The Mass Balance Approach

An Ideal Way to Reduce the Carbon Footprint of Polyurethanes in the Automotive Sector

EURO MOULDERS

European Association of Manufacturers of Moulded Polyurethane Parts for the Automotive Industry

About EURO-MOULDERS

EURO-MOULDERS is a non-profit industry association, representing the European Manufacturers of Moulded Polyurethane Parts for the Automotive Industry. Our mission is to promote its unique benefits in automotive applications, to study scientific and technical issues of common interest to the industry, as well as to address future-oriented developments related to the use of polyurethane parts in the automotive industry.

EURO-MOULDERS's members are Tier 1 and 2 manufacturers of moulded polyurethane parts for the automotive industry, ranging from car seating to acoustic insulation and dashboards. Our members operate the majority of the moulded foam plants for automotive seating in Europe. We also welcome associate members – mainly raw material suppliers to the PU industry.

About this Document

This document is aiming at explaining why chemicals introduced via the mass balance approach are the ideal way to integrate more sustainable content (bio-based, bio-circular, or recycled) into polyurethanes for vehicle interiors. Relatively general in nature and 'lighter' in style, it is suited for a non-specialist general audience, but can also be relevant for environmental professionals, policy makers and regulators.

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EXECUTIVE SUMMARY

This brochure aims to highlight the Mass Balance Approach (MBA) in the context of reducing carbon footprint and producing sustainable polyurethanes for the automotive sector, thus contributing to the EU's broader sustainability goals.

One of the ways to make the automotive industry more sustainable is by transitioning away from fossil-based feedstocks not only as fuel, but also as raw materials in the production of plastics for cars, and by using more sustainable feedstocks, with allocated bio-based, bio-circular, and/or recycled (circular) content. In order to do that in a transparent, verifiable and third-party certifiable manner, chemicals producers are using the mass balance approach.

The MBA is essentially a process approach that allows chemical producers to track how much of alternative (non-fossil) feedstock is used in the production of circular chemicals. This is being done by following the mass flow principles, quantifying inputs and outputs at each stage of the production process and tracking the use of raw materials throughout the value chain. This way, MBA audits enable third-party verification of the process.

The MBA can therefore be a complementary solution to existing, segregated, recycling technologies - notably mechanical recycling and depolymerisation (waste-to-monomer) - in order to incorporate more sustainable raw materials into final products, whilst significantly reducing their carbon footprint.

The major advantage of mass balance is that it allows leveraging alternative feedstocks in already existing infrastructure, together with the fossil-sourced feedstock. As different feedstocks are impossible to physically separate once co-fed in large industrial installations, the MBA is needed to calculate and verify the amount of sustainable content allocated to products.

Another benefit of using chemicals introduced via the MBA is that they are of virgin-grade quality and thus do not require OEMs to consider adaptations to their specifications or to consider new qualification of parts to allow for recycled content. This is why this approach is well suited for the automotive supply chain, which is among the supply chains with the most stringent requirements for materials and parts in general, including for polyurethanes.

Furthermore, the MBA involves calculating the net CO_2 emissions associated with a product or process. By assessing the carbon footprint throughout the supply chain, including raw material extraction, production, distribution, and disposal, companies can gain valuable insights into their environmental impact. This enables them to strategise and implement measures to reduce their carbon emissions effectively, and thus contribute to broader sustainability goals. That is why the MBA has to be recognised in LCA standards (such as ISO[1], EPDs) to allow circular systems to claim benefit of reducing waste to incineration/landfilling and keeping the carbon in the loop.

We as EURO-MOULDERS are willing to mediate this type of discussions as an independent and objective third-party body, related specifically to case of polyurethane parts used in automotive industry.

TABLE OF CONTENTS

1 INTRODUCTION

The European Union (EU), has set itself an ambitious target to become the first climate-neutral continent by 2050. This requires reviewing nearly all its policies, seeking to transform the way Europeans produce and consume, and to steer the economy towards more circular/sustainable business models.

The automotive sector, known for its resource-intensive processes, is among the priority sectors which policy intends to make more sustainable, notably as regards vehicle production, their use and their end-of-life management.

Plastics are omni-present in cars and, on average, account for ~10% of the total mass of the vehicle. Polyurethanes are the second most-used plastic in cars (up to 28 kg per vehicle)[2]. Polyurethanes can be produced using a variety of raw materials: fossil-based, bio-based, bio-circular, and circular (recycled) feedstock. There is growing focus on developing innovative technologies to reduce the use of fossil-based feedstock while lowering the environmental impact of PU foam production. As the demand for products with a lower carbon footprint and transition to circular products gains weight, the automotive industry has to consider and use all solutions available.

This document does not consider the sustainability of vehicles as a whole during their lifecycle, which would be beyond the remit and expertise of EURO-MOULDERS. It focuses on a specific topic linked to plastics in general and to polyurethanes in particular, namely on how to produce high-quality parts and components with recycled and/or renewable content via the so-called "mass balance approach" (MBA), combined (or not) with chemical recycling.

Purpose and Scope

The aim of this brochure is to explain how MBA is particularly suited for providing more sustainable polyurethanes to the automotive sector and to highlight how chemicals introduced via the mass balance approach can complement existing recycling technologies – notably mechanical recycling and depolymerisation – for hard-to-recycle plastics.

