

Version: 7.0/EN

Revision date: December 2020

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

### 1.1 Product identifier

Mixture name: mixture of calcium dihydroxide and water  
Synonyms: milk of lime  
Trade name:

Name	Ufi Code
Ulmer Weißkalkmilch 36	C300-P0FF-600T-GDHU
Ulmer Weißkalkmilch 20	T520-U00Y-J00P-CKHD

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

#### Use of the mixture:

The substance is intended for the following non-exhaustive list of uses:

Building material industry, Chemical industry, Agriculture, Environmental protection (e.g. flue gas treatment, waste water treatment, sludge treatment), Drinking water treatment, Feed, food and pharmaceutical industry, Civil engineering, Paper and paint industry

#### 1.2.1 Identified uses

All uses listed in table 1 of the Appendix of this SDS are identified uses.

#### 1.2.2 Uses advised against

No use identified in Table 1 of the Appendix of this SDS is advised against.

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

Name: Märker Kalk GmbH  
Werk Harburg  
Address: Oskar-Märker-Str. 24  
86655 Harburg  
Phone N°: ++49-(0)9080 8 0  
Fax N°: ++49- (0)9080 8 653  
E-mail of competent person responsible for SDS in the MS or in the EU: [reach@maerker-gruppe.de](mailto:reach@maerker-gruppe.de)

### 1.4 Emergency telephone number

European Emergency N°: 112  
National centre for Prevention and Treatment of Intoxications N°: ++49-(0)6131 19 240, Giftnotrufzentrale Mainz  
Emergency telephone at the company: ++49-(0)9080 8 0  
Available outside office hours:  Yes  No

## SECTION 2: HAZARDS IDENTIFICATION 2.1. Classification of the mixture

Information on a mixture containing a Ca(OH)<sub>2</sub> content above 20%.

### 2.1.1. Classification according to Regulation (EC) 1272/2008

Skin irrit. 2, H315  
STOT SE 3, H335  
Eye Dam. 1, H318

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## 2.1.2. Additional information

For full text of H-statements: see SECTION 16

## 2.2. Label elements

### 2.2.1. Labelling according to Regulation (EC) 1272/2008

Signal word: Danger

Hazard pictograms:



Hazard statements:

H315: Causes skin irritation  
H318: Causes serious eye damage  
H335: May cause respiratory irritation

Precautionary statements:

P102: Keep out of reach of children  
P261: Avoid breathing spray  
P280: Wear protective gloves/protective clothing/eye protection/face protection  
P302+P352: If on skin: Wash with plenty of soap and water  
P304+P340: If Inhaled: Remove victim to fresh air and keep at rest in a position comfortable for breathing  
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.  
P501: Dispose of contents/container in accordance with local/regional/national/international regulation

## 2.3. Other hazards

The constituent calcium dihydroxide does not meet the criteria for PBT or vPvB substance according to Regulation (EC) No 1907/2006, Annex XIII.

The constituent calcium dihydroxide not included in the Candidate List of substances of very high concern for Authorisation.

The constituent calcium dihydroxide is not identified as having endocrine disrupting properties in accordance with the criteria set out in Commission Delegated Regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605.

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## SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

### 3.1. Substances

Not relevant

### 3.2. Mixtures

Description of the mixture:

Mixture of calcium dihydroxide and water

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Hazardous ingredients:

CAS number	EC number	Registration No	Identification name	Weight % content (or range)	Classification according to Regulation (EC) No 1272/2008 [CLP]
1305-62-0	215-137-3	01-2119475151-45-0022	Calcium dihydroxide	> 20 %	<i>Eye Dam 1 H318</i> <i>Skin Irrit. 2 H315</i> <i>STOT SE 3 (inhalation) H335</i>

Substances of Very High Concern (SVHC) that have been published in accordance with Article 59 of Regulation (EC) No 1907/2006 are not included in concentrations above 0.1% by mass.

Impurities: Impurities above the concentration limit for classification or  $\geq 1\%$  (w / w) are not available

## SECTION 4: FIRST AID MEASURES

### 4.1. Description of first aid measures

#### General advice

No known delayed effects. Consult a physician for all exposures except for minor instances.

#### Following inhalation

Remove source of mist/spray or move person to fresh air. Obtain medical attention immediately.

#### Following skin contact

Wash affected area immediately with plenty of water. Remove contaminated clothing. If necessary seek medical advice.

#### Following eye contact

Rinse eyes immediately with plenty of water and seek medical advice.

#### Following ingestion

Clean mouth with water and drink afterwards plenty of water. Do NOT induce vomiting. Obtain medical attention.

#### Self-protection of the first aider

Avoid contact with skin, eyes, and clothing – wear suitable protective equipment (see section 8.2.2).  
Avoid inhalation of dust – ensure that sufficient ventilation or suitable respiratory protective equipment is used (see section 8.2.2).

### 4.2. Most important symptoms and effects, both acute and delayed

The mixture is not acutely toxic via the oral, dermal, or inhalation route. It is classified as irritating to skin and to the respiratory system and entails a risk of serious damage to the eye. There is no concern for adverse systemic effects because local effects (pH-effect) are the major health hazard.

### 4.3. Indication of any immediate medical attention and special treatment needed

Follow the advises given in Section 4.1

## SECTION 5: FIRE FIGHTING MEASURES

### 5.1. Extinguishing media

#### 5.1.1. Suitable extinguishing media

Suitable extinguishing media: The mixture is not combustible. Use a dry powder, foam or CO<sub>2</sub> fire extinguisher to extinguish the surrounding fire.

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

#### 5.1.2. Unsuitable extinguishing media

None

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## 5.2. Special hazards arising from the mixture

None

## 5.3. Advice for fire fighters

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

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## SECTION 6: ACCIDENTAL RELEASE MEASURES

### 6.1. Personal precautions, protective equipment and emergency procedures

#### 6.1.1. For non-emergency personnel

Ensure adequate ventilation.

Keep mist and spray levels to a minimum.

Keep unprotected persons away.

Avoid contact with skin, eyes, and clothing – wear suitable protective equipment (see Section 8).

Avoid inhalation of mist and spray – ensure that sufficient ventilation or suitable respiratory protective equipment is used, wear suitable protective equipment (see Section 8).

#### 6.1.2. For emergency responders

Keep mist and spray levels to a minimum.

Ensure adequate ventilation.

Keep unprotected persons away.

Avoid contact with skin, eyes, and clothing – wear suitable protective equipment (see Section 8).

Avoid inhalation of mist and spray – ensure that sufficient ventilation or suitable respiratory protective equipment is used, wear suitable protective equipment (see Section 8).

### 6.2. Environmental precautions

Contain the spillage. Avoid uncontrolled spills to watercourses and drains (pH increase). Any large spillage into watercourses must be alerted to the Environment Agency or other regulatory body.

### 6.3. Methods and material for containment and cleaning up

Pick up the product mechanically in.

### 6.4. Reference to other sections

For more information on exposure controls/personal protection or disposal considerations, please check Section 8 and 13 and the annex of this safety data sheet.

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## SECTION 7: HANDLING AND STORAGE

### 7.1. Precautions for safe handling

#### 7.1.1. Protective measures

Avoid contact with skin and eyes. Wear protective equipment (refer to Section 8 of this safety data sheet). Do not wear contact lenses when handling this product. It is also advisable to have individual pocket eyewash. Keep mist and spray levels to a minimum. Handling systems should preferably be enclosed. When handling bulks usual precautions should be paid to the risks outlined in the Council Directive 90/269/EEC.

#### 7.1.2. Advice on general occupational hygiene

Avoid inhalation of mists and sprays, ingestion and contact with skin and eyes. General occupational hygiene measures are required to ensure safe handling of the substance. These measures involve good personal and housekeeping practices (i.e. regular cleaning with suitable cleaning devices), no drinking, eating and smoking at the workplace. Shower and change clothes at end of work shift. Do not wear contaminated clothing at home.

### 7.2. Conditions for safe storage, including any incompatibilities

Bulk storage should be in purpose – designed silos. Keep away from acids and nitro compounds. Keep out of reach of children. Do not use aluminium for transport or storage.

**7.3. Specific end use(s)**

Please check the identified uses in the Appendix of this SDS.

For more information please see the relevant exposure scenario, available in the Appendix.

**SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION**

All the information of this section refers to the main ingredient "calcium dihydroxide".

**8.1. Control parameters**

**DNELs:**

<b>Workers</b>				
<b>Route of exposure</b>	<b>Acute effect local</b>	<b>Acute effects systemic</b>	<b>Chronic effects local</b>	<b>Chronic effects systemic</b>
<b>Oral</b>	Not required			
<b>Inhalation</b>	4 mg / m <sup>3</sup> (Respirable dust)	No hazard identified	1 mg / m <sup>3</sup> (Respirable dust)	No hazard identified
<b>Dermal</b>	Hazard identified but no DNEL available	No hazard identified	Hazard identified but no DNEL available	No hazard identified

<b>Consumers</b>				
<b>Route of exposure</b>	<b>Acute effect local</b>	<b>Acute effects systemic</b>	<b>Chronic effects local</b>	<b>Chronic effects systemic</b>
<b>Oral</b>	No exposure expected	No hazard identified	No exposure expected	No hazard identified
<b>Inhalation</b>	4 mg / m <sup>3</sup> (Respirable dust)	No hazard identified	1 mg / m <sup>3</sup> (Respirable dust)	No hazard identified
<b>Dermal</b>	Hazard identified but no DNEL available	No hazard identified	Hazard identified but no DNEL available	No hazard identified

**PNECs:**

<b>Environment protection target</b>	<b>PNEC</b>	<b>Remarks</b>
<b>Fresh water</b>	0.49 mg / L	
<b>Freshwater sediments</b>	No PNEC available	Insufficient data available
<b>Marine water</b>	0.32 mg / L	
<b>Marine sediments</b>	No PNEC available	Insufficient data available
<b>Food (bioaccumulation)</b>	No hazard identified	No potential for bioaccumulation
<b>Microorganisms in sewage treatment</b>	3 mg / L	

<b>Soil (agricultural)</b>	1080 mg / kg soil dw	
<b>Air</b>	No hazard identified	

**Exposure limit values for calcium dihydroxide:**

**EU indicative occupational exposure limit (IOELV):**

Long-term exposure limit (8 hours.)	1 mg/m <sup>3</sup>	Directive (EU) 2017/164
Short-term exposure limit (15 Min.)	4 mg/m <sup>3</sup>	

**8.2. Exposure controls**

To control potential exposures, intentional generation of mists and spray should be avoided. Consequential misting caused by interaction of fluid with fast moving machinery should be avoided. Further, appropriate protective equipment is recommended. Eye protection equipment (e.g. goggles or visors) must be worn, unless potential contact with the eye can be excluded by the nature and type of application (i.e. closed process). Additionally, face protection, protective clothing and safety shoes are required to be worn as appropriate. Please check the relevant exposure scenario, given in the Appendix of this SDS.

**8.2.1. Appropriate engineering controls**

If user operations intentionally or consequently generate mist or spray, use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne mist levels below recommended exposure limits.

**8.2.2. Individual protection measures, such as personal protective equipment**

**8.2.2.1. Eye/face protection**

Do not wear contact lenses. Tight fitting goggles with side shields (frame goggles), or wide vision full goggles in accordance with EN 166:2001, at least optical class 2, mechanical strength F. It is also advisable to have individual pocket eyewash.

**8.2.2.2. Skin protection**

Since calcium dihydroxide is classified as irritating to skin, dermal exposure has to be minimised as far as technically feasible. The use of protective gloves (nitrile (NBR) in accordance with EN ISO 374-1: 2018/type A or B (test chemical K, at least 0,2 mm thick)), protective standard working clothes fully covering skin, full length trousers, long sleeved overalls, with close fittings at openings and shoes resistant to caustics and avoiding dust penetration are required to be worn

**8.2.2.3. Respiratory protection**

Local ventilation to control airborne dust levels below occupational exposure limits is recommended. A suitable particle filter mask is recommended, depending on the expected exposure levels (low dust level: FFP1 mask; medium dust level: FFP2 mask; high dust level: FFP3 mask) - please check the relevant exposure scenario, given in the Appendix.

**8.2.2.4. Thermal hazards**

The substance does not represent a thermal hazard, thus special consideration is not required.

**8.2.3. Environmental exposure controls**

All ventilation systems should be filtered before discharge to atmosphere.

