

ENVIRONMENTAL PRODUCT DECLARATION



In accordance with ISO 14025:2006

**Programme**

The International EPD® System,
www.environdec.com

Regional Hub

EPD registered through the fully
aligned regional hub
EPD South East Asia
<https://www.epd-southeastasia.com/>

Programme Operator

EPD South East Asia

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2022-11-18

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2027-10-31

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

Programme Information

Programme	The International EPD[®] System EPD registered through the fully aligned regional hub: EPD Southeast Asia	
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Product category rules (PCR):

Boards, blocks, panels, sheets of plastics, or in composite system, for structural application (non-construction)
 2018:10, version 1.01: UN CPC 36390

PCR review was conducted by:

International EPD[®] System Technical Committee. A full list of members available on www.environdec.com.
 The review panel may be contacted via info@environdec.com

Review chair:

Lars-Gunnar Lindfors

Independent third-party verification of the declaration and data, according to ISO 14025:2006:

☒ External ☐ Internal

Covering

☐ EPD process certification ☒ EPD verification

Third party verifier:

Hüdai Kara, PhD, Metsims Sustainability Consulting, www.metsims.com, Oxford, U.K.

Approved by:

The International EPD[®] System

Procedure for follow-up of data during EPD validity involves third party verifier:

☐ Yes ☒ No

The EPD owner has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programmes may not be comparable.

About ASTARI



PT Astari Niagara Internasional (ASTARI) is one of the world's largest acrylic manufacturers and the pioneer of acrylic product in Indonesia. Established in 1980, ASTARI currently has more than 42 years of experience in cast acrylic manufacturing. ASTARI has built a strong presence in several key markets, including North America, Europe, the United Kingdom, the Asia Pacific, the Middle East and Africa. ASTARI strives to implement constant and ongoing innovation in its practices. One of the areas where this innovation can be seen is in the use of post-consumer, post-industrial scrap, and other acrylic waste to produce high-quality cast acrylic sheets, also known as ASTARIGLAS® ECO CAST, using 100 % recycled methyl methacrylate monomer (R-MMA).



ASTARIGLAS[®] ECO CAST



ASTARIGLAS[®] ECO CAST

Product name

ASTARIGLAS[®] ECO CAST Transparent using 100% recycled methyl methacrylate monomer (R-MMA).

Product identification

Transparent cast acrylic product made from 100% recycled MMA.

Product description

ASTARIGLAS[®] ECO CAST is a new innovation of high-quality recycled and recyclable cast acrylic sheets. ASTARI uses very high purity ($\geq 99\%$) Depolymerized-MMA (DMMA) as raw material exclusively made in their own facility to produce high-quality recycled and recyclable cast acrylic sheets with the equal quality as cast acrylic sheets produced from virgin MMA.

ASTARIGLAS[®] ECO CAST is made of premium quality DMMA and can be recycled repeatedly without losing its important physical properties while maintaining the same optical, mechanical, and physical properties as cast acrylic sheet made from virgin MMA.

ASTARIGLAS[®] ECO CAST provides superior quality in optical clarity, weatherability, physical properties, and chemical resistance, bringing the concept of recycled acrylic sheets to the next level.

Major application

ASTARIGLAS[®] ECO CAST is a versatile high quality recycled and recyclable cast acrylic sheet. They are easily fabricated in all kinds of machining - CNC router and laser cutting, hot bending, solvent, and polymerizable adhesives bonding, thermoforming, polishing, and digital flatbed printing.

ASTARIGLAS[®] ECO CAST product is a brilliant choice for:

- POP Displays
- Cosmetic Displays
- Signages

Technical Information

ASTARIGLAS® ECO CAST Transparent using 100% recycled methyl methacrylate monomer (R-MMA) produced from R-MMA material by PT Astari Niagara Internasional complies with ISO 7823.1 which ensures the ASTARIGLAS® ECO CAST product to provide the highest quality of optical clarity, weatherability, physical properties, and chemical resistance.

