

## ENVIRONMENTAL PRODUCT DECLARATION

# ECOLEAN FILLING MACHINES EL1+ AND EL2+



**ecolean**  
a lighter approach to packaging

IN ACCORDANCE WITH ISO 14025

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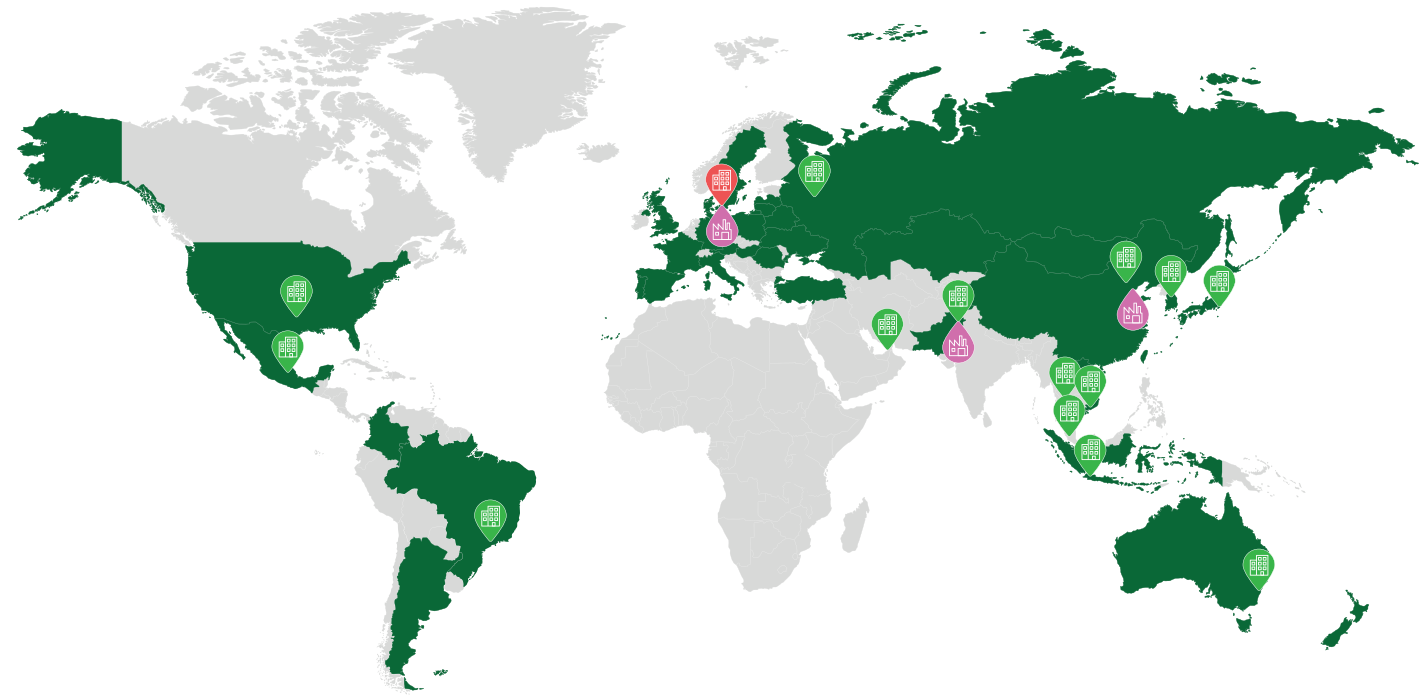
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# ECOLEAN LIGHTWEIGHT PACKAGING HAS BECOME A HEAVYWEIGHT ARGUMENT



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.

