KONČAR - Distribution and Special Transformers

ENVIRONMENTAL PRODUCT DECLARATION

400 kVA Distribution transformers, DT3316 & DT3317(110081), Končar D&ST, Josipa Mokrovića 8, 10090 Zagreb, Croatia

In accordance with ISO 14025 and EN 50693

Programme Operator	EPDItaly
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www.epditaly.it

EPD OWNER

Company name	KONČAR - Distribution and Special Transformers
Registered office	Josipa Mokrovića 8, 10090 Zagreb, Croatia
Contacts for information on the EPD	Tel: +385 1 3783 777 E-mail: info@koncar-dst.hr

EPD INFORMATION

PROGRAMME OPERATOR	
EPDItaly	Via Gaetano De Castillia no. 10 - 20124 Milan, Italy
PCRs	
PCR EPDItaly007 **Electronic and Electrical products and systems rev. 3**	PCR Committee: ICMQ S.p.A. – Via G. De Castillia, 10 Eng. Elena Neri, Indaco2 Moderator: Ing. Ugo Pannuti, ICMQ Spa
PCR EPDItaly018 **Electronic and Electrical products and systems – Power Transformers rev. 3.6**	PCR Committee: NA - Implementation of the Core-PCR EPDItaly007 Rev.3 Moderator: NA - Implementation of the Core-PCR EPDItaly007 Rev.3

EPD INFORMATION

Product names	400 kVA Distribution transformers: DT3316 & DT3317 (110081)
Site	Josipa Mokrovića 8, 10090 Zagreb, Croatia
Type of EPD	Product EPD, the product covered by the EPD is at the design stage; the future execution of the product in accordance with the design data is the sole responsibility of the EPD Owner. The EPD is made in compliance of Annex 6 of Regulation of the EPDItaly Programme, the similar product considered is the DT2857 400 kVA Oil immersed Distribution Transformer of Končar D&ST with a primary voltage of 20 kV and a secondary voltage of 0,42 kV. The set of data used is considered representative on the basis of the representativeness analysis carried out with respect to the data of the similar product.
Summary description and technical information of products	One 400 kVA Oil immersed Distribution Transformer with a primary voltage of 20 kV and a secondary voltage of 0,42 kV, operating for 35 years in Italy and using mineral oil as insulation liquid. This declaration is for products DT3316 & DT3317 (110081) which are manufactured by Končar D&ST in Zagreb, Croatia. The total mass of the products (excluding packaging) is for both approximately 1540,1 kg. The composition of the transformers is exactly the same. More information, among others, contact details of the manufacturer can be found via the following link: koncar-dst.hr.
Scope of products	This EPD is based on an LCA study of Končar's 400 kVA DT3316 & DT3317 (110081) distribution transformers [1] for which 2023 is the refence year. The objective of this study was to publish third party verified data about the environmental performance of this product via an EPD. It concerns a Cradle-to-Grave study with 2023 as base year and that is compiled according to the following standards: EN 50693 [2], ISO14040 [3], ISO 14044 [4] and ISO 14025

	[5]. In addition to the EPDItaly007 - Core PCR for electronic and electrical products and systems, Rev 3.0 (13/01/2023) [6], PCR EPD Italy018– Power transformers v3.6 (the standard EN 50693 is the overall reference for the PCR) [7] and Regulations of the EPDItaly Programme, Rev. 6.0 [10] were used. It should be noted that EPDs relating to the same category of products but belonging to different programs may not be comparable.
Product reference standards	Končar's transformers have CE marking and are in accordance with IEC 60076.
CPC Code	46121

Declared unit

One 400 kVA Oil immersed Distribution Transformer with a primary voltage of 20 kV and a secondary voltage of 0,42 kV, operating for 35 years in Italy and using mineral oil as insulation liquid.

This declaration is for product DT3316 & DT3317 (110081) which are manufactured by Končar D&ST in Zagreb, Croatia. The total mass of the products (excluding packaging) is for both approximately 1540,1 kg. The composition of the transformers is exactly the same. More information, among others, contact details of the manufacturer can be found via the following link: koncar-dst.hr.