Available technical specifications for ASTARIGLAS® ECO CAST Transparent using 100% recycled MMA product are listed below:

Technical specifications	Standard	Value	Unit
General Properties			
Relative Density	ISO 1183	1.19	g/cm ³
Mechanical Properties			
Tensile Strength @23°C	ISO 527	69	MPa
Elongation at Break @23°C	ISO 527	4.2	%
Flexural Strength	ISO 178	116	MPa
Modulus of Elasticity	ASTM D638	460,000	psi
Flexural Modulus	ISO 178	3300	MPa
Impact Strength - Charpy-Unnotched	ISO 179 / I fu	12.5	kJ.m ⁻²

Note:

The standard values quoted are not always strictly equivalent and based on tests on representatives samples. The information given in this publication is based on our general experience and given in good faith. It is intended as a general guide and must not be considered as a binding specification. No warranty is given or is to be implied. In no way does this information incurs the liability of Astari Niagara Internasional, especially in infringement of the rights of a third party.

Content Declaration

ASTARIGLAS[®] ECO CAST product by ASTARI is made from R-MMA (Recycled methyl methacrylate monomer) produced from pre-consumer as well as post-consumer materials that were mixed with other additives to produce high quality product. ASTARIGLAS[®] ECO CAST product's typical product content can be seen in the table below.

Product Content	Concentration % (wt/wt)
R-MMA	>99%
Catalysts	<1%
UV Absorber	<1%
Mould Release Agent	<1%

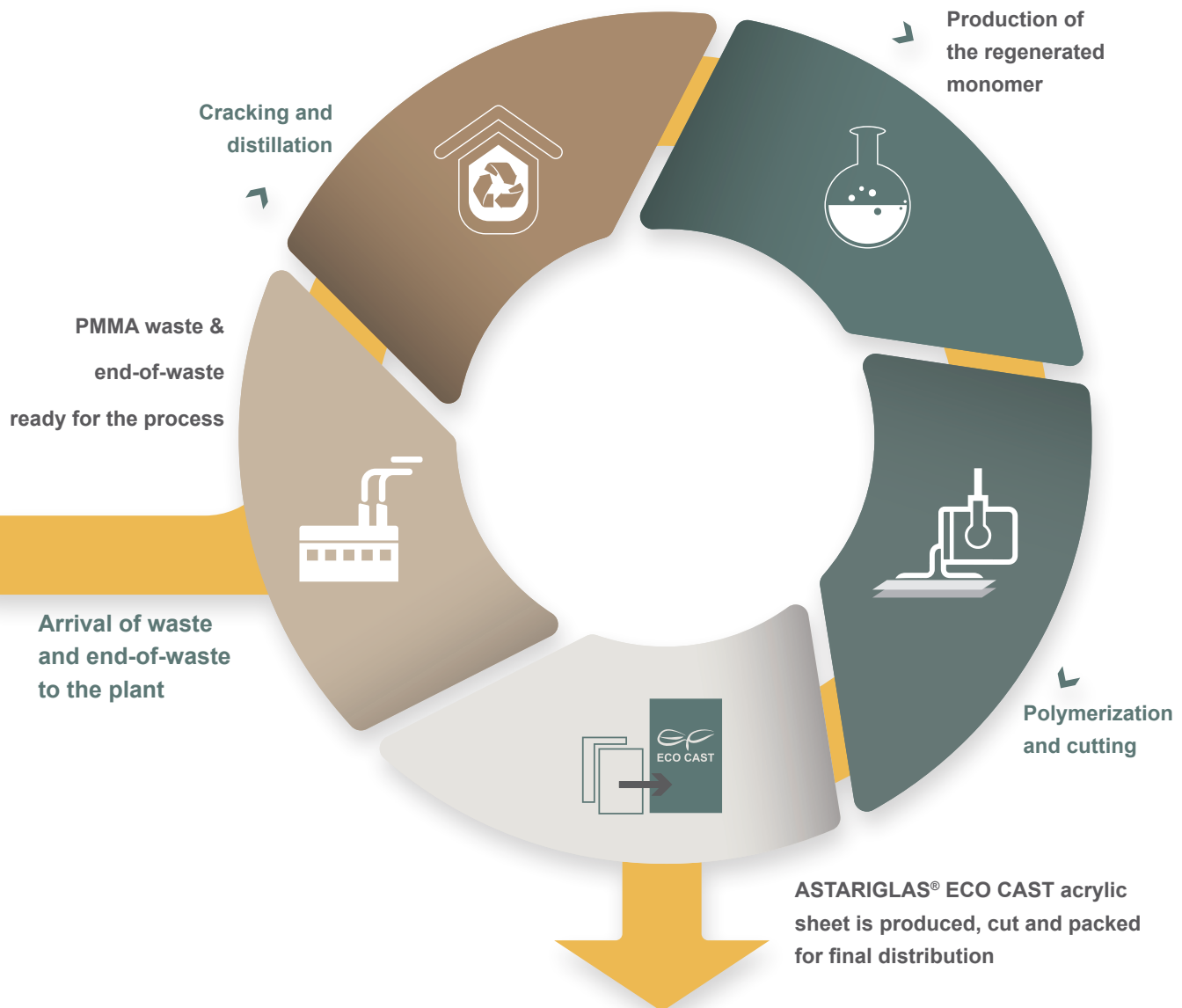
Dangerous substances from the candidate list of SVHC for Authorisation