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Avoid releasing to the environment.

Contain the spillage. Any large spillage into watercourses must be alerted to the regulatory authority responsible for environmental protection or other regulatory body.

For detailed explanations of the risk management measures that adequately control exposure of the environment to the substance please check the relevant exposure scenario, available via your supplier.

For further detailed information, please check the Appendix of this SDS.

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## SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

### 9.1. Information on basic physical and chemical properties

- |                               |  |
|-------------------------------|--|
| a) Physical state:            | suspension in water  |
| b) Colour:                    | white or off white (beige)   |
| c) Odour:                     | odourless  |
| d) Melting point              | 0 °C (water)   |
| e) Boiling point:             | 100 °C (water)   |
| f) Flammability:              | non flammable (study result for calcium dihydroxide, EU A.10 method)   |
| g) Explosion limits:          | non explosive (void of any chemical structures commonly associated with explosive properties)                        |
| h) Flash point:               | not applicable   |
| i) Auto ignition temperature: | no relative self-ignition temperature below 400 °C (study result, EU A.16 method)                                    |
| j) Decomposition temperature: | When heated above 580 °C, calcium dihydroxide decomposes to produce calcium oxide (CaO) and water (H <sub>2</sub> O) |
| k) pH:                        | 12.4 (Ca(OH) <sub>2</sub> saturated solution at 20 °C)   |
| l) Viscosity:                 | not applicable   |
| m) Solubility in water:       | 1844.9 mg/L (study results for calcium dihydroxide, EU A.6 method)   |
| n) Partition coefficient:     | not applicable   |
| o) Vapour pressure:           | 2.3 kPa at 20°C (water)  |
| p) Relative density:          | 1,06 – 1,38 g/ml depending on concentration  |
| q) Vapour density:            | not measured   |
| r) Particle characteristics:  | not applicable, suspension, liquid   |

### 9.2. Other information

None

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## SECTION 10: STABILITY AND REACTIVITY

### 10.1. Reactivity

The mixture dissociates resulting in the formation of calcium cations and hydroxyl anions (when below the limit of water solubility).

### 10.2. Chemical stability

Under normal conditions of use and storage, the mixture is stable.

### 10.3. Possibility of hazardous reactions

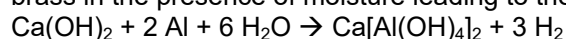
The mixture reacts exothermically with acids. When heated above 580 °C, calcium dihydroxide decomposes to produce calcium oxide (CaO) and water (H<sub>2</sub>O):  $\text{Ca(OH)}_2 \rightarrow \text{CaO} + \text{H}_2\text{O}$ .

### 10.4. Conditions to avoid

None.

### 10.5. Incompatible materials

The mixture reacts exothermically with acids to form salts. The mixture reacts with aluminium and brass in the presence of moisture leading to the production of hydrogen.



## 10.6. Hazardous decomposition products

None.

Further information: The constituent calcium dihydroxide reacts with carbon dioxide to form calcium carbonate, which is a common material in nature.

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## SECTION 11: TOXICOLOGICAL INFORMATION

The mixture is classified as irritating to skin and to the respiratory system and entails a risk of serious damage to the eye.

### 11.1. Information on toxicological effects

#### a. Acute toxicity

One of the substances, calcium dihydroxide, is not acutely toxic.

Oral LD<sub>50</sub> > 2000 mg/kg bw (OECD 425, rat)

Dermal LD<sub>50</sub> > 2500 mg/kg bw (OECD 402, rabbit)

Inhalation no data available

Classification for acute toxicity is not warranted.

#### b. Skin corrosion/irritation

The mixture is irritating to skin (*in vivo*, rabbit).

#### c. Serious eye damage/irritation

The mixture entails a risk of serious damage to the eye (eye irritation studies (*in vivo*, rabbit)).

#### d. Respiratory or skin sensitisation

The constituent calcium dihydroxide is considered not to be a skin sensitiser, based on the nature of the effect (pH shift) and the essential requirement of calcium for human nutrition.

Classification for sensitisation is not warranted.

#### e. Germ cell mutagenicity

One of the substances of the mixture, Calcium dihydroxide, is not genotoxic (in vitro, OECD 471, 473 and 476). In view of the ubiquity of calcium and the physiological irrelevance of a pH increase in aqueous media, calcium dihydroxide has no genotoxic potential

#### f. Carcinogenicity

Calcium (administered as Ca-lactate) is not carcinogenic (experimental result, rat).

The pH effect of the mixture does not give rise to a carcinogenic risk.

Human epidemiological data support lack of any carcinogenic potential of calcium dihydroxide.

Classification for carcinogenicity is not warranted.

#### g. Reproductive toxicity

Calcium (administered as Ca-carbonate) is not toxic to reproduction (experimental result, mouse).

The pH effect does not give rise to a reproductive risk.

Human epidemiological data support lack of any potential for reproductive toxicity of calcium dihydroxide.

Both in animal studies and human clinical studies on various calcium salts no reproductive or developmental effects were detected. Also see the Scientific Committee on Food (Section 16.6). Thus, calcium dihydroxide is not toxic for reproduction and/or development.

Classification for reproductive toxicity according to regulation (EC) 1272/2008 is not required.

#### h. STOT-single exposure

From human data it is concluded that Ca(OH)<sub>2</sub> is irritating to the respiratory tract.



i. **STOT-repeated exposure**

Toxicity of calcium via the oral route is addressed by upper intake levels (UL) for adults determined by the Scientific Committee on Food (SCF), being

UL = 2500 mg/d, corresponding to 36 mg/kg bw/d (70 kg person) for calcium.

Toxicity of Ca(OH)<sub>2</sub> (One of the substances of the mixture) via the dermal route is not considered as relevant in view of the anticipated insignificant absorption through skin and due to local irritation as the primary health effect (pH shift).

Toxicity of Ca(OH)<sub>2</sub> via inhalation (local effect, irritation of mucous membranes) is addressed by an 8-h TWA determined by the Scientific Committee on Occupational Exposure Limits (SCOEL) of 1 mg/m<sup>3</sup> respirable dust (see Section 8.1).

j. **Aspiration hazard**

One of the substances of the mixture, Calcium hydroxide is not known to present an aspiration hazard.

**11.2 Information on other hazards**

**11.2.1 Endocrine disrupting properties**

Available data for the substance have been considered against the criteria laid down in Regulations ((EC) No 1907/2006, (EU) 2017/2100, (EU) 2018/605) and found not to apply.

**11.2.2 Other information**

None

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**SECTION 12: ECOLOGICAL INFORMATION**

All the information of this section refers to the main constituent calcium dihydroxide

**12.1. Toxicity**

**12.1.1. Acute/Prolonged toxicity to fish**

LC<sub>50</sub> (96h) for freshwater fish: 50.6 mg/l

LC<sub>50</sub> (96h) for marine water fish: 457 mg/l

**12.1.2. Acute/Prolonged toxicity to aquatic invertebrates**

EC<sub>50</sub> (48h) for freshwater invertebrates: 49.1 mg/l

LC<sub>50</sub> (96h) for marine water invertebrates: 158 mg/l

**12.1.3. Acute/Prolonged toxicity to aquatic plants**

EC<sub>50</sub> (72h) for freshwater algae: 184.57 mg/l

NOEC (72h) for freshwater algae: 48 mg/l

**12.1.4. Toxicity to micro-organisms e.g. bacteria**

At high concentration, through the rise of pH, calcium dihydroxide is used for disinfection of sewage sludges.

**12.1.5. Chronic toxicity to aquatic organisms**

NOEC (14d) for marine water invertebrates: 32 mg/l

**12.1.6. Toxicity to soil dwelling organisms**

EC<sub>10</sub>/LC<sub>10</sub> or NOEC for soil macroorganisms: 2000 mg/kg soil dw

EC<sub>10</sub>/LC<sub>10</sub> or NOEC for soil microorganisms: 12000 mg/kg soil dw

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#### 12.1.7. Toxicity to terrestrial plants

NOEC (21d) for terrestrial plants: 1080 mg/kg

#### 12.1.8. General effect

Acute pH-effect. Although the mixture is useful to correct water acidity, an excess of more than 1 g/l may be harmful to aquatic life. pH-value above 12 will rapidly decrease as result of dilution and carbonation.

#### 12.2. Persistence and degradability

Not relevant for inorganic substances

#### 12.3. Bioaccumulative potential

Not relevant for inorganic substances

#### 12.4. Mobility in soil

Calcium dihydroxide, which is sparingly soluble, presents a low mobility in most soils

#### 12.5. Results of PBT and vPvB assessment

Not relevant for inorganic substances

#### 12.6 Endocrine disrupting properties

Available data for the substance have been considered against the criteria laid down in Regulations ((EC) No 1907/2006, (EU) 2017/2100, (EU) 2018/605) and found not to apply

#### 12.7 Other adverse effects:

No other adverse effects are identified.

According to the criteria of the European classification and labelling system, the substance does not require classification as hazardous for the environment.

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### SECTION 13: DISPOSAL CONSIDERATIONS

#### 13.1. Waste treatment methods

Disposal of the mixture should be in accordance with local and national legislation. Processing, use or contamination of this product may change the waste management options. Dispose of container and unused contents in accordance with applicable member state and local requirements.

The used packing is only meant for packing this product; it should not be reused for other purposes. After usage, empty the packing completely.

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### SECTION 14: TRANSPORT INFORMATION

Calcium dihydroxide is not classified as hazardous for transport [ADR (road), RID (rail), ICAO/IATA (air), ADN (inland waterways) and IMDG (sea)] in Europe. It is classified in Germany.

#### 14.1. UN-Number

Not regulated in Europe, in Germany: 3266

#### 14.2. UN proper shipping name

Not regulated in Europe, in Germany: corrosive Liquid, Basic, inorganic, n.o.s.

#### 14.3. Transport hazard class

Not regulated in Europe, in Germany: 8

#### 14.4. Packing group

Not regulated in Europe, in Germany: III

#### 14.5. Environmental hazards

None

#### 14.6. Special precautions for user

Avoid any release of dust during transportation, by using air-tight tanks.

Not regulated in Europe, in Germany Tunnel restriction code E

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

Not regulated

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### SECTION 15: REGULATORY INFORMATION

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

Authorisations: Not required

Restrictions on use: None

Other EU regulations: The substance calcium dihydroxide is not a SEVESO substance, not an ozone depleting substance and not a persistent organic pollutant.

National regulations: Germany: water hazard class 1, self assessment AwSV

Storage class: Germany LGK 12 according to TRGS 510 (non-flammable liquids)

#### 15.2. Chemical safety assessment

A chemical safety assessment has been carried out for the ingredient calcium dihydroxide.

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### SECTION 16: OTHER INFORMATION

Data are based on our latest knowledge but do not constitute a guarantee for any specific product features and do not establish a legally valid contractual relationship.

#### 16.1. Relevant H- statements

##### Hazard Statements

H315: Causes skin irritation

H318: Causes serious eye damage

H335: May cause respiratory irritation

#### 16.2. Relevant P- statements

##### Precautionary statements:

P102: Keep out of reach of children

P280: Wear protective gloves/protective clothing/eye protection/face protection

P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P302+P352: IF ON SKIN: Wash with plenty of water

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

P261: Avoid breathing dust/spray

P304+P340: IF INHALED: Remove person to fresh air and keep comfortable for breathing

P501: Dispose of contents/container in accordance with local/regional/national/international regulation

### 16.3. Abbreviations

EC<sub>50</sub>: median effective concentration  
LC<sub>50</sub>: median lethal concentration  
LD<sub>50</sub>: median lethal dose  
NOEC: no observable effect concentration  
OEL: occupational exposure limit  
PBT: persistent, bioaccumulative, toxic chemical  
PNEC: predicted no-effect concentration  
STEL: short-term exposure limit  
TWA: time weighted average  
vPvB: very persistent, very bioaccumulative chemical

### 16.4. Key literature references

The following references relate to calcium dihydroxide:

Anonymous, 2006: Tolerable upper intake levels for vitamins and minerals Scientific Committee on Food, European Food Safety Authority, ISBN: 92-9199-014-0 [SCF document]

Anonymous, 2008: Recommendation from the Scientific Committee on Occupational Exposure Limits (SCOEL) for calcium oxide (CaO) and calcium dihydroxide (Ca(OH)<sub>2</sub>), European Commission, DG Employment, Social Affairs and Equal Opportunities, SCOEL/SUM/137 February 2008

### 16.5. Indication of changes

The SDS has been revised to comply with Regulation (EU) 2020/878 of 18 June 2020 amending Annex II to Regulation (EC) No 1907/2006 of REACH.

