Mapping the value chain for flexible plastic packaging in the UK

Produced on behalf of the Flexible Packaging Consortium

Nestlé MARS TAYLORS OF HARROGATE Ella's kitchen suez

Contents

About this report

This report presents a summary of the detailed work undertaken by SUEZ recycling and recovery UK (SUEZ) on behalf of a consortium of producers.

The work aimed to better understand how their flexible plastic packaging is currently managed in the UK waste management system and how it could be managed under an amended extended producer responsibility (EPR) system, proposed to be introduced in the UK from 2023.

Although not originally intended to be made public, this summary report of the work was commissioned to help inform the full value chain as it gathered to discuss how collections and a new extended producer responsibility system might need to consider and accommodate the consortium's forms of packaging.

This summary report presents the headline outcomes of over 18 months of detailed work.

Executive summary

The value chain working together to understand issues and seek their resolution has been a goal in the waste and resources sector for many years. This report presents a summary of a series of works that are an exemplar of the value chain working together.

With the proposed changes to the extended producer responsibility system in the UK, the brands involved in this work wanted to explore the opportunity for their flexible plastic packaging to be collected and recycled in the UK, as it is in a number of countries in Europe. To do this, we had to determine the following;

- The weight and number of flexible plastic packaging items placed on the market each year.
- The types and likely usage patterns of flexible plastic packaging by household and business consumers.
- The likely styles and costs for the collection of flexible plastic packaging from households and businesses.
- The style of sorting required to match the methods of collection and their cost.
- The current mechanical recycling technologies used in Europe and applicable to the UK.
- The emerging solutions for chemical recycling of the flexible plastic packaging and their likely integration with current mechanical means.

The sum of these works clearly identified that **if collected, flexible plastic packaging could be sorted and recycled** and that emerging chemical recycling technologies show great promise to deliver higher levels of closed loop recycling. **For many of the options for collection and treatment, costs were equal to or less expensive than placement to landfill or energy-from-waste**.

Further, with the planned introduction of a deposit return system in parallel to the other new regulatory systems, certain streams of packaging will be removed from the current kerbside collection systems. This creates an opportunity to add flexible plastic packaging and other forms of recyclable materials into the free space created. To take full advantage of this change, **flexible plastic packaging should be included in the core set of items to be collected for recycling from the anticipated 2023 implementation date**.

Producers of packaging, who are paying under the current extended producer responsibility system and who are expected to fund the near full cost of recovering their packaging in the planned new system, can rightly expect to be able to fund the collection of their packaging for recycling and **a clear signal in the proposed regulations that these materials will be collected at kerbside would start to engage the necessary investment to deliver on the regulatory intent**.

The detailed works which are summarised in this report clearly identify that **collecting flexible plastic packaging at the kerbside is both practicable and affordable**, and that linking the timing of such an introduction to the implementation of a deposit return scheme would bring very obvious advantage in making use of the space created.

Introduction

SUEZ was approached by a number of producers who asked similar questions with regard to the current and future systems of waste management:

In this report, these producers will be collectively referred to as the **Flexible Packaging Consortium (FPC)**.

Together, they appointed SUEZ to undertake the following work:

1. Explain how the current waste management system in the UK functions.
2. Define the range and scope of materials placed on the market using publicly available data, information from the members themselves and residual waste compositional data available from public sources and SUEZ's own testing.
3. Determine how flexible plastic packaging is currently collected in the UK and how it might be collected in the future using UK data and experience and information obtained from the European market where flexible plastic packaging is already collected in a number of countries.
4. Identify sorting and treatment systems currently available, as well as those that are emerging, and establish compatibility with pack designs and collection methodology.
5. Based on item four above, determine collection methods, technical opportunities and constraints, and cost those viable options.
6. Define likely costs for the collection and sorting of flexible plastic packaging to help inform the Flexible Packaging Consortium of their potential extended producer responsibility costs under a full net cost recovery (FnCR) system.

Defining flexible packaging

Flexible plastic packaging is defined as a packaging structure which flexes easily, and which can be made of both single and multiple layers of materials, such as plastic film and aluminium foil. The materials used are chosen for their design properties to ensure that the contents of the packaging are fit for purpose when opened and utilised. For instance, aluminium has barrier properties that can help preserve the moisture content of foods, and polyethylene (PE) has high sealing properties.

These differences in composition need to be carefully considered when designing a future system for the collection, sorting and recycling of flexible plastic packaging.

This careful consideration will inform understanding of how the system(s) will handle the variety of flexible packaging and how the end product will be used in order to achieve the target of 'collected for recycling' and 'recycled'.

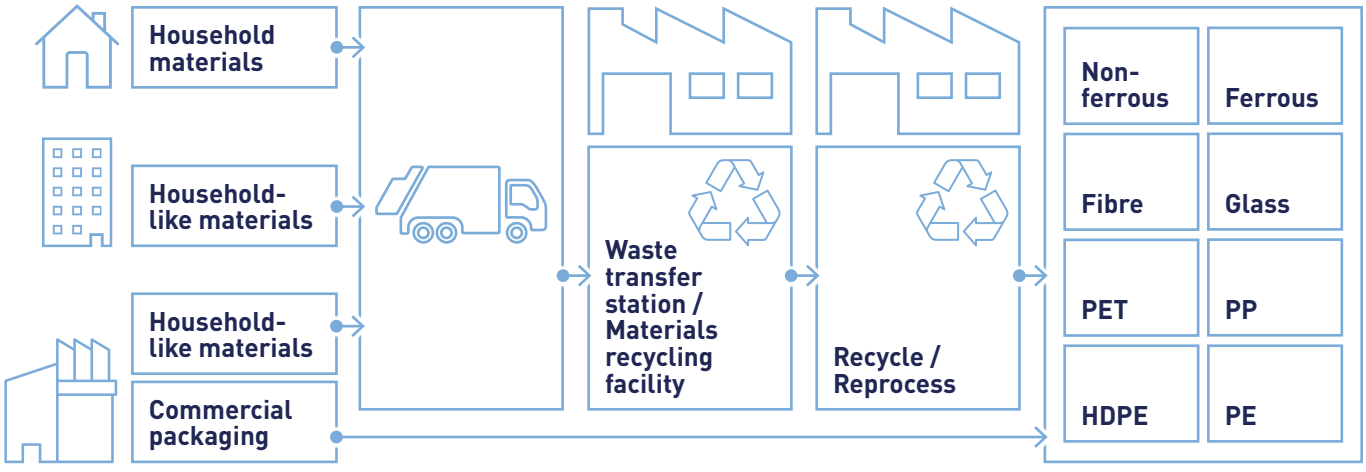
Flexible plastic packaging is often used to reduce the weight of the packaging itself and, in many instances, the energy used in its production. In turn, it reduces the burdens of transporting the packaging in the supply chain and can provide additional health and safety benefits, especially when products are used on the go. Finally, it provides consumers with convenience in terms of portion control and robust but light packaging for use on the go.

Producer responsibility

Packaging in the UK is currently part of an extended producer responsibility scheme which is expected to be replaced under proposals set out through the Environment Bill and the Department for Environment, Food and Rural Affairs' (Defra) Resources and Waste Strategy. The current system has helped increase the recycling rate for packaging. However, it only covers part of the cost of collection, sorting and recycling with the remaining costs borne by taxpayers, businesses and their customers.

The government is proposing a new extended producer responsibility system which will change the way the system is financed and deliver a system that funds nearly 100% of the costs of collecting, sorting and recycling all packaging. A diagram of the material flows and the waste management component of the value chain is shown in figure one. Household (HH) materials are those collected from homes, household-like (HHL) materials are those similar in nature to those that arise in households but are collected from businesses, such as a drinks can or a bottle of milk. Commercial packaging comprises materials not commonly found in households and often used for the transport or presentation of bulked goods.

Figure one:
Material flows and the waste management component of the value chain



Many producers have already adopted or are developing design for recycling guidelines that are being consolidated through several industry organisations, including CEFLEX[1]. These measures are designed to align with expected proposals in the new extended producer responsibility system for modulated payments that will favour packaging formats that are more circular in their design and are more recyclable. Many producers, including the Flexible Packaging Consortium members, take their design responsibilities seriously and fully understand the role of design in reducing waste.

Currently, only 10-17% of local authorities in the UK collect some form of film or flexible plastic packaging, and many of those collections target only limited types of packaging and not the full set placed on the market. The data available is limited, but very little flexible plastic packaging is collected at the kerbside from businesses in the UK. The vast majority of flexible plastic packaging from both households and businesses currently ends up in the residual waste stream and is sent for energy recovery or to landfill.

In the absence of kerbside collections for flexible packaging, many producers, including members of the Flexible Packaging Consortium, have promoted alternative packaging return schemes for their customers. Participation in these programmes has shown that many of their customers want to recycle this packaging and are willing to return it to supermarkets or use other schemes to enable it to be recycled. The materials collected through these different schemes were recycled and have proven, albeit on a relatively small scale, the potential for this packaging.

With the proposed new extended producer responsibility system, the Flexible Packaging Consortium are keen that their packaging is collected directly from homes and businesses to be sorted and recycled into new products. The biggest opportunity to create a more circular system for flexible packaging is to collect it from householders and businesses through their existing collection services. Under the full net cost recovery extended producer responsibility proposals, producers are likely to be responsible for the costs of recycling their materials in addition to the residual cost of packaging that cannot be recycled when it arises from household sources. The purpose of the work summarised in this report reflects the Flexible Packaging Consortium's intent to ensure that their packaging is collected for recycling and actually recycled.

