

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

## Version: 1.0/EN

#### Revision date: September/2010

Printing Date: June/2019

#### **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<sup>-</sup> discharges. The exposure assessment for the aquatic environment only deals with the possible pH changes in STP effluent and surface water related to the OH<sup>-</sup> discharges at the local scale and is performed by assessing the resulting pH impact: the surface water pH should not increase above 9 (In general, most aquatic organisms can tolerate pH values in the range of 6-9).

Risk management measures related to the environment aim to avoid discharging calcium 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 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.



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#### Methodology used for occupational exposure assessment

By definition an exposure scenario (ES) has to describe under which operational conditions (OC) and risk management measure (RMMs) the substance can be handled safely. This is demonstrated if the estimated exposure level is below the respective derived no-effect level (DNEL), which is expressed in the risk characterisation ratio (RCR).

For workers, the repeated dose DNEL for inhalation as well as the acute DNEL for inhalation are based on the respective recommendations of the scientific committee on occupational exposure limits (SCOEL) being 1 mg/m<sup>3</sup> and 4 mg/m<sup>3</sup>, respectively.

In cases where neither measured data nor analogous data are available, 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/m<sup>3</sup> and 4 mg/m<sup>3</sup>, respectively.

For inhalation exposure to powders the data, derived from van Hemmen (van Hemmen, 1992: Agricultural pesticide exposure data bases for risk assessment. Rev Environ Contam Toxicol. 126: 1-85.), has been used to calculate the inhalation exposure. The inhalation exposure for consumers is estimated at 15  $\mu$ g/hr or 0.25  $\mu$ 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  $\mu$ g/hr. To convert these values in mg/m<sup>3</sup> a default value of 1.25 m<sup>3</sup>/hr for the breathing volume under light working conditions will be assumed (van Hemmen, 1992) giving 12  $\mu$ g/m<sup>3</sup> for small tasks and 120  $\mu$ g/m<sup>3</sup> for larger tasks.

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

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



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

			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 Iden	Sector of use category (SU)	Chemical Product	category (PROC)	categor	release category (ERC)
9.1	Manufacture and industrial uses of aqueous solutions of lime substances	x	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	5, 6, 7, 8,	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	x	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	5, 6, 7, 8,	1, 2, 3, 4, 5, 6a, 6b, 6c, 6d, 7, 12a, 12b, 10a, 10b, 11a, 11b
9.3	Manufacture and industrial uses of medium dusty solids/powders of lime substances	x	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	5, 6, 7, 8,	1, 2, 3, 4, 5, 6a, 6b, 6c, 6d, 7, 12a, 12b, 10a, 10b, 11a, 11b

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			Identified uses		Resultin g life cycle stage	entified Use			Process	Article	Environmental	
ES number	Exposure scenario title	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)
9.4	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	x	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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			Identified uses		Resultin g life cycle stage	tified Use			Process	Article		
ES number	Exposure scenario title	Manufacture	Formulation	End use	Consumer	Service life (for articles)	Linked to Identified Use		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		х	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		Х	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	entifie 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)	Linked to Ident	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		х	21	9b, 9a			8
9.13	Consumer use of CO <sub>2</sub> absorbent in breathing apparatuses				x		x	21	2			8

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	ldentif uses			ed	cycle p stage iii	Process	Article	Environmental				
ES number	Exposure scenario title	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)
9.14	Consumer use of garden lime/fertilizer				x		х	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



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

Exposure Scenario	ד 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, SU15, SU16, SU17, SU18, SU19, SU20, SU23, SU24           PC1, PC2, PC3, PC7, PC8, PC9a, PC9b, PC11, PC12, PC13, PC14, PC15, PC16, PC17, PC PC19, PC20, PC21, PC23, PC24, PC25, PC26, PC27, PC28, PC29, PC30, PC31, PC32, PC 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								
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							
PROC 10	Roller application or brushing	chemical safety assessment, Chapter R.12: Use descriptor system (ECHA-2010-G-05-EN).							
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								
PROC 18	Greasing at high energy conditions								
PROC 19	Hand-mixing with intimate contact and only PPE available								
ERC 1-7, 12	Manufacture, formulation and all types of industrial uses								
ERC 10, 11	Wide-dispersive outdoor and indoor use of long- life articles and materials								



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2.1 Control of wor	kers exposure											
Product characteristic												
reflected by an assignme ambient temperature the temperature based, takin abrasive tasks are based	approach, the substance- ent of a so-called fugacity of fugacity is based on the d ng into account the process d on the level of abrasion in 1) is assumed to be involve	class in the MEASE tool. For ustiness of that substance is temperature and the melt instead of the substance inf	or operations conducted w whereas in hot metal oper ting point of the substance trinsic emission potential.	ith solid substances at erations, fugacity is . As a third group, high								
PROC	Used in preparation?	Used in preparation? Content in preparation Physical form Emission potential										
PROC 7	not restricted aqueous solution medium											
All other applicable PROCs	not res	not restricted     aqueous solution     very low										
Amounts used												
combination of the scale PROC) is the main deter	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 7		≤ 240 r	minutes									
All other applicable PROCs		480 minutes (	(not restricted)									
Human factors not infl	uenced by risk managem	ent										
The shift breathing volur	ne 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	orkers exposure										
	s are not used in hot-me											
	ot considered relevant for c nd measures at process			processes.								
	sures at the process level	<u> </u>		ource) are generally n								
	nd measures to control o	lispersion from source to	owards the worker									
PROC	Level of separation	Localised controls	Efficiency of LC	Further information								
	Any potentially required	(LC)	(according to MEASE)									
PROC 7	separation of workers from the emission source is indicated above under	local exhaust ventilation	78 %	-								
PROC 19	"Frequency and duration of exposure". A reduction of exposure duration can be	not applicable	na	-								
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 measur	es to prevent /limit releas	ses, dispersion and expo	osure									
Avoid inhalation or inges	tion. General occupational	hygiene measures are rec	quired to ensure a safe har									
eating and smoking at th	good personal and house workplace, the wearing of bes at end of work shift. Do	of standard working clothes		ise stated below.								



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PROC	Specification of respiratory protective equipment (RPE)	RPE efficiency (assigned protection factor, APF)	Specification of gloves	Further personal protective equipment (PPE)						
PROC 7	FFP1 mask	APF=4	Since calcium oxide is classified as irritating to	Eye protection equipment (e.g. goggles or visors) mus be worn, unless potential contact with the eye can be						
All other applicable PROCs Any RPE as defined abo	skin, the use of excluded by the na and type of application of the excluded by the exclude									
For reasons as given about the use of RPE), (ii) have the use of RPE), (ii) have the transmer of the face property of the employer and self-endevices and the manage policy for a respiratory property of the APFs.	er's capability of using tool ove, the worker should the e suitable facial characteris I devices above which rely perly and securely. mployed persons have leg ment of their correct use in rotective device programm. c of different RPE (accordin ronmental exposure	refore be (i) healthy (espec- tics reducing leakages be on a tight face seal will no al responsibilities for the m the workplace. Therefore e including training of the ing to BS EN 529:2005) car	cially in view of medical pro- tween face and mask (in v t provide the required prot naintenance and issue of m , they should define and d workers.	oblems that may affect iew of scars and facial ection unless they fit the espiratory protective ocument a suitable						
	ronmental exposure	;								
Amounts used The daily and annual a exposure.	mount per site (for point	sources) is not consider	ed to be the main deterr	ninant for environmenta						
Frequency and duratio	n of use									
Intermittent (< 12 time pe	er year) or continuous use/	release								
Environment factors no	ot influenced by risk man	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 m <sup>3</sup> /day									
Technical onsite condi	tions and measures to re	duce or limit discharges	, air emissions and relea	ises to soil						
surface water, in case su introduction into open wa waters are minimised (e. This is also reflected in th	ures related to the environn ich discharges are expecte aters is required. In genera g. through neutralisation). he description of standard an be found in the introduc	ed to cause significant pH of I discharges should be car In general most aquatic or OECD tests with aquatic o	changes. Regular control of ried out such that pH char ganisms can tolerate pH v	of the pH value during nges in receiving surface alues in the range of 6-9						
Conditions and measured	res related to waste									



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3. Exposure estima	ation and reference	to its source								
Occupational exposure	1									
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 (den the RCR is based on the DI ate 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 <sup>3</sup> (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, 12, 13, 14, 15, 16, 17, 18, 19	MEASE      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.     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									
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										
emissions Exposure concentration in	receiving water. The pH of easily as often required b Waste water from lime su	of effluents is normally me y national laws. Ibstance production is an i	stance production sites ma asured very frequently and norganic wastewater strea ams from lime substance p	arm and therefore there is						
waste water treatment plant (WWTP)	normally not be treated in		eatment plants (WWTPs), i							
Exposure concentration in aquatic pelagic compartment	When lime substance is e negligible. When lime is r capacity of the water. The general the buffer capaci equilibrium between carb (CO32-).	emitted to surface water, s ejected to surface water, t e higher the buffer capacit ty preventing shifts in acid on dioxide (CO2), the bica	orption to particulate matted he pH may increase, deperty of the water, the lower the ity or alkalinity in natural we arbonate ion (HCO3-) and the	ending on the buffer the effect on pH will be. In raters is regulated by the the carbonate ion						
Exposure concentration in sediments			S, because it is not consic quatic compartment, sorpt							
Exposure concentrations in soil and groundwater	be relevant.		exposure scenario, becaus							
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 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 lime substance largely end up in soil and water.									
Exposure concentration relevant for the food chain (secondary poisoning)	Bioaccumulation in organ poisoning is therefore not		ne substance: a risk asses	sment for secondary						



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**Revision date: September/2010** 

Printing Date: June/2019

#### 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 site as "high dusty".

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

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

#### Environmental exposure

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

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

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

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

Where:

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

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

pH effluent refers to the pH of the effluent

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

Please note that initially, default values can be used:

- Q river upstream flows: use the 10th of existing measurements distribution or use default value of 18000 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 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.



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

#### Version: 1.0/EN

**Revision date: September/2010** 





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

Version: 1.0/EN Revision date: September/2010

Printing Date: June/2019

# 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	SU15, SU16, SU17, SU18, PC1, PC2, PC3, PC7, PC8, PC9a, PC9b, PC11, PC19, PC20, PC21, PC23, PC24, PC25, PC26, PC34, PC35, PC36, PC AC1, AC2, AC3, AC4, AC5, AC6	SU7, SU8, SU9, SU10, SU11, SU12, SU13, SU14, SU19, SU20, SU23, SU24 PC12, PC13, PC14, PC15, PC16, PC17, PC18, PC27, PC28, PC29, PC30, PC31, PC32, PC33, C37, PC38, PC39, PC40 S, AC7, AC8, AC10, AC11, AC13 s are given in Section 2 below)							
Processes, tasks and/or activities covered	Processes, tasks and/or activities cov	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 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								
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							
PROC 9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)	chemical safety assessment, Chapter R.12: Use descriptor system (ECHA-2010-G-05-EN).							
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								
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 22	Potentially closed proc minerals/metals at e										
PROC 23	Open processing and t minerals/metals at e	ransfer operations with									
PROC 24	High (mechanical) energ bound in materia	y work-up of substances ls and/or articles									
PROC 25	Other hot work ope	Other hot work operations with metals									
PROC 26	Handling of solid inorgan tempe	ic substances at ambient trature									
PROC 27a	Production of metal po	wders (hot processes)									
PROC 27b	Production of metal po	wders (wet processes)									
ERC 1-7, 12	industri										
ERC 10, 11	Wide-dispersive outdoor life articles a										
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.											
PROC	Used in preparation?	Content in preparation	Physical form	Emission potential							
PROC 22, 23, 25, 27a	not res	stricted	solid/powder, molten	high							
PROC 24	not res	stricted	solid/powder	high							
All other applicable PROCs	not res	stricted	solid/powder	low							
Amounts used											
combination of the scale	ndled per shift is not con e of operation (industrial minant of the process intrir	vs. Professional) and lev									
Frequency and duration	n of use/exposure										
PROC		Duration o	f exposure								
PROC 22		≤ 240 n	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 <sup>3</sup> /shif	t (8 hours).							
Other given operational conditions affecting workers exposure											
Operational conditions like process temperature and process pressure are not considered relevant for occupational exposure assessment of the conducted processes. In process steps with considerably high temperatures (i.e. PROC 22, 23, 25), the exposure assessment in MEASE is however based on the ratio of process temperature and melting point. As the associated temperatures are expected to vary within the industry the highest ratio was taken as a worst case assumption for the exposure estimation. Thus all process temperatures are automatically covered in this exposure scenario for PROC 22, 23 and PROC 25.											
Technical conditions 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							



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Technical conditions and measures to control dispersion from source towards the worker					
PROC	Level of separation	Localised controls (LC)	Efficiency of LC (according to MEASE)	Further information	
PROC 7, 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 Shower and change clo compressed air.	e good personal and hous the workplace, the wearin thes at end of work shift	ekeeping practices (i.e. reng of standard working c t. Do not wear contamina	equired to ensure a safe ha egular cleaning with suitat lothes and shoes unless ated clothing at home. Do	ole cleaning devices), no otherwise stated below.	
Conditions and measur	res related to personal p		ealth evaluation		
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		Eye protection equipment (e.g. goggles or visors) must	
All other applicable PROCs	not required	na	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.	
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. <b>2.2 Control of environmental exposure</b> <b>Amounts used</b> The daily and annual amount per site (for point sources) is not considered to be the main determinant for environmental exposure.					
Frequency and duration	n of use				
Intermittent (< 12 time per vear) or continuous use/release					

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



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#### 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**

Exposure

sediments

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.

additional safety margins	since the respirable fractio	in being a sub-maction of th			
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)	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				
as emissions of calcium of 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 aquation	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 air 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				
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) Exposure concentration in	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. 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				
aquatic pelagic compartment			ity or alkalinity in natural warbonate ion (HCO3-) and t		

The sediment compartment is not included in this ES, because it is not considered relevant for concentration in calcium oxide: when calcium oxide is emitted to the aquatic compartment, sorption to sediment particles is negligible.



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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 measured data are not a (www.ebrc.de/mease.htr 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".			
DNEL <sub>inhalation</sub> : 1 mg/m <sup>3</sup> (as respirable dust)				
exists at a level of 4 mg/ acute DNEL is therefore	has to be aware of the fact that apart from the long-term DNEL given above, a DNEL for acute effects m <sup>3</sup> . 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-			

acute DNEL is therefore also covered (according to R.14 guidance, acute exposure levels can be derived by multiplying longterm 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

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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 m<sup>3</sup>/day)

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

pH effluent refers to the pH of the effluent

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

Please note that initially, default values can be used:

- Q river upstream flows: use the 10th of existing measurements distribution or use default value of 18000 m<sup>3</sup>/day
- Q effluent: use default value of 2000 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.



