EPD
INTERNATIONAL EPD SYSTEM

MACHINES FOR FILLING AND PACKAGING OF LIQUID FOOD

PRODUCT CATEGORY CLASSIFICATION: UN CPC 43921

PCR 2012:18

VERSION 3.0.0 FOR OPEN CONSULTATION. DO NOT USE OR CITE

VALID UNTIL 20XX-YY-ZZ *(TO BE ADDED BY THE SECRETARIAT)*

DRAFT VERSION FOR
OPEN CONSULATION

INTRODUCTION TO OPEN CONSULTATION

This draft PCR document is available for open consultation from 2025-06-17 until 2025-08-12. Feel free to forward the draft to any other stakeholder you might think is relevant, including colleagues and other organisations.

We are interested in comments from stakeholders on:

- General
  - Alignment with PCRs available in other programmes for type III environmental declarations, industry-specific LCA guidelines or similar.
- Scope of PCR
  - Product category definition and description
  - Classification of product category using CPC codes
- Goal and scope, life cycle inventory and life cycle impact assessment
  - Functional unit/declared unit
  - System boundary
  - Allocation rules
  - Data quality requirements
  - Recommended databases for generic data
  - Impact categories and impact assessment methodology
- Additional information

Comments shall be sent directly to the PCR Moderator (contact details available in Section 1). There is a template for comments on www.environdec.com that may be used.

For questions about the PCR, please contact the PCR moderator. For general questions about the International EPD System, EPD or PCR development, please contact the Secretariat via support@environdec.com.

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1 INTRODUCTION

This document constitutes Product Category Rules (PCR) developed in the framework of the International EPD System: a programme for Environmental Product Declarations (EPD)[1] according to ISO 14025:2006, ISO 14040:2006, ISO 14044:2006, and product-specific standards, such as EN 15804 and ISO 21930 for construction products. EPDs are voluntary documents for a company or an industry association to present transparent, consistent, and verifiable information about the environmental performance of their products (goods or services).

The General Programme Instructions (GPI), publicly available on www.environdec.com, includes the rules for the overall administration and operation of the programme and the basic rules for developing EPDs registered in the programme. A PCR complements the GPI and the normative standards by providing specific rules, and guidelines for developing an EPD for one or more specific product categories (see Figure 1), thereby enabling the generation of consistent EPDs within a product category. A PCR should not repeat the rules and guidelines of the GPI, but include additions, specifications and deviations to the rules set in the GPI. As such, a PCR shall be used together with the GPI.

This PCR is a main PCR that may be complemented with one or several complementary PCR (c-PCR). If there is an applicable and valid c-PCR, it shall be used in case it has been valid for at least 90 days when the EPD is verified[2]. If it has been valid for less than 90 days, it is optional to use the c-PCR. The valid c-PCRs can be found on www.environdec.com.

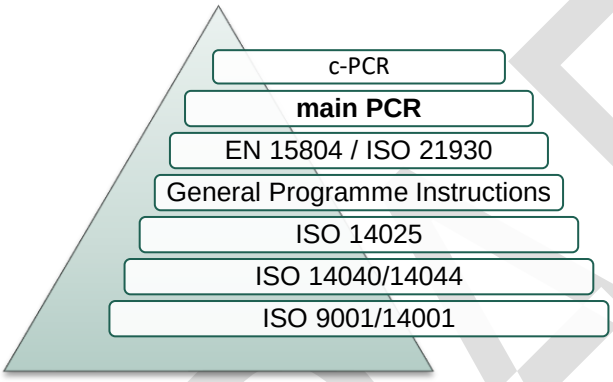

Figure 1. The hierarchy between PCRs, standards, and other documents.

The present PCR uses the following terminology:

- The term “shall” is used to indicate what is obligatory, i.e., a requirement.
- The term “should” is used to indicate a recommendation. Any deviation from a recommendation shall be justified in the EPD development process.
- The terms “may” or “can” are used to indicate an option that is permissible.

For definitions of other terms used in the document, see the GPI and normative standards.

Any references to this PCR shall include the PCR registration number, name, and version number.

The programme operator maintains the copyright of the PCR to ensure that it is possible to publish, update, and make it available to all organisations to develop and register EPDs. Stakeholders participating in PCR development should be acknowledged in the final document and on the website.

[1] Termed type III environmental declarations in ISO 14025.

[2] This does not apply when the EPD is re-verified during its validity, unless the validity period is extended.

2 GENERAL INFORMATION

2.1 ADMINISTRATIVE INFORMATION

Name:	Machines for filling and packaging of liquid food
Registration number and version:	2012:18, draft version 3.0.0
Programme:	EPD INTERNATIONAL EPD SYSTEM
Programme operator:	EPD International AB, Box 210 60, SE-100 31 Stockholm, Sweden. Website: www.environdec.com E-mail: support@environdec.com
PCR Moderator:	Carin Hagsten, Ecolean, carin.hagsten@ecolean.se
PCR Committee:	Ecolean, Carbonzero
Publication date:	*To be added by the Secretariat* See Section 9 for a version history of the PCR.
Valid until:	*To be added by the Secretariat* The validity may change. See www.environdec.com for the latest version of the PCR and the latest information on its validity and transition periods between versions.
Development and updates:	The PCR has been developed following ISO 14027, including public consultation and review. The rules for the development and updating processes are described in Section 9 of the GPI. The PCR is valid for a pre-determined time period to ensure that it is updated at regular intervals. When the PCR is about to expire, the PCR Moderator shall initiate a discussion with the Secretariat on if and how to proceed with updating the PCR and renewing its validity. A PCR may be updated before it expires, based on changes in normative standards or provided significant and well-justified proposals for changes or amendments are presented. When there has been an update of the PCR, the new version should be used to develop EPDs. For small updates (change of third-digit version number), the previous version is normally immediately removed from the PCR library on www.environdec.com and there is no transition period. For medium updates (change of second-digit version number), the previous version of the PCR is valid in parallel during a transition period of at least 90 days, but not exceeding its previously set validity period. For large updates (change of first-digit version number), the previous version is valid in parallel during a transition period of at least 180 days, but not exceeding its previously set validity period. Stakeholder feedback on PCRs is very much encouraged. Any comments on this PCR may be sent directly to the PCR Moderator and/or the Secretariat during its development or during its period of validity.

