ENVIRONMENTAL PRODUCT DECLARATION

ECOLEAN FILLING MACHINES EL3+, EL4+ AND EL6

ecolean
a lighter approach to packaging

IN ACCORDANCE WITH ISO 14025
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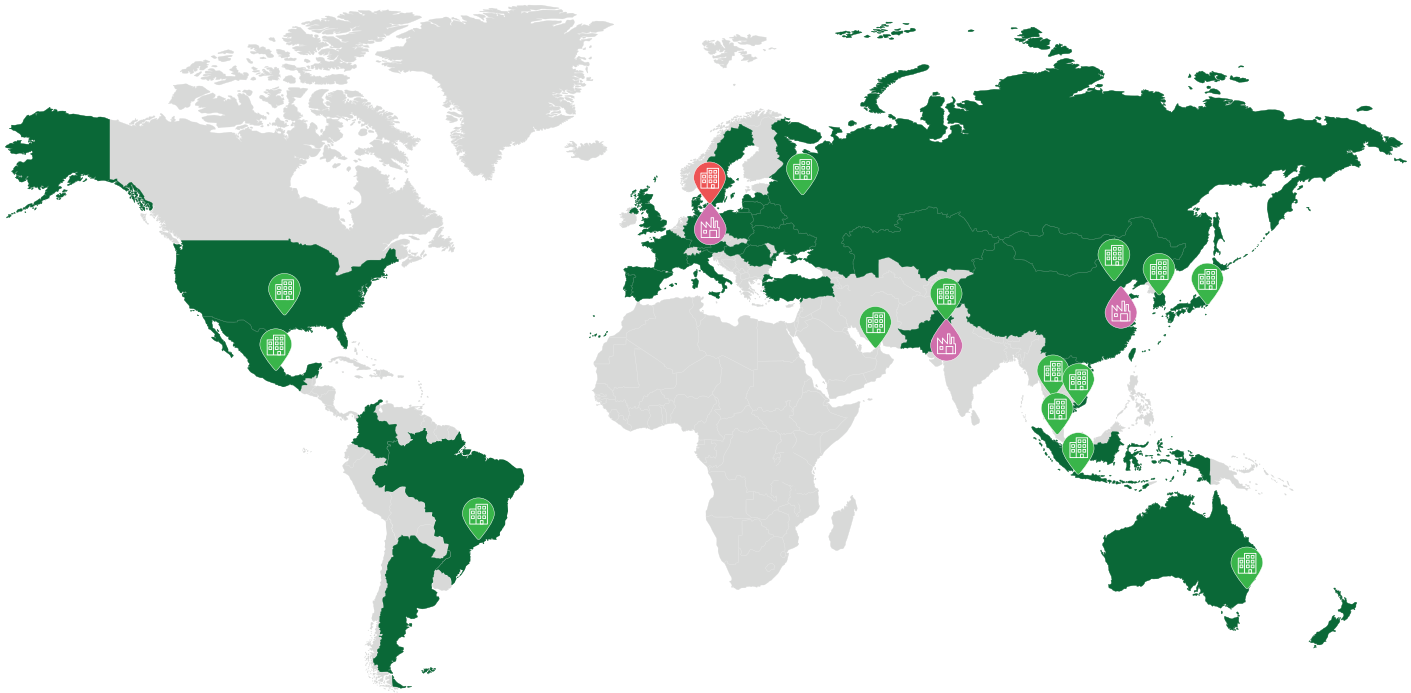
EPD®

ECOLEAN LIGHTWEIGHT PACKAGING HAS BECOME A HEAVYWEIGHT ARGUMENT



Ecolean was founded in 1996 in Helsingborg, Sweden, and innovation has always been fundamental for Ecolean. The Ecolean concept is to use a minimal amount of raw materials to produce a unique flexible lightweight package and a filling system for liquid food products.

Today, Ecolean is a fast growing and globally expanding company that continuously develops its products in order to meet new customer and consumer demands. Ecolean is established on the market as a full system supplier producing both filling line equipment and lightweight packages. Ecolean presently employs more than 450 people, has its headquarter in Helsingborg, Sweden and production sites in Sweden as well as China and Pakistan. The production of filling machines and manufacturing of packaging material takes place in Helsingborg, and the plants in Sweden, China and Pakistan convert the packaging material film into a range of hermetically sealed ready-to-fill packages in a variety of different sizes. The plants in Sweden and China are certified according to ISO 14001. Ecolean production and products are in compliance with relevant legislation. Ecolean has commercial activities in 30 countries, the largest markets being China, Russia and Pakistan.

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COMMUNICATING ENVIRONMENTAL IMPACT

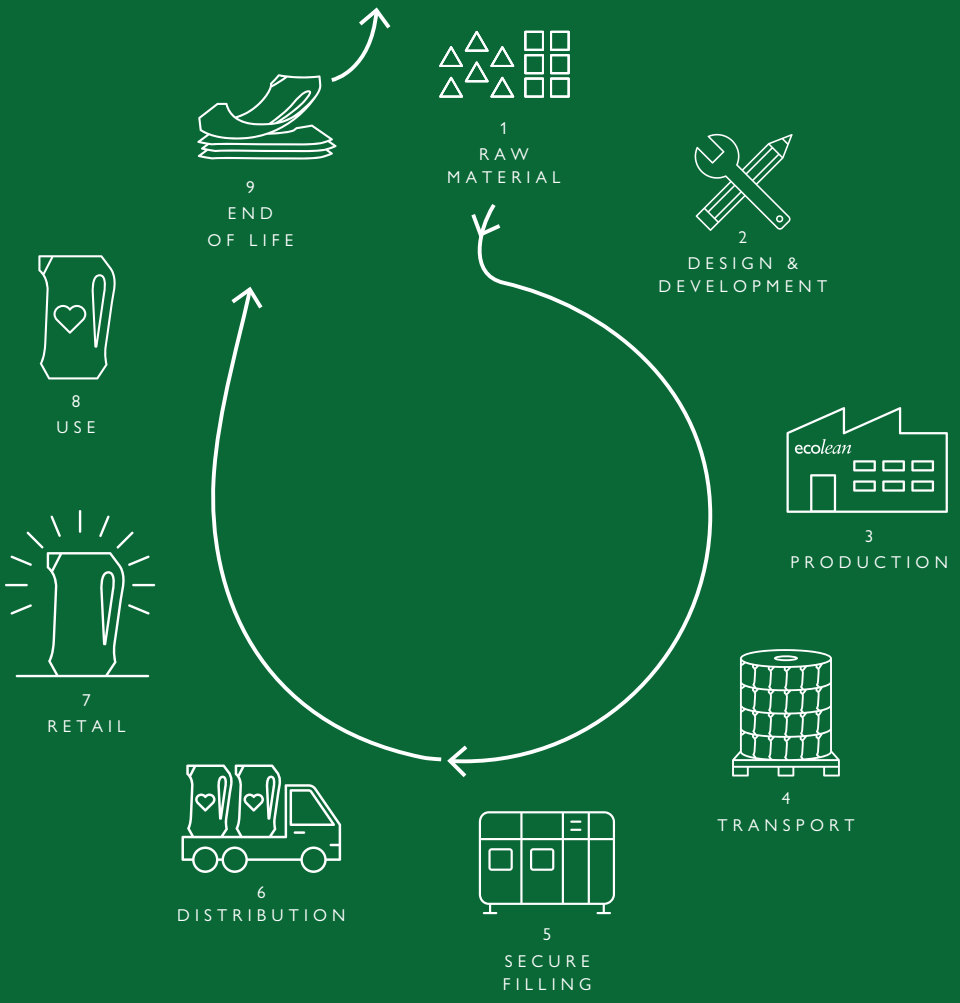
By using the life cycle approach, Ecolean can identify the areas with the most environmental impact, and work to reduce it. The Ecolean production process aims to produce lightweight packages as a way to reduce the amount of raw materials needed, and to minimise the energy consumption in the production and in transportation of material to the customer. Ecolean filling machines are designed to be as efficient as possible, continuously striving to reduce the environmental impact during use phase from the filling machines.

