Safety Data Sheet according to Regulation (EU) No. 1907/2006

CAUSTIC POTASH LIQUID (ALL GRADES)

Revision.2 Revision Date 02.01.2018 Print Date 02.01.2018

EXPOSURE SCENARIO PRODUCT LIST:
M31866-ES1, M31866-ES2, M31866-ES3, M31866-ES4, M31866-ES5

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

1.1 Product Identifiers

Product Identifier:	**CAUSTIC POTASH LIQUID (ALL GRADES)**
REACH Registration No:	Potassium hydroxide - 01-2119487136-33-0017
CAS-No.:	1310-58-3
EC No.:	215-181-3
Substance/Mixture Name:	potassium hydroxide
Trade Name:	Caustic Potash Membrane Dilute Solution 45%, 48%, 50%, Caustic Potash Membrane Food Grade - 50%
Synonyms:	KOH, liquid potash Potassium Hydroxide

1.2 Relevant Identified Uses of the Substance or Mixture, and Uses Advised Against

Product Use:

Manufacture of substances
Formulation
Glass Production
Cleaner
Process cleaner
Petroleum Industry
Fertilizer
Chemical intermediate
Coatings and paints, fillers, putties, thinners
Washing and cleaning products
Electrical batteries and accumulators
Extraction agents pH adjustment Neutralization agent
Precipitants
Flocculants
Food processing

Generic Use Conditions:	PROC 1 Use in closed process, no likelihood of exposure PROC 2 Use in closed, continuous process with occasional controlled exposure PROC 3 Use in closed batch process (synthesis or formulation) PROC 4 Use in batch and other process (synthesis) where opportunity for exposure arises PROC 5 Mixing or blending in batch process for formulation of preparations and articles (multistage and/or significant contact) PROC 7 Industrial spraying PROC 8a/b Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at either dedicated and/or non-dedicated facilities PROC 9 Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC 10 Roller application or brushing PROC 11 Non industrial spraying PROC 13 Treatment of articles by dipping and pouring PROC 14 Production of preparations or articles by tabletting, compression, extrusion, pelettisation PROC 15 Use a laboratory reagent PROC 19 Hand-mixing with intimate contact and only PPE available PROC 23 Open processing and transfer operations with minerals/metals at elevated temperature PROC 24 High (mechanical) energy work-up of substances bound in materials and/or articles PROC 26 Handling of solid inorganic substances at ambient temperature
Application Conditions:	PC9 - Coatings and paints, fillers, putties, thinners PC12 Fertilizers PC19 Intermediate PC20 pH-regulators, flocculants, precipitants, neutralization agents PC35 Washing and cleaning products PC37 Water treatment chemicals PC40 Extraction agents
Uses Advised Against:	None identified.

1.3 Details of the Supplier of the Safety Data Sheet

-Company:	Goulding Chemicals Ltd.
-Address:	Centre Park Road, Marina, Cork, Ireland
-Telephone:	+353 (021) 4911611
-Fax:	+353 (021) 4911660
-Contact Email	larry.egar@gouldings.ie

1.4 Emergency Telephone Number

-Emergency telephone number (outside of office hours): +353 (021) 4911619

1.5 Additional Information

This Safety Data Sheet (SDS) has been prepared in accordance with REACH Regulations 1907/2006 and 453/2010.

2. HAZARDS IDENTIFICATION

GHS CLASSIFICATION:

Classification according to Regulation (EC) No 1272/2008 (CLP)

NOTE: The GHS classification is aligned with the European (REACH Regulation - SIEF) harmonized classification of potassium hydroxide. The data/methods used for the harmonized GHS classification may not reflect Occidental's self-classification for other countries.

2.1 Classification of the substance or mixture

CLP Classification: Listed below

GHS: PHYSICAL HAZARD(S):	Corrosive to metals - Category 1
GHS: CONTACT HAZARD - SKIN:	Category 1A - Causes severe skin burns and eye damage
GHS: ACUTE TOXICITY - ORAL:	Category 4 - Harmful if swallowed
GHS: CARCINOGENICITY:	This product is not classified as a carcinogen per GHS criteria. This product is not classified as a carcinogen by NTP, IARC, or OSHA.

For full text of Hazard- and EU Hazard-statements: see SECTION 16

2.2 Label Elements

GHS SYMBOL:
Corrosive, Exclamation mark

GHS SIGNAL WORD: DANGER

GHS - Physical Hazard Statement(s) H290 - May be corrosive to metals

GHS - Health Hazard Statement(s)
H314 - Causes severe skin burns and eye damage
H302 - Harmful if swallowed

Supplemental Hazard Statement
Not applicable

GHS Precautionary Statement(s) - Prevention
P260 - Do not breathe mist, vapours, or spray
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P264 - Wash skin and contaminated clothing thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P234 - Keep only in original container

GHS Precautionary Statement(s) - Response

P303 + P361 + P353 - IF ON SKIN (or hair): Remove immediately all contaminated clothing. Rinse skin with water P305 + P351 + P338 - IF IN EYES - Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P301 + P312 - IF SWALLOWED, Call a POISON CENTER or doctor/physician if you feel unwell
P330 - Rinse mouth if ingested
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P310 - Immediately call a POISON CENTER or physician
P363 - Wash contaminated clothing before reuse
P321 - Specific treatment (see First Aid information on product label and/or Section 4 of the SDS)
P390 - Absorb spillage to prevent material damage

GHS Precautionary Statement(s) - Storage P405 - Store in a secure manner
P406 - Store in corrosive resistant and NON-ALUMINUM container with a resistant inner liner (NOTE: flammable hydrogen gas may be generated if aluminum container and/or aluminum fittings are used)

GHS Precautionary Statement(s) - Disposal
P501 - Dispose of contents and container in accordance with applicable local, regional, national, and/or international regulations

2.3 Other Hazards

PBT and vPvB assessment: This product does not fulfill the criteria for persistence, bioaccumulation, and toxicity. Therefore, this substance is not considered a PBT or a vPvB substance.

Authorisation Number: This substance is not subject to authorisation
See Section 11: TOXICOLOGICAL INFORMATION

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1/2 Substance/Mixture

Component	EU: EINECS Nr.	REACH Reg. No.	CAS Number	Percent [%]	CLP Classification	PBT/PvB
Potassium hydroxide	215-181-3	01-211948713633-0017	1310-58-3	10-51	Acute Tox. 4 (H302) Skin Corr. 1A (H314)	-----
Water	231-791-2	-----	7732-18-5	49-90	Not classified	Not a PBT/PvB

3.3 Additional Information

For the full text of physical and health codes mentioned in this Section, see Section 2 or Section 16

4. FIRST AID MEASURES

4.1 Description of first aid measures

INHALATION: If inhalation of mists, vapors, or spray occurs and adverse effects result, remove to uncontaminated area. Evaluate ABC's (is Airway constricted, is Breathing occurring, and is blood Circulating) and treat symptomatically. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN CONTACT: Immediately flush contaminated areas with water. Remove contaminated clothing, jewelry and shoes. Wash contaminated areas with large amounts of water. GET MEDICAL ATTENTION IMMEDIATELY. Thoroughly clean and dry contaminated clothing before reuse. Discard contaminated leather goods.

EYE CONTACT: Immediately flush contaminated eyes with a directed stream of water for as long as possible. Remove contact lenses, if present, then continue rinsing. GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION: If swallowed, do not induce vomiting. For definite or probable ingestion, do not administer oral fluids. If vomiting occurs spontaneously, keep airway clear. Monitor airway. Volume resuscitation (IV fluids) and circulatory support (CPR) may be required. Never give anything by mouth to an unconscious or convulsive person. GET MEDICAL ATTENTION IMMEDIATELY.

Protection of First-Aiders: Protect yourself by avoiding contact with this material. Use personal protective equipment. Refer to Section 8 for specific personal protective equipment recommendations. Avoid contact with skin and eyes. Do not ingest. Do not breathe vapors or spray mist. At minimum, treating personnel should utilize PPE sufficient for prevention of bloodborne pathogen transmission.

4.2 Most important symptoms and effects, both acute and delayed

Acute Symptoms/Effects: Listed below.

Inhalation (Breathing): Respiratory System Effects: Exposure to airborne material may cause irritation, redness of upper and lower airways, coughing, laryngeal spasm and edema, shortness of breath, bronchio-constriction, and possible pulmonary edema. Severe and permanent scarring may occur. Aspiration of this material may cause the same conditions.

Skin:	Skin Corrosion. Exposure to skin may cause redness, itching, irritation, swelling, burns (first, second, or third degree), liquefaction of skin, and damage to underlying tissues (deep and painful wounds).
Eye:	Serious Eye Damage. Eye exposures may cause eye lid burns, conjunctivitis, corneal edema, corneal burn, corneal perforation, damage to internal contents of the eye, permanent visual defects, and blindness and/or loss of the eye.
Ingestion (Swallowing):	Gastrointestinal System Effects: Exposure by ingestion may cause irritation, swelling, and perforation of upper and lower gastrointestinal tissues. Permanent scarring may occur.

Delayed Symptoms/Effects:

- Repeated or prolonged exposures to skin that cause irritation may cause a chronic dermatitis

4.3 Indication of any immediate medical attention and special treatment needed

Medical Conditions Aggravated by Exposure: Corrosive. May aggravate pre-existing eye, skin, and respiratory conditions (including asthma and other breathing disorders).

