MACHINES FOR FILLING AND PACKAGING OF LIQUID FOOD

PRODUCT CATEGORY CLASSIFICATION: UN CPC 43921

PCR 2012:18
VERSION 2.0.4

VALID UNTIL: 2025-11-13

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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 type III environmental declarations[1] according to ISO 14025:2006. Environmental Product Declarations (EPD) are voluntary documents for a company or organisation to present transparent information about the life cycle environmental impact for their goods or services.

The rules for the overall administration and operation of the programme are the General Programme Instructions, publically available at www.environdec.com. A PCR complements the General Programme Instructions and the standards by providing specific rules, requirements and guidelines for developing an EPD for one or more specific product categories (see Figure 1). A PCR should enable different practitioners using the PCR to generate consistent results when assessing products of the same product category.

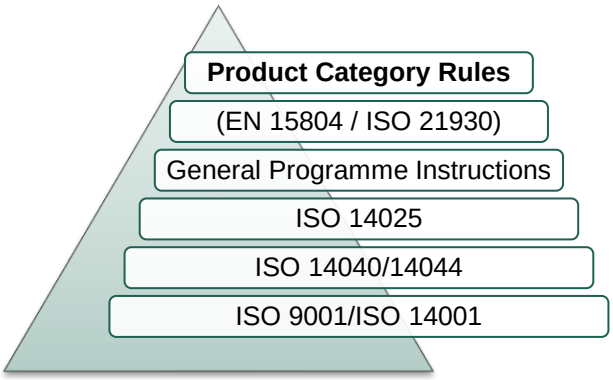

Figure 1 Illustration PCR in relation to the hierarchy of standards and other documents.

Within the present PCR, the following terminology is adopted:

- The term “shall” is used to indicate what is obligatory.
- The term “should” is used to indicate a recommendation, rather than a requirement.
- The term “may” or “can” is used to indicate an option that is permissible

For the definition of terms used in the document, see the normative standards.

A PCR is valid for a pre-determined period of time to ensure that it is updated at regular intervals. The latest version of the PCR is available via www.environdec.com. Stakeholder feedback on PCRs is very much encouraged. Any comments on this PCR document may be given via the PCR Forum at www.environdec.com or sent directly to the PCR moderator during its development or during the period of validity.

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

The programme operator maintains the copyright of the document to ensure that it is possible to publish, update when necessary, and 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] Type III environmental declarations in the International EPD® System are referred to as EPD, Environmental Product Declarations.

2 GENERAL INFORMATION

2.1 ADMINISTRATIVE INFORMATION

Name:	Machines for filling and packaging of liquid food
Registration number and version:	PCR 2012:18, Version 2.0.4
Programme:	The International EPD® System
Programme operator:	EPD International AB, Box 210 60, SE-100 31 Stockholm, Sweden. Website: www.environdec.com E-mail: info@environdec.com
PCR moderator:	Maria Ahlström, Ecolean, maria.ahlstrom@ecolean.se
PCR Committee:	Ecolean
Date of publication and last revision:	2025-01-22 Version 1.0 was published 2012-12-10. See Section 8 for a version history.
Valid until:	2025-11-13
Schedule for renewal:	A PCR is valid for a pre-determined period of time 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 how to proceed with updating the document and renewing its validity. A PCR document may be revised during its period of validity provided significant and well-justified proposals for changes or amendments are presented. See www.environdec.com for up-to-date information and the latest version.
Standards conformance:	▪ General Programme Instructions of the International EPD® System, version 3.0, based on ISO 14025 and ISO 14040/14044
PCR language(s):	This PCR was developed and is available in English. 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 http://unstats.un.org/unsd/cr/registry/regcs.asp?Cl=25&Lg=1&Co=43921.

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[2]:

- 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.

2.2.2 GEOGRAPHICAL REGION

This PCR is applicable to 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 based on this PCR shall be valid from its registration and publication at www.environdec.com and for a five-year period starting from the date of the verification report ("approval date"), or until the EPD has been de-registered from the International EPD® System.

An EPD shall be updated and re-verified during its validity if changes in technology or other circumstances have led to:

- an increase of 10% or more of any of the default indicators on www.environdec.com/impact-categories,
- errors in the declared information, or
- significant changes to the declared product information, content declaration, or additional environmental information.

If such changes have occurred, but the EPD is not updated, the EPD owner shall contact the Secretariat to de-register the EPD.

[2] 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.

3 PCR REVIEW AND BACKGROUND INFORMATION

This PCR was developed in accordance with the process described in the General Programme Instructions of the International EPD® System, including PCR review and open consultation.

