SAFETY DATA SHEET

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

1.1 Product identifier

Trade name or designation of the mixture	ORC Advanced® Pellets
Registration number(s)	01-2120782995-32-0001

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

Identified uses	Soil and Groundwater Remediation.
Uses advised against	None known

1.3 Details of the supplier of the safety data sheet

Company name	Regenesis Ltd.
Address	Cambridge House Henry Street Bath, Somerset BA1 1BT United Kingdom
Telephone number	+44 (0) 1225 618161
E-mail address	CustomerService@regenesis.com

1.4 Emergency telephone number

General in EU	112 (Available 24 hours a day. SDS/Product information may not be available for the Emergency Service.)
CHEMTREC	For Dangerous Goods Incidents ONLY (spill, leak, fire, exposure or accident), call CHEMTREC 24/7 at:
International	(+)1-703-527-3887
USA, Canada, Mexico	(+)1-800-424-9300

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

The mixture has been assessed and/or tested for its physical, health and environmental hazards and the following classification applies

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

Oxid. Solid 2 – H271

Eye. Dam. 1 – H318

STOT SE 3 – H335

Aquatic Chronic 3 – H412

2.2 Label elements

Hazard pictograms		
Signal word	Danger	
Hazard Statements	H271	May cause fire or explosion; strong oxidiser
	H318	Causes serious eye damage
	H335	May cause respiratory irritation
	H412	Harmful to aquatic life with long lasting effects
Precautionary Statements	P210	Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
	P220	Keep away from clothing and other combustible materials
	P280	Wear protective gloves, eye and face protection
	P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do so. Continue rinsing. Immediately call a POISON CENTER or doctor.
	P306 + P360	IF ON CLOTHING: Rinse immediately contaminated clothing and skin before removing clothes
	P371 + P380 + P375	In case of major fire and large quantities: Evacuate area. Fight fire remotely due to the risk of explosion.

2.3 Other hazards

The mixture does not meet the criteria for PBT or vPvB according to Regulation (EC) No 1907/2006, Annex XIII

SECTION 3: Composition/information on ingredients

3.2 Mixtures

Substance Name	EC No.	CAS No.	% w/w	REACH Registration No.	Index No.	Classification
Reaction mass of calcium dihydroxide and calcium peroxide	930-930-0	-	90-100	01-2120782995-32-0001	N/A	Eye Dam. 1 – H318
Dipotassium phosphate	231-834-5	7758-11-4	<5	N/A	N/A	Not classified as hazardous
Monopotassium phosphate	231-913-4	7778-77-0	<5	N/A	N/A	Not classified as hazardous
Ammonium phosphate dibasic	231-987-8	7783-28-0	<1	N/A	N/A	Not classified as hazardous

The full text for all H-statements is displayed in Section 16.

SECTION 4: First aid measures

4.1 Description of first aid measures

General notes	Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Following inhalation	Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTRE or doctor if you feel unwell.
Following skin contact	Rinse immediately contaminated clothing and skin with plenty of water before removing clothes. If skin irritation occurs: get medical

	advice/attention.
Following eye contact	Rinse eyes with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center or doctor.
Following ingestion	Rinse mouth. Do not induce vomiting. Get medical advice/attention if you feel unwell.

4.2 Most important symptoms and effects, both acute and delayed

Serious eye damage. Respiratory irritation.

4.3 Indication of any immediate medical attention and special treatment needed

Provide general supportive measures and treat symptomatically. Keep person under observation. Symptoms may be delayed.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media	Foam. Dry chemical powder. Carbon dioxide (CO2). Water spray, fog (flooding amounts)
Unsuitable extinguishing media	None known.

5.2 Special hazards arising from the substance or mixture

Greatly increases the burning rate of combustible materials. Containers may explode when heated. During fire, gases hazardous to health may be formed. Combustion products may include: metal oxides.

5.3 Advice for firefighters

Special protective equipment for firefighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
Special firefighting procedures	Move containers from fire area if you can do so without risk. Use water spray to cool unopened containers.
Specific methods	In case of major fire and large quantities: evacuate area. Fight fire remotely due to the risk of explosion.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel	Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Keep away from clothing and other combustible materials. IF ON CLOTHING: Rinse immediately contaminated clothing and skin with plenty of water before removing clothes. Wear appropriate protective equipment and clothing during clean-up. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ensure adequate ventilation. Local authorities should be advised if significant spillages cannot be contained.
For emergency responders	Keep unnecessary personnel away. Use personal protection recommended in Section 8 of the SDS.

6.2 Environmental precautions

Avoid discharge into drains, water courses or onto the ground.

6.3 Methods and material for containment and cleaning up

Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Keep away from clothing and other combustible materials. Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air). Collect dust using a vacuum cleaner equipped with HEPA filter. Ventilate the contaminated area.

Large Spills: Stop the flow of material, if this is without risk. Absorb in vermiculite, dry sand or earth and place into containers. Shovel the material into waste container. Minimise dust generation and accumulation. Following product recovery, flush area with water.

Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination.

Never return spills to original containers for re-use.

6.4 Reference to other sections

For personal protection, see section 8 of the SDS. For waste disposal, see section 13 of the SDS.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Avoid breathing dust. Avoid contact with eyes, skin, and clothing. Wear appropriate personal protective equipment including protective gloves, eye protection and face protection. Wear fire resistant or flame retardant clothing. Observe good industrial hygiene practices. Use only outdoors or in a well-ventilated area.

7.2 Conditions for safe storage, including any incompatibilities

Store in a well-ventilated place. Keep container tightly closed. Store away from incompatible materials (see section 10 of the SDS). Recommended storage containers: plastic lined steel, plastic, glass, aluminum, stainless steel, or reinforced fiberglass.

7.3 Specific end use(s)

Soil and Groundwater Remediation

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Occupational exposure limit values

Substance	Reaction mass of calcium dihydroxide and calcium peroxide
CAS No.	-
No exposure limits noted	

Substance	Calcium hydroxide			
CAS No.	1305-62-0			
Country	Limit value – eight hours		Limit value – short term	
	ppm	mg/m^3	ppm	mg/m^3
European Union	-	1 (1)	-	4 (1)(2)
United Kingdom	-	5 1 (1)	-	- 4 (1)
	Remarks			
European Union	(1) Respirable fraction (2) 15 minutes average value			
United Kingdom	(1) Respirable fraction			

Substance	Calcium peroxide
CAS No.	78403-22-2
No exposure limits noted	

Recommended monitoring procedures: Follow standard monitoring procedures

Derived no effect levels (DNELs):

Reaction mass of calcium dihydroxide and calcium peroxide

Exposure Route	Exposure Patterns	DNEL (workers)
Inhalation	Long term systemic	No hazard identified
	Short term systemic	
	Long term local	1 mg/m^3
	Short term local	4 mg/m^3
Dermal	Long term systemic	No hazard identified
	Short term systemic	
	Long term local	
	Short term local	

Exposure Route	Exposure Patterns	DNEL (workers)
Inhalation	Long term systemic	No hazard identified
	Short term systemic	
	Long term local	1 mg/m^3
	Short term local	4 mg/m^3
Dermal	Long term systemic	No hazard identified
	Short term systemic	
	Long term local	
	Short term local	

Predicted no effect concentrations (PNECs):

Reaction mass of calcium dihydroxide and calcium peroxide

PNEC	Value
Aqua (freshwater)	8.7 µg/L
Aqua (marine water)	0.87 µg/L
STP	3.2 mg/L
Sediment (freshwater)	0.052 mg/kg sediment dw
Sediment (marine water)	0.005 mg/kg sediment dw
Soil	0.004 mg/kg soil dw
Secondary poisoning	No potential for bioaccumulation

8.2 Exposure controls

8.2.1 Appropriate engineering controls

Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Eye wash facilities and emergency shower must be available when handling this product.

