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Medcem ASTM Type IL (10)
Low Alkaline Portland Limestone Cement

Environmental Product Declaration

General Information

This cradle to gate Environmental Product Declaration covers a bulk cement product produced at the Medcem Cement Plant. The Life Cycle Assessment (LCA) was prepared in conformity with ISO 21930, ISO 14025, ISO 14040, and ISO 14044. This EPD is intended for business-to-business (B-to-B) audiences.

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ISO 21930:2017 Sustainability in Building Construction-Environmental Declaration of Building Products: serves as the core PCR NSF PCR for Portland, Blended, Masonry, Mortar, and Plastic (Stucco) Cements V3.2 serves as the sub-category PCR
Sub-category PCR review was conducted by Thomas P. Gloria, PhD. (t.gloria@industrial-ecology.com) • Industrial Ecology Consultants
Independent verification of the declaration, according to ISO 21930:2017 and ISO 14025:2006.: ☐ internal ☑ external
Third party verifier Thomas P. Gloria, PhD. (t.gloria@industrial-ecology.com) • Industrial Ecology Consultants
For additional explanatory material Manufacture Representative: Burçin Boğa (burcin.boga@medcem.com.tr) This LCA EPD was prepared by: Melissa Díaz Segura, LCA and EPD Project Manager • Climate Earth (www.climateearth.com)
EPDs are comparable only if they comply with ISO 21930 (2017), use the same sub-category PCR where applicable, include all relevant information modules and are based on equivalent scenarios with respect to the context of construction works.

General Information

Producer

Medcem Cement factory was built by Medcem Madencilik ve Yapi Malzemeleri San Tic AŞ with the highest environmental awareness by using the latest technological systems and started its production activities in the second half of 2015.

Medcem Cement has an annual clinker production capacity of 3.5 million tons.
Our factory, whose production is mostly planned for export, aims to become a rapidly expanding and recognized brand in the world by steadily increasing its market share in the global market.

Medcem Cement is preparing to become one of the world's largest cement producers by multiplying its strength in the international market with its second line investment, the foundation of which was laid in August 2021.
With its new investment planned to be completed in 20 months, Medcem Cement will increase its annual clinker production capacity of 3.5 million tons to 6.5 million tons, resulting in a capacity increase of approximately 90%. The new investment, together with the increase in capacity, will provide an increase of approximately 30% in personnel employment.

Product

The cement product covered in this EPD meet UN CPC 3744 classification and the following standards:

Product Type	Applicable Standard	Standard Designation
Portland Limestone Cement	ASTM C595, C1157, AASHTO M240	Type IL (10)

This EPD reports environmental information for one cement product produced by Medcem at its Medcem Madencilik ve Yapi Malzemeleri San Tic AŞ facility.

Product Components

Inputs	Type IL (10)
Clinker	82.5-89.5%
Limestone, Gypsum & others	10.5-17.5%

Declared Unit

The declared unit is one metric tonne of Type IL (10) cement.

Life Cycle Assessment

System Boundary

This EPD is a cradle-to-gate EPD covering A1-A3 stages of the life cycle.

PRODUCTION Stage (*Mandatory*)			CONSTRUCTION Stage		USE STAGE					END-OF-LIFE Stage			
Extraction and upstream production	Transport to factory	Manufacturing	Transport to site	Installation	Use	Maintenance	Repair	Replacement	Refurbishment	De-construction/ Demolition	Transport to waste processing or disposal	Waste processing	Disposal of waste
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**C1**	**C2**	**C3**	**C4**
X	**X**	**X**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**
Note: MND = module not declared; X = module included.													

Cut-Off

Items excluded from system boundary include:

- production, manufacture and construction of manufacturing capital goods and infrastructure.
- production and manufacture of production equipment, delivery vehicles, and laboratory equipment;
- personnel-related activities (travel, furniture, and office supplies); and
- energy and water use related to company management and sales activities that may be located either within the factory site or at another location.

Allocation Procedure

Allocation follows the requirements and guidance of ISO 14044:2006, Clause 4.3.4; NSF PCR:2021; and ISO 21930:2017 section 7.2. Recycling and recycled content is modeled using the cut-off rule.

