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1 IDENTIFICATION OF T	HE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING
1.1 Product identifier	
Substance name:	Calcium oxide
Synonyms:	Lime, Burnt lime, Un-slaked lime, Building lime, Calcia, Fat lime,
	Chemical lime, Fluxing lime, Hard burnt lime, Soft burnt lime, Pebble
	lime, Calcium oxide, Calcium monoxide, Quick lime, Calcined
	limestone.
	Please note that this list may not be exhaustive.
Chemical name and formula:	Calcium oxide – CaO
Trade name:	Weißkalk FN 459-1 CL 70-0

Trade name:	Weißkalk EN 459-1 CL 70-Q Weißkalk EN 459-1 CL 80-Q Weißkalk EN 459-1 CL 90-Q Weißfeinkalk BS Branntkalk / Stückkalk
CAS:	1305-78-8
EINECS:	215-138-9
Molecular Weight:	56.08 g/mol
REACH Registration number:	01-2119475325-36-0012

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> Relevant identified uses of the substance or mixture and uses advised against Please check the identified uses in table 1 of the Appendix of this SDS.

Uses advises against: There are no uses advised against.

1.2 Details of the supplier of the safety data sheet

Name:	Spenner Zement GmbH & Co. KG
Address:	Hüchtchenweg 2, 59597 Erwitte, Germany
Phone N°:	+49 (0) 29 43 / 986-0
Fax N°:	+49 (0) 29 43 / 986-222
E-mail of competent person responsible for SDS in the MS or in the EU:	info@spenner-zement.de

1.3 Emergency telephone number

European Emergency N°:	112
National centre for Prevention and Treatment of Intoxications N°:	+49 (0) 61 31 / 192 40 der Giftnotrufzentrale Mainz
Emergency telephone at the company	+49 (0) 29 43 / 986-0
Available outside office hours:	Yes

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- 2 HAZARDS IDENTIFICATION
- 2.1 Classification of the substance
- 2.1.1 Classification according to Regulation (EC) 1272/2008

STOT Single Exp. 3, Route of exposure: Inhalation Skin Irritation 2 Eye Damage 1

- 2.1.2 Classification according to Directive 67/548/EEC
- Xi irritant
- 2.2 Label elements
- 2.2.1 Labelling according to Regulation (EC) 1272/2008

Signal word: Danger

Hazard pictogram:



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
P280:	Wear protective gloves/protective clothing/eye protection/face protection
P305+P351+P310:	IF IN EYES: Rinse cautiously with water for several minutes. Immediately call a POISON CENTRE or doctor/physician
P302+P352:	IF ON SKIN: Wash with plenty of water
P261:	Avoid breathing dust/spray
P304+P340:	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P501:	Dispose of contents/container in accordance with local/regional/national/ international regulation



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2.2.2 Labelling according to Directive 67/548/EEC

Indication of danger:

Xi irritant



Risk phrases:

- R37: Irritating to respiratory system
- R38: Irritating to skin
- R41: Risk of serious damage to eyes

Safety phrases:

- S2: Keep out of the reach of children
- S25: Avoid contact with eyes
- S26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice
- S37: Wear suitable gloves
- S39: Wear eye/face protection

2.3 Other hazards

The substance does not meet the criteria for PBT or vPvB substance. No other hazards identified.

3 COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Main constituent

Name:	Calcium oxide
CAS:	1305-78-8
EINECS:	215-138-9

Impurities No impurities relevant for classification and labelling.

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

Move source of dust or move person to fresh air. Obtain medical attention immediately.



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Following skin contact

Carefully and gently brush the contaminated body surfaces in order to remove all traces of product. 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.

4.2 Most important symptoms and effects, both acute and delayed

Calcium oxide is not acutely toxic via the oral, dermal, or inhalation route. The substance is classified as irritating to skin and the respiratory tract, 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

5 FIRE FIGHTING MEASURES

5.1 Extinguishing media

5.1.1 Suitable extinguishing media

Suitable extinguishing media: The product is not combustible. Use a dry powder, foam or CO_2 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

Do not use water. Avoid humidification.

5.2 Special hazards arising from the substance or mixture

Calcium oxide reacts with water and generates heat. This may cause risk to flammable material.

5.3 Advice for fire fighters

Avoid generation of dust. Use breathing apparatus. Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

6 ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

6.1.1 For non-emergency personnel

Ensure adequate ventilation. Keep dust levels to a minimum. Keep unprotected persons away.

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Avoid contact with skin, eyes, and clothing – wear suitable protective equipment (see section 8). Avoid inhalation of dust – ensure that sufficient ventilation or suitable respiratory protective equipment is used, wear suitable protective equipment (see section 8). Avoid humidification.

6.1.2 For emergency responders

Keep dust 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 dust – ensure that sufficient ventilation or suitable respiratory protective equipment is used, wear suitable protective equipment (see section 8).

Avoid humidification.

6.2 Environmental precautions

Contain the spillage. Keep the material dry if possible. Cover area if possible to avoid unnecessary dust hazard. 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

In all cases avoid dust formation.

Keep the material dry if possible.

Pick up the product mechanically in a dry way.

Use vacuum suction unit, or shovel into bags.

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.

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 dust levels to a minimum. Minimize dust generation. Enclose dust sources, use exhaust ventilation (dust collector at handling points). Handling systems should preferably be enclosed. When handling bags 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 or 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.

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7.2 Conditions for safe storage, including any incompatibilities

The substance should be stored under dry conditions. Any contact with air and moisture should be avoided. Bulk storage should be in purpose – designed silos. Keep away from acids, significant quantities of paper, straw, and nitro compounds. Keep out of reach of children. Do not use aluminium for transport or storage if there is a risk of contact with water.

7.3 Specific end use(s)

Please check the identified uses in table 1 of the Appendix of this SDS.

For more information please see the relevant exposure scenario, available via your supplier/given in the Appendix, and check section 2.1: Control of worker exposure.

8 EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1 Control parameters

SCOEL recommendation (SCOEL/SUM/137 February 2008; see Section 16.6):

Occupational Exposure Limit (OEL), 8 h TWA: 1 mg/m³ respirable dust of calcium oxide

Short-term exposure limit (STEL), 15 min: 4 mg/m³ respirable dust of calcium oxide

PNEC aqua = 370 µg/l

PNEC soil/groundwater = 816 mg/l

8.2 Exposure controls

To control potential exposures, generation of dust 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/available via your supplier.

8.2.1 Appropriate engineering controls

If user operations generate dust, use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne dust 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. For powders, tight fitting goggles with side shields, or wide vision full goggles. It is also advisable to have individual pocket eyewash.

8.2.2.2 Skin protection

Since calcium oxide is classified as irritating to skin, dermal exposure has to be minimised as far as technically feasible. The use of protective gloves (nitrile), 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.

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8.2.2.3	Respiratory protection	

Local ventilation to keep levels below established threshold values is recommended. A suitable particle filter mask is recommended, depending on the expected exposure levels - please check the relevant exposure scenario, given in the Appendix/available via your supplier.

8.2.2.4 Thermal hazards

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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.

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.

9 PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance:	White or off white (beige) solid material of varying sizes: Lump, granular or fine powder
Odour:	odourless
Odour threshold:	not applicable
pH:	12.3 (saturated solution at 20 °C)
Melting point:	> 450 °C (study result, EU A.1 method)
Boiling point:	not applicable (solid with a melting point > 450 °C)
Flash point:	not applicable (solid with a melting point > 450 °C)
Evaporation rate:	not applicable (solid with a melting point > 450 °C)
Flammability:	non flammable (study result, EU A.10 method)
Explosive limits:	non explosive (void of any chemical structures commonly associated with explosive properties)
Vapour pressure:	not applicable (solid with a melting point > 450 °C)
Vapour density:	not applicable
Relative density:	3.31 (study result, EU A.3 method)
Solubility in water:	1337.6 mg/L (study results, EU A.6 method)
Partition coefficient:	not applicable (inorganic substance)
Auto ignition temperature:	no relative self-ignition temperature below 400 °C (study result, EU A.16 method)
Decomposition temperature:	not applicable
Viscosity:	not applicable (solid with a melting point > 450 °C)
Oxidising properties:	no oxidising properties (Based on the chemical structure, the substance does not contain a surplus of oxygen or any structural groups known to be correlated with a tendency to react exothermally with combustible material)



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9.2 Other information

Not available

10 STABILITY AND REACTIVITY

10.1 Reactivity

Calcium oxide reacts exothermically with water to form Calcium dihydroxide.

10.2 Chemical stability

Under normal conditions of use and storage (dry conditions), calcium oxide is stable.

10.3 Possibility of hazardous reactions

Calcium oxide reacts exothermically with acids to form calcium salts.

10.4 Conditions to avoid

Minimise exposure to air and moisture to avoid degradation.

10.5 Incompatible materials

Calcium oxide reacts exothermically with water to form calcium dihydroxide:

 $CaO + H_2O \rightarrow Ca(OH)_2 + 1155 \text{ kJ/kg CaO}$

Calcium oxide reacts exothermically with acids to form calcium salts.

Calcium oxide reacts with aluminium and brass in the presence of moisture leading to the production of hydrogen: CaO + 2 Al + 7 $H_2O \rightarrow Ca(Al (OH)_4)_2 + 3 H_2$

10.6 Hazardous decomposition products

None.

Further information: calcium oxide absorbs moisture and carbon dioxide from air to form calcium carbonate, which is a common material in nature.

11 TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

a. Acute toxicity

Oral $LD_{50} > 2000 \text{ mg/kg bw}$ (OECD 425, rat)

Dermal $LD_{50} > 2500 \text{ mg/kg}$ bw (calcium dihydroxide, OECD 402, rabbit); by read across these results are also applicable to calcium oxide, since in contact with moisture calcium hydroxide is formed.

Inhalation no data available

Calcium oxide is not acutely toxic.

Classification for acute toxicity is not warranted.

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b. Skin corrosion/irritation

Calcium oxide is irritating to skin (in vivo, rabbit).

Based on experimental results, calcium oxide requires classification as irritating to skin [R38, irritating to skin; Skin Irrit 2 (H315 – Causes skin irritation)]

c. Serious eye damage/irritation

Calcium oxide entails a risk of serious damage to the eye (eye irritation studies (in vivo, rabbit).

Based on experimental results, calcium oxide requires classification as severely irritating to the eye [R41, Risk of serious damage to eye; Eye Damage 1 (H318 - Causes serious eye damage)].

d. Respiratory or skin sensitisation

No data available. Calcium oxide 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

Bacterial reverse mutation assay (Ames test, OECD 471): Negative

In view of the omnipresence and essentiality of Ca and of the physiological non-relevance of any pH shift induced by calcium oxide in aqueous media, CaO is obviously void of any genotoxic potential, including germ cell mutagenicity.

Classification for genotoxicity is not warranted.

f. Carcinogenicity

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

The pH effect of calcium oxide does not give rise to a carcinogenic risk.

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

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 oxide.

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 oxide 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 CaO is irritating to the respiratory tract.

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As summarised and evaluated in the SCOEL recommendation (Anonymous, 2008), based on human data calcium oxide is classified as irritating to the respiratory system [R37, Irritating to respiratory system; STOT SE 3 (H335 – May cause respiratory irritation)].

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 CaO 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 CaO 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/m³ respirable dust (see Section 8.1).

Therefore, classification of CaO for toxicity upon prolonged exposure is not required.

j. Aspiration hazard

Calcium oxide is not known to present an aspiration hazard.

12 ECOLOGICAL INFORMATION

- 12.1 Toxicity
- 12.1.1 Acute/Prolonged toxicity to fish

 LC_{50} (96h) for freshwater fish: 50.6 mg/l (calcium dihydroxide) LC_{50} (96h) for marine water fish: 457 mg/l (calcium dihydroxide)

12.1.2 Acute/Prolonged toxicity to aquatic invertebrates

EC₅₀ (48h) for freshwater invertebrates: 49.1 mg/l (calcium dihydroxide)

LC₅₀ (96h) for marine water invertebrates: 158 mg/l (calcium dihydroxide)

12.1.3Acute/Prolonged toxicity to aquatic plants

EC₅₀ (72h) for freshwater algae: 184.57 mg/l (calcium dihydroxide)

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

12.1.4Toxicity to micro-organisms e.g. bacteria

At high concentration, through the rise of temperature and pH, calcium oxide is used for disinfection of sewage sludges



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12.1.5Chronic toxicity to aquatic organisms

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

12.1.6Toxicity to soil dwelling organisms

 EC_{10}/LC_{10} or NOEC for soil macroorganisms: 2000 mg/kg soil dw (calcium dihydroxide) EC_{10}/LC_{10} or NOEC for soil microorganisms: 12000 mg/kg soil dw (calcium dihydroxide)

12.1.7Toxicity to terrestrial plants

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

12.1.8General effect

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

12.1.9 Further information

The results by read across are also applicable to calcium oxide, since in contact with moisture calcium hydroxide is formed

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 oxide reacts with water and/or carbon dioxide to form respectively calcium dihydroxide and/or calcium carbonate, which are sparingly soluble, and present a low mobility in most soils.

12.5 Results of PBT and vPvB assessment

Not relevant for inorganic substances

12.6 Other adverse effects

No other adverse effects are identified



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13 DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Disposal of calcium oxide 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.

14 TRANSPORT INFORMATION

Calcium oxide is not classified as hazardous for transport (ADR (Road), RID (Rail), IMDG / GGVSea (Sea).

14.1 UN-Number

UN 1910

14.2 UN proper shipping name

Calcium oxide

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14.3 Transport hazard class(es)
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Class 8 Calcium oxide is listed in IMDG (Amendment 34-08).

14.4 Packing group

Group III (Air transport (ICAO/IATA))

14.5 Environmental hazards

None

14.6 Special precautions for user

Avoid any release of dust during transportation, by using air-tight tanks for powders and covered trucks for pebbles.

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

Not regulated.

15 REGULATORY INFORMATION

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

Authorisations: Not required

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Restrictions on use:	None
Other EU regulations:	Calcium oxide is not a SEVESO substance, not an ozone depleting substance and not a persistent organic pollutant.
National regulations:	Water endangering class 1 (Germany)

15.2 Chemical safety assessment

A chemical safety assessment has been carried out for this substance.

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 Hazard Statements

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

16.2 Precautionary Statements

P102:	Keep out of reach of children
P280:	Wear protective gloves/protective clothing/eye protection/face protection
P305+P351:	IF IN EYES: Rinse cautiously with water for several minutes
P310:	Immediately call a POISON CENTRE or doctor/physician
P302+P352:	IF ON SKIN: Wash with plenty of soap and water
P261:	Avoid breathing dust/fume/gas/mist/vapours/spray
P304+P340:	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P501:	Dispose of contents/container in accordance with local/regional/national/international regulation

16.3 Risk Phrases

- R37: Irritating to respiratory system
- R38: Irritating to skin
- R41: Risk of serious damage to eyes

16.4 Safety Phrases

- S2: Keep out of the reach of children
- S25: Avoid contact with eyes
- S26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice
- S37: Wear suitable gloves
- S39: Wear eye/face protection



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16.5 Abbreviations

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EC₅₀: median effective concentration
LC₅₀: median lethal concentration
LD₅₀: 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

16.6 Key literature references

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)₂), European Commission, DG Employment, Social Affairs and Equal Opportunities, SCOEL/SUM/137 February 2008

16.7 Revision

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.

ANNEX

End of the Safety Data Sheet

prepared in accordance with Annex II of the REACH Regulation EC 1907/2006, Regulation (EC) 1272/2008 and Regulation (EC) 453/2010

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APPENDIX: EXPOSURE SCENARIOS

The current document includes all relevant occupational and environmental exposure scenarios (ES) for the production and use of calcium oxide 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⁻ 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⁻ 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 oxide 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

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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/m³ and 4 mg/m³, respectively.

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

Since the SCOEL recommendation refers to <u>respirable dust</u> while the exposure estimates in MEASE reflect the <u>inhalable</u> 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/m³ and 4 mg/m³, 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 μ g/hr or 0.25 μ g/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 μ g/hr. To convert these values in mg/m³ a default value of 1.25 m³/hr for the breathing volume under light working conditions will be assumed (van Hemmen, 1992) giving 12 μ g/m³ for small tasks and 120 μ g/m³ for larger tasks.

prepared in accordance with Annex II of the REACH Regulation EC 1907/2006, Regulation (EC) 1272/2008 and Regulation (EC) 453/2010

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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 oxide 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.

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prepared in accordance with Annex II of the REACH Regulation EC 1907/2006, Regulation (EC) 1272/2008 and Regulation (EC)

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

			Identified uses		ed	Resultin g life cycle stage				Process	Article	Environmental
ES number	Exposure scenario title	Manufacture	Formulation	End use	Consumer	Service life (for articles)	O	Sector of use category (SU)	Chemical Product Category (PC)	category (PROC)	categor y (AC)	release category (ERC)
9.1	Manufacture and industrial uses of aqueous solutions of lime substances	х	x	x		х	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
9.2	Manufacture and industrial uses of low dusty solids/powders of lime substances	х	x	x		х	2	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, 6, 7, 8a, 8b, 9, 10, 13, 14, 15, 16, 17, 18, 19, 21, 22, 23, 24, 25, 26, 27a, 27b	1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 13	6c, 6d, 7, 12a, 12b,
9.3	Manufacture and industrial uses of medium dusty solids/powders of lime substances	х	x	x		х	3	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, 13, 14, 15, 16, 17, 18, 19, 22, 23, 24, 25, 26, 27a, 27b	1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 13	6c, 6d, 7, 12a, 12b,

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			lde use	ntifi es	ed	Resultin g life cycle stage	Identified Use			Process	Article	Environmental
ES number	Exposure scenario title	Manufacture	Formulation	End use	Consumer	Service life (for articles)	(for articles) Linked to Ident		Chemical Product Category (PC)	category (PROC)	categor y (AC)	release category (ERC)
9.4	Manufacture and industrial uses of high dusty solids/powders of lime substances	x	x	x		х	4	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, 13, 14, 15, 16, 17, 18, 19, 22, 23, 24, 25, 26, 27a, 27b	1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 13	1, 2, 3, 4, 5, 6a, 6b, 6c, 6d, 7, 12a, 12b, 10a, 11a
9.5	Manufacture and industrial uses of massive objects containing lime substances	х	x	x		х	5	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	6, 14, 21, 22, 23, 24, 25	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		х	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, 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

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ES number Exposure scenario title			Identified uses		Resultin g life cycle stage		Identified Use			Process	Article	Environmental		
	Manufacture	Formulation	End use	Consumer	Service life	(for articles)	Linked to Iden	Sector of use category (SU)	Chemical Product Category (PC)	category (PROC)	categor y (AC)	release category (ERC)		
9.7	Professional uses of low dusty solids/powders of lime substances		x	x		;	x	7	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, 13, 15, 16, 17, 18, 19, 21, 25, 26	1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 13	2, 8a, 8b, 8c, 8d, 8e, 8f	
9.8	Professional uses of medium dusty solids/powders of lime substances		x	x		;	x	8	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, 13, 15, 16, 17, 18, 19, 25, 26	1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 13	2, 8a, 8b, 8c, 8d, 8e, 8f, 9a, 9b	
9.9	Professional uses of high dusty solids/powders of lime substances		x	x		;	x	9	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, 13, 15, 16, 17, 18, 19, 25, 26	1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 13	2, 8a, 8b, 8c, 8d, 8e, 8f	

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			lde use	ntifi es	ed	Resultin g life cycle stage	tified Use			Process	Article	Environmental
ES number	Exposure scenario title	Manufacture	Formulation	End use	Consumer	Service life (for articles)	Linked to Identified	Sector of use category (SU)	Chemical Product Category (PC)	category (PROC)	categor y (AC)	release category (ERC)
9.10	Professional use of lime substances in soil treatment		x	x			10	22	9b	5, 8b, 11, 26		2, 8a, 8b, 8c, 8d, 8e, 8f
9.11	Professional uses of articles/container s containing lime substances			x		х	11	22; 1, 5, 6a, 6b, 7, 10, 11, 12, 13, 16, 17, 18, 19, 20, 23, 24		0, 21, 24, 25	1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 13	10a, 11a, 11b, 12a, 12b
9.12	Consumer use of building and construction material (DIY)				x		x	21	9b, 9a			8
9.13	Consumer use of CO ₂ absorbent in breathing apparatuses				x		x	21	2			8

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			lde use	entifi es		Res g lif cyc stag	le	U S(Process	Article	Environmental
ES number	Exposure scenario title	Manufacture	Formulation	End use	Consumer	Service life	(for articles)	Linked to Identified		Chemical Product Category (PC)	category (PROC)	categor y (AC)	release category (ERC)
9.14	Consumer use of garden lime/fertilizer				x			x	21	20, 12			8e
9.15	Consumer use of lime substances as water treatment chemicals in aquaria				x			x	21	20, 37			8
9.16	Consumer use of cosmetics containing lime substances				x			x	21	39			8

prepared in accordance with Annex II of the REACH Regulation EG 1907/2006, Regulation (EG) 1272/2008 and Regulation (EU) 453/2010

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Printing Date: June 13, 2013

ES number 9.1: Manufacture and industrial uses of aqueous

solutions of lime substances

Exposure Scenario	ס Format (1) addressing uses carried סנ	it by workers						
1. Title								
Free short title	Manufacture and industrial uses of a	queous solutions of lime substances						
Systematic title based on use descriptor	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)							
Processes, tasks and/or activities covered	Processes, tasks and/or activities covered are described in Section 2 below.							
Assessment Method	The assessment of inhalation exposure is ba	sed on the exposure estimation tool MEASE.						
2. Operational con	ditions and risk management measures	5						
PROC/ERC	REACH definition	Involved tasks						
PROC 1	Use in closed process, no likelihood of exposure							
PROC 2	Use in closed, continuous process with occasional controlled exposure							
PROC 3	Use in closed batch process (synthesis or formulation)							
PROC 4	Use in batch and other process (synthesis) where opportunity for exposure arises							
PROC 5	Mixing or blending in batch 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	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 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 tabletting, 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							

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1			1							
PROC 18	Greasing at high	energy conditions								
PROC 19	Hand-mixing with intima avail	, , , , , , , , , , , , , , , , , , ,								
ERC 1-7, 12	Manufacture, formula industri									
ERC 10, 11	Wide-dispersive outdoor life articles a									
2.1 Control of work	kers exposure									
Product characteristic										
reflected by an assignme ambient temperature the temperature based, takin abrasive tasks are based	ent of a so-called fugacity of fugacity is based on the d g into account the process	lass in the MEASE tool. F ustiness of that substance temperature and the melt ustead of the substance int	I is one of the main expose or operations conducted w . Whereas in hot metal ope ting point of the substance trinsic emission potential.	ith solid substances at erations, fugacity is . As a third group, high						
PROC	Used in preparation?	Jsed in preparation? Content in preparation Physical form Emission potentia								
PROC 7	not res	stricted	aqueous solution	medium						
All other applicable PROCs	not res	stricted	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	n of use/exposure									
PROC		Duration o	f exposure							
PROC 7		≤ 240 r	ninutes							
All other applicable PROCs		480 minutes (not restricted)							
Human factors not influ	enced by risk managem	ent								
The shift breathing volum	ne during all process steps	reflected in the PROCs is	assumed to be 10 m ³ /shif	t (8 hours).						
Other given operationa	I conditions affecting wo	rkers exposure								
			rational conditions (e.g. p essment of the conducted							
Technical conditions a	nd measures at process	level (source) to prevent	release							
Risk management meas required in the processes		(e.g. containment or segr	regation of the emission s	ource) are generally not						
Technical conditions a	nd measures to control d	ispersion from source to	owards 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	Inv potentially required separation of workers from the emission source is indicated								
PROC 19	above under "Frequency and duration of exposure". A reduction of exposure	not applicable	na	-						

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Avoid inhalation or inges These measures involve	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. es to prevent /limit release tion. General occupational good personal and housel e workplace the wearing c	hygiene measures are rec keeping practices (i.e. regu	quired to ensure a safe har ular 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												
Conditions and measur	res related to personal pr	otection, hygiene and he	ealth evaluation									
PROC	equipment (RPE) factor, APF) gloves (PPE)											
PROC 7	FFP1 mask	APF=4	Since calcium oxide is classified as irritating to	Eye protection equipment (e.g. goggles or visors) must be worn, unless potential contact with the eye can be								
All other applicable PROCs	not required	na	skin, the use of protective gloves is mandatory for all process steps.	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.								
(compare with "duration or resistance and mass of the second seco	ve shall only be worn if the of exposure" above) should he RPE itself, due to the in er's capability of using tool	d reflect the additional phy creased thermal stress by	siological stress for the wo enclosing the head. In ad	rker due to the breathing dition, it shall be								
the use of RPE), (ii) have	ove, the worker should the e suitable facial characteris devices above which rely perly and securely.	tics reducing leakages bet	tween face and mask (in vi	iew of scars and facial								
devices and the manage policy for a respiratory pr	mployed persons have legatement of their correct use in otective device programment	the workplace. Therefore e including training of the v	, they should define and de workers.	ocument a suitable								
	of different RPE (accordin		n be found in the glossary o	of MEASE.								
	ronmental exposure											
Amounts used	mount per site (for point	sources) is not consider	ed to be the main determ	ninant for environmental								
exposure.												
Frequency and duration	n of use											
Intermittent (< 12 time pe	er year) or continuous use/	release										
	ot influenced by risk man	agement										
	rface water: 18000 m³/day											
	I conditions affecting en	vironmental exposure										
Effluent discharge rate: 2	2000 m³/day											

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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 oxide of 1 mg/m3 (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. Method used for Method used for Inhalation exposure Dermal exposure PROC inhalation exposure dermal exposure estimate (RCR) estimate (RCR) assessment assessment Since calcium oxide is classified as irritating to PROC 1, 2, 3, 4, 5, 7, skin, dermal exposure has to be minimised as far < 1 mg/m³ (0.001 -8a, 8b, 9, 10, 12, 13, as technically feasible. A DNEL for dermal effects MEASE 0.66) 14, 15, 16, 17, 18, 19 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 OHdischarges, being the toxicity of Ca2+ 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- 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. 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 Environmental neutralised, the discharge of effluent from lime substance production sites may impact the pH in the emissions receiving water. The pH of effluents is normally measured very frequently and can be neutralised easily as often required by national laws. Exposure Waste water from lime substance production is an inorganic wastewater stream and therefore there is concentration in no biological treatment. Therefore, wastewater streams from lime substance production sites will waste water treatment normally not be treated in biological waste water treatment plants (WWTPs), but can be used for pH plant (WWTP) control of acid wastewater streams that are treated in biological WWTPs. When lime substance is emitted to surface water, sorption to particulate matter and sediment will be Exposure negligible. When lime is rejected to surface water, the pH may increase, depending on the buffer concentration in capacity of the water. The higher the buffer capacity of the water, the lower the effect on pH will be. In aquatic pelagic general the buffer capacity preventing shifts in acidity or alkalinity in natural waters is regulated by the compartment equilibrium between carbon dioxide (CO2), the bicarbonate ion (HCO3-) and the carbonate ion (CO32-). The sediment compartment is not included in this ES, because it is not considered relevant for lime Exposure concentration in substance: when lime substance is emitted to the aquatic compartment, sorption of to sediment sediments particles is negligible.