1.1, 1.2; 2.3; 3.2; 4.1; 5.1.1; 8.1 ; 8.2.2.1; 8.2.2.2.; 8.2.2.3; 9.1; 9.2; 10.3; 11.1; 11.2.1; 11.2.2.; 12.6; 12.7; 13.1; 14.1; 14.6; 14.7;

### Disclaimer

This safety data sheet (SDS) is based on the legal provisions of the REACH Regulation (EC 1907/2006; article 31 and Annex II), as amended. Its contents are intended as a guide to the appropriate precautionary handling of the material. It is the responsibility of recipients of this SDS to ensure that the information contained therein is properly read and understood by all people who may use, handle, dispose or in any way come in contact with the product. Information and instructions provided in this SDS are based on the current state of scientific and technical knowledge at the date of issue indicated. It should not be construed as any guarantee of technical performance, suitability for particular applications, and does not establish a legally valid contractual relationship. This version of the SDS supersedes all previous versions.

## **APPENDIX including Exposure Scenarios 9.1, 9.6 and 9.15**

### Appendix: Exposure scenarios

The current document includes all relevant occupational and environmental exposure scenarios (ES) for the production and use of the mixture of calcium dihydroxide and water (lime of milk) as required under the REACH Regulation (Regulation (EC) No 1907/2006). For the development of the ES the Regulation and the relevant REACH Guidance have been considered. For the description of the covered uses and processes, the “R.12 – Use descriptor system” guidance (Version: 2, March 2010, ECHA-2010-G-05-EN), for the description and implementation of risk management measures (RMM) the “R.13 – Risk management measures” guidance (Version: 1.1, May 2008), for the occupational exposure estimation the “R.14 – Occupational exposure estimation” guidance (Version: 2, May 2010, ECHA-2010-G-09-EN) and for the actual environmental exposure assessment the “R.16 – Environmental Exposure Assessment” (Version: 2, May 2010, ECHA-10-G-06-EN) was used.

### **Methodology used for environmental exposure assessment**

The environmental exposure scenarios only address the assessment at the local scale, including municipal sewage treatment plants (STPs) or industrial waste water treatment plants (WWTPs) when applicable, for industrial and professional uses as any effects that might occur is expected to take place on a local scale.

#### **1) Industrial uses (local scale)**

The exposure and risk assessment is only relevant for the aquatic environment, when applicable including STPs/WWTPs, as emissions in the industrial stages mainly apply to (waste) water. The aquatic effect and risk assessment only deal with the effect on organisms/ecosystems due to possible pH changes related to OH<sup>-</sup> discharges. The exposure assessment for the aquatic environment only deals with the possible pH changes in STP effluent and surface water related to the OH<sup>-</sup> discharges at the local scale and is performed by assessing the resulting pH impact: the surface water pH should not increase above 9 (In general, most aquatic organisms can tolerate pH values in the range of 6-9).

Risk management measures related to the environment aim to avoid discharging calcium dihydroxide 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. Discharges should be carried out such that pH changes in receiving surface waters are minimised. The effluent pH is normally measured and can be neutralised easily, as often required by national laws.

#### **2) Professional uses (local scale)**

The exposure and risk assessment is only relevant for the aquatic and terrestrial environment. The aquatic effect and risk assessment is determined by the pH effect. Nevertheless, the classical risk characterisation ratio (RCR), based on PEC (predicted environmental concentration) and PNEC (predicted no effect concentration) is calculated. The professional uses on a local scale refer to applications on agricultural or urban soil. The environmental exposure is assessed based on data and a modelling tool. The modelling FOCUS/ Exposit tool is used to assess terrestrial and aquatic exposure (typically conceived for biocidal applications).

Details and scaling approach indications are reported in the specific scenarios.

### **Methodology used for occupational exposure assessment**

By definition an exposure scenario (ES) has to describe under which operational conditions (OC) and risk management measure (RMMs) the substance can be handled safely. This is demonstrated if the estimated exposure level is below the respective derived no-effect level (DNEL), which is expressed in the risk characterisation ratio (RCR). For workers, the repeated dose DNEL for inhalation as well as the acute DNEL for inhalation are based on the respective recommendations of the scientific committee on occupational exposure limits (SCOEL) being 1 mg/m<sup>3</sup> and 4 mg/m<sup>3</sup>, respectively.

In cases where neither measured data nor analogous data are available, human exposure is assessed with the aid of a modelling tool. At the first tier screening level, the MEASE tool (<http://www.ebrc.de/mease.html>) is used to assess inhalation exposure according to the ECHA guidance (R.14).

Since the SCOEL recommendation refers to respirable dust while the exposure estimates in MEASE reflect the inhalable fraction, an additional safety margin is inherently included in the exposure scenarios below when MEASE has been used to derive exposure estimates.

#### **Methodology used for consumer exposure assessment**

By definition an ES has to describe under which conditions the substances, preparation or articles can be handled safely. In cases where neither measured data nor analogous data are available, exposure is assessed with the aid of a modelling tool.

For consumers, the repeated dose DNEL for inhalation as well as the acute DNEL for inhalation are based on the respective recommendations of the Scientific Committee on Occupational Exposure Limits (SCOEL), being 1 mg/m<sup>3</sup> and 4 mg/m<sup>3</sup>, respectively.

For inhalation exposure to powders the data, derived from van Hemmen (van Hemmen, 1992: Agricultural pesticide exposure data bases for risk assessment. Rev Environ Contam Toxicol. 126: 1-85.), has been used to calculate the inhalation exposure. The inhalation exposure for consumers is estimated at 15 µg/hr or 0.25 µg/min. For larger tasks the inhalation exposure is expected to be higher. A factor of 10 is suggested when the product amount exceeds 2.5 kg, resulting in the inhalation exposure of 150 µg/hr. To convert these values in mg/m<sup>3</sup> a default value of 1.25 m<sup>3</sup>/hr for the breathing volume under light working conditions will be assumed (van Hemmen, 1992) giving 12 µg/m<sup>3</sup> for small tasks and 120 µg/m<sup>3</sup> for larger tasks.

When the preparation or substance is applied in granular form or as tablets, reduced exposure to dust was assumed. To take this into account if data about particle size distribution and attrition of the granule are lacking, the model for powder formulations is used, assuming a reduction in dust formation by 10 % according to Becks and Falks (Manual for the authorisation of pesticides. Plant protection products. Chapter 4 Human toxicology; risk operator, worker and bystander, version 1.0., 2006).

For dermal exposure and exposure to the eye a qualitative approach has been followed, as no DNEL could be derived for this route due to the irritating properties of calcium oxide. Oral exposure was not assessed as this is not a foreseeable route of exposure regarding the uses addressed.

Since the SCOEL recommendation refers to respirable dust while the exposure estimates by the model from van Hemmen reflect the inhalable fraction, an additional safety margin is inherently included in the exposure scenarios below, i.e. the exposure estimates are very conservative.

The exposure assessment of calcium dihydroxide professional and industrial and consumer use is performed and organized based on several scenarios. An overview of the scenarios and the coverage of substance life cycle is presented in Table 1.

**Table 1:** Overview on exposure scenarios and coverage of substance life cycle

ES number	Exposure scenario title	Manufacture	Identified uses			Resulting life cycle stage Service life (for articles)	Linked to Identified Use	Sector of use category (SU)	Chemical Product Category (PC)	Process category (PROC)	Article category (AC)	Environmental release category (ERC)
			Formulation	End use	Consumer							
9.1	Manufacture and industrial uses of aqueous solutions of lime substances	X	X	X	X	1	3; 1, 2a, 2b, 4, 5, 6a, 6b, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 23, 24	1, 2, 3, 7, 8, 9a, 9b, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40	1, 2, 3, 4, 5, 7, 8a, 8b, 9, 10, 12, 13, 14, 15, 16, 17, 18, 19	1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 13	1, 2, 3, 4, 5, 6a, 6b, 6c, 6d, 7, 12a, 12b, 10a, 10b, 11a, 11b	
9.6	Professional uses of aqueous solutions of lime substances		X	X	X	6	22; 1, 5, 6a, 6b, 7, 10, 11, 12, 13, 16, 17, 18, 19, 20, 23, 24	1, 2, 3, 7, 8, 9a, 9b, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40	2, 3, 4, 5, 8a, 8b, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19	1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 13	2, 8a, 8b, 8c, 8d, 8e, 8f	
9.15	Consumer use of lime substances as water treatment chemicals in aquaria				X	15	21	20, 37			8	

## ES number 9.1: Manufacture and industrial uses of aqueous solutions of lime substances

### Exposure Scenario Format (1) addressing uses carried out by workers

#### 1. Title

<b>Free short title</b>	Manufacture and industrial uses of aqueous solutions of lime substances
<b>Systematic title based on use descriptor</b>	SU3, SU1, SU2a, SU2b, SU4, SU5, SU6a, SU6b, SU7, SU8, SU9, SU10, SU11, SU12, SU13, SU14, SU15, SU16, SU17, SU18, SU19, SU20, SU23, SU24 PC1, PC2, PC3, PC7, PC8, PC9a, PC9b, PC11, PC12, PC13, PC14, PC15, PC16, PC17, PC18, PC19, PC20, PC21, PC23, PC24, PC25, PC26, PC27, PC28, PC29, PC30, PC31, PC32, PC33, PC34, PC35, PC36, PC37, PC38, PC39, PC40 AC1, AC2, AC3, AC4, AC5, AC6, AC7, AC8, AC10, AC11, AC13 (appropriate PROCs and ERCs are given in Section 2 below)
<b>Processes, tasks and/or activities covered</b>	Processes, tasks and/or activities covered are described in Section 2 below.
<b>Assessment Method</b>	The assessment of inhalation exposure is based on the exposure estimation tool MEASE.

#### 2. Operational conditions and risk management measures

PROC/ERC	REACH definition	Involved tasks
PROC 1	Use in closed process, no likelihood of exposure	Further information is provided in the ECHA Guidance on information requirements and chemical safety assessment, Chapter R.12: Use descriptor system (ECHA-2010-G-05-EN).
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 processes for formulation of preparations and articles (multistage and/or significant contact)	
PROC 7	Industrial spraying	
PROC 8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities	
PROC 8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities	
PROC 9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)	
PROC 10	Roller application or brushing	
PROC 12	Use of blowing agents in manufacture of foam	
PROC 13	Treatment of articles by dipping and pouring	
PROC 14	Production of preparations or articles by tableting, compression, extrusion, pelletisation	
PROC 15	Use as laboratory reagent	
PROC 16	Using material as fuel sources, limited exposure to unburned product to be expected	
PROC 17	Lubrication at high energy conditions and in partly open process	
PROC 18	Greasing at high energy conditions	
PROC 19	Hand-mixing with intimate contact and only PPE available	
ERC 1-7, 12	Manufacture, formulation and all types of industrial	



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	uses	
ERC 10, 11	Wide-dispersive outdoor and indoor use of long-life articles and materials	

## 2.1 Control of workers exposure

### Product characteristic

According to the MEASE approach, the substance-intrinsic emission potential is one of the main exposure determinants. This is reflected by an assignment of a so-called fugacity class in the MEASE tool. For operations conducted with solid substances at ambient temperature the fugacity is based on the dustiness of that substance. Whereas in hot metal operations, fugacity is temperature based, taking into account the process temperature and the melting point of the substance. As a third group, high abrasive tasks are based on the level of abrasion instead of the substance intrinsic emission potential. The spraying of aqueous solutions (PROC7 and 11) is assumed to be involved with a medium emission.

PROC	Use in preparation	Content in preparation	Physical form	Emission potential
PROC 7	not restricted		aqueous solution	medium
<b>All other applicable PROCs</b>	not restricted		aqueous solution	very low

### Amounts used

The actual tonnage handled per shift is not considered to influence the exposure as such for this scenario. Instead, the combination of the scale of operation (industrial vs. professional) and level of containment/automation (as reflected in the PROC) is the main determinant of the process intrinsic emission potential.

### Frequency and duration of use/exposure

PROC	Duration of exposure
PROC 7	≤ 240 minutes
<b>All other applicable PROCs</b>	480 minutes (not restricted)

### Human factors not influenced by risk management

The shift breathing volume during all process steps reflected in the PROCs is assumed to be 10 m<sup>3</sup>/shift (8 hours).