The Environmental Product Declaration (EPD) is an independently verified and registered document based on verified life-cycle assessment (LCA) data. By using EPDs in accordance with the international EPD system, Ecolean can communicate the environmental performance of its products in a transparent manner.

This EPD follows the Product Category Rules (PCR) for Machines for Filling and Packaging liquid food (PCR 2012:18 UN CPC 43921 version 2.02) as well as the principles and procedures of ISO 14025:2006.

The EPD was externally validated by an independent verifier approved by the technical committee of EPD International.

The filling line production plant in Sweden is certified according to ISO 9001:2015 and ISO14001:2015. Ecolean production and products are in compliance with relevant legislation.



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EL3+, EL4+ AND EL6 FILLING MACHINE FOR LIQUID FOOD, AMBIENT DISTRIBUTION

This EPD covers the three Ecolean aseptic filling machines, the EL3+, EL4+ and the EL6. The EL3+ machine is used for filling family-sized Ecolean® Air Aseptic packages 500 ml, 750ml and 1000ml, and the EL4+ and EL6 filling machines is used for smaller portion-sized Ecolean® Air Aseptic packages packages 125ml, 200ml and 250ml.

The machine production involves all activities related to procurement of components, assembly of equipment, quality assurance and factory acceptance tests. Based on Ecolean designs, components and parts for the equipment are manufactured at the suppliers, who also are important partners in the assembly activities. In Helsingborg, the supply chain for filling line equipment works closely with the production support department, the R&D department and the global technical service teams. All activities related to the machine equipment are done in accordance with the scope in the ISO 9001:2015 and ISO14001:2015.

The Ecolean aseptic machines have a clean, slim and modern design combined with high efficiency along with an advanced monitoring system and operator interface. The aseptic filling machines feature an automatic splicing device and a buffer magazine, to minimise downtime when splicing a new reel. CIP (Cleaning In Place) is fully automated and chamber cleaning is handled automatically in an integrated circulating cleaning system.

The pre-sterilised ready-to-fill packages are supplied hermetically sealed from the Ecolean packaging production plants. Before opening, filling and sealing in the filling machine, the outer surfaces of the packages are sterilised using a system of diluted hydrogen peroxide and UV light. During the filling procedure, the package is only open for a few seconds in the aseptic chamber. All these measures reduce the complexity of operating an aseptic packaging line and increases the robustness of the total system.

MATERIAL COMPOSITION
EL3+, EL4+, EL6 (MATERIAL, KG)

	EL3+	EL4+	EL6
Stainless steel	5,494	5,343	5,644
Aluminium	1,242	1,208	1,276
Glass	109	106	112
Plastics	265	258	273
Copper	190	185	195
Total	7,300	7,100	7,500

Material composition
The main components in the machines are stainless steel and aluminium as listed above. Materials in the table cover over 99% of the components. No chemical components are included in the machine. Chemicals in use phase are added by the machine user according a specific list recommended by Ecolean. Chemicals on the list follow the REACH regulation. No chemicals on the SVHC list are present in the filling machine.

EL3+ FOR AMBIENT DISTRIBUTION

Designed for aseptic filling of high and low-acid food products into Ecolean® Air Aseptic packages.

Package sizes:	500ml, 750ml and 1000ml
Capacity:	Up to 7,500 packages/hour for 500ml, up to 7,000 packages/hour for 750ml and 1000ml
Length:	7.8 m
Width:	2.1 m
Height:	4.1 m

EL4+ FOR AMBIENT DISTRIBUTION

Designed for aseptic filling of high and low-acid food products into Ecolean® Air Aseptic packages.

Package sizes:	125ml, 200ml and 250ml
Capacity:	Up to 12,000 packages/hour
Length:	7.4 m
Width:	2.9 m
Height:	4.2 m

EL6 FOR AMBIENT DISTRIBUTION

Designed for aseptic filling of high and low-acid food products into Ecolean® Air Aseptic packages.

Package sizes:	125ml, 200ml and 250ml
Capacity:	Up to 18,000 packages/hour
Length:	7.5 m
Width:	2.9 m
Height:	4.2 m

All measurements for filling machine with closed doors.

Schematic overview of main machine modules in the aseptic filling machines, EL3+, EL4+ and EL6

6 Ecolean Filling Machine EL3+, EL4+ and EL6

1. UNWINDING

Reels of pre-sterilised and hermetically sealed packaging material are placed and prepared for splice in the unwinding unit. This unit contains an automatic splicing device and a buffer magazine, which enables the filler to continue full operation, when splicing a new reel.

2. PACKAGE STERILISATION

Upon entrance to the sterile chamber, the outside of the packages are re-sterilised with a low concentration peroxide solution and UV light exposure. The UV light also evaporates the peroxide solution from the packages.