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Printing Date: June 13, 2013

concentrations in soil and groundwater	The terrestrial compartment is not included in this exposure scenario, because it is not considered to be relevant.								
Exposure concentration in atmospheric compartment	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 eaction with CO2 (or other acids), into HCO3- and Ca2+. Subsequently, the salts (e.g. calcium(bi)carbonate) are washed out from the air and thus the atmospheric emissions of neutralised ime substance largely end up in soil and water.								
Exposure concentration relevant for the food chain (secondary poisoning)	poisoning is therefore not required								
4. Guidance to DU	to evaluate whether he works inside the boundaries set by the ES								
Occupational exposur	e								
met or the downstream measures are adequate respective DNEL (given measured data are not a (www.ebrc.de/mease.ht according to the MEASE Method (RDM) are defin	e boundaries set by the ES if either the proposed risk management measures as described above are user can demonstrate on his own that his operational conditions and implemented risk management . This has to be done by showing that they limit the inhalation and dermal exposure to a level below the that the processes and activities in question are covered by the PROCs listed above) as given below. If available, the DU may make use of an appropriate scaling tool such as MEASE ml) to estimate the associated exposure. The dustiness of the substance used can be determined glossary. For example, substances with a dustiness less than 2.5 % according to the Rotating Drum red as "low dusty", substances with a dustiness less than 10 % (RDM) are defined as "medium dusty" lustiness ≥10 % are defined as "high dusty".								
	ng/m ³ (as respirable dust)								
exists at a level of 4 mg, acute DNEL is therefore term exposure estimate exposure duration should	has to be aware of the fact that apart from the long-term DNEL given above, a DNEL for acute effects /m ³ . By demonstrating a safe use when comparing exposure estimates with the long-term DNEL, the also covered (according to R.14 guidance, acute exposure levels can be derived by multiplying long- s by a factor of 2). When using MEASE for the derivation of exposure estimates, it is noted that the d only be reduced to half-shift as a risk management measure (leading to an exposure reduction of								
40 %).									
40 %). Environmental exposu	re								
Environmental exposu If a site does not comp	Ive Ive with the conditions stipulated in the safe use ES, it is recommended to apply a tiered approach to cific assessment. For that assessment, the following stepwise approach is recommended.								
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Environmental exposu If a site does not comp perform a more site-spe Tier 1: retrieve informa above 9 and be predom Tier 2a: retrieve informa value of 9. If the measur $pHriver = Log \qquad \begin{tabular}{lllllllllllllllllllllllllllllllllll$	ly with the conditions stipulated in the safe use ES, it is recommended to apply a tiered approach to cific assessment. For that assessment, the following stepwise approach is recommended. tion on effluent pH and the contribution of the lime substance on the resulting pH. Should the pH be inantly attributable to lime, then further actions are required to demonstrate safe use. ation on receiving water pH after the discharge point. The pH of the receiving water shall not exceed the trees are not available, the pH in the river can be calculated as follows: $\frac{effluent * 10^{pHeffluent} + Qriverupstream * 10^{pHupstream}}{Qriverupstream + Qeffluent} $ (Eq 1) ers to the effluent flow (in m ³ /day) am refers to the upstream river flow (in m ³ /day) fers to the pH of the effluent river refers to the pH of the river upstream of the discharge point hat initially, default values can be used: ver upstream flows: use the 10th of existing measurements distribution or use default value of 18000								

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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- 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- 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.

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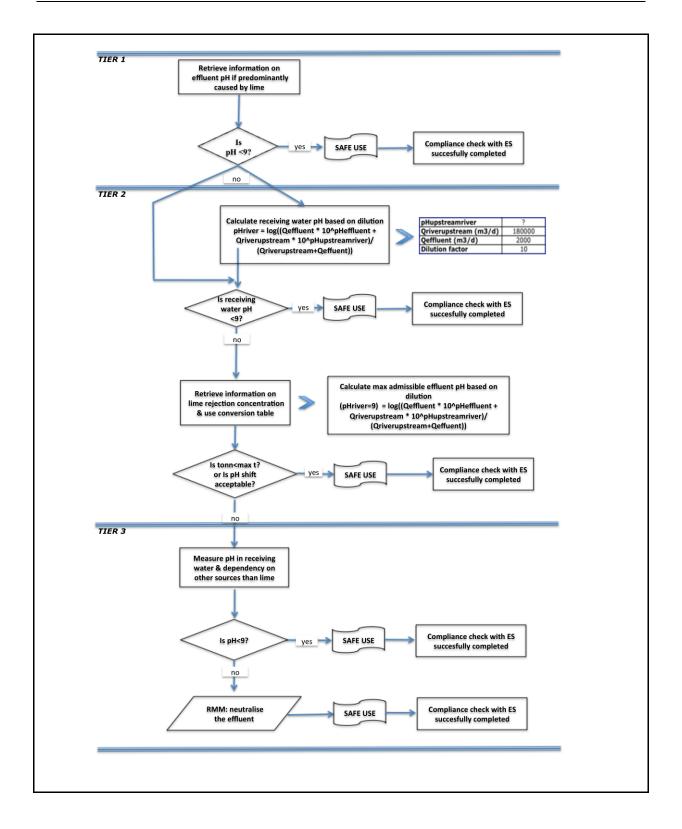
Regulation (EG) 1272/2008 and Regulation (EU) 453/2010

Version: 1.0/EN

spenner zement

Revision date: November / 2010

Printing Date: June 13, 2013



prepared in accordance with Annex II of the REACH Regulation EG 1907/2006, Regulation (EG) 1272/2008 and Regulation (EU) 453/2010

Version: 1.0/EN Revision date: November / 2010

spenner zement

Printing Date: June 13, 2013

ES number 9.2: Manufacture and industrial uses of low dusty solids/powders of lime substances

Exposure Scenario	Format (1) addressing uses carried ou	it by workers						
1. Title								
Free short title	Manufacture and industrial uses of low of	dusty solids/powders of lime substances						
Systematic title based on use descriptor	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)							
Processes, tasks and/or activities covered	Processes, tasks and/or activities cov	ered are described in Section 2 below.						
Assessment Method	The assessment of inhalation exposure is ba	sed on the exposure estimation tool MEASE.						
2. Operational con	ditions and risk management measures	5						
PROC/ERC	REACH definition	Involved tasks						
PROC 1	Use in closed process, no likelihood of exposure							
PROC 2	Use in closed, continuous process with occasional controlled exposure							
PROC 3	Use in closed batch process (synthesis or formulation)							
PROC 4	Use in batch and other process (synthesis) where opportunity for exposure arises							
PROC 5	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)							
PROC 6	Calendering operations							
PROC 7	Industrial spraying							
PROC 8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities	Further information is provided in the ECHA Guidance on information requirements and						
PROC 8b	Transfer of substance or preparation (charging/ discharging) from/to vessels/large containers at dedicated facilities	chemical safety assessment, Chapter R.12: Use descriptor system (ECHA-2010-G-05-EN).						
PROC 9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)							
PROC 10	Roller application or brushing							
PROC 13	Treatment of articles by dipping and pouring							
PROC 14	Production of preparations or articles by tabletting, 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							

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PROC 18	Greasing at high	energy conditions									
PROC 19	Hand-mixing with intimation	Hand-mixing with intimate contact and only PPE available									
PROC 21	Low energy manipulatior materials an	n of substances bound in									
PROC 22	Potentially closed proc minerals/metals at e Industria	essing operations with levated temperature									
PROC 23		Open processing and transfer operations with minerals/metals at elevated temperature									
PROC 24	High (mechanical) energy work-up of substances bound in materials and/or articles										
PROC 25	Other hot work ope	erations with metals									
PROC 26	Handling of solid inorganic substances at ambient										
PROC 27a	Production of metal po	wders (hot processes)									
PROC 27b	Production of metal po	wders (wet processes)									
ERC 1-7, 12	Manufacture, formula industri	21									
ERC 10, 11	Wide-dispersive outdoor life articles a	0									
2.1 Control of work	kers exposure										
Product characteristic											
ambient temperature the temperature based, takin	ent of a so-called fugacity c fugacity is based on the d ing into account the process on the level of abrasion in	ustiness of that substance. temperature and the melt	. Whereas in hot metal op ing point of the substance	erations, fugacity is							
PROC	Used in preparation?	Content in preparation	Physical form	Emission potential							
PROC 22, 23, 25, 27a	not res	solid/powder									
	, 21a not restricted molten high										
PROC 24	not res		molten solid/powder	high high							
PROC 24 All other applicable PROCs	not res	stricted		<u> </u>							
All other applicable		stricted	solid/powder	high							
All other applicable PROCs Amounts used The actual tonnage har combination of the scale		stricted stricted sidered to influence the vs. Professional) and lev	solid/powder solid/powder exposure as such for th	high low is scenario. Instead, the							
All other applicable PROCs Amounts used The actual tonnage har combination of the scale	not res ndled per shift is not con e of operation (industrial minant of the process intrir	stricted stricted sidered to influence the vs. Professional) and lev	solid/powder solid/powder exposure as such for th	high low is scenario. Instead, the							
All other applicable PROCs Amounts used The actual tonnage har combination of the scal PROC) is the main deter	not res ndled per shift is not con e of operation (industrial minant of the process intrir	stricted stricted sidered to influence the vs. Professional) and lev	solid/powder solid/powder exposure as such for th el of containment/autom	high low is scenario. Instead, the							
All other applicable PROCs Amounts used The actual tonnage har combination of the scale PROC) is the main deter Frequency and duration	not res ndled per shift is not con e of operation (industrial minant of the process intrir	stricted stricted sidered to influence the vs. Professional) and lev nsic emission potential.	solid/powder solid/powder exposure as such for th el of containment/autom	high low is scenario. Instead, the							
All other applicable PROCs Amounts used The actual tonnage har combination of the scale PROC) is the main deter Frequency and duration PROC PROC 22 All other applicable	not res ndled per shift is not con e of operation (industrial minant of the process intrir	stricted stricted sidered to influence the vs. Professional) and lev nsic emission potential. Duration or	solid/powder solid/powder exposure as such for th el of containment/automa f exposure ninutes	high low is scenario. Instead, the							
All other applicable PROCs Amounts used The actual tonnage har combination of the scale PROC) is the main deter Frequency and duration PROC PROC 22 All other applicable PROCs	not res ndled per shift is not con e of operation (industrial minant of the process intrir	stricted stricted sidered to influence the vs. Professional) and lev- nsic emission potential. Duration o ≤ 240 m 480 minutes (solid/powder solid/powder exposure as such for th el of containment/automa f exposure ninutes	high low is scenario. Instead, the							
All other applicable PROCs Amounts used The actual tonnage har combination of the scale PROC) is the main deter Frequency and duration PROC PROC 22 All other applicable PROCs Human factors not influ	not res ndled per shift is not con e of operation (industrial minant of the process intrir n of use/exposure	stricted stricted sidered to influence the vs. Professional) and lev nsic emission potential. Duration or ≤ 240 m 480 minutes (ent	solid/powder solid/powder exposure as such for th el of containment/automa f exposure ninutes not restricted)	high low is scenario. Instead, the ation (as reflected in the							
All other applicable PROCs Amounts used The actual tonnage har combination of the scale PROC) is the main deter Frequency and duration PROC PROC 22 All other applicable PROCs Human factors not influ	not res	stricted sidered to influence the vs. Professional) and lev- nsic emission potential. Duration or ≤ 240 m 480 minutes (ent reflected in the PROCs is	solid/powder solid/powder exposure as such for th el of containment/automa f exposure ninutes not restricted)	high low is scenario. Instead, the ation (as reflected in the							

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estimation. Thus all proce	ess temperatures are auto	matically covered in this e	xposure scenario for PRO	C 22, 23 and PROC 25.
Technical conditions a	nd measures at process	level (source) to prevent	release	
Risk management meas required in the processes	ures at the process level	(e.g. containment or segr	regation of the emission s	source) are generally not
Technical conditions a	nd measures to control d	lispersion from source to	owards the worker	
PROC	Level of separation	Localised controls (LC)	Efficiency of LC (according to MEASE)	Further information
PROC 7, 17, 18	Any potentially required separation of workers	general ventilation	17 %	-
PROC 19	from the emission source is indicated above under	not applicable	na	-
PROC 22, 23, 24, 25, 26, 27a	"Frequency and duration of exposure".	local exhaust ventilation	78 %	-
All other applicable PROCs	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 required	na	-
Organisational measure	es to prevent /limit releas	ses, dispersion and expo	osure	
These measures involve eating and smoking at the Shower and change clo compressed air.	tion. General occupational good personal and hous the workplace, the wearin thes at end of work shift res related to personal pr	ekeeping practices (i.e. reing of standard working classics) Do not wear contamination	egular cleaning with suital lothes and shoes unless ated clothing at home. D	ole cleaning devices), no otherwise stated below.
PROC	Specification of respiratory protective equipment (RPE)	RPE efficiency (assigned protection factor, APF)	Specification of gloves	Further personal protective equipment (PPE)
PROC 22, 24, 27a	FFP1 mask	APF=4	Since calcium oxide is	Eye protection equipment (e.g. goggles or visors) must
All other applicable PROCs	not required	na	classified as irritating to skin, the use of protective gloves is mandatory for all process steps.	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.
(compare with "duration of resistance and mass of the considered that the work. For reasons as given abo the use of RPE), (ii) have	ve shall only be worn if the of exposure" above) should he RPE itself, due to the in er's capability of using tool ove, the worker should the e suitable facial characteris devices above which rely	d reflect the additional physic reased thermal stress by s and of communicating a refore be (i) healthy (espec- tics reducing leakages bet	siological stress for the word enclosing the head. In ad re reduced during the weat cially in view of medical pro- tween face and mask (in v	e duration of work orker due to the breathing dition, it shall be ring of RPE. oblems that may affect iew of scars and facial
The employer and self-er	mployed persons have leg	al responsibilities for the m the workplace. Therefore		

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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 oxide of 1 mg/m³ (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, 6, 7, 8a, 8b, 9, 10, 13, 14, 15, 16, 17, 18, 19, 21, 22, 23, 24, 25, 26, 27a, 27b	MEASE	<1 mg/m³ (0.01 – 0.83)	skin, dermal exposure ha as technically feasible. A	DNEL for dermal effects hus, dermal exposure is

Environmental emissions

The environmental exposure assessment is only relevant for the aquatic environment, when applicable including STPs/WWTPs, as emissions of calcium oxide 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-discharges, being the toxicity of Ca2+ 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 calcium oxide will be found predominantly in water. Significant emissions or exposure to air are not expected due to the low vapour pressure of calcium oxide. 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- 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.

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Environmental emissions	The production of calcium oxide can potentially result in an aquatic emission and locally increase the calcium oxide concentration and affect the pH in the aquatic environment. When the pH is not neutralised, the discharge of effluent from calcium oxide 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.		
Exposure concentration in waste water treatment plant (WWTP)	Waste water from calcium oxide production is an inorganic wastewater stream and therefore there is no biological treatment. Therefore, wastewater streams from calcium oxide 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.		
Exposure concentration in aquatic pelagic compartment	When calcium oxide 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 (CO2), the bicarbonate ion (HCO3-) and the carbonate ion (CO32-).		
Exposure concentration in sediments	The sediment compartment is not included in this ES, because it is not considered relevant for calcium oxide: when calcium oxide is emitted to the aquatic compartment, sorption to sediment particles is negligible.		
Exposure concentrations in soil and groundwater	The terrestrial compartment is not included in this exposure scenario, because it is not considered to be relevant.		
Exposure concentration in atmospheric compartment	The air compartment is not included in this CSA because it is considered not relevant for calcium oxide: when emitted to air as an aerosol in water, calcium oxide is neutralised as a result of its reaction with CO2 (or other acids), into HCO3- and Ca2+. Subsequently, the salts (e.g. calcium(bi)carbonate) are washed out from the air and thus the atmospheric emissions of neutralised calcium oxide largely end up in soil and water.		
Exposure concentration relevant for the food chain (secondary poisoning)	Bioaccumulation in organisms is not relevant for calcium oxide: 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) 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" DNEL			
DNEL _{inhalation} : 1 mg/m ³ (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/r acute DNEL is therefore term exposure estimates	nas to be aware of the fact that apart from the long-term DNEL given above, a DNEL for acute effects n ³ . By demonstrating a safe use when comparing exposure estimates with the long-term DNEL, the also covered (according to R.14 guidance, acute exposure levels can be derived by multiplying long- by a factor of 2). When using MEASE for the derivation of exposure estimates, it is noted that the d only be reduced to half-shift as a risk management measure (leading to an exposure reduction of		

40 %).

prepared in accordance with Annex II of the REACH Regulation EG 1907/2006,

Regulation (EG) 1272/2008 and Regulation (EU) 453/2010

Version: 1.0/EN

spenner zement

Revision date: November / 2010

Printing Date: June 13, 2013

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 calcium oxide 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:

$$pHriver = Log \left[\frac{Qeffluent * 10^{pHeffluent} + Qriverupstream * 10^{pHupstream}}{Qriverupstream + Qeffluent} \right]$$
(Eq 1)

Where:

Q effluent refers to the effluent flow (in m³/day)

Q river upstream refers to the upstream river flow (in m³/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 $\ensuremath{m^3/day}$
- Q effluent: use default value of 2000 m³/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- 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- expressed as moles/litre are multiplied by average flow of the effluent and then divided by the molar mass of the calcium oxide.

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.

