



PRODUCT: CAUSTIC SODA PEARL (CSP (CASO)) REVISION: 4 DATED: 05/07/17 PAGE 1 OF 7

PRODUCT SPECIFICATION

Product Name	Caustic Soda Pearl
Alternative Name	Sodium Hydroxide
Specification Reference	CASO/2 (02/09/IH)

SALES SPECIFICATION

Property	Unit	Value
Appearance		White deliquescent spheres
NaOH	min% w/w	98.0
Na ₂ CO ₃	max % w/w	0.5
NaCl	max % w/w	0.2
Fe ₂ O ₃	max % w/w	0.001

NOTES

Exclusion of Liability

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Health and Safety

A Material Safety Data Sheet has been issued describing the health, safety and environmental properties of this product, identifying the potential hazards and giving advice on the handling precautions and emergency procedures. This must be consulted fully before handling, storage and use.



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SAFETY DATA SHEET

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND COMPANY/UNDERTAKING

1.1 Product Identifier

Product Name	Caustic Soda Pearl
Chemical Name	Sodium Hydroxide.
Alternative Name	Sodium Hydrate
Molecular Formula	NaOH
REACH Registration Number	01-2119457892-27-XXXX
CAS Number	1310-73-2

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

Use of the Substance/Mixture

Reagent
pH-regulating agents
Ion exchange resins regenerating agent
Catalyst
Etching agent
Cleaning agent
Chemical intermediate
Chemical manufacture and processing
pH control

Recommended restrictions on use

None anticipated

1.3 Details of the supplier of the safety data sheet

Tennants Distribution Limited
Hazelbottom Road
Cheetham
Manchester
M8 0GR
Tel: 44(0)161 205 4454
Fax: 44(0) 161 203 4298
Email: msds@tennantsdistribution.com

1.4 Emergency telephone number

Tel: 44(0)844 335 0001 (24 hours)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008

Corrosive to metals, Category 1, H290
Skin corrosion, Category 1A, H314

For the full text of the H-Statements mention in this Section, see Section 16.

2.2. Label Elements

Hazardous component: Sodium hydroxide

Hazard Pictogram



Signal Word: Danger

Hazard Statements

H314: Causes severe skin burns and eye damage.
H290: May be corrosive to metal

Precautionary statement(s)

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



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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. Remove contact lenses, if present and easy to do. Continue rinsing.
P310: Immediately call a POISON CENTER or doctor/physician.

2.3 Other hazards

None known.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Hazardous ingredient(s)	%(w/w)	CAS No.	EC No.	Index No.	REACH Reg. No.
Sodium Hydroxide	>=99%	1310-73-2	215-185-5	011-002-00-6	01-2119457892-27-XXXX

4. FIRST AID MEASURES

4.1 Description of first aid measures

If inhaled

Move to fresh air. Oxygen or artificial respiration if needed. Victim to lie down in the recovery position, cover and keep him warm. Call a physician immediately.

In case of skin contact

Take off contaminated clothing and shoes immediately. Wash off immediately with plenty of water. Keep warm and in a quiet place. Call a physician or poison control centre immediately. Wash contaminated clothing before re-use.

In case of eye contact

Call a physician or poison control centre immediately. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. In the case of difficulty of opening the lids, administer an analgesic eye wash (oxybuprocaine). Take victim immediately to hospital.

If swallowed

Call a physician or poison control centre immediately. Take victim immediately to hospital. If swallowed, rinse mouth with water (only if the person is conscious). Do NOT induce vomiting. Artificial respiration and/or oxygen may be necessary.

4.2 Most important symptoms and effects, both acute and delayed

Inhalation

Corrosive to respiratory system. Symptoms: Breathing difficulties, Cough, chemical pneumonitis, pulmonary oedema
Repeated or prolonged exposure: Risk of sore throat, nose bleeds, chronic bronchitis

Skin contact

Corrosive. Causes severe burns. Symptoms: Redness, Swelling of tissue

Eye contact

Causes severe burns.

Small amounts splashed into eyes can cause irreversible tissue damage and blindness. May cause permanent eye injury.
Symptoms: Redness, Lachrymation, Swelling of tissue, Burn

Ingestion

If ingested, severe burns of the mouth and throat, as well as a danger of perforation of the oesophagus and the stomach.
Symptoms: Nausea, Abdominal pain, Bloody vomiting, Diarrhoea, Suffocation, Cough, Severe shortness of breath

4.3 Indication of any immediate medical attention and special treatment needed

Take victim immediately to hospital. Immediate medical attention is required. Consult with an ophthalmologist immediately in all cases. Burns must be treated by a physician. If swallowed Avoid gastric lavage (risk of perforation). Keep under medical supervision for at least 48 hours.

5. FIRE FIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Unsuitable extinguishing media

Water may be ineffective.

5.2 Special hazards arising from the substance or mixture

The product is not flammable. Not combustible. Reacts violently with water. Gives off hydrogen by reaction with metals.