Standards and documents conformance:	General Programme Instructions of the International EPD System, version 5.0.1, based on ISO 14025 and ISO 14040/14044.[3] ISO (2014), ISO 22400-2, Automation systems and integration — Key performance indicators (KPIs) for manufacturing operations management — Part 2: Definitions and descriptions
PCR language(s):	At the time of publication, this PCR was available in English. If the PCR is available in several languages, these are available on www.environdec.com. In case of translated versions, the English version takes precedence in case of any discrepancies.

2.2 SCOPE OF PCR

2.2.1 PRODUCT CATEGORY DEFINITION AND DESCRIPTION

This document provides Product Category Rules (PCR) for the assessment of the environmental performance of 'Machines for filling and packaging of liquid food' and the declaration of this performance by an EPD.

The product category corresponds to a sub-set of UN CPC 43921:

- Division: 43 - General-purpose machinery
  - Group: 439 - Other general-purpose machinery and parts thereof
    - Class: 4392 - Machinery for cleaning bottles, packing, and weighing; spraying machinery
      - Subclass: 43921 - Machinery for cleaning or drying bottles or other containers; machinery for filling, closing, sealing, capsuling or labelling bottles, cans, boxes, bags or other containers; machinery for aerating beverages; other packing or wrapping machinery

More information is available at: https://unstats.un.org/unsd/classifications/Family/Detail/1074

UN CPC 43921 includes many different types of machinery. The scope of this PCR is limited to machinery related to packaging of liquid food products since requirements on hygiene and functionality are very specific for filling and packaging machines handling liquid food.

This PCR covers the following types of machines which are part of CPC 43921[4]:

- machinery for filling, closing, sealing, capsuling or labelling bottles, cans, boxes, bags or other containers for liquid food;
- Other packing or wrapping machinery used in liquid food filling lines.

Optional equipment

If optional equipment is considered in addition to the filling machine (e.g. packaging machines which also pre-applies caps on packages before forming), the 'base machine' has to be defined and analysed accordingly to the criteria presented in the section above. The main modules/parts of the optional equipment and its technical performance data (e.g. power installed) must be specified and results for optional equipment shall be presented separately.

It is also possible to use this PCR to generate EPDs for complete filling machine production lines. The EPD for a filling line shall include the environmental performance related information of the full line and may include details about the specific contribution of all included machines.

[3] Some rules influencing EPD development are independent of the GPI version referred to in the PCR. For example, the latest rules on EPD verification procedures in the GPI shall be followed within 90 days of its publication. See Section 5.1 in the GPI for a description of the four categories of rules and when they shall be followed.

[4] UN CPC Division 43921 also includes 'machinery for cleaning or drying bottles or other containers' and 'machinery for aerating beverages'. These product groups are not covered by this PCR since they are considered to be significantly different from filling and packaging machines for liquid food.

2.2.2 GEOGRAPHICAL SCOPE

This PCR may be used globally.

The data for the downstream module shall be representative of the relevant site/region of the use phase. The EPD shall clearly state the geographic reference and underlying electricity mix used.

2.2.3 EPD VALIDITY

An EPD becomes valid as of its version date (see Section 8.4.5 of the GPI). When an EPD is originally published, the validity period is normally five years starting from the version date or until the EPD has been de-registered from the International EPD System. Shorter validity periods are also accepted, for example if decided by the EPD owner.

For rules on when an EPD shall be updated and re-verified during its validity, see Section 6.8.1 of the GPI. For validity periods in case of updates of EPDs, see Section 6.8 of the GPI.

The version date and the period of validity shall be stated in the EPD.

Publication of a new version of the PCR or the GPI does not affect the validity of already published EPDs.

3 REVIEW AND BACKGROUND INFORMATION

This PCR was developed in accordance with the PCR development process described in the GPI of the International EPD System, including open consultation and review.

3.1 OPEN CONSULTATION

3.1.1 VERSION 1.0.0

This PCR was available for open consultation from *date* until *date*, during which any stakeholder was able to provide comments by contacting the PCR Moderator and/or the Secretariat.

Above dates shall be given in the following format: 20YY-MM-DD.

Add information about any physical or web-based meetings held during the open consultation, if applicable.

Stakeholders were invited via e-mail or other means to take part in the open consultation and were encouraged to forward the invitation to other relevant stakeholders. The following stakeholders provided comments during the open consultation and agreed to be listed as contributors in the PCR and on www.environdec.com:

- *List of stakeholder names and affiliation (to be added after the open consultation).*

In case no stakeholders provided comments and agreed to be listed as contributors, the above sentence shall be adjusted accordingly ("No stakeholders provided comments during the open consultation and agreed to be listed as contributors in the PCR and on www.environdec.com.") and the bullet list shall be removed.

In case of multiple major revisions of the PCR (1.0, 2.0, etc.), information about each open consultation should be added as sub-sections (3.2.1, 3.2.2, etc.).

