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Welcome!

Sustainability for Extruders

Our presentations will begin shortly

Introducing me...

Ian Chisnall

Sustainability and Polyolefins Product Manager

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Introduction - Plastribution Thermoplastics

- Established 1979
- 100% Subsidiary of Itochu Corporation since 1991
- 80+ Employees
- 45 k/Tonnes
  - 32kT Polyolefins
  - 6kT Styrenics
  - 4kT Engineering Thermoplastics
  - 3kT Specialties
- 900+ UK Customers

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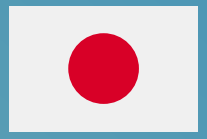
Itochu – Shareholders since 1991



Founded in Japan
1858

100+
Bases around the world

4,300+
Employees

2,000,000
Tonnes of annual polymer trade

Headquarters in Tokyo & Osaka

Operate in
60+
countries

Annual turnover exceeding
£3.3 Billion

ITOCHU

Markets:
Textiles
Machinery
Metals & Minerals
Energy & Chemicals
Food
ICT
Realty
Other

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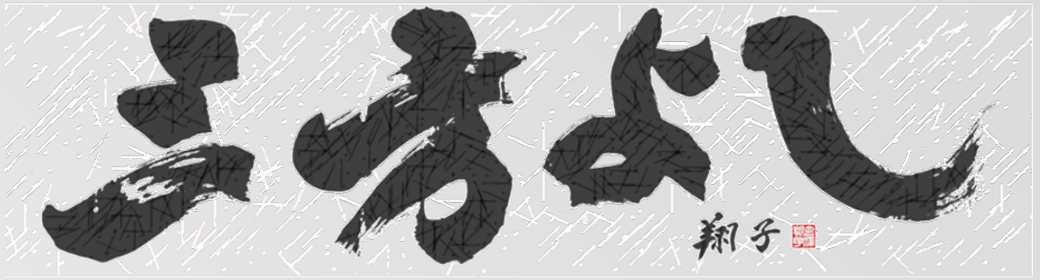
Sampo-Yoshi

Good for Seller – Good for Buyer – Good for Society



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Markets & Customers

Our success is driven by conversations. The right conversations with the right people: suppliers and customers.

Our markets

- Packaging
- Automotive
- Medical
- Electrical
- Electronics
- Industrial
- Construction

Our customers

- Processors
  - Injection Moulding
  - Extrusion
  - Film
  - Profile
  - Compounding & Masterbatch
  - Blow Moulding
- Specifiers
- OEMs
- Designers

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Plastribution & Sustainability

Our story so far and where we are heading.

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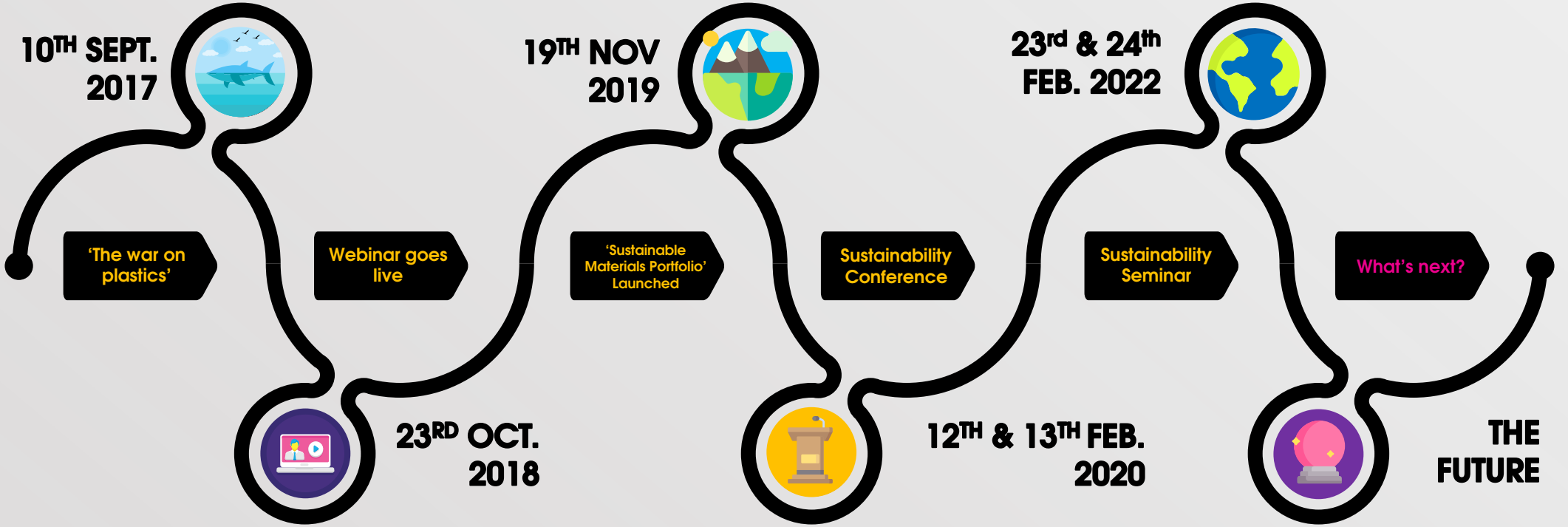
Our Sustainability Journey...



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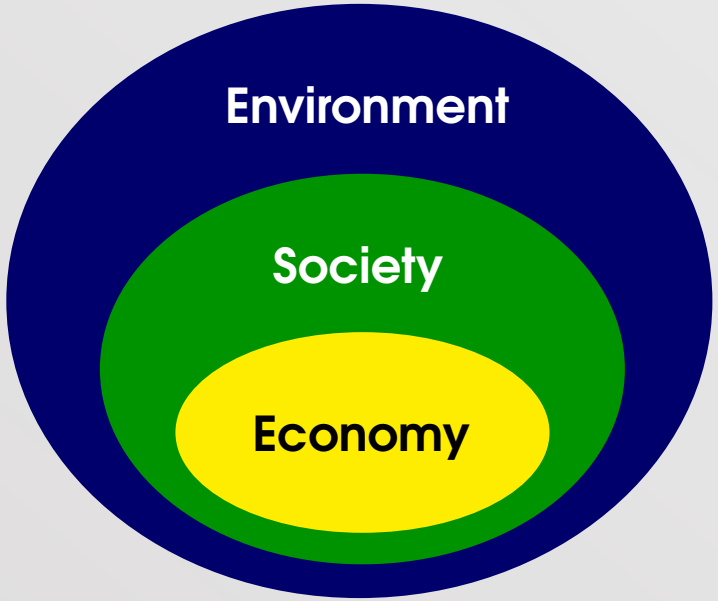
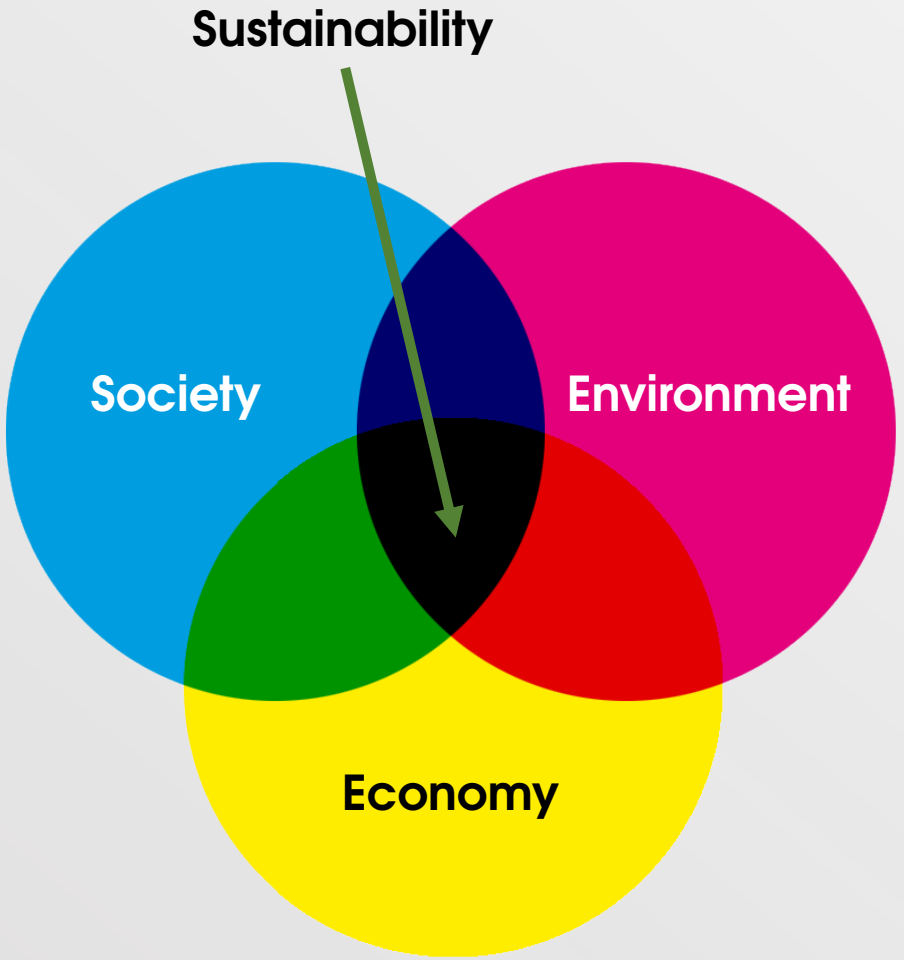
What is Sustainability?

Conserving an ecological balance by avoiding depletion of natural resources

Meets the needs of the present without compromising the ability of future generations to meet their own needs.





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Sustainability & Plastics

Environment

Economics

Society

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Perception

War on Plastic with Hugh and Anita

Hugh Fearnley-Whittingstall and Anita Rani look at the amount of plastic we produce.

Programmes | BBC One

Lego to ditch plastic bags after children call for change

Lego is investing £310m to make its products more sustainable after letters from young customers.

16 Sep 2020 | News | Business

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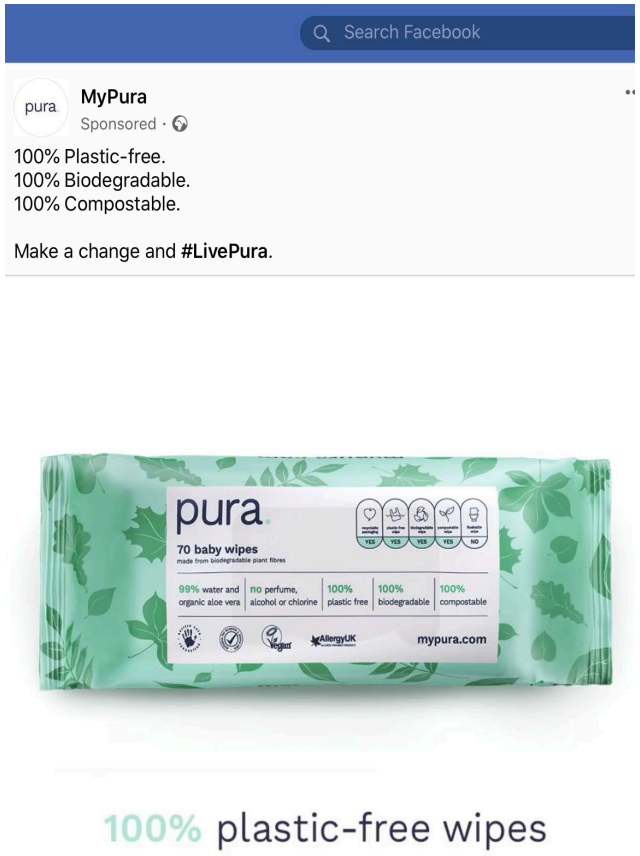
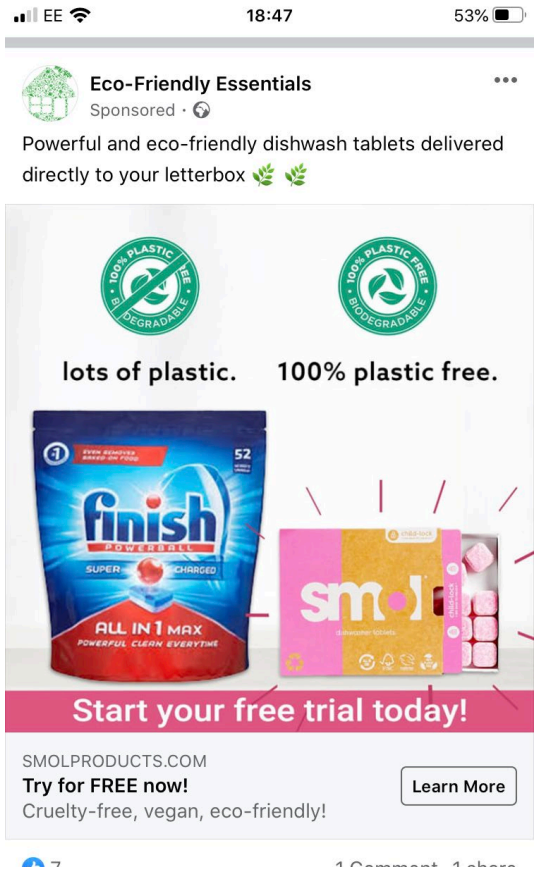
Plastic continues to be the bad guy when it comes to the Environment





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If you're plastic free, you're the good guys...

