 = Extreme

CANADIAN WHMIS SYMBOLS

CANADIAN WHMIS CLASSIFICATION

Ingredient	CAS number	Classification Description	Classification Code
glutaraldehyde	111-30-8	Corrosive Material, Toxic Material Causing Immediate and Serious Toxic Effects, Toxic Material Causing Other Toxic Effects	E, D1B, D2B

GHS Classification	Skin Corrosion/Irritation Category 2, Eye Irritation Category 2A, Respiratory Sensitizer Category 1, Skin Sensitizer Category 1, STOT - SE (Resp. Irr.) Category 3

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Label elements

GHS label elements	
SIGNAL WORD	**DANGER**

Hazard statement(s)

H315	Causes skin irritation
H319	Causes serious eye irritation
H334	May cause allergy or asthma symptoms or breathing difficulties if inhaled
H317	May cause an allergic skin reaction
H335	May cause respiratory irritation

Supplementary statement(s)

Not Applicable

Precautionary statement(s): Prevention

P261	Avoid breathing dust/fume/gas/mist/vapours/spray.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/protective clothing/eye protection/face protection.
P284	[In case of inadequate ventilation] wear respiratory protection.
P272	Contaminated work clothing should not be allowed out of the workplace.

Precautionary statement(s): Response

P304+P340	IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P321	Specific treatment (see advice on this label).
P342+P311	If experiencing respiratory symptoms: Call a POISON CENTER/doctor/physician/first aider
P302+P352	IF ON SKIN: Wash with plenty of water and soap
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P312	Call a POISON CENTER/doctor/physician/first aider/if you feel unwell.
P333+P313	If skin irritation or rash occurs: Get medical advice/attention.
P337+P313	If eye irritation persists: Get medical advice/attention.
P362+P364	Take off contaminated clothing and wash it before reuse.

Precautionary statement(s): Storage

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

Precautionary statement(s): Disposal

P501	Dispose of contents/container to authorised chemical landfill or if organic to high temperature incineration

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

Substances

See section below for composition of Mixtures

Mixtures

CAS No	%[weight]	Name
111-30-8	1.6	glutaraldehyde
7732-18-5	98.4	water

SECTION 4 FIRST AID MEASURES

Description of first aid measures

Eye Contact	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.

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Skin Contact	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.
Inhalation	▸ 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.
Ingestion	▸ Immediately give a glass of water. ▸ First aid is not generally required. If in doubt, contact a Poisons Information Centre or a doctor.

Indication of any immediate medical attention and special treatment needed

	Treat symptomatically.

SECTION 5 FIREFIGHTING MEASURES

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. In such an event consider: ▸ foam. ▸ dry chemical powder. ▸ carbon dioxide.

Special hazards arising from the substrate or mixture

Fire Incompatibility	None known.

Advice for firefighters

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.
Fire/Explosion Hazard	▸ The material is not readily combustible under normal conditions. ▸ However, it will break down 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_2) , other pyrolysis products typical of burning organic material May emit poisonous fumes. May emit corrosive fumes.

SECTION 6 ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Minor Spills	▸ Clean up all spills immediately. ▸ Avoid breathing vapours and contact with skin and eyes. ▸ Control personal contact with the substance, 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	▸ 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. ▸ Stop leak if safe to do so. ▸ Contain spill with sand, earth or vermiculite. ▸ Collect recoverable product into labelled containers for recycling. ▸ Neutralise/decontaminate residue (see Section 13 for specific agent). ▸ Collect solid residue and seal in labelled 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.

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

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SECTION 7 HANDLING AND STORAGE

Precautions for safe handling

Safe 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 storage and handling recommendations contained within this MSDS.
Other information	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 storage and handling recommendations contained within this MSDS.