3.2 PCR REVIEW

3.2.1 VERSION 1.0.0

PCR review panel:	The Technical Committee of the International EPD System. A full list of members is available on www.environdec.com. The review panel may be contacted via support@environdec.com. Members of the Technical Committee were requested to state any potential conflict of interest with the PCR Committee, and if there were conflicts of interest they were excused from the review.
Chair of the PCR review:	*To be added by the Secretariat*
Review dates:	*To be added by the Secretariat*

In case of multiple major revisions of the PCR (1.0, 2.0, etc.), information about each review should be added as sub-sections (3.1.1, 3.1.2, etc.).

3.3 EXISTING PCRS FOR THE PRODUCT CATEGORY

As part of the development of this PCR, existing PCRs and other internationally standardised methods that could potentially act as PCRs were considered to avoid unnecessary overlaps in scope and to ensure harmonisation with established methods of relevance for the product category. The existence of such documents was checked among the following EPD programmes and international standardisation bodies:

- International EPD System. www.environdec.com.

- Environment and Development Foundation (EDF). http://pcr-library.edf.org.tw/product_country/taiwan.asp.
- PEP ecopassport®. http://www.pep-ecopassport.org/create-a-pep/produce-a-lca/
- Japan Environmental Management Association for Industry (JEMAI). http://www.ecoleaf-jemai.jp/eng/pcr.html
- UL Environment. https://industries.ul.com/environment/transparency/product-category-rules-pcrs#uledev

No existing PCRs with overlapping scope were identified.

3.4 REASONING FOR DEVELOPMENT OF PCR

This PCR was developed to enable publication of EPDs for the product category defined in Section 2.2.1 based on ISO 14025 and ISO 14040/14044 and ISO (2014), ISO 22400-2, Automation systems and integration — Key performance indicators (KPIs) for manufacturing operations management — Part 2: Definitions and descriptions. The PCR enables different practitioners to generate consistent results when assessing the environmental impact of products of the same product category, and thereby it supports comparability of products within a product category.

3.5 UNDERLYING STUDIES USED FOR PCR DEVELOPMENT

The first version of this PCR was published in 2012. At this point in time Tetra Pak International was responsible for the preparation of the PCR. Later Ecolean took over as PCR moderator and adapted the PCR according to the regulations in ISO 22400-2. Because the PCR was developed a long time ago and several changes have been made since the start, the listed underlying studies are the LCA studies performed by Ecolean according to a previous version of this PCR.

The methodological choices made during the development of this PCR (declared/functional unit, system boundary, allocation methods, impact categories, data quality rules, etc.) were applied to the underlying studies:

- LCA Report Ecolean Machine EPD 170926 (internal report)
  - Add-on LCA Report Ecolean Machine EPD 210831 (internal report)
  - EPD for Ecolean filling machines EL3+, EL4+ and EL6 (Registration number: S-P-01056)
  - EPD for Ecolean filling machines EL1+ and EL2+ (Registration number: S-P-01057)

4 LCA METHOD

This section provides rules for the LCA method used to develop an EPD for the product category as defined in Section 2.2.1. The basic rules of the LCA method are set in Annex A of the GPI, and this section only includes additions, specifications and deviations to the rules set in the GPI. Guidance and examples of applying the LCA method are also available on www.environdec.com/methodology.

4.1 MODELLING APPROACH

See Section A.1 of the GPI.

4.2 FUNCTIONAL UNIT

The Functional Unit (FU) is defined as 1000 filled approved packages (regardless of their format) delivered by the machinery.

This means that for a machine producing 1000 ml packages, the FU equals to 1000 packages, for a machine producing 500 ml packages, the FU equals to 1000 packages.

The functional unit shall be declared in the EPD, including package type and size as used in the defined standard cycle.

The total expected lifetime production of the machine, following the defined standard production cycle, should be used when allocating the upstream impact per functional unit.

4.3 SYSTEM BOUNDARY

The scope of this PCR and EPDs based on it is cradle-to-gate, including the environmental performance from cradle until (and including) the use phase of the machine. In addition, the EPD shall include information on best practices for recycling, dismantling and handling of different machine parts at the end-of-life. A description is provided in Table 1.

EPD INTERNATIONAL EPD SYSTEM

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PRODUCT CATEGORY CLASSIFICATION: UN CPC 43921

Table 1. Description of system boundaries for the PCR in relation to the life cycle stages and modules given in the GPI.

Modules according to PCR	Upstream	Core		Downstream													
Activities	* Extraction and production of materials for spare parts *Extraction and production of main materials *Components manufacturing and assembly	*Components and spare parts transport	* Machine assembly	*Transport to the final user			*Ancillary materials used in process like detergent, lubrication oil, chemicals				*Energy use during filling operation	*Water use during filling operation					
Life cycle stages	Product stage			Distribution/installation stage		Use stage							End-of-Life stage				Beyond product life cycle
	Raw material supply	Transport	Manufacturing	Transport	Distribution/installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse/ recovery/ recycling potential
Life cycle module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules included in scope	X	X	X	X			X				X	X					

NAME OF PRODUCT CATEGORY
PRODUCT CATEGORY CLASSIFICATION: UN CPC XX, YY, ETC.

4.3.1 LIFE-CYCLE STAGES AND INFORMATION MODULES

Because of different data quality rules and the presentation of results, the product life cycle shall be divided into the following life-cycle stages:

- Upstream processes (from cradle-to-gate)
- Core processes (from gate-to-gate)
- Downstream processes (from gate-to-grave)

In the EPD, the environmental performance or information associated with each of the three life cycle stages above shall be reported separately. The processes included in the scope of the PCR and belonging to each life cycle stage are described in Sections 4.3.1.1 to 4.3.1.3

4.3.1.1 Upstream processes

The upstream processes include:

- Extraction and production of raw materials for the production of machine components, including spare parts.
- Intermediate processes to manufacture and assembly machine components and spare parts

Intermediate processes to manufacture and assembly machine components and spare parts can in some cases be included in core processes, if the filling machine producer has internal production of components and spare parts.