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But it needs this inside to make sure it doesn't get wet...

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Pre Pandemic - Talks in Schools

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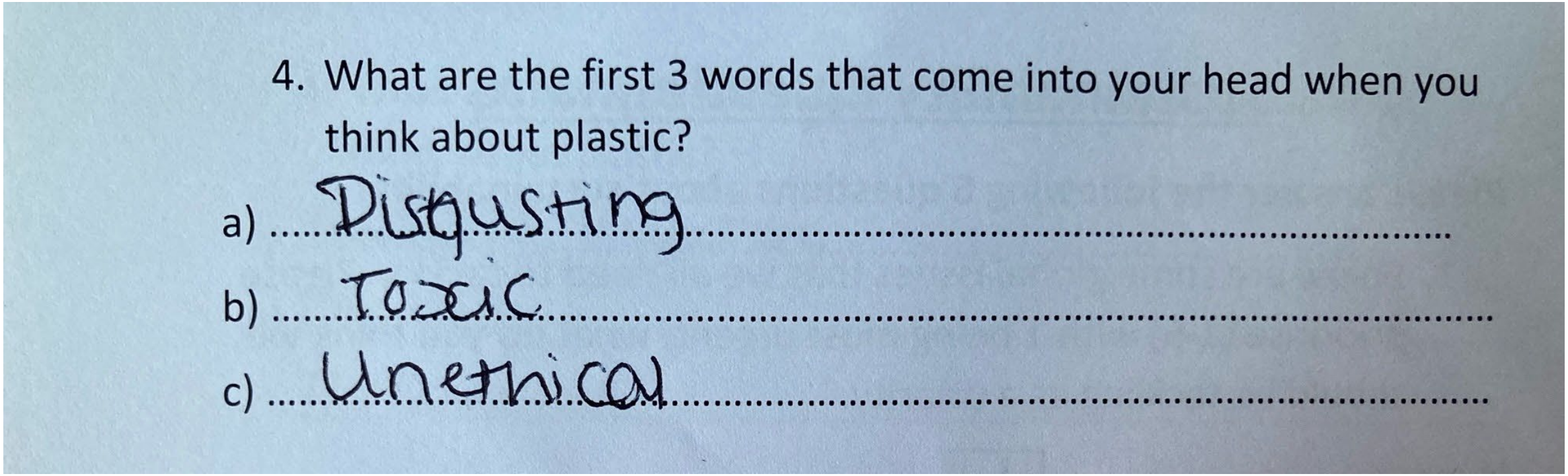
Some responses from teenagers


4. What are the first 3 words that come into your head when you think about plastic?

a) Disgusting

b) Toxic

c) Unethical

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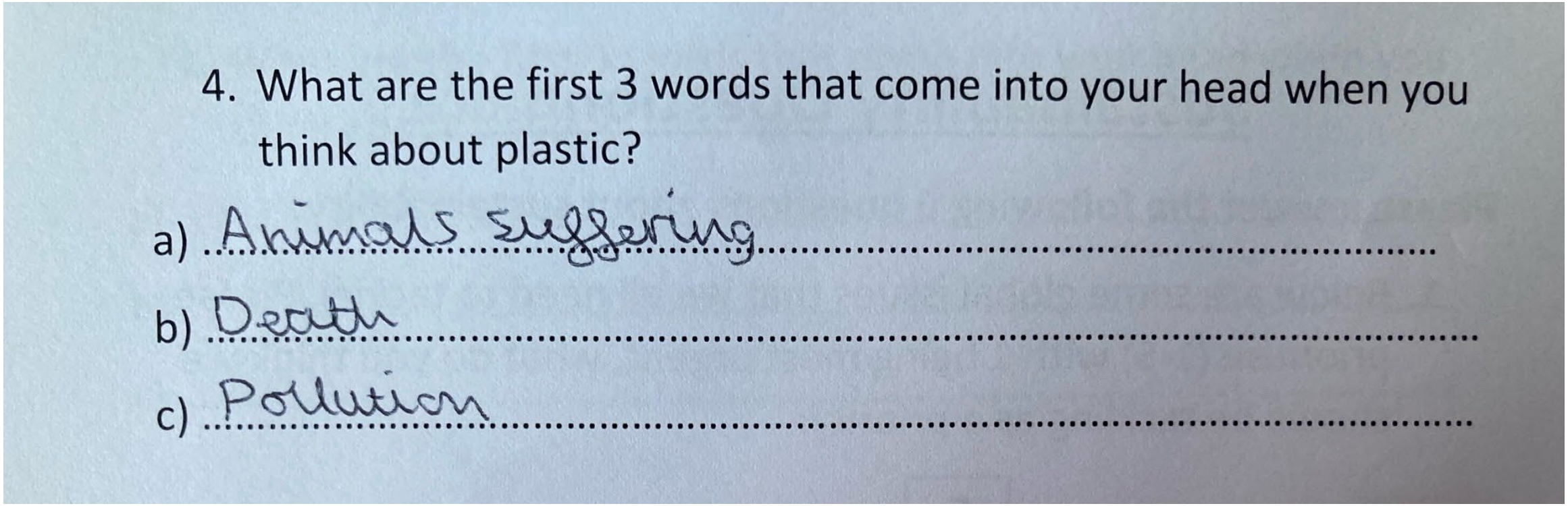
Some responses from teenagers


4. What are the first 3 words that come into your head when you think about plastic?

a) Animals suffering

b) Death

c) Pollution

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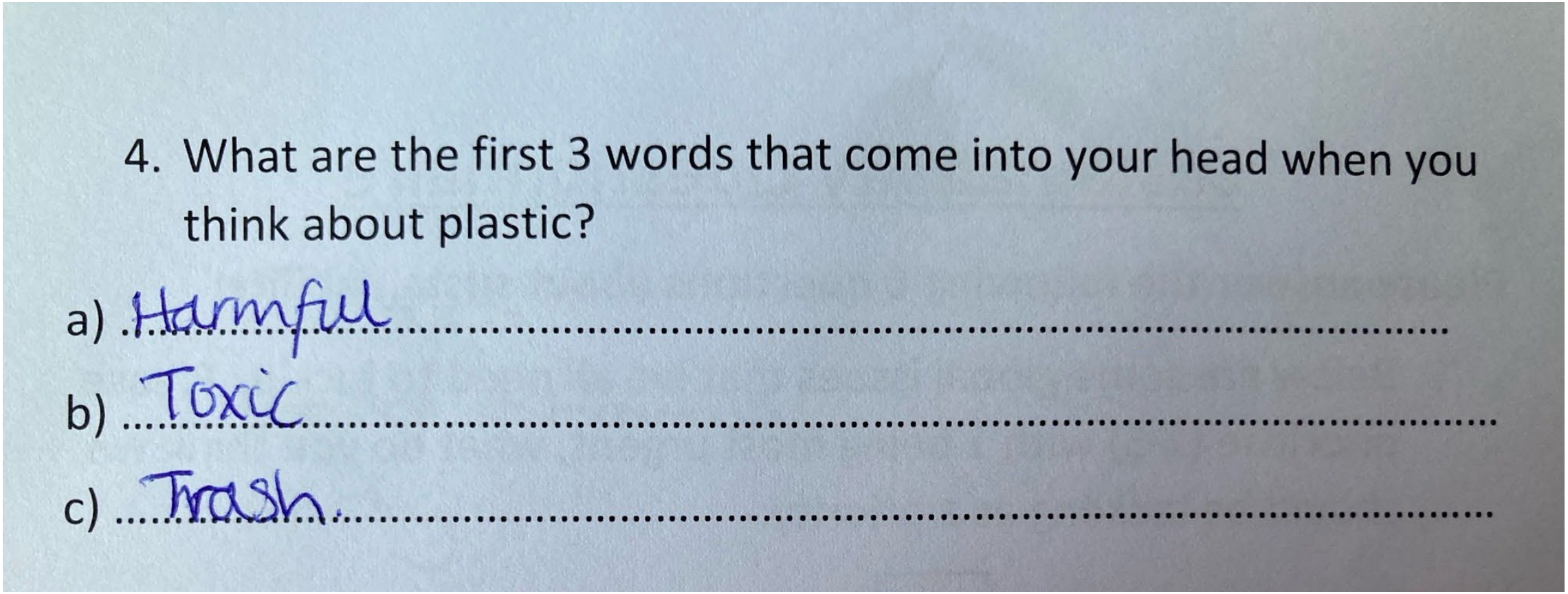
Some responses from teenagers



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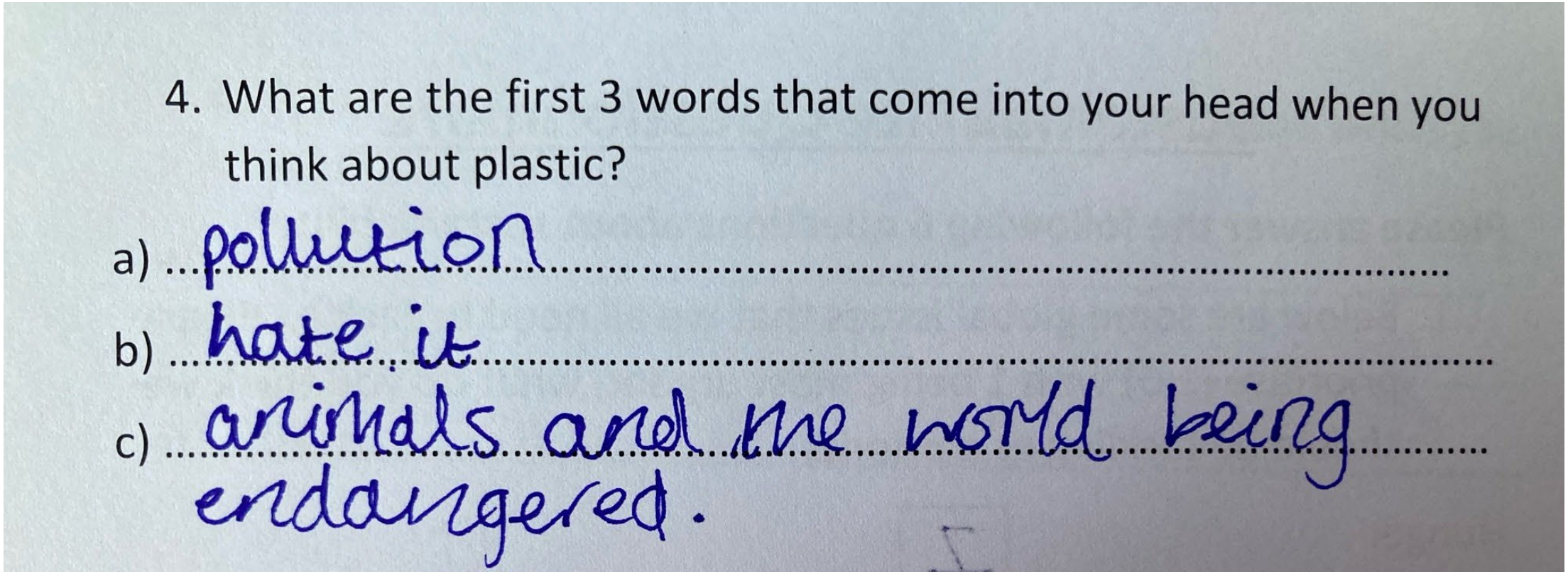
Some responses from teenagers



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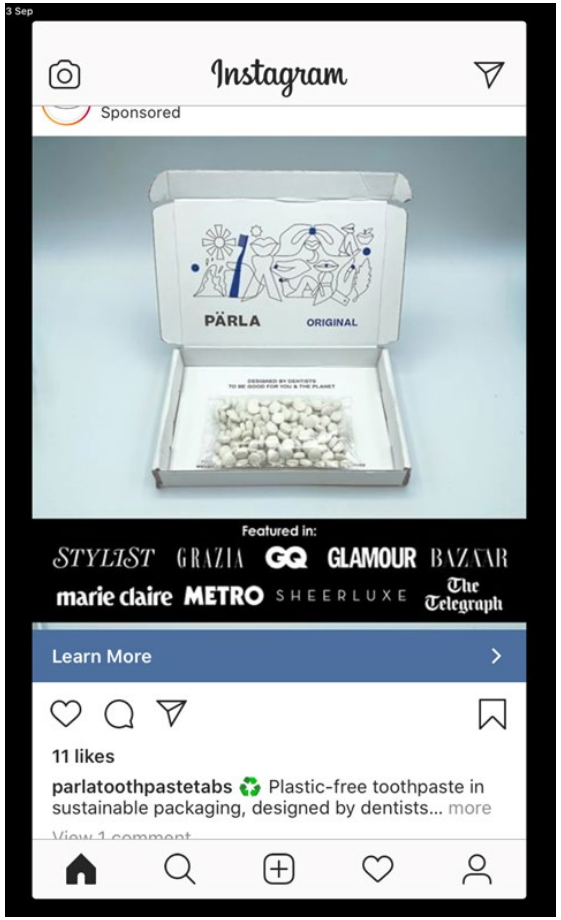
Brands will have you believe that taking out the plastic makes them Sustainable



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Damage of Poor Perception

- Economically
- Environmentally – alternatives to plastic typically have higher carbon footprint or have unintended consequences
- Recruitment

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What can we do?