5.3 Advice for fire-fighters



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In the event of fire, wear self-contained breathing apparatus. Use personal protective equipment. Wear chemical resistant oversuit. Cool containers/tanks with water spray. Prevent fire extinguishing water from contaminating surface water or the ground water system.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel

Prevent further leakage or spillage if safe to do so. Keep away from Incompatible products.

Advice for emergency personnel

Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Ventilate the area. Wear suitable protective clothing.

6.2 Environmental precautions

Should not be released into the environment. Do not flush into surface water or sanitary sewer system. If the product contaminates rivers and lakes or drains inform respective authorities.

6.3 Methods and materials for containment and cleaning up

Sweep up and shovel into suitable containers for disposal. Avoid dust formation. Keep in properly labelled containers. Keep in suitable, closed containers for disposal. Treat recovered material as described in the section "Disposal considerations".

Further information

Spillages or uncontrolled discharges into watercourses must be IMMEDIATELY alerted to the Environment Agency or other appropriate regulatory body.

6.4 Reference to other sections

Refer to protective measures listed in sections 7 and 8.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Use in closed system. When diluting, always add the product to water. Never add water to the product. Use only equipment and materials which are compatible with the product. Keep away from Incompatible products.

To avoid thermal decomposition, do not overheat. Preferably transfer by pump or gravity.

7.2 Conditions for safe storage, including any incompatibilities

Storage

Store in original container. Keep in a well-ventilated place. Keep in a dry place. Keep in properly labelled containers. Keep container closed. Avoid dust formation. Keep away from incompatible products.

Packaging materials

Suitable: Stainless steel. Polyethylene. Paper + PE.

Unsuitable: No data available

7.3 Specific end uses

Specific use(s)

No further information available.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control parameters

Exposure limit values: Sodium Hydroxide

UK. EH40 Workplace Exposure Limits (WELs) 12 2011: Short term exposure limit = 2 mg/m³.

US. ACGIH Threshold Limit Values 03 2013: Ceiling Limit Value = 2 mg/m³

Derived No Effect Level/Derived minimal effect level

Workers, Inhalation, Long-term exposure, 1 mg/m³, Local effects

Consumers, Inhalation, Long-term exposure, 1 mg/m³, Local effects

8.2 Exposure controls

Appropriate engineering controls

Ensure adequate ventilation. Apply technical measures to comply with the occupational exposure limits.

Respiratory protection

In the case of dust or aerosol formation use respirator with an approved filter. Recommended Filter type: P2

Hand protection

Impervious gloves. Suitable material: PVC, Neoprene, Natural Rubber, butyl-rubber Unsuitable material: Leather

Eye protection

Chemical resistant goggles must be worn.

Skin and body protection

Chemical resistant apron. Apron/boots of PVC, neoprene in case of dusts.

Hygiene measures

Eye wash bottles or eye wash stations in compliance with applicable standards. Take off contaminated clothing and shoes immediately. Handle in accordance with good industrial hygiene and safety practice.



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Environmental exposure controls

Dispose of rinse water in accordance with local and national regulations.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	Solid form, crystalline, strongly hygroscopic, flakes, bales, micro granules
Colour	White
Odour	Odourless
Molecular weight	40.01 g/mol
pH	> 13
pKa	No data
Melting point/freezing point	318.4 °C, Pressure: 101.3 kPa
Boiling point/boiling range	1,388 °C, Pressure: 101.3 kPa
Flash point	Not applicable
Evaporation rate	Not applicable
Flammability (solid, gas)	The product is not flammable.
Flammability	Not applicable
Explosive properties	Not explosive, See section 10.
Vapour pressure	1 hPa, at 739°C
Vapour density	No data available
Relative density	2.13, at 20°C
Bulk density	1.14 kg/m ³ , at 20°C
Solubility(ies)	420 g/l, Water, at 0°C 1,100 g/l, Water, at 20°C 3,470 g/l, Water, at 100°C
Solubility/qualitative	Soluble, Alcohol (Glycerol)
Partition coefficient: n- octanol/water	No data
Auto-ignition temperature	No data available
Decomposition temperature	No data available
Viscosity	Not applicable
Oxidizing properties	Non oxidizer
9.2 Other information	
Granulometry	0.8mm, mean diameter

10 STABILITY AND REACTIVITY

10.1 Reactivity

Potential for exothermic hazard. May be corrosive to metals.

10.2 Chemical stability

Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

Gives off hydrogen by reaction with metals. Exothermic reaction with strong acids. Risk of violent reaction.

Risk of explosion.

Reacts violently with water.

