

# Catalogue of recycled resins & aluminium

from used beverage carton packages  
rLDPE, rHDPE, rPP, rAluminium

# CONTENTS

<b>1 Introduction</b>	<b>1</b>	<b>4 Technical data sheets (rHDPE, rPP)</b>	<b>17</b>
<b>2 Recycled products and processing methods</b>	<b>3</b>	4.1 Recon Polymers (rHDPE, rPP)	18
2.1 Overview of recycled products	4	4.2 Plastigram Industries a.s. (rHDPE, rPP)	19
2.2 Recycled products processing methods	5	<b>5 Technical data sheets rAluminum</b>	<b>20</b>
<b>3 Technical data sheets (rLDPE)</b>	<b>6</b>	5.1 Plastigram Industries a.s.	21
3.1 Gayatri Paper Mill (rLDPE)	7	5.2 Palurec GmbH	22
3.2 Recon Polymers (rLDPE)	8	<b>6 Other polyAl recyclers</b>	<b>23</b>
3.3 Palurec GmbH (rLDPE)	9	<b>7 Glossary of abbreviations</b>	<b>25</b>
3.4 Plastigram Industries a.s. (rLDPE)	10		
3.5 Ecorevive srl (TPN, agglomerated) (rLDPE)	11		
3.6 Ecorevive srl (TPR, extruded) (rLDPE)	12		
3.7 Lucart Italy (rLDPE, rHDPE & rPP)	13		
3.8 Ecoplasteam Italy (rLDPE)	14		
3.9 Fulun (rLDPE, HDPE & PP)	15		
3.10 Bioplast (rLDPE)	16		

# 1. Introduction

Tetra Pak strives to make food safe and available, everywhere. Our packages play an important part in the intricate and delicate web that is the global food system, ensuring that millions of people have access to nutritious food, every day. The expansion of access to safe food is, however, facing many challenges, not the least in relation to the global climate crisis. In our endeavours to protect the planet, we have progressed in our development

of the world's most sustainable packaging – a carton that is made solely from responsibly sourced renewable or recycled materials, that is fully recyclable and carbon neutral.

We believe that collective action is key and to reach our goals, we have adopted a full life cycle approach.

**More specifically, we are focusing on four areas for collaborative innovation:**



**1.**

***Maximising the use of renewable materials and sourcing them responsibly, in a way that protects biodiversity***



**2.**

***Minimising carbon impact of our own operations as well as the impact created by our value chain***



**3.**

***Enabling greater access to safe food while reducing food waste***



**4.**

***Driving an active agenda to develop sustainable recycling value chains***



The following catalogue is part of the development of the sustainable recycling value chains, which are mentioned above. Our ambition is that all our packages are collected, recycled, and never become litter. To achieve that, we are working collaboratively across the recycling value chain to:

- Design for recycling
- Drive consumer awareness and engagement
- Support collection and sorting
- Expand recycling capacity and solutions
- Grow recycled material use and applications

By strengthening global carton recycling infrastructure, we can ensure that cartons are transformed into new raw material and products, keeping valuable resources in use to help build a circular economy. One of those valuable resources, is the protective layer in our packages, consisting of polyethylene and aluminium. This composite, also known as polyAl, can be recycled and used for multiple purposes.

The aim of this catalog is to give an overview of the companies that recycle polyAl, including the technical data of the polyAl material as well as examples of end use, which in turn should inspire the development of new products/ companies and increase the end use of recycled polyAl. Join us in the journey of cartons recycling and be part of the circularity transformation. Feel free to connect directly with the local teams listed on the projects.

To read more, you can visit Tetra Pak Sustainability Report 2021 or go to our website: [www.tetrapak.com](http://www.tetrapak.com)

# 2. Recycled products and processing methods

## 2.1 Overview of recycled products

Recycler	Grade	Capacity (MT/yr)	Melt Flow Index (MFI) (190°C, 2.16 kg)	Location	End use examples
Gayatri	rLDPE (granules)	2000	3	South Africa	Outdoor Furniture, Retail Displays, Transport Pallets.
Recon	rLDPE (granules)	4800	3	Netherlands	Injection moulding applications, Bird Feeders, Chairs, Sanitary Products, 3D printing.
Recon	rHDPE (regrind)	150	N/A	Netherlands	Injection moulding applications, e.g. Chairs, Sanitary Products, 3D printing.
Palurec	rLDPE (granules)	5000	3,1-3,7	Germany	Injection moulding applications, e.g. Transport Pallets.
Plastigram	rLDPE (granules)	5000	5,5	Czech Republic	Compounding, replacing existing (r)LDPE, injection moulding applications.
Plastigram	rHDPE, rPP (regrind)	1500	5-7	Czech Republic	Injection moulding applications.
Ecorevive	rLDPE, rLLDPE (agglo)	6000	5,5	Italy	Urban furniture, poles and panels, pallets & additive for asphalts.
Ecorevive	LDPE, rLLDPE (granules)	6000	5,5	Italy	Urban furniture, poles and panels, pallets & additive for asphalts.
Lucart	rLDPE, rHDPE, rPP (granules)	8000	14,1 (190°C, 5 kg)	Italy	Transport pallets.
Ecoplasteam	rLDPE	6000	2,9	Italy	Injection moulding, extrusion, rotomoulding.
Fulun	rHDPE, rLDPE, rPP	30000	3,7	China	Injection moulding applications, e.g. furniture, pallets, waste bins, etc.
Bioplast	rLDPE	500	0,5-3,5	Brazil	Injection molding applications.
Palurec	rHDPE	1500	N/A	Germany	Injection moulding applications.

