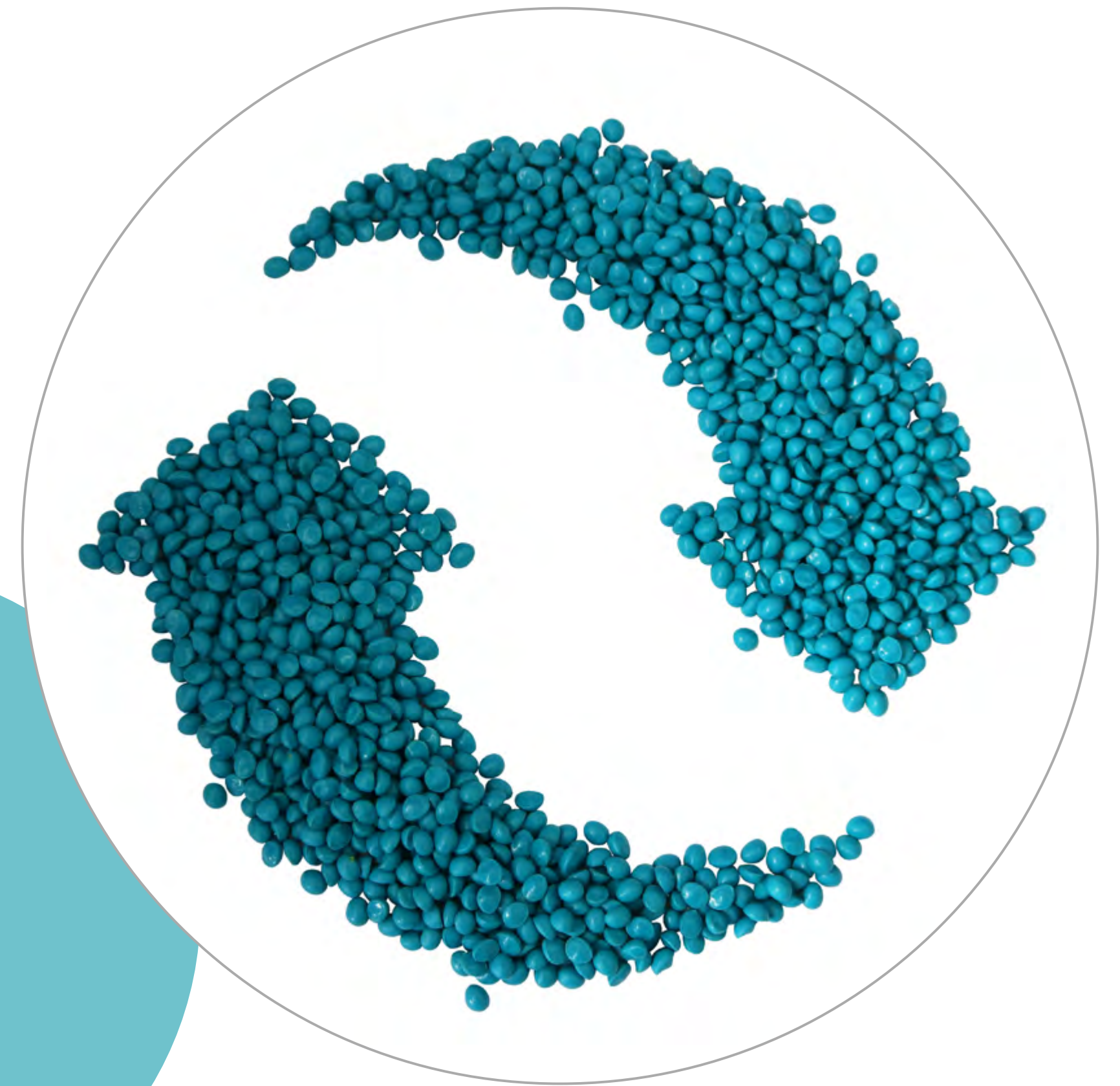


A Material Difference

Dryflex® Circular

TPE Materials with Recycled Content



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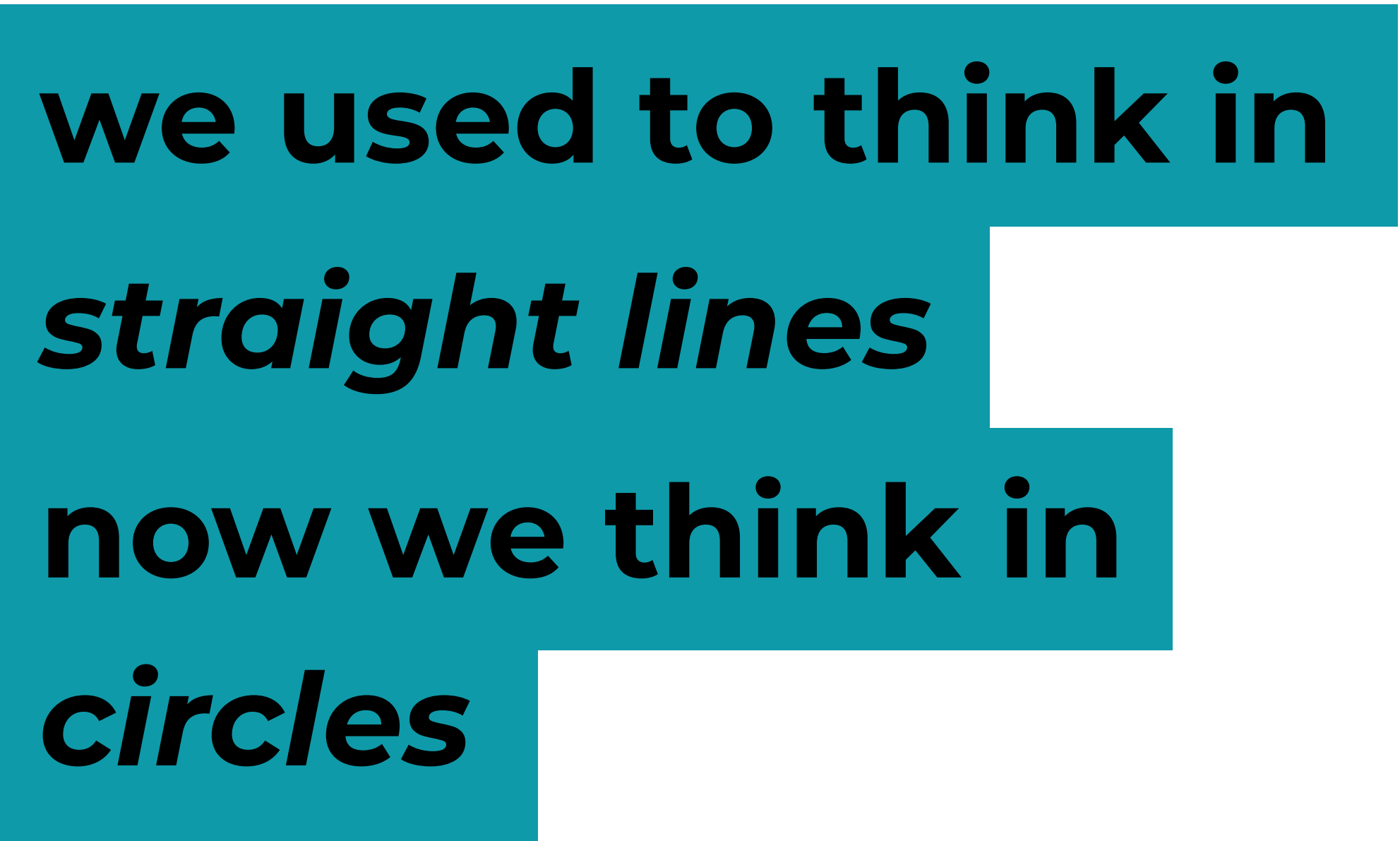
Introduction

