

SPIRIT

Sustainable Plastics Industry Transformation

PlastExpo Nordic

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Keep Discovering

Borealis at a glance

Worldwide



Head Office in **Vienna**, Austria.
Operating on **five continents**
in **120 countries**

Market Position



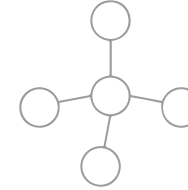
#2 among polyolefin
producers in **Europe**
#8 worldwide

Employees



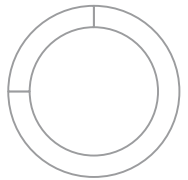
About
6,900 employees

Line of Business



Production and distribution of
polyolefins, base chemicals
and **fertilizers**

Ownership Structure



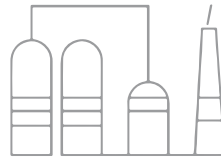
75% OMV, Austria /
25% Mubadala, United Arab
Emirates

Financial figures



Net profit 2020 – **MEUR 589**
Net sales 2020 – **EUR 6.8 billion**

Joint Venture



Borouge – the world's largest
integrated polyolefin complex
in Ruwais, UAE

Circularity



Two **polyolefin recycling**
operations in Europe

Borealis in Porvoo



Plastics are irreplaceable materials of modern society enabling growth

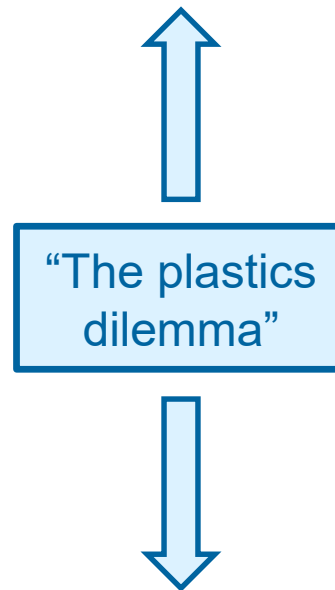
We aim to solve the sustainability challenge of plastics

Plastics are versatile materials and have many superior properties like durability, formability and light-weight. Plastics enable clean water supply, healthcare, safe and effective food-chain, reducing food waste, clean energy and electrification.



The current use of plastics is overshadowed by global challenges like climate change and pollution

- Almost all plastics are based on fossil raw materials
- Plastics recycling rates in a circular material loop are still very low
- Production and end-of-life incineration of plastics creates a lot of CO₂ emissions



SPIRIT programme stands for Sustainable Plastics Industry Transformation

The objective of this SPIRIT programme is to transform the plastics industry into **sustainable “value circle”**, addressing the key challenges together with active partners in a large ecosystem:

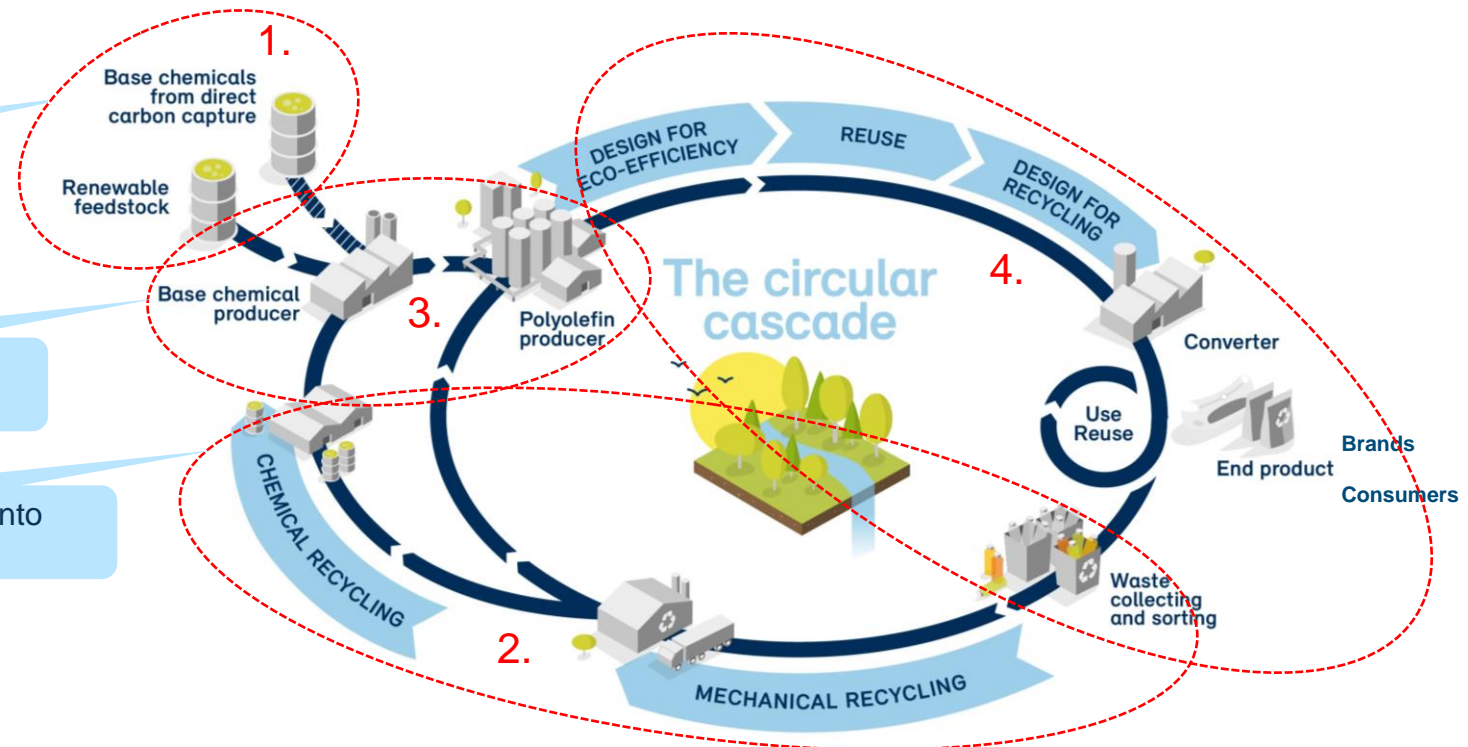
1. Transform the fossil feedstock into renewable and recycled feedstock
2. Establish efficient systems for the large-scale mechanical and chemical recycling of plastics
3. Carbon neutral production with electrification, green hydrogen and renewable energy
4. Enablers for green transition with e.g. design for/from recycling, reuse, recycling concepts, standardisation

Borealis Finland targets:

Replace 33% of fossil virgin feedstock with **renewable or recycled feedstock** by 2030

Turning production processes **carbon neutral** latest by 2045

Transforming plastics industry into **circular economy**



SPiRiT roadmap (available via Business Finland's home page)

Area	1. Renewable feedstock	2. Circular plastics	3. CO ₂ reduction	4. Enablers for green transition
Ambition	Transform plastics feedstock from fossil to renewable/recycled	Quantum leap in plastics recycling – minimise incineration and maximise material to material recycling	Carbon neutral production of plastics	Shaping the market to create pull for circular products
“Topics”	<ul style="list-style-type: none"> • Mapping of various renewable feedstock alternatives, including on-purpose production and CCU (e.g. alcohols, gasification, CO₂ derivatives, etc.) • Opportunity assessment of identified renewable feedstock • Concept and portfolio development for renewable feedstock, including production technologies, pre- and post-treatments, logistics and infra • Testing the processing of renewable / recycled feedstock • Development of analytical methods for new feedstock 	<ul style="list-style-type: none"> • Mapping the raw material potential of plastic waste vs. recycling capacity • Explore plastics recycling value chain and business model; from plastic waste collection to sorting and extrusion • Identification of current bottle necks in mechanical recycling • Concept development for chemical recycling technology including pre- and post-treatment and logistics • Integrated mechanical/chemical recycling approach • Quality of recycled plastics 	<ul style="list-style-type: none"> • Evaluate the effect of renewable / recycled feedstock to furnaces • Evaluate other alternative routes to by-pass furnaces • Develop new furnace concepts like electrification, H₂ firing and efficiency improvements to establish furnace road map • Methane valorisation concepts • Evaluate CO₂ capture (CCS/CCU concept) • Evaluate H₂ and electricity concepts and infra (renewable energy, electricity grid, etc.) 	<ul style="list-style-type: none"> • Develop circular product offering to meet value chain demands: Design for recycling, recycled content and reduced CO₂-footprint • Development of analytical methods for circular products and their raw materials. • Development of environmental product declarations of circular products • Market shaping and ecosystem development for circular products, including new business models like reuse and recycling concept developments • Advocacy in standardisation and regulatory areas – topics like mass balance, recyclability, recycled content, ecolabels, etc.
Cross-cutting topics: new business models, digitalisation solutions, emerging technologies, piloting, analytical methods				

Challenge competition for leading companies (“Veturi”)