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

#### Version: 1.0/EN

**Revision date: September/2010** 





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

Version: 1.0/EN Revision date: September/2010

Printing Date: June/2019

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

Exposure Scenario Format (1) addressing uses carried out 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 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	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				
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 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				
PROC 19	Hand-mixing with intimate contact and only PPE available				
PROC 22	Potentially closed processing operations with minerals/metals at elevated temperature Industrial setting				
PROC 23	Open processing and transfer operations with minerals/metals at elevated temperature				



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Version: 1.0/EN	1224.2		_	
Revision date: Septemb	er/2010		P	rinting Date: June/2019
PROC 24	High (mechanical) energ	y work-up of substances als and/or articles		
PROC 25		erations with metals		
PROC 26		ic substances at ambient erature		
PROC 27a		owders (hot processes)		
PROC 27b	Production of metal po	wders (wet processes)		
ERC 1-7, 12		ation and all types of ial uses		
ERC 10, 11		r and indoor use of long- and materials		
2.1 Control of work				
Product characteristic				
reflected by an assignme ambient temperature the temperature based, takin	ent of a so-called fugacity of fugacity is based on the d ing into account the process	intrinsic emission potential class in the MEASE tool. For ustiness of that substance is temperature and the melt instead of the substance int	or operations conducted w . Whereas in hot metal ope ing point of the substance.	ith solid substances at 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
	not res	stricted	solid/powder	high
PROC 24	1101100			
PROC 24 All other applicable PROCs		stricted	solid/powder	medium
All other applicable		stricted	solid/powder	medium
All other applicable PROCs Amounts used The actual tonnage har combination of the scale PROC) is the main deter	not res ndled per shift is not con e of operation (industrial minant of the process intri	isidered to influence the vs. Professional) and lev	exposure as such for this	s scenario. Instead, the
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	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					
O	exposure.					
Avoid inhalation or ingest These measures involve eating and smoking at t Shower and change clo compressed air.	good personal and hous he workplace, the wearin thes at end of work shift	I hygiene measures are re ekeeping practices (i.e. re ng of standard working c t. Do not wear contamina	equired to ensure a safe ha egular cleaning with suitat lothes and shoes unless ated clothing at home. Do	ble cleaning devices), no otherwise stated below.		
Conditions and measur	es related to personal pr		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, 7, 8a, 8b, 9, 10, 16, 17, 18, 19, 22, 24, 27a	FFP1 mask	APF=4		Eye protection equipment (e.g. goggles or visors) must be worn. unless		
All other applicable PROCs	not required	na	Since calcium oxide is classified as irritating to skin, the use of protective gloves is mandatory for all process steps.	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.		
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.						
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 pe	Intermittent (< 12 time per year) or continuous use/release					
Environment factors no	t influenced by risk man	agement				
Flow rate of receiving sur	face water: 18000 m³/day					
Other given operational	conditions affecting en	vironmental exposure				
Effluent discharge rate: 2	000 m³/day					



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Technical engite conditions and

Technical onsite condit	Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil					
surface water, in case su introduction into open wa waters are minimised (e. This is also reflected in th	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 I	ime should be reused or d	ischarged to the industrial	wastewater and further ne	eutralized if needed.		
3. Exposure estima	ation and reference	to its source				
Occupational exposure						
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 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 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					
effect and risk assessme discharges, being the tox being addressed, includii when applicable, both for local scale. The high wat water. Significant emission emissions or exposure to assessment for the aqua	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:					
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)	roncentration in waste water treatment in ormally 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 WMTPs.					
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			S, because it is not consic aquatic compartment, sor			
Exposure concentrations in soil and groundwater	The terrestrial compartme be relevant.	ent is not included in this e	exposure scenario, becaus	e it is not considered to		



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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.			
	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 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 vailable, the DU may make use of an appropriate scaling tool such as MEASE and) 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".			
DNEL <sub>inhalation</sub> : 1 mg/m <sup>3</sup> (as respirable dust)				
exists at a level of 4 mg/r acute DNEL is therefore term exposure estimates	has to be aware of the fact that apart from the long-term DNEL given above, a DNEL for acute effects m <sup>3</sup> . 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 donly be reduced to half-shift as a risk management measure (leading to an exposure reduction of			



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Printing Date: June/2019

#### **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:

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

Where:

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

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

pH effluent refers to the pH of the effluent

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

Please note that initially, default values can be used:

Q river upstream flows: use the 10th of existing measurements distribution or use default value of 18000 m<sup>3</sup>/day

Eq 1)

- 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.



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

#### Version: 1.0/EN

**Revision date: September/2010** 





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

Version: 1.0/EN Revision date: September/2010

Printing Date: June/2019

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

Exposure Scenario	Format (1) addressing uses carried ou	ut 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 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				
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: U			
PROC 10	Roller application or brushing	descriptor system (ECHA-2010-G-05-EN).			
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				
PROC 19	Hand-mixing with intimate contact and only PPE available				
PROC 22	Potentially closed processing operations with minerals/metals at elevated temperature Industrial setting				
PROC 23	Open processing and transfer operations with minerals/metals at elevated temperature	]			



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Revision date: Septemb	er/2010		Р	rinting Date: June/2019	
PROC 24	High (mechanical) energy work-up of substances bound in materials and/or articles				
PROC 25	Other hot work ope	rations with metals			
PROC 26		ic substances at ambient			
PROC 27a	tempe Production of metal po				
PROC 27b	Production of metal po	wders (wet processes)			
ERC 1-7, 12		ation and all types of	•		
ERC 10, 11	industri Wide-dispersive outdoor life articles a	and indoor use of long-			
2.1 Control of work					
Product characteristic					
reflected by an assignme ambient temperature the temperature based, takin	nt of a so-called fugacity c fugacity is based on the d	lass in the MEASE tool. Foustiness of that substance temperature and the melt	I is one of the main expose or operations conducted w Whereas in hot metal ope ting point of the substance trinsic emission potential.	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		solid/powder, molten	high	
All other applicable PROCs	not res	tricted	solid/powder	high	
Amounts used					
combination of the scale		Professional) and level of	ure as such for this scenal containment/automation (		
Frequency and duration	•				
PROC		Duration o	f exposure		
PROC 7, 8a, 17, 18, 19, 22		≤ 240 r	minutes		
All other applicable PROCs	480 minutes (not restricted)				
	enced by risk managem	ent			
The shift breathing volum	e during all process steps	reflected in the PROCs is	assumed to be 10 m3/shif	t (8 hours).	
Other given operational	conditions affecting wo	rkers exposure			
assessment of the condu exposure assessment in temperatures are expected	cted processes. In process MEASE is however based ed to vary within the indust	s steps with considerably h on the ratio of process ter ry the highest ratio was ta	t considered relevant for c high temperatures (i.e. PR mperature and melting poi ken as a worst case assur xposure scenario for PRO	OC 22, 23, 25), the nt. As the associated nption for the exposure	
Technical conditions an	nd measures at process	level (source) to prevent	release		
Risk management measurequired in the processes		.g. containment or segreg	ation of the emission sour	ce) are generally not	

required in the processes.



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

#### Version: 1.0/EN

Revision date: September/2010

Printing Date: June/2019

PROC 1         Any potentially required separation of workers from the emission source is indicated above under Frequency and duration of exposure.         Interquired separative mitiation         not required general ventilation         not 17 %         -           All other applicable PROCs         Frequency and duration of exposure.         not applicable by the installation of ventilated (positive duration can be achieved, for example, by the installation of ventilated (positive exposure.         not applicable         na         -           All other applicable PROCs         Pressure) contol rooms or by removing the worker from workplaces involved with relevant exposure.         local exhaust ventilation ventilated (positive exposure.         78 %         -           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 deaning 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.         Specification of gloves         Further personal protective equipment (PPE)           PROC 1, 2, 3, 23, 25, 72b         not required         na         Since calcium oxide is mandatory for all protective equipment (PPE)         Eve protection equipment (RPE)         Specification of gloves         Further personal protective equipment (	PROC	Level of separation	Localised controls	Efficiency of LC	Further information	
PROC 7         separation of workers source is indicated above under "Frequency and duration of exposure". A reduction of exposure". A reduction of exposure duration can be achieved, for example, by the installation or by removing the workset provide with relevant exposure.         a		•	(LC)	(according to MEASE)		
PROC 1         from the emission prote is indicate above under Frequency and duration of exposure.' A reduction of exposure duration can be achieved, for example, by the installation of vertilated (positive or by removing the worker from workplaces involved with relevant         del 4 %         -           All other applicable PROCs         A reduction of exposure.' duration can be achieved, for example, by the installation of vertilated (positive or by removing the worker from workplaces involved with relevant         local exhaust ventilation results         78 %         -           Organisational measures to prevent //imit releases, dispersion and exposure         Achieved (relevant)         Iocal exhaust ventilation results         78 %         -           Avoid inhaliton involved with relevant involved in the exposure.         The endition of gover         The endition of govers         The endition of govers           PROC 1, 2, 3, 23, 25, 27b         not required         na         -         Further personal protective equipment (PPE)           PROC 19         FFP2 mask         APF=10 shin, the use change divertive govers is mandatory for the overs is shore below.         Specification of govers is protection of govers is protection of govers is protection of equipment (e.g. protection equipment (e.g. protection equipment (e.g. protection equipment (e.g. protection equipment (e.g. protection (e.e. close and mask (in vev work shuld be relevant protective govers is protection (e.e. close and mask (in vev work shuld be relevant as utabl					-	
PROC 1         source is indicated above under "Frequency and duration of exposure". A reduction of exposure". A reduction of exposure working and services (or example, pressure) control rooms or by removing the exposure.         not applicable         na         -           All other applicable PROCs         by the installation or by removing the exposure.         iccal exhaust ventilation         78 %         -           All other applicable PROCs         by the installation or by removing the exposure.         iccal exhaust ventilation         78 %         -           Organisational measures to prevent limit releases, dispersion and exposure         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 0 work shift. Do not wear contaminated clothing at home. Do not blow dust of with compressed air.           PROC 1, 2, 3, 23, 25, protection respiratory protection fig. 22, 24, 26, 27a         FPrH mask         APF=10         Since calcium oxide is classified as irritiating to equipment (RPE)         Since calcium oxide is classified as irritiating to equipment (RPE)         Since calcium oxide is classified as irritiating to equipment (reg. protection protective equipment (reg. protection protective equipment (reg. protection protective equipment (reg. protection protective equipment (reg. protection protective equipment (reg. protection protective equipment (reg. protection protective equipment (reg. protection protective equion as appropriate equipment (re	PROC 2, 3			17 %	-	
Integration       The grane and its of exposure duration of exposure duration can be achieved, for example, by the installation of exposure duration can be achieved, for example, by the installation of exposure duration can be achieved, for example, by the installation of exposure duration can be achieved, for example, by the installation of exposure duration can be achieved, for example, by the installation of exposure duration can be achieved, for example, by the installation of the substance. These measures involve good personal and housekeeping practices (i.e. required to ensure a safe handling of the substance. These measures involve good personal and housekeeping practices (i.e. required can and with suitable cleaning devices), no eating and smoking at the workplace, the wearing of standard working clothes and shots unless otherwise stated below. The emperiate involve good with the protection, hygiene and health evaluation         PROC       Tesperiation of protective equipment (RPE)       Specification of factor, APF) (PE)       Specification of gloves is madratice (i.e. gloves is and shots unless otherwise stated below. (PE)         PROC 1, 2, 3, 23, 25, not required       not required       na       Interception (PE)       Eye protection equipment (PE)         PROC 1, 2, 3, 24, 26, 27a       FFP1 mask       APF=10       Since calcium oxide is shift. Use of protective equipment (e.g. gloves)       Interception of the protective equipment (e.g. gloves)       Interception of the exploration (i.e. glovegot (i.e. gloves)       Intercepti		source is indicated	ventilation		-	
All other applicable proces       All reduction of exposure duration of exposure duration of exposure duration of exposure by the installation of pressure) control rooms of pressure) control rooms worker from workplaces involved with relevant       Iocal exhaust ventilation       78 %       -         Organisational measures to prevent (limit relevases, 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 dothing at home. Do not blow dust of with compressed air.         Conditions and measures related to personal protection, hygiene and health evaluation       Further personal protective equipment (e.g. goggles or visors) mus potential contact with tis, 22, 24, 26, 27a       FFP2 mask       APF=10         PROC 19       FFP3 mask       APF=4       Since calcium oxids maddatory for ail process steps.       Since valcum oxids is in, the use of protective gloves is maddatory for ail process steps.       Eye protection equipment (e.g. oggles or visors) mus potential contact with tis, 22, 24, 26, 27a       FFP1 mask       APF=4       Since calcium oxids is in, the use of protective gloves is maddatory for ail process steps.       Eye protection evaluade of application (e.e. closed process). Any RPE as defined above shall only be worn if the following principles are implemented in parallet. The duration of exposure and type of application (e.e. closed p	PROC 19		not applicable	na	-	
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 smooting ot the workplace, the wearing of standard working ot thes and shoes unless otherwise stated below.         Shower and change clothes at end of work shift. Do not wear contaminated clothing at home. Do not blow dust off with compressed air.       Conditions and measures related to personal protection, hygiene and health evaluation         PROC       Specification of respiratory protective acuity protective factor, APF)       Specification of gloves       Further personal protection of gloves         PROC 1, 2, 3, 23, 25, not required       na       Eye protection equipment (e.g. gogles or visors) mus be worn, unless         9, 17, 18, PROC 10, 13, 14, 15, FFP1 mask       APF=4       Since calcium oxide is sindard work of a sintilating to skin, the use of protective gloves is madatory for all protective gloves is madatory for all protective gloves is andard work of the output and type of application of work (compare with "duration of exposure" above) should reflect the additional physiological stress for the worker due to the breating to skin, the use of the substance.         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 breating to skin, the use of the protection unless they fit the contours of the face property and securely.         Any RPE as defined above shall on		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	local exhaust ventilation	78 %	-	
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 smooting ot the workplace, the wearing of standard working ot thes and shoes unless otherwise stated below.         Shower and change clothes at end of work shift. Do not wear contaminated clothing at home. Do not blow dust off with compressed air.       Conditions and measures related to personal protection, hygiene and health evaluation         PROC       Specification of respiratory protective acuity protective factor, APF)       Specification of gloves       Further personal protection of gloves         PROC 1, 2, 3, 23, 25, not required       na       Eye protection equipment (e.g. gogles or visors) mus be worn, unless         9, 17, 18, PROC 10, 13, 14, 15, FFP1 mask       APF=4       Since calcium oxide is sindard work of a sintilating to skin, the use of protective gloves is madatory for all protective gloves is madatory for all protective gloves is andard work of the output and type of application of work (compare with "duration of exposure" above) should reflect the additional physiological stress for the worker due to the breating to skin, the use of the substance.         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 breating to skin, the use of the protection unless they fit the contours of the face property and securely.         Any RPE as defined above shall on	Organisational measur	es to prevent /limit releas	ses, dispersion and expo	osure		
PROC         Specification of respiratory protective equipment (RPE)         RPE efficiency (assigned protection factor, APF)         Specification of gloves         Further personal protective equipment (PPE)           PROC 1, 2, 3, 23, 25, 27b         not required         na         Eye protection         Eye protection           9ROC 4, 5, 7, 8a, 8b, 9, 17, 18,         FFP2 mask         APF=10         Since calcium oxide is classified as irritating to skin, the use of protective gloves is mandatory for all process steps.         Since calcium oxide is classified as irritating to be worn, unless         Source (-g.g. gogles or visors) mus be worn, unless           PROC 19         FFP3 mask         APF=20         Since calcium oxide is classified as irritating to protective gloves is mandatory for all process steps.         Since calcium oxide is classified as irritating to be worn as appropriate and type of application (i.e. closed process). Additionally, face protection, protective clothing and safety shoes are required to be worn as appropriate 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), (iii) 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 employeer and self-employeed persons have legal responsibilities for the maintenance and issue of respirat	These measures involve eating and smoking at th Shower and change cloth compressed air.	good personal and house e workplace, the wearing o hes at end of work shift. Do	keeping practices (i.e. region of standard working clother o not wear contaminated c	ular cleaning with suitable s and shoes unless otherw lothing at home. Do not blo	cleaning devices), no vise stated below.	
PROCrespiratory protective equipment (RPE)(assigned protection factor, APF)Specification or glovesprotective equipment (PPE)PROC 1, 2, 3, 23, 25,not requiredna<					Eurther nercenel	
27b       Indicagalised		respiratory protective	(assigned protection		protective equipment	
9, 17, 18,       FFP2 mask       APF=10         PROC 10, 13, 14, 15,       FFP1 mask       APF=4         In f, 22, 24, 26, 27a       FFP1 mask       APF=4         Since calcium oxide is classified as irritating to potential contact with the eye can be excluded by the nature and type of application (i.e. closed process). Additionally, face protective gloves is mandatory for all process steps.       and type of application (i.e. closed process). Additionally, face protective, and safety shoes are required to be worn as appropriate appropriate appropriate for 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 workers.         An overview of the APE's 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 environmenta	27b	not required	na		equipment (e.g.	
16, 22, 24, 26, 27a       FFPT mask       APF=4       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 protective gloves is mandatory for all process steps.       the eye can be excluded by the nature approximate the 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 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 employed persons have legal responsibilities for the maintenance and issue of 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 environmenta	9, 17, 18,	FFP2 mask	APF=10		be worn, unless	
PROC 19       FFP3 mask       APF=20       protective gloves is mandatory for all process steps.       and type of application (i.e. closed process). Additionally, face protection, protective clothing and safety shoes are required to be worn as appropriate dividence 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 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. <b>2.2 Control of environmental exposure Amounts used</b>	PROC 10, 13, 14, 15, 16, 22, 24, 26, 27a	FFP1 mask	APF=4	classified as irritating to	the eye can be	
(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. <b>2.2 Control of environmental exposure Amounts used</b> The daily and annual amount per site (for point sources) is not considered to be the main determinant for environmental enviro	PROC 19			protective gloves is mandatory for all process steps.	Additionally, face protection, protective clothing and safety shoes are required to be worn as appropriate.	
The daily and annual amount per site (for point sources) is not considered to be the main determinant for environmenta	(compare with "duration of resistance and mass of ti 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-en devices and the manage policy for a respiratory pr An overview of the APFs	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 perly and securely. mployed persons have leg ment of their correct use ir rotective device programm of different RPE (accordin	d reflect the additional phy icreased thermal stress by ls and of communicating a refore be (i) healthy (espe- tics reducing leakages be on a tight face seal will no al responsibilities for the m the workplace. Therefore e including training of the ig to BS EN 529:2005) car	siological stress for the work enclosing the head. In ad re reduced during the wea- cially in view of medical pro- tween face and mask (in v t provide the required prot naintenance and issue of re- t, they should define and d workers.	rker due to the breathing dition, it shall be ring of RPE. oblems that may affect iew of scars and facial ection unless they fit the espiratory protective ocument a suitable	
	Amounts used					
	•	mount per site (for point	sources) is not consider	ed to be the main deterr	ninant for environmenta	
		er vear) or continuous use/				

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



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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Printing Date: June/2019

#### 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 m<sup>3</sup>/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/m<sup>3</sup> (as respirable dust) and the respective inhalation exposure estimate derived using MEASE (as inhalable dust). Thus, the RCR includes an additional safety margin since the respirable fraction being a sub-fraction of the inhalable fraction according to EN 481.