The polymer industry is undergoing great changes as we become increasingly aware of the impact we have on the environment and the resources we use to make polymer materials.

As producers and consumers of plastic products, **we need to consider what happens to these items once we've finished using them**, whether that's putting them in our home recycling bin, the manufacturer recycling them in closed-loop systems, incineration, landfill or even marine littering.

Circular Economy principles are becoming better known, one of which is particularly relevant to our role as manufacturers: **circulate products and materials as long as possible**. This means including waste from consumers or industry in the production of new TPE materials, reutilising what would be waste and giving it new life as a resource. This also helps to reduce the demand on virgin fossil-based materials.

This is why we created the **Dryflex Circular TPE portfolio**.



we used to think in
straight lines
now we think in
circles

Recycled Content Definitions

We've structured the Dryflex Circular TPE range into **different series based on the source of the recyclate**. This helps give clarity about the material source and answer questions about what is included in calculations for declarations of recycled content.

PIR : Post Industrial Recyclate

As defined by ISO 14021:2016

Material diverted from the waste stream during a manufacturing process. Excluded is reutilisation of materials such as rework, regrind or scrap generated in a process and capable of being reclaimed within the same process that generated it.

PCR : Post Consumer Recyclate

As defined by ISO 14021:2016

Material generated by households or by commercial, industrial and institutional facilities in their role as end-users of the product which can no longer be used for its intended purpose.

MWR : Maritime Waste Recyclate

This is a PCR source as defined by ISO 14021:2016. However, to help distinguish the source, we've created a separate series for the MWR grades. The primary source is post-use maritime ropes.

Dryflex Circular TPE : Series Overview

Below is a short overview of possibilities, but we’re continually evaluating new recyclate sources. To help minimise transportation, we aim to work with local recyclate sources. There can be variations on the source and availability. [Please contact us to discuss your requirements.](#)

Recyclate Type	Typical Recyclate Source	Typical Hardness Range (Shore)	Typical Recycled Content %	Colour	Odour
PIR Post Industrial Recyclate	hygienic and medical applications	40 A to 50 D	10 to 80%	light and dark colours	no detectable odour
PCR Post Consumer Recyclate	end-of-life vehicles, household waste	40 A to 60 D	10 to 60%	dark colours	detectable
MWR Maritime Waste Recyclate	post-use maritime ropes	40 A to 60 D	10 to 60%	black, blue, green or mint	detectable, ocean like

Calculation of Content

As no technologies currently exist for an analytical determination of recycled content, we calculate content as defined by ISO 15343 section 4 (Plastics recycling traceability and assessment of conformity and recycled content).

The recycled content of Dryflex Circular TPEs is calculated using the formula:

$$\text{Percentage of recycled content of the product} = \frac{\text{mass of recycled materials in the product}}{\text{total mass of the product}} \times 100$$

