

FORTISCHEM a. s., M. R. Štefánika 1, 972 71 Nováky, Slovenská republika

*Elaborate according to COMMISSION REGULATION (EU) 2015/830 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)*

Date of issue: 16.11.2010

Replaces the version of 01.03.2018

Revision date: 30.04.2021

**SECTION 1: Identification of the substance/mixture and of the company/undertaking**

**1.1 Product identifier**

Trade name:	SODIUM HYPOCHLORITE TECHNICAL
Chemical name:	Sodium hypochlorite
REACH REGISTRATION NUMBER:	01-2119488154-34-0004
CAS:	7681-52-9
EINECS:	231-668-3
Index number:	017-011-00-1
Molecular formula:	NaOCl
Structural formula:	ClHO.Na

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

**Industrial and professional use:**

Sodium hypochlorite is widely used in chemical industry (production of large-volume chemical substances, production of fine chemicals, preparation (mixing) of preparations and/or their repacking), in production of textile, leather, fur, in food industry, in production of chemical pulp, paper and paper products, in production of products from rubber, in wood processing and in production of wooden products. It is used as a product for washing and cleaning (PC35), as colouring agent, product for final treatment and impregnation of textile (PC34), chemical for water treatment (PC37). It is used as oxidizer in chemical industry, as bleaching agent in textile and paper industry.

**Users, general public:**

Use for general public (SU22): e.g. cleaning and disinfection (sanitation of a swimming pool), domestic use for water treatment (drinking, waste water, cooling), bleaching agent (textile, paper).

Uses advised against: no data available

**1.3 Details of the supplier of the safety data sheet**

Producers name:	FORTISCHEM a. s.
Address:	M.R. Štefánika 1, 972 71 NOVÁKY, Slovenská republika
Phone:	+421/46/568 1111
Contact to a responsible person for the SDS:	<a href="mailto:kbu@fortischem.sk">kbu@fortischem.sk</a>

**1.4 Emergency telephone number**

NÁRODNÉ TOXIKOLOGICKÉ INFORMAČNÉ CENTRUM,  
FNsP Bratislava, pracovisko Kramáre  
Klinika pracovného lekárstva a toxikológie  
Limbová 5, 833 05 Bratislava

Tel.:	+421 2 54774166
E-mail:	<a href="mailto:ntic@ntic.sk">ntic@ntic.sk</a>
Web:	<a href="http://www.ntic.sk">www.ntic.sk</a>

**SECTION 2: Hazards identification**

**2.1 Classification of a substance or mixture:**

2.1.1 Classification according to Regulation (EC) of the EP and of the Council No. 1272/2008 (CLP):

Hazard class and category:

Skin Corrosive, cat.1B

Aquatic acute 1

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H314 Causes severe skin burns and eye damage.

H400 Very toxic to aquatic life.

**Amplified harmonized classification notified in accordance with Art. 40 Regulation (EC) No. 1272/2008:**Hazard class and category:

Metals corrosive 1 H290

Skin corr.1B, H314

Eye damage 1, H318

Aquatic acute 1, H400

Aquatic chronic 2, H411

Hazard statements:

H290 May be corrosive to metals.

H314 Causes severe skin burns and eye damage.

H318 Causes serious eye damage.

H400 Very toxic to aquatic organisms.

H411 Toxic to aquatic life with long lasting effects

**2.2 Labelling elements****2.2.1 Labelling elements (CLP):**Warning word: **Danger**

Hazard pictograms, codes and symbols:

GHS05 Corrosive



GHS09: Environment

**Hazard statements:**

H290 May be corrosive to metals.

H314 Causes severe skin burns and eye damage.

H400 Very toxic to aquatic organisms.

H7411 Toxic to aquatic life with long lasting effects.

**Safety statements:**

P260 Do not breathe dust/fume/gas/mist/vapours/spray

P273 Avoid release to the environment.

P280 Wear protective gloves/protective clothing/eye protection/face protection.

P303+P 361+P 353 IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.

P305+P 351+P 338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P310 Immediately call a POISON CENTER or doctor/physician.

P390 Absorb spillage to prevent material damage.

**Specific concentration limits**

C ≥ 5% EUH 031 Contact with acids liberates toxic gas.

**SECTION 3: Composition/information on ingredients****SODIUM HYPOCHLORITE TECHNICAL**

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3.1 Substances						
Ingredient	CAS	EINECS	Classification		Koncentračné limity	Obsah % hmot.
			CLP/Amplified harmonized	H-statements		
Sodium hypochlorite	7681-52-9	231-668-3	Skin Corr. 1B	H314	C ≥ 5%: EUH031	[12% akt. Cl]
			Aq. Acute 1	H400		
Sodium hydroxide	1310-73-2	215-185-5	Skin Corr. 1B	H314	C ≥ 5%: Skin Corr. 1A; H314 2 % ≤ C < 5%: Skin Corr. 1B; H314 0,5 % ≤ C < 2%: Skin Irrit. 2; H315 0,5 % ≤ C < 2%: Eye Irrit. 2; H319	max. 1
			Eye Dam. 1	H318		
			Aq. Acute 1	H290		
			Met. Corr. 1	H400		
			Aq. Chronic 2	H411		
Sodium carbonate	497-19-8	207-838-8	Skin Corr. 1A	H314	-	max. 0,8
			Met. Corr. 1	H290		
3.2 Mixtures: substance is not a mixture For the full text of the H-Statements mentioned in this Section - see Section 16.						

#### SECTION 4: First aid measures

##### 4.1 Description of first aid measures

First aid guidelines according to the way of exposure:

##### 4.1.1 General first aid principles:

Call a physician if health problems occur or if you are not sure

In life-threatening conditions it is necessary to resuscitate:

- if the patient has breathing problems                      - start immediately the artificial respiration
- in case of heart failure    - start immediately the indirect heart massage
- in case of unconsciousness    - place a patient in the recovery position on one side

**4.1.2. In case of inhalation:** Bring the victim to fresh air immediately. If he is not breathing, apply artificial respiration, if it is possible, give oxygen. Provide for medical attendance.

**4.1.3 Ingestion:** Rinse mouth with tepid water. Do not induce vomiting! The victim may drink 2-3 cups of water. Provide for medical attendance.

**4.1.4 In case of skin contact:** Take off dirty clothes, wash the affected place with water and soap for at least 15 minutes. Cover the affected place with clean cloth and provide for medical attention. Wash dirty clothes before use and clean the shoes thoroughly.

**4.1.5 In case of eye contact:** Thoroughly flush eyes with a flow of clean water for at least 15 minutes. Provide for medical attendance.

#### SECTION 5: Firefighting measures

**5.1 Extinguishing media:** Adjust extinguishing agents to the burning substances in the surrounding. Carbon

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dioxide, water fog is suitable. Cool vessels with big flow of water until fire extinguishment or remove them fully out of reach or pump them out.

**5.2 Special hazards related to the substance or mixture:** The substance is not flammable. It has oxidizing properties, in case of decomposition of sodium hypochlorite, oxygen is released which supports burning. It forms explosive mixture with organic substances. In case of fire the tank heated to high temperature can explode. In case of contact with acid an intense reaction may occur while releasing heat and creating oxides of chlorine. Products of thermal decomposition in case of fire are corrosive gases. Necessary bordering of the dangerous zone. Regular measurement of occurrence of dangerous substances in the air and of explosiveness limits. Monitoring the direction and winter spreading.

**5.3 Advice for fire fighters:** Insulation breathing apparatus, chemical protective clothes are necessary! Eventually, protection of uncovered parts of the body is necessary.

## SECTION 6: Accidental release measures

### 6.1 Personal precautions, protective equipment and emergency plans:

6.1.1 For other than emergency personnel: Delimit protective zone regarding wind direction, order unauthorized persons out of it. Recommend detaining persons on higher-positioned places (a possibility of chlorine origination which is heavier than air). Provide first aid to victims, get medical attention. At work, use protective equipment. Use full protection – protective clothes, rubber gloves, closed shoes, breathing apparatus. Remove all sources of ignition (open fire, hot surfaces etc.). Use non-sparkling materials.

6.1.2 For emergency personnel: Use full protection – protective clothes, breathing apparatus.

### 6.2 Environmental precautions:

Avoid leakage of the substance to environment. In the case of larger leakages of the substance, prevent medium from entering the sewerage system, water streams and water reservoirs (it liquidates microbiological and biological life). Restrict the extent of the premise affection, e.g. by creation of embankments from earth or sand as much as possible. Due to acidification of sodium hypochlorite the air is contaminated with chlorine.

### 6.3 Methods and material to prevent spreading and cleaning:

Pump out bigger amount of the fluid. Absorb residues of the fluid in suitable material (vapex, cinder, sand, sawdust) and transport them to disposal in non-metallic packages. Prevent contact with metals and acid substances. Leaked sodium hypochlorite may not be neutralized in any case. In case of contamination of water flows or tanks, stop water intake and operation on water areas, in case of rescue works do not enter water. Smaller quantities can be damaged by solutions of sodium sulphite or hydrogen peroxide.

### 6.4 Reference to other sections:

The information on control of exposure and personal protection is available also in Section 8 and further information on measures concerning disposal is available in Section 13.

## SECTION 7: Handling and storage

### 7.1 Precautions for safe handling:

7.1.1 Preferably use as closed systems as possible. Observe limit values of exposure in case of such use, where exposure is possible, e.g. creation of aerosols.

7.1.2 It is inevitable to use personal protective equipment! Avoid contact with skin, eyes, and mucous.

### 7.2 Conditions for safe storage, including any incompatibilities:

Hypochlorite is stored in rubber-coated iron containers or in titanium polyethylene or polypropylene containers resistant to effects of sodium hypochlorite. The recommended storage temperature is maximum 20°C. Store in cool, dry and well ventilated areas. With higher temperatures decomposition is being accelerated.

### 7.3 Specific final applications: -

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**SECTION 8: Exposure controls/personal protection**
**8.1 Control parameters:**

8.1.1 Domestic limit values of exposure in working environment (Regulation of the Government of the Slovak Republic No. 355/2006 Coll.):

NPEL industr.: undefined (8 hours)

NPEL limit: 1.5 mg/m<sup>3</sup>

8.1.2 Limit values of exposures in the Community:

EU Directive No. 2006/15/EC – limits have not been set

8.1.3 Monitoring procedures: -

DNEL values:

Short-term exposure: DNEL inhalant: 3.1 mg/m<sup>3</sup> (local and systematic effects)

Long-term exposure: DNEL inhalant: 1.55 mg/m<sup>3</sup> (local and systematic effects)

DNEL oral: 0.26 mg/kg body weight/day

**8.2 Controls of exposure:**

8.2.1 Engineering measures: Ventilation, suction of working premises it is necessary to prevent presence of harmful pollutant in the air or to minimize its content. Avoid contact with skin, eyes and mucosa.

8.2.2 Personal protection equipment: In order to prevent contact with eyes, skin and respiratory tract, use a respirator with a filter against acid gases and aerosols, impermeable working suit (rubber apron), rubber gloves, closed shoes. To protect eyes, use chemical protective spectacles or protective screen. In case of fire or decomposition use a breathing apparatus.

8.2.3 Controls of environmental exposure: Do not discharge to sewerage system, water courses and soil.

**SECTION 9: Physical and chemical properties**
**Information on basic physical and chemical properties:**

Appearance, colour:	clear yellow-green or turbid fluid
Odour:	typical chlorine odour
Boiling temperature:	cca 96-120°C (in dependence on concentration)
Temperature of congelation:	cca - 25°C
Decomposition temperature:	aprox. 70°C
Flash point:	non-combustible substance
Flammability:	Sodium hypochlorite is not flammable fluid but during its decomposition, oxygen supporting burning is being released.
Reactivity:	it reacts with acids with production of heat and toxic chlorine oxygen
Danger of explosion:	-
Explosiveness:	-
a) lower limit of explosiveness:	-
b) upper limit of explosiveness:	-
Oxidising properties:	strong oxidizer
Vapour pressure:	18mm Hg, or 2 kPa
Specific weight (water=1):	1,21
pH:	12,5
Solubility:	soluble in water
Partition coefficient:	---

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Viscosity:	2.6 m Pa.s
Molar weight (kg/kmol):	74.5
9.2 Other information:	---

### SECTION 10: Stability and reactivity

**10.1 Reactivity:** It reacts with acids with production of heat and toxic oxides of chlorine.

**10.2 Chemical stability:** Sodium hypochlorite is an unstable substance, which might be stored only in water solution.

**10.3 Possibility of dangerous reactions:** At higher temperatures and exposure to daylight is accelerating decomposition product. This decomposition is being catalyzed by some metals (Cu, Al, Ni, Mn, Fe). In case of contact with acid substances also due to air CO<sub>2</sub>, unstable chloric acid which is decomposed into chlorine and oxygen is being released.

**10.4 Conditions/Hazards to avoid:** exposure to daylight, high temperature

**10.5 Incompatible materials:** acids, metals (copper, aluminium, nickel, magnesium, iron), organic substances such as amines, methanol, ammonium salt.

**10.6 Hazardous decomposition products:** toxic chlorine oxide, unstable chloric acid (it decomposes into chlorine and oxygen) in reaction with air CO<sub>2</sub> and acid substances.

