

Environmental Product Declaration

In accordance with 14025 and EN15804 +A2

Water-resistance ANFO



The Norwegian
EPD Foundation

Owner of the declaration:
SSE Sverige AB

Product name:
Water-resistance ANFO

Declared unit:
1 kg of manufactured, installed and used
(detonated) packaged explosives product

Product category /PCR:
CEN Standard EN 15804:2012+A2:2019 serves
as core PCR. NPCR 024 version 2.0 Explosives
and Initiation Systems (11/2021)

Program holder and publisher:
The Norwegian EPD foundation

Declaration number:
NEPD-4419-3642-EN

Registration Number:
NEPD-4419-3642-EN

Issue date:
02.05.2023

Valid to:
02.05.2028

General information

Product:

Water-resistance ANFO

Program Operator:

The Norwegian EPD Foundation
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Declaration number:

NEPD-4419-3642-EN

This declaration is based on Product

Category Rules:

CEN Standard EN 15804:2012+A2:2019 serves as core PCR. NPCR 024 version 2.0 Explosives and Initiation Systems (11/2021)

Statements:

The owner of the declaration shall be liable for the underlying information and evidence. EPD Norway shall not be liable with respect to manufacturer, life cycle assessment data and evidences.

Declared unit:

1 kg of manufactured, installed and used (detonated) packaged explosives product

Declared unit with option:

A1-A3, A4, A5

Verification:

Independent verification of the declaration and data, according to ISO14025:2010

internal

external

Sign

Ole M. Iversen

Ole Iversen

Independent verifier approved by EPD Norway

Owner of the declaration:

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Place of production:

Sweden

Management system:

ISO 9001, ISO 45001

Organisation no:

SE556294459401

Issue date:

02.05.2023

Valid to:

02.05.2028

Year of study:

LCA conducted 2023. Production data from 2022.

Comparability:

EPDs from other programs than EPD Norway may not be comparable.

The EPD has been worked out by:

Kristine Bjordal, Asplan Viak AS

Approved

Håkan Hansson

Manager of EPD Norway

Product

Product description:

The Water-resistance ANFO represents the products labeled HYDRANEX from SSE Sverige AB and Austinite WR from Austin Powder. These packaged explosive ANFO-products are the same and they are manufactured at the SSE factory at Gyttopp, Sweden, then transported to the customer via an intermediate storage site. The customer brings the product to the use site and charges the product manually or by use of their own charging equipment into bore holes. The charged bore holes are then detonated.

Product specification:

Materials	Water-resistance ANFO
Ammonium Nitrate	80-95 %
Destillates (petroleum)	5-10 %
Packaging	
Plastic bag of PE and PP (kg/kg product)	0,008

Energy	
Energy content (MJ/kg)	3,7

Technical data:

EC-type examination certificate for Water-resistance ANFO 079/02

Market:

Nordic Market

Reference service life, product:

Not relevant. Explosives products cannot be used more than once.

LCA: Calculation rules

Declared unit:

1 kg of manufactured, installed and used (detonated) packaged explosive product

Data quality:

Data has been collected in 2023 and is representative of 2022. Data for production, transport and storage of explosives (A1-A3) is based on specific consumption data for the factory at Gyttopp and storage facilities in Sweden. Detonation of explosives has been calculated from a balanced chemical reaction, at final state and 1 bar (EXPLO5 software, ideal detonation).

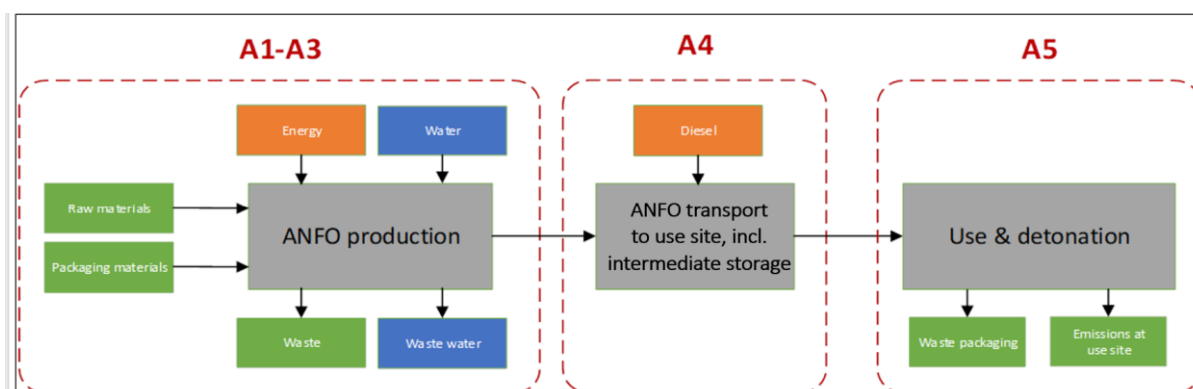
Generic data is from ecoinvent v3.8, Allocation, Cut-Off by classification (May 2022) SimaPro v 9.1.1.1. Characterization factors from EN15804: 2012 + A2: 2019.