PIR : Post Industrial Recyclate

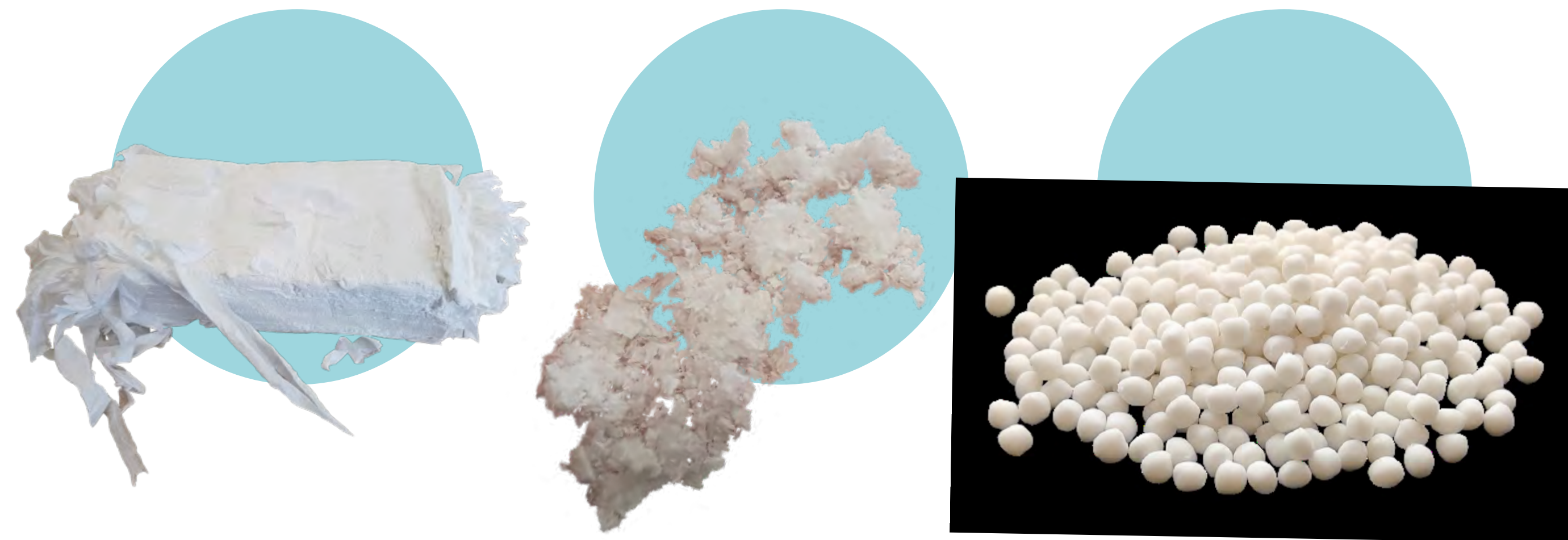
Sources:

Recyclate comes from hygienic and medical applications.

We're continually investigating new sources.

Target Applications:

- Consumer Goods
- Sports Equipment
- Footwear
- Automotive Interior + Exteriors
- & more



[Information on Grades with Automotive Testing >](#)

Typical Dryflex Circular PIR TPEs

Below we show several grades to help demonstrate possibilities, these tables do not list all available materials. Please contact us to discuss your requirements. These grades are available in natural colours.

Grade	Hardness ¹ ISO 868 Shore A	Density ISO 2781 g/cm3	Tensile Strength ² ISO 37 Type 1 MPa	Stress at 100% Strain ² ISO 37 Type 1 MPa	Elongation at Break ² ISO 37 Type 1 %	Tear Strength ² ISO 34-1 Method C N/mm	Compression Set 23°C / 22h ISO 815-1 Method B %	Recycled Content ³ %
Dryflex PIR 50A231N U	50	0.89	3.0	1.4	> 250	15	24	23
Dryflex PIR 70A321N U	70	1.00	3.2	2.5	> 250	23	32	32
Dryflex PIR 93A621N U	93	0.98	9.1	8.0	> 400	61	-	62

¹ After 15 seconds
² Across the flow direction
³ Calculation as defined in ISO 15343 section 4

PCR : Post Consumer Recyclate

Sources:

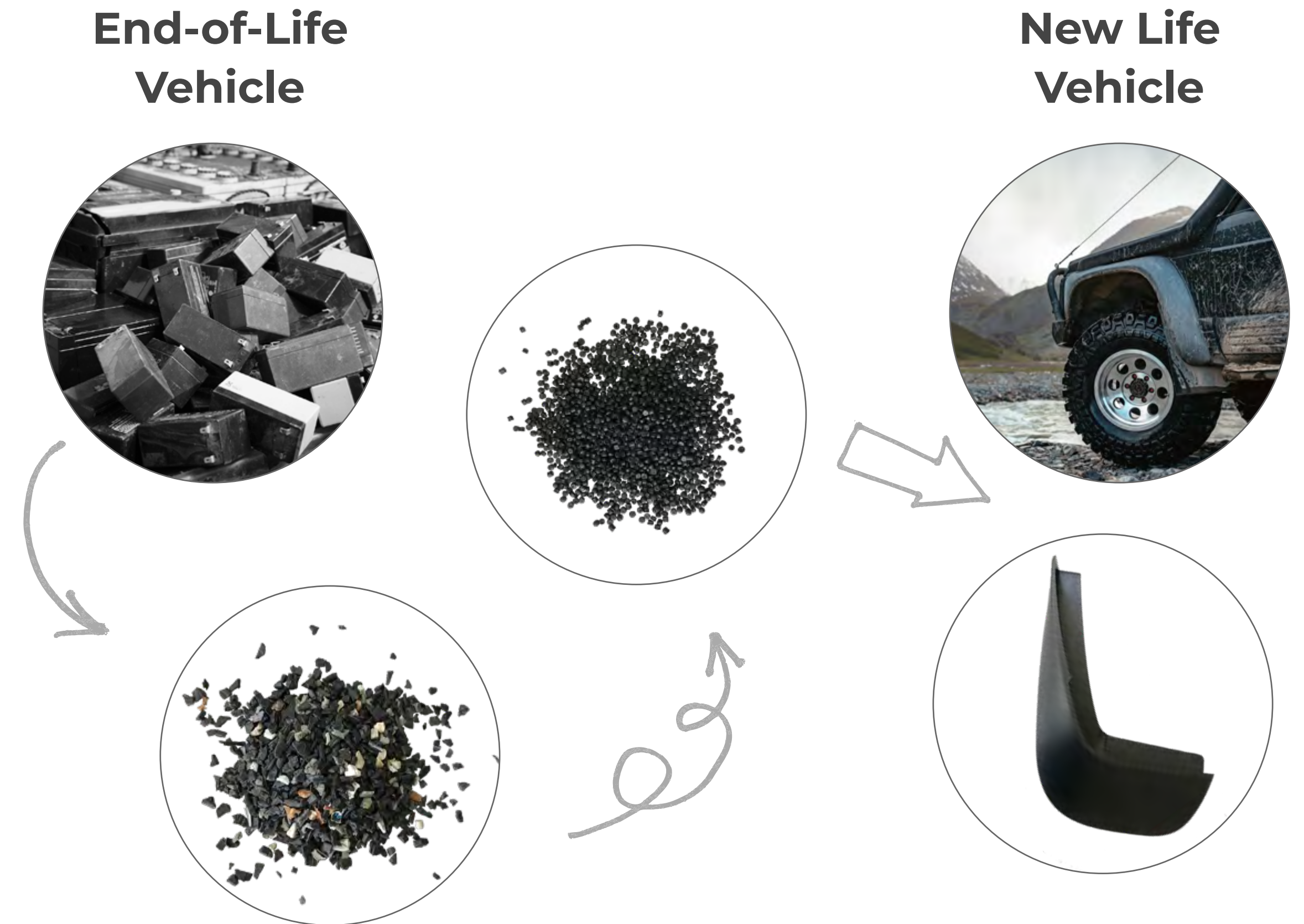
Recyclate sources include recycled PP from end-of-life vehicles, including automotive interior and exterior applications. Other sources include household plastic waste.

