

A man with a beard, wearing a yellow hard hat with the BASF logo and safety glasses, is smiling and looking to the right. He is wearing a blue work jacket over a light blue shirt. He is holding a clear plastic bottle with a blue and yellow cap, containing a yellow liquid. The bottle has a white label with the text 'Naphtha' visible. The background is a blurred industrial setting with metal structures and pipes.

Chemical recycling

A key element of a
circular plastics economy

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Kepler Cheuvreux – Digital Field Trip

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 **BASF**

We create chemistry

Cautionary note regarding forward-looking statements

This presentation contains forward-looking statements. These statements are based on current estimates and projections of the Board of Executive Directors and currently available information. Forward-looking statements are not guarantees of the future developments and results outlined therein. These are dependent on a number of factors; they involve various risks and uncertainties; and they are based on assumptions that may not prove to be accurate. Such risk factors include those discussed in Opportunities and Risks on pages 158 to 166 of the BASF Report 2020. BASF does not assume any obligation to update the forward-looking statements contained in this presentation above and beyond the legal requirements.

Our key sustainability targets



Climate protection

- Reduce our CO₂ emissions¹ by 25% by 2030²
- Achieve net zero CO₂ emissions¹ by 2050

Sustainable product portfolio

- Achieve €22 billion in Accelerator sales by 2025

Circular economy

- Process 250,000 metric tons of circular feedstock annually by 2025
- Double circular sales to €17 billion by 2030

We create chemistry for a sustainable future

Aside from chemical recycling, we already have many products and solutions which help close or extend the plastics materials loop



Infenergy® – footwear material extending lifetime of shoes



Ecovio® – compostable polymer for agricultural mulch film



Joncryl® MB – Resins from renewable raw materials



Tinuvin® NOR® 356 – light stabilizer for increased longevity



trinamiX® – mobile spectroscopy solution to identify plastics



Petra® – polyester based on 100% recycled PET

Plastics production needs to adapt to a changing legislative environment

Highly efficient production of high-performance plastics

- Optimized system over 50 years
- Crude oil based
- Large variety of specialized plastics for demanding applications



