

MATERIAL SAFETY DATA SHEET:
HYDROGEN PEROXIDE SOLUTION 35-49.9%

In compliance with Regulation (EC) No. 1907/2006 with further amendments.



P U Ł A W Y

Version: 5.1.

Issue date: 15.04.2008

Revision date: 28.08.2023

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING		
1.1. Product identifier		
Commercial product name	Hydrogen peroxide solution 35-49.9%	
Synonyms	Dihydrogen peroxide	
Unique Formula Identifier (UFI)	Y3UJ-65C2- HMPE-R08U (hydrogen peroxide 35%) KHNH-KWQV-OKP9-N5N4 (hydrogen peroxide 49.5%)	
1.2. Relevant identified uses of the substance or mixture and uses advised against		
It is used among the others as: <ul style="list-style-type: none">• raw material used in the synthesis of peroxides• an oxidising agent in chemical reactions• active substances in biocidal products• raw material in the production of rubbers and plastics• etching mixture in electronics and metallurgical industry• raw material in the bleaching processes (e.g. in the textile and pulp and paper industry)• sewage neutraliser in the processes of environmental protection and water treatment• raw material for the production of cleaning agents and bleaching agents.		
1.3. Details of the supplier of the safety data sheet		
Company name	Grupa Azoty Zakłady Azotowe „Puławy” S.A.	
Company address	Al. Tysiąclecia Państwa Polskiego 13; 24-110 Puławy; Poland	
Company telephone number	+48 (81) 886 34 31; +48 (81) 565 30 00 fax.: +48 (81) 565 28 56	
E-mail	dyspozytor.zap@grupaazoty.com	
1.4. Emergency telephone number		
Company shift dispatcher: + 48 (81) 565 23 00 (available 24 hrs) Emergency telephone number: 112		
SEKCJA 2: HAZARDS IDENTIFICATION		
2.1. Classification of the substance or mixture		
Classification according to Regulation (EC) 1272/2008		
Product classified as hazardous.		
Human health hazards		
Acute Tox. 4	Acute toxicity, Category 4	H302, H332

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Skin Irrit. 2	Skin irritation, Category 2	H315
Eye Dam. 1	Serious eye damage, Category 1	H318
STOT SE 3	Specific target organ toxicity - single exposure, Category 3	H335
Adverse physical effects		
Product is not classified as hazardous due to its physical properties.		
Environmental hazards		
Aquatic Chronic 3	Hazardous to the aquatic environment, Category 3	H412
2.2. Label elements		
Hazard pictogram(s)	  GHS05 GHS07	
Signal Word	Danger	
Hazard statement(s)	H302 - Harmful if swallowed. H315 - Causes skin irritation. H318 - Causes serious eye damage. H332 - Harmful if inhaled. H335 - May cause respiratory irritation. H412 - Harmful to aquatic life with long lasting effects.	
Precautionary statement(s)	P261 - Avoid breathing mist/vapours. P273 - Avoid release to the environment. P280 - Wear protective gloves/protective clothing/eye protection/face protection. P302 + P352 - IF ON SKIN: wash with plenty of water. P304 + P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing. P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.	
2.3. Other hazards		
Hydrogen peroxide does not meet the criteria accepted for persistent substances with bioaccumulative and toxic potential (Persistent, Bioaccumulative, Toxic - PBT) or very persistent and very bioaccumulative substances (very Persistent very Bioaccumulative - vPvB).		

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The product does not contain substances included in the list established pursuant to Article 59 (1) as having endocrine-disrupting properties or substances with endocrine-disrupting properties according to the criteria set forth in Commission Delegated Regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at a concentration equal to or greater than 0.1% by weight.

Full text of Hazard statements mentioned in this Section are listed in Section 16. For more details see Section 16.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1. Substances

Not applicable.

3.2. Mixtures

Product identifier	Hydrogen peroxide solution 35 - 49.9%
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Classification in accordance with Regulation (EC) 1272/2008

Chemical name	Concentration	EC Number	CAS Number	REACH registration number	Classification	H-statements
Hydrogen peroxide, solution ... %	35 - 49.9%	231-765-0	7722-84-1	01-2119485845-22-0019	Ox. Lig. 1 Acute Tox. 4 Acute Tox. 4 Skin Corr. 1A	H271 H332 H302 H314
Water	50.1 - 65%	231-791-2	7732-18-5	-	-	-

Specific Conc. Limits and ATE - hydrogen peroxide, solution ... %:

Ox. Liq. 1, H271: $C \geq 70\%$
 Ox. Liq. 2, H272: $50\% \leq C < 70\%$
 Skin Corr. 1A, H314: $C \geq 70\%$
 Skin Corr. 1B, H314: $50\% \leq C < 70\%$
 Skin Irrit. 2, H315: $35\% \leq C < 50\%$
 Eye Dam. 1, H318: $8\% \leq C < 50\%$
 Eye Irrit. 2, H319: $5\% \leq C < 8\%$
 STOT SE 3, H335: $C \geq 35\%$.

ATE: 500 mg/kg (ingestion), 11 mg/l/ 4h (inhalation - vapour).

SECTION 4: FIRST AID MEASURES

4.1. Description of first aid measures

General	Speed is essential. Remove victim from hazardous area. Take off contaminated clothing immediately. Get medical advice.
Inhalation	Remove victim from area of exposure to fresh air. Keep patient warm and provide rest. If breathing difficulties occur, keep patient half sitting

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	with upper body raised. Seek immediate medical advice.
Ingestion	Do not induce vomiting. If patient is conscious, wash out mouth immediately and then drink plenty of water. Keep patient warm and provide rest. Obtain immediate medical attention.
Skin contact	Take off all soaked clothing and shoes promptly. If split on skin, wash immediately with plenty of water. Rinse contaminated clothing promptly. Get medical attention.
Eye contact	Wash the eyes with large amounts of water for at least 15 minutes. Avoid strong water stream due to the risk of mechanical damage to cornea. Call for medical advice. Continue rinsing.
4.2. Most important symptoms and effects, both acute and delayed	
Possible discomfort: serious irritation of mucous membranes (nose, throat, eyes), cough, sneezing, dyspnea, chemical burns. Prolonged exposure may lead to toxic pulmonary edema.	
4.3. Indication of any immediate medical attention and special treatment needed	
<u>Contact with skin:</u> Proceed as in the case of chemical burns.	
<u>Ingestion:</u> Do not administer activated charcoal.	
SECTION 5: FIREFIGHTING MEASURES	
5.1. Extinguishing media	
Suitable extinguishing media	In case of fire use extinguishing media appropriate to the material on fire. Water is concerned as the most effective medium in this case.
Unsuitable extinguishing media	Do not use extinguishing media that may accelerate hydrogen peroxide decomposition (e.g. protein-based foams).
5.2. Special hazards arising from the substance or mixture	
Product is fire-stimulating. Decomposes yielding oxygen and heat. Risk of explosion due to decomposition in closed containers, if appropriate vents are not provided. May cause spontaneous ignition of combustible materials.	
5.3. Advice for firefighters	
Wear self-contained breathing apparatus in confined spaces. Full chemical resistant protective clothing must be worn if risk of exposure exists. Apply flooding quantities of water on containers with decomposing hydrogen peroxide. Collect contaminated extinguishing water separately, do not allow to reach sewage or effluent systems without prior dilution.	
SECTION 6: ACCIDENTAL RELEASE MEASURES	
6.1. Personal precautions, protective equipment and emergency procedures	