10.4 Conditions to avoid

Keep away from direct sunlight. To avoid thermal decomposition, do not overheat. Exposure to moisture freezing

10.5 Incompatible materials

Metals, Oxidizing agents, Water, Acids, Aluminium, other light metals and their alloys

10.6 Hazardous decomposition products

Hydrogen

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

Acute Oral Toxicity

No data available

Acute Inhalation Toxicity

No data available

Acute Dermal Toxicity

No data available

Skin Corrosion/Irritation

Corrosive

Serious Eye Damage/Irritation



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Corrosive

Respiratory or skin sensitisation

No observed effect

Germ Cell Mutagenicity

Animal testing did not show any mutagenic effects., In vitro tests did not show mutagenic effects

Carcinogenicity

No data available

Reproductive toxicity

Effect on fertility, foetotoxic effect, no observed effect

Specific target organ toxicity - single exposure

Inhalation, Remarks: Corrosive

Oral, Remarks: Corrosive

Dermal, Remarks: Corrosive

Specific target organ toxicity - repeated exposure

Remarks: Not applicable

Aspiration hazard

No data available

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Fishes, various species, LC50, 96 h, 35 - 189 mg/l

Crustaceans, Ceriodaphnia sp., EC50, 48 h, 40.4 mg/l

12.2 Persistence and degradability

Abiotic degradation

Air. Result: neutralization by natural alkalinity

Water. Result: ionization/neutralisation

Conditions: pH

Soil. Result: ionization/neutralisation

12.3 Bioaccumulative potential

Not relevant

12.4 Mobility in soil

Water, soil/sediments

Considerable solubility and mobility

Soil

soluble, mobile, ionization/neutralization

Air

Chemical degradation

12.5 Results of PBT and vPvB assessment

This substance is not considered to be persistent, bioaccumulating and toxic (PBT).

This substance is not considered to be very persistent and very bioaccumulating (vPvB).

12.6 Other adverse effects

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Dilute with plenty of water. Solutions with high pH-value must be neutralized before discharge. Neutralise with acid. In accordance with local and national regulations.

Contaminated packaging

Where possible recycling is preferred to disposal or incineration. Clean container with water. Dispose of as unused product. In accordance with local and national regulations.

14. TRANSPORT INFORMATION

Road/Rail

UN No.	1823
Proper Shipping Name	SODIUM HYDROXIDE, SOLID
ADR/RID Class	8
Packing Group	II
Label.	8 – Corrosive
HIN No.	80
Tunnel Restriction Code	(E)

Sea

UN No.	1823
Proper Shipping Name	SODIUM HYDROXIDE, SOLID



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IMDG Class	8
Packing Group	II
Label.	8 - Corrosive
Marine Pollutant	Not classified as a Marine Pollutant
Air (ICAO/IATA)	
UN No.	1823
Proper Shipping Name	SODIUM HYDROXIDE, SOLID
ICAO-TI Class	8
Packing Group	II
Label.	8 - Corrosive

15. REGULATORY INFORMATION

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture
 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), as amended
 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, as amended
 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, as amended
 Commission Directive 2000/39/EC of 8 June 2000 establishing a first list of indicative occupational exposure limit values in implementation of Council Directive 98/24/EC on the protection of the health and safety of workers from the risks related to chemical agents at work, as amended
 Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste
 The List of Wastes (Wales) Regulations 2005. 2005 Welsh Statutory Instrument (WSI), number W.148 (1820), 14 July 2005
 The List of Wastes (England) Regulations 2005. 2005 Statutory Instrument (SI), number 895, 6 April 2005, as amended
 EH40/2005. Workplace Exposure Limits, as amended through 1,10, 2007 (WELs) Published by the Health and Safety Executive (HSE). Issued under the Control of Substances Hazardous to Health Regulations - as amended

Inventory Status

Inventory Information	Status
USA. Toxic Substances Control Act (TSCA)	In compliance with inventory
Australia. Inventory of Chemical Substances (AICS)	In compliance with inventory
Canada. Domestic Substances List (DSL)	In compliance with inventory
Korea. Existing Chemicals Inventory (KECI (KR))	In compliance with inventory
EU list of existing chemical substances (EINECS)	In compliance with inventory
Japan. Inventory of Existing & New Chemical Substances (ENCS)	In compliance with inventory
China. Inventory of Existing Chemical Substances (IECSC)	In compliance with inventory
Philippine. Inventory of Chemicals and Chemical Substances (PICCS)	In compliance with inventory
New Zealand. Inventory of Chemicals (NZIOC)	In compliance with inventory
Mexico INSQ (INSQ)	In compliance with inventory

15.2 Chemical Safety Assessment

A Chemical Safety Assessment (CSA) has been completed for this substance.

16. OTHER INFORMATION

Modification since last revision

The Safety Data has been revised throughout in accordance with current information.