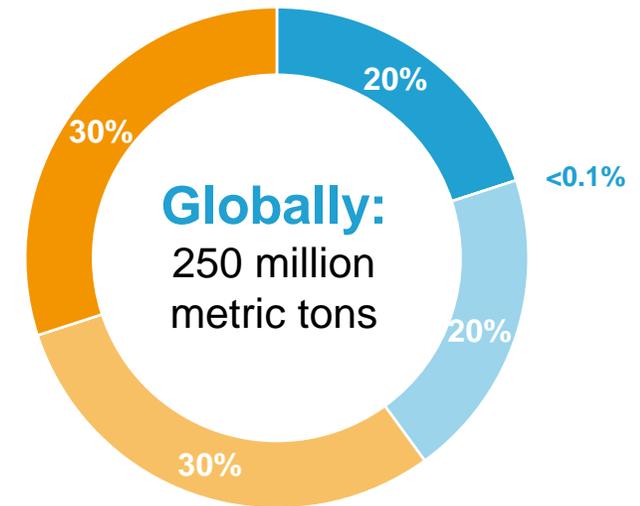
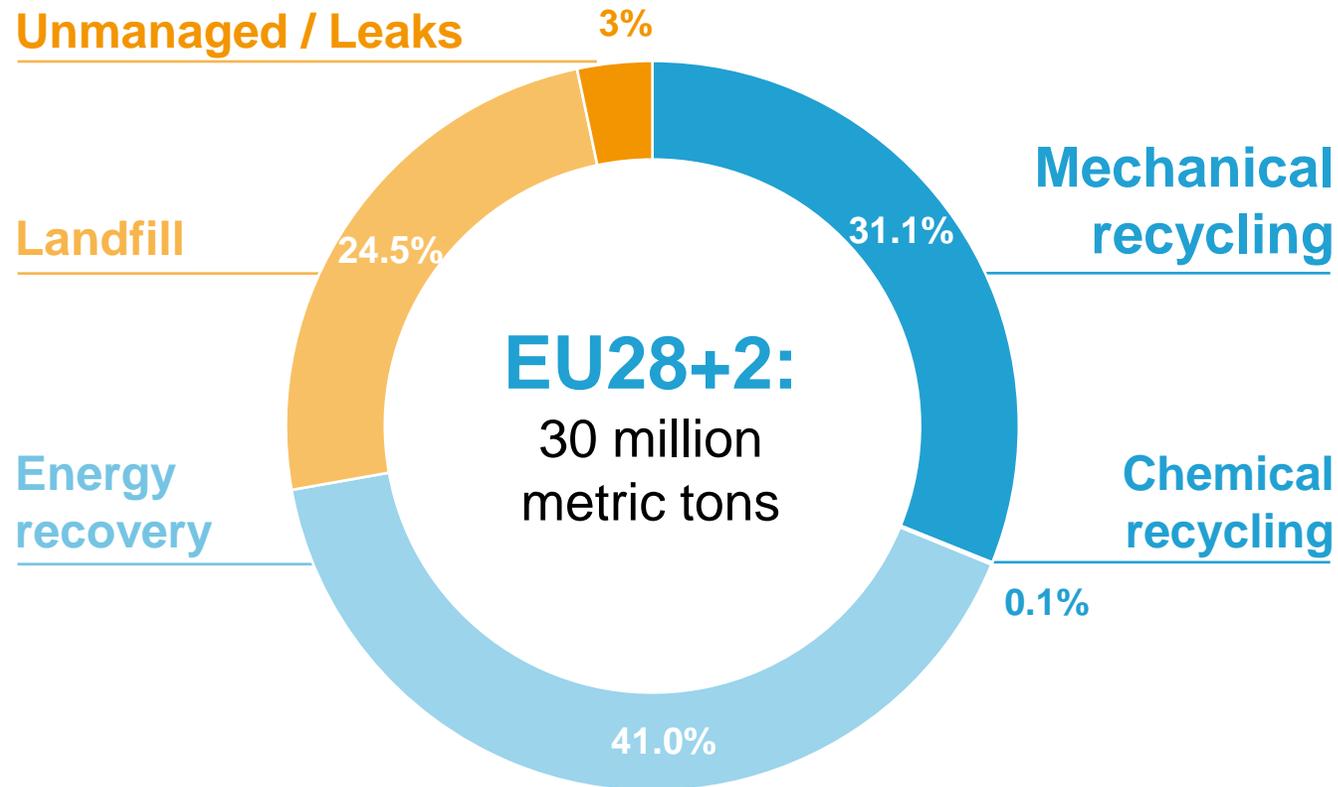
Challenges

- **Public pressure** to reduce plastic waste (marine littering, landfill)
- Ambitious **legislation targets**
 - ▶ Reduce GHG emissions
 - ▶ Increase recyclability of plastics
 - ▶ Increase recycled content in plastics

Chemical recycling can handle the challenges while maintaining process efficiencies and plastics performance

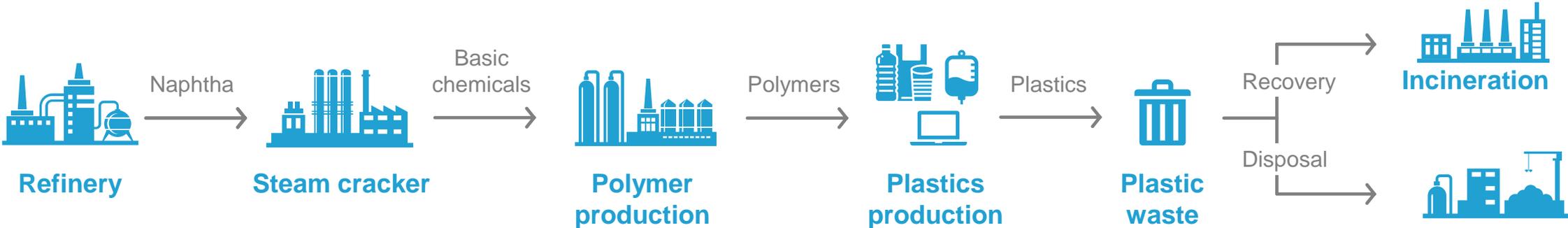
Today's recycling landscape for plastic waste

