LKAB Minerals

In accordance with ISO 14025 and EN 15804:A1 for:

MagnaDense 8s

MagnaDense 20s

from

LKAB Minerals AB

Environmental ProductDeclaration (EPD)

Programme information

Programme:
The International EPD® System
www.environdec.com
Programme operator:
EPD International AB
Box 210 60
SE-100 31 Stockholm Sweden
mailto:info@environdec.com

EPD registration number: S-P-02060
Publication date: 2020-06-16
Valid until: 2025-06-15
Version: 2020-11-17
Product category rules (PCR):
PCR 2012:01 - *Construction products and construction services*
(version 2.31 2019-12-20)

PCR review was conducted by: The Technical Committee of the International EPD® System. The review panel may be contacted via info@environdec.com.

Independent third-party verification of the declaration and data, according to ISO 14025:2006:
☐ EPD process certification ☒ EPD verification

Third party verifier, approved by The International EPD® System Carl Otto Nevén, Nevén Miljökonsult

Procedure for follow-up of data during EPD validity involves third party verifier:
☒ Yes ☐ No

Company information

Owner of the EPD is LKAB Minerals AB, Box 952, 971 28 Luleå.

Geographical representativeness: Global.

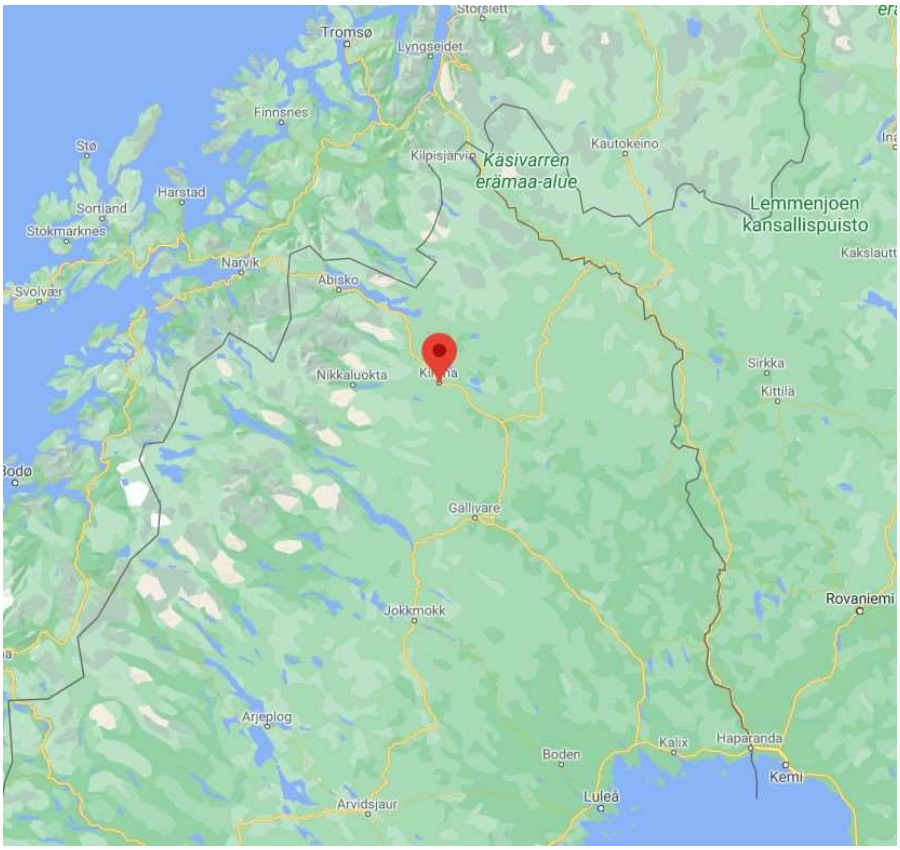
This EPD shall present product environmental performances and shall be used by interested parties, both internally and externally.

LKAB Minerals is part of LKAB, an international and high-tech mining- and minerals group. LKAB is owned by the Swedish state and was founded in 1890 and since mine and upgrade the unique iron ore of northern Sweden for the global steel market. Today we are also a growing industrial mineral supplier, and other group businesses include drilling systems, rail transport rockwork services and property management. LKAB employs about 4,300 people in 12 countries.