Revision Date: 05/07/17

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Exposure Scenario 1: Manufacturing of liquid NaOH	
<i>List of all use descriptors</i>	
Sector of use (SU):	SU 3, 8 Manufacture of bulk, large-scale substances
Product category (PC):	not applicable
Process category (PROC):	PROC1 Use in closed process, no likelihood of exposure PROC2 Use in closed, continuous process with occasional controlled exposure PROC3 Use in closed batch process (synthesis or formulation) PROC4 Use in batch and other process (synthesis) where opportunity for exposure arises PROC8a/b Transfer of chemicals from/to vessels/large containers at (non)dedicated facilities PROC9 Transfer of chemicals into small containers (dedicated filling line)
Article category (AC):	not applicable
Environmental Release Category (ERC):	ERC1 Manufacture of substances
<i>EU Risk Assessment</i>	
An EU risk assessment has been performed based on the Existing Substances Regulation (Council Regulation 793/93). A comprehensive risk assessment report has been finalised in 2007 and is available via internet: http://ecb.jrc.ec.europa.eu/DOCUMENTS/Existing-Chemicals/RISK_ASSESSMENT/REPORT/sodiumhydroxidereport416.pdf	
Contributing exposure scenario controlling environmental exposure	
Product characteristics	
Liquid NaOH, all concentrations	
Frequency and duration of use	
Continuous	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Risk management measures related to the environment aim to avoid discharging NaOH solutions into municipal wastewater or to surface water, in case such discharges are expected to cause significant pH changes. Regular control of the pH value during introduction into open waters is required. In general discharges should be carried out such that pH changes in receiving surface waters are minimised. In general most aquatic organisms can tolerate pH values in the range of 6-9. This is also reflected in the description of standard OECD tests with aquatic organisms.	
Conditions and measures related to external treatment or recovery of waste for disposal	
Liquid NaOH waste should be reused or discharged to the industrial wastewater and further neutralized if needed.	
Contributing exposure scenario controlling worker exposure	
Product characteristic	
Liquid NaOH, all concentrations	
Frequency and duration of use/exposure	
8 hours/day, 200 days/year	
Technical conditions and measures at process level (source) to prevent release	
Replacing, where appropriated, manual processes by automated and/or closed processes. This would avoid irritating mists, sprayings and subsequent potential splashes: <ul style="list-style-type: none"> • Use closed systems or covering of open containers (e.g. screens) • Transport over pipes, technical barrel filling/emptying of barrel with automatic systems (suction pumps etc.) • Use of pliers, grip arms with long handles with manual use "to avoid direct contact and exposure by splashes (no working over one's head)" 	
Technical conditions and measures to control dispersion from source towards the worker	
Local exhaust ventilation and/or general ventilation is good practice	
Organisational measures to prevent /limit releases, dispersion and exposure	
<ul style="list-style-type: none"> • Workers in the risky process/areas identified should be trained a) to avoid to work without respiratory protection and b) to understand the corrosive properties and, especially, the respiratory inhalation effects of sodium hydroxide and c) to follow the safer procedures instructed by the employer. • The employer has also to ascertain that the required PPE is available and used according to instructions 	
Conditions and measures related to personal protection, hygiene and health evaluation	
<ul style="list-style-type: none"> • Respiratory protection: In case of dust or aerosol formation (e.g. spraying): use respiratory protection with approved filter (P2) • Hand protection: impervious chemical resistant protective gloves <ul style="list-style-type: none"> ○ material: butyl-rubber, PVC, polychloroprene with natural latex liner, material thickness: 0.5 mm, breakthrough time: > 480 min 	

- material: nitrile-rubber, fluorinated rubber, material thickness: 0.35-0.4 mm, breakthrough time: > 480 min
- Eye protection: chemical resistant goggles must be worn. If splashes are likely to occur, wear tightly fitting safety goggles, face – shield
- Wear suitable protective clothing, aprons, shield and suits, if splashes are likely to occur, wear: rubber or plastic boots, rubber or plastic boots

Exposure estimation and reference to its source

Worker exposure:

NaOH is a corrosive substance. For the handling of corrosive substances and formulations, immediate dermal contacts occur only occasionally and it is assumed that repeated daily dermal exposure can be neglected. Therefore, dermal exposure to NaOH was not quantified.

NaOH is not expected to be systemically available in the body under normal handling and use conditions and therefore systemic effects of NaOH after dermal or inhalation exposure are not expected to occur.

Based on NaOH measurements and following the proposed risk management measures controlling worker exposure, the reasonable worst-case inhalation exposure of 0.33 mg/m³ (typical value is 0.14 mg/m³) is below the DNEL of 1 mg/m³.

Environmental exposure:

The aquatic effect and risk assessment only deals with the effect on organisms/ecosystems due to possible pH changes related to OH⁻ discharges, as the toxicity of the Na⁺ ion is expected to be insignificant compared to the (potential) pH effect. The high water solubility and very low vapour pressure indicate that NaOH will be found predominantly in water. When the risk management measures related to the environment are implemented, there is no exposure to the activated sludge of a sewage treatment plant and there is no exposure of the receiving surface water.

The sediment compartment is not considered, because it is not considered relevant for NaOH. If emitted to the aquatic compartment, sorption to sediment particles will be negligible.

Significant emissions to air are not expected due to the very low vapour pressure of NaOH. If emitted to air as an aerosol in water, NaOH will be rapidly neutralised as a result of its reaction with CO₂ (or other acids).

Significant emissions to the terrestrial environment are not expected either. The sludge application route is not relevant for the emission to agricultural soil, as no sorption of NaOH to particulate matter will occur in STPs/WWTPs. If emitted to soil, sorption to soil particles will be negligible. Depending on the buffer capacity of the soil, OH⁻ will be neutralised in the soil pore water or the pH may increase.

Bioaccumulation will not occur.