Allocation:

The allocation is made in accordance with the provisions of EN 15804. Incoming energy and water and waste production in-house is allocated equally among all products through mass allocation. Effects of primary production of recycled materials allocated to the main product in which the material was used.

System boundary:

The flow chart for production, transport and use of packaged explosive is shown in the figure below.



Cut-off criteria:

All major raw materials and all the essential energy is included. The production process for raw materials and energy flows that are included with very small amounts (<1%) are not included. This cut-off rule does not apply for hazardous materials and substances.

LCA: Scenarios and additional technical information

The following information describe the scenarios in the different modules of the EPD.

Transport from production place to intermediat storage (A4)

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance KM	Fuel/Energy consumption	value (l/t)
Truck	50 %	EURO6, 16-32 tonnes	296	0,3 l/km	10,76

Transport from intermediat storage to user (A4)

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance KM	Fuel/Energy consumption	value (l/t)
Truck	50 %	EURO6, 16-32 tonnes	100	0,3 l/km	3,64

Transportation distances and vehicles from production plant to customer are defined based on typical transportation distance in the studied markets. These figures represent the most likely

scenario for the distribution of the product. Products normally transported to intermediate storage and then to the user. The average transportation distance presented here is based on the average over the market area. Total transported mass including transportation package is 1,008 kg per 1 kg transported product. A4 also includes the intermediate storage of the product.

Manufacture and charging of explosives (A5-1)

	Unit	Value
Diesel consumption	Kg	0
Packaged explosive consumption	Kg	1
Glycol consumption	Kg	0
Water consumption	kg	0
Treatment of waste from packaging material	kg	0,008

No energy or material is needed for the charging of the product, but waste generated from the packaging material is sent to waste treatment.

Detonation of explosives (A5-2)

	Unit	Value
C	kg	0
CH ₄	kg	0
CO ₂	kg	0,1904
CO	kg	0,002535
H ₂ O	kg	0,4799
N ₂	kg	0,3197
NO _x	kg	0,003928
Na ₂ CO ₃	kg	0
CaCO ₃	kg	0

Theoretical calculations per kg explosive product detonated, from a balanced chemical reaction, at final state and 1 bar (EXPLO5 software, Ideal detonation)

Additional technical information

Not relevant.

LCA: Results

Impact assessment results are presented with core and additional impact indicators presented in EN15804+A2. Reading example: 9,0 E-03 = 9,0*10⁻³ = 0,009

System boundaries (X=included, MND= module not declared, MNR=module not relevant)

Product stage			Assembly stage		Use stage							End of life stage				Benefits & loads beyond system boundary
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	MNR	MNR	MNR	MNR	MNR	MNR	MNR	MNR	MNR	MNR	MNR	MNR