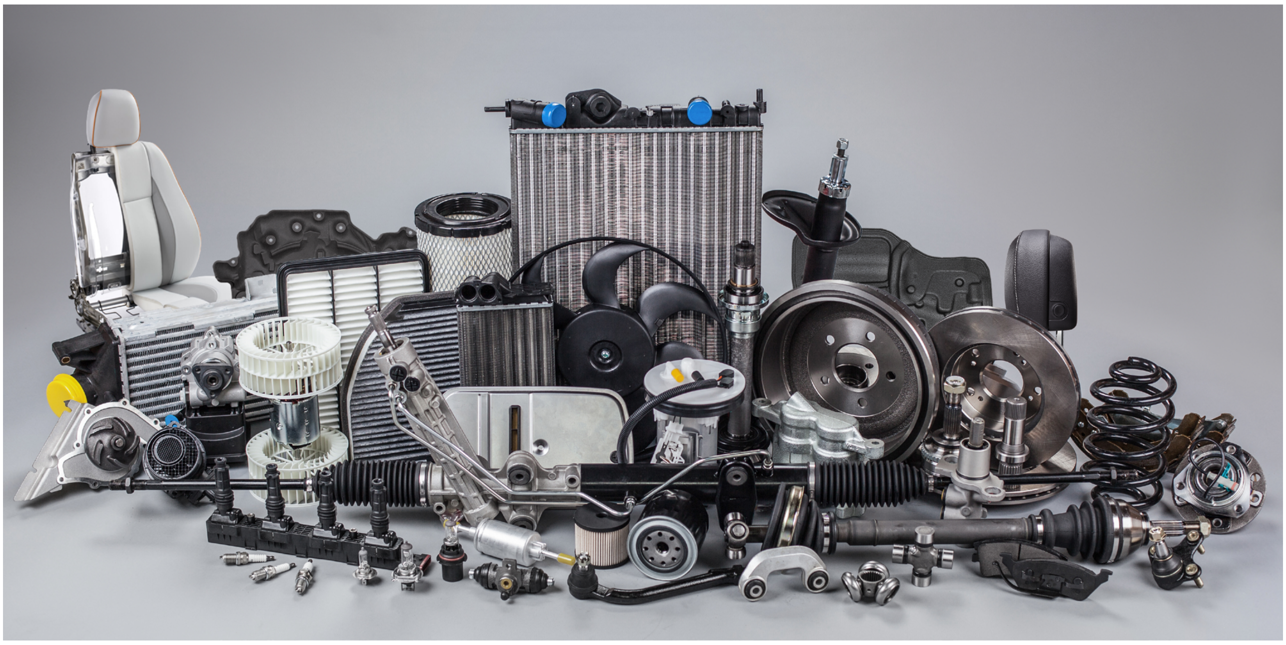


Image 1. Automotive car parts. Source: EURO-MOULDERS

2 POLYURETHANES IN VEHICLE INTERIORS

Polyurethanes are thermoset[i] polymers that are formed through the reaction of diisocyanates with polyols, both substances traditionally derived from fossil feedstocks. Depending on the production process and the specific formulation used, polyurethanes can exist in various forms, including flexible or rigid foams, and CASE[ii] polyurethanes. Thus, they can be tailored to exhibit different properties, depending on the end-use application.

2.1. Polyurethanes in Vehicle Interiors: Versatile, Durable, Comfortable

Polyurethanes are the second most used plastics (per type) in light vehicles, with a share of about 15%, representing roughly 28 kg on average (Figure 1). Although accounting for 10% of total weight of a car, plastics account for nearly 50% of the volume of materials. The proportion of polyurethanes in vehicles is set to further increase as the automotive sector transitions away from combustion engines towards e-mobility solutions and changes specifications on noise, vibration, harshness (NVH) and thermal insulation, amongst others. This goes in line with the ongoing endeavour of the automotive supply chain to reduce the weight of vehicles, thus improving energy efficiency and reducing the overall CO_2 emissions[3].

Polyurethanes are widely used in automotive interiors due to their versatility, customisability, durability, and – above all – comfort properties. The utilisation of polyurethane in vehicle interiors brings forth a multitude of benefits, making it a preferred choice for numerous applications, such as seating cushions (well over 90% of market share), instrument and door panels, headliners, headrests and armrests, acoustic insulation battery packs, etc. The usage of some polyurethane applications can be seen in Figure 2 .

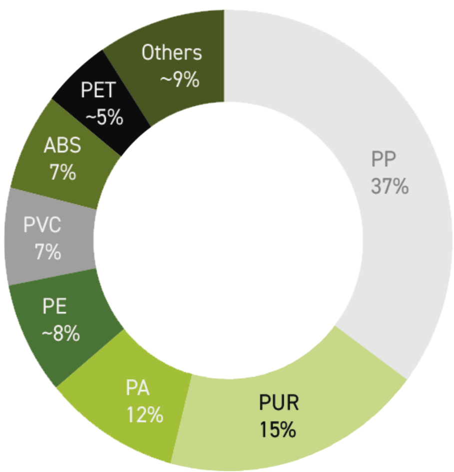


Figure 1. Types of polymers used in the automotive sector

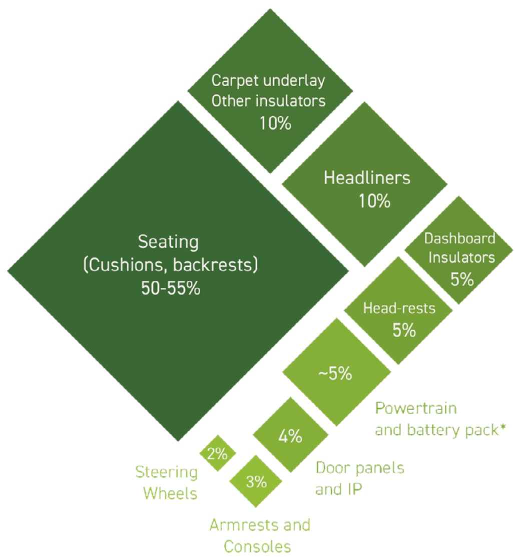


Figure 2. The mass-based distribution of polyurethane in an average car

[i] Thermoset polymers – like polyurethane foams - are formed by irreversible hardening (curing) of viscous liquid raw materials, resulting in creation of infusible and insoluble polymer network. Once hardened, a thermoset cannot be melted for reshaping. Thermoplastics, on the other hand, can be reshaped upon heating.

[ii] CASE is a common abbreviation for a group of coatings, adhesives, sealants and elastomers.

2.2. The Automotive Industry: A Sector With Stringent Specifications

The automotive industry is operating under an array of stringent regulations, industry standards and OEM specifications. These are critical for ensuring vehicle safety, performance and for improving sustainability.

Exacting Standards for Safety and Compliance

Safety is of paramount importance in the automotive world, as millions of lives depend on the reliability and performance of vehicles. Governments and regulatory bodies establish comprehensive safety standards and emission regulations that automobile manufacturers must adhere to strictly. From crash tests to emissions control, every aspect of a vehicle's design and performance is scrutinised and validated to meet the highest safety and environmental standards.

Cars are designed to last for decades. Hence all automotive parts need to undergo various quality control tests, whish are especially stringent for parts involved in passenger safety. If we look at plastics in general – and polyurethane parts specifically – there are three main conditions all interior applications need to comply with: physical-mechanical properties, emissions control and flammability requirements[4].