-  Headquarter, sales office
-  Sales offices
-  Production sites
-  Markets served

# 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.

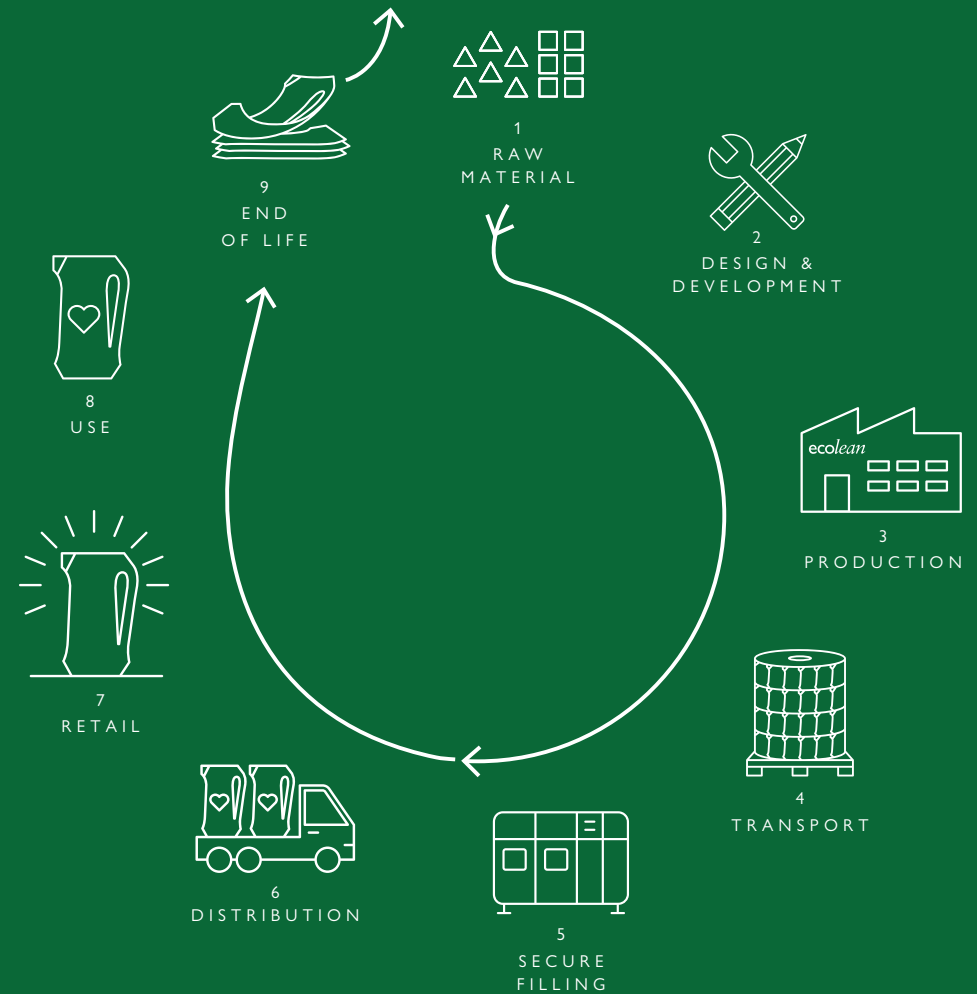
The Environmental Product Declaration (EPD) is an independently verified and registered document based on verified life-cycle assessment (LCA) data. By using EPDs in accordance with the international EPD system, Ecolean can

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.



# EL1+ AND EL2+ FILLING MACHINE FOR LIQUID FOOD, CHILLED DISTRIBUTION

This EPD covers the two Ecolean filling machines for chilled distribution, the EL1+ and the EL2+.

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 EL1+ filling machine is automated and adaptable, with four filling stations for filling liquid food products into Ecolean® Air packa-

ges. The design makes it compact and easy to operate. It is possible to switch between the package sizes. Cleaning of the filling zone is done with the integrated circulating cleaning system. The EL1+ machine is used for filling family-sized Ecolean® Air packages: 500ml, 1000ml and 1500ml.

The EL2+ filling machine features five fillers for filling liquid food products into Ecolean® Air packages and can fill up to 12,000 packages per hour. Its design makes it compact and easy to operate and to switch between the package sizes. The EL2+ is delivered with a fully-automated and circulating cleaning system of the filling zone. The EL2+ is used for smaller portion-sized Ecolean® Air packages from 200ml up to 450ml.

During the actual filling procedure the hermetically sealed package is opened only a few seconds during filling, before it's sealed again which ensures hygienic properties.