8.2.2 Individual protection measures, such as personal protective equipment

General information	Use personal protective equipment as required. Personal protection equipment should be chosen according to the CEN standards and in discussion with the supplier of the personal protective equipment.
Eye/face protection	Wear approved, tight fitting indirect vented or non-vented safety goggles where splashing is probable. Face shield is recommended.
Skin protection	
Hand protection	Wear appropriate chemical resistant gloves. Recommended gloves include rubber, neoprene, nitrile or viton.
Other	Wear appropriate chemical resistant clothing.
Respiratory protection	If engineering controls do not maintain airborne concentrations below recommended exposure limits (where applicable) or to an acceptable level (in countries where exposure limits have not been established), an

	approved respirator must be worn.
Thermal	Wear appropriate thermal protective clothing, when necessary.
Hygiene measures	Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

8.2.3 Environmental exposure controls

Environmental manager must be informed of all major releases.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance	
Physical state	Solid
Form	Grains
Colour	White to pale yellow
Odour	Odourless
Odour threshold	No data available
pH	12.5 (3% suspension/water)
Melting point/freezing point	Melting was not observed below the temperature at which decomposition started
Initial boiling point and boiling range	No data available
Flash point	No data available
Evaporation rate	No data available
Flammability (solid, gas)	No data available
Upper/lower flammability or explosive limits	No data available
Vapour pressure	No data available
Vapour density	No data available
Relative density	3.11 at 20ºC
Solubility(ies)	No data available
Partition coefficient: n-octanol/water	No data available
Auto-ignition temperature	Not considered to be self-ignitable
Decomposition temperature	275 °C (527 °F)
Viscosity	No data available
Explosive properties	Not considered to have explosive properties
Oxidising properties	No data available

SECTION 10: Stability and reactivity

10.1 Reactivity	Keep away from combustible material. Greatly increases the burning rate of combustible materials
10.2 Chemical stability	Decomposes on heating. Product may be unstable at temperatures above: 275°C/527°F
10.3 Possibility of hazardous reactions	Reacts slowly with water.
10.4 Conditions to avoid	Moisture. Heat. Avoid temperatures exceeding the decomposition temperature. Contact with incompatible materials. Keep away from combustible material.
10.5 Incompatible materials	Acids. Bases. Combustible material. Reducing Agents. Salts of heavy metals.

10.6 Hazardous decomposition products	Oxygen. Hydrogen peroxide (H_2O_2). Steam. Heat.

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Reaction mass of calcium dihydroxide and calcium peroxide

Acute toxicity	Species	Test Results	Method
Oral LD50	Rat	LD50 >5,000 mg/kg bw	OECD 401
Inhalation LC50	No data available		
Dermal LD50	Rat	LD50 > 2,000 mg/kg bw	OECD 402
Skin corrosion/irritation	Rabbit	Not irritating	OECD 404
Serious eye damage/irritation	Rabbit	Causes serious eye damage	OECD 405
Respiratory or skin sensitisation	Not considered to be sensitising		
Germ cell mutagenicity	Not considered to be mutagenic (Ames study; equivalent or similar to OECD 487 (in vitro mammalian cell micronucleus test); equivalent or similar to OECD 476 (in vitro mammalian cell gene mutation test))		
Carcinogenicity	Not considered to be carcinogenic		
Reproductive toxicity	Not considered to be reprotoxic; no guideline available (three-generation study)		
STOT-single exposure	Considered to cause specific target organic toxicity via single exposure (irritation of the respiratory tract)		
STOT-repeated exposure	Not considered to cause specific target organic toxicity via repeat exposure; OECD 412		
Aspiration hazard	No data available; not considered to cause an aspiration hazard		

SECTION 12: Ecological information

12.1 Toxicity

Reaction mass of calcium dihydroxide and calcium peroxide

Ecotoxicological endpoint	Value	Species, Method
Acute (short term toxicity):		
Fish	LL50 (96h) >100 mg/L	Cyprius carpio; OECD 203
Crustacea	EC50 (48h) 8.7 mg/L	Daphnia magna; OECD 202
Algae/aquatic plants	EL50 (72h) 36 mg/L	Pseudokirchneriella subcapitata; OECD 201
Activated sludge respiration	EC50 (3h) 194 mg/L	Domestic sewage; OECD 209
Chronic (long-term toxicity):		
Fish	No data available	
Crustacea	No data available	

12.2 Persistence and biodegradability

The substance is inorganic, biodegradation studies are not applicable. No further testing is deemed to be necessary.

12.3 Bioaccumulative potential

Based on the available information, there is no indication of a bioaccumulation potential.

12.4 Mobility in soil

Low potential for absorption.

12.5 Results of PBT and vPvB assessment

The substance is not considered to be PBT or vPvB.

12.6 Other adverse effects

None known.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Residual waste	Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner.
Contaminated packaging	Empty containers should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied.
EU waste code	The Waste code should be assigned in discussion between the user, the producer and the waste disposal company.
Disposal methods/information	Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Dispose of contents/container in accordance with local/regional/national/international regulations.
Special precautions	Dispose in accordance with all applicable regulations.

SECTION 14: Transport information

	ADR/RID	ADN	IMDG	IATA
14.1 UN Number	UN1457	UN1457	UN1457	UN1457
14.2 UN proper shipping name	CALCIUM PEROXIDE	CALCIUM PEROXIDE	CALCIUM PEROXIDE	CALCIUM PEROXIDE
14.3 Transport hazard class(es)				
Class	5.1	5.1	5.1	5.1
Subsidiary risk	-	-	-	-
Label(s)	5.1	5.1	5.1	5.1
Hazard No.	50	-	-	-
Tunnel restriction code	E	-	-	-
14.4 Packing group	II	II	II	II
14.5 Environmental hazards	No	No	No Marine pollutant: No EmS: F-G, S-Q	No ERG Code 5L

14.6 Special precautions for user

Read safety instructions, SDS and emergency procedures before handling.