The Process of Validation of Car Parts

The validation of car parts and components is a critical phase in their development, ensuring they meet the performance, quality and safety standards required for automotive use. The process of validation is crucial because car parts can degrade over time due to the daily wear and tear, exposure to environmental and other factors, which can affect their performance and compromise safety.

Polyurethane parts – especially the ones remotely linked to safety (e.g. foam in which there would be an airbag sensor) – have to go through the costly and time-consuming revalidation process once the foam formulations are even slightly changed. That is why PU parts manufacturers must have consistent supply of top-quality (virgin-equivalent) raw materials.

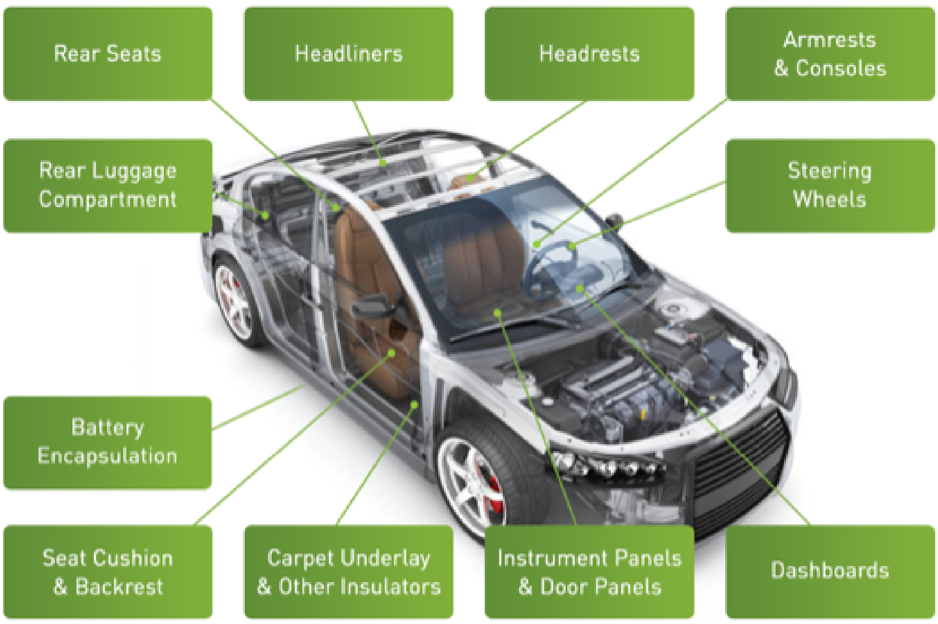


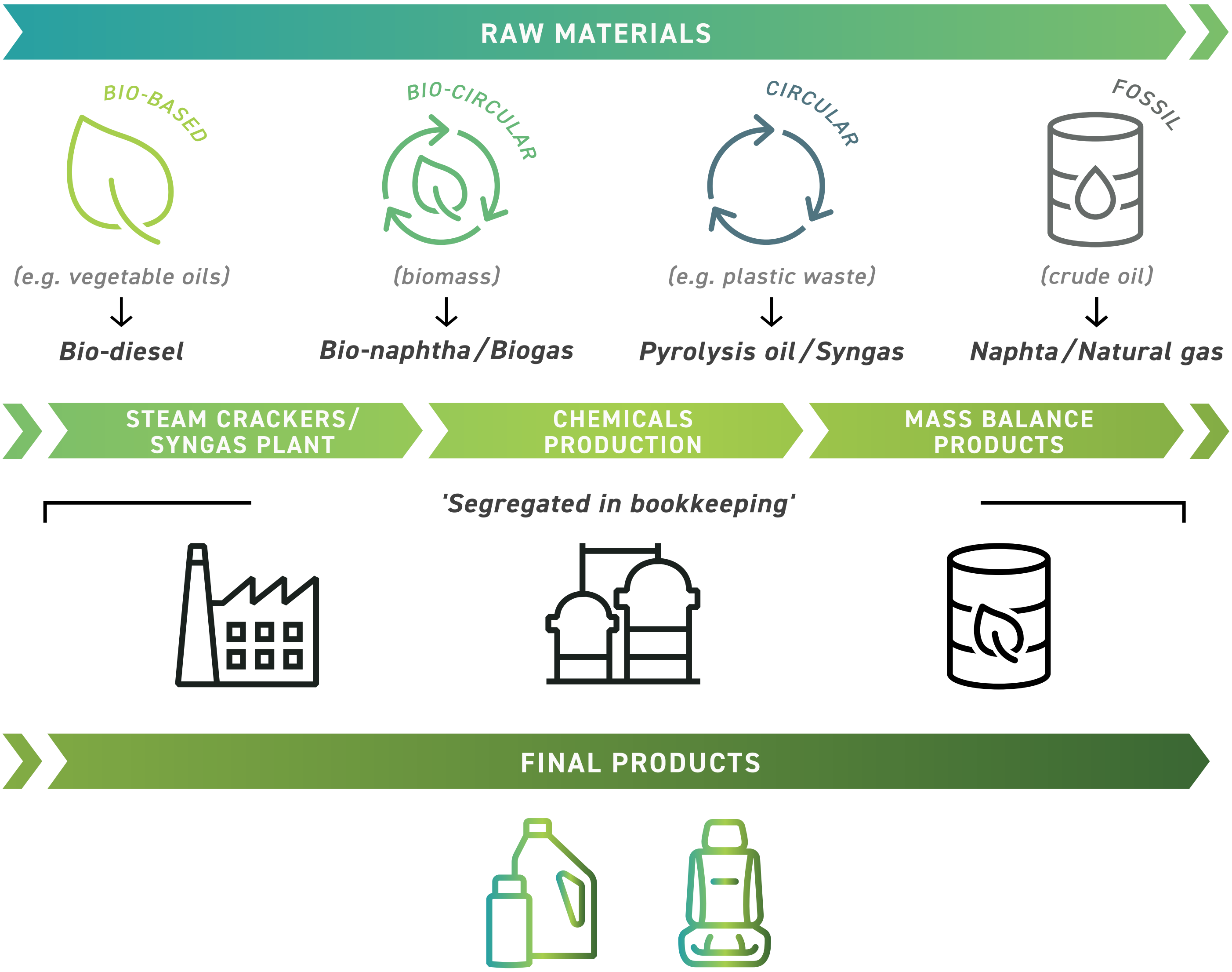
Image 2. Polyurethane applications in a car. Source: EURO-MOULDERS

3 WHAT IS THE MASS BALANCE APPROACH?

The MBA is essentially a process approach that allows chemical producers to track how much of alternative (non-fossil) feedstock is used in the production of circular chemicals. This is already being done by following the mass flow principles and quantifying inputs and outputs at each stage of the production process and by tracking the use of raw materials throughout the value chain.

