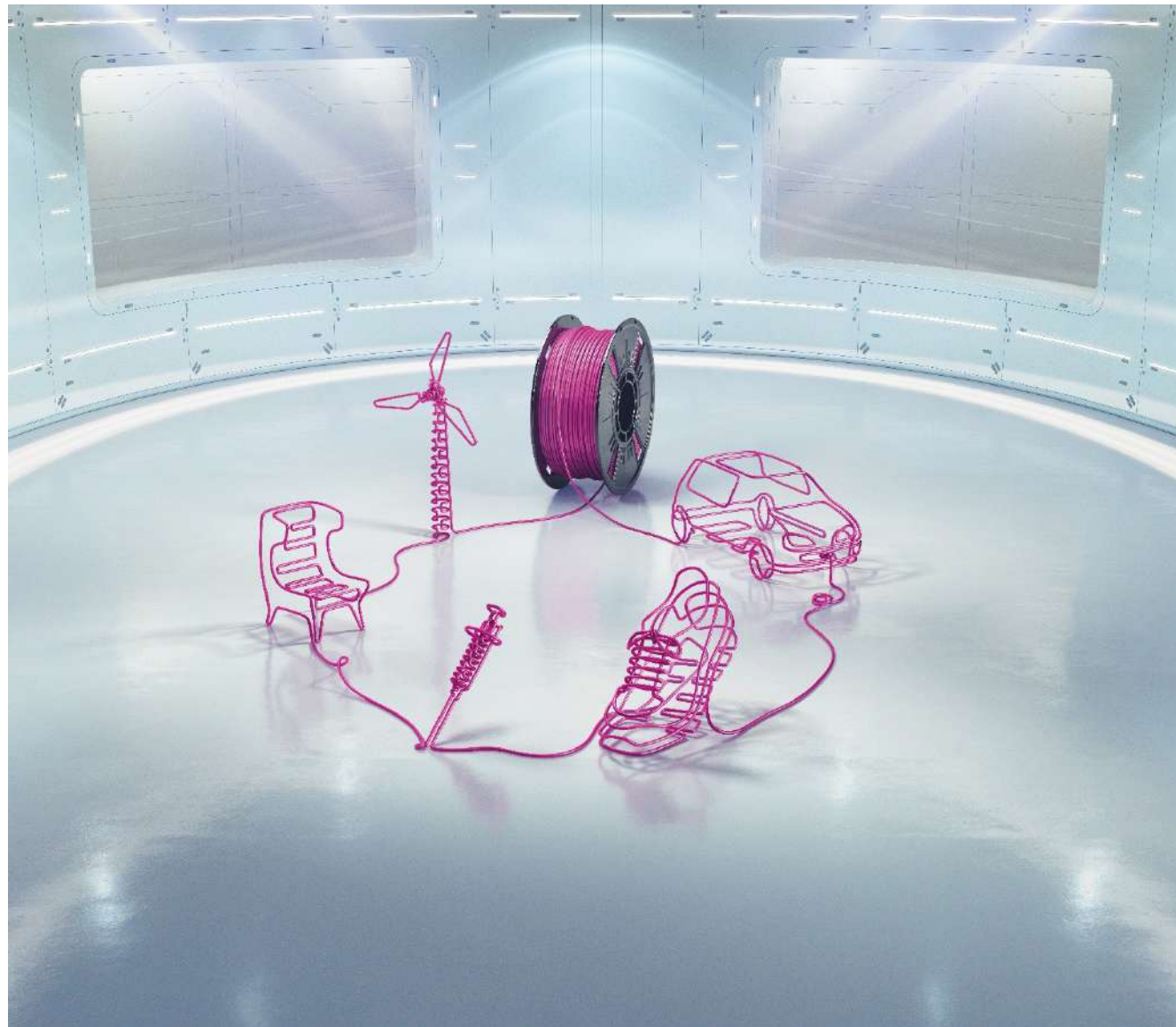


Sustainable Materials –Crucial for Recycling and Circular Economy

The Role of Specialty Chemistry for Circularity and Sustainable Materials

German-Japanese Business Seminar
Tokyo, September 14th, 2022

Dr. Florian B. Kirschner, Evonik Japan,
President



Evonik: A clear structure, focused on our core markets – 2021



Specialty
Additives



Nutrition &
Care



Smart
Materials



Performance
Materials



Technology &
Infrastructure

>33,000
employees

€15 billion sales*
€2.4 billion adjusted EBITDA*

€464 mio
R&D expenses

* fiscal 2021

Who we are

Evonik Group in Japan at a glance

>420

Employees as a Group in Japan

5 sites

Production / compound plant

4 JVs

Developed together with Japanese partners

>50 years

Experience in Japan