- **Business Finland** (BF) organises a challenge competition for leading companies to solve major future challenges, increase RDI investments, create new jobs and build new high-value business ecosystems

**BUSINESS
FINLAND**



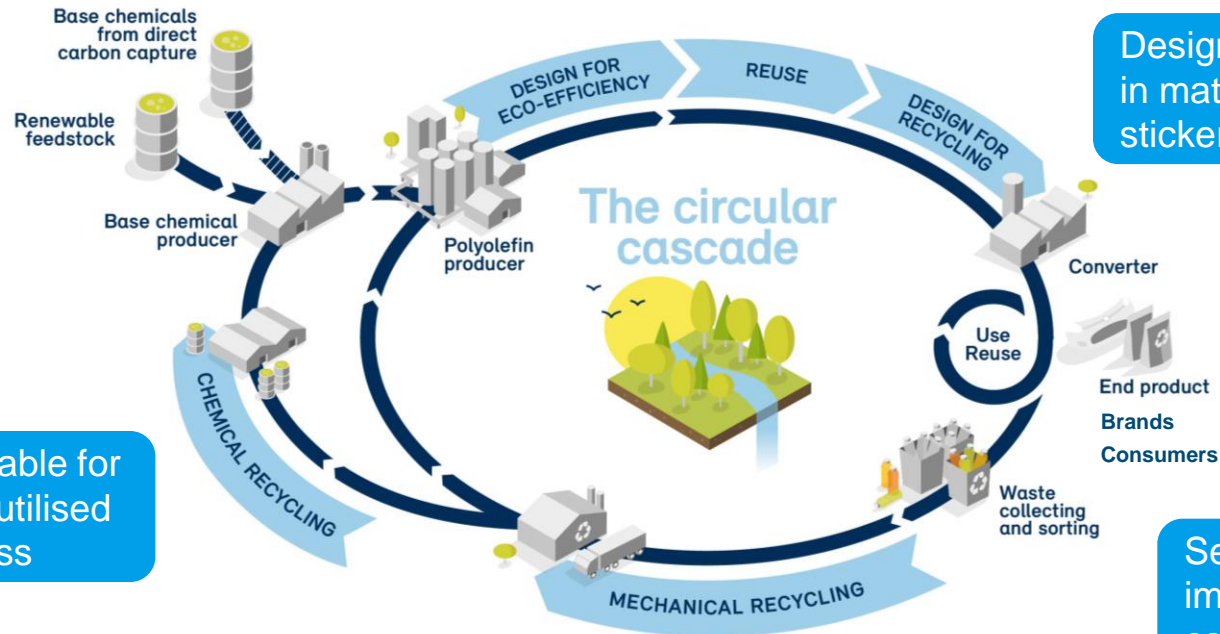
- Borealis selected as “Veturi” company with its SPIRIT programme:
 - Borealis commits to increase its **R&D efforts by EUR 50 million**, and can then achieve **funding of EUR 20 million** (40% of the total costs)
 - **Four years RDI programme 2022-2025** (ca. TRL ≤ 6)

- In addition, BF reserves further partnership funding resources
 - Parallel partnership projects fitting the **SPIRIT roadmap can separately apply additional funding, up to max EUR 50 million** for the entire ecosystem!
 - Three calls annually (next cut-off date 30.9.2022)

		Ambition	Objective
WP1	Renewable feedstock	Transform from fossil to 100% renewable / recycled feedstock	<ul style="list-style-type: none"> • Concept and portfolio development for different renewable feedstock • Testing the processing for cracker and polyolefins production
WP2	Circular plastics	Quantum leap in Finnish plastic recycling rate – recycled replacing virgin	<ul style="list-style-type: none"> • Explore domestic recycling capacity • Approach for integrated mech/chem recycling • Min. incineration, max material-to-material recycling
WP3	CO ₂ reduction	Roadmap for carbon neutral production	<ul style="list-style-type: none"> • Proofing of the roadmap for cracker furnace • Evaluation of electric furnace • Piloting of H₂ as fuel • Increase renewable energy use
WP4	Enablers for green transition	Shaping the market to create pull for recycling	Develop circular product offering to meet customer and value chain demands – products that are recyclable, with recycled content and renewable based
WP5	Ecosystem leadership	Establish a winning ecosystem	Lead and steer the ecosystem towards the common set goals

Plastic is a valuable material, it needs to be recycled

Efficient circularity of plastics keeps the carbon in a closed loop



Design for recycling makes a major difference in material recyclability (multimaterials, labels/stickers, colours → monomaterial solutions)