Together with the new extended producer responsibility system, the inclusion of flexible packaging in kerbside recycling collections will help drive the necessary investment in the sorting and recycling infrastructure. If this packaging is not collected at kerbside, then little, if any, new infrastructure will be developed, as feedstock to fill them would not be available.

1 https://ceflex.eu

Placed on market

knowing how much needs to be managed

The term placed on market (POM) describes the number of packs or the tonnes of a particular packaging format that are supplied on to the market for the first time.

In this report, the term specifically refers to the UK market. The calculation of these figures is often uncertain, as some products are sold direct while others are moved between countries through wholesale, internet or other routes that are less easily tracked. However, it is important to have a good estimate of how many items are placed on market, as it sets the scale of materials that need to be collected, sorted and recycled.

The placed on market assessment for this work was undertaken in two ways – a top-down assessment based on publicly available data and a bottom-up approach using waste composition analysis to estimate the volume of materials placed on market. The top-down and bottom-up assessments both generated figures in tonnes of material. However, we worked with representatives of the producers in the Flexible Packaging Consortium to assess their product ranges together with publicly available information to estimate the actual number of packs placed on the market.

From these calculations, we were able to determine how many tonnes of flexible packaging were likely to arise from both household and business streams. This allowed us to determine the likely weight per household or employee that could potentially be collected and, from the pack information we had accumulated, to calculate the number of packs per household and employee respectively. Knowing the weight of packaging per household or employee is essential when designing and costing collection services.

The following table in figure two sets out the data sources used in the assessment on a top-down basis and bottom-up outcomes (based on over 60 samples of residual waste).

Not all data sources had a breakdown for every family, so some figures in the table have been interpolated using data from a combination of sources.

Figure two: Data sources used in the assessment

Family		Source	Tonnes (,000)	Pack numbers (billions)
Polyolefins (PO)	PE mono	Estimate WRAP / REFLEX	176	43
		WRAP / Valpak	229	56
		CEFLEX (UK estimate)	563	137
	of which carrier bags	Estimate WRAP / REFLEX	121.5	pre-carrier bag charge
		WRAP / Valpak	26	n/a
		CEFLEX (UK estimate)	n/a	n/a
	PP mono	Estimate WRAP / REFLEX	72	17
		WRAP / Valpak	79	19
		CEFLEX (UK estimate)	227	54
	PE/PP	Estimate WRAP / REFLEX	18	4
		WRAP / Valpak	n/a	n/a
		CEFLEX (UK estimate)	n/a	n/a
Metallised		Estimate WRAP / REFLEX	86	20
		WRAP / Valpak	31	7
Aluminium		Estimate WRAP / REFLEX	32	7
		WRAP / Valpak	139	33
		Enval	160	38
		CEFLEX (UK estimate)	99	24
Others		Estimate WRAP / REFLEX	68	16
		WRAP / Valpak	56	13
		CEFLEX (UK estimate)	99	24
UK total		Estimate WRAP / REFLEX	450	100
		WRAP / Valpak	534	130
		RECOUP (2018)	1,141	270
		SUEZ research	895	215
		CEFLEX (UK estimate)	987	240
		UK average	808	195
EU total		CEFLEX	7,600	1,800

A simple summary of the conclusions of the POM work is presented in figure three, showing not only the total tonnes but the split of materials used in production. The estimated tonnes for each family of flexibles is based on the average split for each family (from data in figure two), applied to the SUEZ bottom-up total of 895,000 tonnes per annum.

Figure three: Placed on market for flexible plastic packaging

UK total – 895,000 tonnes, 215 billion packs

Type	PE mono	PP mono	PE/PP mix	Metallised layer with plastic	Aluminium layer with plastic	All other forms of flexible plastic packaging
Tonnes	~430,000	180,000	~15,000	~60,000	~120,000	90,000
Number of packs	~105 billion	~42 billion	~4 billion	13 billion	31 billion	20 billion
Share of materials	48%	20%	2%	7%	13%	10%

Design elements

understanding and being able to communicate the design

One of the advantages and complications of flexible packaging is the ability to design and manufacture types of packaging to meet very specific design requirements.

One of the main purposes of layering different materials in flexible packaging is to preserve the contents from degrading due to contamination, oxidation, changes in temperature and humidity, or other causes. The resilience and adaptability of these packaging types are therefore key to avoiding food waste and maintaining high standards of hygiene and food safety.

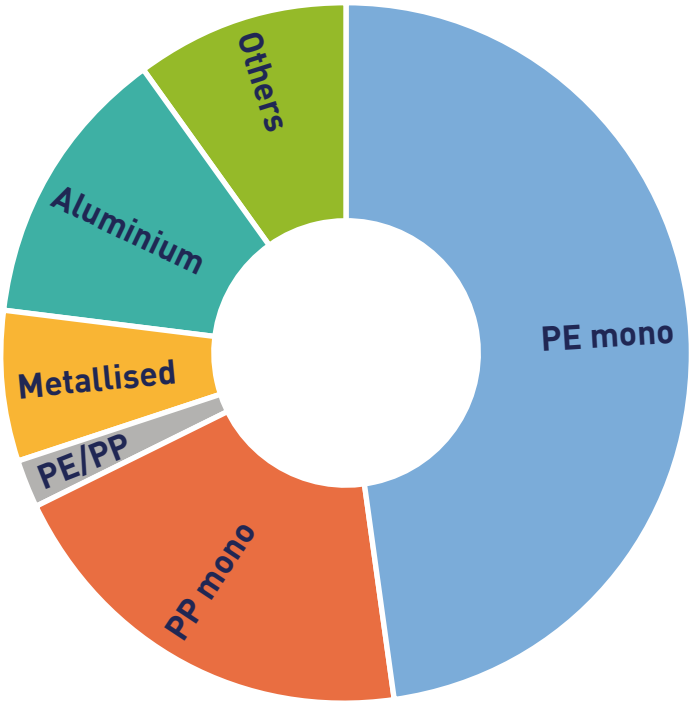
This variation in design provides a wealth of options for the preservation and protection of the products in the packaging, leading to a large range of packs and making it seem difficult to understand what to do with them after use. To simplify this, we worked to condense the multiple designs into a series of design 'families'. These are:

1. **PE mono** – packaging made almost wholly from polyethylene only
2. **PP mono** – packaging made almost wholly from polypropylene only
3. **PE/PP mix** – packaging made from a mix of polyethylene and polypropylene only
4. **Metallised** – a plastic pack with a very thin layer of aluminium attached
5. **Aluminium** – a plastic pack with a layer of aluminium included
6. **Other packaging formats** that do not conform to the above

In figures two and three, we have shown the number of packs and tonnes of those packs placed on the market for each family. Sorting and treatment of the flexible packaging is expected to be organised around these family types. However, if in the future other pack designs become prevalent, then additional family groups may need to be established.

In figure four, we show the split of each family.

Figure four: Split of flexibles placed on market per family



Collection

Recovering packaging from consumers, employees and businesses

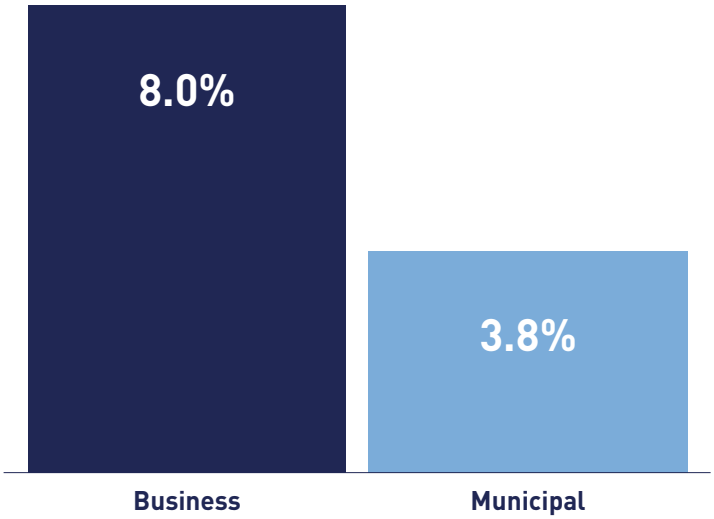
When the products inside packaging are used, the packs themselves are placed into bins at home, at work or on the go. When packs are consumed at home, the householder has a number of constrained choices. If they live in a local authority area that collects flexible packaging, then they can place their materials in the designated container. Where a householder lives in a local authority area that does not collect flexible packaging (the majority at the time of this report), then they can use one of the voluntary schemes available or place the materials in their residual bin.

Even where a service is provided, not all consumers will place all the materials they dispose of in the correct containers. We have taken our experience with other dry recycling streams and European business experience with the collection of flexible packaging to estimate that, where collection for flexible packaging is provided, capture rates (the percentage actually captured compared to 100% of the packaging consumed) of 56% would be expected in the early stages of deployment, and work to improve this would be necessary. The same is true for many other forms of packaging which have lower capture rates in the UK than we see in flexible packaging in other parts of Europe.

For employees and businesses, it is currently uncommon for flexible packaging to be collected alongside other packaging and recyclable materials and thus most of the flexible packaging used at work will be placed into the residual waste containers. Some businesses give employees access to voluntary schemes of collection, but this is limited.

The split of materials by household and business is shown in figure five. Each percentage is calculated as a percentage of the weight of the residual waste sampled.

