# ENVIRONMENTAL PRODUCT DECLARATION

In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for:

## WOLP products from Brazil, Indonesia & Saudi Arabia

from Cladtek Group

| | |
|---|---|
| **Programme** | The International EPD® System<br>www.environdec.com |
| **Programme Operator** | EPD International AB |
| **Regional Hub** | EPD Southeast Asia |
| **EPD Registration Number** | EPD-IES-0013654(S-P-13654) |
| **Publication Date** | 2024-05-30 |
| **Valid Until** | 2029-05-29 |
| **Revision Date** | 2024-09-09 |

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

**Changes Compared to Previous Version**

- An editorial update was made on page #05, 2024-09-09
- The graph on page #05, illustrating energy sources to produce 1 tonne WOLP pipe, was updated, 2024-09-09
- The emissions factors of grid electricity sourced from Brazil tonne to produce 1 ton of WOLP pipe on page #05, was updated, 2024-09-09

# PROGRAMME INFORMATION

## PROGRAMME OPERATOR

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## DECLARATION HOLDER

**Cladtek Group**

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

## LCA CONSULTANT

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# GENERAL INFORMATION

## PROGRAMME INFORMATION

| | | |
|---|---|---|
| **Programme:** | The International EPD® System | EPD Southeast Asia |
| **Address:** | EPD International AB<br>Box 210 60<br>SE-100 31 Stockholm<br>Sweden | Kencana Tower Level M, Business Park<br>Kebon Jeruk<br>Jl Raya Meruya Ilir No.88,<br>Jakarta Barat 11620, Indoesia |
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|---|
| **Accountabilities for PCR, LCA and independent, third-party verification** |
| **Product Category Rules (PCR)** |
| CEN standard EN 15804 serves as the Core Product Category Rules (PCR) |
| Product Category Rules (PCR): *Construction products, 2019:14, version 1.3.3 and UN CPC 412* |
| PCR review was conducted by: *Claudia A. Peña* |
| **Life Cycle Assessment (LCA)** |
| LCA accountability: *Monisha Monachan, Intertek Assuris.* |
| **Third-party verification** |
| Independent third-party verification of the declaration and data, according to ISO 14025:2006, via:<br><br>☒ EPD verification by individual verifier<br><br>Third-party verifier: *Dr Hudai Kara, Metsims Sustainability Consulting, www.metsims.com*<br><br>Approved by: The International EPD® System |
| Procedure for follow-up of data during EPD validity involves third party verifier:<br>☐ Yes ☒ No |

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

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent

content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

## COMPANY INFORMATION

**Owner of the EPD**: Cladtek

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**Description of the organisation**: Cladtek is the largest supplier of weld overlay Corrosion Resistant Alloy (CRA) globally and a leading supplier of CRA mechanically lined pipe (MLP). They offer a range of standalone related services such as induction bending, pipe spool fabrication, thermally sprayed aluminium coating, design and manufacture of clad valves, and design and manufacture of clad pressure vessels including pig launchers and receivers. They also offer complete, integrated clad product solutions that allow our customers to combine our various products and services into a single, seamless package that extends all the way to fabrication of skids and modules.

Cladtek is ISO 9001/API Q1 certified and holds API 5LC (Lic 0019) and API 5LD (Lic 0007). They also carry U, U2 and R stamp certification and API 6A and 6D certification for valves and flanges.

**Name and location of production sites**: Brazil, Indonesia and Saudi Arabia.

## PRODUCT INFORMATION

**Product name**: Weld Overlay Clad Pipe (WOLP).

**Product description**: A Weld Overlay Clad Pipe, often referred to simply as clad pipe, is a type of pipeline component that consists of two layers of material. The core or base material is typically made of carbon or low-alloy steel, while an additional layer of corrosion-resistant alloy material, known as cladding, is applied to the external surface of the pipe.

The cladding material is selected for its excellent corrosion resistance properties, making it suitable for use in environments where corrosion is a significant concern, such as in the oil and gas industry, chemical processing, and other industries. The cladding material is usually a high-alloy, corrosion-resistant material like stainless steel, nickel alloys, or other alloys designed to withstand corrosive conditions.

The welding process is used to bond the cladding material to the base material, creating a robust and durable pipeline component that can resist corrosion and other environmental factors. Weld Overlay Clad Pipes are commonly used in various applications, including the transport of corrosive fluids and gases, particularly in industries where the prevention of material degradation due to corrosion is crucial.