No. 1

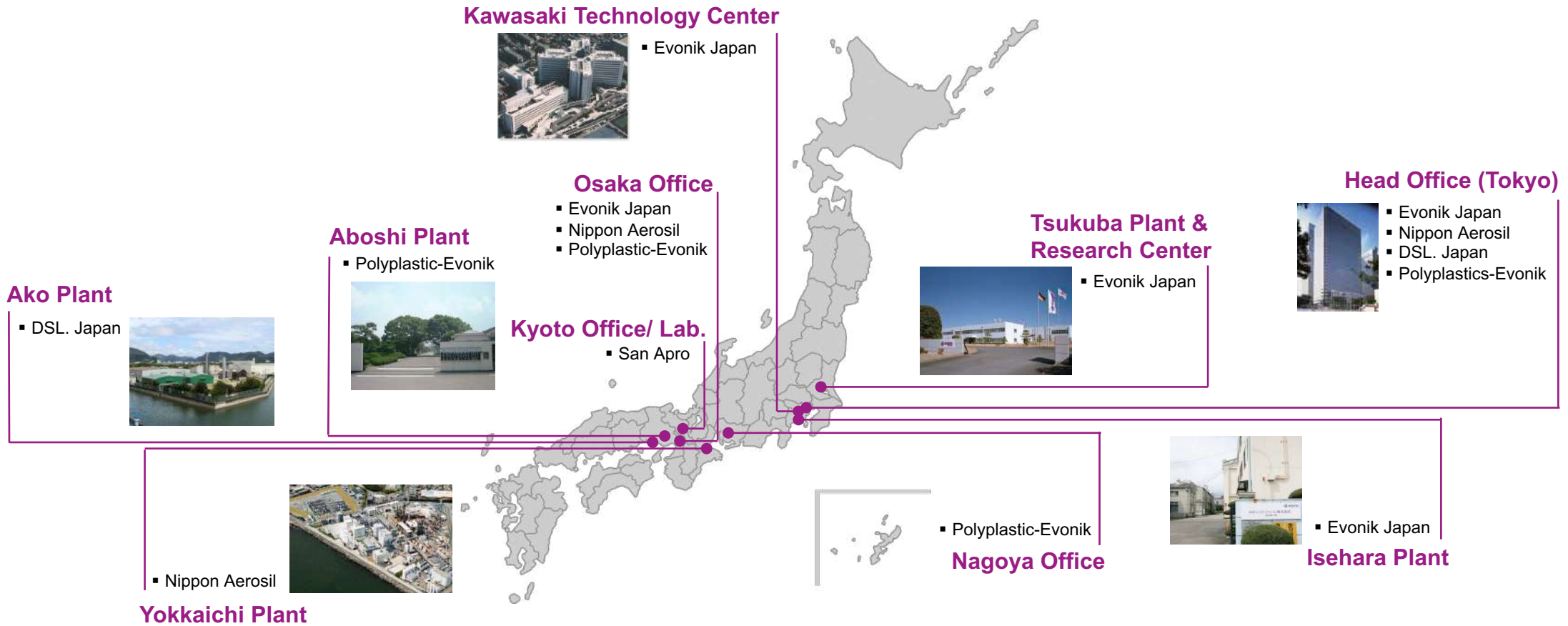
Largest Silica production plant in Asia (NAC Yokkaichi)

4 locations

Product development / technical centers

Locations

Proximity to markets



With our specialties we enable to reduce the consumption of resources



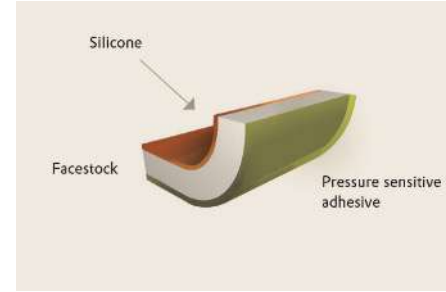
Tires

MORE FUEL-EFFICIENT



Plastics

HIGHER DURABILITY



Liner-less labels

LESS WASTE



Mono-material packaging

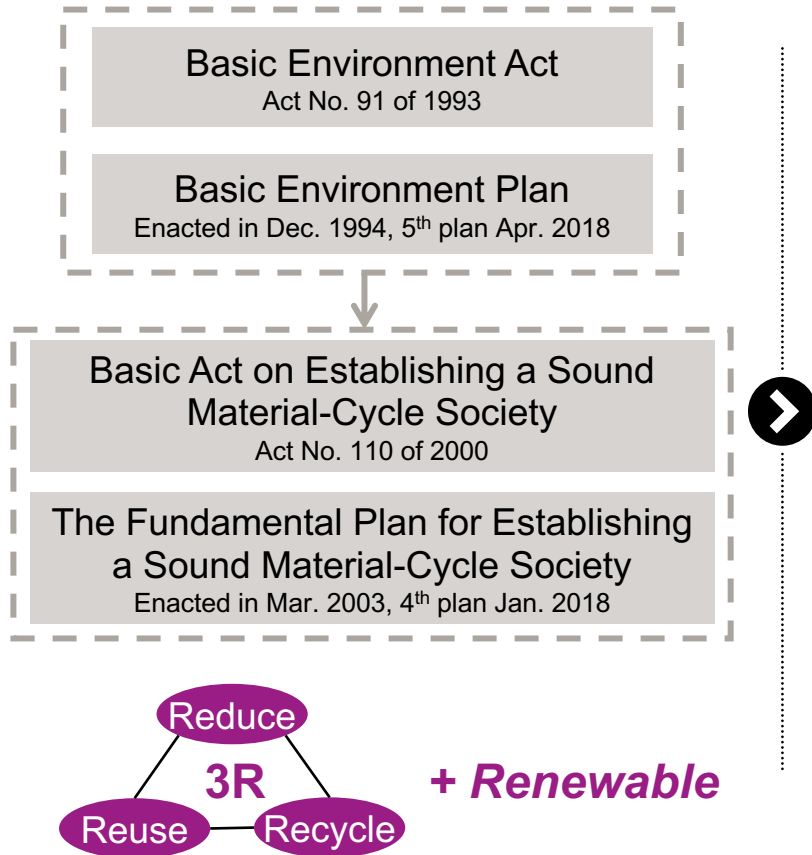
DESIGN FOR RECYCLING

Circular Economy Action Plan: comprehensive approach to decoupling economic growth from resource use



plastics related topics covered by Circular Plastics Alliance (CPA)

Circular Economy in Japan: Started as environmental activity, then transferring to important piece for sustainable economical growth

