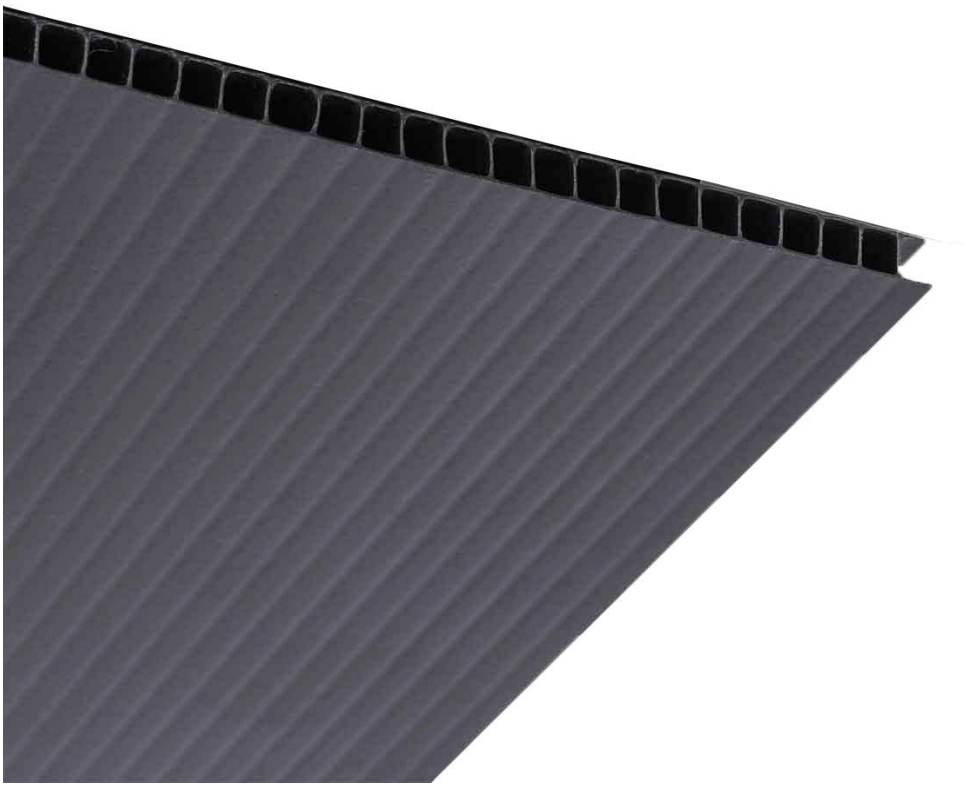
DECLARATION ENVIRONMENTAL PRODUCT No. 03-08/2024

Łukasiewicz
Institute of Ceramics and Building Materials

ENVIRONMENTAL PRODUCT DECLARATION no. 03-08/2024

PP twinwall sheet with the addition of PP regranulate



Declaration owner:	Kaczmarek Malewo Sp.K.
Program Owner:	Łukasiewicz – Institute of Ceramics and Building Materials Environmental Engineering Center
Name of program	Environmental Product Declarations – B2B
Release Date:	**30.08.2024**
Declaration valid until:	**30.08.2029**