ASTARIGLAS[®] ECO CAST Transparent using 100% recycled methyl methacrylate monomer (R-MMA) product does not contain substances listed on the candidate list of "Substance of Very High Concern (SVHC)", as published on the European Chemical Agency (ECA) website as well as substances listed on the most updated REACH regulation of "Substances of Very High Concern", in concentration exceeding 0.1% percentage by mass.

Packaging

Packaging materials for ASTARIGLAS[®] ECO CAST product ready to be shipped consist of wooden pallet, corrugated paper, strapping band, plastic, clear tape, and sticker. While consumer packaging only consists of masking material from kraft paper or PE film.

Production Process



Product Information

UN CPC code

36390 - Other plates, sheets, film, foil, and strips, of plastics.

Geographical Scope

ECO CAST product is produced in Indonesia and finished product is distributed to United States of America (USA), Europe, Australia and New Zealand (ANZ), as well as India.

LCA information

Declared unit: 1 m³ of ECO CAST product

Reference service life: Not applicable

Time representativeness

Specific primary data were collected from 2021-11-01 to 2022-04-31. Generic data from the database or other sources range from 2014-2021.

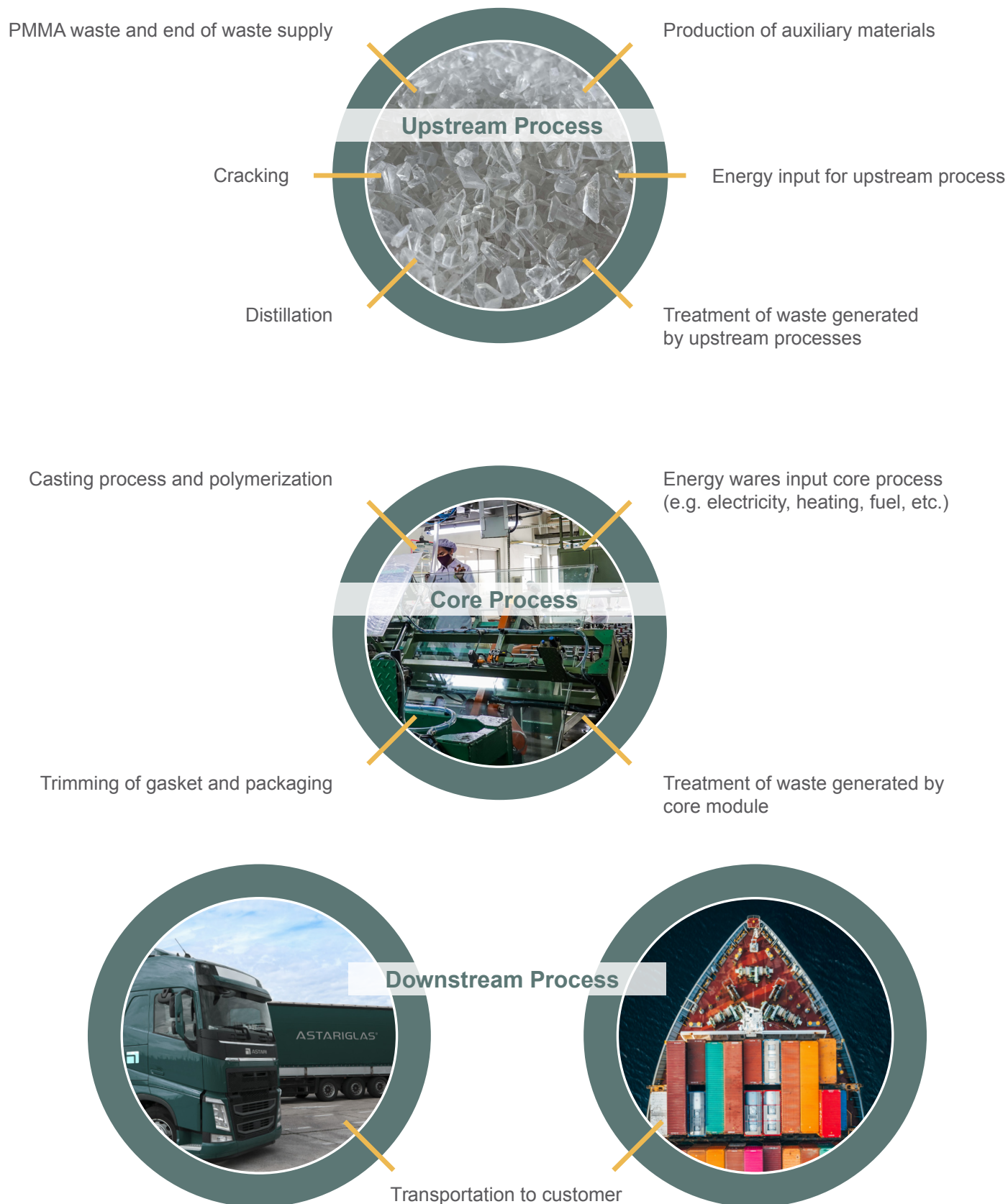
Database(s) and LCA software used

Generic data for upstream and downstream processes use Ecoinvent 3.8 database and modelled by using SimaPro Developer software version 9.3.0.3. No datasets older than 10 years were used.

Description of system boundaries