Verification

This declaration has been developed referring to EPD Italy, following the General Program Instruction; further information and the document itself are available at: www.epditaly.it.

Independent verification of the declaration and data, according to EN ISO 14025:2010.
☐ INTERNAL ☒ EXTERNAL

Third party verifier: SGS Italy S.p.A., Via Caldera, 21, 20153 Milan, Italy (with accreditation number Certificate n° 0005VV).

This life cycle assessment was conducted in accordance with ISO 14025 and the reference PCR by: SGS Search Ingenieursbureau BV, Petroleumhavenweg 8, 1041 AC Amsterdam, Netherlands.

Accountability/ responsibility

Končar D&ST releases EPD Italy from any non-compliance with environmental legislation self-declared by the manufacturer. The holder of the declaration will be responsible for the information and supporting evidence; EPD Italy declines all responsibility for the manufacturer's information, data and results of the evaluation of the life cycle of the product.

Scope and type

The use & maintenance stage, except for the electricity use, are not applicable for the transformer. In the table below, declared means that the stages that are applicable are reported in the LCA.

Manufacturing stage		Distribution stage	Installation stage	Use & Maintenance stage	De-installation / End-of-life stage	Beyond system boundaries
Upstream module	Core module	Downstream module				
X		X	X	X	X	MND

X = module declared
MND = Module Not Declared

Visual product

Description of product

International Electrotechnical Vocabulary defines a transformer as a static piece of apparatus with two or more windings which, by electromagnetic induction, transforms a system of alternating voltage and current into another system of voltage and current, usually of different values and at the same frequency for the purpose of transmitting electrical power [8]. Distribution transformers are used in distribution networks in order to transmit energy from the medium voltage (MV) network to the low voltage (LV) network of the consumers [9]. The rated power of the transformer is 400 kVA and the primary voltage is 20 kV, while the secondary voltage is 0,42 kV. According to the type of cooling the transformer is defined as ONAN.

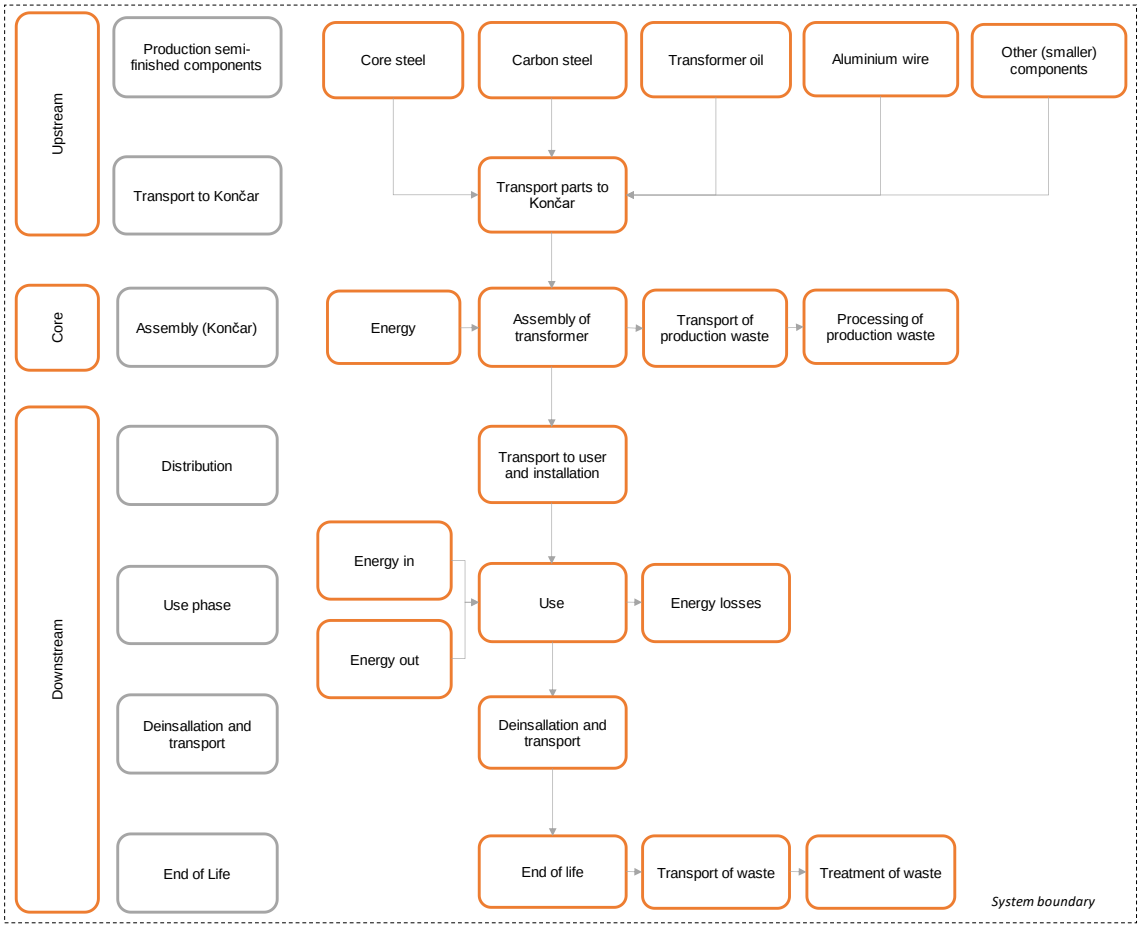
The total weight of both transformers (excl. packaging) is approximately 1.540,1 kg. Packaging consists of a wooded frame (as displayed in the picture) and weighs 24 kg. Both transformers weigh in total, including packaging, approximately 1.564,1 kg.