Mind-set for reuse and recycling

Separate collection of plastic packaging improves the waste plastic quality (recycling concepts for material-to-material recycling)

Polyolefins which are not suitable for mechanical recycling can be utilised in a chemical recycling process

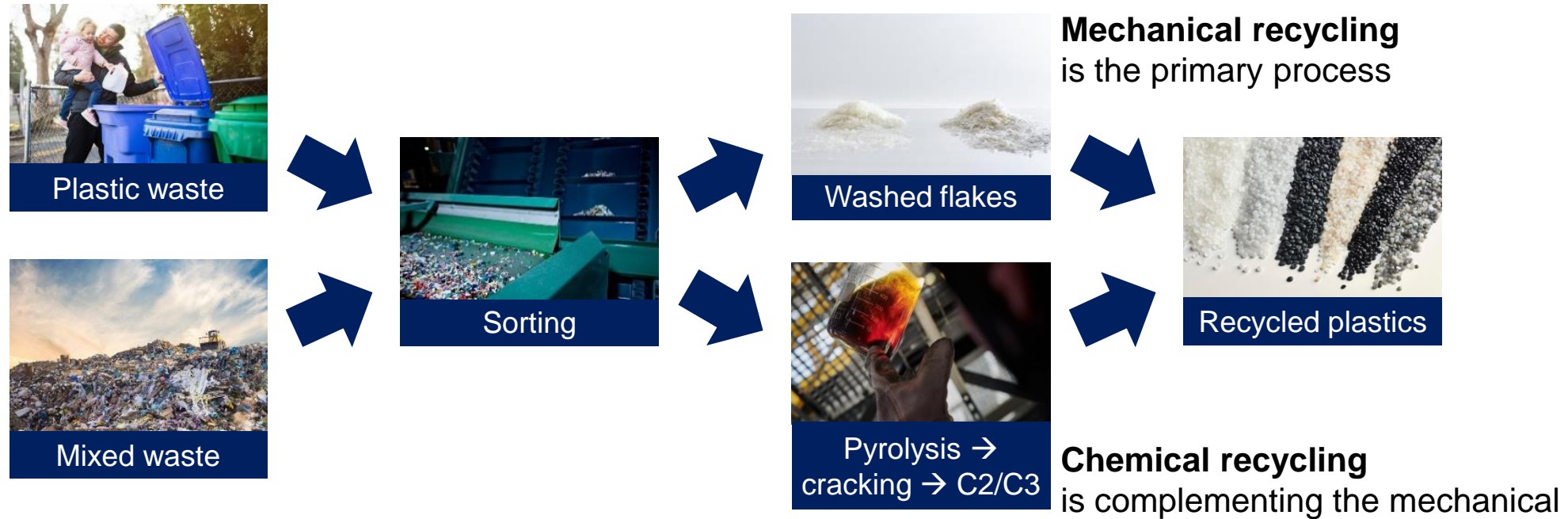
Mechanical recycling of plastics includes sorting, washing and re-melting of plastics

Preference: 1. Reuse, 2. Mechanical recycling, 3. Chemical recycling, 4. CCU

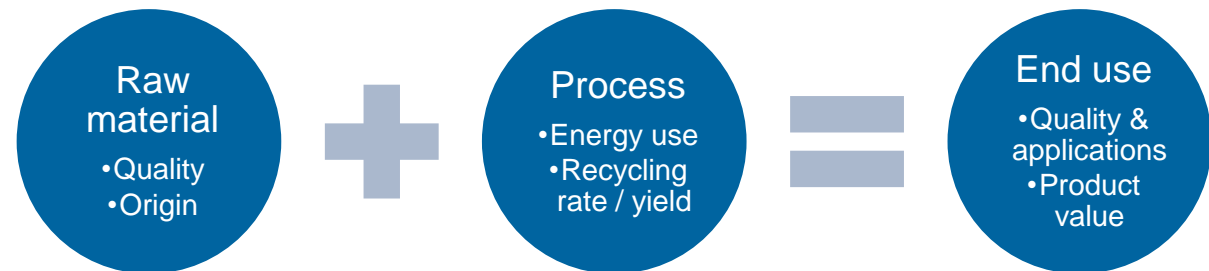
Standardisation and regulation (mass balance, recyclability, recycled content, approvals e.g. for chemical recycling and applications)