A – Separation of polymer and aluminium with extrusion pelletising with melt filtration

B – Cold wash or dry cleaning with extrusion pelletising with melt filtration

C – Dry cleaning with agglomeration

D – Dry cleaning with hotmelt pressing

## 2.2 Recycled products processing methods

### Recycling process for different polyAl output qualities: Simplified overview

Recycling process	General recycling process steps	Pelletising process / manufacturing process	Potential end-product
Dry-cleaning & chemical separation	Reducing fibre & aluminium. Removal of contaminants (glass, stone etc.). Sorting out caps & closures. Separation of polymer & aluminium.	Extrusion pelletising with melt-filtration	LDPE granules (aluminium free, <1%) (Figure 1)
Cold wash (& friction wash)	Reducing fibre & aluminium content. Removal of contaminants (glass, stone etc.). Sorting out caps & closures.	Extrusion pelletising with melt-filtration	Melt-filtrated polyAl granules (Figure 2)
Dry cleaning	Reducing fibre (& aluminium content). Removal of contaminants (glass, stone etc.). Sorting out caps & closures.	Agglomeration or hotmelt pressing	Agglomerated polyAl or panels/ roof sheets (Figure 3)
Full carton	Shredding. Drying. Pressing beverages cartons.	Hotmelt pressing	Panels/ roof sheets (Figure 4)



Figure 1 LDPE granules



Figure 2 PolyAl granules



Figure 3 Agglomerated polyAl

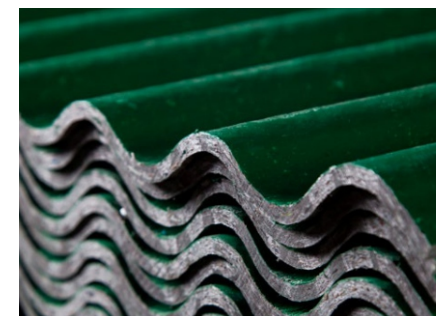


Figure 4 Roof sheets of polyal

# 3. Technical data sheets (rLDPE)



## 3.1 Gayatri Paper Mill (rLDPE)

### Company profile

Tetra Pak, together with Gayatri Paper Mill, invested in a dedicated polyAl pelletising line at Gayatri Paper Mill. The line has been operational and producing pellets since 2016. Ongoing trials have been conducted with local plastic injection moulding companies to develop products made with polyAl content.

Some of the innovative and ground-breaking developments locally have been blending polyAl with other polymers such as polypropylene (PP) and high density polyethylene (HDP). This has opened new opportunities to make use of polyAl content in existing product manufacturing such as retail displays and outdoor furniture.

Further developments are underway to expand polyAl end-use through the manufacturing of transportation pallets that can be returned and reused. Another innovative product that has been developed and is being manufactured locally is a point-of-sale display stand. This is used in retail stores for shelving products for promotional purpose. A total of 1700 stands have already been distributed through a retail chain called Dischem Pharmacies.

**Process:** Dry cleaning process and extrusion line

**Location:** Johannesburg, South Africa

**Production capacity:** 2.000 MT/yr

**Examples of end-uses/ processing method:** Outdoor furniture, retail displays, transportation pallets

**Website:** <https://www.tetrapak.com/insights/cases-articles/polyal-end-market-expansion-gayatri-paper>

### TECHNICAL DATA SHEET

Technical data for Tetrapak recycled LDPE pellets			
Property	Standard	Unit	Recycled LDPE pellets
Specific density at 23 °C	ISO 1183	g/cm <sup>3</sup>	1.05
Melt flow index	ISO 1133		
MFR 190/2,16	ISO1872/1873	g/10 min	3.35
Tensile stress at yield	ISO 527	MPa	11.5
Elongation at yield	ISO 527	%	37
Elongation at break	ISO 527	%	37
Impact strength unnotched at +23 °C	ISO 179	kJ/m <sup>2</sup>	Not done
Impact strength unnotched at -30 °C	ISO 179	kJ/m <sup>2</sup>	Not done
Impact strength notched at +23 °C	ISO 179	kJ/m <sup>2</sup>	Not done
Impact strength notched at 0 °C	ISO 179	kJ/m <sup>2</sup>	Not done
Impact strength notched at -30 °C	ISO 179	kJ/m <sup>2</sup>	Not done
Flexural strength (3,5% flexural stress)	ISO 178	MPa	
Modulus of elasticity	ISO 527	MPa	230
Thermal stability OIT 200 □C	EN 728		Not done
Metals present			Al (11%)



## 3.2 Recon Polymers (rLDPE)

### Company profile

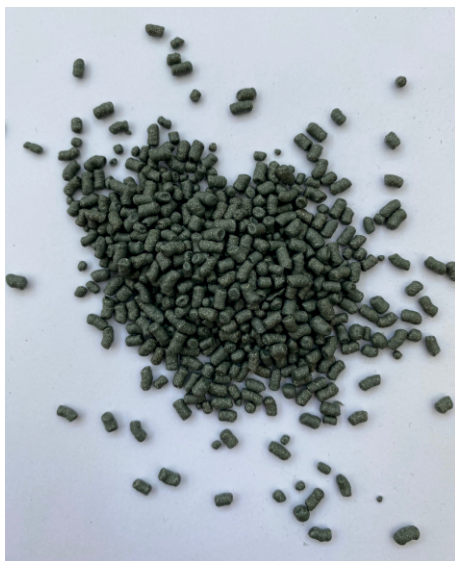
Recon Polymers specialises in the energy-efficient processing of polyAl into raw materials that are widely applicable in the plastics processing industry.