More information

https://koncar-dst.hr/en/

Product Life Cycle

The figure below displays a schematic overview of the product's life cycle.



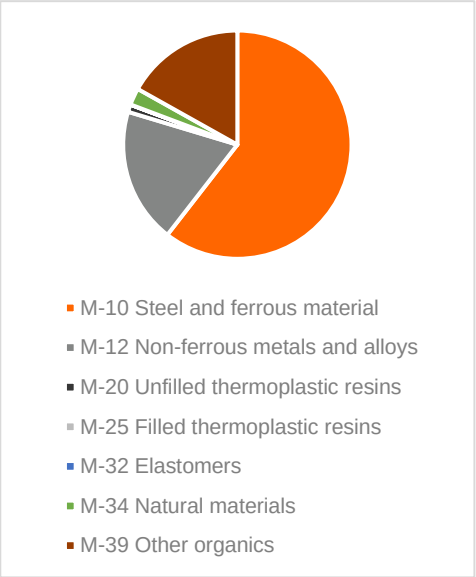
Detailed product description

The declared unit comprises Cradle-to-Grave data for specific products from one plant and one manufacturer. Distribution transformer is produced at Končar production/assembly facility in Zagreb, Croatia. Moreover, Končar's transformers have CE marking and are in accordance with IEC 60076.

The reference flows considered are all materials, packaging and energy flows to produce, use, and dispose one oil immersed distribution transformer.

Both declared transformers have the same composition. The table and figure below show the composition according to the IEC 62474 material classes.

Material	Mass (kg)	Percentage (%)
1 inorganic materials	**1226,7**	**79,6%**
M-10 Steel and ferrous material	931,9	60,5%
M-100 stainless steel	*4,7*	*0,3%*
M-119 Other ferrous alloys	*927,2*	*60,2%*
M-12 Non-ferrous metals and alloys	294,8	19,1%
M-120 Aluminium and its alloys	*291,4*	*18,9%*
M-121 Copper and its alloys	*3,4*	*0,2%*
2 organic materials	**313,4**	**20,4%**
M-20 Unfilled thermoplastic resins	16,2	1,1%
M-25 Filled thermoplastic resins	0,0	< 0,1%
M-32 Elastomers	0,4	< 0,1%
M-34 Natural materials	36,8	2,4%
M-340 Wood	*13,6*	*0,9%*
M-341 Paper	*23,2*	*1,5%*
M-39 Other organics	260,0	16,9%



**Transformer oil is added in this category*

This declaration is based on the Bill of Material of the DT3316 and DT3317 with the specific magnetic core design from specification table of core transformer version 18.3. If any changes will be made, the EPD will be updated accordingly.