The system boundary was chosen based on the goal and scope of the study and in accordance with standards set in PCR Boards, blocks, panels, sheets of plastics, or in composite system, for structural application (non-construction) 2018:10, version 1.01. i.e. "cradle-to-grave".

The processes below are included in the product system to be studied:



LCA Information

Key Assumptions and Limitations

- Production processes of all auxiliary materials (e.g. Chemicals, steel, etc.) use generic data from commercial databases. Datasets used for these materials, mainly for electricity and water have been modified according to the country where the material is manufactured to make the dataset more representative.
- Electricity from national power grid is calculated using Ecoinvent 3.8 dataset of “Electricity, medium voltage {ID} market for | Cut-off, U” to represent medium voltage electricity generated by national power grid used in the manufacturing process of ASTARIGLAS® ECO CAST product
- Distribution of assessed products are only measured to the port of direct customers, e.g. industries, product distributors, etc located on United States of America (USA), Europe, Australia and New Zealand (ANZ), as well as India.
- As ASTARIGLAS® ECO CAST Transparent using 100 % recycled MMA is a new available product in the market, the Life Cycle Inventory data is based on 6-month production data starting from November 2021 to April 2022. Hence the result of the study for ASTARIGLAS® ECO CAST Transparent using 100 % recycled MMA shall be updated and re-verified when data from 1 year of production is available