14.7 Transport in bulk according to Annex II of MARPOL 73/78 and IBC Code

Not applicable

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture
None identified

15.2 Chemical safety assessment
A chemical safety assessment has been performed for the reaction mass of calcium dihydroxide and calcium peroxide.

SECTION 16: Regulatory information

This SDS supersedes the SDS dated 31 January 2018

The following amendments have been made:

- SDS has been fully revised in accordance with Regulation (EU) No 453/2010 and Regulation (EC) No. 1272/2008 (EU CLP) and in accordance with new information on the constituent substances registered under Regulation (EC) 1907/2006 (EU REACH)

List of abbreviations:

ADN: European Agreement Concerning the International Carriage of Dangerous Goods by Inland Waterways.
ADR: European Agreement Concerning the International Carriage of Dangerous Goods by Road.
CAS: Chemical Abstract Service.
CEN: European Committee for Standardization (Comité Européen de Normalisation).
DNEL: Derived No-Effect Level. ECHA: European Chemical Agency.
IATA: International Air Transport Association. IBC: Intermediate Bulk Container. IMDG: International Maritime Dangerous Goods
MARPOL: International Convention for the Prevention of Pollution from Ships. PBT: Persistent, bioaccumulative, toxic.
PNEC: Predicted No-Effect Concentration.
RID: Regulations concerning the International Carriage of Dangerous Goods by Rail. vPvB: very Persistent, very Bioaccumulative.

References:
Lead registrant CSR, available on request

Information on evaluation method leading to the classification of mixture
The classification for health and environmental hazards is derived by a combination of calculation methods and test data, if available.

Full text of any H-statements not written out in full under Sections 2 to 15:

H271 May cause fire or explosion; strong oxidiser
H318 Causes serious eye damage.
H335 May cause respiratory irritation
H412 Harmful to aquatic life with long lasting effects

Training information
Follow training instructions when handling this material.

Disclaimer:
Regenesis cannot anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use. The information in the sheet was written based on the best knowledge and experience currently available.

ANNEX

EXPOSURE SCENARIOS

9.1. Exposure scenario 1: Widespread use by professional workers - Soil and groundwater aerobic bioremediation

Use description

The product is sold to professionals of remediation soils already formulated. The product is not further processed or repackaged and is either mixed or injected into the soil. The product containing the substance may be in powder or in granular form. It has a low solubility and can be applied either directly as a dry powder or as a slurry (that consists of 10 to 40 percent solids by weigh.), to assist in product distribution, to minimize dust, and to provide the hydration necessary to initiate the release of oxygen.

The product is intended for aerobic bioremediation; by adding oxygen to the subsurface through pure oxygen injection, use of oxygen releasing compounds, hydrogen peroxide infiltration, the oxygen becomes available to aerobic microorganisms in the unsaturated zone, saturated zone or both. The process helps to facilitate the conversion of biodegradable compounds to CO_2 and H_2O.

The product containing the substance provides oxygen through a reaction of calcium peroxide and water:

$CaO_2 + 2H_2O \rightarrow Ca(OH)_2 + H_2O_2$

$2H_2O_2 \rightarrow O_2 + 2H2O$

Application method

The application method chosen is often determined by several factors including the depth to groundwater, soil type, location and extent of soil contamination.

For injection applications, the product is mixed with water by the contractor to prepare a 20-70% slurry. It is applied to backfill open excavations or open boreholes. Smaller volumes of greater than 40 percent slurries can be mixed in buckets, however larger volumes of >40 percent slurries may require specialized material handling and transfer equipment. The slurries are injected into the subsurface using techniques such as direct injection through injection tooling, hydraulic fracturing, or other injection devices with large enough pore openings to allow the passing of the slurry.

For direct application in excavations, the product can be as a dry powder or concentrated slurry. An in situ mixing of the product is done by soil mixing equipment or placed into an open excavation. The application of a slurry is recommended in order to minimize potential fugitive dust issues (especially in windy conditions) and as hydration is required to initiate the release of oxygen release. If the product is added dry, it is recommended that the product be wetted down with enough water to saturate the product following the application.

Application rates

The amount of the product required will be directly proportional to the mass of contamination being treated and other compounds that may be present that will be oxidized under aerobic conditions. In the absence of specific site information, approximately 5 to 20 Kg per square meter, of the pit surface area is commonly used during mixing as a polishing treatment for residual contamination in the aqueous phase. If the product is to be blended into the bottom of the excavation, approximately 16 to 64 Kg per cubic meter of the product is often used depending upon the vertical extent of the blending. Maximum treatment effect is obtained with thorough mixing within the backfills material. Generally, the product is applied at a rate of between 0.1% and 1.0% by weight of the soil matrix depending on the extent of the contamination present.

To establish the appropriated loading requirements, a number of analysis are recommended in the treatment area monitoring locations installed prior to the application.

Critical Parameters
- Volatile organic compounds (VOCs)
- Semi-volatile organic compounds (sVOCs)
- Total petroleum hydrocarbons (TPH)
- pH
- Dissolved oxygen (DO)
- Redox potential (Eh)
- Chemical oxygen demand (COD), in soil and groundwater
- Biological oxygen demand (BOD), in soil and groundwater

Non-Critical Parameters
- Total organic carbon (TOC) in soil or fraction organic carbon ($f$oc)
- Reduced metals, such as dissolved iron and manganese
- Reduced inorganics, such as sulfide, nitrate, and chloride
- Alkalinity and hardness

Critical parameters are used to assess the applicability of an aerobic treatment approach and can establish a baseline for potential secondary plume contaminants (e.g. heavy metals). The non-critical parameters are optional but can provide general information about the soil and water chemistry which may be useful when analysing performance monitoring data.

Preventions for workers

The substance preparation is a fine powder and mild oxidizer needs to be handled with care while in the field in accordance with the SDS. Field personnel should take precautions while applying the product including working up wind of the product as well as use appropriate safety equipment including safety glasses, suitable protective clothing, boots (steel toed), chemical resistant gloves, hard hat, and hearing protection (when direct push is used). For dust, splash, mist, or spray exposures wear a filtering dust mask and chemical protective goggles, as deemed appropriate by exposure duration and field conditions. A face shield can also be used in addition to goggles.

Product should never be applied by personnel within the tank excavation, unless proper shoring or sidewall cutback is in place. The product should be applied within the tank excavation floor and/or in an adequate backfill section thickness to account for the anticipated groundwater “smear zone”.

Description of the assessment approach:

The workers’ exposure and risks will very much depend on the application methodology. Three different and complementary assessments were done according to the physical form of the substance at application stage:

- solid reaction mass
- liquid: reaction mass dissolved in water (slurry)
- the potential inhalation to hydrogen peroxide.