We're continually investigating new sources.

Target Applications:

- Automotive exteriors and technical parts.
- Outdoor equipment.
- Safety barriers.

[Information on Grades with Automotive Testing >](#)



Typical Dryflex Circular PCR - TPS Compounds

Below we show several grades to help demonstrate possibilities, these tables do not list all available materials. Please contact us to discuss your requirements. These grades are only available in dark colours.

Grade	Hardness ¹ ISO 868 Shore A	Density ISO 2781 g/cm3	Tensile Strength ² ISO 37 Type 1 MPa	Stress at 100% Strain ² ISO 37 Type 1 MPa	Elongation at Break ² ISO 37 Type 1 %	Tear Strength ² ISO 34-1 Method C N/mm	Compression Set 23°C / 22h ISO 815-1 Method B %	Recycled Content ³ %
Dryflex PCR 60A191B U	60	0.90	5.8	2.2	> 500	23	21	19
Dryflex PCR 90A491B U	90	0.93	6.0	5.5	> 200	45	49	49
Dryflex PCR 60A131B U	60	1.15	5.9	1.7	> 550	24	18	13
Dryflex PCR 90A371B U	90	1.10	6.5	5.7	> 250	48	48	37

¹ After 15 seconds
² Across the flow direction
³ Calculation as defined in ISO 15343 section 4

Typical Dryflex Circular PCR - TPV Compounds

Below we show several grades to help demonstrate possibilities, these tables do not list all available materials. Please contact us to discuss your requirements. These grades are available in dark colours. **Heat aging, oil resistance and viscosity** data is available on request.

Grade	Hardness ¹ ISO 868 Shore A	Density ISO 2781 g/cm3	Tensile Strength ² ISO 37 Type 1 MPa	Stress at 100% Strain ² ISO 37 Type 1 MPa	Elongation at Break ² ISO 37 Type 1 %	Tear Strength ² ISO 34-1 Method C N/mm	Compression Set 23°C / 24h ISO 815-1 Method B %	Compression Set 100°C / 24h ISO 815-1 Method B %	Recycled Content ³ %
Dryflex PCR V 64A161 B	64	0.97	4.7	2.4	> 400	22	21	39	16
Dryflex PCR V 75A211 B	75	0.98	5.4	3.2	> 350	29	27	44	21
Dryflex PCR V 82A281 B	82	0.96	6.8	3.4	> 500	33	33	48	28

¹ After 15 seconds
² Across the flow direction
³ Calculation as defined in ISO 15343 section 4

MWR : Maritime Waste Recyclate

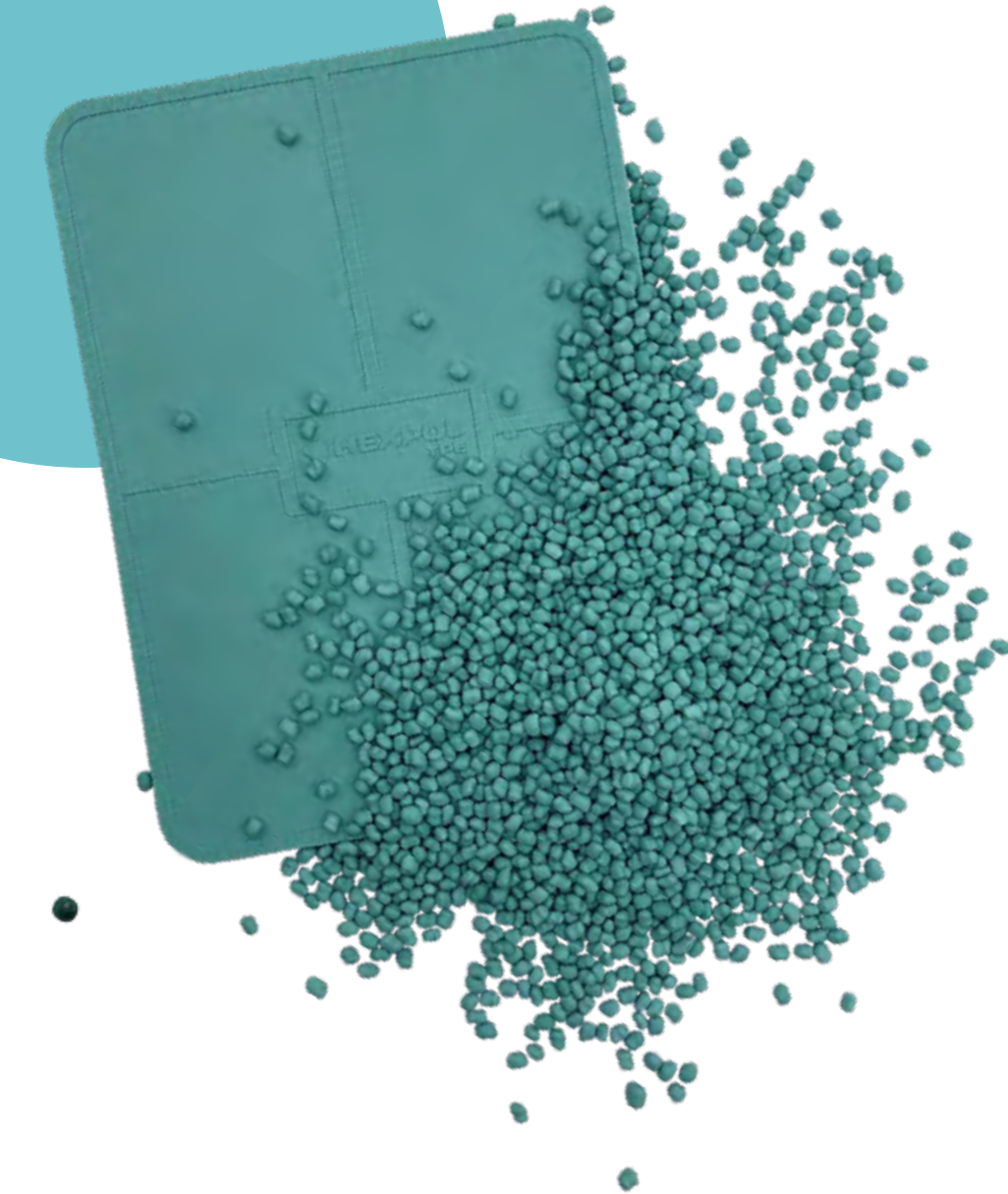
Source:

We're working with **PLASTIX**, a Danish recycling company. They convert used fishnets, trawls and ropes that would previously have ended up in the ocean or on landfill, into high-grade raw materials.

The source of the recyclate we use in our **Dryflex MWR TPEs** consists mainly of **post-use maritime ropes**.

Target Applications:

- Consumer Goods
- Automotive Exteriors
- Outdoor Equipment



Typical Dryflex Circular MWR TPEs

Below we show several grades to help demonstrate possibilities, these tables do not list all available materials. Please contact us to discuss your requirements. These grades are available in black, blue, green and mint colours.

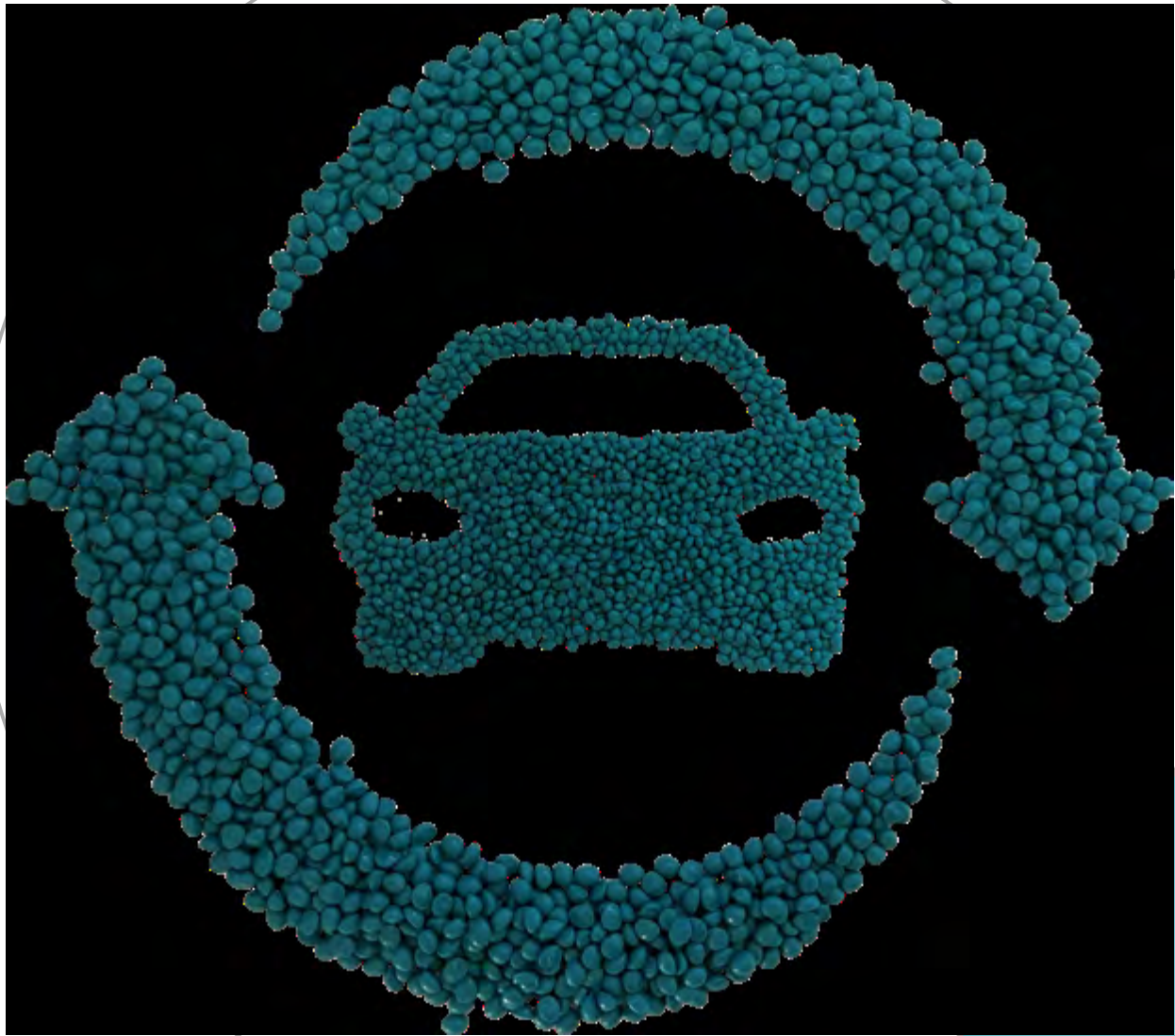
Grade	Hardness ¹ ISO 868 Shore A	Density ISO 2781 g/cm3	Tensile Strength ² ISO 37 Type 1 MPa	Stress at 100% Strain ² ISO 37 Type 1 MPa	Elongation at Break ² ISO 37 Type 1 %	Tear Strength ² ISO 34-1 Method C N/mm	Recycled Content ³ %
Dryflex MWR 40A111 Green	40	0.89	4.3	1.0	> 550	14	11
Dryflex MWR 70A201 Green	70	0.90	8.5	2.7	> 550	30	20
Dryflex MWR 90A401 Green	90	0.90	9.5	5.7	> 550	50	40

