# EXPOSURE SCENARIO

# SODIUM HYPOCHLORITE

# N. Reg. 01-2119488154-34-0033

| Exposure Scenario List |
|---|
| Use in professional cleaning |
| Use in household cleaning |

Acronymis:
SU: sector of use
PC: chemical product category
AC: article category
PROC: process category
ERC: environmental release category
OC: operative condition

**1. Exposure scenario title: Use in professional cleaning**

| | |
|---|---|
| SU 22 Professional use<br>PC 35 Washing and cleaning products | |
| **Name of the contributing environmental scenario and corresponding ERC** | |
| ERC 8a | Widespread use of non-reactive processing aid (no inclusion into or onto article, indoor) |
| ERC 8b | Widespread use of reactive processing aid (no inclusion into or onto article, indoor) |
| ERC 8d | Widespread use of non-reactive processing aid (no inclusion into or onto article, outdoor). |
| ERC 8e | Widespread use of reactive processing aid (no inclusion into or onto article, outdoor). |
| **Name of the contributing scenarios for the workers and the corresponding PROCs** | |
| PROC 5 | Mixing or blending in batch processes |
| PROC 9 | Transfer of substance or mixture into small containers (dedicated filling line, including weighing) |
| PROC 10 | Roller application or brushing |
| PROC 11 | Non industrial spraying |
| PROC 13 | Treatment of articles by dipping and pouring |
| PROC 15 | Use as laboratory reagent |

**2. Conditions of use affecting exposure**

**2.1 Environment contributing scenario:**

| | |
|---|---|
| Product characteristics | The product is a non-hydrophobic mixture.<br>Sodium hypochlorite is in concentration: <5% (low bioaccumulation potential) |
| European tonnage | 250-450,000 tons per year of sodium hypochlorite solution. |
| Frequency and duration of use | Continuous release.<br>Days of issue: 365 days/year |
| Environmental factors not influenced by risk management | Local dilution factor in fresh water 10<br>Local dilution factor in sea water 100 |
| Operating conditions that affect environmental exposure | Avoid releasing into the environment (surface water or soil) or in wastewater.<br>Sodium hypochlorite, however, proves to disappear from all usage scenarios as a result of rapid reduction in factory effluents or sewage. Therefore, it's not expected to be released into the environment.<br>In the worst case, the free chlorine available in the effluent is measured as total residual chlorine (TRC) and is expected to be less than 1.0 E-13 mg / L. |
| Technical conditions and technical measures at the process (source) to avoid release | Common practices vary between sites and must comply with the Biocides Directive n ° 98/8 / EC. |
| In-situ mechanical conditions and measures to reduce or eliminate drains and releases into the ground | NaClO must be completely reduced to sodium chloride during the process, avoiding critical releases into the environment. |
| Organizational measures for avoid / limit the release from a site | Avoid draining into the environment in accordance with the instructions on the packaging label. |
| Conditions and measures for the municipal waste water treatment plant | Domestic waste water is treated in the municipal sewage treatment system, which leads to the removal of any available chlorine remaining |
| Conditions and Measures Related to | External treatment and disposal of waste must |

| | |
|---|---|
| External waste treatment for the disposal | comply with applicable local and / or national regulations. |

**2.2 Worker contributing scenario**

**Contributing exposure scenario controlling consumer exposure for PROC 5, 9, 10, 11, 13, 15**
GENERAL CONDITIONS APPLICABLE TO ALL ACTIVITIES
G11 - It refers to the proportion of sodium hypochlorite in the product up to 5% (unless stated otherwise).
G2 - It relates to daily exposures up to 8 hours (unless otherwise stated).
OC8 – Internal

Risk management measures and measures related to individual protection, hygiene and evaluation Health: Cross References to the Card. General Risk Management Measures (Evaluation of Qualitative exposure, see additional document 1, concluding section of Extended SDS).

