



# Safety Data Sheet

according to EU Regulations 1907/2006 and other amendments  
Integrated Management System

Processed by Computer  
FS-84-001

Revision: 12-07-2019  
Version: 17  
(Replace: Version 16 from 23-04-2019)

## Sodium Hypochlorite

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

#### 1.1 Product identifier

Chemical name:	sodium hypochlorite, solution 13 - 17 % active chlorine
EC number:	231-668-3
CAS number:	7681-52-9
Index number:	017-011-00-1
Registration number:	01-2119488154-34-0042
Chemical characterisation:	Sodium Hypochlorite is an inorganic substance
Others means of identification/ Trade names:	- Active chlorine released by sodium hypochlorite - BE-HPO N; BE-HPO E

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

##### Relevant identified uses of the substance:

Sodium Hypochlorite is used mainly in chemical synthesis, in cleaning, disinfecting and domestic hygiene, in drinking water and drain disinfection and in bleaching.

For more information see the corresponding Exposure Scenario attached to this SDS.

**Uses advised against:** There are no uses advised against

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

Company:	Bondalti CHEMICALS, SA Quinta da Indústria, Rua do Amoníaco Português, nº 10 Beduído 3860-680 Estarreja - Portugal
Telephone:	+351 234 810 300
Fax:	+351 234 810 361
Web page:	www.bondalti.com
Contact:	Maria José Alves
e-mail:	fds@bondalti.com

## Sodium Hypochlorite

### 1.4 Emergency telephone number

Bondalti CHEMICALS, SA	
Telephone:	+351 234 810 300 (24 hours/day - 7 days/week)
Fax:	+351 234 810 361
Emergency Telephone Number	112
SOS – Poisons Centre	<p>In England and Wales: NHS 111 - dial 111</p> <p>In Scotland: NHS 24 - dial 111</p> <p>In North Ireland: Contact local GP or pharmacist during normal hours;</p> <p>In Republic of Ireland: 01 809 2166</p> <p>United States of America: 1-800-222-1222.</p> <p>Cyprus: Department of Labour Inspection, Ministry of Labour</p>

## SECTION 2: HAZARDS IDENTIFICATION

### 2.1 Classification of the substance or mixture

Self classification of Sodium hypochlorite between 5% and 20% active chlorine according to EU regulation 1272/2008

Class of hazard	Hazard category	Hazard Statements
Substance or mixture corrosive to metals	Met. Corr. 1	<b>H290:</b> May be corrosive to metals
Skin corrosion/irritation	Skin Corr. 1B	<b>H314:</b> Causes severe skin burns and eye damage
Serious eye damage/eye irritation	Eye Dam. 1	<b>H318:</b> Causes serious eye damage
Hazardous to the aquatic environment	Aquatic Acute 1	<b>H400:</b> Very toxic to aquatic life (M - factor: 10)
Hazardous to the aquatic environment	Aquatic Chronic 2	<b>H411:</b> Toxic to aquatic life with long lasting effects

## Sodium Hypochlorite

### 2.2 Label elements

#### Regulation (EC) No 1272/2008

##### Symbols



GHS05: corrosion

GHS09: environment

##### Signal word

Danger

##### Hazard Statements:

**H290:** May be corrosive to metals

**H314:** Causes severe skin burns and eye damage

**H400:** Very toxic to aquatic life

**H411:** Toxic to aquatic life with long lasting effects

**EUH031:** Contact with acids liberates toxic gas

##### Precautionary 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+P361+P353:** IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower

**P305+P351+P338:** IF IN EYES: Rinse cautiously with water for several minutes. If using contact lenses, take them out if possible. Continue to rinse

**P310:** Immediately call a POISON CENTER or doctor/physician

**P390:** Absorb spillage to prevent material damage

#### Specific concentration limits:

Concentration (%)	Classification
C ≥ 5%	EUH031: Contact with acids liberates toxic gas

### 2.3 Other hazards

The substance is not classified as PBT/vPvB.

**Sodium Hypochlorite****SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS****3.1 Substances****Hazardous substances**

Chemical name	CAS-No.	EC-No.	REACH No.	Concentration [%]
Sodium hypochlorite	7681-52-9	231-668-3	01-2119488154-34-0042	13 ≤ active chlorine ≤ 17

**SECTION 4: FIRST AID MEASURES****4.1 Description of first aid measures**

General advice:	In the shower, remove all contaminated clothing, including shoes, immediately.
If inhaled:	Remove the victims(s) into the fresh air. If necessary, administer oxygen or artificial respiration. Remain under medical observation. In case of problems: hospitalise.
In case of skin contact:	Rinse immediately and abundantly with water. Seek medical advice. In case of extensive burns, hospitalise.
In case of eye contact:	Hold the eyes open and rinse immediately and abundantly with water (at least 15 minutes). Contact an ophthalmologist.
If swallowed:	Do not induce vomit, wash the mouth and lips abundantly with water if the victim is conscious, and then hospitalise.

**Self-protection of rescuer**

Respiratory protection:	Use "B" filter masks
Hand protection:	Wear PVC 1.2 mm-thick gloves
Eye protection:	Should be used resistant protective goggles to chemicals with side protection.

**4.2. Most important symptoms and effects, both acute and delayed****4.2.1. Inhalation**

- Severe respiratory irritant
- Mucous membrane irritant
- Symptoms: Breathing difficulty, cough, chemical pneumonia, pulmonary oedema
- Repeated or prolonged exposure: Bleeding nose, chronic bronchitis

**Sodium Hypochlorite****4.2.2. Skin contact**

- Serious irritation of the skin
- Symptoms: Redness, Tissue swelling, Burning
- Repeated exposure: Ulcerative lesion

**4.2.3. Eye contact**

- Corrosive
- May cause irreparable damage to the eyes.
- Symptoms: Redness, Lacrimation, Tissue selling, Burning

**4.2.4. Swallowing**

- If swallowed, severe burns to the mouth and throat, as well as risk of perforating oesophagus and stomach.
- Risk of chemical bronchopneumonia through inhaling product into the respiratory tract.
- Risk of shock.
- Symptoms: Nausea, Abdominal pain, Vomit with blood, Diarrhoea, Suffocation, Cough, Severe breathing difficulty
- Risk of: Respiratory problems

**4.3 Indication of any immediate medical attention and special treatment needed**

The seriousness of the lesions and the prognosis of intoxication depend directly on the concentration and duration of exposure.

**SECTION 5: FIREFIGHTING MEASURES****5.1 Extinguishing media**

Suitable extinguishing media:	Spray with water
Unsuitable extinguishing media:	Not applicable

**5.2 Special hazards arising from the substance or mixture**

- Dry residue may ignite upon contact with combustible material.
- Drying solid residue using heat may lead to violent exothermic decomposition.

**5.3 Advice for firefighters**

- Use a respirator with independent air supply and airtight garment.
- Use personal protective equipment.
- Wear chemically resistant suit.
- In case of fire in the vicinity, remove exposed containers.
- Cool containers/tanks with pulverised water.

**Sodium Hypochlorite****SECTION 6: ACCIDENTAL RELEASE MEASURES****6.1 Personal precautions, protective equipment and emergency procedures**

- Prevent additional spillage, if safe to do so.
- Keep away from incompatible products.
- Evacuate staff to safe areas.
- Keep staff away from the spill and upwind of it.
- Ventilate the area.
- Wear suitable protective clothing.

**6.1.1 For Staff not involved in the emergency response**

- Move people to a safe area.

**6.1.2 For Staff responsible for emergency response**

- Wear suitable personal protective equipment (e.g.: chemical protection suit; goggles; protective footwear, gloves and breathing apparatus)
- Evacuate staff to safety areas.
- Keep people away.
- Ventilate the area.

**6.2 Environmental precautions**

- Do not release into the environment.
- Do not flush into surface water or into sanitary sewer system.
- If the product contaminates rivers, lakes or sewers, inform the responsible authorities.

**6.3 Methods and material for containment and cleaning up****6.3.1 – Contain the spill with protective barriers.**

- Cover the sewer exits.

**6.3.2 – Use absorbent material.**

- Gather the waste in suitable containers for this substance.
- Keep the waste in duly labelled containers.

**6.3.3 – Do not use water on spills of this product.****6.4 Reference to other sections**

- See sections 7 and 8 for protective measures.
- See section 13 on waste treatment.

**SECTION 7: HANDLING AND STORAGE****7.1. Precautions for safe handling**

- Use in closed systems
- Use only in well-ventilated places.
- Keep away from incompatible products, such as, acids.
- To avoid thermal decomposition, do not overheat the substance.

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- Use equipment in materials compatible with the product.
- Do not contain the product in a circuit, between closed valves, or in a container that does not have a safety valve, or other control device which enables its expansion.

**7.2. Conditions for safe storage, including any incompatibilities****7.2.1. Storage**

- Store in the original container.
- Store in a well-ventilated place. Keep in a cool environment.
- Store in correctly labelled containers.
- Keep the container closed.
- Store in an area protected with walls to stop spills.
- Store in a cool place, away from light, to preserve product quality.
- Keep away from incompatible products, such as, acids.

**7.2.2. Packing material**

- Stratified polyester.
- PVC
- Polyethylene
- glass

**7.3 Specific end use(s)**

See Exposure Scenarios in Annexes to the SDS.

**SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION****8.1 Control parameters****8.1.1 Components with workplace control parameters**

Components	CAS-No.	Value	Control parameters	Legal basis	Form of exposure
Chlorine	7782-50-5	0.5 ppm	TWA	ACGIH 2017	(Free chlorine)
		1 ppm	STEL	ACGIH 2017	(Free chlorine)
		0.5 ppm	STEL	EH40/2005 (UK)	(Free chlorine)
		0,5 ppm 1,5 mg/m3	STEL	Commission Directive 2006/15/EC of 7 February	(Free chlorine)

TWA: Time weighted average

STEL: Short-term exposure limit

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### 8.1.2 DNEL/PNEC values

DNEL Acute exposure through inhalation = 3.1 mg/m<sup>3</sup> (local and systemic effects)

DNEL Long-term exposure effects through inhalation = 1.55 mg/m<sup>3</sup> (local and systemic effects)

DNEL Long-term dermal exposure = 0.5 % in mixture (weight basis) - (local effects)

DNEL Long-term oral exposure = 0.26 mg/kg/bw/day (systemic effects)

### PNEC value(s)

PNEC Oral = 11.1 mg/kg food (Secondary poisoning)

PNEC freshwater = 0.21 µg/L

PNEC marinewater = 0.042 µg/L

PNEC intermittent releases = 0.26 µg/L

PNEC wastewater treatment plants = 4.69 mg/L

### 8.2 Exposure controls

#### 8.2.1 Appropriate engineering controls

Risk Management Measures and Operating Conditions	
General	Personal Protective Equipment
<ul style="list-style-type: none"> <li>- Containment as appropriate;</li> <li>- Minimise number of people exposed;</li> <li>- Segregation of the emission process;</li> <li>- Effective extraction of contaminant;</li> <li>- General good quality ventilation;</li> <li>- Minimisation of handling phases;</li> <li>- Avoid contact with contaminated tools and objects;</li> <li>- Clean equipment and work area regularly;</li> <li>- Management/supervision at site to check that risk management measures are being used correctly and if operating conditions are followed;</li> <li>- Training of staff relative to good practices;</li> <li>- Good level of personal hygiene.</li> <li>- Apply the technical measures to meet the occupational exposure limits</li> </ul>	<ul style="list-style-type: none"> <li>- Gloves suited to the substance/task;</li> <li>- Skin protection with protection material based on potential contact with chemical products;</li> <li>- Mask suited to the substance /task;</li> <li>- Optional faceguard;</li> <li>- Eye protection.</li> </ul>



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### 8.2.2 Personal protection measures, namely personal protective equipment

Respiratory protection:	Provide sufficient ventilation and/or extractor system in workplaces In case of insufficient ventilation, use suitable breathing apparatus. In case of dangerous vapours, use independent breathing apparatus.
Hand protection:	In case of intermittent and prolonged splashes, use PVC 1.2 mm-thick gloves.
Eye protection:	Safety goggles with side protection
Body and skin protection:	In the workplace: waterproof suit, boots. Intervention at site of accident: Full chemical protection suit. Boots.
Hygiene measures:	Remove contaminated clothing immediately. Do not allow contact with skin or eyes or vapour inhalation. When using, do not eat, drink or smoke. Remove contaminated clothing and protective equipment before going into food areas.

### 8.2.3 Environmental exposure control

Eliminate rinsing water in compliance with applicable regulations:

- 2014/955/EU: Commission Decision of 18 December 2014 amending Decision 2000/532/EC on the list of waste pursuant to Directive 2008/98/EC of the European Parliament and of the Council;
- Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives and other amendments;
- Commission Regulation (EU) No 1357/2014 of 18 December 2014 - replacing Annex III to Directive 2008/98/EC of the European Parliament and of the Council on waste and repealing certain Directives

## SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on basic physical and chemical properties

a) Appearance:	Yellow, limpid liquid with a chlorinated odour
b) Odour:	Chlorinated
c) Odour threshold:	No data (*)
d) pH:	pH = 12.52 at 19.1 °C (5 % chlorine solution) (Ferron, 2007).
e) Melting point:	-28.9 +/- 0.5 °C (purity: 24.3 % available chlorine) (Tieche, A., 2007)
f) Boiling point:	No data (See note 1)
g) Flash point:	The substance is not regarded as flammable. (See note 2)
h) Evaporation rate:	No data (*)
i) Flammability (solid, gas):	The substance is not regarded as flammable. (See note 2)
j) Upper/lower flammability or explosive limits:	The product is neither flammable nor explosive (See note 3)

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k) Vapour pressure:	Negligible
l) Vapour density:	No data (*)
m) Relative density:	1.300 ± 0.001 at 21.2 °C (See note 4)
n) Solubility(ies):	Completely miscible in water
o) Partition coefficient n-octanol/water:	Log Kow (Pow): -3.42 at 20 °C (Anonymous, 2007).
p) Auto-ignition temperature:	No data (*)
q) Decomposition temperature:	No data (5)
r) Viscosity:	Viscosity: 6.2 – 6.6 mPa. S (at 20°C ± 0.2°C) Viscosity: 4.0 mPa. s for a rotation of 200 rpm (at 40°C ± 0.2°C)
s) Explosive properties:	Do not have explosive properties.
t) Oxidising properties:	Do not have oxidising properties.

**Notes:**

(\*) No reliable data source for this data

(1) As sodium hypochlorite solution is an aqueous mixture of an inorganic salt, water will evaporate when heating the solution. After removal of water, white crystals are observed on the bottom of the test and boiling point cannot be determined (Tieche, A., 2007).

(2) No flash point was observed up to 111°C (Ferron, N., 2007).

(3) In accordance with column 2 of REACH Annex VII, explosive properties (required in section 7.11) does not need to be conducted as there are no chemical groups associated with explosive properties present in sodium hypochlorite (refer to Guidance on information requirements and chemical safety assessment, Chapter R.7a).

(4) (purity: 24.3 % available chlorine) (Tieche, A., 2007)

(5) Half life of a 10 % av Cl solution at different temperatures: 15 °C: 800 days; 25°C: 220 days; 60 °C: 3.5 days; 100 °C: 0.079 day

For a 5 % solution: 15 °C: 5000 days; 25°C: 790 days 60 °C: 13.5 days; 100 °C: 0.25 day.

Relevant breakdown products are chlorate and chloride (White, G., 1972).

**9.2 Other information**Dissociation constant:  $K=2.9 \times 10^{-8}$  (at 25 °C),  $pK_a = 7.53$ **SECTION 10: STABILITY AND REACTIVITY****10.1. Reactivity**

- Violent reaction risk.
- Explosion risk.

**10.2. Chemical stability**

- Stable in recommended storage conditions.

**Sodium Hypochlorite****10.3. Possibility of hazardous reactions**

- Corrosive if in contact with metals
- Contact with acids liberates toxic gas.
- The oxygen released during decomposition may aid combustion
- Hazardous decomposition products formed during fires.
- Decomposes when exposed to light.