Notes to Physician: Medical observation and assessment is recommended for all ingestions, all eye exposures, and symptomatic inhalation and dermal exposures. For symptomatic ingestion, do not administer oral fluids and consider investigation by endoscopy, X-ray, or CT scan. Esophageal perforation, airway compromise, hypotension, and shock are possible. For prolonged exposures and significant exposures, consider delayed injury to exposed tissues. There is no antidote. Treatment is supportive care. Follow normal parameters for airway, breathing, and circulation. Surgical intervention may be required.

5. FIRE-FIGHTING MEASURES

5.1 Extinguishing media

Extinguishing Media: Use extinguishing agents appropriate for surrounding fire.

5.2 Special hazards arising from the substance or mixture

Fire Hazard: Non-combustible, substance itself does not burn but may decompose upon heating to produce corrosive and/or toxic fumes. May react with chemically reactive metals such as aluminum, zinc, magnesium, copper, etc. to release hydrogen gas which can form explosive mixtures in air.

5.3 Advice for firefighters

Fire Fighting: Move container from fire area if it can be done without risk. Cool containers with water. Do not apply water directly on this product. Heat is generated when mixed with water. Wear NIOSH approved positive-pressure self-contained breathing apparatus operated in pressure demand mode. Avoid contact with skin.

5.4 Additional fire hazard information

Sensitivity to Mechanical Impact: Not sensitive.

Sensitivity to Static Discharge: Not sensitive.

Flash point: Not flammable

Autoignition Temperature: Not determined

GHS PHYSICAL HAZARD(S):
- Corrosive to Metals - Category 1

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment, and emergency procedures

Personal Precautions:
Avoid contact with skin, eyes and clothing. Wear appropriate personal protective equipment recommended in Section 8, Exposure Controls / Personal Protection, of the SDS.

6.2 Environmental precautions

Completely contain spilled material with dikes, sandbags, etc. Keep out of water supplies and sewers. Liquid material may be removed with a vacuum truck. Flush spill area with water if appropriate. This material is alkaline and may raise the pH of surface waters with low buffering capacity. Releases should be reported, if required, to appropriate agencies.

6.3 Methods and material for containment and cleaning up

Methods and Materials for Containment and Cleaning Up:
In case of spill or leak, stop the leak as soon as possible. Small and large spills: Contain spilled material if possible. Completely contain spilled materials with dikes, sandbags, etc. After containment, collect the spilled material and transfer to a chemical waste area. Liquid material may be removed with a vacuum truck. Neutralize residue with dilute acid and follow with a liberal covering of sodium bicarbonate or other acceptable drying agent. See Section 13, Disposal considerations, for additional information.

6.4 Reference to other sections

Reference to other sections:
See section 8 for information on personal protective equipment. See section 13 for disposal information. See section 7 for storage and handling information.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Precautions for Safe Handling: Avoid breathing vapor or mist. Do not get in eyes, on skin, or on clothing. Wash thoroughly after handling. When mixing, slowly add to water to minimize heat generation and spattering.

7.2 Conditions for safe storage, including any incompatibilities

Safe Storage Conditions: Store and handle in accordance with all current regulations and standards. Keep container tightly closed and properly labeled. Do not store in aluminum container or use aluminum fittings or

transfer lines, as flammable hydrogen gas may be generated. Keep separated from incompatible substances (see below or Section 10 of the Safety Data Sheet).

Incompatibilities/ Materials to Avoid: Flammable liquids, acids, halogenated compounds, water,Prolonged contact with aluminum, brass, bronze, copper, lead, tin, zinc or other alkali sensitive metals or alloys

7.3 Specific end use(s)

Specific Product Use(s): This product should only be used for applications described in Section 1.2

7.4 Additional information

GHS PHYSICAL HAZARD(S):
- Corrosive to Metals - Category 1

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1 Control parameters

Regulatory Exposure Limit(s): As listed below

Component	European Union	Austria	Belgium	Bulgaria	Czech Republic
Potassium hydroxide 1310-58-3	-----	TWA 2 mg/m^3	-----	TWA 2.0 mg/m^3	TWA 1 mg/m^3 Ceiling 2 mg/m^3

Component	Denmark	Finland	France	Germany	Greece
Potassium hydroxide 1310-58-3	Ceiling 2 mg/m^3	STEL 2 mg/m^3 Ceiling 2 mg/m^3	STEL 2 mg/m^3	-----	STEL 2 mg/m^3 TWA 2 mg/m^3

Component	Ireland	The Netherlands	Poland	Portugal	Spain
Potassium hydroxide 1310-58-3	STEL 2 mg/m^3	-----	STEL 1 mg/m^3 TWA 0.5 mg/m^3	Ceiling 2 mg/m^3	STEL 2 mg/m^3

Component	Turkey OELs	The United Kingdom	Italy	Switzerland	Norway
Potassium hydroxide 1310-58-3	-----	-----	-----	TWA 2 mg/m^3	Ceiling 2 mg/m^3

Acute Exposures: Systemic Effects - KOH is not expected to become systemically available in the body under normal handling and use conditions. Therefore a DNEL for systemic effects is not applicable. **Acute**

Exposures: Dermal - According to the CLP Regulation No 1272/2008 Annex VI Table 3.1, the concentration limit for corrosivity of KOH is considered to be 2%

Acute Exposures: Inhalation - High peak exposure does not occur during the manufacturing or use. Therefore a DNEL for inhalation exposures is not applicable.

Long-term exposures: Dermal - No DNEL long-term exposure - local effect for dermal could be dervived as no reliable dose descriptors were available for that route of exposure.

Long-term exposures: Inhalation - DNEL for potassium hydroxide for long-term inhalation for workers is 1.0 mg/m^3.
Acute Exposure: Systemic Effects - KOH is not expected to become systemically available in the body under normal handling and use conditions. Therefore a DNEL for systemic effects is not applicable. **Acute**

Exposure: Dermal - According to the CLP Regulation No 1272/2008 Annex VI Table 3.1, the concentration limit for corrosivity of KOH is considered to be 2%.

Acute Exposure: Inhalation - Potassium hydroxide is not classified regarding acute inhalation toxicity. **Long-**

Term Exposure: Dermal - No DNEL long-term exposure, local effects, could be derived as no reliable dose descriptors were available for the dermal route of exposure.
Long-Term Exposure: Inhalation - DNEL for potassium hydroxide for long-term inhalation for population is 1.0 mg/m^3.
Predicted No Effect Concentration (PNEC): Environment

PNEC: Aquatic - Based on the available data it is not considered useful to derive a PNEC for potassium hydroxide in fresh water because 1) the natural pH can vary significantly between several aquatic ecosystems and also the sensitivity to a change of the pH can vary significantly between aquatic ecosystems and 2) the change in pH due to an atnthropogenic potassium hydroxide addition is influenced by the buffer capacity of the receiving water

PNEC Soil - PNEC for potassium hydroxide in sediment is not considered useful because KOH is a strong alkaline substance that dissociates completely in water to K+ and OH-

OEL: Occupational Exposure Limit; OSHA: United States Occupational Safety and Health Administration; PEL: Permissible Exposure Limit; TWA: Time Weighted Average; STEL: Short Term Exposure Limit

Non-Regulatory Exposure Limit(s): Listed below for the product components that have non-regulatory occupational exposure limits (OEL's)

Component	CAS Number	ACGIH TWA	ACGIH STEL	ACGIH Ceiling	OSHA TWA (Vacated)	OSHA STEL (Vacated)	OSHA Ceiling (Vacated)
Potassium hydroxide	1310-58-3	-----	-----	2 mg/m^3	-----	-----	2 mg/m^3

- The American Conference of Governmental Industrial Hygienists (ACGIH) is a voluntary organization of professional industrial hygiene personnel in government or educational institutions in the United States. The ACGIH develops and publishes recommended occupational exposure limits each year called Threshold Limit Values (TLVs) for hundreds of chemicals, physical agents, and biological exposure indices.

8.2 Exposure controls

RISK MANAGEMENT MEASURES (RMM):

RMM: HEALTH

- This material is corrosive, the risk management measures for human health should focus on the prevention of direct contact with the substance utilizing automated and closed systems as feasible for manufacturing and industrial/ professional uses
- When automated, closed systems and local exhaust ventilation is not feasible, product related design measures preventing direct eye/skin contact with the material and preventing formation of aerosols and splashes should be implemented. Examples of product related design measures may include dispensers and pumps specifically designed to prevent splashes/spills/exposures
- PPE should be used where engineering and administrative controls are not feasible and/or not sufficient to reduce risk

RMM: ENVIRONMENT

- Avoid discharging solutions into municipal wastewater or to surface water
- Adequate control of the pH value during introduction into open waters is required
- Specific measures may be required by local authorities
- Fertilizers containing up to 20% of KOH in the end product require specific environmental risk measurements that include: 1) avoid direct releases into adjacent surface waters 2) minimize drift and 3) analyze agricultural soil prior to application to determine appropriate application rate

ENGINEERING CONTROLS: Provide local exhaust ventilation where dust or mist may be generated. Ensure compliance with applicable exposure limits.