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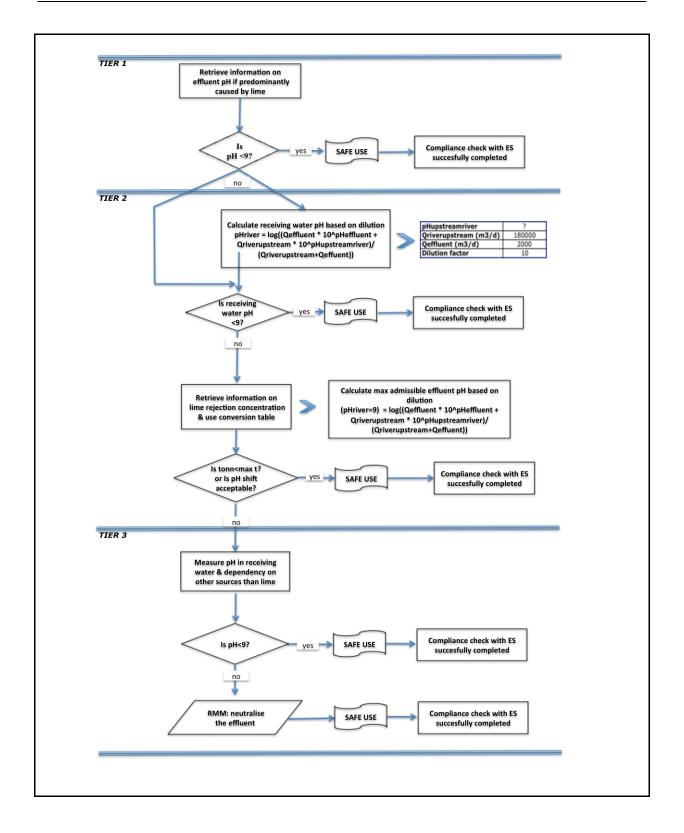
Regulation (EG) 1272/2008 and Regulation (EU) 453/2010

Version: 1.0/EN

spenner zement

Revision date: November / 2010

Printing Date: June 13, 2013



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Version: 1.0/EN Revision date: November / 2010

spenner zement

Printing Date: June 13, 2013

ES number 9.3: Manufacture and industrial uses of medium dusty solids/powders of lime substances

Exposure Scenario	Format (1) addressing uses carried ou	it by workers			
1. Title					
Free short title	Manufacture and industrial uses of mediur	n dusty solids/powders of lime substances			
Systematic title based on use descriptor	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)				
Processes, tasks and/or activities covered	Processes, tasks and/or activities cov	ered are described in Section 2 below.			
Assessment Method	The assessment of inhalation exposure is ba	sed on the exposure estimation tool MEASE.			
2. Operational con	ditions and risk management measures	5			
PROC/ERC	REACH definition	Involved tasks			
PROC 1	Use in closed process, no likelihood of exposure				
PROC 2	Use in closed, continuous process with occasional controlled exposure				
PROC 3	Use in closed batch process (synthesis or formulation)				
PROC 4	Use in batch and other process (synthesis) where opportunity for exposure arises				
PROC 5	Mixing or blending in batch 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	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 9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)				
PROC 10	Roller application or brushing				
PROC 13	Treatment of articles by dipping and pouring				
PROC 14	Production of preparations or articles by tabletting, 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				

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PROC 19	Hand-mixing with intimat	e contact and only PPE		
	available Potentially closed processing operations with minerals/metals at elevated temperature			
PROC 22	minerals/metals at el Industria			
PROC 23	Open processing and transfer operations with minerals/metals at elevated temperature			
PROC 24	High (mechanical) energ bound in materia			
PROC 25	Other hot work ope	rations with metals		
PROC 26	Handling of solid inorgani tempe			
PROC 27a	Production of metal po	wders (hot processes)		
PROC 27b	Production of metal por	wders (wet processes)		
ERC 1-7, 12	Manufacture, formula industria			
ERC 10, 11	Wide-dispersive outdoor life articles a			
2.1 Control of work	kers exposure			
Product characteristic				
reflected by an assignme ambient temperature the temperature based, takin	approach, the substance- int of a so-called fugacity c fugacity is based on the du g into account the process on the level of abrasion in	ass in the MEASE tool. For stiness of that substance. temperature and the melt	or operations conducted w . Whereas in hot metal op ing point of the substance	rith solid substances at erations, fugacity is
PROC	Used in preparation?	Content in preparation	Physical form	Emission potential
PROC 22, 23, 25, 27a	not res	tricted	solid/powder, molten	high
PROC 24	not res	tricted	solid/powder	high
All other applicable PROCs	not res	tricted	solid/powder	medium
Amounts used				
combination of the scale	Idled per shift is not cons of operation (industrial minant of the process intrin	vs. Professional) and leve		
Frequency and duration	n of use/exposure			
PROC		Duration of	f exposure	
PROC 7, 17, 18, 19, 22		≤ 240 n	ninutes	
All other applicable PROCs	480 minutes (not restricted)			
Human factors not influ	enced by risk manageme	ent		
The shift breathing volum	e during all process steps	reflected in the PROCs is	assumed to be 10 m ³ /shif	t (8 hours).
Other given operational	I conditions affecting wo	rkers exposure		
assessment of the condu exposure assessment in temperatures are expected	e process temperature and cted processes. In process MEASE is however based ed to vary within the indust ess temperatures are autor	s steps with considerably h on the ratio of process ter ry the highest ratio was tal	nigh temperatures (i.e. PR mperature and melting poi ken as a worst case assur	OC 22, 23, 25), the nt. As the associated nption for the exposure

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required in the processes	S			
Technical conditions a	nd measures to control o	lispersion from source to	owards the worker	
PROC	Level of separation	Localised controls (LC)	Efficiency of LC (according to MEASE)	Further information
PROC 1, 2, 15, 27b	Any potentially required	not required	na	-
PROC 3, 13, 14	separation of workers from the emission	general ventilation	17 %	-
PROC 19	source is indicated above under	not applicable	na	-
All other applicable PROCs	"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 %	-
	es to prevent /limit releas		osure equired to ensure a safe ha	
Shower and change clo			lothes and shoes unless	
•	res related to personal p		-	o not blow dust off wit
compressed air. Conditions and measu PROC			-	Further personal protective equipmen (PPE)
Conditions and measu PROC PROC 4, 5, 7, 8a, 8b, 9, 10, 16, 17, 18, 19,	res related to personal p Specification of respiratory protective	rotection, hygiene and he RPE efficiency (assigned protection	ealth evaluation Specification of	Further personal protective equipmen (PPE) Eye protection equipment (e.g.
Conditions and measu	res related to personal p Specification of respiratory protective equipment (RPE)	rotection, hygiene and he RPE efficiency (assigned protection factor, APF)	ealth evaluation Specification of	Further personal protective equipmen (PPE) Eye protection equipment (e.g. goggles or visors) mus be worn, unless potential contact with the eye can be excluded by the natur and type of application (i.e. closed process). Additionally, face protection, protective clothing and safety shoes are required to
Conditions and measu PROC PROC 4, 5, 7, 8a, 8b, 9, 10, 16, 17, 18, 19, 22, 24, 27a All other applicable PROCs Any RPE as defined abo (compare with "duration resistance and mass of t	res related to personal provide the second s	rotection, hygiene and he RPE efficiency (assigned protection factor, APF) APF=4 na e following principles are in d reflect the additional physic protection factors by	ealth evaluation Specification of gloves Since calcium oxide is classified as irritating to skin, the use of protective gloves is mandatory for all	Further personal protective equipmen (PPE) Eye protection equipment (e.g. goggles or visors) mus be worn, unless potential contact with the eye can be excluded by the natur and type of application (i.e. closed process). Additionally, face protection, protective clothing and safety shoes are required to be worn as appropriate e duration of work rker due to the breathin dition, it shall be
Conditions and measu PROC PROC 4, 5, 7, 8a, 8b, 9, 10, 16, 17, 18, 19, 22, 24, 27a All other applicable PROCs Any RPE as defined abo (compare with "duration resistance and mass of t considered that the work For reasons as given abo the use of RPE), (ii) have hair). The recommended	res related to personal pr Specification of respiratory protective equipment (RPE) FFP1 mask not required ve shall only be worn if the of exposure" above) should he RPE itself, due to the ir er's capability of using tool ove, the worker should the e suitable facial characteris I devices above which rely	rotection, hygiene and he RPE efficiency (assigned protection factor, APF) APF=4 na e following principles are in d reflect the additional physic nereased thermal stress by ls and of communicating a refore be (i) healthy (espec- stress reducing leakages bell	ealth evaluation Specification of gloves Since calcium oxide is classified as irritating to skin, the use of protective gloves is mandatory for all process steps. nplemented in parallel: The siological stress for the wo	Further personal protective equipmen (PPE) Eye protection equipment (e.g. goggles or visors) mus be worn, unless potential contact with the eye can be excluded by the natur and type of application (i.e. closed process). Additionally, face protection, protective clothing and safety shoes are required to be worn as appropriate e duration of work rker due to the breathin dition, it shall be ring of RPE.
Conditions and measu PROC PROC 4, 5, 7, 8a, 8b, 9, 10, 16, 17, 18, 19, 22, 24, 27a All other applicable PROCs Any RPE as defined abo (compare with "duration resistance and mass of t considered that the work For reasons as given abo the use of RPE), (ii) have hair). The recommended contours of the face prop The employer and self-e devices and the manage	res related to personal provide the solution of respiratory protective equipment (RPE) FFP1 mask FFP1 mask not required ve shall only be worn if the of exposure" above) should he RPE itself, due to the irrer's capability of using tool ove, the worker should the suitable facial characteris I devices above which rely perly and securely. mployed persons have leg	rotection, hygiene and he RPE efficiency (assigned protection factor, APF) APF=4 na e following principles are in d reflect the additional physic creased thermal stress by is and of communicating a refore be (i) healthy (espec- stics reducing leakages bet on a tight face seal will no al responsibilities for the m the workplace. Therefore	ealth evaluation Specification of gloves Since calcium oxide is classified as irritating to skin, the use of protective gloves is mandatory for all process steps. nplemented in parallel: The siological stress for the wo enclosing the head. In ad re reduced during the wea cially in view of medical prot tween face and mask (in vi t provide the required prote naintenance and issue of re t, they should define and de	Further personal protective equipmen (PPE) Eye protection equipment (e.g. goggles or visors) mus be worn, unless potential contact with the eye can be excluded by the natur and type of application (i.e. closed process). Additionally, face protection, protective clothing and safety shoes are required to be worn as appropriate e duration of work rker due to the breathin dition, it shall be ring of RPE. bblems that may affect tee of scars and facial action unless they fit the

prepared in accordance with Annex II of the REACH Regulation EG 1907/2006,

Regulation (EG) 1272/2008 and Regulation (EU) 453/2010

Version: 1.0/EN

spenner zement

Revision date: November / 2010

Printing Date: June 13, 2013

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 m ³ /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.

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Regulation (EG) 1272/2008 and Regulation (EU) 453/2010

Version: 1.0/EN

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Revision date: November / 2010

3. Exposure estima	ation and reference	to its source		
Occupational exposure				
is the quotient of the refin demonstrate a safe use. dust) and the respective i	ed exposure estimate and For inhalation exposure, th inhalation exposure estima	I the respective DNEL (dealer the RCR is based on the Date derived using MEASE	ion exposure. The risk cha rived no-effect level) and h NEL for calcium oxide of 1 (as inhalable dust). Thus, t ne inhalable fraction accord	as to be below 1 to mg/m ³ (as respirable the RCR includes an
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, 13, 14, 15, 16, 17, 18, 19, 22, 23, 24, 25, 26, 27a, 27b	MEASE	< 1 mg/m³ (0.01 – 0.88)	Since calcium oxide is of skin, dermal exposure ha as technically feasible. A has not been derived. T not assessed in this	as to be minimised as far DNEL for dermal effects hus, dermal exposure is
Environmental emission	ns			
effect and risk assessme discharges, being the tox being addressed, includir when applicable, both for local scale. The high wate water. Significant emission emissions or exposure to assessment for the aquat	nt only deal with the effect icity of Ca2+ is expected to a municipal sewage treatr production and industrial er solubility and very low v ons or exposure to air are r the terrestrial environment tic environment will therefor rges at the local scale. The	on organisms/ecosystems o be negligible compared ment plants (STPs) or indu use as any effects that min apour pressure indicate th not expected due to the low it are not expected either for one only deal with the poss	d use) mainly apply to (was s due to possible pH chang to the (potential) pH effect. Istrial waste water treatme ght occur would be expect at calcium oxide will be for w vapour pressure of calcin or this exposure scenario. ible pH changes in STP ef approached by assessing	ges related to OH- Only the local scale is nt plants (WWTPs) ed to take place on a und predominantly in um oxide. Significant The exposure fluent and surface water
Environmental emissions	The production of calcium oxide can potentially result in an aquatic emission and locally increase the calcium oxide concentration and affect the pH in the aquatic environment. When the pH is not neutralised, the discharge of effluent from calcium oxide 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.			
Exposure concentration in waste water treatment plant (WWTP)	no biological treatment. T normally not be treated in	herefore, wastewater stre	organic wastewater strean ams from calcium oxide pr eatment plants (WWTPs), I in biological WWTPs.	oduction sites will
Exposure concentration in aquatic pelagic compartment	negligible. When lime is r capacity of the water. The general the buffer capaci	ejected to surface water, t e higher the buffer capacit ty preventing shifts in acid	rption to particulate matter he pH may increase, depe y of the water, the lower th ity or alkalinity in natural w irbonate ion (HCO3-) and	ending on the buffer e effect on pH will be. In aters is regulated by the
Exposure concentration in sediments	The sediment compartment is not included in this ES, because it is not considered relevant for calcium oxide: when calcium oxide is emitted to the aquatic compartment, sorption of to sediment particles is negligible.			
Exposure concentrations in soil and groundwater	The terrestrial compartment is not included in this exposure scenario, because it is not considered to be relevant.			
Exposure concentration in atmospheric compartment	oxide: when emitted to ai reaction with CO2 (or oth	r as an aerosol in water, c er acids), into HCO3- and washed out from the air a	cause it is considered not alcium oxide is neutralised Ca2+. Subsequently, the and thus the atmospheric e	l as a result of its salts (e.g.
Exposure concentration relevant for the food chain (secondary poisoning)	Bioaccumulation in organ poisoning is therefore not		lcium oxide: a risk assessr	nent for secondary

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Regulation (EG) 1272/2008 and Regulation (EU) 453/2010

Version: 1.0/EN

Revision date: November / 2010

Printing Date: June 13, 2013

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) 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_{inhalation}: 1 mg/m³ (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/m³. 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 calcium oxide 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:

 $pHriver = Log \left[\frac{Qeffluent * 10^{pHeffluent} + Qriverupstream * 10^{pHupstream}}{Qriverupstream + Qeffluent} \right]$ Eq 1)

Where:

Q effluent refers to the effluent flow (in m3/day)

Q river upstream refers to the upstream river flow (in m³/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 m³/day
- Q effluent: use default value of 2000 m³/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- 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- expressed as moles/litre are multiplied by average flow of the effluent and then divided by the molar mass of the calcium oxide.

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



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undergo neutralisation, thus ensuring safe use of lime during production or use phase.

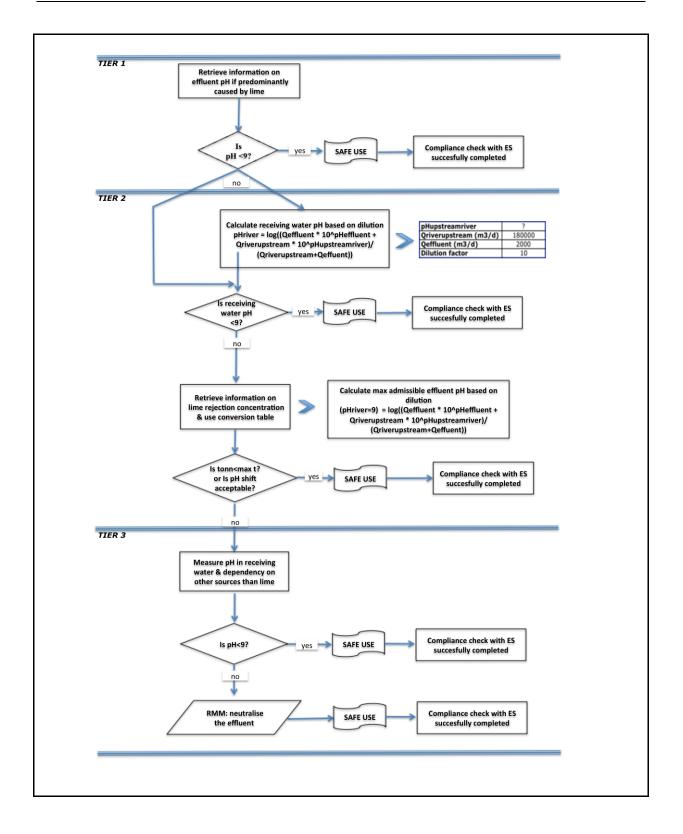
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Regulation (EG) 1272/2008 and Regulation (EU) 453/2010

Version: 1.0/EN

spenner zement

Revision date: November / 2010



prepared in accordance with Annex II of the REACH Regulation EG 1907/2006, Regulation (EG) 1272/2008 and Regulation (EU) 453/2010

Version: 1.0/EN Revision date: November / 2010

spenner zement

Printing Date: June 13, 2013

ES number 9.4: Manufacture and industrial uses of high dusty solids/powders of lime substances

Exposure Scenario	Format (1) addressing uses carried ou	It by workers		
1. Title				
Free short title	Manufacture and industrial uses of high	dusty solids/powders of lime substances		
Systematic title based on use descriptor	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)			
Processes, tasks and/or activities covered	Processes, tasks and/or activities cove	ered are described in Section 2 below.		
Assessment Method	The assessment of inhalation exposure is ba	sed on the exposure estimation tool MEASE.		
2. Operational con	ditions and risk management measures	<u>.</u>		
PROC/ERC	REACH definition	Involved tasks		
PROC 1	Use in closed process, no likelihood of exposure			
PROC 2	Use in closed, continuous process with occasional controlled exposure			
PROC 3	Use in closed batch process (synthesis or formulation)			
PROC 4	Use in batch and other process (synthesis) where opportunity for exposure arises			
PROC 5	Mixing or blending in batch 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	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 9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)			
PROC 10	Roller application or brushing			
PROC 13	Treatment of articles by dipping and pouring			
PROC 14	Production of preparations or articles by tabletting, compression, extrusion, pelletisation			
PROC 15	Use as laboratory reagent			
PROC 15 PROC 16	Use as laboratory reagent Using material as fuel sources, limited exposure to unburned product to be expected			
	Using material as fuel sources, limited exposure			

prepared in accordance with Annex II of the REACH Regulation EG 1907/2006,

Regulation (EG) 1272/2008 and Regulation (EU) 453/2010

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	Hand-mixing with intima	te contact and only PPE		
PROC 19	avail Potentially closed proc	lable		
PROC 22	minerals/metals at e	levated temperature		
PROC 23	Open processing and t minerals/metals at e	ransfer operations with levated temperature		
PROC 24	High (mechanical) energ bound in materia			
PROC 25	Other hot work ope	erations with metals		
PROC 26	Handling of solid inorgan tempe	ic substances at ambient erature		
PROC 27a	Production of metal po	wders (hot processes)		
PROC 27b	Production of metal po	wders (wet processes)		
ERC 1-7, 12	Manufacture, formula industri	ation and all types of al uses		
ERC 10, 11	Wide-dispersive outdoor life articles a			
2.1 Control of worl	kers exposure			
Product characteristic				
ambient temperature the temperature based, takin	ent of a so-called fugacity of fugacity is based on the d ig into account the process d on the level of abrasion in	ustiness of that substance. temperature and the melt istead of the substance int	. Whereas in hot metal ope ing point of the substance	erations, fugacity is
PROC	Used in preparation?	Content in preparation	Physical form	Emission potential
PROC 22, 23, 25, 27a	not res	stricted	solid/powder, molten	high
All other applicable PROCs	not res	stricted	solid/powder	high
Amounts used				
combination of the scale	lled per shift is not conside of operation (industrial vs. minant of the process intrir	Professional) and level of		
Frequency and duration	• •	·		
PROC		Duration of	f exposure	
PROC 7, 8a, 17, 18, 19, 22		≤ 240 n	ninutes	
All other applicable PROCs		480 minutes (not restricted)	
Human factors not influ	uenced by risk managem	ent		
The shift breathing volun	ne during all process steps	reflected in the PROCs is	assumed to be 10 m ³ /shif	t (8 hours).
Other given operationa	I conditions affecting wo	rkers exposure		
assessment of the conductive exposure assessment in temperatures are expect	ke process temperature an icted processes. In process MEASE is however based ed to vary within the indust ess temperatures are auto	s steps with considerably h on the ratio of process ter ry the highest ratio was tal	high temperatures (i.e. PR nperature and melting poi ken as a worst case assur	OC 22, 23, 25), the nt. As the associated nption for the exposure
Technical conditions a	nd measures at process		release	
		level (source) to prevent	Telease	

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		lispersion from source to		
PROC	Level of separation	Localised controls (LC)	Efficiency of LC (according to MEASE)	Further information
PROC 1	Any potentially required	not required	na	-
PROC 2, 3	separation of workers from the emission	general ventilation	17 %	-
PROC 7	source is indicated above under	integrated local exhaust ventilation	84 %	
PROC 19	"Frequency and duration of exposure".	not applicable	na	-
All other applicable PROCs	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 %	-
Organisational measure	es to prevent /limit releas	ses, dispersion and expo	sure	
These measures involve eating and smoking at th Shower and change cloth compressed air.	tion. General occupational good personal and housel e workplace, the wearing ones at end of work shift. Do res related to personal pr	keeping practices (i.e. regu of standard working clothes o not wear contaminated cl	lar cleaning with suitable s and shoes unless otherw othing at home. Do not blo	cleaning devices), no ise stated below.
	Specification of	RPE efficiency		Further personal
PROC	respiratory protective equipment (RPE)	(assigned protection factor, APF)	Specification of gloves	protective equipment (PPE)
PROC 1, 2, 3, 23, 25, 27b	not required	na		Eye protection equipment (e.g.
PROC 4, 5, 7, 8a, 8b,	FFP2 mask	APF=10		goggles or visors) must be worn, unless
9, 17, 18,			Since calcium oxide is	potential contact with
9, 17, 18, PROC 10, 13, 14, 15,	FFP1 mask	APF=4	classified as irritating to	the eye can be
9, 17, 18,		APF=4 APF=20		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
9, 17, 18, PROC 10, 13, 14, 15, 16, 22, 24, 26, 27a PROC 19 Any RPE as defined abo (compare with "duration of resistance and mass of t	FFP1 mask	APF=20 following principles are in d reflect the additional physic reased thermal stress by	classified as irritating to skin, the use of protective gloves is mandatory for all process steps.	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 <u>be worn as appropriate</u> e duration of work rker due to the breathing dition, it shall be
9, 17, 18, PROC 10, 13, 14, 15, 16, 22, 24, 26, 27a PROC 19 Any RPE as defined abo (compare with "duration of resistance and mass of the considered that the work For reasons as given abo the use of RPE), (ii) have	FFP1 mask FFP3 mask FFP3 mask ve shall only be worn if the of exposure" above) should he RPE itself, due to the in er's capability of using tool ove, the worker should the e suitable facial characteris devices above which rely	APF=20 following principles are in d reflect the additional phys creased thermal stress by s and of communicating ar refore be (i) healthy (espec tics reducing leakages bet	classified as irritating to skin, the use of protective gloves is mandatory for all process steps.	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 duration of work rker due to the breathing dition, it shall be ring of RPE.
9, 17, 18, PROC 10, 13, 14, 15, 16, 22, 24, 26, 27a PROC 19 Any RPE as defined abo (compare with "duration of resistance and mass of the considered that the work For reasons as given abo the use of RPE), (ii) have hair). The recommended contours of the face prop The employer and self-end devices and the manage	FFP1 mask FFP3 mask FFP3 mask ve shall only be worn if the of exposure" above) should he RPE itself, due to the in er's capability of using tool ove, the worker should the e suitable facial characteris devices above which rely	APF=20 following principles are in d reflect the additional phys creased thermal stress by s and of communicating al refore be (i) healthy (espec- tics reducing leakages bef on a tight face seal will no al responsibilities for the m the workplace. Therefore	classified as irritating to skin, the use of protective gloves is mandatory for all process steps.	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 duration of work rker due to the breathing dition, it shall be ring of RPE. oblems that may affect teew of scars and facial action unless they fit the espiratory protective
9, 17, 18, PROC 10, 13, 14, 15, 16, 22, 24, 26, 27a PROC 19 Any RPE as defined abo (compare with "duration of resistance and mass of t considered that the work For reasons as given abo the use of RPE), (ii) have hair). The recommended contours of the face prop The employer and self-end devices and the manage policy for a respiratory pr	FFP1 mask FFP3 mask FFP3 mask ve shall only be worn if the of exposure" above) should he RPE itself, due to the in er's capability of using tool ove, the worker should the e suitable facial characteris devices above which rely perly and securely. mployed persons have leg- ment of their correct use in	APF=20 following principles are in d reflect the additional phys creased thermal stress by s and of communicating ar refore be (i) healthy (espec- tics reducing leakages bet on a tight face seal will no al responsibilities for the m the workplace. Therefore e including training of the v	classified as irritating to skin, the use of protective gloves is mandatory for all process steps.	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 duration of work rker due to the breathing dition, it shall be ring of RPE. oblems that may affect teew of scars and facial action unless they fit the espiratory protective boument a suitable
9, 17, 18, PROC 10, 13, 14, 15, 16, 22, 24, 26, 27a PROC 19 Any RPE as defined abo (compare with "duration of resistance and mass of the considered that the work For reasons as given abo the use of RPE), (ii) have hair). The recommended contours of the face prop The employer and self-end devices and the manage policy for a respiratory pr An overview of the APFs	FFP1 mask FFP3 mask FFP3 mask ve shall only be worn if the of exposure" above) should he RPE itself, due to the in er's capability of using tool ove, the worker should the e suitable facial characteris devices above which rely verly and securely. mployed persons have leg- ment of their correct use in rotective device programm- of different RPE (accordin	APF=20 following principles are in d reflect the additional physic creased thermal stress by s and of communicating ar refore be (i) healthy (espec- tics reducing leakages bet on a tight face seal will no al responsibilities for the m the workplace. Therefore e including training of the w g to BS EN 529:2005) car	classified as irritating to skin, the use of protective gloves is mandatory for all process steps.	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 duration of work rker due to the breathing dition, it shall be ring of RPE. oblems that may affect ew of scars and facial ection unless they fit the espiratory protective boument a suitable
9, 17, 18, PROC 10, 13, 14, 15, 16, 22, 24, 26, 27a PROC 19 Any RPE as defined abo (compare with "duration of resistance and mass of the considered that the work For reasons as given abo the use of RPE), (ii) have hair). The recommended contours of the face prop The employer and self-end devices and the manage policy for a respiratory pr An overview of the APFs	FFP1 mask FFP3 mask FFP3 mask ve shall only be worn if the of exposure" above) should he RPE itself, due to the in er's capability of using tool ove, the worker should the e suitable facial characteris devices above which rely verly and securely. mployed persons have leg- ment of their correct use in rotective device programm	APF=20 following principles are in d reflect the additional physic creased thermal stress by s and of communicating ar refore be (i) healthy (espec- tics reducing leakages bet on a tight face seal will no al responsibilities for the m the workplace. Therefore e including training of the w g to BS EN 529:2005) car	classified as irritating to skin, the use of protective gloves is mandatory for all process steps.	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 duration of work rker due to the breathing dition, it shall be ring of RPE. oblems that may affect ew of scars and facial action unless they fit the espiratory protective boument a suitable

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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 oxide of 1 mg/m³ (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, 13, 14, 15, 16, 17, 18, 19, 22, 23, 24, 25, 26, 27a, 27b	MEASE	<1 mg/m³ (0.01 – 0.96)	skin, dermal exposure ha as technically feasible. A	classified as irritating to as to be minimised as far DNEL for dermal effects hus, dermal exposure is exposure scenario.