### SECTION 11: Toxicological information

**11.1 Information on toxicological effects:**

**a) Acute toxicity:**

LD50 rat (orally): 1,100 mg/kg

L00 rat (orally): 626 mg/k

LD50 rabbit (dermally): > 20,000 mg/kg

L00 rabbit (dermally): > 10,000 mg/kg

LC50 rat (1 hour) (inhalantly): > 10.5 mg/l

**b) Skin corrosion/irritation:** corrosive substance, 1B category

Skin (rabbit, guinea pig): 5.25% NaOCl – low-irritable

**c) Serious damage/irritation of eyes:**

Eyes (rabbit, monkey): 5% NaOCl – irritable (cornea, iris, conjunctiva)

**d) Respiratory tract sensitization:**

respiratory tract (mouse): 10% NaOCl (aerosol) – irritable

Some sense irritable reactions were monitored due to chlorine content.

The studies with people showed that gaseous chlorine was irritable at concentration above 0.5 ppm.

**e) Respiratory and skin sensibilization:** NaOCl is not sensitizing for skin. There are not sufficient data on sensibilization of respiratory tract. No indication of respiratory sensibilization from working use.

**f) Toxicity of repeated doses:** NOAEL (orally): 50 mg/kg body weight/day

**g) Mutagenity:** Negative results of mutagenity tests.

**h) Carcinogenity:** The substance does not show carcinogenic effects under common handling and conditions.

**ch) Reproduction toxicity:** Sodium hypochlorite is not classified as a substance harmful for reproduction.

Fertility NOAEL (orally): 5 mg Cl/kg body weight/day

Development NOAEL (orally): 5.7 mg Cl/kg body weight/day

### SECTION 12: Ecological information

**12.1 Toxicity:**

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<b>Acute fish toxicity:</b>	
LC50 <i>Lepomis macrochirus</i>	0.58 mg/l (96 hours)
LC50 <i>Oncorhynchus mykiss</i>	0.2 mg/l (96 hours)
LC50 <i>Oncorhynchus mykiss</i>	0.43 – 0.99 mg/l (30 min.)
LC50 <i>Pimephales promelas</i>	1.19 – 1.55 mg/l (96 hours)
LC50 Ocean spot ( <i>Leiostomus xanthurus</i> )	0.09 mg TRC/l (96 hours)
Bluefish ( <i>Pomatomus saltatrix</i> )	
LC50 Striped bass ( <i>Morone saxatilis</i> )	0.14 mg TRC/l (24 hours)
Sea trout ( <i>Cynoscion nebulosus</i> )	
LC50 for freshwater fish	0.06 mg TRC/l
LC50 for sea food	0.032 mgTRO/l
<b>Chronic fish toxicity:</b>	
NOEC for seafood:	0.04 mg CPO/l (28 d.)
<b>Acute toxicity for water invertebrates (acute immobilization test):</b>	
EC50 <i>Daphnia magna</i>	141 µg/l (48 hours)
EC50 <i>Daphnia magna</i>	2.1 mg/l (96 hours)
LC50 <i>Brachionus plicatilis</i> (rotifer)	0.01 – 0.18 mg/l (30 min.)
<b>Worms:</b>	
EC50 <i>Dugesia tigrina</i>	32 mg/l (96 hours)
EC50/LC50 freshwater invertebrates:	0.141 mg/l
EC50/LC50 sea invertebrates:	0.026 mg/l
<b>Long-term toxicity to invertebrates:</b>	
NOEC for sea invertebrates:	0.007 mg/l
<b>Algae and water plants:</b>	
EC10/LC10 or NOEC freshwater alga:	0.0021 mg/l
EC50/LC50 freshwater plants:	0.1 mg/l
EC10/LC10 or NOEC freshwater plants:	0.02 mg/l
<p>PNEC fresh water = the result of the lowest long-term toxicity/10 = 0.21 µg/l                      PNEC sea water = the result of the lowest long-term toxicity/50 = 0.042 µg/l                      PNEC water-interrupted release = the lowest short-term result/100 = 0.26 µg/l</p>	
<b>Toxicity for water microorganisms:</b>	
EC50/LC50 for water microorganisms:	3 mg/l
PNECSTP:	0.03 mg/l
<b>Bird toxicity:</b>	
LD50 <i>Colinus virginianus</i> :	> 2,510 mg/kg (14 d.) (based on: death rate)
NOEL <i>Colinus virginianus</i> :	1,000 mg/kg (14 d.) (based on: body weight)
LC50 <i>Colinus urginianus</i> :	> 5,620 ppm (8 d.) (based on: death rate)
LC50 <i>Anas platyrhynchos</i> :	> 5,620 ppm (8 d.) (based on: death rate)
Long-term EC10/LC10 or NOEC for birds:	200 mg/kg of food
PNEC rat (orally) for secondary poisoning:	11.1 mg/kg of food
<b>12.2 Persistence and degradability</b>	
<p>Hypochlorite is highly reactive component reacting fast with organic substances in soil and in a sewer. In water there is a balance between chloric acid and hypochlorite anion at pH of environment.                      Biodegradation: not subject to biodegradation                      Chemical degradation: with acid substances, even with air CO2 it reacts with origination of</p>	

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unstable chloric acid decomposing into chlorine and oxygen. It is subject to fast photolysis.

**12.3 Bioaccumulative potential:**

Sodium hypochlorite is not bioaccumulative or bioconcentration due to high solubility in water and high reactivity.

**12.4 Mobility in soil:**

Free active chlorine in soil reacts fast with organic substances. Final destiny of hypochlorite in soil consists in reduction into hypochlorite. Hypochlorite as inorganic substance with endless solubility in water and very low partition coefficient should be considered mobile in soil and in sludge but for a very short period of time.

**12.5 Results of PBT and vPvB assessment:** Sodium hypochlorite is neither PBT nor vPvB substance.

**12.6 Other adverse effects:** Dangerous for water environment.

**SECTION 13: Disposal considerations**


**13.1 Waste treatment methods**

**Recommended method of disposal:** Adhere to all applicable laws and regulations on waste. Do not discharge sodium hydroxide residues into sewage systems and other courses, not even in the vicinity of water sources and neither rinse water containing sodium hydroxide. Leaked sodium hypochlorite shall be pumped to non-metallic tanks, small quantities shall be absorbed in suitable material (vapex, cinder, sand, sawdust) and they shall be transported together with contaminated earth for disposal in non-metallic packages. Prevent contact with metals and acid substances. Leaked sodium hypochlorite may not be neutralized in any case. Smaller quantities can be liquidated using solutions of sodium sulphite or hydrogen peroxide.

**Recommended method of dirty packaging elimination:** Empty packaging can be recycled after perfect emptying. Storage tanks used for transport of sodium hypochlorite are shall be returned to the producer. Liquidation of residues in cisterns shall be provided for by the producer.

**SECTION 14: Transport information**

**Land transport ADR/RID**

UN number	1791
ADR/RID class:	8
Classification code:	C9
Hazard-number (Kemler)	80
Hazard label:	8
Additional labels:	Environmentally hazardous substances
	
Packing group:	II
Limited quantity (LQ):	1000 ml
Tunnel restriction code:	E
Proper shipping name	HYPOCHLORITE solution
Chemical name:	SODIUM HYPOCHLORITE
Special provisions	521
Exempt amount:	E2
Transport category:	2

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WGK:	1
<b>Marine transport IMDG</b>	
UN number	1791
IMDG class:	8
Hazard label	8
Additional labels IMDG:	Marine pollutant
	
Packing group:	II
EmS:	F-A, S-B
Limited quantity:	1000 ml
Proper shipping name	HYPOCHLORITE solution
Chemical name:	SODIUM HYPOCHLORITE
Special provisions:	-
Exempt amount:	E2
<b>Air transport ICAO/IATA</b>	
UN number	1791
ICAO/IATA-DGR class	8
Proper shipping name	HYPOCHLORITE solution
Chemical name:	SODIUM HYPOCHLORITE
Hazard label	8
Additional labels IATA:	
Environmentally hazardous substances	
	
ICAO-packing group:	II
Limited quantity passenger:	500 ml
IATA – packing instructions- passenger:	809
IATA-max.quantity passenger:	1000 ml
IATA – packing instructions- Cargo:	813
IATA-max.quantity- Cargo:	30 l

## SECTION 15: Regulatory information

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

Regulation of the Government of the Slovak Republic No. 355/2006 Coll. on Protection of Employees Against Hazards Related to exposure to chemical factors at work as amended.

Decree No.365/2015 Coll. on establishing the Waste Catalogue.

Regulation (EC) No. 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).

Regulation (EC) No. 1272/2008 of the European Parliament and of the Council on Classification, Labelling and Packaging of substances and mixtures (CLP).

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Directive 67/548/EHS – classification, packaging and labelling of substances.

**15.2 Chemical safety assessment:** Chemical safety assessment was carried out within registration of the substance pursuant to the REACH regulation.**SECTION 16: Other information****Full text of H-Statements referred to under sections 2 and 3:**

- H314 Causes severe skin burns and eye damage.  
H318 Causes serious eye damage.  
H400 Very toxic to aquatic organisms.  
H290 May be corrosive to metals.  
H319 Causes serious eye irritation.  
H411 Toxic to aquatic life with long lasting effects.

**KBU revision:** Revision was carried out in compliance with Regulation (EC) No. 1907/2006 of the EP and of the Council (REACH) and its change published in the Commission Regulation (EU) No. 2015/830.  
Changes in the material safety data sheet – Section 1, 15, 16.

**Important reference to literature and information sources at formation of Safety Data Sheet:**

Registration documentation of the substance under the Regulation No.1907/2006 REACH, national legislation, literature, CSR, ECHA.

**Instructions for training:**

For employee have to be available safety regulations under the Act 596/2002 Z. z., consulted with authorities of public health protection. Persons in contact with the product have to be provable informed about its hazardous properties, the principles of health protection, the environment, with its harmful effect and the principles of first-aid treatment.

**Access to informations:**

Every employer have to allow the access to information in Safety Data Sheet under the Regulation 1907/2006 REACH (article 35) to all workers, who use this product or they are exhibit its effects during work and also to all the substitutes of these workers.

**Other informations:**

The classification is based on the test results of product, which are performed according to registration of the substance under the REACH Regulation.

**APPENDIX: EXPOSURE SCENARIOS****List of Exposure Scenarios**

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Manufacturing
Formulation
Industrial use as intermediate
Industrial use in textile industry
Industrial use in sewage and cooling or heating water treatment
Industrial use in pulp and paper
Industrial cleaning use
Professional cleaning use
Consumer use

**1 – Title of Exposure Scenario : Manufacturing***SODIUM HYPOCHLORITE TECHNICAL*

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The stated information only relate to the above product and do not have to apply when combined with other products or in different processes. The information is based on the current state of knowledge and is presented in good faith. It, however, does not guarantee or prove any contractual relations. It is solely up to the user to make sure the information is relevant and complete for this product special use. The user is obliged to adhere to the existing laws and regulations.

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Name of contributing environmental scenario and corresponding ERC	
ERC1 Manufacture of substances	
Name(s) of contributing worker scenarios and corresponding PROCs	
PROC1	Use in closed process, no likelihood of exposure
PROC2	Use in closed, continuous process with occasional controlled exposure
PROC3	Use in closed batch process (synthesis or formulation)
PROC4	Use in batch and other process (synthesis) where opportunity for exposure arises
PROC8a	Transfer of chemicals from/to vessels/large containers at non dedicated facilities
PROC8b	Transfer of chemicals from/to vessels/large containers at dedicated facilities
PROC9	Transfer of chemicals into small containers (dedicated filling line)
2 – Operational Conditions and Risk Management Measures	
2.1 – Control of Environmental exposure	
Contributing exposure scenario controlling environmental exposure for ERC2	
Product characteristics	Substance is a unique structure.  Non-hydrophobic.  Sodium hypochlorite has low potential for bioaccumulation.
European tonnage	1195.23 kt/y 24% active chlorine (286.85 kt/year Cl <sub>2</sub> equivalent)
Maximum regional tonnage	342.58 kt/y 24% active chlorine (82.22) kt/year Cl <sub>2</sub> equivalent)
Frequency and duration of use	Continuous release.  Emission Days: 360 days/year
Environmental factors not influenced by risk management	Local freshwater dilution factor 10  Local marine water dilution factor 100
Other Operational Conditions of use affecting environmental exposure	Indoor/Outdoor use.  Product applied in aqueous process solution with negligible volatilization. Free available chlorine in effluent is measured as total residual chlorine (TRC) and is calculated to be below 1.0E-13 mg/L  No release to air from process expected because hypochlorite solution is non volatile.  No release to soil from process expected.
Technical conditions and measures at process level (source) to prevent release	Common practices vary across sites but releases expected are negligible to waste water and soil (sodium hypochlorite is destroyed rapidly in contact with organic as well as inorganic material).

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Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	Risk to the environment is driven by freshwater exposure. Onsite wastewater treatment required. Prevent discharge of substance directly to the environment and waste water treatment is required.
Organisation measures to prevent/limit release from site	Prevent environmental discharge consistent with regulatory requirements.
Conditions and measures related to industrial or municipal sewage treatment plant	Waste water treatment is required.
Conditions and measures related to external treatment of waste for disposal	External treatment and disposal of waste should comply with applicable local and/or national regulations.