Product category used: PC 0: Other
Sector of use: SU 0: Others: Environmental Remediation

Environment contributing scenario(s):		
CS 1	Soil and groundwater aerobic bioremediation	ERC 8e
Worker contributing scenario(s):		
Solid		

CS 2	MIXING OR BLENDING IN BATCH PROCESSES	PROC 5
CS 3	TRANSFER OF SUBSTANCE OR MIXTURE (CHARGING AND DISCHARGING) AT NON-DEDICATED FACILITIES	PROC 8a
CS 4	TRANSFER OF SUBSTANCE OR MIXTURE (CHARGING AND DISCHARGING) AT DEDICATED FACILITIES	PROC 8b
CS	TRANSFER OF SUBSTANCE OR MIXTURE INTO SMALL CONTAINERS (DEDICATED FILLING LINE, INCLUDING WEIGHING).	PROC 9
CS 6	MANUAL ACTIVITIES INVOLVING HAND CONTACT	PROC 19
CS 7	HANDLING OF SOLID INORGANIC SUBSTANCES AT AMBIENT TEMPERATURE	PROC 26
Slurry		
CS 8	TRANSFER OF SUBSTANCE OR MIXTURE (CHARGING AND DISCHARGING) AT NON-DEDICATED FACILITIES	PROC 8a
CS 9	TRANSFER OF SUBSTANCE OR MIXTURE (CHARGING AND DISCHARGING) AT DEDICATED FACILITIES	PROC 8b
CS 10	TRANSFER OF SUBSTANCE OR MIXTURE INTO SMALL CONTAINERS (DEDICATED FILLING LINE, INCLUDING WEIGHING).	PROC 9
CS 11	MANUAL ACTIVITIES INVOLVING HAND CONTACT	PROC 19
CS 12	USE OF FUNCTIONAL FLUIDS IN SMALL DEVICES	PROC 20
Liquid		
CS 13	TRANSFER OF SUBSTANCE OR MIXTURE (CHARGING AND DISCHARGING) AT NON-DEDICATED FACILITIES	PROC 8a
CS 14	TRANSFER OF SUBSTANCE OR MIXTURE (CHARGING AND DISCHARGING) AT DEDICATED FACILITIES	PROC 8b
CS 15	TRANSFER OF SUBSTANCE OR MIXTURE INTO SMALL CONTAINERS (DEDICATED FILLING LINE, INCLUDING WEIGHING).	PROC 9
CS 16	MANUAL ACTIVITIES INVOLVING HAND CONTACT	PROC 19

CS 17	USE OF FUNCTIONAL FLUIDS IN SMALL DEVICES	PROC 20

Env CS 1: Soil and groundwater aerobic bioremediation (ERC 8e)

Conditions of use

Amount used, frequency and duration of use (or from service life)
• Daily local widespread use amount: <= 0.000027 tonnes/day (according to ERC 8e descriptor) - Application rate in soil: 1% (10 g substance/kg soil)
Conditions and measures related to biological sewage treatment plant
• No release to STP
Conditions and measures related to external treatment of waste (including article waste)
• Particular considerations on the waste treatment operations *It is assumed that the only waste could be generated inside the containers used for transport of the substance. Low risk assumed for waste life stage. Waste disposal according to national legislation is sufficient.*

Based on the composition of the substance, i.e. calcium peroxide and calcium hydroxide, the substance is expected to have a low potential for adsorption. Calcium hydroxide is expected to release calcium ion and hydroxyl ions. The calculated adsorption coefficient of calcium is very low (Koc = 13.22 L/kg, begin Log Koc = 1.121, MCI method, KOCWIN v2.00). The behaviour of hydroxyl ion depends on the pH buffer capacity of the media and it is controlled by a range of processes, being Koc value not relevant for its fate. Calcium peroxide will hydrolyse into calcium hydroxide and hydrogen peroxide.

According to the previously described, the substance rapidly degrades in the soil and water and the main degradation product, H_2O_2 which is the desired substance for bioremediation also is expected to react and degrade rapidly.

Hydrogen peroxide DT50 in soil is 12 hours and in surface water is 5 days. Therefore, it is considered that hydrogen peroxide from soil is foreseen not to reach freshwater sediment, neither freshwater nor saltwater compartments.

The hydrogen peroxide logarithmic octanol-water partition coefficient is < -1 indicating no potential for bioaccumulation.

The low value of Henry's law constant indicates very poor volatilization of hydrogen peroxide from water into the air. The vapour pressure of hydrogen peroxide is 214 Pa at 20 °C which is clearly lower compared to the vapour pressure of water. Also, as hydrogen peroxide is miscible with water. Taking into account the miscibility and the calculated log Koc, it is expected that hydrogen peroxide has a low potential for adsorption to soil and for partitioning to suspended matter or sediment.

All the above data for release in soil and in water, together with the information on the hydrogen peroxide which is the degradation product indicate the substance has very low risk for the described environmental compartments.

It is considered that hydrogen peroxide due to its rapid decomposition makes the secondary dietary exposure as not probable. No further assessment of secondary exposure via the food chain is therefore considered necessary.

Releases

The local releases to the environment are reported in the following table:

Table 9.5. Local releases to the environment

Release	Release estimation method	Explanations
Water	Estimated release factor	No direct release to freshwater
Air	Estimated release factor	Not relevant
Soil	Estimated release factor	Direct application of the substance to soil (100%)
Groundwater	Estimated release factor	Direct application of the substance to soil (100%)

The substance is intended for direct application to the soil and groundwater. No industrial applications are foreseen; therefore, there are no emissions to STP.

Emissions to soil

The assessed use is the direct application of the substance to the soil to be remediated. Therefore, the emission to this compartment is the relevant one. The maximum rate of application is 1% (w/w) in soil.

Possible movement from soil to groundwater is calculated by EUSES according to the TGD (2003) by equations 67 and 68, where the predicted concentration in porewater of agricultural soil is taken as an indication for potential groundwater levels. This approach is not considering the degradation rates at soil compartment and is therefore, very conservative. This is considered as the worst scenario.

Emission to groundwater

Direct application of the substance to groundwater is restricted by the maximum permissible concentration of hydrogen peroxide of the Directive 2006/18/EC of 0.1 µg/L. furthermore, regular analytics as described before are requested for determining the application rate, according to each particular case.

The local releases to the environment are reported in the following table. Note that the releases reported do not account for the removal in the modelled biological STP.

9.1.1.3. Exposure and risks for the environment and man via the environment

There is direct emission of the substance to the soil to be bioremediated. The application rate is 1% (w/w). This is 10 g of the substance per kg of soil to be treated. This is used as the imput parameter in EUSES.

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table. The exposure estimates have been obtained with EUSES 2.1.2 .