**Location:** Roosendaal, Netherlands

**Production capacity:** 1.500 MT (2021), 4.800 MT (2022 target)

**Examples of end-uses/ processing method:** Injection moulding applications, e.g. bird feeder, chairs, sanitary products

**Website:** <https://www.tetrapak.com/fr-fr/about-tetra-pak/news-and-events/news-room/Recon-Polymers-and-TetraPak-innovate>



Resin granulated



Resin compacted

recon polymers bv

### Technical Datasheet

#### PEAL

General properties	Test method	Units SI	Typical value
Shape	ISO 1183	kg/m <sup>3</sup>	Granular
Colour	Visual		Grey
Filling content	-	%	12.94

Specific properties	Test method	Units SI	Typical value
Density	ISO 1183	kg/m <sup>3</sup>	1.063
Melt Flow Index at 230°C and 2,16 kg	ISO 1133	g/10 min	3

Mechanical properties	1)	Test method	Units SI	Typical value
Charpy impact strength	unnotched, at +23°C	ISO 179/1U	kJ/m <sup>2</sup>	41.86
	unnotched, at -40°C	ISO 179/1U	kJ/m <sup>2</sup>	-
	notched, at +23°C	ISO 179/1A	kJ/m <sup>2</sup>	9.9
	notched, at -40°C	ISO 179/1A	kJ/m <sup>2</sup>	-
Izod impact strength	unnotched, at +23°C	ISO 180/1U	kJ/m <sup>2</sup>	-
	unnotched, at -40°C	ISO 180/1U	kJ/m <sup>2</sup>	-
	notched, at +23°C	ISO 180/1A	kJ/m <sup>2</sup>	-
	notched, at -40°C	ISO 180/1A	kJ/m <sup>2</sup>	-
Tensile test		ISO 527-2		
	tensile modulus	2)	MPa	378
	tensile stress at yield	3)	MPa	10.05
	tensile stress at break	3)	MPa	9.95
	elongation at yield	3)	%	9.26
elongation at break	3)	%	9.95	

Flexural test		ISO 178	MPa	
flexural modulus			MPa	396
maximum flexural stress			MPa	11.6

Hardness		ISO 868		
Shore D			-	48.4

Thermal Properties	Test method	Unit SI	Typical Value
Heat deflection temperature	at 1.80 MPa (HDT/A)	ISO 75/A	°C
	at 0.45 MPa (HDT/B)	ISO 75/B	°C
Vicat softening point	at 10 N (VST/A)	ISO 306	°C
	at 50 N (VST/B)	ISO 306	°C

1) Determined as injection moulded test specimen  
2) Test speed 1 mm/min, test specimen 4 mm thick

3) Test speed 50 mm/min, test specimen 4 mm thick

## 3.3 Palurec GmbH

### Company profile

Palurec GmbH was founded in December 2017. Fachverband Kartonverpackungen für flüssige Nahrungsmittel e.V. (FKN – Association for Beverage Cartons) is the sole shareholder. There are three companies in the association, Tetra Pak GmbH, SIG Combibloc GmbH and Elopak GmbH, which have invested around 8 million euros in the construction of the Palurec recycling plant. The first stage of production will provide capacity of around 18,000 tonnes input. The plant began to operate in spring 2021. With Palurec, it is now possible for the first time in Germany to recycle plastic and aluminium components from cartons into marketable secondary raw materials for a wide range of industrial applications, covering more than 50 percent of the plastic and aluminium components from cartons in Germany.

**Process:** Wet washing pre-treatment process, including reduction of aluminium content by friction and finally processed with agglomeration, extrusion and melt filtration.

**Location:** Hurth, Germany

**Production capacity:** 5.000 – 6.000 MT/yr

**Examples of end-uses:** Injection moulding applications, e.g. transportation pallets.

**Website:** <https://www.palurec.com/en/palurec-en/>

Primary information	Unit of Measurement	Value
<b>Material Name</b>		rLDPE granules
<b>Granule Diameter</b>	mm	3
<b>Filter size in production</b>	Micron	500
<b>Density</b>	g/cm <sup>3</sup> – ISO 1183	0,97
<b>Source of feedstock</b>	Origin description	Recycled Carton Packages from Paper mill from Germany
<b>Inorganic content</b>	%	3,7-4,2
<b>Smell/odour</b>	Score (0 – no odour to 3 – strong odour)	2,1-2,5
<b>MFI (190C; 2,16kg)</b>	g/10mins - ISO 1133	3,1-3,7
<b>Impact strength</b>	kJ/m <sup>2</sup> , Izod notched at 23 C - ISO 180 A	13,3-18.3
<b>Elongation at break</b>	% - ISO 527-3	38-49
<b>Flexular modulus</b>	MPa - ISO 178	418-468



## 3.4 Plastigram Industries a.s. (rLDPE)

### Company profile

Plastigram Industries a.s. (PGI) aims to develop, build and operate factories for recycling, such as multi-layer packaging materials. To achieve this goal, PGI works closely with scientific institutions, e.g. the Czech Academy of Sciences. PGI has developed and tested on industrial scale a technology for recycling the remains of used beverage cartons after paper recycling. Plastigram process allows for recovery of plastics (LDPE regranulate and HDPE regrind) and aluminium (powder).

**Process:** Dry cleaning process and chemical separation of LDPE and aluminium. Cutting compacting and extrusion with melt filtration.