Łukasiewicz
Institute of Ceramics
and Building Materials

DECLARATION
ENVIRONMENTAL
PRODUCT
No. 03-08/2024

Kaczmarek

1. OVERVIEW

Program owner: **Kaczmarek Malewo Sp.K.**	**Products covered by the declaration:** **PP twinwall sheet with the addition of PP regranulate**
Program Owner: Łukasiewicz – Institute of Ceramics and Building Materials Environmental Engineering Centerin Opole. **http://www.icimb.pl/opole/**	**Declaration owner:** Kaczmarek Malewo Sp.K. Malewo 1, 63-800 Gostyń Telefon: +48 65 575 86 00 Adres e-mail: sekretariat@kaczmarek2.pl **https://www.kaczmarek2.pl/**
Date of issue: **30.08.2024**	**Declared Product/Declared Unit:** **1 kg** (1 kilogram) of **PP twinwall sheet with the addition of PP regranulate**
Declaration valid until: **30.08.2029**	The declaration includes: **PP twinwall sheet with the addition of PP regranulate** manufactured in the Kaczmarek Malewo Sp.K. plant. in Piaski and Malewo. The environmental declaration is based on average data provided by the manufacturer for one production plant for individual products covered by the declaration manufactured by Kaczmarek Malewo Sp.K. The average values of the input and output streams were calculated based on data provided by the manufacturer from one production plant. Contains information about the impact of the declared products on the environment. All data regarding the production cycle were collected by Kaczmarek Malewo Sp.K. from the period from January 1, 2022 to December 31, 2022 (12 months) and correspond to the production technology at that time. The life cycle assessment was developed in accordance with the requirements of the PN-EN ISO 15804+A2:2020, PN-EN ISO 14025 and PN-EN ISO 14040 standards. The product categorization rules were adopted in accordance with the PN-EN 15804 standard. The owner of the declaration is responsible for the underlying information and evidence. Łukasiewicz Research Network - Institute of Ceramics and Building Materials Environmental Engineering Center is not responsible for the manufacturer's information, data and evidence regarding life cycle assessment. Declarations that are the result of different programs or are not performed in accordance with the standard may not be comparable.

Product Categorization (PCR) Rules	According to the standard: PN-EN 15804+A2:2020-03 Sustainability of construction works. Environmental Product Declarations. Basic principles of categorization of construction products.
Representativeness:	Polish product, year 2022
Declared durability:	30 years
Reasons for performing LCA:	B2B
Life Cycle Analysis (LCA):	The LCA analysis includes modules A1-A3, A4, C1-C4 and D according to PN-EN 15804+A2 (Cradle-to-Gate with options)

The Łukasiewicz – Institute of Ceramics and Building Materials Environmental Engineering Center provides access to the Type III environmental declaration for PP twinwall sheet with the addition of PP regranulate Kaczmarek Malewo Sp.K. to interested parties.

Authors' team:
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Approved:

Joanna Poluszyńska, PhD

Director of the Center for Environmental Engineering

Ewa Głodek-Bucyk, Ph.D.

Leader of the Process Engineering Research Group

Review:

CEN standard PN-EN 15804+A2 serves as the main PCR document.
Independent verification of declarations and data according to EN ISO 14025:2010

☐ Internal ☒ External

Katarzyna Grzesik, PhD, DSc

2. MANUFACTURER AND PRODUCT INFORMATION

Figure 1. Production plant in Malewo.

The main profile of the company's activity is the production of plastic products. The history of the company dates back to 1985, when its activity began with the production of haberdashery film and technical technology made of softened PVC, was started by PPHT Barbara Kaczmarek Malewo, managed by four brothers. In the following years of activity, on the basis of the experience gained, the scope of production was introduced and expanded to include water, gas and sanitary sewage systems. For almost 40 years, the Kaczmarek Malewo company has been operating in Malewo in Wielkopolska. The production plant is shown in Figure 1.

Thanks to the principles of loyalty, honesty and building success on trust, the company is still managed as a family. The company manufactures PVC-U and PE water supply systems, PE gas systems, PVC-U, PP and PE external sewage systems, PP internal sewage systems, as well as gutter systems, drainage systems, cable casing pipes, as well as manholes, tanks and retention and drainage boxes. The company's latest projects include the implementation of the production of tanks made of K2-Kan XXL structural pipes and PE water supply and sewage pipes with a diameter of up to DN1400.

For the production of systems, the company uses the most modern production lines in Europe. All manufactured products meet quality standards. The official confirmation of the high quality of products is the ISO 9001 certificate: *production and distribution of plastic products for the construction of gas, water and sewage, sewage, gutter, cable, drainage and hollow slab installations.*

POLYCART – twinwall sheet from polypropylene (PP) with the addition of PP regranulate, moisture-resistant, durable and resistant to mechanical damage. Application Area: Food Industry, Construction, Transportation, Pharmaceutical Industry, Automotive Industry, Advertising, Agriculture, Horticulture, Packaging Industry, Glassworks.
To be used as a:

- interlayers: transport of industrial goods e.g. glass-ware,
- construction: moisture barrier for walls and floors, door panels, construction panels,
- advertisement: signboards, billboards, bags, briefcases,
- protection: protection of palletized load edges, keeping any movable inner parts of appliances fixed e.g. in electric and gas cookers,
- packaging: multiple usage returnable packages, pharmaceutical, automotive and food industry,
- insulation: heat insulation of buildings, thermal insulation of plants (refrigerating machines, dishwashers), tree casing.