Core environmental impact indicators

Indicator	Unit	A1-A3	A4	A5-1	A5-2
GWP-total	kg CO2 eq.	1,56E+00	4,34E-02	1,97E-02	1,94E-01
GWP-fossil	kg CO2 eq.	1,56E+00	4,38E-02	1,96E-02	1,94E-01
GWP-biogenic	kg CO2 eq.	-2,43E-03	-4,36E-04	3,68E-05	0,00E+00
GWP-LULUC	kg CO2 eq.	1,22E-03	9,92E-05	4,61E-06	0,00E+00
ODP	kg CFC11 eq.	1,99E-07	8,19E-09	2,35E-09	0,00E+00
AP	mol H ⁺ eq.	1,03E-02	2,26E-04	3,11E-05	2,91E-03
EP-freshwater	kg P eq.	4,67E-05	7,13E-07	4,17E-07	0,00E+00
EP-marine	kg N eq.	1,47E-03	4,40E-05	6,28E-06	1,53E-03
EP-terrestrial	mol N eq.	3,43E-02	6,82E-04	6,99E-05	1,67E-02
POCP	kg NMVOC eq.	2,90E-03	1,72E-04	1,92E-05	4,04E-03
ADP-M&M	kg Sb eq.	3,21E-05	4,74E-07	3,96E-08	0,00E+00
ADP-fossil	MJ	2,38E+01	7,42E-01	9,53E-02	0,00E+00
WDP	m ³	2,37E-01	6,72E-03	2,59E-03	0,00E+00

GWP-total: Global Warming Potential; **GWP-fossil:** Global Warming Potential fossil fuels; **GWP-biogenic:** Global Warming Potential biogenic; **GWP-LULUC:** Global Warming Potential land use and land use change; **ODP:** Depletion potential of the stratospheric ozone layer; **AP:** Acidification potential, Accumulated Exceedance; **EP-freshwater:** Eutrophication potential, fraction of nutrients reaching freshwater end compartment; See "additional Norwegian requirements" for indicator given as PO4 eq. **EP-marine:**

*Eutrophication potential, fraction of nutrients reaching freshwater end compartment; **EP-terrestrial**: Eutrophication potential, Accumulated Exceedance; **POCP**: Formation potential of tropospheric ozone; **ADP-M&M**: Abiotic depletion potential for non-fossil resources (minerals and metals); **ADP-fossil**: Abiotic depletion potential for fossil resources; **WDP**: Water deprivation potential, deprivation weighted water consumption*

Additional environmental impact indicators

Indicator	Unit	A1-A3	A4	A5-1	A5-2
PM	Disease incidence	5,19E-08	4,90E-09	2,83E-10	6,28E-09
IRP	kBq U235 eq.	3,95E-02	6,69E-03	4,08E-04	0,00E+00
ETP-fw	CTUe	1,98E+01	8,08E-01	3,79E-01	5,79E-05
HTP-c	CTUh	9,89E-10	4,37E-11	1,23E-11	0,00E+00
HTP-nc	CTUh	2,22E-08	9,51E-10	1,44E-10	2,74E-09
SQP	Dimensionless	1,02E+01	1,04E+00	2,26E-02	0,00E+00

***PM**: Particulate matter emissions; **IRP**: Ionising radiation, human health; **ETP-fw**: Ecotoxicity (freshwater); **ETP-c**: Human toxicity, cancer effects; **HTP-nc**: Human toxicity, non-cancer effects; **SQP**: Land use related impacts / soil quality*

Classification of disclaimers to the declaration of core and additional environmental impact indicators

ILCD classification	Indicator	Disclaimer
ILCD type / level 1	Global warming potential (GWP)	None
	Depletion potential of the stratospheric ozone layer (ODP)	None
	Potential incidence of disease due to PM emissions (PM)	None
	Acidification potential, Accumulated Exceedance (AP)	None
ILCD type / level 2	Eutrophication potential, Fraction of nutrients reaching marine end compartment (EP-marine)	None
	Eutrophication potential, Accumulated Exceedance (EP-terrestrial)	None
	Formation potential of tropospheric ozone (POCP)	None
	Potential Human exposure efficiency relative to U235 (IRP)	1
ILCD type / level 3	Abiotic depletion potential for non-fossil resources (ADP-minerals&metals)	2
	Abiotic depletion potential for fossil resources (ADP-fossil)	2
	Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	2
	Potential Comparative Toxic Unit for ecosystems (ETP-fw)	2
	Potential Comparative Toxic Unit for humans (HTP-c)	2
	Potential Comparative Toxic Unit for humans (HTP-nc)	2
	Potential Soil quality index (SQP)	2