PERSONAL PROTECTIVE EQUIPMENT:

Eye Protection: Wear chemical safety goggles with a face shield to protect against eye and skin contact when appropriate. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

Skin and Body Protection: Wear protective clothing to minimize skin contact. When potential for contact with wet material exists, wear TychemÒ or similar chemical protective suit. When potential for contact with dry material exists, wear disposable coveralls suitable for dust exposure, such as TyvekÒ. Always place pants legs over boots. Thoroughly clean and dry contaminated clothing before reuse. Discard contaminated leather goods.

Hand Protection: Wear appropriate chemical resistant gloves. Consult a glove supplier for assistance in selecting an appropriate chemical resistant glove.

Protective Material Types: Butyl rubber, Natural rubber, Nitrile, Polyvinyl chloride (PVC), TychemÒ, TyvekÒ

Respiratory Protection: An approved respirator with high efficiency particulate air filters / cartridges may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits, or when symptoms have been observed that are indicative of overexposure. A respiratory protection program that

meets applicable regulatory requirements must be followed whenever workplace conditions warrant use of a respirator.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance:	Clear
Color:	Colorless
Odor:	Odorless
Odor Threshold [ppm]:	Not Available
Molecular Weight:	56.11
Molecular Formula:	KOH
Boiling Point/Range:	216 to 289 °F (102 to 143 °C)
Freezing Point/Range:	-85 to 39 °F (-65 to 4 °C)
Vapor Pressure:	4 mmHg @ 77°F (25°C) 50% solution

20 mmHg @ 77°F (25°C) 20% solution

Vapor Density (air=1):	No data available
Specific Gravity (water=1):	1.09 - 1.52 @ 15.6 °C
Density:	9.09 - 12.67 lbs/gal (1.09 - 1.52 kg/L) @ 15.6 °C
Water Solubility:	100%
pH:	12 - 14
Evaporation Rate (ether=1):	No data available
Partition Coefficient (n-octanol/water):	Not applicable
Flammability (solid, gas):	Not flammable
Flash point:	Not flammable
Lower Flammability Level (air):	Not applicable
Upper Flammability Level (air):	Not applicable

Autoignition Temperature:	Not determined
Viscosity:	No data available
9.2 Other information	
VOC Content (%):	0%
Volatility:	No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity

Reactivity: Soluble in water, releasing heat sufficient to ignite combustibles. Reacts with acids, giving off heat.

10.2 Chemical stability

Chemical Stability: Stable at normal temperatures and pressures.

10.3 Possibility of hazardous reactions 10.4 Conditions to Avoid

Conditions to Avoid: Mixing with water, acid, or incompatible materials may cause splattering and release of large amounts of heat. Will react with some metals forming flammable hydrogen gas. Carbon monoxide gas may form upon contact with reducing sugars, food and beverage products in enclosed spaces.

10.5 Incompatible Materials

Incompatibilities/ Materials to Avoid: Flammable liquids, acids, halogenated compounds, water, Prolonged contact with aluminum, brass, bronze, copper, lead, tin, zinc or other alkali sensitive metals or alloys

10.6 Hazardous Decomposition Products

Hazardous Decomposition Products: None known

11. TOXICOLOGICAL INFORMATION

11.1 Information on Toxicological Effects

TOXICITY DATA:
PRODUCT TOXICITY DATA: CAUSTIC POTASH-LIQUID (ALL GRADES)

LD50 Oral: 365 mg/kg (Rat)	**LD50 Dermal:** No data available	**LC50 Inhalation:** No data available

COMPONENT TOXICITY DATA:

The component toxicity data is populated by the LOLI database and may differ from the product toxicity data given. Note: The component toxicity data is populated by the LOLI database and may differ from the product toxicity data given

Component	LD50 Oral:	LD50 Dermal:	LC50 Inhalation:
Potassium hydroxide 1310-58-3	284 mg/kg (Rat)	-----	-----

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POTENTIAL HEALTH EFFECTS:

Inhalation: May cause severe irritation of the respiratory tract with coughing, choking, pain and possibly burns of the mucous membranes. This material can be extremely destructive to the tissue of the mucus membranes and respiratory system.

Skin contact: Corrosive. Causes severe skin burns. Prolonged or repeat skin exposures can result in dermatitis.

Eye contact: Corrosive. Causes serious eye damage which can result in: severe irritation, pain and burns, and permanent damage including blindness.

Ingestion: Toxic if swallowed. Corrosive. May cause severe mucus membrane burns and gastrointestinal burns. If swallowed, may pose a lung aspiration hazard during vomiting. Lung aspiration may result in chemical pneumonitis, pulmonary edema, and damage to lung tissue or death.

Chronic Effects: Repeated or prolonged skin contact may result in dermatitis

SIGNS AND SYMPTOMS OF EXPOSURE: This material may cause severe burns and permanent damage to any tissue with which it comes into contact. Signs and symptoms of exposure vary, and are dependent on the route of exposure, degree of exposure, and duration of exposure. Aspirating this material may cause signs and symptoms that are similar to those experienced as a result of breathing or inhaling this material.

Inhalation (Breathing): Respiratory System Effects: Exposure to airborne material may cause irritation, redness of upper and lower airways, coughing, laryngeal spasm and edema, shortness of breath, bronchio-constriction, and possible pulmonary edema. Severe and permanent scarring may occur. Aspiration of this material may cause the same conditions.

Skin: Skin Corrosion. Exposure to skin may cause redness, itching, irritation, swelling, burns (first, second, or third degree), liquefaction of skin, and damage to underlying tissues (deep and painful wounds).

Eye: Serious Eye Damage. Eye exposures may cause eye lid burns, conjunctivitis, corneal edema, corneal burn, corneal perforation, damage to internal contents of the eye, permanent visual defects, and blindness and/or loss of the eye.

Ingestion (Swallowing): Gastrointestinal System Effects: Exposure by ingestion may cause irritation, swelling, and perforation of upper and lower gastrointestinal tissues. Permanent scarring may occur.

ACUTE TOXICITY:

When in solution, this material will affect all tissues with which it comes in contact. The severity of the tissue damage is a function of its concentration, the length of tissue contact time, and local tissue conditions. After exposure there may be a time delay before irritation and other effects occur. This material is a strong irritant and is corrosive to the skin, eyes, and mucous membranes. This material may cause severe burns and permanent damage to any tissue with which it comes into contact.

CHRONIC TOXICITY:

Repeated and prolonged skin contact may result in dermatitis.

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EU - GHS HEALTH HAZARDS: Listed below.

NOTE: The GHS classification is aligned with the European (REACH Regulation - SIEF) harmonized classification of potassium hydroxide. The data/methods used for the harmonized GHS classification may not reflect Occidental's self-classification for other countries.

GHS: CONTACT HAZARD - Category 1A - Causes severe skin burns and eye damage **SKIN:**

Skin Absorbent / Dermal Route: NO

GHS: ACUTE TOXICITY - Category 4 - Harmful if swallowed **ORAL:**

GHS: CARCINOGENICITY: This product is not classified as a carcinogen per GHS criteria. This product is not classified as a carcinogen by NTP, IARC, or OSHA.

12. ECOLOGICAL INFORMATION

12.1 Toxicity

ECOTOXICITY DATA:

Aquatic Toxicity:
This material is alkaline and may raise the pH of surface waters with low buffering capacity. This material has exhibited moderate toxicity to aquatic organisms.

Invertebrate Toxicity:
EC50 (Daphnia magna): 60 mg/L/48 hr (static bioassay at 20.3-20.7 C).

12.2 Persistence and degradability

FATE AND TRANSPORT:

PERSISTENCE: This material is alkaline and may raise the pH of surface waters with low buffering capacity. This material is believed to exist in the disassociated state in the environment.

BIODEGRADATION: This material is inorganic and not subject to biodegradation.

12.3 Bioaccumulative potential

BIOACCUMULATIVE POTENTIAL: Potassium hydroxide is a strong alkaline substance that dissociates completely in water to K+ and OH-. Considering its high water solubility, potassium hydroxide is not expected to bioconcentrate in organisms. Log Pow is not applicable for an inorganic compound that dissociates.

BIOCONCENTRATION: Considering its high water solubility, potassium hydroxide is not expected to bioconcentrate in organisms.

12.4 Mobility in soil

High water solubility and low vapor pressure indicate that potassium hydroxide will be found predominantly in aqueous environments. The substance characteristics imply KOH will not adsorb on particulate matter or surfaces and will not accumulate in living substances. Small terrestrial emissions will be neutralized by the buffer capacity of the soil.

12.5 Result of PBT and vPvB assessment

PBT and vPvB assessment: This product does not fulfil the criteria for persistence, bioaccumulation, and toxicity. Therefore, this substance is not considered a PBT or a vPvB substance

12.6 Other adverse effects

ADDITIONAL ECOLOGICAL INFORMATION:
This material has exhibited slight toxicity to terrestrial organisms.The risk that potassium hydroxide poses for the environment is essentially restricted to a pH increase of the aquatic compartment, which is dependent on the hardness of the waters.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Waste from material:
Reuse or reprocess, if possible. May be subject to disposal regulations. Dispose of in accordance with all applicable regulations.

Container Management:
Dispose of container in accordance with applicable local, regional, national, and/or international regulations. Container rinsate must be disposed of in compliance with applicable regulations.