The production of PP twinwall sheet with the addition of PP regranulate is carried out according to the scheme (Fig. 2).

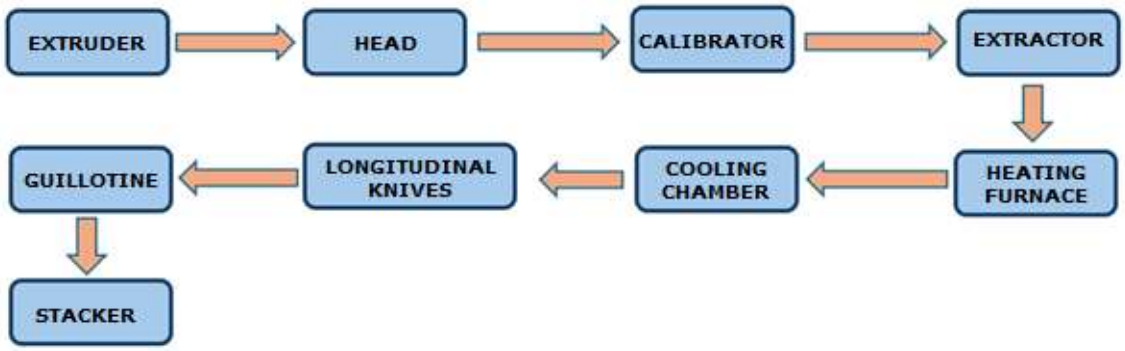
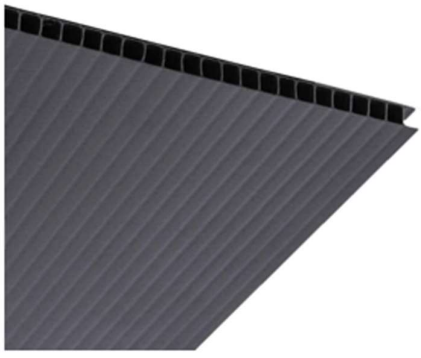


Figure 2: Process diagram of PP twinwall sheet with the addition of PP regranulate.

Specifications:



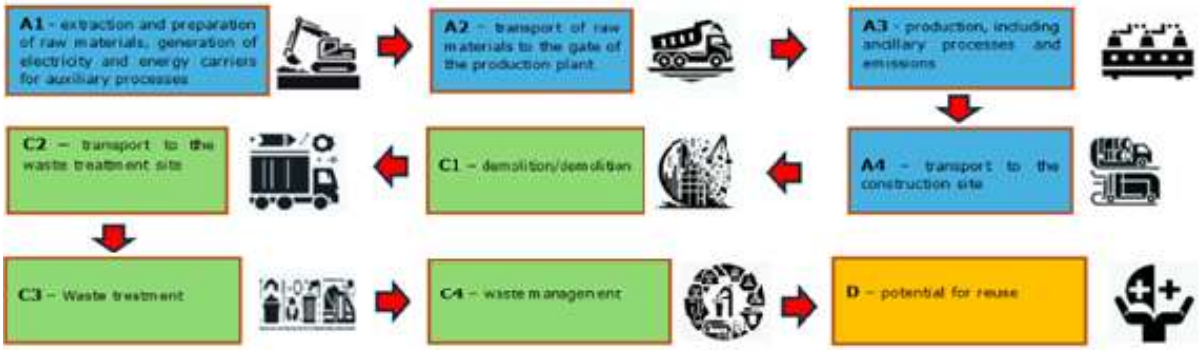
Material	Mass Participation [%]
Polypropylene (PP)	**48,50**
Regranulate PP	**45,00**
Fillers	**5,00**
Dye	**1,50**

Polypropylene density ≥ 900 kg/m^3

3. LCA: CALCULATION RULES

System limitations

The life cycle analysis of the tested products includes modules A1-A3, A4, C1-C4 and D (Cradle to Gate with options) in accordance with EN 15804.



Data collection period

The data on the production process were provided in 2024 for the period 01.01.2022 – 31.12.2022.

Declared unit

1 kg (1 kilogram) of PP twinwall sheet with the addition of PP regranulate.