Specifications of the declared products are presented in the table below.

Type	Code	Capacity	Primary voltage	Secondary voltage	Total weight of product	Total weight of packaging	Insulating liquid	Region
DT3316	110081	400 kVA	20 kV	0,42 kV	1540,1 kg	24 kg	Mineral	IT
DT3317	110081	400 kVA	20 kV	0,42 kV	1540,1 kg	24 kg	Mineral	IT

Representativeness

One product from one supplier, with reference year 2023. The declaration is valid for the Italian market.

Environmental impact, resource use and output flows

Environmental impacts are calculated with SimaPro 9.5.0.0 LCA software using the Ecoinvent 3.9.1 database (cut-off system model), the database used is regarded as representative on the basis of a comparative study, which examined the data for a reference product of the EPD Owner. For characterization the guidelines from the EN 15804:2012+A2:2019 are followed in conformity with the guidelines from the PCR for transformers from EPD Italy.

The environmental impacts of the products covered by this EPD (DT3316 and DT3317) show a variation, greater than 10%, compared to the set of environmental impacts of the similar product (DT2857) with a published EPD.

DT3316 & DT3317 (110081)

Environmental impact per declared unit of the DT3316 & DT3317

Indicator	Unit	Total	Upstream	Core	Distribu-tion	Installat-ion	Use	End-of-life
					Downstream			
Climate change	kg CO2 eq	2,69E+05	5,83E+03	4,61E+01	2,44E+02	4,36E+01	2,62E+05	3,16E+02
Climate change - Fossil	kg CO2 eq	2,47E+05	5,89E+03	1,45E+01	2,44E+02	8,46E+00	2,40E+05	2,70E+02
Climate change - Biogenic	kg CO2 eq	2,20E+04	-6,97E+01	3,16E+01	1,87E-01	3,51E+01	2,19E+04	4,55E+01
Climate change - Land use and LU ch	kg CO2 eq	5,41E+01	1,59E+01	1,60E-02	1,15E-01	1,68E-03	3,78E+01	1,85E-01
Ozone depletion	kg CFC11 eq	5,57E-03	1,75E-04	4,17E-07	5,33E-06	1,46E-07	5,39E-03	3,28E-06
Acidification	mol H+ eq	9,11E+02	3,92E+01	1,59E-01	8,20E-01	7,07E-02	8,70E+02	9,68E-01
Eutrophication, freshwater	kg P eq	4,89E+00	3,56E-01	1,07E-03	1,97E-03	4,29E-05	4,53E+00	4,34E-03
Eutrophication, marine	kg N eq	1,46E+02	6,03E+00	1,93E-02	2,81E-01	3,22E-02	1,40E+02	3,07E-01
Eutrophication, terrestrial	mol N eq	1,76E+03	6,77E+01	2,28E-01	3,00E+00	3,50E-01	1,69E+03	3,37E+00
Photochemical ozone formation	kg NMVOC eq	7,55E+02	2,88E+01	7,05E-02	1,28E+00	1,05E-01	7,24E+02	1,11E+00
Resource use, minerals and metals[1]	kg Sb eq	5,08E-01	7,80E-02	1,10E-03	6,57E-04	8,39E-06	4,28E-01	9,56E-04
Resource use, fossils[1]	MJ	3,87E+06	8,22E+04	1,67E+02	3,56E+03	1,12E+02	3,78E+06	3,00E+03
Water use[1]	m3 depriv.	1,54E+05	1,82E+03	7,61E+01	1,70E+01	1,02E-02	1,52E+05	2,26E+01
Particulate matter	disease inc.	4,49E-03	4,76E-04	1,12E-06	2,46E-05	1,85E-06	3,97E-03	1,61E-05
Ionising radiation[2]	kBq U-235 eq	9,41E+03	2,68E+02	5,56E-01	1,71E+00	3,17E-02	9,13E+03	8,68E+00
Ecotoxicity, freshwater[1]	CTUe	5,37E+05	6,37E+04	1,86E+02	1,71E+03	5,49E+01	4,70E+05	1,24E+03
Human toxicity, cancer[1]	CTUh	8,51E-05	2,07E-05	2,78E-08	1,05E-07	3,90E-09	6,42E-05	1,09E-07
Human toxicity, non-cancer[1]	CTUh	1,35E-03	1,66E-04	1,28E-06	2,56E-06	8,08E-08	1,18E-03	3,76E-06
Land use[1]	Pt	6,16E+05	2,90E+04	5,37E+01	3,62E+03	2,58E+01	5,82E+05	1,51E+03