- Information and Resources
- Launching at this seminar will be our Sustainability Data Sheets, guides to the environmental benefits and downsides to plastics
- Plastribution will always be focussed on technical service:-
    - Material selection
    - Process Improvements
    - Carbon Footprint Reduction

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Our Vision

What we seek to become

To be the preferred supplier of sustainable raw material solutions to the UK's plastics processors

Our Mission

What we are about

Working towards a sustainable material choice for every application

Our Goals

To be your trusted advisor.

Increase the proportion of sustainable materials sold vs standard thermoplastics

Increase our number of active sustainability projects

Our Strategy

Support customers with projects through training and technical support

Evaluating supplier partnerships and validating supplier claims

Develop our portfolio of products to support our customers sustainability goals

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Economics

Legislation & Consumer Demand

Packaging and Waste Tax

Single Use Plastics Ban

Desire from brands to be seen to be “Green”

Anti-plastic movement is strong

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Sustainable Choices can Lower Costs

- Recycled options can sometimes be cheaper than prime
- Part / Process optimisation
  - Lower Energy
  - Shorter Cycles
  - Lighter products
- Additives that can lower carbon footprint and reduce costs
- But if we don't, we lose business

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Our 7 branches of sustainability:

Circular Economy

Recycling & Recyclability

Water Solubility

Compostability Biodegradability

Renewability

Reducing Carbon Footprint

Bio-sourced Materials

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Just some of our Sustainable Materials supply partners…

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Thank you for your time!

For more information:

Call:
01530 560560

Email:
sales@plastribution.co.uk

Visit:
www.plastribution.co.uk

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Plastribution's 7 Branches of Sustainability

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Introducing me...

Dan Jarvis

Technical & Business Development Manager

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It wasn't always 7

Attribute / Supplier	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Single Polymer Solutions											■			■		■	
Reduced Carbon Footprint	■	■	■	■			■	■		■			■				
Biodegradable				■	■	■	■				■					■	■
Compostable				■	■	■	■				■						■
water Soluble					■	■											
Renewable Source			■	■			■			■		■					■
Circular Economy						■	■	■									
Recycled Content (Fully or partial)	■	■	■					■	■	■			■		■		
Reduced reliance on Petrochemical Source	■	■	■	■	■		■	■	■	■		■	■		■	■	■
Downgauging										■				■			
Wall Thickness Reduction			■						■	■					■		
Renewable Filler Content			■						■	■					■	■	
PIR		■	■						■	■			■		■		
PCR	■	■						■									
Reduced Energy Usage (Production)	■	■		■				■	■	■			■		■		
Reduced Energy Usage (Conversion)			■	■					■	■					■		
Bio Based (Fully / Partially)				■	■							■					■
Enhanced Recyclability in Multi-layer structures					■	■										■	
Film	■	■			■	■				■	■			■		■	■
Injection Moulding	■	■	■	■	■	■	■	■	■	■	■	■	■		■		■
Extrusion	■	■					■			■	■	■	■				■
Thermoforming					■		■			■	■		■				■
Blow Moulding		■					■	■		■	■						■

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The 7 branches of sustainability

- We have divided our sustainable portfolio into 7 categories
- These categories have been chosen based on our experience and interactions with customers
- The portfolio is continuously developing, we'd appreciate any feedback you may have
- We are currently working with around 20 suppliers (many new to us) and we aim to continue to grow our sustainable offering

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The 7 branches of sustainability

- Reduced carbon footprint
- Biodegradable/Compostable
- Water Soluble
- Bio-sourced & Bio-feedstock
- Circular Economy
- Recycled/Recyclability
- Renewable Content

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https://plb.ltd/sustainable

Reducing your carbon footprint

From processing advice through to fillers and mineral masterbatches, we can support you in your ambition to become more carbon efficient.

Explore Solutions

Recycled Polymers & Recyclability

Materials that have been reprocessed from post-consumer and post-industrial sources, plus materials that can aid recycling.

Explore Solutions

Biodegradable & Compostable Materials

Innovative biodegradable & compostable materials that break down in to water, naturally occuring gases and biomass.

Explore Solutions

Water Soluble Polymers

A range of polymers designed to dissolve in water without polluting the marine environment with harmful microplastics.

Explore Solutions

Bio-sourced & Bio-feedstock Materials

Materials for a variety of applications sourced from biomass such as sugarcane, tapioca, castor oil and cellulose.

Explore Solutions

Renewable Content Materials

A selection of materials that partially or fully utilise feedstocks that can be replenished on a human timescale.

Explore Solutions

Circular Economy Grades

Materials designed and produced with the aim of minimising waste and making the most of available resources by using a closed-loop production system.

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Branch #1:
Reducing your carbon footprint

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Pioneering innovative sustainable solutions for plastics processors

Introducing our Sustainable Materials Portfolio. Select a category from the options below to learn more.

Reducing your carbon footprint

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Explore Solutions

Renewable Content Materials

A selection of materials that partially or fully utilise feedstocks that can be replenished on a human timescale.

Explore Solutions

Definition:

Carbon Footprint

The total greenhouse gas emissions caused directly or indirectly by a person, organisation, event or product measured in tonnes.

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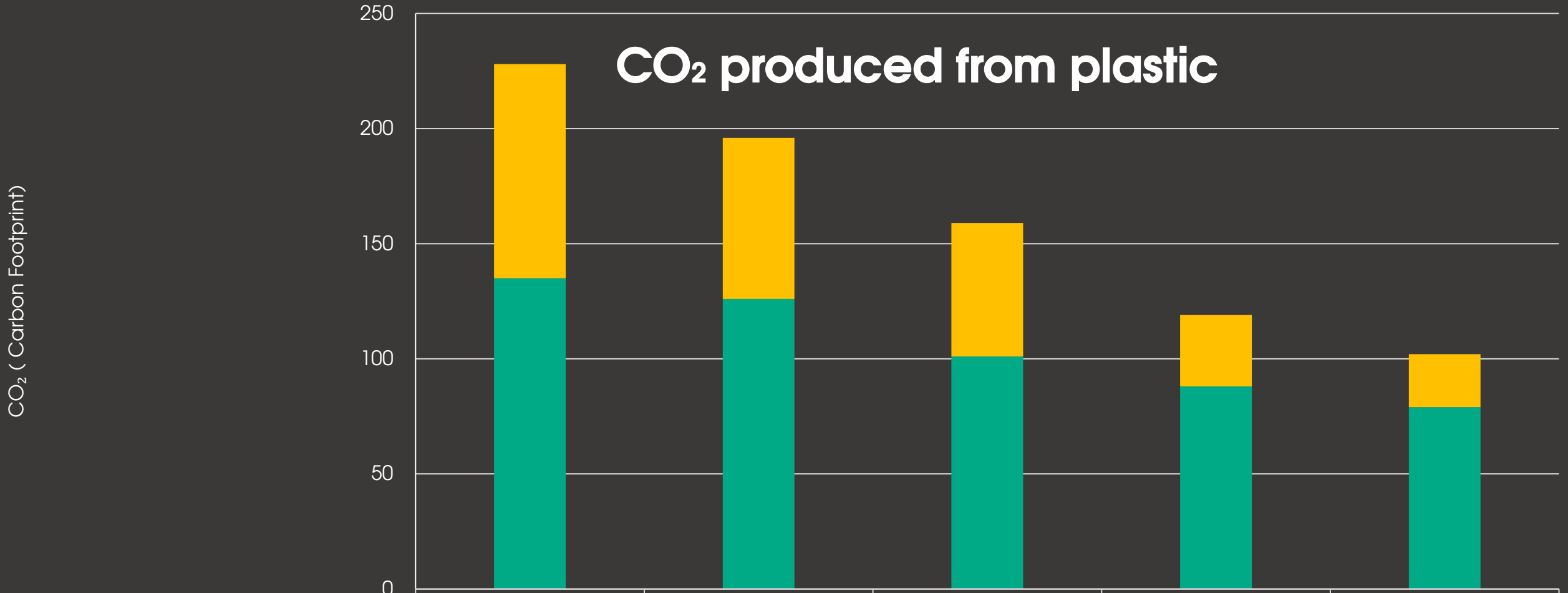
CO_2 produced from plastic



	PP	L/LLDPE	HDPE	PS	PET
CO_2 generated during conversion (MT)	93	70	58	31	23
CO_2 generated during production (MT)	135	126	101	88	79

CO_2 generated during production (MT) CO_2 generated during conversion (MT)

Data Source:
https://www.researchgate.net/publication/332428113_Strategies_to_reduce_the_global_carbon_footprint_of_plastics

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I want to reduce my carbon footprint

- Helps reduce emissions into the atmosphere and the associated climate benefits
- Can reduce energy usage in polymer production
- Can reduce energy usage in conversion
- Can reduce costs
- Can reduce reliance on petrochemical feedstocks

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I want to reduce my carbon footprint

- Can enhance the use of recycled materials and help to generate a more circular economy
- Can enhance the use of renewable materials and potentially use waste products
- In material terms, it is possible to be carbon neutral or even climate positive!

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What we can offer:

Polymers utilising renewable fillers or feedstocks to reduce the use of petrochemicals and reduce energy consumption both during manufacture and conversion

Polymer derived from non-petrochemical feedstocks with an inherent lower carbon footprint

A variety of recycled polymers

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What we can offer:

Polymer additives to make your products carbon neutral or even climate positive

Advice on using the right materials / technologies to enable downgauging (applies to extrusion and IM), reduction in energy consumption, optimising production processes

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What we can offer:

CHIMEI
a step up

GCR GROUP

NOVAMONT

RADICI GROUP
For Sustainability

RIALTI

TotalEnergies

ubq

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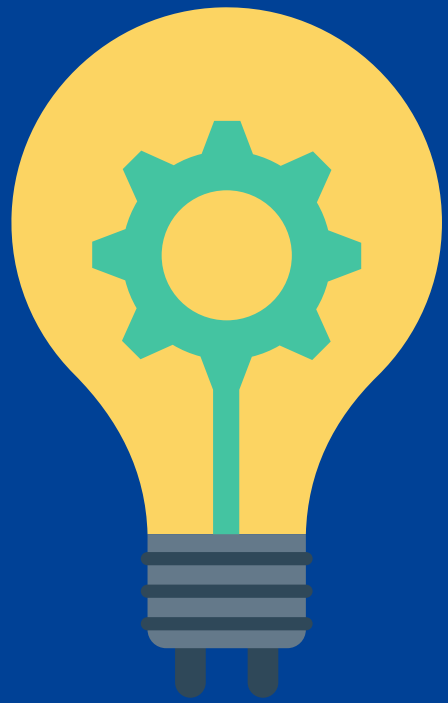
Some other options

- Downgauge (extrusion)
- Thin down wall section (IM)
- Starch/cellulose based polymers
- Source locally
- Use waste products from other industries
- Switch polymer



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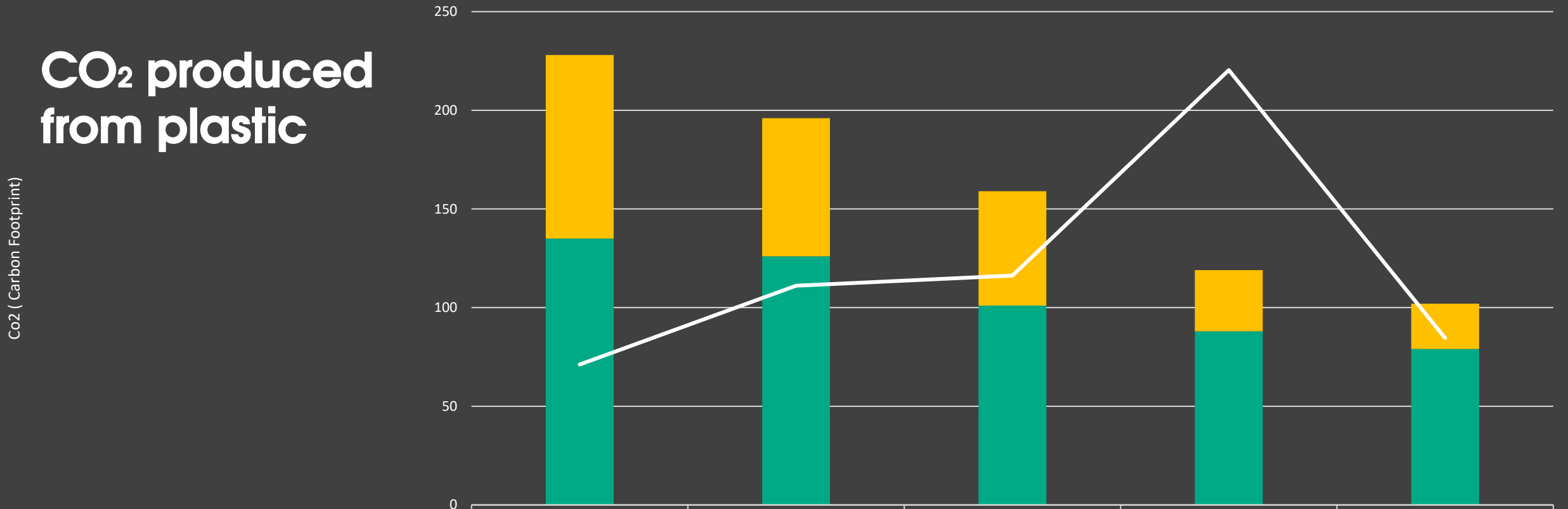
CO_2 produced from plastic



	PP	L/LLDPE	HDPE	PS	PET
CO_2 generated during conversion (MT)	93	70	58	31	23
CO_2 generated during production (MT)	135	126	101	88	79
Total Co2 produced per MT	2.56	4.00	4.18	7.93	3.04

Data Source:
https://www.researchgate.net/publication/332428113_Strategies_to_reduce_the_global_carbon_footprint_of_plastics

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Any questions?

