ERCO Worldwide

SODIUM CHLORATE PROCESS SOLUTION
WHMIS CONTROLLED PRODUCT
Date Issued:06/08/2012
Revision #:4

MATERIAL SAFETY DATA SHEET

1. Chemical Product And Company Information

Chemical Name: Sodium Chlorate Process Solution
Synonyms/Trade Names: Sodium chlorate solution
Chemical Family: Inorganic compound
Formula: $NaClO_3$
Molecular Weight: 106.45
CAS No.: 7775-09-9
Uses: Oxidizing agent; pulp bleaching; defoliant; herbicide.

Manufacturer & Supplier:
ERCO Worldwide, a division of Superior Plus LP
302 The East Mall, Ste. 200
Toronto, Ontario Canada M9B 6C7
(416) 239-7111

Transportation Emergency Telephone Numbers :
CANADA: (613) 996-6666
CANUTEC

USA: 1-800-424-9300
CHEMTREC

Canadian WHMIS Classification (s):

C - Oxidizing

D2B- Other Toxic Effects

2. Composition / Information On Ingredients

Name:	Conc. % By Weight	CAS No.
Sodium Chlorate	20% - 50%	7775-09-9
Sodium Perchlorate	1% - 10%	7601-89-0

3. Hazard Identification

Emergency Overview:

Sodium Chlorate solution is clear and pale yellow coloured. The solution is odourless. It is harmful if swallowed. Sodium chlorate is a very strong oxidizer. Sodium chlorate does not burn but contact with organic materials such as wood, paper, oil, clothing may cause fire or explosion. The presence of sodium perchlorate will enhance this effect. In case of a fire, only use water to extinguish the fire. May form shock sensitive mixtures. Contact with acids may produce toxic chlorine dioxide and chlorine gas.

Routes of Entry:

EFFECTS OF SHORT-TERM (ACUTE) EXPOSURE:

SKIN CONTACT: Direct contact with concentrated solutions or dried product can cause mild irritation.

EYE CONTACT: Mist may cause temporary eye irritation and mild pain until material is rinsed from the surface of the eye.

INGESTION: Non-occupational ingestion has produced death. Initial symptoms include vomiting, diarrhea, nausea, and abdominal pain. After several hours or more, there may be severe intestinal bleeding, destruction of red blood cells and formation of inactive hemoglobin. Urine may be dark with blood clots. Within a day, kidney damage or kidney failure may occur, with cessation of urination. Liver damage, laboured breathing, convulsions, and coma may also develop.
Recovery may take several weeks and may not be complete. The human adult lethal dose is estimated at 5 to 10 grams of pure product.

INHALATION: Sodium chlorate mist may cause coughing and mild temporary irritation of the nose and throat.

EFFECTS OF LONG-TERM (CHRONIC) EXPOSURE:

Repeated and prolonged exposure of the skin can cause dermatitis. Repeated exposure by inhalation or ingestion may result in toxic effects, which appear gradually over weeks. Initially there may be abdominal pain, followed by internal bleeding, destruction of red blood cells, lung damage, liver damage, and kidney damage. The skin may be bluish.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:

None indicated.

Symptoms of Exposure:

Mild irritation on skin contact. Prolonged exposure may cause dermatitis. Eye contact may cause itching and burning. Sodium chlorate is harmful if swallowed. Ingestion of large amounts may be fatal. May be irritating to the respiratory system if sodium chlorate dust is inhaled.

4. First Aid Measures

Skin:
Wash with soap and water. Remove any contaminated clothing and water wash it on site before reuse.

Eyes:
Flush immediately with plenty of lukewarm water for at least 15 minutes, holding the eyelids open. Get medical attention if irritation persists.

Inhalation:
Move the victim to fresh air. If symptoms persist get medical attention.

Ingestion:
DO NOT GIVE ANYTHING BY MOUTH OR INDUCE VOMITING IF THE PATIENT IS UNCONSCIOUS. If the patient is conscious, give one or two glasses of water to dilute stomach contents, and induce vomiting. Sodium thiosulfate (2-5g in 200 ml of 5% sodium bicarbonate) is a specific antidote that inactivates the chlorate ion. Get medical attention promptly.

5. Fire-Fighting Measures

Conditions Of Flammability:
Sodium chlorate is not combustible, but it is a strong oxidizer. Mixtures of the solution with combustible materials, if allowed to dry, can ignite easily and burn fiercely, or may explode. The presence of perchlorate will enhance this effect.

Means To Extinguish:
WATER IS THE ONLY EFFECTIVE EXTINGUISHER for fires involving sodium chlorate.