**Location:** Sokolov, Czech Republic

**Production capacity:** 5.000 – 6.000 MT/yr

**Examples of end-uses/ processing method:** Compounding, replacing existing (r)LDPE.

**Website:** <https://plastigram.eu/>

### TECHNICAL DATA SHEET

#### LDPE regranulate


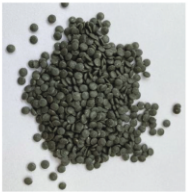
**Company profile:** Plastigram Industries a.s. has developed a technology for recycling the remains of used beverage cartons after paper recycling. The process allows for recovery of plastics (LDPE regranulate and regrind from caps) and aluminium (powder).

**Process description:** Dry cleaning and sorting, washing and separation of LDPE and Aluminium, regranulation with melt filtration.

**Location:** Sokolov, Czech Republic

**Volume:** approx. 4000-6000 tons / year

**Contact:** Luděk Lamich, lamich@plastigram.eu  
Iren Matuška, matuska@plastigram.eu

Primary information	Indicative Value	Method of measurement
Granule diameter	4 mm	
Filter size in extrusion	110 mm	
Material composition	rLDPE with traces of PP, PET PA6	
Inorganic content	0.6 %	
Density	0.93 g/cm <sup>3</sup>	ISO 1183
Smell/odour	1	Score (0 – no odour to 3 – strong odour) measured at 190°C
MFI	5,5 g/10mins	ISO 1133 (190 °C; 2,16kg)
Tensile strength	8 MPa	ISO 527-3
Elongation at break	80 %	ISO 527-3
Flexular modulus	170 MPa	ISO 178
Impact strength	48 kJ/m <sup>2</sup>	ISO 180 A, Izod notched at 23 °C
Recommended processing temperature	< 190 °C	

Plastigram Industries a.s. | Exnárova 1035/1a, 149 00 Praha | IČ 03219658

## 3.5 Ecorevive srl (TPN, agglomerated) (rLDPE)

### Company profile

Ecorevive started in 2012 building on decades of experiences in plastic recycling machineries. An innovative plant has been set, optimised to recycle heterogeneous plastic materials having high humidity contamination. The process is defined as a 'dry process', no water is used to wash and clean the materials.

**Process:** Shredding and sorting, then agglomeration by means of a twin screw and final grinding at 08-20mm screen size (as per customer requirement).

**Location:** Brescia, Italy

**Production capacity:** 6.000 MT/yr rLDPE

**Examples of end-uses/ processing method:** Urban furniture, poles and panels, pallets and additive for asphalts.

**Website:** <https://www.ecorevive.it/>





**Revive**  
recupero innovativo di materie plastiche

TECHNICAL DATAS TPN

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PLASTIQUÒ TP

Certificazione sul contenuto di materiale riciclato

Ecorevive Srl  
0010001010 - 10

A+

> 90%	A*	100%			
> 80% - 90%	A				
> 70% - 80%	B				
> 50% - 70%	C				

spiegata materiale riciclato

REMADE  
IN ITALY

Dati non oggetto di certificazione a cura di Remade in Italy

riduzione dei consumi energetici dal riciclo (heating)	10,50	
riduzione delle emissioni climalteranti dal riciclo (di CO <sub>2</sub> e)	832	

altre certificazioni ambientali

www.remadeinitaly.it

**Technical code:** PlastiQù TP series recycled Agglomerated polyolephinic plastic granules (R-POMIX)

**Commercial name code:** TPN

**COMPOSITION**

- 70% LLDPE
- 17% LDPE
- 3% HDPE/PP
- 10% Aluminium (<50µm, filler)
- <3% cellulose pulp/wood
- <1% PET
- 10ppm Aluminium cans <8mm

**TARIFF CODE**  
39019080

Polymers of ethylene, in primary forms (excl. polyethylene, ethylene-vinyl acetate copolymers, ethylene-alpha-olefins copolymers having a specific gravity of < 0,94, ionomer resin consisting of a salt of a terpolymer of ethylene with isobutyl acrylate and methacrylic acid and A-B-A block copolymer of ethylene of polystyrene, ethylene-butylene copolymer and polystyrene, containing by weight <= 35% of styrene, in blocks of irregular shape, lumps, powders, granules, flakes and similar bulk forms)

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**TECHNICAL CHARACTERISTICS**

Density	0,95 – 1,00 g/ml
Bulk density	330-350 kg/mc
Melt index (190° - 5 Kg)	Melt flow rate: 5,50 g/10 min
Softening temperature Vicat	96°C

**PROCESSABILITY**  
**Technology**  
The material can be mould injected, extruded and thermoformed. It's a good substitute of the virgin material in all that application whose don't need elevated performances.

**MAIN APPLICATIONS**  
Urban furnitures (fences, chairs benches), Buildings, Gadgets, Profiles, Pots and planters, Pallets

**ENVIRONMENTAL INFORMATIONS**  
100% Recycled and Recyclable.  
PlastiQù TPN is made with plastic fraction coming from papermills that contain very high quantity of humidity. Our technology is able to remove all this humidity by means of an agglomeration. It represent an innovative solution for environment. Main part of plastic from papermill is made of tetrapack bricks, that with our technology can now be recycled. Moreover the aluminium foil of tetrapack became a powder filler in the plastic giving to the final product a metalized color effect. PlastiQù TP series is Remade in Italy® certified and it's sold like R-POMIX agreeing to UNI-UNIPLAST 10667-16.