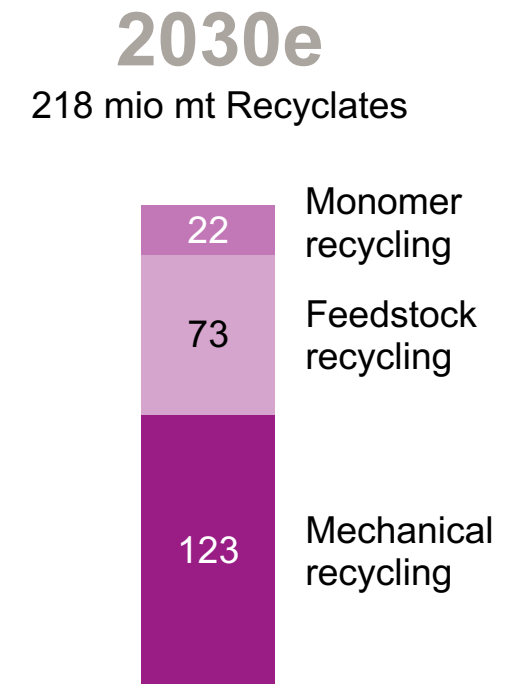
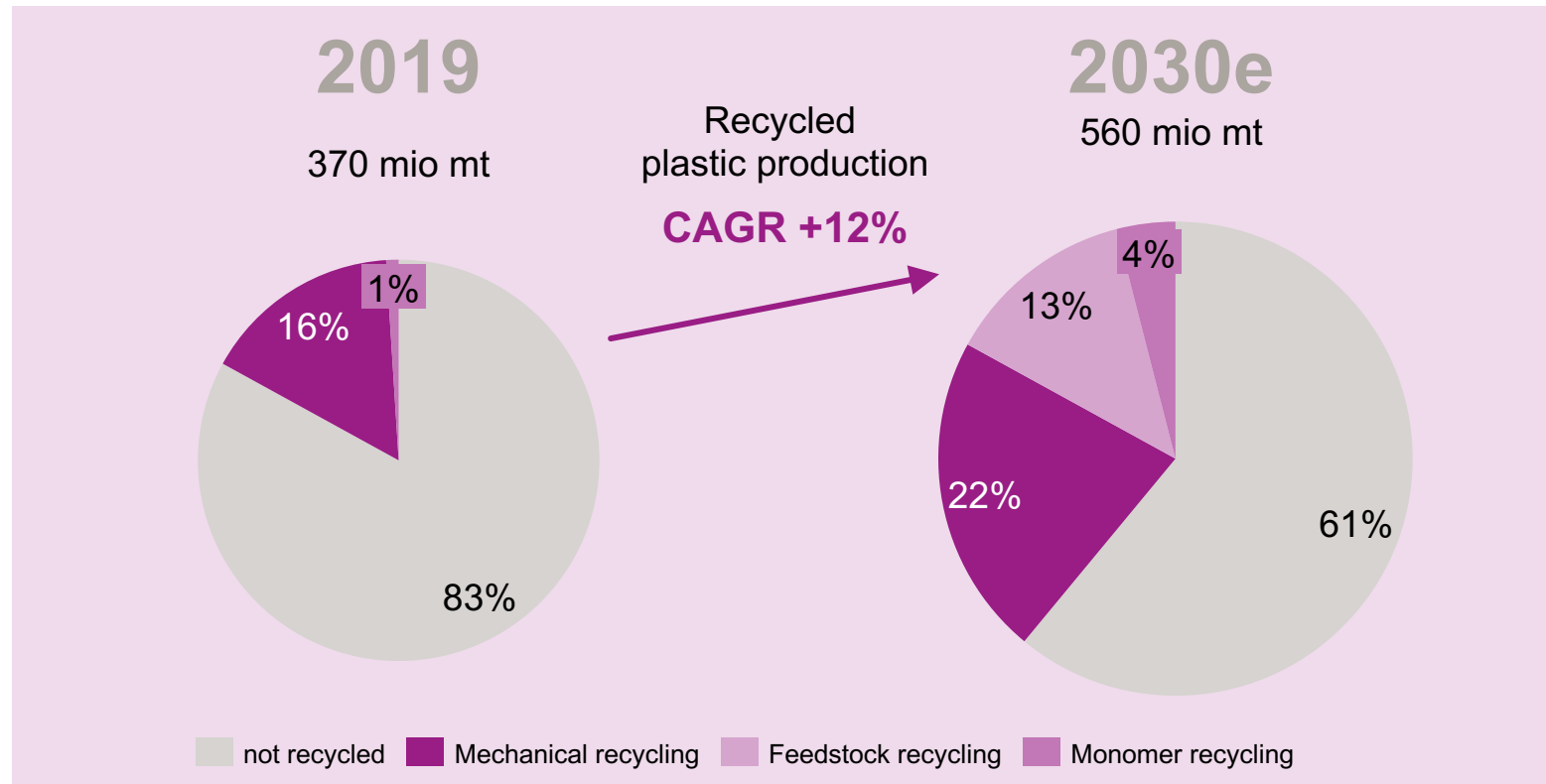


Fundamental Plan is a basis of specific strategy/ vision of circular economy for concrete measures

- **Resource Circulation Strategy for Plastics (2019)**
 - Reduce **one-way package**/ product
 - Develop and use **plastic alternative**
 - Strengthen DfE (design for environment)
 - Stimulate **bioplastic** usage
 - Measure against **marine plastics**
- **Circular Economy Vision (2020)**
 - Involve **all players** from market, society industries and **investors** with their own role and function
- **Specific measures**
 - Act on Promotion of Resource Recycling related to Plastic (2021)
 - Bioplastic Introduce Roadmap (2021)
 - Disclosure & Dialogue Guidance for Promoting Sustainable Finance (2021)

Plastics will grow significantly – Circular feedstock will replace Fossil feedstock

