Fully Circular Rigid Foams: Covestro's Roadmap from Bio-Feedstocks to Smart Pyrolysis

7ª Conferenza Nazionale Poliuretano Espanso Rigido

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Addressing the path to a sustainable future

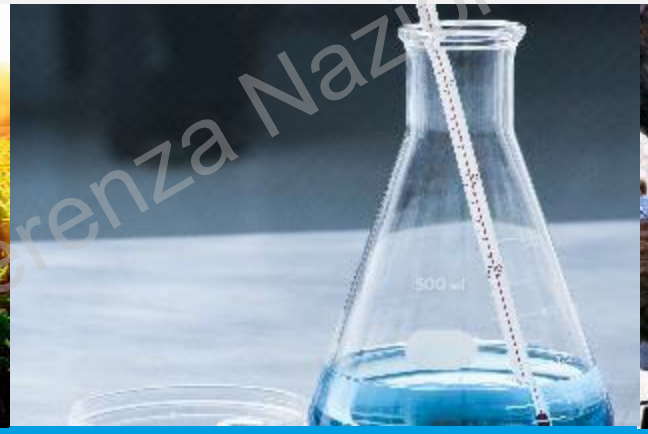
The Covestro approach

Our Purpose

TO MAKE THE WORLD A BRIGHTER PLACE

Our Vision

WE WILL BE FULLY CIRCULAR



CLIMATE NEUTRALITY (Scope 1 & 2)

ALTERNATIVE RAW MATERIALS (Scope 3)

INNOVATIVE RECYCLING

JOINT SOLUTIONS

CLIMATE NEUTRALITY IN 2035 (Scope 1 & 2)

60% REDUCTION IN 2030 (Scope 1 & 2)

COVESTRO TARGET ALIGNED WITH 1.5°C GOAL OF THE PARIS CLIMATE AGREEMENT

SCOPE 3 SHORT-TERM TARGET: -30% CO_2 EMISSIONS IN 2035. CLIMATE NEUTRAL IN 2050.

Note: GHG emissions = Greenhouse gas emissions, calculated in accordance with GHG Protocol and WBCSD recommendations Climate neutrality currently includes residual GHG emissions (scope 1 and 2) of c. 0.2-0.3mt per year; we are planning to offset these unavoidable, remaining GHG emissions through adequate compensation measures

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The right feedstock for the right solution

Key-Sustainability Benefits

1ST GENERATION BIOMASS

- BIO -

Virgin agricultural raw materials

e.g. Crops and oil: canola, sugar cane

Implementation Options

MASS BALANCE

OR

SEGREGATION

Key-Sustainability Benefits

2ND GENERATION BIOMASS

- BIO-CIRCULAR -

Bio-waste materials of biological origin

e.g. tall oil, used cooking oil

Implementation Options

MASS BALANCE

Key-Sustainability Benefits

RECYCLED MATERIALS

- CIRCULAR OPEN-LOOP -

Waste materials of **non-biological origin**

e.g. mixed plastic waste, end-of- life tires via pyrolisis

Implementation Options

MASS BALANCE

Key-Sustainability Benefits

RECYCLED MATERIALS

- CIRCULAR CLOSED-LOOP -

Waste materials of **non-biological origin**

e.g. EoL isoboards
via chemical recycling

Implementation Options

MASS BALANCE

AND

SEGREGATION

Enrich portfolio to support emerging pioneers' demand





Key Market Benefits	Fossil	CQ - Renewable		CQ - Recycled	
		Bio	Bio-circular	Open loop	Close loop
CO_2 reduction (cradle-to-gate)		↓↓	↓↓↓	→ *indicative*	↓↓ *indicative*
Preservation of finite fossil resources		✓	✓	✓	✓
Ease of implementation		👍	👍	👍	In progress
Scalability & Availability		+++	++	+	In progress
	Available	Available	Available	WIP	Mid to long- term

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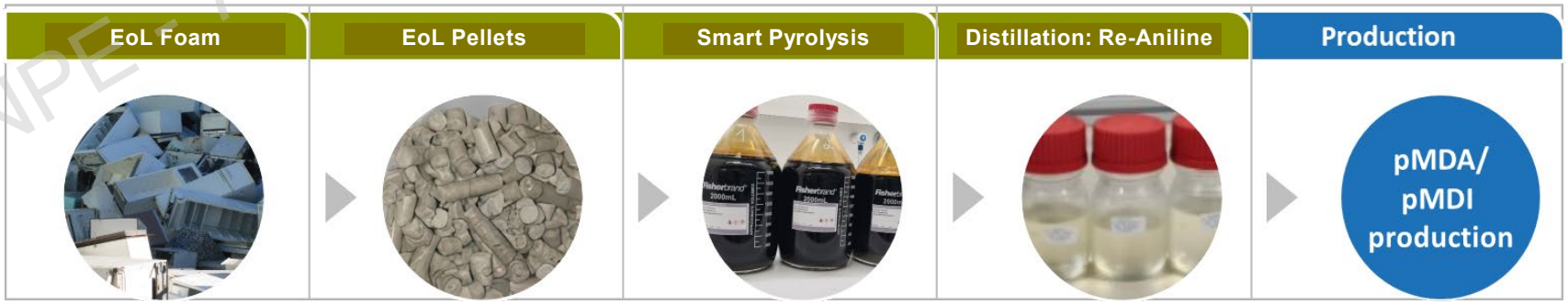
Smart Pyrolysis: Chemical Recycling for PUR/PIR foams

Smart Pyrolysis: Closing the Loop for PU Rigid Foam

- **Rigid PUR/PIR** foam is notoriously difficult to recycle due to its **crosslinked molecular structure** – mechanical recycling reaches its limits
- Europe's MDI market for rigid foam is growing fast: **1,400 kt (2025) → 1,900 kt (2035)**, driven by building insulation & appliance demand
- EU regulations increasingly require **scalable end-of-life solutions** for rigid foam
- Covestro & Fraunhofer UMSICHT developed **smart pyrolysis**: a chemical recycling process that breaks molecular bonds to recover high-purity **re-aniline (~99% purity)**
- Recycled MDI meets the **same quality standards** as conventional MDI



From Research to Reality: Pilot Plant by 2028

- Re-aniline via smart pyrolysis achieves up to **80% lower CO_2 emissions** vs. fossil-based production
- Carbon footprint of recycled MDI is up to **40% lower** than conventional fossil-based routes → reducing the carbon footprint from **PUR/PIR** foams by **25-30%**
- Pilot plant at Fraunhofer UMSICHT: **2,000 t/year capacity**, operational **mid-2028** — enough aniline to insulate > 200,000 refrigerators/year
- Built on years of joint R&D, including the **EU-funded CIRCULAR FOAM** flagship project (Covestro + 24 partners)
- Roadmap: lab → mini-plant → **pilot plant** → commercial implementation

Thank you!

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