Figure five:
Split of flexibles in scope in residual waste stream by origin



When considering the collection of any recyclable materials, it is important to understand the technologies and solutions that exist to sort and recycle them once collected. Before we considered how we might collect these packaging formats, we undertook an exercise to understand what technologies currently exist and are employed in other countries to sort flexible packaging, and how flexible packaging is collected in those countries. This established several constraints that needed to be applied when designing a collection system:

- Flexible packaging will often present as two-dimensional in sorting plants, the same as fibre (paper and card, for instance), so it should not be collected with fibre-based products where there is a risk they may become mixed together.
- Some flexible packaging contains liquid or wet products (wet flexibles) that could contaminate fibre-based recycling if placed into the waste containers with product residues remaining in the packaging. Fibre-based materials are similarly vulnerable to contamination from other packaging types that may have food or wet product residues, like cartons, so it may be necessary to isolate fibre products from wet flexibles and other materials in order to protect their quality. The split of wet and dry packaging by format is shown in figure six.
- By its design, flexible packaging often presents as small in scale and light in weight and as such some of the materials collected might be lost in sorting centres that sort by size or operate conveyor belts at speed. Although reconfiguration of sorting centres would be necessary, it would be simpler for consumers for all flexible packaging to be collected together. It should be noted that many sorting centres will already need to be reconfigured to accommodate the new core materials likely to be included under consistent collections and to account for the loss of materials to the proposed deposit return scheme (DRS).

Figure six: Split of wet and dry packaging by format

The Scottish government has already legislated for the introduction of a deposit return scheme (DRS), whilst England, Wales and Northern Ireland are working towards the introduction of a deposit return scheme for plastic PET bottles, aluminium cans and glass beverage containers. These materials are currently collected at kerbside, so when the planned deposit return scheme system commences, it will move materials away from kerbside and create space on collection vehicles, ultimately changing the composition of the materials delivered to sorting centres.

Collection from households

Household collections are organised by local authorities, and either undertaken directly by themselves or through contracts with private companies. In all instances, the system delivered at the kerbside is designed by the local authorities, and requires containers and collection vehicles aligned to the style of collection. There are over 30 materially different variations of collection systems currently practised in the UK, but for the purposes of this report we distilled them to the following three main groups:

1. Source separated collections

The householder separates the target local authority recycling streams before collection – in many instances into single streams, such as plastics or paper, but occasionally into simple combined streams like metals and glass.

2. Multi-mingled stream collections

The householder separates the recycling streams into a number of combined streams – for instance, fibre-based products in one, glass in another and the remaining materials combined together.

3. Fully mingled collections

In this type of collection, the householder is required to place all the local authority recycling streams into one container for collection.

In modelling some of the collection scenarios, we used the Resources and Waste Policy Impact Calculator model[1] to provide a basis of the impact of a deposit return scheme on the materials being collected at kerbside and a foundation of cost. The model was designed by SUEZ and Anthesis with the input and assistance of LARAC[2], the KENT waste partnership[3] and Project Integra[4].

We then considered options of how 'wet flexibles' might impact and/or be collected to minimise potential impacts on other recyclable materials.

Once we had defined the impacts of a deposit return scheme and the parameters for recycling, we modelled different collection contracts where we had available operational information, providing a basis of technical and operational fact for each of the three collection types previously detailed.

Taking the placed on market figures discussed earlier, we were able to estimate how many packs, by number and weight, were likely to arise.

Figure seven: Flexibles per household per week

	Number of packs	Weight
Average	70	292g
Dry flexibles	50	210g
Wet flexibles	20	82g
Capture rate of 56%	39	164g
Dry flexibles	28	118g
Wet flexibles	11	46g

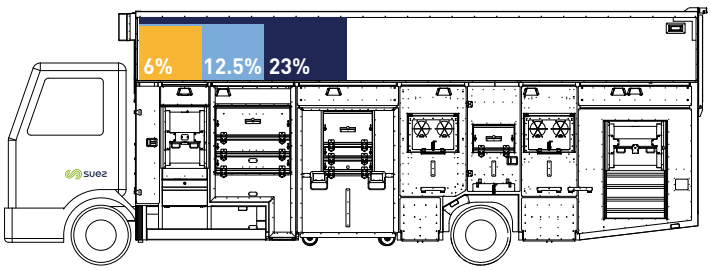
These figures are for packaging only and any contamination within these materials when placed in the containers would increase the weight of materials collected.

1 https://policyimpactcalculator.suez.co.uk
2 https://larac.org.uk/
3 https://www.kent.gov.uk/about-the-council/partnerships/kent-resource-partnership
4 https://www.hants.gov.uk/wasteandrecycling/projectintegra

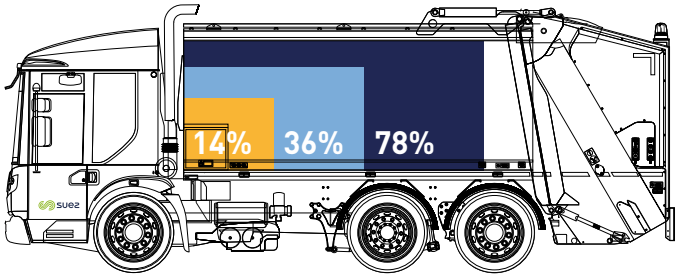
We assessed actual collection vehicle configurations, taking space calculations and density of materials into account. In each instance, we used data from vehicles currently or previously operated by SUEZ and commonly used by other collection services. Examples of space calculations – based on volume, not weight – are shown here in figure eight using data from a full year of collections in 2018 for a 12 tonne 5 metre Romaquip and 26 tonne split back (70:30) RCV.

Figure eight: Collection vehicle space calculations

Romaquip



Split back RCV



Space needed for flexibles **Average fill post deposit return scheme** **Average fill current services**

To calculate the space, we took normal waste compositional data and removed the deposit return scheme target materials of plastic PET bottles and aluminium cans, in percentages equal to those proposed in the last consultation – 70% in year one and 80% in year two. Defra has recently suggested that 85% of deposit return scheme materials would be collected in year three, but this has not been modelled here. We considered the volume and weight of the deposit return scheme materials moving away from kerbside collection, the volume and weight of the flexible packaging likely to be collected per household, and whether some vehicles apply compaction to all or some of the materials collected. For source segregated collections, we modelled the space in a typical plastics compartment only. For a mingled collection, we modelled the whole vehicle capacity. If glass beverage containers are included in the deposit return scheme, then the weight and space impacts in the mingled department would be larger than calculated here.

We used data from SUEZ and publicly available bulk density data to estimate the impacts of weight and volume within the vehicle compartments. We then identified the base composition of existing streams of recycled materials using SUEZ data and publicly available information, using contract specific information when modelling individual contracts.

Costs per unit weight of plastic packaging collected are shown here in figure nine.

Figure nine: Costs per unit weight of plastic packaging collected

	Average cost per kg
All services	£0.12
Kerbside sort	£0.14
Co-mingled	£0.10

Collection from businesses

Dry recycling collections from the approximately 5.8 million businesses in the UK are organised by a combination of private companies and local authorities through their trade waste services. Unlike household collections where every house is serviced, the collection rounds are not controlled by the total number of businesses in a geographic area, but by the number of customers an individual collection company has within that area. Due to this difference, the approach to calculating cost in the business collections was very different to the approach for municipal collections from households.

For the main collection model, we used the figures shown here in figure 10 to estimate the collection volumes likely to arise.

Figure ten: Flexibles per employee per week

	Number of packs	Weight
Average	76	360g
Dry flexibles	55	259g
Wet flexibles	21	101g
Capture rate of 56%	43	202g
Dry flexibles	31	145g
Wet flexibles	12	57g

For an average UK business, the captured rate equates to around 1kg per week.

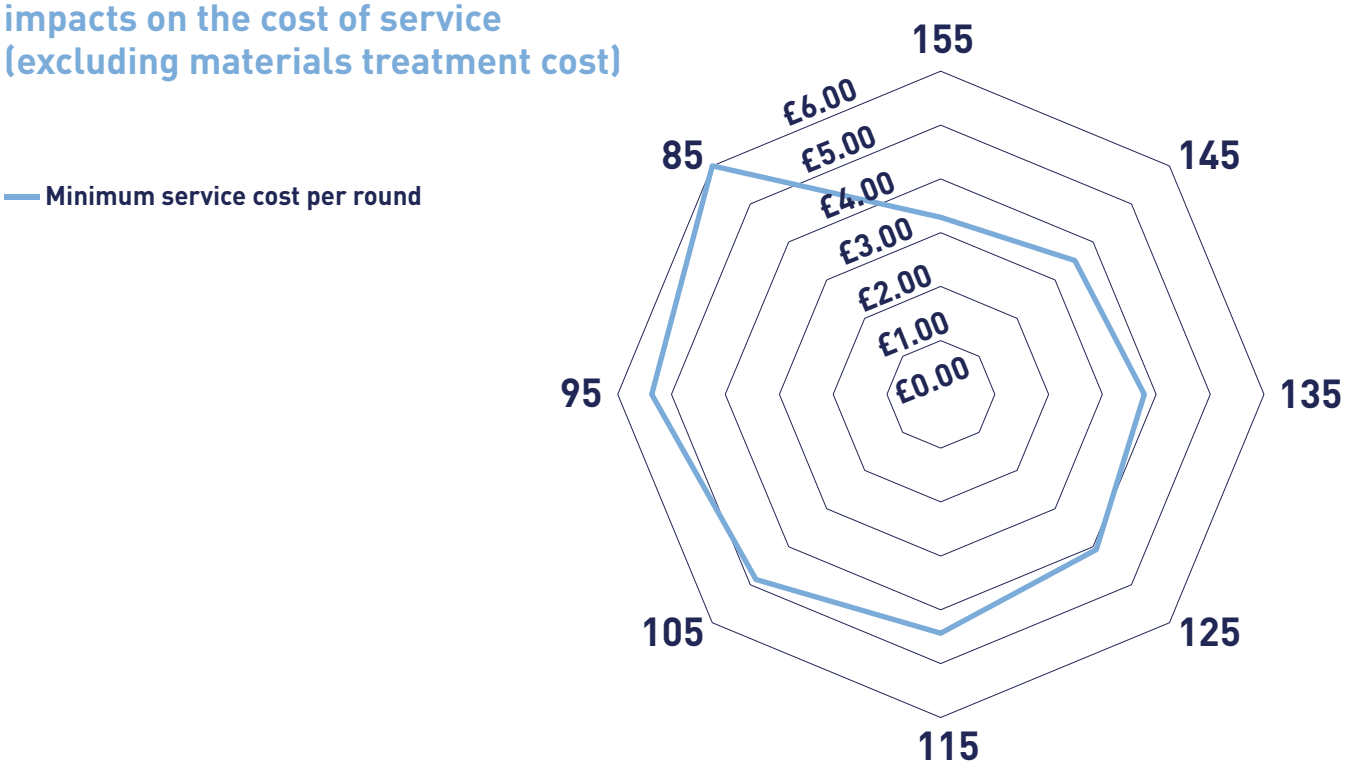
We then established a cost of service for a collection truck (vehicle, crew, fuel etc) using our own cost base from our business collection services. For the purposes of this project, we used an average of costs for the country, but costs will vary with wage levels (London weighting, for example) and type of collection in different regions.