Exposure Scenario 2: Manufacturing of solid NaOH

List of all use descriptors

Sector of use (SU):	SU 3, 8 Manufacture of bulk, large-scale substances
Product category (PC):	not applicable
Process category (PROC):	PROC1 Use in closed process, no likelihood of exposure PROC2 Use in closed, continuous process with occasional controlled exposure PROC3 Use in closed batch process (synthesis or formulation) PROC4 Use in batch and other process (synthesis) where opportunity for exposure arises PROC8a/b Transfer of chemicals from/to vessels/large containers at (non)dedicated facilities PROC9 Transfer of chemicals into small containers (dedicated filling line)
Article category (AC):	not applicable
Environmental Release	
Category (ERC):	ERC1 Manufacture of substances

EU Risk Assessment

An EU risk assessment has been performed based on the Existing Substances Regulation (Council Regulation 793/93). A comprehensive risk assessment report has been finalised in 2007 and is available via internet:

http://ecb.jrc.ec.europa.eu/DOCUMENTS/Existing-Chemicals/RISK_ASSESSMENT/REPORT/sodiumhydroxidereport416.pdf

Contributing exposure scenario controlling environmental exposure

Product characteristics

Solid NaOH

Frequency and duration of use

Continuous

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

Risk management measures related to the environment aim to avoid discharging NaOH solutions into municipal wastewater or to surface water, in case such discharges are expected to cause significant pH changes. Regular control of the pH value during introduction into open waters is required. In general discharges should be carried out such that pH changes in receiving surface waters are minimised. In general most aquatic organisms can tolerate pH values in the range of 6-9. This is also reflected in the description of standard OECD tests with aquatic organisms.

Conditions and measures related to external treatment or recovery of waste for disposal

There is no solid waste of NaOH. Liquid NaOH waste should be reused or discharged to the industrial wastewater and further neutralized if needed.

Contributing exposure scenario controlling worker exposure

Product characteristic

Solid NaOH, all concentrations

Frequency and duration of use/exposure

8 hours/day, 200 days/year

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

Replacing, where appropriated, manual processes by automated and/or closed processes. This would avoid irritating mists, sprayings and subsequent potential splashes:

- Use closed systems or covering of open containers (e.g. screens)
- Transport over pipes, technical barrel filling/emptying of barrel with automatic systems (suction pumps etc.)
- Use of pliers, grip arms with long handles with manual use "to avoid direct contact and exposure by splashes (no working over one's head)"

Technical conditions and measures to control dispersion from source towards the worker

Local exhaust ventilation and/or general ventilation is good practice

Organisational measures to prevent /limit releases, dispersion and exposure

- Workers in the risky process/areas identified should be trained a) to avoid to work without respiratory protection and b) to understand the corrosive properties and, especially, the respiratory inhalation effects of sodium hydroxide and c) to follow the safer procedures instructed by the employer.
- The employer has also to ascertain that the required PPE is available and used according to instructions

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

- Respiratory protection: In case of dust or aerosol formation (e.g. spraying): use respiratory protection with approved filter (P2)
- Hand protection: impervious chemical resistant protective gloves
 - material: butyl-rubber, PVC, polychloroprene with natural latex liner, material thickness: 0.5 mm, breakthrough time: > 480 min
 - material: nitrile-rubber, fluorinated rubber, material thickness: 0.35-0.4 mm, breakthrough time: > 480 min
- Eye protection: chemical resistant goggles must be worn. If splashes are likely to occur, wear tightly fitting safety goggles, face – shield
- Wear suitable protective clothing, aprons, shield and suits, if splashes are likely to occur, wear: rubber or plastic boots, rubber or plastic boots

Exposure estimation and reference to its source

Worker exposure:

NaOH is a corrosive substance. For the handling of corrosive substances and formulations, immediate dermal contacts occur only occasionally and it is assumed that repeated daily dermal exposure can be neglected. Therefore, dermal exposure to NaOH was not quantified.

NaOH is not expected to be systemically available in the body under normal handling and use conditions and therefore systemic effects of NaOH after dermal or inhalation exposure are not expected to occur.

Based on NaOH measurements and following the proposed risk management measures controlling worker exposure, the reasonable worst-case inhalation exposure of 0.26 mg/m^3 (measured at the drumming/bagging place) is below the DNEL of 1 mg/m^3 .

Environmental exposure:

The aquatic effect and risk assessment only deals with the effect on organisms/ecosystems due to possible pH changes related to OH^- discharges, as the toxicity of the Na^+ ion is expected to be insignificant compared to the (potential) pH effect. The high water solubility and very low vapour pressure indicate that NaOH will be found predominantly in water. When the risk management measures related to the environment are implemented, there is no exposure to the activated sludge of a sewage treatment plant and there is not exposure of the receiving surface water.

The sediment compartment is not considered, because it is not considered relevant for NaOH. If emitted to the aquatic compartment, sorption to sediment particles will be negligible.

Significant emissions to air are not expected due to the very low vapour pressure of NaOH. If emitted to air as an aerosol in water, NaOH will be rapidly neutralised as a result of its reaction with CO_2 (or other acids).

