# Chemical Recycling:

# Powered by Supply Chain Collaboration

**Executive summary**

Plastic waste remains a major global challenge, with only one-third of the 360 million metric tonnes produced annually being recycled. Chemical recycling offers a promising solution for processing waste that cannot be handled by mechanical recycling. However, its development is hindered by technological, economic, and infrastructural challenges. This article examines BASF's ChemCycling™ project as a case study, highlighting the crucial role of industry collaboration and investment in building a sustainable chemical recycling value chain.

**Background**

Globally, approximately 360 million metric tonnes of plastic waste are generated each year, yet only a third undergoes recycling. A significant portion of this waste is unsuitable for conventional mechanical recycling due to issues such as contamination, mixed plastic fractions of various types that are not separated, or materials like used tires that are difficult to process. Chemical recycling presents a critical opportunity to complement mechanical recycling by converting repurposing hard-to-recycle materials into reusable resources, thereby increasing overall recycling rate. However, chemical recycling remains in its early stage, facing challenges related to technology, infrastructure, supply chains, and business models.

**The challenge**

While chemical recycling has been successfully demonstrated in laboratory setting, scaling it to commercial levels remains a challenge. Various businesses worldwide are implementing different chemical recycling technologies, but one of primary barriers is the need to establish a robust value chain. This requires integration across multiple industries, including chemical manufacturing, waste management, emerging companies focused on chemical recycling technologies, and other essential stakeholders along the supply chain. Success depends on strong inter-industry collaboration, where by-products from one company or sector become valuable inputs for another (Saavedra et al., 2018; Bruel et al., 2019; Marques-McEwan et al., 2023).

**Results obtained at CircularChem**

To address these challenges and promote a more circular economy for these "unrecyclable" plastics, our team conducted a case study conducted on BASF's **ChemCycling™ project**[1]. BASF is committed to providing circular solutions by reducing waste and decoupling growth from fossil resource consumption, thereby helping to reduce emissions.

1 https://www.basf.com/global/en/who-we-are/sustainability/we-drive-sustainable-solutions/circular-economy/mass-balance-approach/chemcycling.html

**ChemCycling™** has established a network of partners to capture and chemically recycle different waste streams (e.g., mixed plastics, tires) into virgin-grade products. BASF's first target is to scale up production and process 250,000 metric tons of chemically recycled material by 2025, with plans to maintain this processing level annually from 2025 onwards. Achieving these ambitious targets depends on several key factors, primarily the quality and availability of feedstock from various waste stream. However, waste collection and processing vary significantly worldwide, influenced by differing standards, technologies, and infrastructure. In addition, most chemical manufacturing plants have long been designed and optimised for processing fossil fuel feedstocks, making substantial investments necessary for adaptation.