PROC	Method used for inhalation exposure assessment	Inhalation exposure estimate (RCR)	Method used for dermal exposure assessment	Dermal exposure estimate (RCR)
PROC 1, 2, 3, 4, 5, 7, 8a, 8b, 9, 10, 13, 14, 15, 16, 17, 18, 19, 22, 23, 24, 25, 26, 27a, 27b	MEASE	<1 mg/m³ (0.01 – 0.96)	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 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	Waste water from calcium oxide production is an inorganic wastewater stream and therefore there is
concentration in	no biological treatment. Therefore, wastewater streams from calcium oxide 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.
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	The sediment compartment is not included in this ES, because it is not considered relevant for
concentration in	calcium oxide: when calcium oxide is emitted to the aquatic compartment, sorption of to sediment
sediments	particles is negligible.



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Printing Date: June/2019

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	3					
met or the downstream u measures are adequate. respective DNEL (given measured data are not a (www.ebrc.de/mease.htr according to the MEASE Method (RDM) are define	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 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".					
DNELinhalation: 1 m	g/m <sup>3</sup> (as respirable dust)					
exists at a level of 4 mg/ acute DNEL is therefore	has to be aware of the fact that apart from the long-term DNEL given above, a DNEL for acute effects m <sup>3</sup> . 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-					

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



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Printing Date: June/2019

#### **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 m<sup>3</sup>/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.



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

#### Version: 1.0/EN

**Revision date: September/2010** 





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

Version: 1.0/EN Revision date: September/2010

Printing Date: June/2019

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

Exposure Scenario	Format (1) address	ing uses carried ou	It by workers				
1. Title							
Free short title	Manufacture and industrial uses of massive objects containing 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 based on the exposure estimation tool MEASE.						
2. Operational con	ditions and risk mar	nagement measures	5				
PROC/ERC	REACH o	REACH definition		Involved tasks			
PROC 6	Calendering	operations	Further information is provided in the ECHA				
PROC 14	Production of prepar tabletting, compression	, , , , , , , , , , , , , , , , , , ,					
PROC 21	Low energy manipulatior materials an						
PROC 22	Potentially closed proc minerals/metals at e Industria	levated temperature					
PROC 23	Open processing and transfer operations with minerals/metals at elevated temperature		Guidance on information requirements and chemical safety assessment, Chapter R.12: Use descriptor system (ECHA-2010-G-05-EN).				
PROC 24	High (mechanical) energy work-up of substances bound in materials and/or articles						
PROC 25	Other hot work operations with metals						
ERC 1-7, 12	Manufacture, formula industri	al uses					
ERC 10, 11	Wide-dispersive outdoor and indoor use of long- life articles and materials						
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 22, 23,25	not res	not restricted		high			
PROC 24	not restricted		massive objects	high			
All other applicable PROCs	not restricted		massive objects	very low			
Amounts used							
combination of the scale	led per shift is not conside of operation (industrial vs. minant of the process intrir	Professional) and level of	ure as such for this scenar containment/automation (	io. Instead, the as reflected in the			


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PROC	Duration of exposure			
PROC 22		≤ 240 r	ninutes	
All other applicable PROCs		480 minutes (	not restricted)	
Human factors not infl	uenced by risk managem	ent		
The shift breathing volur	ne during all process steps	reflected in the PROCs is	assumed to be 10 m <sup>3</sup> /shift	t (8 hours).
Other given operationa	al conditions affecting wo	orkers exposure		
exposure assessment ir temperatures are expec estimation. Thus all proc Technical conditions a	ucted processes. In proces MEASE is however based ted to vary within the industriess temperatures are auto and measures at process sures at the process level	I on the ratio of process ter try the highest ratio was ta matically covered in this e level (source) to prevent	mperature and melting poin ken as a worst case assur xposure scenario for PROC release	nt. As the associated nption for the exposure C 22, 23 and PROC 25.
	s. Ind measures to control c	lispersion from source to	owards the worker	
PROC	Level of separation	Localised controls (LC)	Efficiency of LC (according to MEASE)	Further information
PROC 6, 14, 21	Any potentially required separation of workers	not required	na	-
PROC 22, 23, 24, 25	from the emission source is indicated above under "Frequency and duration of exposure". A reduction of exposure duration can be achieved, for example, by the installation of ventilated (positive pressure) control rooms or by removing the worker from workplaces involved with relevant exposure.	local exhaust ventilation	78 %	-
Organisational measu	es to prevent /limit releas	ses, dispersion and expo	osure	
Avoid inhalation or inges These measures involve eating and smoking at th	tion. General occupational good personal and house he workplace, the wearing of hes at end of work shift. Do	hygiene measures are rec keeping practices (i.e. regu of standard working clothes	quired to ensure a safe har ular cleaning with suitable s and shoes unless otherw	cleaning devices), no ise stated below.

compressed air.



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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	
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.	
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 breathin resistance and mass of the RPE itself, due to the increased thermal stress by enclosing the head. In addition, it shall be considered that the worker's capability of using tools and of communicating are reduced during the wearing of RPE. For reasons as given above, the worker should therefore be (i) healthy (especially in view of medical problems that may affect the use of RPE), (ii) have suitable facial characteristics reducing leakages between face and mask (in view of scars and facial hair). The recommended devices above which rely on a tight face seal will not provide the required protection unless they fit the contours of the face properly and securely. The employer and self-employed persons have legal responsibilities for the maintenance and issue of respiratory protective devices and the management of their correct use in the workplace. Therefore, they should define and document a suitable policy for a respiratory protective device programme including training of the workers. An overview of the APFs of different RPE (according to BS EN 529:2005) can be found in the glossary of MEASE.					
2.2 Control of envi	ronmental 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	Frequency and duration of use				
Intermittent (< 12 time pe	Intermittent (< 12 time per year) or continuous use/release				
Environment factors no	ot influenced by risk man	agement			
Flow rate of receiving sur	rface water: 18000 m³/day				
Other given operationa	Other given operational conditions affecting environmental exposure				
Effluent discharge rate: 2	Effluent discharge rate: 2000 m³/day				
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil					
surface water, in case su introduction into open wa waters are minimised (e. This is also reflected in th	tisk management measures related to the environment aim to avoid discharging lime solutions into municipal wastewater or to urface water, in case such discharges are expected to cause significant pH changes. Regular control of the pH value during ntroduction into open waters is required. In general discharges should be carried out such that pH changes in receiving surface vaters are minimised (e.g. through neutralisation). In general most aquatic organisms can tolerate pH values in the range of 6- his is also reflected in the description of standard OECD tests with aquatic organisms. The justification for this risk nanagement measure can be found in the introduction section.				
Conditions and measur	res related to waste				
Solid industrial waste of I	ime should be reused or d	ischarged 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 refir demonstrate a safe use. dust) and the respective	ed exposure estimate and For inhalation exposure, th inhalation exposure estima	I the respective DNEL (den the RCR is based on the DI ate 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 <sup>3</sup> (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 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			
effect and risk assessme discharges, being the tox being addressed, includir when applicable, both for local scale. The high wat water. Significant emission emissions or exposure to assessment for the aqua related to the OH- dischar	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.			
emissions Exposure concentration in waste water treatment	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. 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			
plant (WWTP) Exposure concentration in aquatic pelagic compartment	control of acid wastewater streams that are treated in biological WWTPs. 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 organ poisoning is therefore no		lcium oxide: a risk assessr	ment for secondary



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

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

### Environmental exposure

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

**Tier 1**: retrieve information on effluent pH and the contribution of the 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 m<sup>3</sup>/day)

pH effluent refers to the pH of the effluent

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

Please note that initially, default values can be used:

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

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

**Tier 2b**: Equation 1 can be used to identify which effluent pH causes an acceptable pH level in the receiving body. In order to do so, pH of the river is set at value 9 and pH of the effluent is calculated accordingly (using default values as reported previously, if necessary). As temperature influences lime solubility, pH effluent might require to be adjusted on a case-by-case basis. Once the maximum admissible pH value in the effluent is established, it is assumed that the OH- 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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prepared in accordance with Annex II of the REACH Regulation EC 1907/2006, Regulation (EC) 1272/2008 and Regulation (EC) 453/2010

Version: 1.0/EN

**Revision date: September/2010** 

Printing Date: June/2019

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

Exposure Scenario	Format (1) addressing uses carried ou	it by workers
1. Title		
Free short title	Professional uses of aqueous	s solutions of lime substances
	SU23,	1, SU12, SU13, SU16, SU17, SU18, SU19, SU20, SU24
Systematic title based on use descriptor	PC19, PC20, PC21, PC23, PC24, PC25, PC26, PC34, PC35, PC36, AC1, AC2, AC3, AC4, AC5, AC6	PC12, PC13, PC14, PC15, PC16, PC17, PC18, PC27, PC28, PC29, PC30, PC31, PC32, PC33, PC37, PC39, PC40 6, AC7, AC8, AC10, AC11, AC13 s are given in Section 2 below)
Processes, tasks and/or activities covered		ered are described in Section 2 below.
Assessment Method	The assessment of inhalation exposure is base environmental assessment i	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 12	Use of blowing agents in manufacture of foam	
PROC 13	Treatment of articles by dipping and pouring	
PROC 15	Use as laboratory reagent	
PROC 16	Using material as fuel sources, limited exposure to unburned product to be expected	
PROC 17	Lubrication at high energy conditions and in partly open process	
PROC 18	Greasing at high energy conditions	
PROC 19	Hand-mixing with intimate contact and only PPE available	
ERC2, ERC8a, ERC8b, ERC8c, ERC8d, ERC8e, ERC8f	Wide dispersive indoor and outdoor use of reactive substances or processing aids in open systems	Calcium oxide is applied in numerous cases of wide dispersive uses: agricultural, forestry, fish and shrimps farming, soil treatment and environmental protection.



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2.1 Control of 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 istead of the substance int	I is one of the main exposu or operations conducted w . Whereas in hot metal ope ting point of the substance trinsic emission potential. T	ith solid substances at erations, fugacity is . As a third group, high
PROC	Use in preparation	Content in preparation	Physical form	Emission potential
All applicable PROCs	not res	stricted	aqueous solution	very low
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	≤ 240 minutes			
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 <sup>3</sup> /shift	t (8 hours).
Other given operational	I conditions affecting wo	rkers exposure		
			rational conditions (e.g. p essment of the conducted	
Technical conditions ar	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 no
Technical conditions ar	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 19	Separation of workers from the emission source is generally not	not applicable	na	-
All other applicable PROCs	required in the conducted processes.	not required	na	-
Organisational measure	es to prevent /limit releas	ses, dispersion and expo	osure	
These measures involve eating and smoking at the	good personal and housel e workplace, the wearing c	keeping practices (i.e. regu	quired to ensure a safe har ular cleaning with suitable s and shoes unless otherw lothing at home. Do not blo	cleaning devices), no ise stated below.



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PROC	Specification of	RPE efficiency		
	respiratory protective equipment (RPE)	(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 be worn, unless
PROC 17	FFP1 mask	APF=4	Since calcium oxide is classified as irritating to skin, the use of protective gloves is mandatory for all	potential contact with the eye can be excluded by the nature and type of application (i.e. closed process).
All other applicable PROCs	not required	na	process steps.	Additionally, face protection, protective clothing and safety shoes are required to be worn as appropriate.
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. <b>2.2 Control of environmental exposure – only relevant for agricultural soil protection</b> <b>Product characteristics</b>				
Jnit: 1% (very worst-cas	per 120 100 80 60 40 20 0 1	tity of dust m3 (in mg) 3 7 11	Wind speed: - 3.5 m/s - 6 m/s - 3.5 m/s J5 20 Distance from spreader(in m	the



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Amounts used				
CaO	1,700 kg/ha			
Frequency and duration	of use			
1 day/year (one applicatio 1,700 kg/ha CaO is not exc	n per year); Multiple applications during the year are allowed, provided the total yearly amount of ceeded			
	influenced by risk management			
Volume of surface water: 3 Field surface area: 1 ha	00 L/m <sup>2</sup>			
Other given operational of	conditions affecting environmental exposure			
Outdoor use of products Soil mixing depth: 20 cm				
Technical conditions and	I measures at process level (source) to prevent release			
There are no direct release	es to adjacent surface waters.			
Technical conditions and	I measures to reduce or limit discharges, air emissions and releases to soil			
Drift should be minimised.				
Organizational measures	to prevent/limit release from site			
	ts for good agricultural practice, agricultural soil should be analysed prior to application of lime and be adjusted according to the results of the analysis.			
2.2 Control of enviro	onmental exposure – only relevant for urban soil treatment			
Product characteristics				
	Quantity of dust per m3 (in mg) Wind speed: - 3.5 m/s - 6 m/s - 3.5 m/s - 3.5 m/s - 3.5 m/s Distance from the spreader (in m) (Figure taken from: Laudet, A. et al., 1999)			
Amounts used				
CaO	180,000 kg/ha			
Frequency and duration	of use			
1 day/year and only once 180,000 kg/ha (CaO) is not	1 day/year and only once in a lifetime; Multiple applications during the year are allowed, provided the total yearly amount of 180,000 kg/ha (CaO) is not exceeded			
	Environment factors not influenced by risk management			
Field surface area: 1 ha				



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Other given operationa	I conditions affecting en	vironmental exposure		
Outdoor use of products Soil mixing depth: 20 cm				
Technical conditions a	nd measures at process	level (source) to prevent	release	
Lime is only applied onto surface waters.	o the soil in the technosph	ere zone before road con	struction. There are no di	rect releases to adjacent
Technical onsite condit	tions and measures to re	duce or limit discharges	, air emissions and relea	ses to soil
Drift should be minimised	1.			
3. Exposure estimation	ation and reference	to its source		
Occupational exposure				
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/m <sup>3</sup> (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)	Since calcium oxide is of skin, dermal exposure ha as technically feasible. A has not been derived. The not assessed in this	as to be minimised as far DNEL for dermal effects hus, dermal exposure is
Environmental exposur	re for agricultural soil pro	otection		
surface water and sedim more appropriate for agri modelling. FOCUS is a m German EXPOSIT 1.0 m	the calculation of predicted environmental concentration values (PEC) of plant protection products for soil, ground water, frace water and sediment (Kloskowksi et al., 1999). The FOCUS/EXPOSIT modelling tool is preferred to the EUSES as it is or appropriate for agricultural-like application as in this case where parameter as the drift needs to be included in the odelling. FOCUS is a model typically developed for biocidal applications and was further elaborated on the basis of the erman EXPOSIT 1.0 model, where parameters such as drifts can be improved according to collected data: once applied on a soil, calcium oxide can indeed migrate then towards surface waters, via drift.			
emissions	See amounts used			
Exposure concentration in waste water treatment plant (WWTP)	Not relevant for agricultu	al soil protection		
Exposure concentration in	Substance	PEC (ug/L)	PNEC (ug/L)	RCR
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	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 <sup>-5</sup> Pa.			
Exposure concentration relevant for the food chain (secondary poisoning)		uses covered do not signifi	an be considered to be om cantly influence the distrib	



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

### Version: 1.0/EN

**Revision date: September/2010** 

Printing Date: June/2019

### 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 included 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.

milere parametere eaem	a anne ean be imprered e	loooraing to concetted data.			
Environmental emissions	See amounts used				
Exposure concentration in waste water treatment plant (WWTP)	Not relevant for road bord	Not relevant for road border scenario			
Exposure concentration in aquatic pelagic compartment	Not relevant for road bord	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 volatile. The vapour pressures is below 10 <sup>-5</sup> Pa.				
Exposure concentration relevant for the food chain (secondary poisoning)	This point is not relevant because calcium can be considered to be omnipresent and essential in the environment. The uses covered do not significantly influence the distribution of the constituents (Ca <sup>2+</sup> and OH <sup>-</sup> ) in the environment.				
Environmental exposu	Environmental exposure for other uses				
<ul> <li>For all other uses, no quantitative environmental exposure assessment is carried because</li> <li>The operational conditions and risk management measures are less stringent than those outlined for agricultural soil protection or urban soil treatment</li> <li>Lime is an ingredient and chemically bound into a matrix. Releases are negligible and insufficient to cause a pH-shift in active unstances are protected.</li> </ul>					

• Line is an ingredient and chemically bound into a matrix. Releases are negligible and insufficient to cause a ph-smit 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.