Conditions for safe storage, including any incompatibilities

Suitable container	Polyethylene or polypropylene container. Packing as recommended by manufacturer. Check all containers are clearly labelled and free from leaks.
Storage incompatibility	None known

PACKAGE MATERIAL INCOMPATIBILITIES

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Control parameters

OCCUPATIONAL EXPOSURE LIMITS (OEL)

INGREDIENT DATA

Source	Ingredient	Material name	TWA	STEL	Peak	Notes
US ACGIH Threshold Limit Values (TLV)	glutaraldehyde	Glutaraldehyde activated or inactivated	Not Available	Not Available	0.05 (ppm)	TLV® Basis: URT, skin, & eye irr; CNS impair
US NIOSH Recommended Exposure Limits (RELs)	glutaraldehyde	Glutaric dialdehyde; 1,5-Pentanedial	Not Available	Not Available	0.8 (mg/m3) / 0.2 (ppm)	See Appendix C (Aldehydes)

EMERGENCY LIMITS

Ingredient	TEEL-0	TEEL-1	TEEL-2	TEEL-3
glutaraldehyde	0.05(ppm)	0.2(ppm)	1(ppm)	5(ppm)
water	500(ppm)	500(ppm)	500(ppm)	500(ppm)

Ingredient	Original IDLH	Revised IDLH
Plant CO2 Booster	Not Available	Not Available

MATERIAL DATA

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-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.

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.

Exposure controls

Appropriate engineering controls	Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard. Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection. The basic types of engineering controls are: Process controls which involve changing the way a job activity or process is done to reduce the risk. Enclosure and/or isolation of emission source which keeps a selected hazard "physically" away from the worker and ventilation that strategically

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"adds" and "removes" air in the work environment. Ventilation can remove or dilute an air contaminant if designed properly. The design of a ventilation system must match the particular process and chemical or contaminant in use.
Employers may need to use multiple types of controls to prevent employee overexposure.

Local exhaust ventilation usually required. If risk of overexposure exists, wear approved respirator. Correct fit is essential to obtain adequate protection. Supplied-air type respirator may be required in special circumstances. Correct fit is essential to ensure 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, vapours, 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.)
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.

Personal protection

Eye and face protection

- 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], [AS/NZS 1336 or national equivalent]

Skin protection

See Hand protection below

Hand protection

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

NOTE:

- The material may produce skin sensitisation in predisposed individuals. Care must be taken, when removing gloves and other protective equipment, to avoid all possible skin contact.
- Contaminated leather items, such as shoes, belts and watch-bands should be removed and destroyed.

The selection of suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer. Where the chemical is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application.
The exact break through time for substances has to be obtained from the manufacturer of the protective gloves and
has to be observed when making a final choice.
Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include:

- 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, AS/NZS 2161.1 or national equivalent).

- 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, AS/NZS 2161.10.1 or national equivalent) 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, AS/NZS 2161.10.1 or national equivalent) 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.

Body protection

See Other protection below

Continued...

Other protection	▸ Overalls. ▸ P.V.C. apron. ▸ Barrier cream. ▸ Skin cleansing cream. ▸ Eye wash unit.
Thermal hazards	

Recommended material(s)

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:
Plant CO2 Booster

Material	CPI
BUTYL	A
NEOPRENE	A
VITON	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.

Respiratory protection

Type A Filter of sufficient capacity. (AS/NZS 1716 & 1715, EN 143:2000 & 149:2001, ANSI Z88 or national equivalent)

Where the concentration of gas/particulates in the breathing zone, approaches or exceeds the "Exposure Standard" (or ES), respiratory protection is required.
Degree of protection varies with both face-piece and Class of filter; the nature of protection varies with Type of filter.

Required Minimum Protection Factor	Half-Face Respirator	Full-Face Respirator	Powered Air Respirator
up to 10 x ES	A-AUS	-	A-PAPR-AUS / Class 1
up to 50 x ES	-	A-AUS / Class 1	-
up to 100 x ES	-	A-2	A-PAPR-2 ^

^ - Full-face
A(All classes) = Organic vapours, B AUS or B1 = Acid gasses, B2 = Acid gas or hydrogen cyanide(HCN), B3 = Acid gas or hydrogen cyanide(HCN), E = Sulfur dioxide(SO2), G = Agricultural chemicals, K = Ammonia(NH3), Hg = Mercury, NO = Oxides of nitrogen, MB = Methyl bromide, AX = Low boiling point organic compounds(below 65 degC)