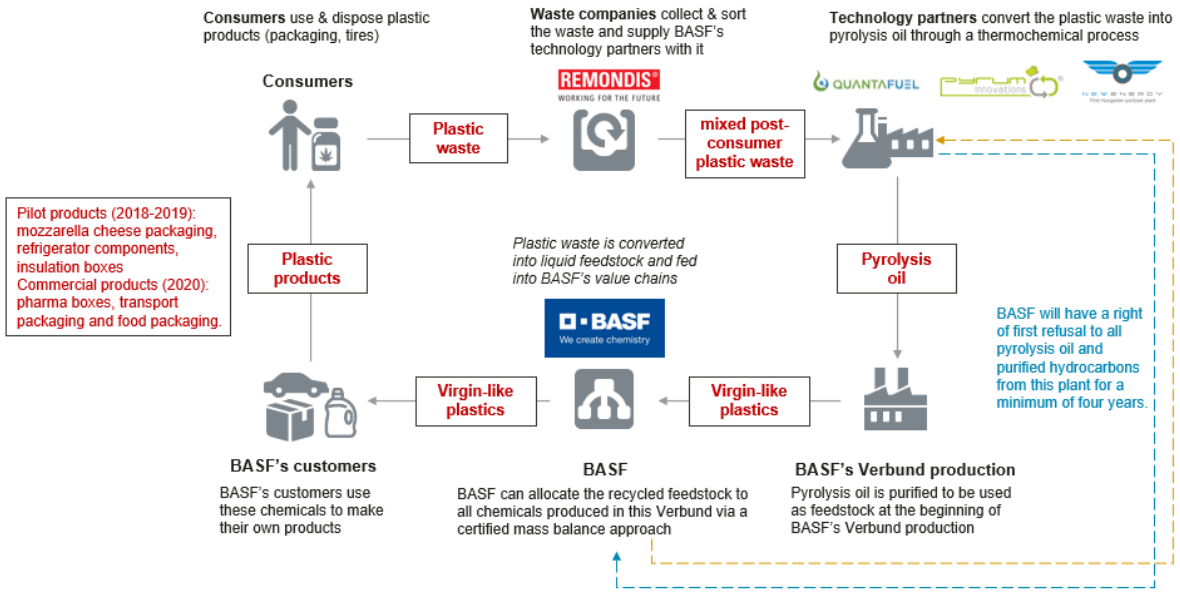


**Figure 1.** BASF ChemCycling Programme.

Note: The figure is made by the authors based on information collected from public sources.

To create a stable value chain, BASF has strategically invested in building a broad supply base for pyrolysis oil through partnership and investments in pyrolysis specialists, Pyrum, New Energy, and Quantafuel. Figure 1 illustrates the key steps and main participants of BASF's ChemCycling process. The process begins with the collection and sorting of post-consumer waste by waste management companies. This waste is then converted into pyrolysis oil through a thermochemical process. This oil is purified and integrated into BASF's integrated chemical production network, replacing fossil feedstocks through a

third-party audited mass balance approach. The resulting products are certified to possess the same quality and properties as those derived from fossil oil. BASF has already introduced pilot products across various industries, including refrigerator components, insulation boxes, pharma boxes, transport packaging and food packaging.

**Wider implications and working with partners**

Accelerating chemical recycling requires collaboration across multiple companies rather than relying on a single firm (Marques-McEwan et al., 2023). This case study highlights the importance of building a strong value chain through strategic partnerships with key participants.

BASF has strategically invested in its technology partners to ensure the supply of pyrolysis oil. For instance, Pyrum secured a EUR 25 million corporate loan from BASF to expand its project pipeline, followed by an additional EUR25 million under corresponding conditions[2]. This collaboration ensures a reliable pyrolysis oil supply for BASF while providing Pyrum with the financial resources needed to build new plants, increase production capacity, and strengthen its market position. Another notable example is that BASF has signed a joint agreement with REMONDIS and Quantafuel. As one of the world leading waste management companies, REMONDIS can ensure the sufficient supply of feedstock for pyrolysis oil production[3]. This agreement resolves the uncertainty of feedstock supply.

The BASF case study demonstrates how companies from different industries (waste management, petrochemical, technology industries) can work together to develop viable alternatives to fossil-based plastics. Technological advancements, strong industry collaboration and financial commitment are essential for enabling chemical recycling. Existing large companies like BASF are well-positioned to drive progress in this field, leveraging their resources and expertise to build a resilient value chain. Their investments not only accelerate the development of new technologies and businesses but also contribute to their own decarbonization goals and create new value streams.

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[2] https://www.pyrum.net/en/ad-hoc-announcements/basf-supports-pyrum-in-the-financing-of-the-current-rollout-plan-with-an-amount-of-at-least-25-million-eur/

[3] https://www.basf.com/gb/en/who-we-are/sustainability/whats-new/sustainability-news/2021/basf-quantafuel-and-remondis-want-to-cooperate-on-chemical-recycling-of-plastic-waste

For circular practices to be effectively implemented, all stakeholders need to develop a clear understanding of the broader ecosystem and their role within it. Ensuring a fair distribution of benefits and risks among key stakeholders will enhance the resilience of the value chain and foster long-term collaborations (Xu et al., 2025). Ultimately, scaling up chemical recycling to a commercial level will help produce more sustainable alternatives to conventional petrochemical-based products.

**References:**


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