Upstream processes not listed may also be included. All elementary flows at resource extraction shall be included, except for the flows that fall under the general cut-off rule in Section 4.5.

4.3.1.2 Core processes

The core process shall include all relevant unit processes that take place within the organisation of the product for which the EPD is issued with particular regard to:

- Transportation of machine components and spare parts to the core process
- Final assembly of machine components at the machine producer (incl. testing)

Core processes not listed here may also be included. All elementary flows at resource extraction shall be included, except for the flows that fall under the general cut-off rule in Section 4.5.

4.3.1.3 Downstream processes

The downstream module shall include the transportation of the machine from final assembly to the final user (an average customer), including transportation packaging.

Furthermore, the downstream module refers to the use phase of the machine including:

- Energy use
- Water use
- Production and use of any ancillary materials in the process such as detergents, chemicals, lubricant oil, etc.

Downstream processes not listed here may also be included. All elementary flows at resource extraction shall be included, except for the flows that fall under the general cut-off rule in Section 4.5.

At the end-of-life filling and packaging machines are dismantled and the treatment of different machine parts varies a lot from country to country and from filler to filler. Due to the high variability of waste treatment options and practices at the machines end-of-life, the processes at the machine end-of-life are excluded from the calculation of environmental performance related indicators. The EPD shall however include information on best practices for recycling, dismantling and handling of different machine parts at the end-of-life.

Section A.3.1 of the GPI outlines rules for how to assign generation of electricity and production of fuels, steam and other energy carriers used, and losses arising, in each information module.

4.3.1.4 Excluded processes

See Section A.3.1.1 of the GPI.

4.3.2 OTHER BOUNDARY SETTING RULES

See Section A.3.2 of the GPI for rules on setting boundaries to nature as well as geographical and temporal boundaries. See Section A.4 of the GPI and Section 4.6 below for rules on setting boundaries to other product systems.

4.4 PROCESS FLOW DIAGRAM

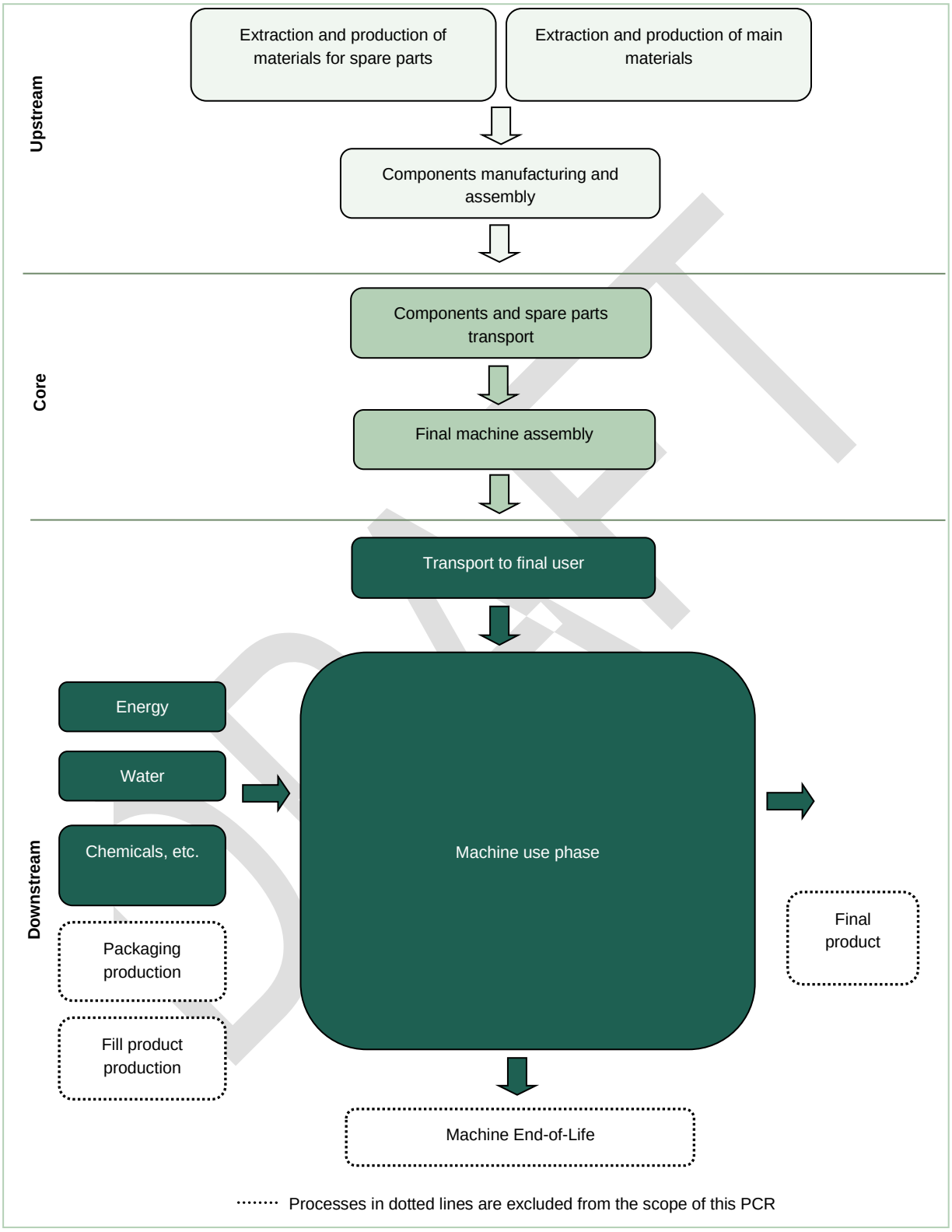

Figure 1. Process flow diagram illustrating the processes that shall be included in the product system, divided into the life-cycle stages. The illustration of processes to include may not be exhaustive.