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For non-emergency personnel	
Suitable protective equipment	Depending on exposure route wear: <ul style="list-style-type: none"> • protective clothing, • suitable breathing apparatus e.g. full face mask with ABEK respirator cartridges, • protective gloves, • safety goggles.
Emergency procedures	Secure the hazardous area and clear of all unauthorized personnel. Contact the fire brigade and chemical rescue station. Isolate spill or leak area immediately. Remove all possible sources of ignition. Depending on the threat level, issue evacuation order for nearby residents.
For emergency responders	
Wear protective clothing, full-face filter mask equipped with ABEK-type filter, protective gloves that are acid-resistant and resistant to mechanical damage, tightly fitting safety goggles.	
6.2. Environmental precautions	
Avoid contamination of water reservoirs, drains and soil. In case of accidental contamination inform appropriate authorities promptly. Disposal of waste must be made in accordance with applicable state and local regulations.	
6.3. Methods and material for containment and cleaning up	
Recommendations for preventing the spread of the spill and its elimination	Recommendations for preventing the spread of the spill and its elimination
6.4. Reference to other sections	
<i>Note: see section 8 for personal protective equipment and section 13 for waste disposal.</i>	
SECTION 7: HANDLING AND STORAGE	
7.1. Precautions for safe handling	
All operations with hydrogen peroxide should be performed in clean and well - ventilated areas. Store and keep away from any combustible materials. Avoid contact with skin and eyes. Keep away from sunlight. Wear recommended personal protective equipment as described in exposure scenarios. Rinse contaminated clothing with plenty of water.	
7.2. Conditions for safe storage, including any incompatibilities	
Stabilized hydrogen peroxide aqueous solutions should be kept in cool, well-ventilated and roofed fireproof storage facilities. Avoid direct exposure to sunlight. Keep away from sources of ignition, hot surfaces and open	

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flame. Use of large storage tanks is permitted provided they are equipped with safety valve/vent, filling and emptying apparatus. Tanks shall be conspicuously marked with the name of the product that they contain.

The use of the following structural materials is allowed:

- specific types of acid-proof stainless steel (316 L),
- high density polyethylene (HDPE)

Prior to the first filling and operation, storage tanks must be thoroughly cleaned and passivated.

Stabilised aqueous solution of 35% dihydrogen peroxide intended to be used for formulation of preparations used as disinfectants and preservatives must be stored only in the packages admitted to packaging of dihydrogen peroxide, in roofed, well-ventilated rooms, at the temperature not exceeding 30°C, away from flammable substances.

During storage protect the product against any contamination.

Do not store together with: alkalis, reducing agents, metallic salts (risk of decomposition) and organic solvents (risk of explosion).

The access to all storage rooms, both inside and outside, must be restricted only to the authorised persons.

Note: See section 9 for chemical and physical properties.

7.3. Specific end use(s)

See the attached exposure scenarios for more details.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control parameters

Substance	Hydrogen peroxide		
Index Number	008-003-00-9		
Country	Limit value - Eight hours [mg/m³]	Limit value - Short term [mg/m³]	Legal basis
European Union	-	-	Directives: 2000/39/EC, 2006/15/EC, 2009/161/EU, 2017/164/EU, 2019/1831/EU

Biological limit values | Not applicable

DNEL (for workers)

Acute toxicity; local effects	Exposure route: inhalation	3 mg/m ³
Chronic toxicity; local effects	Exposure route: inhalation	1.4 mg/m ³

PNEC

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	Fresh water	0.0126 mg/l
	Marine water	0.0126 mg/l
	Water, accidental release	0.0138 mg/l
	Fresh water, sediments	0.047 mg/kg sediment
	Marine water, sediments	0.047 mg/kg sediment
	Soil	0.0023 mg/kg soil
	Sewage plant	4.66 mg/l
8.2 Exposure controls		
Choice of personal protective equipment (PPE) depends on workplace hazards - see the attached exposure scenarios for more details.		
SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES		
9.1 Information on basic physical and chemical properties		
Physical state	Liquid	
Colour	Colourless	
Odour	None	
Melting point/freezing point	-33 °C (35% solution) -55 °C (49.9% solution)	
Boiling point or initial boiling point and boiling range	108 °C (35% solution) 114 °C (50% solution)	
Flammability	Non - flammable	
Lower and upper explosion limit	Not applicable.	
Flash point	Not applicable.	
Auto-ignition temperature	Not relevant (non - flammable mixture)	
Decomposition temperature	Not data	
pH	1.5 - 4	
Kinematic viscosity	1.11 mPa*s at 20 °C (35% solution) [dynamic] 1.17 mPa*s at 20 °C (50% solution) [dynamic]	

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Solubility	Readily miscible with water.
Partition coefficient: n-octanol/ water (Log Ko/w)	-1.57 (100% hydrogen peroxide)
Vapour pressure	2.99 hPa at 25°C (100% hydrogen peroxide)
Density and/or relative density	1.132 (35% solution) (water = 1) 1.195 (50% solution)
Relative vapour density	No data.
Particle characteristics	Not applicable.
9.2. Other information	
Information with regard to physical hazard classes	
Product is not classified as hazardous due to its physical properties.	
Other safety characteristics	
Hydrogen peroxide decomposes releasing heat. Hydrogen peroxide is characterized with strong oxidizing properties. In presence of some catalyst hydrogen decomposition may run violently (thermal explosion).	
SECTION 10: STABILITY AND REACTIVITY	
10.1. Reactivity	
Strong oxidizer. Hydrogen peroxide decomposes into water and oxygen. During decomposition heat is released. Each 1% w/w hydrogen peroxide is equivalent to 3.3% of active oxygen by volume i.e. 1cm ³ of 3% aqueous solution of hydrogen peroxide is able to release 10 cm ³ of gaseous oxygen during decomposition.	
10.2. Chemical stability	
Non stable mixture, undergoes decomposition when in contact with reducing agents or elevated temperature. Addition of stabilizers is necessary to avoid rapid decomposition. Upon storage under recommended conditions, concentration loss may occur (max 1% per year) due to its natural decomposition. Acidic hydrogen peroxide solutions are much more stable than alkaline solutions of comparable purity.	
10.3. Possibility of hazardous reactions	
In presence of some catalyst hydrogen peroxide decomposition may run explosively.	
10.4. Conditions to avoid	
Avoid direct exposure to sunlight. Keep away from sources of ignition, hot surfaces and open flame.	
10.5. Incompatible materials	
Keep away from incompatible materials such as: reducing agents, metals (e.g. iron, copper, chromium, manganese, platinum, silver), their salts, charcoal, dust from the air, organic substances (particularly fibrous),	

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alkalis. Significant activity is shown in case of some enzymes (catalase, peroxidase).															
10.6. Hazardous decomposition products															
During decomposition oxygen and heat is released.															
SECTION 11: TOXICOLOGICAL INFORMATION															
11.1. Information on hazard classes as defined in Regulation (EC) No 1272/2008															
Acute toxicity	<table border="1"> <thead> <tr> <th>Ingredient name</th> <th>Route</th> <th>Specie(s)</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td rowspan="3">Hydrogen Peroxide</td> <td>Inhalation (30 min)</td> <td>rat</td> <td>LC₅₀ > 170 mg/m³</td> </tr> <tr> <td>Ingestion</td> <td>rat</td> <td>LD₅₀ > 1026 mg/kg</td> </tr> <tr> <td>Skin contact</td> <td>rabbit</td> <td>LD₅₀ > 2000 mg/kg</td> </tr> </tbody> </table>	Ingredient name	Route	Specie(s)	Result	Hydrogen Peroxide	Inhalation (30 min)	rat	LC ₅₀ > 170 mg/m ³	Ingestion	rat	LD ₅₀ > 1026 mg/kg	Skin contact	rabbit	LD ₅₀ > 2000 mg/kg
	Ingredient name	Route	Specie(s)	Result											
	Hydrogen Peroxide	Inhalation (30 min)	rat	LC ₅₀ > 170 mg/m ³											
		Ingestion	rat	LD ₅₀ > 1026 mg/kg											
Skin contact		rabbit	LD ₅₀ > 2000 mg/kg												
Skin corrosion/irritation	Causes skin irritation.														
Serious eye damage/irritation	Causes serious eye irritation.														
Respiratory or skin sensitization	There is no evidence for respiratory or skin sensitization.														
Germ cell mutagenicity	There is no evidence for genotoxicity.														
Carcinogenicity	There is no evidence for carcinogenicity.														
Reproductive toxicity	There is no evidence for reproductive toxicity.														
STOT (<i>Specific target organ Toxicity</i>) - single exposure	May cause respiratory tract irritation. Causes severe stomach damage and bleeding from alimentary canal. Decomposition in the stomach may lead to the production of oxygen gas. Released oxygen may cause bowels burst or may absorb in vasculature leading to air embolism.														
STOT-repeated exposure	Not observed.														
Aspiration hazard	No aspiration hazard expected.														
Symptoms related to the physical, chemical and toxicological characteristics															
Inhalation	Inhalation of mist/vapors of hydrogen peroxide causes irritation of respiratory tract and mucous membranes, which may lead to chronic bronchitis.														
Ingestion	Causes severe stomach damage and bleeding from alimentary canal. Released oxygen may cause bowels burst or may absorb in vasculature														