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

### Version: 1.0/EN

Revision date: September/2010

Printing Date: June/2019

### 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 ≥10 % are defined as "high dusty".

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

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



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

Version: 1.0/EN

Printing Date: June/2019

# 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 se	olids/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	ered are described in Section 2 below.		
Assessment Method		d on the exposure estimation tool MEASE. The s based 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)			
PROC 10	Roller application or brushing	Further information is provided in the ECHA Guidance on information requirements and		
PROC 11	Non industrial spraying	chemical safety assessment, Chapter R.12: Use		
PROC 13	Treatment of articles by dipping and pouring	descriptor system (ECHA-2010-G-05-EN).		
PROC 15	Use as laboratory reagent			
PROC 16	Using material as fuel sources, limited exposure to unburned product to be expected			
PROC 17	Lubrication at high energy conditions and in partly open process			
PROC 18	Greasing at high energy conditions			
PROC 19	Hand-mixing with intimate contact and only PPE available			
PROC 21	Low energy manipulation of substances bound in materials and/or articles			
PROC 25	Other hot work operations with metals			
PROC 26	Handling of solid inorganic substances at ambient temperature			
ERC2, ERC8a, ERC8b, ERC8c, ERC8d,	Wide dispersive indoor and outdoor use of reactive substances or processing aids in open			



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ERC8e, ERC8f	syst	systems				
2.1 Control of worl	kers exposure		1			
Product characteristic						
reflected by an assignme ambient temperature the temperature based, takir	ent 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 mel	I is one of the main expose for 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	low		
Amounts used						
combination of the scale		professional) and level of	sure as such for this scenal containment/automation (a			
Frequency and duratio	n of use/exposure					
PROC		Duration of	of exposure			
PROC 17		≤ 240 ו	minutes			
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	s assumed to be 10 m³/shif	t (8 hours).		
Other given operationa	I conditions affecting wo	rkers exposure				
assessment of the conduction exposure assessment in temperatures are expect	Acted processes. In proces MEASE is however based ed to vary within the indust	e process temperature and process pressure are not considered relevant for occupational exposure cted processes. In process steps with considerably high temperatures (i.e. PROC 22, 23, 25), the MEASE is however based on the ratio of process temperature and melting point. As the associated at to vary within the industry the highest ratio was taken as a worst case assumption for the exposure ass temperatures are automatically covered in this exposure scenario for PROC 22, 23 and PROC 25.				
Technical conditions a	nd measures at process	level (source) to prevent	t release			
Risk management meas required in the processes		e.g. containment or segreg	pation of the emission sour	ce) are generally not		
Technical conditions a	nd measures to control d	lispersion from source t	owards the worker			
PROC	Level of separation	Localised controls (LC)	Efficiency of LC (according to MEASE)	Further information		
PROC 19	Any potentially required separation of workers from the emission source is indicated above under "Frequency and duration of exposure".	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.	not required	na	-		



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

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

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

Any RPE as defined above shall only be worn if the following principles are implemented in parallel: The duration of work (compare with "duration of exposure" above) should reflect the additional physiological stress for the worker due to the breathing resistance and mass of the RPE itself, due to the increased thermal stress by enclosing the head. In addition, it shall be considered that the worker's capability of using tools and of communicating are reduced during the wearing of RPE. For reasons as given above, the worker should therefore be (i) healthy (especially in view of medical problems that may affect the use of RPE), (ii) have suitable facial characteristics reducing leakages between face and mask (in view of scars and facial hair). The recommended devices above which rely on a tight face seal will not provide the required protection unless they fit the contours of the face properly and securely.

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

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

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

**Product characteristics** 

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





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Amounts used			
CaO	1,700 kg/ha		
Frequency and duration	n of use		
1 day/year (one application kg/ha is not exceeded (Contemporation )	on per year) Multiple applications during the year are allowed, provided the total yearly amount of 1,700 aO)		
	t influenced by risk management		
Volume of surface water: Field surface area: 1 ha	300 L/m <sup>2</sup>		
Other given operational	conditions affecting environmental exposure		
Outdoor use of products Soil mixing depth: 20 cm			
Technical conditions an	nd measures at process level (source) to prevent release		
There are no direct release	ses to adjacent surface waters.		
Technical conditions ar	nd measures to reduce or limit discharges, air emissions and releases to soil		
Drift should be minimised	l.		
Organizational measure	es to prevent/limit release from site		
	ints for good agricultural practice, agricultural soil should be analysed prior to application of lime and d be adjusted according to the results of the analysis.		
2.2 Control of envir	ronmental exposure – only relevant for urban soil treatment		
Product characteristics			
	Quantity of dust per m3 (in mg) Wind speed: - 3.5 m/s - 6 m/s - 3.5 m/s - 3.5 m/s - 3.5 m/s - 3.5 m/s - 0 Distance from the spreader (in m) (Figure taken from: Laudet, A. et al., 1999)		
Amounts used			
CaO	180,000 kg/ha		
Frequency and duration	n of use		
1 day/year and only onc 180,000 kg/ha is not exce	e in a lifetime. Multiple applications during the year are allowed, provided the total yearly amount of eeded (CaO)		
Environment factors not influenced by risk management			
Field surface area: 1 ha			



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Other given operationa	Other given operational conditions affecting environmental exposure				
Outdoor use of products Soil mixing depth: 20 cm					
Technical conditions a	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 condit	ions and measures to re	duce or limit discharges	, air emissions and relea	ses to soil	
Drift should be minimised	1.				
3. Exposure estimation	ation and reference	to its source			
Occupational exposure	H. Contraction of the second se				
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 (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 <sup>3</sup> (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 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 sedim more appropriate for agri modelling. FOCUS is a n German EXPOSIT 1.0 m	ent (Kloskowksi et al., 199 cultural-like application as nodel typically developed fr odel, where parameters su n indeed migrate then tow	<ol> <li>The FOCUS/EXPOSIT in this case where parameter or biocidal applications and uch as drifts can be improvided.</li> </ol>	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.	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 concentration in	Substance	PEC (ug/L)	PNEC (ug/L)	RCR	
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	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 <sup>-5</sup> Pa.				
Exposure concentration relevant for the food chain (secondary poisoning)		overed do not significantly	considered to be omniprese influence the distribution o		



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

### Version: 1.0/EN

**Revision date: September/2010** 

Printing Date: June/2019

### 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 included 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.

milere parametere each	ao anne oan bo improvoa o	addining to bollooto a 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 bord	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 vola	tile. 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 <sup>2+</sup> and OH <sup>-</sup> ) in the environment.				
Environmental exposure for other uses					
<ul> <li>For all other uses, no quantitative environmental exposure assessment is carried because</li> <li>The operational conditions and risk management measures are less stringent than those outlined for agricultural soil protection or urban soil treatment</li> <li>Lime is an ingredient and chemically bound into a matrix. Releases are negligible and insufficient to cause a pH-shift</li> </ul>					

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.



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

### Version: 1.0/EN

**Revision date: September/2010** 

Printing Date: June/2019

### 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 ≥10 % are defined as "high dusty".

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

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



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

Version: 1.0/EN Revision date: September/2010

Printing Date: June/2019

# 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	ered are described in Section 2 below.			
Assessment Method		d on the exposure estimation tool MEASE. The s based 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 FOUA			
PROC 10	Roller application or brushing	Further information is provided in the ECHA Guidance on information requirements and			
PROC 11	Non industrial spraying	chemical safety assessment, Chapter R.12: Use descriptor system (ECHA-2010-G-05-EN).			
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				
PROC 26	Handling of solid inorganic substances at ambient temperature				
ERC2, ERC8a, ERC8b, ERC8c, ERC8d, ERC8e, ERC8f	Wide dispersive indoor and outdoor use of reactive substances or processing aids in open systems				



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

### Version: 1.0/EN

**Revision date: September/2010** 

2.1 Control of work	2.1 Control of workers 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	lass in the MEASE tool. For ustiness of that substance	l is one of the main exposu 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				
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 m <sup>3</sup> /shift	: (8 hours).		
Other given operationa	I conditions affecting wo	rkers exposure				
assessment of the condu exposure assessment in temperatures are expected	Operational conditions like process temperature and process pressure are not considered relevant for occupational exposure assessment of the conducted processes. In process steps with considerably high temperatures (i.e. PROC 22, 23, 25), the exposure assessment in MEASE is however based on the ratio of process temperature and melting point. As the associated temperatures are expected to vary within the industry the highest ratio was taken as a worst case assumption for the exposure estimation. Thus all process temperatures are automatically covered in this exposure scenario for PROC 22, 23 and PROC 25.					
Technical conditions 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	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 from the emission	generic local exhaust ventilation	72 %	-		
PROC 17, 18	source is indicated above under	integrated local exhaust ventilation	87 %	-		
PROC 19	"Frequency and duration of exposure". A reduction of exposure	not applicable	na	-		
All other applicable PROCs	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	-		



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

### Version: 1.0/EN

Revision date: September/2010

Printing Date: June/2019

#### 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	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 2, 3, 16, 19	FFP1 mask	APF=4		Eye protection equipment (e.g.	
PROC 4, 5, 8a, 8b, 9, 10, 13, 17, 18, 25, 26	FFP2 mask	APF=10	Since calcium oxide is	goggles or visors) must be worn, unless	
PROC 11	FFP1 mask	APF=10		potential contact with	
PROC 15	not required	na	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.	

Any RPE as defined above shall only be worn if the following principles are implemented in parallel: The duration of work (compare with "duration of exposure" above) should reflect the additional physiological stress for the worker due to the breathing resistance and mass of the RPE itself, due to the increased thermal stress by enclosing the head. In addition, it shall be considered that the worker's capability of using tools and of communicating are reduced during the wearing of RPE. For reasons as given above, the worker should therefore be (i) healthy (especially in view of medical problems that may affect the use of RPE), (ii) have suitable facial characteristics reducing leakages between face and mask (in view of scars and facial hair). The recommended devices above which rely on a tight face seal will not provide the required protection unless they fit the contours of the face properly and securely.

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

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

2.2 Control of environmental exposure - only relevant for agricultural soil protection

### **Product characteristics**

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





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Amounts used	
CaO	1,700 kg/ha
Frequency and duration of use	
1 day/year (one application per year) Multiple appli kg/ha is not exceeded (CaO)	cations during the year are allowed, provided the total yearly amount of 1,700
Environment factors not influenced by risk mar	lagement
Volume of surface water: 300 L/m <sup>2</sup> Field surface area: 1 ha	
Other given operational conditions affecting en	vironmental 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 wa	aters.
Technical conditions and measures to reduce of	or limit discharges, air emissions and releases to soil
Drift should be minimised.	
Organizational measures to prevent/limit releas	e from site
In line with the requirements for good agricultural p the application rate should be adjusted according to	ractice, agricultural soil should be analysed prior to application of lime and o the results of the analysis.
2.2 Control of environmental exposure	e – only relevant for urban soil treatment
Product characteristics	
per 120 100 80 60 40 20 0 1	tity of dust m3 (in mg) Wind speed: - 3.5 m/s - 6 m/s - 3.5 m/s 3 7 11 15 20 Distance from the spreader(in m) ken from: Laudet, A. et al., 1999)
Amounts used	
CaO	180,000 kg/ha
Frequency and duration of use	
1 day/year and only once in a lifetime. Multiple a 180,000 kg/ha is not exceeded (CaO)	pplications during the year are allowed, provided the total yearly amount of
Environment factors not influenced by risk mar	agement
Field surface area: 1 ha	



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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Other given operationa	I conditions affecting en	vironmental exposure			
Outdoor use of products Soil mixing depth: 20 cm	Dutdoor use of products				
Technical conditions a	nd measures at process	level (source) to prevent	release		
Lime is only applied onto surface waters.	Lime is only applied onto the soil in the technosphere zone before road construction. There are no direct releases to adjacent surface waters.				
Technical onsite condit	tions and measures to re	duce or limit discharges	, air emissions and relea	ses to soil	
Drift should be minimised	1.				
3. Exposure estimation	ation and reference	to its source			
Occupational exposure	•				
is the quotient of the refir demonstrate a safe use. dust) and the respective	ned exposure estimate and For inhalation exposure, th inhalation exposure estimation	I the respective DNEL (den the RCR is based on the DI ate 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 <sup>3</sup> (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)	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	re for agricultural soil pro	otection			
more appropriate for agri modelling. FOCUS is a m German EXPOSIT 1.0 m	cultural-like application as nodel typically developed f	in this case where parame or biocidal applications and uch as drifts can be improv	modelling tool is preferred eter as the drift needs to be d was further elaborated or red according to collected or rift.	e included in the n the basis of the	
Exposure concentration in waste water treatment plant (WWTP)	Not relevant for agricultural soil protection				
Exposure concentration in	Substance	PEC (ug/L)	PNEC (ug/L)	RCR	
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	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 <sup>-5</sup> Pa.			
Exposure concentration relevant for the food chain (secondary poisoning)	environment. The uses c	This point is not relevant because calcium can be considered to be omnipresent and essential in the environment. The uses covered do not significantly influence the distribution of the constituents (Ca <sup>2+</sup> and OH) in the environment.			



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

### Version: 1.0/EN

**Revision date: September/2010** 

Printing Date: June/2019

### 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.

milere parametere each	and can be improved o				
Environmental emissions	See amounts used	See amounts used			
Exposure concentration in waste water treatment plant (WWTP)	Not relevant for road bord	Not relevant for road border scenario			
Exposure concentration in aquatic pelagic compartment	Not relevant for road bord	Not relevant for road border scenario			
Exposure concentration in sediments	Not relevant for road bord	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 volatile. The vapour pressures is below 10 <sup>-5</sup> Pa.				
Exposure concentration relevant for the food chain (secondary poisoning)	This point is not relevant because calcium can be considered to be omnipresent and essential in the environment. The uses covered do not significantly influence the distribution of the constituents (Ca <sup>2+</sup> and OH <sup>-</sup> ) in the environment.				
Environmental exposure for other uses					
<ul> <li>For all other uses, no quantitative environmental exposure assessment is carried because</li> <li>The operational conditions and risk management measures are less stringent than those outlined for agricultural soil protection or urban soil treatment</li> <li>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</li> </ul>					

Line is specifically used to release CO2-free breathable air, upon reaction with CO2. Such applications only relates to the air compartment, where the line properties are exploited

• Neutralisation/pH-shift is the intended use and there are no additional impacts beyond those desired.



