CPC CODE

34240 Sodium Chlorate

REGISTRATION DATE

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REGISTRATION NUMBER

S-P-00030

Sodium Chlorate $NaClO_3$

Environmental Product Declaration

EPD®

eka

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 has a European scope, covering Sodium Chlorate produced in the following Nouryon plants:

- Stockvik (Sweden)
- Alby (Sweden)
- Oulu (Finland)
- Ambès (France)

Sodium chlorate (NaClO3) is an efficient oxidising agent. Sodium chlorate from Nouryon is supplied to customers in crystalline form (and to some extent in liquid form) and delivered by tanker trucks, rail tank cars or tank containers containing up to 60 ton. Delivery can also be made in “big-bags” containing approximately 1 Mt.

Sodium chlorate is produced by electrolysis of a salt solution. The raw materials are sodium chloride (NaCl), water and electrical power. Sodium chlorate and hydrogen gas (H_2) are formed in the process. Hydrogen can be used as a chemical raw material (for hydration, manufacturing of hydrogen peroxide etc.) or as a fuel. The solution formed is crystallised and the chlorate crystals are separated, washed and dried.

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. Sodium Chlorate

Functional and chemical characteristics

Sodium chlorate ($NaClO_3$) from Nouryon is mainly used at pulp mills in the production of chlorine dioxide used for ECF-bleaching of chemical pulp. Sodium chlorate is an efficient oxidising agent.

Sodium chlorate from Nouryon contains ≥99,5 % sodium chlorate. Sodium chlorate is classified and labelled oxidising, harmful and dangerous for the environment.

	Category of danger	Symbol letters	Hazard phrases
Sodium chlorate	Oxidising, Harmful, Dangerous for the environment	O, Xn, N	H271, H302, H411

H271: May cause fire or explosion; strong oxidiser.
H302 : Harmful if swallowed.
H411: Toxic to aquatic life with long lasting effects.

4. Environmental performance – LCA

The Environmental performance was calculated using LCA (life cycle assessment). All major steps from the extraction of natural resources until transport of the product to customer are included in the environmental performance of the manufacturing phase (cradle-to-gate).
This study was conducted following the product category rules (PCR) 2011:18 (Version 2.01) 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.
The production yields hydrogen and heat as commercial by-products. The allocation between the products have been done on the basis of their respective economic value.
Sodium chlorate from Nouryon is supplied to customers in crystalline form and delivered by tanker trucks, rail tank cars or tank containers containing up to 60 ton. Delivery can also be made in “big-bags” containing approximately 1 Mt.

FUNCTIONAL UNIT

The functional unit in this study is 1000 kg of sodium chlorate (100% concentration). $NaClO_3$ is in crystalline form. The displayed figures are given as an average for Nouryon’s European production.

SYSTEM BOUNDARIES AND CUT-OFFS

The environmental performance is constituted of three life cycle phases: upstream, core and downstream (transport to customer).

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)	Sodium Chloride	5,6	536	0,01	542
	Inert rock	12	0,01	3,6	16
	Soil	15	30	0,84	46
	Gravel	7,9	19	0,39	28
	Others	4,6	6,3	2,0	13
MATERIAL RESOURCES (MJ)	Peat	4,3	0,00	0,00	4,3

4.1 RESULTS-->Use of Resources

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NON RENEWABLE RESOURCES FU: 1000 kg		UPSTREAM	CORE	DOWNSTREAM	TOTAL
		Raw Materials	Production	Distribution	
ENERGY RESOURCES (kg)	Hard coal	7,0	20	0,18	27
	Natural Gas	22	12	2,3	36
	Oil	13	3,1	28	44
	Lignite	1,7	0,98	0,23	2,9
	Other	0,03	0,05	0,00	0,07
ENERGY RESOURCES (MJ)	Nuclear	5495	24431	5,5	29932
	Natural gas	731	369	102	1202
	Oil	571	134	1178	1884
	Other	161	380	4,5	546

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	1,3	1,4	0,04	2,7
	Hydroelectric	2933	5706	169	8808
	Wind, Solar & Other	192	231	68	491

WATER CONSUMPTION [m3] (excluding water use in energy production) FU: 1 000 kg				TOTAL
	Raw Materials	Production	Distribution	
Ground water	0,03	0,02	0,09	0,14
River water	8,7	0,13	3,5	12
Surface water	0,52	1,1	0,26	1,9

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	95	80	95	270
Acidification Potential (SO_2-eq.)	0,59	0,25	0,59	1,4
Ozone Creation Potential (kg Ethene-eq.)*	0,04	0,02	0,06	0,11
Photochemical oxidant formation (kg NMVOC)	0,51	0,19	0,91	1,60
Ozone Depletion Potential (kg CFC 11-eq.)	6,3E-06	1,9E-06	6,9E-07	8,9E-06
Oxygen depletion potential (kg $PO43^-$-eq.)	0,13	0,16	0,12	0,42
Eutrophication, freshwater (kg P-eq)	0,01	0,02	7,12E-04	0,03
Eutrophication, marine (kg N-eq)	0,04	0,01	0,04	0,09
Abiotic Depletion Potential (kg Sb-eq.)	1,8E-04	6,3E-05	6,4E-06	2,5E-04
 WASTE FU: 1 000kg	UPSTREAM	CORE	DOWNSTREAM	TOTAL
	Raw Materials	Production	Distribution	
Hazardous (kg)	0,10	0,39	0	0,49
Non-hazardous (kg)	14	1,1	4,7	20
Radioactive (kg)	0,01	0	0	0,01

4.1 RESULTS-->Emissions

WATER EMISSIONS FU: 1 000 kg	UPSTREAM	CORE	DOWNSTREAM	TOTAL
	Raw Materials	Production	Distribution	
N total [kg]	4,9E-03	7,6E-05	4,6E-13	5,0E-03
P total [kg]	1,1E-03	2,7E-03	5,7E-04	4,3E-03
COD [kg]	1,7	3,3	0,12	5,1
BOD [kg]	0,06	0,02	0,02	0,11
AIR EMISSIONs FU: 1 000kg	UPSTREAM	CORE	DOWNSTREAM	TOTAL
	Raw Materials	Production	Distribution	
Fossil CO_2 (kg)	91	77	92	261
SO_2 (kg)	0,29	0,13	0,13	0,55
CH_4 (kg)	0,13	0,07	0,11	0,31
NO_x (kg)	0,47	0,16	0,84	1,5
NMVOC (kg)	0,06	0,02	0,07	0,15
CO (kg)	0,06	0,08	0,16	0,30
Particulates (kg)	0,17	0,07	0,23	0,47

4.1 RESULTS-->Recycling

MATERIAL SUBJECT TO RECYCLING FU: 1 000 kg	UPSTREAM	CORE	DOWNSTREAM	TOTAL
	Raw Materials	Production	Distribution	
Mainly concrete waste	0	0,19	0	0,19

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