### Other given operational conditions affecting workers exposure

Since aqueous solutions are not used in hot-metallurgical processes, operational conditions (e.g. process temperature and process pressure) are not considered relevant for occupational exposure assessment of the conducted processes.

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

Risk management measures at the process level (e.g. containment or segregation of the emission source) are generally not required in the processes.

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

PROC	Level of separation	Localised controls (LC)	Efficiency of LC (according to MEASE)	Further information
PROC 7	Any potentially required separation of workers from the emission source is indicated above under "Frequency and duration of exposure". A reduction of exposure duration can be achieved, for example, by the installation of ventilated (positive pressure) control rooms or by removing the worker from workplaces involved with relevant exposure.	local exhaust ventilation	78 %	-
PROC 19		not applicable	na	-
<b>All other applicable PROCs</b>		not required	na	-

**Organisational measures to prevent /limit releases, dispersion and exposure**

Avoid inhalation or ingestion. General occupational hygiene measures are required to ensure a safe handling of the substance. These measures involve good personal and housekeeping practices (i.e. regular cleaning with suitable cleaning devices), no eating and smoking at the workplace, the wearing of standard working clothes and shoes unless otherwise stated below. Shower and change clothes at end of work shift. Do not wear contaminated clothing at home. Do not blow dust off with compressed air.

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

PROC	Specification of respiratory protective equipment (RPE)	RPE efficiency (assigned protection factor, APF)	Specification of gloves	Further personal protective equipment (PPE)
PROC 7	FFP1 mask	APF=4	Since calcium dihydroxide is classified as irritating to skin, the use of protective gloves is mandatory for all process steps.	Eye protection equipment (e.g. goggles or visors) must be worn, unless potential contact with the eye can be excluded by the nature and type of application (i.e. closed process). Additionally, face protection, protective clothing and safety shoes are required to be worn as appropriate.
All other applicable PROCs	not required	na		

Any RPE as defined above shall only be worn if the following principles are implemented in parallel: The duration of work (compare with "duration of exposure" above) should reflect the additional physiological stress for the worker due to the breathing resistance and mass of the RPE itself, due to the increased thermal stress by enclosing the head. In addition, it shall be considered that the worker's capability of using tools and of communicating are reduced during the wearing of RPE.

For reasons as given above, the worker should therefore be (i) healthy (especially in view of medical problems that may affect the use of RPE), (ii) have suitable facial characteristics reducing leakages between face and mask (in view of scars and facial hair). The recommended devices above which rely on a tight face seal will not provide the required protection unless they fit the contours of the face properly and securely.

The employer and self-employed persons have legal responsibilities for the maintenance and issue of respiratory protective devices and the management of their correct use in the workplace. Therefore, they should define and document a suitable policy for a respiratory protective device programme including training of the workers.

An overview of the APFs of different RPE (according to BS EN 529:2005) can be found in the glossary of MEASE.

**2.2 Control of environmental exposure**

**Amounts used**

The daily and annual amount per site (for point sources) is not considered to be the main determinant for environmental exposure.

**Frequency and duration of use**

Intermittent (< 12 time per year) or continuous use/release

**Environment factors not influenced by risk management**

Flow rate of receiving surface water: 18000 m³/day

**Other given operational conditions affecting environmental exposure**

Effluent discharge rate: 2000 m³/day

**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 lime 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 (e.g. through neutralisation). 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. The justification for this risk management measure can be found in the introduction section.

**Conditions and measures related to waste**

Solid industrial waste of lime should be reused or discharged to the industrial wastewater and further neutralized if needed.

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

#### Occupational exposure

The exposure estimation tool MEASE was used for the assessment of inhalation exposure. The risk characterisation ratio (RCR) is the quotient of the refined exposure estimate and the respective DNEL (derived no-effect level) and has to be below 1 to demonstrate a safe use. For inhalation exposure, the RCR is based on the DNEL for calcium dihydroxide of 1 mg/m<sup>3</sup> (as respirable dust) and the respective inhalation exposure estimate derived using MEASE (as inhalable dust). Thus, the RCR includes an additional safety margin since the respirable fraction being a sub-fraction of the inhalable fraction according to EN 481.

PROC	Method used for inhalation exposure assessment	Inhalation exposure estimate (RCR)	Method used for dermal exposure assessment	Dermal exposure estimate (RCR)
PROC 1, 2, 3, 4, 5, 7, 8a, 8b, 9, 10, 12, 13, 14, 15, 16, 17, 18, 19	MEASE	< 1 mg/m <sup>3</sup> (0.001 – 0.66)	Since calcium dihydroxide are classified as irritating to skin, dermal exposure has to be minimised as far as technically feasible. A DNEL for dermal effects has not been derived. Thus, dermal exposure is not assessed in this exposure scenario.	

#### Environmental exposure

The environmental exposure assessment is only relevant for the aquatic environment, when applicable including STPs/WWTPs, as emissions of lime substance in the different life-cycle stages (production and use) mainly apply to (waste) water. The aquatic effect and risk assessment only deal with the effect on organisms/ecosystems due to possible pH changes related to OH<sup>-</sup> discharges, being the toxicity of Ca<sup>2+</sup> is expected to be negligible compared to the (potential) pH effect. Only the local scale is being addressed, including municipal sewage treatment plants (STPs) or industrial waste water treatment plants (WWTPs) when applicable, both for production and industrial use as any effects that might occur would be expected to take place on a local scale. The high water solubility and very low vapour pressure indicate that lime substance will be found predominantly in water. Significant emissions or exposure to air are not expected due to the low vapour pressure of lime substance. Significant emissions or exposure to the terrestrial environment are not expected either for this exposure scenario. The exposure assessment for the aquatic environment will therefore only deal with the possible pH changes in STP effluent and surface water related to the OH<sup>-</sup> discharges at the local scale. The exposure assessment is approached by assessing the resulting pH impact: the surface water pH should not increase above 9.

<b>Environmental emissions</b>	The production of lime substance can potentially result in an aquatic emission and locally increase the lime substance concentration and affect the pH in the aquatic environment. When the pH is not neutralised, the discharge of effluent from lime substance production sites may impact the pH in the receiving water. The pH of effluents is normally measured very frequently and can be neutralised easily as often required by national laws.
<b>Exposure concentration in waste water treatment plant (WWTP)</b>	Waste water from lime substance production is an inorganic wastewater stream and therefore there is no biological treatment. Therefore, wastewater streams from lime substance production sites will normally not be treated in biological waste water treatment plants (WWTPs), but can be used for pH control of acid wastewater streams that are treated in biological WWTPs.
<b>Exposure concentration in aquatic pelagic compartment</b>	When lime substance is emitted to surface water, sorption to particulate matter and sediment will be negligible. When lime is rejected to surface water, the pH may increase, depending on the buffer capacity of the water. The higher the buffer capacity of the water, the lower the effect on pH will be. In general the buffer capacity preventing shifts in acidity or alkalinity in natural waters is regulated by the equilibrium between carbon dioxide (CO <sub>2</sub> ), the bicarbonate ion (HCO <sub>3</sub> <sup>-</sup> ) and the carbonate ion (CO <sub>3</sub> <sup>2-</sup> ).
<b>Exposure concentration in sediments</b>	The sediment compartment is not included in this ES, because it is not considered relevant for lime substance: when lime substance is emitted to the aquatic compartment, sorption of to sediment particles is negligible.
<b>Exposure concentrations in soil and groundwater</b>	The terrestrial compartment is not included in this exposure scenario, because it is not considered to be relevant.
<b>Exposure concentration in atmospheric compartment</b>	The air compartment is not included in this CSA because it is considered not relevant for lime substance: when emitted to air as an aerosol in water, lime substance is neutralised as a result of its reaction with CO <sub>2</sub> (or other acids), into HCO <sub>3</sub> <sup>-</sup> and Ca <sup>2+</sup> . Subsequently, the salts (e.g. calcium(bi)carbonate) are washed out from the air and thus the atmospheric emissions of neutralised lime substance largely end up in soil and water.
<b>Exposure concentration relevant for the food chain (secondary poisoning)</b>	Bioaccumulation in organisms is not relevant for lime substance: a risk assessment for secondary poisoning is therefore not required.

**4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES**

**Occupational exposure**

The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. This has to be done by showing that they limit the inhalation and dermal exposure to a level below the respective DNEL (given that the processes and activities in question are covered by the PROCs listed above) as given below. If measured data are not available, the DU may make use of an appropriate scaling tool such as MEASE ([www.ebrc.de/mease.html](http://www.ebrc.de/mease.html)) to estimate the associated exposure. The dustiness of the substance used can be determined according to the MEASE glossary. For example, substances with a dustiness less than 2.5 % according to the Rotating Drum Method (RDM) are defined as “low dusty”, substances with a dustiness less than 10 % (RDM) are defined as “medium dusty” and substances with a dustiness ≥10 % are defined as “high dusty”.

DNEL<sub>inhalation</sub>: 1 mg/m<sup>3</sup> (as respirable dust)

**Important note:** The DU has to be aware of the fact that apart from the long-term DNEL given above, a DNEL for acute effects exists at a level of 4 mg/m<sup>3</sup>. By demonstrating a safe use when comparing exposure estimates with the long-term DNEL, the acute DNEL is therefore also covered (according to R.14 guidance, acute exposure levels can be derived by multiplying long-term exposure estimates by a factor of 2). When using MEASE for the derivation of exposure estimates, it is noted that the exposure duration should only be reduced to half-shift as a risk management measure (leading to an exposure reduction of 40 %).

**Environmental exposure**

If a site does not comply with the conditions stipulated in the safe use ES, it is recommended to apply a tiered approach to perform a more site-specific assessment. For that assessment, the following stepwise approach is recommended.

**Tier 1:** retrieve information on effluent pH and the contribution of the lime substance on the resulting pH. Should the pH be above 9 and be predominantly attributable to lime, then further actions are required to demonstrate safe use.

**Tier 2a:** retrieve information on receiving water pH after the discharge point. The pH of the receiving water shall not exceed the value of 9. If the measures are not available, the pH in the river can be calculated as follows:

$$pH_{river} = \text{Log} \left[ \frac{Q_{effluent} * 10^{pH_{effluent}} + Q_{riverupstream} * 10^{pH_{upstream}}}{Q_{riverupstream} + Q_{effluent}} \right] \quad (Eq 1)$$

Where:

Q effluent refers to the effluent flow (in m<sup>3</sup>/day)

Q river upstream refers to the upstream river flow (in m<sup>3</sup>/day)