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

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

Physical state	Liquid	**Relative density (Water = 1)**	1.0
Odour	Not Available	**Partition coefficient n-octanol / water**	Not Available
Odour threshold	Not Available	**Auto-ignition temperature (°C)**	Not Applicable
pH (as supplied)	Not Available	**Decomposition temperature**	Not Available
Melting point / freezing point (°C)	Not Available	**Viscosity (cSt)**	Not Available
Initial boiling point and boiling range (°C)	Not Available	**Molecular weight (g/mol)**	Not Applicable
Flash point (°C)	Not Available	**Taste**	Not Available
Evaporation rate	Not Available	**Explosive properties**	Not Available
Flammability	Not Available	**Oxidising properties**	Not Available
Upper Explosive Limit (%)	Not Applicable	**Surface Tension (dyn/cm or mN/m)**	Not Available
Lower Explosive Limit (%)	Not Applicable	**Volatile Component (%vol)**	Not Available
Vapour pressure (kPa)	Not Available	**Gas group**	Not Available
Solubility in water (g/L)	Miscible	**pH as a solution(1%)**	Not Available
Vapour density (Air = 1)	Not Available	**VOC g/L**	Not Available

SECTION 10 STABILITY AND REACTIVITY

Reactivity	See section 7
Chemical stability	Product is considered stable and hazardous polymerisation will not occur.
Possibility of hazardous reactions	See section 7
Conditions to avoid	See section 7
Incompatible materials	See section 7
Hazardous decomposition products	See section 5

SECTION 11 TOXICOLOGICAL INFORMATION

Continued...

Information on toxicological effects

Inhaled	Evidence shows, or practical experience predicts, that the material produces irritation of the respiratory system, in a substantial number of individuals, following inhalation. In contrast to most organs, the lung is able to respond to a chemical insult by first removing or neutralising the irritant and then repairing the damage. The repair process, which initially evolved to protect mammalian lungs from foreign matter and antigens, may however, produce further lung damage resulting in the impairment of gas exchange, the primary function of the lungs. Respiratory tract irritation often results in an inflammatory response involving the recruitment and activation of many cell types, mainly derived from the vascular system.
Ingestion	The material has **NOT** been classified by EC Directives or other classification systems 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 rather than those producing morbidity (disease, ill-health). Gastrointestinal tract discomfort may produce nausea and vomiting. In an occupational setting however, ingestion of insignificant quantities is not thought to be cause for concern.
Skin Contact	The material produces mild skin irritation; evidence exists, or practical experience predicts, that the material either ▸ produces mild inflammation of the skin in a substantial number of individuals following direct contact, and/or ▸ produces significant, but mild, inflammation when applied to the healthy intact skin of animals (for up to four hours), such inflammation being present twenty-four hours or more after the end of the exposure period. Skin irritation may also be present after prolonged or repeated exposure; this may result in a form of contact dermatitis (nonallergic). The dermatitis is often characterised by skin redness (erythema) and swelling (oedema) which may progress to blistering (vesiculation), scaling and thickening of the epidermis. At the microscopic level there may be intercellular oedema of the spongy layer of the skin (spongiosis) and intracellular oedema of the epidermis. Entry into the blood-stream through, for example, cuts, abrasions, puncture wounds 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.
Eye	Evidence exists, or practical experience predicts, that the material may cause eye irritation in a substantial number of individuals. Repeated or prolonged eye contact may cause inflammation (similar to windburn) characterised by a temporary redness of the conjunctiva (conjunctivitis); temporary impairment of vision and/or other transient eye damage/ulceration may occur.
Chronic	Practical evidence shows that inhalation of the material is capable of inducing a sensitisation reaction in a substantial number of individuals at a greater frequency than would be expected from the response of a normal population. Pulmonary sensitisation, resulting in hyperactive airway dysfunction and pulmonary allergy may be accompanied by fatigue, malaise and aching. Significant symptoms of exposure may persist for extended periods, even after exposure ceases. Symptoms can be activated by a variety of nonspecific environmental stimuli such as automobile exhaust, perfumes and passive smoking. Practical experience shows that skin contact with the material is capable either of inducing a sensitisation reaction in a substantial number of individuals, and/or of producing a positive response in experimental animals. 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 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 of 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