## 2.2 – Control of worker exposure

### Contributing exposure scenario controlling worker exposure for PROC 1, 2, 3, 4, 8a, 8b, 9.

#### GENERAL CONDITIONS APPLICABLE TO ALL ACTIVITIES

- G12 - Covers percentage substance in the product up to 25 % (unless stated differently).
- G2 - Covers daily exposures up to 8 hours (unless stated differently).
- OC8 – Indoor
- Risk Management Measures and measures related to personal protection, hygiene and health evaluation: Cross reference to tab. General Risk Management Measures (Qualitative Exposure Assessment, see additional document 1, end of extended SDS)

#### SPECIFIC CONDITIONS APPLICABLE TO SPECIFIC ACTIVITIES

Contributing Scenario	Duration of use	Concentration of substance	Risk Management Measures
PROC1 - Use in closed process, no likelihood of exposure	n.s.c.	n.s.c.	Handle substance within a closed system [E47].
PROC2 - Use in closed, continuous process with occasional controlled exposure	n.s.c.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.
PROC3 - Use in closed batch process (synthesis or formulation)	n.s.c.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.
PROC4 - Use in batch and other process (synthesis) where opportunity for exposure arises	n.s.c.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.

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PROC8a - Transfer of chemicals from/to vessels/large containers at non dedicated facilities	Avoid carrying out activities involving exposure for more than 6 h.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.
PROC8b - Transfer of chemicals from/to vessels/large containers at dedicated facilities	Avoid carrying out activities involving exposure for more than 6 h.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.
PROC9 - Transfer of chemicals into small containers (dedicated filling line)	n.s.c.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.

*nsc : no specific conditions*

### 3 – Exposure estimation and reference to its source

#### 3.1 - Environment

EE8 - Qualitative approach used to conclude safe use. (see Additional document 2 “Qualitative assessment - environment”, end of Extended SDS)

#### Predicted environmental concentrations (PECs)

According the previous qualitative assessment, the worst case exposure concentration in waste water treatment plant is 1.0E-13 mg/L. The PECs for the other compartments are not applicable, because sodium hypochlorite is destroyed rapidly in contact with organic as well as inorganic material and furthermore is a non-volatile substance.

#### Indirect exposure of humans via the environment (oral)

Hypochlorite will not reach the environment via the sewage treatment system, as the quick transformation of the applied hypochlorite (as free available chlorine, FAC) in the sewage system ensures the absence of any human exposure to hypochlorite. Also in recreational zones located close to discharge points of chlorinated waste water, the potential for exposure to hypochlorite originating from waste water treatment is negligible as the emission of unreacted hypochlorite is non-existent.

Due to the physico-chemical properties of sodium hypochlorite no indirect exposure is thought to occur via the human food chain. Thus no indirect exposure to sodium hypochlorite is thought to occur via the environment.

#### 3.2 – Human health

Used Advanced Reach Tool model. (Detailed inputs available on request)

Route of exposure	Concentrations		Risk Characterisation Ratio (RCR)		
	Value	Unit	inhalation	dermal	combined

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Long-term exposure, local, inhalative – PROC1	0.02	mg/m <sup>3</sup>	0.01	n.a	n.a
Long-term exposure, local, inhalative – PROC2	1.10	mg/m <sup>3</sup>	0.71	n.a	n.a
Long-term exposure, local, inhalative – PROC3	1.10	mg/m <sup>3</sup>	0.71	n.a	n.a
Long-term exposure, local, inhalative – PROC4	1.20	mg/m <sup>3</sup>	0.77	n.a	n.a
Long-term exposure, local, inhalative – PROC8a	1.25	mg/m <sup>3</sup>	0.81	n.a	n.a
Long-term exposure, local, inhalative – PROC8b	1.25	mg/m <sup>3</sup>	0.81	n.a	n.a
Long-term exposure, local, inhalative – PROC9	0.91	mg/m <sup>3</sup>	0.59	n.a	n.a

*n.a = non adapted*

#### **4 – Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario**

Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling could be necessary to define appropriate site-specific risk management measures. If scaling reveals a condition of unsafe use, additional RMMs or a site-specific chemical safety assessment is required.

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## 1 – Title of Exposure Scenario : Formulation

### List of all use descriptors related to the life cycle stage

SU 3 Industrial uses: Uses of substances as such or in preparations at industrial sites  
SU 10 Formulation [mixing] of preparations and/or re-packaging (excluding alloys)

### Name of contributing environmental scenario and corresponding ERC

ERC2 Formulation of preparations

### Name(s) of contributing worker scenarios and corresponding PROCs

PROC1 Use in closed process, no likelihood of exposure  
PROC2 Use in closed, continuous process with occasional controlled exposure  
PROC3 Use in closed batch process (synthesis or formulation)  
PROC4 Use in batch and other process (synthesis) where opportunity for exposure arises  
PROC5 Mixing or blending in batch processes (multistage and/or significant contact)  
PROC8a Transfer of chemicals from/to vessels/large containers at non dedicated facilities  
PROC8b Transfer of chemicals from/to vessels/large containers at dedicated facilities  
PROC9 Transfer of chemicals into small containers (dedicated filling line)  
PROC14 Production of preparations or articles by tableting, compression, extrusion, pelletisation  
PROC15 Use as laboratory reagent

## 2 – Operational Conditions and Risk Management Measures

### 2.1 – Control of Environmental exposure

#### Contributing exposure scenario controlling environmental exposure for ERC2

Product characteristics	Substance is a unique structure. Non-hydrophobic. Sodium hypochlorite has low potential for bioaccumulation. Concentration: < 25 % (typically 12 – 14 %)
European tonnage	1195.23 kt/y 24% active chlorine (286.85 kt/year Cl2 equivalent) Number of European production and formulation sites > 63
Maximum regional tonnage	342.58 kt/y 24% active chlorine (82.22) kt/year Cl2 equivalent)
Frequency and duration of use	Continuous release. Emission Days: 360 days/year
Environmental factors not influenced by risk management	Local freshwater dilution factor 10 Local marine water dilution factor 100



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Other Operational Conditions of use affecting environmental exposure	<p>Indoor/Outdoor use.</p> <p>Product applied in aqueous process solution with negligible volatilization. Free available chlorine in effluent is measured as total residual chlorine (TRC) and is anticipated to be below 1.0E-13 mg/L</p> <p>No release in air from process expected because hypochlorite solution is non volatile.</p> <p>No release in soil from process expected.</p>
Technical conditions and measures at process level (source) to prevent release	Common practices vary across sites but releases expected are negligible to waste water and soil (sodium hypochlorite is destroyed rapidly in contact with organic as well as inorganic material).
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	Risk to the environment is driven by freshwater exposure. Onsite wastewater treatment required. Prevent discharge of substance directly to the environment and waste water treatment is required.
Organisation measures to prevent/limit release from site	Prevent environmental discharge consistent with regulatory requirement
Conditions and measures related to industrial or municipal sewage treatment plant	Waste water treatment is required.
Conditions and measures related to external treatment of waste for disposal	External treatment and disposal of waste should comply with applicable local and/or national regulations.
<b>2.2 – Control of worker exposure</b>	
<b>Contributing exposure scenario controlling worker exposure for PROC 1, 2, 3, 4, 5, 8a, 8b, 9, 14, 15</b>	
<b>GENERAL CONDITIONS APPLICABLE TO ALL ACTIVITIES</b>	
<ul style="list-style-type: none"> <li>• G12 - Covers percentage substance in the product up to 25 % (unless stated differently).</li> <li>• G2 - Covers daily exposures up to 8 hours (unless stated differently).</li> <li>• OC8 – Indoor</li>   <li>• Risk Management Measures and measures related to personal protection, hygiene and health evaluation: Cross reference to tab. General Risk Management Measures (Qualitative Exposure Assessment, see additional document 1, end of extended SDS)</li> </ul>	
<b>SPECIFIC CONDITIONS APPLICABLE TO SPECIFIC ACTIVITIES</b>	

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Contributing Scenario	Duration of use	Concent <sup>o</sup> of substance	Risk Management Measures
PROC1 - Use in closed process, no likelihood of exposure	n.s.c.	n.s.c.	Handle substance within a closed system [E47].
PROC2 - Use in closed, continuous process with occasional controlled exposure	n.s.c.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.
PROC3 - Use in closed batch process (synthesis or formulation)	n.s.c.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.
PROC4 - Use in batch and other process (synthesis) where opportunity for exposure arises	n.s.c.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.
PROC5 - Mixing or blending in batch processes (multistage and/or significant contact)	n.s.c.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.
PROC8a - Transfer of chemicals from/to vessels/large containers at non dedicated facilities	Avoid carrying out activities involving exposure for more than 6 h.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.
PROC8b - Transfer of chemicals from/to vessels/large containers at dedicated facilities	Avoid carrying out activities involving exposure for more than 6 h.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.
PROC9 - Transfer of chemicals into small containers (dedicated filling line)	n.s.c.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.
PROC14 - Production of preparations or articles by tableting, compression, extrusion, pelletisation	n.s.c.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under medium containment.
PROC 15 – Use as laboratory reagent	n.s.c.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54].

*nsc : no specific conditions*

### 3 – Exposure estimation and reference to its source

#### 3.1 - Environment

EE8 - Qualitative approach used to conclude safe use. (see Additional document 2 “Qualitative assessment -

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environment", end of Extended SDS)

**Predicted environmental concentrations (PECs)**

According the previous qualitative assessment, the worst case exposure concentration used as PEC in waste water treatment plant is 1.0E-13 mg/L. The PECs for the other compartments are not applicable, because sodium hypochlorite is destroyed rapidly in contact with organic as well as inorganic material and furthermore is a non-volatile substance.

**Indirect exposure of humans via the environment (oral)**

Hypochlorite will not reach the environment via the sewage treatment system, as the quick transformation of the applied hypochlorite (as free available chlorine, FAC) in the sewage system assures the absence of any human exposure to hypochlorite. Also in recreational zones located close to discharge points of chlorinated waste water, the potential for exposure to hypochlorite originating from waste water treatment is negligible as the emission of unreacted hypochlorite is non-existent.

Due to the physico-chemical properties of sodium hypochlorite no indirect exposure is thought to occur via the human food chain. Thus no indirect exposure to sodium hypochlorite is thought to occur via the environment.

**3.2 – Human health**

Used Advanced Reach Tool model. (Detailed inputs available on request)

Route of exposure	Concentrations of sodium hypochlorite		Risk Characterisation Ratio (RCR)		
	Value	Unit	inhalation	dermal	combined
Long-term exposure, local, inhalation – PROC1	0.02	mg/m <sup>3</sup>	0.01	n.a	n.a
Long-term exposure, local, inhalation – PROC2	1.10	mg/m <sup>3</sup>	0.71	n.a	n.a
Long-term exposure, local, inhalation – PROC3	1.10	mg/m <sup>3</sup>	0.71	n.a	n.a
Long-term exposure, local, inhalation – PROC4	1.20	mg/m <sup>3</sup>	0.77	n.a	n.a
Long-term exposure, local, inhalation – PROC5	1.25	mg/m <sup>3</sup>	0.81	n.a	n.a
Long-term exposure, local, inhalation – PROC8a	1.25	mg/m <sup>3</sup>	0.81	n.a	n.a
Long-term exposure, local, inhalation – PROC8b	1.25	mg/m <sup>3</sup>	0.81	n.a	n.a
Long-term exposure, local, inhalation – PROC9	0.91	mg/m <sup>3</sup>	0.59	n.a	n.a

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Long-term exposure, local, inhalation – PROC 14	0.23	mg/m <sup>3</sup>	0.15	n.a	n.a
Long-term exposure, local, inhalation – PROC 15	0.70	mg/m <sup>3</sup>	0.45	n.a	n.a

*n.a = not applicable*

**4 – Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario**

Guidance is based on assumed operating conditions which may not be applicable to all sites. Thus scaling is deemed necessary to define appropriate site-specific risk management measures. If scaling reveals a condition of unsafe use (i.e., RCRs > 1), additional RMMs or a site-specific chemical safety assessment is required.

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**1 – Title of Exposure Scenario : Industrial use as intermediate**

**List of all use descriptors related to the life cycle stage**

SU 3 Industrial uses: Uses of substances as such or in preparations at industrial sites  
 SU 8 Manufacture of bulk, large scale chemicals (including petroleum products)  
 SU 9 Manufacture of fine chemicals  
 PC19 Intermediate

**Name of contributing environmental scenario and corresponding ERC**

ERC6a Industrial use resulting in manufacture of another substance (use of intermediates)

**Name(s) of contributing worker scenarios and corresponding PROCs**

PROC1 Use in closed process, no likelihood of exposure  
 PROC2 Use in closed, continuous process with occasional controlled exposure  
 PROC3 Use in closed batch process (synthesis or formulation)  
 PROC4 Use in batch and other process (synthesis) where opportunity for exposure arises  
 PROC8a Transfer of chemicals from/to vessels/large containers at non dedicated facilities  
 PROC8b Transfer of chemicals from/to vessels/large containers at dedicated facilities  
 PROC9 Transfer of chemicals into small containers (dedicated filling line)

**2 – Operational Conditions and Risk Management Measures**

**2.1 – Control of Environmental exposure**

**Contributing exposure scenario controlling environmental exposure for ERC6a**

Product characteristics	Substance is a unique structure.  Non-hydrophobic.  Sodium hypochlorite has low potential for bioaccumulation.  Concentration: <25%
European tonnage	26 % of the total consumption was estimated to be used as a chemical intermediate (75.96 kt/year chlorine equivalent).
Frequency and duration of use	Continuous release.  Emission Days: 360 days/year
Environmental factors not influenced by risk management	Local freshwater dilution factor 10  Local marine water dilution factor 100
Other Operational Conditions of use affecting environmental exposure	Reactions with organic intermediates in controlled closed systems. Sodium hypochlorite solution is filled into the reaction vessels through closed systems.