Significant emissions to the terrestrial environment are not expected either. The sludge application route is not relevant for the emission to agricultural soil, as no sorption of NaOH to particulate matter will occur in STPs/WWTPs. If emitted to soil, sorption to soil particles will be negligible. Depending on the buffer capacity of the soil, OH^- will be neutralised in the soil pore water or the pH may increase.

Bioaccumulation will not occur.

Exposure Scenario 3: Industrial and Professional Use of NaOH

List of all use descriptors

Sector of use (SU): SU 1-24

Because sodium hydroxide has so many uses and is used so widely it can potentially be used in all sectors of end use (SU) described by the use descriptor system (SU 1-24). NaOH is used for different purposes in a variety of industrial sectors.

Product category (PC): PC 0-40

Sodium hydroxide can be used in many different chemical product categories (PC). It can be used for example as an adsorbent (PC2), metal surface treatment product (PC14), non-metal-surface treatment product (PC15), intermediate (PC19), pH regulator (PC20), laboratory chemical (PC21), cleaning product (PC35), water softener (PC36), water treatment chemical (PC37) or extraction agent. However, it could potentially also be used in other chemical product categories (PC 0 – 40).

Process category (PROC): PROC1 Use in closed process, no likelihood of exposure
PROC2 Use in closed, continuous process with occasional controlled exposure
PROC3 Use in closed batch process (synthesis or formulation)
PROC4 Use in batch and other process (synthesis) where opportunity for exposure arises
PROC5 Mixing or blending in batch processes (multistage and/or significant contact)
PROC8a/b Transfer of chemicals from/to vessels/large containers at (non)dedicated facilities
PROC9 Transfer of chemicals into small containers (dedicated filling line)
PROC10 Roller application or brushing
PROC11 Non industrial spraying
PROC13 Treatment of articles by dipping and pouring
PROC15 Use of laboratory reagents in small scale laboratories

The process categories mentioned above are assumed to be the most important ones but other process categories could also be possible (PROC 1 – 27).

Article category (AC): not applicable

Although sodium hydroxide can be used during the manufacturing process of articles, the substance is not expected to be present in the article. The article categories (AC) do not seem applicable for sodium hydroxide.

Environmental Release

Category (ERC): ERC1 Manufacture of substances
ERC2 Formulation of preparations
ERC4 Industrial use of processing aids in processes and products, not becoming part of articles
ERC6A Industrial use resulting in manufacture of another substance (use of intermediates)
ERC6B Industrial use of reactive processing aids
ERC7 Industrial use of substances in closed systems
ERC8A Wide dispersive indoor use of processing aids in open systems
ERC8B Wide dispersive indoor use of reactive substances in open systems
ERC8D Wide dispersive outdoor use of processing aids in open systems
ERC9A Wide dispersive indoor use of substances in closed systems

The environmental release categories mentioned above are assumed to be the most important ones but other industrial environmental release categories could also be possible (ERC 1 – 12).

Further explanations

Typical uses include: production of organic and inorganic chemicals, formulation of chemicals, production and whitening of paper pulp, production of aluminium and other metals, food industry, water treatment, production of textiles, professional end use of formulated products and other industrial uses.

EU Risk Assessment

An EU risk assessment has been performed based on the Existing Substances Regulation (Council Regulation 793/93). A comprehensive risk assessment report has been finalised in 2007 and is available via internet:

http://ecb.jrc.ec.europa.eu/DOCUMENTS/Existing-Chemicals/RISK_ASSESSMENT/REPORT/sodiumhydroxidereport416.pdf

Contributing exposure scenario controlling environmental exposure

Product characteristics

Solid or liquid NaOH, all concentrations (0-100%), if solid: low dustiness class

Frequency and duration of use

Continuous

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

Risk management measures related to the environment aim to avoid discharging NaOH solutions into municipal wastewater or to surface water, in case such discharges are expected to cause significant pH changes. Regular control of the pH value during introduction into open waters is required. In general discharges should be carried out such that pH changes in receiving surface waters are minimised. In general most aquatic organisms can tolerate pH values in the range of 6-9. This is also reflected in the description of standard OECD tests with aquatic organisms.

Conditions and measures related to external treatment or recovery of waste for disposal

There is no solid waste of NaOH. Liquid NaOH waste should be reused or discharged to the industrial wastewater and further neutralized if needed.

Contributing exposure scenario controlling worker exposure

Product characteristic

Solid or liquid NaOH, all concentrations (0-100%), if solid: low dustiness class

Frequency and duration of use/exposure

8 hours/day, 200 days/year

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

For worker, both solid and liquid NaOH containing products at concentration > 2%:

Replacing, where appropriated, manual processes by automated and/or closed processes. This would avoid irritating mists, sprayings and subsequent potential splashes:

- Use closed systems or covering of open containers (e.g. screens)
- Transport over pipes, technical barrel filling/emptying of barrel with automatic systems (suction pumps etc.)
- Use of pliers, grip arms with long handles with manual use "to avoid direct contact and exposure by splashes (no working over one's head)"

Technical conditions and measures to control dispersion from source towards the worker

For worker, both solid and liquid NaOH containing products at concentration > 2%:

Local exhaust ventilation and/or general ventilation is good practice

Organisational measures to prevent /limit releases, dispersion and exposure

For worker, both solid and liquid NaOH containing products at concentration > 2%:

- Workers in the risky process/areas identified should be trained a) to avoid to work without respiratory protection and b) to understand the corrosive properties and, especially, the respiratory inhalation effects of sodium hydroxide and c) to follow the safer procedures instructed by the employer.
- The employer has also to ascertain that the required PPE is available and used according to instructions
- Where possible for professional use, use of specific dispensers and pumps specifically designed to prevent splashes/spills/exposure to occur.