Disclaimer 1 – 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 per declared unit of the DT3316 & DT3317

Indicator	Unit	Total	Upstream	Core	Distribu-tion	Installat-ion	Use	End-of-life
Renewable primary energy as energy carrier (PERE)	MJ	9,79E+05	2,00E+04	1,07E+03	5,22E+01	9,56E-01	9,58E+05	4,70E-01
Renewable primary energy resources as material utilization (PERM)	MJ	6,04E+02	6,04E+02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of renewable primary energy resources (PERT)	MJ	9,80E+05	2,06E+04	1,07E+03	5,22E+01	9,56E-01	9,58E+05	4,70E-01
Non-renewable primary energy as energy carrier (PENRE)	MJ	4,16E+06	6,25E+04	1,78E+02	3,79E+03	1,19E+02	4,09E+06	8,79E+01
Non-renewable primary energy as material utilization (PENRM)	MJ	1,01E+04	1,01E+04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of non-renewable primary energy res. (PENRT)	MJ	4,17E+06	7,27E+04	1,78E+02	3,79E+03	1,19E+02	4,09E+06	8,79E+01
Use of secondary material (SM)	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of renewable secondary fuels (RSF)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

[1] 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.
[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.

Indicator	Unit	Total	Upstream	Core	Distribu-tion	Installat-ion	Use	End-of-life
Use of non-renewable secondary fuels (NRSF)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Water consumption (FW)	m3	4,17E+03	8,96E+01	8,09E+00	5,22E-01	4,03E-03	4,07E+03	5,85E-03

Output flows and waste categories of declared unit of the DT3316 & DT3317

Indicator	Unit	Total	Upstrea m	Core	Distribu-tion	Installat-ion	Use	End-of-life
Hazardous waste (HWD)	kg	1,53E+01	2,51E+00	1,57E-03	2,21E-02	7,34E-04	1,27E+01	5,56E-04
Non-hazardous waste (NHWD)	kg	1,34E+04	1,79E+03	9,11E+00	3,12E+02	2,03E+00	1,13E+04	1,18E-01
Radioactive waste (RWD)	kg	8,33E+00	1,56E-01	4,01E-04	1,09E-03	1,86E-05	8,18E+00	9,06E-06
Components for re-use (CRU)	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling (MFR)	kg	1,19E+03	0,00E+00	8,30E+01	0,00E+00	0,00E+00	0,00E+00	1,10E+03
Materials for energy recovery (MER)	kg	4,15E+01	0,00E+00	3,44E+00	0,00E+00	1,13E+01	0,00E+00	2,67E+01
Exported electrical energy (EEE)	MJ	1,26E+02	3,42E-03	0,00E+00	0,00E+00	4,34E+01	0,00E+00	8,29E+01
Exported thermal energy (EET)	MJ	2,93E+02	3,75E-02	0,00E+00	0,00E+00	1,01E+02	0,00E+00	1,92E+02

Calculation rules

All relevant and known processes and materials have been included**.** The following processes have been **excluded** from the system boundary:

- Auxiliary materials in the assembly phase as quantities are negligible.
- Maintenance and operation of support equipment (except those included in Ecoinvent background processes). The transformers are hermetically sealed and do not require maintenance during their lifetime.
- Capital goods and infrastructure for assembly (except those included in Ecoinvent background processes).