Life Cycle Inventory (LCI)

Primary sources of LCI Data:

Electricity: ecoinvent 3.8 (2021) “Electricity, high voltage {TR}| production mix”
Limestone: Manufacture specific primary data (2022)
Lignite: ecoinvent 3.8 (2021) “Lignite {RoW}| mine operation”
Pet coke: ecoinvent 3.8 (2021) “Petroleum coke {RoW}| petroleum coke production, petroleum refinery operation”
Truck Transport: ecoinvent 3.8 (2021) “Transport, freight, lorry 7.5-16 metric ton, EURO5 {RoW}”
Sea Transport: ecoinvent 3.8 (2021) “Transport, freight, sea, container ship {GLO}”

Electricity grid mix includes: 26.51% Natural gas, 21.11% Hard Coal, 21.92% Hydro, 16.64% Lignite, 7.40% Wind, 2.54% Geothermal, 1.62% cogeneration, with a global warming potential of 0.58 kg CO_2eq /kWh.

Life Cycle Assessment

Medcem Madencilik ve Yapi Malzemeleri San Tic AŞ Cement Type IL (10) Product[1], bulk shipped, per 1 metric tonne.**

Impact Assessment	Unit	Type IL (10)
Global warming potential (GWP)[2]	kg CO_2 eq	777
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC-11 eq	1.12E-05
Eutrophication potential (EP)	kg N eq	2.21
Acidification potential of soil and water sources (AP)	kg SO_2 eq	7.99E-01
Formation potential of tropospheric ozone (POCP)	kg O_3 eq	11.6
Resource Use		
Abiotic depletion potential for non-fossil mineral resources (ADPelements)*	kg Sb eq	9.38E-06
Abiotic depletion potential for fossil resources (ADPfossil)	MJ, NCV	3,052
Renewable primary energy resources as energy (fuel), (RPRE[3]) *	MJ, NCV	171
Renewable primary resources as material, (RPRM[2]) *	MJ, NCV	0.00E+00
Non-renewable primary resources as energy (fuel), (NRPRE[2]) *	MJ, NCV	3,062
Non-renewable primary resources as material, (NRPRM[2]) *	MJ, NCV	0.00E+00
Consumption of fresh water, (FW[2])	m^3	6.81E-01
Secondary Material, Fuel and Recovered Energy		
Secondary Materials, (SM[2]) *	kg	0.00E+00
Renewable secondary fuels, (RSF[2]) *	MJ, NCV	0.00E+00
Non-renewable secondary fuels (NRSF[2]) *	MJ, NCV	0.00E+00
Recovered energy, (RE[2]) *	MJ, NCV	0.00E+00
Waste & Output Flows		
Hazardous waste disposed, (HW[2]) *	kg	2.79E-03
Non-hazardous waste disposed, (NHWD[2]) *	kg	1.78E-01
High-level radioactive waste, (HLRW[2]) *	kg	7.46E-09
Intermediate and low-level radioactive waste, (ILLRW[2]) *	kg	1.58E-06
Components for reuse, (CRU[2]) *	kg	0.00E+00
Materials for recycling, (MR[2]) *	kg	6.39E-02
Materials for energy recovery, (MER[2]) *	kg	0.00E+00
Recovered energy exported from the product system, (EE[2]) *	MJ, NCV	0.00E+00
Additional Inventory Parameters for Transparency		
CO_2 emissions from calcination and uptake from carbonation[4]	kg CO_2 eq	460

* Emerging LCA impact categories and inventory items are still under development and can have high levels of uncertainty that preclude international acceptance pending further development. Use caution when interpreting data in these categories. The following optional indicators are not reported and also have high levels of uncertainty: Land use related impacts, toxicological aspects, and emissions from land use change.

**Only EPDs prepared from cradle-to-grave life-cycle results and based on the same function, quantified by the same functional unit, and taking account of replacement based on the product reference service life (RSL) relative to an assumed building service life, can be used to assist purchasers and users in making informed comparisons between products.