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

For worker and professional, both solid and liquid NaOH containing products at concentration > 2%:

- Respiratory protection: In case of dust or aerosol formation (e.g. spraying): use respiratory protection with approved filter (P2)
- Hand protection: impervious chemical resistant protective gloves
 - material: butyl-rubber, PVC, polychloroprene with natural latex liner, material thickness: 0.5 mm, breakthrough time: > 480 min
 - material: nitrile-rubber, fluorinated rubber, material thickness: 0.35-0.4 mm, breakthrough time: > 480 min
- If splashes are likely to occur, wear tightly fitting chemical resistant safety goggles, face –shield
- If splashes are likely to occur, wear suitable protective clothing, aprons, shield and suits, rubber or plastic boots, rubber or plastic boots

Exposure estimation and reference to its source

Worker/professional exposure:

NaOH is a corrosive substance. For the handling of corrosive substances and formulations, immediate dermal contacts occur only occasionally and it is assumed that repeated daily dermal exposure can be neglected. Therefore, dermal exposure to NaOH was not quantified.

NaOH is not expected to be systemically available in the body under normal handling and use conditions and therefore systemic effects of NaOH after dermal or inhalation exposure are not expected to occur.

Based on NaOH measurements in the pulp and paper industry, de-inking waste paper, aluminium, textile and chemical industry and following the proposed risk management measures controlling worker and professional exposure, the inhalation exposure is below the DNEL of 1 mg/m³.

In addition to the measured exposure data the ECETOC TRA tool has been used to estimate the inhalation exposure (see Table below). It was assumed that there is no local exhaust ventilation and no respiratory protection unless specified otherwise. The duration of exposure was set at more than 4 hours per day as a worst-case assumption and professional use was specified where relevant as a worst-case assumption. For the solid, the low dustiness class was selected because NaOH is very hygroscopic. Only the most

relevant PROCs were considered in the assessment.

PROC	PROC description	Liquid (mg/m ³)	Solid (mg/m ³)
PROC 1	Use in closed process, no likelihood of exposure	0.17	0.01
PROC 2	Use in closed, continuous process with occasional controlled exposure (e.g. sampling)	0.17	0.01
PROC 3	Use in closed batch process (synthesis or formulation)	0.17	0.1
PROC 4	Use in batch and other process (synthesis) where opportunity for exposure arises	0.17	0.2 (with LEV)
PROC 5	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)	0.17	0.2 (with LEV)
PROC 7	Spraying in industrial settings and applications	0.17	Not applicable
PROC 8a/b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated or dedicated facilities	0.17	0.5
PROC 9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)	0.17	0.5
PROC10	Roller application or brushing of adhesive and other coating	0.17	0.5
PROC11	Spraying outside industrial settings or applications	0.17	0.2 (with LEV)
PROC13	Treatment of articles by dipping and pouring	0.17	0.5
PROC14	Production of preparations or articles by tableting, compression, extrusion, pelettisation	0.17	0.2 (with LEV)
PROC15	Use a laboratory reagent	0.17	0.1
PROC19	Hand-mixing with intimate contact and only PPE available.	0.17	0.5
PROC23	Open processing and transfer operations (with minerals) at elevated temperature	0.17	0.4 (with LEV and RPE(90%))
PROC24	High (mechanical) energy work-up of substances bound in materials and/or articles	0.17	0.5 (with LEV and RPE(90%))

Environmental exposure:

The aquatic effect and risk assessment only deals with the effect on organisms/ecosystems due to possible pH changes related to OH⁻ discharges, as the toxicity of the Na⁺ ion is expected to be insignificant compared to the (potential) pH effect. The high water solubility and very low vapour pressure indicate that NaOH will be found predominantly in water. When the risk management measures related to the environment are implemented, there is no exposure to the activated sludge of a sewage treatment plant and there is no exposure of the receiving surface water.

The sediment compartment is not considered, because it is not considered relevant for NaOH. If emitted to the aquatic compartment, sorption to sediment particles will be negligible.

Significant emissions to air are not expected due to the very low vapour pressure of NaOH. If emitted to air as an aerosol in water, NaOH will be rapidly neutralised as a result of its reaction with CO₂ (or other acids).

Significant emissions to the terrestrial environment are not expected either. The sludge application route is not relevant for the emission to agricultural soil, as no sorption of NaOH to particulate matter will occur in STPs/WWTPs. If emitted to soil, sorption to soil particles will be negligible. Depending on the buffer capacity of the soil, OH⁻ will be neutralised in the soil pore water or the pH may increase.

