SAFETY DATA SHEET
ACCORDING TO EC-REGULATIONS 1907/2006 (REACH), 1272/2008 (CLP) & 453/2010

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

1.1 Product identifier

GHS Product Identifier	CAUSTIC SODA LIQUOR
EC INDEX No.	011-002-00-6
Alternative names	Sodium hydroxide solution.
REACH Registration No.	01-2119457892-27-XXXX

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

Identified use(s)	Chemical manufacture and processing. pH control.
Uses advised against	None anticipated.

1.3 Details of the supplier of the safety data sheet

Company Identification	VYNOVA Runcorn Limited Runcorn Site HQ South Parade, PO Box 9 Runcorn, Cheshire, WA7 4JE Tel : +49(0)4425 98 01, Fax : +49(0)4425 98 2408
E-Mail (competent person)	msds.runcorn@vynova-group.com

1.4 Emergency telephone number

IN AN EMERGENCY DIAL 999 (UK only) or 112 (EU)
For specialist advice in an emergency telephone +44 (0)1928572000

2. SECTION 2: HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

Directive 67/548/EEC & Directive 1999/45/EC	C : Corrosive. R35: Causes severe burns.
Regulation (EC) No. 1272/2008 (CLP).	Skin Corr. 1A Met. Corr. 1

2.2 Label elements

Hazard statement(s)
H314: Causes severe skin burns and eye damage.
H290: May be corrosive to metals.

Signal word(s) DANGER

Hazard pictogram(s)

Precautionary statement(s)
P260: Do not breathe dust/fume/gas/mist/vapours/spray.
P280: Wear protective gloves/protective clothing/eye protection/face protection.
P301+P330+P331: IF SWALLOWED: rinse mouth. Do NOT induce vomiting.
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.

Additional label requirements
None

2.3 Other hazards
None

3. SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Hazardous ingredient(s)	%(w/w)	CAS No.	EC No.	H - Codes	GHS Classification
Sodium Hydroxide	10 - 75	001310-73-2	215-185-5	H314, H290	Skin Corr. 1A Met. Corr. 1

This data sheet covers solutions containing greater than 5% caustic soda (sodium hydroxide), rayon and membrane grades.
Rayon grades contain typically less than 0.1mg/kg mercury.

4. SECTION 4: FIRST AID MEASURES

4.1 Description of first aid measures

Inhalation Remove patient from exposure, keep warm and at rest. Administer oxygen if necessary.

Skin Contact Remove contaminated clothing. Drench with large quantities of water. Continue to wash the affected area for at least 10 minutes.

Eye Contact Immediately irrigate with eyewash solution or clean water, holding the eyelids apart, for at least 15 minutes. Continue irrigation until medical attention can be obtained.

Ingestion Do not induce vomiting. Provided the patient is conscious, wash out mouth with water and give 200-300 ml (half a pint) of water to drink.

4.2 Most important symptoms and effects, both acute and delayed

Causes severe damage to eyes and skin. May cause severe damage with formation of corneal ulcers and permanent impairment of vision. Mist is severely irritant to the respiratory tract. Effect may vary from irritation of the nasal mucous membrane to severe lung irritation. Will immediately cause corrosion of and damage to the gastrointestinal tract.

4.3 Indication of any immediate medical attention and special treatment needed

SPEED IS ESSENTIAL. OBTAIN IMMEDIATE MEDICAL ATTENTION.
Showers and eye washing equipment must be provided at handling points.
Remove contaminated clothing and wash all affected areas with plenty of water.
Symptomatic treatment and supportive therapy as indicated.

5. SECTION 5: FIRE-FIGHTING MEASURES

5.1 Extinguishing media

Suitable Extinguishing Media Foam, CO_2 or dry powder.
Unsuitable Extinguishing Media As appropriate for surrounding fire.

5.2 Special hazards arising from the substance or mixture

Non-combustible. Exothermic reaction with water. Contact with some metals e.g. aluminium, zinc can produce flammable hydrogen gas. Contact with some organic chemicals can produce violent or explosive reactions.

5.3 Advice for fire-fighters

A self contained breathing apparatus and suitable protective clothing must be worn in fire conditions.

6. SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Ensure suitable personal protection during removal of spillages.