[1] This product contains no materials that are considered hazardous as defined by the PCR.
[2] GWP 100; 100-year time horizon GWP factors are provided by the IPCC 2013 Fifth Assessment Report (AR5).
CO2 from biogenic secondary fuels used in kiln are climate-neutral (CO2 sink = CO2 emissions), ISO 21930, 7.2.7.
[3] Calculated per ACLCA ISO 21930 Guidance.
[4] Calcination emissions were calculated based on the Cement CO2 and Energy Protocol detailed output method (B1) published by the World Business Council for Sustainable Development (WBCSD) Cement Sustainability Initiative (CSI).

References

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Additional Environmental Information

SUSTAINABILITY AND ENVIRONMENT

Sustainability is defined as maintaining the ability to be permanent while ensuring the continuity of diversity and productivity. In addition to years of continuity, it means using the right ways and resources to achieve goals and objectives.

The MEDCEM FAMILY is aware of its responsibilities to regulate the current growth and development with a perspective that does not endanger the lives and resources of future generations. MEDCEM considers the entire life cycle in its processes as a whole. MEDCEM, which has created both a social and physical vision to protect the global system, ecology, economy and energy that make up this life cycle, has adopted this sustainability vision as a priority in its investments and processes as all group companies and employees. Our processes are implemented with a continuous improvement approach;

WASTE MANAGEMENT

The wastes generated in the cement sector are not caused by the production process but are caused by maintenance activities and office activities (tea rooms, administrative offices, etc.). The wastes generated in our factory are separated at the source and sent to recycling and energy recovery. In this way, it is ensured that the wastes formed are minimized at the source and brought back to the economy. Thanks to the zero-waste management system, all of our employees play a major role in reintroducing waste into the economy.
With our Solid Waste Incineration facility, the wastes of other factories are transformed into energy.
The facility makes a great contribution to the environment, the industrialists in the region and the country's economy with the disposal of wastes. The facility has a total capacity of 27.6 MW/h of electricity or 100 tons/h of steam.

DEALING WITH CLIMATE CHANGE

Carbon Reduction
MEDCEM, whose mission is to reduce CO2 emissions to combat climate change, attaches importance to energy and material recovery from waste. For this purpose; It aims to reduce the use of fossil fuels and protect non-renewable natural resources by obtaining alternative fuels and raw materials from wastes, and to combat climate change by reducing greenhouse gas emissions.
MEDCEM has a special place for nature and society with its "high-performance environmental cement" that makes a difference in its production, has minimum fuel consumption, use of renewable energy and environmentally friendly additives, has a low clinker/cement ratio, and reduces CO2 emissions.
With our EPD (Environmental Product Declaration) document that we have as MEDCEM, we are happy to produce by taking inspiration from nature without harming our environment.

Energy Efficiency
Equipped with the best available technologies, considering energy efficiency, MEDCEM is equipped with low energy consumption equipment. MEDCEM with the aim of using renewable energy; It transforms the waste heat generated in the production process into energy thanks to the Waste Heat Recovery System (WHR), ensures emission reduction and also supports the improvement of the environmental footprint of the sector.
In addition, with the aim of using renewable energy, MEDCEM has started investments in SPP and RES as alternative energy sources. In line with the goal of reducing the pollutant gas emissions of our country, our facility uses the SNCR (Selective Non-Catalytic Reduction) system, which is the most preferred in Europe and the world, in order to reduce the environmentally harmful NOx emissions in the combustion gases in our facility.
MEDCEM, which has the most advanced environmentally friendly technology and equipment at every stage of the process, is equipped with state-of-the-art bag filter investments, closed belt lines and stock areas, etc. dust removal systems in all its units to produce its products. It monitors every stage of production with computer-controlled continuous measurement systems in order to control the environmental impact of its activity.

Additional Environmental Information

Water Management

Water is one of the main sources of industry as well as the main source of life. Water efficiency has gained more and more importance in recent years due to important factors such as population growth and climate change. MEDCEM produces cement and clinker using the dry process method. Water in our facility; It is used for cooling in the kiln process and grinding, and no waste water is generated by the water conversion system.

Emphasizing water efficiency, MEDCEM ensures that rain and surface water are reused for dedusting by physical treatment. In this way, MEDCEM significantly reduces the use of water resources and aims to use water resources more efficiently.