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Branch #2: Biodegradable & compostable polymers

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https://plb.ltd/sustainable

Pioneering innovative sustainable solutions for plastics processors

Introducing our Sustainable Materials Portfolio. Select a category from the options below to learn more.

Reducing your carbon footprint

From processing advice through to fillers and mineral masterbatches, we can support you in your ambition to become more carbon efficient.

Explore Solutions

Recycled Polymers & Recyclability

Materials that have been reprocessed from post-consumer and post-industrial sources, plus materials that can aid recycling.

Explore Solutions

Biodegradable & Compostable Materials

Innovative biodegradable & compostable materials that break down in to water, naturally occuring gases and biomass.

Explore Solutions

Water Soluble Polymers

A range of polymers designed to dissolve in water without polluting the marine environment with harmful microplastics.

Explore Solutions

Bio-sourced & Bio-feedstock Materials

Materials for a variety of applications sourced from biomass such as sugarcane, tapioca, castor oil and cellulose.

Explore Solutions

Renewable Content Materials

A selection of materials that partially or fully utilise feedstocks that can be replenished on a human timescale.

Explore Solutions

Definition:

Biodegradable

Can be broken down into water, naturally occurring gases and biomass by the action of living things.

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Definition:

Compostability

A product that breaks down into water, naturally occurring gases and biomass by microbial action and leaves no toxic residues (Biological recycling).

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I want my product to be biodegradable/compostable

- Helps to reduce the impact of polymers on the environment
- Helps to reduce the impact of polymers entering the oceans
- Potentially allows home composting of polymers
- Reduce visible littering
- Generate valuable biomass and/or energy

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I want my product to be biodegradable/compostable

- Waste reduction
- By-products are non-toxic and can be broken down by naturally occurring bacteria
- Can be mixed with traditional polymers
- Can reduce the prevalence of micro plastics

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What we can offer:

Additives to promote the breakdown of standard polymers by promoting bacterial action without going through a micro plastics phase

Both bio-based and petrochemical based fully water soluble polymers

Biodegradable polymers derived either partially or fully from renewable feedstock

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What we can offer:

aquapak

Lactips

Poly materia™

NOVAMONT

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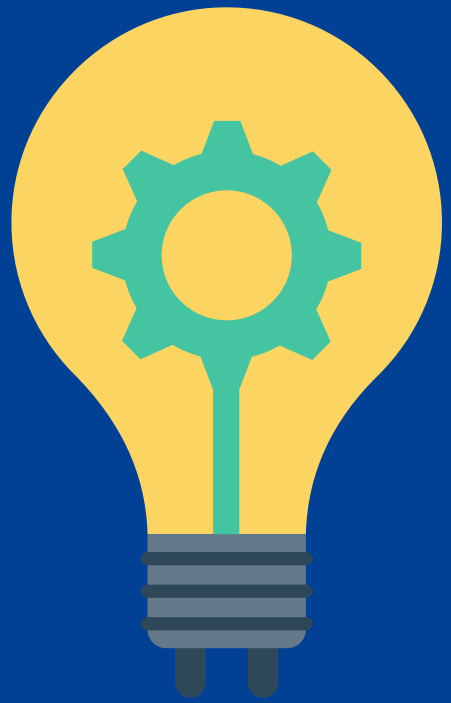
Things to consider

- Biodegradability is not straight forward
- There are many different standards that can be used to measure both biodegradability and compostability
- There is a huge difference between home composting, industrial composting and landfilling
- Other products include starch based polymers, PBAT, OXO, PHBV



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Any questions?

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Branch #3:
Water soluble polymers

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Pioneering innovative sustainable solutions for plastics processors

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A range of polymers designed to dissolve in water without polluting the marine environment with harmful microplastics.

Explore Solutions

Bio-sourced & Bio-feedstock Materials

Materials for a variety of applications sourced from biomass such as sugarcane, tapioca, castor oil and cellulose.

Explore Solutions

Renewable Content Materials

A selection of materials that partially or fully utilise feedstocks that can be replenished on a human timescale.

Explore Solutions

I want my product to be water soluble

- Can be fully biodegradable
- Non-harmful to a marine environment
- Can be a potential solution for single use items
- Can be derived from bio and renewable feedstock
- Can be edible
- Can help reduce carbon footprint

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I want my product to be water soluble

- Can be used to give an effective gas barrier
- Can be used in conjunction with other materials to enhance recyclability
- Can be water soluble at a variety of temperatures
- Can be home compostable
- Can replace traditional multi-polymer structures
- Potential to run on standard conversion equipment

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What we can offer:

PVOH based water soluble polymer (warm and hot water solubility)

Fully bio-based water soluble polymer (cold water solubility)

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What we can offer:

aquapak

Lactips

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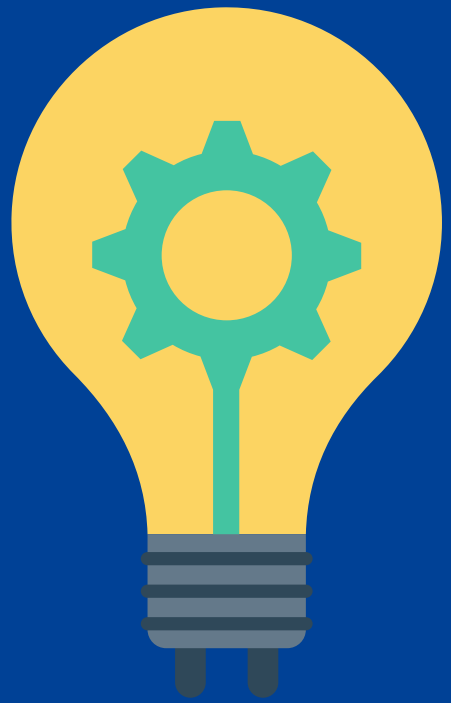
Things to consider

- Other water soluble and water swellable polymers are available
- Levels of solubility differ from polymer to polymer
- Very application specific
- Processing considerations
- Recycling concerns



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Sustainability and Regulations

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Why are regulations relevant?

- **Old**
  - Montreal Protocol
  - REACH SVHC
  - PC banned in baby bottles March 2011
    - (Okay for beer though)
- **New**
  - UK ban on plastics articles April 2020
  - EU SUP directive July 2021
  - Plastic packaging tax coming April 2022

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EU SUP is still relevant

- The EU SUP is a plastic directive based on the articles commonly found on beaches.
- It contains a number of bans, restrictions and recycling targets for plastic articles.
- The UK government has committed to following or exceeding the EU SUP.
- The SUP refers to all plastics and has no exceptions for biodegradable and/or bio sourced.

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EU SUP Market Restrictions (bans)

- Cotton bud sticks, Cutlery, Plates, Beverage Stirrers, Straws, Sticks for balloons, expanded PS for food packaging.
- The UK has already banned plastic; straws, stirrers and cotton bud sticks.
- Consultations have recently been held on the ban of plastic balloon sticks, cutlery, plates and expanded PS containers in England.
  - These bans are scheduled for April 2023

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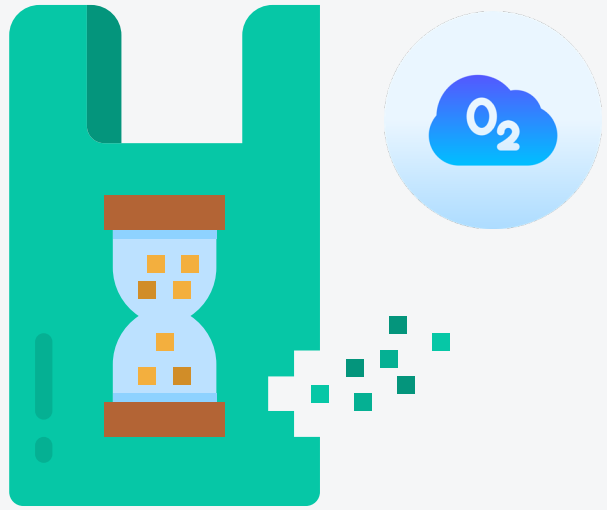
EU SUP Market Restrictions - oxo-degradable

- The general concern with oxo degradable is that material does not actually degrade but just fragments, in some ways worsening the issue
- This has been contested with some saying that the material breaks down completely
- The ban makes no distinction between oxo-degradable and oxo-biodegradable
- There have been some indications that this ban would be brought over to the UK but so far nothing concrete



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EU SUP Consumption reductions

Must show a consumption reduction for the following items between 2022 and 2026

- Food containers
  - Food for immediate consumption
- Beverage cups
  - Not sealable i.e coffee cups

NI have released a consultation on a proposing a levi on plastic food containers and beverage cups of up to 50p.

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Targets on recycling

- PET bottles recycled content targets
  - 25% recycled content by 2025
  - 30% recycled content by 2030

- 77% of all beverage bottles recycled by 2025

- Target increases up to 90% of all plastic bottles. By 2029

- The UK's recycling in general is quite good with 350,000 tonnes a year recycled compared to 13,000 tonnes back in 2000. But it could be better

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Consistent collection

- This is already in place across Wales
  - Wales has the 2nd highest household recycling rate in the world

- England has run consultancies with the inclusion of separate food collection and plastic film collection.
  - Dates have not been confirmed with major push back from councils
  - Changes coming in to place somewhere between 2024 and 2030
  - This could lead to larger volumes of recycled film available

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Deposit return schemes

- Two separate schemes Both revolving around drinks containers

- Scotland
  - Currently postponed to August 2023
  - Covers PET glass steel or aluminium drinks containers up to 3 litres

- Rest of UK
  - Currently postponed to late 2024
  - Less finalised then the Scottish scheme but looks to be covering the same things with the possible addition of HDPE bottles

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Plastic Packaging Tax

- £200/ton tax on any single use plastic packaging component that doesn't contain 30% or more recycled content.
  - In theory increasing the value of prime replacement recycled material by over £600 per ton.
- Aim to encourage recycling and investment in recycling infrastructure.
- 30% content and the fact that food contact packaging isn't exempt is a known stretch.
- A component is considered a plastic component if the majority of the part by weight is plastic.

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What is packaging?

- A packaging component is a part designed to contain protect, handle, present or deliver goods. Either on its own or as part of an assembly.
- There has been some debate on industrial re-useable packaging but this does appear to be included.
- Single use consumer packaging is also covered.
  - This includes, Plastic bags, disposable cups, plates and bowls, gift wrap and sticky tape.