Plant CO2 Booster	**TOXICITY**	**IRRITATION**
	Not Available	Not Available

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glutaraldehyde	**TOXICITY**	**IRRITATION**
	Dermal (rabbit) LD50: 403 mg/kg	Eye (rabbit): 0.25mg/24h-SEVERE
	Inhalation (rat) LC50: 480 mg/m3/4h	Eye (rabbit): 1 mg-SEVERE
	Oral (rat) LD50: 134 mg/kg	Skin (human): 6 mg/3d-int-SEVERE
		Skin (rabbit): 13 mg open-mild
		Skin (rabbit): 2 mg/24h-SEVERE
	Not Available	Not Available
water	**TOXICITY**	**IRRITATION**
	Not Available	Not Available

** Value obtained from manufacturer's msds*
unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances

Plant CO2 Booster	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. Allergic reactions which develop in the respiratory passages as bronchial asthma or rhinoconjunctivitis, are mostly the result of reactions of the allergen with specific antibodies of the IgE class and belong in their reaction rates to the manifestation of the immediate type. In addition to the allergen-specific potential for causing respiratory sensitisation, the amount of the allergen, the exposure period and the genetically determined disposition of the exposed person are likely to be decisive. Factors which increase the sensitivity of the mucosa may play a role in predisposing a person to allergy. They may be genetically determined or acquired, for example, during infections or exposure to irritant substances. Immunologically the low molecular weight substances become complete allergens in the organism either by binding to peptides or proteins (haptens) or after metabolism (prohaptens). Particular attention is drawn to so-called atopic diathesis which is characterised by an increased susceptibility to allergic rhinitis, allergic bronchial asthma and atopic eczema (neurodermatitis) which is associated with increased IgE synthesis. 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. The following information refers to contact allergens as a group and may not be specific to this product. Contact allergies quickly manifest themselves as contact eczema, more rarely as urticaria or Quincke's oedema. 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 sensitisation potential: the distribution of the substance and the opportunities for contact with it are equally important. A weakly sensitising substance which is widely distributed can be a more important allergen than one with stronger sensitising potential with which few individuals come into contact. From a clinical point of view, substances are noteworthy if they produce an allergic test reaction in more than 1% of the persons tested. No significant acute toxicological data identified in literature search. 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 a contact dermatitis (nonallergic). This form of dermatitis is often characterised by skin redness (erythema) and swelling epidermis. Histologically there may be intercellular oedema of the spongy layer (spongiosis) and intracellular oedema of the epidermis.
GLUTARALDEHYDE	The following information refers to contact allergens as a group and may not be specific to this product. Contact allergies quickly manifest themselves as contact eczema, more rarely as urticaria or Quincke's oedema. 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 sensitisation potential: the distribution of the substance and the opportunities for contact with it are equally important. A weakly sensitising substance which is widely distributed can be a more important allergen than one with stronger sensitising potential with which few individuals come into contact. From a clinical point of view, substances are noteworthy if they produce an allergic test reaction in more than 1% of the persons tested. 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. Allergic reactions which develop in the respiratory passages as bronchial asthma or rhinoconjunctivitis, are mostly the result of reactions of the allergen with specific antibodies of the IgE class and belong in their reaction rates to the manifestation of the immediate type. In addition to the allergen-specific potential for causing respiratory sensitisation, the amount of the allergen, the exposure period and the genetically determined disposition of the exposed person are likely to be decisive. Factors which increase the sensitivity of the mucosa may play a role in predisposing a person to allergy. They may be genetically determined or acquired, for example, during infections or exposure to irritant

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	substances. Immunologically the low molecular weight substances become complete allergens in the organism either by binding to peptides or proteins (haptens) or after metabolism (prohaptens). Particular attention is drawn to so-called atopic diathesis which is characterised by an increased susceptibility to allergic rhinitis, allergic bronchial asthma and atopic eczema (neurodermatitis) which is associated with increased IgE synthesis. 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. The material may produce severe skin irritation after prolonged or repeated exposure, and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterised by skin redness (erythema) thickening of the epidermis. Histologically there may be intercellular oedema of the spongy layer (spongiosis) and intracellular oedema of the epidermis. Prolonged contact is unlikely, given the severity of response, but 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 CO2 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 CO2. 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 CO2. 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
WATER	No significant acute toxicological data identified in literature search.