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

### Version: 1.0/EN

**Revision date: September/2010** 

Printing Date: June/2019

### 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 with a dustiness less than 10 % (RDM) are defined as "medium dusty".

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

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



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

Version: 1.0/EN Revision date: September/2010

Printing Date: June/2019

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

Exposure Scenario	Format (1) addressing uses carried ou	ut by workers			
1. Title					
Free short title	Professional uses of high dusty s	olids/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		ered are described in Section 2 below.			
Assessment Method		ed on the exposure estimation tool MEASE. The is based 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 FOUA			
PROC 10	Roller application or brushing	Further information is provided in the ECHA Guidance on information requirements and			
PROC 11	Non industrial spraying	chemical safety assessment, Chapter R.12: Use descriptor system (ECHA-2010-G-05-EN).			
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				
PROC 26	Handling of solid inorganic substances at ambient temperature				
ERC2, ERC8a, ERC8b, ERC8c, ERC8d, ERC8e, ERC8f	Wide dispersive indoor and outdoor use of reactive substances or processing aids in open systems				



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2.1 Control of work	2.1 Control of workers 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	Use in preparation	Content in preparation	Physical form	Emission potential			
All applicable PROCs	not res	stricted	solid/powder	high			
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 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	lenced by risk managem	ent					
The shift breathing volum	ne during all process steps	reflected in the PROCs is	assumed to be 10 m <sup>3</sup> /shift	t (8 hours).			
Other given operationa	I conditions affecting wo	rkers exposure					
assessment of the condu exposure assessment in temperatures are expected	Operational conditions like process temperature and process pressure are not considered relevant for occupational exposure assessment of the conducted processes. In process steps with considerably high temperatures (i.e. PROC 22, 23, 25), the exposure assessment in MEASE is however based on the ratio of process temperature and melting point. As the associated temperatures are expected to vary within the industry the highest ratio was taken as a worst case assumption for the exposure estimation. Thus all process temperatures are automatically covered in this exposure scenario for PROC 22, 23 and PROC 25.						
	nd measures at process						
Risk management measurequired in the processes		e.g. containment or segreg	ation of the emission sour	ce) are generally not			
Technical conditions a	nd measures to control c	lispersion 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 from the emission	generic local exhaust ventilation	72 %	-			
PROC 17, 18	source is indicated above under "Frequency and	integrated local exhaust ventilation	87 %	-			
PROC 19	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	-			



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

### Version: 1.0/EN

Revision date: September/2010

Printing Date: June/2019

#### 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	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 9, 26	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	
PROC 11, 17, 18, 19	FFP3 mask	APF=20			
PROC 25	FFP2 mask	APF=10			
All other applicable PROCs	FFP2 mask	APF=10	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.	

Any RPE as defined above shall only be worn if the following principles are implemented in parallel: The duration of work (compare with "duration of exposure" above) should reflect the additional physiological stress for the worker due to the breathing resistance and mass of the RPE itself, due to the increased thermal stress by enclosing the head. In addition, it shall be considered that the worker's capability of using tools and of communicating are reduced during the wearing of RPE. For reasons as given above, the worker should therefore be (i) healthy (especially in view of medical problems that may affect the use of RPE), (ii) have suitable facial characteristics reducing leakages between face and mask (in view of scars and facial hair). The recommended devices above which rely on a tight face seal will not provide the required protection unless they fit the contours of the face properly and securely.

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

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

2.2 Control of environmental exposure - only relevant for agricultural soil protection

### **Product characteristics**

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





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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Amounts used					
CaO	1,700 kg/ha				
Frequency and duration	n of use				
1 day/year (one applicati 1,700 kg/ha is not exceed	ion per year). Multiple applications during the year are allowed, provided the total yearly amount of ded (CaO)				
	t influenced by risk management				
Volume of surface water: Field surface area: 1 ha	300 L/m2				
Other given operational	conditions affecting environmental exposure				
Outdoor use of products Soil mixing depth: 20 cm					
Technical conditions an	nd measures at process level (source) to prevent release				
There are no direct release	ses to adjacent surface waters.				
Technical conditions an	nd measures to reduce or limit discharges, air emissions and releases to soil				
Drift should be minimised					
Organizational measure	es to prevent/limit release from site				
	nts for good agricultural practice, agricultural soil should be analysed prior to application of lime and d be adjusted according to the results of the analysis.				
2.2 Control of envir	ronmental exposure – only relevant for urban soil treatment				
Product characteristics					
	Quantity of dust per m3 (in mg) Wind speed: - 3.5 m/s - 6 m/s - 3.5 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	180,000 kg/ha				
Frequency and duration					
· · · · ·	e in a lifetime. Multiple applications during the year are allowed, provided the total yearly amount of				
Environment factors not influenced by risk management					
Field surface area: 1 ha					



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Other given operationa	I conditions affecting en	vironmental exposure		
Outdoor use of products Soil mixing depth: 20 cm				
Technical conditions a	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 condit	tions and measures to re	duce or limit discharges	, air emissions and relea	ses to soil
Drift should be minimised	d.			
3. Exposure estimation	ation and reference	to its source		
Occupational exposure	•			
is the quotient of the refir demonstrate a safe use. dust) and the respective	ned exposure estimate and For inhalation exposure, th inhalation exposure estimation	the respective DNEL (deal the RCR is based on the Di 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 <sup>3</sup> (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 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	re for agricultural soil pro	otection		
more appropriate for agri modelling. FOCUS is a m German EXPOSIT 1.0 m	icultural-like application as nodel typically developed f	in this case where parame or biocidal applications and uch as drifts can be improv	modelling tool is preferred eter as the drift needs to be d was further elaborated or red according to collected or rift.	e included in the n the basis of the
Exposure concentration in waste water treatment plant (WWTP)	Not relevant for agricultural soil protection			
Exposure concentration in	Substance	PEC (ug/L)	PNEC (ug/L)	RCR
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	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 <sup>-5</sup> Pa.			
Exposure concentration relevant for the food chain (secondary poisoning)		overed do not significantly	considered to be omniprese influence the distribution c	



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

### Version: 1.0/EN

**Revision date: September/2010** 

Printing Date: June/2019

### 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.

Miloro paramotoro odon (	as anns oan be improved t	loooraing to concetted date	a.	
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 volatile. The vapour pressures is below 10 <sup>-5</sup> Pa.			
Exposure concentration relevant for the food chain (secondary poisoning)	This point is not relevant because calcium can be considered to be omnipresent and essential in the environment. The uses covered do not significantly influence the distribution of the constituents (Ca <sup>2+</sup> and OH <sup>-</sup> ) in the environment.			
Environmental exposure for other uses				
<ul> <li>The operation protection or u</li> <li>Lime is an ing</li> </ul>	rban soil treatment	agement measures are le	rried because ess stringent than those outl es are negligible and insuffic	Ũ

• Line is an ingredient and chemically bound into a matrix. Releases are negligible and insufficient to cause a ph-smit 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.



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

### Version: 1.0/EN

Revision date: September/2010

Printing Date: June/2019

### 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 ≥10 % are defined as "high dusty".

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

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



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

Version: 1.0/EN

Revision date: September/2010

Printing Date: June/2019

# ES number 9.10: Professional use of lime substances in soil treatment

Exposure Scenario	Format (1) address	sing uses carried ou	It 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.			
2. Operational con	ditions and risk mai	nagement measures	5	
Task/ERC	REACH	definition	Involved tasks	
Milling	PRC	DC 5		
Loading of spreader	PROC 8b,	PROC 26		f calcium oxides for soil ment.
Application to soil (spreading)	PRC	C 11		
ERC2, ERC8a, ERC8b, ERC8c, ERC8d, ERC8e, ERC8f	reactive substances or	or and outdoor use of processing aids in open ems	Calcium oxide is applied in numerous cases of wide dispersive uses: agricultural, forestry, fish and shrimps farming, soil treatment and environmental 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.				
Task	Use in preparation	Content in preparation	Physical form	Emission potential
Milling	not restricted		solid/powder	high
Loading of spreader	not restricted		solid/powder	high
Application to soil (spreading)	not res	stricted	solid/powder	high
Amounts used				
The actual tonnage handled per shift is not considered to influence the exposure as such for this scenario. Instead, the combination of the scale of operation (industrial vs. professional) and level of containment/automation (as reflected in the PROC) is the main determinant of the process intrinsic emission potential.				
Frequency and duration of use/exposure				
Task	Duration of exposure			
Milling	240 minutes			
Loading of spreader	240 minutes			
Application to soil (spreading)	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 m <sup>3</sup> /shif	t (8 hours).



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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Other given operational conditions affecting workers exposure

Operational conditions (e.g. process temperature and process pressure) are not considered relevant for occupational exposure assessment of the conducted processes.

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

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

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

Task	Level of separation	Localised controls (LC)	Efficiency of LC	Further information
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 measures to prevent /limit releases, dispersion and exposure

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

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

	contrained and medication related to personal protocilon, nygiche and neutri 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	Since calcium oxide is classified as irritating to skin, the use of protective gloves is mandatory for all process steps.	Eye protection equipment (e.g. goggles or visors) must be worn, unless potential contact with the eye can be excluded by the nature and type of application (i.e. closed process).	
Loading of spreader	FFP3 mask	APF=20			
Application to soil (spreading)	not required	na		Additionally, face protection, protective clothing and safety shoes are required to be worn as appropriate.	

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.



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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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.


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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**Revision date: September/2010** 

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Drift should be minimised.



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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#### 3. Exposure estimation and reference to its source **Occupational exposure** Measured data and modelled exposure estimates (MEASE) were 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/m<sup>3</sup> (as respirable dust) Method used for Method used for Inhalation exposure **Dermal exposure** Task inhalation exposure dermal exposure estimate (RCR) estimate (RCR) assessment assessment Milling MEASE 0.488 mg/m<sup>3</sup> (0.48) Since calcium oxide is classified as irritating to skin, dermal exposure has to be minimised as far Loading of spreader MEASE (PROC 8b) 0.488 mg/m3 (0.48) as technically feasible. A DNEL for dermal effects has not been derived. Thus, dermal exposure is Application to soil measured data 0.880 mg/m<sup>3</sup> (0.88) not assessed in this exposure scenario. (spreading) Environmental exposure for agricultural soil protection The PEC calculation for soil and surface water was based on the FOCUS soil group (FOCUS, 1996) and on the "draft guidance on the calculation of predicted environmental concentration values (PEC) of plant protection products for soil, ground water, surface water and sediment (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: once applied on the soil, calcium oxide can indeed migrate then towards surface waters, via drift. Environmental See amounts used emissions Exposure concentration in Not relevant for agricultural soil protection waste water treatment plant (WWTP) Exposure Substance PEC (ug/L) PNEC (ug/L) RCR concentration in aquatic pelagic CaO 5.66 370 0.015 compartment As described above, no exposure of surface water nor sediment to lime is expected. Further, in Exposure natural waters the hydroxide ions react with HCO3- to form water and CO32-. CO32- forms CaCO3 by concentration in reacting with Ca2+. The calcium carbonate precipitates and deposits on the sediment. Calcium sediments carbonate is of low solubility and a constituent of natural soils. PNEC (mg/L) RCR Exposure Substance PEC (mg/L) concentrations in soil CaO 500 816 0.61 and groundwater Exposure concentration in This point is not relevant. Calcium oxide is not volatile. The vapour pressures is below 10<sup>-5</sup> Pa. atmospheric compartment Exposure concentration This point is not relevant because calcium can be considered to be omnipresent and essential in the relevant for the food environment. The uses covered do not significantly influence the distribution of the constituents (Ca<sup>2+</sup> chain (secondary and OH<sup>-</sup>) in the environment. poisoning)



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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Printing Date: June/2019

#### 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 included 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.

milliono paramotoro odorre	ao annio ban bo improvoa b	leeelang te eeneetea aata	-				
Environmental emissions	See amounts used						
Exposure concentration in waste water treatment plant (WWTP)	Not relevant for road bord	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 bord	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	tile. The vapour pressures is	below 10 <sup>-₅</sup> Pa.			
Exposure concentration relevant for the food chain (secondary poisoning)	environment. The uses co	This point is not relevant because calcium can be considered to be omnipresent and essential in the environment. The uses covered do not significantly influence the distribution of the constituents (Ca <sup>2+</sup> and OH <sup>-</sup> ) in the environment.					
Environmental exposu	re for other uses						
<ul> <li>The operational protection or u</li> <li>Lime is an inguinational protection or u</li> </ul>	rban soil treatment	agement measures are le	ried because ss stringent than those outli s are negligible and insuffici	-			

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.



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

### Version: 1.0/EN

**Revision date: September/2010** 

Printing Date: June/2019

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

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

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



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

Version: 1.0/EN Revision date: September/2010

Printing Date: June/2019

# 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	Profess	ional uses of articles/conta	ainers containing lime sub	stances				
Systematic title based on use descriptor	AC1, A	, SU6b, SU7, SU10, SU1 SU23, AC2, AC3, AC4, AC5, AC6 ropriate PROCs and ERC	SU24 5, AC7, AC8, AC10, AC11	, AC13				
Processes, tasks and/or activities covered		Processes, tasks and/or activities covered are described in Section 2 below.						
Assessment Method	The assessment of	The assessment of inhalation exposure is based on the exposure estimation tool MEASE.						
2. Operational con	ditions and risk mar	nagement measures	5					
PROC/ERC	REACH o	definition		ed tasks				
PROC 0	Other p PROC 21 (low emissio) exposure e	n potential) as proxy for estimation)	Use of containers containing calcium oxide/preparations as CO <sub>2</sub> absorbents (e.g breathing apparatus)					
PROC 21	Low energy manipulatior materials an		•	bound in materials and/or cles				
PROC 24	High (mechanical) energ bound in materia	y work-up of substances	Grinding, mec	hanical cutting				
PROC 25	Other hot work ope	erations with metals	Welding, soldering					
ERC10, ERC11, ERC 12	Wide dispersive indoor and outdoor use of long- life articles and materials with low release drains), flooring, furniture, toys, leather pro- paper and cardboard products (magazin books, news paper and packaging pap electronic equipment (casing)							
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 in	lass in the MEASE tool. For ustiness of that substance temperature and the melt netead of the substance interests.	or operations conducted w . Whereas in hot metal op ting point of the substance	vith solid substances at erations, fugacity is				
PROC	Used in preparation?	Content in preparation	Physical form	Emission potential				
PROC 0	not res		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				
Amounts used								
combination of the scale	led per shift is not conside of operation (industrial vs. minant of the process intrir	professional) and level of						



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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Frequency and duration	n of use/exposure								
PROC		Duration o	of exposure						
PROC 0		480 minutes (not restricted as far as occupational exposure to calcium oxide is concerned, the actual wearing duration may be restricted due the user instructions of the actual breathing apparatus)							
PROC 21		480 minutes (not restricted)							
PROC 24, 25		≤ 240 minutes							
Human factors not infl	uenced by risk management								
The shift breathing volur	ne during all process steps reflected ir	n the PROCs is	assumed to be 10 m <sup>3</sup> /shift	: (8 hours).					
Other given operationa	al conditions affecting workers expo	osure							
exposure assessment in temperatures are expect	ucted processes. In process steps with MEASE is however based on the rati ted to vary within the industry the high cess temperatures are automatically co	o of process te est ratio was ta	mperature and melting poir ken as a worst case assun	nt. As the associated nption for the exposure					
Technical conditions a	nd measures at process level (sour	ce) to prevent	release						
Risk management meas required in the processe	sures at the process level (e.g. contain	ment or segreg	ation of the emission source	ce) are generally not					
	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 measu	res to prevent /limit releases, disper	sion and expo	osure						
These measures involve eating and smoking at th	stion. General occupational hygiene m e good personal and housekeeping pra e workplace, the wearing of standard hes at end of work shift. Do not wear o	actices (i.e. regi working clothe	ular cleaning with suitable of s and shoes unless otherw	cleaning devices), no ise stated below.					