As the world's largest CRA weld overlay pipe manufacturer, Cladtek has substantial cladding capacity. Cladtek provides weld overlay solutions to pipes, elbows, tees, fittings, and flanges of almost any size.

Once clad, pipes undergo full hydrostatic testing to prove product integrity. The test facility is capable to handle pressures up to 1400Bar (20,000 psi). The Cladtek CRA pipe is also extensively Non-destructively Examined. This can include EC, UT, RT, dye penetrant testing, and visual and laser scanning. Much of the inspection is automated using innovative technologies to enhance reliability and optimise performance.

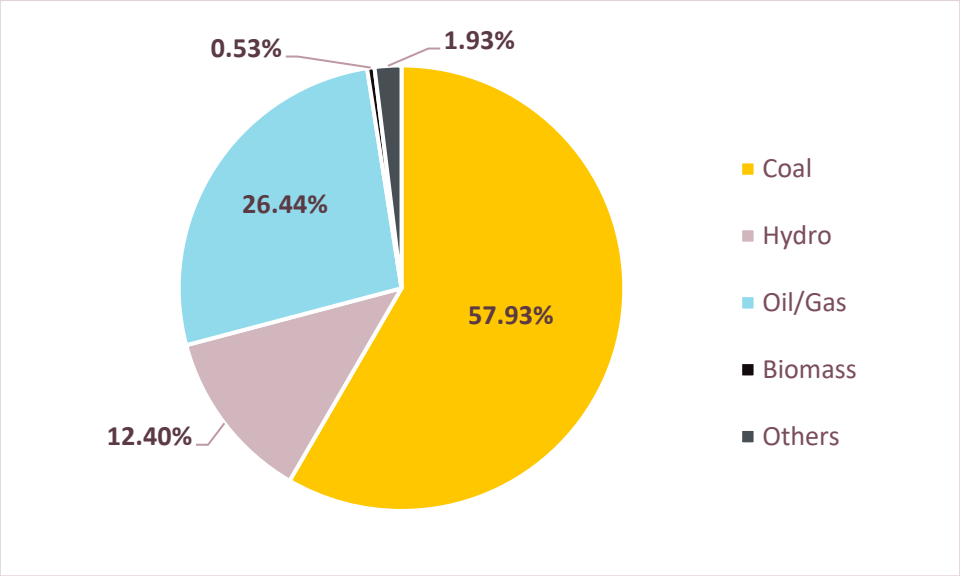
**UN CPC code**: 412

**Geographical scope**:

- Modules A1-A4 are performed in the regions of Brazil, Indonesia and Saudi Arabia.
- Modules C-D have a more global scenario. The main destination of the pipes coming from Brazilian manufacturing is Brazil and only 2% go to other countries in the world. Those coming from Saudi Arabian facilities are distributed only in that country and those from Indonesia are sent all worldwide.

**Energy source for production of 1 tonne WOLP Pipe:**

The electricity sourced from the Brazil grid has a GWP value of 0.5 $kgCO_2$ eq/kWh. The electricity sourced from Indonesia electricity grid has a GWP value of 1.14 $kgCO_2$ eq/kWh and the Saudi Arabia electricity grid has a GWP value of 1.04 $kgCO_2$ eq/kWh. The pie chart below illustrates the contributions of renewable and non-renewable sources to the GWP impact. Notably, the largest contribution is from coal of 57.93%. The percentage below is the weighted average of Brazil, Saudi Arabia and Indonesia.




**% Contributions of renewable and non-renewable sources to the GWP**

# LCA INFORMATION

**Declared unit**: 1 tonne of the WOLP pipe.

**Time representativeness**: from 2021-01-01 to 2021-12-31 (twelve months).

**Database and LCA software used**: Ecoinvent v3.8 [cut-off] LCI database and SimaPro 9.4.0.3.

**Description of system boundaries**: Cradle to gate with modules C1–C4 and module D (A1–A3 + C + D).

## SYSTEM DIAGRAM

| | Product stage | | | Construction process stage | | Use stage | | | | | | | End of life stage | | | | Resource recovery stage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Raw material supply | Transport | Manufacturing | Transport | Construction installation | Use | Maintenance | Repair | Replacement | Refurbishment | Operational energy use | Operational water use | De-construction demolition | Transport | Waste processing | Disposal | Reuse-Recovery-Recycling-potential |
| **Module** | **A1** | **A2** | **A3** | **A4** | **A5** | **B1** | **B2** | **B3** | **B4** | **B5** | **B6** | **B7** | **C1** | **C2** | **C3** | **C4** | **D** |
| Modules declared | X | X | X | X | MND | MND | MND | MND | MND | MND | MND | MND | X | X | X | X | X |
| Geography | BRA, IDN, SAU* | BRA, IDN, SAU* | BRA, IDN, SAU* | GLO | - | - | - | - | - | - | - | - | GLO | GLO | GLO | GLO | GLO |
| Specific data used | 37% | | | | | - | - | - | - | - | - | - | - | - | - | - | - |
| Variation – products | NA | | | | | - | - | - | - | - | - | - | - | - | - | - | - |
| Variation – sites | >10% | | | | | - | - | - | - | - | - | - | - | - | - | - | - |