Environmental emissions

The environmental exposure assessment is only relevant for the aquatic environment, when applicable including STPs/WWTPs, as emissions of calcium oxide 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-discharges, being the toxicity of Ca2+ 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 calcium oxide will be found predominantly in water. Significant emissions or exposure to air are not expected due to the low vapour pressure of calcium oxide. 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- 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.

Environmental emissions	The production of calcium oxide can potentially result in an aquatic emission and locally increase the calcium oxide concentration and affect the pH in the aquatic environment. When the pH is not neutralised, the discharge of effluent from calcium oxide 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.
Exposure concentration in waste water treatment plant (WWTP)	Waste water from calcium oxide production is an inorganic wastewater stream and therefore there is no biological treatment. Therefore, wastewater streams from calcium oxide 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.

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Exposure concentration in aquatic pelagic compartment	When calcium oxide 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 (CO2), the bicarbonate ion (HCO3-) and the carbonate ion (CO32-).
Exposure concentration in sediments	The sediment compartment is not included in this ES, because it is not considered relevant for calcium oxide: when calcium oxide is emitted to the aquatic compartment, sorption of to sediment particles is negligible.
Exposure concentrations in soil and groundwater	The terrestrial compartment is not included in this exposure scenario, because it is not considered to be relevant.
Exposure concentration in atmospheric compartment	The air compartment is not included in this CSA because it is considered not relevant for calcium oxide: when emitted to air as an aerosol in water, calcium oxide is neutralised as a result of its reaction with CO2 (or other acids), into HCO3- and Ca2+. Subsequently, the salts (e.g. calcium(bi)carbonate) are washed out from the air and thus the atmospheric emissions of neutralised calcium oxide largely end up in soil and water.
Exposure concentration relevant for the food chain (secondary poisoning)	Bioaccumulation in organisms is not relevant for calcium oxide: 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	
met or the downstream u measures are adequate. respective DNEL (given t measured data are not a (www.ebrc.de/mease.htm according to the MEASE Method (RDM) are define	boundaries set by the ES if either the proposed risk management measures as described above are iser can demonstrate on his own that his operational conditions and implemented risk management This has to be done by showing that they limit the inhalation and dermal exposure to a level below the that the processes and activities in question are covered by the PROCs listed above) as given below. If vailable, the DU may make use of an appropriate scaling tool such as MEASE <u>nl</u>) to estimate the associated exposure. The dustiness of the substance used can be determined glossary. For example, substances with a dustiness less than 2.5 % according to the Rotating Drum ed as "low dusty", substances with a dustiness less than 10 % (RDM) are defined as "medium dusty" ustiness ≥10 % are defined as "high dusty".
met or the downstream u measures are adequate. respective DNEL (given t measured data are not a (<u>www.ebrc.de/mease.htm</u> according to the MEASE Method (RDM) are define and substances with a du	iser can demonstrate on his own that his operational conditions and implemented risk management. This has to be done by showing that they limit the inhalation and dermal exposure to a level below the that the processes and activities in question are covered by the PROCs listed above) as given below. If vailable, the DU may make use of an appropriate scaling tool such as MEASE <u>nl</u>) to estimate the associated exposure. The dustiness of the substance used can be determined glossary. For example, substances with a dustiness less than 2.5 % according to the Rotating Drum ed as "low dusty", substances with a dustiness less than 10 % (RDM) are defined as "medium dusty"

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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 calcium oxide 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:

$$pHriver = Log \left[\frac{Qeffluent * 10^{pHeffluent} + Qriverupstream * 10^{pHupstream}}{Qriverupstream + Qeffluent} \right]$$
(Eq 1)

Where:

Q effluent refers to the effluent flow (in m³/day)

Q river upstream refers to the upstream river flow (in m³/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 $\rm m^{3}/day$
- Q effluent: use default value of 2000 m³/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- 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- expressed as moles/litre are multiplied by average flow of the effluent and then divided by the molar mass of the calcium oxide.

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.

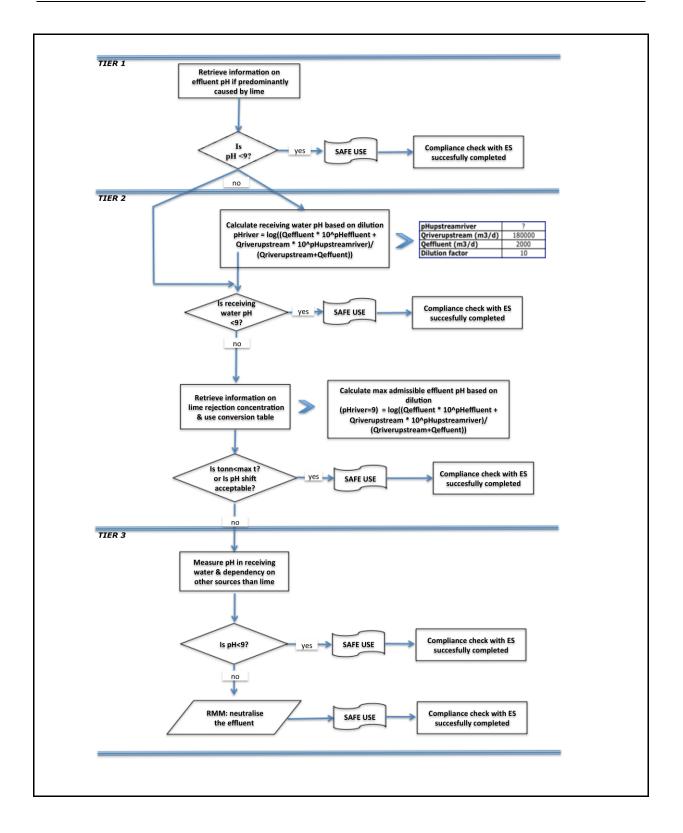
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ES number 9.5: Manufacture and industrial uses of massive objects containing lime substances

Exposure Scenario	Format (1) address	sing uses carried ou	It by workers		
1. Title					
Free short title	Manufacture a	and industrial uses of mas	sive objects containing lim	e substances	
Systematic title based on use descriptor	 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) 				
Processes, tasks and/or activities covered	Processes, t	asks and/or activities cove	ered are described in Sect	ion 2 below.	
Assessment Method	The assessment of	inhalation exposure is ba	sed on the exposure estim	nation tool MEASE.	
2. Operational con	ditions and risk mar	nagement measures			
PROC/ERC	REACH d	lefinition	Involve	d tasks	
PROC 6	Calendering	operations			
PROC 14	Production of prepar tabletting, compression,				
PROC 21	Low energy manipulation materials an		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 22	Potentially closed proc minerals/metals at e Industria	levated temperature			
PROC 23	Open processing and to minerals/metals at e				
PROC 24	High (mechanical) energ bound in materia				
PROC 25	Other hot work ope	rations with metals			
ERC 1-7, 12	Manufacture, formula industri				
ERC 10, 11	Wide-dispersive outdoor life articles a				
2.1 Control of work	kers exposure				
Product characteristic					
reflected by an assignme ambient temperature the temperature based, takin	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	Used in preparation?	Content in preparation	Physical form	Emission potential	
PROC 22, 23,25	not res	tricted	massive objects, molten	high	
PROC 24	not res	tricted	massive objects	high	
All other applicable PROCs	not res	tricted	massive objects	very low	

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Amounts used					
combination of the scale	dled per shift is not conside of operation (industrial vs. minant of the process intri	Professional) and level of			
Frequency and duratio	n of use/exposure				
PROC		Duration o	f exposure		
PROC 22		≤ 240 r	ninutes		
All other applicable PROCs		480 minutes (not restricted)		
Human factors not influ	uenced by risk managem	ent			
The shift breathing volum	ne during all process steps	reflected in the PROCs is	assumed to be 10 m ³ /shif	t (8 hours).	
Other given operationa	Il conditions affecting wo	orkers exposure			
assessment of the conductive exposure assessment in temperatures are expect	ke process temperature an ucted processes. In proces MEASE is however based red to vary within the indust ress temperatures are auto	s steps with considerably I on the ratio of process ter try the highest ratio was ta	high temperatures (i.e. PR mperature and melting poin ken as a worst case assur	OC 22, 23, 25), the nt. As the associated nption for the exposure	
Technical conditions a	nd measures at process	level (source) to prevent	release		
Risk management meas required in the processes	sures at the process level s.	(e.g. containment or segr	regation of the emission s	source) are generally not	
Technical conditions a	nd measures to control c	lispersion from source to	owards the worker		
	Level of separation Localised controls (LC) Efficiency of LC (according to MEASE) Further information				
PROC	Level of separation	Localised controls (LC)	Efficiency of LC (according to MEASE)	Further information	
PROC PROC 6, 14, 21	Any potentially required			Further information	
		(LC)	(according to MEASE)	Further information - -	
PROC 6, 14, 21 PROC 22, 23, 24, 25	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	(LC) not required	ra na 78 %	Further information	

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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 22	FFP1 mask	APF=4	Since calcium oxide is classified as irritating to	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	protective gloves is mandatory for all process steps.			
(compare with "duration or resistance and mass of the second seco	ve shall only be worn if the of exposure" above) should he RPE itself, due to the ir er's capability of using too	d reflect the additional phy acreased thermal stress by	siological stress for the wo enclosing the head. In ad	orker due to the breathing dition, it shall be		
the use of RPE), (ii) have	ove, the worker should the e suitable facial characteris devices above which rely perly and securely.	tics reducing leakages be	tween face and mask (in v	iew of scars and facial		
devices and the manage policy for a respiratory pr	mployed persons have leg ment of their correct use in otective device programm	the workplace. Therefore e including training of the	, they should define and d workers.	ocument a suitable		
	of different RPE (accordin	<u>, </u>	t be found in the glossary	OT MEASE.		
Amounts used	ronmental exposure	;				
	mount per site (for point	sources) is not consider	ed to be the main deterr	ninant for environmental		
Frequency and duration	Frequency and duration of use					
Intermittent (< 12 time pe	er year) or continuous use/	release				
Environment factors no	ot influenced by risk mar	agement				
Flow rate of receiving su	rface water: 18000 m³/day					
Other given operationa	I conditions affecting en	vironmental exposure				
Effluent discharge rate: 2	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 measur	res related to waste					
Solid industrial waste of	lime should be reused or d	lischarged to the industrial	wastewater and further ne	eutralized if needed.		

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3. Exposure estima	ation and reference	to its source				
Occupational exposure						
is the quotient of the refin demonstrate a safe use. dust) and the respective	ed exposure estimate and For inhalation exposure, the inhalation exposure estimation	the respective DNEL (den ne RCR is based on the DI ate derived using MEASE	tion exposure. The risk cha rived no-effect level) and h NEL for calcium oxide of 1 (as inhalable dust). Thus, t ne inhalable fraction accord	as to be below 1 to mg/m ³ (as respirable the RCR includes an		
PROC	Method used for inhalation exposure assessmentInhalation exposure estimate (RCR)Method used for dermal exposure assessmentDermal exposure estimate (RCR)					
PROC 6, 14, 21, 22, 23, 24, 25	MEASE	< 1 mg/m³ (0.01 – 0.44)	Since calcium oxide is o skin, dermal exposure ha as technically feasible. A has not been derived. T not assessed in this	as to be minimised as far DNEL for dermal effects hus, dermal exposure is		
Environmental emissio	ns					
discharges, being the tox being addressed, includir when applicable, both for local scale. The high wate water. Significant emission emissions or exposure to assessment for the aquation	icity of Ca2+ is expected t and municipal sewage treate production and industrial er solubility and very low v ons or exposure to air are the terrestrial environment tic environment will therefor rges at the local scale. Th	o be negligible compared ment plants (STPs) or indu use as any effects that mig apour pressure indicate th not expected due to the low at are not expected either for one only deal with the poss	s due to possible pH chang to the (potential) pH effect. Istrial waste water treatme ght occur would be expect at calcium oxide will be for w vapour pressure of calcii or this exposure scenario. ible pH changes in STP ef approached by assessing	Only the local scale is nt plants (WWTPs) ed to take place on a und predominantly in um oxide. Significant The exposure fluent and surface water		
Environmental emissions	calcium oxide concentrat neutralised, the discharge	ion and affect the pH in the e of effluent from calcium of of effluents is normally me	ult in an aquatic emission a e aquatic environment. Wh oxide production sites may asured very frequently and	hen the pH is not rimpact the pH in the		
Exposure concentration in waste water treatment plant (WWTP)	Waste water from calcium oxide production is an inorganic wastewater stream and therefore there is no biological treatment. Therefore, wastewater streams from calcium oxide 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.					
Exposure concentration in aquatic pelagic compartment	Exposure concentration in aquatic pelagicWhen calcium oxide 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					
Exposure concentration in sediments	The sediment compartment is not included in this ES, because it is not considered relevant for calcium oxide: when calcium oxide is emitted to the aquatic compartment, sorption of to sediment particles is negligible.					
Exposure concentrations in soil and groundwater	The terrestrial compartment is not included in this exposure scenario, because it is not considered to be relevant.					
Exposure concentration in atmospheric compartment	The air compartment is not included in this CSA because it is considered not relevant for calcium oxide: when emitted to air as an aerosol in water, calcium oxide is neutralised as a result of its reaction with CO2 (or other acids), into HCO3- and Ca2+. Subsequently, the salts (e.g. calcium(bi)carbonate) are washed out from the air and thus the atmospheric emissions of neutralised calcium oxide largely end up in soil and water.					
Exposure concentration relevant for the food chain (secondary poisoning)	Bioaccumulation in orgar poisoning is therefore no		lcium oxide: a risk assessr	nent for secondary		

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Regulation (EG) 1272/2008 and Regulation (EU) 453/2010

Version: 1.0/EN

spenner zement

Revision date: November / 2010

Printing Date: June 13, 2013

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) 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_{inhalation}: 1 mg/m³ (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/m³. 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 calcium oxide 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:

$$pHriver = Log \left[\frac{Qeffluent * 10^{pHeffluent} + Qriverupstream * 10^{pHupstream}}{Qriverupstream + Qeffluent} \right]$$
(Eq 1)

Where:

Q effluent refers to the effluent flow (in m³/day)

Q river upstream refers to the upstream river flow (in m³/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 m³/day
- Q effluent: use default value of 2000 m³/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- 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- expressed as moles/litre are multiplied by average flow of the effluent and then divided by the molar mass of the calcium oxide.

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.

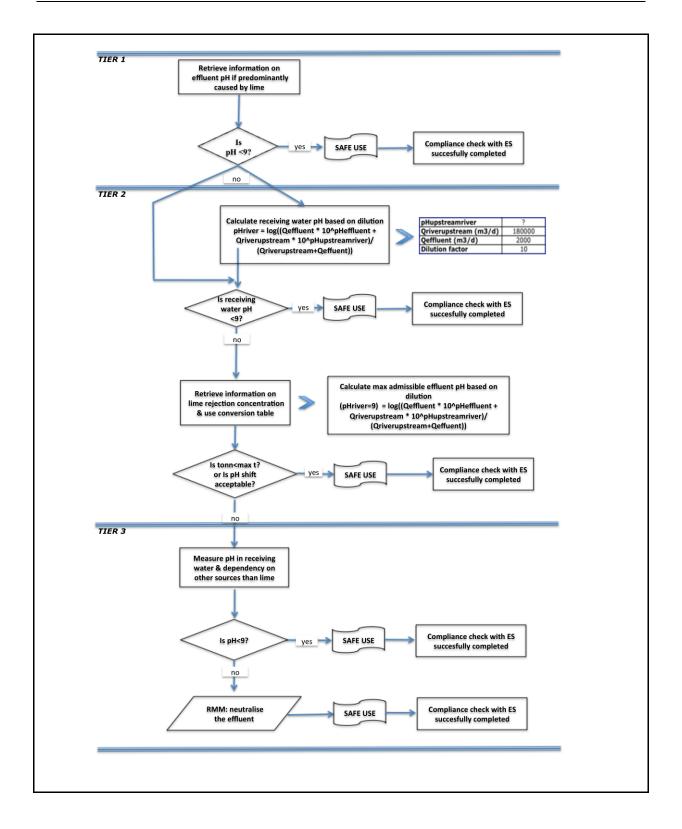
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Regulation (EG) 1272/2008 and Regulation (EU) 453/2010

Version: 1.0/EN

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Revision date: November / 2010



prepared in accordance with Annex II of the REACH Regulation EG 1907/2006, Regulation (EG) 1272/2008 and Regulation (EU) 453/2010

Version: 1.0/EN Revision date: November / 2010

Printing Date: June 13, 2013

ES number 9.6: Professional uses of aqueous solutions of lime

substances

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Exposure Scenario Format (1) addressing uses carried out by workers				
1. Title				
Free short title	Professional uses of aqueous solutions of lime substances			
Systematic title based on use descriptor	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)			
Processes, tasks and/or activities covered	Processes, tasks and/or activities covered are described in Section 2 below.			
Assessment Method	The assessment of inhalation exposure is based on the exposure estimation tool MEASE. The environmental assessment is based on FOCUS-Exposit.			

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2. Operational con	ditions and risk mar	nagement measures				
PROC/ERC	REACH o	lefinition	Involve	ed tasks		
PROC 2	Use in closed, conti occasional cont					
PROC 3	Use in closed batch p formu					
PROC 4	Use in batch and other p opportunity for e					
PROC 5	Mixing or blending in formulation of prepa (multistage and/or					
PROC 8a	Transfer of substa (charging/discharging) containers at non-	from/to vessels/large				
PROC 8b	Transfer of substance o discharging) from/to ves dedicated					
PROC 9	Transfer of substance or preparation into sm containers (dedicated filling line, including weighing)		Guidance on informa chemical safety assessr	provided in the ECHA tion requirements and nent, Chapter R.12: Use		
PROC 10	Roller applicati	on or brushing	descriptor system (ECHA-2010-G-05-E			
PROC 11	Non industr	ial spraying				
PROC 12	Use of blowing agents	in manufacture of foam				
PROC 13	Treatment of articles b	by dipping and pouring	7			
PROC 15	Use as labora	atory reagent				
PROC 16	Using material as fuel so to unburned produ					
PROC 17	Lubrication at high energ open p					
PROC 18	Greasing at high	energy conditions	_			
PROC 19	Hand-mixing with intima avail					
ERC2, ERC8a, ERC8b, ERC8c, ERC8d, ERC8e, ERC8f	Wide dispersive indo reactive substances or syst	processing aids in open	wide dispersive uses: a and shrimps farming	d in numerous cases of gricultural, forestry, fish g, soil treatment and al protection.		
2.1 Control of work	kers 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		
All applicable PROCs	not res	• •	aqueous solution	very low		

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compressed air.

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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	n of use/exposure					
PROC		Duration o	f exposure			
PROC 11		≤ 240 r	minutes			
All other applicable PROCs		480 minutes ((not restricted)			
Human factors not influ	lenced by risk managem	ent				
The shift breathing volun	ne during all process steps	reflected in the PROCs is	assumed to be 10 m ³ /shift	t (8 hours).		
Other given operationa	I conditions affecting wo	rkers exposure				
			erational conditions (e.g. p essment of the conducted			
Technical conditions a	nd measures at process	level (source) to prevent	release			
Risk management meas required in the processes		(e.g. containment or seg	regation of the emission s	ource) are generally not		
Technical conditions a	nd measures to control d	ispersion from source to	owards the worker			
PROC	Level of separation	Localised controls (LC)	Efficiency of LC (according to MEASE)	Further information		
PROC 19	Separation of workers					
All other applicable PROCs source is generally not required in the conducted processes. 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						

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PROC	res related to personal pr 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		Eye protection equipment (e.g. goggles or visors) must
PROC 17	FFP1 mask	APF=4	Since calcium oxide is classified as irritating to skin, the use of protective gloves is mandatory for all process steps.	be worn, unless potential contact with the eye can be excluded by the nature
All other applicable PROCs	not required	na		and type of application (i.e. closed process). Additionally, face protection, protective clothing and safety shoes are required to be worn as appropriate.

(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.

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2.2 Control of environme	ntal exposure – only relevant for agricultural soil protection
Product characteristics	
Drift: 1% (very worst-case estimation	te based on data from dust measurements in air as a function of the distance from application)
	Quantity of dust per m3 (in mg) Wind speed: - 3.5 m/s - 6 m/s - 3.5 m/s - 3.5 m/s Distance from the spreader(in m)
Amounts used	(Figure taken from: Laudet, A. et al., 1999)
CaO	1,700 kg/ha
Frequency and duration of use	
	year); Multiple applications during the year are allowed, provided the total yearly amount of
Environment factors not influe	
Volume of surface water: 300 L/n	1 ²
Field surface area: 1 ha	
	ions affecting environmental exposure
Outdoor use of products Soil mixing depth: 20 cm	
	sures at process level (source) to prevent release
There are no direct releases to a	
Technical conditions and meas	sures to reduce or limit discharges, air emissions and releases to soil
Drift should be minimised.	
Organizational measures to pro	event/limit release from site
	ood agricultural practice, agricultural soil should be analysed prior to application of lime and usted according to the results of the analysis.
2.2 Control of environme	ntal exposure – only relevant for urban soil treatment
Product characteristics	
Drift: 18/ (von vvorat acco actima	te based on data from dust measurements in air as a function of the distance from application)

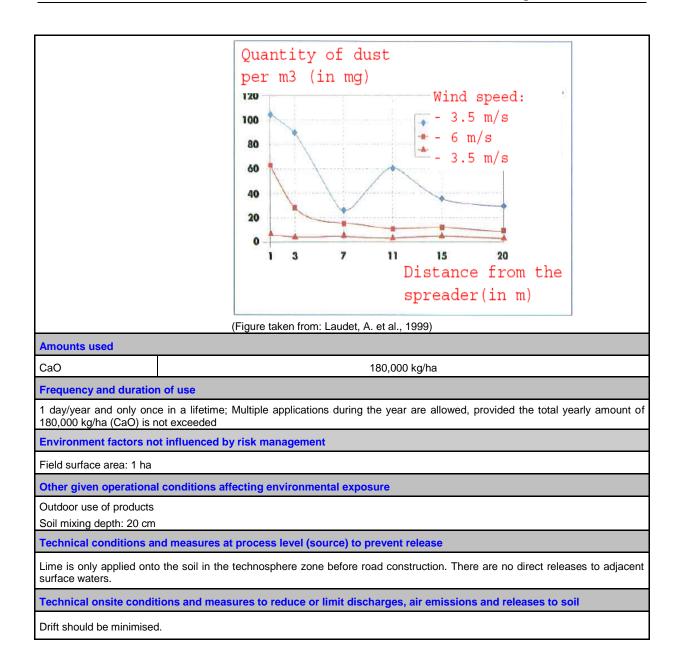
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Regulation (EG) 1272/2008 and Regulation (EU) 453/2010

Version: 1.0/EN

Revision date: November / 2010

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3 Exposure estim	ation and reference	to its source		
Occupational exposure				
The exposure estimation is the quotient of the refir demonstrate a safe use. dust) and the respective	tool MEASE was used for ned exposure estimate and For inhalation exposure, th inhalation exposure estima	I the respective DNEL (den the RCR is based on the D the derived using MEASE	tion exposure. The risk cha rived no-effect level) and h NEL for calcium oxide of 1 (as inhalable dust). Thus, t ne inhalable fraction accord	as to be below 1 to mg/m ³ (as respirable the RCR includes an
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/m³ (<0.001 – 0.6)	skin, dermal exposure ha	
Environmental exposur	e for agricultural soil pro	otection		
surface water and sedim more appropriate for agri modelling. FOCUS is a m German EXPOSIT 1.0 m	ent (Kloskowksi et al., 199 cultural-like application as nodel typically developed f	 The FOCUS/EXPOSIT in this case where parameter or biocidal applications and uch as drifts can be improvided. 	plant protection products for modelling tool is preferred eter as the drift needs to be d was further elaborated o ved according to collected rift.	I to the EUSES as it is e included in the n the basis of the
emissions	See amounts used			
Exposure concentration in waste water treatment plant (WWTP)	Not relevant for agricultur	ral soil protection		
Exposure	Substance	PEC (ug/L)	PNEC (ug/L)	RCR
concentration in aquatic pelagic compartment	CaO	5.66	370	0.015
Exposure concentration in sediments	natural waters the hydrox by reacting with Ca2+. Th	ide ions react with HCO3-	nor sediment to lime is exp - to form water and CO32- ipitates and deposits on th atural soils.	. CO32- forms CaCO3
Exposure	Substance	PEC (mg/L)	PNEC (mg/L)	RCR
concentrations in soil and groundwater	CaO	500	816	0.61
Exposure concentration in atmospheric compartment	This point is not relevant. Calcium oxide is not volatile. The vapour pressures is below 10 ⁻⁵ Pa.			
Exposure concentration relevant for the food chain (secondary poisoning)		uses covered do not signifi	an be considered to be orr icantly influence the distrib	

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Version: 1.0/EN

Revision date: November / 2010

Printing Date: June 13, 2013

Environmental exposure for urban soil treatment

The urban soil treatment 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 (Kloskowksi 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.