**10.4. Conditions to avoid**

- Keep away from direct sunlight.
- To avoid thermal decomposition, do not overheat.
- Do not freeze

**10.5. Incompatible materials**

- Metals, metallic salts, Acids, Organic materials

**10.6 Hazardous decomposition products**

An adverse reaction may produce Chlorine, Hypochlorous Acid, and Sodium Chlorate

**SECTION 11: TOXICOLOGICAL INFORMATION****11.1 Information on toxicological effects**

Causes severe burns to skin and eyes, destroying tissues.

<b>Hazard Class</b>	<b>Dose Descriptor</b>	<b>Method/Reference</b>
Acute oral toxicity:	Oral LD <sub>50</sub> (rat (Wistar) male) = 1100mg/Kg pc	Kästner, W.; Heitland; Disch; Gloxhuber (1981)
Acute dermal toxicity:	Dermal LD <sub>50</sub> (rabbit (albino) male/female) = > 20 000 mg/Kg pc	Griffiths, B.S. (1978a)
Acute inhalation toxicity:	LC <sub>50</sub> (1 h) (rat (Albino) male): > 10.5 mg/L air	Anonymous (1962b)
Skin irritation/corrosion:	Sodium hypochlorite 5.25 % solution (pH 10.7, 0.5 ml) was applied on rabbit and guinea pig abraded and non-abraded skin in a 4-hour patch test as outlined in the revised FHSA procedure that had been proposed by FDA (Edwards, 1972). The skin was examined at 4, 24 and 48 hours after patch removal. Results showed the compound to be slightly irritant to both rabbits (PII = 1.2) and guinea pigs (PII = 0.8)	Nixon et al., 1975

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Hazard Class	Dose Descriptor	Method/Reference
Eye irritation:	In accordance with column 2 of REACH Annex VII, Eye irritation (required in section 8.2) does not need to be conducted as the available information indicates that the criteria are met for classification as corrosive to the skin. Thus, sodium hypochlorite has to be classified with eye damage cat. 1 according to GHS. No further test are needed. Studies performed in the past are shown as supporting studies.	Chemical Safety Report (3.07.2015 – 2.2)
Skin sensitisation:	Sensitization tests conducted on human volunteers (H. R. I. P. T.: human repeated insult patch test) with hypochlorite bleach formulations have shown no evidence of potential allergic contact dermatitis.	Chemical Safety Report (3.07.2015 – 2.2)
Germ cell mutagenicity Genotoxicity <i>in vivo</i> :	Based on the results obtained in in vitro, in vivo and germ cell mutagenicity studies and taking into account the mechanism of action, the weight of evidence and the results of the carcinogenicity and reprotoxicity studies sodium hypochlorite /hypochlorous acid is not considered to be genotoxic/mutagenic or clastogenic and thus has not to be classified mutagenic according to Council Directive 67/548/EEC and CLP	Chemical Safety Report (3.07.2015 – 2.2)
Carcinogenicity:	Taking into account all the available information, it can be concluded that carcinogenicity is not a relevant endpoint for the oral route and is thus not classified cancerogenic according to 67/548/EEC and CLP.	Chemical Safety Report (3.07.2015 – 2.2)
Reproductive toxicity Fertility:	The substance is not toxic to reproduction; NOAEL (oral) : $\geq 5$ mg available Cl/kg pc/day (rat (Long-Evans) male/female)	Carlton, B.D. and Barlett P., Basaran A., Colling K., Osis I. and Smith K. (1986)

## SECTION 12: ECOLOGICAL INFORMATION

### 12.1 Toxicity

#### Information on environmental effects

Due to the unstable and highly reactive nature of hypochlorite, it will disappear very quickly upon entering the environment. This means there can be no regional concentration base and, therefore a regional Exposure Scenario is unrealistic and will not be taken into account.

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In most cases of use, the pH will be approximately neutral (typically >6) or towards alkaline for various reasons, but mainly to avoid any possibility of chlorine release; in this way dioxins are not expected to form.

Hazard Class	Dose Descriptor	Method/Reference
Toxicity to fish:	Freshwater fish LC <sub>50</sub> : 0.06 mg TRC /L Saltwater fish LC <sub>50</sub> : 0.032 mg TRO /L Saltwater fish NOEC: 0.04 mg CPO /L	Chemical Safety Assessment
Toxicity to daphnia and other aquatic invertebrates:	Freshwater <i>Daphnia magna</i> EC <sub>50</sub> (48h): 0.141 µg/L  marine EC <sub>50</sub> (48h) ( <i>Crassostrea virginica</i> larvae): 0.026mg/L  NOEC marine invertebrates: 0.007 mg/L	Gallagher, S.P.; Lezotte, F.; Krueger, H.O. (2009) Roberts, M.H., Gleeson, R.A. (1978) Chemical Safety Assessment
Toxicity in algae/cyanobacteria	Freshwater algae ( <i>Dunaliella primolecta</i> ) EC <sub>10</sub> /LC <sub>10</sub> or NOEC: 0.0021 mg/L	Chemical Safety Assessment
Toxicity to freshwater plants	EC <sub>50</sub> (growth inhibition) ( <i>Myriophyllum spicatum</i> ): 0.1 mg/L EC <sub>50</sub> (growth inhibition) ( <i>Myriophyllum spicatum</i> ): 0.02 mg/L	Chemical Safety Assessment

### 12.2 Persistence and degradability

Not applicable since sodium hypochlorite is rapidly destroyed in contact with organic and inorganic materials.

### 12.3 Bioaccumulative potential

The substance has no bioaccumulative potential.

### 12.4. Mobility in soil

- Important water/soil solubility and mobility
- Soil/sediments, log KOC:1,12 Highly mobile in soils
- Air, Henry Constant (H), 0.076 Pa.m<sup>3</sup>/mol , 20 °C Volatility not significant

**Sodium Hypochlorite****12.5. Results of PBT and vPvB assessment**

This substance is not known to be persistent, bioaccumulative or toxic (PBT).

This substance is not considered to be either very persistent or very bioaccumulative (vPvB).

**12.6 Other adverse effects**

No data

**13. DISPOSAL CONSIDERATIONS****13.1 Waste treatment methods****Waste disposal procedures:**

- Sodium Hypochlorite waste can be neutralized with hydrogen peroxide or absorbed with absorbent spills material.
- It is not advisable to discharge sodium hypochlorite waste through the wastewater.
- EWC Code 06 01 99 – Waste not otherwise specified (Contaminated Sodium Hypochlorite).

**Packaging treatment:**

- Recycling of packaging is preferable to elimination or incineration.
- Rinse containers with water and neutralize obtained water
- EWC Code 15 01 10(\*) – Packaging containing / contaminated by waste from hazardous substances.

**Applicable regulations:**

- 2014/955/EU: Commission Decision of 18 December 2014 amending Decision 2000/532/EC on the list of waste pursuant to Directive 2008/98/EC of the European Parliament and of the Council;
- Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives and other amendments;
- Commission Regulation (EU) No 1357/2014 of 18 December 2014 - replacing Annex III to Directive 2008/98/EC of the European Parliament and of the Council on waste and repealing certain Directives

## Sodium Hypochlorite

### SECTION 14: TRANSPORT INFORMATION

	ADR	IATA	IMDG	RID
14.1 UN number:	1791	1791	1791	1791
14.2 UN proper shipping name:	Hypochlorite Solution	Hypochlorite Solution	Hypochlorite Solution	Hypochlorite Solution
14.3 Transport hazard class(es):	8	8	8	8
Labels:	8	Corrosive	8	8
Packing Instruction (cargo aircraft):				
Packing Instruction (cargo aircraft):		855/Max Liq Qty/Pkg: 30 L		
Packing Instruction (cargo passenger):		851/Max Liq Qty/Pkg: 1 L		
Packing Instruction (LQ):	1 L	Y840/Max. Liq Qty/Pkg: 0,5 L	1 L	
Packing Instruction (EQ):	E2	E2	E2	
14.4 Packing group:	II	II	II	II
14.5 Environmentally hazardous:	Yes	Yes	Yes	Yes
14.6 Special precautions for user:				
Tunnel restriction code:	E			
EmS:			F-A; S-B	
HI:	80			80
14.7 Transport in Bulk according to Annex II of Marpol and the IBC Code:				
Pollution Category:			Y	
Hazards:			S/P	
Ship Type:			2	

### SECTION 15: REGULATORY INFORMATION

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

This safety sheet was made taking into consideration the following legislation:

##### Community Legislation:

- Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC and other amendments;

**Sodium Hypochlorite**

- Regulation (EC) No. 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006 and other amendments;
- Regulation (EU) No 528/2012 of the European Parliament and of the Council of 22 May 2012 concerning the making available on the market and use of biocidal products and other amendments;
- [Council Directive 89/391/EEC of 12 June 1989 on the introduction of measures to encourage improvements in the safety and health of workers at work](#)
- Council Directive 98/24/EC of 7 April 1998 on the protection of the health and safety of workers from the risks related to chemical agents at work (fourteenth individual Directive within the meaning of Article 16(1) of Directive 89/391/EEC) and other amendments;
- Commission Directive 2006/15/EC of 7 February 2006 establishing a second list of indicative occupational exposure limit values in implementation of Council Directive 98/24/EC and amending Directives 91/322/EEC and 2000/39/EC;
- 2014/955/EU: Commission Decision of 18 December 2014 amending Decision 2000/532/EC on the list of waste pursuant to Directive 2008/98/EC of the European Parliament and of the Council;
- Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives and other amendments;
- Commission Regulation (EU) No 1357/2014 of 18 December 2014 - replacing Annex III to Directive 2008/98/EC of the European Parliament and of the Council on waste and repealing certain Directives;
- Directive 2008/68/EC of the European Parliament and of the Council of 24 September 2008, on the inland transport of dangerous goods (ADR; RID and ADN) and other amendments;
- Directive 2012/18/EU of the European Parliament and of the Council of 4 July 2012 on the control of major-accident hazards involving dangerous substances, amending and subsequently repealing Council Directive 96/82/EC.
- ACIGH 2017: Guide to Occupational Exposure Values;

**15.2 Chemical safety assessment**

A chemical safety report was made.



**Sodium Hypochlorite****SECTION 16: OTHER INFORMATION****General:**

This information is to our best present knowledge, correct and complete and is given in good faith. The user shall ensure that the information is complete and appropriate for the uses given in the text. Other specific uses of the product not mentioned in the text remain the user's own responsibility.

**Recommendations for occupational training:**

Provide the operators with suitable information, instruction and training on the product.

**Changes:**

Changes are in blue text.

DATE	REVISION	CHANGES MADE
12-07-2019	17	Section 1.2
		Section 2.3
		Section 14
		Section 15.1

**Abbreviations mentioned on the Sheet:**

ACGIH – American Conference of Governmental Industrial Hygienists

ADN - European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways

ADR - The European Agreement concerning the International Carriage of Dangerous Goods by Road.

Aquatic Acute 1 - Acute aquatic hazard, category 1

Aquatic Chronic 2 – Chronic aquatic hazard, category 2

CAS Nº – “World’s authority for chemicals informations”

CE Nº - European Community

DNEL – Derived Non Effect Concentration

EC50 – Half of maximum effective concentration

ERC – Environmental Release Category

Eye Dam. 1 - Serious eye damage, category 1

IATA - International Air Transport Association

IMDG - International Maritime Dangerous Goods

INRS – Institut National de Recherche et de Sécurité

LC50 – Median Lethal Concentration

LER – List of Waste

LQ – Limited Quantities

Met. Corr. 1 - Corrosive to metals, category 1

NOAEL – No observed adverse effect level

PBT - Substance Persistent, bioaccumulative and toxic.

PC – Product Category

PNEC – Predicted No-Effect Concentration



## Safety Data Sheet

according to EU Regulations 1907/2006 and other amendments  
Integrated Management System

Processed by Computer  
FS-84-001

Revision: 12-07-2019

Version: 17

(Replace: Version 16 from 23-04-2019)

### Sodium Hypochlorite

PROC – Process Category

REACH - Registration, Evaluation, Authorisation and Restriction of Chemicals

RID - International Rule for Transport of Dangerous Substances by Railway

SDS - Safety Data Sheet

Skin Corr. 1B - Skin corrosion, category 1B

vPvB - Very persistent and very bioaccumulative.

#### References:

#### CHEMICAL SAFETY REPORT- 2015-10-16 CSR-PI-5.5.3

#### Annex – Exposure Scenarios

**Exposure Scenario 1:** Manufacture

**Exposure Scenario 2:** Formulation

**Exposure Scenario 3:** Use at industrial site - Use as an intermediate

**Exposure Scenario 4:** Use at industrial site - Use in textile industry

**Exposure Scenario 5:** Use at industrial site - Industrial use in sewage and cooling or heating water treatment

**Exposure Scenario 6:** Use at industrial site - Industrial use in pulp and paper

**Exposure Scenario 7:** Use at industrial site - Industrial cleaning use

**Exposure Scenario 8:** Use by professional worker - Professional cleaning uses

**Exposure Scenario 9:** Consumer use

## Sodium Hypochlorite

### Exposure Scenario 1: Manufacture

Environment contributing scenarios	
Manufacture	ERC 1
Worker contributing scenarios	
General exposures (closed systems)	PROC 1
General exposures (closed systems); with sample collection	PROC 2
Use in batch processes (closed systems), with sample collection	PROC 3
Use in batch processes, with sample collection	PROC 4
Drum/batch transfers, non-dedicated facilities	PROC 8a
Drum/batch transfer, dedicated facilities	PROC 8b
Small containers transfers, dedicated facilities	PROC 9
Laboratory activities	PROC 15

#### 1.1. Environmental contributing scenario 1: Manufacture

##### 1.1.1. Conditions of use

Amount used, frequency and duration of use (or from service life)
Annual use at a site: $\leq 3.426\text{E5 tonnes/year}$
<i>Maximum regional tonnage for a 24% active chlorine solution. It corresponds to 82.22 kT/y Cl<sub>2</sub> equivalent</i>
Percentage of EU tonnage used at regional scale: 100 %
Emission Days (days/year): 360 days/year
Conditions and measures related to sewage treatment plant
Municipal STP: Yes [Effectiveness Water: 100%]
Discharge rate of STP: $\geq 2\text{E3 m}^3/\text{d}$
Application of the STP sludge on agricultural soil: No
Conditions and measures related to treatment of waste (including article waste)
Particular considerations on the waste treatment operations: No (low risk) (ERC based assessment demonstrating control of risk with default conditions. Low risk assumed for waste life stage. Waste disposal according to national/local legislation is sufficient.)
Other conditions affecting environmental exposure
Receiving surface water flow rate: $\geq 1.8\text{E4 m}^3/\text{d}$

##### 1.1.2. Releases

Product applied in aqueous solution process with negligible volatilization. Free chlorine in the effluent is measured as total residual chlorine (TRC) and should be below $1.0\text{E} - 13 \text{ mg/L}$ . No release in air from process is expected because sodium hypochlorite solution is non-volatile. No release in soil from process is expected.
Technical conditions and measures at process level (source) to prevent release
Common practices vary across sites, but releases expected to waste water and soil are negligible (sodium hypochlorite is quickly destroyed in contact with organic and inorganic materials).
Technical onsite conditions and measures to reduce or limit discharge, air emissions and releases into

## Sodium Hypochlorite

### soil

Environmental risk comes from freshwater exposure. Onsite wastewater treatment required. Prevent discharge of undissolved substance to or recover from onsite wastewater.

### Conclusion on risk characterisation

A qualitative approach is used to conclude safe use. The worst-case exposure concentration used as PEC in waste water treatment plant is 1E-13 mg/l. The PECs for other compartments are not applicable, because sodium hypochlorite is destroyed rapidly in contact with organic as well as inorganic material and furthermore that is a non-volatile substance.

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 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.