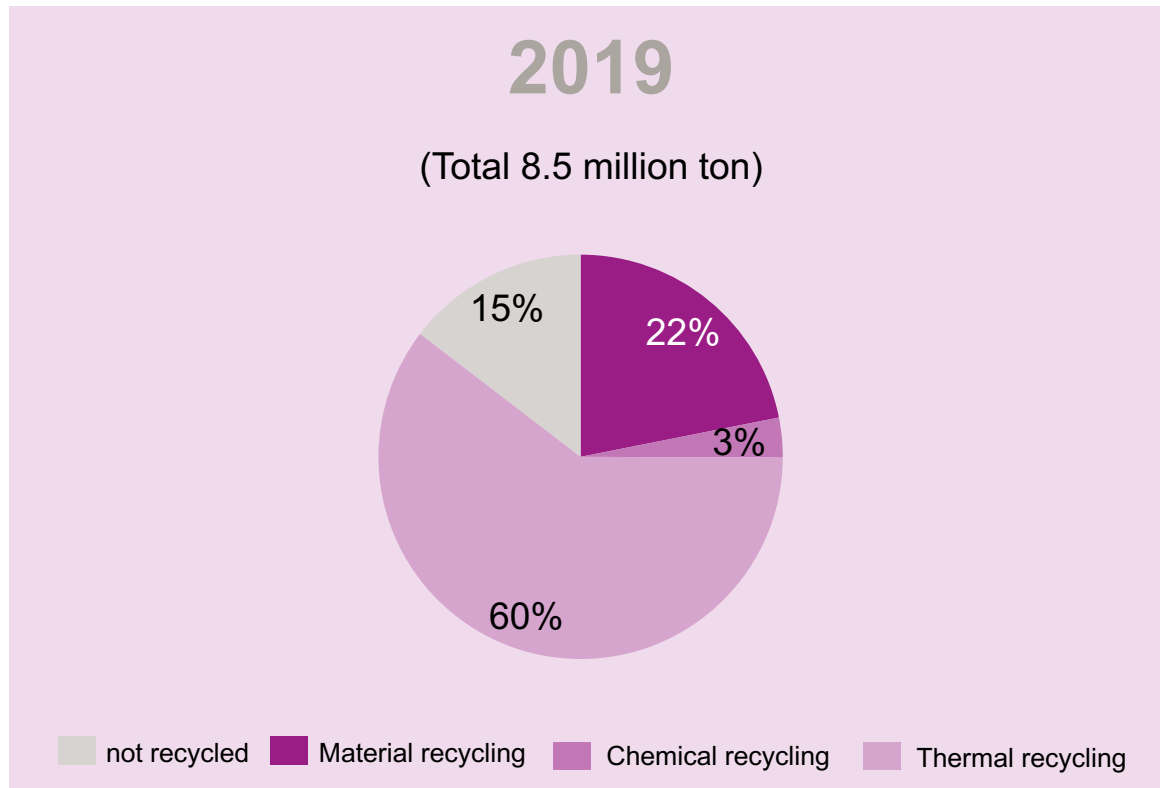
From technology perspective, mechanical & feedstock recycling are considered to generate the biggest profit-pool growth



¹ Sources Mck: How plastics-waste recycling could transform the chemical industry; Plastics Europe 2021

Plastics will grow significantly – *Circular* feedstock will replace *Fossil* feedstock – Japan Perspective

From technology perspective, mechanical & feedstock recycling are considered to generate the biggest profit-pool growth



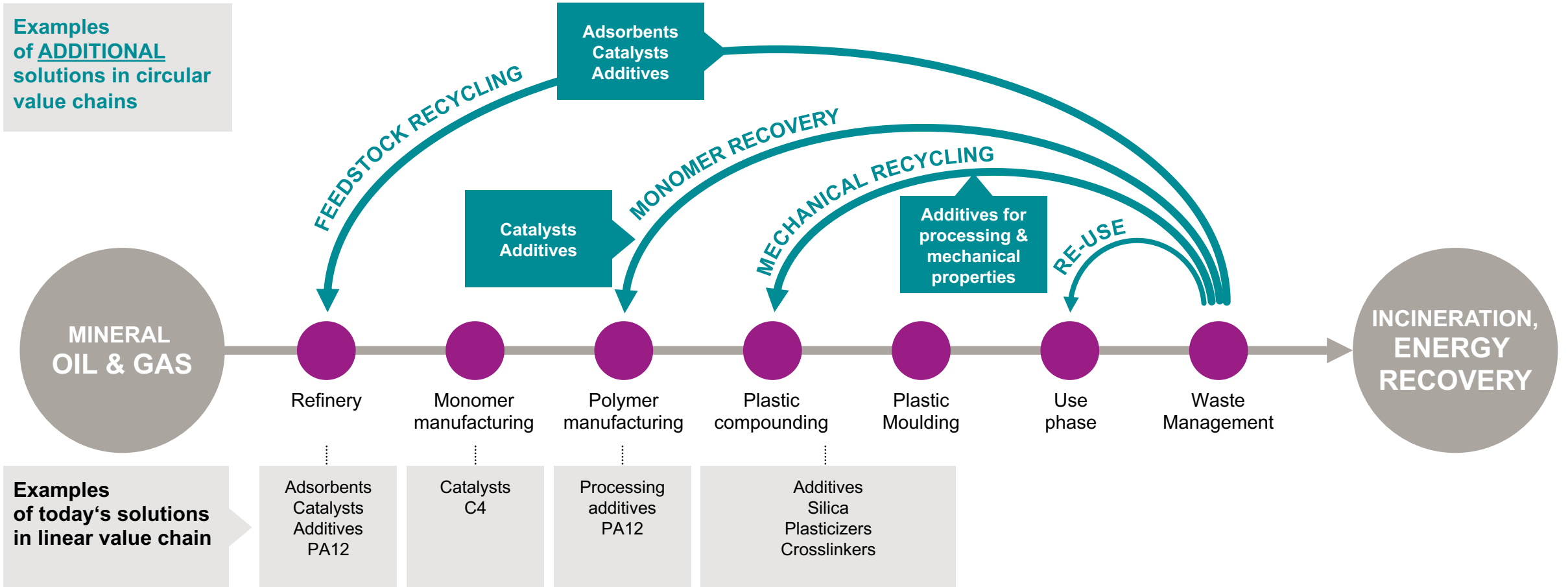
2025~

“Resource Circulation Strategy for Plastics” formulated on 31. May 2019 set Milestones for Reuse/Recycle:

- Achieve design for plastic packaging and containers to be reusable and recyclable **by 2025**
- 60% rate of reusing/recycling for packaging and containers **by 2030**
- 100% effective utilization of used plastics **by 2035**

Sources: Plastic Waste Management Institute <https://www.pwmi.or.jp/data.php?p=panf>,
Ministry of the Environment Government of Japan <https://plastic-circulation.env.go.jp/about/senryaku>

Evonik provides solutions along the entire Circular Plastics Value Chain. With our Specialties we help our clients to keep plastic in the loop.



Circular Plastic Solutions are strongly driven by Consumers pull



Circular Plastic Solutions are strongly driven by Consumers pull Japan Perspective



The most sustainable way of managing waste? Avoid it !



