

CPC CODE

34280 Hydrogen peroxide

REGISTRATION DATE

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REGISTRATION NUMBER

S-P-00031



Hydrogen peroxide H_2O_2

Environmental Product Declaration



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Nouryon

1. The company

Nouryon

Nouryon is a global specialty chemicals leader, providing essential chemicals to manufacturing of everyday products such as paper, building materials, food, pharmaceuticals, and personal care items.

One product segment is pulp bleaching technologies, in which Nouryon is a leading global force and the largest producer of sodium chlorate worldwide, and a regional supplier of hydrogen peroxide. The company designs, supplies and operates plants and equipment for the processing of bleaching chemicals.

With it's about 10,000 employees Nouryon operates in over 80 countries around the world.

Sustainability is a cornerstone of the overall strategy to achieve long-term success in Nouryon and the focus is on providing innovative and sustainable solutions that meet customers need, while also improving the company's environmental performance and maximizing the positive societal impact.

Further information on www.nouryon.com

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2. The product and the process

This EPD covers Hydrogen peroxide produced in Nouryon's European plants:

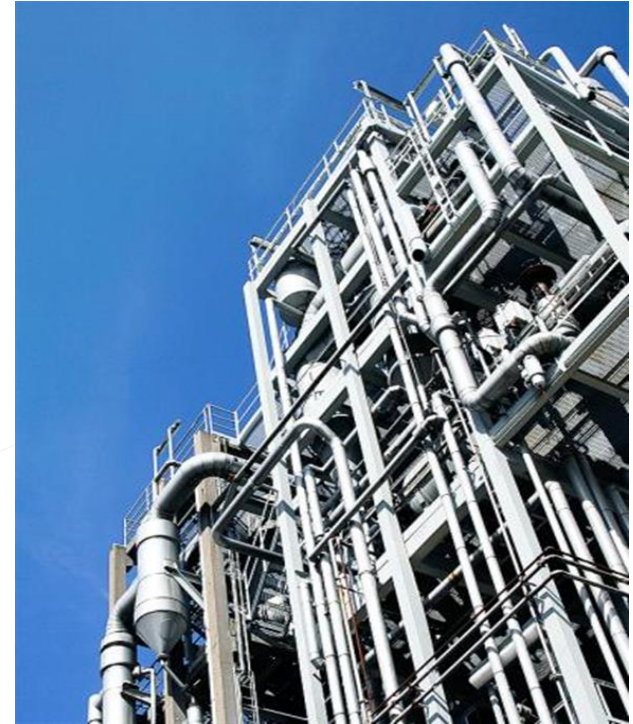
- Bohus (Sweden)
- Alby (Sweden)
- Rjukan (Norway)

Hydrogen peroxide (H_2O_2) is produced from hydrogen and atmospheric oxygen. Hydrogen is a by-product from manufacturing of sodium chlorate. It is also produced from propane/natural gas in steam reformers or via water in electrolyzers.

The reactions take place in an organic solvent, which is circulated in the process, with palladium as a catalyst. In the first step hydrogen gas is added, and the solvent is hydrogenated. The second step is the oxidation where oxygen from the air is added. Hydrogen peroxide is formed.

In the third step hydrogen peroxide is extracted from the solvent with water and distilled to desired concentration, varying from 19-70wt%. The concentrated hydrogen peroxide solution is stabilised by addition of small quantities of substances, which give some tolerance towards accidental contamination.

Before the organic solvent can be reused in the first step, water is removed in a last drying step.



Following the cut-off rules indicated in the PCR, this LCA includes 99% of the total inflow. Some materials added in small quantities have not been considered.

3. Hydrogen peroxide

Functional and chemical characteristics

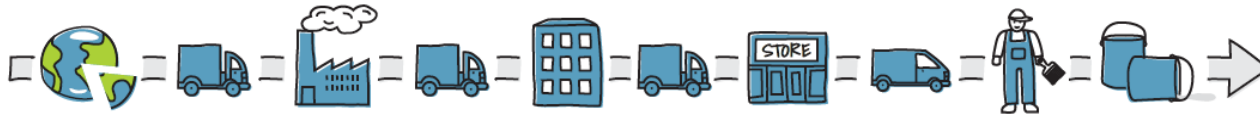
Hydrogen peroxide from Nouryon is mainly used for ECF-bleaching and TCF-bleaching of paper pulp but is also used for bleaching of recycled paper in the de-inking process. Hydrogen peroxide is also used in many other important applications in the chemical industry.