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Ecorevive srl  
Sede Operativa  
Via Magonza, 1 - 25100-Pravaglia (Crema) (BS)  
Tel. & fax (+39) 030-6882504  
Sede Legale  
Via Verdi, 11 - 24021-Borghetto

## 3.6 Ecorevive srl (TPR, extruded) (rLDPE)

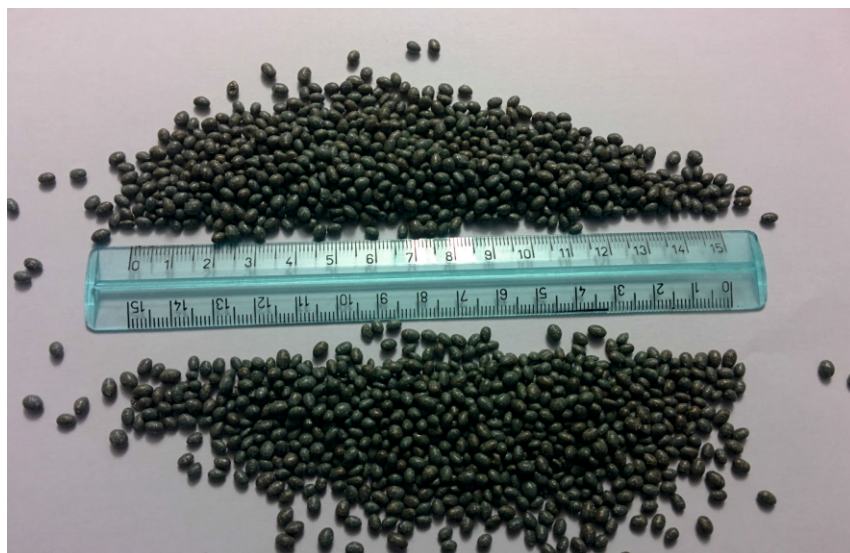
**Process:** Agglomerated material of Ecorevive (TPN) is granulated with extruder and filtered (filter size 750 microns).

**Location:** Brescia, Italy

**Production capacity:** 6.000 MT/yr rLDPE

**Examples of end-uses/ processing method:** Urban furniture, poles and panels, pallets and additive for asphalts.

**Website:** <https://www.ecorevive.it/>





recupero innovativo di materie plastiche

TECHNICAL DATAS TPR

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PLASTIQÙ TP

Certificazione sul contenuto di materiale riciclato



100% A+  
90% A  
80% B  
70% C

A+

Tipologia materiale riciclato: Polimeri



Dati non oggetto di certificazione a cura di Remade in Italy

Indicazione del contenuto energetico del riciclo (tep/kg)	10,50
Indicazione delle emissioni di metano dal riciclo (gr CO <sub>2</sub> eq/kg)	892

altre certificazioni ambientali:

www.remadeinitaly.it

**CODIFICATION**

Technical code: PlastiQù TP series recycled polyolefinic plastic granules (R-POMIX)

Commercial name code: TPR

**COMPOSITION**

70% LLDPE  
17% LDPE  
3% HDPE/PP  
10% Aluminium (<50µm, filler)  
1% cellulose pulp

**TARIFF CODE**

39019080

Polymers of ethylene, in primary forms (excl. polyethylene, ethylene-vinyl acetate copolymers, ethylene-alpha-olefins copolymers having a specific gravity of < 0,94, ionomer resin consisting of a salt of a terpolymer of ethylene with isobutyl acrylate and methacrylic acid and A-B-A block copolymer of ethylene of polystyrene, ethylene-butylene copolymer and polystyrene, containing by weight <= 35% of styrene, in blocks of irregular shape, lumps, powders, granules, flakes and similar bulk forms)

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**TECHNICAL CHARACTERISTICS**

Density	0,98 – 1,02 g/ml
Bulk density	330-350 kg/mc
Melt index (190° - 5 Kg)	Melt flow rate: 5,50 g/10 min
Softening temperature Vicat	95°C

**PROCESSABILITY**

**Technology**

The material can be mould injected, extruded and thermoformed. It's a good substitute of the virgin material in all that application whose don't need elevated performances.

**MAIN APPLICATIONS**

Urban furnitures (fences, chairs benches), Buildings, Gadgets, Profiles, Pots and planters, Pallets

**ENVIRONMENTAL INFORMATIONS**

100% Recycled and Recyclable.

PlastiQù TPR is made with plastic fraction coming from papermills that contain very high quantity of humidity. Our technology is able to remove all this humidity by means of an agglomeration. It represent an innovative solution for environment. Main part of plastic from papermill is made of tetrapack bricks, that with our technology can now be recycled. Moreover the aluminium foil of tetrapack became a powder filler in the plastic giving to the final product a metalized color effect. PlastiQù TP series is Remade in Italy® certified and it's sold like R-POMIX agreeing to UNI-UNIPLAST 10667-16.

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EcoRevive srl  
Sede Operativa  
Via Magona, 1 - 25050-Peschiera del Garda (BS)  
Tel. & fax (+39) 030-8682504  
Sede Legale  
Via Verdi, 11 - 24021-Bergamo

## 3.7 Lucart Italy (rLDPE, rHDPE & rPP)

### Company profile

Lucart is Europe's largest producer of machine glazed paper for flexible packaging and is one of the top European manufacturers of paper and tissue products. The production capacity of Lucart Group is 395.000 MT/yr with 12 paper machines and 65 converting lines. The consolidated turnover is over €500m and the number of employees is more than 1600. The Lucart Group confirms its strategic plan through a multinational structure to compete on the global market. The polyAl line in Italy has a capacity of 8.000 MT/yr input material.

**Process:** In Italy, Lucart has a polyAl recycling line including washing equipment for rejects, new drying equipment and an extruder with melt filtration.