3. TOP CUT, SEPARATOR

In the top cut unit the top strip of the packages are cut away. The separator unit separates the package web into single packages, which are then transferred to the filling zone.

4. FILLING ZONE

In the filling zone, packages are opened, filled with product and sealed in a sterile environment. The handle of the package is inflated with air and sealed.

5. VALVE CLUSTER

The aseptic valve cluster and filling system provide for a safe and efficient filling of the aseptic product. The valve cluster also isolates any potential upstream processing system pressure and flow fluctuations, assuring a controlled and precise filling.

6. AIR HANDLING

The air handling unit delivers HEPA filtered air and assures a controlled air flow and environment during all states of operation of the filling machine.

7. OUT FEED

Filled packages exit through the outfeed unit and are placed onto a conveyor belt to be transported to additional downstream equipment that meets the market and consumer's demands.

ENVIRONMENTAL PRODUCT DECLARATION

The scope of this EPD is filling machines, not including other equipment. The boundary is cradle to grave with some processes excluded according the PCR.

Upstream
The upstream process includes the extraction and production of raw materials for the primary machine and spare parts. The production of raw materials is followed from the cradle. The following database data have been used:

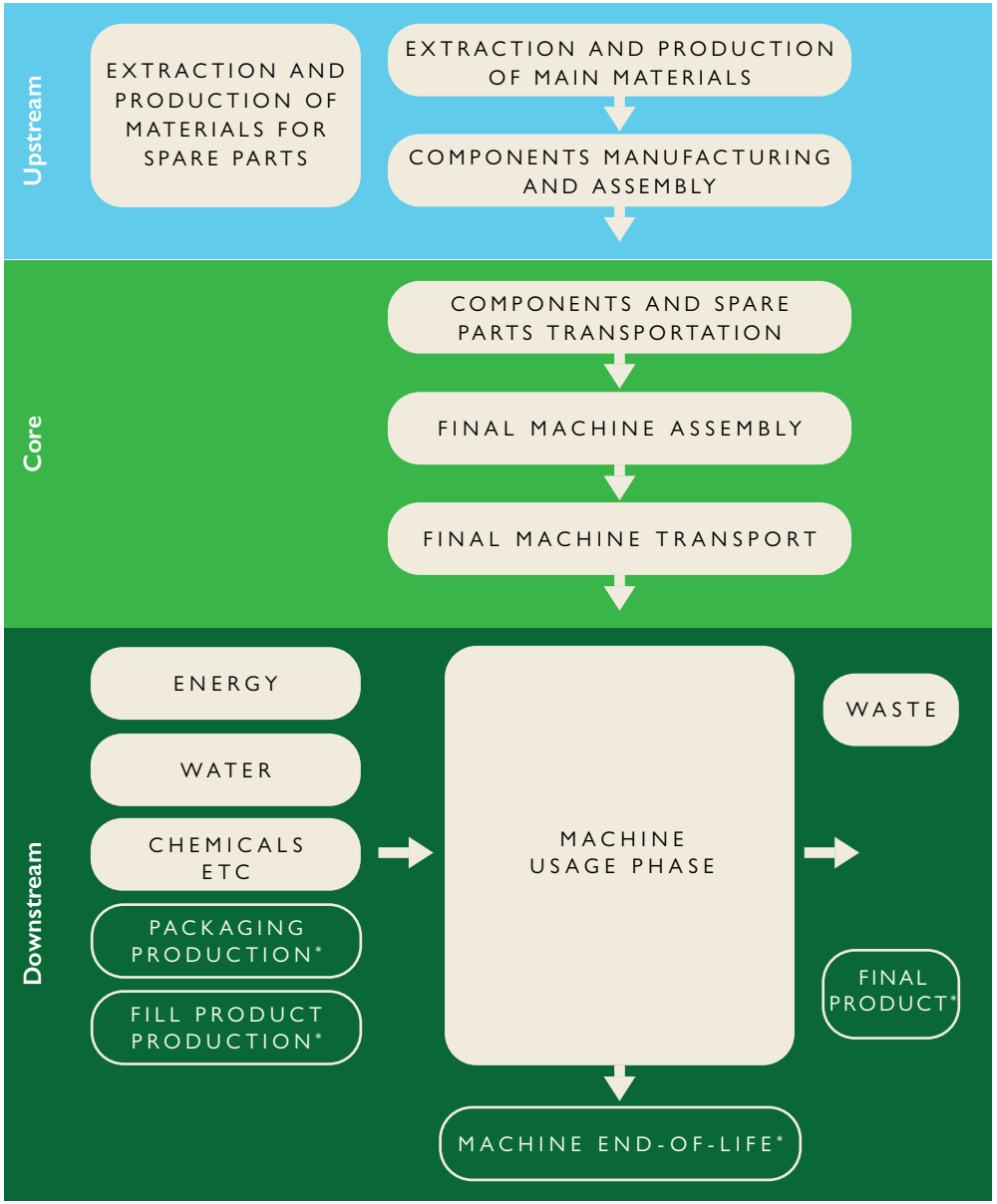
- Aluminium: EAA Environmental Profile Report for the EU Aluminium Industry, EAA, April 2008
- Stainless steel: Worldsteel Association
- Plastics (polymer with PVC): Plastics Europe
- Glass, copper, brass and rubber: GaBi LCA software

For the assembly, the same database data have been used for all components; 4.5 MJ of heat and 4.1 MJ of electricity per kg of assembled component (Ecoinvent 3.3 database). Heat from natural gas and European average electricity assumed: GaBi 10 LCA software 2020. A material loss of 5% is assumed for all components.

Core
The parts to produce the machines are transported to Helsingborg, Sweden, where they are assembled into the filling machines. Specific data for 2020 has been used for the Ecolean production plant, such as energy consumption, weight and component materials for the machines. An estimated value for the electricity used in the assembly of the machines was provided by Ecolean (Swedish electricity from hydropower 14,2g CO_2-eq/kWh, GaBi LCA software).

The machines undergo multiple tests and inspections before they are shipped out to customers. The transport distances has been estimated for four chosen markets:

- Europe: 1,700 km by truck
- Russia: 1,800 km by truck and 400 km by ship
- Pakistan: 12,300 km by ship
- China: 21,500 km by ship



**Processes in lines (packaging production, filled product production, final product, machine end-of life) are excluded according the PCR.*

Downstream
The main part of the machine life-time takes place during the operational phase when the machine is installed at a customer's site and in the process of filling packages with liquid food. The waste levels based on system design and running conditions are estimated to 0.5 percent. The absolute majority of this waste is non filled packages.