14. TRANSPORT INFORMATION

LAND TRANSPORT

UN NUMBER:	UN1814
PROPER SHIPPING NAME:	Potassium hydroxide, solution
HAZARD CLASS/ DIVISION:	8
PACKING GROUP:	II
LABELING REQUIREMENTS:	8
RQ (lbs):	RQ 1,000 Lbs. (Potassium hydroxide)

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:

UN NUMBER:	UN1814
SHIPPING NAME:	Potassium hydroxide, solution
CLASS OR DIVISION:	8
PACKING/RISK GROUP:	II
LABELING REQUIREMENTS:	8

LAND TRANSPORT RID:

UN Number:	UN1814
Proper shipping name:	Potassium hydroxide, solution
Hazard Class:	8
Packing Group:	II
Labels:	8

LAND TRANSPORT ADR:

UN Number:	UN1814
Proper shipping name:	Potassium hydroxide, solution
ADR - Hazards Class	8
Packing group:	II
Labels:	8
ADR - Tunnel Restriction Codes	E
MARITIME TRANSPORT IMO / IMDG:	
UN NUMBER:	UN1814
PROPER SHIPPING NAME:	Potassium hydroxide, solution
HAZARD CLASS/ DIVISION:	8
Packing Group:	II
LABELING REQUIREMENTS:	8

15. REGULATORY INFORMATION

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

15.1 NATIONAL REGULATORY STATUS:

International Inventory Status:

European Union Inventory:

Component	EU-NLPL	ELINCS	EU: EINECS Nr.
Potassium hydroxide 1310-58-3			215-181-3

15.2 CHEMICAL SAFETY ASSESSMENT (CSA):

A Chemical Safety Report (CFR) has been carried out as required under Title VII. There are no known current restrictions under Title VIII.

16. OTHER INFORMATION

16.1 Further Information

PBT-substances: Persistent, bioaccumulative and toxic substances

DSD: Dangerous Substance Directive

DPD: Dangerous Preparation Directive
CLP (EU-GHS): Classification, labelling and packaging
(Globally Harmonised System in Europe)

The information contained in this data sheet is copied from the Safety Data Sheet provided by the manufacturer. The information is given in good faith and to the best of our knowledge but no guarantee, implied or otherwise, is made.

16.2 Relevant H-statements

GHS - Physical Hazard Statement(s) H290 - May be corrosive to metals

GHS - Health Hazard Statement(s)
H314 - Causes severe skin burns and eye damage
H302 - Harmful if swallowed **16.3 Indication of changes**

Reason for Revision (EU):

- Revised the European (EU) safety data sheet format to be compliant with Article 31 and Annex II of REACH.

16.4 Additional information

IMPORTANT:
The information presented herein, while not guaranteed, was prepared by technical personnel and is true and accurate to the best of our knowledge. NO WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE, OR WARRANTY OR GUARANTY OF ANY OTHER KIND, EXPRESSED OR IMPLIED, IS MADE REGARDING PERFORMANCE, SAFETY, SUITABILITY, STABILITY OR OTHERWISE. This information is
not intended to be all-inclusive as to the manner and conditions of use, handling, storage, disposal and other factors that may involve other or additional legal, environmental, safety or performance considerations, and Occidental Chemical Corporation assumes no liability whatsoever for the use of or reliance upon this information. While our technical personnel will be happy to respond to questions, safe handling and use of the product remains the responsibility of the customer. No suggestions for use are intended as, and nothing herein shall be construed as, a recommendation to infringe any existing patents or to violate any Federal, State, local or foreign laws

OSHA Statement
OSHA Standard 29 CFR 1910.1200 requires that information be provided to employees regarding the hazards of chemicals by means of a hazard communication program including labeling, safety data sheets, training and access to written records. We request that you, and it is your legal duty to, make all information in this Safety Data Sheet available to your employees.

End of Safety Data Sheet

ANNEX - EXPOSURE SCENARIO

EXPOSURE SCENARIO NAME:	**CAUSTIC POTASH-LIQUID - ES1**

EXPOSURE SCENARIOS: ES1: Manufacturing of liquid KOH
ES2: Manufacturing of solid KOH
ES3: Industrial and professional use of KOH
ES4: Consumer use of KOH in preparations (excl. batteries) ES5: Use of KOH in batteries

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1. Short title of Exposure Scenario: Manufacturing: Liquid KOH

2. Description of Activities/Process(es) covered by Exposure Scenario

Not Applicable

Sector of Use (SU):

Product Category (PC): Not applicable

Process Category (PROC):

PROC 1 - Use in closed process, no likelihood of exposure
PROC 2 - Use in closed, continuous process with occasional controlled exposure
PROC 3 - Use in closed batch process (synthesis or formulation)
PROC 4 - Use in batch and other process (synthesis) where opportunity for exposure arises
PROC 8a/b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at either dedicated and/or non-dedicated facilities PROC 9 - Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

Article Category (AC): Not applicable

OPERATIONAL CONDITIONS OF USE

3.1 Duration and frequency of use:

• The maximum duration considered for this exposure scenario is a full working shift (8 hr/day) and 200 days/year

4.1 Physical form of substance or preparation:

Solid, Liquid

4.2 Product Specification (Concentration of substance in preparation or article):

• Production sites usually manufacture liquid KOH with a concentration of approximately 50%

• Some facilities produce KOH liquid products between 10 and 75%

4.3 Maximum amount per time or activity:

• The amount used per worker varies from activity to activity

5. Other relevant operational conditions of use:

• Assumes use at not > 20°C above ambient

• Assumes a good basic standard of occupational hygiene has been implemented

RISK MANAGEMENT MEASURES RELATED TO HUMAN HEALTH

6.1 Risk Management Measures Related to Human Health

Risk Management Measures Targeted to Workers (Industrial):
This material is corrosive; therefore, risk management measures for human health should focus on the prevention of direct contact with the substance. Automated and closed systems should be used for manufacturing of this substance. Respiratory protection is needed when aerosols of this substance can be formed. Due to the substance's corrosive properties, appropriate skin and eye protection is required.

Engineering Controls (workers):

• Use closed systems or covering of open containers

• Transport over pipes, technical barrel filling/emptying of barrel with automatic systems (e.g. suction pumps)

• Local exhaust ventilation is not required but good practice

• General ventilation is good practice unless local exhaust ventilation is present

Administrative / Work Practice Controls (workers):

• Use of pliers, grip arms with long handles with manual use to avoid direct contact and exposure by splashes

Personal Protective Equipment (PPE), normal working conditions (workers):

• Respiratory Protection: Full face respirator with high efficiency particular air (HEPA) filter is required in case of dust or aerosol formation

• Hand Protection: Chemical Resistant Gloves - MATERIAL: Butyl-rubber, PVC, polychloroprene with natural latexliner MATERIAL THICKNESS: 0.5 mm BREAKTHROUGH TIME:: > 480 minutes

• Hand Protection: Chemical Resistant Gloves - MATERIAL: nitrile-rubber, fluorinated rubber MATERIAL THICKNESS: 0.5 mm, BREAKTHROUGH TIME:: > 480 minutes

• Eye Protection: Chemical Resistant Goggles must be worn. If splashes are likely to occur tightly fitting safety goggles and face-shield are required

• Body Protection: Wear suitable protective clothing, aprons, shield, protective helmet and suits. If splashes are likely to occur, wear rubber or plastic boots (required)

Other Risk Management Measures (workers):

• Workers in the risky process/ areas identified should be trained a) to avoid work without respiratory protection and b) to understand the corrosive properties and, especially, the respiratory inhalation effects of the material and c) to follow the safer procedures instructed by the employer.

• Employer must ascertain that the required PPE is available and used according to instructions

RISK MANAGEMENT MEASURES RELATED TO THE ENVIRONMENT

6.2 Risk Management Measures Targeted to Protect the Environment

Environmental Release Category (ERC): ERC1 - Manufacture of substances

Risk Management Measures Targeted to Protect the Environment:
Risk management measures related to the environment aim to avoid discharging potassium carbonate solutions into municipal wastewater or to surface water, in case such discharges are expected to cause significant and undesired pH changes. Adequate 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. Most aquatic organisms can tolerate pH values in the range of 6-9.

WASTE MANAGEMENT MEASURES

7. Waste Management Measures

Waste Related Measures: Air
Not applicable for this exposure scenario.

Waste Related Measures: Water
Liquid KOH waste should be reused or discharged to the industrial wastewater and further neutralized if needed (cfr. RMM related to environment).

Waste Related Measures: Soil
Not applicable for this exposure scenario.

INFORMATION ON ESTIMATED EXPOSURE

8.1 Exposure Estimations for Human Health

EXPOSURE ESTIMATION FOR WORKERS

Local irritation is the only activity of potassium hydroxide relevant to human health. Potassium hydroxide (KOH) is not expected to be systemically available in the body under normal handling and use conditions; therefore, systemic effects of KOH after dermal or inhalation exposure are not expected to occur.

Dermal Exposure Estimate (local effects):	**Negligible**
Justification For Estimate of Dermal Exposure (local effects): Potassium Hydroxide (KOH) products with a concentration > 2% are corrosive, therefore, effective control measures are in place to prevent dermal exposure. Furthermore protective clothing and gloves are considered to be used consistently when handling corrosive substances. Production companies report the use of protective gloves, suits and boots while handling pure KOH. Repeated daily dermal exposure to commercial product is therefore considered negligible. Dilutions of KOH containing <2% are not produced at the production sites. Eye exposure is possible due to hand-eye contact, but this is not quantified.	