Acute Toxicity	Not Applicable	**Carcinogenicity**	Not Applicable
Skin Irritation/Corrosion	Skin Corrosion/Irritation Category 2	**Reproductivity**	Not Applicable
Serious Eye Damage/Irritation	Eye Irritation Category 2A	**STOT - Single Exposure**	STOT - SE (Resp. Irr.) Category 3
Respiratory or Skin sensitisation	Respiratory Sensitizer Category 1 Skin Sensitizer Category 1	**STOT - Repeated Exposure**	Not Applicable
Mutagenicity	Not Applicable	**Aspiration Hazard**	Not Applicable

CMR STATUS

RESPIRATORY	glutaraldehyde	US - California OEHHA/ARB - Chronic Reference Exposure Levels and Target Organs (CRELs) - Respiratory	X

SECTION 12 ECOLOGICAL INFORMATION

Toxicity

NOT AVAILABLE

Ingredient	Endpoint	Test Duration	Effect	Value	Species	BCF
Plant CO2 Booster	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

DO NOT discharge into sewer or waterways.

Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
Not Available	Not Available	Not Available

Bioaccumulative potential

Ingredient	Bioaccumulation
Not Available	Not Available

Mobility in soil

Ingredient	Mobility

Continued...

Not Available	Not Available

SECTION 13 DISPOSAL CONSIDERATIONS

Waste treatment methods

Product / Packaging disposal	▸ Containers may still present a chemical hazard/ danger when empty. ▸ Return to supplier for reuse/ recycling if possible. Otherwise: ▸ If container can not be cleaned sufficiently well to ensure that residuals do not remain or if the container cannot be used to store the same product, then puncture containers, to prevent re-use, and bury at an authorised landfill. ▸ Where possible retain label warnings and MSDS and observe all notices pertaining to the product. 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 local or regional waste management authority for disposal if no suitable treatment or disposal facility can be identified. ▸ Dispose of by: burial in a land-fill specifically licenced to accept chemical and / or pharmaceutical wastes or incineration in a licenced apparatus (after admixture with suitable combustible material). ▸ Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.

SECTION 14 TRANSPORT INFORMATION

Labels Required

Marine Pollutant	NO

Land transport (DOT): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Air transport (ICAO-IATA / DGR): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Sea transport (IMDG-Code / GGVSee): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

SECTION 15 REGULATORY INFORMATION

Safety, health and environmental regulations / legislation specific for the substance or mixture