The specific utility data for the filling machine 2020 is provided by Ecolean (the consumption of electricity, steam, chemicals and water) and database data from the
GaBi LCA software have been used for the production of electricity (European, Russian, Chinese average), production of steam (assumed to be based on natural gas) and chemicals. The Pakistan electricity mix was modelled based on available statistics and database data from the GaBi LCA software database, 2020, for the energy sources. Data used for electricity production:

- European electricity mix 383g CO_2-eq/kWh
- Russian electricity mix 572g CO_2-eq/kWh
- Pakistan electricity mix 552g CO_2-eq/kWh
- Chinese electricity mix 804g CO_2-eq/kWh

Data for filling machine use phase is calculated according to standard production cycle. At the end-of-life of the filling machine, the preferred choice is to send it back to Ecolean. The machine can either be refurbished for a new life or dismantled for recycling. Most parts of the machine consists of high valued metals, well suited for recycling. Some components, such as electrical parts, need to be treated as electrical waste. All dismantling are taken care of by professionals and the recycling of machine components follows the relevant legislation. The end-of-life process is excluded from the EPD according to the PCR.

Geographic scope
This EPD covers a geographic scope of four markets: Europe, Russia, Pakistan and China.

Functional unit
The Functional Unit (FU) is defined as 1,000 filled approved packages (regardless their format) delivered by the machine, according to the related PCR. The Ecolean filling machines can fill a variety of packaging sizes, according information on page 4.

Cut off criteria
No cut offs have been made in this EPD. However, the inventory of the machine material composition has been carried out by using estimations. For each component e.g. machine body, main covers, cleaning system or electrical system a rough estimate of the materials have been made. The upstream components manufacturing and assembly was not based on site specific supplier data. Instead generic database data were applied to reflect this life cycle step.

Standard production cycle
The use of water, energy and chemicals by the machines during the use phase has been calculated based on the standard life cycle as stated in the PCR.

The Ecolean standard production cycle
Calculations of a production cycle is based on 365 days reference time. Productions run during this time is assumed to be done in accordance to valid standard operating procedure (SOP) for the equipment and as efficient as possible in good manufacturing practice. The equipment is also maintained according to valid service system and with recommended usage of spare parts. Maintenance done on large time frames is calculated in respect of the reference time and time between failure and time to repair is based on actual data. The amount of waste during the production cycle is based on system design parameters combined with real production data. The production length, setup and parameters are based on real data, taking product, equipment, market and risk management into account.

PARAMETER VALUE UNIT	UNIT	EL3+	EL4+	EL6
Lifetime of the machine	Hours production time	60,166	67,078	57,437
Planned operation time (POT)	Hours per day	21.37	21.37	21.37
Planned downtime	Hours per day	1.04	0.92	1.72
Actual unit downtime (ADOT)	Hours per day	0.72	0.39	0.71
Actual unit busy time (AUBT)	Hours per day	19.61	20.05	18.95
Actual unit delay time (ADET)	Hours per day	0.58	0.47	0.41
Actual unit setup time (AUST)*	Hours per day	2.55	1.20	2.80
Actual production time (APT)	Hours per day	16.48	18.38	15.74
Technical efficiency	%	97.26	98.23	98.22
Quality ratio	%	99.50	99.50	99.50
Total amount of approved packages per production cycle		122,296	218,485	281,228
Percent of wasted packages per production cycle	%	0.5	0.5	0.5

**Includes preparation, change of product, after production (such as daily cleaning) and sterilization (if applicable).*

ENVIRONMENTAL PERFORMANCE – EL3+, EL4+, EL6 THE EUROPEAN MARKET (EU)

INDICATORS	UNIT*	Ecolean Filling Machine											
		EL3+				EL4+				EL6			
		Upstream	Core	Downstream	Total	Upstream	Core	Downstream	Total	Upstream	Core	Downstream	Total
Global warming potential (GWP): Fossil	kg CO_2 eq	1,23E-01	3,22E-03	1,03E+00	1,16E+00	7,12E-02	1,86E-03	5,88E-01	6,61E-01	5,55E-02	1,31E-03	4,75E-01	5,32E-01
Global warming potential (GWP): Biogenic	kg CO_2 eq	1,59E-02	3,30E-04	3,26E-01	3,42E-01	9,18E-03	1,90E-04	1,97E-01	2,06E-01	7,17E-03	1,46E-04	1,64E-01	1,71E-01
Global warming potential (GWP): LUC	kg CO_2 eq	1,62E-04	2,41E-05	1,11E-03	1,30E-03	9,39E-05	1,39E-05	6,68E-04	7,76E-04	7,32E-05	1,09E-05	5,58E-04	6,42E-04
Global warming potential (GWP): Total	kg CO_2 eq	1,39E-01	3,57E-03	1,35E+00	1,50E+00	8,03E-02	2,07E-03	7,82E-01	8,64E-01	6,27E-02	1,46E-03	6,37E-01	7,01E-01
Acidification potential (AP)	kg SO_2 eq	6,10E-04	1,56E-05	1,79E-03	2,42E-03	3,53E-04	9,02E-06	1,06E-03	1,42E-03	2,75E-04	7,03E-06	8,75E-04	1,16E-03
Eutrophication potential (EP)	kg PO_4 eq	4,36E-05	2,88E-06	2,00E-04	2,47E-04	2,52E-05	1,66E-06	1,17E-04	1,44E-04	1,96E-05	1,30E-06	9,67E-05	1,18E-04
Photochemical ozone creation potential (POCP)	kg NMVOC eq	3,35E-04	4,61E-06	1,24E-03	1,58E-03	1,94E-04	2,66E-06	7,18E-04	9,15E-04	1,51E-04	2,05E-06	5,91E-04	7,44E-04
Abiotic depletion potential for non fossil resources (ADPE)	kg Sb eq	2,77E-06	1,08E-09	5,53E-07	3,33E-06	1,60E-06	6,42E-10	2,49E-07	1,85E-06	1,25E-06	1,10E-10	2,61E-07	1,51E-06
Abiotic depletion potential for fossil resources (ADPF)	MJ	1,51E+00	3,97E-02	1,29E+01	1,45E+01	8,71E-01	2,29E-02	7,25E+00	8,14E+00	6,79E-01	1,78E-02	5,80E+00	6,49E+00
Water scarcity	m^3 world eq	4,74E-01	2,57E-05	4,96E-02	5,24E-01	2,74E-01	1,48E-05	2,95E-02	3,03E-01	2,14E-01	1,11E-05	2,45E-02	2,38E-01
Use of renewable primary energy excluding renewable primary energy resources used as raw materials (PERE)	MJ	4,66E-01	9,92E-02	5,85E+00	6,41E+00	2,69E-01	5,92E-02	3,53E+00	3,86E+00	2,10E-01	1,00E-03	2,93E+00	3,14E+00
Use of renewable primary energy resources used as raw materials (PERM)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PERT)	MJ	4,65E-01	9,92E-02	5,85E+00	6,41E+00	2,69E-01	5,92E-02	3,53E+00	3,86E+00	2,10E-01	1,00E-03	2,93E+00	3,14E+00
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials (PENRE)	MJ	1,72E+00	3,98E-02	1,80E+01	1,97E+01	9,91E-01	2,30E-02	1,03E+01	1,13E+01	7,73E-01	1,79E-02	8,31E+00	9,10E+00
Use of non-renewable primary energy resources used as raw materials (PENRM)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PENRT)	MJ	1,72E+00	3,98E-02	1,80E+01	1,97E+01	9,91E-01	2,30E-02	1,03E+01	1,13E+01	7,73E-01	1,79E-02	8,31E+00	9,10E+00
Use of secondary material (SM)	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of renewable secondary fuels (RSF)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of non renewable secondary fuels (NRSF)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Net use of fresh water (FW)	m^3	2,11E-03	2,49E-04	6,75E-03	9,10E-03	1,22E-03	1,48E-04	4,07E-03	5,43E-03	9,50E-04	1,16E-06	3,38E-03	4,34E-03
Hazardous waste disposed (HWD)	kg	4,70E-06	1,84E-09	8,15E-09	4,71E-06	2,72E-06	1,06E-09	4,47E-09	2,73E-06	2,12E-06	8,31E-10	3,79E-09	2,12E-06
Non-hazardous waste disposed (NHWD)	kg	1,25E-02	2,69E-05	1,05E-02	2,30E-02	7,22E-03	1,60E-05	6,20E-03	1,34E-02	5,62E-03	2,73E-06	5,13E-03	1,08E-02
Radioactive waste disposed (RWD)	kg	8,28E-05	5,77E-08	1,99E-03	2,08E-03	4,78E-05	3,34E-08	1,20E-03	1,25E-03	3,74E-05	2,21E-08	1,00E-03	1,04E-03
Components for re-use (CRU)	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling (MFR)	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Material for energy recovery (MER)	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported electrical energy (EEE)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported thermal energy (EET)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