6.2 Environmental precautions

Avoid release to the environment. Prevent liquid entering sewers, basements and any watercourses.

6.3 Methods and material for containment and cleaning up

Stop leak if safe to do so. Contain spillages.
Small spillages: Neutralise wherever possible. Wash the spillage area with water.
Large spillages: Contain spillages with sand, earth or any suitable adsorbent material. Remove and dispose of residues. Wash the spillage area with water. Water washing to drain of large amounts of caustic soda should only be carried out with the prior consent of the Environment Agency or other appropriate regulatory body.
Contaminated adsorbent must be removed in sealed, plastic lined drums and disposed of via an authorised waste disposal contractor.

6.4 Reference to other sections
See Section: 8, 13

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

7. SECTION 7: HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Keep away from acids and chlorinated hydrocarbons.
Care should be taken when diluting solutions. Do not spray. Avoid generation of aerosols or mist.
Rayon grades only: For operations involving black sludge containing mercury, atmospheric levels of mercury must be controlled in compliance with the occupational exposure limit (see 7.2).

7.2 Conditions for safe storage, including any incompatibilities
For small quantities - Keep container tightly closed.
For large quantities - Can be stored at normal or slightly elevated temperatures in mild steel tanks. Where temperature is above 40 Deg C for liquors containing 30% or more of caustic or above 60 Deg C for lower concentrations tanks must be stressed relieved.
Following prolonged storage in mild steel tanks, a black sludge will collect at the bottom of the tank. The sludge will contain iron, sodium carbonate and when Rayon grades are stored, mercury. In the latter case the mercury is likely to be present in a finely divided form, spread throughout the particulate matter in the sludge. Provision should be made for testing the tank atmosphere for oxygen and mercury prior to entry.

7.3 Specific end use(s)
Not applicable.

8. SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

HAZARDOUS INGREDIENT(S)	CAS No.	LTEL 8 hr TWA ppm	LTEL 8 hr TWA mg/m3	STEL (ppm)	STEL (mg/m³)	Notes
Sodium Hydroxide	001310-73-2	-	-	-	2	WEL
Mercury & its inorganic divalent compounds		-	0.02	-	-	IOELV, Sk

DNEL / DMEL	Oral	Inhalation	Dermal
Industry - Long Term - Local effects	-	1.0 mg/m³	-
Industry - Long Term - Systemic effects	-	-	-
Industry - Short term - Local effects	-	-	2%
Industry - Short term - Systemic effects	-	-	-
Consumer. - Long Term - Local effects	-	1.0 mg/m³	-
Consumer. - Long Term - Systemic effects	-	-	-
Consumer. - Short term - Local effects	-	-	2%
Consumer. - Short term - Systemic effects	-	-	-

Environment	PNEC
Aquatic Compartment (including sediment)	Not relevant for this material.
Terrestrial Compartment	Not relevant for this material.
Atmospheric Compartment	Not relevant for this material.

8.2 Exposure controls
Appropriate engineering controls
Provide adequate ventilation, including appropriate local extraction, if fumes or vapours are likely to be evolved.

Personal Protection

Eye/face protection — Wear close fitting goggles or full face shield.

Skin protection — Wear suitable protective clothing and gloves.
Suitable Materials: PVC, Neoprene, natural rubber
Unsuitable gloves materials: Leather
Leather footwear is not suitable.
Check with protective equipment manufacturer's data.

Respiratory protection — Wear suitable respiratory protective equipment if exposure to levels above the occupational exposure limit is likely. Use a respirator/filter with at least: Filter type P2
Rayon grades only: For operations involving black sludge containing mercury, air line fed breathing apparatus must be worn (see 7.2).
Check with protective equipment manufacturer's data.

9. SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Molecular weight:	40
Form	Clear or slightly turbid liquid.
Colour	colourless
Boiling Point (Deg C)	104.6 (10%); 107.8 (20%); 128.5 (40%); 140.2 (47%); 145.8 (50%); 168.6 (60%)
Vapour Pressure (Pascals)	@25°C: 3000 (10%); 2270 (20%); 640 (40%); 270 (47%); 170 (50%); 270@60°C (60%)
Density (g/ml)	@25°C: 1.11 (10%); 1.214 (20%); 1.424 (40%); 1.491 (47%); 1.514 (50%); 1.583 (60%)
Solubility (Water)	soluble (100g NaOH/100g H2O at 25°C)
Solubility (Other)	ethanol
Freezing Point (Deg C)	-6.0 (10%); -27 (20%); 17 (40%); 6.2 (47%); 12 (50%); 52 (60%)
Viscosity (mPa.s)	@25°C: 1.7 (10%); 4.04 (20%); 27.8 (40%); 45.3 (47%); 58.1 (50%); 14.8@60°C (60%)

9.2 Other information

Refer to technical brochure.

10. SECTION 10: STABILITY AND REACTIVITY

10.1 Reactivity

Highly reactive with aluminium, zinc, tin and alloys of these metals producing flammable hydrogen gas. Contact with some organic chemicals can produce violent or explosive reactions.

10.2 Chemical Stability

Stable under normal conditions.

10.3 Possibility of hazardous reactions

Can react violently if in contact with acids and chlorinated hydrocarbons. Exothermic reaction with water.
Can react with sugar residues to form carbon monoxide.

10.4 Conditions to avoid

If electric arc welding or cutting, particular attention must be paid to the way the circuit is completed to eliminate the possibility of electrolysis of liquor producing hydrogen.

10.5 Incompatible materials

Keep away from: Acids , ammonia solution , chlorinated hydrocarbons

10.6 Hazardous Decomposition Product(s)

hydrogen

11. SECTION 11: TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Test result / data

Acute oral toxicity	Will immediately cause corrosion of and damage to the gastrointestinal tract. Lethal dose for man is approximately 5g.
Acute inhalation toxicity	Mist is severely irritant to the respiratory tract. Effect may vary from irritation of the nasal mucous membrane to severe lung irritation.
Acute dermal toxicity	Corrosive. May cause severe burns with permanent skin damage which are slow to heal. Repeated or prolonged contact to dilute solutions may cause dermatitis.
Skin irritation.	Causes severe skin burns.
Serious eye damage/irritation	Causes serious eye damage. May cause severe damage with formation of corneal ulcers and permanent impairment of vision.
Respiratory irritation	Mist is severely irritant to the respiratory tract. Effect may vary from irritation of the nasal mucous membrane to severe lung irritation.
Sensitisation	Respiratory system : No data. There is no evidence of skin sensitisation in humans.
Repeated dose toxicity	No reliable data available.

Germ cell mutagenicity	There is no evidence of mutagenic potential. The material did not induce mutagenicity in in-vitro or in-vivo studies.
Carcinogenicity	Sodium hydroxide is corrosive to the skin and respiratory tract and will not be systemically available in the body under normal conditions of handling and use. As a consequence it is not expected to cause cancer in any organ.
Reproductive toxicity	Sodium hydroxide will not be systemically available in the body under normal conditions of handling and use and will not be toxic to the reproductive system or the developing foetus.
Specific target organ toxicity — single exposure (STOT SE)	Not classified
Specific target organ toxicity — repeated exposure (STOT RE)	Not classified
Aspiration hazard	Not an aspiration hazard
Other effects	None.

12. SECTION 12: ECOLOGICAL INFORMATION

12.1 Toxicity

No reliable data available. Concentrations greater than 10ppm, especially in fresh water, or a pH value equal to or greater than 10.5 may be fatal to fish and other aquatic organisms. Can cause damage to aquatic plants. Can cause damage to vegetation.

12.2 Persistence and degradability

Sodium hydroxide is highly soluble in water and has a low vapour pressure. It will be found predominantly in the aquatic environment. It degrades readily by reaction with the natural carbon dioxide in the air.

12.3 Bioaccumulative potential

Sodium hydroxide does not bioaccumulate.

12.4 Mobility in soil

Sodium hydroxide becomes increasingly more mobile in soil with dilution.

12.5 Results of PBT and vPvB assessment

Sodium hydroxide does not meet the criteria for persistency, bioaccumulation and toxicity. (EU RAR 2007)

12.6 Other adverse effects

Concentrations sufficient to render effluent alkaline may cause damage to effluent treatment organisms.

13. SECTION 13: DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Disposal should be in accordance with local, state or national legislation.
Do not empty into drains; dispose of this material and its container in a safe way.
Contaminated adsorbent must be removed in sealed, plastic lined drums and disposed of via an authorised waste disposal contractor.