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	No release in environment is expected. In worst case the free available chlorine in effluent is measured as total residual chlorine (TRC) and is anticipated to be below 1.0E-13 mg/L
Technical conditions and measures at process level (source) to prevent release	Common release control mechanisms (all sites fall under IPPC BREF) and specific local regulations respected to minimize risk. Common practices vary across sites but no releases are expected. Off-gas from the reactor is usually treated in a thermal exhaust air decontaminator before release into the atmosphere.
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	Risk to the environment is driven by freshwater exposure. Onsite wastewater treatment required. Prevent discharge of substance directly to the environment and waste water treatment is required.
Organisation measures to prevent/limit release from site	Prevent environmental discharge consistent with regulatory requirement
Conditions and measures related to industrial or municipal sewage treatment plant	Waste water treatment is required to remove any residual organic compounds and remaining available chlorine.
Conditions and measures related to external treatment of waste for disposal	External treatment and disposal of waste should comply with applicable local and/or national regulations.

## 2.2 – Control of worker exposure

### Contributing exposure scenario controlling worker exposure for PROC 1, 2, 3, 4, 8a, 8b, 9.

#### GENERAL CONDITIONS APPLICABLE TO ALL ACTIVITIES

- G12 - Covers percentage substance in the product up to 25 % (unless stated differently).
- G2 - Covers daily exposures up to 8 hours (unless stated differently).
- OC8 – Indoor
- Risk Management Measures and measures related to personal protection, hygiene and health evaluation: Cross reference to tab. General Risk Management Measures (Qualitative Exposure Assessment, see additional document 1, end of extended SDS)

#### SPECIFIC CONDITIONS APPLICABLE TO SPECIFIC ACTIVITIES

Contributing Scenario	Duration of use	Concent <sup>o</sup> of substance	Risk Management Measures
PROC1 - Use in closed process, no likelihood of exposure	n.s.c.	n.s.c.	Handle substance within a closed system [E47].
PROC2 - Use in closed, continuous process with occasional controlled exposure	n.s.c.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.
PROC3 - Use in closed batch process	n.s.c.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54].

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(synthesis or formulation)			Process under low containment.
PROC4 - Use in batch and other process (synthesis) where opportunity for exposure arises	n.s.c.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.
PROC8a - Transfer of chemicals from/to vessels/large containers at non dedicated facilities	Avoid carrying out activities involving exposure for more than 6 h.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.
PROC8b - Transfer of chemicals from/to vessels/large containers at dedicated facilities	Avoid carrying out activities involving exposure for more than 6 h.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.
PROC9 - Transfer of chemicals into small containers (dedicated filling line)	n.s.c.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.

*nsc : no specific conditions*

### 3 – Exposure estimation and reference to its source

#### 3.1 - Environment

EE8 - Qualitative approach used to conclude safe use. (see Additional document 2 “Qualitative assessment - environment”, end of Extended SDS)

#### Predicted environmental concentrations (PECs)

Emissions to the environment will not occur as NaClO either reacts or is reduced completely to sodium chloride during the process. The waste water is usually treated because of the organic compounds and at the same time any left available chlorine is destroyed.

According the previous qualitative assessment, the worst case exposure concentration used as PEC in waste water treatment plant is 1.0E-13 mg/L. The PECs for the other compartments are not required, because sodium hypochlorite is destroyed rapidly in contact with organic as well as inorganic material and furthermore is a non-volatile substance.

#### Indirect exposure of humans via the environment (oral)

Hypochlorite will not reach the environment via the sewage treatment system, as the quick transformation of the applied hypochlorite (as free available chlorine, FAC) in the sewage system assures the absence of any human exposure to hypochlorite. Also in recreational zones located close to discharge points of chlorinated waste water, the potential for exposure to hypochlorite originating from waste water treatment is negligible as the emission of unreacted hypochlorite is non-existent.

Due to the physico-chemical properties of sodium hypochlorite no indirect exposure is thought to occur via the human food chain. Thus no indirect exposure to sodium hypochlorite is thought to occur via the environment.

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### 3.2 – Human health

Used Advanced Reach Tool model. (Detailed inputs available on request)

Route of exposure	Concentrations of sodium hypochlorite		Risk Characterisation Ratio (RCR)		
	Value	Unit	inhalation	dermal	combined
Long-term exposure, local, inhalation – PROC1	0.02	mg/m <sup>3</sup>	0.01	n.a	n.a
Long-term exposure, local, inhalation – PROC2	1.10	mg/m <sup>3</sup>	0.71	n.a	n.a
Long-term exposure, local, inhalation – PROC3	1.10	mg/m <sup>3</sup>	0.71	n.a	n.a
Long-term exposure, local, inhalation – PROC4	1.20	mg/m <sup>3</sup>	0.77	n.a	n.a
Long-term exposure, local, inhalation – PROC8a	1.25	mg/m <sup>3</sup>	0.81	n.a	n.a
Long-term exposure, local, inhalation – PROC8b	1.25	mg/m <sup>3</sup>	0.81	n.a	n.a
Long-term exposure, local, inhalation – PROC9	0.91	mg/m <sup>3</sup>	0.59	n.a	n.a

*n.a = not applicable*

### 4 – Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

Guidance is based on assumed operating conditions which may not be applicable to all sites. Thus, scaling is deemed necessary to define appropriate site-specific risk management measures. If scaling reveals a condition of unsafe use (i.e., RCRs > 1), additional RMMs or a site-specific chemical safety assessment is required.



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## 1 – Title of Exposure Scenario : Industrial use in textile industry

### List of all use descriptors related to the life cycle stage

SU 3 Industrial uses: Uses of substances as such or in preparations at industrial sites  
 SU 5 Manufacture of textiles, leather, fur  
 PC 34 Textile dyes, finishing and impregnating products; including bleaches and other processing aids

### Name of contributing environmental scenario and corresponding ERC

ERC6b Industrial use of reactive processing aids

### Name(s) of contributing worker scenarios and corresponding PROCs

PROC1 Use in closed process, no likelihood of exposure  
 PROC2 Use in closed, continuous process with occasional controlled exposure  
 PROC3 Use in closed batch process (synthesis or formulation)  
 PROC4 Use in batch and other process (synthesis) where opportunity for exposure arises  
 PROC5 Mixing or blending in batch processes (multistage and/or significant contact)  
 PROC8a Transfer of chemicals from/to vessels/large containers at non dedicated facilities  
 PROC8b Transfer of chemicals from/to vessels/large containers at dedicated facilities  
 PROC9 Transfer of chemicals into small containers (dedicated filling line)  
 PROC13 Treatment of articles by dipping and pouring

## 2 – Operational Conditions and Risk Management Measures

### 2.1 – Control of Environmental exposure

#### Contributing exposure scenario controlling environmental exposure for ERC6b

Product characteristics	Substance is a unique structure. Non-hydrophobic. Sodium hypochlorite has low potential for bioaccumulation. Concentration: < 25 %
European tonnage	12.05 kt of Cl <sub>2</sub> equivalent have been used in Europe in 1994 (300 t as chlorine gas and 11.75 kt as bleach).
Frequency and duration of use	Continuous release. Emission Days: 360 days/year
Environmental factors not influenced by risk management	Local freshwater dilution factor 10 Local marine water dilution factor 100
Other Operational Conditions of use affecting environmental exposure	Sulphite must be use in part of dechlorination process leading to negligible releases of NaClO in water.

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	No release in environment is expected. In worst case the free available chlorine in effluent is measured as total residual chlorine (TRC) and is anticipated to be below 1.0E-13 mg/L
Technical conditions and measures at process level (source) to prevent release	Common release control mechanisms (all sites fall under IPPC BREF) and specific local regulations respected to minimize risk. Common practices vary across sites but no releases are expected.  Off-gas from the reactor is usually treated in a thermal exhaust air decontaminator before release into the atmosphere.
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	Wool chlorination is performed in an acidic environment, in which gaseous chlorine formation is unavoidable. This requires a high degree of enclosure of the plants, the presence of abatement system of gaseous emission and a neutralisation stage
Organisation measures to prevent/limit release from site	Prevent environmental discharge consistent with regulatory requirement
Conditions and measures related to industrial or municipal sewage treatment plant	Waste water treatment is required to remove any residual organic compounds and remaining available chlorine
Conditions and measures related to external treatment of waste for disposal	External treatment and disposal of waste should comply with applicable local and/or national regulations.

## 2.2 – Control of worker exposure

### Contributing exposure scenario controlling worker exposure for PROC 1, 2, 3, 4, 5, 8a, 8b, 9, 13

#### GENERAL CONDITIONS APPLICABLE TO ALL ACTIVITIES

- G12 - Covers percentage substance in the product up to 25 % (unless stated differently).
- G2 - Covers daily exposures up to 8 hours (unless stated differently).
- OC8 – Indoor
- Risk Management Measures and measures related to personal protection, hygiene and health evaluation: Cross reference to tab. General Risk Management Measures (Qualitative Exposure Assessment, see additional document 1, end of extended SDS)

#### SPECIFIC CONDITIONS APPLICABLE TO SPECIFIC ACTIVITIES

Contributing Scenario	Duration of use	Concent° of substance	Risk Management Mesures
PROC1 - Use in closed process, no likelihood of exposure	n.s.c.	n.s.c.	Handle substance within a closed system [E47].
PROC2 - Use in closed, continuous process with occasional controlled exposure	n.s.c.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.

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PROC3 - Use in closed batch process (synthesis or formulation)	n.s.c.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.
PROC4 - Use in batch and other process (synthesis) where opportunity for exposure arises	n.s.c.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.
PROC5 - Mixing or blending in batch processes (multistage and/or significant contact)	n.s.c.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.
PROC8a - Transfer of chemicals from/to vessels/large containers at non dedicated facilities	Avoid carrying out activities involving exposure for more than 6 h.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.
PROC8b - Transfer of chemicals from/to vessels/large containers at dedicated facilities	Avoid carrying out activities involving exposure for more than 6 h.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.
PROC9 - Transfer of chemicals into small containers (dedicated filling line)	n.s.c.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.
PROC13 - Treatment of articles by dipping and pouring	n.s.c.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under medium containment. Minimise exposure by ventilated partial enclosure of the operator or equipment.

*nsc : no specific conditions*

### 3 – Exposure estimation and reference to its source

#### 3.1 - Environment

EE8 - Qualitative approach used to conclude safe use. (see Additional document 2 “Qualitative assessment - environment”, end of Extended SDS)

#### Predicted environmental concentrations (PECs)

For use in textile industry, the releases of sodium hypochlorite are expected to be low due to the operational conditions put in place in the different process (for example, a dechlorination stage in wool treatment) and also, due to the rapid decay of hypochlorite.

According the previous qualitative assessment, the worst case exposure concentration used as PEC in waste water treatment plant is 1.0E-13 mg/L. The PECs for the other compartments are not required, because sodium

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hypochlorite is destroyed rapidly in contact with organic as well as inorganic material and furthermore is a non-volatile substance.

**Indirect exposure of humans via the environment (oral)**

Hypochlorite will not reach the environment via the sewage treatment system, as the quick transformation of the applied hypochlorite (as free available chlorine, FAC) in the sewage system assures the absence of any human exposure to hypochlorite. Also in recreational zones located close to discharge points of chlorinated waste water, the potential for exposure to hypochlorite originating from waste water treatment is negligible as the emission of unreacted hypochlorite is non-existent.

Due to the physico-chemical properties of sodium hypochlorite no indirect exposure is thought to occur via the human food chain. Thus no indirect exposure to sodium hypochlorite is thought to occur via the environment.

**3.2 – Human health**

Used Advanced Reach Tool model. (Detailed inputs available on request)

Route of exposure	Concentrations of sodium hypochlorite		Risk Characterisation Ratio (RCR)		
	Value	Unit	inhalation	dermal	combined
Long-term exposure, local, inhalation – PROC1	0.02	mg/m <sup>3</sup>	0.01	n.a	n.a
Long-term exposure, local, inhalation – PROC2	1.10	mg/m <sup>3</sup>	0.71	n.a	n.a
Long-term exposure, local, inhalation – PROC3	1.10	mg/m <sup>3</sup>	0.71	n.a	n.a
Long-term exposure, local, inhalation – PROC4	1.20	mg/m <sup>3</sup>	0.77	n.a	n.a
Long-term exposure, local, inhalation – PROC5	1.25	mg/m <sup>3</sup>	0.81	n.a	n.a
Long-term exposure, local, inhalation – PROC8a	1.25	mg/m <sup>3</sup>	0.81	n.a	n.a
Long-term exposure, local, inhalation – PROC8b	1.25	mg/m <sup>3</sup>	0.81	n.a	n.a
Long-term exposure, local, inhalation – PROC9	0.91	mg/m <sup>3</sup>	0.59	n.a	n.a
Long-term exposure, local, inhalation – PROC13	0.70	mg/m <sup>3</sup>	0.45	n.a	n.a

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*n.a = not applicable***4 – Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario**

Guidance is based on assumed operating conditions which may not be applicable to all sites. Thus, scaling is deemed necessary to define appropriate site-specific risk management measures. If scaling reveals a condition of unsafe use (i.e., RCRs > 1), additional RMMs or a site-specific chemical safety assessment is required.