There is no reason to believe that relevant in- or outputs are excluded from this study. Based on the available information, the total of processes that are excluded contribute less than 1% of the total mass and environmental impact.

Data collection and quality

Data is retrieved from a Bill of Materials (BoM) supplied by Končar Zagreb production/assembly plant. There are no inconsistencies found in the data and there is no reason to believe data is incomplete or not reliable. The reference year for data collected is 2023.

Data about the production of five main components are provided by the suppliers of the components or secondary data was used when primary data was unavailable. The five main components add up to 94,0% of the mass of the transformer. Communication with suppliers went via Končar. Seeing that the data collection from suppliers was initiated in 2021, the suppliers were asked for updated (2023) data. Suppliers sent new data or confirmed no significant changes were made in their processes and that the 2020 is deemed representative for the current practice, other suppliers sent updated data of the production year 2021 and confirmed that the data has not changed since the production year 2021.

The materials for which generic data is used are under the 10% threshold.

The remaining materials are modelled with generic data, basic information on the compositions of these materials is provided by Končar.

Allocation

Allocation is avoided where possible. In the manufacturing stage allocation is avoided by calculating the energy consumption per unit of time and the operating time per type of transformer. This approach is preferred above allocation of yearly energy consumption based on power rating or weight of the transformer. For the DT3316 and DT3317, the energy consumption is derived from the previously published representative product.

The allocation of recycling and recovery processes is done according to the polluter pays principle. This means that for materials leaving the systems all processes that are required to reach the end-of-waste status are allocated to the system under study. These processes include transport, shredding and sorting.

Scenarios and additional technical information

Manufacturing stage
This module considers the extraction and processing of all raw materials and energy which occur upstream to the transformer manufacturing process, as well as waste processing up to the end-of waste state.

Transport distance of the raw materials to the manufacturing facility via road, boat and/or train.

Manufacturing of the semifinished parts and the assembly of the transformer includes all processes linked to production such as storing, mixing, packing and internal transportation. Use of electricity and fuels production are considered as well as direct emissions from production process.

The manufacturing of production equipment and infrastructure is not included in the system boundary unless it is included in Ecoinvent background processes.

Packaging-related flows in the production process and all up-stream packaging are included in the manufacturing module.

The manufacturing process takes place at one production site. For upstream (raw material processes) and downstream processes (waste processing) generic data is used when no specific data is obtained.

Distribution stage
In conformity with the EPD Italy PCR for Power transformers, in this stage 1500 km transport per truck is modelled as an average distance for transformers in Europe.

Installation stage
The processes required to place the transformers can differ based on the location. For this stage a worst-case assumption is done in which the transformers are placed with a large crane.

Use & Maintenance stage
In this phase only electricity losses occur, no maintenance, replacements or operational energy use is applicable for this transformer as the transformers are designed to operate 35 years without replacement of parts. In case of the unlikely event of failure, the transformer is replaced completely.

Electricity consumption is calculated according to the formula from the PCR EPD Italy – Power transformers, as shown below.

$$E_d[kWh] = [P_{load} * k_{load}^2 + P_{noload}] * t_{year} * RSL + P_{aux} * f_{aux} * t_{year} * RSL$$

Parameters for electricity consumption in use phase

	400 kVA	Explanation
P_{load}	3,25	Determined by Končar.
K_{load}	0,7	Depends on specific distribution, the in the PCR [6] suggested 70% is used.
P_{noload}	0,387	Determined by Končar.
P_{aux}	0	Is zero for the transformer under study because they are naturally cooled.
F_{aux}	0	Is zero for the transformer under study because they are naturally cooled.
t_{year}	8760	Conforms default value from the PCR [6].
RSL	35	Conforms default value from the PCR [6].