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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Conditions and measur	res related to personal p	rotection, 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 of resistance and mass of the considered that the work For reasons as given abore the use of RPE), (ii) have hair). The recommended contours of the face prop The employer and self-en- devices and the manage policy for a respiratory pr	of exposure" above) should he RPE itself, due to the in er's capability of using tool ove, the worker should the a suitable facial characteris devices above which rely	d reflect the additional physicreased thermal stress by s and of communicating a refore be (i) healthy (espec- tics reducing leakages bel- on a tight face seal will no al responsibilities for the m the workplace. Therefore e including training of the v	siological stress for the wo enclosing the head. In ad re reduced during the wea cially in view of medical pre- tween face and mask (in v t provide the required prot- naintenance and issue of re- , they should define and d- workers.	orker due to the breathing dition, it shall be ring of RPE. oblems that may affect iew of scars and facial ection unless they fit the espiratory protective ocument a suitable
2.2 Control of envi	ronmental exposure	)		
Product characteristics	1			
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	)			
is the quotient of the refir demonstrate a safe use. dust) and the respective	tool MEASE was used for ted exposure estimate and For inhalation exposure, th inhalation exposure estima since the respirable fractio	I the respective DNEL (den ne 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/m <sup>3</sup> (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 oxide is	classified as irritating to
PROC 21	MEASE	0.05 mg/m³ (0.05)		as to be minimised as far
PROC 24	MEASE	0.825 mg/m³ (0.825)	has not been derived. T	hus, dermal exposure is
PROC 25	MEASE	0.6 mg/m³ (0.6)	not assessed in this	exposure scenario.
Environmental exposur		a matrix: there is no inter	nded release of lime during	a pormal and reasonable

Lime is an ingredient and is chemically bound into a matrix: there is no intended release of lime during normal and reasonable foreseeable conditions of use. Releases are negligible and insufficient to cause a pH-shift in soil, wastewater or surface water.



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

### Version: 1.0/EN

**Revision date: September/2010** 

Printing Date: June/2019

### 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 with a dustiness less than 10 % (RDM) are defined as "medium dusty".

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

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



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

Version: 1.0/EN

**Revision date: September/2010** 

Printing Date: June/2019

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

Exposure Scenario	Forma	t (2) addı	ressing	uses carried out by	<sup>,</sup> consum	ers	
1. Title							
Free short title			Consur	mer use of building and	constructio	n material	
Systematic title based descriptor	on use			SU21, PC9a, PC9b, ERC8c, ERC8d, ERC8e, ERC8f			
Processes, tasks acti	vities co	overed		ng (mixing and filling) of ation of liquid, pasty lime			
Assessment Method*			Human A quali as expo Dutch r	health:	been perfor tion exposu 992).	med for oral and c re to dust has bee	-
2. Operational cor	dition	s and ri					
RMM				ated risk management n		e in place	
			on of ac	tivity referring to artic			ironmental release
PC 9a, 9b Mixing and load Application of lin Post-applicatior			d loading on of lime ication e	g of powder containing l plaster, putty or slurry xposure.	to the walls	or ceiling.	
ERC 8c, 8d, 8e, 8f		Wide disp Wide disp	ersive o ersive o	ndoor use resulting in ind utdoor use of processin utdoor use of reactive s utdoor use resulting in in	g aids in op ubstances i	en systems n open systems	
2.1 Control of con	sume						
Product characteristic							
Description of the preparation	Conce subst	entration ance in th ration		Physical state of the preparation	Dustine	ss (if relevant)	Packaging design
Lime substance	100 %			Solid, powder	High me	edium and low,	Bulk in bags of up to
Plaster, Mortar	20-40			Solid, powder	dependir lime sub (indicativ	ng on the kind of stance ve value from t sheet see	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		ve value from sheet see	Bulk in bags of up to 35 kg.
Lime wash paint/milk of lime preparation	~ 30 %	6		Milk of lime preparation	-		-
Amounts used		1.					
Description of the preparation		Amoun	t used p	ber event			
Filler, putty		Difficult holes to	to deter	1.	unt is heavi		ne depth and size of the
Plaster/lime wash paint		~ 25 kg	dependi	ing on the size of the roo			
Floor/wall equalizer		~ 25 kg	dependi	ing on the size of the roo			
Frequency and duration	on of us	e/exposur					
Description of task				on of exposure per eve		frequency of e	vents
Mixing and loading of lir powder.	ne conta	ining		in (DIY <sup>1</sup> -fact sheet, RIV er 2.4.2 Mixing and loadi rs)		2/year (DIY <sup>1</sup> fac	t sheet)
Application of lime plast slurry to the walls or cei		or		I minutes - hours		2/year (DIY <sup>1</sup> fac	t sheet)



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Human factors not influ	uenced by	/ risk managem	ent				
Description of the task		ion exposed	Breathing rat	e	Exposed body part		Corresponding skin area [cm <sup>2</sup> ]
Handling of powder	Adult		1.25 m³/hr		Half of both hands		430 (DIY <sup>1</sup> fact sheet)
Application of liquid,							
pasty lime	Adult		NR		Hands and forearms		1900 (DIY <sup>1</sup> fact sheet)
preparations.							
Other given operationa							
Description of the task		Indoor/outdo	or		volume		exchange rate
Handling of powder		indoor		area ar	ersonal space, small ound the user)		hr <sup>-1</sup> (unspecified room)
Application of liquid, pas preparations.	,	indoor		NR		NR	
Conditions and measu	res relate	d to informatio	n and behaviou	iral advid	ce to consumers		
In order to avoid health of	lamage Dl	Yers should cor	nply with the sa	me strict	protective measures wl	hich a	apply to professional
workplaces:	•						
<ul> <li>Change wet cl</li> </ul>	othina. sh	oes and gloves i	mmediatelv.				
e e e e e e e e e e e e e e e e e e e	0.	0		are vario	ous effective skin prote	ction	products which should
					, cleansing and care).		
		a care product.			i, cicalising and care).	oicai	ise the skin thoroughly
Conditions and measu			rotection and h	vaiene			
In order to avoid health o					protective measures w	hich a	apply to professional
workplaces:							
	na or mixin	a buildina mater	rials. durina dem	nolition or	caulking and, above a	ll. dur	ring overhead work, wear
		ell as face masks			······································	,	
					an facilitate burns. Whe	en wo	rking in a wet
					r. Wear gauntlet gloves		
because they	can consid	erably reduce th	ne amount of hu	midity wh	nich permeates the wor	king d	clothes.
2.2 Control of envi	ronmen	tal exposure	9				
Product characteristics	5						
Not relevant for exposure		ient					
Amounts used*							
Not relevant for exposure	e assessm	ient					
Frequency and duratio							
Not relevant for exposure	e assessm	ient					
Environment factors no	ot influen	ced by risk mar	nagement				
Default river flow and dil							
Other given operationa	I conditio	ns affecting en	vironmental ex	posure			
Indoor							
Direct discharge to the w	vastewater	is avoided.					
Conditions and measu							
Default size of municipal	sewage s	ystem/treatment	t plant and sludg	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	ient					
Conditions and measu	res relate	d to external re	ecovery of was	te			
Not relevant for exposure	e assessm	ient					
3. Exposure estimation	ation an	d reference	to its sourc	e			
The risk characterisation					estimate and the respe	ective	DNEL (derived no-
effect level) and is given							
substances of 4 mg/m3 (							
includes an additional sa	ifety margi	n since the resp	irable fraction is	a sub-fra	action of the inhalable f	ractio	on according to EN 481.
Since limes are classified	d as irritati	ng to skin and e	yes a qualitative	e assessr	nent has been perform	ed for	r dermal exposure and
exposure to the eve.							



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Human exposure		
Handling of powder	1	
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 <sup>2</sup>	Qualitative assessment
	(-)	If risk reduction measures are taken into account no human exposure is
	large task: 1 µg/cm <sup>2</sup> (-)	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 <sup>1</sup> -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 <sup>3</sup>	Quantitative assessment
	(0.003)	Dust formation while pouring the powder is addressed by using the dutch
	Large task: 120 µg/m³ (0.03)	model (van Hemmen, 1992, as described in section 9.0.3.1 above).
Application of liquid	l, pasty lime preparations	<u> </u>
Route of exposure	Exposure estimate	Method used, comments
Oral	-	Qualitative assessment
orar		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
Innalation		Not expected, as the vapour pressure of limes in water is low and generation
		of mists or aerosols does not take place.
Post-application ex		· · ·
		ueous lime preparation will quickly convert to calcium carbonate with carbon
dioxide from the atmo		
Environmental expo		
		nment to avoid discharging lime solutions directly into municipal wastewater, the
		atment plant is circum-neutral and therefore, there is no exposure to the
biological activity. The	e influent of a municipal wa	astewater treatment plant is often neutralized anyway and lime may even be
		ter streams that are treated in biological WWTPs. Since the pH of the influent of
•	liment and terrestrial comp	the pH impact is negligible on the receiving environmental compartments, such
as surface water, sec	inneni anu ienesinal comp	



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

Version: 1.0/EN

Revision date: September/2010

Printing Date: June/2019

# ES number 9.13: Consumer use of CO<sub>2</sub> absorbent in breathing apparatuses

Exposure S	cenario l	Format (2) addi	ressing	uses carried out by	consume	ers		
1. Title								
Free short tit	le			Consumer use of CO <sub>2</sub> a	absorbent	in breathing anna	ratuses	
		on use descripto	r	SU21, PC2, ERC8b		in breating appa	1414505	
Processes ta	asks activ	vities covered		Filling of the formulation into the cartridge				
				Use of closed circuit breathing apparatuses				
				Cleaning of equipment		pulatabbb		
Assessment	Method*			Human health				
				A qualitative assessme	nt has bee	n performed for o	ral and dermal exposure.	
				The inhalation exposure	e has beer	n assessed by the	Dutch model (van	
				Hemmen, 1992).				
				Environment				
				A qualitative justification				
				management me				
RMM				ar form. Furthermore, a c				
				the absorbent. During the	e breathing	g cycle calcium dif	nydroxide will be quickly	
20/220		with CO <sub>2</sub> to form t					(550)	
PC/ERC				o article categories (AC				
PC 2				aratus for e.g. recreationa osorbent and CO <sub>2</sub> will qui			e as CO <sub>2</sub> absorbent. The	
				ixide to form the carbona				
		of oxygen.	i uniyulu		te. The CC		re-breathed again, alter	
			The abs	orbent will be discarded	after each	use and refilled b	efore each dive.	
ERC 8b				g in inclusion into or onto				
2.1 Contro		nsumers ex						
Product char								
Description of		Concentration	of the	Physical state of	Dustine	ss (if relevant)	Packaging design	
preparation		substance in th	ne	the preparation				
		preparation						
CO <sub>2</sub> absorben	it	78 - 84%		Solid, granular	Very low dustiness		4.5, 18 kg canister	
		Depending on the		-		on by 10 %	_	
		application the r	nain			ed to powder)		
		component has				nation cannot		
		different additive				out during the		
		A specific amou				the scrubber		
		water is always (14-18%).	auueu		cartridge			
"Used" CO <sub>2</sub> at	nsorhent	~ 20%		Solid, granular	Very low dustiness		1-3 kg in breathing	
	500100111	2070		Colla, granalar	(reduction by 10 %		apparatus	
						ed to powder)	apparatuo	
Amounts use								
		preathing apparatu		1-3 kg depending on the	e kind of b	reathing apparatu	IS	
		n of use/exposu						
Description of				on of exposure per even		frequency of e		
Filling of the for cartridge	ormulation	into the	Ca. 1.3	3 min per filling, in sum «	< 15 min	Before each div	e (up to 4 times)	
Use of closed	circuit bre	athing	1-2 h			Up to 4 dives a	dav	
apparatus		adding	1-211				uuy	
Cleaning and	emptying	of equipment	< 15 m	in		After each dive	(up to 4 times)	
		uenced by risk m						
Description of		Population exp		Breathing rate	Exposed	d body part	Corresponding skin	
task		-					area [cm <sup>2</sup> ]	
Filling of the		adult		1.25 m <sup>3</sup> /hr (light	hands		840	
formulation int	to the			working activity)			(REACH guidance	
cartridge		{					R.15, men)	
Use of closed					-		-	
breathing appa Cleaning and		1			hands		840	
of equipment	emprying				nanus		(REACH guidance	
							R.15, men)	
Other given o	perationa	I conditions affe	ctina co	onsumers exposure	1			
Description of			or/outdo		volume	Air	exchange rate	



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Filling of the formulat cartridge	ion into the	NR	NR	NR
Use of closed circuit apparatus	oreathing	-	-	-
Cleaning and emptyin equipment	ng of	NR	NR	NR
	sures relate	d to information and b	ehavioural advice to cons	sumers
Do not get in eyes, or	n skin, or on c / closed as to	lothing. Do not breathe avoid the soda lime to c	dust	
	h eyes, rinse	immediately with plenty	of water and seek medical	advice.
	tructions of th		o assure a proper use of th	e breathing apparatus.
		d to personal protectio		
149).		·	g handling. Use a filtering l	alf mask (mask type FFP2 acc. to EN
2.2 Control of Product characteris		ental exposure		
Not relevant for expos		ent		
Amounts used*				
Not relevant for expos	sure assessm	ient		
Frequency and dura				
Not relevant for expo				
		ced by risk manageme	nt	
Default river flow and				
Other given operation	onal conditio	ns affecting environme	ental exposure	
		d to municipal sewage		
			nd sludge treatment techni	que
Not relevant for expos		d to external treatmen	t of waste for disposal	
		d to external recovery	of waste	
Not relevant for expos			UI WASIC	
		and reference to	ite sourco	
				and the respective DNEL (derived no-
				and the respective DNEL (derived ho-
				timate (as inhalable dust). Thus, the RCR
				ne inhalable fraction according to EN 481.
			d eyes a qualitative asses	sment has been performed for dermal
exposure and exposu				
			g their own CO <sub>2</sub> scrubber)	t can be assumed that instructions will be
taken into account to Human exposure	reduce expos	sure		
Filling of the formul	ation into the	e cartridge		
Route of exposure			Method used, comme	nts
Oral	-		Qualitative assessment	
				occur as part of the intended product use.
Dermal	-		Qualitative assessment	
				es are taken into account no human lowever, dermal contact to dust from
				a lime or direct contact to the granules
				o protective gloves are worn during
				ccasionally result in mild irritation easily
_			avoided by prompt rinsi	ng with water.
Eye				
	Dust		Qualitative assessment	aa ara takan inta aaggunt na human
	Dust		If risk reduction measur	es are taken into account no human
	Dust		If risk reduction measure exposure is expected.	Oust from loading of the granular soda lime
	Dust		If risk reduction measure exposure is expected. It is expected to be minimeven without protective	Dust from loading of the granular soda lime al, therefore eye exposure will be minimal goggles. Nevertheless, prompt rinsing with
	Dust		If risk reduction measure exposure is expected. It is expected to be minimeven without protective water and seeking med	Oust from loading of the granular soda lime al, therefore eye exposure will be minimal
			If risk reduction measure exposure is expected. It is expected to be minimeven without protective water and seeking medeadvisable.	Dust from loading of the granular soda lime al, therefore eye exposure will be minimal goggles. Nevertheless, prompt rinsing with ical advice after accidental exposure is
Inhalation	Small task:	1.2 μg/m³ (3 × 10 <sup>-4</sup> )	If risk reduction measure exposure is expected. It is expected to be minimeven without protective water and seeking medeadvisable. Quantitative assessment	Dust from loading of the granular soda lime al, therefore eye exposure will be minimal goggles. Nevertheless, prompt rinsing with ical advice after accidental exposure is
Inhalation	Small task:	1.2 μg/m³ (3 × 10 <sup>-4</sup> ) 12 μg/m³ (0.003)	If risk reduction measure exposure is expected. It is expected to be minimeven without protective water and seeking meder advisable. Quantitative assessment Dust formation while poor	Dust from loading of the granular soda lime al, therefore eye exposure will be minimal goggles. Nevertheless, prompt rinsing with ical advice after accidental exposure is nt uring the powder is addressed by using
Inhalation	Small task:	1.2 μg/m³ (3 × 10⁻⁴) 12 μg/m³ (0.003)	If risk reduction measure exposure is expected. It is expected to be minimeven without protective water and seeking meder advisable. Quantitative assessment Dust formation while poor the dutch model (van H	Dust from loading of the granular soda lime al, therefore eye exposure will be minimal goggles. Nevertheless, prompt rinsing with ical advice after accidental exposure is