SPECIFIC CONDITIONS APPLICABLE TO ALL ACTIVITIES

| Contributing scenarios | Duration of use | Substance concentration | Risk management measures |
|---|---|---|---|
| PROC 5- Mixing or blending in batch processes | n.s.c. | n.s.c. | Provide a good level of general ventilation. Natural ventilation comes from doors, windows, etc. Air from controlled ventilation is provided or removed with an electric fan [E1]. Process in low containment conditions. |
| PROC 9- Transfer of substance or mixture into small containers (dedicated filling line, including weighing) | n.s.c. | n.s.c. | Provide a good level of general ventilation. Natural ventilation comes from doors, windows, etc. Air from controlled ventilation is provided or removed with an electric fan [E1]. Process in low containment conditions. |
| PROC 10- Roller application or brushing | OC28-Avoid performing activities that involve exposure to more than 4 hours | n.s.c. | Provide a good level of general ventilation. Natural ventilation comes from doors, windows, etc. Air from controlled ventilation is provided or removed with an electric fan [E1]. Process in low containment conditions. |
| PROC 11- Non industrial spraying | OC 27 - Avoid performing activities | n.s.c. | Provide a good level of general ventilation. |

| | | | |
|---|---|---|---|
| | that exhibit exposure beyond 1 hour | | Natural ventilation comes from doors, windows, etc. Air from controlled ventilation is provided or removed with an electric fan [E1]. Process in low containment conditions. |
| PROC 13- Treatment of articles by dipping and pouring | OC28-Avoid performing activities that involve exposure to more than 4 hours | n.s.c. | Provide a good level of general ventilation. Natural ventilation comes from doors, windows, etc. Air from controlled ventilation is provided or removed with an electric fan [E1]. Process in low containment conditions. |
| PROC 15- Use as laboratory reagent | n.s.c. | n.s.c. | Provide a good level of general ventilation. Natural ventilation comes from doors, windows, etc. Air from controlled ventilation is provided or removed with an electric fan [E1]. Process in low containment conditions. |

n.s.c.= no specific condition

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

**3.1 Environment**

EE8 - Qualitative Approach Used to Operate Safe Use (See Additional Document 2 "Quality Assessment - Environment", Concluding section of Extended SDS).

**Predicted Environmental Concentrations (PECs)**
According to the previous qualitative assessment, the concentration of exposure in the worst case, used as PEC, in a wastewater treatment plant is 1.0 E-13 mg / L. PECs for other compartments are not applicable because sodium hypochlorite is rapidly destroyed in contact with organic and inorganic materials and, moreover, it is not a volatile substance.

**Indirect Man Exposure Through the Environment (Oral)**
Hypoclorite does not reach the environment through the wastewater treatment system, since the rapid transformation of the applied hypochlorite (such as available chlorine, FAC) into the wastewater system avoids the man being exposed to this substance. Even in the recreational areas near the chlorinated wastewater discharge points, the potential for exposure to hypochlorite derived from wastewater treatment is negligible, as the unreacted hypochlorite emissions are insubstantial.
Due to the physico-chemical properties of sodium hypochlorite, most likely no exposure occurs indirectly through the human food chain. Therefore, there is probably no indirect exposure to sodium hypochlorite through the environment.

**3.2 – Human exposure**

Used the Advanced Reach Tool (detailed information is available on request).

| Route of exposure | Sodium hypochlorite concentration | | Risk Characterization Report (RCR) | | |
|---|---|---|---|---|---|
| | Value | Unit | inhalation | dermic | combined |
| Long term, local, inhalation PROC5 | 1,00 | mg/m³ | 0,65 | *n.a.* | *n.a* |
| Long term, local, inhalation PROC9 | 1,10 | mg/m³ | 0,71 | *n.a.* | *n.a* |
| Long term, local, inhalation PROC10 | 1,20 | mg/m³ | 0,77 | *n.a.* | *n.a* |
| Long term, local, inhalation PROC11 | 1,00 | mg/m³ | 0,65 | *n.a.* | *n.a* |
| Long term, local, inhalation PROC13 | 1,20 | mg/m³ | 0,77 | *n.a.* | *n.a* |
| Long term, local, inhalation PROC15 | 0,85 | mg/m³ | 0,55 | *n.a.* | *n.a* |

*n.a = non applicable*

**4. Guidance for Downstream Users on how to evaluate whether he works inside the boundaries set by the ES**

The guide is based on assumed operating conditions that may not apply to all sites. Therefore, it is necessary to scale to define appropriate risk management measures specific to the site. If scaling reveals an unsafe use condition (ie RCR> 1), further risk management measures or site-specific chemical safety assessment are required.