The principal objective of the mass balance approach is to achieve a transparent and credible system to calculate and verify sustainable content in polymers with an independent third-party certification system[5].

It has grown in importance over the past few years as a pathway towards a circular economy by (partially) replacing virgin (fossil-based) feedstocks. The MBA uses mass flow tracking to record how much of bio-based, bio-circular, or circular (recycled) feedstock is used in the production of base chemicals. This is important because the end-molecules produced are largely the same, no matter what the feedstock used. Scheme 1 below shows the basic principles of the mass balance process.



Scheme 1. Basic principle of the mass balance approach

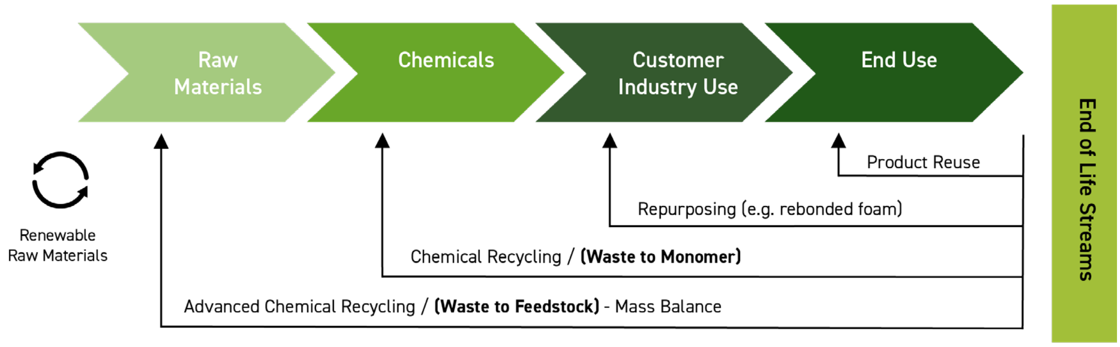
3.1. Why the MBA?

Globally, only 9% of plastics are recycled, with the rest being either landfilled or incinerated for energy. Scheme 2 presents the typical end of life streams for plastics.

Mechanical recycling, a well-established method, involves the physical processing of plastics to create recycled materials. While effective for many applications, it encounters limitations when dealing with complex polymer structures and mixed-material components, commonly found in automotive design. For polyurethanes, the usage of recyclates via mechanical recycling – such as rebounded foam – in automotive is limited due to inherent changes of material properties. *Depolymerisation* (or waste to monomer) technology involves (chemically) breaking down polymers to its constituent raw materials (monomers). Currently, there are several depolymerisation plants operating in Europe, which use end-of-life mattresses to produce recycled polyols. The use of such polyols to make parts for the automotive industry is constrained because of partial loss of quality.

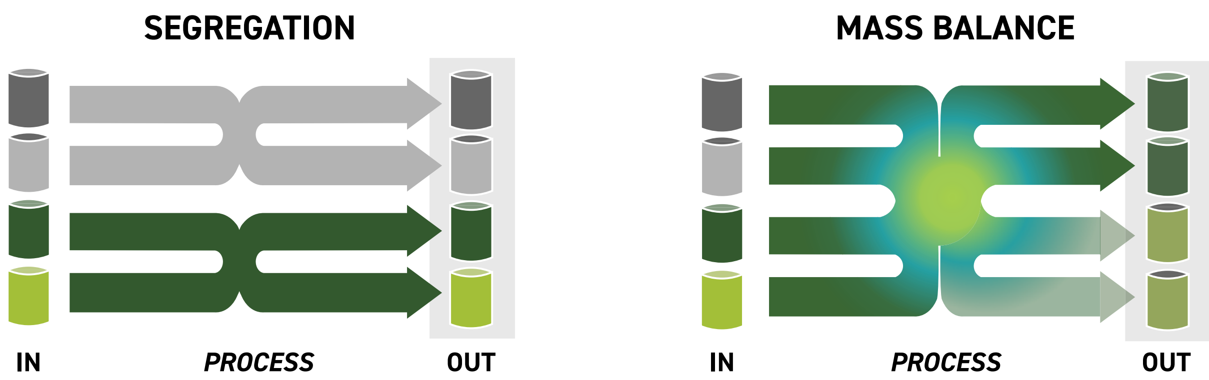
In various sectors, hard-to-recycle plastics require multifaceted solutions because of their intricate composition. Advanced chemical recycling combined with the *Mass Balance Approach* is particularly valuable for these materials, to ensure they can be recycled and that recycled content can be accounted for in the production of new plastic components.

In order to transition to a circular economy for plastics, there needs to be complementarity of recycling technologies, recognising the unique strengths of each one[6].



Scheme 2. End-of-life streams for plastics

Scheme 3 below can help visualise the Mass Balance chain of custody model as compared to the Segregation Model. The latter involves physically separating goods (within a defined standard) throughout the supply chain. Materials from different sources can be mixed within a common category, but material categories are kept physically separate (e.g. organic versus non-organic). The MBA is a more flexible model that tracks the environmental impact of various feedstocks throughout the entire supply chain. It doesn't require physical separation of materials but allows for a transparent accounting of sustainable content at various stages of production.