## 1.2. Worker contributing scenario 1: General exposures (closed systems) (PROC 1)

### 1.2.1. Conditions of use

Product (article) characteristics
Concentration of substance in mixture: 5 - 25 %
Amount used (or contained in articles), frequency and duration of use/exposure
Duration of activity: < 8 hours
Technical and organisational conditions and measures
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: Closed system (minimal contact during routine operations)
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Advanced
Conditions and measures related to personal protection, hygiene and health evaluation
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
Other conditions affecting workers exposure
Place of use: Indoor
Process temperature (for liquid): ≤ 40 °C
Skin surface potentially exposed: One hand face only (240 cm <sup>2</sup> )

### 1.2.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.019 mg/m <sup>3</sup>	RCR = 0.012

## Sodium Hypochlorite

Inhalation, systemic, acute	0.019 mg/m <sup>3</sup>	RCR < 0.01
Inhalation, local, long-term	0.019 mg/m <sup>3</sup>	RCR = 0.012
Inhalation, local, acute	0.019 mg/m <sup>3</sup>	RCR < 0.01
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	5.95E-4 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.012
Combined routes, systemic, acute		RCR < 0.01

### 1.3. Worker contributing scenario 2: General exposures (closed systems); with sample collection (PROC 2)

#### 1.3.1. Conditions of use

<b>Product (article) characteristics</b>
Concentration of substance in mixture: 5 – 25 %
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Duration of activity: < 8 hours
<b>Technical and organisational conditions and measures</b>
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: Closed continuous process with occasional controlled exposure
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Advanced
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
<b>Other conditions affecting workers exposure</b>
Place of use: Indoor
Process temperature (for liquid): ≤ 40 °C
Skin surface potentially exposed: Two hands face (480 cm <sup>2</sup> )

#### 1.3.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, systemic, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, local, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, local, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.012 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)

## Sodium Hypochlorite

Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

### 1.4. Worker contributing scenario 3: Use in batch processes (closed systems), with sample collection (PROC 3)

#### 1.4.1. Conditions of use

<b>Product (article) characteristics</b>
Concentration of substance in mixture: 5 – 25 %
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Duration of activity: < 8 hours
<b>Technical and organisational conditions and measures</b>
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: Closed batch process with occasional controlled exposure
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Advanced
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
<b>Other conditions affecting workers exposure</b>
Place of use: Indoor
Process temperature (for liquid): ≤ 40 °C
Skin surface potentially exposed: One hand face only (240 cm <sup>2</sup> )

#### 1.4.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, systemic, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, local, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, local, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.012 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

## Sodium Hypochlorite

### 1.5. Worker contributing scenario 4: Use in batch processes, with sample collection (PROC 4)

#### 1.5.1. Conditions of use

<b>Product (article) characteristics</b>
Concentration of substance in mixture: 5 – 25 %
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Duration of activity: < 8 hours
<b>Technical and organisational conditions and measures</b>
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: Semi-closed process with occasional controlled exposure
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Advanced
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
<b>Other conditions affecting workers exposure</b>
Place of use: Indoor
Process temperature (for liquid): ≤ 40 °C
Skin surface potentially exposed: Two hands face (480 cm <sup>2</sup> )

#### 1.5.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, systemic, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, local, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, local, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.06 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

### 1.6. Worker contributing scenario 5: Drum/batch transfers, non-dedicated facilities (PROC 8a)

#### 1.6.1. Conditions of use

<b>Product (article) characteristics</b>
Concentration of substance in mixture: 5 – 25 %
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Duration of activity: < 8 hours



## Sodium Hypochlorite

### Technical and organisational conditions and measures

General ventilation: Basic general ventilation (1-3 air changes per hour)

Containment: No

Local exhaust ventilation: no [Effectiveness Inhal: 0%]

Occupational Health and Safety Management System: Advanced

### Conditions and measures related to personal protection, hygiene and health evaluation

 Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training)  
 [Effectiveness Dermal: 90%]

Respiratory Protection: No [Effectiveness Inhal: 0%]

Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)

### Other conditions affecting workers exposure

Place of use: Indoor

Process temperature (for liquid): ≤ 40 °C

 Skin surface potentially exposed: Two hands (960 cm<sup>2</sup>)

### 1.6.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, systemic, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, local, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, local, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.06 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

### 1.7. Worker contributing scenario 6: Drum/batch transfers, dedicated facilities (PROC 8b)

#### 1.7.1. Conditions of use

##### Product (article) characteristics

Concentration of substance in mixture: 5 – 25 %

##### Amount used (or contained in articles), frequency and duration of use/exposure

Duration of activity: &lt; 8 hours

##### Technical and organisational conditions and measures

General ventilation: Basic general ventilation (1-3 air changes per hour)

Containment: Semi-closed process with occasional controlled exposure

Local exhaust ventilation: no [Effectiveness Inhal: 0%]

Occupational Health and Safety Management System: Advanced

##### Conditions and measures related to personal protection, hygiene and health evaluation



## Sodium Hypochlorite

Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training)  
 [Effectiveness Dermal: 90%]

Respiratory Protection: No [Effectiveness Inhal: 0%]

Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)

### Other conditions affecting workers exposure

Place of use: Indoor

Process temperature (for liquid): ≤ 40 °C

Skin surface potentially exposed: Two hands (960 cm<sup>2</sup>)

### 1.7.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, systemic, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, local, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, local, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.06 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

### 1.8. Worker contributing scenario 7: Small Containers transfers, dedicated facilities (PROC 9)

#### 1.8.1. Conditions of use

Product (article) characteristics
Concentration of substance in mixture: 5 – 25 %
Amount used (or contained in articles), frequency and duration of use/exposure
Duration of activity: < 8 hours
Technical and organisational conditions and measures
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: Semi-closed process with occasional controlled exposure
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Advanced
Conditions and measures related to personal protection, hygiene and health evaluation
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
Other conditions affecting workers exposure
Place of use: Indoor

## Sodium Hypochlorite

 Process temperature (for liquid):  $\leq 40^{\circ}\text{C}$ 

 Skin surface potentially exposed: Two hands face ( $480\text{ cm}^2$ )

### 1.8.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	$0.186\text{ mg/m}^3$	RCR = 0.12
Inhalation, systemic, acute	$0.186\text{ mg/m}^3$	RCR = 0.06
Inhalation, local, long-term	$0.186\text{ mg/m}^3$	RCR = 0.12
Inhalation, local, acute	$0.186\text{ mg/m}^3$	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	$0.06\text{ mg/cm}^2$	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

### 1.9. Worker contributing scenario 8: Laboratory activities (PROC 15)

#### 1.9.1. Conditions of use

<b>Product (article) characteristics</b>
Concentration of substance in mixture: 5 – 25 %
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Duration of activity: < 8 hours
<b>Technical and organisational conditions and measures</b>
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: No
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Advanced
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
<b>Other conditions affecting workers exposure</b>
Place of use: Indoor
Process temperature (for liquid): $\leq 40^{\circ}\text{C}$
Skin surface potentially exposed: Two hands face ( $240\text{ cm}^2$ )

**Sodium Hypochlorite****1.9.2. Exposure and risks for workers**

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.019 mg/m <sup>3</sup>	RCR = 0.012
Inhalation, systemic, acute	0.019 mg/m <sup>3</sup>	RCR < 0.01
Inhalation, local, long-term	0.019 mg/m <sup>3</sup>	RCR = 0.012
Inhalation, local, acute	0.019 mg/m <sup>3</sup>	RCR < 0.01
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.006 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.012
Combined routes, systemic, acute		RCR < 0.01

**1.10. Conclusion on risk characterisation**

The risk management measures required based on the quantitative assessment provides sufficient protection against corrosion and respiratory irritation hazard. Details of the RMMs are given in the Exposure Scenarios. Under these conditions, the risks are considered as controlled.

**1.11. Method of calculation**

TRA Workers 3.0

## Sodium Hypochlorite

### Exposure Scenario 2: Formulation

Environment contributing scenarios	
Formulation	ERC 2
Worker contributing scenarios	
General exposures (closed systems)	PROC 1
General exposures (closed systems); with sample collection	PROC 2
Use in batch processes (closed systems), with sample collection	PROC 3
Use in batch processes, with sample collection	PROC 4
Mixing/blending in batch processes	PROC 5
Drum/batch transfers, non-dedicated facilities	PROC 8a
Drum/batch transfer, dedicated facilities	PROC 8b
Small containers transfers, dedicated facilities	PROC 9
Production of preparation/articles	PROC 14
Laboratory activities	PROC 15

#### 2.1 Environmental contributing scenario 1: Formulation

##### 2.1.1 Conditions of use

Amount used, frequency and duration of use (or from service life)
Annual use at a site: $\leq 3.426E5$ tonnes/year
<i>Maximum regional tonnage for a 24% active chlorine solution. It corresponds to 82.22 kT/y Cl<sub>2</sub> equivalent</i>
Percentage of EU tonnage used at regional scale: = 100 %
Emission Days (days/year): 360 days/year
Conditions and measures related to sewage treatment plant
Municipal STP: Yes [Effectiveness Water: 100%]
Discharge rate of STP: $\geq 2E3$ m <sup>3</sup> /d
Application of the STP sludge on agricultural soil: No
Conditions and measures related to treatment of waste (including article waste)
Particular considerations on the waste treatment operations: No (low risk) (ERC based assessment demonstrating control of risk with default conditions. Low risk assumed for waste life stage. Waste disposal according to national/local legislation is sufficient.)
Other conditions affecting environmental exposure
Receiving surface water flow rate: $\geq 1.8E4$ m <sup>3</sup> /d

##### 2.1.2 Releases

Product applied in aqueous solution process with negligible volatilization.  
 Free chlorine in the effluent is measured as total residual chlorine (TRC) and should be below 1.0E - 13 mg/L.  
 No release in air from process is expected because sodium hypochlorite solution is non-volatile.  
 No release in soil from process is expected.

##### Technical conditions and measures at process level (source) to prevent release

## Sodium Hypochlorite

Common practices vary across sites, but releases expected to waste water and soil are negligible (sodium hypochlorite is quickly destroyed in contact with organic and inorganic materials).

### Technical onsite conditions and measures to reduce or limit discharge, air emissions and releases into soil

Environmental risk comes from freshwater exposure. Onsite wastewater treatment required. Prevent discharge of undissolved substance to or recover from onsite wastewater.

### Conclusion on risk characterisation

A qualitative approach is used to conclude safe use. The worst-case exposure concentration used as PEC in waste water treatment plant is 1E-13 mg/l. The PECs for other compartments are not applicable, because sodium hypochlorite is destroyed rapidly in contact with organic as well as inorganic material and furthermore that is a non-volatile substance.

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 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.

## 2.2 Worker contributing scenario 1: General exposures (closed systems) (PROC 1)

### 2.2.1 Conditions of use

#### Product (article) characteristics

Concentration of substance in mixture: 5 – 25 %

#### Amount used (or contained in articles), frequency and duration of use/exposure

Duration of activity: < 8 hours

#### Technical and organisational conditions and measures

General ventilation: Basic general ventilation (1-3 air changes per hour)

Containment: Closed system (minimal contact during routine operations)

Local exhaust ventilation: no [Effectiveness Inhal: 0%]

Occupational Health and Safety Management System: Advanced

#### Conditions and measures related to personal protection, hygiene and health evaluation

Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]

Respiratory Protection: No [Effectiveness Inhal: 0%]

Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)

#### Other conditions affecting workers exposure

Place of use: Indoor

Process temperature (for liquid): ≤ 40 °C

Skin surface potentially exposed: One hand face only (240 cm<sup>2</sup>)

## Sodium Hypochlorite

### 2.2.2 Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.019 mg/m <sup>3</sup>	RCR = 0.012
Inhalation, systemic, acute	0.019 mg/m <sup>3</sup>	RCR < 0.01
Inhalation, local, long-term	0.019 mg/m <sup>3</sup>	RCR = 0.012
Inhalation, local, acute	0.019 mg/m <sup>3</sup>	RCR < 0.01
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	5.95E-4 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.012
Combined routes, systemic, acute		RCR < 0.01

### 2.3 Worker contributing scenario 2: General exposures (closed systems); with sample collection (PROC 2)

#### 2.3.1 Conditions of use

<b>Product (article) characteristics</b>
Concentration of substance in mixture: 5 – 25 %
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Duration of activity: < 8 hours
<b>Technical and organisational conditions and measures</b>
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: Closed continuous process with occasional controlled exposure
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Advanced
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
<b>Other conditions affecting workers exposure</b>
Place of use: Indoor
Process temperature (for liquid): ≤ 40 °C
Skin surface potentially exposed: Two hands face (480 cm <sup>2</sup> )

### 2.3.2 Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, systemic, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, local, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12

## Sodium Hypochlorite

Inhalation, local, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.012 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

### 2.4 Worker contributing scenario 3: Use in batch processes (closed systems), with sample collection (PROC 3)

#### 2.4.1 Conditions of use

<b>Product (article) characteristics</b>
Concentration of substance in mixture: 5 – 25 %
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Duration of activity: < 8 hours
<b>Technical and organisational conditions and measures</b>
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: Closed batch process with occasional controlled exposure
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Advanced
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
<b>Other conditions affecting workers exposure</b>
Place of use: Indoor
Process temperature (for liquid): ≤ 40 °C
Skin surface potentially exposed: One hand face only (240 cm <sup>2</sup> )

#### 2.4.2 Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, systemic, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, local, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, local, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.012 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)



## Sodium Hypochlorite

Combined routes, systemic, long-term	RCR = 0.12
Combined routes, systemic, acute	RCR = 0.06

### 2.5 Worker contributing scenario 4: Use in batch processes, with sample collection (PROC 4)

#### 2.5.1 Conditions of use

<b>Product (article) characteristics</b>
Concentration of substance in mixture: 5 – 25 %
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Duration of activity: < 8 hours
<b>Technical and organisational conditions and measures</b>
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: Semi-closed process with occasional controlled exposure
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Advanced
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
<b>Other conditions affecting workers exposure</b>
Place of use: Indoor
Process temperature (for liquid): ≤ 40 °C
Skin surface potentially exposed: Two hands face (480 cm <sup>2</sup> )

#### 2.5.2 Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, systemic, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, local, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, local, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.06 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06



## Sodium Hypochlorite

### 2.6 Worker contributing scenario 5: Mixing/blending in batch processes (PROC 5)

#### 2.6.1 Conditions of use

<b>Product (article) characteristics</b>
Concentration of substance in mixture: 5 – 25 %
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Duration of activity: < 8 hours
<b>Technical and organisational conditions and measures</b>
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: No
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Advanced
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
<b>Other conditions affecting workers exposure</b>
Place of use: Indoor
Process temperature (for liquid): ≤ 40 °C
Skin surface potentially exposed: Two hands face (480 cm <sup>2</sup> )

#### 2.6.2 Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, systemic, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, local, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, local, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.12 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

### 2.7 Worker contributing scenario 6: Drum/batch transfers, non-dedicated facilities (PROC 8a)

#### 2.7.1 Conditions of use

<b>Product (article) characteristics</b>
Concentration of substance in mixture: 5 – 25 %
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Duration of activity: < 8 hours
<b>Technical and organisational conditions and measures</b>

## Sodium Hypochlorite

General ventilation: Basic general ventilation (1-3 air changes per hour)

Containment: No

Local exhaust ventilation: no [Effectiveness Inhal: 0%]

Occupational Health and Safety Management System: Advanced

### Conditions and measures related to personal protection, hygiene and health evaluation

 Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training)  
 [Effectiveness Dermal: 90%]

Respiratory Protection: No [Effectiveness Inhal: 0%]

Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)

### Other conditions affecting workers exposure

Place of use: Indoor

Process temperature (for liquid): ≤ 40 °C

 Skin surface potentially exposed: Two hands (960 cm<sup>2</sup>)

## 2.7.2 Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, systemic, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, local, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, local, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.06 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

## 2.8 Worker contributing scenario 7: Drum/batch transfers, dedicated facilities (PROC 8b)

### 2.8.1 Conditions of use

#### Product (article) characteristics

Concentration of substance in mixture: 5 – 25 %

#### Amount used (or contained in articles), frequency and duration of use/exposure

Duration of activity: &lt; 8 hours

#### Technical and organisational conditions and measures

General ventilation: Basic general ventilation (1-3 air changes per hour)