## MATERIAL COMPOSITION EL1+, EL2+ (MATERIAL, KG)

	EL1+	EL2+
Stainless steel	2,002	2,002
Aluminium	479	479
Glass	56	56
Plastics	50	50
Copper	13	13
Total	2,600	2,600

### 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. Due to very high resemblance between the EL1+ and EL2+, the same material composition has been used for the two platforms. 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.



**EL1+ FOR CHILLED DISTRIBUTION**  
Designed for chilled filling of high and low-acid food products into Ecolean® Air packages.

Package sizes:	500ml, 1000ml and 1500ml.
Capacity:	Up to 7,000 packages/hour.
Length:	5.0 m
Width:	1.0 m
Height:	3.3 m

**EL2+ FOR CHILLED DISTRIBUTION**  
Designed for chilled filling of high and low-acid food products into Ecolean® Air packages.

Package sizes:	200ml, 250ml and 450ml.
Capacity:	Up to 12,000 packages/hour.
Length:	5.0 m
Width:	1.0 m
Height:	3.3 m

*All measurements for filling machine with closed doors.*

## Schematic overview of main machine modules in the chilled filling machines, EL1+ and EL2+



### 1. UNWINDING

Reels of hermetically sealed packaging material are placed and prepared for splice in the unwinding unit.

### 2. 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.

### 3. FILLING ZONE

In the filling chamber, packages are opened, filled with product and sealed.

### 4. 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 customer's and market demands.

### 5. AIR HANDLING UNIT

The air handling unit consists of HEPA filtered air with individually controlled laminar door barriers.

### 6. VALVE CLUSTER

Aseptic membrane valves with an option to add steam for sterilisation of filling system.

### 7. CONTROL SYSTEM

The EL2+ uses the latest Omron control system that features a virtual master servo axis to enable optimisation of machine performance.

# 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 to 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 of components, 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

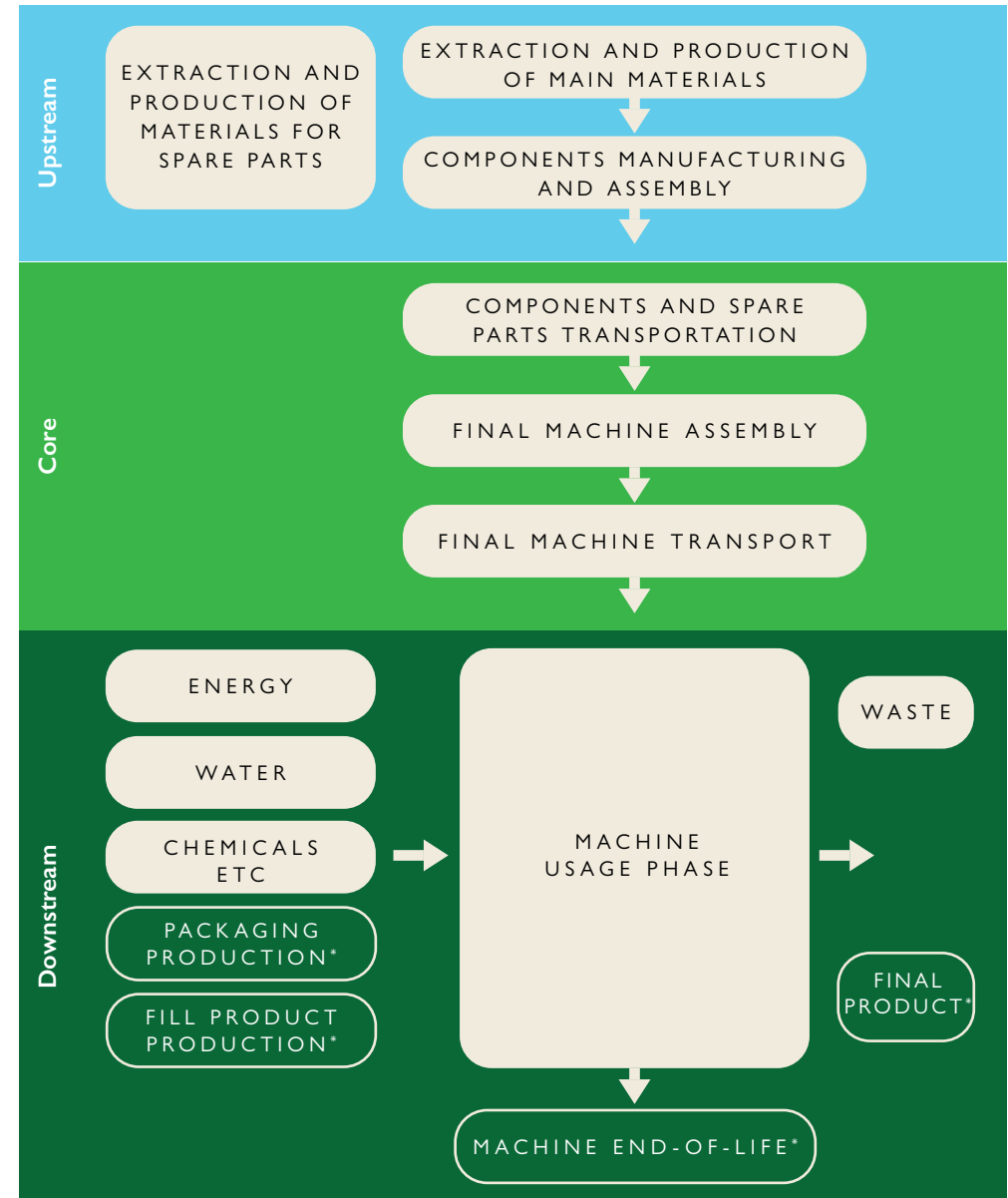
European average electricity assumed: GaBi 10 LCA software 2020. A material loss of 5% is assumed for all components.