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	leading to air embolism.
Skin contact	Causes skin burns leading to the symptoms such as: white spots, eczema, blisters, wounds.
Eye contact	Causes corneal burns.
Delayed and immediate effects as well as chronic effects from short and long-term exposure	
Acute poisoning causes more or less extensive tissue damage due to chemical burns and leads to systemic disorders like acid-base and water-electrolyte homeostasis dysfunction. Due to large loss of blood reduction in albumin and total protein blood levels are observed. There may be signs of severe shock.	
11.2. Information on other hazards	
Endocrine disrupting properties	
Hydrogen peroxide does not have endocrine disrupting properties, and thus does not cause harmful effects for health.	
Other information	
No data.	
SECTION 12: ECOLOGICAL INFORMATION	
12.1. Toxicity	

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Acute toxicity:

Ingredient name	Test organism	Result
Hydrogen peroxide	Freshwater Fish	LC ₅₀ (24 h): 16.4 mg/l
	Aquatic invertebrates	EC ₅₀ (48 h): 2.4 mg/l

Chronic toxicity:

Ingredient name	Test organism	Result
Hydrogen peroxide	Aquatic invertebrates	NOEC: 0.63 mg/l

Toxicity to aquatic algae:

Ingredient name	Test organism	Result
Hydrogen peroxide	Algae	NOEC: 0.63 mg/l

Toxicity to microorganisms:

Ingredient name	Test organism	Result
Hydrogen peroxide	Aquatic microorganisms	EC ₅₀ : 466 mg/l

12.2. Persistence and degradability

Readily biodegradable (according to OECD criteria). Undergoes photolysis in the air. Half-life of hydrogen peroxide in the atmosphere is predicted as 24 hours.

12.3. Bioaccumulative potential

Product does not have any bioaccumulative properties.

12.4. Mobility in soil

Based on its physico-chemical properties (high polarity and miscibility with water) the product is predicted to have a high mobility in soil.

12.5. Results of PBT and vPvB assessment

Taking into account toxicological, biodegradation and bioaccumulation studies of hydrogen peroxide its is estimated that PBT and vPvB assessment is not fulfilled.

12.6. Endocrine disrupting properties

Hydrogen peroxide does not have endocrine disrupting properties, and thus does not cause harmful effects for environment.

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12.7. Other adverse effects	
Hydrogen peroxide is not listed in Regulation (EC) 1005/2009 as the substance potentially depleting the ozone layer. Accidental release of large quantities of hydrogen peroxide into water reservoirs may be hazardous to fish and aquatic life.	
SECTION 13: DISPOSAL CONSIDERATIONS	
13.1. Waste treatment methods	
Waste treatment methods	In case of accidental release or spill rinse contaminated surfaces with large amount of water. Dilute with water until decomposition is no longer visible (intense release of gas bubbles).
Package waste disposal	Avoid disposal of leftovers into drains and sewers. Dispose in accordance with national and local environmental regulations. Empty containers must be handed over to a licensed waste disposal contractor.
Waste code	16 09 03* Superoxides (e.g. hydrogen peroxide)
Special precautions	See item 7 of hydrogen peroxide MSDS.
Relevant Community provisions	Disposal of this product any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements.
SECTION 14: TRANSPORT INFORMATION	
14.1. UN number or ID number	
UN number: 2014	
14.2. UN proper shipping name	
Hydrogen peroxide aqueous solution	
14.3. Transport hazard class(es)	
5.1	
14.4. Packing group	
II	
14.5. Environmental hazards	
See section 12	
14.6. Special precautions for user	

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Not applicable.	
14.7. Maritime transport in bulk according to IMO instruments	
Product name	Hydrogen peroxide solutions (over 8% but not over 60% by mass)
Ship type	3
Pollution Category	Y
SECTION 15: REGULATORY INFORMATION	
15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture	
Authorisations	
Material does not require permission according to attachment XIV of EC regulation No. 1907/2006.	
Restrictions	
No restrictions are defined according to attachment XVII of EC regulation No. 1907/2006.	
Other regulations:	
Hydrogen peroxide is used as an active ingredient in biocides and is subject to Regulation (EU) No 528/2012 of the European Parliament and of the Council of 22 May 2012 concerning the making available on the market and use of biocidal products. Hydrogen peroxide is listed in Annex I to the Regulation (EU) 2019/1148 on the marketing and use of explosives precursors. Acquisition, introduction, possession or use by the general public is restricted. Any suspicious transactions and significant disappearances and thefts must be reported to the National Contact Point within 24 hours of considering or detection.	
15.2. Chemical safety assessment	
Grupa Azoty Zakłady Azotowe „Puławy” S.A. conducted a relevant chemical safety assessment for hydrogen peroxide.	
SECTION 16. OTHER INFORMATION	
Changes implemented	SECTION 2, SECTION 6, Exposure scenarios.
Classification of the mixture is based on classification of ingredients.	
<u>Legend to abbreviations and acronyms:</u>	
Index number - is the nine-digit code that is assigned to chemical substances in part 3 of Annex VI (EC) 1272/2008	
EC number - is the seven-digit code that is assigned to chemical substances that are commercially available within the European Union (it means number EINECS or ELINCS).	
CAS number - unique numerical identifier assigned by the Chemical Abstracts Service to every chemical substance	

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DNEL - is the level of exposure to a substance above which humans should not be exposed (mg/kg, mg/l).

PNEC - is the concentration below which exposure to a substance is not expected to cause adverse effects for environment (mg/kg, mg/l).

NOEC - (*no observed effect concentration*) - the test concentration immediately below the lowest tested concentration with statistically significant adverse effect. The NOEC has no statistically significant adverse effect compared to the control.

LC₅₀ - in toxicology, mean lethal concentration (LC) of a toxic substance in air or in water required to kill half of the members of a tested population after a specified test duration.

LD₅₀ - in toxicology, lethal dose (LD) is an indication of the lethality of a given chemical substance. It represents the amount of a material, which results in death of 50% of a group of test animals.

EC₅₀ - is the effective concentration of substance that causes 50% of the maximum response.

Log K_{O/W} - is defined as the ratio of the molar concentrations of a chemical in n-octanol and water, in dilute solution.

K_{O/C} - is defined as the ratio of the molar concentrations of a chemical in organic carbon and water.

Indicative Occupational exposure limit value - 8 hours - Maximum acceptable average concentration limit value (time-weighted average) of an air contaminant in respiratory air. An occupational exposure limit value is either a level limit value or a ceiling limit value. Measured or calculated in relation to a reference period of 8 hours time-weighted average (TWA).

Indicative Occupational exposure Limit value - Short term [mg/m³] Maximum acceptable average concentration limit value (time-weighted average) of an air contaminant in respiratory air. An occupational exposure limit value is either a level limit value or a ceiling limit value. Short-term exposure limit (STEL) - a limit value above which exposure should not occur and which is related to a 15-minute period unless otherwise specified.