Containment: Semi-closed process with occasional controlled exposure

Local exhaust ventilation: no [Effectiveness Inhal: 0%]

Occupational Health and Safety Management System: Advanced

### Conditions and measures related to personal protection, hygiene and health evaluation

 Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training)  
 [Effectiveness Dermal: 90%]

## Sodium Hypochlorite

Respiratory Protection: No [Effectiveness Inhal: 0%]

Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)

### Other conditions affecting workers exposure

Place of use: Indoor

Process temperature (for liquid): ≤ 40 °C

 Skin surface potentially exposed: Two hands (960 cm<sup>2</sup>)

### 2.8.2 Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, systemic, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, local, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, local, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.06 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

### 2.9 Worker contributing scenario 8: Small containers transfers, dedicated facilities (PROC 9)

#### 2.9.1 Conditions of use

Product (article) characteristics
Concentration of substance in mixture: 5 – 25 %
Amount used (or contained in articles), frequency and duration of use/exposure
Duration of activity: < 8 hours
Technical and organisational conditions and measures
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: Semi-closed process with occasional controlled exposure
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Advanced
Conditions and measures related to personal protection, hygiene and health evaluation
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
Other conditions affecting workers exposure
Place of use: Indoor
Process temperature (for liquid): ≤ 40 °C
Skin surface potentially exposed: Two hands face (480 cm <sup>2</sup> )

## Sodium Hypochlorite

### 2.9.2 Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, systemic, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, local, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, local, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.06 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

### 2.10 Worker contributing scenario 9: Production of preparation/articles (PROC 14)

#### 2.10.1 Conditions of use

<b>Product (article) characteristics</b>
Concentration of substance in mixture: 5 – 25 %
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Duration of activity: < 8 hours
<b>Technical and organisational conditions and measures</b>
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: No
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Advanced
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
<b>Other conditions affecting workers exposure</b>
Place of use: Indoor
Process temperature (for liquid): ≤ 40 °C
Skin surface potentially exposed: Two hands face (480 cm <sup>2</sup> )

#### 2.10.2 Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, systemic, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06

## Sodium Hypochlorite

Inhalation, local, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, local, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.03 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

### 2.11 Worker contributing scenario 10: Laboratory activities (PROC 15)

#### 2.11.1 Conditions of use

<b>Product (article) characteristics</b>
Concentration of substance in mixture: 5 – 25 %
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Duration of activity: < 8 hours
<b>Technical and organisational conditions and measures</b>
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: No
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Advanced
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
• Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
• Respiratory Protection: No [Effectiveness Inhal: 0%]
• Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
<b>Other conditions affecting workers exposure</b>
Place of use: Indoor
Process temperature (for liquid): ≤ 40 °C
Skin surface potentially exposed: One hand face only (240 cm <sup>2</sup> )

#### 2.11.2 Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.019 mg/m <sup>3</sup>	RCR = 0.012
Inhalation, systemic, acute	0.019 mg/m <sup>3</sup>	RCR < 0.01
Inhalation, local, long-term	0.019 mg/m <sup>3</sup>	RCR = 0.012
Inhalation, local, acute	0.019 mg/m <sup>3</sup>	RCR < 0.01
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.006 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.012



## Safety Data Sheet

according to EU Regulations 1907/2006 and other amendments  
Integrated Management System

Processed by Computer  
FS-84-001

Revision: 12-07-2019  
Version: 17  
(Replace: Version 16 from 23-04-2019)

### Sodium Hypochlorite

Combined routes, systemic, acute

RCR < 0.01

#### 2.12. Conclusion on risk characterisation

The risk management measures required based on the quantitative assessment provides sufficient protection against corrosion and respiratory irritation hazard. Details of the RMMs are given in the Exposure Scenarios. Under these conditions, the risks are considered as controlled.

#### 2.13. Method of calculation

TRA Workers 3.0

## Sodium Hypochlorite

### Exposure Scenario 3: Use at industrial site - Use as an intermediate

Sector of use and Product Category	
<b>SU 8:</b> Manufacture of bulk, large scale chemicals (including petroleum products)	
<b>SU 9:</b> Manufacture of fine chemicals	
<b>PC 19:</b> Intermediate	
Environment contributing scenarios	
Use as intermediate	ERC 6a
Worker contributing scenarios	
General exposures (closed systems)	PROC 1
General exposures (closed systems); with sample collection	PROC 2
Use in batch processes (closed systems), with sample collection	PROC 3
Use in batch processes, with sample collection	PROC 4
Drum/batch transfers, non-dedicated facilities	PROC 8a
Drum/batch transfer, dedicated facilities	PROC 8b
Small containers transfers, dedicated facilities	PROC 9
Laboratory activities	PROC 15

#### 3.1. Environmental contributing scenario 1: Use as intermediate

##### 3.1.1. Conditions of use

Amount used, frequency and duration of use (or from service life)
European tonnage: 26 % of the total consumption was estimated to be used as a chemical intermediate (75.96 kt/year chlorine equivalent).
Percentage of EU tonnage used at regional scale: 100 %
Emission Days (days/year): 360 days/year
Conditions and measures related to sewage treatment plant
Municipal STP: Yes [Effectiveness Water: 100%]
Discharge rate of STP: $\geq 2E3$ m <sup>3</sup> /d
Application of the STP sludge on agricultural soil: Yes
Conditions and measures related to treatment of waste (including article waste)
Particular considerations on the waste treatment operations: No (low risk) (ERC based assessment demonstrating control of risk with default conditions. Low risk assumed for waste life stage. Waste disposal according to national/local legislation is sufficient.)
Other conditions affecting environmental exposure
Receiving surface water flow rate: $\geq 1.8E4$ m <sup>3</sup> /d

##### 3.1.2. Releases

Reactions with organic intermediates in controlled closed systems. Sodium hypochlorite solution is filled into the reaction vessels through closed systems.



## Sodium Hypochlorite

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 discharge, air emissions and releases into soil

NaClO must be reduced completely to sodium chloride during the process avoiding critical releases in environment.

Chlorine formation should be avoided by maintaining high alkalinity.

Waste water treatment is required to remove any residual organic compounds and at the same time remaining available chlorine.

### Conclusion on risk characterisation

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.

The worst-case exposure concentration used as PEC in waste water treatment plant is 1E-13 mg/l. The PECs for other compartments are not applicable, because sodium hypochlorite is destroyed rapidly in contact with organic as well as inorganic material and furthermore that is a non-volatile substance.

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 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. Worker contributing scenario 1: General exposures (closed systems) (PROC 1)

### 3.2.1. Conditions of use

#### Product (article) characteristics

Concentration of substance in mixture: 5 – 25 %

#### Amount used (or contained in articles), frequency and duration of use/exposure

Duration of activity: < 8 hours

#### Technical and organisational conditions and measures

General ventilation: Basic general ventilation (1-3 air changes per hour)

Containment: Closed system (minimal contact during routine operations)

Local exhaust ventilation: no [Effectiveness Inhal: 0%]

Occupational Health and Safety Management System: Advanced

#### Conditions and measures related to personal protection, hygiene and health evaluation

Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training)



## Sodium Hypochlorite

[Effectiveness Dermal: 90%]

Respiratory Protection: No [Effectiveness Inhal: 0%]

Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)

### Other conditions affecting workers exposure

Place of use: Indoor

Process temperature (for liquid): ≤ 40 °C

 Skin surface potentially exposed: One hand face only (240 cm<sup>2</sup>)

### 3.2.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.019 mg/m <sup>3</sup>	RCR = 0.012
Inhalation, systemic, acute	0.019 mg/m <sup>3</sup>	RCR < 0.01
Inhalation, local, long-term	0.019 mg/m <sup>3</sup>	RCR = 0.012
Inhalation, local, acute	0.019 mg/m <sup>3</sup>	RCR < 0.01
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	5.95E-4 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.012
Combined routes, systemic, acute		RCR < 0.01

### 3.3. Worker contributing scenario 2: General exposures (closed systems); with sample collection (PROC 2)

#### 3.3.1. Conditions of use

Product (article) characteristics
Concentration of substance in mixture: 5 – 25 %
Amount used (or contained in articles), frequency and duration of use/exposure
Duration of activity: < 8 hours
Technical and organisational conditions and measures
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: Closed continuous process with occasional controlled exposure
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Advanced
Conditions and measures related to personal protection, hygiene and health evaluation
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
Other conditions affecting workers exposure
Place of use: Indoor

## Sodium Hypochlorite

 Process temperature (for liquid):  $\leq 40^{\circ}\text{C}$ 

 Skin surface potentially exposed: Two hands face ( $480\text{ cm}^2$ )

### 3.3.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	$0.186\text{ mg/m}^3$	RCR = 0.12
Inhalation, systemic, acute	$0.186\text{ mg/m}^3$	RCR = 0.06
Inhalation, local, long-term	$0.186\text{ mg/m}^3$	RCR = 0.12
Inhalation, local, acute	$0.186\text{ mg/m}^3$	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	$0.012\text{ mg/cm}^2$	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

### 3.4. Worker contributing scenario 3: Use in batch processes (closed systems), with sample collection (PROC 3)

#### 3.4.1. Conditions of use

Product (article) characteristics
Concentration of substance in mixture: 5 – 25 %
Amount used (or contained in articles), frequency and duration of use/exposure
Duration of activity: < 8 hours
Technical and organisational conditions and measures
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: Closed batch process with occasional controlled exposure
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Advanced
Conditions and measures related to personal protection, hygiene and health evaluation
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
Other conditions affecting workers exposure
Place of use: Indoor
Process temperature (for liquid): $\leq 40^{\circ}\text{C}$
Skin surface potentially exposed: One hand face only ( $240\text{ cm}^2$ )

### 3.4.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
---------------------------------------	------------------------	-----------------------------

## Sodium Hypochlorite

Inhalation, systemic, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, systemic, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, local, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, local, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.012 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

### 3.5. Worker contributing scenario 4: Use in batch processes, with sample collection (PROC 4)

#### 3.5.1. Conditions of use

<b>Product (article) characteristics</b>
Concentration of substance in mixture: 5 – 25 %
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Duration of activity: < 8 hours
<b>Technical and organisational conditions and measures</b>
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: Semi-closed process with occasional controlled exposure
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Advanced
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
<b>Other conditions affecting workers exposure</b>
Place of use: Indoor
Process temperature (for liquid): ≤ 40 °C
Skin surface potentially exposed: Two hands face (480 cm <sup>2</sup> )

#### 3.5.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, systemic, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, local, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, local, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.06 mg/cm <sup>2</sup>	

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Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

### 3.6. Worker contributing scenario 5: Drum/batch transfers, non-dedicated facilities (PROC 8a)

#### 3.6.1. Conditions of use

<b>Product (article) characteristics</b>
Concentration of substance in mixture: 5 – 25 %
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Duration of activity: < 8 hours
<b>Technical and organisational conditions and measures</b>
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: No
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Advanced
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
<b>Other conditions affecting workers exposure</b>
Place of use: Indoor
Process temperature (for liquid): ≤ 40 °C
Skin surface potentially exposed: Two hands (960 cm <sup>2</sup> )

#### 3.6.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, systemic, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, local, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, local, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.06 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

## Sodium Hypochlorite

### 3.7. Worker contributing scenario 6: Drum/batch transfers, dedicated facilities (PROC 8b)

#### 3.7.1. Conditions of use

<b>Product (article) characteristics</b>
Concentration of substance in mixture: 5 – 25 %
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Duration of activity: < 8 hours
<b>Technical and organisational conditions and measures</b>
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: Semi-closed process with occasional controlled exposure
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Advanced
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
<b>Other conditions affecting workers exposure</b>
Place of use: Indoor
Process temperature (for liquid): ≤ 40 °C
Skin surface potentially exposed: Two hands (960 cm <sup>2</sup> )

#### 3.7.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, systemic, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, local, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, local, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.06 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

### 3.8. Worker contributing scenario 7: Small containers transfers, dedicated facilities (PROC 9)

#### 3.8.1. Conditions of use

<b>Product (article) characteristics</b>
Concentration of substance in mixture: 5 – 25 %
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Duration of activity: < 8 hours
<b>Technical and organisational conditions and measures</b>

## Sodium Hypochlorite

General ventilation: Basic general ventilation (1-3 air changes per hour)

Containment: Semi-closed process with occasional controlled exposure

Local exhaust ventilation: no [Effectiveness Inhal: 0%]

Occupational Health and Safety Management System: Advanced

### Conditions and measures related to personal protection, hygiene and health evaluation

 Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training)  
 [Effectiveness Dermal: 90%]

Respiratory Protection: No [Effectiveness Inhal: 0%]

Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)

### Other conditions affecting workers exposure

Place of use: Indoor

Process temperature (for liquid): ≤ 40 °C

 Skin surface potentially exposed: Two hands face (480 cm<sup>2</sup>)

### 3.8.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, systemic, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, local, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, local, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.06 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

### 3.9. Worker contributing scenario 8: Laboratory activities (PROC 15)

#### 3.9.1. Conditions of use

Product (article) characteristics
Concentration of substance in mixture: 5 – 25 %
Amount used (or contained in articles), frequency and duration of use/exposure
Duration of activity: < 8 hours
Technical and organisational conditions and measures
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: No
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Advanced
Conditions and measures related to personal protection, hygiene and health evaluation
Dermal Protection: No [Effectiveness Dermal: 0%]
Respiratory Protection: No [Effectiveness Inhal: 0%]

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Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)

**Other conditions affecting workers exposure**

Place of use: Indoor

Process temperature (for liquid):  $\leq 40^{\circ}\text{C}$

Skin surface potentially exposed: One hand face only ( $240\text{ cm}^2$ )

**3.9.2. Exposure and risks for workers**

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	$0.186\text{ mg/m}^3$	RCR = 0.12
Inhalation, systemic, acute	$0.186\text{ mg/m}^3$	RCR = 0.06
Inhalation, local, long-term	$0.186\text{ mg/m}^3$	RCR = 0.12
Inhalation, local, acute	$0.186\text{ mg/m}^3$	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	$0.06\text{ mg/cm}^2$	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

**3.10. Conclusion on risk characterisation**

The risk management measures required based on the quantitative assessment provides sufficient protection against corrosion and respiratory irritation hazard. Details of the RMMs are given in the Exposure Scenarios. Under these conditions, the risks are considered as controlled.

**3.11. Method of calculation**

TRA Workers 3.0



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### Exposure Scenario 4: Use at industrial site - Use in textile industry

Sector of use and Product Category	
<b>SU 5:</b> Manufacture of textiles, leather, fur	
<b>PC 34:</b> Textile dyes, finishing and impregnating products; including bleaches and other processing aids	
Environment contributing scenarios	
Use in textile industry (reactive processing aid)	ERC 6b
Worker contributing scenarios	
General exposures (closed systems)	PROC 1
General exposures (closed systems), with sample collection	PROC 2
Use in batch process (closed systems), with sample collection	PROC 3
Use in batch processes, with sample collection	PROC 4
Mixing/blending in batch processes	PROC 5
Drum/batch transfers, non-dedicated facilities	PROC 8a
Drum/batch transfers, dedicated facilities	PROC 8b
Small containers transfers, dedicated facilities	PROC 9
Treatment by dipping/pouring	PROC 13
Laboratory activities	PROC 15

#### 4.1. Environmental contributing scenario 1: Use in textile industry (reactive processing aid)

##### 4.1.1. Conditions of use

Amount used, frequency and duration of use (or from service life)
European tonnage: $\leq 1.205E4$ tonnes/year of $Cl_2$ equivalent have been used in Europe in 1994 (300 t as chlorine gas and 11.75 kt as bleach).
Percentage of EU tonnage used at regional scale: 100 %
Conditions and measures related to sewage treatment plant
Municipal STP: Yes [Effectiveness Water: 0.095%]
Discharge rate of STP: $\geq 2E3$ m <sup>3</sup> /d
Application of the STP sludge on agricultural soil: Yes
Conditions and measures related to treatment of waste (including article waste)
Particular considerations on the waste treatment operations: No (low risk) (ERC based assessment demonstrating control of risk with default conditions. Low risk assumed for waste life stage. Waste disposal according to national/local legislation is sufficient.)
Other conditions affecting environmental exposure
Receiving surface water flow rate: $\geq 1.8E4$ m <sup>3</sup> /d

##### 4.1.2. Releases

Sulphite must be use in part of dechlorination process leading to negligible releases of NaClO in water.  
 No release in environment is expected.  
 In worst case the free available chlorine in effluent is measured as total residual chlorine (TRC) and is



## Sodium Hypochlorite

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 discharge, air emissions and releases into soil

Wool chlorination performed in an acid 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 waste water treatment is required to remove any residual organic compounds and remaining available chlorine.