*BRA=Brazil; IDN= Indonesia; SAU: Saudi Arabia; GLO= Global

## CONTENT INFORMATION

| Product components | Average Weight (Brazil, Indonesia & Saudi Arabia) (kg) | Post-consumer material, weight % | Biogenic material, weight-% and kg C/tonnene of product |
|---|---|---|---|
| CS pipe | 8.14E+02 | 37.00% | - |
| CRA wire | 2.21E+02 | 0.00% | - |
| TOTAL | 1.04E+03 | 29.10% | - |
| **Packaging materials** | **Weight (kg)** | **Weight % (versus the product)** | **Weight biogenic carbon, kg C/tonnene of product** |
| Flat pallet | 4.96E+01 | 4.77% | 2.22 |
| LDPE packaging film | 3.68E-01 | 0.04% | - |
| TOTAL | 4.99E+01 | 4.80% | 2.22 |

- The product does not contain any of the substance listed in REACH SVHC candidate list Candidate List of substances of very high concern for Authorisation - ECHA (europa.eu).

## ASSUMPTIONS

Assumptions in this study are as follows –

- The study represents the weighted average production of WOLP manufacturing from 3 manufacturing sites in Brazil, Indonesia, and Saudia Arabia.
- The average transport distance from the building to landfill site for WOLP disposal is assumed to be 250 km.
- The losses for waste sorting, processing in Module C is assumed to be 10%.
- The losses for waste recycling in Module D are assumed to be 10%.

## CUT-OFF CRITERIA

In the process of building an LCI it is typical to exclude items considered to have a negligible (aka relatively inconsequential or immaterial) contribution to results. “Criteria for the exclusion of inputs and outputs (cutoff rules) in the Life Cycle Assessment and information modules and any additional information are intended to support an efficient calculation procedure. They shall not be applied to hide data. Any application of the criteria for the exclusion of inputs and outputs shall be documented.

The following procedure shall be followed for the exclusion of inputs and outputs:

• All inputs and outputs to a (unit) process shall be included in the calculation for which data is available.

• Data gaps shall be filled by worst-case estimates with average or generic data. Any assumptions for such choices shall be documented.

• All known mass and energy flows shall be reported; no known flows shall be deliberately excluded.

• Particular care should be taken to include material and energy flows known to have the potential to cause significant emissions into air and water or soil related to the environmental indicators of this standard. Conservative assumptions in combination with plausibility considerations and expert judgement can be used to demonstrate compliance with these criteria.

The following exclusions from the scope of the study were made:

- Human and animal energy inputs to processes.
- Production and disposal of infrastructure (machines, transport vehicles, roads, etc.)
- Transport of employees to and from their normal place of work and business travel; and
- Environmental impacts associated with support functions (e.g., R&D, marketing, finance,
- management etc.).
- No known significant environmental flows are excluded using this criterion

## DATA SOURCES

The majority of the data used in the modelling is from primary data from Cladtek group, in cases where it was necessary supplemental datasets from an LCA database (Ecoinvent v3.8) were used.

## DATA QUALITY

Data quality was monitored with the use of data quality requirements based on ISO 14044:2006. To ensure the quality of data were sufficient, data quality checks were completed on data quality indicators (DQIs) – Reliability, Representative, Temporal Correlation, Geographical Correlation, & Technological Correlation. Data quality indicators were assessed using a data quality matrix whereby key data were assigned scores between 1 (best) and 5 (worst). The data quality matrix used in this study was adapted from Weidema et al. (2013) and is available in the background LCA report.

## ALLOCATION

In terms of the specific data for 1 tonne of WOLP manufacturing stage no co-product allocation has been applied. However, some sites (Brazil & Indonesia) have used the mass allocation to calculate the unit process data normalized to production for energy and emission related flows, which is according to ISO 14040/44. In terms of generic data, the main database used, Ecoinvent v3.8 (cut-off), defaults to an economic allocation for most processes. However, in some cases a mass-based allocation is used, where there is a direct physical relationship. The allocation approach of specific Ecoinvent modules is documented on their website and method reports (see www.Ecoinvent.org).