** Unit per declared unit*

*All results in the EPD are written in logarithmic base of ten. Reading example: 5.2E-03 = 5.2*10^{-3} = 0.0052.*
The CML category indicators are used for the impact assessment.

ENVIRONMENTAL PERFORMANCE – EL3+, EL4+, EL6 THE RUSSIAN MARKET (RU)

INDICATORS	UNIT*	Ecolean Filling Machine											
		EL3+				EL4+				EL6			
		Upstream	Core	Downstream	Total	Upstream	Core	Downstream	Total	Upstream	Core	Downstream	Total
Global warming potential (GWP): Fossil	kg CO_2 eq	1,23E-01	3,62E-03	1,39E+00	1,52E+00	7,12E-02	2,09E-03	8,07E-01	8,81E-01	5,55E-02	1,49E-03	6,57E-01	7,14E-01
Global warming potential (GWP): Biogenic	kg CO_2 eq	1,59E-02	3,43E-04	2,60E-02	4,23E-02	9,18E-03	1,98E-04	1,40E-02	2,34E-02	7,17E-03	1,52E-04	1,27E-02	2,00E-02
Global warming potential (GWP): LUC	kg CO_2 eq	1,62E-04	2,49E-05	1,41E-04	3,28E-04	9,39E-05	1,44E-05	7,59E-05	1,84E-04	7,32E-05	1,12E-05	6,84E-05	1,53E-04
Global warming potential (GWP): Total	kg CO_2 eq	1,39E-01	3,98E-03	1,42E+00	1,56E+00	8,03E-02	2,30E-03	8,21E-01	9,04E-01	6,27E-02	1,65E-03	6,69E-01	7,34E-01
Acidification potential (AP)	kg SO_2 eq	6,10E-04	2,14E-05	6,62E-03	7,25E-03	3,53E-04	1,24E-05	4,00E-03	4,36E-03	2,75E-04	9,65E-06	3,30E-03	3,59E-03
Eutrophication potential (EP)	kg PO_4 eq	4,36E-05	3,94E-06	4,61E-04	5,08E-04	2,52E-05	2,27E-06	2,75E-04	3,03E-04	1,96E-05	1,77E-06	2,28E-04	2,49E-04
Photochemical ozone creation potential (POCP)	kg NMVOC eq	3,35E-04	1,24E-05	3,92E-03	4,27E-03	1,94E-04	7,11E-06	2,35E-03	2,55E-03	1,51E-04	5,56E-06	1,94E-03	2,09E-03
Abiotic depletion potential for non fossil resources (ADPE)	kg Sb eq	2,77E-06	1,10E-09	3,99E-07	3,18E-06	1,60E-06	6,52E-10	1,55E-07	1,76E-06	1,25E-06	1,18E-10	1,84E-07	1,43E-06
Abiotic depletion potential for fossil resources (ADPF)	MJ	1,51E+00	4,51E-02	2,04E+01	2,19E+01	8,71E-01	2,60E-02	1,18E+01	1,27E+01	6,79E-01	2,03E-02	9,53E+00	1,02E+01
Water scarcity	m^3 world eq	4,74E-01	2,69E-05	4,65E-02	5,21E-01	2,74E-01	1,55E-05	2,76E-02	3,01E-01	2,14E-01	1,16E-05	2,30E-02	2,37E-01
Use of renewable primary energy excluding renewable primary energy resources used as raw materials (PERE)	MJ	4,66E-01	9,93E-02	1,56E+00	2,13E+00	2,69E-01	5,93E-02	9,18E-01	1,25E+00	2,10E-01	1,04E-03	7,79E-01	9,90E-01
Use of renewable primary energy resources used as raw materials (PERM)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PERT)	MJ	4,65E-01	9,93E-02	1,56E+00	2,13E+00	2,69E-01	5,93E-02	9,18E-01	1,25E+00	2,10E-01	1,04E-03	7,79E-01	9,90E-01
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials (PENRE)	MJ	1,72E+00	4,53E-02	2,42E+01	2,59E+01	9,91E-01	2,61E-02	1,41E+01	1,51E+01	7,73E-01	2,03E-02	1,14E+01	1,22E+01
Use of non-renewable primary energy resources used as raw materials (PENRM)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PENRT)	MJ	1,72E+00	4,53E-02	2,42E+01	2,59E+01	9,91E-01	2,61E-02	1,41E+01	1,51E+01	7,73E-01	2,03E-02	1,14E+01	1,22E+01
Use of secondary material (SM)	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of renewable secondary fuels (RSF)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of non renewable secondary fuels (NRSF)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Net use of fresh water (FW)	m^3	2,11E-03	2,49E-04	7,07E-03	9,43E-03	1,22E-03	1,49E-04	4,26E-03	5,63E-03	9,50E-04	1,21E-06	3,55E-03	4,50E-03
Hazardous waste disposed (HWD)	kg	4,70E-06	1,91E-09	8,99E-09	4,71E-06	2,72E-06	1,10E-09	4,98E-09	2,73E-06	2,12E-06	8,61E-10	4,21E-09	2,12E-06
Non-hazardous waste disposed (NHWD)	kg	1,25E-02	2,76E-05	5,24E-03	1,77E-02	7,22E-03	1,63E-05	2,98E-03	1,02E-02	5,62E-03	3,02E-06	2,47E-03	8,10E-03
Radioactive waste disposed (RWD)	kg	8,28E-05	6,38E-08	1,50E-03	1,58E-03	4,78E-05	3,69E-08	9,01E-04	9,49E-04	3,74E-05	2,49E-08	7,51E-04	7,88E-04
Components for re-use (CRU)	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling (MFR)	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Material for energy recovery (MER)	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported electrical energy (EEE)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported thermal energy (EET)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