## 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<sub>2</sub>-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 to 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, for the energy sources. Data used for electricity production:

- European electricity mix  
383 g CO<sub>2</sub>-eq/kWh
- Russian electricity mix  
572 g CO<sub>2</sub>-eq/kWh
- Pakistan electricity mix  
552 g CO<sub>2</sub>-eq/kWh
- Chinese electricity mix  
804 g CO<sub>2</sub>-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 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	EL1+	EL2+
Lifetime of the machine	Hours production time	52,491	52,105
Planned operation time (POT)	Hours per day	21.37	21.37
Planned downtime	Hours per day	0.30	0.43
Actual unit downtime (ADOT)	Hours per day	1.57	1.57
Actual unit busy time (AUBT)	Hours per day	19.50	19.37
Actual unit delay time (ADET)	Hours per day	1.31	1.31
Actual unit setup time (AUST)*	Hours per day	3.81	3.79
Actual production time (APT)	Hours per day	14.38	14.28
Technical efficiency	%	94.00	94.00
Quality ratio	%	99.50	99.50
Total amount of approved packages per production cycle		99,556	169,406
Percent of wasted packages per production cycle	%	0.5	0.5

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



ENVIRONMENTAL PERFORMANCE – EL1+, EL2+ THE EUROPEAN MARKET (EU)