3.1 PCR REVIEW

3.1.1 VERSION 1.0

Version 1.0 was reviewed by the Technical Committee of the Technical Committee of the International EPD® System.

3.1.2 VERSION 2.0

PCR review panel:	The Technical Committee of the International EPD® System. A full list of members available on www.environdec.com. The review panel may be contacted via info@environdec.com. Members of the Technical Committee were requested to state any potential conflict of interest with the PCR moderator or PCR committee, and were excused from the review.
Chair of the PCR review:	Adriana del Borghi
Review dates:	2019-01-31 until 2019-03-25

3.2 OPEN CONSULTATION

3.2.1 VERSION 1.0

Version 1.x was available for open consultation from 2011-12-27 until 2012-02-15 (Version 1.0) and 2015-01-23 until 2015-02-08 (Version 1.1).

3.2.2 VERSION 2.0

This PCR was available for open consultation from 2018-09-05 until 2018-11-05, during which any stakeholder was able to provide comments by posting on the PCR forum on www.environdec.com or by contacting the PCR moderator.

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. No stakeholders that provided comments during the open consultation agreed to be listed as contributors to the PCR and at www.environdec.com.

3.3 EXISTING PCRS FOR THE PRODUCT CATEGORY

As part of the development of this PCR, existing PCRs were considered in order to avoid overlaps in scope. The existence of such documents was checked in the public PCR listings of the following programmes based on ISO 14025 or similar:

- 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 in order to enable publication of Environmental Product Declarations (EPD) for this product category based on ISO 14025, ISO 14040/14044 and other relevant standards to be used in different applications and target audiences.

4 GOAL AND SCOPE, LIFE CYCLE INVENTORY AND LIFE CYCLE IMPACT ASSESSMENT

The goal of this section is to provide specific rules, requirements and guidelines for developing an EPD for the product category as defined in Section 2.2.1.

4.1 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.

4.2 REFERENCE SERVICE LIFE (RSL)

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.

4.3.1 LIFE CYCLE STAGES

For the purpose of different data quality rules and for the presentation of results, the life cycle of products is divided into three different 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 (including testing)
- Transportation of the machine from final assembly to an average customer, including transport packaging.

4.3.1.3. Downstream processes

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.

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.

4.3.2 OTHER BOUNDARY SETTING

4.3.2.1. Boundary towards nature

Boundaries to nature are defined as flows of material and energy resources from nature into the system. Emissions to air, water and soil cross the system boundary when they are emitted from or leaving the product system.

4.3.2.2. Time boundaries

The data shall be representative of the year/time frame for which the EPD is valid.

4.3.2.3. Boundaries in the life cycle

See Section 3.3.1 The EPD may present the information divided into additional sub-divisions.

4.3.2.4. Boundaries towards other technical systems

See Section 3.6.2.