pH effluent refers to the pH of the effluent

pH upstream river refers to the pH of the river upstream of the discharge point

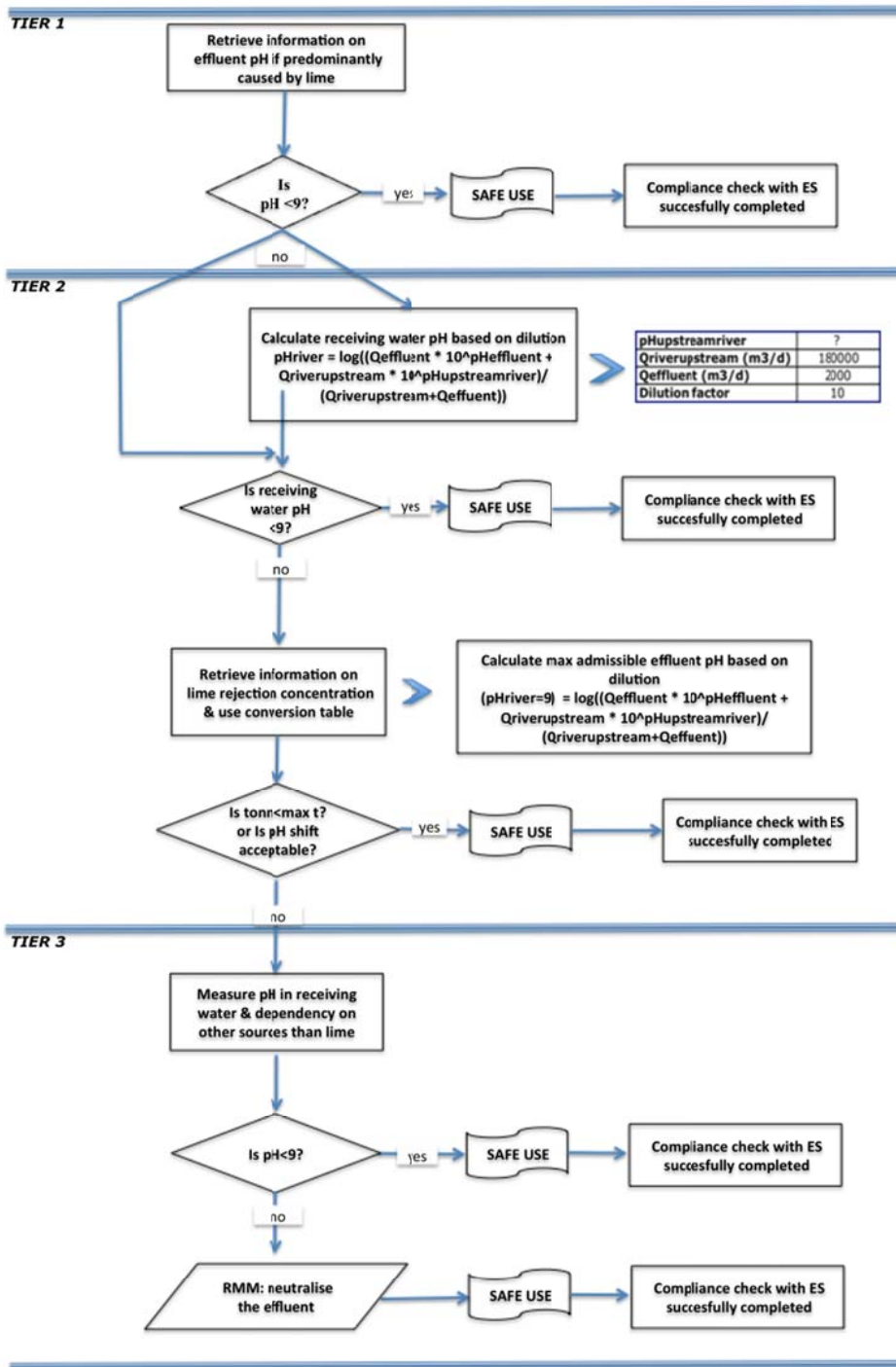
Please note that initially, default values can be used:

- Q river upstream flows: use the 10th of existing measurements distribution or use default value of 18000 m<sup>3</sup>/day
- Q effluent: use default value of 2000 m<sup>3</sup>/day
- The upstream pH is preferably a measured value. If not available, one can assume a neutral pH of 7 if this can be justified.

Such equation has to be seen as a worst case scenario, where water conditions are standard and not case specific.

**Tier 2b:** Equation 1 can be used to identify which effluent pH causes an acceptable pH level in the receiving body. In order to do so, pH of the river is set at value 9 and pH of the effluent is calculated accordingly (using default values as reported previously, if necessary). As temperature influences lime solubility, pH effluent might require to be adjusted on a case-by-case basis. Once the maximum admissible pH value in the effluent is established, it is assumed that the OH<sup>-</sup> concentrations are all dependent on lime discharge and that there is no buffer capacity conditions to consider (this is a unrealistic worst case scenario, which can be modified where information is available). Maximum load of lime that can be annually rejected without negatively affecting the pH of the receiving water is calculated assuming chemical equilibrium. OH<sup>-</sup> expressed as moles/litre are multiplied by average flow of the effluent and then divided by the molar mass of the lime substance.

**Tier 3:** measure the pH in the receiving water after the discharge point. If pH is below 9, safe use is reasonably demonstrated and the ES ends here. If pH is found to be above 9, risk management measures have to be implemented: the effluent has to undergo neutralisation, thus ensuring safe use of lime during production or use phase.



## ES number 9.6: Professional uses of aqueous solutions of lime substances

### Exposure Scenario Format (1) addressing uses carried out by workers

#### 1. Title

<b>Free short title</b>	Professional uses of aqueous solutions of lime substances
<b>Systematic title based on use descriptor</b>	SU22, SU1, SU5, SU6a, SU6b, SU7, SU10, SU11, SU12, SU13, SU16, SU17, SU18, SU19, SU20, SU23, SU24 PC1, PC2, PC3, PC7, PC8, PC9a, PC9b, PC11, PC12, PC13, PC14, PC15, PC16, PC17, PC18, PC19, PC20, PC21, PC23, PC24, PC25, PC26, PC27, PC28, PC29, PC30, PC31, PC32, PC33, PC34, PC35, PC36, PC37, PC39, PC40 AC1, AC2, AC3, AC4, AC5, AC6, AC7, AC8, AC10, AC11, AC13 (appropriate PROCs and ERCs are given in Section 2 below)
<b>Processes, tasks and/or activities covered</b>	Processes, tasks and/or activities covered are described in Section 2 below.
<b>Assessment Method</b>	The assessment of inhalation exposure is based on the exposure estimation tool MEASE. The environmental assessment is based on FOCUS-Exposit.

#### 2. Operational conditions and risk management measures

PROC/ERC	REACH definition	Involved tasks
PROC 2	Use in closed, continuous process with occasional controlled exposure	Further information is provided in the ECHA Guidance on information requirements and chemical safety assessment, Chapter R.12: Use descriptor system (ECHA-2010-G-05-EN).
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 processes for formulation of preparations and articles (multistage and/or significant contact)	
PROC 8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities	
PROC 8b	Transfer of substance or preparation (charging/ discharging) from/to vessels/large containers at 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 12	Use of blowing agents in manufacture of foam	
PROC 13	Treatment of articles by dipping and pouring	
PROC 15	Use as laboratory reagent	
PROC 16	Using material as fuel sources, limited exposure to unburned product to be expected	
PROC 17	Lubrication at high energy conditions and in partly open process	
PROC 18	Greasing at high energy conditions	
PROC 19	Hand-mixing with intimate contact and only PPE available	

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<b>ERC2, ERC8a, ERC8b, ERC8c, ERC8d, ERC8e, ERC8f</b>	Wide dispersive indoor and outdoor use of reactive substances or processing aids in open systems	Calcium dihydroxide is applied in numerous cases of wide dispersive uses: agricultural, forestry, fish and shrimps farming, soil treatment and environmental protection.
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## 2.1 Control of workers exposure

### Product characteristic

According to the MEASE approach, the substance-intrinsic emission potential is one of the main exposure determinants. This is reflected by an assignment of a so-called fugacity class in the MEASE tool. For operations conducted with solid substances at ambient temperature the fugacity is based on the dustiness of that substance. Whereas in hot metal operations, fugacity is temperature based, taking into account the process temperature and the melting point of the substance. As a third group, high abrasive tasks are based on the level of abrasion instead of the substance intrinsic emission potential. The spraying of aqueous solutions (PROC7 and 11) is assumed to be involved with a medium emission.

PROC	Use in preparation	Content in preparation	Physical form	Emission potential
<b>All applicable PROCs</b>	not restricted		aqueous solution	very low

### Amounts used

The actual tonnage handled per shift is not considered to influence the exposure as such for this scenario. Instead, the combination of the scale of operation (industrial vs. professional) and level of containment/automation (as reflected in the PROC) is the main determinant of the process intrinsic emission potential.

### Frequency and duration of use/exposure

PROC	Duration of exposure
<b>PROC 11</b>	≤ 240 minutes
<b>All other applicable PROCs</b>	480 minutes (not restricted)

### Human factors not influenced by risk management

The shift breathing volume during all process steps reflected in the PROCs is assumed to be 10 m<sup>3</sup>/shift (8 hours).

### Other given operational conditions affecting workers exposure

Since aqueous solutions are not used in hot-metallurgical processes, operational conditions (e.g. process temperature and process pressure) are not considered relevant for occupational exposure assessment of the conducted processes.

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

Risk management measures at the process level (e.g. containment or segregation of the emission source) are generally not required in the processes.

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

PROC	Level of separation	Localised controls (LC)	Efficiency of LC (according to MEASE)	Further information
<b>PROC 19</b>	Separation of workers from the emission source is generally not required in the conducted processes.	not applicable	na	-
<b>All other applicable PROCs</b>		not required	na	-

### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid inhalation or ingestion. General occupational hygiene measures are required to ensure a safe handling of the substance. These measures involve good personal and housekeeping practices (i.e. regular cleaning with suitable cleaning devices), no eating and smoking at the workplace, the wearing of standard working clothes and shoes unless otherwise stated below. Shower and change clothes at end of work shift. Do not wear contaminated clothing at home. Do not blow dust off with compressed air.

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

PROC	Specification of respiratory protective equipment (RPE)	RPE efficiency (assigned protection factor, APF)	Specification of gloves	Further personal protective equipment (PPE)
PROC 11	FFP3 mask	APF=20	Since calcium dihydroxide is classified as irritating to skin, the use of protective gloves is mandatory for all process steps.	Eye protection equipment (e.g. goggles or visors) must be worn, unless potential contact with the eye can be excluded by the nature and type of application (i.e. closed process). Additionally, face protection, protective clothing and safety shoes are required to be worn as appropriate.
PROC 17	FFP1 mask	APF=4		
<b>All other applicable PROCs</b>	not required	na		

Any RPE as defined above shall only be worn if the following principles are implemented in parallel: The duration of work (compare with "duration of exposure" above) should reflect the additional physiological stress for the worker due to the breathing resistance and mass of the RPE itself, due to the increased thermal stress by enclosing the head. In addition, it shall be considered that the worker's capability of using tools and of communicating are reduced during the wearing of RPE.

For reasons as given above, the worker should therefore be (i) healthy (especially in view of medical problems that may affect the use of RPE), (ii) have suitable facial characteristics reducing leakages between face and mask (in view of scars and facial hair). The recommended devices above which rely on a tight face seal will not provide the required protection unless they fit the contours of the face properly and securely.

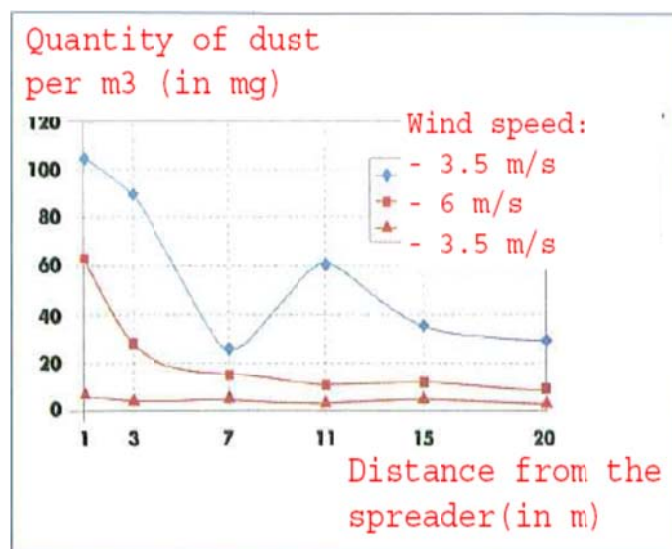
The employer and self-employed persons have legal responsibilities for the maintenance and issue of respiratory protective devices and the management of their correct use in the workplace. Therefore, they should define and document a suitable policy for a respiratory protective device programme including training of the workers.

An overview of the APFs of different RPE (according to BS EN 529:2005) can be found in the glossary of MEASE.

**2.2 Control of environmental exposure – only relevant for agricultural soil protection**

**Product characteristics**

Drift: 1% (very worst-case estimate based on data from dust measurements in air as a function of the distance from application)



(Figure taken from: Laudet, A. et al., 1999)



Version: 7.0/EN

Revision date: December 2020

Printing Date: 24-Feb-21

**Amounts used**

Ca(OH) <sub>2</sub>	2,244 kg/ha
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**Frequency and duration of use**

1 day/year (one application per year). Multiple applications during the year are allowed, provided the total yearly amount of 2,244 kg/ha is not exceeded (CaOH<sub>2</sub>)

**Environment factors not influenced by risk management**

Volume of surface water: 300 L/m<sup>2</sup>  
 Field surface area: 1 ha

**Other given operational conditions affecting environmental exposure**

Outdoor use of products  
 Soil mixing depth: 20 cm

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

There are no direct releases to adjacent surface waters.

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

Drift should be minimised.