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**1 – Title of Exposure Scenario: Industrial use in sewage and cooling or heating water treatment**

**List of all use descriptors related to the life cycle stage**

SU 3 Industrial uses: Uses of substances as such or in preparations at industrial sites  
 SU 23 Electricity, steam, gas water supply and sewage treatment  
 PC 20 Products such as ph-regulators, flocculants, precipitants, neutralization agents  
 PC 37 Water treatment chemicals

**Name of contributing environmental scenario and corresponding ERC**

ERC6b Industrial use of reactive processing aids

**Name(s) of contributing worker scenarios and corresponding PROCs**

PROC1 Use in closed process, no likelihood of exposure  
 PROC2 Use in closed, continuous process with occasional controlled exposure  
 PROC3 Use in closed batch process (synthesis or formulation)  
 PROC4 Use in batch and other process (synthesis) where opportunity for exposure arises  
 PROC5 Mixing or blending in batch processes (multistage and/or significant contact)  
 PROC8a Transfer of chemicals from/to vessels/large containers at non dedicated facilities  
 PROC8b Transfer of chemicals from/to vessels/large containers at dedicated facilities  
 PROC9 Transfer of chemicals into small containers (dedicated filling line)

**2 – Operational Conditions and Risk Management Measures**

**2.1 – Control of Environmental exposure**

**Contributing exposure scenario controlling environmental exposure for ERC6b**

Product characteristics	Substance is a unique structure.  Non-hydrophobic.  Sodium hypochlorite has low potential for bioaccumulation.  Concentration: < 25 %
European tonnage	Sewage treatment: 15.18 kt/year and 9.55 kt/year chlorine equivalent have been used in Europe in 1994  Cooling water: The consumption of hypochlorite produced by the chemical industry for cooling water applications is estimated at 5.58 kt/year chlorine equivalent. The use of gaseous chlorine is rather similar with 4.80 kt/year chlorine equivalent for the year 1994
Frequency and duration of use	Continuous release.

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	Emission Days: 360 days/year
Environmental factors not influenced by risk management	Local freshwater dilution factor 10 Local marine water dilution factor 100
Other Operational Conditions of use affecting environmental exposure	Cooling water process must follow IPPC reference document on the application of best available techniques (BAT) to industrial cooling systems (European Commission, 2001). Site-specific operational conditions to be applied are determined for both chlorine and hypochlorite in the BAT document.  Chlorination processes used for disinfection of wastewater in sewage treatment require a chlorine dose of 5 – 40 mg Cl <sub>2</sub> /L. The chlorine dosages are designed in order to minimise the chlorine discharges to the environment.
Technical conditions and measures at process level (source) to prevent release	Common practices vary across sites but no releases are expected.
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	Risk to the environment is driven by freshwater exposure. Onsite wastewater treatment required. Prevent discharge of substance directly to the environment and waste water treatment is required.
Organisation measures to prevent/limit release from site	Prevent environmental discharge consistent with regulatory requirement
Conditions and measures related to industrial or municipal sewage treatment plant	Waste water treatment is required to remove any residual organic compounds and remaining available chlorine.
Conditions and measures related to external treatment of waste for disposal	External treatment and disposal of waste should comply with applicable local and/or national regulations.

## 2.2 – Control of worker exposure

### Contributing exposure scenario controlling worker exposure for PROC 1, 2, 3, 4, 5, 8a, 8b, 9

#### GENERAL CONDITIONS APPLICABLE TO ALL ACTIVITIES

- G12 - Covers percentage substance in the product up to 25 % (unless stated differently).
- G2 - Covers daily exposures up to 8 hours (unless stated differently).
- OC8 – Indoor
- Risk Management Measures and measures related to personal protection, hygiene and health evaluation: Cross reference to tab. General Risk Management Measures (Qualitative Exposure Assessment, see additional document 1, end of extended SDS)

#### SPECIFIC CONDITIONS APPLICABLE TO SPECIFIC ACTIVITIES

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Contributing Scenario	Duration of use	Concent <sup>o</sup> of substance	Risk Management Mesures
PROC1 - Use in closed process, no likelihood of exposure	n.s.c.	n.s.c.	Handle substance within a closed system [E47].
PROC2 - Use in closed, continuous process with occasional controlled exposure	n.s.c.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.
PROC3 - Use in closed batch process (synthesis or formulation)	n.s.c.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.
PROC4 - Use in batch and other process (synthesis) where opportunity for exposure arises	n.s.c.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.
PROC5 - Mixing or blending in batch processes (multistage and/or significant contact)	n.s.c.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.
PROC8a - Transfer of chemicals from/to vessels/large containers at non dedicated facilities	Avoid carrying out activities involving exposure for more than 6 h.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.
PROC8b - Transfer of chemicals from/to vessels/large containers at dedicated facilities	Avoid carrying out activities involving exposure for more than 6 h.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.
PROC9 - Transfer of chemicals into small containers (dedicated filling line)	n.s.c.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.

*nsc : no specific conditions*

### 3 – Exposure estimation and reference to its source

#### 3.1 - Environment

EE8 - Qualitative approach used to conclude safe use. (see Additional document 2 “Qualitative assessment - environment”, end of Extended SDS)

#### Predicted environmental concentrations (PECs)

The releases of sodium hypochlorite to the aquatic compartment are generally low due to the rapid decay of



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hypochlorite. Indeed, due to immediate further reaction upon encountering oxidisable matter in the receiving water, any remaining free available chlorine will be eliminated upon discharge, with rates of decay increasing with discharged concentrations.

According to the previous qualitative assessment, the worst case exposure concentration used as PEC in waste water treatment plant is 1.0E-13 mg/L. The PECs for the other compartments are not required, because sodium hypochlorite is destroyed rapidly in contact with organic as well as inorganic material and furthermore is a non-volatile substance.

**Indirect exposure of humans via the environment (oral)**

Hypochlorite will not reach the environment via the sewage treatment system, as the quick transformation of the applied hypochlorite (as free available chlorine, FAC) in the sewage system assures the absence of any human exposure to hypochlorite. Also in recreational zones located close to discharge points of chlorinated waste water, the potential for exposure to hypochlorite originating from waste water treatment is negligible as the emission of unreacted hypochlorite is non-existent.

Due to the physico-chemical properties of sodium hypochlorite no indirect exposure is thought to occur via the human food chain. Thus no indirect exposure to sodium hypochlorite is thought to occur via the environment.

**3.2 – Human health**

Used Advanced Reach Tool model. Detailed inputs available on request)

Route of exposure	Concentrations of sodium hypochlorite		Risk Characterisation Ratio (RCR)		
	Value	Unit	inhalation	dermal	combined
Long-term exposure, local, inhalation – PROC1	0.02	mg/m <sup>3</sup>	0.01	n.a	n.a
Long-term exposure, local, inhalation – PROC2	1.10	mg/m <sup>3</sup>	0.71	n.a	n.a
Long-term exposure, local, inhalation – PROC3	1.10	mg/m <sup>3</sup>	0.71	n.a	n.a
Long-term exposure, local, inhalation – PROC4	1.20	mg/m <sup>3</sup>	0.77	n.a	n.a
Long-term exposure, local, inhalation – PROC5	1.25	mg/m <sup>3</sup>	0.81	n.a	n.a
Long-term exposure, local, inhalation – PROC8a	1.25	mg/m <sup>3</sup>	0.81	n.a	n.a
Long-term exposure, local, inhalation – PROC8b	1.25	mg/m <sup>3</sup>	0.81	n.a	n.a
Long-term exposure, local, inhalation – PROC9	0.91	mg/m <sup>3</sup>	0.59	n.a	n.a

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*n.a = not applicable***4 – Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario**

Guidance is based on assumed operating conditions which may not be applicable to all sites. Thus, scaling is deemed necessary to define appropriate site-specific risk management measures. If scaling reveals a condition of unsafe use (i.e., RCRs > 1), additional RMMs or a site-specific chemical safety assessment is required.

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## 1 – Title of Exposure Scenario : Industrial use in pulp and paper

### List of all use descriptors related to the life cycle stage

SU 3 Industrial uses: Uses of substances as such or in preparations at industrial sites  
 SU 6b Manufacture of pulp, paper and paper products  
 PC 26 Paper and board dye, finishing and impregnation products: including bleaches and other processing aids

### Name of contributing environmental scenario and corresponding ERC

ERC6b Industrial use of reactive processing aids

### Name(s) of contributing worker scenarios and corresponding PROCs

PROC1 Use in closed process, no likelihood of exposure  
 PROC2 Use in closed, continuous process with occasional controlled exposure  
 PROC3 Use in closed batch process (synthesis or formulation)  
 PROC4 Use in batch and other process (synthesis) where opportunity for exposure arises  
 PROC5 Mixing or blending in batch processes (multistage and/or significant contact)  
 PROC8a Transfer of chemicals from/to vessels/large containers at non dedicated facilities  
 PROC8b Transfer of chemicals from/to vessels/large containers at dedicated facilities  
 PROC9 Transfer of chemicals into small containers (dedicated filling line)

## 2 – Operational Conditions and Risk Management Measures

### 2.1 – Control of Environmental exposure

#### Contributing exposure scenario controlling environmental exposure for ERC6b

Product characteristics	Substance is a unique structure. Non-hydrophobic. Sodium hypochlorite has low potential for bioaccumulation. Concentration: < 25 %
European tonnage	Consumption for the year 1994 was 17.43 and 8.53 kt/year chlorine equivalent for chlorine and hypochlorite, respectively
Frequency and duration of use	Continuous release. Emission Days: 360 days/year
Environmental factors not influenced by risk management	Local freshwater dilution factor 10 Local marine water dilution factor 100
Other Operational Conditions of use affecting environmental exposure	The concentration of hypochlorite in the system is low, and quantities are determined so that there is negligible residual free hypochlorite at the end of the cleaning process.  No release in environment is expected. In worst case the free

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	available chlorine in effluent is measured as total residual chlorine (TRC) and is anticipated to be below 1.0E-13 mg/L
Technical conditions and measures at process level (source) to prevent release	Only two specific applications are considered acceptable in pulp and paper industry:  - disinfection of the paper machine system - break down of the wet strength resins Common practices vary across sites but no releases are expected.
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	Risk to the environment is driven by freshwater exposure. Onsite wastewater treatment required. Prevent discharge of substance directly to the environment and waste water treatment is required.
Organisation measures to prevent/limit release from site	Prevent environmental discharge consistent with regulatory requirements.
Conditions and measures related to industrial or municipal sewage treatment plant	Waste water treatment is required to remove any residual organic compounds and remaining available chlorine..
Conditions and measures related to external treatment of waste for disposal	External treatment and disposal of waste should comply with applicable local and/or national regulations.

## 2.2 – Control of worker exposure

### Contributing exposure scenario controlling worker exposure for PROC 1, 2, 3, 4, 5, 8a, 8b, 9

#### GENERAL CONDITIONS APPLICABLE TO ALL ACTIVITIES

- G12 - Covers percentage substance in the product up to 25 % (unless stated differently).
- G2 - Covers daily exposures up to 8 hours (unless stated differently).
- OC8 – Indoor
- Risk Management Measures and measures related to personal protection, hygiene and health evaluation: Cross reference to tab. General Risk Management Measures (Qualitative Exposure Assessment, see additional document 1, end of extended SDS)

#### SPECIFIC CONDITIONS APPLICABLE TO SPECIFIC ACTIVITIES

Contributing Scenario	Duration of use	Concent <sup>o</sup> of substance	Risk Management Mesures
PROC1 - Use in closed process, no likelihood of exposure	n.s.c.	n.s.c.	Handle substance within a closed system [E47].
PROC2 - Use in closed, continuous process with occasional controlled exposure	n.s.c.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.
PROC3 - Use in closed batch process	n.s.c.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54].

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(synthesis or formulation)			Process under low containment.
PROC4 - Use in batch and other process (synthesis) where opportunity for exposure arises	n.s.c.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.
PROC5 - Mixing or blending in batch processes (multistage and/or significant contact)	n.s.c.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.
PROC8a - Transfer of chemicals from/to vessels/large containers at non dedicated facilities	Avoid carrying out activities involving exposure for more than 6 h.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.
PROC8b - Transfer of chemicals from/to vessels/large containers at dedicated facilities	Avoid carrying out activities involving exposure for more than 6 h.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.
PROC9 - Transfer of chemicals into small containers (dedicated filling line)	n.s.c.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.

*nsc : no specific conditions*

### 3 – Exposure estimation and reference to its source

#### 3.1 - Environment

EE8 - Qualitative approach used to conclude safe use. (see Additional document 2 “Qualitative assessment - environment”, end of Extended SDS)

#### Predicted environmental concentrations (PECs)

According the previous qualitative assessment, the worst case exposure concentration used as PEC in waste water treatment plant is 1.0E-13 mg/L. The PECs for the other compartments are not required, because sodium hypochlorite is destroyed rapidly in contact with organic as well as inorganic material and furthermore is a non-volatile substance.

#### Indirect exposure of humans via the environment (oral)

Hypochlorite will not reach the environment via the sewage treatment system, as the quick transformation of the applied hypochlorite (as free available chlorine, FAC) in the sewage system assures the absence of any human exposure to hypochlorite. Also in recreational zones located close to discharge points of chlorinated waste water, the potential for exposure to hypochlorite originating from waste water treatment is negligible as the emission of unreacted hypochlorite is non-existent.

Due to the physico-chemical properties of sodium hypochlorite no indirect exposure is thought to occur via the human food chain. Thus no indirect exposure to sodium hypochlorite is thought to occur via the environment.