ENHANCING LIFETIME

HIGHEST PERFORMANCE AND
DURABILITY WITH TOUGHENERS

BEST WEATHERING RESISTANCE
WITH ALIPHATIC CROSSLINKERS

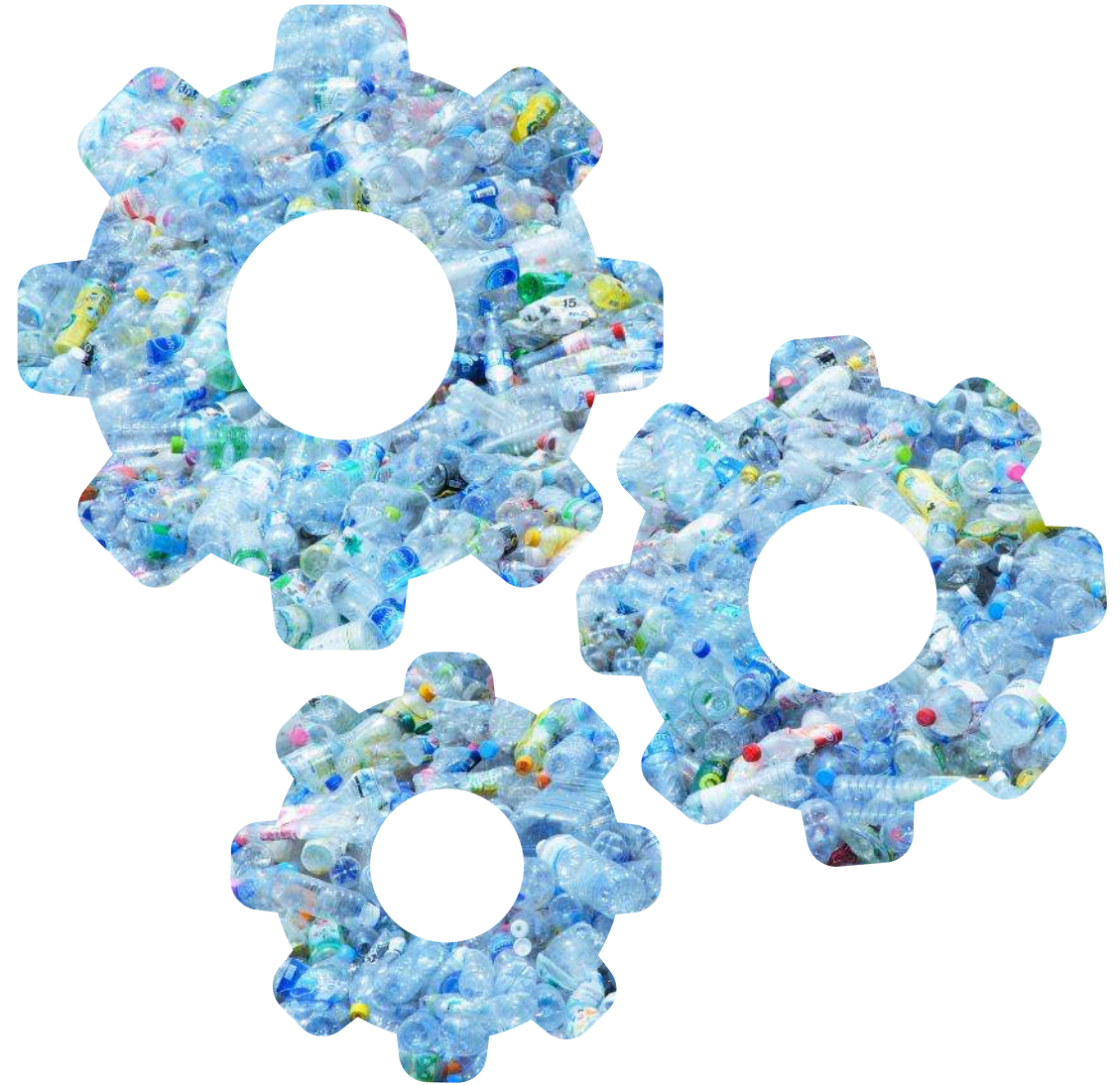
Avoiding waste is not always possible – and here we need to take care of it



WE PROVIDE SOLUTIONS
TO ENABLE
SUSTAINABLE
PLASTIC
APPLICATIONS
AT COMPETITIVE COSTS
AND QUALITY

MECHANICAL AND CHEMICAL RECYCLING & RUBBER RECYCLING

- Providing technologies and services to recover valuable resources from disposed materials
- Additives for performance upgrade
- Additives, catalysts & expertise for efficient processing



No product is so perfect that it has not once to be recycled.