Fate of 30 million metric tons of plastic waste generated in EU28+2 in 2018

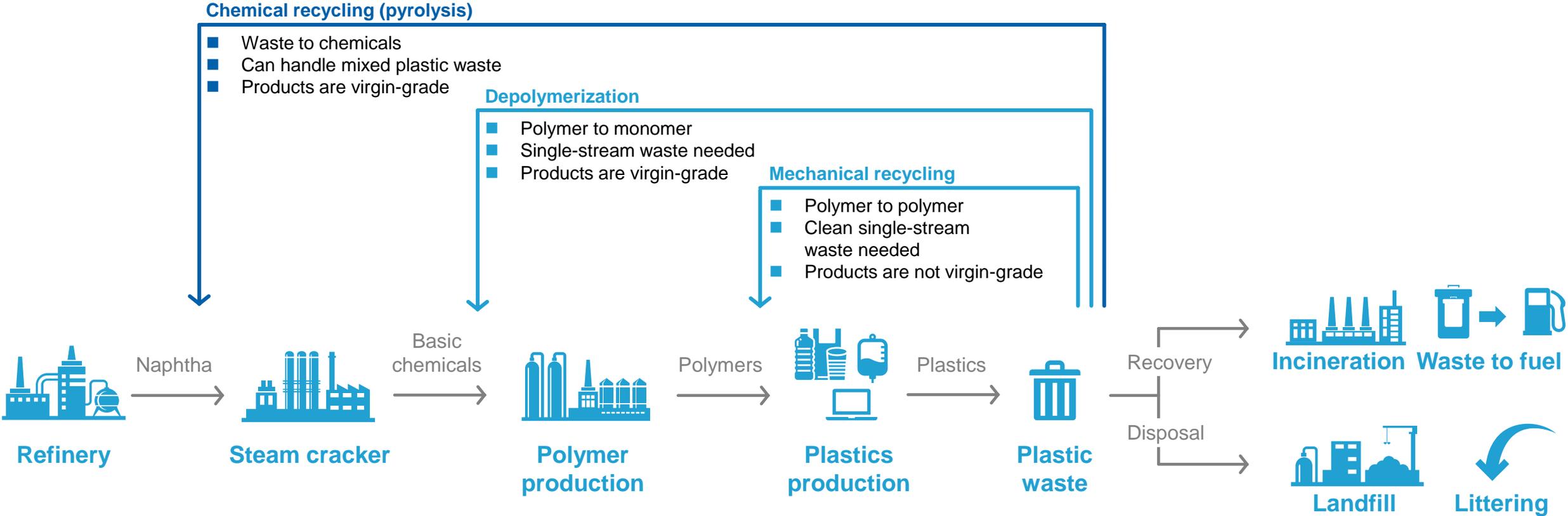


Only one third of all plastic waste is kept in the materials cycle in EU28+2

The plastics value chain



Chemical recycling complements mechanical recycling and can contribute significantly to achieving EU recycling targets



Chemical recycling is one of many measures needed to reduce fossil resource consumption and to achieve a world free of plastic waste

BASF's ChemCycling™ project is breaking new ground in plastics waste recycling



BASF cooperates with Quantafuel, Pyrum and New Energy to develop chemical recycling as a business



- Pyrolysis of **mixed plastic waste**
- Start-up of plant in September 2020
- BASF supports further development of Quantafuel's technology towards optimizing the output for the use as feedstock in chemical production