INDICATORS	UNIT*	Ecolean Machine							
		EL1+				EL2+			
		Upstream	Core	Downstream	Total	Upstream	Core	Downstream	Total
Global warming potential (GWP): Fossil	kg CO <sub>2</sub> eq	5,35E-02	1,69E-03	5,57E-01	6,12E-01	3,06E-02	9,65E-04	3,18E-01	3,49E-01
Global warming potential (GWP): Biogenic	kg CO <sub>2</sub> eq	6,93E-03	1,51E-04	1,70E-01	1,78E-01	3,96E-03	8,62E-05	9,56E-02	9,97E-02
Global warming potential (GWP): LUC	kg CO <sub>2</sub> eq	7,06E-05	1,06E-05	5,80E-04	6,62E-04	4,04E-05	6,07E-06	3,26E-04	3,73E-04
Global warming potential (GWP): Total	kg CO <sub>2</sub> eq	6,04E-02	1,85E-03	7,25E-01	7,87E-01	3,45E-02	1,06E-03	4,12E-01	4,48E-01
Acidification potential (AP)	kg SO <sub>2</sub> eq	2,62E-04	6,96E-06	9,46E-04	1,22E-03	1,50E-04	3,98E-06	5,35E-04	6,88E-04
Eutrophication potential (EP)	kg PO <sub>4</sub> eq	1,88E-05	1,28E-06	1,06E-04	1,26E-04	1,07E-05	7,30E-07	5,99E-05	7,14E-05
Photochemical ozone creation potential (POCP)	kg NMVOC eq	1,44E-04	2,09E-06	6,61E-04	8,07E-04	8,22E-05	1,19E-06	3,75E-04	4,59E-04
Abiotic depletion potential for non fossil resources (ADPE)	kg Sb eq	8,82E-07	1,18E-09	2,44E-07	1,13E-06	5,03E-07	6,75E-10	1,44E-07	6,48E-07
Abiotic depletion potential for fossil resources (ADPF)	MJ	6,53E-01	1,77E-02	7,07E+00	7,74E+00	3,73E-01	1,01E-02	4,05E+00	4,44E+00
Water scarcity	m <sup>3</sup> world eq	1,87E-01	1,22E-05	2,60E-02	2,13E-01	1,07E-01	6,98E-06	1,46E-02	1,22E-01
Use of renewable primary energy excluding renewable primary energy resources used as raw materials (PERE)	MJ	2,05E-01	1,25E-01	3,05E+00	3,38E+00	1,17E-01	7,15E-02	1,71E+00	1,90E+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
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PERT)	MJ	2,05E-01	1,25E-01	3,05E+00	3,38E+00	1,17E-01	7,15E-02	1,71E+00	1,90E+00
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials (PENRE)	MJ	7,45E-01	1,78E-02	9,69E+00	1,05E+01	4,26E-01	1,02E-02	5,52E+00	5,96E+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
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PENRT)	MJ	7,45E-01	1,78E-02	9,69E+00	1,05E+01	4,26E-01	1,02E-02	5,52E+00	5,96E+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
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
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
Net use of fresh water (FW)	m <sup>3</sup>	9,14E-04	3,16E-04	3,52E-03	4,75E-03	5,23E-04	1,81E-04	1,98E-03	2,68E-03
Hazardous waste disposed (HWD)	kg	2,02E-06	8,14E-10	4,25E-09	2,03E-06	1,15E-06	4,65E-10	2,44E-09	1,16E-06
Non-hazardous waste disposed (NHWD)	kg	5,57E-03	2,94E-05	5,54E-03	1,11E-02	3,18E-03	1,68E-05	3,13E-03	6,33E-03
Radioactive waste disposed (RWD)	kg	3,65E-05	3,27E-08	1,04E-03	1,08E-03	2,09E-05	1,87E-08	5,84E-04	6,05E-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
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
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
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
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