** Unit per declared unit*

*All results in the EPD are written in logarithmic base of ten. Reading example: 5.2E-03 = 5.2*10^{-3} = 0.0052.*
The CML category indicators are used for the impact assessment.

ENVIRONMENTAL PERFORMANCE – EL3+, EL4+, EL6 THE PAKISTAN MARKET(PK)

INDICATORS	UNIT*	Ecolean Filling Machine											
		EL3+				EL4+				EL6			
		Upstream	Core	Downstream	Total	Upstream	Core	Downstream	Total	Upstream	Core	Downstream	Total
Global warming potential (GWP): Fossil	kg CO_2 eq	1,23E-01	4,31E-03	1,35E+00	1,48E+00	7,12E-02	2,49E-03	7,84E-01	8,58E-01	5,55E-02	1,80E-03	6,38E-01	6,95E-01
Global warming potential (GWP): Biogenic	kg CO_2 eq	1,59E-02	1,59E-04	1,10E-02	2,71E-02	9,18E-03	9,18E-05	4,83E-03	1,41E-02	7,17E-03	6,84E-05	5,15E-03	1,24E-02
Global warming potential (GWP): LUC	kg CO_2 eq	1,62E-04	1,07E-05	9,94E-05	2,72E-04	9,39E-05	6,22E-06	5,04E-05	1,51E-04	7,32E-05	4,82E-06	4,74E-05	1,25E-04
Global warming potential (GWP): Total	kg CO_2 eq	1,39E-01	4,47E-03	1,36E+00	1,51E+00	8,03E-02	2,58E-03	7,88E-01	8,71E-01	6,27E-02	1,87E-03	6,42E-01	7,07E-01
Acidification potential (AP)	kg SO_2 eq	6,10E-04	9,61E-05	1,44E-03	2,15E-03	3,53E-04	5,53E-05	8,44E-04	1,25E-03	2,75E-04	4,35E-05	6,99E-04	1,02E-03
Eutrophication potential (EP)	kg PO_4 eq	4,36E-05	1,02E-05	1,97E-04	2,51E-04	2,52E-05	5,88E-06	1,15E-04	1,46E-04	1,96E-05	4,62E-06	9,49E-05	1,19E-04
Photochemical ozone creation potential (POCP)	kg NMVOC eq	3,35E-04	7,67E-05	1,46E-03	1,87E-03	1,94E-04	4,41E-05	8,48E-04	1,09E-03	1,51E-04	3,47E-05	6,98E-04	8,84E-04
Abiotic depletion potential for non fossil resources (ADPE)	kg Sb eq	2,77E-06	1,02E-09	3,59E-07	3,14E-06	1,60E-06	6,06E-10	1,31E-07	1,74E-06	1,25E-06	8,20E-11	1,64E-07	1,41E-06
Abiotic depletion potential for fossil resources (ADPF)	MJ	1,51E+00	5,08E-02	1,67E+01	1,82E+01	8,71E-01	2,92E-02	9,51E+00	1,04E+01	6,79E-01	2,28E-02	7,66E+00	8,37E+00
Water scarcity	m^3 world eq	4,74E-01	1,48E-05	1,01E-02	4,84E-01	2,74E-01	8,58E-06	5,44E-03	2,79E-01	2,14E-01	6,17E-06	4,65E-03	2,19E-01
Use of renewable primary energy excluding renewable primary energy resources used as raw materials (PERE)	MJ	4,66E-01	9,81E-02	3,23E+00	3,80E+00	2,69E-01	5,86E-02	1,94E+00	2,27E+00	2,10E-01	4,92E-04	1,62E+00	1,83E+00
Use of renewable primary energy resources used as raw materials (PERM)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PERT)	MJ	4,65E-01	9,81E-02	3,23E+00	3,80E+00	2,69E-01	5,86E-02	1,94E+00	2,27E+00	2,10E-01	4,92E-04	1,62E+00	1,83E+00
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials (PENRE)	MJ	1,72E+00	5,09E-02	1,78E+01	1,96E+01	9,91E-01	2,93E-02	1,02E+01	1,12E+01	7,73E-01	2,29E-02	8,24E+00	9,04E+00
Use of non-renewable primary energy resources used as raw materials (PENRM)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PENRT)	MJ	1,72E+00	5,09E-02	1,78E+01	1,96E+01	9,91E-01	2,93E-02	1,02E+01	1,12E+01	7,73E-01	2,29E-02	8,24E+00	9,04E+00
Use of secondary material (SM)	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of renewable secondary fuels (RSF)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of non renewable secondary fuels (NRSF)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Net use of fresh water (FW)	m^3	2,11E-03	2,47E-04	8,53E-03	1,09E-02	1,22E-03	1,48E-04	5,15E-03	6,52E-03	9,50E-04	6,02E-07	4,28E-03	5,23E-03
Hazardous waste disposed (HWD)	kg	4,70E-06	8,22E-10	6,94E-09	4,71E-06	2,72E-06	4,76E-10	3,73E-09	2,72E-06	2,12E-06	3,68E-10	3,18E-09	2,12E-06
Non-hazardous waste disposed (NHWD)	kg	1,25E-02	2,70E-05	7,41E-03	1,99E-02	7,22E-03	1,60E-05	4,30E-03	1,15E-02	5,62E-03	2,74E-06	3,56E-03	9,19E-03
Radioactive waste disposed (RWD)	kg	8,28E-05	6,74E-08	4,82E-04	5,65E-04	4,78E-05	3,90E-08	2,83E-04	3,31E-04	3,74E-05	2,65E-08	2,40E-04	2,78E-04
Components for re-use (CRU)	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling (MFR)	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Material for energy recovery (MER)	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported electrical energy (EEE)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported thermal energy (EET)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