References	<ul style="list-style-type: none">• Chemical safety report• A. Bielański „Podstawy Chemii Nieorganicznej” PWN, Warszawa 2004
Instruction	HSE training; ADR training for drivers.

Hazard statements referred to under headings 2 - 15

H302 - Harmful if swallowed.

H315 - Causes skin irritation.

H318 - Causes serious eye damage.

H332 - Harmful if inhaled.

H335 - May cause respiratory irritation.

H412 - Harmful to aquatic life with long lasting effects.

NOTE:

The information in this Safety Data Sheet is given in good faith and belief in its accuracy based on our knowledge of the substance/mixture concerned at the date of publication. It does not imply the acceptance of any legal liability or just responsibility whatsoever by the Company for the consequences of its use or misuse

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in any particular circumstances.

Annexes:

Exposure Scenario 1: Manufacture and industrial use of dihydrogen peroxide solutions, including the formulation of mixtures.

Exposure Scenario 2: Loading and unloading of hydrogen peroxide, distribution covering all identified uses.

Exposure Scenario 3: Identified use of hydrogen peroxide in bleaching processes.

Exposure Scenario 4: Use of hydrogen peroxide in environmental protection and agriculture.

Exposure Scenario 5: Use of hydrogen peroxide in cleaning and bleaching agents.

SCENARIUSZ NARAŻENIA NR 1: HYDROGEN PEROXIDE SOLUTION 35-49.9%

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Wersja: 2.3.

Data utworzenia: 21.12.2010

Data aktualizacji: 28.08.2023

MANUFACTURE AND INDUSTRIAL USE OF DIHYDROGEN PEROXIDE SOLUTIONS, INCLUDING THE FORMULATION OF MIXTURES
1. Sector of use (SU):
SU 3: Industrial uses: Uses of substances as such or in preparations at industrial sites. SU 4: Manufacture of food products. SU 8: Manufacture of bulk, large scale chemicals (including petroleum products). SU 9: Manufacture of fine chemicals. SU 10: Formulation [mixing] of preparations and/or re-packaging (excluding alloys). SU 11: Manufacture of rubber products. SU 12: Manufacture of plastics products, including compounding and conversion. SU 14: Manufacture of basic metals, including alloys. SU 15: Manufacture of fabricated metal products, except machinery and equipment. SU 16: Manufacture of computer, electronic and optical products, electrical equipment. SU 17: General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment
2. Process category (PROC):
PROC 1: Use in closed process, no likelihood of exposure. PROC 2: Use in closed, continuous process with occasional controlled exposure. PROC 3: Use in closed batch process (synthesis or formulation). PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises. PROC 5: Mixing or blending in batch processes for formulation of preparations* and articles (multistage and/or significant contact). PROC 7: Industrial spraying. PROC 10: Roller application or brushing. PROC 12: Use of blowing agents in manufacture of foam. PROC 13: Treatment of articles by dipping and pouring. PROC 14: Production of preparations* or articles by tableting, compression, extrusion, pelletisation. PROC 15: Use as laboratory reagent.
3. Product category (PC):
PC 0: (other: inorganic chemical; food additives). PC 1: Adhesives, sealants. PC 2: Adsorbents. PC 8: Biocidal products (e.g. Disinfectants, pest control). PC 9a: Coatings and paints, thinners, paint removers. PC 12: Fertilizers. PC 14: Metal surface treatment products, including galvanic and electroplating products. PC 15: Non-metal-surface treatment products.

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PC 20: Products such as pH-regulators, flocculants, precipitants, neutralization agents.
PC 21: Laboratory chemicals.
PC 23: Leather tanning, dye, finishing, impregnation and care products.
PC 25: Metal working fluids.
PC 26: Paper and board dye, finishing and impregnation products: including bleaches and other processing aids.
PC 27: Plant protection products.
PC 29: Pharmaceuticals.
PC 31: Polishes and wax blends.
PC 32: Polymer preparations and compounds.
PC 33: Semiconductors.
PC 34: Textile dyes, finishing and impregnating products; including bleaches and other processing aids.
PC 35: Washing and cleaning products (including solvent based products).
PC 37: Water treatment chemicals.
PC 39: Cosmetics, personal care products.

4. Environmental release category (ERC):

ERC 1: Manufacture of substances.
ERC 2: Formulation into mixture.
ERC 4: Industrial use of processing aids in processes and products, not becoming part of articles.
ERC 6a: Industrial use resulting in manufacture of another substance (use of intermediates).
ERC 6b: Industrial use of reactive processing aids.
ERC 6c: Industrial use of monomers for manufacture of thermoplastics.
ERC 6d: Industrial use of process regulators for polymerisation processes in production of resins, rubbers, polymers.

5. Processes and activities covered by the exposure scenario

The scenario describes all processes and activities related to the industrial production of dihydrogen peroxide in continuous, automated and closed processes as well as industrial use of dihydrogen peroxide in closed or semi-closed processes. The foregoing processes are conducted during the formulation of mixtures, in the chemical synthesis, in the chemical surface treatment (etching in the electronics industry or metal finishing in the metalworking industry) as well as chemical modification of foodstuffs.

6. Product characteristics

Physical state	Liquid
Volatility	Low
Concentration	< 50%

7. Amounts used

> 1000 tons/year

8. Frequency and duration of use/exposure

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Duration of exposure: > 4 h/day Frequency of exposure at workplace: 220 d/y for a single worker Emission days per site: 360 d/y (production); 300 d/y (chemical synthesis and applications)				
9. Technical conditions and measures to prevent or avoid human exposure				
Production considers tasks and activities, which are performed continuously in closed system. During normal operation, the reactor is closed therefore no likelihood of exposure to vapours of hydrogen peroxide. Proper indoor ventilation systems are recommended. During application of dilute hydrogen peroxide solutions in an open system (e.g. etching the surface) use local exhaust ventilation.				
10. Conditions and measures related to personal protection, hygiene and health evaluation				
The frequency and duration of exposure are different depending on the tasks. Some of them can cause an increase in short-term exposure. In this case, employees should wear additional personal protective equipment.				
Eye protection	Protective goggles protective shield resistant to chemicals.			
Skin and body protection	Protective clothing.			
Hand protection	Protective gloves.			
Respiratory protection	In case of exposure to vapors/aerosols use full facepiece mask equipped with ABEK type respiratory cartridges.			
Other recommended protection measures	Keep away from food, drinks and tobacco. Wash hands thoroughly after each contact with the product. Use hand protective creams. Take off immediately all contaminated clothing. Immediately rinse away contaminated skin with water.			
11. Frequency and duration of environmental release				
	Parameter	Production	Chemical synthesis	Applications
	Number of emission days	360	300	300
	Estimated released quantities, air	0.0001%	0.001%	0.001%
	Estimated released quantities, sewage	0.003%	0.007%	0.005%
	Estimated released quantities, soil	0.0001%	0.0001%	0.001%
	Max. local emission, air (kg/days)	20.8	29.8	3.37
	Max. local emission, sewage (kg/days)	625	209	16.8
12. Technical conditions and measures to reduce or avoid environmental release				
This exposure scenario considers tasks and activities usually performed in closed systems. Therefore no likelihood of exposure/release, or with occasional controlled exposure/release. All technological devices should be regularly controlled and maintained to avoid the uncontrolled discharge of hydrogen peroxide.				