LKAB Minerals AB is certified according to standards for Quality, Environment and Working Environment (ISO9001, ISO14001 and ISO45001). Products are produced according to the Construction Products Regulation (CPR) within the EU regulation 305/2011. Products are certified according to standard EN12620 Aggregates for concrete. Sampling and testing are performed according to harmonised standards inEN12620.

Products are produced at LKAB
Production site in Kiruna. Kiruna is situated in the northern part of Sweden.

Information:
More information about LKAB Minerals, Products and Applications
can be found at website http://www.lkabminerals.com/.



Product information

Product name and identification:

UN CPC code: 153

MagnaDense 8s (MD8s)
0/6 grade

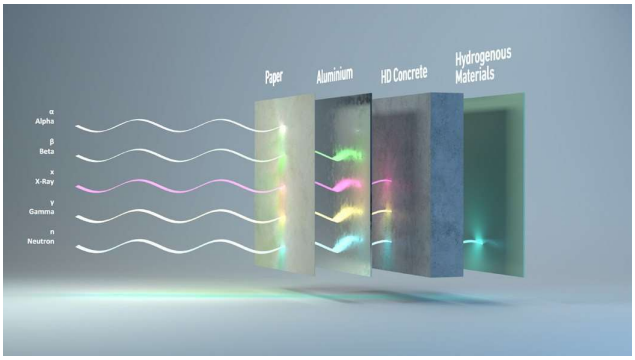
MagnaDense 20s (MD20s)
4/16 grade

Product description:

MD8s is an all-in grade with a topsize of 6mm. MD20s is a coarse grade with size between 4-16mm. Both products have high density 4,8 Mg/ m3. Grading is measured with method EN 933-1 and density with method EN1097-6. The products are used as aggregates for loose ballast and aggregates for high density concrete used for applications such as radiation shielding, constructions, civil-engineering projects, gravity- based foundations. MagnaDense products are naturally iron ore aggregates with high iron content and density. Constructions benefit from high density especially in under-water applications.

Öresund bridge

Caissons are filled with high density loose ballast material.



Photon and neutron radiation shielding

Gamma, as well as neutron radiation (i.e. used in both photon and proton treatment clinics), is attenuated through the high density of MagnaDense in combination with hydrogenous materials.

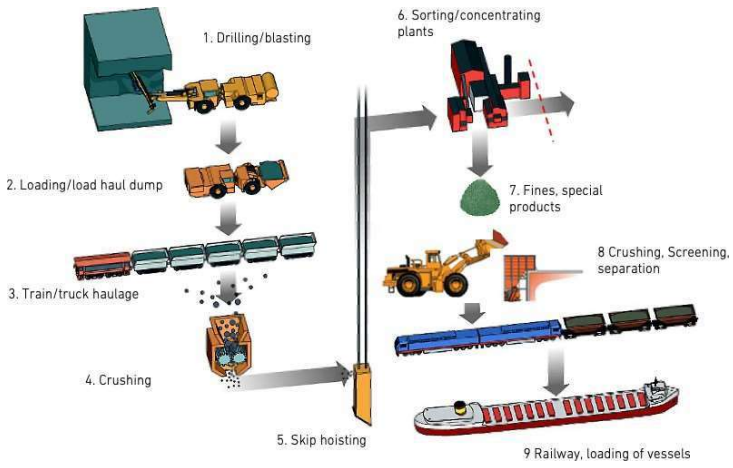
Chemical content:

Products MD8s and 20s are similar regarding chemical content. They contain about 90% Magnetite and 10% gangue rock. They do not contain hazardous material. Products are exempted from Reach registration since they originate from a natural mineral and do not undergo any chemical modification. Products do not contain any substances of very high concern (SVHC).

For usage in concrete, alkali silica reactive particles, free mica, chlorides, sulphur and sulphate are present in small amounts but well below limit values. No halogens, organic substances, pesticides, genetically modified organism, allergens are added into the product.