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### 3.2 – Human health

Used Advanced Reach Tool model. (Detailed inputs available on request)

Route of exposure	Concentrations of sodium hypochlorite		Risk Characterisation Ratio (RCR)		
	Value	Unit	inhalation	dermal	combined
Long-term exposure, local, inhalation – PROC1	0.02	mg/m <sup>3</sup>	0.01	n.a	n.a
Long-term exposure, local, inhalation – PROC2	1.10	mg/m <sup>3</sup>	0.71	n.a	n.a
Long-term exposure, local, inhalation – PROC3	1.10	mg/m <sup>3</sup>	0.71	n.a	n.a
Long-term exposure, local, inhalation – PROC4	1.20	mg/m <sup>3</sup>	0.77	n.a	n.a
Long-term exposure, local, inhalation – PROC5	1.25	mg/m <sup>3</sup>	0.81	n.a	n.a
Long-term exposure, local, inhalation – PROC8a	1.25	mg/m <sup>3</sup>	0.81	n.a	n.a
Long-term exposure, local, inhalation – PROC8b	1.25	mg/m <sup>3</sup>	0.81	n.a	n.a
Long-term exposure, local, inhalation – PROC9	0.91	mg/m <sup>3</sup>	0.59	n.a	n.a

*n.a = not applicable*

### 4 – Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

Guidance is based on assumed operating conditions which may not be applicable to all sites. Thus, scaling is deemed necessary to define appropriate site-specific risk management measures. If scaling reveals a condition of unsafe use (i.e., RCRs > 1), additional RMMs or a site-specific chemical safety assessment is required.

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## 1 – Title of Exposure Scenario : Industrial cleaning use

### List of all use descriptors related to the life cycle stage

SU 3 Industrial uses: Uses of substances as such or in preparations at industrial sites  
 SU 4 Manufacture of food products  
 PC 35 Washing and cleaning products (including solvent based products)

### Name of contributing environmental scenario and corresponding ERC

ERC6b Industrial use of reactive processing aids

### Name(s) of contributing worker scenarios and corresponding PROCs

PROC5 Mixing or blending in batch processes (multistage and/or significant contact)  
 PROC7 Industrial spraying  
 PROC8a Transfer of chemicals from/to vessels/large containers at non dedicated facilities  
 PROC9 Transfer of chemicals into small containers (dedicated filling line)  
 PROC10 Roller application or brushing  
 PROC13 Treatment of articles by dipping and pouring

## 2 – Operational Conditions and Risk Management Measures

### 2.1 – Control of Environmental exposure

#### Contributing exposure scenario controlling environmental exposure for ERC6b

Product characteristics	Substance is a unique structure. Non-hydrophobic. Sodium hypochlorite has low potential for bioaccumulation. Concentration: < 25%
European tonnage	250-450,000 tonnes per year of solution of sodium hypochlorite (5% solution).
Frequency and duration of use	Continuous release. Emission Days: 360 days/year
Environmental factors not influenced by risk management	Local freshwater dilution factor 10 Local marine water dilution factor 100
Other Operational Conditions of use affecting environmental exposure	Avoid releases to the environment (surface waters or soil) or to wastewaters. However sodium hypochlorite is shown to disappear rapidly from all use scenarios presented, by either rapid reduction in factory effluent or in the sewer. Thus, no releases in environment are expected. In worst case the free available chlorine in effluent is measured as total residual chlorine (TRC) and is

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	anticipated to be below 1.0E-13 mg/L.
Technical conditions and measures at process level (source) to prevent release	Common practices vary across sites and should comply with Biocide Directive No 98/8/EC.
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	Risk to the environment is driven by freshwater exposure. Onsite wastewater treatment required. Prevent discharge of substance directly to the environment and waste water treatment is required.
Organisation measures to prevent/limit release from site	Prevent environmental discharge consistent with regulatory requirement.
Conditions and measures related to industrial or municipal sewage treatment plant	Waste water treatment is required to remove any residual organic compounds and remaining available chlorine.
Conditions and measures related to external treatment of waste for disposal	External treatment and disposal of waste should comply with applicable local and/or national regulations.

## 2.2 – Control of worker exposure

### Contributing exposure scenario controlling worker exposure for PROC 5, 7, 8a, 9, 10, 13

#### GENERAL CONDITIONS APPLICABLE TO ALL ACTIVITIES

- G12 - Covers percentage substance in the product up to 25 % (unless stated differently).
- G2 - Covers daily exposures up to 8 hours (unless stated differently).
- OC8 – Indoor
- Risk Management Measures and measures related to personal protection, hygiene and health evaluation: Cross reference to tab. General Risk Management Measures (Qualitative Exposure Assessment, see additional document 1, end of extended SDS)

#### SPECIFIC CONDITIONS APPLICABLE TO SPECIFIC ACTIVITIES

Contributing Scenario	Duration of use	Concent <sup>o</sup> of substance	Risk Management Mesures
PROC5 - Mixing or blending in batch processes (multistage and/or significant contact)	n.s.c.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.
PROC 7 - Industrial spraying	OC28 - Avoid carrying out activities involving exposure for more than 4 hours.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under medium containment; Minimise exposure by ventilated complete enclosure of the operator or equipment.
PROC8a - Transfer of chemicals from/to vessels/large containers at	Avoid carrying out activities	n.s.c.	Provide extract ventilation to points where emissions occur. [E54].



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non dedicated facilities	involving exposure for more than 6 h.		Process under low containment.
PROC9 - Transfer of chemicals into small containers (dedicated filling line)	n.s.c.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under low containment.
PROC 10: Roller application or brushing	n.s.c.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under medium containment.
PROC 13: Treatment of articles by dipping and pouring	n.s.c.	n.s.c.	Provide extract ventilation to points where emissions occur. [E54]. Process under medium containment. Minimise exposure by ventilated partial enclosure of the operator or equipment.

*nsc : no specific conditions*

### 3 – Exposure estimation and reference to its source

#### 3.1 - Environment

EE8 - Qualitative approach used to conclude safe use. (see Additional document 2 “Qualitative assessment - environment”, end of Extended SDS)

#### Predicted environmental concentrations (PECs)

According the previous qualitative assessment, the worst case exposure concentration used as PEC in waste water treatment plant is 1.0E-13 mg/L. The PECs for the other compartments are not required, because sodium hypochlorite is destroyed rapidly in contact with organic as well as inorganic material and furthermore is a non-volatile substance.

#### Indirect exposure of humans via the environment (oral)

Hypochlorite will not reach the environment via the sewage treatment system, as the quick transformation of the applied hypochlorite (as free available chlorine, FAC) in the sewage system assures the absence of any human exposure to hypochlorite. Also in recreational zones located close to discharge points of chlorinated waste water, the potential for exposure to hypochlorite originating from waste water treatment is negligible as the emission of unreacted hypochlorite is non-existent.

Due to the physico-chemical properties of sodium hypochlorite no indirect exposure is thought to occur via the human food chain. Thus no indirect exposure to sodium hypochlorite is thought to occur via the environment.

#### 3.2 – Human health

Used Advanced Reach Tool model. (Detailed inputs available on request)

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Route of exposure	Concentrations of sodium hypochlorite		Risk Characterisation Ratio (RCR)		
	Value	Unit	inhalation	dermal	combined
Long-term exposure, local, inhalation – PROC5	1.25	mg/m <sup>3</sup>	0.81	n.a	n.a
Long-term exposure, local, inhalation – PROC7	1.20	mg/m <sup>3</sup>	0.77	n.a	n.a
Long-term exposure, local, inhalation – PROC8a	1.25	mg/m <sup>3</sup>	0.81	n.a	n.a
Long-term exposure, local, inhalation – PROC9	0.91	mg/m <sup>3</sup>	0.59	n.a	n.a
Long-term exposure, local, inhalation – PROC10	1.00	mg/m <sup>3</sup>	0.65	n.a	n.a
Long-term exposure, local, inhalation – PROC13	0.70	mg/m <sup>3</sup>	0.45	n.a	n.a

*n.a = not applicable*

#### **4 – Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario**

Guidance is based on assumed operating conditions which may not be applicable to all sites. Thus, scaling is deemed necessary to define appropriate site-specific risk management measures. If scaling reveals a condition of unsafe use (i.e., RCRs > 1), additional RMMs or a site-specific chemical safety assessment is required.

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## 1 – Title of Exposure Scenario : Professional cleaning use

### List of all use descriptors related to the life cycle stage

SU 22 Professional uses: Public domain (administration, education, entertainment, services, craftsmen)  
PC 35 Washing and cleaning products (including solvent based products)

### Name of contributing environmental scenario and corresponding ERC

ERC8a Wide dispersive indoor use of processing aids in open systems  
ERC8b Wide dispersive indoor use of reactive substances in open systems  
ERC8d Wide dispersive outdoor use of processing aids in open systems  
ERC8e Wide dispersive outdoor use of reactive substances in open systems

### Name(s) of contributing worker scenarios and corresponding PROCs

PROC5 Mixing or blending in batch processes (multistage and/or significant contact)  
PROC9 Transfer of chemicals into small containers (dedicated filling line)  
PROC10 Roller application or brushing  
PROC11 Non industrial spraying  
PROC13 Treatment of articles by dipping and pouring  
PROC15 Use as laboratory reagent

## 2 – Operational Conditions and Risk Management Measures

### 2.1 – Control of Environmental exposure

#### Contributing exposure scenario controlling environmental exposure for ERC8a, 8b, 8d, 8e

Product characteristics	Substance is a unique structure. Non-hydrophobic. Sodium hypochlorite has low potential for bioaccumulation. Concentration: < 5%
European tonnage	250-450,000 tonnes per year of solution of sodium hypochlorite.
Frequency and duration of use	Continuous release. Emission Days: 365 days/year
Environmental factors not influenced by risk management	Local freshwater dilution factor 10 Local marine water dilution factor 100
Other Operational Conditions of use affecting environmental exposure	Avoid releases to the environment (surface waters or soil) or to wastewaters. However Hypochlorite is shown to disappear rapidly from all use scenarios presented, by either rapid reduction in factory effluent or in the sewer. Thus, no releases in environment are expected. In worst case the free available chlorine in effluent is

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	measured as total residual chlorine (TRC) and is anticipated to be below 1.0E-13 mg/L.
Technical conditions and measures at process level (source) to prevent release	Common practices vary across sites and should comply with Biocide Directive No 98/8/EC.
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	NaClO must be reduced completely to sodium chloride during the process avoiding critical releases in environment.
Organisation measures to prevent/limit release from site	Prevent environmental discharge consistent with regulatory requirement.
Conditions and measures related to industrial or municipal sewage treatment plant	Waste water treatment is required to remove any residual organic compounds and remaining available chlorine.
Conditions and measures related to external treatment of waste for disposal	External treatment and disposal of waste should comply with applicable local and/or national regulations.

## 2.2 – Control of worker exposure

### Contributing exposure scenario controlling worker exposure for PROC 5, 9, 10, 11, 13, 15

#### GENERAL CONDITIONS APPLICABLE TO ALL ACTIVITIES

- G11 - Covers percentage substance in the product up to 5% (unless stated differently).
- G2 - Covers daily exposures up to 8 hours (unless stated differently).
- OC8 – Indoor
- Risk Management Measures and measures related to personal protection, hygiene and health evaluation: Cross reference to tab. General Risk Management Measures (Qualitative Exposure Assessment, see additional document 1, end of extended SDS)

#### SPECIFIC CONDITIONS APPLICABLE TO SPECIFIC ACTIVITIES

Contributing Scenario	Duration of use	Concent <sup>o</sup> of substance	Risk Management Mesures
PROC5 - Mixing or blending in batch processes (multistage and/or significant contact)	n.s.c.	n.s.c.	Provide a good standard of general ventilation. Natural ventilation is from doors, windows etc. Controlled ventilation means air is supplied or removed by a powered fan.[E1] Process under low containment.
PROC9 - Transfer of chemicals into small containers (dedicated filling line)	n.s.c.	n.s.c.	Provide a good standard of general ventilation. Natural ventilation is from doors, windows etc. Controlled ventilation means air is

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			supplied or removed by a powered fan.[E1] Process under low containment.
PROC 10: Roller application or brushing	OC28 - Avoid carrying out activities involving exposure for more than 4 hours.	n.s.c.	Provide a good standard of general ventilation. Natural ventilation is from doors, windows etc. Controlled ventilation means air is supplied or removed by a powered fan.[E1] Process under low containment.
PROC 11: Non industrial spraying	OC27 - Avoid carrying out activities involving exposure for more than 1 hour.	n.s.c.	Provide a good standard of general ventilation. Natural ventilation is from doors, windows etc. Controlled ventilation means air is supplied or removed by a powered fan.[E1] Process under low containment.
PROC 13: Treatment of articles by dipping and pouring	OC28 - Avoid carrying out activities involving exposure for more than 4 hours.	n.s.c.	Provide a good standard of general ventilation. Natural ventilation is from doors, windows etc. Controlled ventilation means air is supplied or removed by a powered fan.[E1] Process under low containment.
PROC 15: Use as laboratory reagent	n.s.c.	n.s.c.	Provide a good standard of general ventilation. Natural ventilation is from doors, windows etc. Controlled ventilation means air is supplied or removed by a powered fan.[E1]

*nsc : no specific conditions*

### 3 – Exposure estimation and reference to its source

#### 3.1 - Environment

EE8 - Qualitative approach used to conclude safe use. (see Additional document 2 “Qualitative assessment - environment”, end of Extended SDS)

#### Predicted environmental concentrations (PECs)

According the previous qualitative assessment, the worst case exposure concentration used as PEC in waste water treatment plant is 1.0E-13 mg/L. The PECs for the other compartments are not required, because sodium hypochlorite is destroyed rapidly in contact with organic as well as inorganic material and furthermore is a non-volatile substance.

#### Indirect exposure of humans via the environment (oral)

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Hypochlorite will not reach the environment via the sewage treatment system, as the quick transformation of the applied hypochlorite (as free available chlorine, FAC) in the sewage system assures the absence of any human exposure to hypochlorite. Also in recreational zones located close to discharge points of chlorinated waste water, the potential for exposure to hypochlorite originating from waste water treatment is negligible as the emission of unreacted hypochlorite is non-existent.