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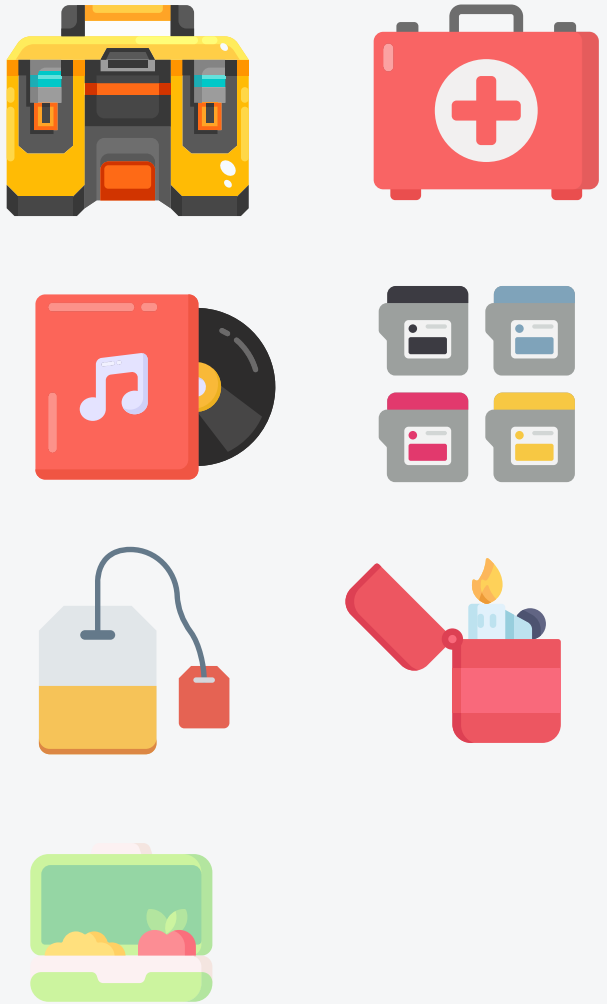
What isn’t packaging?

Anything where, if it could be used as packaging, the packaging is not the primary function

- Storage
  - CD case, tool box, first aid box
- Packaging integral to the product
  - Tea bags, lighter, ink cartridges
- Products for the presentation of goods
  - Re-useable display stands.
- Reusable consumer goods
  - Lunch box



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Who's liable?

The company that makes the last substantial modification is required to pay the tax

- The tax cannot be paid previous to this
- There will need to be communication throughout the supply chain

The tax point is the last modification made by the company that makes the final substantial modification. (I'm still awaiting confirmation on this)

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What is a substantial modification?

- **Change to the; shape, structure, thickness or weight.**
  - This is a terrible definition that in no way mentions printing.

- **Examples of substantial modifications**
  - Extrusion, profile sheet or film production
  - Moulding, any injection moulded article
  - Layering and laminating, production of multi layered film or labels
  - Forming, any heat forming process such as vac forming
  - Printing, application of ink

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What isn’t a substantial modification?

- **Labelling**
  - The application of a label is not a substantial modification
- **Cutting and sealing**
  - Slitting film or forming bags or sealing on a film lid
- **Blowing bottle preforms**
  - Though you would expect blowing bottles to be a substantial modification it’s specifically not.
- **Substantial modifications made during filling**
  - This means that if film is sold into a form fill and seal application the tax point can be quite far down the supply chain.
  - Also for rigid packaging if the material is printed during the filling process

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Exemptions and exclusions?

- **Plastic packaging containing more than 30% recycled content**
- **Direct packaging of licenced medicines**
  - Secondary packaging not included
- **Tertiary packaging that is not being intentionally imported**
- **Packaging that will be exported**
- **Producing or importing <10t per year**

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Exports

- Packaging tax can be deferred for 1 year for material that will be exported.
- When you have proof of the export the volumes can then be written off from the tax.
- You can also reclaim paid tax with proof that the packaging has been exported.
  - Maximum of 2 years after the tax has been paid.
- If material that you expected to be exported remains in the UK you will be required to pay tax.

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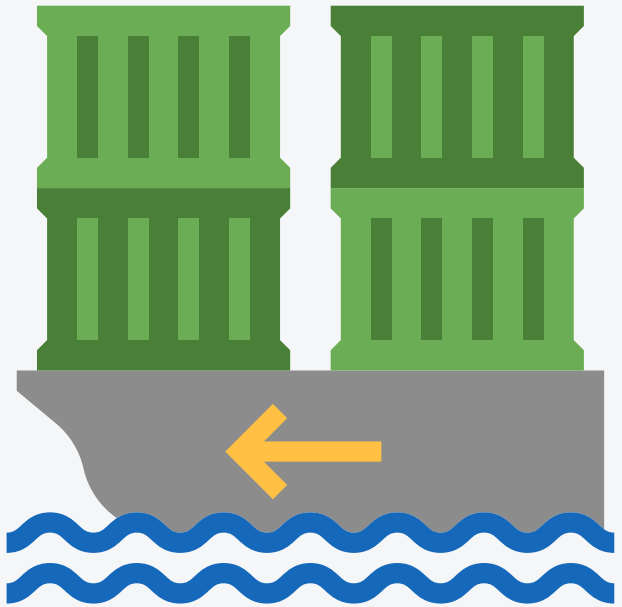
Importing packaging and packaged items

- **You would need to pay the tax on any packaging you import. Including packaging of filled goods.**
  - If you cross the 10t per year threshold .
- Example if you import drinks bottles you will pay tax on the bottle the cap the label and if they are shrink wrapped into 12 packs you will apply tax on that to.
- you would not pay tax on pallet wrap holding these packs on the pallet.



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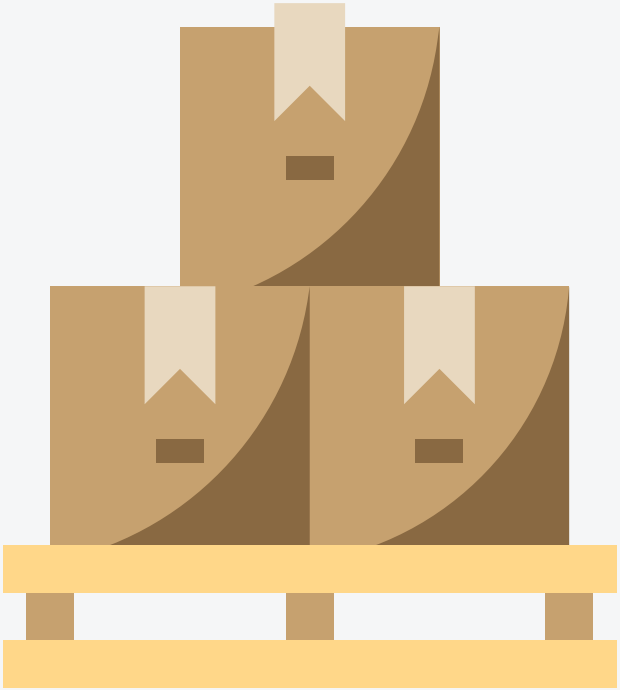
Tertiary packaging

- Tertiary packaging is exempt when imported as packaging as the importer would not have control over whether any or how much is applied.
  - Shrink hoods, pallet wrap etc.
- However if you purposefully import or produce this packaging you will have to pay the tax.
- If the tertiary packaging is being applied in the UK to pallets being exported tax will need to be paid.



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Types of recycled material

- **Pre-consumer**
  - Recovered from waste generated in a manufacturing process, and processed by a reprocessing facility
- **Post-consumer**
  - Plastic recovered from the waste of an end user
  - This can include material returns from the distribution chain
- **NOT regrind**
  - If material can be fed directly back into the manufacturing process it came from it cannot be included as recycled content
  - Its still not exactly clear where regrind ends and pre-consumer begins

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Possible solutions?

- **Where possible use recycled content**
  - This will be difficult especially for food contact applications
  - As chemical recycling is introduced this may become better
  - If you can reclaim material from the supply chain this can be a good source of known material

- **Reduce packaging weight by down gauging**
  - Still paying the tax but as little as possible

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How do I register?

- For specifics on registration and the documentation that you require the best place is the gov.uk official guidance
- https://www.gov.uk/government/collections/plastic-packaging-tax
- This page is a collection of all the information that the government has produced previously
- This contains a lot of information on the specifics of required evidence and book keeping.

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EPR reform

- Coming in 2024
- Large increases compared to the current system.
- At this point the EPR is coming in and it will be applying all packaging whether Plastic or not
  - Though with modulated fees that are likely to disadvantage plastics
  - These fees will also be placed on the brand owner.

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Sustainability and Regulations

Any Questions?

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Branch #4:
Circular economy

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Water Soluble Polymers

A range of polymers designed to dissolve in water without polluting the marine environment with harmful microplastics.

Explore Solutions

Bio-sourced & Bio-feedstock Materials

Materials for a variety of applications sourced from biomass such as sugarcane, tapioca, castor oil and cellulose.

Explore Solutions

Renewable Content Materials

A selection of materials that partially or fully utilise feedstocks that can be replenished on a human timescale.

Explore Solutions

Circular Economy Grades

Materials designed and produced with the aim of minimising waste and making the most of available resources by using a closed-loop production system.

Explore Solutions

Definition:

Circular Economy

A circular economy is an alternative to a traditional linear economy (make, use, dispose) in which we keep resources in use for as long as possible, extract the maximum value from them whilst in use, then recover and regenerate products and materials at the end of each service life.

(www.wrap.org.uk)

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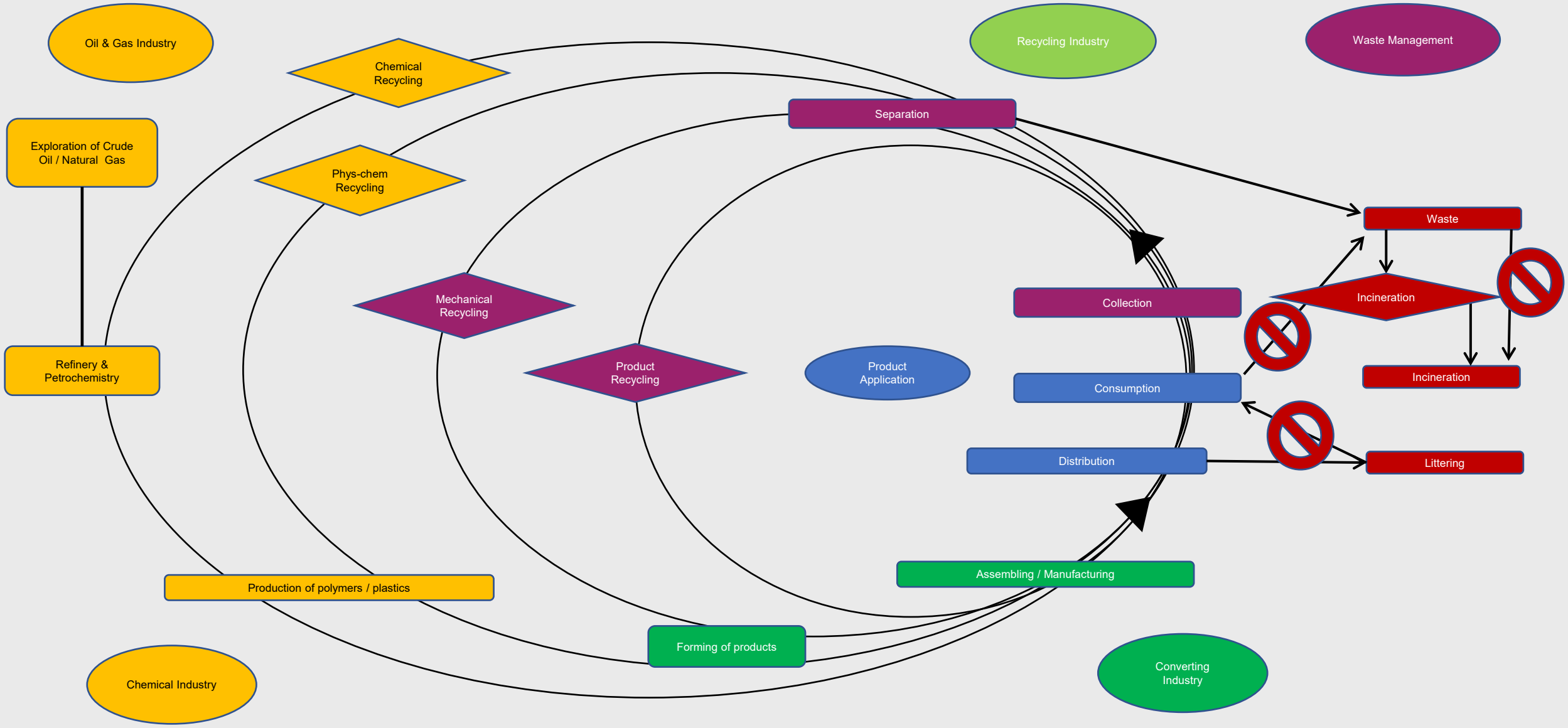

Policies for circular economy of plastics systems
Source: TU Berlin, Kaufer. U Stricker et al.