4.5 CUT-OFF RULES

See Section A.3.3 of the GPI.

Since the product life cycle in this PCR is not divided into the product life cycle-stages A-C and the underlying information modules, the cut-off rule applies per upstream, core and downstream stage.

4.6 ALLOCATION RULES

See Section A.4 of the GPI.

4.6.1 ALLOCATION OF CO-PRODUCTS

See Section A.4.1 of the GPI.

4.6.2 ALLOCATION OF WASTE

See Section A.4.2 of the GPI.

4.7 DATA AND DATA QUALITY RULES

See Section A.5 of the GPI.

See Section 4.8 for further rules related to data and data quality per life-cycle stage.

4.7.1 DATA CATEGORIES

See Section A.5.1 of the GPI.

4.7.2 DATA QUALITY REQUIREMENTS FOR PRIMARY DATA

See Section A.5.2 of the GPI.

4.7.3 DATA QUALITY REQUIREMENTS FOR REPRESENTATIVE SECONDARY DATA

See Section A.5.3 of the GPI.

4.7.4 DATA QUALITY ASSESSMENT AND DECLARATION

See Section A.5.4 of the GPI.

4.8 OTHER LCA RULES

See Section A.6 of the GPI.

For specific LCA rules per life-cycle stage, see Section 4.9.

4.8.1 MASS BALANCE

See Section A.6.1 of the GPI.

4.8.2 ELECTRICITY MODELLING

See Section A.6.2 of the GPI.

4.8.3 BIOGAS MODELLING

See Section A.6.3 of the GPI.

4.9 SPECIFIC RULES PER LIFE-CYCLE STAGE

See Section A.7 of the GPI.

Below are further data quality requirements and other LCA rules per life-cycle stage of relevance for the product category.

4.9.1 UPSTREAM PROCESSES

The upstream processes shall include:

- Extraction and production of raw materials for the production of machine components, including spare parts
- Intermediate processes to manufacture and assembly machine components

The aim of the assessment should be to cover all the components in the machine, including spare parts used during its lifetime. The bill of materials (BOM) or similar information can be used to identify type and weight of components used in the machine. For spare parts, information on planned maintenance over the lifetime of the machine should be used as the basis.

By aggregating the components into material type, the environmental impact can be calculated based on literature data for the production of each material type.

The sum of all components identified and quantified shall add up to at least 95% of the total machine weight, including spare parts. The environmental burden from the “unidentified” 5% shall however be approximated by using proxy data, assuming that the “unidentified” raw material mass is composed of the same material mixture as the rest of the machine, including spare parts.

The underlying LCA shall include a sensitivity analyses, investigating the impact of using such proxy data.

If information is available from previous studies, looking at the upstream processes for machinery of similar design and composition, this information can be used as the basis for the assessment. However, the specific weight of the machinery, and its spare parts, shall be used as the basis for the assessment.

The total expected lifetime production of the machine, following the defined standard production cycle, should be used when allocating the upstream impacts per functional unit.

The following requirements apply to the upstream processes:

- Primary data shall be used for actual product weights, amounts of raw materials used and amounts of waste.
- Representative secondary data should be used for the extraction and production of raw materials used for the production of the equipment under study, including spare parts. Representative secondary data can for example be sourced from commercial or free databases.

4.9.2 CORE PROCESSES

The processes listed below shall be included:

- Transportation of components and spare parts
- Final assembly of machine components at the machine producer

The following requirements apply to the core processes:

For the final machine assembly process, latest available primary data from the machine producer should be collected. Since machine producers often assemble several different types of machines at one location, average production facility data from the relevant production location(s) can be used.

For the electricity used in the core processes, the hierarchy presented in Section A.7.1 of the GPI shall be followed.

The mix of electricity used in core processes shall be documented in the EPD, where relevant.

4.9.3 DOWNSTREAM PROCESSES

The processes listed below shall be included:

- Transportation of the machine from final assembly to an average customer
- Energy use of machine during use phase
- Water use of machine during use phase
- Production of any ancillary materials used in the process such as detergents, chemicals, lubricant oil

For the transportation of the machine from final assembly to an average customer, average data from the machine producer shall be used. The transport distance and transport mode should be representative of the geographic scope of the EPD. Life cycle inventory data for the transportation step itself (for example data for road transport) can be taken from representative secondary data sources.

The impact of food or packaging production shall not be included in the assessment. However, the amount of food and packaging waste generated in the equipment is relevant and should be declared in the EPD for the definition of the standard production cycle.

The data for the downstream module shall be representative of the relevant site/region of the use phase. The EPD shall clearly state the geographic reference and underlying electricity mix used.

Data on the pollutant emissions from the use stage should be based on documented tests, verified studies in conjunction with average or typical product use, or recommendations concerning suitable product use. Whenever applicable, test methods shall be internationally recognised.

STANDARD PRODUCTION CYCLE DEFINITION

The use of water, energy and chemicals by the machine during the use phase shall be calculated based on the standard production cycle definition as described below. The standard production cycle shall be declared in the EPD.