¹ After 15 seconds
² Across the flow direction
³ Calculation as defined in ISO 15343 section 4

Dryflex Circular TPEs for Automotive

Recyclate Sources, Properties and Applications

Application Areas	Available Sources	Key Properties	Typical Applications
Interior	PIR	Low Odour + Emissions	Inlay Mats
Exterior	PIR, PCR	Excellent UV Resistance	Charging Flaps
Air + Water Management	PIR, PCR	High Flowability	Air Deflectors
Technical Parts	PIR, PCR	Various	Cable Grommets



Automotive Tests

Dryflex Circular TPEs for Automotive fulfil typical **automotive OEM specifications**. These include flammability, heat ageing, lightfastness and mechanical performance.

Well segregated (single source, not mixed), very clean PIR sources from the production of hygienic and medical applications can be used for automotive interior applications with **low odour and VOC emissions** as well as **colourability**.

Choosing reliable recycle sources makes it easier to achieve materials with virgin-like properties, and product safety can be controlled according to systems such as, e.g. EU REACH, GADSL, IMDS.

Typical Odour + VOC Emission Properties

Grade TPS-SEBS	Odour	Thermodesorption VOC	Thermodesorption FOG
Test Method	VDA 270 (B3)	VDA 278	VDA 278
Units		µg/g	µg/g
65 Shore A, 20 % PIR	2.0	60	594
85 Shore A, 30 % PIR	2.5	49	700
Market Minimum Expectation	≤ 3.0	≤ 500	≤ 1500

Example Grades: Dryflex Circular TPEs for Automotive

CUSTOMISED MATERIALS : Below we show several grades to help demonstrate possibilities, these tables do not list all available materials. Please contact us to discuss your requirements.

Grade	Hardness ¹ ISO 868 Shore A or D	Density ISO 2781 g/cm ³	Tensile Strength ² ISO 37 Type 2 200 mm/min MPa	Stress at 100% Strain ² ISO 37 Type 2 200 mm/min MPa	Elongation at Break ² ISO 37 Type 2 200 mm/min %	Tear Strength ² ISO 34-1 Method A N/mm	Compression Set 70°C / 22h ISO 815, Method A %	Recycled Content ³ %	Application Areas
Dryflex PIR 653120	65 A	0.99	4.0	1.6	> 650	11	54	20	Interior
Dryflex PCR 753062	75 A	0.89	8.3	2.3	> 800	19	49	20	Exterior
Dryflex PCR 40D3210	40 D	0.99	12.0	8.2	> 550	26	68	40	Exterior
Dryflex PIR 853102	85 A	0.97	12.9	4.0	> 750	22	59	25	Air-Water Management, Technical Parts

¹ After 3 seconds
² Across the flow direction
³ Calculation as defined in ISO 15343 section 4

FAQs

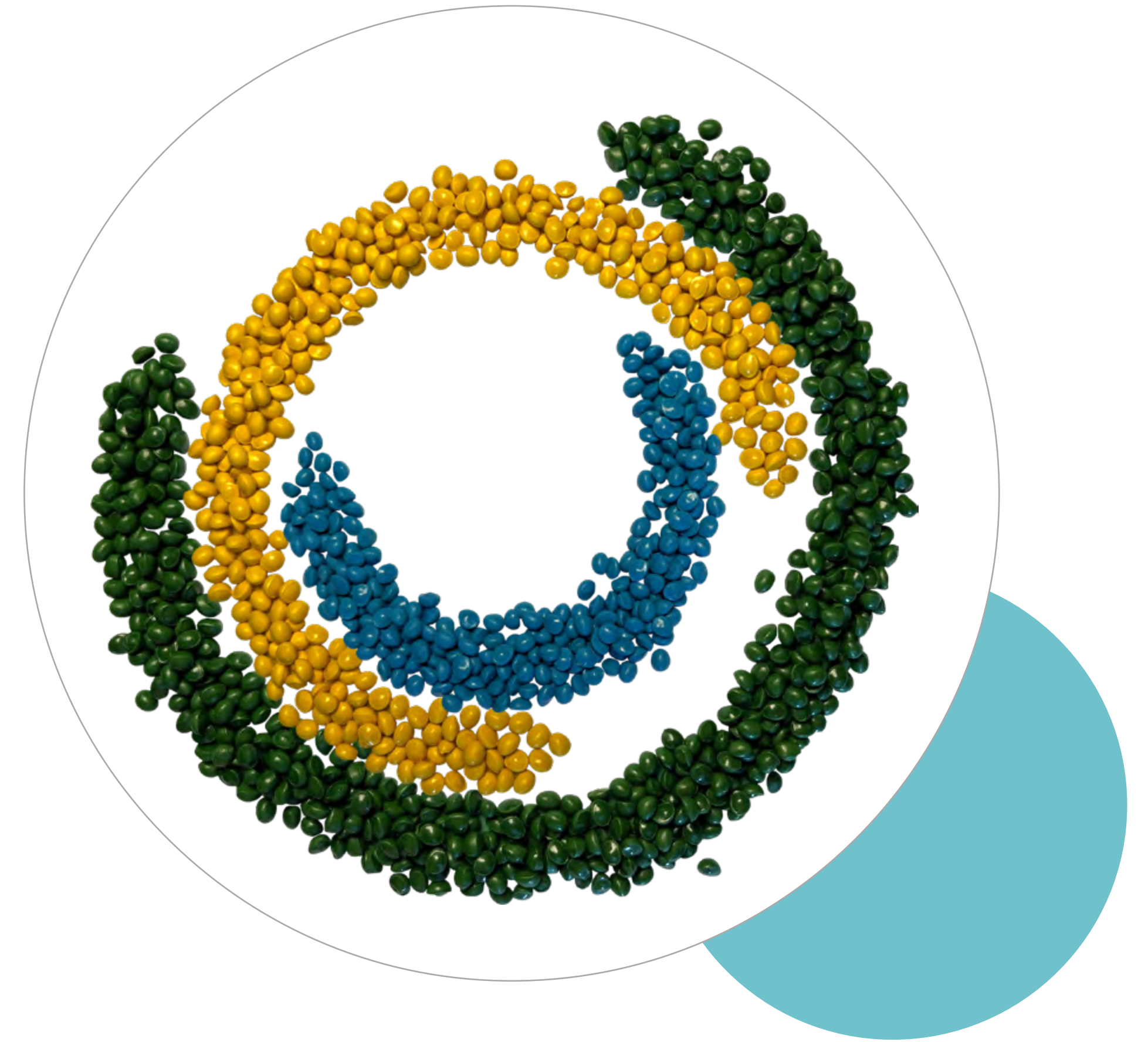
When working with recycled materials...