4.4 SYSTEM DIAGRAM

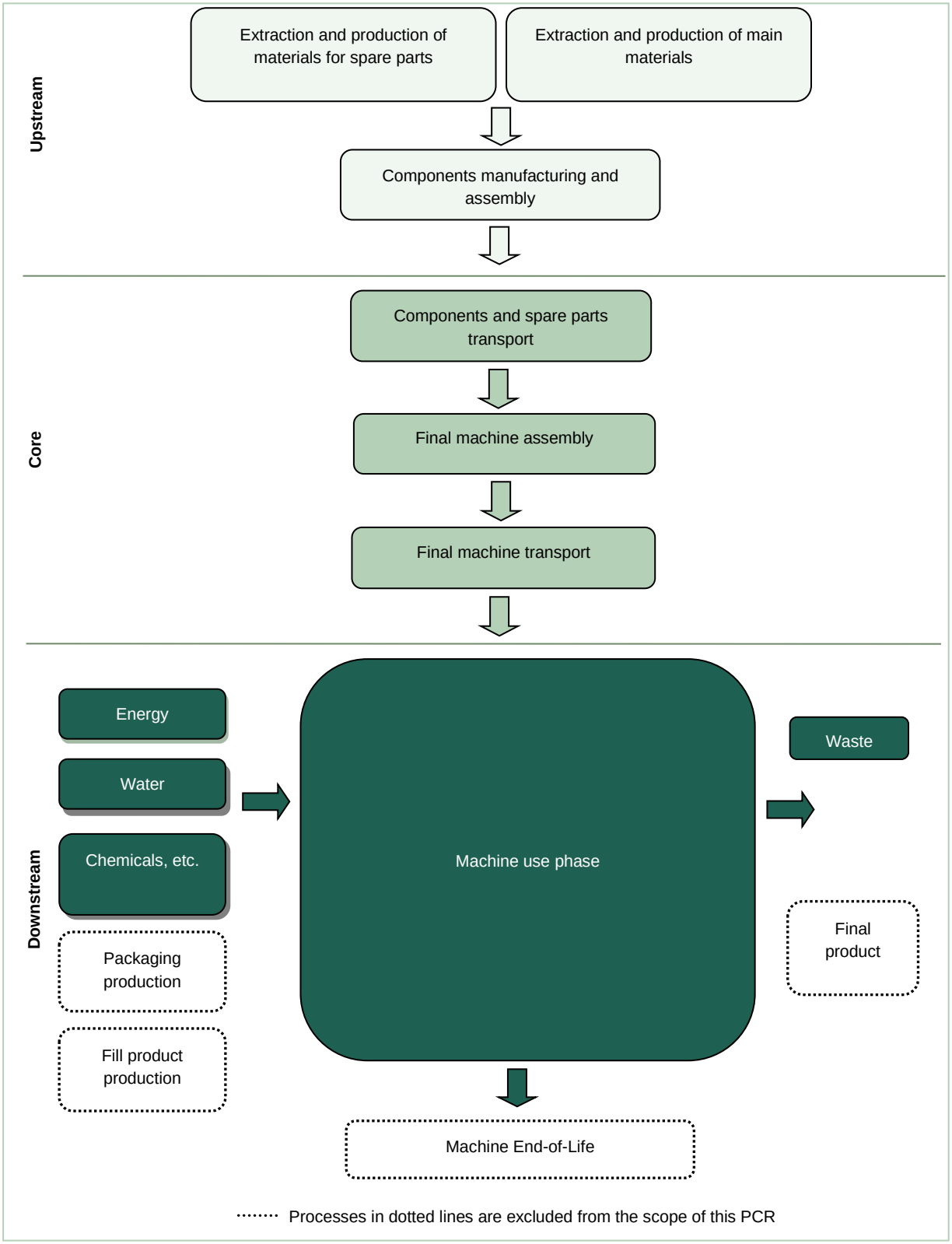

Figure 2 System diagram illustrating the processes that are included in the product system, divided into upstream, core and downstream processes.

4.5 CUT-OFF RULES

Data for elementary flows to and from the product system contributing to a minimum of 99% of the declared environmental impacts shall be included (not including processes that are explicitly outside the system boundary as described in Section 4.3).

The check for cut-off rules in a satisfactory way is through the combination of expert judgment based on experience of similar product systems and a sensitivity analysis in which it is possible to understand how the un-investigated input or output could affect the final results.

4.6 ALLOCATION RULES

4.6.1 CO-PRODUCT ALLOCATION

The following step-wise procedure shall be applied for multifunctional products and multiproduct processes:

1. Allocation shall be avoided, if possible, by dividing the unit process into two or more sub-processes and collecting the environmental data related to these sub-processes.
2. If allocation cannot be avoided, the inputs and outputs of the system shall be partitioned between its different products or functions in a way that reflects the underlying physical relationships between them; i.e. they should reflect the way in which the inputs and outputs are changed by quantitative changes in the products or functions delivered by the system.

4.6.2 REUSE, RECYCLING, AND RECOVERY

In the framework of the International EPD® System, the methodological choices for allocation for reuse, recycling and recovery have been set according to the polluter pays principle (PPP). This means that the generator of the waste shall carry the full environmental impact until the point in the product's life cycle at which the waste is transported to a scrapyard or the gate of a waste processing plant (collection site). The subsequent user of the waste shall carry the environmental impact from the processing and refinement of the waste but not the environmental impact caused in the "earlier" life cycles. So, if there is an inflow of recycled material to the production system, the recycling process and the transportation from the recycling process to where the material is used shall be included.

See General Programme Instruction for further information and examples.

4.7 DATA QUALITY REQUIREMENTS

An LCA calculation requires two different kinds of information:

- data related to the **environmental aspects** of the considered system (such materials or energy flows that enter the production system). These data usually come from the company that is performing the LCA calculation.
- data related to the **life cycle impacts** of the material or energy flows that enter the production system. These data usually come from databases.

Data on environmental aspects shall be as specific as possible and shall be representative of the studied process.