		0		
Environmental emissions	See amounts used			
Exposure concentration in waste water treatment plant (WWTP)	Not relevant for road border scenario			
Exposure concentration in aquatic pelagic compartment	Not relevant for road border scenario			
Exposure concentration in sediments	Not relevant for road border scenario			
Exposure	Substance	PEC (mg/L)	PNEC (mg/L)	RCR
concentrations in soil and groundwater	CaO	529	816	0.65
Exposure concentration in atmospheric compartment	This point is not relevant.	Calcium oxide is not volat	ile. The vapour pressures i	is below 10 ⁻⁵ 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 ²⁺ and OH ⁻) in the environment.			
Environmental exposure for other uses				
The operation	antitative environmental ex al conditions and risk man rban soil treatment	•		tlined for agricultural soil

 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 CO2-free breathable air, upon reaction with CO2. 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.

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Regulation (EG) 1272/2008 and Regulation (EU) 453/2010

Version: 1.0/EN

Revision date: November / 2010

Printing Date: June 13, 2013

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) 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 site as "high dusty".

DNEL_{inhalation}: 1 mg/m³ (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/m³. 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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Version: 1.0/EN Revision date: November / 2010

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Printing Date: June 13, 2013

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

lime substances

Exposure Scenario	Format (1) addressing uses carried ou	It by workers		
1. Title				
Free short title	Professional uses of low dusty so	blids/powders of lime substances		
Systematic title based on use descriptor	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)			
Processes, tasks and/or activities covered	Processes, tasks and/or activities cove			
Assessment Method		d on the exposure estimation tool MEASE. The sased on FOCUS-Exposit.		
2. Operational con	ditions and risk management measures	5		
PROC/ERC	REACH definition	Involved tasks		
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 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)	Further information is provided in the ECHA Guidance on information requirements and chemical safety assessment, Chapter R.12: Use		
PROC 10	Roller application or brushing	descriptor system (ECHA-2010-G-05-EN).		
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			

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PROC 25	Other hot work operations with metals				
PROC 26		Handling of solid inorganic substances at ambient temperature			
ERC2, ERC8a, ERC8b, ERC8c, ERC8d, ERC8e, ERC8f	Wide dispersive indo reactive substances or syst				
2.1 Control of work	kers exposure				
Product characteristic					
reflected by an assignme ambient temperature the temperature based, takin	approach, the substance- ent of a so-called fugacity of fugacity is based on the d g into account the process on the level of abrasion ir	lass in the MEASE tool. For ustiness of that substance temperature and the melt	or operations conducted w Whereas in hot metal op ing point of the substance	rith solid substances at erations, fugacity is	
PROC	Use in preparation	Content in preparation	Physical form	Emission potential	
PROC 25	not res	stricted	solid/powder, molten	high	
All other applicable PROCs	not res	stricted	solid/powder	low	
Amounts used					
combination of the scale	lled per shift is not conside of operation (industrial vs. minant of the process intrir	professional) and level of		-	
Frequency and duration	n of use/exposure				
PROC		Duration o	f exposure		
PROC 17		≤ 240 r	ninutes		
All other applicable PROCs		480 minutes (not restricted)		
Human factors not influ	lenced by risk managem	ent			
The shift breathing volum	ne during all process steps	reflected in the PROCs is	assumed to be 10 m ³ /shif	t (8 hours).	
Other given operationa	I conditions affecting wo	rkers exposure			
assessment of the condu exposure assessment in temperatures are expected	te process temperature an icted processes. In proces MEASE is however based ed to vary within the indust ess temperatures are auto	s steps with considerably h on the ratio of process ter ry the highest ratio was ta	high temperatures (i.e. PR nperature and melting poi ken as a worst case assur	OC 22, 23, 25), the nt. As the associated nption for the exposure	
Technical conditions a	nd measures at process	level (source) to prevent	release		
Risk management measurequired in the processes	ures at the process level (e	e.g. containment or segreg	ation of the emission sour	ce) are generally not	

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PROC	Level of separation	Localised controls	Efficiency of LC	Further information		
PROC 19	Any potentially required separation of workers from the emission source is indicated above under "Frequency and	(LC)	(according to MEASE)	-		
All other applicable PROCs	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 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 measur	res related to personal p	otection, hygiene and h	ealth 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		Eye protection		
PROC 16, 17, 18, 25	FFP2 mask	APF=10		equipment (e.g.		
	not required	na	Since calcium oxide is classified as irritating to skin, the use of protective gloves is mandatory for all	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).		
All other applicable PROCs			process steps.	Additionally, face protection, protective clothing and safety shoes are required to be worn as appropriate		

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.

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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) Quantity of dust per m3 (in mg) 120 Wind speed: 3.5 m/s 100 - 6 m/s 80 3.5 m/s 60 40 20 0 11 15 7 20 ٦ 3 Distance from the spreader(in m) (Figure taken from: Laudet, A. et al., 1999) Amounts used CaO 1,700 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 1,700 kg/ha is not exceeded (CaO) Environment factors not influenced by risk management Volume of surface water: 300 L/m² 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.

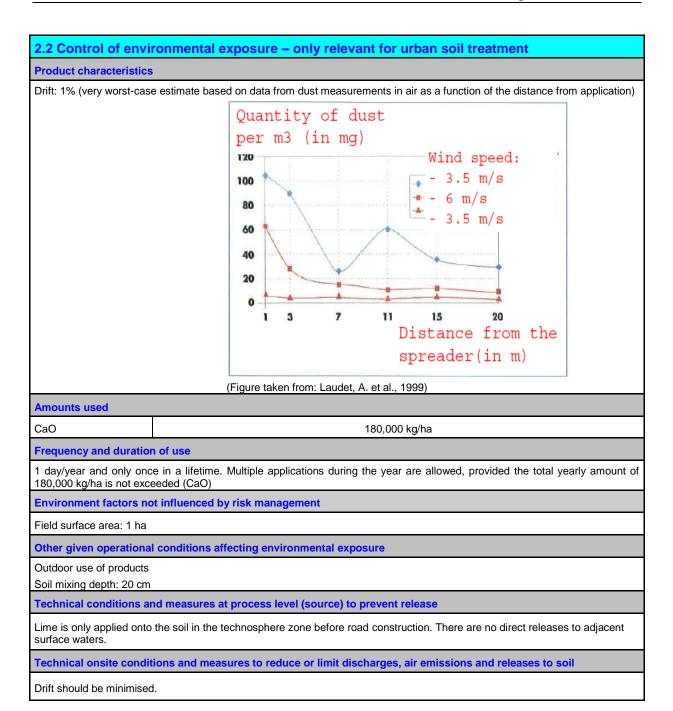
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Regulation (EG) 1272/2008 and Regulation (EU) 453/2010

Version: 1.0/EN

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Revision date: November / 2010



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3. Exposure estima	ation and reference	to its source				
Occupational exposure						
is the quotient of the refin demonstrate a safe use. dust) and the respective	ned exposure estimate and For inhalation exposure, th inhalation exposure estima	the respective DNEL (den the RCR is based on the D the derived using MEASE	tion exposure. The risk cha rived no-effect level) and h NEL for calcium oxide of 1 (as inhalable dust). Thus, the inhalable fraction accord	as to be below 1 to mg/m ³ (as respirable the RCR includes an		
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/m³ (0.01 – 0.75)	Since calcium oxide 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 exposur	e for agricultural soil pro	otection				
surface water and sedime more appropriate for agri modelling. FOCUS is a m German EXPOSIT 1.0 m	ent (Kloskowksi et al., 199 cultural-like application as nodel typically developed f odel, where parameters su in indeed migrate then tow	 The FOCUS/EXPOSIT in this case where parameter or biocidal applications and 	plant protection products for modelling tool is preferred eter as the drift needs to be d was further elaborated o ved according to collected rift.	to the EUSES as it is e included in the n the basis of the		
emissions	See amounts used					
Exposure concentration in waste water treatment plant (WWTP)	Not relevant for agricultural soil protection					
Exposure	Substance	PEC (ug/L)	PNEC (ug/L)	RCR		
concentration in aquatic pelagic compartment	CaO	5.66	370	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 HCO3- to form water and CO32 CO32- forms CaCO3 by reacting with Ca2+. 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		
	CaO	500	816	0.61		
Exposure concentration in atmospheric compartment	This point is not relevant. Calcium oxide is not volatile. The vapour pressures is below 10 ⁻⁵ 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 ²⁺ and OH ⁻) in the environment.					

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Regulation (EG) 1272/2008 and Regulation (EU) 453/2010

Version: 1.0/EN

Revision date: November / 2010

Printing Date: June 13, 2013

Environmental exposure for urban soil treatment

The urban soil treatment 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 (Kloskowksi 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.

Environmental emissions	See amounts used				
Exposure concentration in waste water treatment plant (WWTP)	Not relevant for road border scenario				
Exposure concentration in aquatic pelagic compartment	Not relevant for road border scenario				
Exposure concentration in sediments	Not relevant for road border scenario				
Exposure	Substance	PEC (mg/L)	PNEC (mg/L)	RCR	
concentrations in soil and groundwater	CaO	529	816	0.65	
Exposure concentration in atmospheric compartment	This point is not relevant.	Calcium oxide is not volat	ile. The vapour pressures	is below 10 ⁻⁵ 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 ²⁺ and OH) in the environment.				
Environmental exposu	re for other uses				
The operation		posure assessment is carr agement measures are les		tlined for agricultural soil	

protection or urban soil treatment

• 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 CO2-free breathable air, upon reaction with CO2. 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.

spenner zement prepared in accordance with Annex II of the REACH Regulation EG 1907/2006,

Regulation (EG) 1272/2008 and Regulation (EU) 453/2010

Version: 1.0/EN

Revision date: November / 2010

Printing Date: June 13, 2013

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) 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 site as than 10 % (RDM) are defined as "medium dusty".

DNEL_{inhalation}: 1 mg/m³ (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/m³. 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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Version: 1.0/EN Revision date: November / 2010

spenner zement

Printing Date: June 13, 2013

ES number 9.8: Professional uses of medium dusty solids/powders

of lime substances

Exposure Scenario	Format (1) addressing uses carried ou	It by workers			
1. Title					
Free short title	Professional uses of medium dusty solids/powders of lime substances				
Systematic title based on use descriptor	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)				
Processes, tasks and/or activities covered	Processes, tasks and/or activities cove				
Assessment Method		d on the exposure estimation tool MEASE. The sased on FOCUS-Exposit.			
2. Operational con	ditions and risk management measures	3			
PROC/ERC	REACH definition	Involved tasks			
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 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)	Further information is provided in the ECHA Guidance on information requirements and chemical safety assessment, Chapter R.12: Use			
PROC 10	Roller application or brushing	descriptor system (ECHA-2010-G-05-EN).			
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 25	Other hot work operations with metals				

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PROC 26	Handling of solid inorganic substances at ambient temperature				
ERC2, ERC8a, ERC8b, ERC8c, ERC8d, ERC8e, ERC8f	Wide dispersive indo reactive substances or syst	processing aids in open			
2.1 Control of work	ers exposure				
Product characteristic					
reflected by an assignme ambient temperature the temperature based, takin	nt of a so-called fugacity of fugacity is based on the d	lass in the MEASE tool. F ustiness of that substance temperature and the meli	I is one of the main expose or operations conducted w . Whereas in hot metal ope ting point of the substance trinsic emission potential.	ith solid substances at erations, fugacity is	
PROC	Use in preparation	Content in preparation	Physical form	Emission potential	
PROC 25	not res	stricted	solid/powder, molten	high	
All other applicable PROCs	not res	stricted	solid/powder	medium	
Amounts used					
combination of the scale		professional) and level of	ure as such for this scenar containment/automation (a		
Frequency and duration	n of use/exposure				
PROC		Duration o	f exposure		
PROC 11, 16, 17, 18, 19		≤ 240 r	ninutes		
All other applicable PROCs		480 minutes (not restricted)		
Human factors not influ	enced by risk managem	ent			
The shift breathing volum	e during all process steps	reflected in the PROCs is	assumed to be 10 m3/shift	t (8 hours).	
Other given operationa	I conditions affecting wo	rkers exposure			
assessment of the conduction exposure assessment in temperatures are expected.	cted processes. In process MEASE is however based ad to vary within the indust	s steps with considerably l on the ratio of process ter ry the highest ratio was ta	t considered relevant for o nigh temperatures (i.e. PR mperature and melting poin ken as a worst case assum xposure scenario for PROC	OC 22, 23, 25), the nt. As the associated nption for the exposure	
Technical conditions a	nd measures at process	level (source) to prevent	release		
Risk management meas required in the processes		(e.g. containment or seg	regation of the emission s	ource) are generally no	
Technical conditions a	nd measures to control d	lispersion from source to	owards the worker		
PROC	Level of separation	Localised controls (LC)	Efficiency of LC (according to MEASE)	Further information	
PROC 11, 16	Any potentially required separation of workers	generic local exhaust ventilation	72 %	-	
PROC 17, 18	from the emission	integrated local exhaust ventilation	87 %	-	
PROC 19	source is indicated above under	not applicable	na	_	
All other applicable	"Frequency and duration of exposure".	not required	na	<u> </u>	
PROCs	A reduction of exposure	•			

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Revision date: November / 2010

Printing Date: June 13, 2013

compressed air.	res related to personal pr		lothing at home. Do not block	ow dust off with Further personal
Avoid inhalation or inges These measures involve eating and smoking at th	tion. General occupational good personal and house workplace, the wearing c	hygiene measures are re keeping practices (i.e. reg of standard working clothe	quired to ensure a safe ha ular cleaning with suitable s and shoes unless otherw	cleaning devices), no <i>v</i> ise stated below.
Organisational moreur	worker from workplaces involved with relevant exposure.	cas, dispersion and over		
	ventilated (positive pressure) control rooms or by removing the			
	achieved, for example, by the installation of			

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.

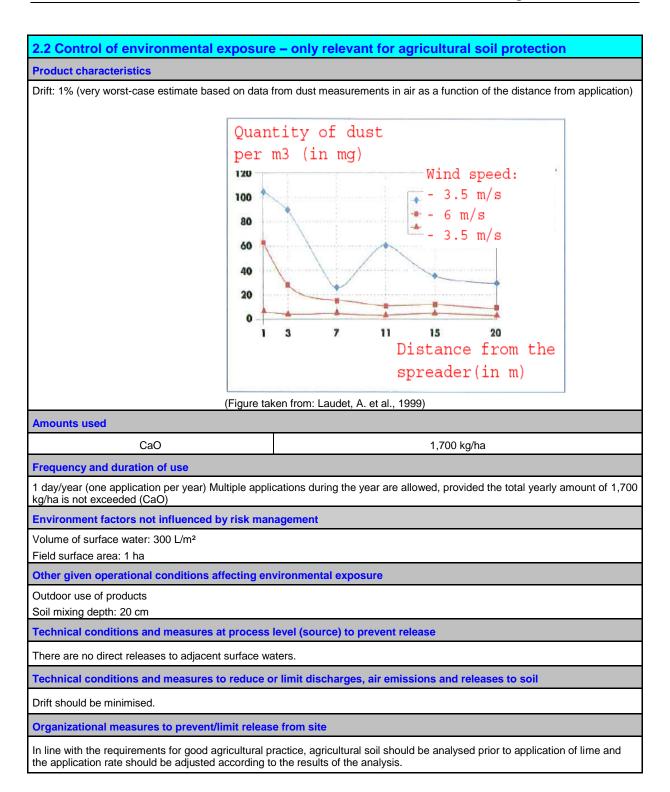
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Version: 1.0/EN

spenner zement

Revision date: November / 2010



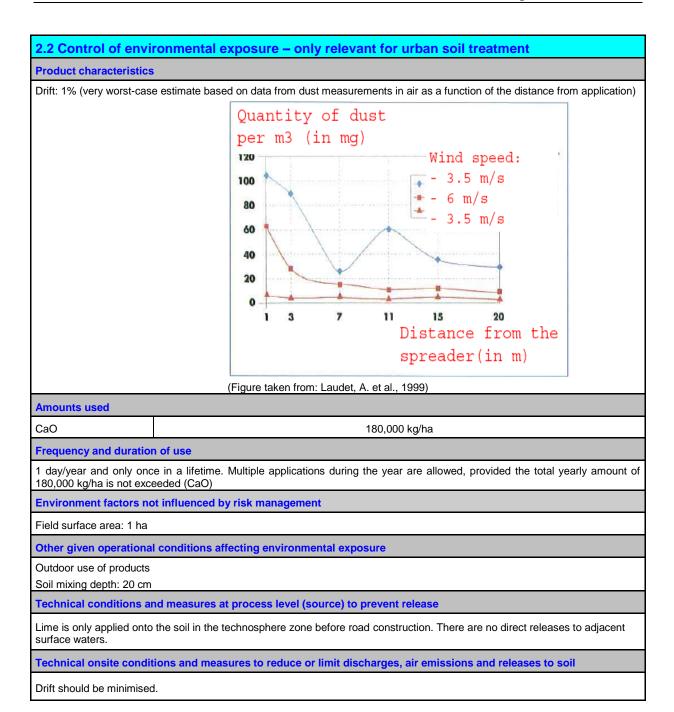
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Version: 1.0/EN

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Revision date: November / 2010



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3 Exposure estima	ation and reference	to its source				
Occupational exposure						
The exposure estimation is the quotient of the refir demonstrate a safe use. dust) and the respective	tool MEASE was used for ned exposure estimate and For inhalation exposure, th inhalation exposure estima	I the respective DNEL (den the RCR is based on the D the derived using MEASE	tion exposure. The risk cha rived no-effect level) and h NEL for calcium oxide of 1 (as inhalable dust). Thus, t ne inhalable fraction accord	as to be below 1 to mg/m ³ (as respirable the RCR includes an		
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, 25, 26	MEASE	< 1 mg/m³ (0.25 – 0.825)	skin, dermal exposure ha	DNEL for dermal effects hus, dermal exposure is		
Environmental exposur	e for agricultural soil pro	otection				
surface water and sedim more appropriate for agri modelling. FOCUS is a r German EXPOSIT 1.0 m the soil, calcium oxide ca	ent (Kloskowksi et al., 199 cultural-like application as nodel typically developed for	9). The FOCUS/EXPOSIT in this case where parameter or biocidal applications and uch as drifts can be improvided.	plant protection products for modelling tool is preferred eter as the drift needs to be d was further elaborated o ved according to collected rift.	to the EUSES as it is e included in the n the basis of the		
Environmental emissions	See amounts used					
Exposure concentration in waste water treatment plant (WWTP)	Not relevant for agricultur	al soil protection				
Exposure	Substance	PEC (ug/L)	PNEC (ug/L)	RCR		
concentration in aquatic pelagic compartment	CaO	5.66	370	0.015		
Exposure concentration in sediments	natural waters the hydrox reacting with Ca2+. The	ide ions react with HCO3-	nor sediment to lime is exp to form water and CO32- ates and deposits on the s atural soils.	CO32- forms CaCO3 by		
Exposure	Substance	PEC (mg/L)	PNEC (mg/L)	RCR		
concentrations in soil and groundwater	CaO	500	816	0.61		
Exposure concentration in atmospheric compartment	This point is not relevant. Calcium oxide is not volatile. The vapour pressures is below 10 ⁻⁵ Pa.					
Exposure concentration relevant for the food chain (secondary poisoning)		overed do not significantly	considered to be omniprese influence the distribution of			

spenner zement prepared in accordance with Annex II of the REACH Regulation EG 1907/2006,

Regulation (EG) 1272/2008 and Regulation (EU) 453/2010

Version: 1.0/EN

Revision date: November / 2010

Printing Date: June 13, 2013

Environmental exposure for urban soil treatment

The urban soil treatment 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 (Kloskowksi 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.

Environmental emissions	See amounts used				
Exposure concentration in waste water treatment plant (WWTP)	Not relevant for road border scenario				
Exposure concentration in aquatic pelagic compartment	Not relevant for road border scenario				
Exposure concentration in sediments	Not relevant for road border scenario				
Exposure	Substance	PEC (mg/L)	PNEC (mg/L)	RCR	
concentrations in soil and groundwater	CaO	529	816	0.65	
Exposure concentration in atmospheric compartment	This point is not relevant.	Calcium oxide is not volat	ile. The vapour pressures i	is below 10 ⁻⁵ 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 ²⁺ and OH) in the environment.				
Environmental exposu	re for other uses				
The operations protection or u	rban soil treatment	•	ss stringent than those out	-	

 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 CO2-free breathable air, upon reaction with CO2. 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.

spenner zement prepared in accordance with Annex II of the REACH Regulation EG 1907/2006,

Regulation (EG) 1272/2008 and Regulation (EU) 453/2010

Version: 1.0/EN

Revision date: November / 2010

Printing Date: June 13, 2013

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) 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 site as "high dusty".