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13. Conditions and measures related to municipal sewage treatment plant	
Average effluent flow rate	2000 m ³ /day (default assumption)
Average receiving river flow rate	≥ 18000 m ³ /day, (default assumption)
Efficiency STP	- 90%
Additional information	Industrial plants may be connected to the public sewer system, provided they have appropriate authorization. Due to the presence of organic matter in wastewaters, hydrogen peroxide has a short half-life (approximately 6 minutes). Thus, approximately 97% of hydrogen peroxide is neutralized within first 30 minutes contact with effluents.
14. Conditions and measures related to waste management	
Type of waste	Solid and liquid waste
Disposal technique	Waste has to be treated as industrial waste and should be incinerated in thermal combustion units where hydrogen peroxide is completely removed.
Fraction released to environment during waste treatment	Hydrogen peroxide is highly reactive and will decompose when in contact with other waste. No environmental emissions are anticipated.
15. Exposure estimation	
Exposure assessment method	Tool applied for exposure assessment: ECETOC TRA Worker v2. Detailed description of ECETOC TRA software may be found at the webpage https://www.ecetoc-tra.org/
Workers (oral exposure)	Implementation of good industrial practice eliminates the possibility of exposure via ingestion.
Workers (dermal and eye exposure)	Concentrated hydrogen peroxide solutions (35% and more) must be handled with care, with the use of suitable eye and skin protection.
Process Category (LEV*)	Inhalation: level of exposure [mg/m ³] (for 50% solution of H ₂ O ₂). Time of exposure 4-8 hours
PROC 1, LEV- none	0.007
PROC 2, LEV 90%	0.071
PROC 3, LEV 90%	0.213
PROC 4, LEV 90%	0.354
PROC 5, LEV 90%	0.354
PROC 7, LEV 90%	0.354
PROC 10, LEV 90%	0.708
PROC 12, LEV 80%	0.283

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PROC 13, LEV 90%	0.708		
PROC 14, LEV 90%	0.354		
PROC 15, LEV 90%	0.354		
*LEV - efficiency of local exhaust ventilation			
Consumers	Not applicable		
Environment	Estimated with EUSES		
Environmental exposure assessment was conducted by means of EUSES program			
	PEC value (predicted concentration of dihydrogen peroxide)		
	Production	Chemical synthesis	Industrial use
Fresh water	0.006 mg/l	0.0037 mg/l	0.0048 mg/l
Sea water	0.0013 mg/l	0.0004 mg/l	0.0006 mg/l
Soil	1.45×10^{-4} mg/kg	1.51×10^{-4} mg/kg	1.17×10^{-4} mg/kg
Sewage treatment plants	0.63 mg/l	0.146 mg/l	0.059 mg/l

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LOADING AND UNLOADING OF HYDROGEN PEROXIDE, DISTRIBUTION COVERING ALL IDENTIFIED USES

1. Sector of use (SU):

SU 3: Industrial uses: Uses of substances as such or in preparations at industrial sites.
SU 4: Manufacture of food products.
SU 5: Manufacture of textiles, leather, fur.
SU 8: Manufacture of bulk, large scale chemicals (including petroleum products).
SU 9: Manufacture of fine chemicals.
SU 10: Formulation [mixing] of preparations and/or re-packaging (excluding alloys).
SU 11: Manufacture of rubber products.
SU 12: Manufacture of plastics products, including compounding and conversion.
SU 14: Manufacture of basic metals, including alloys.
SU 15: Manufacture of fabricated metal products, except machinery and equipment.
SU 16: Manufacture of computer, electronic and optical products, electrical equipment.
SU 17: General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment.

2. Process category (PROC):

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).

3. Product category (PC):

PC 1: Adhesives, sealants.
PC 8: Biocidal products (e.g. Disinfectants, pest control).
PC 12: Fertilizers.
PC 14: Metal surface treatment products, including galvanic and electroplating products.
PC 15: Non-metal-surface treatment products.
PC 21: Laboratory chemicals.
PC 25: Metal working fluids.
PC 27: Plant protection products.
PC 29: Pharmaceuticals.
PC 31: Polishes and wax blends.
PC 32: Polymer preparations and compounds.
PC 34: Textile dyes, finishing and impregnating products; including bleaches and other processing aids.
PC 35: Washing and cleaning products (including solvent based products).
PC 37: Water treatment chemicals.
PC 39: Cosmetics, personal care products.

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4. Environmental release category (ERC):	
ERC 1: Manufacture of substances. ERC 2: Formulation into mixture. ERC 4: Industrial use of processing aids in processes and products, not becoming part of articles. ERC 6a: Industrial use resulting in manufacture of another substance (use of intermediates). ERC 6b: Industrial use of reactive processing aids. ERC 6c: Industrial use of monomers for manufacture of thermoplastics.	
5. Processes and activities covered by the exposure scenario	
The scenario describes the processes and activities related to loading and unloading the product. It includes the processes such as: <ul style="list-style-type: none">• filling and emptying the containers, tanks in the production sites, delivery of raw materials;• transfer, loading and unloading of the product from the transport containers into storage tanks.	
6. Product characteristics	
Physical state	Liquid
Volatility	Low
Concentration	< 50%
7. Amounts used	
RMM (Risk Management Measures) and other operational conditions ensure control of risk at any given time and for any given throughput during the industrial use of hydrogen peroxide. In case risk of exposure to vapours exists proper indoor ventilation is required.	
8. Frequency and duration of use/exposure	
Duration of exposure: 8 h/day Frequency of exposure at workplace: 220 d/y for a single worker Emission days per site: No relevant environmental emissions anticipated.	
9. Technical conditions and measures to prevent or avoid human exposure	
RMM (Risk Management Measures) and other operational conditions ensure control of risk at any given time and for any given throughput during the industrial use of hydrogen peroxide.	
10. Conditions and measures related to personal protection, hygiene and health evaluation	
Transfer and filling processes are carried out in a closed system. Possible short-term exposure can occur during maintenance of charging system. In case risk of exposure exists, use the following personal protective equipment:	
Eye protection	Protective goggles or protective shield resistant to chemicals.
Skin and body protection	Protective clothing.
Hand protection	Protective gloves.

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Respiratory protection	In case of exposure to vapors/aerosols use respiratory protection e.g. full facepiece mask equipped with ABEK type respiratory cartridges.
Other recommended protection measures	Keep away from food, drinks and tobacco. Wash hands thoroughly after each contact with the product. Use hand protective creams. Take off immediately all contaminated clothing. Immediately rinse away contaminated skin with water.
11. Frequency and duration of environmental release	
No significant environmental emissions are anticipated (based on EU Risk Assessment Report, European Commission 2003).	
12. Technical conditions and measures to reduce or avoid environmental release	
This exposure scenario considers tasks and activities usually performed in closed systems. Therefore no likelihood of exposure/release, or with occasional controlled exposure/release. All technological devices should be regularly controlled and maintained to avoid the uncontrolled discharge of hydrogen peroxide.	
13. Conditions and measures related to municipal sewage treatment plant	
Average effluent flow rate	2000 m ³ /day (default assumption)
Average receiving river flow rate	≥ 18000 m ³ /day, (default assumption)
Efficiency of STP	~ 90%
Additional information	Industrial plants may be connected to the public sewer system, provided they have appropriate authorization. Due to the presence of organic matter in wastewaters, hydrogen peroxide has a short half-life (approximately 6 minutes). Thus, approximately 97% of hydrogen peroxide is neutralized within first 30 minutes contact with effluents.
14. Conditions and measures related to waste management	
<u>Wastewater:</u> In case of leakage, wash away with plenty of water and transfer all contaminated water to industrial wastewater treatment system	
<u>Solid and liquid waste:</u> No waste under normal operating conditions.	
15. Exposure estimation	
Exposure assessment method	Tool applied for exposure assessment: ECETOC TRA Worker v2. Detailed description of ECETOC TRA software may be found at the webpage https://www.ecetoc-tra.org/

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Workers (oral exposure)	Implementation of good industrial practice eliminates the possibility of exposure via ingestion.
Workers (dermal and eye exposure)	Concentrated hydrogen peroxide solutions (35% and more) must be handled with care, with the use of suitable eye and skin protection.
Process Category (LEV*) PROC 8a, LEV- 90% PROC 8b, LEV 90% PROC 9, LEV 90% *LEV - efficiency of local exhaust ventilation	Inhalation: level of exposure [mg/m ³] (for 50% solution of H ₂ O ₂). Time of exposure 4-8 hours 0.71 0.11 0.35
Consumers	Not applicable
Environment	No environmental emissions are anticipated.