13.2 Additional information

Sludge waste containing mercury (see Storage) will require to be disposed of in an authorised treatment facility licenced under the Environmental Protection Act (EPA).

14. SECTION 14: TRANSPORT INFORMATION

14.1 UN number

UN No. (ADR/RID/ADN)	1824
UN No. (IMDG)	1824
UN No. (ICAO/IATA)	1824

14.2 Proper Shipping Name

Proper Shipping Name	SODIUM HYDROXIDE SOLUTION

14.3 Transport hazard class(es)

ADR/RID/ADN	8
IMDG Class	8
ICAO-TI Class	8
ADR/RID/ADN Label.	8
IMDG Label.	8
ICAO Label.	8

14.4 Packing Group

ADR Packing Group	II
IMDG Packing Group	II
ICAO Packing Group	II

14.5 Environmental hazards

Marine Pollutant	Not classified as a Marine Pollutant.

14.6 Special precautions for user

Tunnel Restriction Code	(E)

14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code

Product Name	Sodium hydroxide solution.
Ship Type	3
Pollution Category	Y

15. SECTION 15: REGULATORY INFORMATION

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

Control of Substances Hazardous to Health Regulations (COSHH) 2002 SI 2002/2677 and COSHH Essentials: Easy steps to control chemicals - Control of Substances Hazardous to Health Regulations HSG193.
Wassergefährdungsklasse (Germany) WGK class 1 (official).

Inventory Status
Listed in: Australia (AICS), Canada (DSL/NDSL), China (IECSC), European Union (EINECS/ELINCS), Japan (ENCS), New Zealand Inventory (NZIoC), Philippines (PICCS), South Korea (KECI), Switzerland, Taiwan (NECI), United States (TSCA).

15.2 Chemical Safety Assessment

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

16. SECTION 16: OTHER INFORMATION

Indication of changes For Revisions See Section: First Issue

LEGEND

WEL : Workplace Exposure Limit (UK HSE EH40)
COM : The company aims to control exposure in its workplace to this limit
TLV : The company aims to control exposure in its workplace to the ACGIH limit
TLV-C: The company aims to control exposure in its workplace to the ACGIH Ceiling limit
MAK : The company aims to control exposure in its workplace to the German limit
Sk : Can be absorbed through skin
Sen : Capable of causing respiratory sensitisation
Bmgv : Biological monitoring guidance value (UK HSE EH40)
ILV : Indicative Limit Value (UK HSE EH40)
IOELV : Indicative Occupational Exposure Limit Value
PBT Persistent, Bioaccumulative and Toxic
vPvB very Persistent very Bioaccumulative

Key literature references

EU RAR NaOH (2007), European Union Risk Assessment Report sodium hydroxide. Office for Official Publications of the European Union. Luxembourg.
GESTIS - database on hazardous substances
Chemical Safety Report, Sodium Hydroxide (21 July 2010)

Further information

Information in this publication is believed to be accurate and is given in good faith, but it is for the Customer to satisfy itself of the suitability for its own particular purpose. Accordingly, VYNOVA Runcorn Limited gives no warranty as to the fitness of the Product for any particular purpose and any implied warranty or condition (statutory or otherwise) is excluded except to the extent that such exclusion is prevented by law. Freedom under Patent, Copyright and Designs cannot be assumed.

Appendix: Exposure scenarios

List of Exposure Scenarios
Exposure Scenario 1: Manufacturing of liquid NaOH
Exposure Scenario 2: Manufacturing of solid NaOH
Exposure Scenario 3: Industrial and Professional Use of NaOH
Exposure Scenario 4: Consumer Use of NaOH

Exposure Scenario 1: Manufacturing of liquid 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

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:

- 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 0.33 mg/m^3 (typical value is 0.14 mg/m^3) 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 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
PROC11Non 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/m^3.

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 adhesiveand 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 tabletting, 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 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 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

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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/m^3 is slightly higher than the long term DNEL for inhalation of 1 mg/m^3 but smaller than the short term occupational exposure limit of 2 mg/m^3. Furthermore, NaOH will be rapidly neutralised as a result of its reaction with CO_2 (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.