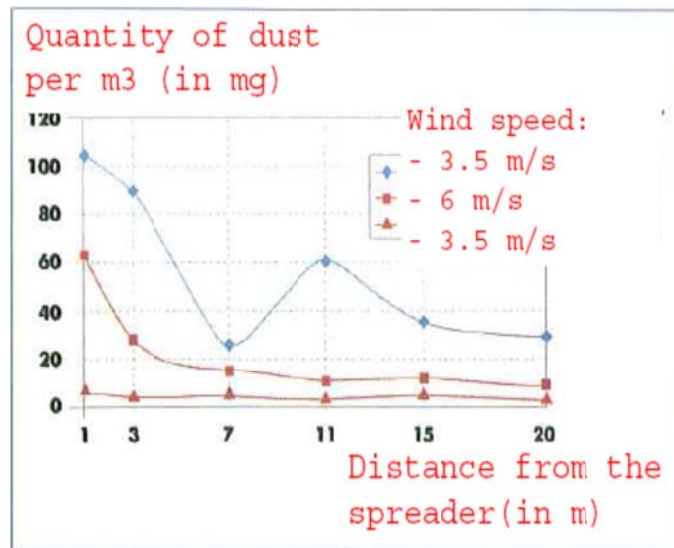
**Organizational measures to prevent/limit release from site**

In line with the requirements for good agricultural practice, agricultural soil should be analysed prior to application of lime and the application rate should be adjusted according to the results of the analysis.

**2.2 Control of environmental exposure – only relevant for soil treatment in civil engineering**

**Product characteristics**

Drift: 1% (very worst-case estimate based on data from dust measurements in air as a function of the distance from application)



(Figure taken from: Laudet, A. et al., 1999)

**Amounts used**

Ca(OH) <sub>2</sub>	238,208 kg/ha
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**Frequency and duration of use**

1 day/year and only once in a lifetime. Multiple applications during the year are allowed, provided the total yearly amount of 238,208 kg/ha is not exceeded (CaOH<sub>2</sub>)

**Environment factors not influenced by risk management**

Field surface area: 1 ha

Version: 7.0/EN

Revision date: December 2020

Printing Date: 24-Feb-21

**Other given operational conditions affecting environmental exposure**

Outdoor use of products  
 Soil mixing depth: 20 cm

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

Lime is only applied onto the soil in the technosphere zone before road construction. There are no direct releases to adjacent surface waters.

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

Drift should be minimised.

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

**Occupational exposure**

The exposure estimation tool MEASE was used for the assessment of inhalation exposure. The risk characterisation ratio (RCR) is the quotient of the refined exposure estimate and the respective DNEL (derived no-effect level) and has to be below 1 to demonstrate a safe use. For inhalation exposure, the RCR is based on the DNEL for calcium dihydroxide of 1 mg/m<sup>3</sup> (as respirable dust) and the respective inhalation exposure estimate derived using MEASE (as inhalable dust). Thus, the RCR includes an additional safety margin since the respirable fraction being a sub-fraction of the inhalable fraction according to EN 481.

PROC	Method used for inhalation exposure assessment	Inhalation exposure estimate (RCR)	Method used for dermal exposure assessment	Dermal exposure estimate (RCR)
PROC 2, 3, 4, 5, 8a, 8b, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19	MEASE	< 1 mg/m <sup>3</sup> (<0.001 – 0.6)	Since calcium dihydroxide is classified as irritating to skin, dermal exposure has to be minimised as far as technically feasible. A DNEL for dermal effects has not been derived. Thus, dermal exposure is not assessed in this exposure scenario.	

**Environmental exposure for agricultural soil protection**

The PEC calculation for soil and surface water was based on the FOCUS soil group (FOCUS, 1996) and on the “draft guidance on the calculation of predicted environmental concentration values (PEC) of plant protection products for soil, ground water, surface water and sediment (Kloskowski et al., 1999). The FOCUS/EXPOSIT modelling tool is preferred to the EUSES as it is more appropriate for agricultural-like application as in this case where parameter as the drift needs to be included in the modelling. FOCUS is a model typically developed for biocidal applications and was further elaborated on the basis of the German EXPOSIT 1.0 model, where parameters such as drifts can be improved according to collected data: once applied on the soil, calcium dihydroxide can indeed migrate then towards surface waters, via drift.

<b>Environmental emissions</b>	See amounts used			
<b>Exposure concentration in waste water treatment plant (WWTP)</b>	Not relevant for agricultural soil protection			
<b>Exposure concentration in aquatic pelagic compartment</b>	<b>Substance</b>	<b>PEC (ug/L)</b>	<b>PNEC (ug/L)</b>	<b>RCR</b>
	Ca(OH) <sub>2</sub>	7.48	490	0.015
<b>Exposure concentration in sediments</b>	As described above, no exposure of surface water nor sediment to lime is expected. Further, in natural waters the hydroxide ions react with HCO <sub>3</sub> <sup>-</sup> to form water and CO <sub>3</sub> <sup>2-</sup> . CO <sub>3</sub> <sup>2-</sup> forms CaCO <sub>3</sub> by reacting with Ca <sup>2+</sup> . The calcium carbonate precipitates and deposits on the sediment. Calcium carbonate is of low solubility and a constituent of natural soils.			
<b>Exposure concentrations in soil and groundwater</b>	<b>Substance</b>	<b>PEC (mg/L)</b>	<b>PNEC (mg/L)</b>	<b>RCR</b>
	Ca(OH) <sub>2</sub>	660	1080	0.61
<b>Exposure concentration in atmospheric compartment</b>	This point is not relevant. Calcium dihydroxide is not volatile. The vapour pressures is below 10 <sup>-5</sup> Pa.			
<b>Exposure concentration relevant for the food chain (secondary poisoning)</b>	This point is not relevant because calcium dihydroxides can be considered to be omnipresent and essential in the environment. The uses covered do not significantly influence the distribution of the constituents (Ca <sup>2+</sup> and OH <sup>-</sup> ) in the environment.			

**Environmental exposure for soil treatment in civil engineering**

The soil treatment in civil engineering scenario is based on a road border scenario. At the special road border technical meeting (Ispra, September 5, 2003), EU Member States and industry agreed on a definition for a “road technosphere”. The road technosphere can be defined as “the engineered environment that carries the geotechnical functions of the road in connection with its structure, operation and maintenance including the installations to ensure road safety and manage run off. This technosphere, which includes the hard and soft shoulder at the edge of the carriageway, is vertically dictated by the groundwater watertable. The road authority has responsibility for this road technosphere including road safety, road support, prevention of pollution and water management”. The road technosphere was therefore excluded as assessment endpoint for risk assessment for the purpose of the existing/new substances regulations. The target zone is the zone beyond the technosphere, to which the environmental risk assessment applies.

The PEC calculation for soil was based on the FOCUS soil group (FOCUS, 1996) and on the “draft guidance on the calculation of predicted environmental concentration values (PEC) of plant protection products for soil, ground water, surface water and sediment (Kloskowski et al., 1999). The FOCUS/EXPOSIT modelling tool is preferred to the EUSES as it is more appropriate for agricultural-like application as in this case where parameter as the drift needs to be included in the modelling. FOCUS is a model typically developed for biocidal applications and was further elaborated on the basis of the German EXPOSIT 1.0 model, where parameters such as drifts can be improved according to collected data.

<b>Environmental emissions</b>	See amounts used			
<b>Exposure concentration in waste water treatment plant (WWTP)</b>	Not relevant for road border scenario			
<b>Exposure concentration in aquatic pelagic compartment</b>	Not relevant for road border scenario			
<b>Exposure concentration in sediments</b>	Not relevant for road border scenario			
<b>Exposure concentrations in soil and groundwater</b>	<b>Substance</b>	<b>PEC (mg/L)</b>	<b>PNEC (mg/L)</b>	<b>RCR</b>
	Ca(OH) <sub>2</sub>	701	1080	0.65
<b>Exposure concentration in atmospheric compartment</b>	This point is not relevant. Calcium dihydroxide is not volatile. The vapour pressures is below 10 <sup>-5</sup> Pa.			
<b>Exposure concentration relevant for the food chain (secondary poisoning)</b>	This point is not relevant because calcium can be considered to be omnipresent and essential in the environment. The uses covered do not significantly influence the distribution of the constituents (Ca <sup>2+</sup> and OH <sup>-</sup> ) in the environment.			

**Environmental exposure for other uses**

For all other uses, no quantitative environmental exposure assessment is carried because

- The operational conditions and risk management measures are less stringent than those outlined for agricultural soil protection or soil treatment in civil engineering
- Lime is an ingredient and chemically bound into a matrix. Releases are negligible and insufficient to cause a pH-shift in soil, wastewater or surface water
- Lime is specifically used to release CO<sub>2</sub>-free breathable air, upon reaction with CO<sub>2</sub>. Such applications only relates to the air compartment, where the lime properties are exploited
- Neutralisation/pH-shift is the intended use and there are no additional impacts beyond those desired.

#### 4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. This has to be done by showing that they limit the inhalation and dermal exposure to a level below the respective DNEL (given that the processes and activities in question are covered by the PROCs listed above) as given below. If measured data are not available, the DU may make use of an appropriate scaling tool such as MEASE ([www.ebrc.de/mease.html](http://www.ebrc.de/mease.html)) to estimate the associated exposure. The dustiness of the substance used can be determined according to the MEASE glossary. For example, substances with a dustiness less than 2.5 % according to the Rotating Drum Method (RDM) are defined as "low dusty", substances with a dustiness less than 10 % (RDM) are defined as "medium dusty" and substances with a dustiness  $\geq 10$  % are defined as "high dusty".

DNEL<sub>inhalation</sub>: 1 mg/m<sup>3</sup> (as respirable dust)

**Important note:** The DU has to be aware of the fact that apart from the long-term DNEL given above, a DNEL for acute effects exists at a level of 4 mg/m<sup>3</sup>. By demonstrating a safe use when comparing exposure estimates with the long-term DNEL, the acute DNEL is therefore also covered (according to R.14 guidance, acute exposure levels can be derived by multiplying long-term exposure estimates by a factor of 2). When using MEASE for the derivation of exposure estimates, it is noted that the exposure duration should only be reduced to half-shift as a risk management measure (leading to an exposure reduction of 40 %).

## ES number 9.7: Professional uses of low dusty solids/powders of lime substances

Exposure Scenario Format (1) addressing uses carried out by workers		
1. Title		
<b>Free short title</b>	Professional uses of low dusty solids/powders of lime substances	
<b>Systematic title based on use descriptor</b>	SU22, SU1, SU5, SU6a, SU6b, SU7, SU10, SU11, SU12, SU13, SU16, SU17, SU18, SU19, SU20, SU23, SU24 PC1, PC2, PC3, PC7, PC8, PC9a, PC9b, PC11, PC12, PC13, PC14, PC15, PC16, PC17, PC18, PC19, PC20, PC21, PC23, PC24, PC25, PC26, PC27, PC28, PC29, PC30, PC31, PC32, PC33, PC34, PC35, PC36, PC37, PC39, PC40 AC1, AC2, AC3, AC4, AC5, AC6, AC7, AC8, AC10, AC11, AC13 (appropriate PROCs and ERCs are given in Section 2 below)	
<b>Processes, tasks and/or activities covered</b>	Processes, tasks and/or activities covered are described in Section 2 below.	
<b>Assessment Method</b>	The assessment of inhalation exposure is based on the exposure estimation tool MEASE. The environmental assessment is based on FOCUS-Exposit.	
2. Operational conditions and risk management measures		
PROC/ERC	REACH definition	Involved tasks
PROC 2	Use in closed, continuous process with occasional controlled exposure	Further information is provided in the ECHA Guidance on information requirements and chemical safety assessment, Chapter R.12: Use descriptor system (ECHA-2010-G-05-EN).
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 processes for formulation of preparations and articles (multistage and/or significant contact)	
PROC 8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities	
PROC 8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at 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 15	Use as laboratory reagent	
PROC 16	Using material as fuel sources, limited exposure to unburned product to be expected	
PROC 17	Lubrication at high energy conditions and in partly open process	
PROC 18	Greasing at high energy conditions	
PROC 19	Hand-mixing with intimate contact and only PPE available	
PROC 21	Low energy manipulation of substances bound in materials and/or articles	
PROC 25	Other hot work operations with metals	

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<b>PROC 26</b>	Handling of solid inorganic substances at ambient temperature
<b>ERC2, ERC8a, ERC8b, ERC8c, ERC8d, ERC8e, ERC8f</b>	Wide dispersive indoor and outdoor use of reactive substances or processing aids in open systems

## 2.1 Control of workers exposure

### Product characteristic

According to the MEASE approach, the substance-intrinsic emission potential is one of the main exposure determinants. This is reflected by an assignment of a so-called fugacity class in the MEASE tool. For operations conducted with solid substances at ambient temperature the fugacity is based on the dustiness of that substance. Whereas in hot metal operations, fugacity is temperature based, taking into account the process temperature and the melting point of the substance. As a third group, high abrasive tasks are based on the level of abrasion instead of the substance intrinsic emission potential.