EXPOSURE SCENARIO No. 3:
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IDENTIFIED USE OF HYDROGEN PEROXIDE IN BLEACHING PROCESSES	
1. Sector of use (SU):	
<p>SU 3: Industrial uses: Uses of substances as such or in preparations at industrial sites. SU 5: Manufacture of textiles, leather, fur. SU 6: Manufacture of pulp, paper and paper products. SU 21: Consumer uses: Private households (= general public = consumers). SU 22: Professional uses: Public domain (administration, education, entertainment, services, craftsmen).</p>	
2. Process category (PROC):	
<p>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 13: Treatment of articles by dipping and pouring. PROC 19: Hand-mixing with intimate contact and only PPE available.</p>	
3. Product category (PC):	
<p>PC 23: Leather tanning, dye, finishing, impregnation and care products. PC 24: Lubricants, greases, release products. PC 26: Paper and board dye, finishing and impregnation products: including bleaches and other processing aids. PC 34: Textile dyes, finishing and impregnating products; including bleaches and other processing aids.</p>	
4. Environmental release category (ERC):	
<p>ERC 4: Industrial use of processing aids in processes and products, not becoming part of articles. ERC 6b: Industrial use of reactive processing aids. ERC 8a: Wide dispersive indoor use of processing aids in open systems. ERC 8b: Wide dispersive indoor use of reactive substances in open systems. ERC 8e: Wide dispersive outdoor use of reactive substances in open systems.</p>	
5. Processes and activities covered by the exposure scenario	
<p>This exposure scenario describes processes and activities related to automated, semi-automated and manual bleaching processes performed with the use of aqueous hydrogen peroxide solutions in industrial and professional settings.</p> <p>Consumer use of bleaches containing hydrogen peroxide is also considered.</p> <p>Hydrogen peroxide is also used in the de-inking and bleaching of pulps in the manufacture of paper, bleaching of fibers and non-fibrous materials and textiles (including carpets) and as bleaching agent in industrial laundries and in household.</p>	
6. Product characteristics	
Physical state	Liquid

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Volatilit	Low	
Concentration	Max. 35%	
7. Amounts used		
Not applicable.		
8. Frequency and duration of use/exposure		
Duration and frequency of use (workers):		
	Pulp bleaching, de-inking	Bleaching of fibers and non fibrous materials
Duration of exposure:	8 h/d	8 h/d
Frequency of exposure at workplace:	220 d/y for a single worker	220 d/y for a single worker
Emission days per site:	360 d/y	300 d/y
Duration and frequency of use (consumers):		
	Duration of exposure:	10 minutes (single use)
	Frequency of exposure:	3 to 4 events/week
	Amount used per event:	100 ml of bleaching product
9. Technical conditions and measures to prevent or avoid human exposure		
Production lines used to dilute concentrated hydrogen peroxide solutions operate in a closed, fully automated systems (no likelihood of exposure/release, or with occasional controlled exposure/release). In case production is not fully automated, number of people performing manual mode is to be minimized.		
Proper mechanical and local exhaust ventilation systems are recommended in case of large plants using hydrogen peroxide in bleaching processes.		
10. Conditions and measures related to personal protection, hygiene and health evaluation		
Transfer and filling processes are carried out in a closed system. Possible short-term exposure can occur during maintenance of charging system.		
In case risk of exposure exists, use the following personal protective equipment:		
Eye protection	Protective goggles or protective shield resistant to chemicals.	
Skin and body protection	Protective clothing.	
Hand protection	Protective gloves.	
Respiratory protection	In case of exposure to vapors/aerosols use respiratory protection e.g. full facepiece mask equipped with ABEK type respiratory cartridges.	

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Other recommended protection measures	Keep away from food, drinks and tobacco. Wash hands thoroughly after each contact with the product. Use hand protective creams. Take off immediately all contaminated clothing. Immediately rinse away contaminated skin with water.																			
Remarks	Maximum concentration of hydrogen peroxide for consumer applications use should not exceed 12%. Regardless the fact that 12% hydrogen peroxide solution is not skin irritant, it is recommended to use protective gloves.																			
11. Frequency and duration of environmental release																				
	<table border="1"> <thead> <tr> <th>Parameter</th> <th>Pulp bleaching, de-inking</th> <th>Bleaching (other use)</th> </tr> </thead> <tbody> <tr> <td>Release to air</td> <td>0.001%</td> <td>0.01%</td> </tr> <tr> <td>Release to wastewater</td> <td>0.009%</td> <td>0.009%</td> </tr> <tr> <td>Release to soil</td> <td>0.0001%</td> <td>0.0001%</td> </tr> <tr> <td>Dilution factor (freshwater)</td> <td>10</td> <td>10</td> </tr> <tr> <td>Dilution factor (seawater)</td> <td>100</td> <td>100</td> </tr> </tbody> </table>		Parameter	Pulp bleaching, de-inking	Bleaching (other use)	Release to air	0.001%	0.01%	Release to wastewater	0.009%	0.009%	Release to soil	0.0001%	0.0001%	Dilution factor (freshwater)	10	10	Dilution factor (seawater)	100	100
Parameter	Pulp bleaching, de-inking	Bleaching (other use)																		
Release to air	0.001%	0.01%																		
Release to wastewater	0.009%	0.009%																		
Release to soil	0.0001%	0.0001%																		
Dilution factor (freshwater)	10	10																		
Dilution factor (seawater)	100	100																		
12. Technical conditions and measures to reduce or avoid environmental release																				
Waste released to environment are biodegradable. Bleaching products containing small amounts of hydrogen peroxide (used by professionals and consumers) may be treated as a municipal waste.																				
13. Conditions and measures related to municipal sewage treatment plant																				
Average effluent flow rate	2000 m ³ /day (default assumption)																			
Average receiving river flow rate	≥ 18000 m ³ /day, (default assumption)																			
Efficiency of STP	99.3%																			
Additional information	It is assumed that the local sewage treatment plant processes wastewater from 10.000 inhabitants, with individual release of 200 l per day, i.e. a total wastewater volume of 2 000 000 l per day.																			
14. Conditions and measures related to waste management																				
<p>Air: Release is possible in case activated carbon filters are depleted.</p> <p>Wastewater: Industrial wastewater must be neutralized by applying the following techniques:</p> <ul style="list-style-type: none"> • Biological wastewater treatment or, • Ozonation of wastewater <p>Wastewater from professional and private bleaching should be sent to the public sewage system, where rapid decomposition of hydrogen peroxide in contact with sewage will occur.</p> <p>Solid and liquid waste (industrial setting): Treat as industrial waste.</p> <p>Solid and liquid waste (consumer and professional setting): Dispose of via regular municipal waste.</p>																				
15. Exposure estimation																				

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Workers (oral exposure)	Implementation of good industrial practice eliminates the possibility of exposure via ingestion.		
Workers (dermal and eye exposure)	Concentrated hydrogen peroxide solutions (35% and more) must be handled with care, with the use of suitable eye and skin protection.		
Process Category (LEV*)	Inhalation: level of exposure [mg/m ³] (for 35% solution of H ₂ O ₂). Time of exposure 4-8 hours		
Industrial use			
PROC 1, LEV- none	0.0050		
PROC 2, LEV 90%	0.0496		
PROC 3, LEV 90%	0.1488		
PROC 4, LEV 90%	0.2479		
PROC 13, LEV 90%	0.4958		
Professional use			
PROC 1, LEV- none	0.0050		
PROC 2, LEV 80%	0.4958		
PROC 3, LEV 80%	0.2975		
PROC 4, LEV 80%	0.9917		
PROC 13, LEV 80%	No data		
PROC19, LEV 80 %	No data		
*LEV - efficiency of local exhaust ventilation			
Consumers (ingestion exposure)	Under normal operating conditions - not relevant.		
Consumers (dermal exposure)	Maximum concentration of hydrogen peroxide for consumer applications should not exceed 12%. Regardless the fact that 12% hydrogen peroxide solution is not skin irritant, it is recommended to use protective gloves.		
Consume (inhalation exposure)	0.13 mg/m ³		
Environment			
Environmental exposure assessment was conducted by means of EUSES program			
PEC value (predicted concentration of dihydrogen peroxide)			
		Chemical pulp bleaching, decolourisation	Bleaching (other applications)