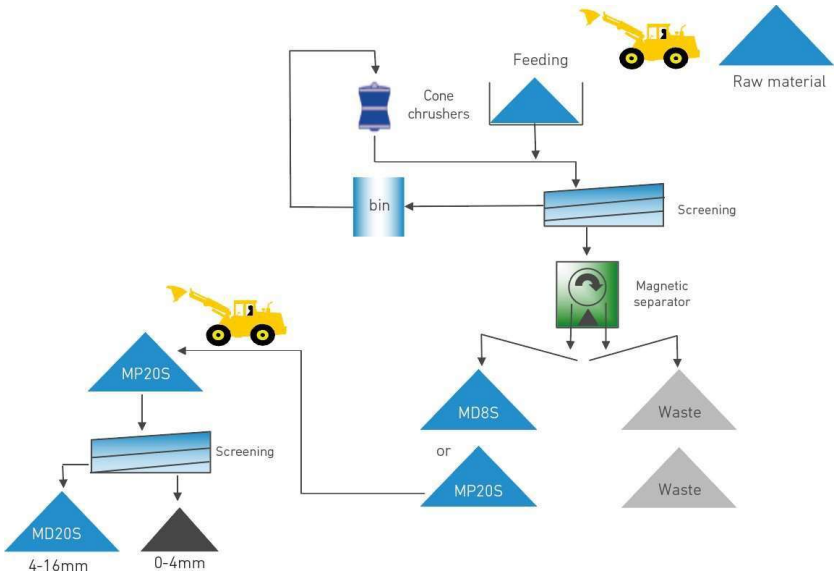
Production process:

The material originates from LKAB's iron ore mine in Kiruna. The ore is mined, crushed, sorted (step 1-6) before ending up as raw material for the aggregates. Raw material is transported from the concentrating plants to the production site (step 7). The production site (step 8) is a stationary plant. Loading of material on trains and later to vessels is not included in this EPD (step 9).



The production site produces MD8s and MD20s, one product at a time. The production operates year-round in an arctic climate and produces about 700 000 tons of MagnaDense per year.

Raw material is fed into screening. Screening is done on 6 mm or 16mm depending on final product (6mm for 8s and 16mm for 20s). Undersize particles are magnetically separated, divided into magnetic and non-magnetic material. Magnetic material for 8s is final product. Non-magnetic material is considered as waste. Oversized particles from screening are crushed into smaller sizes and transported back to screening.



Magnetic material for 20s is regarded as an intermediate product (MP20s). The intermediate product is screened in a final step. Screening removes the undersize, the final product becomes a 4/16 grade.

Larger quantities are delivered as bulk cargo without any external packaging. Smaller quantities are packed with a plastic sack and a wooden pallet.

LCA information

Declared unit:
The declared unit is 1 ton (1000 kg) of aggregates.

Reference service life:
Not Applicable

Database(s) and LCA software used:
SimaPro 9, Ecoinvent 3

Cut-off criteria:
All major raw materials and all the essential energy is included. Production processes for raw materials and energy flows which represent very small amounts (<0.1%) have been excluded.

Time representativeness:
Specific processes were assessed with average data for one year of production (for 2018/2019). Background data have been modelled with generic data from the Ecoinvent 3 database. The data is representative according to temporal, geographical and technological requirements. Background datasets are from 1996 or later and updated within the last 3 years.

Allocation:
The allocation is made in accordance with the provisions of EN 15804. Allocation has been avoided by subdivision of included processes. For processes where materials/energy input represent the whole production of LKAB Minerals at Kiruna the allocation factor of 6.3 % has been used which is based on LKAB's own specific process documentation. For processes where one material/energy input represents production of both MD8s and MD20s the process material and energy use have been presented per ton produced MagnaDense product without any subdivision between MD8s and MD20s.

System boundaries:
Data in report represents Product stage, "cradle to gate", including step A1-A3 in table below, highlighted in blue. Product stage include Raw materials, Transport and Manufacturing. Assembly -, Use –, End-of-life stages and Beyond the system boundaries are excluded from the EPD. Excluded modules are not declared.

System boundaries
MND= Module Not Declared

Product stage			Assembly stage		Use stage								End oflife stage			Beyond the system boundaries
A1-3 Included			A4-5 MND		B1-B7 MND								C1-4 MND			D MND
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demoli-tion	Transport	Waste processing	Disposal	Reuse-Recovery-Recy-cling-Potential

Environmental performance

Potential environmental impact (A1-A3) per 1 ton of aggregates.