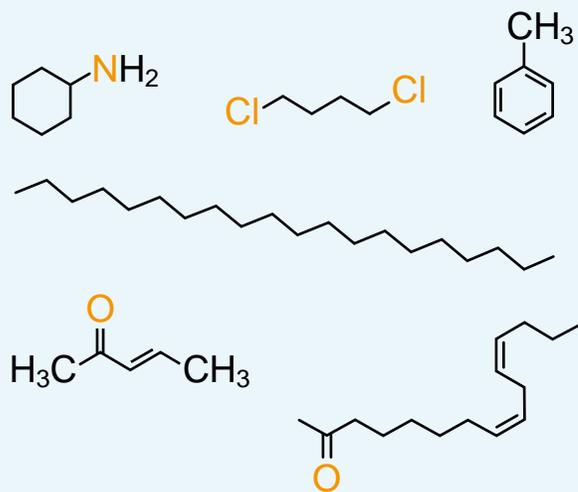
- Pyrolysis of **end-of-life tires**
- One production line in operation after 10+ years of optimization
- Ready for roll-out of technology, planning to build additional production lines with partners



- Pyrolysis of **end-of-life tires**
- One plant in operation after almost a decade of optimization
- Feasibility study underway that targets the adaption of New Energy's technology to the conversion of other plastic waste streams

Together with Quantafuel, BASF develops purification catalysts for their technology