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	Fresh water	0.0098 mg/l	0.004 mg/l	
	Sea water	0.001 mg/l	0.0004 mg/l	
	Soil	1.54×10^{-4} mg/kg	1.28×10^{-4} mg/kg	
	Sewage treatment plants	0.098 mg/l	0.042 mg/l	

EXPOSURE SCENARIO No. 4:
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USE OF HYDROGEN PEROXIDE IN ENVIRONMENTAL PROTECTION AND AGRICULTURE	
1. Sector of use (SU):	
SU 1: Agriculture, forestry, fishery. SU 2: Mining. SU 3: Industrial uses: Uses of substances as such or in preparations at industrial sites. SU 8: Manufacture of bulk, large scale chemicals (including petroleum products). SU 21: Consumer uses: Private households (= general public = consumers). SU 22: Professional uses: Public domain (administration, education, entertainment, services, craftsmen).	
2. Process category (PROC):	
PROC 1: Use in closed process, no likelihood of exposure. PROC 2: Use in closed, continuous process with occasional controlled exposure. PROC 3: Use in closed batch process (synthesis or formulation). PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises.	
3. Product category (PC):	
PC 0: (other: inorganic chemical; food additives). PC 20: Products such as pH-regulators, flocculants, precipitants, neutralization agents. PC 37: Water treatment chemicals.	
4. Environmental release category (ERC):	
ERC 4: Industrial use of processing aids in processes and products, not becoming part of articles. ERC 6b: Industrial use of reactive processing aids. ERC 8a: Wide dispersive indoor use of processing aids in open systems. ERC 8b: Wide dispersive indoor use of reactive substances in open systems. ERC 8d: Wide dispersive outdoor use of processing aids in open systems. ERC 8e: Wide dispersive outdoor use of reactive substances in open systems.	
5. Processes and activities covered by the exposure scenario	
This exposure scenario describes processes and activities related to industrial use of hydrogen peroxide as an oxidizing agent for the removal of pollutants from industrial wastewater, exhaust gases or solid waste. The scenario covers also professional use of hydrogen peroxide solutions in potable water, wastewater and swimming pool water treatment. In addition, scenario includes professional use of hydrogen peroxide in the process of in situ remediation of polluted soils and groundwater and the professional applications in agriculture, e.g. for cleaning pipes in greenhouses or milking equipment and as a source of oxygen in irrigation water or to improve the oxygen supply to the roots.	
6. Product characteristics	
Physical state	Liquid
Volatility	Low

EXPOSURE SCENARIO No. 4:
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Concentration	< 50%		
7. Amounts used			
Not applicable.			
8. Frequency and duration of use/exposure			
<p>Duration of exposure: > 4 h/day Frequency of exposure at workplace: 220 d/y for a single worker Emission days per site: 15 d/y</p> <p>In case of consumer and institutional applications for cleaning and preservation, direct contact with the product may occur once a day for approximately 10 minutes and the workers are allowed stay in the process area for a period of 8 hours.</p>			
9. Technical conditions and measures to prevent or avoid human exposure			
<p>Contact with concentrated solutions of hydrogen peroxide during treatment of industrial/municipal wastewater and purification of industrial process water or public potable water is only possible episodically. In these processes hydrogen peroxide solutions are dispensed automatically, therefore low and short duration risk exposure (e.g. during control of the process parameters and maintenance works) is expected.</p> <p>The in situ remediation of contaminated soils and groundwater are continuous processes which are performed outdoors. Diluted hydrogen peroxide solutions are directly pumped into the ground at the site of treatment. A remediation process may run for up to several months. The risk of exposure exists during maintenance works, process parameters control or re-filling of storage tanks. Daily duration of exposure is up to 1 hour. Longer exposure to hydrogen peroxide solutions may only occur when taking water or soil samples. Frequency and duration of exposure will increase during indoor remediation of contaminated soils.</p> <p>The use of hydrogen peroxide solutions in agriculture occurs rarely. Semi-confined systems are used and direct exposure may occur during transportation of product into the irrigation system.</p>			
10. Conditions and measures related to personal protection, hygiene and health evaluation			
In case of exposure risk, one must use:			
Eye protection	Protective goggles or protective shield resistant to chemicals.		
Skin and body protection	Protective clothing.		
Hand protection	Protective gloves.		
Respiratory protection	In case of exposure to vapors/aerosols use respiratory protection e.g. full facepiece mask equipped with ABEK type respiratory cartridges.		
Other recommended protection measures	Keep away from food, drinks and tobacco. Wash hands thoroughly after each contact with the product. Use hand protective creams. Take off immediately all contaminated clothing. Immediately rinse away contaminated skin with water.		
11. Frequency and duration of environmental release			
	Release to air	0.1%	
	Release to wastewater	0.05%	

EXPOSURE SCENARIO No. 4:
HYDROGEN PEROXIDE SOLUTION 35 - 49.9%

In compliance with Regulation (EC) No. 1907/2006 with further amendments.



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	Release to soil	0.8%	
	Dilution factor (freshwater)	10	
	Dilution factor (seawater)	100	
12. Technical conditions and measures to reduce or avoid environmental release			
Waste released to environment are biodegradable, therefore no significant environmental emissions are anticipated.			
13. Conditions and measures related to municipal sewage treatment plant			
Average effluent flow rate	2000 m ³ /day (default assumption)		
Average receiving river flow rate	≥ 18000 m ³ /day, (default assumption)		
Efficiency of STP	99.3%		
Additional information	According to EUSES model, hydrogen peroxide concentration in the untreated wastewater is 8.23 mg/l (for identified use described in this scenario). No adsorption of product in sewage sludge will occur. The modeled PECSTP is 0.058 mg/l.		
14. Conditions and measures related to waste management			
No significant environmental emissions are anticipated.			
15. Exposure estimation			
Workers (oral exposure)	Implementation of good industrial practice eliminates the possibility of exposure via ingestion.		
Workers (dermal and eye exposure)	Concentrated hydrogen peroxide solutions (35% and more) must be handled with care, with the use of suitable eye and skin protection.		
Process Category (LEV*)	Inhalation: level of exposure [mg/m ³] (for 50% solution of H ₂ O ₂).		
Professional use, inside buildings			
PROC 1, LEV- none	0.007		
PROC 2, LEV 80%	0.7084		
PROC 3, LEV 80%	0.425		
PROC 4, LEV 80-85%	1.06245		
Professional use, outside buildings			
PROC 2, LEV 30%	2.479		
PROC 3, LEV 30%	1.488		

EXPOSURE SCENARIO No. 4:**HYDROGEN PEROXIDE SOLUTION 35 - 49.9%***In compliance with Regulation (EC) No. 1907/2006 with further amendments.***P U Ł A W Y**

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PROC 4, LEV 30%	4.958
Industrial use, inside buildings	
PROC 1, LEV- none	0.007
PROC 2, LEV none	0.708
PROC 3, LEV 90%	0.2125
PROC 4, LEV 90%	0.3542
Industrial use, outside buildings	
PROC 2, LEV 30%	0.496
PROC 3, LEV 30%	1.488
PROC 4, LEV 30%	2.479
*LEV - efficiency of local exhaust ventilation	
Consumers	No consumer exposure anticipated.
Environment (maximum PECs)	Estimated with EUSES
PEC value (predicted concentration of dihydrogen peroxide)	
Freshwater	0.0085 mg/l
Marine water	7.75×10^{-4} mg/l
Soil	1.13×10^{-4} mg/kg
STP	0.088 mg/l
Humans/environment	Not applicable