Due to the physico-chemical properties of sodium hypochlorite no indirect exposure is thought to occur via the human food chain. Thus no indirect exposure to sodium hypochlorite is thought to occur via the environment.

### 3.2 – Human health

Used Advanced Reach Tool model. (Detailed inputs available on request)

Route of exposure	Concentrations of sodium hypochlorite		Risk Characterisation Ratio (RCR)		
	Value	Unit	inhalation	dermal	combined
Long-term exposure, local, inhalation – PROC5	1.00	mg/m <sup>3</sup>	0.65	n.a	n.a
Long-term exposure, local, inhalation – PROC9	1.10	mg/m <sup>3</sup>	0.71	n.a	n.a
Long-term exposure, local, inhalation – PROC10	1.20	mg/m <sup>3</sup>	0.77	n.a	n.a
Long-term exposure, local, inhalation – PROC11	1.00	mg/m <sup>3</sup>	0.65	n.a	n.a
Long-term exposure, local, inhalation – PROC13	1.20	mg/m <sup>3</sup>	0.77	n.a	n.a
Long-term exposure, local, inhalation – PROC15	0.85	mg/m <sup>3</sup>	0.55	n.a	n.a

*n.a = not applicable*

### 4 – Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

Guidance is based on assumed operating conditions which may not be applicable to all sites. Thus, scaling is deemed necessary to define appropriate site-specific risk management measures. If scaling reveals a condition of unsafe use (i.e., RCRs > 1), additional RMMs or a site-specific chemical safety assessment is required.

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<b>1 – Title of Exposure Scenario : Consumer use</b>	
<b>List of all use descriptors related to the life cycle stage</b>	
SU 21 Consumer uses: Private households (= general public = consumers)	
<b>Name of contributing environmental scenario and corresponding ERC</b>	
ERC8a Wide dispersive indoor use of processing aids in open systems ERC8b Wide dispersive indoor use of reactive substances in open systems ERC8d Wide dispersive outdoor use of processing aids in open systems ERC8e Wide dispersive outdoor use of reactive substances in open systems	
<b>Name(s) of contributing consumer scenarios and corresponding PCs</b>	
PC 34: Textile dyes, finishing and impregnating products; including bleaches and other processing aids PC 35: Washing and cleaning products (including solvent based products) PC 37: Water treatment chemicals	
<b>2 – Operational Conditions and Risk Management Measures</b>	
<b>2.1 – Control of Environmental exposure</b>	
<b>Contributing exposure scenario controlling environmental exposure for ERC8a, 8b, 8d, 8e</b>	
Product characteristics	Substance is a unique structure.  Non-hydrophobic.  Sodium hypochlorite has low potential for bioaccumulation.  Concentration: < 15 % (typically 3 – 5 %)
European tonnage	118.57 kt per year in Cl <sub>2</sub> equivalent
Frequency and duration of use	Continuous release.  Emission Days: 365 days/year
Environmental factors not influenced by risk management	Local freshwater dilution factor 10  Local marine water dilution factor 100
Other Operational Conditions of use affecting environmental exposure	Avoid direct releases to the environment (surface waters or soil). However hypochlorite is shown to disappear rapidly from all use scenarios presented, by either rapid degradation in factory effluent or in the sewer. Thus, no releases to the environment are expected. In a worst case assessment the free available chlorine in effluent is measured as total residual chlorine (TRC) and should be below 1.0E-13 mg/L.

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Technical conditions and measures at process level (source) to prevent release	Common practices vary and should comply with instructions on package labels.
Organisation measures to prevent/limit release from site	Prevent environmental discharge consistent with product label instructions.
Conditions and measures related to industrial or municipal sewage treatment plant	Household wastewater is treated in municipal sewage treatment which leads to the removal of any remaining available chlorine through reaction with organic and inorganic substances present in wastewater.
Conditions and measures related to external treatment of waste for disposal	External treatment and disposal of waste should comply with applicable local and/or national regulations.
<b>2.2 – Control of consumer exposure</b>	
<b>Contributing exposure scenario controlling consumer exposure for PC 34, 35, 37</b>	
<b>Product characteristic</b>	
Concentration: <= 12.5 % (typically 3 – 5 %)	
Physical state: liquid	
Vapour pressure: 2.5 kPa at 20 °C	
<b>Amounts used</b>	
NA	
<b>Frequency and duration of use/exposure</b>	
Duration [for contact]: < 30 min. (cleaning and bleaching)	
Frequency [for one person cleaning]: 2/7 days a week	
Frequency [for one person bleaching]: 1/7 days a week (laundry bleaching) and 4/day (spraying)	
Uptake [oral]: as NaClO 0.003 mg/kg/day for a 60 kg person and 0.0033 mg/kg/day for children weighing 30 kg	
<b>Human factors not influenced by risk management</b>	
Consumers may be exposed to the formulation when dosing the product into water and to the preparation (cleaning solution; inhalation, dermal, oral). Exposure to the solution predominantly occurs through misuse, such as poor rinsing, spilling on skin or drinking of the cleaning solution.	
<b>Other given operational conditions affecting consumers exposure</b>	
Indoor air volume: min. 4 m <sup>3</sup> , ventilation rate: min. 0.5/h	
<b>Conditions and measures related to information and behavioural advice to consumers</b>	



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Safety and application notes on product label and/or package insert.

**Conditions and measures related to personal protection and hygiene**

None

**3 – Exposure estimation and reference to its source**

**3.1 - Environment**

EE8 - Qualitative approach used to conclude safe use. (see Additional document 2 “Qualitative assessment - environment”, end of Extended SDS)

**Predicted environmental concentrations (PECs)**

According the previous qualitative assessment, the worst case exposure concentration used as PEC in waste water treatment plant is 1.0E-13 mg/L. The PECs for the other compartments are not applicable, because sodium hypochlorite is destroyed rapidly in contact with organic as well as inorganic material and furthermore is a non-volatile substance.

**Indirect exposure of humans via the environment (oral)**

Hypochlorite will not reach the environment via the sewage treatment system, as the quick transformation of the applied hypochlorite (as free available chlorine, FAC) in the sewage system assures the absence of any human exposure to hypochlorite. Also in recreational zones located close to discharge points of chlorinated waste water, the potential for exposure to hypochlorite originating from waste water treatment is negligible as the emission of unreacted hypochlorite is non-existent.

Due to the physico-chemical properties of sodium hypochlorite no indirect exposure is thought to occur via the human food chain. Thus no indirect exposure to sodium hypochlorite is thought to occur via the environment.

**3.2 – Human health**

Short term (acute) oral exposure values were calculated for relevant scenarios consumer use scenarios (drinking water). Estimates were based on most conservative assumptions. Thus, values represent worst-case scenarios.

Conclusions of the consumer short term exposure assessment for sodium hypochlorite

Scenario	Inhalation		Dermal		Oral	
	Unit mg/m <sup>3</sup>	Method	Unit mg/kg	Method	Unit mg/kg	Method
Drinking water (adult)	--	--	--	--	0.0003	Calculated
Drinking water (child 10 year)	--	--	--	--	0.0007	Calculated

Consumer use short and long term exposure values were calculated for all relevant scenarios. The inhalation route was not relevant for any of the scenarios. Highest exposure values were obtained for the drinking water scenario, resulting in oral exposure of 0.0007 mg/kg bw and a total exposure of 0.012 mg/kg bw (0.011 as av. Cl<sub>2</sub>). The total value is calculated assuming 2 L drinking water consumption per day.

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The following table shows the summary of consumer use long term exposure concentrations for all relevant exposure scenarios. Estimates were based on most conservative assumptions. Thus, values represent worst-case scenarios.

Conclusions of the consumer exposure assessment for sodium hypochlorite

Scenario	Inhalation		Dermal		Oral		Total	
	Unit mg/m <sup>3</sup> /day	Method	Unit mg/kg/day	Method	Unit mg/kg/day	Unit mg/m <sup>3</sup> /d	Unit mg/kg	Justification
Household use total							0.037 (0.035 as av. Cl <sub>2</sub> )	EASE
Laundry Bleaching/ Pre-treatment	--	--	0.002	EASE/ Calculated	--	--	0.002	EASE
Hard surface cleaning	--	--	0.035	EASE/ Calculated	--	--	0.035	EASE
Inhalation exposure	0.00168	EASE/ Calculated	--	--	--	--	3.05E-06	EASE

For Consumer use highest long term exposure concentrations were calculated for household use hard surface cleaning with 0.002 mg/kg bw/day and 0.035 mg/m<sup>3</sup>/day dermal exposures and 03.05E-03 mg/kg bw/day inhalation exposure, resulting in 0.037 mg/kg bw/day combined total exposure.

#### **4 – Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario**

Not applicable.

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**ADDITIONAL DOCUMENTS OF eSDS (for all Exposure Scenarios)**

**ADDITIONAL DOCUMENT 1 – Qualitative assessment – Human Health (for all Exposure Scenarios)**

**Qualitative Exposure Assessment link to substance classified R34 (Causes burns) and R37 (Irritating to respiratory system), or H314 (Cause severe skin burns and eye damages) and H335 (May cause respiratory respiration)**

In absence of dose-response data regarding corrosion (R34 or H314) and irritating to respiratory system (R37 or H335), in accordance with R8 (R.8.6), a qualitative approach is followed to assess exposure to corrosive substances. Therefore, exposure should be minimised by using the appropriate general risk management measures below (ECHA Technical Guidance Part E, Table E.3-1). When these risk management measures and operational conditions are applied, the risk for exposure to corrosive and respiratory irritant substance is controlled.

**Tab. General Risk Management Measures for substances classified R34 and R37, or H314 and H335 (ECHA Technical Guidance Part E - Table E3-1)**

<b>Risk Management Measures and Operational Conditions</b>	
<b>General</b>	<b>Personal Protective Equipment</b>
<ul style="list-style-type: none"> <li>- Containment as appropriate;</li> <li>- Minimise number of staff exposed;</li> <li>- Segregation of the emitting process;</li> <li>- Effective contaminant extraction;</li> <li>- Good standard of general ventilation;</li> <li>- Minimisation of manual phases;</li> <li>- Avoidance of contact with contaminated tools and objects;</li> <li>- Regular cleaning of equipment and work area;</li> <li>- Management/supervision in place to check that the RMMs in place are being used correctly and OCs followed;</li> <li>- Training for staff on good practice;</li> <li>- Good standard of personal hygiene.</li> </ul>	<ul style="list-style-type: none"> <li>- Substance/task appropriate gloves;</li> <li>- Skin coverage with appropriate barrier material based on potential for contact with the chemicals;</li> <li>- Substance/task appropriate respirator;</li> <li>- Optional face shield;</li> <li>- Eye protection.</li> </ul>

**ADDITIONAL DOCUMENT 2 – Qualitative assessment – Environment (for all Exposure Scenarios)****Water and sediments compartments**

The emissions of hypochlorite to the environment from manufacturing processes are minor. Generally, free available chlorine (FAC) in effluent is measured as total residual chlorine (TRC), but it cannot be distinguished to what extent this TRC value in the final effluent is related to hypochlorite or to other oxidative compounds that are present in the same effluent. TRC is the sum of free available chlorine (HOCl, FAC) and combined available chlorine (RH<sub>2</sub>Cl, CAC). For the sites that reported levels of TRC in the effluent as well as dilution factor information for the receiving surface waters tentative initial PEC<sub>local</sub> values ranging from < 0.000006 to 0.07 mg/L were measured. However, TRC values were considered not applicable due to immediate further reaction upon encountering oxidisable matter in the receiving water, any remaining FAC will be eliminated immediately upon discharge, with rates of decay increasing with discharged concentrations. Thus, the measured TRC values are not directly applicable for hypochlorite exposure assessment. Instead of using measured TRC values modelled, FAC values were used for determination of predicted environmental concentrations (PEC).

Essentially no hypochlorous acid/hypochlorite (below 10-35 mg/L as FAC, Vandepitte and Schowanek, 2007) will remain in the sewer after 1 hour following disposal of a bottle of neat bleach to sewer. Volatilisation of hypochlorous acid/hypochlorite is not expected during sewage treatment. The FAC concentration estimated at the end of sewers was reasonably estimated to be negligible, with worst case PEC-values of 1.0E-13 mg/L (Vandepitte and Schowanek, 2007). (NB: these estimated concentrations carry a large uncertainty margin, but even then, they are considerably below than the aquatic PNEC). Even though hypochlorite decay rates in rivers and marine environments are lower than in sewage treatment plants, FAC PEC-values for direct emissions were not considered to differ significantly from the worst case estimate.

As hypochlorite is destroyed rapidly in contact with organic as well as inorganic material no exposures are expected in sediments.

**Terrestrial compartment (including secondary poisoning)**

The possible exposure routes of soils to HOCl are via contaminated sludge or via direct application of chlorinated water. As can be calculated with the model of Vandepitte and Schowanek (for more information, please refer to the EU risk assessment on sodium hypochlorite), 1997 it becomes clear that HOCl concentrations available in domestic discharges are completely eliminated in the sewer system before entering the activated sludge system. In addition HOCl is a highly soluble molecule not likely to sorb onto activated sludge. Therefore, there is no evidence that HOCl has the potential to contaminate activated sludge. And as a consequence, contamination of soils due to dumping of with HOCl polluted sludge can be excluded.