DO NOT use dry chemical fire extinguishing agents containing ammonium compounds (such as some A:B:C agents), since an explosive compound can be formed. DO NOT use carbon dioxide, dry chemical powder or other extinguishing agents that smother flames, since they are not effective in extinguishing fires involving oxidizers.

Hazardous Combustion Products:
After water is lost on heating as in a fire situation, oxygen is released. This promotes fierce burning of any combustibles which are present.

Flash Point & Method:	Not applicable
Upper Flammability Limit:	Not applicable
Lower Flammability Limit:	Not applicable
Auto-Ignition Temperature:	Not applicable
Mechanical Impact Sensitivity:	Experimental data is not available. Not notably sensitive unless contaminated with combustibles.
Static Discharge Sensitivity:	Experimental data is not available. Not notably sensitive unless contaminated with combustibles.

6. Accidental Release Measures

Leak Or Spill Procedures:
Contain and collect spilled material if possible into clean containers, then flush down the spill area with water. Keep spills and residues out of sewers and the external environment. Keep materials which can burn away from spilled material.

Waste Control Procedures:
Reuse recovered material if possible, otherwise return it to the manufacturer. Thoroughly wash or incinerate all contaminated combustible material in an environmentally acceptable manner before it dries out.

7. Handling Storage

Handling Procedures And Equipment:
No smoking, flames or sparks may be allowed where sodium chlorate is stored or used. Clothing fires are the principal hazard when working with this material in an industrial setting - immediately wash any clothing contaminated with chlorate. If welding or flame cutting must be done near sodium chlorate a designated fire watcher with a charged water hose in hand should be in attendance throughout the operation.

Storage:
Store in a cool, dry, fireproof area. Keep away from combustible or readily oxidizable materials and acids. Recover or wash away any spillage promptly.

8. Exposures Controls / Personal Protection

Protective Equipment:
For intermittent exposures with a higher likelihood of contact with sodium chlorate, wear PVC or rubber rainsuit, hard hat, rubber or plastic gloves, rubber boots, and safety glasses or goggles. Wash down clothing, gloves and boots after each use to remove traces of sodium chlorate.
For continuous use with a low likelihood of exposure to sodium chlorate, wear polyester/cotton clothing (flame retardant recommended) in lieu of rainsuit, but keeping rubber boots and gloves, hard hat and safety glasses. Change clothing at the end of each work shift or when it may be contaminated. Keep contaminated clothing wetted between taking it off and washing it. Do not send clothing which may be contaminated with chlorate off site to be washed. Tuck pants into boots, to avoid absorbing any solution which may be on the floor. A dust mask should be worn where there may be exposure to sodium chlorate dust.

Engineering Controls:
Keep both crystal and solutions contained. Do not use combustible materials of construction where chlorate will be used or stored.

9. Physical And Chemical Properties

State: Liquid
Odour: None
Odour Threshold: Not applicable
Boiling Point: This will vary according to solution composition, and is typically in the range 102 - 108°C
Melting Point: Not applicable
Freezing Point: This will vary according to solution composition and concentration. e.g. Ice will crystallize from 20% $NaClO_3$ solution @ -8°C. $NaClO_3$ will crystallize from 50% $NaClO_3$ solution @ +25°C.
pH: 7 - 9 for all concentrations
Coefficient Of Water/Oil Distribution: Not available
Appearance: Clear, pale to light yellow solution.
Specific Gravity: This will vary according to solution composition, and is typically in the range 1.15 - 1.45
Vapour Pressure: Not applicable. Vapour is water.
Vapour Density: Not applicable
Evaporation Rate: no information available
Solubility In Water: Product is water solution and can be diluted at any proportion.
Bulk Density: not applicable

10. Stability And Reactivity

Chemical Stability:
Stable, but see "Hazardous decomposition products" below. Note: In intense fire situations there have been several cases of violent explosions attributed to sodium chlorate by itself.

Reactivity Conditions:
Reaction may occur when mixed with any combustibles, especially in the presence of heat or a source of ignition. Reaction with acids will occur on contact generating chlorine and /or chlorine dioxide gas..

Incompatible Substances:
Mixtures with combustible materials burn fiercely when ignited, and may explode. Reaction with strong acids releases chlorine (a toxic gas) and chlorine dioxide (a toxic gas which may decompose spontaneously and explosively). Other incompatible substances include, but are not limited to, phosphorus, sulfur, sulfides, ammonium compounds and powdered metals.