DNEL_{inhalation}: 1 mg/m³ (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/m³. 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 %).

prepared in accordance with Annex II of the REACH Regulation EG 1907/2006, Regulation (EG) 1272/2008 and Regulation (EU) 453/2010

Version: 1.0/EN Revision date: November / 2010

spenner zement

Printing Date: June 13, 2013

ES number 9.9: Professional uses of high dusty solids/powders of

lime substances

Exposure Scenario Format (1) addressing uses carried out by workers			
1. Title			
Free short title	Professional uses of high dusty solids/powders of lime substances		
Systematic title based on use descriptor	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)		
Processes, tasks and/or activities covered	Processes, tasks and/or activities covered are described in Section 2 below.		
Assessment Method	The assessment of inhalation exposure is based on the exposure estimation tool MEASE. The environmental assessment is based on FOCUS-Exposit.		

prepared in accordance with Annex II of the REACH Regulation EG 1907/2006,

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2. Operational con	ditions and risk mar	nagement measures	6		
PROC/ERC	REACH o	lefinition	Involve	d tasks	
PROC 2	Use in closed, conti occasional cont		4		
PROC 3	Use in closed batch p formu		hesis) where ses esses for articles		
PROC 4	Use in batch and other p opportunity for e				
PROC 5	Mixing or blending in formulation of prepa (multistage and/or	arations and articles			
PROC 8a	Transfer of substa (charging/discharging) containers at non-	from/to vessels/large			
PROC 8b	Transfer of substance o discharging) from/to ves dedicated	sels/large containers at			
PROC 9	Transfer of substance of containers (dedicated weig	filling line, including	Further information is	provided in the ECHA	
PROC 10	Roller applicati	on or brushing	Further information is provided in the ECHA Guidance on information requirements and		
PROC 11	Non industr	Non industrial spraying chemical safety assessment, Chapter descriptor system (ECHA-2010-G-			
PROC 13	Treatment of articles b	y dipping and pouring			
PROC 15	Use as labora	atory reagent			
PROC 16	Using material as fuel so to unburned produ				
PROC 17	Lubrication at high energ open p				
PROC 18	Greasing at high	energy conditions			
PROC 19	Hand-mixing with intima avail				
PROC 25	Other hot work ope	rations with metals			
PROC 26	Handling of solid inorgan tempe		ıt		
ERC2, ERC8a, ERC8b, ERC8c, ERC8d, ERC8e, ERC8f	Wide dispersive indo reactive substances or syst	processing aids in open			
2.1 Control of work	kers exposure				
Product characteristic					
reflected by an assignme ambient temperature the temperature based, takin	approach, the substance- ent of a so-called fugacity c fugacity is based on the d g into account the process on the level of abrasion in	lass in the MEASE tool. For ustiness of that substance temperature and the melt	or operations conducted w . Whereas in hot metal ope ing point of the substance	ith solid substances at erations, fugacity is	
PROC	Use in preparation	Content in preparation	Physical form	Emission potential	
All applicable PROCs	not res	tricted	solid/powder	high	

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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	n of use/exposure			
PROC		Duration o	f exposure	
PROC 4, 5, 8a, 8b, 9, 10, 16, 17, 18, 19, 26		≤ 240 r	ninutes	
PROC 11		≤ 60 m	ninutes	
All other applicable PROCs		480 minutes (not restricted)	
Human factors not influ	enced by risk managem	ent		
The shift breathing volum	ne during all process steps	reflected in the PROCs is	assumed to be 10 m ³ /shif	t (8 hours).
Other given operationa	I conditions affecting wo	rkers exposure		
assessment of the conduction exposure assessment in temperatures are expected	te process temperature an inted processes. In process MEASE is however based ed to vary within the indust ess temperatures are autor	s steps with considerably h on the ratio of process ter ry the highest ratio was ta	high temperatures (i.e. PR mperature and melting poin ken as a worst case assur	OC 22, 23, 25), the nt. As the associated nption for the exposure
Technical conditions ar	nd measures at process	level (source) to prevent	release	
Risk management measu required in the processes	ures at the process level (e s.	.g. containment or segreg	ation of the emission sour	ce) are generally not
Technical conditions and	nd measures to control d	ispersion from source to	owards the worker	
PROC	Level of separation	Localised controls (LC)	Efficiency of LC (according to MEASE)	Further information
PROC 4, 5, 8a, 8b, 9, 11, 16, 26	Any potentially required separation of workers	generic local exhaust ventilation	72 %	-
PROC 17, 18	from the emission source is indicated above under	integrated local exhaust ventilation	87 %	-
PROC 19	"Frequency and duration of exposure". A reduction of exposure duration can be	not applicable	na	only in well ventilated rooms or outdoors (efficiency 50 %)-
All other applicable PROCs	achieved, for example, by the installation of ventilated (positive pressure) control rooms or by removing the worker from workplaces involved with relevant exposure.	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 measur	es related to personal pr	otection, hygiene and he	ealth evaluation	
PROC	Specification of respiratory protective equipment (RPE)	RPE efficiency (assigned protection factor, APF)	Specification of gloves	Further personal protective equipment (PPE)
PROC 9, 26	FFP1 mask	APF=4	Since calcium oxide is	Eye protection

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PROC 11, 17, 18, 19	FFP3 mask	APF=20	classified as irritating to skin, the use of	equipment (e.g. goggles or visors) must
PROC 25	FFP2 mask	APF=10	protective gloves is mandatory for all	be worn, unless potential contact with
All other applicable PROCs	FFP2 mask	APF=10	process steps.	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.
(compare with "duration or resistance and mass of the	ve shall only be worn if the of exposure" above) should he RPE itself, due to the in er's capability of using tool	d reflect the additional phy creased thermal stress by	siological stress for the wo	orker due to the breathing dition, it shall be
the use of RPE), (ii) have	ove, the worker should the e suitable facial characteris devices above which rely erly and securely.	tics reducing leakages be	tween face and mask (in v	iew of scars and facial
devices and the manager policy for a respiratory pr	mployed persons have leg- ment of their correct use in otective device programm	the workplace. Therefore e including training of the	, they should define and d workers.	ocument a suitable
	of different RPE (accordin			
Product characteristics	ronmental exposure	= only relevant for	agricultural soli pro	Diection
Drift: 1% (verv worst-case	e estimate based on data t	from dust measurements i	n air as a function of the di	istance from application)
		tity of dust m3 (in mg)	Wind speed:	
	60 40 20 0 1		- 3.5 m/s	
	40		15 20	
	40 20 0		15 20 Distance from spreader(in m	
Amounts used	40 20 0		15 20 Distance from spreader(in m	
Amounts used CaO	40 20 0	ken from: Laudet, A. et al.,	15 20 Distance from spreader(in m	
	40 20 0 1 (Figure tak	ken from: Laudet, A. et al.,	15 20 Distance from spreader(in m 1999)	

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Environment factors not influenced by risk management

Volume of surface water: 300 L/m2

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.

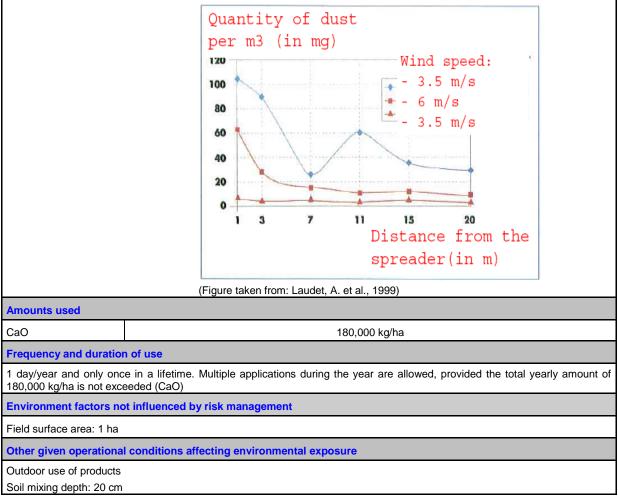
Organizational measures to prevent/limit release from site

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 urban soil treatment

Product characteristics

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



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Technical conditions an	nd measures at process	level (source) to prevent	release		
Lime is only applied onto surface waters.	the soil in the technosphe	re zone before road const	ruction. There are no direc	t releases to adjacent	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil					
Drift should be minimised	ł.				
3. Exposure estima	ation and reference	to its source			
Occupational exposure	E Constantino de la c				
is the quotient of the refir demonstrate a safe use. dust) and the respective	ned exposure estimate and For inhalation exposure, th inhalation exposure estima	I the respective DNEL (de the RCR is based on the D ate derived using MEASE	tion exposure. The risk cha rived no-effect level) and h NEL for calcium oxide of 1 (as inhalable dust). Thus, t ne inhalable fraction accord	as to be below 1 to mg/m ³ (as respirable he RCR includes an	
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, 25, 26	MEASE	<1 mg/m³ (0.5 – 0.825)	Since calcium oxide is o skin, dermal exposure ha as technically feasible. A has not been derived. Th not assessed in this	as to be minimised as far DNEL for dermal effects hus, dermal exposure is	
Environmental exposur	e for agricultural soil pro	otection			
surface water and sedime more appropriate for agri modelling. FOCUS is a m German EXPOSIT 1.0 m	ent (Kloskowksi et al., 199 cultural-like application as nodel typically developed fr odel, where parameters su in indeed migrate then tow	 The FOCUS/EXPOSIT in this case where parameter or biocidal applications and uch as drifts can be improved. 	plant protection products fo modelling tool is preferred eter as the drift needs to be d was further elaborated or yed according to collected or rift.	I to the EUSES as it is e included in the n the basis of the	
emissions	See amounts used				
Exposure concentration in waste water treatment plant (WWTP)	Not relevant for agricultu	ral soil protection			
Exposure	Substance	PEC (ug/L)	PNEC (ug/L)	RCR	
concentration in aquatic pelagic compartment	CaO	5.66	370	0.015	
Exposure concentration in sediments	Exposure concentration in As described above, no exposure of surface water nor sediment to lime is expected. Further, in natural waters the hydroxide ions react with HCO3- to form water and CO32 CO32- forms CaCO3 by reacting with Ca2+. The calcium carbonate precipitates and deposits on the sediment. Calcium				
Exposure	Substance	PEC (mg/L)	PNEC (mg/L)	RCR	
concentrations in soil and groundwater	CaO	500	816	0.61	
Exposure concentration in atmospheric compartment	This point is not relevant.	Calcium oxide is not vola	tile. The vapour pressures	is below 10 ⁻⁵ Pa.	
Exposure concentration relevant for the food chain (secondary poisoning)		overed do not significantly	considered to be omniprese influence the distribution o		

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Revision date: November / 2010

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Environmental exposure for urban soil treatment

The urban soil treatment 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 (Kloskowksi 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.

miere parametere caen e	ae anne can be improved e	te cenected data			
Environmental emissions	See amounts used				
Exposure concentration in waste water treatment plant (WWTP)	Not relevant for road border scenario				
Exposure concentration in aquatic pelagic compartment	Not relevant for road border scenario				
Exposure concentration in sediments	Not relevant for road border scenario				
Exposure	Substance	PEC (mg/L)	PNEC (mg/L)	RCR	
concentrations in soil and groundwater	CaO	529	816	0.65	
Exposure concentration in atmospheric compartment	This point is not relevant.	Calcium oxide is not volat	ile. The vapour pressures	is below 10 ⁻⁵ 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 ²⁺ and OH) in the environment.				
Environmental exposu	re for other uses				
The operation		posure assessment is carr agement measures are les		tlined for agricultural soil	

 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 CO2-free breathable air, upon reaction with CO2. 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.

spenner zement prepared in accordance with Annex II of the REACH Regulation EG 1907/2006,

Regulation (EG) 1272/2008 and Regulation (EU) 453/2010

Version: 1.0/EN

Revision date: November / 2010

Printing Date: June 13, 2013

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) 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 site as "high dusty".

DNEL_{inhalation}: 1 mg/m³ (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/m³. 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 9.10: Professional use of lime substances in soil

treatment

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Exposure Scenario Format (1) addressing uses carried out by workers						
1. Title						
Free short title	Professional use of lime substances in soil treatment					
Systematic title based on use descriptor	SU22 (appropriate PROCs and ERCs are given in Section 2 below)					
Processes, tasks and/or activities covered	Processes, tasks and/or activities covered are described in Section 2 below.					
Assessment Method	The assessment of inhalation exposure is based on measured data and on the exposure estimation tool MEASE. The environmental assessment is based on FOCUS-Exposit.					

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2. Operational con	ditions and risk ma	nagement measures	5		
Task/ERC	REACH	definition	Involve	ed tasks	
Milling	PRO	DC 5			
Loading of spreader	PROC 8b	, PROC 26	Preparation and use of calcium oxides for soil		
Application to soil (spreading)	PRC	DC 11	treati	ment.	
ERC2, ERC8a, ERC8b, ERC8c, ERC8d, ERC8e, ERC8f	reactive substances or	or and outdoor use of processing aids in open tems	wide dispersive uses: a and shrimps farming	ed in numerous cases of agricultural, forestry, fish g, soil treatment and cal protection.	
2.1 Control of work	ers exposure				
Product characteristic					
reflected by an assignme ambient temperature the temperature based, takin	nt of a so-called fugacity of fugacity is based on the d g into account the process	intrinsic emission potential class in the MEASE tool. For lustiness of that substance is temperature and the melt instead of the substance int	or operations conducted w . Whereas in hot metal op ting point of the substance	vith solid substances at erations, fugacity is	
Task	Use in preparation	Content in preparation	Physical form	Emission potential	
Milling	not res	stricted	solid/powder	high	
Loading of spreader	not res	stricted	solid/powder	high	
Application to soil (spreading)	not res	stricted	solid/powder	high	
Amounts used					
combination of the scale		ered to influence the expos professional) and level of nsic emission potential.			
Frequency and duration	n of use/exposure				
Task		Duration o	f exposure		
Milling		240 m	inutes		
Loading of spreader		240 m	inutes		
Application to soil (spreading)	480 minutes (not restricted)				
Human factors not influ	enced by risk managem	ent			
The shift breathing volum	ne during all process steps	reflected in the PROCs is	assumed to be 10 m ³ /shif	ít (8 hours).	
Other given operational	I conditions affecting wo	orkers exposure			
Operational conditions (e assessment of the condu		nd process pressure) are r	not considered relevant for	r occupational exposure	
Technical conditions ar	nd measures at process	level (source) to prevent	release		
Risk management measu required in the processes		e.g. containment or segreg	ation of the emission sour	ce) are generally not	

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Technical conditions a	nd measures to control d	lispersion from source to	owards the worker	
Task	Level of separation	Localised controls (LC)	ETTICIANCY OT LC	
Milling	Separation of workers is generally not	not required	na	-
Loading of spreader	required in the conducted processes.	not required	na	-
Application to soil (spreading)	During application the worker is sitting in the cabin of the spreader	Cabin with filtered air supply	99%	-
Organisational measure	es to prevent /limit releas	ses, dispersion and expo	osure	
These measures involve eating and smoking at the	tion. General occupational good personal and housel e workplace, the wearing on hes at end of work shift. Do	keeping practices (i.e. regulation of standard working clothes	ular cleaning with suitable s and shoes unless otherw	cleaning devices), no <i>r</i> ise stated below.
Conditions and measur	res related to personal p	otection, hygiene and h	ealth evaluation	
Task	Specification of respiratory protective equipment (RPE)	RPE efficiency (assigned protection factor, APF)	Specification of gloves	Further personal protective equipment (PPE)
Milling	FFP3 mask	APF=20		Eye protection equipment (e.g. goggles or visors) must be worn, unless
Loading of spreader	FFP3 mask	APF=20	Since calcium oxide is classified as irritating to skin, the use of protective gloves is	potential contact with the eye can be excluded by the nature and type of application
Application to soil (spreading)	not required	na	mandatory for all process steps.	(i.e. closed process). Additionally, face protection, protective clothing and safety shoes are required to be worn as appropriate.
(compare with "duration of resistance and mass of the considered that the work For reasons as given about the use of RPE), (ii) have	ve shall only be worn if the of exposure" above) should he RPE itself, due to the in er's capability of using tool ove, the worker should the e suitable facial characteris devices above which rely werk and securely	d reflect the additional phy creased thermal stress by s and of communicating a refore be (i) healthy (espe- tics reducing leakages be	siological stress for the wo enclosing the head. In ad re reduced during the wea cially in view of medical pr tween face and mask (in v	orker due to the breathing dition, it shall be ring of RPE. oblems that may affect iew of scars and facial

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.

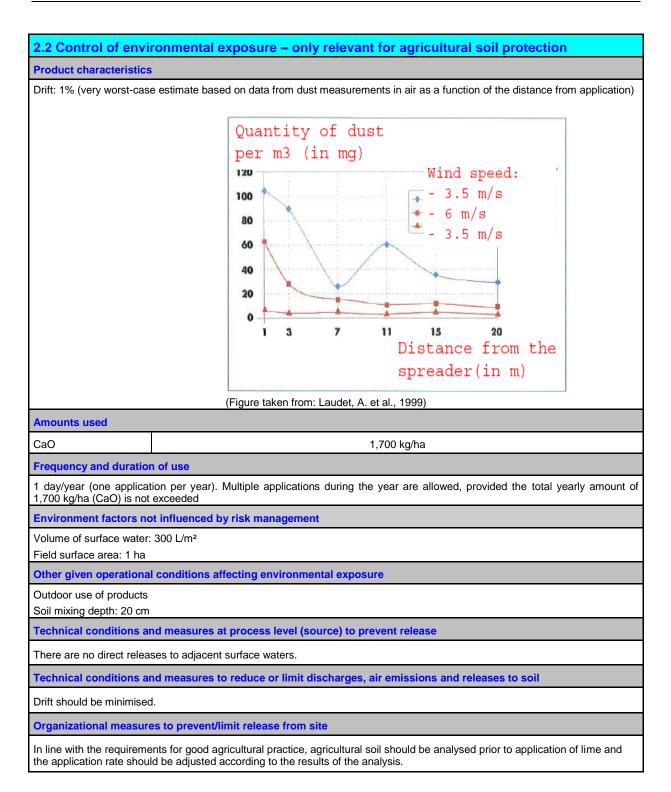
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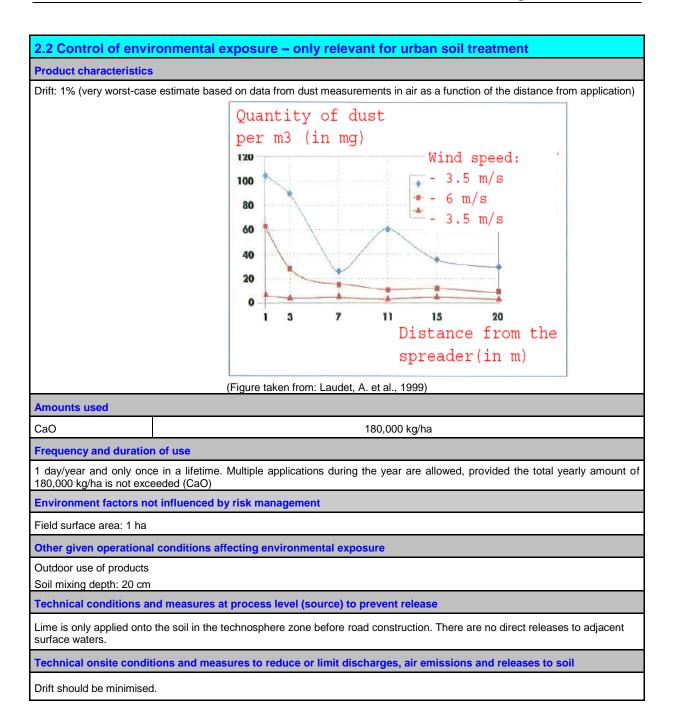
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3. Exposure estimation	ation and reference	to its source				
Occupational exposure						
characterisation ratio (RC	CR) is the quotient of the red demonstrate a safe use. F	efined exposure estimate a	e assessment of inhalation and the respective DNEL (e RCR is based on the DN	derived no-effect level)		
Task	Method used for inhalation exposure assessmentInhalation exposure estimate (RCR)Method used for dermal exposure assessmentDermal exp estimate (RCR)					
Milling	MEASE	0.488 mg/m³ (0.48)		classified as irritating to		
Loading of spreader	MEASE (PROC 8b)	0.488 mg/m³ (0.48)		as to be minimised as far DNEL for dermal effects		
Application to soil (spreading)	measured data	0.880 mg/m³ (0.88)	has not been derived. T			
Environmental exposur	e for agricultural soil pro	otection				
on the calculation of prec surface water and sedime more appropriate for agri modelling. FOCUS is a m German EXPOSIT 1.0 m	licted environmental conce ent (Kloskowksi et al., 199 cultural-like application as nodel typically developed fr	entration values (PEC) of p 9). The FOCUS/EXPOSIT in this case where parameter or biocidal applications and uch as drifts can be improved	I group (FOCUS, 1996) an blant protection products for modelling tool is preferred eter as the drift needs to be d was further elaborated o ved according to collected irift.	or soil, ground water, d to the EUSES as it is e included in the n the basis of the		
Environmental emissions	See amounts used	·				
Exposure concentration in waste water treatment plant (WWTP)	Not relevant for agricultur	ral soil protection				
Exposure	Substance	PEC (ug/L)	PNEC (ug/L)	RCR		
concentration in aquatic pelagic compartment	CaO	5.66	370	0.015		
Exposure concentration in sediments	natural waters the hydrox reacting with Ca2+. The	ide ions react with HCO3-	nor sediment to lime is exp - to form water and CO32 ates and deposits on the s atural soils.	CO32- forms CaCO3 by		
Exposure	Substance	PEC (mg/L)	PNEC (mg/L)	RCR		
concentrations in soil and groundwater	CaO	500	816	0.61		
Exposure concentration in atmospheric compartment	This point is not relevant.	This point is not relevant. Calcium oxide is not volatile. The vapour pressures is below 10 ⁻⁵ Pa.				
Exposure concentration relevant for the food chain (secondary poisoning)	This point is not relevant environment. The uses c and OH ⁻) in the environm	overed do not significantly	considered to be omniprese r influence the distribution of	ent and essential in the of the constituents (Ca ²⁺		

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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 (Kloskowksi 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.

		0				
Environmental emissions	See amounts used					
Exposure concentration in waste water treatment plant (WWTP)	Not relevant for road border scenario					
Exposure concentration in aquatic pelagic compartment	Not relevant for road border scenario					
Exposure concentration in sediments	Not relevant for road border scenario					
Exposure	Substance	PEC (mg/L)	PNEC (mg/L)	RCR		
concentrations in soil and groundwater	CaO	529	816	0.65		
Exposure concentration in atmospheric compartment	This point is not relevant.	Calcium oxide is not volat	ile. The vapour pressures	is below 10 ⁻⁵ 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 ²⁺ and OH) in the environment.					
Environmental exposu	re for other uses					
The operation	al conditions and risk man rban soil treatment	posure assessment is carr agement measures are les	ss stringent than those ou	C C		

• 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 CO2-free breathable air, upon reaction with CO2. 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.

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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) 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 site as "high dusty".