New Material = New Mindset

Though it's not uncommon for recycled content to meet stringent specifications, brands with rigorous specifications for qualities like colour, performance, and aesthetic properties may need to adjust requirements *to achieve higher levels of recycled content*.

When assessing recycled content specifications, we'd encourage brand owners and converters to think about meeting the *application's requirements* rather than matching the specifications of their current virgin material.

Keeping in mind that some virgin material may have characteristics designed for specific applications but are irrelevant for the application at hand.



What About Quality + Product Safety?

Like all of our materials, Dryflex Circular TPEs are rigorously tested.

- We don't spot buy, we treat recycle the same as virgin raw materials, **everything is bought to a specification**.
- We don't buy one-off deliveries of mixed scrap, all of our feedstocks are from **constant sources**.
- Dryflex Circular TPEs are produced under the **ISO 9001** and **ISO 14001** standards.
- With regard to the **SVHC** candidate list associated with the **EU +/-or UK REACH** regulation, we have selected suppliers whose applications are free of candidate substances and who carry out screenings (queries in the supply chains or tests).
- Dryflex Circular TPEs are supplied to a finished product **specification** and tolerance.
- We're working with customers for **application specific testing** and approvals.
- Based on knowledge of the recycle composition and/or available **IMDS** entries/**GADSL** information for the recycle, IMDS entries considering the GADSL are possible for Dryflex Circular TPEs qualified for automotive applications.
- *Dryflex Circular TPEs are not approved for use in food, medical, toy or sensitive applications*

Which Colours are Available, Does the Colour Vary?

We're used to ordering based on a colour code, however when working with recycle, the raw material has its own colour variants which must be compensated for. The source of the recycle will determine which colours we can offer for the TPE materials.

PIR

If you are looking for **light, natural** colours. Or **TPEs that you can more easily colour with your own masterbatch**, our PIR materials may offer the solution. Our recycle sources include hygienic and medical applications.



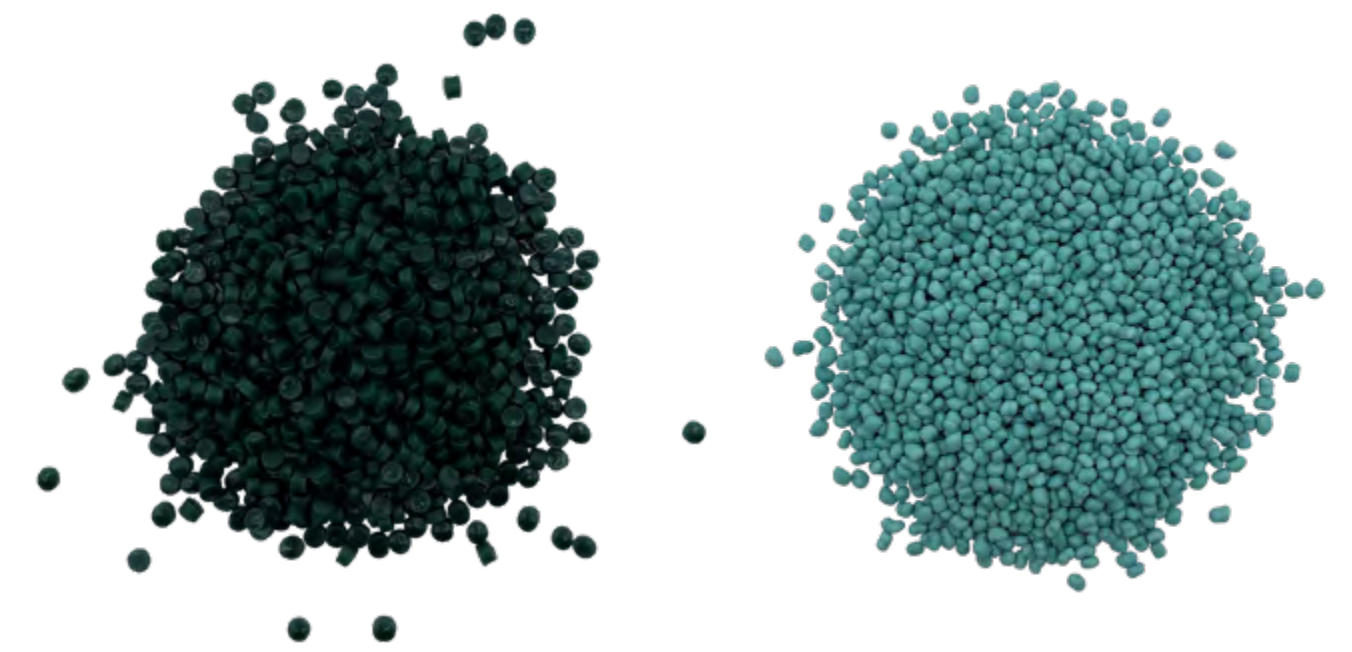
PCR

The PCR recycle includes recycled PP from end-of-life vehicles, including automotive interior and exterior applications. As well as household plastic waste. The PCR grades are available in **dark** colours.