\* Unit per declared unit

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

## ENVIRONMENTAL PERFORMANCE – EL1+, EL2+ THE RUSSIAN MARKET (RU)

INDICATORS	UNIT*	Ecolean Machine							
		EL1+				EL2+			
		Upstream	Core	Downstream	Total	Upstream	Core	Downstream	Total
Global warming potential (GWP): Fossil	kg CO <sub>2</sub> eq	5,35E-02	1,87E-03	7,46E-01	8,02E-01	3,06E-02	1,07E-03	4,24E-01	4,55E-01
Global warming potential (GWP): Biogenic	kg CO <sub>2</sub> eq	6,93E-03	1,57E-04	1,27E-02	1,97E-02	3,96E-03	8,94E-05	7,25E-03	1,13E-02
Global warming potential (GWP): LUC	kg CO <sub>2</sub> eq	7,06E-05	1,10E-05	6,92E-05	1,51E-04	4,04E-05	6,29E-06	3,97E-05	8,63E-05
Global warming potential (GWP): Total	kg CO <sub>2</sub> eq	6,04E-02	2,03E-03	7,59E-01	8,21E-01	3,45E-02	1,16E-03	4,31E-01	4,67E-01
Acidification potential (AP)	kg SO <sub>2</sub> eq	2,62E-04	9,59E-06	3,48E-03	3,76E-03	1,50E-04	5,48E-06	1,96E-03	2,11E-03
Eutrophication potential (EP)	kg PO <sub>4</sub> eq	1,88E-05	1,75E-06	2,43E-04	2,63E-04	1,07E-05	1,00E-06	1,37E-04	1,48E-04
Photochemical ozone creation potential (POCP)	kg NMVOC eq	1,44E-04	5,60E-06	2,07E-03	2,22E-03	8,22E-05	3,20E-06	1,16E-03	1,25E-03
Abiotic depletion potential for non fossil resources (ADPE)	kg Sb eq	8,82E-07	1,19E-09	1,63E-07	1,05E-06	5,03E-07	6,80E-10	9,85E-08	6,02E-07
Abiotic depletion potential for fossil resources (ADPF)	MJ	6,53E-01	2,01E-02	1,10E+01	1,16E+01	3,73E-01	1,15E-02	6,24E+00	6,62E+00
Water scarcity	m <sup>3</sup> world eq	1,87E-01	1,28E-05	2,44E-02	2,12E-01	1,07E-01	7,29E-06	1,37E-02	1,21E-01
Use of renewable primary energy excluding renewable primary energy resources used as raw materials (PERE)	MJ	2,05E-01	1,25E-01	8,02E-01	1,13E+00	1,17E-01	7,15E-02	4,52E-01	6,41E-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
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PERT)	MJ	2,05E-01	1,25E-01	8,02E-01	1,13E+00	1,17E-01	7,15E-02	4,52E-01	6,41E-01
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials (PENRE)	MJ	7,45E-01	2,02E-02	1,30E+01	1,37E+01	4,26E-01	1,16E-02	7,36E+00	7,79E+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
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PENRT)	MJ	7,45E-01	2,02E-02	1,30E+01	1,37E+01	4,26E-01	1,16E-02	7,36E+00	7,79E+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
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
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
Net use of fresh water (FW)	m <sup>3</sup>	9,14E-04	3,16E-04	3,69E-03	4,92E-03	5,23E-04	1,81E-04	2,07E-03	2,78E-03
Hazardous waste disposed (HWD)	kg	2,02E-06	8,44E-10	4,69E-09	2,03E-06	1,15E-06	4,82E-10	2,68E-09	1,16E-06
Non-hazardous waste disposed (NHWD)	kg	5,57E-03	2,97E-05	2,76E-03	8,36E-03	3,18E-03	1,70E-05	1,57E-03	4,77E-03
Radioactive waste disposed (RWD)	kg	3,65E-05	3,55E-08	7,80E-04	8,17E-04	2,09E-05	2,03E-08	4,38E-04	4,59E-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
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
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
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
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

\* Unit per declared unit

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

ENVIRONMENTAL PERFORMANCE – EL1+, EL2+ THE PAKISTAN MARKET (PK)