DNEL_{inhalation}: 1 mg/m³ (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/m³. 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 %).

prepared in accordance with Annex II of the REACH Regulation EG 1907/2006, Regulation (EG) 1272/2008 and Regulation (EU) 453/2010

Version: 1.0/EN Revision date: November / 2010

spenner zement

Printing Date: June 13, 2013

ES number 9.11: Professional uses of articles/containers containing

lime substances

Exposure Scenario	Format (1) address	sing uses carried ou	It by workers				
1. Title							
Free short title	Professional uses of articles/containers containing lime substances						
	SU22, SU1, SU5, SU6a, SU6b, SU7, SU10, SU11, SU12, SU13, SU16, SU17, SU18, SU19, SU2						
Systematic title based on use descriptor	SU23, SU24 AC1, AC2, AC3, AC4, AC5, AC6, AC7, AC8, AC10, AC11, AC13						
	(app	ropriate PROCs and ERC	s are given in Section 2 be	elow)			
Processes, tasks and/or activities covered	Processes,	tasks and/or activities cove	ered are described in Sect	ion 2 below.			
Assessment Method	The assessment of	f inhalation exposure is ba	sed on the exposure estim	nation tool MEASE.			
2. Operational con	ditions and risk mar	nagement measures	5				
PROC/ERC	REACH o	lefinition	Involve	d tasks			
PROC 0	Other p PROC 21 (low emissio) exposure e	n potential) as proxy for	Use of containers containing calcium oxide/preparations as CO ₂ absorbents (e.g. breathing apparatus)				
PROC 21	Low energy manipulatior materials ar		Handling of substances bound in materials and/or articles				
PROC 24	High (mechanical) energ bound in materia		Grinding, mechanical cutting				
PROC 25	Other hot work ope	rations with metals	Welding,	soldering			
ERC10, ERC11, ERC 12	Wide dispersive indoor a life articles and mate		Calcium oxide bound into or onto articles and materials such as: wooden and plastic construction and building materials (e.g. gutters, drains), flooring, furniture, toys, leather products, paper and cardboard products (magazines, books, news paper and packaging paper), electronic equipment (casing)				
2.1 Control of work	ers 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	Used in preparation?	Content in preparation	Physical form	Emission potential			
PROC 0	not res	stricted	massive objects (pellets), low potential for dust formation due to abrasion during previous filling and handling activities of pellets, not during use of breathing apparatus	low (worst case assumption as no inhalation exposure is assumed during the use of the breathing apparatus due to the very low abrasive potential)			
PROC 21	not res	stricted	massive objects	very low			
PROC 24, 25	not res	stricted	massive objects	high			

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Revision date: November / 2010

Amounts used				
combination of the scale	dled per shift is not considered to influ- of operation (industrial vs. profession minant of the process intrinsic emission	al) and level of		
Frequency and duratio	n of use/exposure			
PROC		Duration o	f exposure	
PROC 0	(not restricted as far as occupatio duration may be restricted o	onal exposure to		
PROC 21		480 minutes (not restricted)	
PROC 24, 25		≤ 240 r	minutes	
Human factors not infl	uenced by risk management			
The shift breathing volun	ne during all process steps reflected in	n the PROCs is	assumed to be 10 m ³ /shift	t (8 hours).
Other given operationa	I conditions affecting workers expo	osure		
temperatures are expect estimation. Thus all proc Technical conditions a	MEASE is however based on the rati ted to vary within the industry the high tess temperatures are automatically con- nd measures at process level (sour ures at the process level (e.g. contain	est ratio was ta overed in this e rce) to prevent	ken as a worst case assur xposure scenario for PROC release	nption for the exposure C 22, 23 and PROC 25.
required in the processe				
Technical conditions a	nd measures to control dispersion	from source to	owards the worker	
PROC	Level of separation	Localised controls (LC)	Efficiency of LC (according to MEASE)	Further information
PROC 0, 21, 24, 25	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 required	na	-
Organisational measur	es to prevent /limit releases, disper	sion and expo	osure	
These measures involve eating and smoking at th	tion. General occupational hygiene m good personal and housekeeping pra workplace, the wearing of standard hes at end of work shift. Do not wear o	actices (i.e. regu working clothes	ular cleaning with suitable s and shoes unless otherw	cleaning devices), no rise stated below.

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Conditions and measur	res related to personal pr	otection, hygiene and he	ealth evaluation	
PROC	Specification of respiratory protective equipment (RPE)	RPE efficiency (assigned protection factor, APF)	Specification of gloves	Further personal protective equipment (PPE)
PROC 0, 21	not required	na		Eye protection equipment (e.g. goggles or visors) must
PROC 24, 25	FFP1 mask	APF=4	Since calcium oxide is classified as irritating to skin, the use of protective gloves is mandatory for all process steps.	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.
(compare with "duration or resistance and mass of the second seco	ve shall only be worn if the of exposure" above) should he RPE itself, due to the in er's capability of using tool	d reflect the additional phy creased thermal stress by	siological stress for the wo enclosing the head. In ad	orker due to the breathing dition, it shall be
the use of RPE), (ii) have	ove, the worker should the suitable facial characteris devices above which rely erly and securely.	tics reducing leakages bet	tween face and mask (in v	iew of scars and facial
The employer and self-er devices and the manager	mployed persons have leg- ment of their correct use in otective device programm	the workplace. Therefore	, they should define and d	
An overview of the APFs	of different RPE (accordin	g to BS EN 529:2005) car	be found in the glossary	of MEASE.
2.2 Control of envi	ronmental exposure	•		
Product characteristics	i			
Lime is chemically bound	l into/onto a matrix with ve	ry low release potential		
3. Exposure estima	ation and reference	to its source		
Occupational exposure				
The exposure estimation is the quotient of the refir demonstrate a safe use. dust) and the respective	tool MEASE was used for ned exposure estimate and For inhalation exposure, th inhalation exposure estima since the respirable fractio	I the respective DNEL (den the RCR is based on the DI ate derived using MEASE	rived no-effect level) and h NEL for calcium oxide of 1 (as inhalable dust). Thus, t	as to be below 1 to mg/m³ (as respirable the RCR includes an
PROC	Method used for inhalation exposure assessment	Inhalation exposure estimate (RCR)	Method used for dermal exposure assessment	Dermal exposure estimate (RCR)
PROC 0	MEASE (PROC 21)	0.5 mg/m³ (0.5)	Since calcium ovido is	classified as irritating to
PROC 21	MEASE	0.05 mg/m³ (0.05)	skin, dermal exposure ha	as to be minimised as far
PROC 24	MEASE	0.825 mg/m³ (0.825)	as technically feasible. A has not been derived. T	DNEL for dermal effects hus, dermal exposure is
PROC 25	MEASE	0.6 mg/m³ (0.6)		exposure scenario.
Environmental exposur	е			
	d is chemically bound into f use. Releases are negligi			

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Version: 1.0/EN

Revision date: November / 2010

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(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 site as "high dusty".

DNEL_{inhalation}: 1 mg/m³ (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/m³. 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 %).

prepared in accordance with Annex II of the REACH Regulation EG 1907/2006,

Regulation (EG) 1272/2008 and Regulation (EU) 453/2010

Version: 1.0/EN Revision date: November / 2010

spenner zement

Printing Date: June 13, 2013

ES number 9.12: Consumer use of building and construction material (DIY – do it yourself)

Exposure Scenario	Forma	t (2) addre	essing	uses carried out by	consumers	
1. Title						
Free short title			Consu	mer use of building and	construction material	
Systematic title based on use descriptor			SU21, PC9a, PC9b, ERC8c, ERC8d, ERC8e, ERC8f			
Processes, tasks activities covered			Handling (mixing and filling) of powder formulations Application of liquid, pasty lime preparations.			
Assessment Method*			Human health: A qualitative assessment has been performed for oral and dermal exposure as well as exposure to the eye. Inhalation exposure to dust has been assessed by the Dutch model (van Hemmen, 1992). Environment: A qualitative justification assessment is provided.			
2. Operational con	ndition					
RMM				ated risk management m		
					le categories (AC) and env	ironmental release
PC/ERC		categories			io outogenee (ne) una env	
PC 9a, 9b	Mixing ar Applicatio		n of lime	g of powder containing l plaster, putty or slurry xposure.		
ERC 8c, 8d, 8e, 8f Wide disp Wide disp Wide disp		Wide dispe Wide dispe	persive indoor use resulting in inclusion into or onto a matrix persive outdoor use of processing aids in open systems persive outdoor use of reactive substances in open systems persive outdoor use resulting in inclusion into or onto a matrix			
2.1 Control of con	sume			5		
Product characteristic		<u> </u>				
Description of the preparation	Conce subst	entration o ance in the ration		Physical state of the preparation	Dustiness (if relevant)	Packaging design
Lime substance	100 %			Solid, powder	High, medium and low,	Bulk in bags of up to
Plaster, Mortar	20-40			Solid, powder	depending on the kind of lime substance (indicative value from DIY ¹ fact sheet see section 9.0.3)	35 kg.
Plaster, Mortar	20-40	%		Pasty	-	-
Putty, filler	30-55	%		Pasty, highly viscous, thick liquid	-	In tubes or buckets
Pre-mixed lime wash paint	~30%			Solid, powder	High - low (indicative value from DIY ¹ fact sheet see section 9.0.3)	Bulk in bags of up to 35 kg.
Lime wash paint/milk of lime preparation				Milk of lime preparation	-	-
Amounts used						
Description of the preparation		Amount	used p	per event		
Filler, putty		-	o deter) unt is heavily dependent on t	he depth and size of the

prepared in accordance with Annex II of the REACH Regulation EG 1907/2006,

Regulation (EG) 1272/2008 and Regulation (EU) 453/2010

Version: 1.0/EN

spenner zement

Revision date: November / 2010

		~ 25 kg	dependi	ing on the size of	of the roo	m, wall to	be treated.		
•		~ 25 kg	dependi	ing on the size of	of the roo	m, wall to	be equalized		
Frequency and duratio		Ŭ		0		7	· ·		
Description of task				on of exposure	per eve	nt	frequency	of e	vents
Mixing and loading of lime containing powder.		1.33 min (DIY ¹ -fact sheet, RIVM, Chapter 2.4.2 Mixing and loading of powders)		2/year (DIY ¹ fact sheet)					
Application of lime plaster, putty or slurry to the walls or ceiling		•	Severa	l minutes - hour	S		2/year (DI	Y ¹ fac	t sheet)
Human factors not influenced by risk n			anagem	ent					
Description of the task	Population exposed		osed	Breathing rat	e	Exposed	d body part		Corresponding skin area [cm²]
Handling of powder	Adult			1.25 m³/hr		Half of b	oth hands		430 (DIY ¹ fact sheet)
Application of liquid, pasty lime preparations.	Adult			NR		Hands a	nd forearms		1900 (DIY ¹ fact sheet)
Other given operationa	al conditio	ons affe	cting co	onsumers expo	osure				
Description of the task	(Indoc	or/outdo	or	Room	volume		Air	exchange rate
Handling of powder		indoo	r			ersonal sp ound the ι	ace, small iser)	0.6	hr ⁻¹ (unspecified room)
Application of liquid, pas preparations.	sty lime	indoo	r		NR			NR	
Conditions and measu	res relate	d to inf	ormatio	n and behaviou	ural advid	ce to cons	umers		
	ered areas cordance v and apply	s of skin vith a sk a care	(arms, le in protec product.	tion plan (skin p	protection				products which should nse the skin thoroughly
be used in acc after the work Conditions and measu In order to avoid health of workplaces: • When preparin protective gog • Choose work of environment, of	ered areas cordance v and apply res relate damage D damage D gloves car cotton glov	s of skin vith a sk a care d to per IYers sh ng buildi ell as fac efully. L ves with	(arms, le cin protect product. rsonal p nould cor ng mater ce masks eather g plastic c	egs, face): there tion plan (skin p rotection and h nply with the sa rials, during den s during dusty w loves become w overing (nitrile)	nygiene me strict nolition or ork. vet and ca are bette	protective caulking a r. Wear ga	g and care). measures w and, above a burns. Whe untlet gloves	Clear hich a III, dui en wo s durii	apply to professional ring overhead work, wea rking in a wet ng overhead work
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be used in acc after the work Conditions and measu In order to avoid health of workplaces: • When preparing protective gog • Choose work of environment, of because they 2.2 Control of envir Product characteristics Not relevant for exposure Amounts used* Not relevant for exposure Frequency and duratio Not relevant for exposure Frequency and duratio Not relevant for exposure Default river flow and dill Other given operational	ered areas cordance v and apply res relate damage D ng or mixin gloves car cotton glov can consic ironmer s e assessm e assessm n of use e assessm ot influen ution	s of skin vith a sk a care d to per IYers sh ag buildi ell as fac efully. L ces with derably htal ex hent hent ced by	(arms, ke in protect product. rsonal p iould cor ng mater ce masks eather g plastic c reduce th posure	egs, face): there tion plan (skin p rotection and f nply with the sat ials, during dent s during dusty w overing (nitrile) he amount of hu e	nygiene me strict nolition or ork. vet and ca are bette midity wh	protective caulking a r. Wear ga	g and care). measures w and, above a burns. Whe untlet gloves	Clear hich a II, dui en wo s durii	apply to professional ring overhead work, wea rking in a wet ng overhead work
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be used in acc after the work Conditions and measu In order to avoid health of workplaces: • When preparing protective gog • Choose work of environment, of because they 2.2 Control of envir Product characteristics Not relevant for exposure Amounts used* Not relevant for exposure Frequency and duratio Not relevant for exposure Frequency and duratio Not relevant for exposure Environment factors me Default river flow and dill Other given operational Indoor Direct discharge to the we	ered areas cordance v and apply res relate damage D ng or mixin gles as we gloves car cotton glov can consid ironmen s e assessm e assessm e assessm on of use e assessm ot influen ution al conditio	s of skin vith a sk a care d to pel IYers sh ng buildi ell as fac efully. L ves with derably n nent nent nent ced by ons affe	(arms, ki in protec product. rsonal p nould cor ng mater ce masks eather g plastic c reduce th posure risk mar cting en	egs, face): there tion plan (skin p rotection and h nply with the sal rials, during den s during dusty w loves become w overing (nitrile) he amount of hu be magement	protection me strict nolition or ork. vet and ca are bette midity wh	protective caulking a r caulking a r. Wear ga nich perme	g and care). measures w and, above a burns. Whe untlet gloves	Clear hich a II, dui en wo s durii	apply to professional ring overhead work, wea rking in a wet ng overhead work
be used in acc after the work Conditions and measu In order to avoid health of workplaces: • When preparing protective gog • Choose work environment, of because they 2.2 Control of envir Product characteristics Not relevant for exposure Frequency and duration Not relevant for exposure Frequency and duration Not relevant for exposure Environment factors me Default river flow and dil Other given operational Indoor Direct discharge to the we Conditions and measu	ered areas cordance v and apply res relate damage D ng or mixin gles as we gloves can cotton glov can consic ironmer s e assessm e assessm of use e assessm ot influen ution al conditio	s of skin vith a sk a care d to per lYers sh ag build ell as fac efully. L cefully. L efully. L derably htal ex nent nent ced by s sith ced by s savoid d to mu	(arms, kei in protecproduct. rsonal p rould cor ng mater ce masks eather g plastic c reduce th posure risk mar cting en ded.	egs, face): there tion plan (skin p rotection and f nply with the sat ials, during den s during dusty w overing (nitrile) he amount of hu e magement vironmental ex sewage treatm	Approvement of the second seco	protective caulking a r caulking a r. Wear ga nich perme	g and care).	Clear hich a II, dui en wo s durii	apply to professional ring overhead work, wea rking in a wet ng overhead work
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be used in acc after the work Conditions and measu In order to avoid health of workplaces: • When preparing protective gog • Choose work environment, of because they 2.2 Control of envir Product characteristics Not relevant for exposure Amounts used* Not relevant for exposure Frequency and duration Not relevant for exposure Environment factors me Default river flow and dil Other given operational Indoor Direct discharge to the we Conditions and measu	ered areas cordance v and apply res relate damage D ng or mixin gles as we gloves car cotton glov can consid ironmen s e assessm e assessm e assessm ot influen ution al conditio vastewater res relate res relate	s of skin vith a sk a care d to per IYers sh ng buildi ell as fac efully. L ves with derably in tal ex nent nent ced by ons affe system/t d to ex	(arms, le in protec product. rsonal p rould cor ng mater ce masks eather g plastic c reduce th posure risk man cting en ded.	egs, face): there tion plan (skin p rotection and f nply with the sat ials, during dusty w loves become w overing (nitrile) ne amount of hu e nagement vironmental ex sewage treatm t plant and sludg	ent plant ge treatm	protective caulking a an facilitate r. Wear ga hich perme	g and care).	Clear hich a II, dui en wo s durii	apply to professional ring overhead work, wea rking in a wet ng overhead work

prepared in accordance with Annex II of the REACH Regulation EG 1907/2006,

Regulation (EG) 1272/2008 and Regulation (EU) 453/2010

Version: 1.0/EN

spenner zement

Revision date: November / 2010

Printing Date: June 13, 2013

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 noeffect level) and is given in parentheses below. For inhalation exposure, the RCR is based on the acute DNEL for lime substances of 4 mg/m³ (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 limes are classified as irritating to skin and eyes a qualitative assessment has been performed for dermal exposure and exposure to the eye.

Human exposure				
Handling of powder				
Route of exposure	Exposure estimate	Method used, comments		
Oral	-	Qualitative assessment		
		Oral exposure does not occur as part of the intended product use.		
Dermal	small task: 0.1 µg/cm ²	Qualitative assessment		
	(-) large task: 1 μg/cm² (-)	If risk reduction measures are taken into account no human exposure is expected. However, dermal contact to dust from loading of lime substances 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 ¹ -fact sheet (RIVM report 320104007).		
Eye	Dust	Qualitative assessment		
		If risk reduction measures are taken into account no human exposure is expected. Dust from loading of the lime substances cannot be excluded if no protective goggles are used. Prompt rinsing with water and seeking medical advice after accidental exposure is advisable.		
Inhalation	Small task: 12 µg/m ³	Quantitative assessment		
	(0.003)	Dust formation while pouring the powder is addressed by using the dutch		
	Large task: 120 µg/m ³ (0.03)	model (van Hemmen, 1992, as described in section 9.0.3.1 above).		
Application of liquid	I, pasty lime preparations	S.		
Route of exposure	Exposure estimate	Method used, comments		
Oral	-	Qualitative assessment		
		Oral exposure does not occur as part of the intended product use.		
Dermal	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 the application. Splashes may occasionally result in mild irritation easily avoided by immediate rinsing of the hands with water.		
Eye	Splashes	Qualitative assessment		
		If appropriate goggles are worn no exposure to the eyes needs to be expected. However, splashes into the eyes cannot be excluded if no protective goggles are worn during the application of liquid or pasty lime preparations, especially during overhead work. Prompt rinsing with water and seeking medical advice after accidental exposure is advisable.		
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.		
Post-application exp	posure			
No relevant exposure dioxide from the atmo		ueous lime preparation will quickly convert to calcium carbonate with carbon		
Environmental expo	osure			



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Revision date: November / 2010

Printing Date: June 13, 2013

Referring to the OC/RMMs related to the environment to avoid discharging lime solutions directly into municipal wastewater, the pH of the influent of a municipal wastewater treatment plant is circum-neutral and therefore, there is no exposure to the biological activity. 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.

prepared in accordance with Annex II of the REACH Regulation EG 1907/2006, Regulation (EG) 1272/2008 and Regulation (EU) 453/2010

Version: 1.0/EN Revision date: November / 2010

Printing Date: June 13, 2013

ES number 9.13: Consumer use of CO_2 absorbent in breathing

apparatuses

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Exposure S	cenario I	Format (2) addı	ressing	uses carried out by	, consume	ers		
1. Title								
Free short title Systematic title based on use descriptor				Consumer use of CO ₂	absorbent i	n breathing appa	ratuses	
Systematic ti	tle based	on use descripto	r	SU21, PC2, ERC8b				
Processes, ta	asks activ	ities covered		Filling of the formulation into the cartridge				
				Use of closed circuit breathing apparatuses				
				Cleaning of equipmen	t			
Assessment	Method*			Human health				
			A qualitative assessment has been performed for oral and dermal exposure. The inhalation exposure has been assessed by the Dutch model (van Hemmen, 1992).					
			Environment					
				A qualitative justification	on assessm	ent is provided.		
2. Operatio	onal con	ditions and ri	sk ma	nagement measur	es			
RMM	will furthe		iness of				-18%) is added which hydroxide will be quickly	
PC/ERC	Descript	ion of activity re	ferring t	o article categories (A	C) and env	ironmental relea	se categories (ERC)	
PC 2	Use of closed circuit breathing apparatus for e.g. recreational diving containing soda lime as CO ₂ absorbent. The breathed air will flow through the absorbent and CO ₂ will quickly react (catalysed by water and sodium hydroxide) with the calcium dihydroxide to form the carbonate. The CO ₂ -free air can be re-breathed again, after addition of oxygen. Handling of the absorbent: The absorbent will be discarded after each use and refilled before each dive.						er and sodium re-breathed again, after	
ERC 8b	Ŭ							
				g in inclusion into or ont	to a matrix			
		sumers expos	sure					
Product char					1			
Description o preparation	of the	Concentration substance in th preparation		Physical state of the preparation	Dustiness (if relevant)		Packaging design	
CO ₂ absorben	t	78 - 84%		Solid, granular	Very low dustiness		4.5, 18 kg canister	
		Depending on the application the r			compare	n by 10 % d to powder)		
		component has different additives.			be ruled	nation cannot out during the the scrubber		
		A specific amou water is always (14-18%).		cartridge				
"Used" CO ₂ at	"Used" CO ₂ absorbent ~ 20%			Solid, granular	(reductio	dustiness n by 10 % d to powder)	1-3 kg in breathing apparatus	
Amounts use	d					. /		
CO ₂ -Absorber	nt used in b	preathing apparatu	IS	1-3 kg depending on t	he kind of b	reathing apparatu	IS	
Frequency ar	nd duratio	n of use/exposur	е					
Description o	of the task		Duratio	on of exposure per ev	ent	frequency of e	vents	
Filling of the fo	ormulation	into the	Ca. 1.3	33 min per filling, in sum	< 15 min	Before each div	re (up to 4 times)	
	circuit bre	athing	1-2 h	Up		Up to 4 dives a	Up to 4 dives a day	
Use of closed apparatus								

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Human factors not influ	lenced by	v risk managem	ent				
Description of the task	Populat	ion exposed	Breathing rat	e	Exposed body part		Corresponding skin area [cm²]
Filling of the formulation into the cartridge	adult		1.25 m ³ /hr (light working activity)		hands - hands		840 (REACH guidance R.15, men)
Use of closed circuit breathing apparatus							-
Cleaning and emptying of equipment							840 (REACH guidance R.15, men)
Other given operationa	l conditio	ns affecting co	onsumers expo	sure		-	
Description of the task	Indoor/outdoo		or	Room	volume	Air	exchange rate
Filling of the formulation cartridge	into the	NR		NR		NR	
Use of closed circuit brea apparatus	athing	-		-		-	
Cleaning and emptying o equipment	of	NR		NR		NR	
Conditions and measu	res relate	d to informatio	n and behaviou	iral advid	ce to consumers		
Do not get in eyes, on sk	in, or on c	lothing. Do not b	preathe dust				
Keep container tightly clo	osed as to	avoid the soda	lime to dry out.				
Keep out of reach of child	dren.						
Wash thoroughly after ha	andling.						
In case of contact with e	yes, rinse	immediately with	n plenty of water	and see	k medical advice.		
Do not mix with acids.							
Carefully read the instruc				· · ·	r use of the breathing	appara	atus.
Conditions and measure							
Wear suitable gloves, go 149).	ggles and	protective cloth	es during handli	ng. Use a	a filtering half mask (m	ask ty	pe FFP2 acc. to EN
2.2 Control of envi	ronmen	tal exposure	9				
Product characteristics	5						
Not relevant for exposure	e assessm	ent					
Amounts used*							
Not relevant for exposure	e assessm	ient					
Frequency and duratio	n of use						
Not relevant for exposure	e assessm	ent					
Environment factors no	ot influend	ced by risk mar	nagement				
Default river flow and dilu	ution						
Other given operationa	l conditio	ns affecting en	vironmental ex	posure			
Indoor							
Conditions and measu	res relate	d to municipal	sewage treatmo	ent plant			
Default size of municipal	sewage s	ystem/treatment	t plant and slud	ge treatm	ent technique		
Conditions and measu	res relate	d to external tr	eatment of was	ste for di	sposal		
Not relevant for exposure	e assessm	ent				_	
Conditions and measu	res relate	d to external re	ecovery of was	te			
Not relevant for exposure	e assessm	ent					
3. Exposure estimation and reference to its source							

spenner zement prepared in accordance with Annex II of the REACH Regulation EG 1907/2006,

Regulation (EG) 1272/2008 and Regulation (EU) 453/2010

Version: 1.0/EN

Human exposure

Revision date: November / 2010

Printing Date: June 13, 2013

The risk characterisation ratio (RCR) is the quotient of the refined exposure estimate and the respective DNEL (derived noeffect level) and is given in parentheses below. For inhalation exposure, the RCR is based on the acute DNEL for lime substances of 4 mg/m³ (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.