### Conclusion on risk characterisation

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.

The worst-case exposure concentration used as PEC in waste water treatment plant is 1E-13 mg/l. The PECs for other compartments are not applicable, because sodium hypochlorite is destroyed rapidly in contact with organic as well as inorganic material and furthermore that is a non-volatile substance.

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 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.

## 4.2. Worker contributing scenario 1: General exposures (closed systems) (PROC 1)

### 4.2.1. Conditions of use

#### Product (article) characteristics

Concentration of substance in mixture: 5 – 25 %

#### Amount used (or contained in articles), frequency and duration of use/exposure

Duration of activity: < 8 hours

#### Technical and organisational conditions and measures

General ventilation: Basic general ventilation (1-3 air changes per hour)

Containment: Closed system (minimal contact during routine operations)

Local exhaust ventilation: no [Effectiveness Inhal: 0%]

Occupational Health and Safety Management System: Advanced

#### Conditions and measures related to personal protection, hygiene and health evaluation

Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]

Respiratory Protection: No [Effectiveness Inhal: 0%]

Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)

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### Other conditions affecting workers exposure

Place of use: Indoor

 Process temperature (for liquid):  $\leq 40^{\circ}\text{C}$ 

 Skin surface potentially exposed: One hand face only (240 cm<sup>2</sup>)

### 4.2.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.019 mg/m <sup>3</sup>	RCR = 0.012
Inhalation, systemic, acute	0.019 mg/m <sup>3</sup>	RCR < 0.01
Inhalation, local, long-term	0.019 mg/m <sup>3</sup>	RCR = 0.012
Inhalation, local, acute	0.019 mg/m <sup>3</sup>	RCR < 0.01
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	5.95E-4 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.012
Combined routes, systemic, acute		RCR < 0.01

### 4.3. Worker contributing scenario 2: General exposures (closed systems); with sample collection (PROC 2)

#### 4.3.1. Conditions of use

Product (article) characteristics
Concentration of substance in mixture: 5 – 25 %
Amount used (or contained in articles), frequency and duration of use/exposure
Duration of activity: < 8 hours
Technical and organisational conditions and measures
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: Closed continuous process with occasional controlled exposure
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Advanced
Conditions and measures related to personal protection, hygiene and health evaluation
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
Other conditions affecting workers exposure
Place of use: Indoor
Process temperature (for liquid): $\leq 40^{\circ}\text{C}$
Skin surface potentially exposed: Two hands face (480 cm <sup>2</sup> )

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### 4.3.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, systemic, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, local, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, local, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.012 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

### 4.4. Worker contributing scenario 3: Use in batch processes (closed systems), with sample collection (PROC 3)

#### 4.4.1. Conditions of use

<b>Product (article) characteristics</b>
Concentration of substance in mixture: 5 – 25 %
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Duration of activity: < 8 hours
<b>Technical and organisational conditions and measures</b>
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: Closed batch process with occasional controlled exposure
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Advanced
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
<b>Other conditions affecting workers exposure</b>
Place of use: Indoor
Process temperature (for liquid): ≤ 40 °C
Skin surface potentially exposed: One hand face only (240 cm <sup>2</sup> )

### 4.4.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, systemic, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, local, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12

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Inhalation, local, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.012 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

### 4.5. Worker contributing scenario 4: Use in batch processes, with sample collection (PROC 4)

#### 4.5.1. Conditions of use

<b>Product (article) characteristics</b>
Concentration of substance in mixture: 5 – 25 %
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Duration of activity: < 8 hours
<b>Technical and organisational conditions and measures</b>
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: Semi-closed process with occasional controlled exposure
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Advanced
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
<b>Other conditions affecting workers exposure</b>
Place of use: Indoor
Process temperature (for liquid): ≤ 40 °C
Skin surface potentially exposed: Two hands face (480 cm <sup>2</sup> )

#### 4.5.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, systemic, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, local, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, local, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.06 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)

## Sodium Hypochlorite

Combined routes, systemic, long-term	RCR = 0.12
Combined routes, systemic, acute	RCR = 0.06

### 4.6. Worker contributing scenario 5: Mixing/Blending in batch processes (PROC 5)

#### 4.6.1. Conditions of use

<b>Product (article) characteristics</b>
Concentration of substance in mixture: 5 – 25 %
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Duration of activity: < 8 hours
<b>Technical and organisational conditions and measures</b>
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: No
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Advanced
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
<b>Other conditions affecting workers exposure</b>
Place of use: Indoor
Process temperature (for liquid): ≤ 40 °C
Skin surface potentially exposed: Two hands face (480 cm <sup>2</sup> )

#### 4.6.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, systemic, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, local, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, local, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.12 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

### 4.7. Worker contributing scenario 6: Drum/batch transfers, non-dedicated facilities (PROC 8a)

#### 4.7.1. Conditions of use

<b>Product (article) characteristics</b>
Concentration of substance in mixture: 5 – 25 %

## Sodium Hypochlorite

### Amount used (or contained in articles), frequency and duration of use/exposure

Duration of activity: &lt; 8 hours

### Technical and organisational conditions and measures

General ventilation: Basic general ventilation (1-3 air changes per hour)

Containment: No

Local exhaust ventilation: no [Effectiveness Inhal: 0%]

Occupational Health and Safety Management System: Advanced

### Conditions and measures related to personal protection, hygiene and health evaluation

 Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training)  
 [Effectiveness Dermal: 90%]

Respiratory Protection: No [Effectiveness Inhal: 0%]

Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)

### Other conditions affecting workers exposure

Place of use: Indoor

Process temperature (for liquid): ≤ 40 °C

 Skin surface potentially exposed: Two hands (960 cm<sup>2</sup>)

### 4.7.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, systemic, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, local, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, local, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.06 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

### 4.8. Worker contributing scenario 7: Drum/batch transfers, dedicated facilities (PROC 8b)

#### 4.8.1. Conditions of use

#### Product (article) characteristics

Concentration of substance in mixture: 5 – 25 %

### Amount used (or contained in articles), frequency and duration of use/exposure

Duration of activity: &lt; 8 hours

### Technical and organisational conditions and measures

General ventilation: Basic general ventilation (1-3 air changes per hour)

Containment: Semi-closed process with occasional controlled exposure

Local exhaust ventilation: no [Effectiveness Inhal: 0%]

Occupational Health and Safety Management System: Advanced

## Sodium Hypochlorite

### Conditions and measures related to personal protection, hygiene and health evaluation

Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training)  
 [Effectiveness Dermal: 90%]

Respiratory Protection: No [Effectiveness Inhal: 0%]

Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)

### Other conditions affecting workers exposure

Place of use: Indoor

Process temperature (for liquid): ≤ 40 °C

Skin surface potentially exposed: Two hands (960 cm<sup>2</sup>)

### 4.8.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, systemic, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, local, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, local, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.06 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

### 4.9. Worker contributing scenario 8: Small containers transfers, dedicated facilities (PROC 9)

#### 4.9.1. Conditions of use

Product (article) characteristics
Concentration of substance in mixture: 5 – 25 %
Amount used (or contained in articles), frequency and duration of use/exposure
Duration of activity: < 8 hours
Technical and organisational conditions and measures
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: Semi-closed process with occasional controlled exposure
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Advanced
Conditions and measures related to personal protection, hygiene and health evaluation
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
Other conditions affecting workers exposure



## Sodium Hypochlorite

Place of use: Indoor

 Process temperature (for liquid):  $\leq 40^{\circ}\text{C}$ 

 Skin surface potentially exposed: Two hands face ( $480\text{ cm}^2$ )

### 4.9.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	$0.186\text{ mg/m}^3$	RCR = 0.12
Inhalation, systemic, acute	$0.186\text{ mg/m}^3$	RCR = 0.06
Inhalation, local, long-term	$0.186\text{ mg/m}^3$	RCR = 0.12
Inhalation, local, acute	$0.186\text{ mg/m}^3$	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	$0.06\text{ mg/cm}^2$	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

### 4.10. Worker contributing scenario 9: Treatment by dipping/pouring (PROC 13)

#### 4.10.1. Conditions of use

<b>Product (article) characteristics</b>
Concentration of substance in mixture: 5 – 25 %
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Duration of activity: < 8 hours
<b>Technical and organisational conditions and measures</b>
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: No
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Advanced
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
<b>Other conditions affecting workers exposure</b>
Place of use: Indoor
Process temperature (for liquid): $\leq 40^{\circ}\text{C}$
Skin surface potentially exposed: Two hands face ( $480\text{ cm}^2$ )

### 4.10.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
---------------------------------------	------------------------	-----------------------------



## Sodium Hypochlorite

Inhalation, systemic, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, systemic, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, local, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, local, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.12 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

### 4.11. Worker contributing scenario 10: Laboratory activities (PROC 15)

#### 4.11.1. Conditions of use

<b>Product (article) characteristics</b>
Concentration of substance in mixture: 5 – 25 %
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Duration of activity: < 8 hours
<b>Technical and organisational conditions and measures</b>
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: No
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Advanced
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
<b>Other conditions affecting workers exposure</b>
Place of use: Indoor
Process temperature (for liquid): ≤ 40 °C
Skin surface potentially exposed: One hand face only (240 cm <sup>2</sup> )

#### 4.11.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.019 mg/m <sup>3</sup>	RCR = 0.012
Inhalation, systemic, acute	0.019 mg/m <sup>3</sup>	RCR < 0.01
Inhalation, local, long-term	0.019 mg/m <sup>3</sup>	RCR = 0.012
Inhalation, local, acute	0.019 mg/m <sup>3</sup>	RCR < 0.01
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.006 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)



## Safety Data Sheet

according to EU Regulations 1907/2006 and other amendments  
Integrated Management System

Processed by Computer  
FS-84-001

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### Sodium Hypochlorite

Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.012
Combined routes, systemic, acute		RCR < 0.01

#### 4.12. Conclusion on risk characterisation

The risk management measures required based on the quantitative assessment provides sufficient protection against corrosion and respiratory irritation hazard. Details of the RMMs are given in the Exposure Scenarios. Under these conditions, the risks are considered as controlled.

#### 4.13. Method of calculation

TRA Workers 3.0

## Sodium Hypochlorite

### Exposure Scenario 5: Use at industrial site - Industrial use in sewage and cooling or heating water

Sector of use and Product Category	
<b>SU 23:</b> Electricity, steam, gas water supply and sewage treatment <b>PC 20:</b> Products such as pH regulators, flocculants, precipitants, neutralisation agents <b>PC 37:</b> Water treatment chemicals	
Environment contributing scenarios	
Use in sewage and cooling/heating water treatment (reactive processing aid)	ERC 6b
Worker contributing scenarios	
General exposures (closed systems)	PROC 1
General exposures (closed systems), with sample collection	PROC 2
Use in batch process (closed systems), with sample collection	PROC 3
Use in batch processes, with sample collection	PROC 4
Mixing/blending in batch processes	PROC 5
Drum/batch transfers, non-dedicated facilities	PROC 8a
Drum/batch transfers, dedicated facilities	PROC 8b
Small containers transfers, dedicated facilities	PROC 9
Laboratory activities	PROC 15

#### 5.1. Environmental contributing scenario 1: Use in sewage and cooling/heating water treatment (reactive processing aid)

##### 5.1.1. Conditions of use

Amount used, frequency and duration of use (or from service life)
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.
Percentage of EU tonnage used at regional scale: 100 %
Conditions and measures related to sewage treatment plant
Municipal STP: Yes [Effectiveness Water: 0.095%]
Discharge rate of STP: $\geq 2E3$ m <sup>3</sup> /d
Application of the STP sludge on agricultural soil: Yes
Conditions and measures related to treatment of waste (including article waste)
Particular considerations on the waste treatment operations: No (low risk) (ERC based assessment demonstrating control of risk with default conditions. Low risk assumed for waste life stage. Waste disposal according to national/local legislation is sufficient.)
Other conditions affecting environmental exposure
Receiving surface water flow rate: $\geq 1.8E4$ m <sup>3</sup> /d

## Sodium Hypochlorite

### 5.1.2. Releases

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. Common practices vary across sites but no releases are expected.

#### Technical conditions and measures at process level (source) to prevent release

NaClO must be reduced completely to sodium chloride during the process avoiding critical releases in environment. Waste water treatment is required to remove any residual organic compounds and remaining available chlorine.

#### Conclusion on risk characterisation

The releases of sodium hypochlorite to the aquatic compartment are generally low due to rapid decay of hypochlorite. Indeed, due to immediate further reaction upon encountering oxidizable matter in the receiving water, any remaining free available chlorine will be eliminated upon discharge, with rates of decay increasing with discharged concentrations.

The worst-case scenario of exposure concentrations used as PEC at wastewater treatment plant is 1.0E-13mg/L. The PECs for other compartments are not applicable, because sodium hypochlorite is destroyed rapidly in contact with organic as well as inorganic material and furthermore that is a non-volatile substance.

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 wastewater 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.