Disclaimer 1 – This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to

possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator

Resource use

Parameter	Unit	A1-A3	A4	A5-1	A5-2
RPEE	MJ	8,00E-01	8,98E-02	3,93E-03	0,00E+00
RPEM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00
TPE	MJ	8,00E-01	8,98E-02	3,93E-03	0,00E+00
NRPE	MJ	2,21E+01	7,42E-01	9,53E-02	0,00E+00
NRPM	MJ	1,70E+00	0,00E+00	0,00E+00	0,00E+00
TRPE	MJ	2,38E+01	7,42E-01	9,53E-02	0,00E+00
SM	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00
W	m ³	1,45E-02	2,82E-04	6,58E-05	0,00E+00

RPEE Renewable primary energy resources used as energy carrier; RPEM Renewable primary energy resources used as raw materials; TPE Total use of renewable primary energy resources; NRPE Non renewable primary energy resources used as energy carrier; NRPM Non renewable primary energy resources used as materials; TRPE Total use of non renewable primary energy resources; SM Use of secondary materials; RSF Use of renewable secondary fuels; NRSF Use of non renewable secondary fuels; W Use of net fresh water

End of life - Waste

Parameter	Unit	A1-A3	A4	A5-1	A5-2
HW	KG	1,80E-03	1,88E-04	1,48E-05	0,00E+00
NHW	KG	1,42E-01	6,27E-02	3,78E-03	0,00E+00
RW	KG	4,35E-05	5,54E-06	5,63E-07	0,00E+00

HW Hazardous waste disposed; NHW Non hazardous waste disposed; RW Radioactive waste disposed

End of life – output flow

Parameter	Unit	A1-A3	A4	A5-1	A5-2
CR	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MR	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MER	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EEE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00
ETE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00

CR Components for reuse; MR Materials for recycling; MER Materials for energy recovery; EEE Exported electric energy; ETE Exported thermal energy

Reading example: 9,0 E-03 = 9,0*10⁻³ = 0,009

Information describing the biogenic carbon content at the factory gate

Biogenic carbon content	Unit	Value
Biogenic carbon content in product	kg C	0
Biogenic carbon content in the accompanying packaging	kg C	0

Additional Norwegian requirements

Greenhouse gas emission from the use of electricity in the manufacturing phase
National production mix from import, low voltage (production of transmission lines, in addition to direct emissions and losses in grid) of applied electricity for the manufacturing process(A3).

National electricity grid	Unit	Value
Electricity, Sweden production mix, with import, medium voltage, Econinvent v3.8	kg CO ₂ -eq/kWh	0,065
Electricity, Sweden production mix, with import, low voltage, Econinvent v3.8	kg CO ₂ -eq/kWh	0,071

Additional environmental impact indicators required in NPCR Part A for construction products

In order to increase the transparency of biogenic carbon contribution to climate impact, the indicator GWP-IOBC is required as it declares climate impacts calculated according to the principle of instantaneous oxidation. GWP-IOBC is also referred to as GWP-GHG in context to Swedish public procurement legislation.

Indicator	Unit	A1-A3	A4	A5-1	A5-2
GWP-IOBC	kg CO ₂ eq.	1,56E+00	4,34E-02	1,97E-02	1,94E-01

GWP-IOBC Global warming potential calculated according to the principle of instantaneous oxidation.

Hazardous substances

The declaration is based upon reference to threshold values and/or test results and/or material safety data sheets provided to EPD verifiers. Documentation available upon request to EPD owner.

- The product contains no substances given by the REACH Candidate list or the Norwegian priority list. The product is classified as hazardous waste (Avfallsforskriften, Annex III), see table.

Name	CAS no.	Amount
Ammonium Nitrate	6484-52-2	80-95 %
Destillates (petroleum)		5-10 %

Indoor environment





Not relevant. No tests have been carried out on the product concerning indoor climate.

Carbon footprint

Carbon footprint has not been worked out for the product.

Bibliography

ISO 14025:2010	Environmental labels and declarations - Type III environmental declarations - Principles and procedures
ISO 14044:2006	Environmental management - Life cycle assessment - Requirements and guidelines
EN 15804:2012+A2:2019	Sustainability of construction works - Environmental product declaration - Core rules for the product category of construction products
SimaPro	LCA software, developed by PRé Sustainability
NPCR PART A Ver 2	Construction Products and Services
NPCR 024 2021 ver. 2.0	Explosives and Initiation Systems
Bjordal, Kristine, 2023	LCA Report for Classic ANFO and Water-resistance ANFO

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