Data on the life cycle of materials or energy inputs are classified into three categories – specific data, selected generic data, and proxy data, defined as follows:

- **specific data** (also referred to as "primary data" or "site-specific data") – data gathered from the actual manufacturing plant where product-specific processes are carried out, and data from other parts of the life cycle traced to the specific product system under study, e.g. materials or electricity provided by a contracted supplier that is able to provide data for the actual delivered services, transportation that takes place based on actual fuel consumption, and related emissions, etc.,
- **generic data** (sometimes referred to as "secondary data"), divided into**:**
  - **selected generic data** – data from commonly available data sources (e.g. commercial databases and free databases) that fulfil prescribed data quality characteristics for precision, completeness, and,
  - **proxy data** – data from commonly available data sources (e.g. commercial databases and free databases) that do not fulfil all of the data quality characteristics of "selected generic data".

As a general rule, specific data shall always be used, if available, after performing a data quality assessment. Requirements on data quality are further described in Section 4.9.1 for upstream processes, Section 4.9.2 for core processes and Section 4.9.3 for downstream processes.

Any data used should preferably represent average values for a specific reference year. However, the way these data are generated could vary, e.g. over time, and in such cases, they should have the form of a representative annual average value for a specified reference period. Such deviations should be declared.

4.7.1 RULES FOR USING GENERIC DATA

The attributional LCA approach in the International EPD® System forms the basic prerequisites for selecting generic data. To allow the classification of generic data as "selected generic data", they shall fulfil selected prescribed characteristics for precision, completeness, and representativeness (temporal, geographical, and technological), such as:

- the reference year must be as current as possible and preferably assessed to be representative for at least the validity period of the EPD,
- the cut-off criteria to be met on the level of the modelled product system are the qualitative coverage of at least 99% of energy, mass, and overall environmental relevance of the flows,
- completeness in which the inventory data set should, in principle, cover all elementary flows that contribute to a relevant degree of the impact categories, and
- the representativeness of the resulting inventory in the given temporal, technological, and geographical reference should, as a general principle, be better than ±5% of the environmental impact of fully representative data.

4.8 IMPACT CATEGORIES AND IMPACT ASSESSMENT

The EPD shall declare the default impact categories as described in the General Programme Instructions. The characterisation models and factors to use for the default impact categories are available on www.environdec.com/impact-categories and shall be updated on a regular basis based on the latest developments in LCA methodology and ensuring the market stability of EPDs. The source and version of the characterisation models and the factors used shall be reported in the EPD. Alternative regional life cycle impact assessment methods and characterisation factors are allowed to be calculated and displayed in addition to the default list. If so, the EPD shall contain an explanation of the difference between the different sets of indicators, as they may appear to the reader to display duplicate information.

4.9 OTHER CALCULATION RULES AND SCENARIOS

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 life time 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[3].

[3] For example, if 95% of the machine weight is composed of 50% steel and 50% aluminum, the "unidentified" mass (5%) shall be assumed to be 50% steel and 50% aluminum.

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:

Specific data shall be used for actual product weights, amounts of raw materials used and amounts of waste.

Generic data should be used for the extraction and production of raw materials used for the production of the equipment under study, including spare parts. Generic 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
- Transportation of the machine from final assembly to an average customer.

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 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 generic data sources.

For the electricity used in the core processes, electricity production impacts shall be accounted for in this priority when specific data are used in the core processes:

1. Specific electricity mix as generated, or purchased, from an electricity supplier, demonstrated by a Guarantee of Origin (or similar, where reliability, traceability, and the avoidance of double-counting are ensured) as provided by the electricity supplier. If no specific mix is purchased, the residual electricity mix from the electricity supplier shall be used.[4]
2. National residual electricity mix or residual electricity mix on the market
3. National electricity production mix or electricity mix on the market.

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:

- 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

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.

[4] The residual electricity mix is the mix when all contract-specific electricity that has been sold to other customers has been subtracted from the total production mix of the electricity supplier.

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.