At present, the vast majority of business collections are fully mingled, so we have based our modelling on this type of service. In the future, we expect that the base service will move towards a split body with fibre collected separately from the other dry recycling materials. However, we believe the volume and cost calculations are relevant for both types of collection if planned correctly.

Collections from businesses are organised in a fundamentally different way than municipal collection. In the municipal context, route density is set by the number of households along a route and the vehicle will collect from 100% of all homes on the route. With business collections, the collection companies will have a set of customers that they collect from within a particular geographic area and the route density is then determined by the number of customers they are able to reach on each individual round. This can have a material impact on the cost per customer and on the cost per kg of any item collected, so for the purposes of the calculation we assumed a minimum round of 85 customer collections. If collectors had more customers per round, then the net cost would decline significantly.

A graph showing the change in service cost due to collection density is shown in figure 11.

Figure 11: Business waste route density impacts on the cost of service (excluding materials treatment cost)



Costs per kg of flexible plastic packaging collected are presented here in figure 12.

Figure 12: Costs per kg of flexible plastic packaging collected

	Cost range (pence/kg)	
Business collections for flexible packaging	**Lower**	**Upper**
Rural areas (lower average route density)	7	27
Suburban areas (medium average route density)	9	20
Urban areas (higher average route density)	7	16

Sorting

once collected, materials can be sorted into defined streams

Sorting is the process of taking the delivered, collected materials and separating them into streams ready for recycling. The costs incurred will vary depending on how the materials are collected, on whether the materials are mingled during collection and, if they are mingled, on the combination of materials that are collected together. Costs of sorting also vary by the volume of collected materials that can be processed per hour, which is dependent on the weight of the items and the speed with which they can be passed across sorting belts and equipment.

For the purposes of costs, we used our sorting centres in Europe to provide a basis of evidence. These facilities are currently able to sort flexible packaging and film into streams suitable for further reprocessing. We used sorting costs from UK-based facilities to inform UK variances in cost between countries and to fine tune our cost ranges.

For materials collected in a source-separated manner, the costs of sorting are relatively low, but the costs of collection are higher. With mingled collection systems, the costs of collection are relatively low, but the cost of sorting is higher.

In understanding how materials might be collected, it is important to understand that, generally, most sorting plants will use a mix of processes such as 2D or 3D, weight and weight to surface area, near infrared and various magnetic properties to separate materials. One difficulty therefore is that paper and thin card may also present in a similar manner as plastic film and some flexible packaging, so it may be necessary to collect paper and card separately from film and flexibles to ensure that they can be effectively sorted.

Costs of sorting can also vary between size of plants, with costs generally being higher for smaller plants than larger plants due to the spread of fixed costs across the volume or weight of materials processed.

Cost estimates for sorting vary between 14 pence and 45 pence per kg depending on the conditions outlined here and applies to materials collected from both households and businesses. For these and all other calculations presented in this summary report, we have not included any assessment of value in the recycled products produced, which would reduce the net cost of the collection and sorting provision.

Treatment

treatment solutions exist for some types of flexible packaging and are being developed for others

Multiple treatment routes exist and are emerging for flexible plastic packaging and films. As part of the work for the Flexible Packaging Consortium, we undertook a review of treatment capacity and treatment technologies that are currently used or are being developed. This included a review of treatment systems and offtake markets that currently exist, as well as those that are nascent or in development.

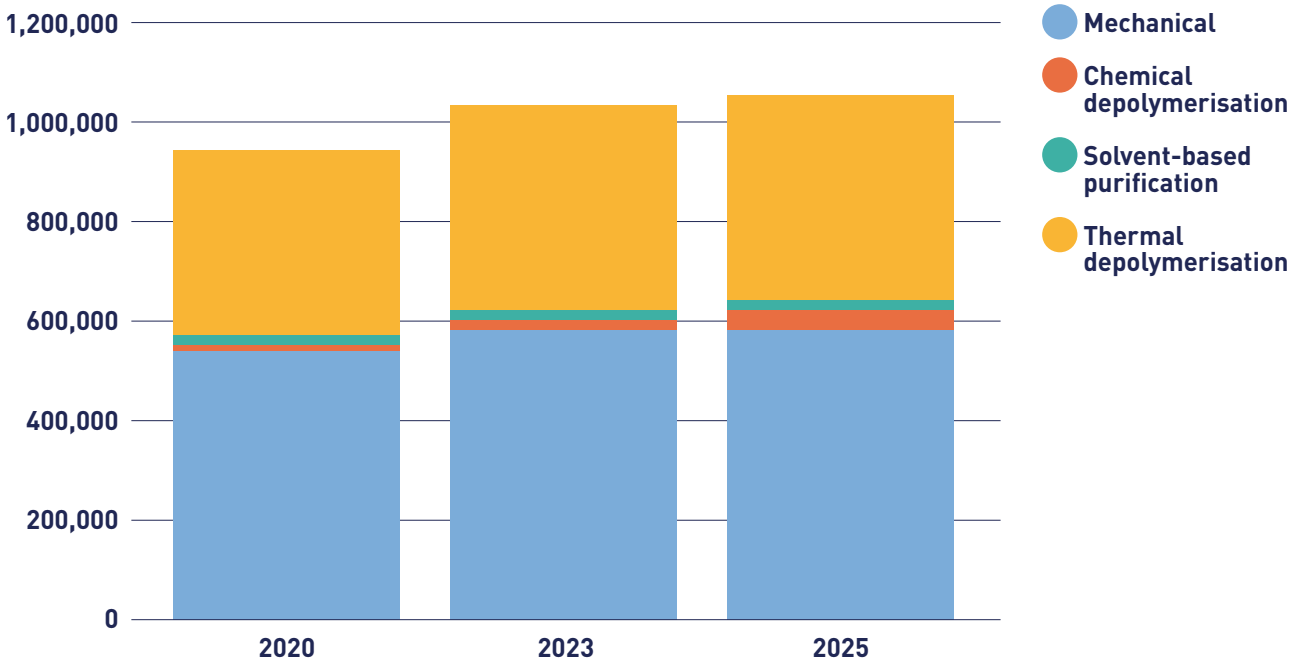
This review was desk based, but we engaged directly with over 40 companies that are currently offering or are proposing to offer treatment solutions for plastic film and flexible packaging materials. We split the types of technologies into two main types, mechanical and chemical. The definition of the two main types is:

Mechanical recycling of plastics refers to the processing of plastics waste into secondary raw material or products without significantly changing the chemical / molecular structure of the materials.

Chemical recycling refers to several different technologies that convert sorted plastic waste into their original or similar molecular building blocks using thermal or chemical processes.

The results of the survey for the UK and EU are presented here in figure 13.

Figure 13:
European recycling capacity 2020-2025 by treatment technology type (tpa)



For the future mechanical and chemical recycling solutions, we used responses from developers or their public announcements as an indicator of future build and capacity. The current level of investment in this kind of processing reflects the feedstock that is presently available and the status of extended producer responsibility and other policy measures which provide financial mechanisms for investment in infrastructure. Should the UK government and devolved authorities confirm that film and flexible plastic packaging would be collected at kerbside and that the extended producer responsibility system will be amended as proposed, then the level of investment would be expected to increase.

The proposed extended producer responsibility system and recycled content plastic tax should further support the development of offtake markets to match the increase in materials being recycled. There are already examples of this in chemical recycling, where recycled plastic packaging has achieved food grade quality and therefore maintains the higher material qualities for longer, an important target for the plastics sector. Some technologies are successfully recovering the aluminium layers in certain packaging, while others are making an oil product designed for further refining.

To help illustrate the current solutions and potential development scenarios, we have created **a series of development flow diagrams which are presented in the appendix**. These are designed to show current solutions and product grades, as well as future development scenarios that could flow from chemical recycling options.

Conclusion

Through the works undertaken by SUEZ on behalf of the Flexible Packaging Consortium, we have defined the likely volume of flexible plastic packaging placed on the market and the possible methods for their collection, sorting and recycling. **This work is founded on sound evidence using European experience and data, as well as data specific to the UK**.

The techniques and costs developed show that there is no reason why the UK should not be able to follow practice in some EU countries and collect flexible plastic packaging for recycling. There is a significant opportunity to synchronise the introduction of flexible plastic packaging with the removal of deposit return scheme materials from kerbside collections between 2023 and 2026.

The Flexible Packaging Consortium have shared much of the detail of the works undertaken with Defra, the UK Plastics Pact and other organisations involved in the discussions on consistent kerbside collections and the proposed extended producer responsibility system. This report presents a summary of the details provided.