Table 9.6. Exposure concentrations and risks for the environment and man via the environment

Protection target	Exposure concentration	Risk quantification
Fresh water	**Local PEC:** 2.8E-7 mg/L	RCR < 0.01
Sediment (freshwater)	**Local PEC:** 2.8E-7 mg/kg dw	RCR < 0.01
Marine water	**Local PEC:** 2.56E-8 mg/L	RCR < 0.01
Sediment (marine water)	**Local PEC:** 2.1E-8 mg/kg dw	RCR < 0.01

Since there is direct exposure to soil, the local PECs for this compartment are calculated as:

Protection target	Exposure concentration	Risk quantification
Soil (total) averaged over 30 days	**Local PEC:** 10 g/kg dw	RCR >1
Soil (total) averaged over 180 days	**Local PEC:** 5 g/kg dw	RCR>1
Pore water of treated soil	**Local PEC:** 28.8 g/L	RCR >1
Groundwater	**Local PEC:** 28.8 g/L	RCR >1

The substance reaction mass of calcium dihydroxide and calcium peroxide, at water contact, decomposes to calcium oxide and hydrogen peroxide; this last component decomposes rapidly to water and oxygen. The DT50 of hydrogen peroxide in soil is 12 hours. The above-depicted figures are not considering the substance degradation and are not realistic.

The substance is applied on to soil contaminated with substances like petroleum hydrocarbons, oil, gasoline, solvents, pesticides; this is, the soil is much more concentrated on organic than the regular soil. Therefore, the degradation half live it is assumed to be much lower than in regular soils, and more similar to the values in manure or sludge (2 to 6 minutes).

The local exposure is restricted to the contaminated area to treat. There is an extensive monitoring of a number of parameters for the aerobic treatment and the soil and water chemistry. Since every soil to be decontaminated will require particular treatment, is not possible to apply a single degradation rate for the substance and/or hydrogen peroxide. The application parameters are to be defined case by case as well as the chemistry monitorisation to comply with regulations.

The regional exposure concentrations are described in section 10.2. These figures are representatives of the overall risk of the substance use, even also not considering the degradation rates.

Risk characterisation

Conclusions: Risks are considered as adequately controlled.

A. - SOLID REACTION MASS OF CALCIUM DIHYDROXIDE AND CALCIUM PEROXIDE:

Worker CS 2: MIXING OR BLENDING IN BATCH PROCESSES (PROC 5)

Conditions of use

Assessed substance: reaction mass *Form of the substance: Solid*	*PROC 5*
Parameter	Data
Product type of the substance/preparation:	Powders, granules or pelletised material
Dustiness:	Coarse dust
Moisture content:	Dry product (< 5 % moisture content)
Weight fraction:	1
Source distance from the worker's breathing zone (mouth and nose):	More than 1 meter (far-field zone)
Activity Class:	Movement and agitation of powders, granules or pelletised material
Situation which best represents activity:	Transferring 100– 1000 kg/minute
Agitation level	Handling with high level of agitation (mechanical mixing)
Containment level	Handling that reduces contact between product and adjacent air
Process fully enclosed?	No
Effective housekeeping practices in place?	Yes
Task duration (0-480 min):	480
Localized controls - primary:	Medium level (99% reduction)
Localized controls - secondary:	No localized controls
Work area:	Indoors
Room size:	Any size workroom
Segregation from source:	Partial segregation with ventilation and filtration (70% reduction)
Personal enclosure:	Partial personal enclosure with ventilation (70% reduction)
Ventilation rate:	3 air changes per hour (ACH)

Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	**Exposure concentration**	**Risk quantification**

Inhalation, local, long term	0.006 mg/m³ (ART V 1.5)	RCR = 0.006
Eye, local, acute		Qualitative

Risk characterisation

Qualitative risk characterisation:
The substance is classified as eye damage 1 (H318 Causes serious eye damage). Use of chemically resistant goggles is necessary.
The substance may cause respiratory irritation (H335). Use of substance/task appropriate respiratory protection is necessary.

Conclusions: Risks are considered as adequately controlled

Worker CS 3: TRANSFER OF SUBSTANCE OR MIXTURE (CHARGING AND DISCHARGING) AT NON-DEDICATED FACILITIES (PROC 8a)

Conditions of use

Assessed substance: reaction mass *Form of the substance: Solid*	*PROC 8a*
Parameter	Data
Product type of the substance/preparation:	Powders, granules or pelletised material
Dustiness:	Coarse dust
Moisture content:	Dry product (< 5 % moisture content)
Source distance from the worker's breathing zone (mouth and nose):	Less than 1 meter (near-field zone)
Activity Class:	Movement and agitation of powders, granules or pelletised material
Situation which best represents activity:	Transferring 10 – 100 kg/minute
Agitation level	Handling with low level of agitation
Containment level	Handling that reduces contact between product and adjacent air. Note: This does not include processes that are fully contained by localised controls
Process fully enclosed?	No
Effective housekeeping practices in place?	Yes
Task duration (0-480 min):	480
Localized controls - primary:	No localized controls
Localized controls - secondary:	No localized controls
Exposure site	Outdoors
Segregation from source	No segregation
Separation of the worker	No personal enclosure

Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, local, long term	0.00035 mg/m³ (ART V 1.5)	RCR = 0.00035
Eye, local, acute		Qualitative

Risk characterisation

Qualitative risk characterisation:
The substance is classified as eye damage 1 (H318 Causes serious eye damage). Use of chemically resistant goggles is necessary.
The substance may cause respiratory irritation (H335). Use of substance/task appropriate respiratory protection is necessary.
Conclusions: Risks are considered as adequately controlled

Worker CS 4: TRANSFER OF SUBSTANCE OR MIXTURE (CHARGING AND DISCHARGING) AT DEDICATED FACILITIES (PROC 8b)

Conditions of use

Assessed substance: reaction mass *Form of the substance: Solid*	*PROC 8b*
Parameter	Data
Product type of the substance/preparation:	Powders, granules or pelletised material
Dustiness:	Coarse dust
Moisture content:	Dry product (< 5 % moisture content)
Source distance from the worker's breathing zone (mouth and nose):	Less than 1 meter (near-field zone)
Activity Class:	Movement and agitation of powders, granules or pelletised material
Situation which best represents activity:	Transferring 10 – 100 kg/minute
Agitation level	Handling with low level of agitation
Containment level	Handling that reduces contact between product and adjacent air. Note: This does not include processes that are fully contained by localised controls
Process fully enclosed?	No
Effective housekeeping practices in place?	Yes
Task duration (0-480 min):	480
Localized controls - primary:	No localized controls
Localized controls - secondary:	No localized controls
Exposure site	Outdoors
Segregation from source	No segregation
Separation of the worker	No personal enclosure

Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, local, long term	0.00035 mg/m³ (ART V 1.5)	RCR = 0.00035
Eye, local, acute		Qualitative

Risk characterisation

Qualitative risk characterisation:
The substance is classified as eye damage 1 (H318 Causes serious eye damage). Use of chemically resistant goggles is necessary.
The substance may cause respiratory irritation (H335). Use of substance/task appropriate respiratory protection is necessary.