**Location:** Lucca, Italy

**Production capacity:** 8.000 MT/yr rLDPE

**Examples of end-uses/ processing method:** Transportation pallets.

**Website:** <https://www.lucartgroup.com/en/>

Primary information	Unit & Method of Measurement	Indicative Value
<b>Material Name</b>		Granplast filtrated (rLDPE, rHDPE & rPP granules)
<b>Granule Diameter</b>	mm	0,75
<b>Filter size in production</b>	micron	1.000 and 1.800 micron
<b>Density</b>	g/cm <sup>3</sup> – ISO 1183	0,955
<b>Source of feedstock</b>	Origin description	Recycled Carton Packages from Paper mill in Italy
<b>Composition</b>		56% LDPE, 27% HDPE and small fractions of PP, PET and cellulose
<b>Inorganic content</b>	%	9,7
<b>Smell/odour</b>	Score (0 – no odour to 3 – strong odour)	2
<b>MFI (190C; 5 kg)</b>	g/10mins - ASTM D1238	14,1
<b>Tensile strength</b>	MPa - ISO 527-2	9,4
<b>Elongation at break</b>	% - ISO 527-2	4,4
<b>Young's Modulus</b>	MPa - ISO 527-2	554
<b>Flexural Modulus</b>	Mpa – ISO 178	295



## 3.8 Ecoplasteam Italy (rLDPE)

### Company profile

Production of high quality granule with characteristics similar to virgin plastic. The patented mechanical recycling process guarantees consistency of characteristics and processability.

**Process:** Injection moulding, extrusion, rotomoulding, extrusion blow moulding.

**Location:** Alessandria, Italy

**Production capacity:** 6.000 MT/yr

**Examples of end-uses:** Office & stationery, household items, work tools, jewelry & fashion accessories, trash cans & bins, toys, bathroom accessories, automotive (air filter, wheel covers, glove compartment), oil and lubricant packaging, outdoor furniture, 3D printing items.

**Website:** <https://www.ecoplasteam.com/>



IL PRODOTTO THE PRODUCT		ecoplasteam.com																																																																									
EcoAllene PROCESSO BREVETTATO   PATENTED PROCESS		EcoAllene AA00																																																																									
<p>The product consists of polymer granules obtained from the recycling of poly laminate waste (polyethylene and aluminum, CER 03.03.07) deriving from tetrapak type beverage cartons.</p> <p><b>Product composition per KG of material:</b> Polyethylene and aluminum waste from the treatment of post-consumer packaging waste.</p> <p>UNI 10667-1 compliant material, UNI 10667-2 and UNI 10667-16</p> <p><b>Percentage of certified recycled material:</b></p> <ul style="list-style-type: none"> <li>100% post consumer material</li> </ul> <p><b>Storage conditions</b></p> <p>The storage in the customer's warehouse in conditions of unknown relative humidity can significantly vary this value and therefore, before using EcoAllene, it is suggested to subject the material to a drying phase with hot air at about 90°/2h for restore the humidity conditions to 100 ppm optimal for processing.</p> <p><b>Uses not permitted</b></p> <p>The use of food contact and medical material is not allowed.</p> <p>The information contained in this technical data sheet is believed to be accurate, but all recommendations are made without any guarantee, since the conditions of use are not under the control of the company Ecoplasteam Spa Società Benefit, which declines any responsibility in relation to the use of the information and the use of this mixture in combination with other materials or in other processes.</p> <p>Rev_01 - 01/06/2021</p>																																																																											
<p><b>Property</b> The values in the table were obtained from an average of analyzes and tests carried out during the production of granules deriving from post-consumer and industrial waste.</p> <table border="1"> <thead> <tr> <th>ANALYSIS</th> <th>METHOD</th> <th>Unit of measure</th> <th>VALUE</th> </tr> </thead> <tbody> <tr> <td>Density</td> <td>ISO 1183</td> <td>g/cm<sup>3</sup></td> <td>1,016</td> </tr> <tr> <td>Maximum % of aluminum</td> <td>-</td> <td>%</td> <td>10,0</td> </tr> <tr> <td>Melt Flow Index (190°C/2,16 kg)</td> <td>ASTM D1238-13</td> <td>g/10min</td> <td>2,9</td> </tr> <tr> <td>Melt Flow Index (230°C/2,16 kg)</td> <td>ISO 1133</td> <td>g/10min</td> <td>7,2</td> </tr> <tr> <td>Melt Flow Index (230°C/5 kg)</td> <td>ISO 1133</td> <td>g/10min</td> <td>27</td> </tr> <tr> <td>VICAT a 49 N (50°C/h)</td> <td>ISO 306</td> <td>°C</td> <td>67,0</td> </tr> <tr> <td>Deflection load (3,2 mm)</td> <td>ISO 527</td> <td>MPa</td> <td>22,8</td> </tr> <tr> <td>Maximum tensile load</td> <td>ISO 527</td> <td>MPa</td> <td>10,8</td> </tr> <tr> <td>Bending yield strength</td> <td>ISO 178</td> <td>MPa</td> <td>14,4</td> </tr> <tr> <td>Elongation at break in traction</td> <td>ISO 527</td> <td>%</td> <td>37</td> </tr> <tr> <td>Impact resistance IZOD c.i.</td> <td>ISO 180</td> <td>J/m</td> <td>94</td> </tr> <tr> <td>Impact resistance IZOD c.i.</td> <td>ISO 180</td> <td>KJ/m<sup>2</sup></td> <td>23,7</td> </tr> <tr> <td>Tensile modulus of elasticity</td> <td>ISO 527</td> <td>MPa</td> <td>604</td> </tr> <tr> <td>Flexural modulus of elasticity</td> <td>ISO 178</td> <td>MPa</td> <td>556</td> </tr> <tr> <td>Longitudinal shrinkage</td> <td>ISO 294</td> <td>%</td> <td>N.D</td> </tr> <tr> <td>Cross shrinkage</td> <td>ISO 294</td> <td>%</td> <td>N.D</td> </tr> <tr> <td>Shore D hardness</td> <td>ISO 868</td> <td>15°</td> <td>62</td> </tr> </tbody> </table> <p>The analysis parameters can have fluctuations from 3 to 5%</p>				ANALYSIS	METHOD	Unit of measure	VALUE	Density	ISO 1183	g/cm <sup>3</sup>	1,016	Maximum % of aluminum	-	%	10,0	Melt Flow Index (190°C/2,16 kg)	ASTM D1238-13	g/10min	2,9	Melt Flow Index (230°C/2,16 kg)	ISO 1133	g/10min	7,2	Melt Flow Index (230°C/5 kg)	ISO 1133	g/10min	27	VICAT a 49 N (50°C/h)	ISO 306	°C	67,0	Deflection load (3,2 mm)	ISO 527	MPa	22,8	Maximum tensile load	ISO 527	MPa	10,8	Bending yield strength	ISO 178	MPa	14,4	Elongation at break in traction	ISO 527	%	37	Impact resistance IZOD c.i.	ISO 180	J/m	94	Impact resistance IZOD c.i.	ISO 180	KJ/m <sup>2</sup>	23,7	Tensile modulus of elasticity	ISO 527	MPa	604	Flexural modulus of elasticity	ISO 178	MPa	556	Longitudinal shrinkage	ISO 294	%	N.D	Cross shrinkage	ISO 294	%	N.D	Shore D hardness	ISO 868	15°	62
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<p><b>Manufacturer Name:</b> <b>ECOPLASTEAM Spa Benefit Company</b></p> <p><b>Registered office and production site:</b> Via Gambalera, 180 Spinetta Marengo, 15122 (AL) - Italy</p> <p><b>Administrative and Headquarters:</b> Corso Galileo Ferraris, 110 Turin, 10129 - Italy</p>																																																																											