DEFINITIONS

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

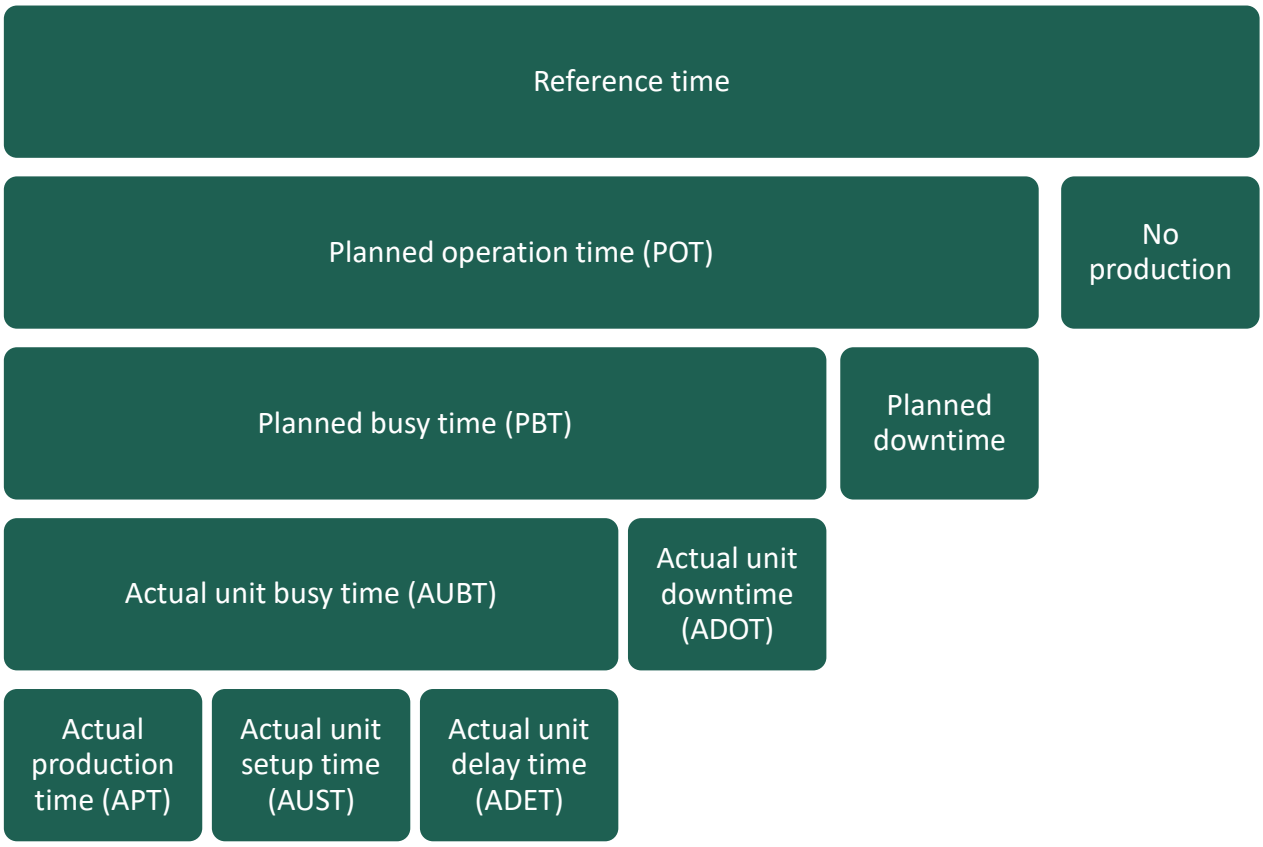

Figure 3 *Accumulated time diagram based on the terminology in ISO 22400-2:2014*

Definitions of the time elements in Figure *3* 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 Table 1 shall be declared in the EPD for the standard production cycle.

Table 1 *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 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.

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 4.3.1.1).

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.

Generic 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 accounted for using national electricity production mix or electricity mix on the market.

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.

5 CONTENT AND FORMAT OF EPD

EPDs based on this PCR shall contain the information described in this section. Flexibility is allowed in the formatting and layout provided that the EPD still includes the prescribed information. A generic template for EPDs is available via www.environde.com.

As a general rule the EPD content:

- shall be in line with the requirements and guidelines in ISO 14020 (Environmental labels and declarations - General principles),
- shall be verifiable, accurate, relevant and not misleading, and
- shall not include rating, judgements or direct comparison with other products.

An EPD should be made with a reasonable number of pages for the intended audience and use.

5.1 EPD LANGUAGES

EPDs should be published in English, but may also be published in additional languages. If the EPD is not available in English, it shall contain an executive summary in English including the main content of the EPD. This summary is part of the EPD and thus subject to the same verification procedure.

5.2 UNITS AND QUANTITIES

The following requirements apply for units and quantities:

- The International System of Units (SI units) shall be used, e.g., kilograms (kg), Joules (J) and metres (m). Reasonable multiples of SI units may be decided in the PCR to improve readability, e.g., grams (g) or megajoules (MJ). The following exceptions apply:
  - Resources used for energy input (primary energy) should be expressed as kilowatt-hours (kWh) or megajoules (MJ), including renewable energy sources, e.g., hydropower, wind power and geothermal power.
  - Water use should be expressed in cubic metres (m^3)
  - Temperature should be expressed in degrees Celsius (°C),
  - Time should be expressed in the units most practical, e.g., seconds, minutes, hours, days or years.
- Three significant figures[6] should be adopted for all results, The number of significant digits shall be appropriate and consistent.
- The thousand separator and decimal mark in the EPD shall follow one of the following styles (a number with six significant figures shown for illustration):
  - SI style (French version): 1 234,56
  - SI style (English version): 1 234.56