Inhalation Exposure Estimate:	• 0.33 mg/m^3
Activities/Process(es) covered by Inhalation Exposure Estimate: • PROC 1 • PROC 2 • PROC 3 • PROC 4 • PROC 8a • PROC 8b • PROC 9	
Justification for Estimate of Inhalation Exposure: For drumming liquid KOH the modeled data are underestimated by ECETOC TRA in comparison with the measured surrogate data of NaOH. The value 0.33 mg/m^3 is taken as reasonable worst case level and 0.14 mg/m^3 is taken as typical exposure level.	

INDIRECT EXPOSURE OF HUMANS VIA THE ENVIRONMENT

Indirect exposure to humans via the environment (oral) is not relevant in the case of potassium hydroxide.

8.2 Exposure Estimations for Environment

9.6 EXPOSURE ESTIMATION FOR ENVIRONMENT

Exposure concentrations were not calculated for sediments, soil, groundwater, surface water, air, and waste water treatment plants because those compartments are not considered relevant for this exposure scenario.

GUIDANCE TO DOWNSTREAM USER (DU)

9. Guidance to Downstream Users to evaluate whether they work inside the boundaries set by the Exposure Scenario:
Analytical measurements, to determine potassium hydroxide (KOH) concentrations in the air of working places during production and use, seem to be unavailable. There are no measured inhalation data available for potassium hydroxide (KOH). However, measured data from analogous substance NaOH can be used by read across as a worst case approach for KOH.

END OF EXPOSURE SCENARIO

ANNEX - EXPOSURE SCENARIO

EXPOSURE SCENARIO NAME:	**CAUSTIC POTASH-LIQUID - ES 2**

EXPOSURE SCENARIOS: ES1: Manufacturing of liquid KOH
ES2: Manufacturing of solid KOH
ES3: Industrial and professional use of KOH
ES4: Consumer use of KOH in preparations (excl. batteries) ES5: Use of KOH in batteries

1. Short title of Exposure Scenario: Manufacturing: Solid KOH
2. Description of Activities/Process(es) covered by Exposure Scenario

Sector of Use (SU): Not Applicable

Product Category (PC): Not applicable

Process Category (PROC): PROC 1 - Use in closed process, no likelihood of exposure
PROC 2 - Use in closed, continuous process with occasional controlled exposure
PROC 3 - Use in closed batch process (synthesis or formulation)
PROC 4 - Use in batch and other process (synthesis) where opportunity for exposure arises
PROC 8a/b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at either dedicated and/or non-dedicated facilities PROC 9 - Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

Article Category (AC): Not applicable

OPERATIONAL CONDITIONS OF USE

3.1 Duration and frequency of use:

• The maximum duration considered for this exposure scenario is a full working shift (8 hr/day) and 220 days/year

4.1 Physical form of substance or preparation:

Solid, Liquid

4.2 Product Specification (Concentration of substance in preparation or article):

• Production sites usually manufacture liquid KOH with a concentration of approximately 50%

• Some facilities produce KOH liquid products between 10 and 75%

4.3 Maximum amount per time or activity:

• The amount used per worker varies from activity to activity

5. Other relevant operational conditions of use:

• Assumes use at not > 20°C above ambient

• Assumes a good basic standard of occupational hygiene has been implemented

RISK MANAGEMENT MEASURES RELATED TO HUMAN HEALTH

6.1 Risk Management Measures Related to Human Health

Risk Management Measures Targeted to Workers (Industrial):

This material is corrosive; therefore, risk management measures for human health should focus on the prevention of direct contact with the substance. Automated and closed systems should be used for manufacturing of this substance. Respiratory protection is needed when aerosols of this substance can be formed. Due to the substance's corrosive properties, appropriate skin and eye protection is required.

Engineering Controls (workers):

• Use closed systems or covering of open containers

• Transport over pipes, technical barrel filling/emptying of barrel with automatic systems (e.g, suction pumps)

• Local exhaust ventilation is not required but good practice

• General ventilation is good practice unless local exhaust ventilation is present

Administrative / Work Practice Controls (workers):

• Use of pliers, grip arms with long handles with manual use to avoid direct contact and exposure by splashes

Personal Protective Equipment (PPE), normal working conditions (workers):

• Respiratory Protection: Full face respirator with high efficiency particular air (HEPA) filter is required in case of dust or aerosol formation

- Hand Protection: Chemical Resistant Gloves - MATERIAL: Butyl-rubber, PVC, polychloroprene with natural latexliner MATERIAL THICKNESS: 0.5 mm BREAKTHROUGH TIME:: > 480 minutes
- Hand Protection: Chemical Resistant Gloves - MATERIAL: nitrile-rubber, fluorinated rubber MATERIAL

THICKNESS: 0.5 mm, BREAKTHROUGH TIME:: > 480 minutes

- Eye Protection: Chemical Resistant Goggles must be worn. If splashes are likely to occur tightly fitting safety goggles and face-shield are required
- Body Protection: Wear suitable protective clothing, aprons, shield, protective helmet and suits. If splashes are likely to occur, wear rubber or plastic boots (required)

Other Risk Management Measures (workers):

- Workers in the risky process/ areas identified should be trained;

a) to avoid work without respiratory protection and
b) to understand the corrosive properties and, especially, the respiratory inhalation effects of the material and
c) to follow the safer procedures instructed by the employer

- Employer must ascertain that the required PPE is available and used according to instructions

RISK MANAGEMENT MEASURES RELATED TO THE ENVIRONMENT

6.2 Risk Management Measures Targeted to Protect the Environment

Environmental Release Category (ERC): ERC1 - Manufacture of substances

Risk Management Measures Targeted to Protect the Environment:
Risk management measures related to the environment aim to avoid discharging potassium carbonate solutions into municipal wastewater or to surface water, in case such discharges are expected to cause significant and undesired pH changes. Adequate 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. Most aquatic organisms can tolerate pH values in the range of 6-9.

WASTE MANAGEMENT MEASURES

7. Waste Management Measures

Waste Related Measures: General
There is no solid waste of potassium hydroxide (KOH). Liquid KOH waste should be reused or discharged to the industrial wastewater and further neutralized if needed (see risk management measures related to environment).

Waste Related Measures: Air
Not applicable for this exposure scenario.

Waste Related Measures: Water

Liquid KOH waste should be reused or discharged to the industrial wastewater and further neutralized if needed (cfr. RMM related to environment).

Waste Related Measures: Soil

Not applicable for this exposure scenario.

INFORMATION ON ESTIMATED EXPOSURE

8.1 Exposure Estimations for Human Health

EXPOSURE ESTIMATION FOR WORKERS

Local irritation is the only activity of potassium hydroxide relevant to human health. Potassium hydroxide (KOH) is not expected to be systemically available in the body under normal handling and use conditions; therefore, systemic effects of KOH after dermal or inhalation exposure are not expected to occur.

Dermal Exposure Estimate (local effects):	**Negligible**
Justification For Estimate of Dermal Exposure (local effects): Potassium Hydroxide (KOH) products with a concentration > 2% are corrosive, therefore, effective control measures are in place to prevent dermal exposure. Furthermore protective clothing and gloves are considered to be used consistently when handling corrosive substances. Production companies report the use of protective gloves, suits and boots while handling pure KOH. Repeated daily dermal exposure to commercial product is therefore considered negligible. Dilutions of KOH containing <2% are not produced at the production sites. Eye exposure is possible due to hand-eye contact, but this is not quantified.	
Inhalation Exposure Estimate:	• 0.20 mg/m^3
Activities/Process(es) covered by Inhalation Exposure Estimate: • PROC 1 • PROC 2 • PROC 3 • PROC 4 • PROC 8a • PROC 8b • PROC 9	
Justification for Estimate of Inhalation Exposure: Highest exposures are measured at the drumming/bagging area; therefore, these values are used for risk characterization.	

INDIRECT EXPOSURE OF HUMANS VIA THE ENVIRONMENT

Indirect exposure to humans via the environment (oral) is not relevant in the case of .?. An example of indirect exposure to humans via the environment would be human exposures through the uptake of drinking water.

8.2 Exposure Estimations for Environment

9.6 EXPOSURE ESTIMATION FOR ENVIRONMENT

Exposure concentrations were not calculated for sediments, soil, groundwater, surface water, air, and waste water treatment plants because those compartments are not considered relevant for this exposure scenario.

GUIDANCE TO DOWNSTREAM USER (DU)

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9. Guidance to Downstream Users to evaluate whether they work inside the boundaries set by the Exposure Scenario:

Follow all applicable risk management measures (RMM's) to minimise potential exposures to human health and to the environment. See section 6.