Assumptions

A1 - extraction and consumption of raw materials refers to specific mass shares in the production process per declared unit of the product,

A2 – distances from the place of obtaining raw materials to the production plant, individual for each raw material, means of transport varied depending on the method of delivery of raw materials,

A3 – CO_2, NO_x, SO_2 and dust emission values from the production process obtained as a result of measurements carried out at the plant, the rest estimated on the basis of fuel consumption.

A4 - transport - data used for calculations are included in the developed scenario.

C1 – dismantling/demolition of the material. The data is collected based on the developed scenario. At the demolition site, the waste is pre-sorted. Dismantling of thermal insulation systems does not require energy and material expenditures, it is possible to demolish them manually or with the use of power tools. The impact of these operations is so small that the environmental impact resulting from module C1 is negligible.

C2 – pre-sorted waste is transported to the waste treatment plant according to the scenario.

	C3 – takes into account the environmental impact during waste treatment. It is assumed that all waste generated by the activities in module C1 goes to the waste treatment plant. The calculations are performed based on the developed scenario. **C4** – describes the processes of neutralization of waste generated as a result of the installation and demolition of thermal insulation systems. The calculations are made on the basis of the developed scenario. **D** – refers to the impact and effects of the use of secondary material. The calculations are performed based on the developed scenario.
Cut-off criteria	99% of all bulk streams involved in the production process were taken into account. All the energy used in the process was taken into account in the environmental declaration.
General data	The data for the calculations come from Ecoinvent v. 3.9.2 and KOBiZE. The emission factors for electricity were determined using the actual KOBiZE data. The applied emission factor of Polish electricity (Ecoinvent supplemented with current national data KOBiZE) is 0.685 kg CO_2/kWh. A detailed analysis of data quality was part of an external audit.
Allocation	All data provided by the manufacturer have been referenced to the product's declared unit (DU) – **1 kg** of PP twinwall sheet with the addition of PP regranulate. The allocation rules used in this EPD are based on the general principles of ICIMB-PCR A.

4. LCA: SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION

For the life cycle analysis of products covered by the cradle to gate with options environmental declaration, scenarios have been developed for modules A4, C1-C4 and D:

Module A4:
Transport is carried out by a vehicle with a load capacity of 16-32 tonnes that meets the EURO 6 emission standards, the average distance from the plant to the customer is 350 km.

Module C1:
Manual demolition and initial sorting on site were adopted. The consumption of energy and other raw materials in this module has been omitted due to negligible values. The separated fractions are directed to the waste treatment plant.

Module C2:
The waste is directed to the waste treatment plant. From there, after separating the recyclable fraction, the fraction for thermal processing and the fraction for storage in a landfill, their appropriate amounts are directed to further processes.

- Transport is carried out by trucks with a load capacity of 7.5-16 tons, meeting the EURO 6 emission standards,
- The material is transported to the waste management plant.
- Transport to the waste treatment plant takes place at a distance of 50 km from the demolition site.
- Transport to the landfill takes place at a distance of 50 km from the waste treatment plant.
- Transport to the waste incineration plant takes place at a distance of 100 km from the waste treatment plant.

Module C3:
All waste goes to the waste treatment plant. The following processes were assumed for the calculations: unloading (loader), grinding (mill)

The following were adopted for the calculations:

energy consumption	0,03	kWh/kg
Fuel consumption	0,315	MJ/kg

Module C4
Storage of part of the waste separated in the processing process (module C3) and thermal utilization of part of the waste fraction were assumed. As a result of thermal utilization, energy is released, which is partially recovered as heat and electrical energy. It was assumed that the average calorific value of PP is 42.86 MJ/kg. The efficiency of heat recovery from waste incineration is 32.0%, while the efficiency of electricity production is 11.2%. The benefits of thermal waste treatment are included in module D as exported energy.

Module D
The potential for reusing the material, the benefits of thermal waste treatment and recycling of packaging (foil, PP tape) have been taken into account here.

5. LCA: RESULTS

The table below shows the LCA modules taken into account in the calculation of the environmental impact categories for the products covered by the declaration.