Hydrogen peroxide is an efficient oxidising agent. Hydrogen peroxide from Nouryon is supplied as aqueous solution at a maximum concentration of 70 wt%.

Hydrogen peroxide from Nouryon contains max 500 mg/kg stabiliser and 30-81 wt% water. Hydrogen peroxide solution 70 wt% is classified and labelled corrosive, harmful and oxidising.

	Category of danger	Symbol letters	Risk phrases
Hydrogen peroxide	Corrosive, Harmful, Oxidising	C, Xn ,O	H272, H302+H332, H314, H335, H401
Stabiliser	-	-	-
Water	-	-	-
H272: May intensify fire; oxidiser. H302 + H332: Harmful if swallowed or if inhaled H314: Causes severe skin burns and eye damage. H335: May cause respiratory irritation. H401: Toxic to aquatic life.			

4. Environmental performance – LCA



The Environmental performance was calculated using LCA (life cycle assessment). All major steps from the extraction of natural resources until the transport of the product to the customer are included in the environmental performance of the product (cradle-to-gate).

This study was conducted following the product category rules (PCR) 2011:18 for the assessment of the environmental performance of UN “CPC 342 – Basic inorganic chemicals n.e.c.”, published by the International EPD system.

The data used were collected for year 2016. Site-specific data has been retrieved. For some of the raw materials, generic data has been used according to the suggested sources in the PCR.

Heat is co-produced in the production. In Bohus, the heat is sold to other production units and the allocation between hydrogen peroxide and heat has been done on the basis of their respective economic value.

FUNCTIONAL UNIT

The environmental performance of hydrogen peroxide 1000 kg of product (100% concentration).

SYSTEM BOUNDARIES AND CUT-OFFS

The environmental performance is constituted of three life cycle phases: upstream, core and downstream (transport to customer). The use of stabilizer additive has been excluded for practical reasons. This is used in very small quantities (0,3 kg/ton product) and has an impact less than 1%.

4.1 RESULTS-->Use of Resources

Note: EPD:s from different programs may not be comparable

 NON RENEWABLE RESOURCES FU: 1000 kg		UPSTREAM	CORE	DOWNSTREAM	TOTAL
		Raw Materials	Production	Distribution	
MATERIAL RESOURCES (kg)	Soil	0,03	16	0,06	17
	Salt	26	0,03	0	26
	Gravel	0,02	9,0	0,02	9,0
	Natural aggregate	2,1	0,08	0,00	2,2
	Aluminum oxide	-	6,5	-	6,5
	Other	1,8	1,9	2,1	5,7
MATERIAL RESOURCES (MJ)	Peat	0,04	2,9	0,00	3,0

4.1 RESULTS-->Use of Resources

Note: EPD:s from different programs may not be comparable

 NON RENEWABLE RESOURCES FU: 1000 kg		UPSTREAM	CORE	DOWNSTREAM	TOTAL
		Raw Materials	Production	Distribution	
ENERGY RESOURCES (kg)	Natural Gas	113	0,68	0,84	115
	Oil	61	0,71	9,8	72
	Hard coal	5,1	2,2	0,05	7,4
	Other	0,78	0,20	0,07	1,0
ENERGY RESOURCES (MJ)	Natural gas	4945	23	37	5004
	Nuclear	132	5169	1,6	5302
	Oil	2594	30	416	3040
	Other	136	47	2,1	185

4.1 RESULTS-->Use of Resources

Note: EPD:s from different programs may not be comparable

 RENEWABLE RESOURCES FU: 1000 kg		UPSTREAM	CORE	DOWNSTREAM	TOTAL
		Raw Materials	Production	Distribution	
ENERGY RESOURCES (MJ)	Biomass	0,91	0,13	0,00	1,0
	Hydroelectric	22	3306	9,7	3338
	Wind, Solar & Other	24	53	25	102