EXPOSURE SCENARIO No. 5:
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USE OF HYDROGEN PEROXIDE IN CLEANING AND BLEACHING AGENTS	
1. Sector of use (SU):	
SU 21: Consumer uses: Private households (= general public = consumers). SU 22: Professional uses: Public domain (administration, education, entertainment, services, craftsmen).	
2. Process category (PROC):	
PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises. PROC 10: Roller application or brushing. PROC 11: Non industrial spraying. PROC 13: Treatment of articles by dipping and pouring. PROC 19: Hand-mixing with intimate contact and only PPE available.	
3. Product category (PC):	
PC 21: Laboratory chemicals. PC 35: Washing and cleaning products (including solvent based products). PC 39: Cosmetics, personal care products.	
4. Environmental release category (ERC):	
ERC 8a: Wide dispersive indoor use of processing aids in open systems. ERC 8b: Wide dispersive indoor use of reactive substances in open systems. ERC 8d: Wide dispersive outdoor use of processing aids in open systems. ERC 8e: Wide dispersive outdoor use of reactive substances in open systems.	
5. Processes and activities covered by the exposure scenario	
This exposure scenario covers use of cleaning agents containing hydrogen peroxide in professional and consumer setting. These products may be used either diluted or undiluted to clean surfaces, drains or sanitary facilities. Cleaning agents may be applied by rubbing, spraying or brushing them onto surfaces. After cleaning surfaces are often washed or wiped dry. The scenario covers also professional and consumer use of hydrogen peroxide as a bleaching component in mixtures used in hair lightening and teeth whitening.	
6. Product characteristics	
Physical state	Liquid
Volatility	Low
Concentration	≤ 18%
7. Amounts used	
Professional setting	Use in cleaning agents ≤ 400 g Use in bleaching agents: small amounts
Consumer setting	Use in cleaning agents ≤ 110 g Use in bleaching agents: small amounts

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Regional annual use (tons)	6210 (all consumer uses)
Local annual use (tons)	1242 (all consumer uses)
8. Frequency and duration of use/exposure	
<p><u>Use in cleaning agents:</u> The operational conditions related to the frequency, duration and amount of use are taken from the exposure scenarios provided by the International Association for Soaps, Detergents and Maintenance Products (AISE 2009). <i>Professional setting:</i> Frequency at workplace: 80 applications per day (spraying); 8 applications (brushing) Duration of exposure: 0.1 minutes (spraying), 60 minutes (brushing)</p> <p><i>Consumer setting:</i> Frequency at workplace: once per day (liquid surface cleaners and spray cleaners); twice per week (toilet cleaners) Duration of exposure: max. 20 minutes (liquid surface cleaners); 10 minutes (spray cleaners), < 1 minute (toilet cleaners) Dose: 110 g/single application (liquid surface cleaners); 30 g (spray cleaners), 50 g (toilet cleaners)</p> <p><u>Use in bleaching agents:</u> Duration of exposure: max. few hours (per single use) Frequency of exposure at workplace: Low Emission days per site: 365 d/y</p>	
9. Technical conditions and measures to prevent or avoid human exposure	
Workers/consumers may be exposed to hydrogen peroxide by inhalation and skin contact. Use proper indoor ventilation systems.	
10. Conditions and measures related to personal protection, hygiene and health evaluation	
In case of exposure risk, one must use:	
Eye protection	Protective goggles or protective shield resistant to chemicals.
Skin and body protection	Suitable workwear.
Hand protection	Protective gloves.
Respiratory tract protection	Not required.
Other recommended protection measures	Keep away from food, drinks and tobacco. Wash hands thoroughly after each contact with the product. Use hand protective creams. Take off immediately all contaminated clothing. Immediately rinse away contaminated skin with water.
Additional information	Maximum concentration of hydrogen peroxide for consumer applications should not exceed 12%.

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11. Frequency and duration of environmental release		
	Release to air	0%
	Release to wastewater	0.8%
	Release to soil	0%
	Dilution factor (freshwater)	10
	Dilution factor (seawater)	100
12. Technical conditions and measures to reduce or avoid environmental release		
A combination of organizational and technical measures (leak detection and control) should be implemented to eliminate unexpected release.		
13. Conditions and measures related to municipal sewage treatment plant		
Average effluent flow rate	2000 m ³ /day (default assumption)	
Average receiving river flow rate	≥ 18000 m ³ /day, (default assumption)	
Efficiency STP	~ 90%	
Additional information	<p>According to EUSES model, hydrogen peroxide concentration in the untreated wastewater is 1.36 mg/l (for identified use described in this scenario). The modeled PECSTP is 0.0095 mg/l.</p> <p>It is assumed that the local sewage treatment plant processes wastewater from 10.000 inhabitants, with individual release is 200 l per day, i.e. a total wastewater volume of 2 000 000 l per day.</p>	
14. Conditions and measures related to waste management		
<p>Air: Release is possible in case activated carbon filters are depleted.</p> <p>Wastewater: Industrial wastewater must be neutralized by applying the following techniques:</p> <ul style="list-style-type: none"> • Biological wastewater treatment or, • Ozonation of wastewater <p>Wastewater (bleaching applications): Sent to the public sewage system, where rapid decomposition of hydrogen peroxide in contact with sewage will occur.</p> <p>Solid and liquid waste (industrial setting): Treat as industrial waste.</p> <p>Solid and liquid waste (consumer and professional setting): Dispose of via regular municipal waste.</p>		
15. Exposure estimation		
Use in cleaning agents:		
Workers (oral exposure)	Implementation of good industrial practice eliminates the possibility of exposure via ingestion.	
Workers (dermal and eye exposure)	Wear protective rubber gloves when in contact with 12% solution of hydrogen peroxide. Use safety glasses in case of concentrated	

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	products.
Workers (inhalation), RMMs Spray cleaning Cleaning by rubbing, brushing Use of toilet cleaners Use of cleaning agents containing H ₂ O ₂	Calculated with ConsExpo (maximum concentration) 0.002 mg/m ³ (7% w/w), acute exposure 1.07 mg/m ³ (7% w/w), acute exposure 1.16 mg/m ³ (12% w/w), acute exposure 1.07 (7% w/w), long-term exposure
Consumers (ingestion exposure)	Under normal operating conditions - not relevant.
Consumers (dermal and eye exposure)	Wear protective rubber gloves and goggles when in contact with 12% solution of hydrogen peroxide.
Consumers (inhalation), RMMs Spray cleaning Cleaning by rubbing, brushing Use of toilet cleaners	Calculated with ConsExpo (maximum concentration) 0.002 mg/m ³ (7% w/w), acute exposure 1.07 mg/m ³ (7% w/w), acute exposure 1.16 mg/m ³ (16% w/w), acute exposure
Environment (maximum PECs)	Estimated with EUSES
PEC value (predicted concentration of dihydrogen peroxide)	
Freshwater Marine water Soil STP Humans/environment	0.0037 mg/l 2.94 x 10 ⁻⁴ mg/l 1.11 x 10 ⁻⁴ mg/kg 0.0095 mg/l Not applicable

Use in cleaning agents:

Workers	Not applicable
Consumers	Not applicable
Environment (maximum PECs)	Estimated with EUSES
PEC value (predicted concentration of dihydrogen peroxide)	
Freshwater Marine water Soil STP Humans/environment	0.0037 mg/l 2.94 x 10 ⁻⁴ mg/l 1.11 x 10 ⁻⁴ mg/kg 0.0095 mg/l Not applicable