Thermoplastic
plastic waste

**ADDITIVES FOR
MECHANICAL
RECYCLING**



EoL Tires

**ADDITIVES FOR
RUBBER
RECYCLING**



Defined polymer
waste

**CATALYSTS FOR
MONOMER
RECOVERY**



Mixed plastic
waste

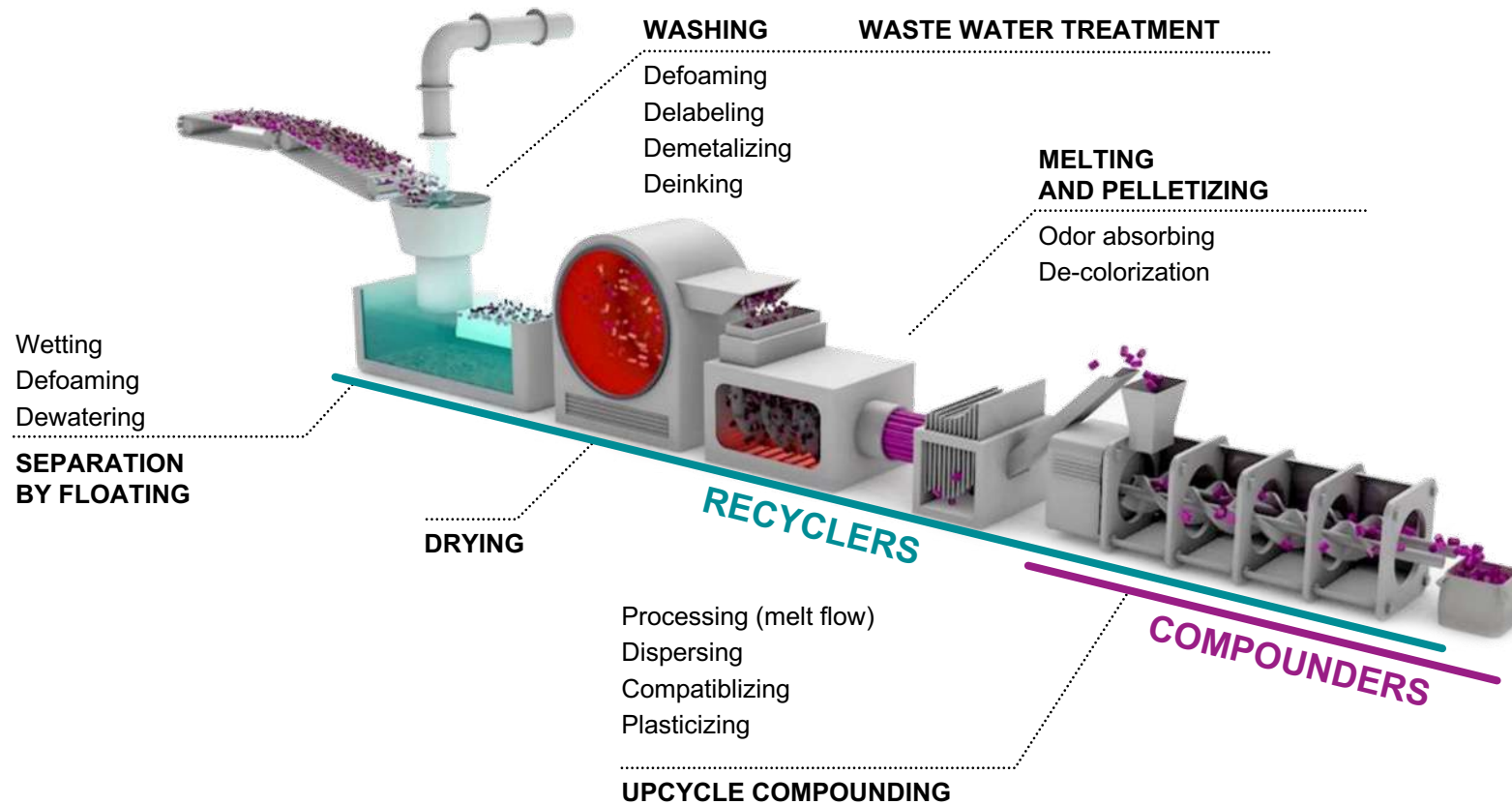
**ADDITIVES &
CATALYSTS FOR
SYNGAS/
PYROLYSIS**



Together with
our partners we
develop solutions.

LET'S TALK

Mechanical Recycling: Our additives help along the entire process to convert plastic waste into plastic goods



Mechanical Recycling



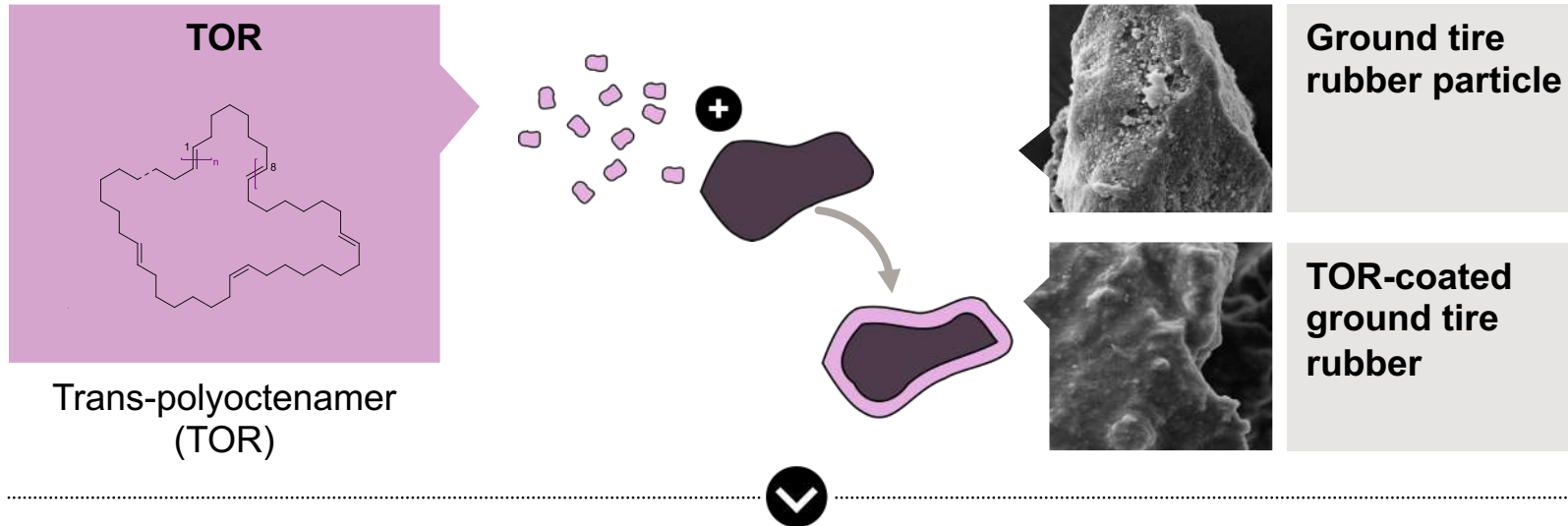
For Recyclers

- Additives in separation / washing steps make recycling processes **more efficient**
- Additives and odor absorbers directly **increase the quality and yields** of recyclates for upcycling purposes

For Compounders

- Additives to improve processing and polymer properties leading to **competitive costs and quality**, and enabling **higher recycled contents**

End-of-Life Tire recycling: VESTENAMER technology to enable multiple circular rubber applications