END OF EXPOSURE SCENARIO

ANNEX - EXPOSURE SCENARIO

EXPOSURE SCENARIO NAME:	**CAUSTIC POTASH-LIQUID - ES 3**

EXPOSURE SCENARIOS: ES1: Manufacturing of liquid KOH
ES2: Manufacturing of solid KOH
ES3: Industrial and professional use of KOH
ES4: Consumer use of KOH in preparations (excl. batteries) ES5: Use of KOH in batteries

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1. Short title of Exposure Scenario: Industrial and professional use of KOH

2. Description of Activities/Process(es) covered by Exposure Scenario

Sector of Use (SU): Because this product has so many uses, and is used so widely it can be potentially used in all sectors of use (SU) described by the use descriptor system (SU 0-23)

Product Category (PC):

Typically, potassium hydroxide (KOH) may be used in many different chemical product categories (PC) such as:
PC9 - Coatings and paints, fillers, putties, thinners
PC12 - Fertilizers
PC19 - Intermediate
PC20 - pH-regulators, flocculants, precipitants, neutralization agents
PC35 - Washing and cleaning products
PC37 - Water treatment chemicals
PC39 - Cosmetics, personal care products
PC40 - Extraction agents
This product could potentially be used in all product categories (PC 0-40)

Process Category (PROC):

The listed process categories are assumed to be the most significant ones, but other process categories could also be applicable (PROC 1-27)
PROC 1 - Use in closed process, no likelihood of exposure
PROC 2 - Use in closed, continuous process with occasional controlled exposure
PROC 3 - Use in closed batch process (synthesis or formulation)
PROC 4 - Use in batch and other process (synthesis) where opportunity for exposure arises
PROC 5 - Mixing or blending in batch process for formulation of preparations and articles (multistage and/or significant contact)
PROC 7 - Industrial spraying
PROC 8a/b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at either dedicated and/or non-dedicated facilities PROC 9 - Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
PROC 10 - Roller application or brushing

PROC 11 - Non industrial spraying
PROC 13 - Treatment of articles by dipping and pouring
PROC 14 - Production of preparations or articles by tabletting, compression, extrusion, pelettisation
PROC 15 - Use a laboratory reagent
PROC 19 - Hand-mixing with intimate contact and only PPE available PROC 23 - Open processing and transfer operations with minerals/metals at elevated temperature

PROC 24 - High (mechanical) energy work-up of substances bound in materials and/or articles
PROC 26 - Handling of solid inorganic substances at ambient temperature **Article**

Category (AC): Not applicable

OPERATIONAL CONDITIONS OF USE

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3. Application Conditions:

This exposure scenario covers the industrial and professional uses of solid and liquid potassium hydroxide (KOH). KOH industrial uses include but are not limited to: as an intermediate in the production of organic and inorganic chemicals that end up in a broad variety of end products, pH stabilizer, reactant in chemical synthesis, alkaline batteries manufacturing and recycling, transfer of KOH, flocculant, precipitant, formulation of products, extracting agent, metal manufacturing, laboratory chemical, water treatment, cleaning applications. KOH professional uses include, but are not limited to: transfer of KOH by professionals, formulation of products (detergents, drain cleaners, oven cleaners, floor strippers, fertilizers, paint strippers, cosmetics, etc.), during production phase of various cleaning
products, use of professional cleaning products, wide dispersive indoor and outdoor use of KOH-containing formulations by professionals (detergents, drain deblockers, cosmetics/personal care, fragrances, paint strippers, etc.), laboratory processing aid (ph regulator, neutralizing agent, etc.).

3.1 Duration and frequency of use:

- The duration and frequency of use will vary depending on the specific application
- Industrial uses: the maximum duration considered for industrial uses in this exposure scenario is a full working shift(8hr/day) and 200 days/year
- Professional uses (some examples include): Professional Floor Strippers - These are applied at a rate of 1-2 L of stripper solution per 10 m2 of flooring, with a single disc machine. Usually 10-15 minutes acting time is necessary between applying and scrubbing the floor. Afterwards the stripper/polish mixture is removed by a vacuum cleaner. Professional oven cleaners - These are applied using a trigger spray or spray can. The frequency of application is 1 event per day and the duration is 10 minutes per event. Professional drain cleaners - Drain cleaners are dosed slowly down the drain. Frequency is of application is 1 application per event per day, and the duration is 1 5 minutes per event. One has to wait at least 15 minutes so that the drain opener can clear the blockage.

4.1 Physical form of substance or preparation:

Solid, Liquid

4.2 Product Specification (Concentration of substance in preparation or article):

- Industrial:
- Production sites usually manufacture liquid KOH with a concentration of approximately 50%
- Some facilities produce KOH liquid products between 10 and 75%
- Professional:
- Depending on the professional application, the product concentration can range from <5 - 90%. This can be as a solution or in a solid form

4.3 Maximum amount per time or activity:

- The amount used per worker varies from activity to activity

. Other relevant operational conditions of use:

- Assumes activities are at ambient temperature (unless stated differently)
- Assumes a good basic standard of occupational hygiene has been implemented

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RISK MANAGEMENT MEASURES RELATED TO HUMAN HEALTH

6.1 Risk Management Measures Related to Human Health

Risk Management Measures Targeted to Workers (Industrial):
This material is corrosive; therefore, risk management measures for human health should focus on the prevention of direct contact with the substance. Automated and closed systems should be used for manufacturing of this substance. Respiratory protection is needed when aerosols of this substance can be formed. Due to the substance's corrosive properties, appropriate skin and eye protection is required.

Engineering Controls (workers):

- Use closed systems or covering of open containers
- Transport over pipes, technical barrel filling/emptying of barrel with automatic systems (e.g. suction pumps)
- Local exhaust ventilation is not required but good practice
- General ventilation is good practice unless local exhaust ventilation is present

Administrative / Work Practice Controls (workers):

- Use of pliers, grip arms with long handles with manual use to avoid direct contact and exposure by splashes

Personal Protective Equipment (PPE), normal working conditions (workers):

- Respiratory Protection: Full face respirator with high efficiency particular air (HEPA) filter is required in case of dust or aerosol formation
- Hand Protection: Chemical Resistant Gloves - MATERIAL: Butyl-rubber, PVC, polychloroprene with natural latexliner MATERIAL THICKNESS: 0.5 mm BREAKTHROUGH TIME:: > 480 minutes

- Hand Protection: Chemical Resistant Gloves - MATERIAL: nitrile-rubber, fluorinated rubber MATERIAL THICKNESS: 0.5 mm, BREAKTHROUGH TIME:: > 480 minutes
- Eye Protection: Chemical Resistant Goggles must be worn. If splashes are likely to occur tightly fitting safety goggles and face-shield are required
- Body Protection: Wear suitable protective clothing, aprons, shield, protective helmet and suits. If splashes are ikely to occur, wear rubber or plastic boots (required)

Other Risk Management Measures (workers):

- Workers in the risky process/ areas identified should be trained a) to avoid work without respiratory protection and b) to understand the corrosive properties and, especially, the respiratory inhalation effects of the material and c) to follow the safer procedures instructed by the employer
- Employer must ascertain that the required PPE is available and used according to instructions
- Measures related to the design of product:

- High viscosity adjustment with aids (good practice)
- Delivery only as barrel commodity and/or in tank car (good practice)

Risk Management Measures Targeted to Professional Use (professionals):

Please refer to the risk management measures for workers and apply those measures to professionals regarding this exposure scenario (PPE, engineering, etc.). There are some additional PPE requirements for professional use.

Personal Protective Equipment (PPE), normal working conditions (professionals):

- Respiratory protection: In case of dust or aerosol formation (e.g. spraying): use respiratory protection with approved filter (P2). If KOH concentration in product is greater than 2% respirator use is required. If KOH concentration in product is between 0.5% and 2% respirator use is good practice, but not required. If KOH concentration in product is less than 0.5% respirator use is not needed
- Hand protection: In case of potential dermal contact: use impervious chemical resistant protective gloves. If KOH concentration in product is greater than 2%, the use of hand protection is required. If KOH concentration in product is between 0.5% and 2%, the use of hand protection is good practice, but not required. If KOH concentration in product is less than 0.5%, hand protection is not needed
- Protective clothing: If splashes are likely to occur, wear suitable protective clothing, aprons, shield and suits, rubber or plastic boots. If KOH concentration in product is greater than 2%, the use of protective clothing is required. If KOH concentration in product is between 0.5% and 2%, the use of protective clothing is good practice, but not required. If KOH concentration in product is less than 0.5%, protective clothing is not needed
- Eye protection: If splashes are likely to occur, wear tightly fitting chemical resistant safety goggles, face -shield. If KOH concentration in product is greater than 2%, the use of eye protection is required. If KOH concentration in product is between 0.5% and 2%, the use of eye protection is good practice, but not required. If KOH concentration in product is less than 0.5%, eye protection is not needed

RISK MANAGEMENT MEASURES RELATED TO THE ENVIRONMENT

6.2 Risk Management Measures Targeted to Protect the Environment

Environmental Release Category (ERC):

To assess the environmental exposure of substances, environmental release categories have been developed for REACH. The following environmental release categories could be applicable to this substance for this exposure scenario:

ERC2 - Formulation of preparations

ERC4 - Industrial use of processing aids in processes and products, not becoming part of articles ERC5 - Into or onto a matrix

ERC6 - Industrial use of intermediates and reactive processing aids

ERC7- Industrial use of substances in closed systems

ERC8 - Wide dispersive indoor and outdoor use of reactive substances, processing aids in open systems

The environmental release categories listed are assumed to be the most significant ones, but other environmental release categories could also be applicable (ERC 1 - 11b)

Risk Management Measures Targeted to Protect the Environment:

Risk management measures related to the environment aim to avoid discharging potassium carbonate solutions into municipal wastewater or to surface water, in case such discharges are expected to cause significant and undesired pH changes. Adequate 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. Most aquatic organisms can tolerate pH values in the range of 6-9. Additionally there are some specific environmental risk management measures related to fertilizers containing up to 20% of KOH in the end product. Direct releases to adjacent surface waters should be avoided. Drift should be minimized. And in line with the requirements for good agricultural practice, agricultural soil should be analysed prior to application of the fertilizer and the application rate should be adjusted according to the results of the analysis.