Hazardous Decomposition Products:
When evaporated to dryness and heated above 265°C sodium chlorate will decompose to give oxygen gas (not poisonous, but a hazardous oxidizer) and common salt.

11. Toxicological Information

Skin Contact: Prolonged contact may cause irritation.
Skin Absorption: No information is available.
Eye Contact: May cause irritation.
Inhalation: not applicable
Ingestion: May cause nausea, vomiting, abdominal pain, diarrhea, cyanosis, and/or anuria (urine shutdown). May be fatal if ingested in significant amount (10 to 30 grams have been reported as fatal in humans).
LD_{50}: 2,400 mg/kg (rat, oral) for 50% NaClO3 solution.
21,000 mg/kg (rat, oral) for 10% NaClO4 solution.
May be calculated for other concentrations in accordance with CPR subsection 45 (1)
LC_{50}: Not applicable
Exposure Limits: No limits have been published.
Irritancy: Mild
Sensitization: No information is available.
Carcinogenicity: Not listed by IARC or ACGIH
Teratogenicity & Mutagenicity: No information is available.
Reproductive Toxicology: No information is available.
Toxicological Synergism: No information is available.

12. Ecological Information

Ecological Information:
Sodium chlorate can be leached out of soil. Chlorate accumulates in plant cells until toxic concentrations are reached and the plant dies.

Biodegradability:
Sodium chlorate degrades very slowly in soil under aerobic conditions. Sodium perchlorate is persistent in the environment. May decompose by microbial degradation more rapidly under anaerobic conditions.

Aquatic Toxicity:
Slightly toxic to aquatic organisms. There are no data available for solution having composition covered by this MSDS, but data for main components are listed below for information purposes only.

Ecotoxicity Values for sodium chlorate :
EC50; Species: Phaeodactylum tricornutum (Diatom, exponential growth phase, CCAP 1052/A strain); Conditions: freshwater, static, 20 deg C; Concentration: 298000 ug/L for 72 hr (95% confidence interval: 177000-468000 ug/L); Effect: decreased population biomass />99.0% purity/
[Brixham Environmental Laboratory; Study No.T129/B p.3 (1995) Available from, as of July 25, 2008: http://cfpub.epa.gov/ecotox/quick_query.htm **PEER REVIEWED**

EC50; Species: Phaeodactylum tricornutum (Diatom, exponential growth phase, CCAP 1052/A strain); Conditions: freshwater, static, 20 deg C; Concentration: 444000 ug/L for 72 hr (95% confidence interval: 274000-719000 ug/L); Effect: decreased population growth rate />99.0% purity/
[Brixham Environmental Laboratory; Study No.T129/B p.3 (1995) Available from, as of July 25, 2008: http://cfpub.epa.gov/ecotox/quick_query.htm **PEER REVIEWED**

EC50; Species: Pseudokirchneriella subcapitata (Green algae); Conditions: freshwater, static; Concentration: 133000 ug/L for 5 days (95% confidence interval: 122000-144000 ug/L); Effect: population abundance /99% purity/
[USEPA, Office of Pesticide Programs; Pesticide Ecotoxicity Database (2000) on Chloric acid, Sodium salt (7775-09-9). Available from, as of July 25, 2008: http://cfpub.epa.gov/ecotox/quick_query.htm **PEER REVIEWED**

LC50; Species: Daphnia magna (Water flea); Conditions: freshwater, static, 12 deg C, pH 6.52-6.59; Concentration: 3162000 ug/L for 48 hr
[Dosdall, L.M; Water Qual Res J Can 32 (4): 839-54 (1997) Available from, as of July 25, 2008: http://cfpub.epa.gov/ecotox/quick_query.htm **PEER REVIEWED**

LC50; Species: Cyprinus carpio (common carp); Conditions: static; Concentration: 2340000 ug/L for 96 hr
[Agaev RA et al; C A Sel -Environ Pollut 13: 4 /Uzb Biol Zh 1: 40-3 (1986) Available from, as of July 25, 2008: http://cfpub.epa.gov/ecotox/quick_query.htm **PEER REVIEWED**

LC50 Oncorhynchus mykiss (Rainbow trout) 4200 mg/L for 24 hr /Conditions of bioassay not specified in source examined/
[European Chemicals Bureau; IUCLID Dataset, Sodium chlorate (7775-09-9) p.25 (2000 CD-ROM edition). Available from, as of July 28, 2008: http://esis.jrc.ec.europa.eu/ **PEER REVIEWED**