Scheme 3. Chain of custody model visualisation: segregation vs mass balance

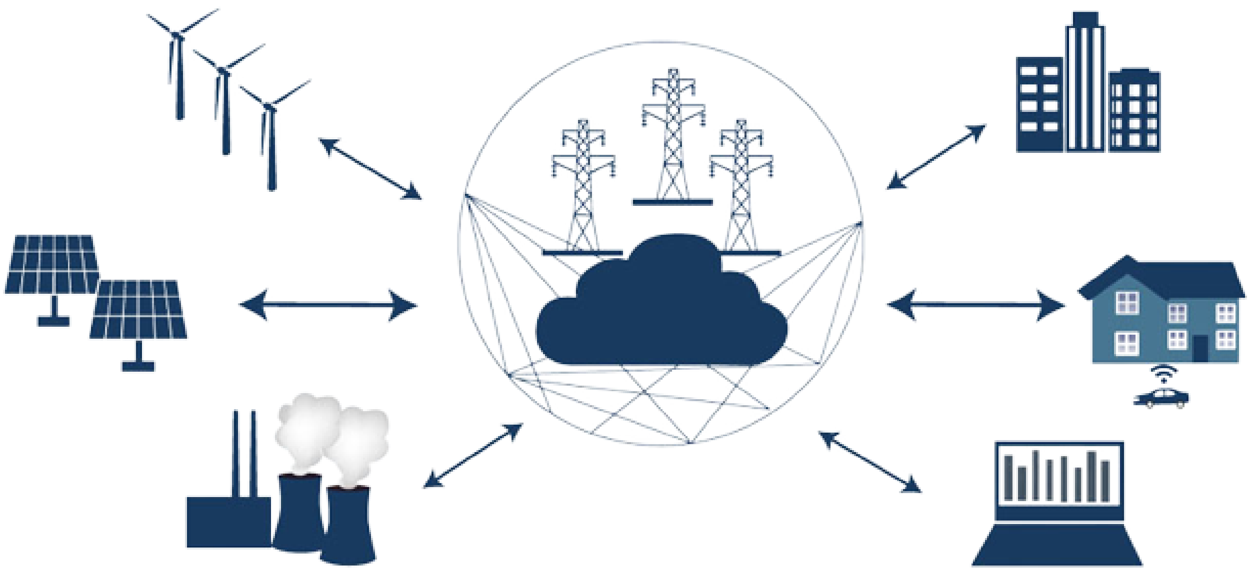
3.2. How Does it Work?

3.2.1. Key Principles of the Mass Balance Approach

The core principles underlying the mass balance approach revolve around the conservation of mass and the tracking of materials throughout a system. It operates on the principle that the total mass of inputs into a system must equal the total mass of outputs. This means that for every unit of material or energy that enters the system, an equivalent unit must exit. The mass balance approach also considers the allocation of impacts and credits across different products or product lines based on their material composition and properties.

The concept of mass balance approach can roughly be compared to energy providers, akin to green electricity. In this analogy, let's envision the chemical industry's production network as a complex energy grid, sourcing power from conventional plants and a diverse array of renewable sources. In case of renewable electricity, examples include solar or wind-powered energy sources. In case of producing circular chemicals via MBA, alternative feedstocks would include bio-based, bio-circular, and circular feedstocks (more about them in the next paragraph).

At the end of the day, customers decide which type of energy generation they want to support; choosing green power drives the shift to renewable energy sources that feed into the existing grid. Similarly, the mass balance approach facilitates the integration of alternative raw materials into already existing, large-scale complex[i] production networks.



Scheme 4. Example of an electricity energy grid

[i] The complexity of petrochemical installations is due to multiple inputs and outputs in the system. It is best exemplified in [this infographic](#).

3.2.2. Classification of Different Types of Alternative Feedstocks

Alternative feedstocks are categorised into various types based on their origin:

Bio-Based

Refers to feedstock derived from renewable biological sources, such as plant or animal based materials (e.g. vegetable oils, beef tallow).

Bio-Circular

Involves the use of residues from forestry, agriculture or food residues, creating a circular economy approach that maximises resource efficiency and minimising waste.

Circular (or Recyled)

Entails the use of post-consumer (e.g. end-of-life tyres or end-of-life plastics) or post-industrial waste materials, diverting them from landfills or energy incineration and reducing the need for virgin fossil resources.

Diversifying raw material sources allows to produce chemicals of exactly the same quality and properties in existing infrastructure of the chemical industry while allowing to reduce dependency on fossil-based input, thus promoting circular practices and reducing the carbon footprint of the chemicals produced. It is important to recognise this fact on a regulatory level, in order to facilitate the most flexible approach to transition towards more environmentally responsible practices without compromising product quality.

Image 3. Example of bio-based (vegetable oil), bio-circular (used cooking oil) and circular (end of life tyres) feedstocks. Source: Adobe Stock.

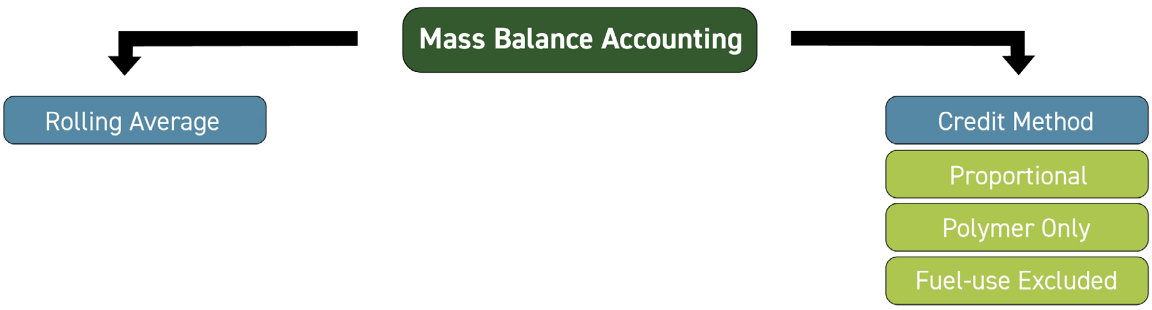
3.2.3. Different Mass Balance Allocation Methodologies

To allocate recycled and renewable content of plastics resulting from advanced chemical recycling technologies, a mass balance approach is needed. At EU level, discussions are currently ongoing to get to the bottom of which method is the most appropriate.

There is a basic choice to make: i) allocate credits relatively freely to outputs to chemical industry's processes (credit method), or ii) allocate recycled or circular content to each unit of output proportionally (rolling average method).

The rolling average method is not preferred by the industry. Indeed, we are currently in a transition phase in which the chemical industry is still in inital phases of using alternative feedstocks for the production of chemicals. By using rolling averages, the ratio of circular to fossil feedstock would be too low initially to see any significant impact in final products.

The credit method, on the other hand, offers the possibility to rapidly - and more effectively – scale up chemical recycling's infrastructure. It allows producers to sell products with up to 100% allocated recycled content, which in itself will drive investments in the circular economy.