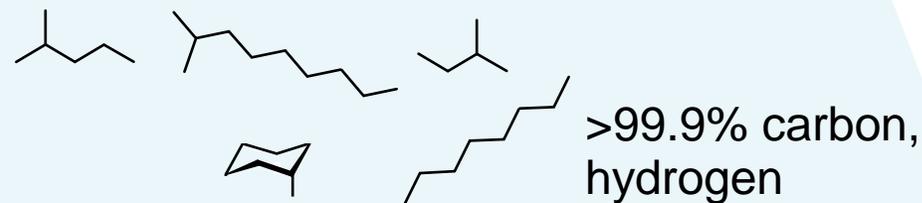
Pyrolysis feed



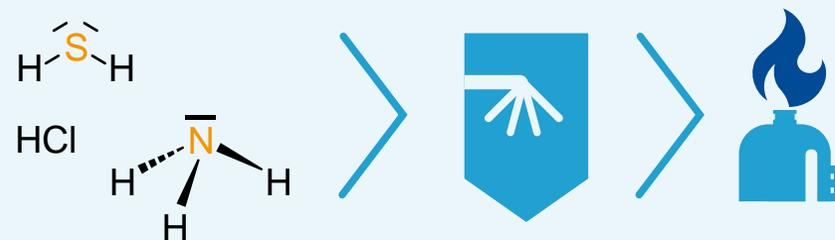
Purification catalysts



Purified pyrolysis oil



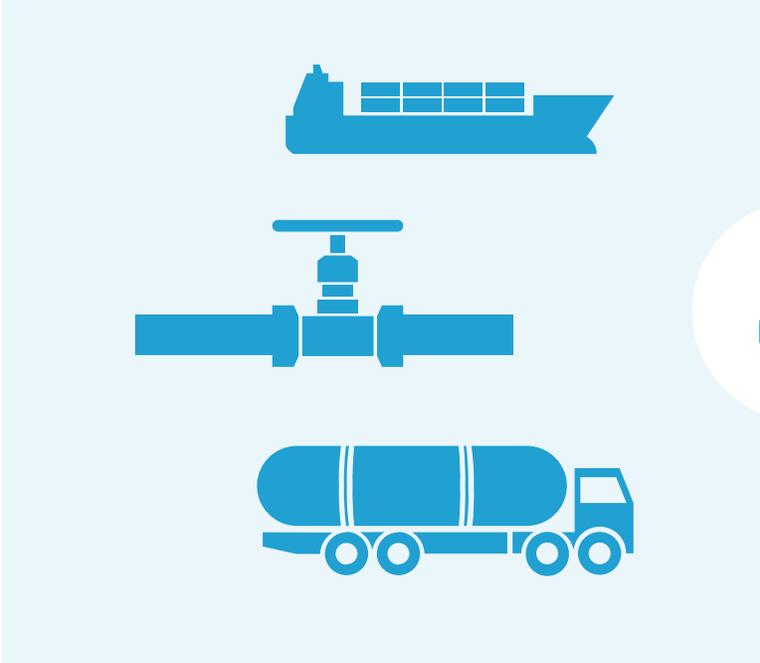
Contaminant stream



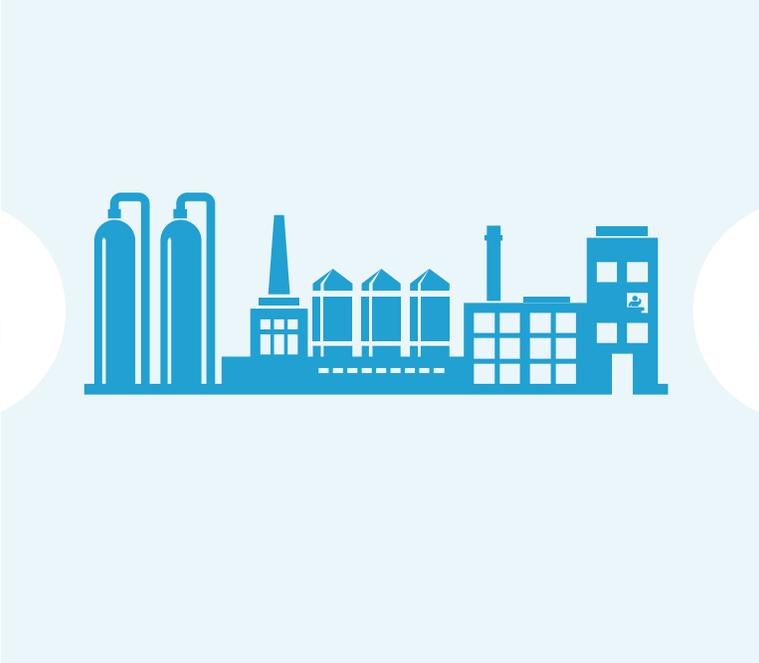
- Waste plastic feedstock contains a variety of chemical structures and a significant number of heteroatoms, e.g., chlorine, nitrogen and oxygen.
- These are undesirable in pyrolysis oil as they cause corrosion, create safety risks or poison process catalysts.

Chemical recycling broadens BASF's feedstock base and leverages the Verbund concept

Flexible feedstocks



Verbund concept



Mass Balance concept



BASF can allocate new feedstocks to the most attractive applications combining its unique Verbund and Mass Balance concepts

We continuously expand our portfolio of products based on chemically recycled feedstocks

- Currently, BASF already has 40 independently certified sales products with an allocated share of recycled raw materials in its portfolio
- With Hexamoll® DINCH Ccycled™, BASF recently launched its non-phthalate plasticizer based on feedstock derived from previously non-recycled plastic waste
- Ccycled™ plasticizers contribute to the recycling of plastic waste



Next steps in BASF's chemical recycling partnerships



ChemCycling™ is a key contributor to BASF's commitment to use 250,000 metric tons of recycled feedstock annually by 2025.

Regulatory support for chemical recycling needed

- Chemical recycling **needs to count towards recycling targets**
- **Incentives** for recycled content should apply to all kinds of recycling
- **Acceptance of mass balance approach:** mass-balanced recycled content should be supported to the same extent as single-sourced recycled content

Technology-open definition of recycling is key to address the plastic waste problem



Summary

- ▶ Chemical recycling can handle the challenges ahead of today's plastics production, while maintaining **process efficiencies and plastics performance**
- ▶ Chemical recycling is **complementary to mechanical recycling** and is needed to achieve EU recycling targets
- ▶ Challenges regarding the **acceptance and technology** need to be tackled
- ▶ **Life cycle analysis** demonstrates that chemical recycling is a sustainable way to close the recycling loop for plastics
- ▶ Today's **capacities and quality of pyrolysis oil** are by far **not sufficient** to meet the demand
- ▶ **Cross-industry cooperation** and **continuous investment** in chemical recycling capacities and technology are required





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