  In case of potential confusion or intended use of the EPD in markets where different symbols are used, the EPD shall state what symbols are used for thousand separator and decimal mark.
- Dates and times presented in the EPD should follow the format in ISO 8601. For years, the prescribed format is YYYY-MM-DD, e.g., 2017-03-26 for March 26th, 2017.
- The result tables shall:
  - Only contain values or the letters “INA” (Indicator Not Assessed). It is not possible to specify INA for mandatory indicators. INA shall only be used for voluntary parameters that are not quantified because no data is available.[7]
  - Contain no blank cells, hyphens, less than or greater than signs or letters (except “INA”).

[6] Significant figures are those digits that carry meaning contributing to its precision. For example with two significant digits, the result of 123.45 shall be displayed as 120, and 0.12345 shall be displayed as 0.12. In scientific notation, these two examples would be displayed as $1.2*10^2$ and $1.2*10^{-2}$.

[7] This requirement does not intend to give guidance on what indicators are mandated (“shall”) or voluntary.

- Use the value 0 only for parameters that have been calculated to be zero.
- Footnotes shall be used to explain any limitation to the result value.

5.3 USE OF IMAGES IN EPD

Images used in the EPD, especially pictures featured on the cover page, may in themselves be interpreted as an environmental claim. Images such as trees, mountains, wildlife that are not related to the declared product should therefore be used with caution and in compliance with national legislation and best available practices in the markets in which the EPD is intended to be used.

5.4 EPD REPORTING FORMAT

The reporting format of the EPD shall include the following sections:

- Cover page (see Section 5.4.1)
- Programme information (see Section 5.4.2)
- Product information (see Section 5.4.3)
- Content declaration (see Section 5.4.4)
- Environmental performance (see Section 5.4.5)
- Additional environmental information (see Section 5.4.6)
- References (see Section 5.4.9)

The following information shall be included, when applicable:

- Information related to Sector EPDs (see Section 5.4.7)
- Differences versus previous versions (see Section 5.4.8)
- Executive summary in English (see Section 5.4.10)

5.4.1 COVER PAGE

The cover page shall include:

- Product name and image,
- Name and logotype of EPD owner,
- The text “Environmental Product Declaration” and/or “EPD”
- *Programme: The International EPD® System, www.environdec.com,*
- *Programme operator: EPD International AB*
- Logotype of the International EPD® System,
- EPD registration number as issued by the programme operator[8],
- *Date of publication (issue): 20XX-YY-ZZ,*
- *Date of revision: 20XX-YY-ZZ*, when applicable,
- *Date of validity; 20XX-YY-ZZ*
- A note that “*An EPD should provide current information, and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com.*

[8] The EPD shall not include a “registration number” if such is provided by the certification body, as this may be confused with the registration number issued by the programme operator.

- A statement of conformity with ISO 14025,

5.4.2 PROGRAMME INFORMATION

The programme information section of the EPD shall include:

- Address of programme operator: *EPD International AB, Box 210 60, SE-100 31 Stockholm, Sweden, E-mail: info@environdec.com*
- The following mandatory statement from ISO 14025: "*EPDs within the same product category but from different programmes may not be comparable*."
- A statement that the EPD owner has the sole ownership, liability and responsibility of the EPD
- Information about verification[9] and reference PCR in a table with the following format and contents:

Product category rules (PCR): *<name, registration number, version and UN CPC code(s)>*
PCR review was conducted by: *<name and organisation of the review chair, and information on how to contact the chair through the programme operator>*
Independent third-party verification of the declaration and data, according to ISO 14025:2006: ☐ EPD process certification ☐ EPD verification
Third party verifier: *<name, organisation and signature of the third party verifier>* *In case of certification bodies:* Accredited by: *<name of the accreditation body and accreditation number, if applicable>.* *In case of individual verifiers:* Approved by: The International EPD® System Technical Committee, supported by the Secretariat
Procedure for follow-up of data during EPD validity involves third party verifier: ☐ Yes ☐ No

5.4.3 PRODUCT INFORMATION

The product information section of the EPD shall include:

- Address and contact information to EPD owner,
- Description of the organisation. This may include information on products- or management system-related certifications (e.g. ISO 14024 Type I environmental labels, ISO 9001- and 14001-certificates and EMAS-registrations) and other relevant work the organisation wants to communicate (e.g. SA 8000, supply-chain management and social responsibility),
- Name and location of production site,
- Product identification by name, and an unambiguous identification of the product by standards, concessions or other means,
- Identification of the product according to the UN CPC scheme system. Other relevant codes for product classification may also be included, e.g.
  - Common Procurement Vocabulary (CPV),
  - United Nations Standard Products and Services Code® (UNSPSC),

[9] If the EPD has been verified by an approved individual verifier who has received contractual assistance from a certification body that is not accredited, this certification body shall not be included in this table.