Cut-off rules

In case of insufficient input data or data gaps for a unit process, the cut-off criteria shall be 1% of renewable and non-renewable primary energy usage and 1% of the total mass input of that unit process. The total of neglected input flows per module, e.g., per module upstream to downstream shall be a maximum of 5% of energy usage and mass. In this study, all data in the product system is included. If there is missing specific data, generic data from the database or literature were used.

Data Quality

- Time related coverage: specific data were collected from 2021-11-01 to 2022-04-31.
- Geographic coverage: specific data were collected from the area under study, i.e., Cikupa, Tangerang, Banten Regency, Indonesia. Electricity production as a key input is sourced from Indonesia’s national power grid, calculated using electricity mix {ID} available as dataset in Ecoinvent 3.8.
- Technological coverage: specific data were collected from ASTARIGLAS® ECO CAST product manufacturing process under study. Production activities take place since 2021. There is no specific data for upstream except R-MMA manufacturing by the company, therefore generic data from the global average was used with similar technology aspects to describe the process under study.

Data quality for both specific and generic data were sufficient to conduct life cycle assessment in accordance with the defined goal and scope.

Allocation

In this study, allocation is avoided as much as possible by dividing the process unit to be allocated into two or more sub-processes and collecting input and output data related to these sub-processes. If allocation is unavoidable, the inputs and outputs of a process unit will be divided based on the mass allocation. Data provided by the company for the inputs and outputs of ECO CAST product is already specific data for ECO CAST product only, hence no allocation was applied for ECO CAST product in this study.

Environmental Performance

The potential environmental impact indicators along with the characterization method are described in the table below:

Impact Indicator		Abbreviation	Unit	Characterization Method
Potential Environmental Impact Indicators, in accordance with PCR 2018:10, Version 1.01				
Global Warming Potential	Fossil	GWP-fossil	kg CO ₂ eq.	IPCC 2013
	Biogenic	GWP-biogenic	kg CO ₂ eq.	IPCC 2013
	Land use and land use change	GWP-luluc	kg CO ₂ eq.	IPCC 2013
	TOTAL	GWP-total	kg CO ₂ eq.	IPCC 2013
Acidification potential		AP	mol H ⁺ eq.	Accumulated Exceedance
Eutrophication potential	Eutrophication potential - freshwater	EP-freshwater	kg P eq.	EUTREND model (ReCiPe)
	Eutrophication potential - marine	EP-marine	kg N eq	EUTREND model (ReCiPe)
	Eutrophication potential - terrestrial	EP-terrestrial	mol N eq	Accumulated Exceedance
Photochemical oxidation creation potential		POCP	kg NMVOC eq.	LOTUS-EUROS
Ozone depletion potential		ODP	kg CFC 11	WMO 2014
Abiotic depletion potential	Metals and minerals / elements	ADPE	kg Sb eq.	CML 2002a
	Fossil resources	ADPF	MJ, net calorific value	CML 2002a
Water deprivation potential		WDP	m ³ world eq.	AWARE
Resource Use Parameters				
Use of renewable primary energy excluding renewable primary energy resources used as raw materials		PERE	MJ	N/A
Use of renewable primary energy resources used as raw materials		PERM	MJ	N/A
Total use of renewable primary energy resources		PERT	MJ	N/A
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials		PENRE	MJ	N/A
Use of non-renewable primary energy resources used as raw materials		PENRM	MJ	N/A
Total use of non-renewable primary energy resources		PENRT	MJ	N/A
Use of secondary material		SM	kg	N/A
Use of renewable secondary fuels		RSF	MJ	N/A
Use of non-renewable secondary fuels		NRSF	MJ	N/A
Use of net fresh water		FW	m ³	N/A