** Unit per declared unit*

All results in the EPD are written in logarithmic base of ten. Reading example: 5.2E-03 = $5.2*10^{-3}$ = 0.0052.
The CML category indicators are used for the impact assessment.

ENVIRONMENTAL PERFORMANCE – EL3+, EL4+, EL6 THE CHINESE MARKET (CN)

INDICATORS	UNIT*	Ecolean Filling Machine											
		EL3+				EL4+				EL6			
		Upstream	Core	Downstream	Total	Upstream	Core	Downstream	Total	Upstream	Core	Downstream	Total
Global warming potential (GWP): Fossil	kg CO_2 eq	1,23E-01	6,30E-03	1,83E+00	1,96E+00	7,12E-02	3,63E-03	1,08E+00	1,15E+00	5,55E-02	2,70E-03	8,79E-01	9,37E-01
Global warming potential (GWP): Biogenic	kg CO_2 eq	1,59E-02	1,65E-04	7,43E-02	9,03E-02	9,18E-03	9,54E-05	4,34E-02	5,26E-02	7,17E-03	7,12E-05	3,70E-02	4,42E-02
Global warming potential (GWP): LUC	kg CO_2 eq	1,62E-04	1,08E-05	1,17E-03	1,34E-03	9,39E-05	6,24E-06	7,00E-04	8,00E-04	7,32E-05	4,84E-06	5,84E-04	6,62E-04
Global warming potential (GWP): Total	kg CO_2 eq	1,39E-01	6,47E-03	1,91E+00	2,05E+00	8,03E-02	3,73E-03	1,12E+00	1,20E+00	6,27E-02	2,78E-03	9,16E-01	9,82E-01
Acidification potential (AP)	kg SO_2 eq	6,10E-04	1,62E-04	6,48E-03	7,25E-03	3,53E-04	9,31E-05	3,91E-03	4,36E-03	2,75E-04	7,33E-05	3,23E-03	3,58E-03
Eutrophication potential (EP)	kg PO_4 eq	4,36E-05	1,68E-05	4,98E-04	5,58E-04	2,52E-05	9,68E-06	2,98E-04	3,33E-04	1,96E-05	7,61E-06	2,46E-04	2,73E-04
Photochemical ozone creation potential (POCP)	kg NMVOC eq	3,35E-04	1,32E-04	4,07E-03	4,54E-03	1,94E-04	7,57E-05	2,44E-03	2,71E-03	1,51E-04	5,96E-05	2,01E-03	2,22E-03
Abiotic depletion potential for non fossil resources (ADPE)	kg Sb eq	2,77E-06	1,07E-09	4,00E-07	3,18E-06	1,60E-06	6,37E-10	1,56E-07	1,76E-06	1,25E-06	1,07E-10	1,85E-07	1,43E-06
Abiotic depletion potential for fossil resources (ADPF)	MJ	1,51E+00	7,51E-02	2,03E+01	2,19E+01	8,71E-01	4,33E-02	1,17E+01	1,26E+01	6,79E-01	3,39E-02	9,48E+00	1,02E+01
Water scarcity	m^3 world eq	4,74E-01	1,69E-05	1,53E-01	6,27E-01	2,74E-01	9,77E-06	9,25E-02	3,66E-01	2,14E-01	7,11E-06	7,66E-02	2,90E-01
Use of renewable primary energy excluding renewable primary energy resources used as raw materials (PERE)	MJ	4,66E-01	9,82E-02	3,02E+00	3,59E+00	2,69E-01	5,86E-02	1,81E+00	2,14E+00	2,10E-01	5,28E-04	1,51E+00	1,72E+00
Use of renewable primary energy resources used as raw materials (PERM)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PERT)	MJ	4,65E-01	9,82E-02	3,02E+00	3,59E+00	2,69E-01	5,86E-02	1,81E+00	2,14E+00	2,10E-01	5,28E-04	1,51E+00	1,72E+00
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials (PENRE)	MJ	1,72E+00	7,54E-02	2,10E+01	2,28E+01	9,91E-01	4,34E-02	1,21E+01	1,31E+01	7,73E-01	3,40E-02	9,83E+00	1,06E+01
Use of non-renewable primary energy resources used as raw materials (PENRM)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PENRT)	MJ	1,72E+00	7,54E-02	2,10E+01	2,28E+01	9,91E-01	4,34E-02	1,21E+01	1,31E+01	7,73E-01	3,40E-02	9,83E+00	1,06E+01
Use of secondary material (SM)	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of renewable secondary fuels (RSF)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of non renewable secondary fuels (NRSF)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Net use of fresh water (FW)	m^3	2,11E-03	2,48E-04	1,47E-02	1,70E-02	1,22E-03	1,48E-04	8,89E-03	1,03E-02	9,50E-04	6,68E-07	7,36E-03	8,31E-03
Hazardous waste disposed (HWD)	kg	4,70E-06	8,25E-10	1,63E-08	4,72E-06	2,72E-06	4,77E-10	9,44E-09	2,73E-06	2,12E-06	3,70E-10	7,90E-09	2,12E-06
Non-hazardous waste disposed (NHWD)	kg	1,25E-02	2,95E-05	7,17E-03	1,97E-02	7,22E-03	1,74E-05	4,16E-03	1,14E-02	5,62E-03	3,88E-06	3,44E-03	9,07E-03
Radioactive waste disposed (RWD)	kg	8,28E-05	9,47E-08	2,75E-04	3,58E-04	4,78E-05	5,47E-08	1,57E-04	2,05E-04	3,74E-05	3,89E-08	1,36E-04	1,74E-04
Components for re-use (CRU)	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling (MFR)	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Material for energy recovery (MER)	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported electrical energy (EEE)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported thermal energy (EET)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

** Unit per declared unit*

All results in the EPD are written in logarithmic base of ten. Reading example: 5.2E-03 = $5.2*10^{-3}$ = 0.0052.
The CML category indicators are used for the impact assessment.