## 3.9 Fulun (rLDPE, rHDPE & rPP)

### Company profile

In 2018 Fulun set up its new recycling plant, which has integrated capacity for fibre (70kt/y) and polyAl (40kt/y) recycling. The plant has a drum pulper for fibre recycling and equipment for polymer and aluminium separation, upgraded from batch to continuous process, by using formic acid or NaOH to reduce the adhesion between the different layers. Fulun has also installed a plastic granulator line and a water treatment plant. With that, Fulun has become the only company with capability to treat wasted paper-based composite packaging material in Hangzhou City. Today 180 people work at Fulun, including 26 R&D colleagues. The company is certified with ISO9001 quality management system and ISO14001 environmental management system.

**Process:** Wet washing line with chemical separation process, using formic acid, to separate the aluminium from the LDPE, HDPE and PP.

**Location:** Hangzhou, China

**Production capacity:** 30.000 MT/yr

**Examples of end-uses/ processing method:** Injection moulding applications, e.g. furniture, pallets, waste bins.

**Website:** <https://www.tetrapak.com/insights/cases-articles/polyal-line-upgrade-fulun>

Primary information	Unit of Measurement	Value
<b>Material Name</b>		Commercial Name
<b>Granule Diameter</b>	Mm	2~5
<b>Filter size in production</b>	Micron	425
<b>Source of feedstock</b>	Origin description	LDPE
<b>Impurities</b>	%	2.13
<b>Inorganic content</b>	%	2.13
<b>Smell/odour</b>	Score (0 – no odour to 3 – strong odour)	1
<b>MFI ISO1133 (190C; 2,16kg)</b>	g/10mins	3.6512
<b>Impact strength</b>	kJ/m2, Charpy notched at 23 C	
<b>Tensile strength</b>	Mpa	10.36
<b>Elongation at break</b>	%	159.4
<b>Flexular strength</b>	MPa	
<b>Flexular modulus</b>	MPa	



## 3.10 Bioplast (rLDPE)

### Company profile

Bioplast is a Brazilian company, located in Iperó, Sao Paulo, with professionals with extensive experience in alternative to thermoplastic resins, including those of engineering plastics and composites, focusing on recycling and industrialisation of industrial plastic waste.

**Process:** Pre-treatment by sub-supplier, shredding, agglomeration and extrusion process.

Bioplast also has compounding capabilities.

**Location:** Ipero, Sao Paulo, Brazil

**Production capacity:** 500 MT/yr

**Examples of end-uses:** Plastic sheets.

**Website:** <https://bioplastambiental.com.br/>

Primary information	Unit of Measurement	Value
Material Name		Bio Tec
Granule Diameter	Mm	n/a
Filter size in production	Micron	n/a
Source of feedstock	Origin description	LDPE from carton packages
Humidity	%	< 0,50
Inorganic content (ISO 3451-4)	%	10 - 25
MFI (ASTM D1238)	g/10mins	0,5 - 3,5
Impact strength	kJ/m2, Charpy notched at 23 C	> 30
Tensile strength	Mpa	10 -15
Elongation at break	%	> 50



# 4. Technical data sheets rHDPE/ rPP

## 4.1 Recon Polymers rHDPE/ rPP

### Company profile

Recon Polymers specialises in the energy-efficient processing of polyAl into raw materials that are widely applicable in the plastics processing industry.

**Location:** Roosendaal, Netherlands

**Production Capacity:** 150 MT/yr

**Examples of end-uses/ processing method:** Injection moulding applications, e.g. bird feeder, chairs, sanitary products.