### 5.2. Worker contributing scenario 1: General exposures (closed systems) (PROC 1)

#### 5.2.1. Conditions of use

##### Product (article) characteristics

Concentration of substance in mixture: 5 – 25 %

##### Amount used (or contained in articles), frequency and duration of use/exposure

Duration of activity: < 8 hours

##### Technical and organisational conditions and measures

General ventilation: Basic general ventilation (1-3 air changes per hour)

Containment: Closed system (minimal contact during routine operations)

Local exhaust ventilation: no [Effectiveness Inhal: 0%]

Occupational Health and Safety Management System: Advanced

##### Conditions and measures related to personal protection, hygiene and health evaluation

Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training)  
 [Effectiveness Dermal: 90%]

Respiratory Protection: No [Effectiveness Inhal: 0%]

## Sodium Hypochlorite

Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)

### Other conditions affecting workers exposure

Place of use: Indoor

Process temperature (for liquid):  $\leq 40^{\circ}\text{C}$

Skin surface potentially exposed: One hand face only (240 cm<sup>2</sup>)

### 5.2.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.019 mg/m <sup>3</sup>	RCR = 0.012
Inhalation, systemic, acute	0.019 mg/m <sup>3</sup>	RCR < 0.01
Inhalation, local, long-term	0.019 mg/m <sup>3</sup>	RCR = 0.012
Inhalation, local, acute	0.019 mg/m <sup>3</sup>	RCR < 0.01
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	5.95E-4 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.012
Combined routes, systemic, acute		RCR < 0.01

### 5.3. Worker contributing scenario 2: General exposures (closed systems); with sample collection (PROC 2)

#### 5.3.1. Conditions of use

Product (article) characteristics
Concentration of substance in mixture: 5 – 25 %
Amount used (or contained in articles), frequency and duration of use/exposure
Duration of activity: < 8 hours
Technical and organisational conditions and measures
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: Closed continuous process with occasional controlled exposure
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Advanced
Conditions and measures related to personal protection, hygiene and health evaluation
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
Other conditions affecting workers exposure
Place of use: Indoor
Process temperature (for liquid): $\leq 40^{\circ}\text{C}$
Skin surface potentially exposed: Two hands face (480 cm <sup>2</sup> )

## Sodium Hypochlorite

### 5.3.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, systemic, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, local, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, local, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.012 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

### 5.4. Worker contributing scenario 3: Use in batch processes (closed systems), with sample collection (PROC 3)

#### 5.4.1. Conditions of use

<b>Product (article) characteristics</b>
Concentration of substance in mixture: 5 – 25 %
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Duration of activity: < 8 hours
<b>Technical and organisational conditions and measures</b>
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: Closed batch process with occasional controlled exposure
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Advanced
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
<b>Other conditions affecting workers exposure</b>
Place of use: Indoor
Process temperature (for liquid): ≤ 40 °C
Skin surface potentially exposed: One hand face only (240 cm <sup>2</sup> )

### 5.4.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12

## Sodium Hypochlorite

Inhalation, systemic, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, local, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, local, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.012 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

### 5.5. Worker contributing scenario 4: Use in batch processes, with sample collection (PROC 4)

#### 5.5.1. Conditions of use

<b>Product (article) characteristics</b>
Concentration of substance in mixture: 5 – 25 %
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Duration of activity: < 8 hours
<b>Technical and organisational conditions and measures</b>
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: Semi-closed process with occasional controlled exposure
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Advanced
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
<b>Other conditions affecting workers exposure</b>
Place of use: Indoor
Process temperature (for liquid): ≤ 40 °C
Skin surface potentially exposed: Two hands face (480 cm <sup>2</sup> )

#### 5.5.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.13 mg/m <sup>3</sup>	RCR = 0.084
Inhalation, systemic, acute	0.13 mg/m <sup>3</sup>	RCR = 0.042
Inhalation, local, long-term	0.13 mg/m <sup>3</sup>	RCR = 0.084
Inhalation, local, acute	0.13 mg/m <sup>3</sup>	RCR = 0.042
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.06 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)



## Sodium Hypochlorite

Combined routes, systemic, long-term	RCR = 0.084
Combined routes, systemic, acute	RCR = 0.042

### 5.6. Worker contributing scenario 5: Mixing/Blending in batch processes (PROC 5)

#### 5.6.1. Conditions of use

<b>Product (article) characteristics</b>
Concentration of substance in mixture: 5 – 25 %
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Duration of activity: < 8 hours
<b>Technical and organisational conditions and measures</b>
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: No
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Advanced
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
<b>Other conditions affecting workers exposure</b>
Place of use: Indoor
Process temperature (for liquid): ≤ 40 °C
Skin surface potentially exposed: Two hands face (480 cm <sup>2</sup> )

#### 5.6.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, systemic, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, local, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, local, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.12 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

### 5.7. Worker contributing scenario 6: Drum/batch transfers, non-dedicated facilities (PROC 8a)

#### 5.7.1. Conditions of use

<b>Product (article) characteristics</b>
Concentration of substance in mixture: 5 – 25 %



## Sodium Hypochlorite

### Amount used (or contained in articles), frequency and duration of use/exposure

Duration of activity: &lt; 8 hours

### Technical and organisational conditions and measures

General ventilation: Basic general ventilation (1-3 air changes per hour)

Containment: No

Local exhaust ventilation: no [Effectiveness Inhal: 0%]

Occupational Health and Safety Management System: Advanced

### Conditions and measures related to personal protection, hygiene and health evaluation

 Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training)  
 [Effectiveness Dermal: 90%]

Respiratory Protection: No [Effectiveness Inhal: 0%]

Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)

### Other conditions affecting workers exposure

Place of use: Indoor

Process temperature (for liquid): ≤ 40 °C

 Skin surface potentially exposed: Two hands (960 cm<sup>2</sup>)

### 5.7.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, systemic, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, local, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, local, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.06 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

### 5.8. Worker contributing scenario 7: Drum/batch transfers, dedicated facilities (PROC 8b)

#### 5.8.1. Conditions of use

#### Product (article) characteristics

Concentration of substance in mixture: 5 – 25 %

### Amount used (or contained in articles), frequency and duration of use/exposure

Duration of activity: &lt; 8 hours

### Technical and organisational conditions and measures

General ventilation: Basic general ventilation (1-3 air changes per hour)

Containment: Semi-closed process with occasional controlled exposure

Local exhaust ventilation: no [Effectiveness Inhal: 0%]

Occupational Health and Safety Management System: Advanced

## Sodium Hypochlorite

### Conditions and measures related to personal protection, hygiene and health evaluation

Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training)  
 [Effectiveness Dermal: 90%]

Respiratory Protection: No [Effectiveness Inhal: 0%]

Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)

### Other conditions affecting workers exposure

Place of use: Indoor

Process temperature (for liquid): ≤ 40 °C

Skin surface potentially exposed: Two hands (960 cm<sup>2</sup>)

### 5.8.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, systemic, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, local, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, local, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.06 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

### 5.9. Worker contributing scenario 8: Small containers transfers, dedicated facilities (PROC 9)

#### 5.9.1. Conditions of use

Product (article) characteristics
Concentration of substance in mixture: 5 – 25 %
Amount used (or contained in articles), frequency and duration of use/exposure
Duration of activity: < 8 hours
Technical and organisational conditions and measures
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: Semi-closed process with occasional controlled exposure
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Advanced
Conditions and measures related to personal protection, hygiene and health evaluation
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
Other conditions affecting workers exposure

## Sodium Hypochlorite

Place of use: Indoor

 Process temperature (for liquid):  $\leq 40^{\circ}\text{C}$ 

 Skin surface potentially exposed: Two hands face ( $480\text{ cm}^2$ )

### 5.9.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	$0.186\text{ mg/m}^3$	RCR = 0.12
Inhalation, systemic, acute	$0.186\text{ mg/m}^3$	RCR = 0.06
Inhalation, local, long-term	$0.186\text{ mg/m}^3$	RCR = 0.12
Inhalation, local, acute	$0.186\text{ mg/m}^3$	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	$0.06\text{ mg/cm}^2$	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

### 5.10. Worker contributing scenario 9: Laboratory activities (PROC 15)

#### 5.10.1. Conditions of use

<b>Product (article) characteristics</b>
Concentration of substance in mixture: 5 – 25 %
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Duration of activity: < 8 hours
<b>Technical and organisational conditions and measures</b>
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: No
Local exhaust ventilation: yes [Effectiveness Inhal: 90%]
Local exhaust ventilation (for dermal): no [Effectiveness Dermal: 0%]
Occupational Health and Safety Management System: Advanced
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
<b>Other conditions affecting workers exposure</b>
Place of use: Indoor
Process temperature (for liquid): $\leq 40^{\circ}\text{C}$
Skin surface potentially exposed: One hand face only ( $240\text{ cm}^2$ )

**Sodium Hypochlorite****5.10.2. Exposure and risks for workers**

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.019 mg/m <sup>3</sup>	RCR = 0.012
Inhalation, systemic, acute	0.019 mg/m <sup>3</sup>	RCR < 0.01
Inhalation, local, long-term	0.019 mg/m <sup>3</sup>	RCR = 0.012
Inhalation, local, acute	0.019 mg/m <sup>3</sup>	RCR < 0.01
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.006 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.012
Combined routes, systemic, acute		RCR < 0.01

**5.11. Conclusion on risk characterisation**

The risk management measures required based on the quantitative assessment provides sufficient protection against corrosion and respiratory irritation hazard. Details of the RMMs are given in the Exposure Scenarios. Under these conditions, the risks are considered as controlled.

**5.12. Method of calculation**

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### Exposure Scenario 6: Use at industrial site - Industrial use in pulp and paper

Sector of use and Product Category	
<b>SU 6b:</b> Manufacture of pulp, paper and paper products	
<b>PC 26:</b> Paper and board dye, finishing and impregnation products: including bleaches and other processing aids	
Environment contributing scenarios	
Use in pulp and paper (reactive processing aid)	ERC 6b
Worker contributing scenarios	
General exposures (closed systems)	PROC 1
General exposures (closed systems), with sample collection	PROC 2
Use in batch process (closed systems), with sample collection	PROC 3
Use in batch processes, with sample collection	PROC 4
Mixing/blending in batch processes	PROC 5
Drum/batch transfers, non-dedicated facilities	PROC 8a
Drum/batch transfers, dedicated facilities	PROC 8b
Small containers transfers, dedicated facilities	PROC 9
Laboratory activities	PROC 15

#### 6.1. Environmental contributing scenario 1: Use in pulp and paper (reactive processing aid)

##### 6.1.1. Conditions of use

Amount used, frequency and duration of use (or from service life)
European tonnage: consumption for the year 1994 was 17.43 and 8.53 kt/year chlorine and for hypochlorite, respectively.
Percentage of EU tonnage used at regional scale: 100 %
Conditions and measures related to sewage treatment plant
Municipal STP: Yes [Effectiveness Water: 0.095%]
Discharge rate of STP: $\geq 2E3$ m <sup>3</sup> /d
Application of the STP sludge on agricultural soil: Yes
Conditions and measures related to treatment of waste (including article waste)
Particular considerations on the waste treatment operations: No (low risk) (ERC based assessment demonstrating control of risk with default conditions. Low risk assumed for waste life stage. Waste disposal according to national/local legislation is sufficient.)
Other conditions affecting environmental exposure
Receiving surface water flow rate: $\geq 1.8E4$ m <sup>3</sup> /d

##### 6.1.2. Releases

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 into the air is expected. In the worst case scenario, the free available chlorine in effluent is

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measured as total residual chlorine (TRC) and is calculated to be less than 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
- breaking 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

NaClO must be reduced completely to sodium chloride during the process avoiding critical releases in environment.

Waste water treatment is required to remove any residual organic compounds and remaining available chlorine.

### Conclusion on risk characterisation

The worst-case scenario of exposure concentrations used as PEC at wastewater treatment plant is 1.0E-13mg/L. The PECs for other compartments are not applicable, because sodium hypochlorite is destroyed rapidly in contact with organic as well as inorganic material and furthermore that is a non-volatile substance.

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 wastewater 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.

## 6.2. Worker contributing scenario 1: General exposures (closed systems) (PROC 1)

### 6.2.1. Conditions of use

#### Product (article) characteristics

Concentration of substance in mixture: 5 – 25 %

#### Amount used (or contained in articles), frequency and duration of use/exposure

Duration of activity: < 8 hours

#### Technical and organisational conditions and measures

General ventilation: Basic general ventilation (1-3 air changes per hour)

Containment: Closed system (minimal contact during routine operations)

Local exhaust ventilation: no [Effectiveness Inhal: 0%]

Occupational Health and Safety Management System: Advanced

#### Conditions and measures related to personal protection, hygiene and health evaluation

Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]

Respiratory Protection: No [Effectiveness Inhal: 0%]

Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)

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### Other conditions affecting workers exposure

Place of use: Indoor

 Process temperature (for liquid):  $\leq 40^{\circ}\text{C}$ 

 Skin surface potentially exposed: One hand face only (240 cm<sup>2</sup>)

### 6.2.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.019 mg/m <sup>3</sup>	RCR = 0.012
Inhalation, systemic, acute	0.019 mg/m <sup>3</sup>	RCR < 0.01
Inhalation, local, long-term	0.019 mg/m <sup>3</sup>	RCR = 0.012
Inhalation, local, acute	0.019 mg/m <sup>3</sup>	RCR < 0.01
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	5.95E-4 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.012
Combined routes, systemic, acute		RCR < 0.01

### 6.3. Worker contributing scenario 2: General exposures (closed systems); with sample collection (PROC 2)

#### 6.3.1. Conditions of use

Product (article) characteristics
Concentration of substance in mixture: 5 – 25 %
Amount used (or contained in articles), frequency and duration of use/exposure
Duration of activity: < 8 hours
Technical and organisational conditions and measures
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: Closed continuous process with occasional controlled exposure
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Advanced
Conditions and measures related to personal protection, hygiene and health evaluation
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
Other conditions affecting workers exposure
Place of use: Indoor
Process temperature (for liquid): $\leq 40^{\circ}\text{C}$
Skin surface potentially exposed: Two hands face (480 cm <sup>2</sup> )



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### 6.3.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, systemic, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, local, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, local, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.012 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

### 6.4. Worker contributing scenario 3: Use in batch processes (closed systems), with sample collection (PROC 3)

#### 6.4.1. Conditions of use

<b>Product (article) characteristics</b>
Concentration of substance in mixture: 5 – 25 %
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Duration of activity: < 8 hours
<b>Technical and organisational conditions and measures</b>
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: Closed batch process with occasional controlled exposure
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Advanced
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
<b>Other conditions affecting workers exposure</b>
Place of use: Indoor
Process temperature (for liquid): ≤ 40 °C
Skin surface potentially exposed: One hand face only (240 cm <sup>2</sup> )

### 6.4.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, systemic, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, local, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12



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Inhalation, local, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.012 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

### 6.5. Worker contributing scenario 4: Use in batch processes, with sample collection (PROC 4)

#### 6.5.1. Conditions of use

<b>Product (article) characteristics</b>
Concentration of substance in mixture: 5 – 25 %
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Duration of activity: < 8 hours
<b>Technical and organisational conditions and measures</b>
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: Semi-closed process with occasional controlled exposure
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Advanced
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
<b>Other conditions affecting workers exposure</b>
Place of use: Indoor
Process temperature (for liquid): ≤ 40 °C
Skin surface potentially exposed: Two hands face (480 cm <sup>2</sup> )

#### 6.5.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, systemic, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, local, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, local, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.06 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

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### 6.6. Worker contributing scenario 5: Mixing/Blending in batch processes (PROC 5)

#### 6.6.1. Conditions of use

<b>Product (article) characteristics</b>
Concentration of substance in mixture: 5 – 25 %
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Duration of activity: < 8 hours
<b>Technical and organisational conditions and measures</b>
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: No
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Advanced
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
<b>Other conditions affecting workers exposure</b>
Place of use: Indoor
Process temperature (for liquid): ≤ 40 °C
Skin surface potentially exposed: Two hands face (480 cm <sup>2</sup> )

#### 6.6.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, systemic, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, local, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, local, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.12 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

### 6.7. Worker contributing scenario 6: Drum/batch transfers, non-dedicated facilities (PROC 8a)

#### 6.7.1. Conditions of use

<b>Product (article) characteristics</b>
Concentration of substance in mixture: 5 – 25 %
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Duration of activity: < 8 hours

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### Technical and organisational conditions and measures

General ventilation: Basic general ventilation (1-3 air changes per hour)

Containment: No

Local exhaust ventilation: no [Effectiveness Inhal: 0%]

Occupational Health and Safety Management System: Advanced

### Conditions and measures related to personal protection, hygiene and health evaluation

 Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training)  
 [Effectiveness Dermal: 90%]

Respiratory Protection: No [Effectiveness Inhal: 0%]

Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)

### Other conditions affecting workers exposure

Place of use: Indoor

Process temperature (for liquid): ≤ 40 °C

 Skin surface potentially exposed: Two hands (960 cm<sup>2</sup>)

### 6.7.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, systemic, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, local, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, local, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.06 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

### 6.8. Worker contributing scenario 7: Drum/batch transfers, dedicated facilities (PROC 8b)

#### 6.8.1. Conditions of use

##### Product (article) characteristics

Concentration of substance in mixture: 5 - 25%

##### Amount used (or contained in articles), frequency and duration of use/exposure

Duration of activity: &lt; 8 hours

##### Technical and organisational conditions and measures

General ventilation: Basic general ventilation (1-3 air changes per hour)

Containment: Semi-closed process with occasional controlled exposure

Local exhaust ventilation: no [Effectiveness Inhal: 0%]

Occupational Health and Safety Management System: Advanced

##### Conditions and measures related to personal protection, hygiene and health evaluation

Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training)

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[Effectiveness Dermal: 90%]

Respiratory Protection: No [Effectiveness Inhal: 0%]

Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)

### Other conditions affecting workers exposure

Place of use: Indoor

Process temperature (for liquid): ≤ 40 °C

 Skin surface potentially exposed: Two hands (960 cm<sup>2</sup>)

### 6.8.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, systemic, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, local, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, local, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.06 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

### 6.9. Worker contributing scenario 8: Small containers transfers, dedicated facilities (PROC 9)

#### 6.9.1. Conditions of use

Product (article) characteristics
Concentration of substance in mixture: 5 – 25 %
Amount used (or contained in articles), frequency and duration of use/exposure
Duration of activity: < 8 hours
Technical and organisational conditions and measures
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: Semi-closed process with occasional controlled exposure
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Advanced
Conditions and measures related to personal protection, hygiene and health evaluation
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
Other conditions affecting workers exposure
Place of use: Indoor
Process temperature (for liquid): ≤ 40 °C

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 Skin surface potentially exposed: Two hands face (480 cm<sup>2</sup>)

### 6.9.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure concentration	Risk characterisation
Inhalation, systemic, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, systemic, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, local, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, local, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.06 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

### 6.10. Worker contributing scenario 9: Laboratory activities (PROC 15)

#### 6.10.1. Conditions of use

<b>Product (article) characteristics</b>
Concentration of substance in mixture: 5 – 25 %
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Duration of activity: < 8 hours
<b>Technical and organisational conditions and measures</b>
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: No
Local exhaust ventilation: yes [Effectiveness Inhal: 90%]
Local exhaust ventilation (for dermal): no [Effectiveness Dermal: 0%]
Occupational Health and Safety Management System: Advanced
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
<b>Other conditions affecting workers exposure</b>
Place of use: Indoor
Process temperature (for liquid): ≤ 40 °C
Skin surface potentially exposed: One hand face only (240 cm <sup>2</sup> )

**Sodium Hypochlorite****6.10.2. Exposure and risks for workers**

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.019 mg/m <sup>3</sup>	RCR = 0.012
Inhalation, systemic, acute	0.019 mg/m <sup>3</sup>	RCR < 0.01
Inhalation, local, long-term	0.019 mg/m <sup>3</sup>	RCR = 0.012
Inhalation, local, acute	0.019 mg/m <sup>3</sup>	RCR < 0.01
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.006 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.012
Combined routes, systemic, acute		RCR < 0.01

**6.11. Conclusion on risk characterisation**

The risk management measures required based on the quantitative assessment provides sufficient protection against corrosion and respiratory irritation hazard. Details of the RMMs are given in the Exposure Scenarios. Under these conditions, the risks are considered as controlled.