DESCRIPTION OF SYSTEM BOUNDARIES (X – INCLUDED IN LCA, MND – UNDECLARED MODULE)																
Production stage			**Construction phase**		**Stage of use**							**End of life stage**				**Benefits and flows beyond the system boundaries**
Mining & Sourcing	Transport	Production	Transport	Construction Process	Usufruct	Maintenance	Repair	Exchange	Renovation	Energy consumption	Water consumption	Demolition	Transport	Waste Treatment	Waste management	Potential for reuse
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
X	**X**	**X**	**X**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**	**X**	**X**	**X**	**X**	**X**

The following tables present the results of the LCA analysis for the PP twinwall sheet. Explanations of the abbreviations used to describe the impact category are provided below:

GWP-total	Global warming potential
GWP-fossil	Global warming potential fossil fuel
GWP-biogenic	Global warming potential biogenic
GWP-luluc	Global warming potential land use and land change
ODP	Depletion potential of the stratospheric ozone layer
AP	Acidification potential of land and water
EP-freshwater	Eutrophication potential, fraction of nutrients reaching freshwater end compartment
EP-marine	Eutrophication potential, fraction of nutrients reaching marine end compartment
EP-terrestial	Eutrophication potential, Accumulated Exceedance
POCP	Formation potential of tropospheric ozone photochemical oxidants
ADP-minerals&metals	Abiotic depletion potential for nonfossil resources
ADP-fossil	Abiotic depletion potential for fossil resources
WDP	Water (user) deprivation potential
PM	Potential incidence of disease due to PM emissions
IRP	Potential Human exposure efficiency relative to U235
ETP-fw	Potential comparative Toxic Unit for ecosystems
HTP-c	Potential comparative Toxic Unit for humans (cancerogenic)
HTP-nc	Potential comparative Toxic Unit for humans (non-cancerogenic)
SQP	Potential soil quality index
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
PEN-RE	Use of non-renewable primary energy resources excluding non-renewable primary energy resources used as raw materials
RE	Use of non-renewable primary energy resources used as raw materials
PENRT	Total use of non-renewable primary energy resources
SM	Use of secondary material
RSF	Use of renewable fuels
NRSF	Use of non-renewable secondary fuels
FW	Use of net fresh water

MAIN IMPACT INDICATORS: 1 kg PP twinwall sheet with the addition of PP regranulate

		Life cycle stage								
Indicator	**Unit**	**A1**	**A2**	**A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-total	kg CO2 eq.	1,71E+00	1,15E-01	2,13E-01	6,83E-02	0,00E+00	9,49E-03	5,67E-02	3,10E-04	-1,81E+00
GWP-fossil	kg CO2 eq.	1,70E+00	1,14E-01	4,55E-01	6,82E-02	0,00E+00	9,48E-03	5,55E-02	3,07E-04	-1,80E+00
GWP-biogenic	kg CO2 eq.	9,57E-03	5,85E-05	-2,43E-01	6,40E-05	0,00E+00	8,88E-06	1,11E-03	3,11E-06	-1,73E-02
GWP-luluc	kg CO2 eq.	4,24E-04	6,78E-05	6,56E-04	3,31E-05	0,00E+00	4,60E-06	2,59E-05	5,98E-08	-9,17E-04
A	kg CFC11 eq.	1,13E-08	2,15E-09	1,89E-09	1,45E-09	0,00E+00	2,01E-10	5,31E-10	4,90E-12	-2,81E-08
AP	mol H+ eq.	5,86E-03	1,43E-03	2,14E-03	1,45E-04	0,00E+00	2,02E-05	3,96E-04	2,58E-06	-9,28E-03
EP-freshwater	kg PO4 eq.	1,92E-04	6,33E-06	5,27E-04	4,73E-06	0,00E+00	6,57E-07	3,09E-05	9,59E-09	-1,03E-03
EP-marine	kg N eq.	1,02E-03	3,58E-04	4,37E-04	3,67E-05	0,00E+00	5,09E-06	1,53E-04	1,18E-06	-1,12E-03
EP-terrestrial	mol N eq.	1,08E-02	3,92E-03	3,74E-03	3,73E-04	0,00E+00	5,18E-05	1,60E-03	1,28E-05	-1,04E-02
POCP	kg NMVOC eq.	5,29E-03	1,19E-03	1,19E-03	2,26E-04	0,00E+00	3,13E-05	4,73E-04	3,85E-06	-7,27E-03
ADP-minerals & metals	kg Sb eq.	7,96E-06	2,67E-07	6,26E-07	2,17E-07	0,00E+00	3,02E-08	3,30E-08	1,64E-10	-1,59E-06
ADP-fossil	MJ	6,10E+01	1,50E+00	5,06E+00	9,45E-01	0,00E+00	1,31E-01	6,53E-01	3,93E-03	-1,58E+01
WDP	WDP (m^3) world. ekw	1,20E+00	5,30E-03	4,41E-02	3,95E-03	0,00E+00	5,48E-04	2,03E-03	8,68E-06	-1,18E-01