Due to the very specialised kind of consumers (divers filling their own CO_2 scrubber) it can be assumed that instructions will be taken into account to reduce exposure

Human exposure		
Filling of the formul	ation into the cartridge	
Route of exposure	Exposure estimate	Method used, comments
Oral	-	Qualitative assessment
		Oral exposure does not occur as part of the intended product use.
Dermal	-	Qualitative assessment
		If risk reduction measures are taken into account no human exposure is expected. However, dermal contact to dust from loading of granular soda lime or direct contact to the granules 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.
Eye	Dust	Qualitative assessment
		If risk reduction measures are taken into account no human exposure is expected. Dust from loading of the granular soda lime is expected to be minimal, therefore eye exposure will be minimal even without protective goggles. Nevertheless, prompt rinsing with water and seeking medical advice after accidental exposure is advisable.
Inhalation	Small task: 1.2 µg/m³ (3 × 10 ⁻⁴)	Quantitative assessment
	Large task: 12 µg/m³ (0.003)	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.
Use of closed circui	t breathing apparatus	
Route of exposure	Exposure estimate	Method used, comments
Oral	-	Qualitative assessment
		Oral exposure does not occur as part of the intended product use.
Dermal	-	Qualitative assessment
		Due to the product characteristics, it can be concluded that dermal exposure to the absorbent in breathing apparatuses is non-existent.
Eye	-	Qualitative assessment
		Due to the product characteristics, it can be concluded that eye exposure to the absorbent in breathing apparatuses is non-existent.
Inhalation	negligible	Qualitative assessment
		Instructional advice is provided to remove any dust before finishing the assembly of the scrubber. Divers filling their own CO ₂ scrubber represent a specific subpopulation within consumers. Proper use of equipment and materials is in their own interest; hence it can be assumed that instructions will be taken into account.
		Due to the product characteristics and the instructional advices given, it can be concluded that inhalation exposure to the absorbent during the use of the breathing apparatus is negligible.

prepared in accordance with Annex II of the REACH Regulation EG 1907/2006,

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Route of exposure	Exposure estimate	Method used, comments
Oral	-	Qualitative assessment
		Oral exposure does not occur as part of the intended product use.
Dermal	Dust and splashes	Qualitative assessment
		If risk reduction measures are taken into account no human exposure is expected. However, dermal contact to dust from emptying granular soda lime or direct contact to the granules cannot be excluded if no protective gloves are worn during cleaning. Furthermore, during the cleaning of the cartridge with water contact to moistened soda lime may occur. This may occasionally result in mild irritation easily avoided by immediate rinsing of with water.
Eye	Dust and splashes	Qualitative assessment
		If risk reduction measures are taken into account no human exposure is expected. However, contact to dust from emptying granular soda limes or during the cleaning of the cartridge with water contact to moisten soda limes may occur in very rare occasions. Prompt rinsing with water and seeking medical advice after accidental exposure is advisable.
Inhalation	Small task: 0.3 µg/m³ (7.5 × 10 ⁻⁵)	Quantitative assessment
	Large task: 3 μg/m³ (7.5 × 10 ⁻⁴)	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 and a factor of 4 to account for the reduced amount of lime in the "used" absorbent.
Environmental expo	osure	
The pH impact due to treatment plant is ofte that are treated in bio	o use of lime in breathing apparatuses on neutralized anyway and lime may e logical WWTPs. Since the pH of the ir	is expected to be negligible. The influent of a municipal wastewater ven be used beneficially for pH control of acid wastewater streams influent of the municipal treatment plant is circum neutral, the pH tments, such as surface water, sediment and terrestrial compartment

prepared in accordance with Annex II of the REACH Regulation EG 1907/2006,

Regulation (EG) 1272/2008 and Regulation (EU) 453/2010

spenner zement

Revision date: November / 2010

Printing Date: June 13, 2013

ES number 9.14: Consumer use of garden lime/fertilizer

	_	(0)							
Exposure Scenario	Forma	nt (2) add	ressing	g uses carried out b	y consum	ers			
1. Title									
Free short title				Consumer use of gard	den lime/fert	tilizer			
Systematic title based	on use	e descripto	or	SU21, PC20, PC12, ERC8e					
Processes, tasks activ	ities c	overed		Manual application of	garden lime	e, fert	ilizer		
				Post-application expo	sure				
Assessment Method*				Human health					
				A qualitative assessment has been performed for oral and dermal exposure as well as for the exposure to the eye. The dust exposure has been assessed by the Dutch model (van Hemmen, 1992). Environment					
2. Operational con	ditio	ns and r	isk ma	A qualitative justificati		ient is	s provided.		
RMM				ated risk management i		re in i	olace.		
PC/ERC			ion of a	ctivity referring to arti				rironmental release	
PC 20		-		g of the garden lime by	shovel/hand	d (woi	rst case) and	soil incorporation.	
				exposure to playing child					
PC 12				g of the garden lime by		d (wo	orst case) an	d soil incorporation.	
				exposure to playing chile					
ERC 8e				outdoor use of reactive s		in ope	en systems		
2.1 Control of con	sume								
Product characteristic									
Description of the preparation	Concentration of the substance in the preparation			Physical state of the preparation	Dustine	Dustiness (if relevant) Packagin		Packaging design	
Garden lime	100 %			Solid, powder	High dus	High dusty		Bulk in bags or containers of 5, 10 and 25 kg	
Fertilizer	Up to	20 %		Solid, granular	Low dust	Low dusty		Bulk in bags or containers of 5, 10 and 25 kg	
Amounts used								Ŭ	
Description of the prep	oaratio	n		Amount used per event Source			Source of i	e of information	
							Information and direction of use		
Garden lime				100g /m ² (up to 200g/	m²)		Information	and direction of use	
Garden lime Fertilizer				100g /m ² (up to 200g/ 100g /m ² (up to 1kg/m	,)		and direction of use and direction of use	
	n of us	se/exposu	re		,)			
Fertilizer		se/exposu			² (compost)			and direction of use	
Fertilizer Frequency and duratio		se/exposu	Durati Minute Depen	100g /m ² (up to 1kg/m	² (compost) ent	free	Information	and direction of use	
Fertilizer Frequency and duratio Description of the task		se/exposu	Durati Minute Depen area 2 h (to	100g /m ² (up to 1kg/m on of exposure per ev s-hours	ent	free 1 ta Rel	Information quency of e asks per yea	and direction of use	
Fertilizer Frequency and duratio Description of the task Manual application		· · · · · · · · · · · · · · · · · · ·	Durati Minute Depen area 2 h (to exposi	100g /m ² (up to 1kg/m on of exposure per ev s-hours ding on the size of the t ddlers playing on grass ure factors handbook)	ent	free 1 ta Rel	Information quency of e asks per yea evant for up	and direction of use vents	
Fertilizer Frequency and duratio Description of the task Manual application Post-application	uenced	· · · · · · · · · · · · · · · · · · ·	Durati Minute Depen area 2 h (to exposition	100g /m ² (up to 1kg/m on of exposure per ev s-hours ding on the size of the t ddlers playing on grass ure factors handbook)	ent	free 1 ta Rel app	Information quency of e asks per yea evant for up plication	and direction of use vents r	
Fertilizer Frequency and duratio Description of the task Manual application Post-application Human factors not influ Description of the	uenced	d by risk n Ilation exp	Durati Minute Depen area 2 h (to exposition	100g /m ² (up to 1kg/m on of exposure per ev s-hours ding on the size of the t ddlers playing on grass ure factors handbook) nent	ent reated (EPA	free 1 ta Rel app	Information quency of e asks per yea evant for up lication ly part	and direction of use vents r to 7 days after Corresponding skin	

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Description of the task	Indoor/outdo	or	Room volume	Air exchange rate	
Manual application	outdoor		1 m ³ (personal space, small area around the user)	NR	
Post-application	outdoor		NR	NR	
Conditions and measur	es related to information	n and behavio	ural advice to consumers		
Do not get in eyes, on ski	in, or on clothing. Do not l	oreathe dust. U	se a filtering half mask (mask t	ype FFP2 acc. to EN 149).	
Keep container closed an	nd out of reach of children				
In case of contact with ey	ves, rinse immediately with	n plenty of wate	er and seek medical advice.		
Wash thoroughly after ha	ndling.				
Do not mix with acids and	d always add limes to wat	er and not wate	er to limes.		
Incorporation of the garde	en lime or fertilizer into the	e soil with subs	equent watering will facilitate th	ne effect.	
Conditions and measur			hygiene		
Wear suitable gloves, goo	ggles and protection cloth	es.			
2.2 Control of envir	ronmental exposure	e			
Product characteristics					
Drift: 1 % (very worst-case	e estimate based on data	from dust mea	surements in air as a function o	of the distance from application)	
Amounts used					
Amount used	Ca(OH)2	2,244 kg/ha	In professional a	gricultural soil protection, it is	
	CaO	1,700 kg/ha		ot to exceed 1700 kg CaO/ha or	
	CaO.MgO	1,478 kg/ha		g amount of 2244 kg rate is three times the amount	
	Ca(OH)2.Mg(OH)2	2,030 kg/ha		ensate the annual losses of lime	
F	CaCO3.MgO	2,149 kg/ha		this reason, the value of 1700 kg	
	Ca(OH)2.MgO	1,774 kg/ha		prresponding amount of 2244 kg ed in this dossier as the basis	
F	Natural hydraulic lime	2,420 kg/ha	for the risk asses	sment. The amount used for the	
				ts can be calculated based on and the molecular weight.	
Frequency and duration	ofuse			rand the molecular weight.	
	on per year); Multiple appl	lications during	the year are allowed, provided	the total yearly amount of 1,700	
Environment factors not		agement			
Not relevant for exposure					
Other given operational		vironmental ex	xnosure		
Outdoor use of products			,poouro		
Soil mixing depth: 20 cm					
Technical conditions an	d measures at process		to prevent release		
There are no direct releas					
	,		ges, air emissions and releas	ses to soil	
Drift should be minimised.		i mint discriar	ges, all emissions and releas	565 10 5011	
			ant plant		
Conditions and measur		sewage treattr	ient plant		
Not relevant for exposure		entmont of wa	este for disposal		
Conditions and measur Not relevant for exposure					
Conditions and measur		covery of was			
Not relevant for exposure					
		to ite cours	20		
3. Exposure estima					
effect level) and is given i substances of 1 mg/m ³ (a includes an additional saf	in parentheses below. For as respirable dust) and the fety margin since the resp	r inhalation exp e respective inh irable fraction i	s a sub-fraction of the inhalable	e long-term DNEL for lime inhalable dust). Thus, the RCR e fraction according to EN 481.	
Since lime substances an exposure and exposure to	0	skin and eyes	a qualitative assessment has b	been performed for dermal	

prepared in accordance with Annex II of the REACH Regulation EG 1907/2006,

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Human exposure		
Manual application		
Route of exposure	Exposure estimate	Method used, comments
Oral	-	Qualitative assessment
		Oral exposure does not occur as part of the intended product use.
Dermal	Dust, powder	Qualitative assessment
		If risk reduction measures are taken into account no human exposure is expected. However, dermal contact to dust from application of lime substances or by direct contact to the limes cannot be excluded if no protective gloves are worn during application. Due to the relatively long application time, skin irritation would be expected. This can easily be avoided by immediate rinsing with water. It would be assumed that consumers who had experience of skin irritation will protect themselves. Therefore, any occurring skin irritation, which will be reversible, can be assumed to be non-recurring.
Eye	Dust	Qualitative assessment
		If risk reduction measures are taken into account no human exposure is expected. Dust from surfacing with lime cannot be excluded if no protective goggles are used. Prompt rinsing with water and seeking medical advice after accidental exposure is advisable.
Inhalation (garden	Small task: 12 µg/m ³ (0.0012)	Quantitative assessment
lime)	Large task: 120 µg/m³ (0.012)	No model describing the application of powders by shovel/hand is available, therefore, read-across from the dust formation model while pouring powders has been used as a worst case.
		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	Small task: 0.24 µg/m³ (2.4 * 10 ⁻⁴)	Quantitative assessment
(fertilizer)	Large task: 2.4 µg/m³ (0.0024)	No model describing the application of powders by shovel/hand is available, therefore, read across from the dust formation model while pouring powders has been used as a worst case.
		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 and a factor of 5 to account for the reduced amount of limes in fertilizer.

According to the PSD (UK Pesticide Safety Directorate, now called CRD) post-application exposure need to be addressed for products which are applied in parks or amateur products used to treat lawns and plants grown in private gardens. In this case exposure of children, who may have access to these areas soon after treatment, needs to be assessed. The US EPA model predicts the post-application exposure to products used in private gardens (e.g. lawns) by toddlers crawling on the treated area and also via the oral route through hand-to-mouth activities.

Garden lime or fertilizer including lime is used to treat acidic soil. Therefore, after application to the soil and subsequent watering the hazard driving effect of lime (alkalinity) will be quickly neutralized. Exposure to lime substances will be negligible within a short time after application.

Environmental exposure

No quantitative environmental exposure assessment is carried out because the operational conditions and risk management measures for consumer use are less stringent than those outlined for professional agricultural soil protection. Moreover, the neutralisation/pH-effect is the intended and desired effect in the soil compartment. Releases to wastewater are not expected.

prepared in accordance with Annex II of the REACH Regulation EG 1907/2006, Regulation (EG) 1272/2008 and Regulation (EU) 453/2010

Version: 1.0/EN Revision date: November / 2010

spenner zement

Printing Date: June 13, 2013

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

Exposure Scenario I	- Forma	t (2) addı	ressing	uses carried out by	consume	ers		
1. Title								
Free short title				Consumer use of lime	substances	s as water treatme	ent chemicals	
Systematic title based	on use	descripto	or	SU21, PC20, PC37, ERC8b				
Processes, tasks activ	ities co	overed		Loading, filling or re-filling of solid formulations into container/preparation of lime milk				
				Application of lime milk	to water			
Assessment Method*				Human health:				
			A qualitative assessme as well as for exposure the Dutch model (van I	e of the eye	. Dust exposure h	oral and dermal exposure has been assessed by		
			Environment:					
				A qualitative justification	on assessm	ent is provided.		
2. Operational con	ditior	ns and ri	isk ma	nagement measur	es			
RMM		No furthe	r produc	t integrated risk manage	ment meas	ures are in place.		
PC/ERC		Descripti categorie		ctivity referring to artic)	le categori	ies (AC) and env	ironmental release	
PC 20/37	T	Filling an	d re-fillin	g (transfer of lime substa	ances (solic	d)) of lime reactor	for water treatment.	
	Transfer of lime		of lime s	ubstances (solid) into co	ntainer for	further applicatior	۱.	
		Dropwise	applicat	tion of lime milk to water.				
ERC 8b		Wide disp	persive i	ndoor use of reactive substances in open systems				
2.1 Control of cons	sume	rs expos	sure					
Product characteristic								
Description of the preparation	subs	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	``	ve value from sheet see	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)			Bulk-tank lorry or in "Big Bags" or in sacks	
Amounts used								
Description of the prep	aratior	ו ו		Amount used per eve	ent			
Water treatment chemica aquaria			or	depending on the size of the water reactor to be filled (~ 100g /L)				
Water treatment chemica drinking water	al in lim	e reactor f	or	depending on the size of the water reactor to be filled (~up to 1.2 kg/L)				
Lime milk for further app	lication			~ 20 g / 5L				
Frequency and duratio	n of us	e/exposu	re					
Description of task			Durati	on of exposure per eve	ent	frequency of e	vents	
Preparation of lime milk and refilling)	(loading	g, filling		in act sheet, RIVM, Chapter and loading of powders)		1 task/month 1task/week		

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water	lime milk to	Severa	al minutes - hour	rs		1 tasks/ m	onth			
Human factors not infl	luenced by	risk managen	nent							
Description of the task	Populati	on exposed	Breathing rat	Breathing rate		Exposed body part		Corresponding skin area [cm²]		
Preparation of lime milk (loading, filling and refilling)	adult		1.25 m³/hr		Half of both hands			430 (RIVM report 320104007)		
Dropwise application of lime milk to water	adult		NR		Hands			860 (RIVM report 320104007)		
Other given operationa	al condition	ns affecting co	onsumers expo	osure						
Description of the task	٢	Indoor/outdo	or	Room vo	lume		Air	exchange rate		
Preparation of lime milk filling and refilling)	(loading,	Indoor/outdoo	r	1 m ³ (pers area arou			0.6 indo	hr ⁻¹ (unspecified room or)		
Dropwise application of to water	lime milk	indoor		NR			NR			
Conditions and measu	ires related	to informatio	n and behaviou	Iral advice	to cons	umers				
Do not get in eyes, on s	kin, or on cl	othing. Do not l	preathe dust							
Keep container closed a	and out of re	ach of children								
Use only with adequate	ventilation.									
In case of contact with e	eyes, rinse in	mmediately with	n plenty of water	r and seek n	nedical a	advice.				
Wash thoroughly after h	andling.									
Do not mix with acids an	nd always a	dd limes to wat	er and not wate	r to limes.						
Conditions and measu	ires related	to personal p	rotection and h	nygiene						
Wear suitable gloves, ge	oggles and	protective cloth	es. Use a filterir	ng half mask	(mask t	Wear suitable gloves, goggles and protective clothes. Use a filtering half mask (mask type FFP2 acc. to EN 149).				
2.2 Control of env	2.2 Control of environmental exposure					EN 149).				
Product characteristics						71		EN 149).		
		tal exposure	e			71		EN 149).		
	s		e					EN 149).		
Product characteristic	s		e 					EN 149).		
Product characteristic Not relevant for exposur	re assessme	ent	e					EN 149).		
Product characteristic Not relevant for exposur Amounts used*	re assessme re assessme	ent	e					EN 149).		
Product characteristic Not relevant for exposur Amounts used* Not relevant for exposur	re assessme re assessme on of use	ent ent	e					EN 149).		
Product characteristic Not relevant for exposur Amounts used* Not relevant for exposur Frequency and duratic	re assessme re assessme on of use re assessme	ent ent						EN 149).		
Product characteristic Not relevant for exposur Amounts used* Not relevant for exposur Frequency and duratic Not relevant for exposur	re assessme re assessme on of use re assessme re assessme rot influenc	ent ent						EN 149).		
Product characteristic Not relevant for exposur Amounts used* Not relevant for exposur Frequency and duratic Not relevant for exposur Environment factors n	re assessme re assessme on of use re assessme re assessme ot influenc lution	ent ent ent ed by risk mai	nagement	<pre>cposure</pre>				EN 149).		
Product characteristic Not relevant for exposur Amounts used* Not relevant for exposur Frequency and duratic Not relevant for exposur Environment factors n Default river flow and dil	re assessme re assessme on of use re assessme re assessme ot influenc lution	ent ent ent ed by risk mai	nagement	kposure				EN 149).		
Product characteristic Not relevant for exposur Amounts used* Not relevant for exposur Frequency and duratic Not relevant for exposur Environment factors n Default river flow and dil Other given operationa Indoor	re assessme on of use re assessme ot influenc lution al condition	ent ent ed by risk man	nagement vironmental ex					EN 149).		
Product characteristic Not relevant for exposur Amounts used* Not relevant for exposur Frequency and duratic Not relevant for exposur Environment factors n Default river flow and dil Other given operational	re assessme re assessme on of use re assessme not influenc lution al condition ures related	ent ent ed by risk mains affecting en	nagement ivironmental ex sewage treatm	ent plant	technia			EN 149).		
Product characteristic Not relevant for exposur Amounts used* Not relevant for exposur Frequency and duratic Not relevant for exposur Environment factors n Default river flow and dil Other given operationa Indoor Conditions and measur Default size of municipa	re assessme re assessme on of use re assessme re assessme lution al condition ures related al sewage sy	ent ent ed by risk man ns affecting en to municipal rstem/treatmen	nagement vironmental existence sewage treatment t plant and sludg	ent plant ge treatment				EN 149).		
Product characteristic Not relevant for exposur Amounts used* Not relevant for exposur Frequency and duratic Not relevant for exposur Environment factors n Default river flow and dil Other given operationa Indoor Conditions and measu Default size of municipa Conditions and measu	re assessme on of use re assessme on of use re assessme not influenc lution al condition ures related al sewage sy ures related	ent ent ed by risk mains affecting en to municipal stem/treatmen to external tr	nagement vironmental existence sewage treatment t plant and sludg	ent plant ge treatment				EN 149).		
Product characteristic Not relevant for exposur Amounts used* Not relevant for exposur Frequency and duratic Not relevant for exposur Environment factors n Default river flow and dil Other given operationa Indoor Conditions and measur Default size of municipa	re assessme on of use re assessme on of use re assessme tot influenc lution al condition ures related al sewage sy ures related re assessme	ent ent ed by risk man ns affecting en to municipal rstem/treatmen to external tr ent	nagement vironmental ex sewage treatment t plant and sludge eatment of was	ent plant ge treatment ste for disp				EN 149).		

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Revision date: November / 2010

Printing Date: June 13, 2013

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 noeffect level) and is given in parentheses below. For inhalation exposure, the RCR is based on the acute DNEL for lime substances of 4 mg/m³ (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 µg/cm² (-)	Qualitative assessment
	large task: 1 μg/cm² (-)	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 µg/m³ (0.003)	Quantitative assessment
	Large task: 120 µg/m³ (0.03)	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	Small task: 1.2 µg/m³ (0.0003)	Quantitative assessment
(granules)	Large task: 12 µg/m³ (0.003)	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 applicatio	n 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.			
Environmental expo	sure				
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.					

prepared in accordance with Annex II of the REACH Regulation EG 1907/2006,

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ES number 9.15: Consumer use of cosmetics containing lime

substances

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Exposure Scenario Format (2) addressing	uses carried out by consumers				
1. Title					
Free short title	Consumer use of cosmetics containing limes				
Systematic title based on use descriptor	SU21, PC39 , ERC8a				
Processes, tasks activities covered	-				
	Human health:				
Assessment Method*	According to Article 14(5) (b) of regulation (EC) 1907/2006 risks to human health need not be considered for substances included in cosmetic products within the scope of Directive 76/768/EC.				
	Environment				
	A qualitative justification assessment is provided.				
2. Operational conditions and risk ma	nagement measures				
ERC 8a Wide dispersive in	ndoor use of processing aids in open systems				
2.1 Control of consumers exposure					
Product characteristic					
Not relevant, as the risk to human health from this	use does not need to be considered.				
Amounts used					
Not relevant, as the risk to human health from this	use does not need to be considered.				
Frequency and duration of use/exposure					
Not relevant, as the risk to human health from this	use does not need to be considered.				
Human factors not influenced by risk managem	nent				
Not relevant, as the risk to human health from this	use does not need to be considered.				
Other given operational conditions affecting co	onsumers exposure				
Not relevant, as the risk to human health from this	use does not need to be considered.				
Conditions and measures related to information	n and behavioural advice to consumers				
Not relevant, as the risk to human health from this	use does not need to be considered.				
Conditions and measures related to personal p	rotection and hygiene				
Not relevant, as the risk to human health from this	use does not need to be considered.				
2.2 Control of environmental exposure	e				
Product characteristics					
Not relevant for exposure assessment					
Amounts used*					
Not relevant for exposure assessment					
Frequency and duration of use					
Not relevant for exposure assessment					
Environment factors not influenced by risk man	nagement				
Default river flow and dilution					
Other given operational conditions affecting en	vironmental exposure				
Indoor					
Conditions and measures related to municipal	sewage treatment plant				
Default size of municipal sewage system/treatmen	t plant and sludge treatment technique				
Conditions and measures related to external tr	reatment of waste for disposal				
Not relevant for exposure assessment					
Conditions and measures related to external re	ecovery of waste				

prepared in accordance with Annex II of the REACH Regulation EG 1907/2006,

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Printing Date: June 13, 2013

Not relevant for exposure assessment

3. Exposure estimation and reference to its source

Human exposure

Human exposure to cosmetics will be addressed by other legislation and therefore need not be addressed under regulation (EC) 1907/2006 according to Article 14(5) (b) of this regulation.

Environmental exposure

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