Conclusions: Risks are considered as adequately controlled

Worker CS 5: TRANSFER OF SUBSTANCE OR MIXTURE INTO SMALL CONTAINERS (DEDICATED FILLING LINE, INCLUDING WEIGHING) (PROC 9)

Conditions of use

Assessed substance: reaction mass *Form of the substance: Solid*	*PROC 9*
Parameter	Data
Product type of the substance/preparation:	Powders, granules or pelletised material
Dustiness:	Coarse dust
Moisture content:	Dry product (< 5 % moisture content)
Source distance from the worker's breathing zone (mouth and nose):	More than 1 meter (far-field zone)
Activity Class:	Vacuum transfer of powders
Situation which best represents activity:	Transferring 0.1 – 1 kg/minute
Containtment level	Handling that reduces contact between product and adjacent air. Note: This does not include processes that are fully contained by localised controls
Process fully enclosed?	No
Effective housekeeping practices in place?	Yes
Task duration (0-480 min):	480
Localized controls - primary:	No localized controls
Localized controls - secondary:	No localized controls
Exposure site	Outdoors
Segregation from source	No segregation

Separation of the worker	No personal enclosure

Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, local, long term	0.000035 mg/m³ (ART V 1.5)	RCR = 0.000035
Eye, local, acute		Qualitative

Risk characterisation

Qualitative risk characterisation:
The substance is classified as eye damage 1 (H318 Causes serious eye damage). Use of chemically resistant goggles is necessary. The substance may cause respiratory irritation (H335). Use of substance/task appropriate respiratory protection is necessary.

Conclusions: Risks are considered as adequately controlled

Worker CS 6: MANUAL ACTIVITIES INVOLVING HAND CONTACT (PROC 19)
Conditions of use

Assessed substance: reaction mass *Form of the substance: Solid*	*PROC 19*
Parameter	Data
Product type of the substance/preparation:	Powders, granules or pelletised material
Dustiness	Coarse dust
Moisture content	Dry Product (<5% moisture content)
Activity Class:	Handling of contaminated solid objects
Situation:	Handling of objects with visible contamination (object covered with fugitive dust from surrounding dusty activities)
Handling type	Careful handling, involves workers showing attention to potential danger, error or harm and carrying out the activity in a very exact and thorough (or cautious) manner.
Process fully enclosed?	No
Effective housekeeping practices in place?	Yes
Task duration (0-480 min):	480
Exposure site	Outdoors
Source located close to buildings?	No
Localized controls, primary	No localized controls
Localized controls, secondary	No localized controls

Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, local, long term	0.00014 mg/m³ (ART V 1.5)	RCR = 0.00014
Eye, local, acute		Qualitative

Risk characterisation

Qualitative risk characterisation:
The substance is classified as eye damage 1 (H318 Causes serious eye damage). Use of chemically resistant goggles is necessary.
The substance may cause respiratory irritation (H335). Use of substance/task appropriate respiratory protection is necessary.

Conclusions: Risks are considered as adequately controlled

Worker CS 7: HANDLING OF SOLID INORGANIC SUBSTANCES AT AMBIENT TEMPERATURE (PROC 26)

Conditions of use

Assessed substance: reaction mass *Form of the substance: Solid*	*PROC 26*
Parameter	Data
Product type of the substance/preparation:	Powders, granules or pelletised material
Dustiness:	Coarse dust
Moisture content:	Dry product (< 5 % moisture content)
Source distance from the worker's breathing zone (mouth and nose):	Less than 1 meter (near-field zone)
Activity Class:	Vacuum transfer of powders
Situation which best represents activity:	Transferring 1 – 10 kg/minute
Containtment level	Open process
Process fully enclosed?	No
Effective housekeeping practices in place?	Yes
Task duration (0-480 min):	480
Work area:	Outdoors
Source located close to buildings?	No
Localized controls - primary:	No localized controls
Localized controls - secondary:	No localized controls

Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, local, long term	0.000042mg/m³ (ART V 1.5)	RCR = 0.000042
Eye, local, acute		Qualitative

Risk characterisation

Qualitative risk characterisation:
The substance is classified as eye damage 1 (H318 Causes serious eye damage). Use of chemically resistant goggles is necessary.
The substance may cause respiratory irritation (H335). Use of substance/task appropriate respiratory protection is necessary.

Conclusions: Risks are considered as adequately controlled

B.- LIQUID: REACTION MASS DISSOLVED IN WATER (SLURRY)

Worker CS 8: TRANSFER OF SUBSTANCE OR MIXTURE (CHARGING AND DISCHARGING) AT NON-DEDICATED FACILITIES (PROC 8a)

Conditions of use

Assessed substance: reaction mass *Form of the substance: Slurry*	*PROC 8a*
Parameter	Data
Product type of the substance/preparation:	Powders dissolved in a liquid or incorporated in a liquid matrix
Viscosity:	medium
Weight fraction:	0.7
Source distance from the worker's breathing zone (mouth and nose):	More than 1 meter (far-field zone)
Activity Class:	Falling liquids
Situation which best represents activity:	Transfer of liquid product with flow 10-100 l/minute
Level of contamination:	Open process
Loading type:	Submerged loading, where the liquid dispenser remains below the fluid level reducing the amount of aerosol formation
Process fully enclosed?	No
Effective housekeeping practices in place?	Yes
Task duration (0-480 min):	480
Exposure site	Outdoors
Source located close to buildings?	No
Worker distance	> 4 m

Localized controls, primary	No localized controls
Localized controls, secondary	No localized controls
Segregation from source	No segregation
Separation of the worker	No personal enclosure

Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	**Exposure concentration**	**Risk quantification**
Inhalation, local, long term	0.000013mg/m³ (ART V 1.5)	RCR = 0.000013
Eye, local, acute		Qualitative

Risk characterisation

Qualitative risk characterisation:
The substance is classified as eye damage 1 (H318 Causes serious eye damage). Use of chemically resistant goggles is necessary.
The substance may cause respiratory irritation (H335). Use of substance/task appropriate respiratory protection is necessary.