MWR

Maritime waste such as ropes are collected from various ports and fisheries, the colour of the ropes varies widely. Standard colours of the MWR raw materials we use are dark green or blue (*think ocean-ish colours*). The MWR TPEs are available in shades of **green, blue** or **black**.



How is the Availability of the Recyclate?

In this guide we show typical properties, these tables are not exhaustive and do not list all available properties and materials.

When working with recyclate, *we try to work with local sources*, this helps to reduce transportation (and carbon footprint) and gives greater control of the supply chain. Some variation to the sources and product data shown in this eGuide can be expected, as TPE materials are developed at our international companies using local feedstocks.

We don't spot buy our recyclate. We work closely with suppliers to understand the source, their quality controls and the **availability** of the recyclate. *But demand is also rising fast*, so the more information we have about your forecasted volume requirements, the more we can work with suppliers to secure it.

Please [contact us](#) to discuss your specific requirements.



Dryflex® Circular

COLLAB

We believe that **collaboration**, from all parts of the supply chain, will be key to making plastics more circular. We've started several **collab** projects, working with customers to find ways to utilise their **waste** streams and turn-it into **new life materials**.

Processing : Injection Moulding Guidelines

Dryflex Circular TPEs can be processed using conventional thermoplastic fabricating methods such as injection moulding. This processing information is intended only as a guide. The actual parameters will depend on the machine used and the moulding being produced.

Injection Speed:

Medium - Fast

Injection Pressure:

Medium - Fast

Back Pressure:

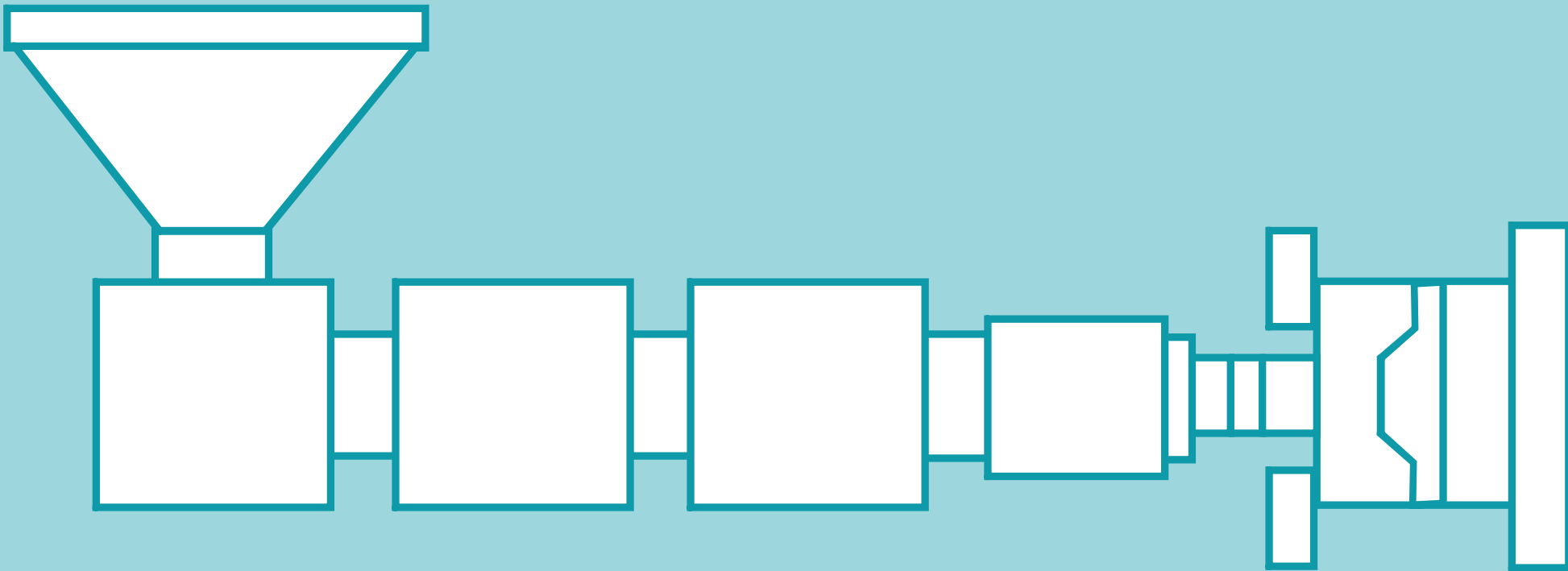
Low - Medium

Holding Pressure:

Sufficient to pack the mould

Cooling:

Can be demoulded when parts have cooled sufficiently



Recommended start-up temperatures °C

170 - 190

180 - 200

190 - 210

200 - 220

15 - 50

Dryflex Circular - TPEs with Recycled Content

Processing + Storage

Dryflex Circular TPEs can be processed without predrying when stored under normal conditions. The product should be stored in a dry and cool place in the manufacturer's original packaging. If poor surface finish, bubbles, voids or streaks are seen on the finished article then material should be dried for 2 to 3 hours at 80°C.

Cycle times will be governed by temperature and section thickness.

Temperatures should not exceed 260°C and the compound should only be at elevated temperatures for a short period of time. Care must be taken to allow sufficient cooling of the section prior to demoulding in order to prevent permanent distortion of the article.

[More Processing + Problem Solving Information >](#)

Have you also seen these products...

Dryflex® Green



Dryflex Green are Biobased TPEs containing raw materials from renewable sources

Lifocork®



Lifocork Biocomposites combine the look + feel of natural cork with the processability of plastics

Mass Balance



TPEs with bio +/- or bio-circular feedstock allocated via the mass balance approach

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