 WATER CONSUMPTION [m3] (excluding water use in energy production) FU: 1 000 kg					TOTAL
		Raw Materials	Production	Distribution	
Ground water		0,01	0,003	0,03	0,05
River water		0,09	0,03	1,3	1,4
Surface water		0,004	1,4	0,10	1,5

4.1 RESULTS-->Environmental impact & waste

 ENVIRONMENTAL IMPACTS FU: 1000 kg	UPSTREAM	CORE	DOWNSTREAM	TOTAL
	Raw Materials	Production	Distribution	
Global Warming Potential (CO ₂ -eq.), excl. biogenic and sequestered	111	364	34	508
Acidification Potential (SO ₂ -eq.)	0,42	0,06	0,15	0,63
Ozone Creation Potential (kg Ethene-eq.)	0,05	0,04	0,02	0,11
Photochemical oxidant formation (kg NMVOC)	0,30	0,06	0,28	0,64
Ozone Depletion Potential (kg CFC 11-eq.)	1,4E-06	1,5E-07	1,5E-10	1,5E-06
Oxygen depletion potential (kg PO ₄ ³⁻ -eq.)	0,06	0,06	0,04	0,15
Eutrophication, freshwater (kg P-eq)	4,8E-03	2,0E-03	2,1E-04	0,01
Eutrophication, marine (kg N-eq)	0,01	2,8E-03	0,01	0,03
Abiotic Depletion Potential (kg Sb-eq.)	2,8E-05	1,5E-05	2,2E-06	4,5E-05
 WASTE FU: 1 000kg	UPSTREAM	CORE	DOWNSTREAM	TOTAL
	Raw Materials	Production	Distribution	
Hazardous (kg)	0,08	0,15	0	0,22
Non-hazardous (kg)	1,1	0,62	1,8	3,2
Radioactive (kg)	0,00	0,00	0,00	0,00

4.1 RESULTS-->Emissions

WATER EMISSIONS FU: 1 000 kg	UPSTREAM	CORE	DOWNSTREAM	TOTAL
	Raw Materials	Production	Distribution	
N total [kg]	1,1E-05	1,5E-04	1,8E-13	1,6E-04
P total [kg]	2,7E-03	2,5E-04	2,1E-04	3,83E-03
COD [kg]	0,09	1,9	0,007	2,0
BOD [kg]	0,03	0,003	4,8-05	0,03
AIR EMISSIONS FU: 1 000kg	UPSTREAM	CORE	DOWNSTREAM	TOTAL
	Raw Materials	Production	Distribution	
Fossil CO ₂ (kg)	68	363	32	464
SO ₂ (kg)	0,24	0,03	0,02	0,29
CH ₄ (kg)	1,5	0,009	0,04	1,6
NO _x (kg)	0,25	0,05	0,26	0,57
NM VOC (kg)	0,14	0,36	0,02	0,52
CO (kg)	0,16	0,02	0,06	0,24
Particulates (kg)	0,13	0,02	0,07	0,22

4.1 RESULTS-->Recycling

MATERIAL SUBJECT TO RECYCLING FU: 1 000 kg	UPSTREAM	CORE	DOWNSTREAM	TOTAL
	Raw Materials	Production	Distribution	
Aluminum oxide waste	0	12,4	0	12,4

5. Additional information

REFERENCES

- International EPD Consortium, General Programme Instructions (EPD), ver. 2.01 of 11/05/2016;
- PCR 2011:18 for the assessment of the environmental performance of UN CPC 342 – Basic inorganic chemicals n.e.c.

CONTACTS

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EPD and underlying LCA study is provided by Nouryon/ IVL

This declaration is publicly available on: www.environdec.com

5. Additional information -->Verification

PCR REVIEW CONDUCTED BY:	The Technical Committee of the The International® EPD System. Chair: Massimo Marino. Contact via info@environdec.com
INDEPENDENT VERIFICATION OF THE DECLARATION AND DATA, ACCORDING TO ISO 14025	EXTERNAL Lars Gunnar Lindfors lasselindfors@me.com
ACCREDITED /APPROVED BY	The International® EPD System