- Classification of Products by Activity (NACE/CPA) or
- Australian and New Zealand Standard Industrial Classification (ANZSIC),

- 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 4.9.3
  - Spare parts (weight)
- Geographical scope of the EPD, i.e., for which geographical location(s) of use and end-of-life the product's performance has been calculated
- Production mix of electricity for the DownstreamModule
- Functional unit, including package type and size as used in the defined standard cycle
- Reference service life (RSL), if applicable,
- Standard production cycle,
- Declaration of the year(s) covered by the data used for the LCA calculation and other relevant reference years,
- Reference to the main database(s) for generic data and LCA software used, if relevant,
- System diagram of the processes included in the LCA, divided into the life cycle stages,
- Description if the EPD system boundary is "cradle-to-gate", "cradle-to-gate with options" or "cradle-to-grave",
- Information on which life cycle stages are not considered (if any), with a justification of the omission,
- Relevant websites for more information or explanatory materials.

This section may also include:

- Name and contact information of organisation carrying out the underlying LCA study,
- Additional information about the underlying LCA-based information, such as assumptions, cut-off rules, data quality and allocation.

5.4.4 CONTENT DECLARATION

The content declaration shall have the form of a list of materials and chemical substances including information on their environmental and hazardous properties. The gross weight of material shall be declared in the EPD at a minimum of 99 % of one unit of product.

Information on the hazardous properties of materials and chemical substances should follow the requirements given in the latest revision of the Globally Harmonized System of Classification and Labelling of Chemicals (GHS)[10], issued by United Nations or national or regional applications of the GHS.

As an example, the following regulations should be used for EPDs intended to be used in the European Union:

[10] The GHS document is available on www.unece.org.

- 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

5.4.4.1. Information about recycled materials

When a product is made in whole or in part with recycled materials, the provenience of the materials (pre-consumer or post-consumer) shall be presented in the EPD as part of the content declaration.

To avoid any misunderstanding about which material may be considered “recycled material”, the guidance given in ISO 14021 shall be taken into account. In brief, the standard states that:

- only pre-consumer or post-consumer materials (scraps) shall be considered in the accounting of the recycled materials, and
- materials coming from scrap reutilisation (such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it) shall not be considered as recycled content.

5.4.5 ENVIRONMENTAL PERFORMANCE

5.4.5.1. Environmental impacts

The EPD shall declare the environmental impact indicators, per functional unit and per life cycle stage, using the default impact categories, characterisation models and factors available on www.environdec.com/impact-categories. The source and version of the characterisation models and the factors used shall be reported in the EPD. Alternative regional life cycle impact assessment methods and characterisation factors are allowed to be calculated and displayed in addition to the default list. If so, the EPD shall contain an explanation of the difference between the different sets of indicators, as they may appear to the reader to display duplicate information.

5.4.5.2. Use of resources

The indicators for resource use based on the life cycle inventory (LCI) listed in Table 2 shall be declared per functional unit, and per life cycle stage.

PARAMETER		UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Primary energy resources – Renewable	Use as energy carrier	MJ, net calorific value				
	Used as raw materials	MJ, net calorific value				
	TOTAL	MJ, net calorific value				
Primary energy resources – Non-renewable	Use as energy carrier	MJ, net calorific value				
	Used as raw materials	MJ, net calorific value				
	TOTAL	MJ, net calorific value				
Secondary material		kg				
Renewable secondary fuels		MJ, net calorific value				
Non-renewable secondary fuels		MJ, net calorific value				

Net use of fresh water (see notes)	m^3				

Table 2 Indicators describing use of primary and secondary resources.