GLOSSARY

ACIDIFICATION POTENTIAL (KG SO_2-EQ)

Acidic gases such as sulphur dioxide (SO_2) react with water in the atmosphere to form acid precipitation – commonly refered to as "acid rain", in an acid deposition process. When this rain falls, often a considerable distance from the original source to the gas, it causes ecosystem impairment of varying degree, depending upon the nature of the landscape's ecosystems. Gases that cause acid deposition include ammonia, nitrogen oxides and sulphur oxides.

EUTROPHICATION POTENTIAL (KG PO_4^{3-}-EQ)

Nitrates and phosphates are essential for life, nevertheless heightened concentrations or excess levels in bodies of water can encourage excessive growth of algae and reduce the oxygen levels in the water. Eutrophication can therefore be classified as the over-enrichment of water courses. Its occurrence can lead to harm to ecosystems, increasing mortality of aquatic fauna and flora, and to loss of species dependent upon low-nutrient environments. Emissions of ammonia, nitrates, nitrogen oxides and phosphorous to air or water all have an impact on eutrophication.

GLOBAL WARMING POTENTIAL (KG CO_2-EQ)

The aggregate measure of the contribution to the greenhouse effect of some gases through their conversion into carbon dioxide equivalents. Global warming potential and climate change refers to the change in global temperature caused via the greenhouse effect by the release of "greenhouse gases" such as carbon dioxide by human activity. Raised global temperature is expected to cause climatic disturbance, desertification, rising sea levels and the spread of disease. The Environmental Profiles characterisation model is based on factors developed by the UN's Intergovernmental Panel on Climate Change (IPCC). Factors are expressed as Global Warming Potential over the time horizon of 100 years (GWP100), measured in the reference unit, kg CO_2 equivalent.

PHOTOCHEMICAL OZONE CREATION POTENTIAL (KG C_2H_4-EQ)

In atmospheres containing nitrogen oxides (NOx, a common pollutant) and volatile organic compounds (VOCs), ozone can be formed via the presence of sunlight. Although ozone is critical in the high atmosphere to protect against ultraviolet (UV) light, low level ozone is implicated in impacts as diverse as crop damage and increased incidence of asthma and other respiratory ailments.

OZONE DEPLETING GASES (KG R-11-EQ)

Degradation and depletion of the ozone layer in the stratosphere, which has the property of blocking the ultraviolet components of sunlight due to its particularly reactive compounds, originated by chlorofluorocarbons (CFC) or by chlorofluoromethanes (CFM). The substance used as a point of reference for assessing the ODP (Ozone Depletion Potential) is trichlorofluoromethane, R-11-eq or CFC-11-eq.

DIFFERENCES VERSUS PREVIOUS VERSION

Changes at the production plant

- Ecolean has since 2017 purchased renewable electricity from hydro-power. In the previous EPD (published 2017-10-02, based on 2016 data) Ecolean used general Swedish average electricity to calculate the climate impact from electricity use.

Changes of machine

- New updated weights are reported for all machines.
- A new aseptic filling machine, the EL6, has been added to this EPD.
- Updated standard production cycle and consumptions.

Changes in PCR

- New functional unit.
- New boundaries for assessed lifecycle, including downstream processes.

Changes in the LCA software

- GaBi 10 LCA software 2020 has been used for calculations.

Version history S-P-01056 Ecolean Filling machines EL3+, EL4+ and EL6

- 2017-10-02: First publication
- 2021-09-30: Updated due to ended validity

PROGRAMME-RELATED INFORMATION AND VERIFICATION

Product Category Rules (PCR):
Machines for filling and packaging of liquid food 2012:18 version 2.02

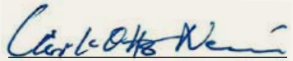
Product group classification:
UN CPC43921

Reference year for data:
2020

Geographic scope:
Europe, Russia, Pakistan, China

The PCR review was conducted by:
The Technical committee of the International EPD® System. Chair: Adriana del Borghi.
Contact via info@environdec.com

Independent verification of the declaration and data, according to ISO 14025:2006:
☐ EPD Process Certification (internal) ☑ EPD Verification (external)

Third party verifier:

Carl-Otto Nevén

NEVÉN Miljökonsult
Kvarnåsvägen 8, SE-433 31 Partille, Sweden
Approved by the International EPD® System

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

EPDs from different programmes may not be comparable. In addition, product specific information must be comparable in order to allow for a fair comparison of EPD results. EPDs for different types of filling or packaging machines are non-comparable, even when based on this PCR, since they fulfil different types of functions. A list of machine utilities has been omitted due to confidentiality, according General Programme Instructions of the International EPD® System. Version 3.01. The intended use for this EPD is for business to business communication.

CONTACT INFORMATION

EPD owner:
Ecolean AB, PO Box 812, SE-251 08 Helsingborg, Sweden
www.ecolean.com
Contact: Anna Palminger, Sustainability Director, anna.palminger@ecolean.se
The EPD owner has the sole ownership, liability and responsibility of the EPD.

LCA practitioner:
Ecolean AB, PO Box 812, SE-251 08 Helsingborg, Sweden
www.ecolean.com
Contact: Anna Palminger, Sustainability Director, anna.palminger@ecolean.se

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

References:
General Programme Instructions of the International EPD® System. Version 3.01 dated 2019-09-18.
Product Group Classification: UN CPC 43921 Machines for filling and packaging of liquid food 2012:18 Version 2.02
Regulation (EC) No 1907/2006 of the European parliament and of the council of 18 December 2006
concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)
Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008
on classification, labelling and packaging of substances and mixtures
LCA report: LCA Report Ecolean Machine EPD 170926,
Add-on LCA Report Ecolean Machine EPD 210831
LCA software GaBi 10, database 2020.2

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Ecolean AB , Box 812, 251 08 Helsingborg, Sweden , Visiting Address: Kielergatan 48, Phone: +46(0)10 459 40 00, info@ecolean.se, ecolean.com