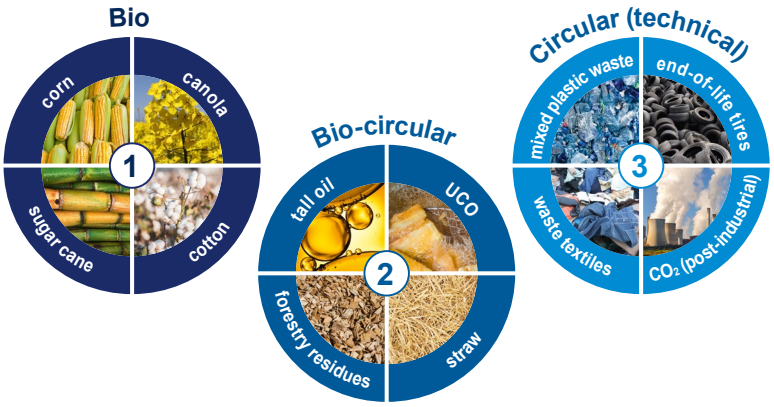
Mass Balance Approach for Polymer Production

The building blocks („intermediates“) to make polymers, e.g. naphtha, phenol and ethane are typically derived from crude oil and natural gas, i.e. **fossil-based** feedstocks.

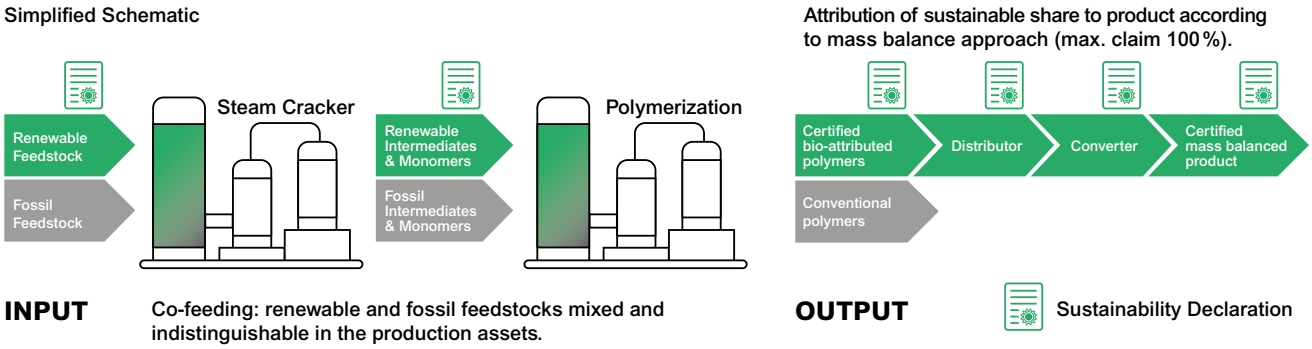
Today, however, it is possible to produce the very same building blocks for polymers from **renewable** feedstocks or even from chemical (advanced) recycling of waste polymers. Whereas **bio-polymers** are made from naturally occurring resources, e.g. corn or sugar cane, **bio-circular polymers** are made from „waste“ bio products such as used cooking oils, wood waste or kitchen waste. This „waste“ is processed into biogas and bio-naphtha which are **chemically identical** to their fossil-based counterparts.



Since it is commercially unfeasible to operate different production plants to process these differently-sourced polymer building blocks, they are mixed and processed together in the same plant – known as „crackers“ – to produce the well-known polymers we use today. Using renewable feedstocks (compared to fossil-based feedstocks) significantly reduces the emission of **greenhouse gases**. In many cases, this leads to a reduction in **Global Warming Potential** (measured in CO_2e) of more than 50 % and, depending on the specific polymer grade, more than 90 %.

So, where does the **Mass Balance Approach** come into play and why? Since it is not possible to detect the source of the building blocks used in the final polymer (remember, they are identical), the quantity of renewable feedstock used to produce the polymer needs to be „**accounted**“ for at the **input stage** – and then tracked and audited along the value chain.

The Mass Balance Approach is therefore an accounting-type system where the quantity of renewable feedstock used is **recorded** at the input stage (production) and then **attributed** (allocated) to the final product at the **output stage** (sales). The „accounting“ of renewable feedstock use is operated by issuing unique **Sustainability Declarations** (certificates) which state the quantity of renewable (**bio-circular**) feedstock **attributed** to each batch of product sold. Both the input (production) and output (sales) are recorded, verified and audited and must always be „**in balance**“ over a three-month accounting period – for all players in the **chain of custody**.



To provide transparency and trust, the Mass Balance Approach is operated and audited by **independent certification bodies**, such as ISCC PLUS and REDcert². This ensures that the actual amount of renewable feedstock used is tracked and that no more than this amount can be attributed to the final product.

The Mass Balance Approach works in a similar way to the green electricity concept. Customers pay for renewable sources of electricity, but the electricity they receive at the point-of-use, does not always come from renewable sources directly. Still, by buying green electricity, customers are contributing to a sustainable future. This also applies for buying mass balanced polymers. By buying mass balanced polymers converters, and ultimately consumers, contribute to the reduction in Greenhouse Gas Emissions and to a more sustainable future.

Head Office
ALBIS Distribution GmbH & Co. KG
Mühlenhagen 35
20539 Hamburg · Germany
T +49 40 78105 0
sustainablesolutions@albis.com
albis.com

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