INDICATORS	UNIT*	Ecolean Machine							
		EL1+				EL2+			
		Upstream	Core	Downstream	Total	Upstream	Core	Downstream	Total
Global warming potential (GWP): Fossil	kg CO <sub>2</sub> eq	5,35E-02	2,18E-03	7,26E-01	7,82E-01	3,06E-02	1,25E-03	4,13E-01	4,44E-01
Global warming potential (GWP): Biogenic	kg CO <sub>2</sub> eq	6,93E-03	7,30E-05	4,76E-03	1,18E-02	3,96E-03	4,17E-05	2,83E-03	6,83E-03
Global warming potential (GWP): LUC	kg CO <sub>2</sub> eq	7,06E-05	4,58E-06	4,72E-05	1,22E-04	4,04E-05	2,62E-06	2,74E-05	7,03E-05
Global warming potential (GWP): Total	kg CO <sub>2</sub> eq	6,04E-02	2,25E-03	7,31E-01	7,93E-01	3,45E-02	1,29E-03	4,15E-01	4,51E-01
Acidification potential (AP)	kg SO <sub>2</sub> eq	2,62E-04	4,34E-05	7,62E-04	1,07E-03	1,50E-04	2,48E-05	4,31E-04	6,06E-04
Eutrophication potential (EP)	kg PO <sub>4</sub> eq	1,88E-05	4,61E-06	1,04E-04	1,27E-04	1,07E-05	2,63E-06	5,89E-05	7,23E-05
Photochemical ozone creation potential (POCP)	kg NMVOC eq	1,44E-04	3,48E-05	7,73E-04	9,51E-04	8,22E-05	1,99E-05	4,38E-04	5,40E-04
Abiotic depletion potential for non fossil resources (ADPE)	kg Sb eq	8,82E-07	1,15E-09	1,42E-07	1,02E-06	5,03E-07	6,59E-10	8,67E-08	5,91E-07
Abiotic depletion potential for fossil resources (ADPF)	MJ	6,53E-01	2,27E-02	9,03E+00	9,70E+00	3,73E-01	1,30E-02	5,15E+00	5,53E+00
Water scarcity	m <sup>3</sup> world eq	1,87E-01	7,30E-06	5,22E-03	1,93E-01	1,07E-01	4,17E-06	3,00E-03	1,10E-01
Use of renewable primary energy excluding renewable primary energy resources used as raw materials (PERE)	MJ	2,05E-01	1,25E-01	1,68E+00	2,01E+00	1,17E-01	7,12E-02	9,45E-01	1,13E+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
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PERT)	MJ	2,05E-01	1,25E-01	1,68E+00	2,01E+00	1,17E-01	7,12E-02	9,45E-01	1,13E+00
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials (PENRE)	MJ	7,45E-01	2,28E-02	9,62E+00	1,04E+01	4,26E-01	1,30E-02	5,48E+00	5,92E+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
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PENRT)	MJ	7,45E-01	2,28E-02	9,62E+00	1,04E+01	4,26E-01	1,30E-02	5,48E+00	5,92E+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
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
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
Net use of fresh water (FW)	m <sup>3</sup>	9,14E-04	3,16E-04	4,46E-03	5,69E-03	5,23E-04	1,80E-04	2,50E-03	3,20E-03
Hazardous waste disposed (HWD)	kg	2,02E-06	3,51E-10	3,61E-09	2,02E-06	1,15E-06	2,00E-10	2,08E-09	1,16E-06
Non-hazardous waste disposed (NHWD)	kg	5,57E-03	2,94E-05	3,90E-03	9,50E-03	3,18E-03	1,68E-05	2,21E-03	5,41E-03
Radioactive waste disposed (RWD)	kg	3,65E-05	3,71E-08	2,47E-04	2,84E-04	2,09E-05	2,12E-08	1,39E-04	1,60E-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
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
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
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
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

\* Unit per declared unit

All results in the EPD are written in logarithmic base of ten. Reading example: 5.2E-03 = 5.2\*10<sup>-3</sup> = 0.0052

The CML category indicators are used for the impact assessment..

ENVIRONMENTAL PERFORMANCE – EL1+, EL2+ THE CHINESE MARKET (CN)