WASTE MANAGEMENT MEASURES

7. Waste Management Measures

Waste Related Measures: General

There is no solid waste of potassium hydroxide (KOH). Liquid KOH waste should be reused or discharged to the industrial wastewater and further neutralized if needed (see risk management measures related to environment).

Waste Related Measures: Air

Not applicable for this exposure scenario.

Waste Related Measures: Water

Liquid KOH waste should be reused or discharged to the industrial wastewater and further neutralized if needed (cfr. RMM related to environment).

Waste Related Measures: Soil

Not applicable for this exposure scenario.

INFORMATION ON ESTIMATED EXPOSURE

8.1 Exposure Estimations for Human Health

EXPOSURE ESTIMATION FOR WORKERS

Local irritation is the only activity of potassium hydroxide relevant to human health. Potassium hydroxide (KOH) is not expected to be systemically available in the body under normal handling and use conditions; therefore, systemic effects of KOH after dermal or inhalation exposure are not expected to occur. PROC 26 was considered to mainly apply to the metals industry. Handling of inorganic substances is assumed to be included in the existing PROC's assessed.

Workers in industrial settings (applicable)

Dermal Exposure Estimate (local effects):	**Negligible**
Justification For Estimate of Dermal Exposure (local effects): Potassium Hydroxide (KOH) products with a concentration > 2% are corrosive, therefore, effective control measures are in place to prevent dermal exposure. Furthermore protective clothing and gloves are considered to be used consistently when handling corrosive substances. Production companies report the use of protective gloves, suits and boots while handling pure KOH. Repeated daily dermal exposure to commercial product is therefore considered negligible. Dilutions of KOH containing <2% are not produced at the production sites. There is no need to quantitatively derive dermal exposure estimations because a DNEL for dermal exposure is not applicable. Eye exposure is possible due to hand-eye contact, but this is not quantified.	
Inhalation Exposure Estimate:	• 0.23 mg/m^3 • - Liquid KOH
Activities/Process(es) covered by Inhalation Exposure Estimate:	

- PROC 1
- PROC 2
- PROC 3
- PROC 4
- PROC 5
- PROC 7
- PROC 8a
- PROC 8b
- PROC 9
- PROC 10
- PROC 11

- PROC 13
- PROC 14
- PROC 15
- PROC 19
- PROC 23
- PROC 24

Justification for Estimate of Inhalation Exposure:
The exposure estimate was calculated using ECETOC TRA. 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. Professional use was specified where relevant as a worst-case assumption. For the solid, the low dustiness was selected because KOH is very hygroscopic. Only the most relevant PROC's were considered in the assessment.

Inhalation Exposure Estimate:	• 0.01 mg/m^3 • - Solid KOH

Activities/Process(es) covered by Inhalation Exposure Estimate:

- PROC 1
- PROC 2

Justification for Estimate of Inhalation Exposure:
The exposure estimate was calculated using ECETOC TRA. 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. Professional use was specified where relevant as a worst-case assumption. For the solid, the low dustiness was selected because KOH is very hygroscopic. Only the most relevant PROC's were considered in the assessment.

Inhalation Exposure Estimate:	• 0.1 mg/m^3 • - Solid KOH

Activities/Process(es) covered by Inhalation Exposure Estimate:

- PROC 3
- PROC 15

Justification for Estimate of Inhalation Exposure: The exposure estimate was calculated using ECETOC TRA. 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. Professional use was specified where relevant as a worst-case assumption. For the solid, the low dustiness was selected because KOH is very hygroscopic. Only the most relevant PROC's were considered in the assessment.	
Inhalation Exposure Estimate:	• 0.2 mg/m^3 (Use of Local Exhaust Ventilation - LEV is required) • - Solid KOH
Activities/Process(es) covered by Inhalation Exposure Estimate: • PROC 4 • PROC 5 • PROC 11 • • PROC 14	
Justification for Estimate of Inhalation Exposure: The exposure estimate was calculated using ECETOC TRA. 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. Professional use was specified where relevant as a worst-case assumption. For the solid, the low dustiness was selected because KOH is very hygroscopic. Only the most relevant PROC's were considered in the assessment.	
Inhalation Exposure Estimate:	• 0.4 mg/m^3 (Use of Local Exhaust Ventilation and Respiratory Protection Equipment with at least 90% efficiency is required) • - Solid KOH
Activities/Process(es) covered by Inhalation Exposure Estimate: • PROC 23	
Justification for Estimate of Inhalation Exposure: The exposure estimate was calculated using ECETOC TRA 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. Professional use was specified where relevant as a worst-case assumption. For the solid, the low dustiness was selected because KOH is very hygroscopic. Only the most relevant PROC's were considered in the assessment	
Inhalation Exposure Estimate:	• 0.5 mg/m^3 • - Solid KOH

Activities/Process(es) covered by Inhalation Exposure Estimate: • PROC 8a • PROC 8b • PROC 13 • PROC 9 • PROC 10 • PROC 19	
Justification for Estimate of Inhalation Exposure: The exposure estimate was calculated using ECETOC TRA. 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. Professional use was specified where relevant as a worst-case assumption. For the solid, the low dustiness was selected because KOH is very hygroscopic. Only the most relevant PROC's were considered in the assessment.	
Inhalation Exposure Estimate:	• 0.5 mg/m3 (Use of Local Exhaust Ventilation and Respiratory Protection Equipment with at least 90% efficiency is required) • - Solid KOH
Activities/Process(es) covered by Inhalation Exposure Estimate: • PROC 24	
Justification for Estimate of Inhalation Exposure: The exposure estimate was calculated using ECETOC TRA. 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. Professional use was specified where relevant as a worst-case assumption. For the solid, the low dustiness was selected because KOH is very hygroscopic. Only the most relevant PROC's were considered in the assessment.	
Inhalation Exposure Estimate:	**Not applicable (N/A) - Solid KOH**
Activities/Process(es) covered by Inhalation Exposure Estimate: Exposure estimation is not applicable (NA) to:, PROC 7	
Justification for Estimate of Inhalation Exposure: Not applicable to this exposure scenario.	

Workers in professional settings (applicable)
The exposure estimations listed for industrial workers also pertain to professional workers in the covered process categories (PROC's)

INDIRECT EXPOSURE OF HUMANS VIA THE ENVIRONMENT
Indirect exposure to humans via the environment (oral) is not relevant in the case of potassium hydroxide (KOH). An example of indirect exposure to humans via the environment would be human exposures through the uptake of drinking water.

8.2 Exposure Estimations for Environment

9.6 EXPOSURE ESTIMATION FOR ENVIRONMENT

Exposure concentrations were not calculated for sediments, soil, groundwater, surface water, air, and waste water treatment plants because those compartments are not considered relevant for this exposure scenario. The high water solubility and very low vapor pressure indicate that KOH will be found predominantly in water. Significant emissions to air are not expected due to the very low vapor pressure of KOH. 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 KOH to particulate matter will occur in STPs / WWTPs. The exposure assessment for the aquatic environment will only deal with the possible pH changes in sewage treatment plant (STP) or waste water treatment plant (WWTP) effluent and surface water related to the OH- discharges at the local scale.

Exposure Concentration in Sewage Treatment / Waste Water Treatment Plants:	**Referring to the Risk Management Measures related to the environment, aiming to avoid discharging KOH solutions into municipal wastewater unless, the influent of municipal waste water treatment plants are normally circum-neutral and strongly buffered; therefore, no effect on the biological activity is expected**
Exposure Concentration in Soil and Groundwater:	**An exposure concentration was not calculated for KOH in soil and groundwater because it is not considered relevant for KOH However, an additional consideration should be made related to the use of fertilizers containing up to 20% KOH in the end product. In that case, the fertilizer has an intended pH-correction impact on the soil and following the risk management measures on good agricultural practice, agricultural soil should be analyzed prior to application of the fertilizer and the application rate should be adjusted according to the results of the analysis. This way, the impact to terrestrial organisms should be beneficial rather than adverse.**

Exposure Concentration Relevant to the Food Chain (Secondary Poisoning):

Bioaccumulation in organisms is not relevant for KOH. Therefore, there is no need to perform a risk assessment for secondary poisoning.

GUIDANCE TO DOWNSTREAM USER (DU)

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9. Guidance to Downstream Users to evaluate whether they work inside the boundaries set by the Exposure Scenario:

Follow all applicable risk management measures (RMM's) to minimise potential exposures to human health and to the environment. See section 6.