**1. Exposure Scene Title: Use in household cleaning**

| | |
|---|---|
| **SU 21** Uses by consumers | |
| **Name of the contributing environmental scenario and corresponding ERC** | |
| ERC 8a<br><br>ERC 8b<br><br>ERC 8d<br><br>ERC 8e | Widespread use of non-reactive processing aid (no inclusion into or onto article, indoor<br>Widespread use of reactive processing aid (no inclusion into or onto article, indoor)<br>Widespread use of non-reactive processing aid (no inclusion into or onto article, outdoor)<br>Widespread use of reactive processing aid (no inclusion into or onto article, outdoor) |
| **Name of the contributing scenarios for the workers and the corresponding PCs** | |
| PC 34<br><br>PC 35<br><br>PC 37 | Textile dyes, and impregnating products<br><br>Washing and cleaning products<br><br>Water treatment chemicals |

**2. Conditions of use affecting exposure**

**2.1 Environment contributing scenario:**

| | |
|---|---|
| Product characteristics | The product is a non-hydrophobic mixture.<br>Sodium hypochlorite is in concentration: <15% (low bioaccumulation potential) |
| European tonnage | 118,57 kt per year in equivalent $Cl_2$. |
| Frequency and duration of use | Continuous release.<br>Days of issue: 365 days/year |
| Environmental factors not influenced by risk management | Local dilution factor in fresh water 10<br>Local dilution factor in sea water 100 |
| Operating conditions that affect environmental exposure | Avoid releasing into the environment (surface water or soil) or in wastewater.<br>Sodium hypochlorite, however, proves to disappear from all usage scenarios as a result of rapid reduction in factory effluents or sewage. Therefore, it's not expected to be released into the environment.<br>In the worst case, the free chlorine available in the effluent is measured as total residual chlorine (TRC) and is expected to be less than 1.0 E-13 mg / L. |
| Technical conditions and technical measures at the process (source) to avoid release | Common practices vary and must comply with the instructions on the packaging labels. |
| In-situ mechanical conditions and measures to reduce or eliminate drains and releases into the ground | Avoid draining into the environment in accordance with the instructions on the packaging label. |
| Conditions and measures for the municipal waste water treatment plant | Domestic waste water is treated in the municipal sewage treatment system, which leads to the removal of any available chlorine remaining after the reaction with organic and inorganic substances present in the waste water, the diluition neutralizes the pH. |
| Conditions and Measures Related to External waste treatment for the disposal | External treatment and disposal of waste must comply with applicable local and / or national regulations. |

**2.2 Costumer contributing scenario**

**Contributing exposure scenario controlling consumer exposure for PC34, 35, 37**

| **Product Characteristic** |
|---|
| Concentration<= 12,5% (typically 3 to 5%)<br>Physical state: liquid<br>Vapour pressure 2,5 kPa at 20°C |
| **Used amount** |
| NA |
| **Frequency and duration of use** |
| Duration [for contact]: < 30 min (cleaning and bleaching)<br>Frequency [for person who cleans]: 2/7 days/week<br>Frequency [for person who bleaches]:1/7 days/week (washing machine) and 4/days (spray application)<br>Taking [oral]: as NaClO 0.003 mg / kg / day for a person of 60 kg and 0.0033 mg / kg / day for children weighing 30 kg. |
| **Human factors not influenced by risk management**<br>Consumers may be exposed to the formulation during the dosing of the product in water and the preparation (detergent solution, inhalation, dermal, oral). Exposure to the solution takes place predominantly through incorrect use, such as insufficient rinsing, swallowing or ingestion of the detergent solution. |
| **Other specific operating conditions affecting consumer exposure** |
| Internal Air Volume: min.4 $m_3$, ventilation speed: min.0.5/hour |
| **Conditions and measures related for Customer Information** |
| Safety notes and applications on the product label and/or the package insert. |
| **Conditions and measures related to personal protection and hygiene** |
| Nothing |

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

**3.1 Environmental**

EE8 – Qualitative approach used to operate a safe use (see additional Document 2 "Qualitative assessment– Environment", concluding section of extended SDS).