In the case of end-of-life allocation of generic data, the Ecoinvent v3.8 with a cut-off by classification end-of life allocation method was used. In this approach, environmental burdens and benefits of recycled/reused materials are given to the product system consuming them, rather than the system providing them, and are quantified based on recycling content of the material under investigation. This is a common approach in LCA for materials where there is a loss in inherent properties during recycling, the supply of recycled material exceeds demand and recycled content of the product is independent of whether it is recycled downstream.

It follows the ISO standards on LCA.

## COMPARABILITY

EPDs within the same product category but from different programs may not be comparable. EPDs of construction products may not be comparable if they do not comply with EPDs within the same product category but registered in different EPD programmes may not be comparable. For two EPDs to be comparable, they shall be based on the same PCR (including the same version number up to the first two digits20) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison.

# RESULTS OF THE ENVIRONMENTAL PERFORMANCE INDICATORS

The impact categories presented in the following table refer to 1 tonne of WOLP product from the Cladtek Group. The environmental impacts are analysed using EF 3.0 normalization and weighting set method.

## Mandatory impact category indicators according to EN 15804

| Results per 1 tonne of WOLP pipe | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Indicator** | **Unit** | **A1-A3** | **A4** | **C1** | **C2** | **C3** | **C4** | **D** |
| **GWP-total** | kg $CO_2$ eq. | 5.57E+03 | 7.41E+01 | 1.62E+00 | 4.34E+01 | 2.86E+01 | 5.27E-01 | -6.51E+02 |
| **GWP-fossil** | kg $CO_2$ eq. | 5.55E+03 | 7.41E+01 | 1.62E+00 | 4.34E+01 | 2.85E+01 | 5.27E-01 | -6.51E+02 |
| **GWP-biogenic** | kg $CO_2$ eq. | 1.15E+01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **GWP-luluc** | kg $CO_2$ eq. | 5.49E+00 | 4.67E-02 | 1.27E-04 | 1.56E-02 | 3.16E-02 | 4.97E-04 | 6.84E-01 |
| **ODP** | kg CFC 11 eq. | 2.91E-04 | 1.51E-05 | 3.49E-07 | 9.42E-06 | 3.48E-06 | 2.13E-07 | -1.39E-05 |
| **AP** | mol $H^+$ eq. | 2.97E+01 | 2.03E+00 | 1.69E-02 | 1.80E-01 | 3.16E-01 | 4.95E-03 | -2.04E+00 |
| **EP-freshwater** | kg P eq. | 4.59E+00 | 3.53E-03 | 5.80E-05 | 3.64E-03 | 2.03E-02 | 4.82E-05 | -1.73E-01 |
| **EP-marine** | kg N eq. | 6.69E+00 | 5.02E-01 | 7.47E-03 | 5.30E-02 | 7.18E-02 | 1.72E-03 | -4.47E-01 |
| **EP-terrestrial** | mol N eq. | 6.33E+01 | 5.57E+00 | 8.18E-02 | 5.79E-01 | 8.08E-01 | 1.88E-02 | -5.63E+00 |
| **POCP** | kg NMVOC eq. | 1.91E+01 | 1.45E+00 | 2.25E-02 | 1.77E-01 | 2.21E-01 | 4.65E-03 | -2.00E+00 |
| **ADP-inerals&metals*** | kg Sb eq. | 3.27E-02 | 7.77E-04 | 2.48E-06 | 1.14E-03 | 1.40E-03 | 1.20E-06 | 8.41E-05 |
| **ADP-fossil*** | MJ | 6.74E+04 | 9.75E+02 | 2.22E+01 | 6.40E+02 | 3.51E+02 | 1.47E+01 | -4.39E+03 |
| **WDP*** | $m^3$ | 2.34E+04 | 1.83E+00 | 2.98E-02 | 2.07E+00 | 3.74E+00 | 6.61E-01 | -2.90E+01 |
| **Acronyms** | GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption | | | | | | | |

## Additional mandatory and voluntary impact category indicators

| Results per 1 tonne of WOLP pipe | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Indicator** | **Unit** | **A1-A3** | **A4** | **C1** | **C2** | **C3** | **C4** | **D** |
| **GWP-GHG[1]** | kg $CO_2$ eq. | 5.57E+03 | 7.41E+01 | 1.62E+00 | 4.34E+01 | 2.87E+01 | 5.27E-01 | -6.49E+02 |
| **Particulate matter** | disease inc. | 3.55E-04 | 2.89E-06 | 4.47E-07 | 2.99E-06 | 4.15E-06 | 9.70E-08 | -3.43E-05 |
| **Ionizing radiation [2]** | kBq U-235 eq | 2.33E+02 | 4.45E+00 | 1.01E-01 | 2.98E+00 | 1.97E+00 | 6.53E-02 | 4.27E+01 |
| **Ecotoxicity, freshwater [3]** | CTUe | 7.88E+04 | 6.76E+02 | 1.34E+01 | 5.63E+02 | 1.58E+03 | 9.28E+00 | -2.29E+04 |
| **Human toxicity, non-cancer [3]** | CTUh | 7.79E-06 | 3.88E-08 | 4.68E-10 | 1.45E-08 | 3.81E-08 | 2.36E-10 | 6.31E-07 |
| **Human toxicity, cancer [3]** | CTUh | 6.43E-05 | 5.80E-07 | 1.15E-08 | 5.64E-07 | 1.74E-06 | 6.07E-09 | 1.77E-04 |
| **Land use [3]** | Pt | 9.37E+03 | 2.77E+02 | 2.84E+00 | 4.32E+02 | 6.87E+02 | 3.21E+01 | -1.26E+03 |

[1] This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic $CO_2$ is set to zero.
[2] This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.
[3] The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

## RESOURCE USE INDICATORS

The total primary energy use indicators are calculated using Option B from Product Category Rule (PCR) 2019:14 for Preparing and Environmental Declaration (EPD), version 1.3.4 by EPD international.

| Results per 1 tonne of WOLP pipe | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Indicator** | **Unit** | **A1-A3** | **A4** | **C1** | **C2** | **C3** | **C4** | **D** |
| **PERE** | MJ | 7.42E+03 | 7.52E+00 | 1.20E-01 | 7.14E+00 | 4.84E+01 | 1.25E-01 | 3.36E+02 |
| **PERM** | MJ | 7.55E+01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 8.82E-01 |
| **PERT** | MJ | 7.50E+03 | 7.52E+00 | 1.20E-01 | 7.14E+00 | 4.84E+01 | 1.25E-01 | 3.37E+02 |
| **PENRE** | MJ | 7.39E+04 | 1.04E+03 | 2.36E+01 | 6.79E+02 | 3.73E+02 | 1.56E+01 | -4.51E+03 |
| **PENRM** | MJ | 1.03E+01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **PENRT** | MJ | 7.39E+04 | 1.04E+03 | 2.36E+01 | 6.79E+02 | 3.73E+02 | 1.56E+01 | -4.51E+03 |
| **SM** | kg | 3.41E+02 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **RSF** | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **NRSF** | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |

| Results per 1 tonne of WOLP pipe | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Indicator** | **Unit** | **A1-A3** | **A4** | **C1** | **C2** | **C3** | **C4** | **D** |
| **FW** | $m^3$ | 8.25E+01 | 6.41E-02 | 1.14E-03 | 7.07E-02 | 1.33E-01 | 1.57E-02 | -5.86E-01 |
| **Acronyms** | PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water | | | | | | | |

## WASTE INDICATORS

| Results per 1 tonne of WOLP pipe | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Indicator** | **Unit** | **A1-A3** | **A4** | **C1** | **C2** | **C3** | **C4** | **D** |
| **Hazardous waste disposed** | kg | 2.13E+01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Non-hazardous waste disposed** | kg | 1.23E+02 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.00E+02 | 6.38E+01 |
| **Radioactive waste disposed** | kg | 1.41E-02 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |

## OUTPUT FLOW INDICATORS

| Results per 1 tonne of WOLP pipe | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Indicator** | **Unit** | **A1-A3** | **A4** | **C1** | **C2** | **C3** | **C4** | **D** |
| **Components for re-use** | kg | 2.47E-01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Material for recycling** | kg | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 9.00E+02 | 0.00E+00 | 0.00E+00 |
| **Materials for energy recovery** | kg | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Exported energy, electricity** | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Exported energy, thermal** | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |

## OTHER PARAMETERS

| Parameter | Unit | Value |
|---|---|---|
| Biogenic carbon removal from product | kg C/tonne of product | 0 |
| Biogenic carbon removal from packaging | kg C/tonne of product | 2.22 |

# REFERENCES

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