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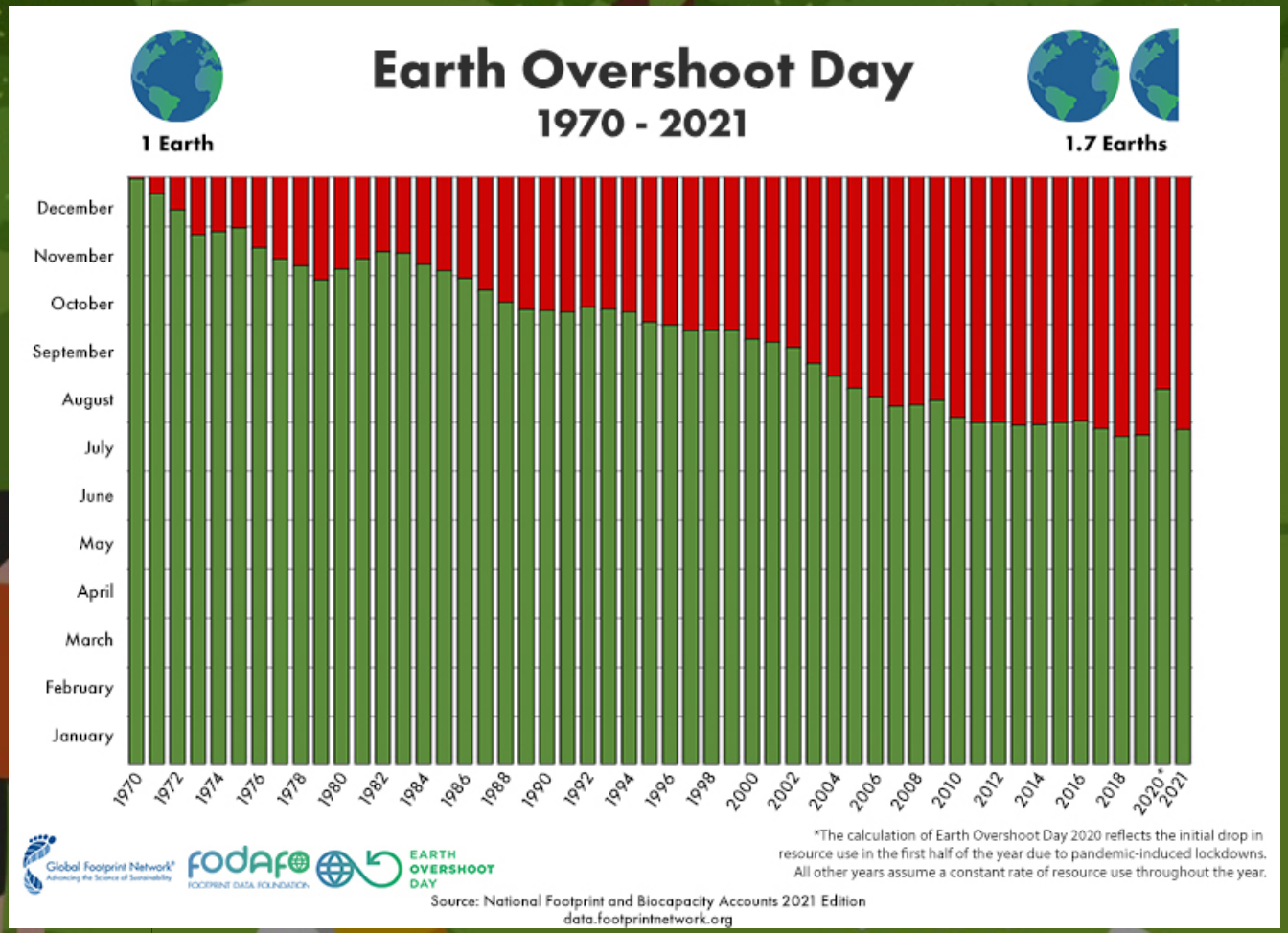
Earth Overshoot Day

Earth Overshoot Day (**EOD**), is the calculated illustrative calendar date on which humanity's resource consumption for the year exceeds Earth's capacity to regenerate those resources that year.

In 1970, EOD was calculated as December 29th

In 2021 EOD was calculated as July 29th



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I want to use materials that form part of a circular economy

- Encourages the use of recycled polymers and enhances recycling technology both mechanical and chemical
- Promotes the concept of design for recycling e.g. single polymer solutions, tethered caps etc.
- Makes everyone in the product chain responsible
- Reduces carbon footprint

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What we can offer:

Recycled Polymers

PE containing at least 50% PCR with equivalent or even enhanced properties compared to prime

PP (Ho and Co) containing at least 50% recyclate not currently existing in the recyclate market

PS containing at least 30% recycled content

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What we can offer:

Bio-based and biodegradable polymers which can form part of a circular economy

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experts in sustainable materials.

What we can offer:

PE containing at least 50% PCR with equivalent or even enhanced properties compared to prime

PP (Ho and Co) containing at least 50% recyclate not currently existing in the recyclate market

PS containing at least 30% recycled content

TotalEnergies

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What we can offer:

CHIMEI
a step up

RADICI GROUP
For Sustainability

RIALTI

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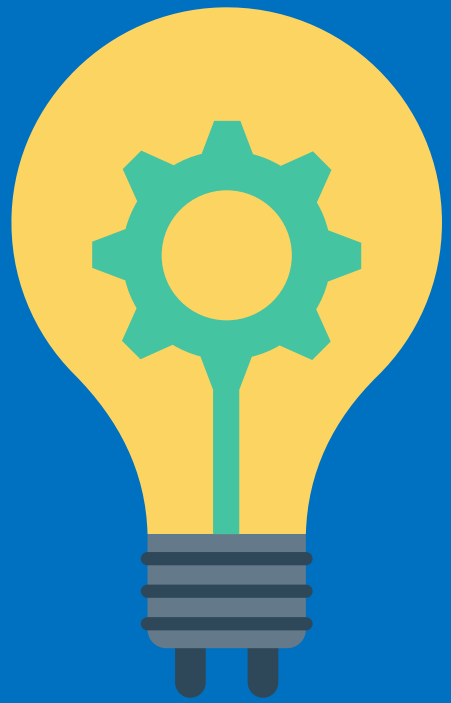
Things to consider

- For the circular economy to work, it relies on everyone in the produce, convert, use, recycle chain to play their part
- Current lack of infrastructure and investment?
- Design of products and material choices are critical



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Any questions?

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Branch #5:
Bio-sourced materials

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Water Soluble Polymers

A range of polymers designed to dissolve in water without polluting the marine environment with harmful microplastics.

Explore Solutions

Bio-sourced & Bio-feedstock Materials

Materials for a variety of applications sourced from biomass such as sugarcane, tapioca, castor oil and cellulose.

Explore Solutions

Renewable Content Materials

A selection of materials that partially or fully utilise feedstocks that can be replenished on a human timescale.

Explore Solutions

Circular Economy Grades

Materials designed and produced with the aim of minimising waste and making the most of available resources by using a closed-loop production system.

Explore Solutions

Definition:

Bio-based/bio-sourced

Derived from bio-mass, for example corn, sugar cane, milk, cellulose etc.

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I want to use bio-sourced materials in my product

- Reduce the use of petrochemical feedstocks and preserve valuable resources
- Can reduce carbon footprint
- Can use waste products from other industries
- Can enhance compostability and biodegradability

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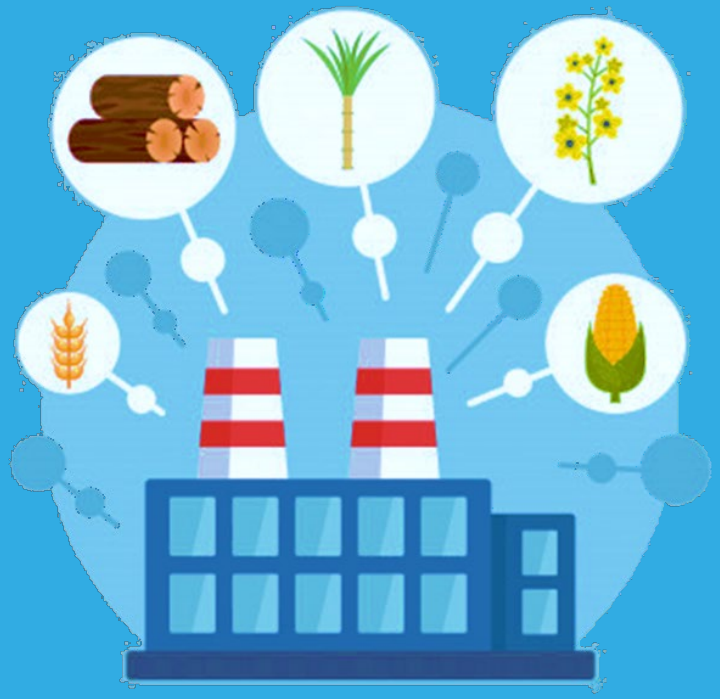
I want to use bio-sourced materials in my product

- Reduce landfill and potentially expensive preparation for recycling
- Enhanced public perception
- Enhanced haptics



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What we can offer:

PLA which is both bio-sourced and biodegradable

Bio-sourced fully water soluble polymers

Polymers derived fully or partially from waste products

Engineering grade polymers partially derived from bio-source

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What we can offer:

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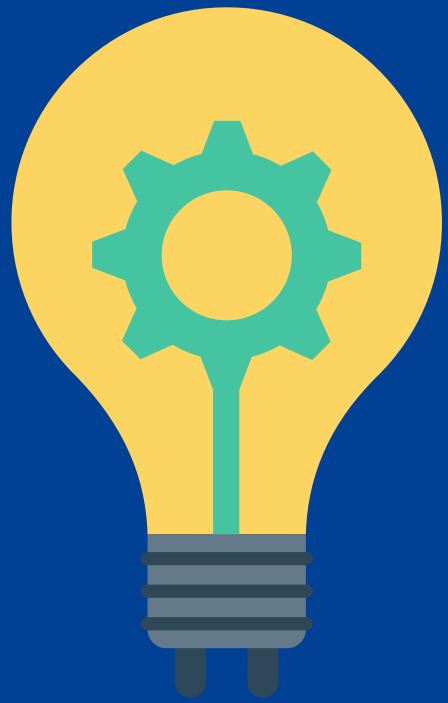
Things to consider

- Bio PE/PP – biobased but still on-purpose prime polymer. Does not biodegrade
- Where does it come from? (carbon footprint)
- What is the impact on other environmental factors? (water consumption, agricultural land)
- PLA - supply and demand heavily out of balance



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Any questions?

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Branch #6:
Renewable content

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Water Soluble Polymers

A range of polymers designed to dissolve in water without polluting the marine environment with harmful microplastics.

Explore Solutions

Bio-sourced & Bio-feedstock Materials

Materials for a variety of applications sourced from biomass such as sugarcane, tapioca, castor oil and cellulose.

Explore Solutions

Renewable Content Materials

A selection of materials that partially or fully utilise feedstocks that can be replenished on a human timescale.

Explore Solutions

Circular Economy Grades

Materials designed and produced with the aim of minimising waste and making the most of available resources by using a closed-loop production system.

Explore Solutions

Definition:

Renewable Feedstocks

A feedstock that can be replenished on a human timescale (i.e. not a slow regeneration rate).

Renewable Additives

Minerals, natural fibres, glass etc.

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I want to use a material that is made using renewable content

- Reduced reliance on petrochemical feedstocks
- Can enhance properties of traditional or bio-based polymers
- Can use waste products from other industries
- Can reduce carbon footprint
- Can reduce energy usage in production and conversion
- Can make use of valuable PCR or PIR
- Can use naturally occurring renewable materials

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What we can offer:

Renewable mineral masterbatches

Products containing renewable content

Additives derived from renewable waste sources

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What we can offer:

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GCR GROUP

NOVAMONT

Lactips

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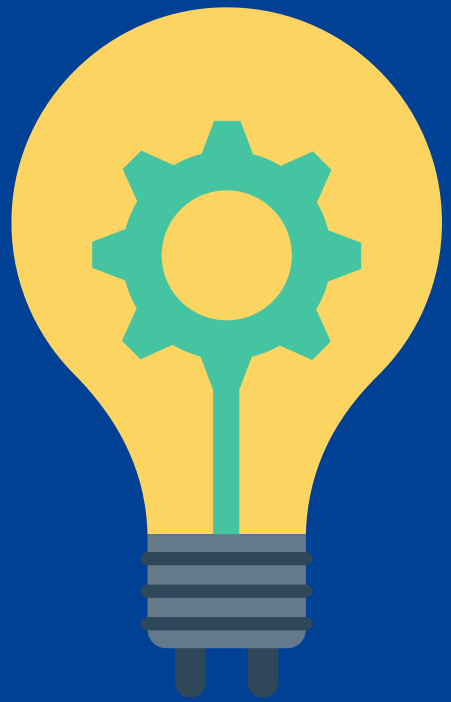
Things to consider

- Minerals can be derived from other waste sources e.g. seafood shells
- Recycling concerns
- How renewable is your renewable content? e.g. glass



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Any questions?

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Branch #7:
Recycled polymers & recyclability

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Pioneering innovative sustainable solutions for plastics processors

Introducing our Sustainable Materials Portfolio. Select a category from the options below to learn more.

Reducing your carbon footprint

From processing advice through to fillers and mineral masterbatches, we can support you in your ambition to become more carbon efficient.

Explore Solutions

Recycled Polymers & Recyclability

Materials that have been reprocessed from post-consumer and post-industrial sources, plus materials that can aid recycling.