**Predicted environmental concentrations (PEC)**

According to the previous qualitative assessment, the concentration of exposure in the worst case, used as a PEC, in a sewage treatment plant is 1,0 e-13 mg/L. The PEC for the other compartments are not applicable, since the sodium hypochlorite is quickly destroyed in contact with organic and inorganic material and, for more, it is not a volatile substance.

**Indirect man exposure through the environment (oral)**

Hypochlorite does not reach the environment through the sewage treatment system, as the rapid transformation of the applied hypochlorite (such as available free chlorine, FAC) in the wastewater system prevents humans from being exposed to this substance. Even in recreational areas located near the drainage points of chlorinated wastewater, the potential for exposure to hypochlorite derived from wastewater treatment is negligible because the non-reacted hypochlorite emissions are inexistent. Because of the physico-chemical properties of sodium hypochlorite, in all probability there is no indirect exposure through the human food chain. Therefore, in all likelihood there is indirect exposure to sodium hypochlorite through the environment.

**3.2 – Human exposure**

Short-term (acute) oral exposure values have been calculated for the relevant scenarios for the use of consumers (water intake). Estimates were based on the most conservative assumptions. The values represent the worst case scenarios. The conclusions of the short-term exposure assessment for consumers are as follows:

| Exposure | Inhalation | | Dermic | | Oral | |
|---|---|---|---|---|---|---|
| | Unit mg/m³ | Method | Unit mg/m³ | Method | Unit mg/kg body weight | Method |
| Water Intake (adult) | - | - | - | - | 0,0003 | calculated |
| Water intake (child 10 year old) | - | - | - | - | 0,0007 | calculated |

*n.a = non applicable*

Short and long term exposure values for consumer use have been calculated for all relevant scenarios. The inhalation route was not relevant to any of the scenarios. The highest exposure values were obtained for the water absorption scenario resulting in an oral exposure of 0.0007 mg / kg / body weight and a total exposure of 0.012 mg / kg body weight (0.011 as $Cl_2$ disp.). The total value is calculated by assuming 2 L per day. The table below shows a summary of the concentrations for long-term exposure of consumers for all relevant exposure scenarios. The estimates were based on the most conservative hypotheses. Values are therefore the worst case scenarios. Conclusions of the consumer exposure assessment for sodium hypochlorite:

| | Inhalation | | Dermic | | Oral | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Unit mg/m³/ g | Method | Unit mg/kg/ g | Method | Unit mg/kg/ g | Method | Unit mg/kg body/weight/ day | justification |
| Total domestic use | | | | | | | 0,037 (0,035 as $Cl_2$ free) | EASE |
| Bleaching in washing machine/ pretreatment | - | - | 0,002 | EASE/ calculated | - | - | 0,002 | EASE |
| Hard surface cleaning | - | - | 0,035 | EASE/ calculated | - | - | 0,035 | EASE |
| Inhalation exposure | 0,00168 | EASE calculated | - | - | - | - | 3,05E-06 | EASE |

For consumers, the highest long-term exposure concentrations have been calculated for domestic cleaning of hard surfaces with dermal exposure of 0.002 mg / kg body weight / day and 0.035 mg / m3 / day and an inhalation exposure of 3,05E-06 mg / kg body weight / day, resulting in a combined total exposure of 0.037 mg / kg body weight per day

**4- User guide downstream to assess whether it works within the limits set by the exposure scenario**

Non applicable.

**ADDITIONAL DOCUMENTS TO THE eSDS (for all exposure scenarios)**

**ADDITIONAL DOCUMENT 1 - Qualitative assessment - Human health (for all Exposure scenarios)**

**Link to the qualitative exposure assessment for the R34 classified substance (Cause burns) and R37**
**(Irritating to the respiratory system), or H314 (H314:Causes severe skin burns and eye damage) and H335 (May cause respiratory irritation).**

In the absence of dose-response data related to corrosivity (R34 or H314) and respiratory tract irritation (R37 or H335), in accordance with REACH Guidance on information requirements and chemical safety assessment Chapter R.8 (R8.6) a qualitative approach was used to evaluate the exposure to corrosive substances . Exposure must therefore be minimized using the following general risk management measures (ECHA Part E, Table E.3-1). When these risk digestion measures and operating conditions are applied, the risk of exposure to a corrosive and irritant substance for the respiratory system is checked.