INDICATORS	UNIT*	Ecolean Machine							
		EL1+				EL2+			
		Upstream	Core	Downstream	Total	Upstream	Core	Downstream	Total
Global warming potential (GWP): Fossil	kg CO <sub>2</sub> eq	5,35E-02	3,08E-03	9,79E-01	1,04E+00	3,06E-02	1,76E-03	5,54E-01	5,86E-01
Global warming potential (GWP): Biogenic	kg CO <sub>2</sub> eq	6,93E-03	7,58E-05	3,80E-02	4,50E-02	3,96E-03	4,33E-05	2,15E-02	2,55E-02
Global warming potential (GWP): LUC	kg CO <sub>2</sub> eq	7,06E-05	4,60E-06	6,08E-04	6,83E-04	4,04E-05	2,63E-06	3,42E-04	3,84E-04
Global warming potential (GWP): Total	kg CO <sub>2</sub> eq	6,04E-02	3,16E-03	1,02E+00	1,08E+00	3,45E-02	1,81E-03	5,75E-01	6,12E-01
Acidification potential (AP)	kg SO <sub>2</sub> eq	2,62E-04	7,33E-05	3,41E-03	3,74E-03	1,50E-04	4,19E-05	1,91E-03	2,11E-03
Eutrophication potential (EP)	kg PO <sub>4</sub> eq	1,88E-05	7,60E-06	2,62E-04	2,88E-04	1,07E-05	4,34E-06	1,47E-04	1,63E-04
Photochemical ozone creation potential (POCP)	kg NMVOC eq	1,44E-04	5,97E-05	2,15E-03	2,35E-03	8,22E-05	3,41E-05	1,21E-03	1,32E-03
Abiotic depletion potential for non fossil resources (ADPE)	kg Sb eq	8,82E-07	1,18E-09	1,63E-07	1,05E-06	5,03E-07	6,73E-10	9,87E-08	6,03E-07
Abiotic depletion potential for fossil resources (ADPF)	MJ	6,53E-01	3,38E-02	1,09E+01	1,16E+01	3,73E-01	1,93E-02	6,21E+00	6,60E+00
Water scarcity	m <sup>3</sup> world eq	1,87E-01	8,24E-06	8,04E-02	2,68E-01	1,07E-01	4,71E-06	4,51E-02	1,52E-01
Use of renewable primary energy excluding renewable primary energy resources used as raw materials (PERE)	MJ	2,05E-01	1,25E-01	1,57E+00	1,90E+00	1,17E-01	7,12E-02	8,83E-01	1,07E+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
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PERT)	MJ	2,05E-01	1,25E-01	1,57E+00	1,90E+00	1,17E-01	7,12E-02	8,83E-01	1,07E+00
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials (PENRE)	MJ	7,45E-01	3,39E-02	1,13E+01	1,21E+01	4,26E-01	1,94E-02	6,41E+00	6,86E+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
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PENRT)	MJ	7,45E-01	3,39E-02	1,13E+01	1,21E+01	4,26E-01	1,94E-02	6,41E+00	6,86E+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
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
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
Net use of fresh water (FW)	m <sup>3</sup>	9,14E-04	3,16E-04	7,68E-03	8,91E-03	5,23E-04	1,80E-04	4,31E-03	5,01E-03
Hazardous waste disposed (HWD)	kg	2,02E-06	3,52E-10	8,54E-09	2,03E-06	1,15E-06	2,01E-10	4,84E-09	1,16E-06
Non-hazardous waste disposed (NHWD)	kg	5,57E-03	3,05E-05	3,78E-03	9,38E-03	3,18E-03	1,74E-05	2,14E-03	5,34E-03
Radioactive waste disposed (RWD)	kg	3,65E-05	4,95E-08	1,39E-04	1,75E-04	2,09E-05	2,83E-08	7,85E-05	9,94E-05
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
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
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
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
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

\* Unit per declared unit

All results in the EPD are written in logarithmic base of ten. Reading example: 5.2E-03 = 5.2\*10<sup>-3</sup> = 0.0052

The CML category indicators are used for the impact assessment..

# GLOSSARY

## ACIDIFICATION POTENTIAL (KG SO<sub>2</sub>-EQ)

Acidic gases such as sulphur dioxide (SO<sub>2</sub>) react with water in the atmosphere to form acid precipitation – commonly referred 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<sub>4</sub><sup>3-</sup>-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<sub>2</sub>-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<sub>2</sub> equivalent.

## PHOTOCHEMICAL OZONE CREATION POTENTIAL (KG C<sub>2</sub>H<sub>4</sub>-EQ)

In atmospheres containing nitrogen oxides (NO<sub>x</sub>, 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.
- The EL1 machine has been replaced with the updated EL1+ in 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-01057 Ecolean Filling machines EL1+ and EL2+

- 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](mailto: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:**

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The EPD owner has the sole ownership, liability and responsibility of the EPD.

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**LCA practitioner:**

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**Programme operator:**

The International EPD® System

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**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

This brochure is printed on Swan Ecolabelled paper.



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