Environmental Performance

Impact Indicator	Abbreviation	Unit	Characterization Method
Waste Categories and Output Flows			
Hazardous waste disposed	HWD	kg	N/A
Non-hazardous waste disposed	NHWD	kg	N/A
Radioactive waste disposed	RWD	kg	N/A
Components for reuse	CRU	kg	N/A
Materials for recycling	MFR	kg	N/A
Materials for energy recovery	MER	kg	N/A
Exported electrical energy	EEE	MJ	N/A
Exported thermal energy	EET	MJ	N/A

Potential environmental impact – environmental information according to PCR 2018:10, Boards, Blocks, Panels, Sheets of Plastics, or in Composite System, for Structural Application (Non-Construction) Version 1.01

Results for 1 m ³ ASTARIGLAS [®] ECO CAST Product					
Impact Indicator	Unit	Upstream	Core	Downstream	Total
GWP-fossil	kg CO ₂ eq.	2.99E+03	1.26E+02	1.34E+02	3.25E+03
GWP-biogenic	kg CO ₂ eq.	-5.08E+01	3.53E-02	3.29E-02	-5.07E+01
GWP-luluc	kg CO ₂ eq.	4.89E+00	3.48E-03	2.14E-03	4.90E+00
GWP-total	kg CO ₂ eq.	2.94E+03	1.26E+02	1.34E+02	3.20E+03
AP	mol H ⁺ eq.	1.98E+01	2.47E-01	4.33E+00	2.44E+01
EP-freshwater	kg P eq.	4.87E-01	1.04E-04	9.39E-05	4.87E-01
EP-marine	kg N eq.	3.14E+00	5.04E-01	1.08E+00	4.72E+00
EP-terrestrial	mol N eq.	3.45E+01	8.46E-01	1.20E+01	4.73E+01
POCP	kg NMVOC eq.	9.30E+00	2.60E-01	3.05E+00	1.26E+01
ODP	kg CFC 11	1.89E-04	1.10E-05	2.81E-05	2.28E-04
ADPE	kg Sb eq.	3.56E-01	8.58E-07	2.21E-06	3.56E-01
ADPF	MJ, net calorific value	3.11E+04	1.96E+03	1.74E+03	3.48E+04
WDP	m ³ world eq.	3.49E+02	1.38E+01	-2.32E-01	3.62E+02

Resource Use

Results for 1 m³ ASTARIGLAS® ECO CAST Product					
Parameter	Unit	Upstream	Core	Downstream	Total
PERE	MJ	3.61E+03	2.99E+01	2.32E+00	3.64E+03
PERM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	3.61E+03	2.99E+01	2.32E+00	3.64E+03
PENRE	MJ	4.74E+04	2.77E+03	1.85E+03	5.20E+04
PENRM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	4.74E+04	2.77E+03	1.85E+03	5.20E+04
SM	kg	0.00E+00	1.65E+03	0.00E+00	1.65E+03
RSF	MJ	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
FW	m3	2.56E+02	1.01E+01	2.99E-01	2.67E+02

Waste Production and Output Flows

Waste production

Results for 1 m³ ASTARIGLAS® ECO CAST Product					
Parameter	Unit	Upstream	Core	Downstream	Total
HWD	kg	0.00E+00	4.82E+02	0.00E+00	4.82E+02
NHWD	kg	0.00E+00	2.10E+01	0.00E+00	2.10E+01
RWD	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Output flows

Results for 1 m³ ASTARIGLAS® ECO CAST Product					
Parameter	Unit	Upstream	Core	Downstream	Total
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	0.00E+00	6.42E+01	0.00E+00	6.42E+01
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EET	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Contact Information

Owner of the EPD



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Differences Versus Previous Versions

An update on the image of the cover, and the image on page #06, 2022-11-18.

References

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THE INTERNATIONAL EPD® SYSTEM

ENVIRONMENTAL PRODUCT DECLARATION

ASTARIGLAS®



ECO CAST



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