If identified as relevant the EPD can include additional production cycle scenarios.

NAME OF PRODUCT CATEGORY

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DEFINITIONS

The following definitions are used in the description of the standard cycle:

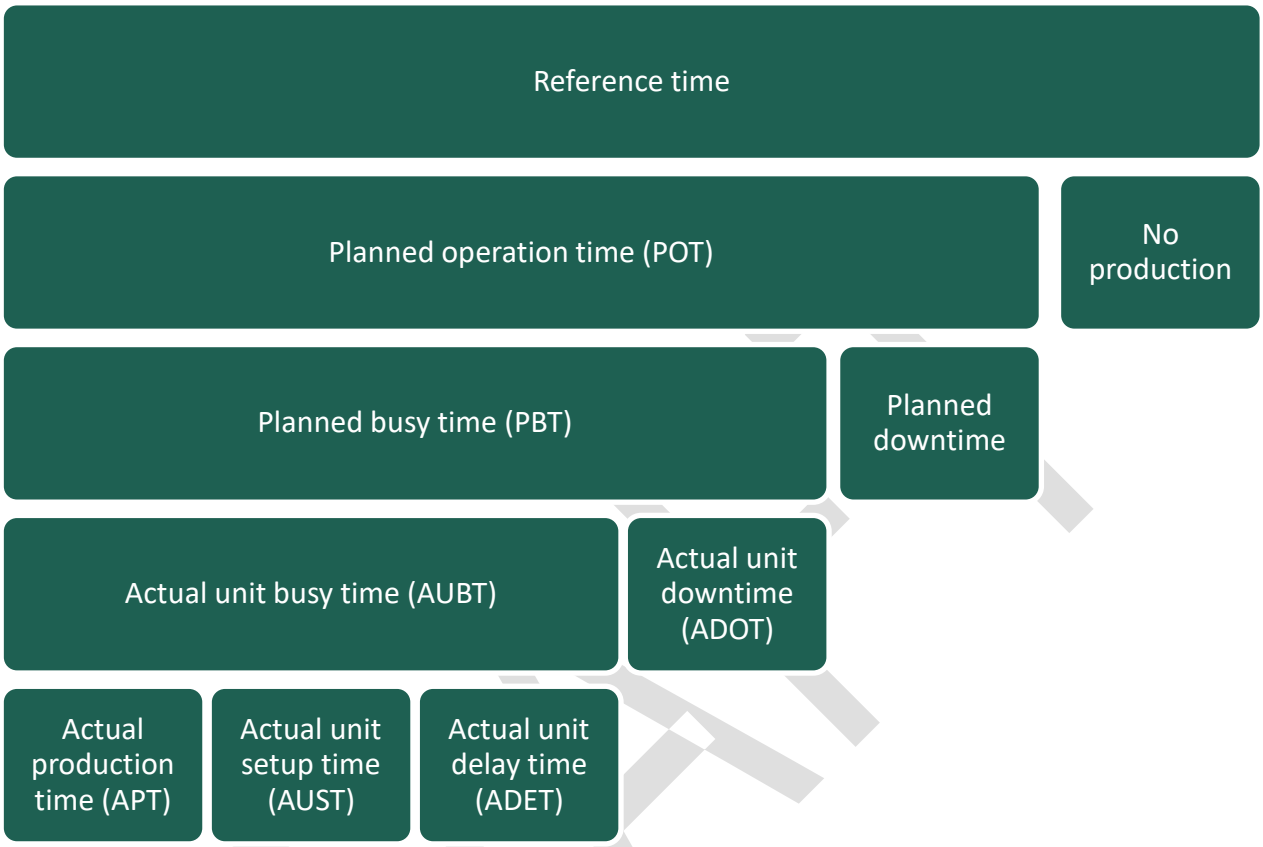

Figure 2 Accumulated time diagram based on the terminology in ISO 22400-2:2014

Definitions of the time elements in Figure 2 are available in the ISO 22400-2:2014.

In addition, the technical efficiency and quality ratio shall be defined in the EPD.

Definitions of technical efficiency and quality ratio are also available in ISO 22400-2:2014.

“Produced quantity” is used in quality ratio and is the number of packages produced during AUBT.

STANDARD SETTINGS

All inputs and outputs to the machine during the use phase need to be calculated for the functional unit. The settings as defined in

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Table 2 shall be declared in the EPD for the standard production cycle.

Table 2 List of parameters to be included in the EPD in order to define the settings for the standard production cycle.

PARAMETER	VALUE	UNIT (EXAMPLE)
Lifetime of the machine		Hours production time
Planned operation time (POT)		Hours per day
Planned downtime	May be excluded	Hours per day
Actual unit downtime (ADOT)		Hours per day
Actual unit busy time (AUBT)		Hours per day
Actual unit delay time (ADET)		Hours per day
Actual unit setup time (AUST)	Includes preparation, change of product, after production (such as daily cleaning) and sterilization (if applicable).	Hours per day
Actual production time (APT)		Hours per day
Technical efficiency	Calculated	%
Quality ratio	Calculated	-

The specific use of energy, water and chemicals shall be considered for the production (APT) and preparation and after production respectively (AUST).

If no specific data on energy and consumables is available for the preparation and after production (AUST), the same input data as in the production phase shall be used as an approximation.

For equipment stop time (i.e. the accumulated time interval from when a stop caused by a failure in the equipment itself) (ADET) it can be assumed that the machine is consuming electricity, water, compressed air etc. as standing still in standby mode.

The impact of planned downtime can be excluded from the assessment, but the consumption of raw materials for spare parts shall be included under upstream processes (see Section Fel! Hittar inte referenskälla.).