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	t breathing apparatus	Method yood comments
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
<u></u>		absorbent during the use of the breathing apparatus is negligible.
Cleaning and empty		
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
_)*		
		It risk reduction measures are taken into account no human
		If risk reduction measures are taken into account no human exposure is expected. However, contact to dust from emptying
		exposure is expected. However, contact to dust from emptying
		exposure is expected. However, contact to dust from emptying granular soda limes or during the cleaning of the cartridge with
		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
		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
Inholotion	Small task: 0.2 u/~3 /7 5 40-51	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 <sup>-5</sup> )	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. Quantitative assessment
Inhalation	Small task: 0.3 μg/m³ (7.5 × 10 <sup>-5</sup> ) Large task: 3 μg/m³ (7.5 × 10 <sup>-4</sup> )	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. Quantitative assessment Dust formation while pouring the powder is addressed by using
Inhalation		<ul> <li>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.</li> <li>Quantitative assessment</li> <li>Dust formation while pouring the powder is addressed by using the Dutch model (van Hemmen, 1992, as described in section</li> </ul>
Inhalation		<ul> <li>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.</li> <li>Quantitative assessment</li> <li>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</li> </ul>
Inhalation		<ul> <li>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.</li> <li>Quantitative assessment</li> <li>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</li> </ul>
	Large task: 3 μg/m³ (7.5 × 10 <sup>-4</sup> )	<ul> <li>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.</li> <li>Quantitative assessment</li> <li>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</li> </ul>
Environmental expo	Large task: 3 µg/m³ (7.5 × 10 <sup>-4</sup> )	<ul> <li>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.</li> <li>Quantitative assessment</li> <li>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.</li> </ul>
Environmental expo The pH impact due to	Large task: 3 µg/m <sup>3</sup> (7.5 × 10 <sup>-4</sup> ) <b>sure</b> to use of lime in breathing apparatuses	<ul> <li>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.</li> <li>Quantitative assessment</li> <li>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</li> </ul>

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 EC 1907/2006, Regulation (EC) 1272/2008 and Regulation (EC) 453/2010

Version: 1.0/EN

Revision date: September/2010

Printing Date: June/2019

# ES number 9.14: Consumer use of garden lime/fertilizer

Exposure Scenario	Forma	nt (2) add	ressing	g uses carried	l out by	<sup>,</sup> consum	ers		
1. Title									
Free short title				Consumer use	of garde	an lime/fert	ilizor		
Systematic title based	on use	descript	or	SU21, PC20,					
Processes, tasks acti	vitios o	overed		Manual applic			fortilizor		
FIOLESSES, IASKS ACI	villes c	overeu		Post-application			, ierunzer		
Assessment Method*				Human health		ule			
Assessment Method						nt has had	n porformod	for	oral and dermal exposure
									posure has been
				assessed by t					
				Environment			,		
				A qualitative ju	ustificatio	n assessm	ent is provid	led.	
2. Operational cor	ditio	ns and r	isk ma						
RMM	Iditio			ated risk manag			o in place		
PC/ERC								d on	vironmental release
FC/ERC		categori			to artic	le calegon	es (AC) and	1 env	nonmental release
PC 20					imo hv s	hovel/hand	(worst case	) and	d soil incorporation.
FC 20				exposure to play			(WOISI Case	<i>;)</i> and	son incorporation.
PC 12		Surface	nreading	a of the garden	lime by c	hovel/ han	1 (worst cas	a) an	d soil incorporation.
1012				exposure to play			a (worst cas	e) an	
ERC 8e		Wide die	nersive c	butdoor use of re	active e	ihstances i	n onen evet	eme	
	oumo							0113	
2.1 Control of con		is expo	sure						
Product characteristic			- ( 1)		(	Denti			Desta visuali i
Description of the		entration		Physical stat		Dustines	ss (if releva	nt)	Packaging design
preparation		tance in t	ne	the preparati	on				
O and a line a		aration				I Park also	1		Dull is here an
Garden lime	100 %	<i>/</i> o		Solid, powder		High dus	High dusty		Bulk in bags or
									containers of 5, 10 and 25 kg
Fertilizer	L In to	20 %		Solid, granula	r	Low dust			Bulk in bags or
Fertilizer	Op to	20 %		Soliu, granula	Solid, granular Low dusty		y		containers of 5, 10 and
									25 kg
Amounts used	1								23 kg
Description of the pre	paratio	n		Amount used	por ovo	nt	Sourc	o of	information
Garden lime	Jaratio			100g /m <sup>2</sup> (up t	$\sim 200 a/m$	11L 12)			and direction of use
Fertilizer				100g /m² (up t					and direction of use
Frequency and duration	on of us	alavnosu	ro	Toog /III (up t	o ng/m	(compost)	)   11101111	allon	
Description of the tasl	r or us	be/exp030	Durati	on of exposure	ner eve	nt	frequency		vents
Manual application	<u>`</u>			s-hours	per eve	, I I L	1 tasks pe		
Manual application				iding on the size	of the tr	bated	i lasks pe	гуса	I
			area	iung on the size		ealeu			
Post-application				ddlers playing o	n arass (	FPΔ	Relevant f	orun	to 7 days after
1 Ost application				ure factors hand	hook)		Relevant for up to 7 days after application		to r days alter
Human factors not inf	uencer	d by risk r					Spp.roution		
Description of the		lation exp		Breathing rat	te	Exposed	l body part		Corresponding skin
task					-		. Jour puit		area [cm <sup>2</sup> ]
Manual application	Adult			1.25 m³/hr		Hands a	nd forearms		1900 (DIY fact sheet)
Post-application		/Toddlers		NR		NR			NR
Other given operation			ecting c		osure				_ · ···
Description of the task			or/outdo			volume		Δir	exchange rate
Manual application	·	outdo				ersonal sp	are email	NR	
manual application		outuc				ound the u			
Post-application		outdo	or		NR		,	NR	
Conditions and measu	ires rel			on and behavio		ice to cons	sumers		
Do not get in eyes, on s	kin or c	on clothing	Do not	breathe dust 11	se a filter	ring half me	ask (maek tu	ne F	EP2 acc. to EN 149)
Keep container closed a						ing nair ma	isk (mask ty	per	11 2 acc. to EN 149).
In case of contact with e					r and se	ek medical	advice		
Wash thoroughly after h	<b>,</b> ,			in ploting of wate		en mouloal			
Do not mix with acids a			es to wa	ter and not wate	r to lime	S.			
Incorporation of the gar							facilitate the	effe	ct.
Conditions and measu									
Conditions and medst			. Jonar	. stostion and					

Wear suitable gloves, goggles and protection clothes.



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	environmental exposu	ire	
Product characteri			
· · ·	st-case estimate based on dat	ta from dust measurem	ents in air as a function of the distance from application)
Amounts used			
Amount used	Ca(OH)2	2,244 kg/ha	In professional agricultural soil protection, it is
	CaO	1,700 kg/ha	recommended not to exceed 1700 kg CaO/ha or
	CaO.MgO	1,478 kg/ha	the corresponding amount of 2244 kg
	Ca(OH)2.Mg(OH)2	2,030 kg/ha	Ca(OH) <sub>2</sub> /ha. This rate is three times the amount
	CaCO3.MgO	2,149 kg/ha	needed to compensate the annual losses of lime
	Ca(OH)2.MgO	1,774 kg/ha	by leaching. For this reason, the value of 1700 kg
	Natural hydraulic lime	2,420 kg/ha	CaO/ha or the corresponding amount of 2244 kg
		2,420 Ng/11a	Ca(OH) <sub>2</sub> /ha is used in this dossier as the basis
			for the risk assessment. The amount used for the
			other lime variants can be calculated based on
			their composition and the molecular weight.
Frequency and du	ration of use		
		polications during the ve	ar are allowed, provided the total yearly amount of 1,700
kg/ha is not exceed		pheadene damig the ye	ar are allowed, provided the total yearly allount of 1,700
	ors not influenced by risk ma	anagement	
Not relevant for exp		anagement	
	tional conditions affecting e	environmental exposu	re de la companya de
Outdoor use of proc			
Soil mixing depth: 2			
<b>Technical conditio</b>	ons and measures at proces	s level (source) to pre	vent release
There are no direct	releases to adjacent surface v	waters.	
			ir emissions and releases to soil
Drift should be mini			
	easures related to municipa	al sowage treatment p	ant
Not relevant for exp		a sewage treatment p	ant
		the star and a family for	- diaman di
	easures related to external	treatment of waste to	r disposal
Not relevant for exp			
	easures related to external	recovery of waste	
Not relevant for exp	oosure assessment		
3. Exposure es	stimation and referenc	e to its source	
The risk characteris	sation ratio (RCR) is the quoti-	ent of the refined expos	ure estimate and the respective DNEL (derived no-
			the RCR is based on the long-term DNEL for lime exposure estimate (as inhalable dust). Thus, the RCR
includes an addition	nal safety margin since the re-	spirable fraction is a sul	p-fraction of the inhalable fraction according to EN 481.
includes an addition Since lime substant	nal safety margin since the re- ces are classified as irritating	spirable fraction is a sul	
includes an addition Since lime substant exposure and expo	nal safety margin since the re- ces are classified as irritating	spirable fraction is a sul	p-fraction of the inhalable fraction according to EN 481.
includes an addition Since lime substant exposure and expo Human exposure	hal safety margin since the re- ces are classified as irritating sure to the eye.	spirable fraction is a sul	p-fraction of the inhalable fraction according to EN 481.
includes an addition Since lime substance exposure and expo Human exposure Manual application	hal safety margin since the re- ces are classified as irritating sure to the eye.	spirable fraction is a sul	p-fraction of the inhalable fraction according to EN 481.
includes an addition Since lime substant exposure and expo Human exposure	hal safety margin since the re- ces are classified as irritating sure to the eye.	spirable fraction is a sul to skin and eyes a qual	p-fraction of the inhalable fraction according to EN 481.
includes an addition Since lime substance exposure and expo Human exposure Manual application	nal safety margin since the re- ces are classified as irritating sure to the eye. n	spirable fraction is a sul to skin and eyes a qual	p-fraction of the inhalable fraction according to EN 481. itative assessment has been performed for dermal
includes an addition Since lime substance exposure and expo Human exposure Manual application Route of	nal safety margin since the re- ces are classified as irritating sure to the eye. n	spirable fraction is a su to skin and eyes a qual Method us	p-fraction of the inhalable fraction according to EN 481. itative assessment has been performed for dermal
includes an addition Since lime substance exposure and expo Human exposure Manual application Route of exposure	nal safety margin since the re- ces are classified as irritating sure to the eye. n Exposure estimate	spirable fraction is a su to skin and eyes a qual Method us Qualitative	p-fraction of the inhalable fraction according to EN 481. itative assessment has been performed for dermal
includes an addition Since lime substance exposure and expo Human exposure Manual application Route of exposure	nal safety margin since the re- ces are classified as irritating sure to the eye. n Exposure estimate	spirable fraction is a su to skin and eyes a qual Method us Qualitative Oral expos	b-fraction of the inhalable fraction according to EN 481. itative assessment has been performed for dermal ed, comments assessment
includes an addition Since lime substance exposure and expo Human exposure Manual application Route of exposure Oral	nal safety margin since the re- ces are classified as irritating sure to the eye. n Exposure estimate	spirable fraction is a su to skin and eyes a qual Method us Qualitative Oral expos Qualitative	b-fraction of the inhalable fraction according to EN 481. itative assessment has been performed for dermal ed, comments assessment ure does not occur as part of the intended product use. assessment
includes an addition Since lime substance exposure and expo Human exposure Manual application Route of exposure Oral	nal safety margin since the re- ces are classified as irritating sure to the eye. n Exposure estimate	spirable fraction is a su to skin and eyes a qual Method us Qualitative Oral expos Qualitative If risk redu	b-fraction of the inhalable fraction according to EN 481. itative assessment has been performed for dermal ed, comments assessment ure does not occur as part of the intended product use. assessment ction measures are taken into account no human
includes an addition Since lime substance exposure and expo Human exposure Manual application Route of exposure Oral	nal safety margin since the re- ces are classified as irritating sure to the eye. n Exposure estimate	spirable fraction is a su to skin and eyes a qual Method us Qualitative Oral expos Qualitative If risk redu exposure i	b-fraction of the inhalable fraction according to EN 481. itative assessment has been performed for dermal assessment ure does not occur as part of the intended product use. assessment ction measures are taken into account no human s expected. However, dermal contact to dust from
includes an addition Since lime substance exposure and expo Human exposure Manual application Route of exposure Oral	nal safety margin since the re- ces are classified as irritating sure to the eye. n Exposure estimate	spirable fraction is a su to skin and eyes a qual Method us Qualitative Oral expos Qualitative If risk redu exposure i application	assessment ure does not occur as part of the intended product use. assessment ction measures are taken into account no human s expected. However, dermal contact to dust from of lime substances or by direct contact to the limes
includes an addition Since lime substance exposure and expo Human exposure Manual application Route of exposure Oral	nal safety margin since the re- ces are classified as irritating sure to the eye. n Exposure estimate	spirable fraction is a sui to skin and eyes a qual Method us Qualitative Oral expos Qualitative If risk redu exposure i application cannot be	b-fraction of the inhalable fraction according to EN 481. itative assessment has been performed for dermal assessment ure does not occur as part of the intended product use. assessment ction measures are taken into account no human s expected. However, dermal contact to dust from of lime substances or by direct contact to the limes excluded if no protective gloves are worn during
includes an addition Since lime substance exposure and expo Human exposure Manual application Route of exposure Oral	nal safety margin since the re- ces are classified as irritating sure to the eye. n Exposure estimate	spirable fraction is a su to skin and eyes a qual Method us Qualitative Oral expos Qualitative If risk redu exposure i application cannot be application	be-fraction of the inhalable fraction according to EN 481. itative assessment has been performed for dermal <b>sed, comments</b> assessment ure does not occur as part of the intended product use. assessment ction measures are taken into account no human s expected. However, dermal contact to dust from of lime substances or by direct contact to the limes excluded if no protective gloves are worn during . Due to the relatively long application time, skin irritation
includes an addition Since lime substance exposure and expo Human exposure Manual application Route of exposure Oral	nal safety margin since the re- ces are classified as irritating sure to the eye. n Exposure estimate	spirable fraction is a suito skin and eyes a qual Method us Qualitative Oral expos Qualitative If risk redu exposure i application cannot be application would be e	be-fraction of the inhalable fraction according to EN 481. itative assessment has been performed for dermal <b>sed, comments</b> assessment ure does not occur as part of the intended product use. assessment ction measures are taken into account no human s expected. However, dermal contact to dust from of lime substances or by direct contact to the limes excluded if no protective gloves are worn during . Due to the relatively long application time, skin irritation xpected. This can easily be avoided by immediate
includes an addition Since lime substance exposure and expo Human exposure Manual application Route of exposure Oral	nal safety margin since the re- ces are classified as irritating sure to the eye. n Exposure estimate	spirable fraction is a su to skin and eyes a qual Method us Qualitative Oral expose Qualitative If risk redu exposure i application cannot be application would be e rinsing with	be-fraction of the inhalable fraction according to EN 481. itative assessment has been performed for dermal <b>sed, comments</b> assessment ure does not occur as part of the intended product use. assessment ction measures are taken into account no human is expected. However, dermal contact to dust from of lime substances or by direct contact to the limes excluded if no protective gloves are worn during . Due to the relatively long application time, skin irritation xpected. This can easily be avoided by immediate in water. It would be assumed that consumers who had
includes an addition Since lime substance exposure and expo Human exposure Manual application Route of exposure Oral	nal safety margin since the re- ces are classified as irritating sure to the eye. n Exposure estimate	spirable fraction is a su to skin and eyes a qual Method us Qualitative Oral expose Qualitative If risk redu exposure i application cannot be application would be e rinsing witt experience	e-fraction of the inhalable fraction according to EN 481. itative assessment has been performed for dermal sed, comments assessment ure does not occur as part of the intended product use. assessment ction measures are taken into account no human s expected. However, dermal contact to dust from of lime substances or by direct contact to the limes excluded if no protective gloves are worn during . Due to the relatively long application time, skin irritation xpected. This can easily be avoided by immediate n water. It would be assumed that consumers who had of skin irritation will protect themselves. Therefore, any
includes an addition Since lime substance exposure and expo Human exposure Manual application Route of exposure Oral	nal safety margin since the re- ces are classified as irritating sure to the eye. n Exposure estimate	spirable fraction is a su to skin and eyes a qual Method us Qualitative Oral expose Qualitative If risk redu exposure i application cannot be application would be e rinsing witt experience occurring s	e-fraction of the inhalable fraction according to EN 481. itative assessment has been performed for dermal sed, comments assessment ure does not occur as part of the intended product use. assessment ction measures are taken into account no human of lime substances or by direct contact to dust from of lime substances or by direct contact to the limes excluded if no protective gloves are worn during . Due to the relatively long application time, skin irritation xpected. This can easily be avoided by immediate of skin irritation will protect themselves. Therefore, any kin irritation, which will be reversible, can be assumed
includes an addition Since lime substan- exposure and expo Human exposure Manual applicatio Route of exposure Oral Dermal	nal safety margin since the re- ces are classified as irritating sure to the eye.	spirable fraction is a suito skin and eyes a qual to skin and eyes a qual Method us Qualitative Oral expose If risk redu exposure i application cannot be application would be e rinsing witt experience occurring s to be non-1	assessment ure does not occur as part of the intended product use. assessment ure does not occur as part of the intended product use. assessment ction measures are taken into account no human s expected. However, dermal contact to dust from of lime substances or by direct contact to the limes excluded if no protective gloves are worn during . Due to the relatively long application time, skin irritatior xpected. This can easily be avoided by immediate n water. It would be assumed that consumers who had of skin irritation will protect themselves. Therefore, any kin irritation, which will be reversible, can be assumed ecurring.
includes an addition Since lime substance exposure and expo Human exposure Manual application Route of exposure Oral	nal safety margin since the re- ces are classified as irritating sure to the eye. n Exposure estimate	spirable fraction is a suito skin and eyes a qual to skin and eyes a qual Qualitative Oral expose Qualitative If risk redu exposure i application cannot be application would be e rinsing with experience occurring sito be non-1 Qualitative	assessment assessment assessment assessment ure does not occur as part of the intended product use. assessment ction measures are taken into account no human s expected. However, dermal contact to dust from of lime substances or by direct contact to the limes excluded if no protective gloves are worn during . Due to the relatively long application time, skin irritation xpected. This can easily be avoided by immediate of skin irritation will protect themselves. Therefore, any kin irritation, which will be reversible, can be assumed ecurring. assessment
includes an addition Since lime substan- exposure and expo Human exposure Manual applicatio Route of exposure Oral Dermal	nal safety margin since the re- ces are classified as irritating sure to the eye.	spirable fraction is a suito skin and eyes a qual to skin and eyes a qual Method us Qualitative Oral expose Qualitative If risk redu exposure i application cannot be application would be e rinsing with experience occurring s to be non-1 Qualitative If risk redu	assessment itative assessment has been performed for dermal assessment ure does not occur as part of the intended product use. assessment ction measures are taken into account no human s expected. However, dermal contact to dust from of lime substances or by direct contact to the limes excluded if no protective gloves are worn during . Due to the relatively long application time, skin irritation xpected. This can easily be avoided by immediate to water. It would be assumed that consumers who had of skin irritation will protect themselves. Therefore, any kin irritation, which will be reversible, can be assumed <u>ecurring.</u> assessment ction measures are taken into account no human
includes an addition Since lime substan- exposure and expo Human exposure Manual applicatio Route of exposure Oral Dermal	nal safety margin since the re- ces are classified as irritating sure to the eye.	spirable fraction is a suito skin and eyes a qual to skin and eyes a qual Qualitative Oral expos Qualitative If risk redu exposure i application cannot be application would be e rinsing with experience occurring s to be non Qualitative If risk redu exposure i	be-fraction of the inhalable fraction according to EN 481. itative assessment has been performed for dermal assessment ure does not occur as part of the intended product use. assessment ction measures are taken into account no human s expected. However, dermal contact to dust from of lime substances or by direct contact to the limes excluded if no protective gloves are worn during . Due to the relatively long application time, skin irritation xpected. This can easily be avoided by immediate awater. It would be assumed that consumers who had of skin irritation, which will be reversible, can be assumed ecurring. assessment ction measures are taken into account no human s expected. Dust from surfacing with lime cannot be
includes an addition Since lime substan- exposure and expo Human exposure Manual applicatio Route of exposure Oral Dermal	nal safety margin since the re- ces are classified as irritating sure to the eye.	spirable fraction is a suito skin and eyes a qual to skin and eyes a qual Qualitative Oral expos Qualitative If risk redu exposure i application cannot be application cannot be application would be e rinsing with experience occurring s to be non Qualitative If risk redu exposure i excluded if	be-fraction of the inhalable fraction according to EN 481. itative assessment has been performed for dermal <b>sed, comments</b> assessment ure does not occur as part of the intended product use. assessment ction measures are taken into account no human s expected. However, dermal contact to dust from of lime substances or by direct contact to the limes excluded if no protective gloves are worn during . Due to the relatively long application time, skin irritation xpected. This can easily be avoided by immediate awater. It would be assumed that consumers who had of skin irritation, which will be reversible, can be assumed ecurring. assessment ction measures are taken into account no human s expected. Dust from surfacing with lime cannot be no protective goggles are used. Prompt rinsing with
includes an addition Since lime substan- exposure and expo Human exposure Manual applicatio Route of exposure Oral Dermal	nal safety margin since the re- ces are classified as irritating sure to the eye.	spirable fraction is a suito skin and eyes a qual to skin and eyes a qual Qualitative Oral expos Qualitative If risk redu exposure i application cannot be application cannot be application would be e rinsing with experience occurring s to be non Qualitative If risk redu exposure i excluded if	be-fraction of the inhalable fraction according to EN 481. itative assessment has been performed for dermal assessment ure does not occur as part of the intended product use. assessment ction measures are taken into account no human s expected. However, dermal contact to dust from of lime substances or by direct contact to the limes excluded if no protective gloves are worn during . Due to the relatively long application time, skin irritation xpected. This can easily be avoided by immediate n water. It would be assumed that consumers who had of skin irritation, which will be reversible, can be assumed ecurring. assessment ction measures are taken into account no human s expected. Dust from surfacing with lime cannot be