LC50 Oncorhynchus mykiss (Rainbow trout) 2750 mg/L for 48 hr; static
[European Chemicals Bureau; IUCLID Dataset, Sodium chlorate (7775-09-9) p.24 (2000 CD-ROM edition). Available from, as of July 28, 2008: http://esis.jrc.ec.europa.eu/ **PEER REVIEWED**

LC50; Species: Oncorhynchus mykiss (Rainbow trout); Conditions: freshwater, static; Concentration: 1100000 ug/L for 48 hr /30% purity/
[USEPA, Office of Pesticide Programs; Pesticide Ecotoxicity Database (2000) on Chloric acid, Sodium salt (7775-09-9). Available from, as of July 25, 2008: http://cfpub.epa.gov/ecotox/quick_query.htm **PEER REVIEWED**

LC50 Oncorhynchus mykiss (Rainbow trout) 1750 mg/L for 96 hr; 15 deg C, pH 6.3 /Conditions of bioassay not specified in source examined/
[European Chemicals Bureau; IUCLID Dataset, Sodium chlorate (7775-09-9) p.27 (2000 CD-ROM edition). Available from, as of July 28, 2008: http://esis.jrc.ec.europa.eu/ **PEER REVIEWED**

LC50; Species: Pimephales promelas (Fathead minnow, weight 0.65-1.78 g, length 3.6-5.0 cm); Conditions: freshwater, static, 28.7 deg C, pH 7.52, dissolved oxygen 5.16 mg/L; Concentration: 13500000 ug/L for 96 hr (95% confidence interval: 12750000-14300000 ug/L) /formulated product/
[Shifrer CC et al; Utah Water Res Lab, USDI, Logan, UT: 79 (1974) Available from, as of July 25, 2008: http://cfpub.epa.gov/ecotox/quick_query.htm **PEER REVIEWED**

LC50; Species: Pimephales promelas (Fathead minnow, weight 0.56-2.88 g, length 3.8-5.5 cm); Conditions: freshwater, static, 23.0 deg C, pH 7.38, dissolved oxygen 5.82 mg/L; Concentration: 13600000 ug/L for 96 hr (95% confidence interval: 12840000-14400000 ug/L) /formulated product/
[Shifrer CC et al; Utah Water Res Lab, USDI, Logan, UT: 79 (1974) Available from, as of July 25, 2008: http://cfpub.epa.gov/ecotox/quick_query.htm **PEER REVIEWED**

LC50; Species: Pimephales promelas (Fathead minnow, weight 0.91-2.56 g, length 3.7-5.4 cm); Conditions: freshwater, static, 15.76 deg C, pH 7.22, dissolved oxygen 5.99 mg/L; Concentration: 13800000 ug/L for 96 hr (95% confidence interval: 13120000-14520000 ug/L) /formulated product/
[Shifrer CC et al; Utah Water Res Lab, USDI, Logan, UT: 79 (1974) Available from, as of July 25, 2008: http://cfpub.epa.gov/ecotox/quick_query.htm **PEER REVIEWED**

LC50 Ictalurus punctatus (Channel catfish) 3157 mg/L for 24 hr /Conditions of bioassay not specified in source examined/
[European Chemicals Bureau; IUCLID Dataset, Sodium chlorate (7775-09-9) p.25 (2000 CD-ROM edition). Available from, as of July 28, 2008: http://esis.jrc.ec.europa.eu/ **PEER REVIEWED**

LC50 Rasbora heteromorpha (Harlequin) 8600 mg/L for 24 hr /Conditions of bioassay not specified in source examined/
[European Chemicals Bureau; IUCLID Dataset, Sodium chlorate (7775-09-9) p.28 (2000 CD-ROM edition). Available from, as of July 28, 2008: http://esis.jrc.ec.europa.eu/ **PEER REVIEWED**

LC50 Rutilus rutilus (Roach) 7090 mg/L for 96 hr /Conditions of bioassay not specified in source examined/
[European Chemicals Bureau; IUCLID Dataset, Sodium chlorate (7775-09-9) p.27 (2000 CD-ROM edition). Available from, as of July 28, 2008: http://esis.jrc.ec.europa.eu/ **PEER REVIEWED**

LC50 Eisenia foetida (Earthworm) >750 mg/kg dw soil (test substrate consisted of 83.5% fine quartz sand, 5% bentonite, 10% finely ground dried sqhagnum peat, 1% calcium carbonate and 0.5% cattle manure) for 14 days
[European Chemicals Bureau; IUCLID Dataset, Sodium chlorate (7775-09-9) p.36 (2000 CD-ROM edition). Available from, as of July 28, 2008: http://esis.jrc.ec.europa.eu/ **PEER REVIEWED**