Explore Solutions

Biodegradable & Compostable Materials

Innovative biodegradable & compostable materials that break down in to water, naturally occuring gases and biomass.

Explore Solutions

Water Soluble Polymers

A range of polymers designed to dissolve in water without polluting the marine environment with harmful microplastics.

Explore Solutions

Bio-sourced & Bio-feedstock Materials

Materials for a variety of applications sourced from biomass such as sugarcane, tapioca, castor oil and cellulose.

Explore Solutions

Renewable Content Materials

A selection of materials that partially or fully utilise feedstocks that can be replenished on a human timescale.

Explore Solutions

Definition:

Recycling

The act of reprocessing used materials into new products for further use. This can include up cycling and down cycling.

Plastic recycling is the process of recovering scrap or waste plastic and reprocessing the material into useful products.

Nearly all types of thermoplastics can be recycled.

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Definition:

Recyclate

Recyclate is the feedstock used to generate recycled polymers, e.g. the collection of PET bottles.

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Definition:

Post Industrial Recyclate (PIR)

Material diverted from the waste stream created during a manufacturing process.

This means that the waste leaves the premises of the factory that generated it, and then follows the recycling path.

Excluded is material that can be reused in the same manufacturing process.

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Definition:

Post Consumer Recyclate (PCR)

Material disposed of by individuals or businesses that the user deems to have served its original purpose.

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Post Consumer Recyclate

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Post Industrial Recyclate

Non-Woven, white or coloured

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Post Industrial Recyclate

Monofilament, white or coloured

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Post Industrial Recyclate

Mixed Colours

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Post Industrial Recyclate

White

Black

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Post Industrial Recyclate

Glass fiber reinforced

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I want to use materials that are recycled or can be recycled

- Nearly all thermoplastics are capable of being recycled, but relies on effective waste management
- Encourages single polymer solutions
- Can help to reduce carbon footprint
- Can help to reduced the use of petrochemical resources
- Encourages involvement in a circular economy
- Reuses valuable PCR and PIR

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I want to use materials that are recycled or can be recycled

- Reduces volume of plastics going to landfill
- Enhanced public perception
- Compliance with current and upcoming legislation
- Helps to reduce down cycling

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What we can offer:

Polymers containing a proportion of PCR or PIR derived as part of a circular economy

Functional additives to enhance the properties of recycled polymers

A variety of recycled products from carefully selected and screened suppliers

Products from prime suppliers incorporating recycled content e.g. Ducor, Carmel

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What we can offer:

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RSHPOLYMERE

MBAPOLYMERS

LUXUS LTD

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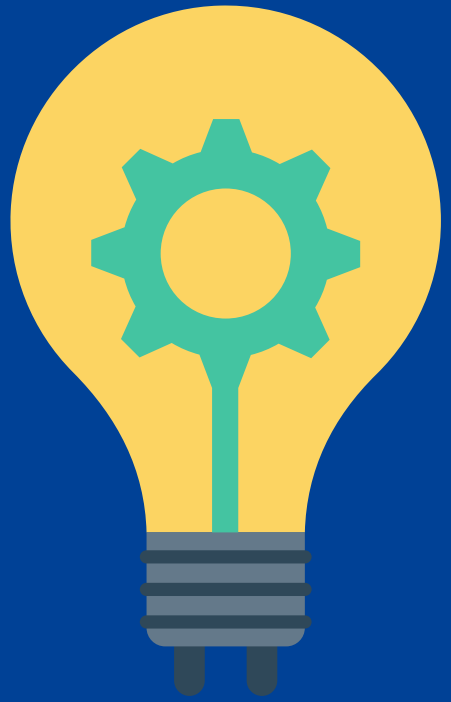
Things to consider when using recycled polymers

- Limited approvals e.g. likely not to be food contact safe
- Limited technical data
- Processing complications e.g. drying, parameters may need alteration
- Odours
- Quality e.g. batch to batch variation
- Presence of contaminants e.g. metals, other polymers
- Availability
- Feedstock
- Packaging (likely to be big bags)
- Colour requirements
- End product properties (may not be like prime)
- Visual defects particularly in thin sections / thin films



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Sustainability Data Sheets

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What is a sustainability data sheet?

- Specific to a material e.g., PP, PE
- Summarises the sustainability credentials and limitations of the material
- Includes data that is often difficult to find
- Includes options to improve the sustainability of the material via product design or use of alternative materials
- Only includes commercially available options

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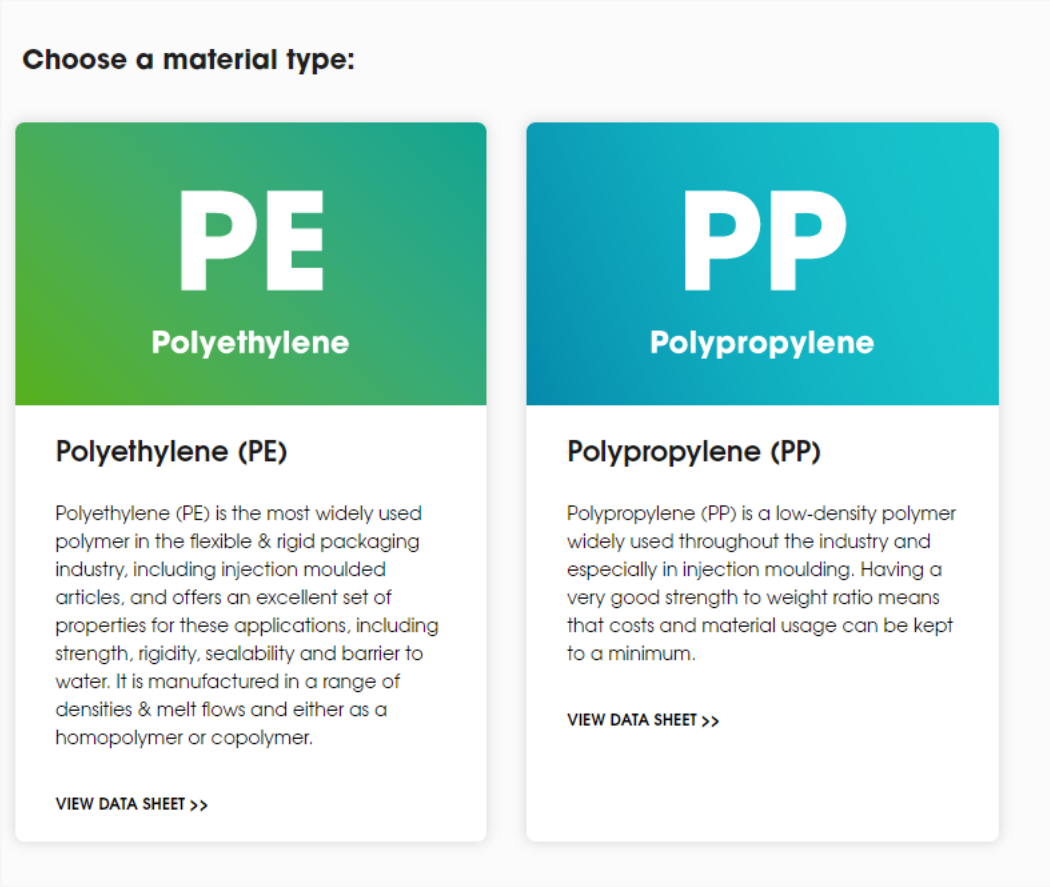
Why are they different?

- All sustainability options in one place
  - From additives to recycled grade availability.

- If you're using a material such as PE, you can use the datasheet to understand the sustainable options available for that material depending on what you or your end-user is looking to achieve.



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Polypropylene (PP)

Sustainability Data Sheet

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Introduction

Polypropylene (PP) is a low-density polymer widely used throughout the industry and especially in injection moulding. Having a very good strength to weight ratio means that costs and material usage can be kept to a minimum.

Typical Properties

Density: 905 kg/m^3

Melt index: 0.3 – 130 g/10min (@2.16kg, 230°C)

Melting point: 130 – 170°C

Notched Izod impact strength (rigid moulding / extrusion): 3 – 40+ kJ/m^2

Flexural modulus (rigid moulding / extrusion): 850 – 2000 MPa

Carbon footprint data (NB: cradle-to-gate)

Material	kg CO_2 equivalents (CO_2e) per kg of resin	Typical density (g/cm^3)	Ref
PP	1.95	0.905	2
rPP	0.90	0.905	3
HDPE	1.90	0.955	2
Paper	2.42	1.200	1
Glass	4.40	2.500	1

Recycling

Biodegradability & compostability

Recycling

Widely recycled including kerb side collection for rigid products.

Biodegradability & compostability

Polypropylene is neither biodegradable* nor compostable.

Bio-sourced

Polypropylene is manufactured from propylene which is mainly obtained from petroleum or natural gas and therefore not routinely bio-sourced**.

Material solutions for sustainability

Fillers can be used to reduce the amount of raw polymer being used and enhance mechanical properties. These can be minerals such as calcium carbonate, talc or natural fibres such as wood fibre. Mineral fillers can also reduce cycle times and lower processing energy requirements.

* For items less than 1.2mm thick, a masterbatch can be added to make the material biodegradable without breaking down in to microplastics. This technology is separate from oxy-degradables.

Recycled grades are available. Limitations are typically colour and food approvals. The quality of recycled PP material is variable, so polymer modifiers can be used to improve their performance.

** Some suppliers are starting to offer polypropylene manufactured using wholly or partially bio-sourced propylene. A mass balance approach may be used whereby bio-sourced feedstock is allocated to polymer production.

Designing for sustainability

Make sure products are clearly marked as PP to aid recycling.

Reduce or ideally eliminate the use of colours, particularly carbon black, to improve recyclability.

Make the most of the material; high stiffness grades can allow thinner walls and high impact grades can help produce a longer lasting product.

In some applications a glass filled PP may be able to replace a glass filled PBT or Nylon: this can lead to a CO_2 and weight saving.

Metallocene-catalysed PP allows for very high clarity grades to be produced. This can replace the use of GPPS in some thin wall applications allowing for a CO_2 saving.

Products available from Plastribution

Type	Manufacturer	Product
Mineral filler ($CaCO_3$ & talc)	GCR	Granic
Wood fibre filler	Sumika	Thermofil
Biodegradable additive	Polymateria	Cycle+, DegrAid
Impact modifiers	ExxonMobil	Vistamaxx
	Borealis	Queo
Carbon negative additive	UBQ	UBQ
Recycled PP	MBA	MBA polymers
PP with recycled content	TotalEnergies	Total Circular Polymers

References

1. https://www.winnipeg.ca/finance/findata/matmgt/documents/2012/682-2012/682-2012_Appendix_H-WSTP_South_End_Plant_Process_Selection_Report/Appendix%207.pdf

2. Cradle-to-Gate Life Cycle Inventory of Nine Plastic Resins & Four Polyurethane Precursors – The Plastics Division of the American Chemistry Council & Franklin Associates – August 2011 (Table AD-3)

3. Carbon footprint of plastic from biomass and recycled feedstock: methodological insights – The International Journal of Life Cycle Assessment volume 26 – January 2021

Contact us about this datasheet:

Polyethylene (PE)

Sustainability Data Sheet

Download as PDF

Introduction

Polyethylene (PE) is the most widely used polymer in the flexible & rigid packaging industry, including injection moulded articles, and offers an excellent set of properties for these applications, including strength, rigidity, sealability and barrier to water. It is manufactured in a range of densities & melt flows and either as a homopolymer or copolymer.

Typical Properties

Density: 910 – 960 kg/m^3 (LDPE, LLDPE, HDPE)

Melt index: 0.05 – 50 g/10min (@ 2.16kg, 190°C)

Melting point: 105 – 130°C

Dart drop impact resistance (flexible extruded film): 30 – 1100 g/25µm

Notched Izod impact strength (rigid moulding / extrusion): 3.5 – 45 kJ/m^2

Flexural modulus (rigid moulding / extrusion): 260 – 1200 MPa

Carbon footprint data (NB: cradle-to-gate)

Material	kg CO_2 equivalents (CO_2e) per kg of resin	Typical density (g/cm^3)	Ref
LDPE	2.06	0.92	2
LLDPE	1.82	0.918	2
HDPE	1.90	0.955	2
EVA	2.11	0.93	1
rLDPE	1.01	0.92	1
rHDPE		0.955	1
Paper	2.42	1.2	1

Recycling

Polyethylene is 100% recyclable and can be recycled several times over. Film containing high percentages of EVA copolymer (such as stretch hoods) may not be collected for recycling.

Biodegradability & compostability

Polyethylene is neither biodegradable* nor compostable.

Bio-sourced

Polyethylene is manufactured from ethylene which is mainly obtained from petroleum or natural gas and therefore not routinely biosourced**.

Material solutions for sustainability

Fillers can be used to reduce the amount of virgin polymer (and therefore the carbon footprint) in an end-product. They can also enhance mechanical properties. Examples are minerals such as calcium carbonate & talc or natural fibres such as wood fibre. Use of mineral fillers can help to reduce processing energy requirements and moulding cycle times.