Further work is underway considering:

- The likely timescales for conversion of kerbside collections to include flexible plastic packaging.
- The likely volume of flexible plastic packaging that would arise and need sorting and recycling over time.
- The likely sorting and recycling infrastructure capacity required to support the volumes being collected and when it is required.

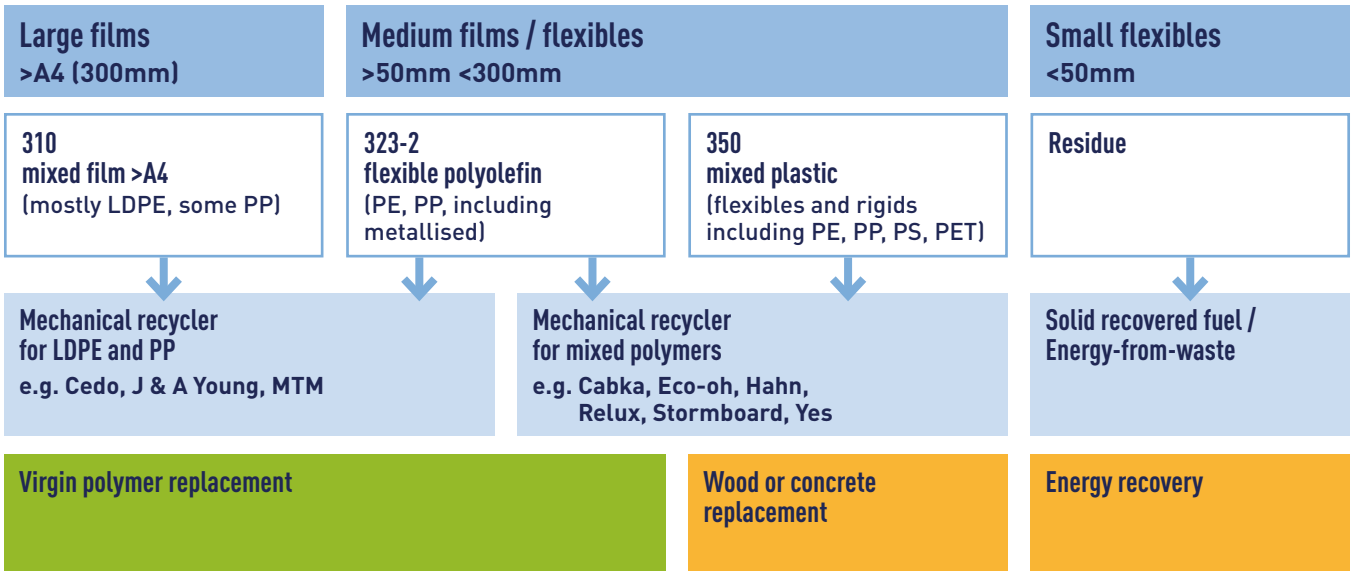
Beyond the Flexible Packaging Consortium work, the next set of policy consultations are due early in 2021 and we would hope they propose the inclusion of film and flexible plastic packaging from 2023 as part of the core set of recycling materials, and that the final amended extended producer responsibility system will include targets for recycling of these materials and appropriate measures for the allocation of cost.

Appendix

The future development scenarios presented in this appendix are indicative options only. Company names are used to illustrate these potentials, but do not represent actual material flows or a complete set of companies for each option or scenario.