LC50 Lepomis macrochirus (Bluegill) >1000 mg/L for 96 hr; flow through /from table/
[USEPA/OPPTS/Environmental Fate and Effects Division Ecological Risk Assessment for Reregistration of Sodium chlorate p.47 (June 1, 2006) EPA-HQ-OPP-2005-0507-0026. Available from, as of July 28, 2008: http://www.regulations.gov/search/Regs/home.html#home **PEER REVIEWED**

LC50 Cyprinodon variegatus (Sheepshead minnow) >1000 mg/L for 96 hr; flow through /from table/
[USEPA/OPPTS/Environmental Fate and Effects Division Ecological Risk Assessment for Reregistration of Sodium chlorate p.47 (June 1, 2006) EPA-HQ-OPP-2005-0507-0026. Available from, as of July 28, 2008: http://www.regulations.gov/search/Regs/home.html#home **PEER REVIEWED**

EC50 Crassostrea virginica (Eastern oyster) >1000 mg/L for 96 hr; flow through, 20-23 deg C, pH 7.7-8.0, salinity 21-24 ppt (parts per thousand); Effect: reduced shell growth /from table/
[USEPA/OPPTS/Environmental Fate and Effects Division Ecological Risk Assessment for Reregistration of Sodium chlorate p.47 (June 1, 2006) EPA-HQ-OPP-2005-0507-0026. Available from, as of July 28, 2008: http://www.regulations.gov/search/Regs/home.html#home **PEER REVIEWED**

Ecotoxicity Values for sodium perchlorate and chromium (VI):
Effects of water contamination with perchlorate and hexavalent chromium [Cr (VI)] on the mosquito Culex quinquefasciatus were assessed. The chronic (10-day) LC50s values for perchlorate and chromium were 74+/-8.0 mg/L and 0.41+/-0.15 mg/L, respectively. Relative Growth Index, a measure of growth and mortality rates in a population, was significantly reduced within 5 days for levels of perchlorate as low as 25 mg/L and for levels of chromium as low as 0.16 mg/L. Neither compound altered wing length of surviving adults. In combination, contaminants were synergistic, causing 14% more mortality than predicted. Acute (24-hr) LC50 values for perchlorate and Cr (VI) were 17,000+/-3200 and 38+/-1.3 mg/L, respectively. Effects on mosquito larvae in contaminated environments are likely to be observed for Cr (VI) but not for perchlorate, which generally does not occur at levels as high as those shown here to affect larval mosquitoes.

13. Disposal Considerations

Disposal Considerations:
Sodium chlorate process liquor is classed as a hazardous waste. Contact a waste disposal company for advice for regional regulations. Empty containers may contain residues and should be washed thoroughly prior to disposal. The wash water should be handled as a hazardous waste.

14. Transportation Information

Shipping Name (TDGR)	UN Number	Hazard Class	Packing Group
Sodium Chlorate, Aqueous Solution	2428	5.1	II

15. Regulatory Information

This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all of the information required by the CPR .

Safety:
CANADIAN FEDERAL REGULATIONS: (not a comprehensive list)

WHMIS CLASSIFICATION:
C - Oxidizing Materials
D2B - Materials Causing Other Toxic Effects. Subdivision B: Toxic Material
WHMIS INGREDIENT DISCLOSURE LIST: No

UNITED STATES FEDERAL REGULATIONS: (not a comprehensive list)

TOXIC SUBSTANCES CONTROL ACT (TSCA): CAS# 7775-09-9 is listed on the inventory.
OSHA: Not a Hazardous Substance under 29 CFR Section 1910, Subpart Z.
CERCLA: Not a Hazardous Substance under 40 CFR Part 302
SARA 313: Not subject to the reporting requirements of 40 CFR Part 372
SARA 311/312 EPA HAZARD CATEGORIES: Fire Hazard, Reactive Hazard, Immediate (Acute) Health
SARA 302: Not subject to 40 CFR Part 355

Environmental:
All components of this product are either on the Canadian Domestic Substances List (DSL) or the Non-Domestic Substances List (NDSL) or exempt.

All components of this product are either on the U.S. Toxic Substances Control Act (TSCA) Inventory List or exempt.

Transportation:
Refer to Section 14.
ERG Number 140

16. Other Information

Prepared By:

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416-239-7111

Summary of Changes Made in this Revision :

Sections " 5. Fire-Fighting Measures", "10. Stability And Reactivity", "11. Toxicological Information" and "12 Ecological Information" were updated.

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