END OF EXPOSURE SCENARIO

ANNEX - EXPOSURE SCENARIO

EXPOSURE SCENARIO NAME:	**CAUSTIC POTASH-LIQUID - ES 4**

EXPOSURE SCENARIOS: ES1: Manufacturing of liquid KOH
ES2: Manufacturing of solid KOH
ES3: Industrial and professional use of KOH
ES4: Consumer use of KOH in preparations (excl. batteries) ES5: Use of KOH in batteries

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1. Short title of Exposure Scenario: Consumer use of KOH in preparations (excl. batteries)

2. Description of Activities/Process(es) covered by Exposure Scenario

Sector of Use (SU): SU21 - Consumer uses: Private households (= general public = consumers)

Product Category (PC):
PC9 - Coatings and paints, fillers, putties, thinners
PC12 - Fertilizers
PC20 - pH-regulators, flocculants, precipitants, neutralization agents
PC28 - Perfumes, fragrances
PC35 - Washing and cleaning products
PC39 - Cosmetics, personal care products
Because of the wide range of applications, it could be potentially be used in all other chemical product categories (PC0 - 40)

Process Category (PROC): Not applicable

Article Category (AC): Not applicable

OPERATIONAL CONDITIONS OF USE

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3. Application Conditions:

The exposure scenario applies to consumer use of potassium hydroxide (KOH), excluding alkaline batteries use, which is addressed in Exposure Scenario 5 (ES-5). A portion of KOH production is applied in wide dispersive uses and enters in consumer products such as, but not limited to: detergents, paint and varnish removers, drain cleaners, degreasing agents, cosmetics, personal care, fragrances, and dairy pipeline cleaners.

3.1 Duration and frequency of use:

• The duration and frequency of use will vary depending on the specific application

4.1 Physical form of substance or preparation:
Solid, Liquid

4.2 Product Specification (Concentration of substance in preparation or article):

• The amount of KOH used will interact with other ingredients in acid-base reactions and thus practically no KOH is left in the final consumer product. However, some cleaning products may contain 0.25 - 0.45% KOH in the final formulation. Some toilet cleaners may contain up to 1.1% and certain soaps may contain up to 0.5% KOH in the final formulation

4.3 Maximum amount per time or activity:

• The amount used per worker varies from activity to activity

5. Other relevant operational conditions of use:

• Assumes use at not > 20°C above ambient

• Assumes a good basic standard of occupational hygiene has been implemented

RISK MANAGEMENT MEASURES RELATED TO HUMAN HEALTH

6.1 Risk Management Measures Related to Human Health

Risk Management Measures Targeted to Consumers (consumers):
The risk management measures related to consumers are mainly related to prevent accidents.

Engineering or Product Design Controls (consumers):

• 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 potassium carbonate in concentrations > 3%, 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 required that appropriate use instructions, and product information should always be provided to consumers. This clearly can reduce the risk of misuse. For reducing the number of accidents, it is advisable to use these products in the absence of children or other sensitive groups. To prevent improper use of potassium carbonate, instructions for use should contain a warning against dangerous mixtures • It is advisable to deliver only in very viscous preparations

• It is advisable to deliver only in small amounts

Instructions Addressed to Consumers (consumers):

• Keep out of reach of children

• Do not apply product into ventilator openings or slots

Personal Protective Equipment (PPE), required under regular conditions of consumer use (consumers): • Respiratory protection: In case of dust or aerosol formation (e.g. spraying): use respiratory protection with approved filter (P2). If KOH concentration in product is greater than 2% respirator use is required. If KOH concentration in product is between 0.5% and 2% respirator use is good practice, but not required. If KOH concentration in product is less than 0.5% respirator use is not needed

- Hand protection: In case of potential dermal contact: use impervious chemical resistant protective gloves. If KOH concentration in product is greater than 2%, the use of hand protection is required. If KOH concentration in product is between 0.5% and 2%, the use of hand protection is good practice, but not required. If KOH concentration in product is less than 0.5%, hand protection is not needed
- Eye protection: If splashes are likely to occur, wear tightly fitting chemical resistant safety goggles, face -shield. If KOH concentration in product is greater than 2%, the use of eye protection is required. If KOH concentration in product is between 0.5% and 2%, the use of eye protection is good practice, but not required. If KOH concentration in product is less than 0.5%, eye protection is not needed

RISK MANAGEMENT MEASURES RELATED TO THE ENVIRONMENT

6.2 Risk Management Measures Targeted to Protect the Environment
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 ERC8e- Wide dispersive outdoor use of reactive substances in open systems

Risk Management Measures Targeted to Protect the Environment:
There are no specific risk management measures related to environment.

WASTE MANAGEMENT MEASURES

7. Waste Management Measures

Waste Related Measures: General
Wasted material and its containers must be disposed of in a safe way (e.g. by returning to a public recycling facility). If the container is empty, trash as regular municipal waste.

INFORMATION ON ESTIMATED EXPOSURE

8.1 Exposure Estimations for Human Health

EXPOSURE ESTIMATION FOR WORKERS
Not applicable to this exposure scenario.

EXPOSURE ESTIMATION FOR CONSUMERS
For consumer exposure it is important to stress that potassium hydroxide exposure is an external exposure. Contact with tissue and water will give potassium and hydroxide ions which are abundantly present in the body
If the recommended RMM's are respected, local exposure through inhalation will not be higher when compared to inhalation exposures in Exposure Scenario 3. Therefore, the consumer exposure through inhalation is not further quantitatively assessed

INDIRECT EXPOSURE OF HUMANS VIA THE ENVIRONMENT

Indirect exposure to humans via the environment (oral) is not relevant in the case of KOH.

8.2 Exposure Estimations for Environment

EXPOSURE ESTIMATION FOR ENVIRONMENT

Consumer uses relate to already diluted products which will be quickly further neutralized in the sewer and therefore will not reach a WWTP or surface water.

GUIDANCE TO DOWNSTREAM USER (DU)

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9. Guidance to Downstream Users to evaluate whether they work inside the boundaries set by the Exposure Scenario:

Follow all applicable risk management measures (RMM's) to minimise potential exposures to human health and to the environment. See section 6.

ANNEX - EXPOSURE SCENARIO

EXPOSURE SCENARIO NAME:	**CAUSTIC POTASH-LIQUID - ES 5**

EXPOSURE SCENARIOS:

ES1: Manufacturing of liquid KOH
ES2: Manufacturing of solid KOH
ES3: Industrial and professional use of KOH
ES4: Consumer use of KOH in preparations (excl. batteries)
ES5: Use of KOH in batteries

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1. Short title of Exposure Scenario: Consumer use of KOH in batteries

2. Description of Activities/Process(es) covered by Exposure Scenario

Sector of Use (SU): SU21 - Consumer uses: Private households (= general public = consumers)

Product Category (PC): Not applicable

Process Category (PROC): Not applicable

Article Category (AC): AC3 - Electrical batteries and accumulators

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OPERATIONAL CONDITIONS OF USE

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3. Application Conditions:

The exposure scenario focuses on the consumer use of alkaline batteries, the service life and the end-of-life stage of KOH in batteries. KOH is present in alkaline batteries, but the substance is strictly confined in the battery containers and is not in direct contact with consumers. Batteries are sealed articles and during normal use its contents, including KOH, will not be directly released and emission from KOH in these life-cycle stages should be minimal.

3.1 Duration and frequency of use:

- Not applicable (N/A)
- When using alkaline batteries, KOH is not in direct contact with consumers

4.1 Physical form of substance or preparation: Liquid

4.2 Product Specification (Concentration of substance in preparation or article):

- KOH is present in alkaline batteries, but the substance is strictly confined in the battery containers and is not indirect contact with consumers

4.3 Maximum amount per time or activity:

- Not relevant

5. Other relevant operational conditions of use:

- None identified

RISK MANAGEMENT MEASURES RELATED TO HUMAN HEALTH

6.1 Risk Management Measures Related to Human Health

Risk Management Measures Targeted to Consumers (consumers):
The risk management measures related to consumers are mainly related to prevent accidents.

Engineering or Product Design Controls (consumers):

- Measures related to the design of the product:
- It is required to use completely sealed articles with a long service life maintenance

RISK MANAGEMENT MEASURES RELATED TO THE ENVIRONMENT

6.2 Risk Management Measures Targeted to Protect the Environment

Risk Management Measures Targeted to Protect the Environment:
Due to the negligible exposure of KOH during normal battery use and disposal, there are no specific risk management measures related to environment.

WASTE MANAGEMENT MEASURES

7. Waste Management Measures

Waste Related Measures: General
Batteries should be recycled as much as possible (e.g. by returning to a public recycling facility). Recovery of KOH from alkaline batteries includes removing the electrolyte, collection and neutralization with sulphuric acid and carbon dioxide. The occupational exposure related to these steps are considered in the exposure scenario on industrial and professional use of KOH.

INFORMATION ON ESTIMATED EXPOSURE

8.1 Exposure Estimations for Human Health

EXPOSURE ESTIMATION FOR WORKERS
Not applicable to this exposure scenario.

EXPOSURE ESTIMATION FOR CONSUMERS
Consumer exposure is negligible because batteries are sealed articles with a long service life maintenance

INDIRECT EXPOSURE OF HUMANS VIA THE ENVIRONMENT
Indirect exposure to humans via the environment (oral) is not relevant in the case of potassium hydroxide. An example of indirect exposure to humans via the environment would be human exposures through the uptake of drinking water.

8.2 Exposure Estimations for Environment

EXPOSURE ESTIMATION FOR ENVIRONMENT

The environmental release from the consumer use during service life is negligible because batteries are sealed articles with a long service life. After use, batteries normally are recycled and even in case it is disposed as municipal waste, KOH is not expected to cause a significant (pH) effect to the environment when incinerated or land-filled.

GUIDANCE TO DOWNSTREAM USER (DU)

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9. Guidance to Downstream Users to evaluate whether they work inside the boundaries set by the Exposure Scenario:

Follow all applicable risk management measures (RMM's) to minimise potential exposures to human health and to the environment. See section 6.

END OF EXPOSURE SCENARIO