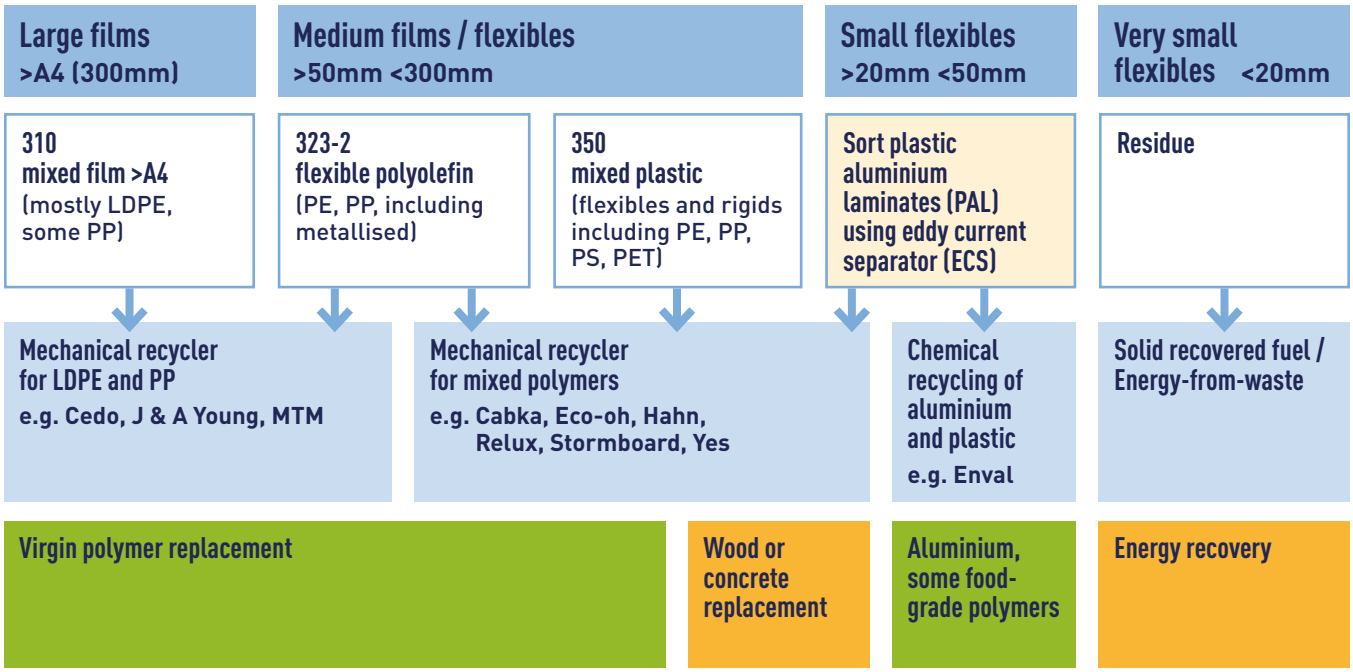
FROM COMMINGLED COLLECTIONS, VIA A MATERIALS RECYCLING FACILITY

1a. Current process / technology e.g. SUEZ Rotterdam



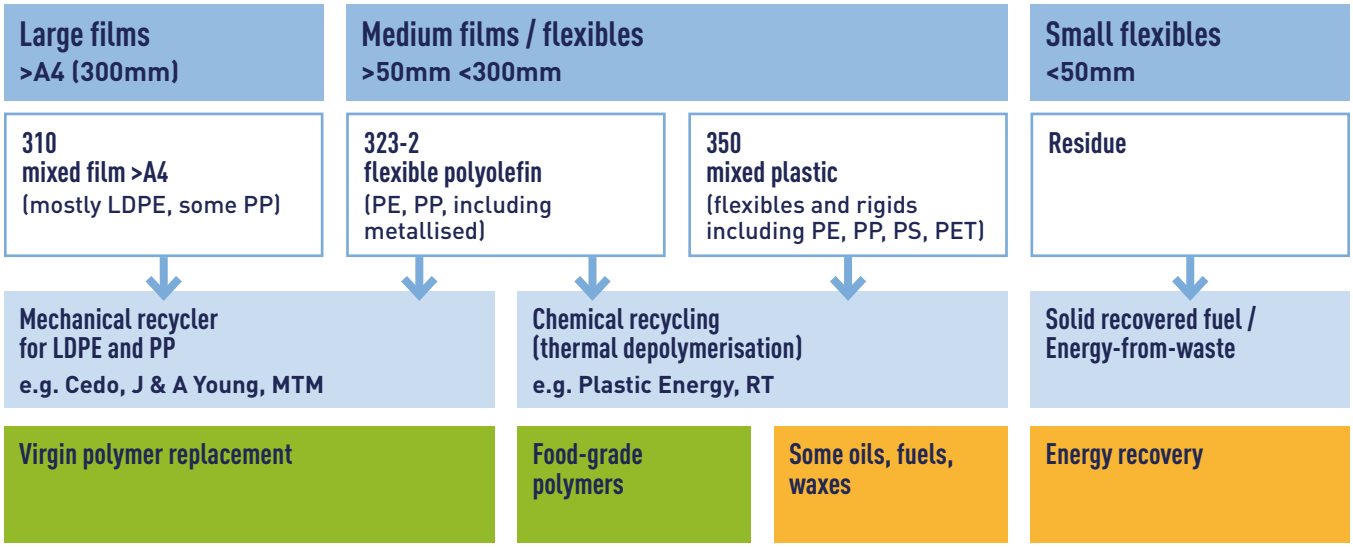
FROM COMMINGLED COLLECTIONS, VIA A MATERIALS RECYCLING FACILITY

1b. Current + chemical for <50mm



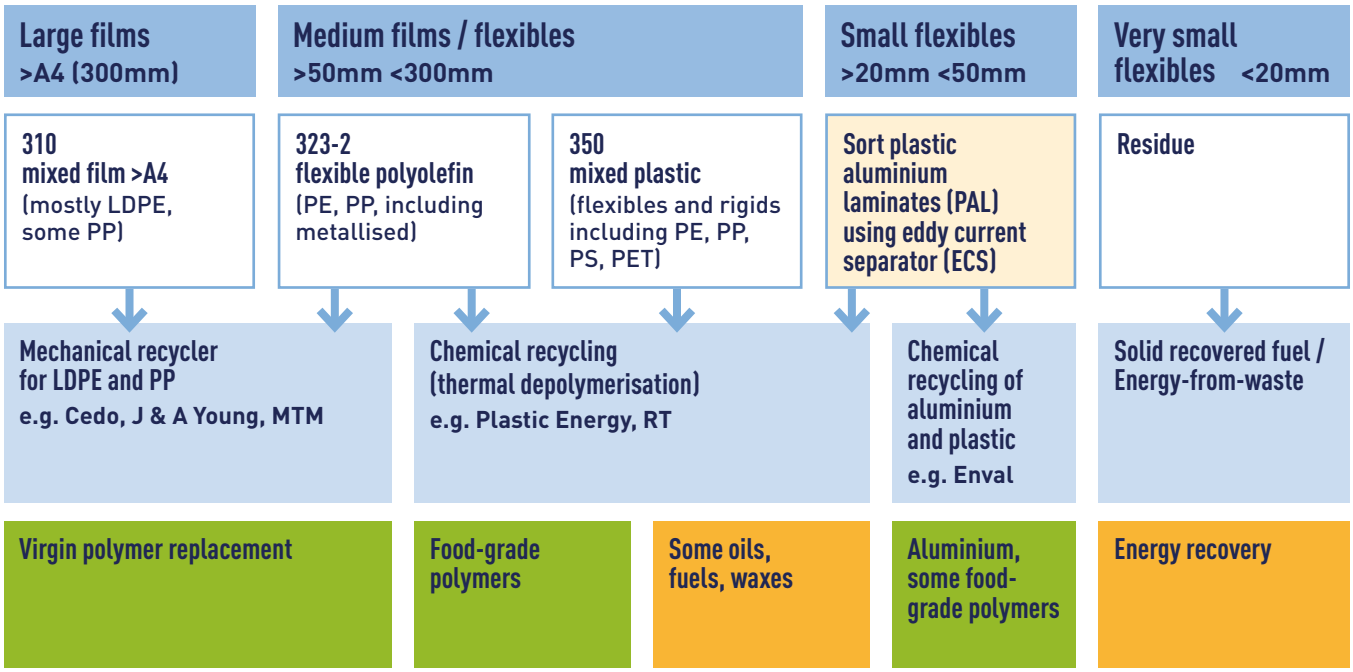
FROM COMMINGLED COLLECTIONS, VIA A MATERIALS RECYCLING FACILITY

1c. Mechanical and chemical



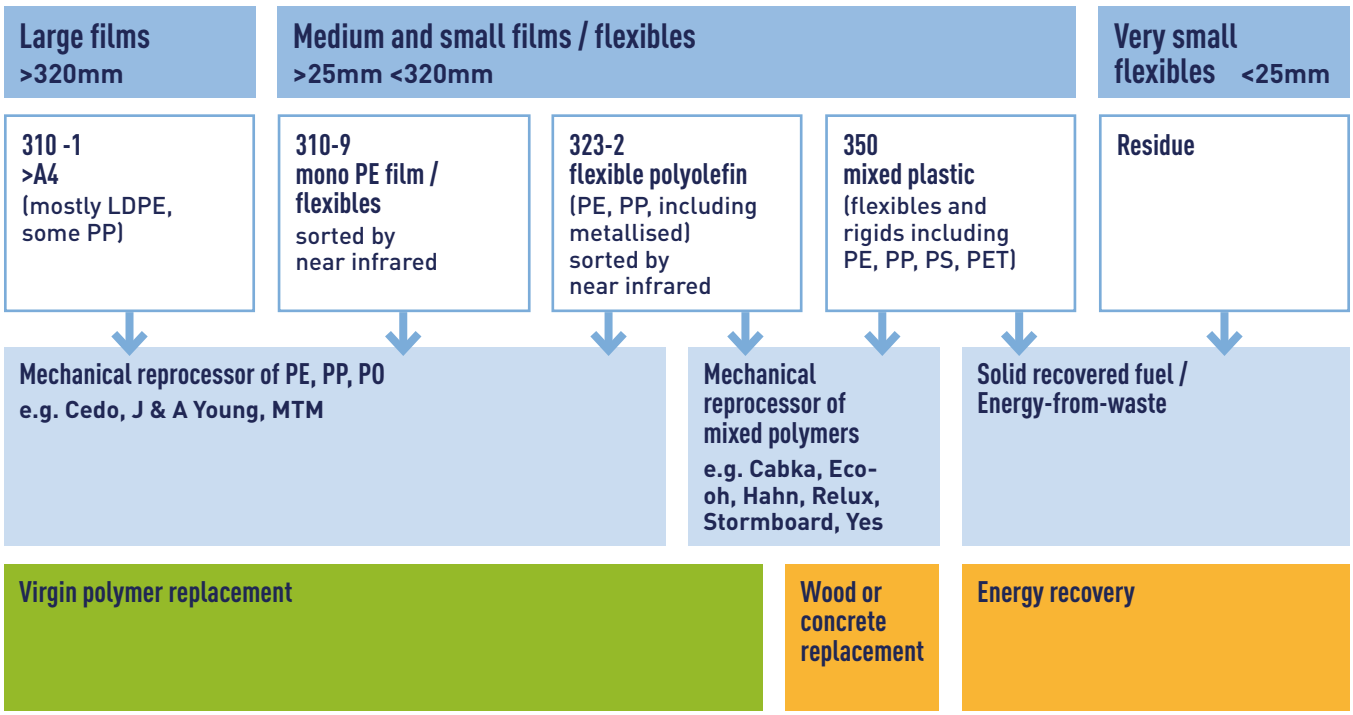
FROM COMMINGLED COLLECTIONS, VIA A MATERIALS RECYCLING FACILITY