**6.12. Method of calculation**

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### Exposure Scenario 7: Use at industrial site - Industrial cleaning use

Sector of use and Product Category	
<b>SU 4:</b> Manufacture of food products	
<b>PC 35:</b> Washing and cleaning products (including solvent based products)	
Environment contributing scenarios	
Industrial cleaning use	ERC 6b
Worker contributing scenarios	
Mixing/blending in batch processes	PROC 5
Industrial spraying	PROC 7
Drum/batch transfers, non-dedicated facilities	PROC 8a
Small containers transfers, dedicated facilities	PROC 9
Roller application or brushing	PROC 10
Treatment by dipping/pouring	PROC 13

#### 7.1. Environmental contributing scenario 1: Industrial cleaning use

##### 7.1.1. Conditions of use

Amount used, frequency and duration of use (or from service life)
European tonnage: 250-450,000 tonnes per year of solution of sodium hypochlorite (5% solution).
Percentage of EU tonnage used at regional scale: = 100 %
Conditions and measures related to sewage treatment plant
Municipal STP: Yes [Effectiveness Water: 0.095%]
Discharge rate of STP: $\geq 2E3$ m <sup>3</sup> /d
Application of the STP sludge on agricultural soil: Yes
Conditions and measures related to treatment of waste (including article waste)
Particular considerations on the waste treatment operations: No (low risk) (ERC based assessment demonstrating control of risk with default conditions. Low risk assumed for waste life stage. Waste disposal according to national/local legislation is sufficient.)
Other conditions affecting environmental exposure
Receiving surface water flow rate: $\geq 1.8E4$ m <sup>3</sup> /d

##### 7.1.2. Releases

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 the effluent is measured as total residual chlorine (TRC) and is anticipated to be below 1.0E – 13 mg/L.

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.



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No release into the air is expected. In the worst case scenario, the free available chlorine in effluent is measured as total residual chlorine (TRC) and is calculated to be less than 1.0E - 13 mg/L.

### 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. Waste water treatment is required to remove any residual organic compounds and remaining available chlorine.

### Conclusion on risk characterisation

The worst-case scenario of exposure concentrations used as PEC at wastewater treatment plant is 1.0E-13mg/L. The PECs for other compartments are not applicable, because sodium hypochlorite is destroyed rapidly in contact with organic as well as inorganic material and furthermore that is a non-volatile substance.

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 wastewater 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.

## 7.2. Worker contributing scenario 1: Mixing/Blending in batch processes (PROC 5)

### 7.2.1. Conditions of use

#### Product (article) characteristics

Concentration of substance in mixture: 5 – 25 %

#### Amount used (or contained in articles), frequency and duration of use/exposure

Duration of activity: < 8 hours

#### Technical and organisational conditions and measures

General ventilation: Good general ventilation (3-5 air changes per hour)

Containment: No

Local exhaust ventilation: no [Effectiveness Inhal: 0%]

Occupational Health and Safety Management System: Advanced

#### Conditions and measures related to personal protection, hygiene and health evaluation

Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training)  
 [Effectiveness Dermal: 90%]

Respiratory Protection: No [Effectiveness Inhal: 0%]

Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)

#### Other conditions affecting workers exposure

Place of use: Indoor

Process temperature (for liquid): ≤ 40 °C

Skin surface potentially exposed: Two hands face (480 cm<sup>2</sup>)

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### 7.2.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.13 mg/m <sup>3</sup>	RCR = 0.084
Inhalation, systemic, acute	0.13 mg/m <sup>3</sup>	RCR = 0.042
Inhalation, local, long-term	0.13 mg/m <sup>3</sup>	RCR = 0.084
Inhalation, local, acute	0.13 mg/m <sup>3</sup>	RCR = 0.042
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.12 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.084
Combined routes, systemic, acute		RCR = 0.042

### 7.3. Worker contributing scenario 2: Industrial spraying (PROC 7)

#### 7.3.1. Conditions of use

<b>Product (article) characteristics</b>
Concentration of substance in mixture: 5 - 25%
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Duration of activity: < 1 hour
<b>Technical and organisational conditions and measures</b>
General ventilation: Good general ventilation (3-5 air changes per hour)
Containment: No
Local exhaust ventilation: yes [Effectiveness Inhal: 95%]
Local exhaust ventilation (for dermal): no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Advanced
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: Yes (Respirator with APF of 10) [Effectiveness Inhal: 90%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
<b>Other conditions affecting workers exposure</b>
Place of use: Indoor
Process temperature (for liquid): ≤ 40 °C
Skin surface potentially exposed: Two hands and upper wrists (1500 cm <sup>2</sup> )

### 7.3.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.13 mg/m <sup>3</sup>	RCR = 0.084
Inhalation, systemic, acute	2.605 mg/m <sup>3</sup>	RCR = 0.84

## Sodium Hypochlorite

Inhalation, local, long-term	0.13 mg/m <sup>3</sup>	RCR = 0.084
Inhalation, local, acute	2.605 mg/m <sup>3</sup>	RCR = 0.84
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.12 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.084
Combined routes, systemic, acute		RCR = 0.84

### 7.4. Worker contributing scenario 3: Drum/batch processes, non-dedicated facilities (PROC 8a)

#### 7.4.1. Conditions of use

<b>Product (article) characteristics</b>
Concentration of substance in mixture: 5 – 25 %
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Duration of activity: < 8 hours
<b>Technical and organisational conditions and measures</b>
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: No
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Advanced
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
<b>Other conditions affecting workers exposure</b>
Place of use: Indoor
Process temperature (for liquid): ≤ 40 °C
Skin surface potentially exposed: Two hands (960 cm <sup>2</sup> )

#### 7.4.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, systemic, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, local, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, local, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.06 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12

## Sodium Hypochlorite

Combined routes, systemic, acute

RCR = 0.06

### 7.5. Worker contributing scenario 4: Small containers transfers, dedicated facilities (PROC 9)

#### 7.5.1. Conditions of use

##### Product (article) characteristics

Concentration of substance in mixture: 5 - 25%

##### Amount used (or contained in articles), frequency and duration of use/exposure

Duration of activity: &lt; 8 hours

##### Technical and organisational conditions and measures

General ventilation: Basic general ventilation (1-3 air changes per hour)

Containment: Semi-closed process with occasional controlled exposure

Local exhaust ventilation: no [Effectiveness Inhal: 0%]

Occupational Health and Safety Management System: Advanced

##### Conditions and measures related to personal protection, hygiene and health evaluation

 Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training)  
 [Effectiveness Dermal: 90%]

Respiratory Protection: No [Effectiveness Inhal: 0%]

Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)

##### Other conditions affecting workers exposure

Place of use: Indoor

Process temperature (for liquid): ≤ 40 °C

 Skin surface potentially exposed: Two hands face (480 cm<sup>2</sup>)

#### 7.5.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, systemic, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, local, long-term	0.186 mg/m <sup>3</sup>	RCR = 0.12
Inhalation, local, acute	0.186 mg/m <sup>3</sup>	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.06 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

### 7.6. Worker contributing scenario 5: Roller application or brushing (PROC 10)

#### 7.6.1. Conditions of use

##### Product (article) characteristics

Concentration of substance in mixture: 5-25%

##### Amount used (or contained in articles), frequency and duration of use/exposure

## Sodium Hypochlorite

Duration of activity: &lt; 4 hours

### Technical and organisational conditions and measures

General ventilation: Basic general ventilation (1-3 air changes per hour)

Containment: No

Local exhaust ventilation: yes [Effectiveness Inhal: 90%]

Local exhaust ventilation (for dermal): no [Effectiveness Dermal: 0%]

Occupational Health and Safety Management System: Advanced

### Conditions and measures related to personal protection, hygiene and health evaluation

 Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training)  
 [Effectiveness Dermal: 90%]

Respiratory Protection: No [Effectiveness Inhal: 0%]

Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)

### Other conditions affecting workers exposure

Place of use: Indoor

Process temperature (for liquid): ≤ 40 °C

 Skin surface potentially exposed: Two hands (960 cm<sup>2</sup>)

### 7.6.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.011 mg/m <sup>3</sup>	RCR < 0.01
Inhalation, systemic, acute	0.019 mg/m <sup>3</sup>	RCR < 0.01
Inhalation, local, long-term	0.011 mg/m <sup>3</sup>	RCR < 0.01
Inhalation, local, acute	0.019 mg/m <sup>3</sup>	RCR < 0.01
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.12 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR < 0.01
Combined routes, systemic, acute		RCR < 0.01

### 7.7. Worker contributing scenario 6: Treatment by dipping/pouring (PROC 13)

#### 7.7.1. Conditions of use

##### Product (article) characteristics

Concentration of substance in mixture: 5 – 25 %

##### Amount used (or contained in articles), frequency and duration of use/exposure

Duration of activity: &lt; 8 hours

##### Technical and organisational conditions and measures

General ventilation: Basic general ventilation (1-3 air changes per hour)

Containment: No

Local exhaust ventilation: no [Effectiveness Inhal: 0%]

Occupational Health and Safety Management System: Advanced

**Sodium Hypochlorite****Conditions and measures related to personal protection, hygiene and health evaluation**Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training)  
[Effectiveness Dermal: 90%]

Respiratory Protection: No [Effectiveness Inhal: 0%]

Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)

**Other conditions affecting workers exposure**

Place of use: Indoor

Process temperature (for liquid):  $\leq 40^{\circ}\text{C}$ Skin surface potentially exposed: Two hands face ( $480\text{ cm}^2$ )**7.7.2. Exposure and risks for workers**

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	$0.186\text{ mg/m}^3$	RCR = 0.12
Inhalation, systemic, acute	$0.186\text{ mg/m}^3$	RCR = 0.06
Inhalation, local, long-term	$0.186\text{ mg/m}^3$	RCR = 0.12
Inhalation, local, acute	$0.186\text{ mg/m}^3$	RCR = 0.06
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	$0.12\text{ mg/cm}^2$	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.12
Combined routes, systemic, acute		RCR = 0.06

**7.8. Conclusion on risk characterisation**

The risk management measures required based on the quantitative assessment provides sufficient protection against corrosion and respiratory irritation hazard. Details of the RMMs are given in the Exposure Scenarios. Under these conditions, the risks are considered as controlled.

**7.9. Method of calculation**

TRA Workers 3.0

## Sodium Hypochlorite

### Exposure Scenario 8: Use by professional worker - Professional cleaning uses

Sector of use and Product Category	
<b>SU 0:</b> Other	
<b>PC 35:</b> Washing and cleaning products (including solvent based products)	
Environment contributing scenarios	
Professional cleaning use	ERC 8a
Worker contributing scenarios	
Mixing/blending in batch processes	PROC 5
Small containers transfers, dedicated facilities	PROC 9
Roller application or brushing	PROC 10
Professional spraying	PROC 11
Treatment by dipping/pouring	PROC 13
Laboratory activities	PROC 15
Drum/batch transfers, non-dedicated facilities	PROC 8a
Drum/batch transfers, dedicated facilities	PROC 8b

#### 8.1. Environmental contributing scenario 1: Professional cleaning use

##### 8.1.1 Conditions of use

Amount used, frequency and duration of use (or from service life)
European tonnage: 250-450,000 tonnes per year of solution of sodium hypochlorite solution.
Percentage of EU tonnage used at regional scale: 100 %
Conditions and measures related to sewage treatment plant
Municipal STP: Yes [Effectiveness Water: 0.095%]
Discharge rate of STP: $\geq 2E3$ m <sup>3</sup> /d
Application of the STP sludge on agricultural soil: Yes
Conditions and measures related to treatment of waste (including article waste)
Particular considerations on the waste treatment operations: No (low risk) (ERC based assessment demonstrating control of risk with default conditions. Low risk assumed for waste life stage. Waste disposal according to national/local legislation is sufficient.)
Other conditions affecting environmental exposure
Receiving surface water flow rate: $\geq 1.8E4$ m <sup>3</sup> /d

##### 8.1.2. Releases

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 the effluent is measured as total residual chlorine (TRC) and is anticipated to be below  $1.0E - 13$  mg/L.

**Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil**



## Sodium Hypochlorite

NaClO must be reduced completely to sodium chloride during the process avoiding critical releases in environment. Waste water treatment is required to remove any residual organic compounds and remaining available chlorine.

### Conclusion on risk characterisation

The worst-case scenario of exposure concentrations used as PEC at wastewater treatment plant is 1.0E-13mg/L. The PECs for other compartments are not applicable, because sodium hypochlorite is destroyed rapidly in contact with organic as well as inorganic material and furthermore that is a non-volatile substance.

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 wastewater 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.