SPiRiT WP2 focuses on solving the plastic waste challenge

Mechanical and chemical recycling of plastics are complementary to each other

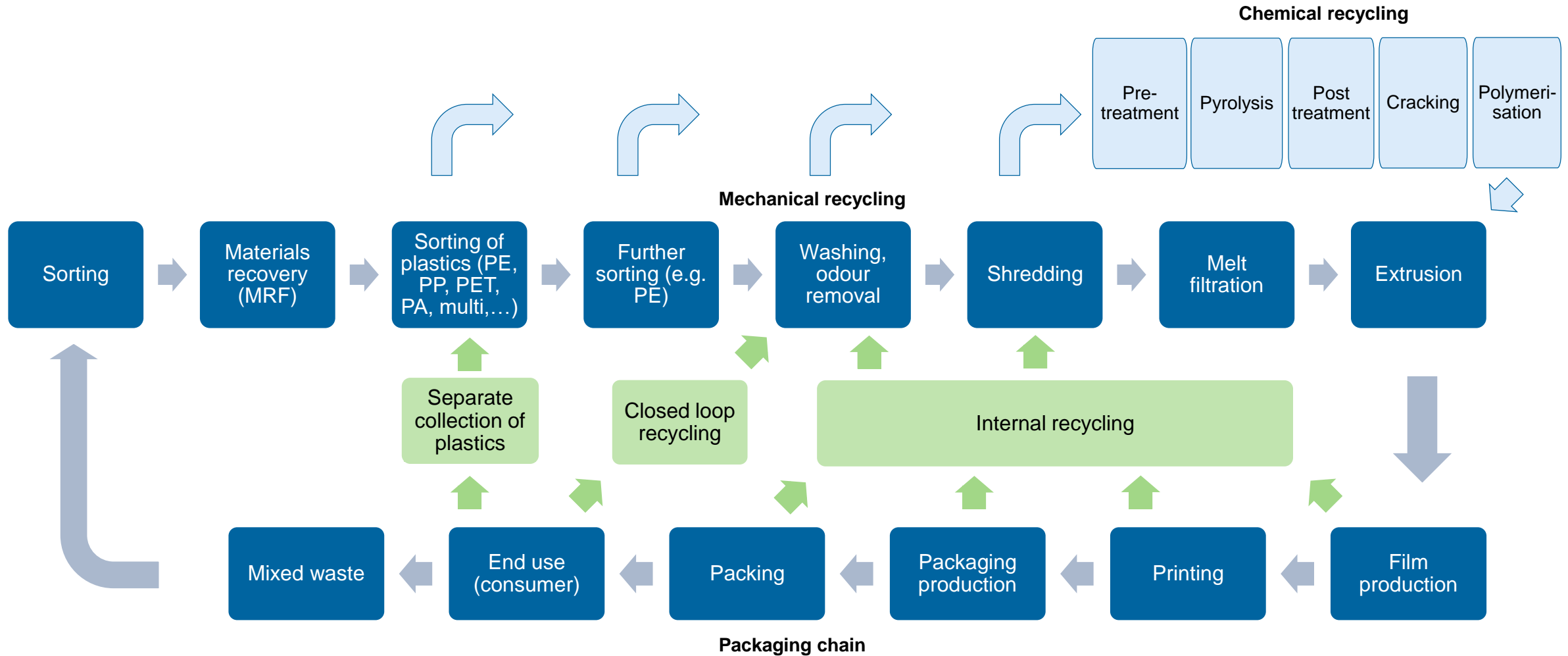


Target is to sort the raw material into optimal process in order to reach targeted end product and to **replace virgin material**.



Minimise the waste in material recycling

Short-cuts allow lighter process and better quality



Design for recycling is an extremely important enabler

Examples of good packaging design

Use whenever possible a mono-material (PE, PP or PET) to form the flexible or rigid packaging body

Use transparent, clear or white, for the main body of the pack

Design the package in such a way that it can be fully emptied

Ensure that when paper is designed in combination with plastics on a single pack, it must be separable (and separated by the end user in order to access the contents)