End-of-life stage, deinstallation
The processes required to remove the transformers can differ based on the location. For this stage a worst-case assumption is done in which the transformers are removed with a large crane.

In this stage 500 km transport per truck is assumed as average distance for transformers to a waste sorting facility in Europe.

End of life scenarios per material are given by the EN 50693. Despite that recycle rates for the metals are expected to be higher, the default scenarios from the PCR are the most conservative option and therefore used.

It is assumed for the disposal rate (incineration and landfilling) of metals is that 0% goes to landfilling and 0% to incineration. It is assumed that for the disposal rate (incineration and landfilling) of plastics, wood and paper is that 5% goes to landfilling and 95% goes to incineration.

Additional environmental information

Končar D&ST Inc. within its scope of business special and medium power transformers commits to respect legal regulations of the Republic of Croatia, obligations arising from the acceptance of the ISO 14001:2015 and ISO 45001:2018 standard requirements as well as the applicable requirements of the interested parties. Certificates confirming compliance with ISO 14001:2015 and ISO 45001:2018 can be found via https://koncar-dst.hr/en/about-us/environmental-protection/ and https://koncar-dst.hr/en/about-us/occupational-health-and-safety/ respectively. Certification for those two management systems was provided by Bureau Veritas Certification (Certificate No.: HR007598 and HR007611).

Company management supports the implementation and development of an environmental and OH&S protection system in order for successful implementation of the strategy and objectives and continuous improvement of the management system.

Aware of the environmental protection we are committed to continuous management of the company´s environmental and OH&S impact:

- Timely and effective prevention of possible soil, water and air pollution, as well as ensuring safe and healthy working conditions for job-related injury and disease prevention to eliminate the danger;
- Rational use of natural resources;
- Reduction of waste quantities and proper waste sorting;
- Acting on the awareness of all employees and contract partners and the use of administrative measures, including training;
- Končar strives to select materials with a low environmental impact where those meet technical requirements and the supply meets Končar's demands, and replacing existing processes with less hazardous processes, operations, materials or equipment;
- Planning and introduction of lower impact manufacturing processes and product design with the use of engineering measures and reorganization of work;
- On the involvement of workers in counselling and participation to eliminate hazards and reduce OH&S risk using appropriate personal protective equipment.

Končar D&ST Inc. encourages interested parties to apply environmental protection and OH&S principles.

Moreover, Končar's products are manufactured in conformity with all applicable environmental legislation. Končar's products are not under suspicion related to environmetal applicable legislation.

Declaration of hazardous materials

None of the substances contained in the product are listed in the "Candidate List of Substances of Very High Concern for authorisation", or they do not exceed the threshold with the European Chemicals Agency.

Moreover, Končar D&ST complies with the regulations as laid down: (EU)1907/2006 (REACH) and (EU)1272/2008. Meaning no hazardous substances are released to air, water or soil during the production and use of the transformers as produced by Končar D&ST.

References

[1] LCA report Končar Distribution transformers, October 2024.

[2] EN 50693:2019 Product category rules for life cycle assessments of electronic and electrical products and systems.

[3] ISO, 2006. “Environmental management. Life cycle assessment - Principles and framework”. ISO 14040:2006/AMD1:2020.

[4] ISO, 2006. “Environmental management. Life cycle assessment – Requirements and Guidelines”. ISO 14044:2006/AMD1:2017/ AMD2:2020.

[5] ISO, 2006. “Environmental labels and declarations – Type III environmental declarations”, ISO 14025:2006.

[6] EPD Italy 007 Core PCR for electronic and electrical products and systems, revision 3.0, 13-01-2023.

[7] EPD Italy 018 PCR for Power transformers, revision 3.6, 01-07-2024.

[8] International Electrotechnical Vocabulary, Chapter 421: Power transformers and reactors.

[9] Pavlos S. Georgilakis: Spotlight on Modern Transformer Design, Springer, 2009.

[10] Regulations of the EPDItaly Programme, Rev. 6.0.