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Printing Date: June/2019

r					
Inhalation (garden	Small task: 12 µg/m <sup>3</sup> (0.0012)	Quantitative assessment			
lime)	Large task: 120 µg/m <sup>3</sup> (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/m <sup>3</sup> (2.4 * 10 <sup>-4</sup> )	Quantitative assessment			
(fertilizer)	Large task: 2.4 µg/m <sup>3</sup> (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.			
Dect employed					
Post-application					
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 EC 1907/2006, Regulation (EC) 1272/2008 and Regulation (EC) 453/2010

Version: 1.0/EN

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

Exposure Scenario	Forma	at (2) addı	essina	uses carried out by	consum	ers	
1. Title							
Free short title				Consumer use of lime	substance	s as water treatme	ent chemicals
Systematic title based on use descriptor			SU21, PC20, PC37, EF				
Processes, tasks activities covered			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 assessment has been performed for oral and dermal exposure as well as for exposure of the eye. Dust exposure has been assessed by the Dutch model (van Hemmen, 1992). Environment: A qualitative justification assessment is provided.				
2. Operational co	ondit	ions and	d risk	management me	asures		
RMM				t integrated risk manager			
PC/ERC		Descripti categorie		ctivity referring to articl	e categor	ies (AC) and env	ironmental release
PC 20/37 Filling and re-filling Transfer of lime su		g (transfer of lime substances (solid)) of lime reactor for water treatment. ubstances (solid) into container for further application. tion of lime milk to water.					
ERC 8b				ndoor use of reactive sub		open systems	
2.1 Control of co	nsur	ners ex	posur	e			
<b>Product characteristic</b>							
Description of the		centration		Physical state of	Dustine	ss (if relevant)	Packaging design
preparation	prep	substance in the preparation		the preparation			
Water treatment chemical	Up to 100 %			Solid, fine powder			Bulk in bags or buckets/containers.
Water treatment chemical	Up to 99 %			Solid, granular of different size (D50 value 0.7 D50 value 1.75 D50 value 3.08)	low dustiness B		Bulk-tank lorry or in "Big Bags" or in sacks
Amounts used							
Description of the prep				Amount used per eve			
Water treatment chemical in lime reactor for aquaria		depending on the size of the water reactor to be filled (~ 100g /L)					
Water treatment chemical in lime reactor for drinking water		depending on the size of the water reactor to be filled (~up to 1.2 kg/L)					
Lime milk for further app				~ 20 g / 5L			
Frequency and duration of use/exposure							
Preparation of lime milk (loading, filling and refilling) 1.33 m (DIY-fa		n 1 task		frequency of e 1 task/month 1task/week	events		
		I minutes - hours 1 tasks/ month					
Human factors not influenced by risk management							
Description of the task	Population exposed			Breathing rate	Exposed body part		Corresponding skin area [cm <sup>2</sup> ]
Preparation of lime milk (loading, filling and refilling)	adult			1.25 m³/hr	Half of both hands		430 (RIVM report 320104007)
Dropwise application of lime milk to water			NR	Hands		860 (RIVM report 320104007)	
Other given operational Description of the task		litions affe	<mark>cting co</mark> or/outdo	onsumers exposure	volume	Air	exchange rate
		1.11400					



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Preparation of lime m	vilk (looding	Indoor/outdoor	1 m <sup>3</sup> (personal space, small	0.6 hr <sup>-1</sup> (unspecified room		
filling and refilling)	llik (loauling,	maoon/outaoon	area around the user)	indoor)		
Dropwise application	of lime milk	indoor	NR	NR		
to water						
			behavioural advice to consumers			
Do not get in eyes, o Keep container close		lothing. Do not breathe each of children.	e dust			
	Use only with adequate ventilation.					
Wash thoroughly afte	er handling.		of water and seek medical advice.			
		add limes to water and				
		d to personal protecti				
	Wear suitable gloves, goggles and protective clothes. Use a filtering half mask (mask type FFP2 acc. to EN 149).					
		ental exposure				
Product characteris						
Not relevant for expo	sure assessm	ient				
Not relevant for expo		ent				
Frequency and dura		lent				
Not relevant for expo		ient				
		ced by risk managem	ent			
Default river flow and	l dilution					
	onal conditio	ns affecting environn	nental exposure			
Indoor						
		d to municipal sewag				
			and sludge treatment technique			
Not relevant for expo			nt of waste for disposal			
		d to external recover	v of waste			
Not relevant for expo			y or waste			
		and reference t	o its source			
				postive DNEL (derived po		
The risk characterisation ratio (RCR) is the quotient of the refined exposure estimate and the respective DNEL (derived no- effect level) and is given in parentheses below. For inhalation exposure, the RCR is based on the acute DNEL for lime						
			ctive inhalation exposure estimate (as			
			raction is a sub-fraction of the inhalable			
			nd eyes a qualitative assessment has b	peen performed for dermal		
exposure and exposu	ure to the eye.					
Human exposure		. \				
Preparation of lime Route of exposure	Exposure e		Mothed used comments			
Oral	Exposure	estimate	Method used, comments           Qualitative assessment			
Ulai			Oral exposure does not occur as p	art of the intended product use.		
Dermal (powder)	small task:	0.1 µg/cm² (-)	Qualitative assessment			
· · · · · · · · · · · · · · · · · · ·	large task:		If risk reduction measures are take			
	_		exposure is expected. However, de			
		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 ConsE	xpo has been used. The contact		
			rate to dust formed while pouring p	owder has been taken from the		
			DIY-fact sheet (RIVM report 32010	4007). For granules the		
	1		exposure estimate will be even low	/er.		
Eye	Duri		Qualitative assessment			
,	Dust			n into account no human		
,	Dust		If risk reduction measures are take			
,	Dust		If risk reduction measures are take exposure is expected. Dust from lo	ading of the limes cannot be		
	Dust		If risk reduction measures are take exposure is expected. Dust from lo excluded if no protective goggles a	bading of the limes cannot be are used. Prompt rinsing with		
			If risk reduction measures are take exposure is expected. Dust from lo	bading of the limes cannot be are used. Prompt rinsing with		
Inhalation (powder)	Small task:	12 µg/m³ (0.003)	If risk reduction measures are take exposure is expected. Dust from lo excluded if no protective goggles a water and seeking medical advice advisable. Quantitative assessment	bading of the limes cannot be are used. Prompt rinsing with after accidental exposure is		
	Small task:	12 μg/m³ (0.003) 120 μg/m³ (0.03)	If risk reduction measures are take exposure is expected. Dust from lo excluded if no protective goggles a water and seeking medical advice advisable. Quantitative assessment Dust formation while pouring the p	bading of the limes cannot be are used. Prompt rinsing with after accidental exposure is owder is addressed by using		
	Small task:		If risk reduction measures are take exposure is expected. Dust from lo excluded if no protective goggles a water and seeking medical advice advisable. Quantitative assessment	bading of the limes cannot be are used. Prompt rinsing with after accidental exposure is owder is addressed by using		



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Inhalation	Small task: 1.2 µg/m <sup>3</sup> (0.0003)	Quantitative assessment			
(granules)	Large task: 12 µg/m <sup>3</sup> (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 application	Dropwise application of lime milk to water				
Route of exposure	Exposure estimate	Method used, comments			
Oral	-	Qualitative assessment			
		Oral exposure does not occur as part of the intended product use.			
Dermal	Droplets or splashes	Qualitative assessment			
		If risk reduction measures are taken into account no human			
		exposure is expected. However, splashes on the skin cannot be			
		excluded if no protective gloves are worn during application.			
		Splashes may occasionally result in mild irritation easily avoided			
		by immediate rinsing of the hands in water.			
Eye	Droplets or splashes	Qualitative assessment			
		If risk reduction measures are taken into account no human			
		exposure is expected. However, splashes into the eyes cannot be			
		excluded if no protective goggles are worn during the application.			
		However, it is rare for eye irritation to occur as a result of			
		exposure to a clear solution of calcium hydroxide (lime water) and			
		mild irritation can easily be avoided by immediate rinsing of the			
		eyes with water.			
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 exp	osure				
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.					



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Version: 1.0/EN

**Revision date: September/2010** 

Printing Date: June/2019

# ES number 9.15: Consumer use of cosmetics containing lime substances

Exposure Scenario Format (2) ad	dressing	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		-	
Assessment Method*		Human health: 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 mar		
		door use of processing aids in open systems	
2.1 Control of consumers exp			
	USUIE		
Product characteristic Not relevant, as the risk to human health	from this u	ing dags not pood to be considered	
	n from this u	ise does not need to be considered.	
Amounts used	from this	ine deep not need to be considered	
Not relevant, as the risk to human health			
Frequency and duration of use/expos		ing doop not need to be considered	
Not relevant, as the risk to human health			
Human factors not influenced by risk			
Not relevant, as the risk to human health			
Other given operational conditions af			
Not relevant, as the risk to human health			
		and behavioural advice to consumers	
Not relevant, as the risk to human health			
Conditions and measures related to personal protection and hygiene			
Not relevant, as the risk to human health			
2.2 Control of environmental exposure			
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 management			
Default river flow and dilution			
Other given operational conditions affecting environmental exposure			
Indoor			
Conditions and measures related to municipal sewage treatment plant			
Default size of municipal sewage system/treatment plant and sludge treatment technique			
Conditions and measures related to external treatment of waste for disposal			
Not relevant for exposure assessment			
Conditions and measures related to external recovery of waste			
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