Packaging must contain a recycling symbol and a sorting instruction



Be sure to . . .	Doing so is important because...
1. Use PE or PP whenever possible to form a mono-material flexible or rigid packaging body.	Mono-materials are more easily recyclable than multi-layer, multi-material packaging. Generally speaking, the most efficient and widespread collection, sorting and recycling systems are currently in place for mono-material PE, PP and PET. While collection and sorting systems for other plastics do exist in certain regions, they are not yet available on an industrial scale.
2. Use transparent, clear or white, for the main body of the pack.	With existing technologies, it is difficult, costly and sometimes impossible for recyclers to remove pigments from the pack body. White pigment body of packaging ONLY if barrier to light is required.
3. Design the package in such a way that it can be fully emptied after use.	If the content of the pack cannot be fully emptied, the residue complicates the recycling process. It is more expensive and produces an inferior recycle (recycled plastic) because the odour, colour or mechanical properties contaminate the final result, and the environmental (LCA) impact of the product is inferior.
4. Use compatible and separable combinations of polymer types, barrier layers, dyes and adhesives.	Minimising incompatibilities produces a recycle with better properties and therefore more suitable for a second life in consumer goods packaging. We recognise that in certain cases there are markets where incompatible resins are necessary to match an application's requirements. For these types of packaging it is necessary to design the packaging so that it can easily be separated from the PE and PP recycling streams during the washing process (owing to the difference in densities).
5. Use aluminium foil as a barrier layer only when it can be easily separated from the pack for aluminium recycling.	Aluminium foil as an inseparable barrier layer is problematic in the recycling process. If required every effort should be made to ensure that aluminium foil can be separated from the main pack body (or fragments thereof containing aluminium particles) for aluminium recycling by means of eddy-current separation.
6. Follow specific density guidelines when selecting pack components, including labels, sleeves and metallisation.	In the recycling process polyolefins are sorted by density in a water-based float sink system. This cleanly separates waste streams according to polymer types, such as PE, PP or PET. However, if barrier layers, foaming agents or fillers are used, they change the density of the polymers and this may lead to incorrect and separable by density.
7. Design labels, sleeves and other on-pack printing in such a way that they can be easily separated from the main pack body. For both PE and PP packs, use the same polymer and same colour for the entire pack – body, caps, closures and labels.	Labels, sleeves and other on-pack components complicate the recycling process and contaminate the recycled product. Ideally they should be completely removable. On-pack pigments and colours applied through direct, reverse or trap printing can only be removed in the recycling process through a short friction washing cycle using hot water at temperatures of up to 50° C. If that is not sufficient to remove the label from pack body such as for in-mould labels use washable inks. It is preferable to print only the most essential information to fulfil legal requirements (sell-by date, batch number, etc.) directly on the main body pack. Consistency in components helps the optical scanner sort the packs correctly for recycling.
8. Use as little surface space as possible for printing or labelling on the pack.	As a rule, the less space taken up by a label or printing inks, the more likely the pack is to be recognised during sorting and results in higher quality recycles.
9. Use light-coloured, non-gassing inks for essential on-pack information.	Inks that cannot be removed and thermally neutralised during recycling disrupt the process. It is therefore very important to use light-coloured, non-gassing inks that are temperature resistant up to 240° C.
10. Ensure that when paper is designed in combination with plastics on a single pack, it must be separable and separated from the main plastic body by the end user in order to access the contents.	Paper fibres cannot be effectively removed in the recycling process as it clings to polymer flakes and degrades under heat, setting off gasses, and otherwise causing discolouration and odours. It is essential that the end user can separate the paper from the main plastic body of the pack.

For further information and additional technical guidance on designing Polyolefin packaging for recyclability, contact sustainability@borealisgroup.com or www.borealiseverminds.com

More info: [Borealis EverMinds™ - 10 codes of conduct](#)
[10 Codes of Conduct for Design for Recyclability | Must watch for all packaging designers – YouTube](#)

Please be in contact with us – and join the SPIRIT!

WP1	Renewable feedstock	Transform from fossil to 100% renewable / recycled feedstock	Antti Ilves antti.ilves@borealisgroup.com Tel. +358 50 379 0284
WP2	Circular plastics	Quantum leap in Finnish plastic recycling rate – recycled replacing virgin	Jaakko Tuomainen jaakko.tuomainen@borealisgroup.com Tel. +358 50 379 4525
WP3	CO ₂ reduction	Roadmap for carbon neutral production	Mikko Rönkä mikko.ronka@borealisgroup.com Tel. +358 50 379 4266
WP4	Enablers for green transition	Shaping the market to create pull for recycling	Auli Nummila-Pakarinen auli.nummila-pakarinen@borealisgroup.com Tel. +358 50 379 4588
WP5	Ecosystem & program leadership	Establish a winning ecosystem	Jari Lehtinen jari.lehtinen@borealisgroup.com Tel. +358 50 379 4270

- We are currently in the stage of contacting the ecosystem partners, and structuring the first projects
- The SPIRIT ecosystem launch event will take place on June 7, more info available at our stand 6s49

Thank you

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