Conclusions: Risks are considered as adequately controlled

Worker CS 9: TRANSFER OF SUBSTANCE OR MIXTURE (CHARGING AND DISCHARGING) AT DEDICATED FACILITIES (PROC 8b)

Conditions of use

Assessed substance: reaction mass *Form of the substance: Slurry*	*PROC 8b*
Parameter	Data
Product type of the substance/preparation:	Powders dissolved in a liquid or incorporated in a liquid matrix
Viscosity:	medium
Weight fraction:	0.7
Source distance from the worker's breathing zone (mouth and nose):	More than 1 meter (far-field zone)
Activity Class:	Falling liquids
Situation which best represents activity:	Transfer of liquid product with flow 10-100 l/minute
Level of contamination:	Open process
Loading type:	Submerged loading, where the liquid dispenser remains below the fluid level reducing the amount of aerosol formation
Process fully enclosed?	No

Effective housekeeping practices in place?	Yes
Task duration (0-480 min):	480
Exposure site	Outdoors
Source located close to buildings?	No
Worker distance	> 4 m
Localized controls, primary	No localized controls
Localized controls, secondary	No localized controls
Segregation from source	No segregation
Separation of the worker	No personal enclosure

Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	**Exposure concentration**	**Risk quantification**
Inhalation, local, long term	0.000013mg/m³ (ART V 1.5)	RCR = 0.000013
Eye, local, acute		Qualitative

Risk characterisation

Qualitative risk characterisation:
The substance is classified as eye damage 1 (H318 Causes serious eye damage). Use of chemically resistant goggles is necessary.
The substance may cause respiratory irritation (H335). Use of substance/task appropriate respiratory protection is necessary.

Conclusions: Risks are considered as adequately controlled

Worker CS 10: TRANSFER OF SUBSTANCE OR MIXTURE INTO SMALL CONTAINERS (DEDICATED FILLING LINE, INCLUDING WEIGHING) (PROC 9)

Conditions of use

Assessed substance: reaction mass *Form of the substance: Slurry*	*PROC 9*
Parameter	Data
Product type of the substance/preparation:	Powders dissolved in a liquid or incorporated in a liquid matrix
	medium
Weight fraction:	0.7
Source distance from the worker's breathing zone (mouth and nose):	More than 1 meter (far-field zone)

Activity Class:	Falling liquids
Situation which best represents activity:	Transfer of liquid product with flow 0.1-1l/minute
Level of contamination:	Open process
Loading type:	Submerged loading, where the liquid dispenser remains below the fluid level reducing the amount of aerosol formation
Process fully enclosed?	No
Effective housekeeping practices in place?	Yes
Task duration (0-480 min):	480
Exposure site	Outdoors
Source located close to buildings?	No
Worker distance	> 4 m
Localized controls, primary	No localized controls
Localized controls, secondary	No localized controls
Segregation from source	No segregation
Separation of the worker	No personal enclosure

Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, local, long term	0.0000042mg/m³ (ART V 1.5)	RCR = 0.0000042
Eye, local, acute		Qualitative

Risk characterisation

Qualitative risk characterisation:
The substance is classified as eye damage 1 (H318 Causes serious eye damage). Use of chemically resistant goggles is necessary.
The substance may cause respiratory irritation (H335). Use of substance/task appropriate respiratory protection is necessary.

Conclusions: Risks are considered as adequately controlled

Worker CS 11: MANUAL ACTIVITIES INVOLVING HAND CONTACT (PROC 19)

Conditions of use

Assessed substance: reaction mass *Form of the substance: Slurry*	*PROC 19*
Parameter	Data

Product type of the substance/preparation:	Paste, slurry or clearly (soaked) wet powder
Contaminated with powder	Yes
Dustiness	Coarse dust
Powder weight fraction:	0.7
Source distance from the worker's breathing zone (mouth and nose):	Less than 1 meter (near-field zone)
Activity Class:	Handling of contaminated objects
Situation:	Handling of objects with visible contamination (object covered with fugitive dust from surrounding dusty activities)
Handling type:	Careful handling involves workers showing attention to potential danger, error or harm and carrying out the activity in a very exact and thorough (or cautious) manner.
Process fully enclosed?	No
Effective housekeeping practices in place?	Yes
Task duration (0-480 min):	480
Exposure site	Outdoors
Source located close to buildings?	No
Localized controls, primary	No localized controls
Localized controls, secondary	No localized controls

Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	**Exposure concentration**	**Risk quantification**
Inhalation, local, long term	0.0094mg/m³ (ART V 1.5)	RCR = 0.0094
Eye, local, acute		Qualitative

Risk characterisation

Qualitative risk characterisation:
The substance is classified as eye damage 1 (H318 Causes serious eye damage). Use of chemically resistant goggles is necessary.
The substance may cause respiratory irritation (H335). Use of substance/task appropriate respiratory protection is necessary.

Conclusions: Risks are considered as adequately controlled

Worker CS 12: USE OF FUNCTIONAL FLUIDS IN SMALL DEVICES (PROC 20)

Conditions of use

Assessed substance: reaction mass	*PROC 20*

Form of the substance: Slurry	
Parameter	Data
Product type of the substance/preparation:	Paste, slurry or clearly (soaked) wet powder
Contaminated with powder	Yes
Dustiness	Coarse dust
Powder weight fraction:	0.7
Source distance from the worker's breathing zone (mouth and nose):	Less than 1 meter (near-field zone)
Activity Class:	Handling of contaminated objects
Situation which best represents activity:	Handling of objects with limited residual dust (thin layer visible)
Handling type:	Careful handling involves workers showing attention to potential danger, error or harm and carrying out the activity in a very exact and thorough (or cautious) manner.
Process fully enclosed?	No
Effective housekeeping practices in place?	Yes
Task duration (0-480 min):	480
Exposure site	Outdoors
Source located close to buildings?	No
Localized controls, primary	No localized controls
Localized controls, secondary	No localized controls

Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	**Exposure concentration**	**Risk quantification**
Inhalation, local, long term	0.0032mg/m³ (ART V 1.5)	RCR = 0.0032
Eye, local, acute		Qualitative

Risk characterisation

Qualitative risk characterisation:
The substance is classified as eye damage 1 (H318 Causes serious eye damage). Use of chemically resistant goggles is necessary.
The substance may cause respiratory irritation (H335). Use of substance/task appropriate respiratory protection is necessary.

Conclusions: Risks are considered as adequately controlled

C.- HYDROGEN PEROXIDE

Worker CS 13: TRANSFER OF SUBSTANCE OR MIXTURE (CHARGING AND DISCHARGING) AT NON-DEDICATED FACILITIES (PROC 8a)

Conditions of use

Assessed substance: Hydrogen peroxide *Form of the substance: Liquid*	*PROC 8a*
Parameter	Data
Product type of the substance/preparation:	Liquid
Process temperature:	15-25ºC
Vapour pressure:	214Pa
Liquid mole fraction:	0.61
Source distance from the worker's breathing zone (mouth and nose):	More than 1 meter (far-field zone)
Activity Class:	Falling liquids
Situation which best represents activity:	Transfer of liquid product with flow 10-100 l/minute
Level of contamination:	Open process
Loading type:	Submerged loading, where the liquid dispenser remains below the fluid level reducing the amount of aerosol formation
Process fully enclosed?	No
Effective housekeeping practices in place?	Yes
Task duration (0-480 min):	480
Exposure site	Outdoors
Source located close to buildings?	No
Worker distance	> 4 m
Localized controls, primary	No localized controls
Localized controls, secondary	No localized controls
Segregation from source	No segregation
Separation of the worker	No personal enclosure

Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	**Exposure concentration**	**Risk quantification**
Inhalation, local, long term	0.0015mg/m³ (ART V 1.5)	RCR = 0.005
Eye, local, acute		Qualitative

Risk characterisation

Qualitative risk characterisation:
The substance is classified as eye damage 1 (H318 Causes serious eye damage). Use of chemically resistant goggles is necessary.
The substance may cause respiratory irritation (H335). Use of substance/task appropriate respiratory protection is necessary.