## 8.2. Worker contributing scenario 1: Mixing/Blending in batch processes (PROC 5)

### 8.2.1. Conditions of use

Product (article) characteristics
Concentration of substance in mixture: 1 – 5 %
Amount used (or contained in articles), frequency and duration of use/exposure
Duration of activity: < 8 hours
Technical and organisational conditions and measures
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: No
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Basic
Conditions and measures related to personal protection, hygiene and health evaluation
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
Other conditions affecting workers exposure
Place of use: Indoor
Process temperature (for liquid): ≤ 40 °C
Skin surface potentially exposed: Two hands face (480 cm <sup>2</sup> )

### 8.2.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.062 mg/m <sup>3</sup>	RCR = 0.04
Inhalation, systemic, acute	0.062 mg/m <sup>3</sup>	RCR = 0.02

## Sodium Hypochlorite

Inhalation, local, long-term	0.062 mg/m <sup>3</sup>	RCR = 0.04
Inhalation, local, acute	0.062 mg/m <sup>3</sup>	RCR = 0.02
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.04 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.04
Combined routes, systemic, acute		RCR = 0.02

### 8.3. Worker contributing scenario 2: Small containers transfers, dedicated facilities (PROC 9)

#### 8.3.1. Conditions of use

<b>Product (article) characteristics</b>
Concentration of substance in mixture: 1 – 5 %
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Duration of activity: < 8 hours
<b>Technical and organisational conditions and measures</b>
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: Semi-closed process with occasional controlled exposure
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Basic
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
<b>Other conditions affecting workers exposure</b>
Place of use: Indoor
Process temperature (for liquid): ≤ 40 °C
Skin surface potentially exposed: Two hands face (480 cm <sup>2</sup> )

#### 8.3.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.062 mg/m <sup>3</sup>	RCR = 0.04
Inhalation, systemic, acute	0.062 mg/m <sup>3</sup>	RCR = 0.02
Inhalation, local, long-term	0.062 mg/m <sup>3</sup>	RCR = 0.04
Inhalation, local, acute	0.062 mg/m <sup>3</sup>	RCR = 0.02
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.02 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.04

## Sodium Hypochlorite

Combined routes, systemic, acute

RCR = 0.02

### 8.4. Worker contributing scenario 3: Roller application or brushing (PROC 10)

#### 8.4.1. Conditions of use

<b>Product (article) characteristics</b>
Concentration of substance in mixture: 1 – 5 %
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Duration of activity: < 1 hour
<b>Technical and organisational conditions and measures</b>
General ventilation: Enhanced general ventilation (5-10 air changes per hour)
Containment: No
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Basic
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: Yes (respirator with APF of 10) [Effectiveness Inhal: 90%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
<b>Other conditions affecting workers exposure</b>
Place of use: Indoor
Process temperature (for liquid): ≤ 40 °C
Skin surface potentially exposed: Two hands (960 cm <sup>2</sup> )

#### 8.4.2. Exposure and risks for workers

The exposure concentrations and risk characterization ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.093 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, systemic, acute	1.861 mg/m <sup>3</sup>	RCR = 0.6
Inhalation, local, long-term	0.093 mg/m <sup>3</sup>	RCR = 0.06
Inhalation, local, acute	1.861 mg/m <sup>3</sup>	RCR = 0.6
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.04 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.06
Combined routes, systemic, acute		RCR = 0.6

## Sodium Hypochlorite

### 8.5. Worker contributing scenario 4: Professional spraying (PROC 11)

#### 8.5.1. Conditions of use

<b>Product (article) characteristics</b>
Concentration of substance in mixture: 1 – 5 %
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Duration of activity: < 4 hours
<b>Technical and organisational conditions and measures</b>
General ventilation: Good general ventilation (3-5 air changes per hour)
Containment: No
Local exhaust ventilation: yes [Effectiveness Inhal: 80%]
Local exhaust ventilation (for dermal): no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Basic
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: Yes (respirator with APF of 20) [Effectiveness Inhal: 95 %]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
<b>Other conditions affecting workers exposure</b>
Place of use: Indoor
Process temperature (for liquid): ≤ 40 °C
Skin surface potentially exposed: Two hands and upper wrists (1500 cm <sup>2</sup> )

#### 8.5.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.26 mg/m <sup>3</sup>	RCR = 0.168
Inhalation, systemic, acute	1.737 mg/m <sup>3</sup>	RCR = 0.56
Inhalation, local, long-term	0.26 mg/m <sup>3</sup>	RCR = 0.168
Inhalation, local, acute	1.737 mg/m <sup>3</sup>	RCR = 0.56
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.1 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.168
Combined routes, systemic, acute		RCR = 0.56

### 8.6. Worker contributing scenario 5: Treatment by dipping/pouring (PROC 13)

#### 8.6.1. Conditions of use

<b>Product (article) characteristics</b>
Concentration of substance in mixture: 1 – 5 %
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>

## Sodium Hypochlorite

Duration of activity: &lt; 8 hours

### Technical and organisational conditions and measures

General ventilation: Basic general ventilation (1-3 air changes per hour)

Containment: No

Local exhaust ventilation: no [Effectiveness Inhal: 0%]

Occupational Health and Safety Management System: Basic

### Conditions and measures related to personal protection, hygiene and health evaluation

 Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training)  
 [Effectiveness Dermal: 90%]

Respiratory Protection: No [Effectiveness Inhal: 0%]

Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)

### Other conditions affecting workers exposure

Place of use: Indoor

Process temperature (for liquid): ≤ 40 °C

 Skin surface potentially exposed: Two hands face (480 cm<sup>2</sup>)

### 8.6.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.062 mg/m <sup>3</sup>	RCR = 0.04
Inhalation, systemic, acute	0.062 mg/m <sup>3</sup>	RCR = 0.02
Inhalation, local, long-term	0.062 mg/m <sup>3</sup>	RCR = 0.04
Inhalation, local, acute	0.062 mg/m <sup>3</sup>	RCR = 0.02
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.04 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.04
Combined routes, systemic, acute		RCR = 0.02

### 8.7. Worker contributing scenario 6: Laboratory activities (PROC 15)

#### 8.7.1. Conditions of use

##### Product (article) characteristics

Concentration of substance in mixture: 1 – 5 %

##### Amount used (or contained in articles), frequency and duration of use/exposure

Duration of activity: &lt; 8 hours

##### Technical and organisational conditions and measures

General ventilation: Basic general ventilation (1-3 air changes per hour)

Containment: No

Local exhaust ventilation: no [Effectiveness Inhal: 0%]

Occupational Health and Safety Management System: Basic

##### Conditions and measures related to personal protection, hygiene and health evaluation

## Sodium Hypochlorite

Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training)  
 [Effectiveness Dermal: 90%]

Respiratory Protection: No [Effectiveness Inhal: 0%]

Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)

### Other conditions affecting workers exposure

Place of use: Indoor

Process temperature (for liquid): ≤ 40 °C

Skin surface potentially exposed: One hand face only (240 cm<sup>2</sup>)

### 8.7.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.062 mg/m <sup>3</sup>	RCR = 0.04
Inhalation, systemic, acute	0.062 mg/m <sup>3</sup>	RCR = 0.02
Inhalation, local, long-term	0.062 mg/m <sup>3</sup>	RCR = 0.04
Inhalation, local, acute	0.062 mg/m <sup>3</sup>	RCR = 0.02
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.002 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.04
Combined routes, systemic, acute		RCR = 0.02

### 8.8. Worker contributing scenario 7: Drum/batch processes, non-dedicated facilities (PROC 8a)

#### 8.8.1. Conditions of use

Product (article) characteristics
Concentration of substance in mixture: 1 – 5 %
Amount used (or contained in articles), frequency and duration of use/exposure
Duration of activity: < 8 hours
Technical and organisational conditions and measures
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: No
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Basic
Conditions and measures related to personal protection, hygiene and health evaluation
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
Other conditions affecting workers exposure
Place of use: Indoor

## Sodium Hypochlorite

 Process temperature (for liquid):  $\leq 40^{\circ}\text{C}$ 

 Skin surface potentially exposed: Two hands (960 cm<sup>2</sup>)

### 8.8.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.062 mg/m <sup>3</sup>	RCR = 0.04
Inhalation, systemic, acute	0.062 mg/m <sup>3</sup>	RCR = 0.02
Inhalation, local, long-term	0.062 mg/m <sup>3</sup>	RCR = 0.04
Inhalation, local, acute	0.062 mg/m <sup>3</sup>	RCR = 0.02
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.02 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.04
Combined routes, systemic, acute		RCR = 0.02

### 8.9. Worker contributing scenario 8: Drum/batch processes, dedicated facilities (PROC 8b)

#### 8.9.1. Conditions of use

<b>Product (article) characteristics</b>
Concentration of substance in mixture: 1 – 5 %
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>
Duration of activity: < 8 hours
<b>Technical and organisational conditions and measures</b>
General ventilation: Basic general ventilation (1-3 air changes per hour)
Containment: Semi-closed process with occasional controlled exposure
Local exhaust ventilation: no [Effectiveness Inhal: 0%]
Occupational Health and Safety Management System: Basic
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>
Dermal Protection: Yes (chemically resistant gloves conforming to EN374 with basic employee training) [Effectiveness Dermal: 90%]
Respiratory Protection: No [Effectiveness Inhal: 0%]
Eye protection: Yes (chemically resistant face shield, goggles or safety glasses with side shields when there is potential for direct contact)
<b>Other conditions affecting workers exposure</b>
Place of use: Indoor
Process temperature (for liquid): $\leq 40^{\circ}\text{C}$
Skin surface potentially exposed: Two hands (960 cm <sup>2</sup> )



**Sodium Hypochlorite****8.9.2. Exposure and risks for workers**

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure Concentration	Risk Characterization Ratio
Inhalation, systemic, long-term	0.062 mg/m <sup>3</sup>	RCR = 0.04
Inhalation, systemic, acute	0.062 mg/m <sup>3</sup>	RCR = 0.02
Inhalation, local, long-term	0.062 mg/m <sup>3</sup>	RCR = 0.04
Inhalation, local, acute	0.062 mg/m <sup>3</sup>	RCR = 0.02
Dermal, systemic, acute		Qualitative (see below)
Dermal, local, long-term	0.02 mg/cm <sup>2</sup>	
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.04
Combined routes, systemic, acute		RCR = 0.02

**8.10. Conclusion on risk characterisation**

The risk management measures required based on the quantitative assessment provides sufficient protection against corrosion and respiratory irritation hazard. Details of the RMMs are given in the Exposure Scenarios. Under these conditions, the risks are considered as controlled.

**8.11. Method of calculation**

TRA Workers 3.0

## Sodium Hypochlorite

### Exposure Scenario 9: Consumer use

Environment contributing scenarios	
Consumer use	ERC 8a, 8b, 8d, 8e
Consumer contributing scenarios	
<b>PC 34:</b> Consumer use of products for textile treatment (dyes, bleaches,..) <b>PC 35:</b> Consumer use of washing and cleaning products. <b>PC 37:</b> Consumer use of products for water treatment. <b>PC 39:</b> Consumer use of cosmetic products <b>PC 28:</b> Consumer use of perfumes/fragrances	

#### 9.1. Environmental contributing scenario 1: Consumer use

##### 9.1.1. Conditions of use

Amount used, frequency and duration of use (or from service life)
European tonnage: 118.57 kt per year in Cl <sub>2</sub> equivalent
Conditions and measures related to treatment of waste (including article waste)
Particular considerations on the waste treatment operations: No (low risk) (ERC based assessment demonstrating control of risk with default conditions. Low risk assumed for waste life stage. Waste disposal according to national/local legislation is sufficient.)
Other Conditions affecting environmental exposure
Municipal STP: Yes [Effectiveness Water: 0.095%]
Discharge rate of STP: >= 2E3 m <sup>3</sup> /d
Application of the STP sludge on agricultural soil: Yes
Receiving surface water flow rate: >= 1.8E4 m <sup>3</sup> /d

##### 9.1.2. Releases

<p>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 the effluent is measured as total residual chlorine (TRC) and is anticipated to be below 1.0E – 13 mg/L.</p> <p>Household wastewater is treated in municipal sewage treatment because of the organic compounds and at the same time any left available chlorine is destroyed.</p>
Conclusion on risk characterisation
<p>The worst-case scenario of exposure concentrations used as PEC at wastewater treatment plant is 1.0E-13mg/L. The PECs for other compartments are not applicable, because sodium hypochlorite is destroyed rapidly in contact with organic as well as inorganic material and furthermore that is a non-volatile substance.</p> <p>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</p>

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wastewater 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.

**9.2. Consumer contributing scenarios****9.2.1. Conditions of use****Contributing exposure scenario controlling consumer exposure for PC****Product characteristics**Concentration:  $\leq 12.5\%$  (normally 3 – 5 %)

Physical state: liquid

Vapour pressure: 2.5 kPa at 20 °C

**Amounts used**

NA

**Frequency and duration of use/exposure**Duration [for contact]:  $< 30$  min. (cleaning and bleaching) to ca. 1 hour (swimming)

Frequency [for one person - cleaning]: 1 job/day, every day

Frequency [for one person - bleaching]: 2 jobs/week (laundry bleaching) and 4/day (spraying)

**Human factors not influenced by risk management**

Consumers may be exposed to formulation when dosing the product into water and to the preparation (cleaning solution; inhalation; dermal, oral). Exposure to the solution predominantly occurs by misuse such poor rinsing, spilling to skin or drinking the cleaning solution.

**Other given operating conditions affecting consumers exposure**Indoor air volume: min. 4 m<sup>3</sup>, degree of ventilation: min. 0.5/h**Conditions and measures related to information and behavioral advice to consumers**

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

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

None

**9.2.2. Exposure and risks for consumers**

For each scenario general public exposure is described. Exposure for general public is relevant in household and drinking water scenarios. The exposure assessment is based on the EU Risk Assessment Report on sodium hypochlorite (2007).

**9.2.2.1. Household use**

Use of sodium hypochlorite in household uses may represent a biocidal use. Biocidal applications are covered under the Biocide Dossier. Exposures were included to represent worst-case scenarios.

The final classification of the product will also depend on the levels of other materials present such as caustic soda and surfactants.

**Dermal Exposure**

The potential dermal exposure was calculated considering the two typical usages of NaClO which could lead to exposure to the substance: hand washing/Laundry pre-treatment and hard surface cleaning. To

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this end, the habits and practice data collected by industry (AISE companies of HERA, <http://www.heraproject.com/Index.cfm>) and included in the updated version of the TGD (Appendix submitted to ECB in 2002) have been used.

The total dermal exposure was estimated assuming 2 laundry bleaching tasks/ week plus 1 hard surface cleaning task / day (both are maximum use data). The total amount of hypochlorite to which the skin may be exposed externally as well as the potential uptake via skin has been determined.

### Inhalation Exposure

The pH of solutions of sodium hypochlorite can range from as low as 9 (diluted) to 13 (concentrated) and as such the dominant species are the hypochlorite anion and hypochlorous acid with the former predominating and the latter giving the typical odour (AISE, 1997). No chlorine is predicted at these pHs. The only occasion when chlorine can be formed is through conditions of misuse by mixing with strong acids.

Some household products designed for hard surface cleaning are formulated as sprays. Such products typically contain 500 ml of a < 5 % sodium hypochlorite solution (Typical conc. 1 - 3 %). Based on industry data, an average product use of 20 g/day in a total of 30 min (0.5 h) spray cleaning time/day is used for this assessment (0.5 h is the total time assumed for 377-003 Sodium hypochlorite 03/07/2015 2.2 CHEMICAL SAFETY REPORT -CHESAR 266 this scenario/day, consisting of several tasks lasting few minutes each).

### Summary of long term exposure for household use

	Laundry bleaching/pre-treatment	Hard surface cleaning
Inhalation	1.68 µg/m <sup>3</sup>	
Dermal	0.035 mg/kg bw/day	0.002 mg/kg/bw/day
Oral	n.a	n.a

#### 9.2.2.2. Drinking water

Use of sodium hypochlorite for drinking water applications may represent a biocidal use. Biocidal applications are covered under the Biocide Dossier.

Assuming a daily per capita consumption of 2 litres by a person weighing 60 kg (the more conservative TGD default - for a female) and that the concentration of admissible available chlorine admissible in the water is 0.1 mg/L in many European countries:

## Sodium Hypochlorite

### Summary of exposure for drinking water

	Drinking water (Adults)	Drinking water (children)
<b>Acute exposure</b>		
Oral	0.0003 mg/kg bw/day	0.0007 mg/kg bw/day
Inhalation	/	/
Dermal	/	/
<b>Long term exposure</b>		
Oral	0.0003 mg/kg bw/day	0.0007 mg/kg bw/day
Inhalation	/	/
Dermal	/	/

### Quantitative risk characterisation for consumers

	Route	Exposure concentrations (EC)	DNEL	Risk characterisation ratio
<b>Long-term - systemic effects</b>	Dermal	---	---	---
	Inhalation	1.68E-03 mg/m <sup>3</sup>	1.55 mg/m <sup>3</sup>	1.08E-04
	Oral	0.003 mg/kg bw/day	0.26 mg/kg bw/day	0.011
<b>Long-term local effects</b>	Dermal	< 0,5 % in mixture (weight basis)	0.5 % in mixture (weight basis)	< 1
	Inhalation	1.68E-03 mg/m <sup>3</sup>	1.55 mg/m <sup>3</sup>	1.08E-04