*An additive masterbatch can be added to polyethylene to transform the polymer such that it becomes biodegradable without forming microplastics. The technology works in both flexible films and rigid articles of wall thickness less than 1.2mm. NB: this technology is separate from oxy-degradables.

**Some suppliers are starting to offer polyethylene manufactured using wholly or partially bio-sourced ethylene. A mass balance approach may be used whereby biosourced feedstock is allocated to polymer production.

Recycled grades of polyethylene are available, either from post-industrial or post-consumer waste, although use may be limited due to colour & food contact status. Quality is very variable so polymer modifiers can be added to improve their performance.

Designing for sustainability

Downgauge flexible film or reduce rigid wall thickness by using performance materials such as metallocene-catalysed polyethylene (mPE) to reduce overall virgin material usage. In moulding, mPE also offers better clarity and organoleptics as well as higher strength.

Reduce or ideally eliminate the use of colours, particularly carbon black, to improve recyclability.

Select the correct grade for the job, e.g., a high stiffness/high impact grade to allow downgauging and/or increase service life.

Products available from Plastribution

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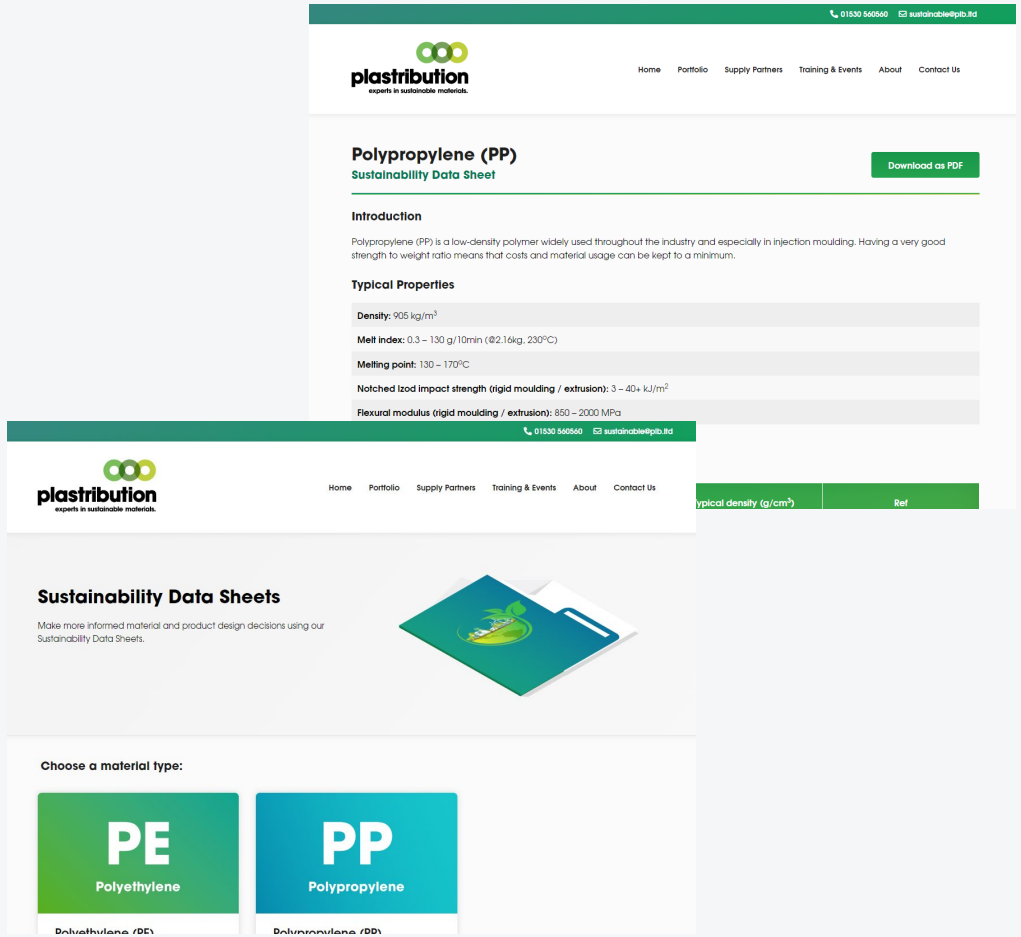
What's to come?

- We've started with the two largest volume polymers, PE & PP
- The range of datasheets will be expanded to cover commonly used polymers
- Nylon and ABS are next
- Data sheets will be maintained and updated as applicable (see our website for the latest version)



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Sustainability Data Sheets

Any Questions?

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Some Challenges of Switching to Sustainable Plastics

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Challenge 1
Understanding Sustainability

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A Common Question

I am making / designing component x and I want to / have been asked to make a green / sustainable / environmentally friendly version – what can you offer me?

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What does sustainability mean?

- avoidance of the depletion of natural resources in order to maintain an ecological balance (oxford languages)
- meeting our own needs without compromising the ability of future generations to meet their own needs (https://www.mcgill.ca/sustainability/files/sustainability/what-is-sustainability.pdf)
- the idea that goods and services should be produced in ways that do not use resources that cannot be replaced and that do not damage the environment (Cambridge dictionary)

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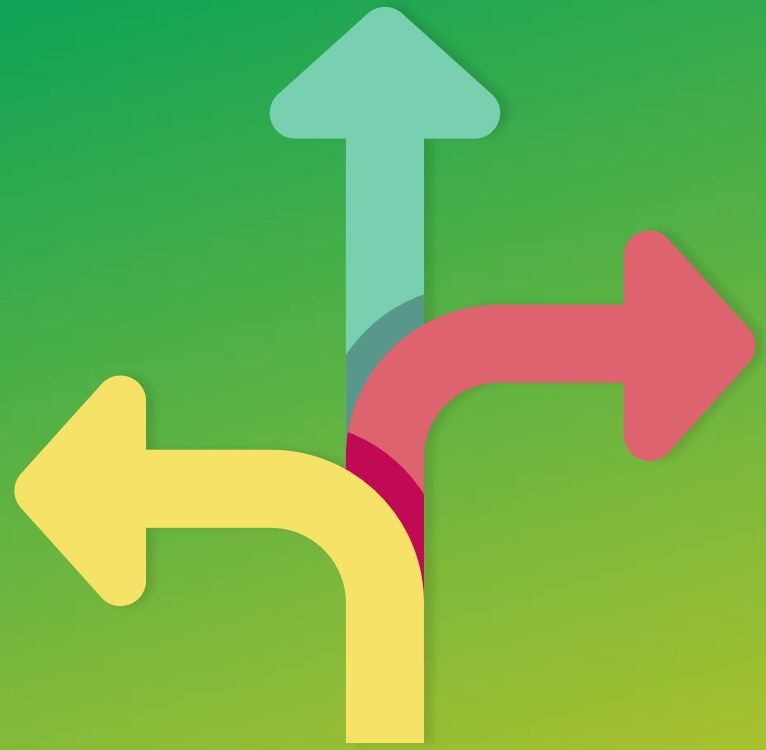
What does sustainability mean for plastics processors?

- Is it the origin of the material (bio / petrochemical)?
- Is it the renewability of the material?
- Is it the inclusion of renewable additives?
- Is it the biodegradability characteristics of the material?
- Is it the carbon footprint?
- Is it the energy consumption?
- Is it the recyclability of the material?
- Is it the use of recycled materials?
- Is it being part of a circular economy?
- Is it about what happens when it enters the ocean?
- Is it about what happens when it is littered?



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The 7 branches of sustainability

- Reduced carbon footprint
- Biodegradable/Compostable
- Water Soluble
- Bio-Content
- Circular Economy
- Recycled/Recyclability
- Renewable Content

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Challenge 2
Meeting the Required Specification

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What does your part need to do / what can you compromise?

- What are the mechanical / thermal properties required?
- Does it need to be clear? And how clear?
- Does it need to be colourable?
- Are there approvals required e.g. Food, FR, water contact etc.
- What is the service life requirement?
- What are the chemical resistance requirements?

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Do you have the right equipment?

- Are you willing/able to make investment?
- Some products require little or no change
- Some products require minor modifications to current process / equipment
- Some products will require investment in time, equipment or both
- Do the products match with current systems e.g. hot runners, specific gating types, multi-layer systems, extraction / ventilation

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Other considerations

- **Design consideration**
  - Design for material
  - Design for reuse
  - Design for recyclability
- **Shelf life**
  - Prior to manufacture
  - Finished product on site
  - Storage with end user

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Challenge 3
Making it Work Commercially

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What are the pricing requirements?

- What is the base price for your existing material and how much more are your customers prepared to pay?
- Historical expectation that repro/recycled materials are cheap
- Market sentiment changing – demand for recycled/bio-polymers far outstripping capacity currently
- Newer technologies = smaller plants = higher pricing
- Economies of scale unlikely to reach current traditional TP levels
- Could higher prices be offset by increased demand due to public preferences? Remember though, the public focus is likely to change

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Case Studies

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Case Study 1
Tote Box

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Tote Box

- Very common utility product
- Usually PP but depending on application and manufacturer can be HPPP, CPPP, RCPPP
- Performance level dependent on application
- Can be clear, coloured or black

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Options for enhanced sustainability

- recycled resin
- enhanced resins to improve performance
- carbon neutral / climate positive materials
- sustainable additives

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Recycled resin

Pros

- Inherently lower carbon footprint vs prime
- Contribute to a circular economy

Cons

- Limited colours
- Potential loss of physical performance
- Cost?

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RSHPOLYMERE

MBAPOLYMERS

LUXUS LTD

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Enhanced resins to improve performance

Pros

- Ability to uplift mechanical performance e.g. impact strength
- Potential to downgauge / use an alternative resin
- Aids compatibilization with other resins e.g. PP/PE mixed recycled feedstock
- Improves consistency batch to batch
- Fully recyclable

Cons

- Some cost implication (but limited due to typical low addition rates)
- Potential need to modify existing equipment & tooling

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Borealis - Queo

BOREALIS
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ExxonMobil - Vistamaxx

ExxonMobil Chemical

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Carbon neutral / climate positive materials

Pros

- Gives the ability to make carbon neutral or even climate positive products
- Fully recyclable
- Cost neutral
- Contributes to a circular economy
- Reduced reliance on petrochemicals

Cons

- Some limitations on colourability
- Some limitations on processing temperature
- Some limitations on part thickness
- Food contact could be an issue

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Sustainable additives

Pros

- Gives the ability to reduce carbon footprint
- Fully recyclable
- Enhances processing (lower temperatures, faster cycling)
- Reduced reliance on petrochemicals
- Can improve some physical properties

Cons

- Some limitations on colourability
- Unless redesigning parts, weight can increase
- Potential impact on mechanical performance

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Case Study 2
Mailing Bag

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Mailing / home shopping bags

Current typical formulation

- LLDPE-based, medium to high slip, 50-80µm
  - Strength, sealability, conversion
- Either mono- or coextruded (white / black)
- Heavily filled (high opacity) - hide contents

Large market size

- High % growth in last two years driven by increase in use of home shopping due to pandemic
- The global e-commerce industry used approximately 950 000 tonnes of plastic packaging in 2019 – this was estimated to double by 2025 before the influence of the pandemic was taken into account (source: statista.com)

Options for enhanced sustainability

- **Include recycled PE**
  - Middle layer of coex. structure, hide with colour
- **Impact modification**
  - Elastomer / plastomer addition to boost mechanical properties, allowing higher % use of recycled material
- **Mineral fillers**
  - Replace polymer / white masterbatch by calcium carbonate masterbatch
  - Adds to opacity
  - Reinforcing effect, cost benefits

Options for enhanced sustainability

- **Additive to impart biodegradability**
  - Typically added as a drop-in masterbatch at 2%
- **Compostable polymer**
  - Replace PE fully by an alternative, compostable polymer
- **Performance polymers**
  - Utilise higher performing polymers such as metallocene-catalysed LLDPE to downgauge film thickness and therefore use less polymer overall

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- Recyled suppliers (e.g. chase)
- Vistamaxx / Queo
- Granic
- Polymateria
- Novamont
- Exceed and Enable

Chase Plastics
Excellence in recycled polymers

NOVAMONT

Polymateria™

Granic

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We are here to help!

- Full Technical support from the Plastribution team
- Support from our key partners

We can help you:

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- Select the best material for your application
- Support with part design and tooling
- Support with trials
- Provide information to support you with your customers/marketing

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Any Questions?

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Thank you for your time today!

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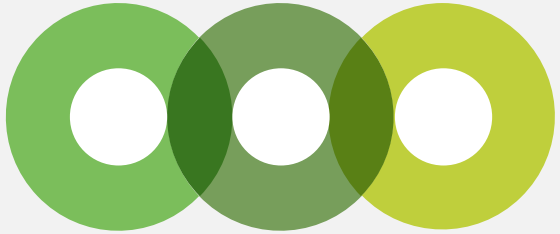

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