PROC	Use in preparation	Content in preparation	Physical form	Emission potential
<b>PROC 25</b>	not restricted		solid/powder, molten	high
<b>All other applicable PROCs</b>	not restricted		solid/powder	low

### Amounts used

The actual tonnage handled per shift is not considered to influence the exposure as such for this scenario. Instead, the combination of the scale of operation (industrial vs. professional) and level of containment/automation (as reflected in the PROC) is the main determinant of the process intrinsic emission potential.

### Frequency and duration of use/exposure

PROC	Duration of exposure
<b>PROC 17</b>	≤ 240 minutes
<b>All other applicable PROCs</b>	480 minutes (not restricted)

### Human factors not influenced by risk management

The shift breathing volume during all process steps reflected in the PROCs is assumed to be 10 m<sup>3</sup>/shift (8 hours).

### Other given operational conditions affecting workers exposure

Operational conditions like process temperature and process pressure are not considered relevant for occupational exposure assessment of the conducted processes. In process steps with considerably high temperatures (i.e. PROC 22, 23, 25), the exposure assessment in MEASE is however based on the ratio of process temperature and melting point. As the associated temperatures are expected to vary within the industry the highest ratio was taken as a worst case assumption for the exposure estimation. Thus all process temperatures are automatically covered in this exposure scenario for PROC 22, 23 and PROC 25.

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

Risk management measures at the process level (e.g. containment or segregation of the emission source) are generally not required in the processes.

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

PROC	Level of separation	Localised controls (LC)	Efficiency of LC (according to MEASE)	Further information
PROC 19	Any potentially required separation of workers from the emission source is indicated above under "Frequency and duration of exposure". A reduction of exposure duration can be achieved, for example, by the installation of ventilated (positive pressure) control rooms or by removing the worker from workplaces involved with relevant exposure.	not applicable	na	-
All other applicable PROCs		not required	na	-

**Organisational measures to prevent /limit releases, dispersion and exposure**

Avoid inhalation or ingestion. General occupational hygiene measures are required to ensure a safe handling of the substance. These measures involve good personal and housekeeping practices (i.e. regular cleaning with suitable cleaning devices), no eating and smoking at the workplace, the wearing of standard working clothes and shoes unless otherwise stated below. Shower and change clothes at end of work shift. Do not wear contaminated clothing at home. Do not blow dust off with compressed air.

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

PROC	Specification of respiratory protective equipment (RPE)	RPE efficiency (assigned protection factor, APF)	Specification of gloves	Further personal protective equipment (PPE)
PROC 4, 5, 11, 26	FFP1 mask	APF=4	Since calcium dihydroxide is classified as irritating to skin, the use of protective gloves is mandatory for all process steps.	Eye protection equipment (e.g. goggles or visors) must be worn, unless potential contact with the eye can be excluded by the nature and type of application (i.e. closed process). Additionally, face protection, protective clothing and safety shoes are required to be worn as appropriate.
PROC 16, 17, 18, 25	FFP2 mask	APF=10		
All other applicable PROCs	not required	na		

Any RPE as defined above shall only be worn if the following principles are implemented in parallel: The duration of work (compare with "duration of exposure" above) should reflect the additional physiological stress for the worker due to the breathing resistance and mass of the RPE itself, due to the increased thermal stress by enclosing the head. In addition, it shall be considered that the worker's capability of using tools and of communicating are reduced during the wearing of RPE.

For reasons as given above, the worker should therefore be (i) healthy (especially in view of medical problems that may affect the use of RPE), (ii) have suitable facial characteristics reducing leakages between face and mask (in view of scars and facial hair). The recommended devices above which rely on a tight face seal will not provide the required protection unless they fit the contours of the face properly and securely.

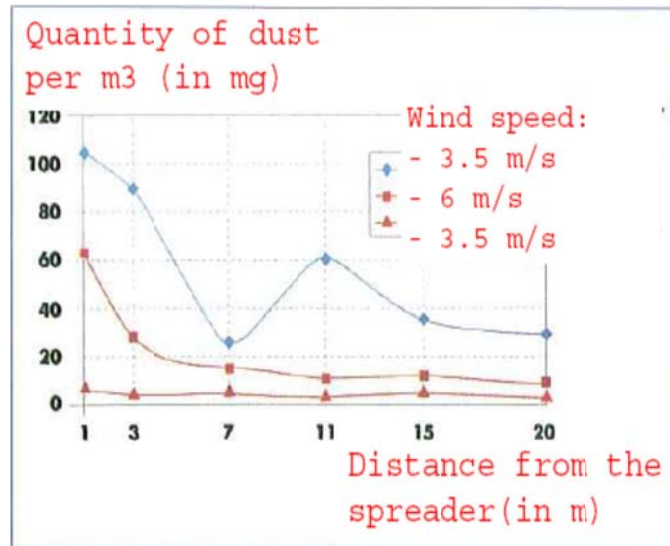
The employer and self-employed persons have legal responsibilities for the maintenance and issue of respiratory protective devices and the management of their correct use in the workplace. Therefore, they should define and document a suitable policy for a respiratory protective device programme including training of the workers.

An overview of the APFs of different RPE (according to BS EN 529:2005) can be found in the glossary of MEASE.

**2.2 Control of environmental exposure – only relevant for agricultural soil protection**

**Product characteristics**

Drift: 1% (very worst-case estimate based on data from dust measurements in air as a function of the distance from application)



(Figure taken from: Laudet, A. et al., 1999)

**Amounts used**

Ca(OH) <sub>2</sub>	2,244 kg/ha
---------------------	-------------

**Frequency and duration of use**

1 day/year (one application per year). Multiple applications during the year are allowed, provided the total yearly amount of 2,244 kg/ha is not exceeded (CaOH<sub>2</sub>)

**Environment factors not influenced by risk management**

Volume of surface water: 300 L/m<sup>2</sup>

Field surface area: 1 ha

**Other given operational conditions affecting environmental exposure**

Outdoor use of products

Soil mixing depth: 20 cm

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

There are no direct releases to adjacent surface waters.

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

Drift should be minimised.

**Organizational measures to prevent/limit release from site**

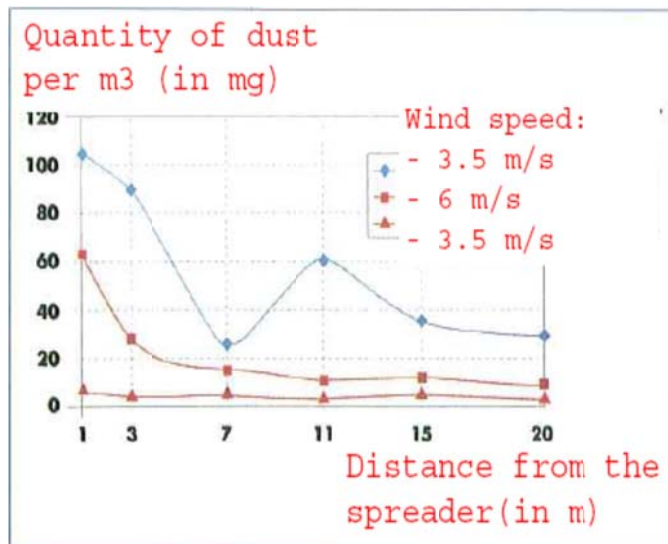
In line with the requirements for good agricultural practice, agricultural soil should be analysed prior to application of lime and the application rate should be adjusted according to the results of the analysis.



**2.2 Control of environmental exposure – only relevant for soil treatment in civil engineering**

**Product characteristics**

Drift: 1% (very worst-case estimate based on data from dust measurements in air as a function of the distance from application)



(Figure taken from: Laudet, A. et al., 1999)

**Amounts used**

Ca(OH)<sub>2</sub> 238,208 kg/ha

**Frequency and duration of use**

1 day/year and only once in a lifetime. Multiple applications during the year are allowed, provided the total yearly amount of 238,208 kg/ha is not exceeded (CaOH<sub>2</sub>)

**Environment factors not influenced by risk management**

Field surface area: 1 ha

**Other given operational conditions affecting environmental exposure**

Outdoor use of products  
 Soil mixing depth: 20 cm

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

Lime is only applied onto the soil in the technosphere zone before road construction. There are no direct releases to adjacent surface waters.

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

Drift should be minimised.

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

#### Occupational exposure

The exposure estimation tool MEASE was used for the assessment of inhalation exposure. The risk characterisation ratio (RCR) is the quotient of the refined exposure estimate and the respective DNEL (derived no-effect level) and has to be below 1 to demonstrate a safe use. For inhalation exposure, the RCR is based on the DNEL for calcium dihydroxide of 1 mg/m<sup>3</sup> (as respirable dust) and the respective inhalation exposure estimate derived using MEASE (as inhalable dust). Thus, the RCR includes an additional safety margin since the respirable fraction being a sub-fraction of the inhalable fraction according to EN 481.

PROC	Method used for inhalation exposure assessment	Inhalation exposure estimate (RCR)	Method used for dermal exposure assessment	Dermal exposure estimate (RCR)
PROC 2, 3, 4, 5, 8a, 8b, 9, 10, 11, 13, 15, 16, 17, 18, 19, 21, 25, 26	MEASE	< 1 mg/m <sup>3</sup> (0.01 – 0.75)	Since calcium dihydroxide is classified as irritating to skin, dermal exposure has to be minimised as far as technically feasible. A DNEL for dermal effects has not been derived. Thus, dermal exposure is not assessed in this exposure scenario.	

#### Environmental exposure for agricultural soil protection

The PEC calculation for soil and surface water was based on the FOCUS soil group (FOCUS, 1996) and on the “draft guidance on the calculation of predicted environmental concentration values (PEC) of plant protection products for soil, ground water, surface water and sediment (Kloskowski et al., 1999). The FOCUS/EXPOSIT modelling tool is preferred to the EUSES as it is more appropriate for agricultural-like application as in this case where parameter as the drift needs to be included in the modelling. FOCUS is a model typically developed for biocidal applications and was further elaborated on the basis of the German EXPOSIT 1.0 model, where parameters such as drifts can be improved according to collected data: once applied on the soil, calcium dihydroxide can indeed migrate then towards surface waters, via drift.

Environmental emissions	See amounts used			
Exposure concentration in waste water treatment plant (WWTP)	Not relevant for agricultural soil protection			
Exposure concentration in aquatic pelagic compartment	Substance	PEC (ug/L)	PNEC (ug/L)	RCR
	Ca(OH) <sub>2</sub>	7.48	490	0.015
Exposure concentration in sediments	As described above, no exposure of surface water nor sediment to lime is expected. Further, in natural waters the hydroxide ions react with HCO <sub>3</sub> <sup>-</sup> to form water and CO <sub>3</sub> <sup>2-</sup> . CO <sub>3</sub> <sup>2-</sup> forms CaCO <sub>3</sub> by reacting with Ca <sup>2+</sup> . The calcium carbonate precipitates and deposits on the sediment. Calcium carbonate is of low solubility and a constituent of natural soils.			
Exposure concentrations in soil and groundwater	Substance	PEC (mg/L)	PNEC (mg/L)	RCR
	Ca(OH) <sub>2</sub>	660	1080	0.61
Exposure concentration in atmospheric compartment	This point is not relevant. Calcium dihydroxide is not volatile. The vapour pressures is below 10 <sup>-5</sup> Pa.			
Exposure concentration relevant for the food chain (secondary poisoning)	This point is not relevant because calcium can be considered to be omnipresent and essential in the environment. The uses covered do not significantly influence the distribution of the constituents (Ca <sup>2+</sup> and OH <sup>-</sup> ) in the environment.			