Overall result for the use phase:

The overall use of energy, water, and chemicals of the machine during the use phase shall be calculated following:

Total use = ∑Consumables during APT + ADET + AUST

Assumptions regarding package waste during ADET and AUST shall be included in the EPD.

The following requirements apply to the downstream processes:

Ancillary materials (excluding spare parts) entering the machine with a total mass of less than 1% of the total input[5] to the machine during its lifetime (based on standard production cycle settings) can be excluded from the assessment. Ancillary materials not included in the LCA shall be documented in the EPD.

For inputs and outputs to the machine over its lifetime, primary technical data from the machine producer is required. The technical data used shall refer to the considered configuration of the machine and it should be verifiable by providing technical documentation.

[5] Total input means here input of materials excluding fill product and packaging materials as those are excluded from the scope of the PCR.

Representative secondary data could be used to determine the impact of any inputs to the use phase, such as the generation of electricity or production of chemicals. Such data can be sourced from commercial or free databases.

For the electricity used in the downstream processes, electricity production impacts shall be modelled using the electricity consumption mix on the market, except for processes under direct or indirect control of the EPD owner, for which the hierarchy of Section A.7.1 in GPI 5 shall be followed.

The data for the downstream module shall be representative of the relevant site/region of the use phase. The EPD shall clearly state the geographic reference and underlying electricity mix used.

RECONDITIONING AND END-OF-LIFE

Recommendations for separation and recycling shall be given, as well as recommendations for other waste treatment of product parts if relevant.

If information about the waste treatment procedure for a specific filling or packaging machine is available, the end-of-life treatment can be included in the calculation of the environmental performance related information.

4.10 ENVIRONMENTAL PERFORMANCE INDICATORS

See Section A.8 of the GPI.

4.11 SPECIFIC RULES PER EPD TYPE

4.11.1 MULTIPLE PRODUCTS FROM THE SAME COMPANY

See Section A.9.1 of the GPI.

4.11.2 SECTOR EPD

See Section A.9.2 of the GPI.

4.11.3 EPD OWNED BY A TRADER

See Section A.9.3 of the GPI.

4.11.4 EPD OF PRODUCT NOT YET ON THE MARKET

See Section A.9.4 of the GPI.

4.11.5 EPD OF PRODUCT RECENTLY ON THE MARKET

See Section A.9.5 of the GPI.

5 CONTENT OF LCA REPORT

Data for verification shall be presented in the form of an LCA report – a systematic and comprehensive summary of the project documentation that supports the verification of an EPD. The LCA report is not part of the public communication.

See Section 8.3.1 of the GPI for rules on the content of the LCA report.

Note that there may be rules on the content of the LCA report elsewhere in the GPI or in this PCR.

6 CONTENT AND FORMAT OF EPD

See Section 7 of the GPI.

6.1 EPD LANGUAGES

See Section 7.1 of the GPI.

6.2 UNITS AND QUANTITIES

See Section 7.2 of the GPI.

6.3 USE OF IMAGES IN EPD

See Section 7.3 of the GPI.

6.4 SECTIONS OF THE EPD

See Section 7.4 of the GPI.

6.4.1 COVER PAGE

See Section 7.4.1 of the GPI.

6.4.2 GENERAL INFORMATION

See Section 7.4.2 of the GPI.

6.4.3 INFORMATION ABOUT EPD OWNER

See Section 7.4.3 of the GPI.

6.4.4 PRODUCT INFORMATION

See Section 7.4.4 of the GPI.

The following information shall in addition be included in the product information section of the EPD:

- Description of the machine, including but not limited to:
  - Packaging information: type(s), shape(s) and size(s) handled by the machine
  - Relevant distribution system: chilled or ambient
  - Size and dimensions: Length, width, height

- Weight of the machine (excluding spare parts)

- Description of the machine performance, including but not limited to:
  - Capacity: on time base (e.g. type and number of product units/hour)
  - Utilities (production phase): Electric power (kW), compressed air (litres/minute), water supply (litres/minute), steam (kg/hour), hydrogen peroxide (litres/hour), lubricants (litres/hour), etc
  - Quality ratio: Defined in Section Fel! Hittar inte referenskälla.
  - Spare parts (weight)
- Specification of electricity mix used for the downstream processes
- Define the Standard production cycle

6.4.5 CONTENT DECLARATION

See Section 7.4.5 of the GPI.

6.4.6 LCA INFORMATION

See Section 7.4.6 of the GPI.

6.4.7 ENVIRONMENTAL PERFORMANCE

See Section 7.4.7 of the GPI.

The EPD shall declare the environmental performance indicators listed or referred to in Section 4.10, per functional unit, per life cycle stage upstream, core and downstream.

6.4.8 ADDITIONAL ENVIRONMENTAL INFORMATION

See Section 7.4.8 of the GPI.

The following additional environmental information shall be reported in the EPD:

- The amount of food and packaging waste generated in the equipment during the defined standard cycle. This waste shall not be included in the environmental impact assessment since the impact of this waste depends on many parameters and is highly variable[6]
- Information about which parts or materials of the machine are suitable for certain waste treatment options.

Other environmental information relevant for the machine can be added.

6.4.9 ADDITIONAL SOCIAL AND ECONOMIC INFORMATION

See Section 7.4.9 of the GPI.

6.4.10 INFORMATION RELATED TO SECTOR EPDS

See Section 7.4.10 of the GPI.

[6] The impact of product waste depends for example on the type of fill product and on the type of packaging material worked by the machine. It is recommended that fillers use the “no. of wasted packages” to calculate the impact from production of this waste for their specific packages and fill product.