Bioaccumulation will not occur.

Exposure Scenario 4: Consumer Use of NaOH

List of all use descriptors

Sector of use (SU): SU 21 Private households

Product category (PC): PC 0-40

Sodium hydroxide can be used in many different chemical product categories (PC): PC 20, 35, 39 (neutralisation agents, cleaning products, cosmetics, personal care products). The other PCs are not explicitly considered in this exposure scenario. However, NaOH can also be used in other PCs in low concentrations e.g. PC3 (up to 0.01%), PC8 (up to 0.1%), PC28 and PC31 (up to 0.002%) but it can be used also in the remaining product categories (PC 0-40).

Process category (PROC): not applicable

Article category (AC): not applicable

Environmental Release

Category (ERC):
 ERC8A Wide dispersive indoor use of processing aids in open systems
 ERC8B Wide dispersive indoor use of reactive substances in open systems
 ERC8D Wide dispersive outdoor use of processing aids in open systems
 ERC9A Wide dispersive indoor use of substances in closed systems

The environmental release categories mentioned above are assumed to be the most important ones but other wide dispersive environmental release categories could also be possible (ERC 8 – 11b).

Further explanations

NaOH (up to 100%) is also used by consumers. It is used at home for drain and pipe cleaning, wood treatment and it also used to make soap at home. NaOH is also used in batteries and in oven-cleaner pads.

EU Risk Assessment

An EU risk assessment has been performed based on the Existing Substances Regulation (Council Regulation 793/93). A comprehensive risk assessment report has been finalised in 2007 and is available via internet:

http://ecb.jrc.ec.europa.eu/DOCUMENTS/Existing-Chemicals/RISK_ASSESSMENT/REPORT/sodiumhydroxidereport416.pdf

Contributing exposure scenario controlling environmental exposure

Product characteristics

Solid or liquid NaOH, all concentrations (0-100%), if solid: low dustiness class

Conditions and measures related to external treatment or recovery of waste for disposal

This material and its container must be disposed of in a safe way (e.g. by returning to a public recycling facility). If container is empty, trash as regular municipal waste.

Batteries should be recycled as much as possible (e.g. by returning to a public recycling facility). Recovery of NaOH from alkaline batteries includes emptying the electrolyte, collection and neutralization with sulphuric acid and carbon dioxide.

Contributing exposure scenario controlling worker exposure

Product characteristic

Solid or liquid NaOH, all concentrations (0-100%), if solid: low dustiness class

Typical concentrations: floor strippers (<10%), hair straighteners (<2%), oven cleaners (<5%), drain openers (liquid: 30%, solid: <100%), cleaning products (<1.1%)

Conditions and measures related to the design of the product

- It is required to use resistant labelling-package to avoid its auto-damage and loss of the label integrity, under normal use and storage of the product. The lack of quality of the package provokes the physical loss of information on hazards and use instructions.
- It is required that household chemicals, containing sodium hydroxide for more than 2%, which may be accessible to children should be provided with a child-resistant fastening (currently applied) and a tactile warning of danger (Adaptation to Technical Progress of the Directive 1999/45/EC, annex IV, Part A and Article 15(2) of Directive 67/548 in the case of, respectively, dangerous preparations and substances intended for domestic use). This would prevent accidents by children and other sensitive groups of society.
- It is advisable to deliver only in very viscous preparations
- It is advisable to delivery only in small amounts
- For use in batteries, it is required to use completely sealed articles with a long service life maintenance.

Conditions and measures related to information and behavioural advice to consumers

It is required that improved use instructions, and product information should always be provided to the consumers. This clearly can efficiently reduce the risk of misuse. For reducing the number of accidents in which (young) children or elderly people are involved, it should be advisable to use these products in the absence of children or other potential sensitive groups. To prevent improper use of sodium hydroxide, instructions for use should contain a warning against dangerous mixtures.

Instructions addressed to consumers:

- Keep out of reach of children.
- Do not apply product into ventilator openings or slots.

Conditions and measures related to personal protection and hygiene

For consumer, both solid and liquid NaOH containing products at concentration > 2%:

- Respiratory protection: In case of dust or aerosol formation (e.g. spraying): use respiratory protection with approved filter (P2)
- Hand protection: impervious chemical resistant protective gloves
- If splashes are likely to occur, wear tightly fitting chemical resistant safety goggles, face-shield

Exposure estimation and reference to its source

Consumer exposure:

Acute/short term exposure was assessed only for the most critical use: use of NaOH in a spray oven cleaner. Consexpo and SprayExpo were used to estimate exposure. The calculated short-term exposure of 0.3 – 1.6 mg/m³ is slightly higher than the long term DNEL for inhalation of 1 mg/m³ but smaller than the short term occupational exposure limit of 2 mg/m³. Furthermore, NaOH will be rapidly neutralised as a result of its reaction with CO₂ (or other acids).

Environmental exposure:

Consumer uses relates to already diluted products which will further be neutralized quickly in the sewer, well before reaching a WWTP or surface water.