End-of-life tire recycling



- Best processing and compatibility with highest circular rubber contents for competitive & quality
- Broad portfolio of silica, silanes, liquid polybutadienes for further modification
- We help to qualify the ground tire rubber for your specific sustainable application¹

¹ LCA available



Road construction



Molded products



Rubber blends

Recycling of Mattresses

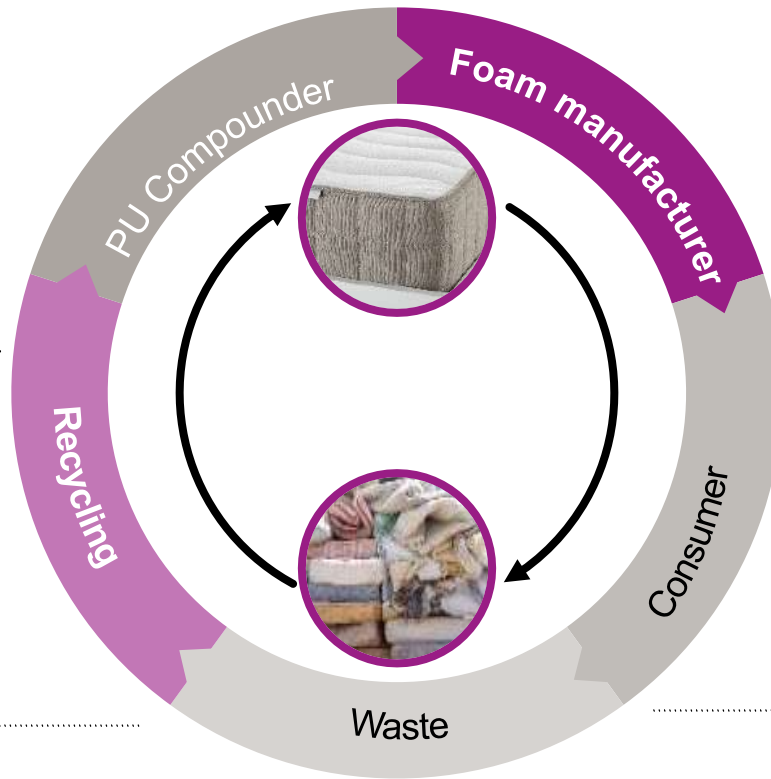
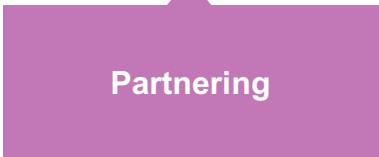
A great approach towards Circularity



Circular building blocks as base for corresponding PU-formulations



Evonik-Solvolyis process enables mattress recycling in a economical & ecological way

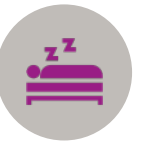


Evonik's Additives enable highest circular content and increase the first-time-right rate



Additives

Highest performance and lower CO₂-footprint



The average lifetime of a mattress in EU is 10a resulting in ca. 30 mio waste mattresses per year ~ 450 kt¹⁾



1: Source: Federal Association secondary raw materials

Partnering along the value chain is key to closing the loop



BMW ecosystem “Future Sustainable Car Materials“

- Identifying jointly hurdles & limitations
- Developing solutions jointly
- Meeting future mandatory recycled contents