glutaraldehyde(111-30-8) is found on the following regulatory lists	"International Maritime Dangerous Goods Requirements (IMDG Code)","IMO MARPOL 73/78 (Annex II) - List of Noxious Liquid Substances Carried in Bulk","IOFI Global Reference List of Chemically Defined Substances","US American Cleaning Institute Cleaning Product Ingredient Inventory","US - California Air Toxics "Hot Spots" List (Assembly Bill 2588) Substances for Which Emissions Must Be Quantified","US TSCA Section 8 (d) - Health and Safety Data Reporting","US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants","US Harmonized Tariff Schedule - Pharmaceutical Appendix","US CAA (Clean Air Act) - HON Rule - Synthetic Organic Chemical Manufacturing Industry Chemicals","International Maritime Dangerous Goods Requirements (IMDG Code) - Substance Index","US Postal Service (USPS) Numerical Listing of Proper Shipping Names by Identification (ID) Number","US Postal Service (USPS) Hazardous Materials Table: Postal Service Mailability Guide","US - California Permissible Exposure Limits for Chemical Contaminants","US ACGIH Threshold Limit Values (TLV) - Carcinogens","US - Hawaii Air Contaminant Limits","US National Toxicology Program (NTP) Technical Reports Index","US NTP (National Toxicology Program) - Management Status Report","United Nations Recommendations on the Transport of Dangerous Goods Model Regulations (English)","FisherTransport Information","US Cosmetic Ingredient Review (CIR) Cosmetic ingredients found safe, with qualifications","US TSCA Section 8 (a) - Preliminary Assessment Information Rules (PAIR) - Reporting List","US - California - 22 CCR - Hazardous Waste Codes - Appendix XII","US FDA Indirect Food Additives: Adhesives and Components of Coatings - Substances for Use Only as Components of Adhesives - Adhesives","US FDA Everything Added to Food in the United States (EAFUS)","US CAA (Clean Air Act) - HON Rule - Organic HAPs (Hazardous Air Pollutants)","US - New Jersey Right to Know Hazardous Substances (English)","OECD List of High Production Volume (HPV) Chemicals","US - Minnesota Hazardous Substance List","US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants","US - Michigan Exposure Limits for Air Contaminants","US - California - 22 CCR - Hazardous Wastes and Hazardous Materials - Appendix X","US Coast Guard, Department of Homeland Security Part 153: Ships Carrying Bulk Liquid, Liquefied gas or compressed gas hazardous materials. Table 1 to Part 153 --Summary of Minimum Requirements","US FDA Indirect Food Additives - Substances for Use Only as Components of Paper and Paperboard - Components of paper and paperboard in contact with aqueous and fatty foods 21CFR 176-170","US - Washington Toxic air pollutants and their ASIL, SQER and de minimis emission values","US - Washington Permissible exposure limits of air contaminants","US DOE Temporary Emergency Exposure Limits (TEELs)","US EPA Master Testing List - Index I Chemicals Listed","US NIOSH Recommended Exposure Limits (RELs)","US - North Dakota Air Pollutants - Guideline Concentrations","US - Alaska Limits for Air Contaminants","US California - Aerosol Coating Product Emissions - Maximum Incremental Reactivity (MIR) Values","United Nations Recommendations on the Transport of Dangerous Goods Model Regulations (Spanish)","US - Rhode Island Hazardous Substance List","US Spacecraft Maximum Allowable Concentrations (SMACs) for Airborne Contaminants","US - Minnesota Permissible Exposure Limits (PELs)","US - California Occupational Safety and Health Regulations (CAL/OSHA) - Hazardous Substances List","GESAMP/EHS Composite List - GESAMP Hazard Profiles","Regulations concerning the International Carriage of Dangerous Goods by Rail - Table A: Dangerous Goods List - RID 2013 (English)","International Air Transport Association (IATA) Dangerous Goods Regulations","US - California Toxic Air Contaminant List Category II","US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants","US ACGIH Threshold Limit Values (TLV)","US - Massachusetts - Right To Know Listed Chemicals","US - California OEHHA/ARB - Chronic Reference Exposure Levels and Target Organs (CRELs)","IMO IBC Code Chapter 17: Summary of minimum requirements","US - Pennsylvania - Hazardous Substance List","US - Connecticut Hazardous Air Pollutants","US EPA High Production Volume Program Chemical List","US FDA CFSAN Food Additives Status List","US - Wisconsin Control of Hazardous Pollutants - Emission Thresholds, Standards and Control Requirements (Hazardous Air Contaminants)"

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water(7732-18-5) is found on the following regulatory lists	"US American Cleaning Institute Cleaning Product Ingredient Inventory","US TSCA Section 8 (a) Inventory Update Rule (IUR) - Partial Exemptions","OSPAR National List of Candidates for Substitution – Norway","OECD List of High Production Volume (HPV) Chemicals","US DOE Temporary Emergency Exposure Limits (TEELs)","IMO IBC Code Chapter 18: List of products to which the Code does not apply","Sigma-AldrichTransport Information","US FMA Air Freshener Fragrance Ingredient Survey Results","US NFPA 30B Manufacture and Storage of Aerosol Products - Chemical Heat of Combustion","US - Pennsylvania - Hazardous Substance List"

SECTION 16 OTHER INFORMATION

Other information

Classification of the preparation 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

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.