1d. Mechanical and chemical + small



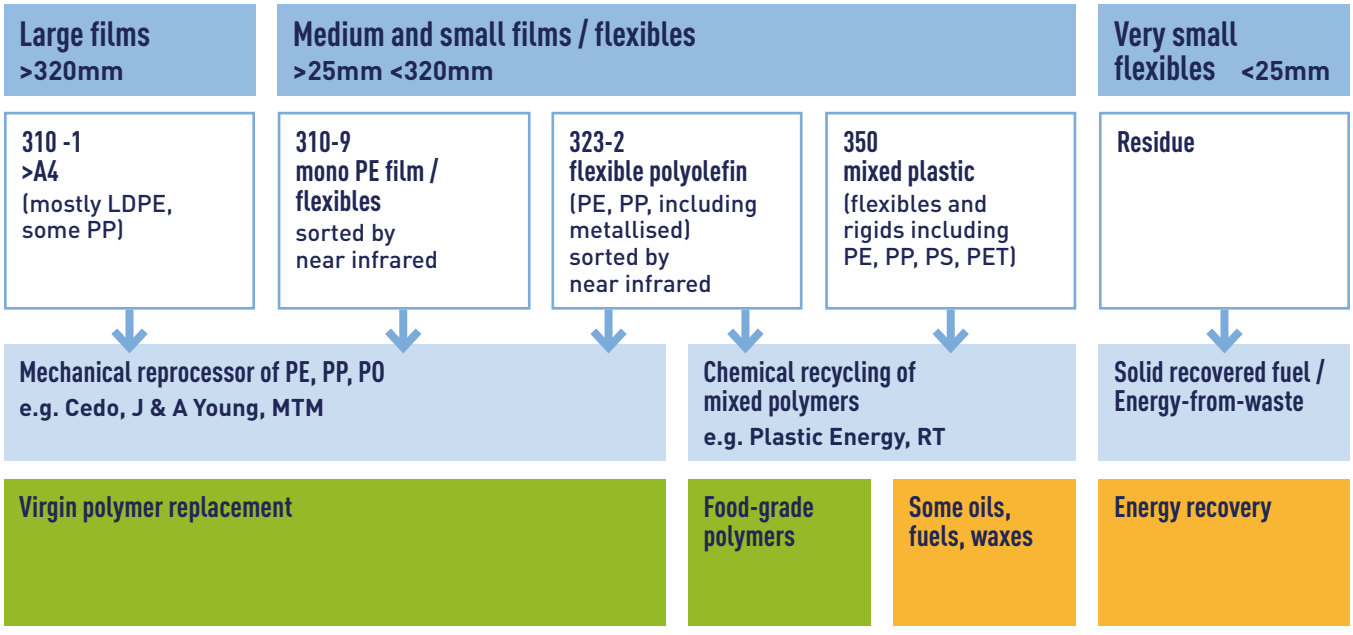
FROM COMMINGLED COLLECTIONS, VIA A MATERIALS RECYCLING FACILITY

2a: Latest process / technology
e.g. SUEZ Ölbronn, Germany



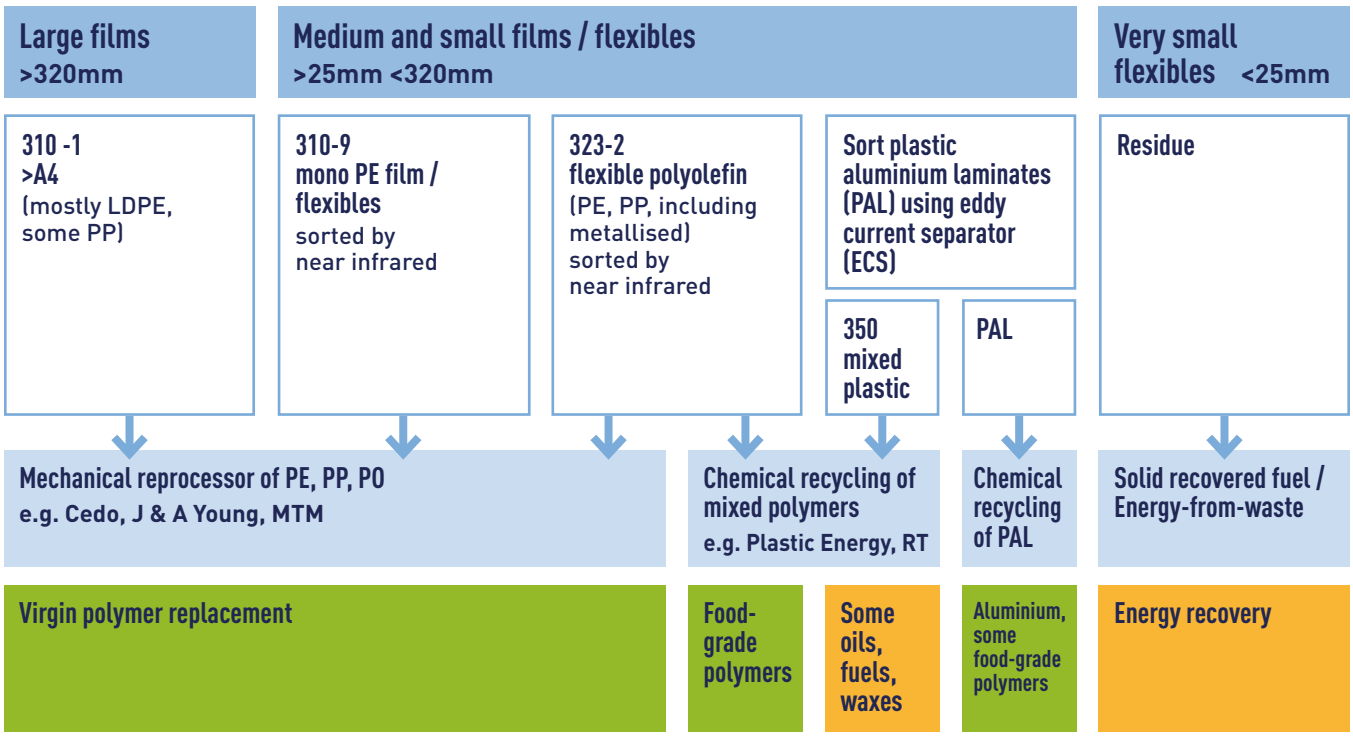
FROM COMMINGLED COLLECTIONS, VIA A MATERIALS RECYCLING FACILITY

2b: Latest process / technology + chemical, step one



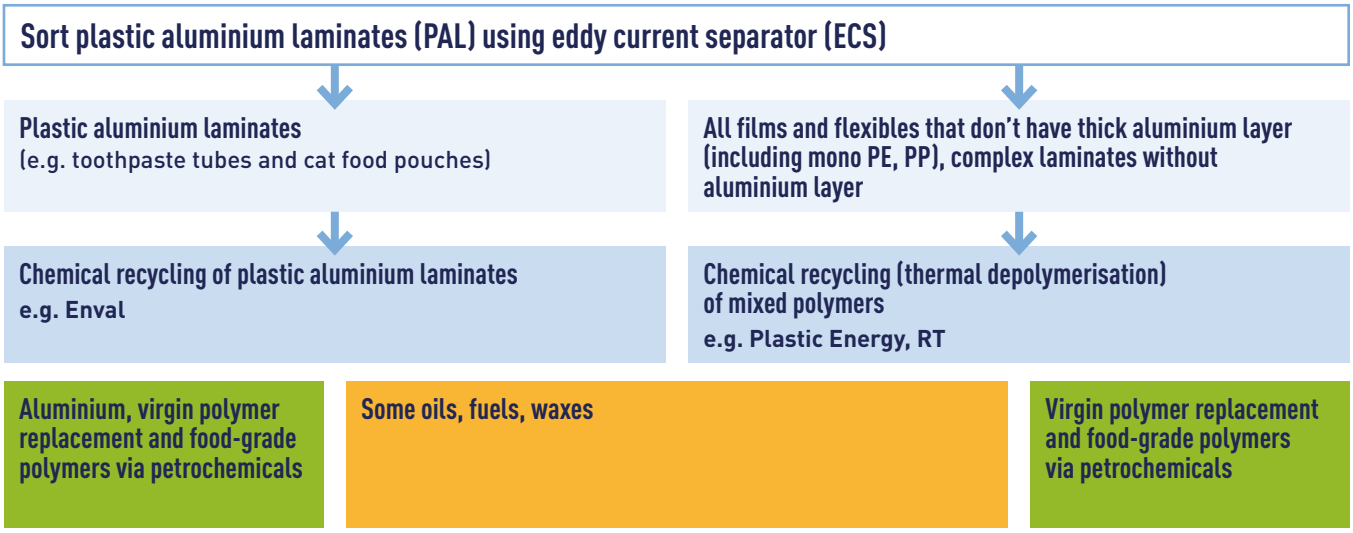
FROM COMMINGLED COLLECTIONS, VIA A MATERIALS RECYCLING FACILITY

2c: Latest process / technology + chemical, step two (plastic aluminium laminates recovery)