NAME OF PRODUCT CATEGORY
PRODUCT CATEGORY CLASSIFICATION: UN CPC XX, YY, ETC.

6.4.11 VERSION HISTORY

See Section 7.4.11 of the GPI.

6.4.12 ABBREVIATIONS

See Section 7.4.12 of the GPI.

6.4.13 REFERENCES

See Section 7.4.13 of the GPI.

7 LIST OF ABBREVIATIONS

CPC	Central product classification
EPD	Environmental product declaration
GPI	General Programme Instructions
ISO	International Organization for Standardization
LCA	Life cycle assessment
PCR	Product category rules
RSL	Reference service life
UN	United Nations

8 REFERENCES

Add-on LCA Report Ecolean Machine EPD 210831 (internal report)

CEN (2021) EN 15804:2012+A2:2019/AC:2021, Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products.

EPD International (2024) General Programme Instructions for the International EPD System. Version 5.0.1, dated 2025-04-07. Available on www.environdec.com.

EPD for Ecolean filling machines EL3+, EL4+ and EL6 (Registration number: S-P-01056)

EPD for Ecolean filling machines EL1+ and EL2+ (Registration number: S-P-01057)

ISO (2006a) ISO 14025:2006, Environmental labels and declarations – Type III environmental declarations – Principles and procedures.

ISO (2006b) ISO 14040:2006, Environmental management – Life cycle assessment – Principles and framework.

ISO (2006c) ISO 14044: 2006, Environmental management – Life cycle assessment – Requirements and guidelines.

ISO (2015a) ISO 14001:2015, Environmental management systems – Requirements with guidance for use.

ISO (2015b) ISO 9001:2015, Quality management systems – Requirements.

ISO (2017) ISO 21930:2017, Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services.

ISO (2014), ISO 22400-2, Automation systems and integration — Key performance indicators (KPIs) for manufacturing operations management — Part 2: Definitions and descriptions

LCA Report Ecolean Machine EPD 170926 (internal report)

9 VERSION HISTORY OF PCR

VERSION 1.0 2012-12-10

Original version

VERSION 1.1 2015-02-09

- Compliance with General Programme Instructions v2.01:
  - Introduction
  - General information
  - Content of the EPD
  - Validity of the EPD
  - Environmental indicators
- Editorial changes

VERSION 2.0, 2020-05-18

- Compliance with General Programme Instructions v3.01
- Update of functional unit
- Update of system boundaries (e.g., the classification into upstream, core, and downstream processes)
- Update of standard cycle definitions to be in line with ISO 22400-2:2014

VERSION 2.01, 2020-08-31

- Editorial changes

VERSION 2.02, 2020-09-04

- Editorial changes

VERSION 2.0.3, 2024-05-10

- Extended validity for one year because of the initiation of an updating process.
- Change of PCR Moderator.

VERSION 3.0.0, 2025-XX-XX

- Compliance with General Programme Instructions v. 5.0.1
- “Final machine transport” was rephrased to “Transport to final user” and moved from core to downstream to align with the cradle to gate description
- Inserted into new PCR template
- Change of PCR Moderator
- Editorial changes

ANNEX A: EXAMPLE ELECTRICITY CONSUMPTION

In this annex, an example is provided showing how to calculate the amount of electricity used per functional unit, for a defined standard production cycle. This example is based on Tetra Pak's filling machine 'A3 Flex'.

PARAMETER	VALUE	UNIT (EXAMPLE)
Lifetime of the machine	30000	Hours production time
Planned operation time (POT)	24	Hours per day
Planned downtime	May be excluded	Hours per day
Actual unit downtime (ADOT)	0 Comment: Work unit is assumed to only execute order production	Hours per day
Actual unit busy time (AUBT)	1.3	Hours per day
Actual unit setup time (AUST)	Includes preparation, change of product, after production (such as daily cleaning). Preparation time: 0.65 After production time: 1	Hours per day
Actual production time (APT)	21	Hours per day
Technical efficiency	94 Comment: Calculated	%
Quality ratio	0.994 Comment: Calculated	-
Capacity	8000 Comment: Based on technical data	Packages per hour

To calculate the electricity consumption for the A3 Flex per functional unit, the information in the table above is needed, in addition to technical data regarding the performance of the filling machine:

Capacity: 8000 1-litre packages per hour

Electricity consumption production phase: 32 kWh per hour

Electricity consumption per functional unit:

Production phase:

21 hours/production cycle * 32 kWh/h = 670 kWh/production cycle

AUST:

(0.65+1) hours/production cycle * 32 kWh/hour = 53 kWh/production cycle

Comment: As stated in the PCR: 'If no specific data on energy and consumables is available for the preparation, after production or extended cleaning, the same input data as in the production phase shall be used as an approximation.' Here the electricity use is identical to the production phase.

NAME OF PRODUCT CATEGORY

PRODUCT CATEGORY CLASSIFICATION: UN CPC XX, YY, ETC.

ADET:

1.3 hours/production cycle * 0.5 * 32 kWh/hour = 21 kWh/production cycle

Comment: As stated in the PCR: 'For equipment stop time and other stop time it can be assumed that the machine during half of the time is consuming electricity, water, compressed air etc. as under normal production conditions, and for the rest of the time the machine is standing still in standby or off mode.'

Functional unit (FU): 1000 1-litre packages

Packages filled during the production cycle:

8000 packages/hour * 21 hours/production cycle = 168000 packages/production cycle

Electricity consumption per functional unit:

(670+53+21) kWh/production cycle / 168000 packages/production cycle = 4.4 kWh / 1000 packages = 4.4 kWh / FU.