Scheme 5. Mass balance accounting options for post-consumer plastics

If the credit method is chosen, there are three possible allocation methods to follow:

(i) ***Proportional***, where credits can only be transferred among units of the same output;

(ii) ***Polymers only***, where credits can be freely allocated among outputs that are directly linked to the production of polymers;

(iii) ***Fuel use excluded*** / all products except fuel use, where credits can be freely allocated among all outputs that are not used as fuels.

It is important to note that these models are only in political discussion for circular feedstocks from plastic wastes and do not include -bio or other wastes.

Within both the chemicals and plastics industry[7], the fuel exempt methodology is (amongst these) a preferred option for mass balance accounting. It is estimated that this method offers the highest chances to achieve the EU's ambitious recycling and recycling content targets, whilst further driving investments into recycling. It is also the most flexible option, as it allows companies to optimally allocate recycled content to the products, depending on specific market conditions.

Other credit methods – proportional and polymer only – are often regarded as restrictive. If selected, they would hamper the acceleration of the circular economy as would lead to lower amounts of allocated recycled content. As initially these would be too low to have a notable effect, the expectation is reduction of market demand and subsequent technology progress. In addition, a recent study[8] shows that these models are looking to significantly increase costs.

3.3. What are the Benefits of the MBA?

The mass balance approach gives value to all stakeholders, from manufacturers and raw materials suppliers to policymakers and consumers. Suppliers can leverage this approach to guarantee transparency and align their practices with the overarching sustainability goals by reducing landfill and incineration while at the same time reducing dependency on fossil-based feedstock. Most importantly, consumers gain the ability to make informed choices, supporting companies that prioritise sustainability, and influencing the market towards more eco-friendly solutions.

3.3.1. Advantages of Using Mass Balance Approach Methodology

A

Avoiding Separate Production Processes: In the first place, the advantage is that different feedstocks (fossil-based and more sustainable products) may be converted in the same, existing production set-ups, thus avoiding time-consuming creation of separate production processes that would significantly raise costs and environmental impact.

B

Virgin-like Quality: The advantage of chemicals produced with a mass balance approach is that they are of virgin-equivalent quality and do not require customers to consider adaptations to their specifications to allow for sustainable content. This is why this approach is particularly well suited for the automotive supply chain, which is among the supply chains with the most stringent requirements for polyurethanes.

C

Product Differentiation: Using the mass balance approach, companies can certify their products based on the origin and sustainability of the materials used. This enables product differentiation in the market, appealing to environmentally conscious consumers seeking eco-friendly options.

D

Driving Circular Economy Practices: The mass balance approach supports the principles of a circular economy by tracing the flow of alternative feedstock throughout the supply chain. This encourages businesses to adopt circular economy practices, such as material reuse and recycling, thereby reducing waste and minimising the consumption of finite resources.

In addition to this:

E

Regulatory Compliance: The mass balance approach can help companies meet regulatory requirements and sustainability targets, for example in meeting recycled content obligations. For automotive parts manufacturers, it serves as a powerful tool to meet mandatory recycled content obligations and strategically allocate resources to achieve that goal.

3.4. Data Collection, Accounting & Certification

As explained previously, the Mass Balance Approach (MBA) is an essential chain of custody model used to track the flow of materials in the life cycle of products. It allows to have a transparent and credible system in place, to verify sustainable content in end-products. This however requires standardised procedures and independent third-party verfication. This is why comprehensive sets of sata are required, covering a products complete life cycle.

3.4.1. Types of Data Needed for Mass Balance Approach Methodology

To ensure validity of the MBA chain of custody model, a comprehensive, transparent, and accurate data collection is vital. Detailed explanation would be beyond the purpose of this brochure; nonetheless, the main data categories - from the perspective of polyurethane parts producers - are herewith outlined:

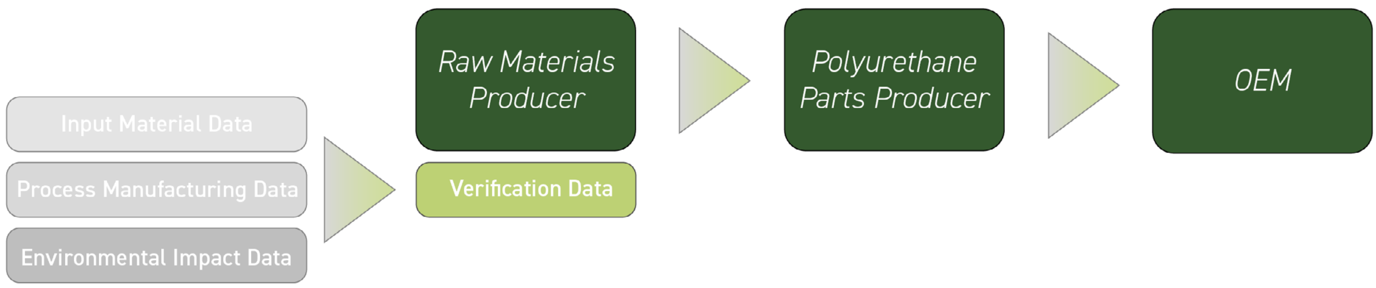
• **Input Material Data** refers to the raw materials entering a system or a process and involves tracking and quantifying the types (e.g. virgin/recycled) and amounts of raw materials used in the production process, including additives or fillers. If (for some raw materials) the MBA certificates providing data on recycled or sustainable content are available, this is taken into account.

• **Manufacturing Process Data** includes specifics on energy consumption, process efficiencies, waste generation, and emissions, during the production process itself. The goal is to provide a comprehensive account of the environmental impact associated with the manufacturing process.

• **Environmental Impact Data** is broader in scope, encompassing the overall impact of both production and product use. This category includes metrics like greenhouse gas emissions, water usage, and waste generation. It offers a holistic view of the environmental impacts associated with the entire life cycle of the product.

Every stakeholder in the supply chain needs to separately collect these types of data, which are then accounted for in the **Verification Data,** a crucial type of information (and evidence) collected to ensure transparency, credibility and accuracy of the mass balance calculations. Verification data may include measurements, records, or documentation that substantiate the quantities of raw materials, energy inputs, and outputs at various stages of the production process. Each of the existing certification schemes follow similar patterns for verifying the calculations, yet with some small differentiations depending on the intended use.

Via third-party auditing, Verification Data can then (relatively easily) be transferred to the next stakeholder in the supply chain. An example for the automotive industry is shown in the Scheme 6 below.