**Environmental exposure for soil treatment in civil engineering**

The soil treatment in civil engineering scenario is based on a road border scenario. At the special road border technical meeting (Ispra, September 5, 2003), EU Member States and industry agreed on a definition for a “road technosphere”. The road technosphere can be defined as “the engineered environment that carries the geotechnical functions of the road in connection with its structure, operation and maintenance including the installations to ensure road safety and manage run off. This technosphere, which includes the hard and soft shoulder at the edge of the carriageway, is vertically dictated by the groundwater watertable. The road authority has responsibility for this road technosphere including road safety, road support, prevention of pollution and water management”. The road technosphere was therefore excluded as assessment endpoint for risk assessment for the purpose of the existing/new substances regulations. The target zone is the zone beyond the technosphere, to which the environmental risk assessment applies.

The PEC calculation for soil was based on the FOCUS soil group (FOCUS, 1996) and on the “draft guidance on the calculation of predicted environmental concentration values (PEC) of plant protection products for soil, ground water, surface water and sediment (Kloskowsi et al., 1999). The FOCUS/EXPOSIT modelling tool is preferred to the EUSES as it is more appropriate for agricultural-like application as in this case where parameter as the drift needs to be included in the modelling. FOCUS is a model typically developed for biocidal applications and was further elaborated on the basis of the German EXPOSIT 1.0 model, where parameters such as drifts can be improved according to collected data.

<b>Environmental emissions</b>	See amounts used			
<b>Exposure concentration in waste water treatment plant (WWTP)</b>	Not relevant for road border scenario			
<b>Exposure concentration in aquatic pelagic compartment</b>	Not relevant for road border scenario			
<b>Exposure concentration in sediments</b>	Not relevant for road border scenario			
<b>Exposure concentrations in soil and groundwater</b>	<b>Substance</b>	<b>PEC (mg/L)</b>	<b>PNEC (mg/L)</b>	<b>RCR</b>
	Ca(OH) <sub>2</sub>	701	1080	0.65
<b>Exposure concentration in atmospheric compartment</b>	This point is not relevant. Calcium dihydroxide is not volatile. The vapour pressures is below 10 <sup>-5</sup> Pa.			
<b>Exposure concentration relevant for the food chain (secondary poisoning)</b>	This point is not relevant because calcium can be considered to be omnipresent and essential in the environment. The uses covered do not significantly influence the distribution of the constituents (Ca <sup>2+</sup> and OH <sup>-</sup> ) in the environment.			

**Environmental exposure for other uses**

For all other uses, no quantitative environmental exposure assessment is carried because

- The operational conditions and risk management measures are less stringent than those outlined for agricultural soil protection or soil treatment in civil engineering
- Lime is an ingredient and chemically bound into a matrix. Releases are negligible and insufficient to cause a pH-shift in soil, wastewater or surface water
- Lime is specifically used to release CO<sub>2</sub>-free breathable air, upon reaction with CO<sub>2</sub>. Such applications only relates to the air compartment, where the lime properties are exploited
- Neutralisation/pH-shift is the intended use and there are no additional impacts beyond those desired.

#### 4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. This has to be done by showing that they limit the inhalation and dermal exposure to a level below the respective DNEL (given that the processes and activities in question are covered by the PROCs listed above) as given below. If measured data are not available, the DU may make use of an appropriate scaling tool such as MEASE ([www.ebrc.de/mease.html](http://www.ebrc.de/mease.html)) to estimate the associated exposure. The dustiness of the substance used can be determined according to the MEASE glossary. For example, substances with a dustiness less than 2.5 % according to the Rotating Drum Method (RDM) are defined as "low dusty", substances with a dustiness less than 10 % (RDM) are defined as "medium dusty" and substances with a dustiness  $\geq 10$  % are defined as "high dusty".

DNEL<sub>inhalation</sub>: 1 mg/m<sup>3</sup> (as respirable dust)

**Important note:** The DU has to be aware of the fact that apart from the long-term DNEL given above, a DNEL for acute effects exists at a level of 4 mg/m<sup>3</sup>. By demonstrating a safe use when comparing exposure estimates with the long-term DNEL, the acute DNEL is therefore also covered (according to R.14 guidance, acute exposure levels can be derived by multiplying long-term exposure estimates by a factor of 2). When using MEASE for the derivation of exposure estimates, it is noted that the exposure duration should only be reduced to half-shift as a risk management measure (leading to an exposure reduction of 40 %).

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## ES number 9.15: Consumer use of lime substances as water treatment chemicals

### Exposure Scenario Format (2) addressing uses carried out by consumers

#### 1. Title

<b>Free short title</b>	Consumer use of lime substances as water treatment chemicals
<b>Systematic title based on use descriptor</b>	SU21, PC20, PC37, ERC8b
<b>Processes, tasks activities covered</b>	Loading, filling or re-filling of solid formulations into container/preparation of lime milk Application of lime milk to water
<b>Assessment Method*</b>	Human health: A qualitative assessment has been performed for oral and dermal exposure as well as for exposure of the eye. Dust exposure has been assessed by the Dutch model (van Hemmen, 1992). Environment: A qualitative justification assessment is provided.

#### 2. Operational conditions and risk management measures

<b>RMM</b>	No further product integrated risk management measures are in place.
<b>PC/ERC</b>	<b>Description of activity referring to article categories (AC) and environmental release categories (ERC)</b>
PC 20/37	Filling and re-filling (transfer of lime substances (solid)) of lime reactor for water treatment. Transfer of lime substances (solid) into container for further application. Dropwise application of lime milk to water.
ERC 8b	Wide dispersive indoor use of reactive substances in open systems

#### 2.1 Control of consumers exposure

##### Product characteristic

Description of the preparation	Concentration of the substance in the preparation	Physical state of the preparation	Dustiness (if relevant)	Packaging design
Water treatment chemical	Up to 100 %	Solid, fine powder	high dustiness (indicative value from DIY fact sheet see section 9.0.3)	Bulk in bags or buckets/containers.
Water treatment chemical	Up to 99 %	Solid, granular of different size (D50 value 0.7 D50 value 1.75 D50 value 3.08)	low dustiness (reduction by 10% compared to powder)	Bulk-tank lorry or in „Big Bags“ or in sacks

##### Amounts used

Description of the preparation	Amount used per event
Water treatment chemical in lime reactor for aquaria	depending on the size of the water reactor to be filled (~ 100g /L)
Water treatment chemical in lime reactor for drinking water	depending on the size of the water reactor to be filled (~up to 1.2 kg/L)
Lime milk for further application	~ 20 g / 5L

##### Frequency and duration of use/exposure

Description of task	Duration of exposure per event	frequency of events
Preparation of lime milk (loading, filling and refilling)	1.33 min (DIY-fact sheet, RIVM, Chapter 2.4.2 Mixing and loading of powders)	1 task/month 1task/week

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Dropwise application of lime milk to water	Several minutes - hours	1 tasks/ month		
<b>Human factors not influenced by risk management</b>				
Description of the task	Population exposed	Breathing rate	Exposed body part	Corresponding skin area [cm <sup>2</sup> ]
Preparation of lime milk (loading, filling and refilling)	adult	1.25 m <sup>3</sup> /hr	Half of both hands	430 (RIVM report 320104007)
Dropwise application of lime milk to water	adult	NR	Hands	860 (RIVM report 320104007)
<b>Other given operational conditions affecting consumers exposure</b>				
Description of the task	Indoor/outdoor	Room volume	Air exchange rate	
Preparation of lime milk (loading, filling and refilling)	Indoor/outdoor	1 m <sup>3</sup> (personal space, small area around the user)	0.6 hr <sup>-1</sup> (unspecified room indoor)	
Dropwise application of lime milk to water	indoor	NR	NR	
<b>Conditions and measures related to information and behavioural advice to consumers</b>				
<p>Do not get in eyes, on skin, or on clothing. Do not breathe dust          Keep container closed and out of reach of children.          Use only with adequate ventilation.          In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.          Wash thoroughly after handling.          Do not mix with acids and always add limes to water and not water to limes.</p>				
<b>Conditions and measures related to personal protection and hygiene</b>				
Wear suitable gloves, goggles and protective clothes. Use a filtering half mask (mask type FFP2 acc. to EN 149).				
<b>2.2 Control of environmental exposure</b>				
<b>Product characteristics</b>				
Not relevant for exposure assessment				
<b>Amounts used*</b>				
Not relevant for exposure assessment				
<b>Frequency and duration of use</b>				
Not relevant for exposure assessment				
<b>Environment factors not influenced by risk management</b>				
Default river flow and dilution				
<b>Other given operational conditions affecting environmental exposure</b>				
Indoor				
<b>Conditions and measures related to municipal sewage treatment plant</b>				
Default size of municipal sewage system/treatment plant and sludge treatment technique				
<b>Conditions and measures related to external treatment of waste for disposal</b>				
Not relevant for exposure assessment				
<b>Conditions and measures related to external recovery of waste</b>				
Not relevant for exposure assessment				

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

The risk characterisation ratio (RCR) is the quotient of the refined exposure estimate and the respective DNEL (derived no-effect level) and is given in parentheses below. For inhalation exposure, the RCR is based on the acute DNEL for lime substances of  $4 \text{ mg/m}^3$  (as respirable dust) and the respective inhalation exposure estimate (as inhalable dust). Thus, the RCR includes an additional safety margin since the respirable fraction is a sub-fraction of the inhalable fraction according to EN 481.

Since lime substances are classified as irritating to skin and eyes a qualitative assessment has been performed for dermal exposure and exposure to the eye.

#### Human exposure

##### Preparation of lime milk (loading )

Route of exposure	Exposure estimate	Method used, comments
Oral	-	Qualitative assessment Oral exposure does not occur as part of the intended product use.
Dermal (powder)	small task: $0.1 \text{ }\mu\text{g/cm}^2$ (-) large task: $1 \text{ }\mu\text{g/cm}^2$ (-)	Qualitative assessment If risk reduction measures are taken into account no human exposure is expected. However, dermal contact to dust from loading of limes or direct contact to the lime cannot be excluded if no protective gloves are worn during application. This may occasionally result in mild irritation easily avoided by prompt rinsing with water. Quantitative assessment The constant rate model of ConsExpo has been used. The contact rate to dust formed while pouring powder has been taken from the DIY-fact sheet (RIVM report 320104007). For granules the exposure estimate will be even lower.
Eye	Dust	Qualitative assessment If risk reduction measures are taken into account no human exposure is expected. Dust from loading of the limes cannot be excluded if no protective goggles are used. Prompt rinsing with water and seeking medical advice after accidental exposure is advisable.
Inhalation (powder)	Small task: $12 \text{ }\mu\text{g/m}^3$ (0.003) Large task: $120 \text{ }\mu\text{g/m}^3$ (0.03)	Quantitative assessment Dust formation while pouring the powder is addressed by using the Dutch model (van Hemmen, 1992, as described in section 9.0.3.1 above).
Inhalation (granules)	Small task: $1.2 \text{ }\mu\text{g/m}^3$ (0.0003) Large task: $12 \text{ }\mu\text{g/m}^3$ (0.003)	Quantitative assessment Dust formation while pouring the powder is addressed by using the Dutch model (van Hemmen, 1992 as described in section 9.0.3.1 above) and applying a dust reduction factor of 10 for the granular form.

##### Dropwise application of lime milk to water

Route of exposure	Exposure estimate	Method used, comments
Oral	-	Qualitative assessment Oral exposure does not occur as part of the intended product use.
Dermal	Droplets or splashes	Qualitative assessment If risk reduction measures are taken into account no human exposure is expected. However, splashes on the skin cannot be excluded if no protective gloves are worn during application. Splashes may occasionally result in mild irritation easily avoided by immediate rinsing of the hands in water.
Eye	Droplets or splashes	Qualitative assessment If risk reduction measures are taken into account no human exposure is expected. However, splashes into the eyes cannot be excluded if no protective goggles are worn during the application. However, it is rare for eye irritation to occur as a result of exposure to a clear solution of calcium hydroxide (lime water) and mild irritation can easily be avoided by immediate rinsing of the eyes with water.

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Inhalation	-	Qualitative assessment Not expected, as the vapour pressure of limes in water is low and generation of mists or aerosols does not take place.
<b>Environmental exposure</b>		
The pH impact due to use of lime in cosmetics is expected to be negligible. The influent of a municipal wastewater treatment plant is often neutralized anyway and lime may even be used beneficially for pH control of acid wastewater streams that are treated in biological WWTPs. Since the pH of the influent of the municipal treatment plant is circum neutral, the pH impact is negligible on the receiving environmental compartments, such as surface water, sediment and terrestrial compartment.		

End of the Safety Data Sheet