Conclusions: Risks are considered as adequately controlled

Worker CS 14: TRANSFER OF SUBSTANCE OR MIXTURE (CHARGING AND DISCHARGING) AT DEDICATED FACILITIES (PROC 8b)

Conditions of use

Assessed substance: reaction mass *Form of the substance: Liquid*	*PROC 8b*
Parameter	Data
Product type of the substance/preparation:	Liquid
Process temperature:	15-25ºC
Vapour pressure:	214Pa
Liquid mole fraction:	0.61
Source distance from the worker's breathing zone (mouth and nose):	More than 1 meter (far-field zone)
Activity Class:	Falling liquids
Situation which best represents activity:	Transfer of liquid product with flow 10-100 l/minute
Level of contamination:	Open process
Loading type:	Submerged loading, where the liquid dispenser remains below the fluid level reducing the amount of aerosol formation
Process fully enclosed?	No
Effective housekeeping practices in place?	Yes
Task duration (0-480 min):	480
Exposure site	Outdoors
Source located close to buildings?	No
Worker distance	> 4 m
Localized controls, primary	No localized controls
Localized controls, secondary	No localized controls
Segregation from source	No segregation
Separation of the worker	No personal enclosure

Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, local, long term	0.0015mg/m³ (ART V 1.5)	RCR = 0.005
Eye, local, acute		Qualitative

Risk characterisation

Qualitative risk characterisation:
The substance is classified as eye damage 1 (H318 Causes serious eye damage). Use of chemically resistant goggles is necessary.
The substance may cause respiratory irritation (H335). Use of substance/task appropriate respiratory protection is necessary.

Conclusions: Risks are considered as adequately controlled

Worker CS 15: TRANSFER OF SUBSTANCE OR MIXTURE INTO SMALL CONTAINERS (DEDICATED FILLING LINE, INCLUDING WEIGHING) (PROC 9)

Conditions of use

Assessed substance: reaction mass *Form of the substance: Liquid*	*PROC 9*
Parameter	Data
Product type of the substance/preparation:	Liquid
Process temperatura:	15-25ºC
Vapour pressure:	214Pa
Liquid mole fraction:	0.61
Source distance from the worker's breathing zone (mouth and nose):	More than 1 meter (far-field zone)
Activity Class:	Falling liquids
Situation which best represents activity:	Transfer of liquid product with flow <0.1 l/minute
Level of contamination:	Open process
Loading type:	Submerged loading, where the liquid dispenser remains below the fluid level reducing the amount of aerosol formation
Process fully enclosed?	No
Effective housekeeping practices in place?	Yes
Task duration (0-480 min):	480
Exposure site	Outdoors

Source located close to buildings?	No
Worker distance	> 4 m
Localized controls, primary	No localized controls
Localized controls, secondary	No localized controls
Segregation from source	No segregation
Separation of the worker	No personal enclosure

Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, local, long term	0.00051mg/m³ (ART V 1.5)	RCR = 0.00017
Eye, local, acute		Qualitative

Risk characterisation

Qualitative risk characterisation:
The substance is classified as eye damage 1 (H318 Causes serious eye damage). Use of chemically resistant goggles is necessary.
The substance may cause respiratory irritation (H335). Use of substance/task appropriate respiratory protection is necessary.

Conclusions: Risks are considered as adequately controlled

Worker CS 16: MANUAL ACTIVITIES INVOLVING HAND CONTACT (PROC 19)

Conditions of use

Assessed substance: *Form of the substance: Liquid*	*PROC 19*
Parameter	Data
Product type of the substance/preparation:	Liquid
Process temperatura:	15-25ºC
Vapour pressure:	214Pa
Liquid mole fraction:	0.61
Source distance from the worker's breathing zone (mouth and nose):	Less than 1 meter (near-field zone)
Activity Class:	Handling of contaminated objects
Situation which best represents activity:	Activities with treated/contaminated objects (surface <0.1 m²)
Level lof contamination:	<90% of surface
Process fully enclosed?	No

Effective housekeeping practices in place?	Yes
Task duration (0-480 min):	480
Exposure site	Outdoors
Source located close to buildings?	No
Worker distance	> 4 m
Localized controls, primary	No localized controls
Localized controls, secondary	No localized controls
Segregation from source	No segregation
Separation of the worker	No personal enclosure

Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	**Exposure concentration**	**Risk quantification**
Inhalation, local, long term	0.00051mg/m³ (ART V 1.5)	RCR = 0.00017
Eye, local, acute		Qualitative

Risk characterisation

Qualitative risk characterisation:
The substance is classified as eye damage 1 (H318 Causes serious eye damage). Use of chemically resistant goggles is necessary.
The substance may cause respiratory irritation (H335). Use of substance/task appropriate respiratory protection is necessary.

Conclusions: Risks are considered as adequately controlled

Worker CS 17: USE OF FUNCTIONAL FLUIDS IN SMALL DEVICES (PROC 20)

Conditions of use

Assessed substance: reaction mass *Form of the substance: Liquid*	*PROC 20*
Parameter	Data
Product type of the substance/preparation:	Liquid
Process temperature:	15-25ºC
Vapour pressure:	214Pa
Liquid mole fraction:	0.61
Source distance from the worker's breathing zone (mouth	Less than 1 meter (near-field zone)

and nose):	
Activity Class:	Falling liquids
Situation which best represents activity:	Transfer of liquid product with flow of 0.1 - 1 l/minute
Containment level	Open process
Loading type	Submerged loading, where the liquid dispenser remains below the fluid level reducing the amount of aerosol formation
Process fully enclosed?	No
Effective housekeeping practices in place?	Yes
Task duration (0-480 min):	480
Exposure site	Outdoors
Source located close to buildings?	No
Worker distance	> 4 m
Localized controls, primary	No localized controls
Localized controls, secondary	No localized controls
Segregation from source	No segregation
Separation of the worker	No personal enclosure

Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Route of exposure and type of effects	Exposure concentration	Risk quantification
Inhalation, local, long term	0.047mg/m³ (ART V 1.5)	RCR = 0.016
Eye, local, acute		Qualitative

Risk characterisation

Qualitative risk characterisation:
The substance is classified as eye damage 1 (H318 Causes serious eye damage). Use of chemically resistant goggles is necessary.
The substance may cause respiratory irritation (H335). Use of substance/task appropriate respiratory protection is necessary.

Conclusions: Risks are considered as adequately controlled