Scheme 6. Data collection model for the MBA, example for the automotive industry.

3.4.2. Data Collection and Measurement

Accurate data collection is vital for the successful implementation of the mass balance approach. Companies can utilise various methods to collect and measure the required data:

A

Automated Systems: Implementing automated data collection systems within the production process can ensure real-time data capture and reduce the risk of human error.

B

IoT and Sensors: The Internet of Things (IoT) devices and sensors can monitor various production parameters, providing accurate data on energy usage, material flows, and environmental metrics.

C

Supply Chain Collaboration: Collaborating with suppliers and partners to share data along the supply chain enhances transparency and facilitates the tracking of material movements.

D

Data Analytics: Advanced data analytics can be employed to process and interpret the vast amount of data generated.

3.4.3. Considerations for Data Quality and Reliability

Data quality and reliability are paramount for the credibility of mass balance accounting. Ensuring the accuracy and validity of the data involves several considerations:

A

Data Verification: Periodic data verification and validation through internal and external audits are essential to identify and correct any inaccuracies or inconsistencies.

B

Standardisation: Establishing standardised data collection and reporting protocols ensures consistency and comparability of data across different stages of the product life cycle.

C

Data Transparency: Companies should maintain transparency regarding data sources, methodologies, and assumptions used in the accounting process.

D

Independent Certification: Seeking certification from recognised third-party organisations or sustainability standards bodies provides additional assurance of data quality and reliability.

3.4.4. Importance and Providers of Certification

The typical certification process which is followed by most of the prevalent certification bodies has the following pattern; interested parties contact a certifying agency, provide them with the relevant information on their intentions and in return, receive information that many times is not publicly available, followed by a document exchange taking place between them, tailoring and preparing the necessary steps and data required for the third-party audit.

The latter audit, depending on the scheme, can occur either in a desk form or physical. The auditing procedure repeats itself every year for most of the schemes, enclosing in general the following elements: the mass balance and all relevant information such as bills of materials, material flows, processes, tools, raw materials used and products sold are checked. The total certification cost may vary among different certification systems as a total.

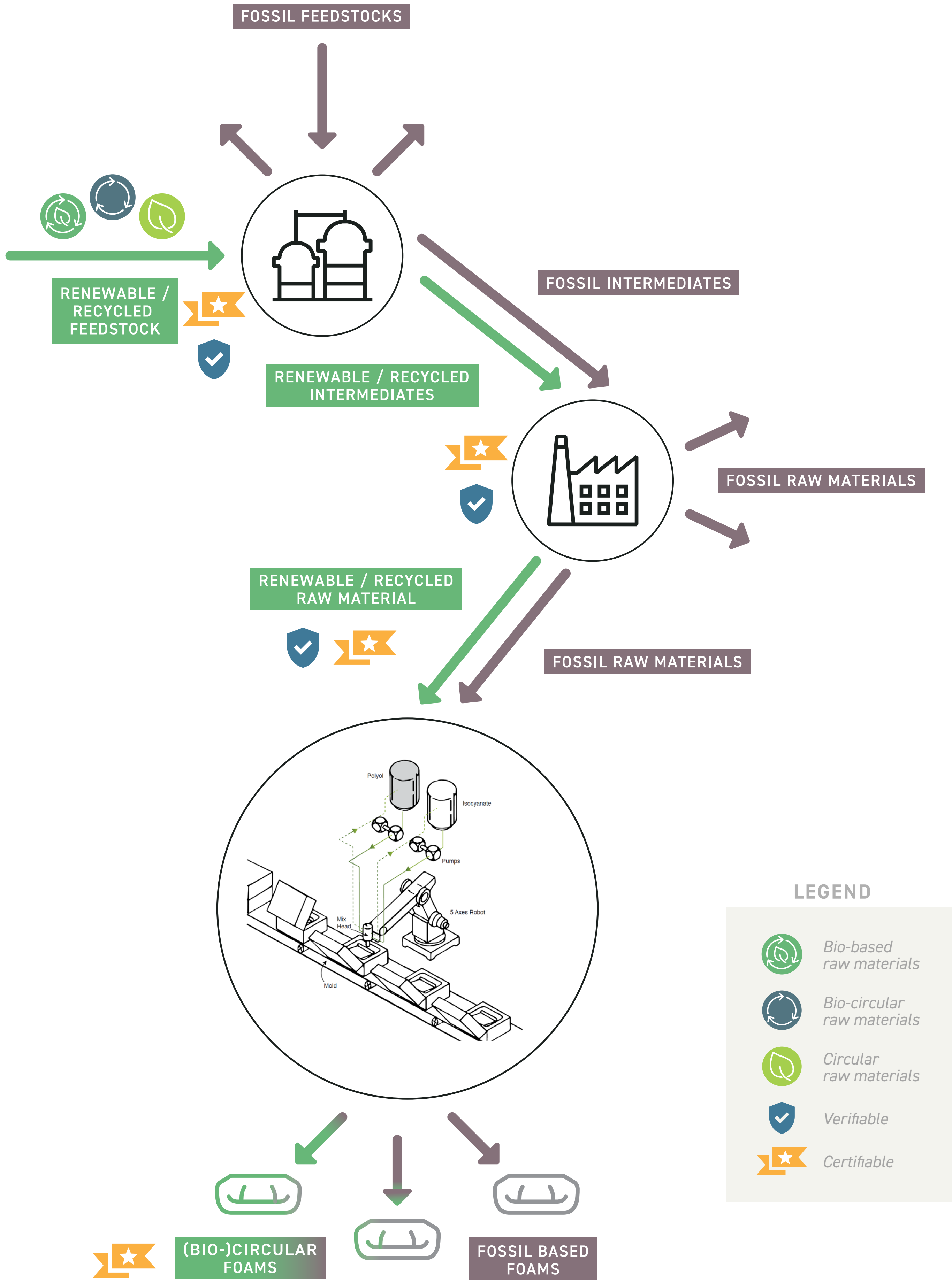
In addition to the certification provider, the fee is also dependent on the certified company's annual revenue, registered sites and/or quantity of certified materials. Usually, such schemes following the MBA have a valid time of one (1) year.

Image 4. Illustration of a certification scheme. Source: Adobe Stock.