Notes:

- In order to identify the primary energy used as an energy carrier (and not used as raw materials), the parameter may be calculated as the difference between the total input of primary energy and the input of energy resources used as raw materials.
- Information about “net use of fresh water” is an important environmental indicator that is currently not covered well in most life cycle assessment (LCA) studies mainly due to inconsistency in life cycle inventory data as well as a lack of a harmonized classification system for water inputs and outputs of production processes. The aim should be to include “net use of fresh water” as indicator in EPDs covered by this PCR, but with the current data gaps and inconsistencies, it is not possible to calculate reliable results. The EPD should therefore include “fresh water use in use phase” (defined as measured input of water used during use phase) as water indicator until an harmonized classification system for water inputs and outputs will allow for calculation and reporting of “net use of fresh water” along the supply chain of the machinery.
- The net use of fresh water does not constitute a “water footprint” as potential environmental impacts due to the water use in different geographical locations is not captured. For this indicator:
  - Evaporation, transpiration, product integration, release into different drainage basins or the sea, displacement of water from one water resource type to another water resource type within a drainage basin (e.g. from groundwater to surface water) is included.
  - In-stream water use is not included.
  - For water used in closed loop processes (such as cooling system) and in power generation only the net water consumption (such as reintegration of water losses) should be considered.
  - Seawater shall not be included
  - Tap water or treated water (e.g. from a water treatment plant), or wastewater that is not directly released in the environment (e.g. sent to a wastewater treatment plant) are not elementary water flows, but intermediate flows from a process within the technosphere.
  - Additional transparency in terms of geographical location, type of water resource (e.g. groundwater, surface water), water quality and temporal aspects may be included as additional information.

5.4.5.3. Waste production and output flows

The treatment processes (final disposal) of wastes generated by the activities included in the system boundary should be included in the LCA calculation as any other process and not reported as wastes. When it is not possible for some reason (such as the database framework or lack of information), the amount of wastes and the destination shall be declared as outflows from the system.

When the amount of waste or the output flows from the life cycle inventory (LCI) are declared, the indicators in Table 3 and Table 4 shall be reported per functional unit, and per life cycle stage.

PARAMETER	UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Hazardous waste disposed	kg				
Non-hazardous waste disposed	kg				
Radioactive waste disposed	kg				

Table 3 Indicators describing waste production.

PARAMETER	UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Components for reuse	kg				
Material for recycling	kg				
Materials for energy recovery	kg				

Exported energy, electricity	MJ				
Exported energy, thermal	MJ				

Table 4 Indicators describing output flows.

5.4.6 ADDITIONAL INFORMATION

The following additional environmental information should 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[11].
- 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.

5.4.7 INFORMATION RELATED TO SECTOR EPDS

For sector EPDs, the following information shall also be included:

- a list of the contributing manufacturers that the Sector EPD covers,
- a description of how the selection of the sites/products has been done and how the average has been determined, and
- a statement that the document covers average values for an entire or partial product category (specifying the percentage of representativeness) and, hence, the declared product is an average that is not available for purchase on the market.

5.4.8 DIFFERENCES VERSUS PREVIOUS VERSIONS

For EPDs that have been updated, the following information shall also be included:

- a description of the differences versus previously published versions, e.g. a description of the percentage change in results and the main reason for the change;
- a revision date on the cover page

5.4.9 REFERENCES

This section shall include a list of references, including the General Programme Instructions (including version number), standards and PCR (registration number, name and version).

5.4.10 EXECUTIVE SUMMARY IN ENGLISH

For EPDs published in another language than English, an executive summary in English shall be included.

The executive summary should contain relevant summarised information related to the programme, product, environmental performance, additional information, information related to sector EPDs, references and differences versus previous versions.

[11] 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.

6 GLOSSARY

CO_2	Carbon dioxide
CPC	Central product classification
EPD	Environmental product declaration
ISO	International Organization for Standardization
kg	kilogram
LCA	Life cycle assessment
PCR	Product Category Rules
SI	The International System of Units
SO_2	Sulphur dioxide
UN	United Nations

7 REFERENCES

EPD International (2017) General Programme Instructions for the International EPD® System. Version 3.0, dated 2017-12-11. www.environdec.com

Guidance for Product Category Rule Development (2013), Ingwersen, W., Subramanian, V., editors. Product Category Rule Guidance Development Initiative. Version 1.0. http://www.pcrguidance.org

ISO (2000), ISO 14020:2000, Environmental labels and declarations – General principles

ISO (2004), ISO 8601:2004 Data elements and interchange formats – Information interchange – Representation of dates and times

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 (2013), ISO/TS 14067:2013, Greenhouse gases – Carbon footprint of products – Requirements and guidelines for quantification and communication

ISO (2014), ISO 14046:2014, Environmental management – Water footprint – Principles, requirements and guidelines

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

8 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 2.0.4, 2025-01-22

- Extended validity a second time, for another six months, because of a delay in the updating process.

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'.

Table 5 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	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.

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**.

MACHINES FOR FILLING AND PACKAGING OF LIQUID FOOD
PRODUCT CATEGORY CLASSIFICATION: UN CPC 43921