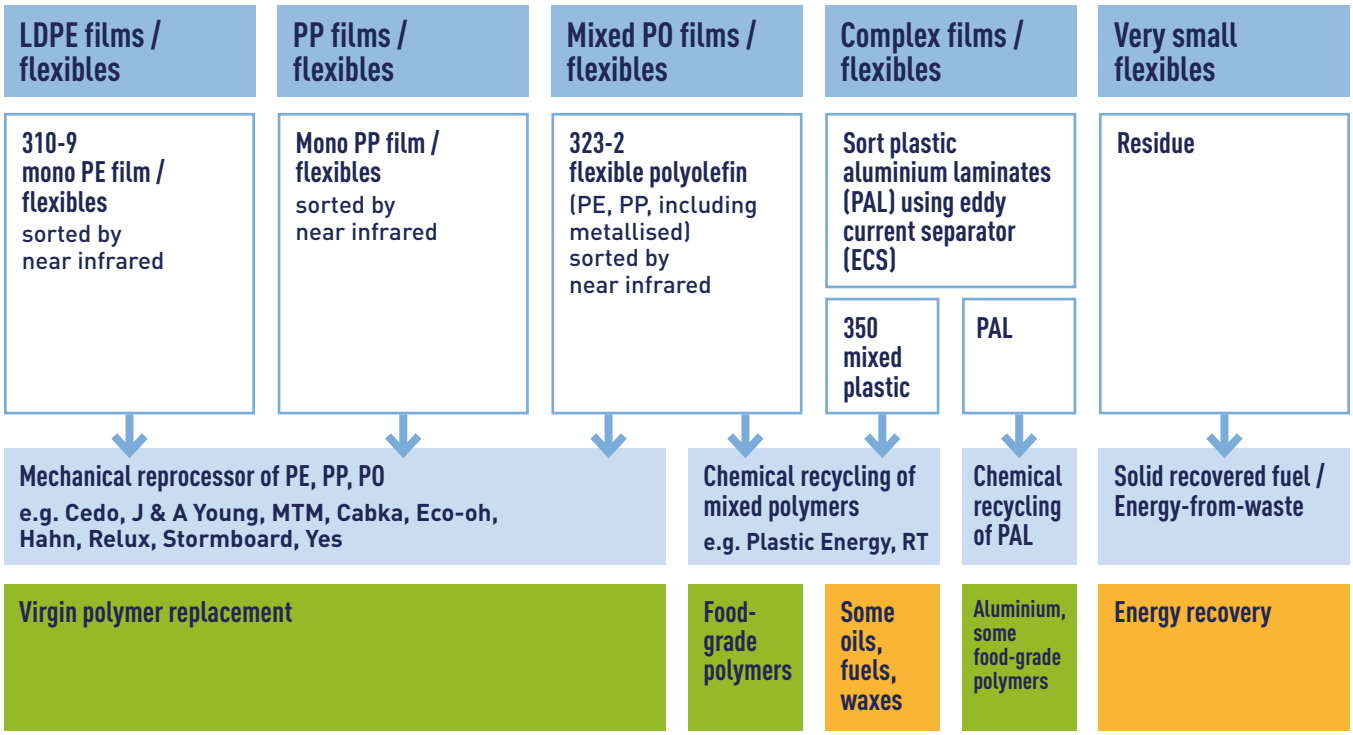
FROM SEPARATE COLLECTIONS

3. Flexibles collected as one single stream (all sizes) – all goes to chemical recycling



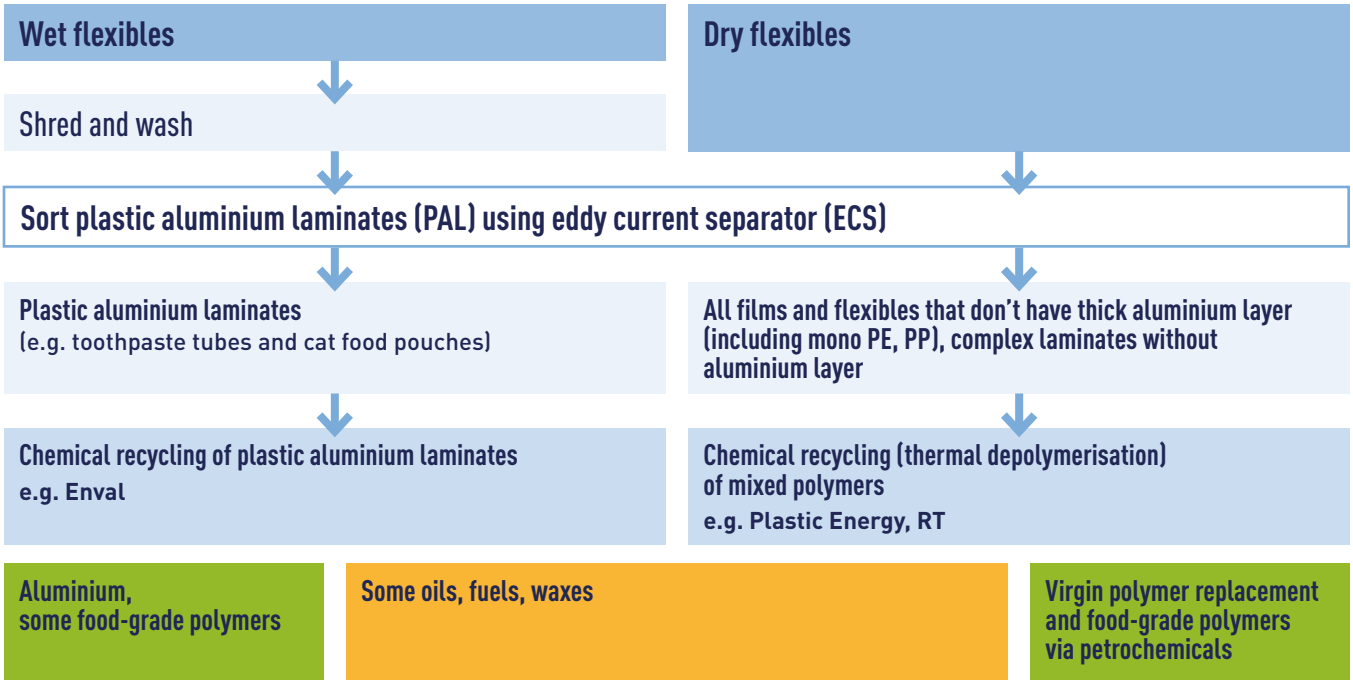
FROM SEPARATE COLLECTIONS

4. Flexibles collected as one single stream (all sizes) – goes to flexible plastics recycling facility (advanced near infrared sorting)



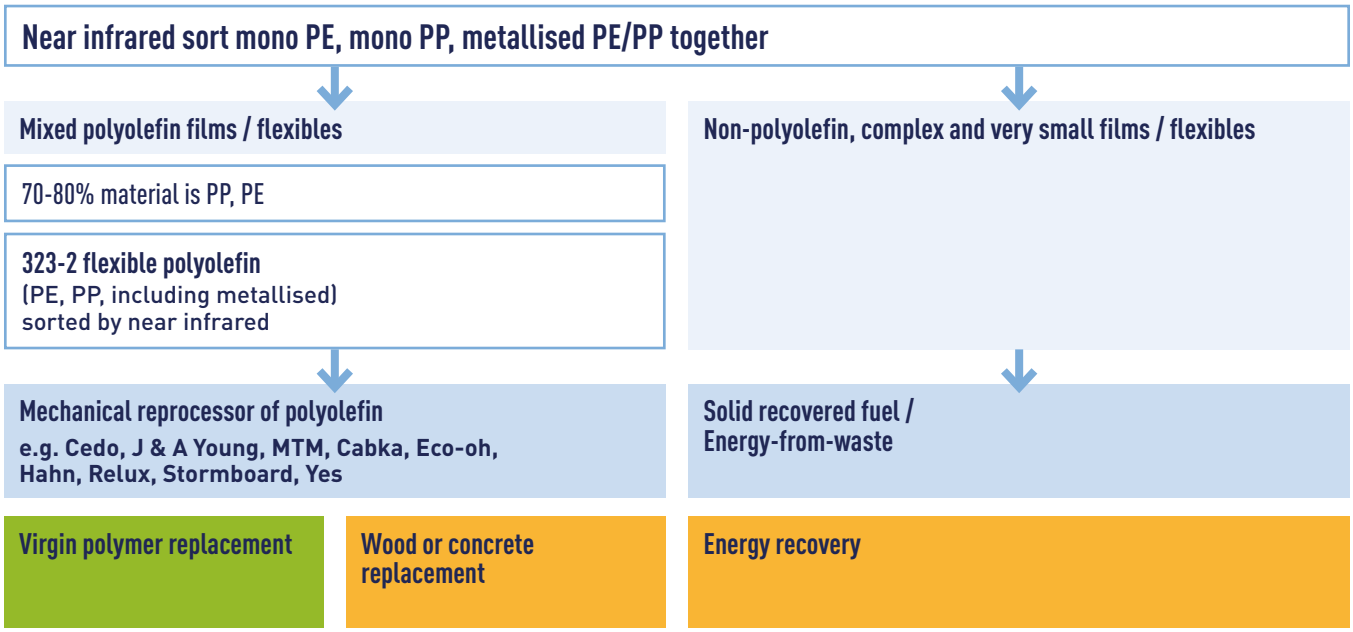
FROM SEPARATE COLLECTIONS

5. Flexibles collected as two streams (wet and dry) – all goes to chemical recycling



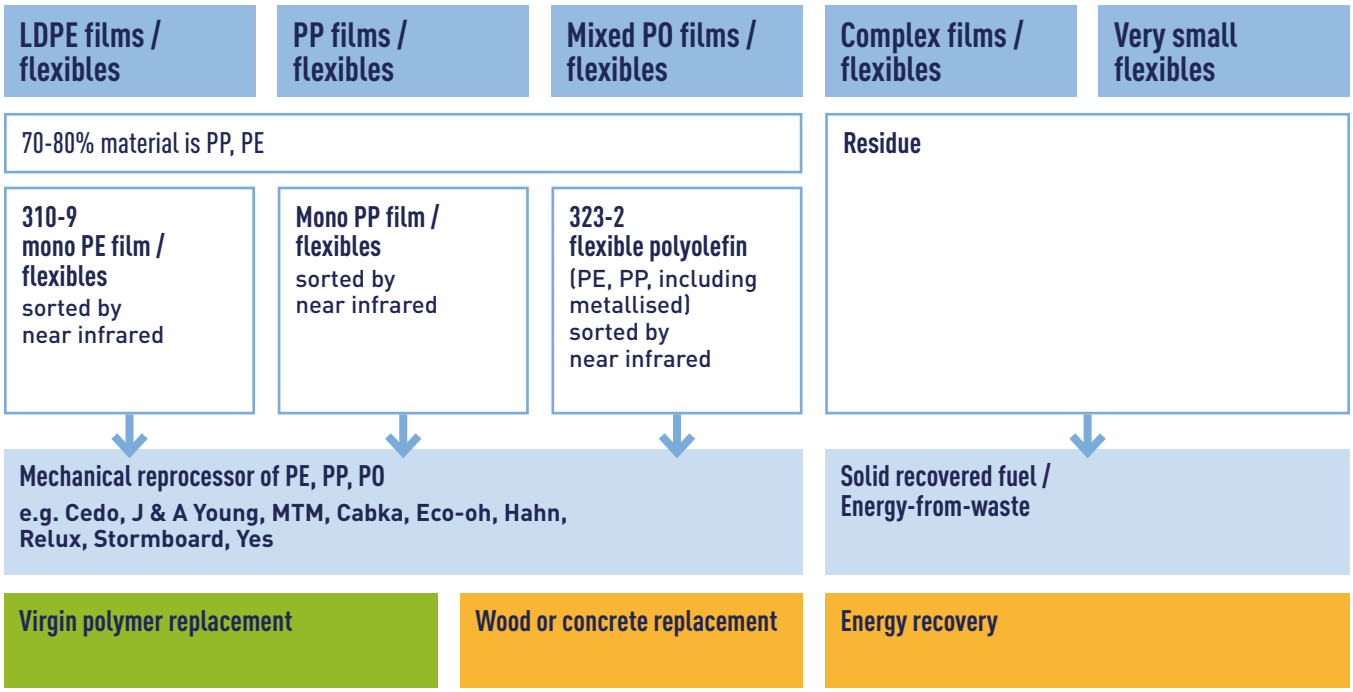
FROM SEPARATE COLLECTIONS

6. 'Reflex scenario' quick win with mixed polyolefins to mechanical recycling, rest to solid recovered fuel / energy-from-waste



FROM SEPARATE COLLECTIONS

7. Quick win with near infrared sort PE, PP and mixed polyolefins to mechanical recycling, rest to solid recovered fuel / energy-from-waste



SPECIFICATIONS OF FILM AND FLEXIBLE OUTPUTS IN THE DUTCH AND GERMAN SYSTEM

The Netherlands and Germany have defined product specifications for different compositions and qualities of baled film / flexibles derived from households, which have featured in these scenarios. They include the following:

Fraction No. 310-1: Larger than A4 plastic films (mostly PE, some PP)

Used, residue-drained, system-compatible items made of plastic film, surface > DIN A4, e.g. bags, carrier bags and shrink-wrapping film, incl. secondary components such as labels etc.

Fraction No. 310-9: Mono – PE films sorted by near infrared

Used, residue-drained, system-compatible, flexible items made of mono polyethylene (PE), positively sorted by near infrared, such as bags, carrier bags and shrink-wrapping film.

Fraction No. 323-2: Flexible Polyolefin (PE, PP)

Used, residue-drained, system-compatible, flexible items made of polyolefin (PE, PP) that are typical for packaging such as films, carrier bags (incl. aluminised films) and plastics made of polyolefins that are dimensionally stable, such as trays, covers incl. secondary components such as lids, labels etc.

Fraction No. 350: Mixed plastics (flexibles / films and rigids – all polymers)

Used, residue-drained, system-compatible items made of plastics that are typical for packaging (PE, PP, PS, PET) incl. secondary components, such as lids, labels etc.

For more information and downloads of the specifications, visit www.gruener-punkt.de/en/downloads

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