ADDITIONAL IMPACT INDICATORS: 1 kg PP twinwall sheet with the addition of PP regranulate

		Life cycle stage								
Indicator	**Unit**	**A1**	**A2**	**A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
PM	Disease incidency	6,29E-08	6,37E-09	1,01E-08	4,96E-09	0,00E+00	6,88E-10	8,28E-09	7,70E-11	-8,12E-08
IRP	kBq U235 eq.	8,71E-02	1,58E-03	8,94E-03	1,28E-03	0,00E+00	1,78E-04	3,99E-04	3,68E-06	-1,71E-02
ETP-fw	CTUe	1,92E-04	6,33E-06	5,27E-04	4,73E-06	0,00E+00	6,57E-07	3,09E-05	9,59E-09	-1,03E-03
HTP-c	CTUh	1,36E-10	2,33E-11	3,28E-10	1,59E-11	0,00E+00	2,21E-12	6,10E-12	5,06E-14	-6,16E-09
HTP-nc	CTUh	5,28E-09	3,79E-10	1,06E-09	2,45E-10	0,00E+00	3,40E-11	1,77E-10	1,69E-12	-4,62E-08
SQP	-	1,46E+00	6,27E-01	2,40E+01	5,71E-01	0,00E+00	7,92E-02	6,95E-02	2,25E-02	-3,06E+00

INDICATORS DESCRIBING RESOURCE CONSUMPTION: 1 kg PP twinwall sheet with the addition of PP regranulate										
	Life cycle stage									
Indicator	**Unit**	**A1**	**A2**	**A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	9,08E-01	1,92E-02	4,67E+00	1,49E-02	0,00E+00	2,07E-03	2,48E-02	3,84E-04	-7,10E-01
PERMIAN	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	MJ	9,08E-01	1,92E-02	4,67E+00	1,49E-02	0,00E+00	2,07E-03	2,48E-02	3,84E-04	-7,10E-01
PEN-RE	MJ	6,19E+01	1,57E+00	6,51E+00	9,86E-01	0,00E+00	1,37E-01	7,59E-01	4,09E-03	-2,10E+01
RE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	MJ	6,19E+01	1,57E+00	6,51E+00	9,86E-01	0,00E+00	1,37E-01	7,59E-01	4,09E-03	-2,10E+01
SM	Kg	0,00E+00	0,00E+00	1,34E-03	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	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	0,00E+00	0,00E+00
FW	m^3	1,71E-02	1,72E-04	9,87E-03	1,50E-04	0,00E+00	2,08E-05	4,95E-04	1,50E-07	-8,44E-03

INDICATORS DESCRIBING OUTPUT STREAMS AND WASTE: 1 kg PP twinwall sheet with the addition of PP regranulate										
	Life cycle stage									
Indicator	**Unit (referenced to DU)**	**A1**	**A2**	**A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
Amount of hazardous waste	kg	WN	WN	4,05E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Amount of non-hazardous waste	kg	WN	WN	2,47E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Amount of radioactive waste	kg	WN	WN	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Reusable components	kg	WN	WN	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Recyclable materials	kg	WN	WN	1,34E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Energy Recovery Materials	kg	WN	WN	8,10E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported Energy	MJ/energy carrier	WN	WN	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,08E-01

BIOGENIC CARBON	
Biogenic carbon content in the product (kg C_{org})	**0,00E+00**
Biogenic carbon content per package (kg C_{org})	**3,96E-02**

6. INTERPRETATION OF RESULTS

Figure 3 shows a graph of the contributions of individual life cycle modules to the basic categories of impact of PP twinwall sheet with the addition of PP regranulate:

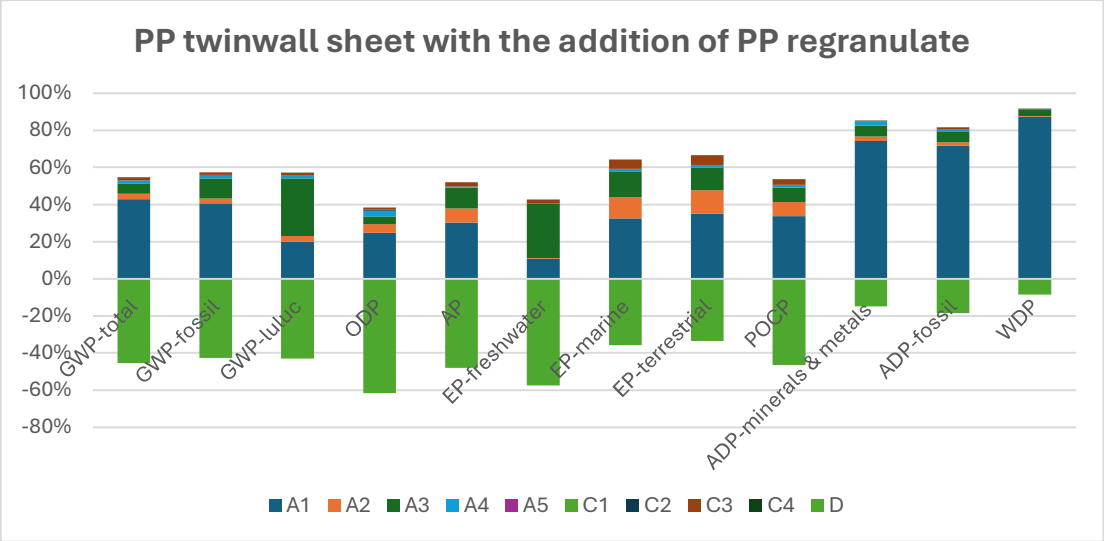


Figure 3 Shares of life cycle modules on the main categories of impacts – PP twinwall sheet with the addition of PP regranulate.

7. LITERATURE

- ✓ PN-EN ISO 14025:2014-04, Environmental labels and declarations -- Type III environmental declarations -- Rules and procedures.
- ✓ PN-EN 15804+A2:2020, Sustainability of building structures -- Environmental product declarations -Basic principles of categorization of construction products.
- ✓ PN-EN ISO 14040:2009 Environmental management. Life Cycle Assessment. Principles and structure.
- ✓ PN-EN ISO 14044:2009, Environmental management. Life Cycle Assessment. Requirements and guidelines.
- ✓ EN 15942:2012, Sustainability of construction works – Environmental product declarations – Communication format business-to-business.
- ✓ Directive (EU) 2018/852 of the European Parliament and of the Council of 30 May 2018 amending Directive 94/62/EC on packaging and packaging waste.
- ✓ PN-EN 15343:2008, Plastics - Recycled Plastics - Plastics recycling traceability and assessment of conformity and recycled content
- ✓ The Act of 14 December 2012 on Waste, Journal of Laws. 2013, item 21.
- ✓ Act of 27 April 2001. Environmental Protection Law Journal of Laws 2024.54, consolidated text.
- ✓ Data from the company's website: **https://www.kaczmarek2.pl/**

Explanatory material can be obtained by contacting the representative directly Kaczmarek Malewo Sp.K.

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Łukasiewicz
Institute
of Ceramics
and Building
Materials

PROCESS ENGINEERING RESEARCH GROUP

TYPE III ENVIRONMENTAL DECLARATION CERTIFICATE

no. 03-08/2024

Products:

PP twinwall sheet with the addition of PP regranulate

Owner:

Kaczmarek Malewo Sp.K.

Malewo 1, 63-800 Gostyń

The declaration was developed in accordance with the requirements of the standard:

PN-EN 15804+A2: 2020-03

Sustainability of construction works
Environmental product declarations
Core rules for the product category of construction products

The declaration was verified in accordance with the requirements of the standard:

PN-EN ISO 14025:2010

Environmental labels and declarations
Type III environmental declarations. Principles and procedures

The certificate was issued for the first time on **August 30, 2024,** and is valid for 5 years or until the said EPD is amended.

Process Engineering Research Group Leader

Ewa Głodek-Bucyk, PhD Eng.

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