PARAMETER		UNIT	MD8s/MD20s
Global warming potential (GWP)	Fossil	kg CO2 eq.	4,96E+00
	Biogenic	kg CO2 eq.	0.00E+00
	Land use and land transfor-mation	kg CO2 eq.	0.00E+00
	TOTAL	kg CO2 eq.	4,96E+00
Depletion potential of the stratospheric ozone layer (ODP)		kg CFC 11 eq.	6,07E-07
Acidification potential (AP)		kg SO2 eq.	2,12E-02
Eutrophication potential (EP)		kg PO43- eq.	1,45E-02
Formation potential of tropospheric ozone (POCP)		kg C2H4 eq.	7,36E-04
Abiotic depletion potential – Elements		kg Sb eq.	1,77E+00
Abiotic depletion potential – Fossil resources		MJ, net calorific value	5,28E+01
Water scarcity potential		m3 eq.	0.00E+00

Use of resources (A1-A3) per 1 ton of aggregates.

PARAMETER		UNIT	MD8s/MD20s
Primary energy resources – Renewable	Use as energy carrier	MJ, net calorific value	5,25E+00
	Used as raw materials	MJ, net calorific value	2,92E-04
	TOTAL	MJ, net calorific value	5,25E+00
Primary energy resources – Non-renewable	Use as energy carrier	MJ, net calorific value	5,62E+01
	Used as raw materials	MJ, net calorific value	1,40E+00
	TOTAL	MJ, net calorific value	5,76E+01
Secondary material		kg	0.00E+00
Renewable secondary fuels		MJ, net calorific value	0.00E+00
Non-renewable secondary fuels		MJ, net calorific value	0.00E+00
Net use of fresh water		m^3	0.00E+00

Waste production (A1-A3) per 1 ton of aggregates.

PARAMETER	UNIT	MD8s/MD20s
Hazardous waste disposed	kg	1,18E-04
Non-hazardous waste disposed	kg	1,06E-01
Radioactive waste disposed	kg	3,14E-04

Output flows (A1-A3) per 1 ton of aggregates.

PARAMETER	UNIT	MD8s/MD20s
Components for reuse	kg	0.00E+00
Material for recycling	kg	0.00E+00
Materials for energy recovery	kg	0.00E+00
Exported energy, electricity	MJ	0.00E+00
Exported energy, thermal	MJ	0.00E+00

Additional information

Magnetite aggregates can be reused many times. Material is ferri-magnetic and can be separated from non-magnetic material by using magnetic separation. Aggregates can be stored outdoors without being deteriorated. Products are stable under normal ambient conditions and has an indefinite shelf life. MagnaDense is used as loose ballast and concrete aggregate in underwater constructions where the material offers excellent resistivity to seawater and does not leech, as tested in accordance with NEN protocol 7373:2004. MagnaDense is harmless to the environment and nontoxic in all its forms.

Magnetite is not a conflict mineral. Products originates from LKAB mines in Sweden.

MagnaDense concrete is typically used to reach the desired density/weight through using a lower volume as compared with standard concrete (e.g., to shield against radiation, to counter hydrostatic pressure and uplifting forces in water, to reduce vibrations and enable sound dampening, and so on). Through the reduction in total volume, compared with a solution using standard concrete, the volume of aggregates and cement used will be less and should be considered when estimating the total CO2 emissions for a project.

LKAB and LKAB Minerals sustainability work is reported in the Annual and Sustainability report. Sustainability reports has been issued since 2008. Reports are available at www.lkab.com.

Sustainability is at the core of our business and our ambition is to create
prosperity by being one of the most innovative, resource-efficient and responsible mining and minerals companies in the world.

References

General Programme Instructions of the International EPD® System. Version 3.01.

PCR, EPD International, 2019 - PCR 2012:01 Construction products and construction services (version 2.31), 2019-12-20 ISO

14025:2006 – 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+A1:2013 - Sustainability of construction works - Environmental product declaration - Core rules for the product category of construction products

ISO 21930:2007 - Sustainability in building construction - Environmental declaration of building products LCI/LCA

Report - Background report for MagnaDense 8s and 20s. Report number: LCA-report Sweco 2020-03

Version description

Version	Comments
2020-06-16	First version of EPD for MagnaDense with results presented for MD8s and MD20s separately.
2020-07-01	New version where allocation factors between MD8s and MD20s have been removed and the results presented as one product.
2020-11-17	Corrected value of the amounts of ammonium nitrate in the explosives and revised environmental impact assessment based on specific country electricity mix for the production of ammonium nitrate.