**Website:** <http://reconpolymers.com/>



## 4.2 Plastigram Industries a.s. rHDPE/ rPP

### Company profile

Plastigram Industries a.s. (PGI) aims to develop, build and operate factories for recycling, such as multi-layer packaging materials. To achieve this goal, PGI works closely with scientific institutions, e.g. the Czech Academy of Sciences. PGI has developed and tested on industrial scale a technology for recycling the remains of used beverage cartons after paper recycling. Plastigram process allows for recovery of plastics (LDPE regranulate and HDPE regrind) and aluminum (powder).

**Process:** Dry cleaning process and chemical separation of LDPE and aluminium. Cutting compacting and extrusion with melt filtration.

**Quality description:** rHDPE & rPP regrind from caps, mixed colours, melt flow rate of 5-7 g / 10 min (190°C, 2,16 kg).

**Location:** Sokolov, Czech Republic

**Production capacity:** 1.500 MT/yr

**Examples of processing method:** Injection moulding products

**Website:** <https://plastigram.eu/>

Primary information	Indicative Value	Method of measurement
<b>Regrind size</b>	2-20 mm	
<b>Material composition</b>	45% HDPE, 35% LDPE, 15-20% PP, < ca 2% other (Alu, paper fibres, etc.)	
<b>Smell/odour</b>	0	Score (0 – no odour to 3 – strong odour)
Indicative properties of regranulate from the regrind (extruded with 230 µm filter screen)		
Inorganic content	1.1 %	ISO 11358-1
Density	0.95 g/cm <sup>3</sup>	ISO 1183
MFI	7,5 g/10mins	ISO 1133 (190 °C; 2,16kg)
Tensile modulus	720 MPa	ISO 527-2
Tensile strength	17.8 MPa	ISO 527-2
Elongation at yield	7.9 %	ISO 527-2
Elongation at break	8.2 %	ISO 527-2
Flexular modulus	680 MPa	ISO 178
Impact strength	3.4 kJ/m <sup>2</sup>	ISO 798-1 Charpy notched
Shore D hardness	57.5	ISO 868 after 15 s

### TECHNICAL DATA SHEET

#### Regrind from caps

**Company profile:** Plastigram Industries a.s. has developed a technology for recycling the remains of used beverage cartons after paper recycling. The process allows for recovery of plastics (LDPE regranulate and regrind from caps) and aluminum (powder).

**Process description:** Dry cleaning, sorting of caps from foils, wet cleaning of caps.

**Location:** Sokolov, Czech Republic

**Volume:** approx. 1500-2000 MT/yr

**Contact:** Luděk Lamich, lamich@plastigram.eu  
Iren Matuška, matuska@plastigram.eu



# 5. Technical data sheets rAluminium

## 5.1 Plastigram Industries a.s.

### Company profile

Plastigram Industries a.s. (PGI) aims to develop, build and operate factories for recycling, such as multi-layer packaging materials. To achieve this goal, PGI works closely with scientific institutions, e.g. the Czech Academy of Sciences. PGI has developed and tested on industrial scale a technology for recycling the remains of used beverage cartons after paper recycling. Plastigram process allows for recovery of plastics (LDPE regranulate and HDPE regrind) and aluminum (powder).

**Quality description:** Aluminium powder, share of organic contaminants (paper fibres, plastics) ca 40%.

**Location:** Sokolov, Czech Republic

**Production capacity:** 1.000 MT/yr

**Website:** <https://plastigram.eu/>



## 5.2 Palurec GmbH

### Company profile

Palurec GmbH was founded in December 2017. Fachverband Kartonverpackungen für flüssige Nahrungsmittel e.V. (FKN – Association for Beverage Cartons) is the sole shareholder. There are three companies in the association, Tetra Pak GmbH, SIG Combibloc GmbH and Elopak GmbH, which have invested around 8 million euros in the construction of the Palurec recycling plant. The first stage of production will provide capacity of around 18,000 tonnes input. The plant began to operate in spring 2021. With Palurec, it is now possible for the first time in Germany to recycle plastic and aluminium components from cartons into marketable secondary raw materials for a wide range of industrial applications, covering more than 50 percent of the plastic and aluminium components from cartons in Germany.

**Process:** Wet washing pre-treatment process, including reduction of aluminium content by friction. Finally processed with agglomeration, extrusion and melt filtration.

**Quality description:** Aluminium powder, share of 75% moisture, of dry content, share of organic contaminants (paper fibres, plastics) ca 75%.

**Location:** Hurth, Germany

**Production capacity:** 1.000 MT/yr

**Website:** <https://www.palurec.com/en/palurec-en/>





# 6. Other polyAI recyclers

## Other polyAl recyclers

Recycler	Country	Grade(s)	Approximate output capacity (MT/year)
Luhai	China	rLDPE, rHDPE & PP	2500
Khatema Fibres Ltd	India	rLDPE, rHDPE & PP	900
Marcolite	Mexico	rLDPE, rHDPE & PP	1800
Imerssa	Mexico	rLDPE, rHDPE & PP	1050
Lientai	Taiwan	rLDPE, rHDPE & PP	3900
KMK Paper	Turkey	rLDPE, rHDPE & PP	1500
STP	Saudi Arabia	rLDPE, rHDPE & PP	1500

# 7. Glossary of abbreviations

MT	Metric tons
LLDPE	Linear low density polyethylene
PolyAl	Polymer and aluminium
PP	Polypropylene
rHDPE	Recycled high density polyethylene
rLDPE	Recycled low density polyethylene
rPP	Recycled polypropylene