3.4.5. Conclusions - Data Collection, Accounting & Certification

In conclusion, to ensure the MBA effectiveness, the collection and accounting of data must be accurate, transparent and reliable. Implementing robust data collection methods, maintaining data quality, and independent certification demonstrate company's commitment to sustainability and responsible environmental stewardship. Through the mass balance approach, businesses can contribute significantly to the promotion of a circular economy and reduction of the environmental impact of plastic materials.

3.5. Example - the MBA for PU Part Production



Scheme 7. Example of the MBA in PU part production

3.5.1. Industry Examples

Chemicals introduced via the mass balance approach are already used in plastics worldwide, notably in the packaging industry, but also in construction, footwear, personal care and, of course, the automotive industry.

As an example, BMW Group is using (bio)mass balanced paints for automotive coatings[9] from BASF. They report 40% CO_2 reduction per coating layer. Another major OEM, Mercedes-Benz Group, is producing door handles with virgin-like quality chemicals introduced via the mass balance approach[10]. In this process, BASF combines pyrolysis oil from end-of-life tyres and biomethane from agricultural waste.

Furthermore, Tier 1 suppliers to the automotive industry, Adient (producer of automotive seating) and Autoneum (acoustic and thermal management supplier), are incorporating Dow's SPECFLEX™ – circular mass-balanced polyol with 55% recycled content and overall better LCA - into their existing products without formulae and process adaptations[11].

Multiple automotive parts producers are currently performing trials and tests for various plastic components, with the expectation of using more chemicals introduced via the mass balance approach when the regulatory landscape becomes clear.

Some examples from other industries include LEGO Group – one of the world's most famous toys producers - who began to use sustainable materials based on the mass balance principle in 2021[12]. The Dutch multinational consumer electronics and health technology corporation Philips also uses sustainable raw materials introduced via MBA. This – and thousands of other examples from the plastics industry – can be found in the online databases of certification providers, such as ISCC[13].

In essence, these examples underscore the versatility of the mass balance approach, demonstrating its applicability across diverse industries. By striking a balance between traditional and sustainable raw materials, businesses are not only meeting the demands of the present but also ensuring a more sustainable and resilient future for the global economy.

Image 5. The matt clearcoat of the new BMW i4 M50 in Frozen Portimao Blue was produced without fossil raw materials and is based on organic waste.Source: BMW Group.

Image 6. Scrap tyres used to make new door handles. Source: Mercedes-Benz Group.

Image 7. Polyurethane solutions from recycled raw materials. Source: Dow Corporate.

Image 8. Sustainable materials used in production of Lego® products. Source: Lego.

4 CONCLUSION

This brochure aims to highlight the Mass Balance Approach (MBA) in the context of producing sustainable polyurethanes for the automotive sector, thus contributing to the EU's broader sustainability goals.

As was detailed in this document, the MBA is essentially a process-oriented method that enables tracking of the usage of bio-based, bio-circular, and circular feedstock in the production of base, virgin-equivalent, chemicals. By meticulously quantifying inputs and outputs at each stage of the production process and monitoring raw material utilisation across the value chain, the MBA facilitates the verification and certification of the entire process. This is of paramount importance in the plastics industry, as the EU is expected to introduce mandatory provisions for recycled content in plastics used in the automotive industry.

Chemicals produced from alternative feedstocks via the MBA not only match the quality of virgin equivalents but also seamlessly integrate into existing production processes that also use other feedstocks without necessitating adaptations or requalification of automotive parts. This makes the MBA an ideal solution for the automotive supply chain, which operates under stringent requirements for plastics, including polyurethanes.

In a nutshell, the MBA provides a framework for transitioning towards more environmentally responsible practices without compromising product quality. Therefore, it could be an effective solution as the EU will also look for further increased demands in order to achieve the targets indicated in the European Green Deal.

We as EURO-MOULDERS are willing to mediate this type of discussions as an independent and objective third-party body, related specifically to case of polyurethane parts used in automotive industry.

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Annex - Frequently Asked Questions

What is the meaning of mass balance?

In its widest sense, mass balance is a fundamental accounting concept, positing that within a chemical reaction no mass is lost or gained. It represents the total mass of the input and output materials, as well as the distribution of substances within all stages of the process. It is common engineering practice to have a mass balance in various industrial processes.

What is the actual benefit of using chemicals introduced via the MBA?

Manufacturers of plastic products – such as polyurethane parts/foams - will be able to confirm recycled or renewable content in their products whilst reducing the carbon footprint without massive investments. MBA chemicals are drop-in chemicals for fossil-based products. Without such mechanisms, the chemical industry will find it difficult to meet the objectives set by the legislation.

From a consumer perspective, what does ‘bio content’ refer to in chemicals introduced via the MBA?

‘Bio content’ in MBA products means that the feedstock used is partially derived from non-fossil-based sources. When consumers encounter the term "bio" on a product, they may not inherently differentiate between "bio-attributed" and "bio-sourced" distinctions. In either scenario, they are likely to perceive that they have taken a positive environmental action.

What is the difference between 'bio-attributed' and 'bio-based'/'bio-sourced' chemicals introduced via the MBA?

‘Bio-attribution’ measures the extent to which fossil fuel-derived feedstocks have been substituted by renewable or bio-feedstocks. A third-party certified audit tracks the feedstocks through the production system as they are converted into drop-in e. g. olefins.

‘Bio-based’ or ‘bio-sourced’ means that fossil-derived feedstock has been completely replaced by renewable or bio-feedstocks.

Do producers need to go through the process of re-qualifying chemicals introduced via the MBA?

It depends. Products from the mass balance approach are chemically identical to products from conventional (fossil-based) feedstock, but in some instances have a different name (at least different by a suffix), which can lead to re-qualification.

What are the feedstocks for chemicals introduced via the MBA?

Main feedstocks for MBA products are biomass (bio-circular products), vegetable oils (bio-based products) and plastic waste (circular products), which are combined with crude oil (fossil products).
Bionaphta is a byproduct of the renewable diesel which is a second-generation hydrotreated vegetable oil (HVO) product from renewable waste and other raw materials not competing with the food chain.

Are there enough alternative feedstocks to supply a mass production of PU via the MBA?

There is no clear answer to this. It depends on many factors such as overall demand, as currently only a handful of companies are using chemicals introduced via MBA only for specific products. The production process of these chemicals is the same as virgin chemicals' production process, so scaling up of production does not present a challenge. However, better waste management would need to be enforced to ensure there is enough feedstock.

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