**Tab. General risk management measures for R34 and R37, or H314 and H335 (ECHA Part E - Table E3-1)**

| **Risk Management Measures and Operating Conditions** | |
|---|---|
| **General** | **Protection Devices** |
| - Containment as appropriate;<br>- Reducing the number of exposed staff;<br>- Segregation of issuing processes;<br>- Effective extraction of the contaminant;<br>- Good level of general ventilation;<br>- Minimization of manual steps;<br>- Avoid contact with contaminated tools and objects;<br>- Regular cleaning of the equipment and work area;<br>- On-site management / supervision to verify that activated RMMs are used correctly and that operational<br>conditions (OCs) are followed;<br>- Staff training on good practices;<br>- Good personal hygiene level. | - Gloves suitable for substance / occupation;<br>- Skin cover with appropriate barrier material, based on the potential for contact with chemicals;<br>- Appropriate respirator for substance or occupation;<br>- Optional facial screen;<br>- Eye protection. |

**ADDITIONAL DOCUMENT 2 - Qualitative assessment - Environment (for all Exposure scenarios)**

**Aquatic compartment**

Hypochlorite emissions in the environment from production processes are minimal. Generally, free available chlorine (FAC) in effluents is measured as total residual chlorine (TRC), but it is not possible to distinguish how much this TRC value in the final effluent is related to the hypochlorite or to other oxidizing compounds present in the same effluent . TRC is the sum of available free chlorine (HOCl, FAC) and available chlorine (RH2Cl, CAC). For sites that reported the TRC levels in the effluent and information on the dilution factor for receiving surface water, initial local experimental PEC values of <0.000006 to 0.07 mg / L were measured.

TRC values, however, have been considered not applicable: in fact, following the immediate reaction after coming into contact with oxidizing matter in the receiving water, any free available chlorine will be eliminated after discharge, With deterioration rates increasing with the concentrations discharged. Therefore, measured TRC values are not directly applicable for the evaluation of hypochlorite exposure. Instead of using modeled measured TRC values, FAC values for predicted environmental concentrations (PECs) were used. Virtually no hypochlorite / hypochlorite acid (below 10-35 mg / L as FAC, Vandepitte and Schowanek, 2007) in sewerage after one hour, after the disposal of a bottle of pure bleach in sewer.

No hypochlorous / hypochlorite acidification is expected during the treatment of wastewater. The estimated FAC concentration at the end of sewage was reasonably estimated as negligible, with PEC values in the worst case of 1.0 E-13 mg / L (Vandepitte and Schowanek, 2007). (NB: these estimated concentrations involve a wide margin of uncertainty, but in this case are considerably lower than the PNEC aquatic).

Although the rates of deterioration of the hypochlorine in the river and marine environments are lower than the waste water treatment plants, it is considered that the PEC values for the FAC for direct emissions do not differ significantly from the worst case estimate. Since hypochlorite is quickly destroyed in contact with both organic and inorganic material, no exposure to sediment is expected.

**Terrestrial compartment (including Secondary Poisoning)**

Possible routes of exposure to HOCl are through contaminated sludge or by direct application of chlorinated water. How can you calculate with the Vandepitte and Schowanek model (for larger Information refer to the European risk assessment of sodium hypochlorite), 1997, is clear That the HOCl concentrations available in domestic waste are completely eliminated in the system Sewage system before entering the active sludge system. In addition, HOCl is a highly soluble molecule that It is hardly absorbed into the active mud. There is therefore no evidence that HOCl has the potential for contaminate active mud. As a result, soil contamination can be excluded due to discharges containing mud contaminated by HOCl. It is unlikely that exposure to secondary poisoning with hypochlorite is likely, since this is rapidly destroyed in contact with organic and inorganic species.

**Atmospheric compartment**

Hypochlorite solutions are not volatile, so there is no significant leakage potential in the air.

In addition, methods for determining the effects of chemical products on species resulting from atmospheric contamination have not yet been completely developed, with the exception of mammalian inoculation studies. The methodology used to assess the hazard (and, consequently, the risk characterization) of chemicals in water and soil can not be applied to the atmosphere (ECHA CSA Part B, 2008).