Source: BMW

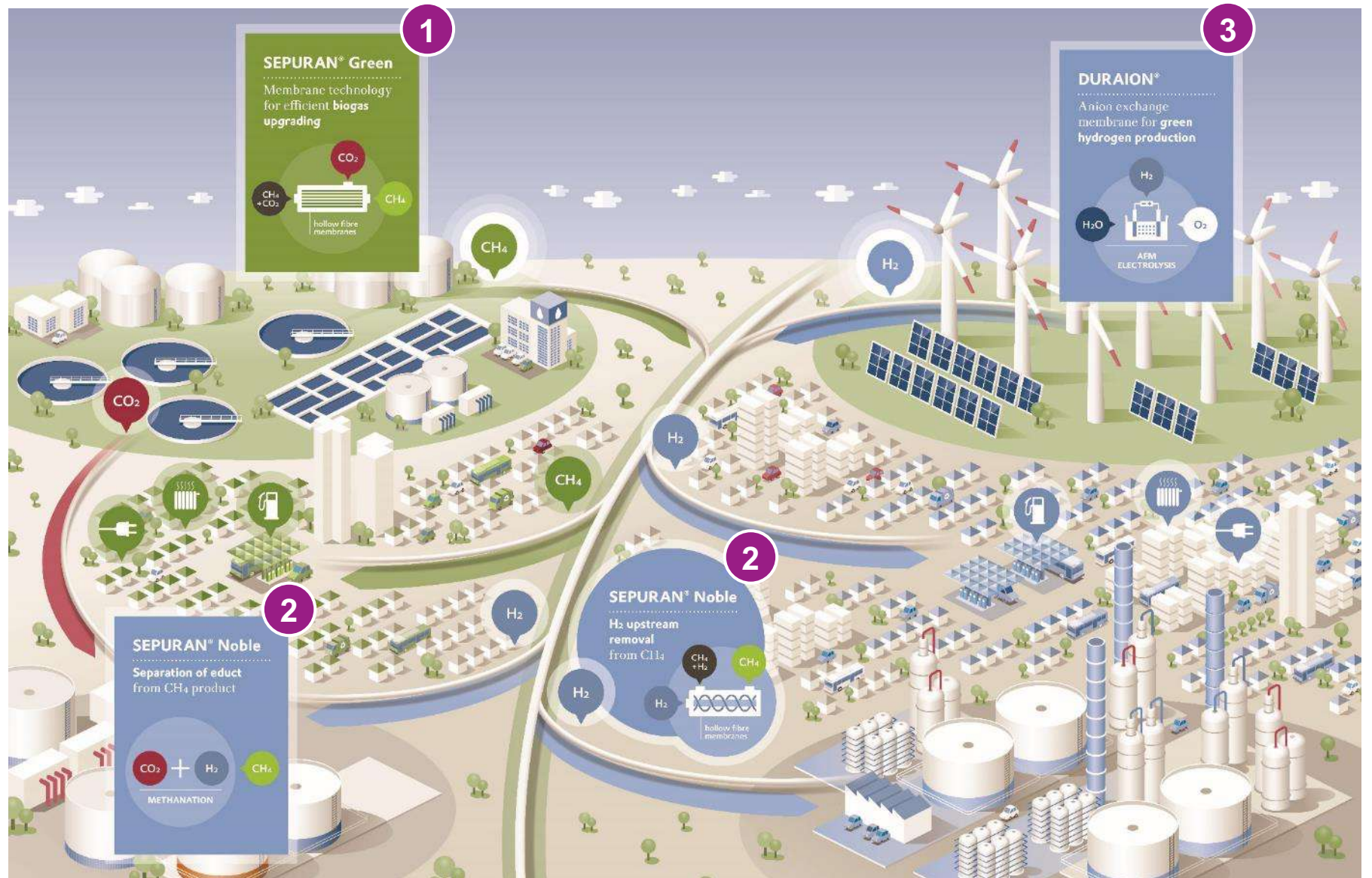


With our membrane technology, we significantly contribute to the transition to a sustainable gas economy

1. Raw biogas from organic waste is converted into **sustainable biomethane** and "green" CO₂
2. Our **hydrogen extraction membranes** enable to use **existing natural gas pipelines** to transport and extract green hydrogen

In the **production of synthetic biomethane** from CO₂ and green hydrogen, we ensure efficient product separation

3. With our anion exchange membrane DURAION®, we contribute to the **breakthrough of electrolytic production of green hydrogen** in the future

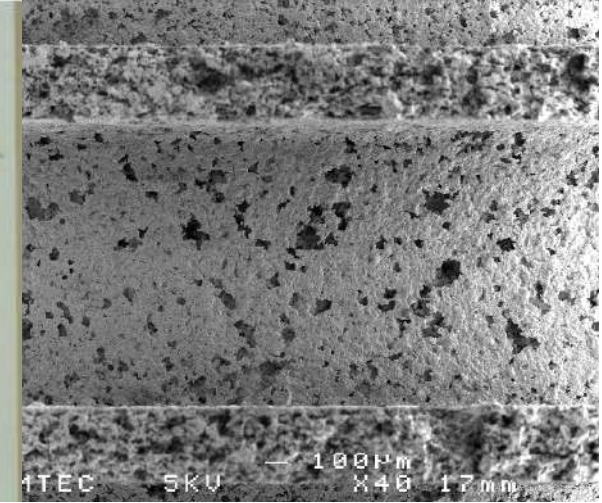
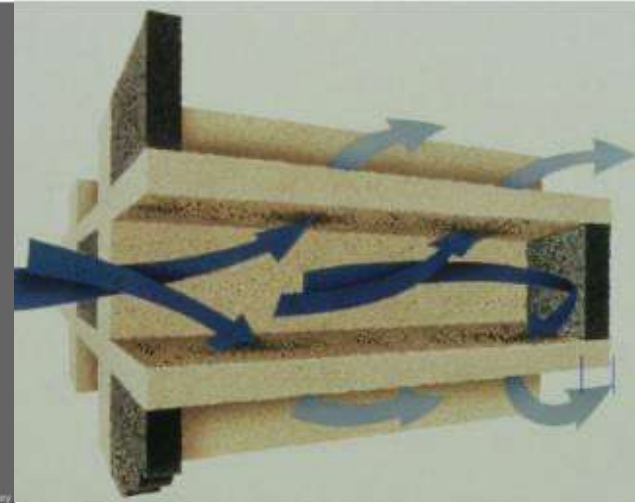
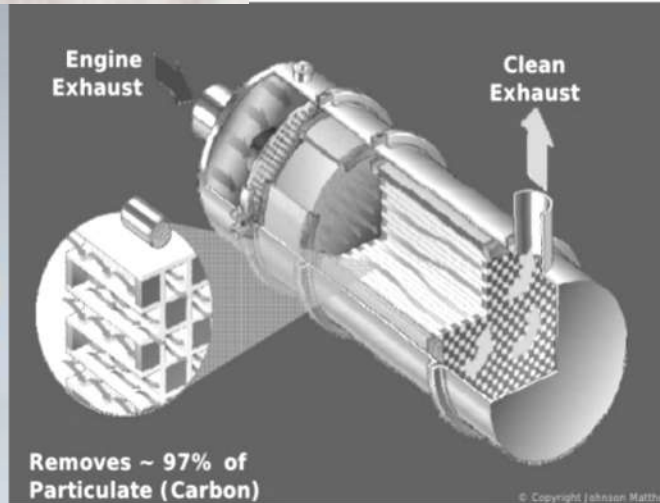


EVONIK Provide tailored product ex AKO plant to GPF Market



Exhaust gas regulations are becoming increasingly strict worldwide!

EURO 6 and China 6 regulations make the new generation of particulate filters indispensable.



Require smaller pores

Gas permeability ↓

Fuel consumption ↑

~~CO₂ ↑~~



Require much higher porosity and thinner cell walls



Silica Magic !

Evonik provides new high-performance insulation granules for “Insulation/ Condensation/ Thermobreak and Safe Touch” coatings

Traditional insulation

- Insulation found in most plant operations:
Mineral fiber blanket, closed cell foam, calcium silicate, polyurethane foam, perlite, ceramic fiber, fiberglass, cellular glass



TEGO® Therm HPG



New generation of thermal insulation coatings

- Today high performance insulating coatings use micro-sized material that minimizes the transfer of heat.
- The material act as an effective thin insulator up to 250°C.



Super insulating

- A specially engineered material with a microporous structure
- Low thermal conductivity



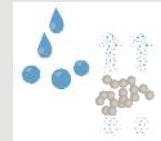
Fire resistant

- Purely mineral product based on silicon dioxide (SiO₂)
- Non-combustible



Hydrophobic core

- Vapor diffusion open
- No liquid water conductivity



EVONIK ENABLES THE TRANSITION

from a linear to a circular
economy





EVONIK

Leading Beyond Chemistry