No secondary poisoning exposure is thought to occur with hypochlorite as it is destroyed rapidly in contact with organic as well as inorganic species.

**Atmospheric compartment**

Hypochlorite solutions are non-volatile, thus there is no significant potential for dispersion in air. Further, methods for the determination of effects of chemicals on species arising from atmospheric contamination have not yet been fully developed, except for inhalation studies with mammals. Therefore, the methodology used for hazard assessment (and subsequently the risk characterisation) of chemicals in water and soil cannot be applied to the atmosphere (ECHA CSA Part B, 2008).

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**ADDITIONAL DOCUMENTS OF eSDS (for all Exposure Scenarios)**

**ADDITIONAL DOCUMENT 1 – Qualitative assessment – Human Health (for all Exposure Scenarios)**

**Qualitative Exposure Assessment link to substance classified R34 (Causes burns) and R37 (Irritating to respiratory system), or H314 (Cause severe skin burns and eye damages) and H335 (May cause respiratory respiration)**

In absence of dose-response data regarding corrosion (R34 or H314) and irritating to respiratory system (R37 or H335), in accordance with R8 (R.8.6), a qualitative approach is followed to assess exposure to corrosive substances. Therefore, exposure should be minimised by using the appropriate general risk management measures below (ECHA Technical Guidance Part E, Table E.3-1). When these risk management measures and operational conditions are applied, the risk for exposure to corrosive and respiratory irritant substance is controlled.

**Tab. General Risk Management Measures for substances classified R34 and R37, or H314 and H335 (ECHA Technical Guidance Part E - Table E3-1)**

<b>Risk Management Measures and Operational Conditions</b>	
<b>General</b>	<b>Personal Protective Equipment</b>
<ul style="list-style-type: none"> <li>- Containment as appropriate;</li> <li>- Minimise number of staff exposed;</li> <li>- Segregation of the emitting process;</li> <li>- Effective contaminant extraction;</li> <li>- Good standard of general ventilation;</li> <li>- Minimisation of manual phases;</li> <li>- Avoidance of contact with contaminated tools and objects;</li> <li>- Regular cleaning of equipment and work area;</li> <li>- Management/supervision in place to check that the RMMs in place are being used correctly and OCs followed;</li> <li>- Training for staff on good practice;</li> <li>- Good standard of personal hygiene.</li> </ul>	<ul style="list-style-type: none"> <li>- Substance/task appropriate gloves;</li> <li>- Skin coverage with appropriate barrier material based on potential for contact with the chemicals;</li> <li>- Substance/task appropriate respirator;</li> <li>- Optional face shield;</li> <li>- Eye protection.</li> </ul>

**ADDITIONAL DOCUMENT 2 – Qualitative assessment – Environment (for all Exposure Scenarios)****Water and sediments compartments**

The emissions of hypochlorite to the environment from manufacturing processes are minor. Generally, free available chlorine (FAC) in effluent is measured as total residual chlorine (TRC), but it cannot be distinguished to what extent this TRC value in the final effluent is related to hypochlorite or to other oxidative compounds that are present in the same effluent. TRC is the sum of free available chlorine (HOCl, FAC) and combined available chlorine (RH<sub>2</sub>Cl, CAC). For the sites that reported levels of TRC in the effluent as well as dilution factor information for the receiving surface waters tentative initial PEC<sub>local</sub> values ranging from < 0.000006 to 0.07 mg/L were measured. However, TRC values were considered not applicable due to immediate further reaction upon encountering oxidisable matter in the receiving water, any remaining FAC will be eliminated immediately upon discharge, with rates of decay increasing with discharged concentrations. Thus, the measured TRC values are not directly applicable for hypochlorite exposure assessment. Instead of using measured TRC values modelled, FAC values were used for determination of predicted environmental concentrations (PEC). Essentially no hypochlorous acid/hypochlorite (below 10-35 mg/L as FAC, Vandepitte and Schowanek, 2007) will remain in the sewer after 1 hour following disposal of a bottle of neat bleach to sewer. Volatilisation of hypochlorous acid/hypochlorite is not expected during sewage treatment. The FAC concentration estimated at the end of sewers was reasonably estimated to be negligible, with worst case PEC-values of 1.0E-13 mg/L (Vandepitte and Schowanek, 2007). (NB: these estimated concentrations carry a large uncertainty margin, but even then, they are considerably below than the aquatic PNEC). Even though hypochlorite decay rates in rivers and marine environments are lower than in sewage treatment plants, FAC PEC-values for direct emissions were not considered to differ significantly from the worst case estimate.

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The possible exposure routes of soils to HOCl are via contaminated sludge or via direct application of chlorinated water. As can be calculated with the model of Vandepitte and Schowanek (for more information, please refer to the EU risk assessment on sodium hypochlorite), 1997 it becomes clear that HOCl concentrations available in domestic discharges are completely eliminated in the sewer system before entering the activated sludge system. In addition HOCl is a highly soluble molecule not likely to sorb onto activated sludge. Therefore, there is no evidence that HOCl has the potential to contaminate activated sludge. And as a consequence, contamination of soils due to dumping of with HOCl polluted sludge can be excluded.

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**Atmospheric compartment**

Hypochlorite solutions are non volatile, thus there is no significant potential for dispersion in air. Further, Methods for the determination of effects of chemicals on species arising from atmospheric contamination have not yet been fully developed, except for inhalation studies with mammals. Therefore, the methodology used for hazard assessment (and subsequently the risk characterisation) of chemicals in water and soil cannot be applied to the atmosphere (ECHA CSA Part B, 2008).

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**ADDITIONAL DOCUMENT 3 - Tab.: ART tier2 inputs for inhalation assessment. (for all Exposure Scenario)**



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Contributing scenario	Number of activities	Duration of exposure (min)	Product type	Process temperature	Vapour pressure at process temperature	%	Near/Far field	Activity class	Activity subclass	Primary control measures	Secondary control measures	Segregation	Personal enclosure	House-keeping	Indoors/ outdoors	Size of the room - Ventilation rate
Proc 1 (indust)	1	480	Liquid	15-25°C	2500 Pa	<25%	FF	Activities with open liquid surfaces or open reservoirs	Activities with relatively undisturbed surfaces : Open surface < 0.1 m <sup>2</sup>	None	High level of containment	None	None	Yes	Indoors	any size 3 ACH
Proc 2 (indust)	2	420	Liquid	15-25°C	2500 Pa	<25%	FF	Activities with open liquid surfaces or open reservoirs	Activities with relatively undisturbed surfaces : Open surface < 0.1 m <sup>2</sup>	None	low level of containment	None	None	Yes	Indoors	any size 3 ACH
		60	Liquid	15-25°C	2500 Pa	<25%	NF	Transfer of liquid product 1-10 L/min (sampling, charging, ...)	Falling liquids/ Splash loading / Handling that reduces contact between product and adjacent air	Local exhaust ventilation (LEV) Fixed capturing hood	Low level of containment	-	-	Yes	Indoors	any size 3 ACH
Proc 3 (indust)	2	420	Liquid	15-25°C	2500 Pa	<25%	FF	Activities with open liquid surfaces or open reservoirs	Activities with relatively undisturbed surfaces : Open surface < 0.1 m <sup>2</sup>	None	low level of containment	None	None	Yes	Indoors	any size 3 ACH
		60	Liquid	15-25°C	2500 Pa	<25%	NF	Transfer of liquid product 1-10 L/min (sampling, charging, ...)	Falling liquids/ Splash loading / Handling that reduces contact between product and adjacent air	Local exhaust ventilation (LEV) Fixed capturing hood	Low level of containment	-	-	Yes	Indoors	any size 3 ACH
Proc 4 (indust)	2	360	Liquid	15-25°C	2500 Pa	<25%	FF	Activities with open liquid surfaces or open reservoirs	Activities with relatively undisturbed surfaces : Open surface < 0.1 m <sup>2</sup>	None	low level of containment	None	None	Yes	Indoors	any size 3 ACH
		120	Liquid	15-25°C	2500 Pa	<25%	NF	Transfer of liquid product 1-10 L/min (sampling, charging, ...)	Falling liquids/ Splash loading / Handling that reduces contact between product and adjacent air	Local exhaust ventilation (LEV) Fixed capturing hood	Low level of containment	-	-	Yes	Indoors	any size 3 ACH

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Proc 5 (indust)	2	90	Liquid	15-25°C	2500 Pa	<25%	FF	Activities with open liquid surfaces or open reservoirs	Activities with relatively undisturbed surfaces : Open surface < 0.3 m <sup>2</sup>	None	Low level of containment	None	None	Yes	Indoors	any size 3 ACH
		390	Liquid	15-25°C	2500 Pa	<25%	NF	Transfer of liquid product 1-10 L/min (sampling, charging, ...)	Falling liquids/ Splash loading / Handling that reduces contact between product and adjacent air	Local exhaust ventilation (LEV) Fixed capturing hood	Low level of containment	-	-	Yes	Indoors	any size 3 ACH
Proc 8a (indust)	1	360	Liquid	15-25°C	2500 Pa	<25%	NF	Transfer of liquid product <100 L/min	Falling liquids/ Splash loading / Handling that reduces contact between product and adjacent air	Local exhaust ventilation (LEV) Fixed capturing hood	low level of containment	-	-	Yes	Indoors	any size 3 ACH
Proc 8b (indust)	1	360	Liquid	15-25°C	2500 Pa	<25%	NF	Transfer of liquid product <100 L/min	Falling liquids/ Splash loading / Handling that reduces contact between product and adjacent air	Local exhaust ventilation (LEV) Fixed capturing hood	low level of containment	-	-	Yes	Indoors	any size 3 ACH
Proc 9 (indust)	1	480	Liquid	15-25°C	2500 Pa	<25%	NF	Transfer of liquid product <10 L/min	Falling liquids/ Splash loading / Handling that reduces contact between product and adjacent air	Local exhaust ventilation (LEV) Fixed capturing hood	Low level of containment	-	-	Yes	Indoors	any size 1 ACH
Proc 7 (indust)	1	240	Liquid	15-25°C	2500 Pa	<25%	FF	surface spraying application of liquids	application in any direction; low compressed air use; rate <3m <sup>2</sup> /min	Local exhaust ventilation (LEV) Fixed capturing hood	Medium level of containment	None	complete enclosure with ventilation	Yes	Indoors	any size 1 ACH
Proc 10 (indust)	1	480	Liquid	15-25°C	2500 Pa	<25%	NF	Spreading of liquid	<3m <sup>2</sup> /hour	Local exhaust ventilation (LEV) Fixed capturing hood	Medium level of containment	-	-	Yes	Indoors	any size 1 ACH
Proc 13 (indust)	1	480	Liquid	15-25°C	2500 Pa	<25%	FF	Activities with open liquid surfaces or open reservoirs	Activities with relatively undisturbed surfaces : Open surface >3 m <sup>2</sup>	Local exhaust ventilation (LEV) Fixed capturing hood	Medium level of containment	None	Partial enclosure with ventilation	Yes	Indoors	any size 1 ACH
Proc 14 (indust)	1	480	Liquid	15-25°C	2500 Pa	<25%	FF	Handling of contaminated objects	Contamination : >90% surface 1 to 3 m <sup>2</sup>	Local exhaust ventilation (LEV) Fixed capturing hood	Medium level of containment	None	None	Yes	Indoors	any size 1 ACH

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Proc 15 (indust)	1	480	Liquid	15-25°C	2500 Pa	<25%	FF	Transfer of liquid product <0,1 L/min	Falling liquids/ Splash loading / Handling that reduces contact between product and adjacent air	Local exhaust ventilation (LEV) Enclosing hoods	None	None	None	Yes	Indoors	any size 1 ACH
Proc 5 (Prof.)	2	180	Liquid	15-25°C	2500 Pa	<5%	FF	Activities with open liquid surfaces or open reservoirs	Activities with relatively undisturbed surfaces : Open surface < 0.3 m <sup>2</sup>	None	Low level of containment	None	None	Yes	Indoors	any size 1 ACH
		300	Liquid	15-25°C	2500 Pa	<5%	NF	Transfer of liquid product 1-10 L/min (sampling, charging, ...)	Falling liquids/ Splash loading	None	Low level of containment	-	-	Yes	Indoors	any size 1 ACH
Proc 9 (Prof.)	1	480	Liquid	15-25°C	2500 Pa	<5%	NF	Transfer of liquid product <10 L/min	Falling liquids/ Splash loading	None	Low level of containment	-	-	Yes	Indoors	any size 1 ACH
Proc 10 (Prof.)	1	240	Liquid	15-25°C	2500 Pa	<5%	NF	Spreading of liquid	<1m <sup>2</sup> /hour	None	Low level of containment	-	-	Yes	Indoors	any size 3 ACH
Proc 11 (Prof.)	1	60	Liquid	15-25°C	2500 Pa	<5%	NF	surface sraying application of liquids	application in any direction; low compressed air use; rate <3m <sup>2</sup> /min	None	Low level of containment	-	-	Yes	Indoors	any size 3 ACH
Proc 13 (Prof.)	1	240	Liquid	15-25°C	2500 Pa	<5%	FF	Activities with open liquid surfaces or open reservoirs	Activities with relatively undisturbed surfaces : Open surface >1 m <sup>2</sup>	None	Low level of containment	None	None	Yes	Indoors	any size 1 ACH
Proc 15 (Prof.)	1	480	Liquid	15-25°C	2500 Pa	<5%	FF	Transfer of liquid product <0,1 L/min	Falling liquids/ Splash loading / Handling that reduces contact between product and adjacent air	None	None	None	None	Yes	Indoors	any size 1 ACH