ADVANCED RECYCLING Conference 2025

19–20 November • Cologne (Germany)

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Free WiFi

Network ID nova-Conference
Password #2025ARC

#2025ARC

#2025ARC

18 November 2025, 19:00 (CET)
On the Eve of the Conference

Meeting Point for a Social Evening Gathering

Kölsch Brewery **Schreckenskammer**
Ursulagartenstraße 11–15, 50668 Köln (Cologne)
(10 Minutes Walk from Cologne Central Station)

Join at sli.do
for real time questions and comments

Main Sessions
Grand Hall
#2025ARC

Parallel Sessions
Room Laurentius
#2025ARC-2

Find your perfect match!
We have sent the link to nova's matchmaking platform to all on-site participants of the Advanced Recycling Conference 2025.

All details: Please see Page 12.

Your Conference Team

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Registration

advanced-recycling.eu/registration

Venue & Accommodation

Maternushaus
Kardinal-Frings-Str. 1–3
50668 Köln (Cologne)
Germany

Phone: +49 221 – 1631-0
frontoffice@maternushaus.de
www.maternushaus.de

Recommended Hotels
www.advanced-recycling.eu/venue

Entrance Fee

2 Days • 19–20 November 2025
Ticket for on site (and online) attendance
incl. dinner buffet on the first day
1495 €

Day 1 • 19 November 2025
Ticket for on site (and online) attendance
incl. dinner buffet
895 €

Day 2 • 20 November 2025
Ticket for on site (and online) attendance
695 €

2 Days Online Ticket • 19–20 November 2025
Ticket for virtual attendance
745 €

2 Days Student Ticket • 19–20 November 2025
Ticket for on site attendance
incl. dinner buffet on the first day
350 €

Welcome to the Fourth Edition of the "Advanced Recycling Conference" (ARC)

In only three years, the ARC has established itself as one of the leading conferences on chemical and physical recycling in Europe. The conference is renowned for providing a comprehensive overview and in-depth analysis of the latest policy and technological developments in Europe, and to a certain extent, globally.

Last year, we observed increasing tension in the recycling market in Europe, which affected not only chemical recycling but also mechanical recycling. Numerous start-ups and smaller companies had to file for bankruptcy, and many announced recycling projects were postponed or discontinued altogether, with even industry giants not being spared.

The reasons for this are manifold and often attributable to inadequate and especially uncertain EU framework conditions, which are developing only very slowly in response to a dynamic market. The associated uncertainties and the tense market, combined with unprofitable business models, are resulting in a lack of investment. Political decision-makers must ask themselves whether the recycling targets set should be achieved with a recycling industry in Europe or rather at another location. There is a risk that Europe will miss an opportunity to exploit the full potential of existing waste streams which is not only relevant for our industry but also for the raw material security, the "strategic autonomy". In any case, it cannot be an economically and ecologically sustainable alternative if wastes are exported from Europe and then reimported as recycled material, or worse, replaced with virgin material. All carbon molecules entering Europe as raw materials, intermediates or products must remain in Europe and, via all recycling technologies, become part of the circular economy and renewable feedstock for industry. Keeping all the carbon in the cycle will not be possible without innovative, strongly implemented advanced recycling. DG Environment is increasingly aware of this, and hopefully a secure investment framework will be in place by early next year.

Different associations, including the "Renewable Carbon Initiative (RC)" will continue to act as a voice for a renewable chemical and materials industry and as an interface with political decision-makers, providing advice to pave the way for renewable carbon.

Despite the many negative reports from last year, Europe has no shortage of innovative technical recycling solutions. It is impressive to see that despite all the crises and headwinds, new start-ups, spin-offs, and SMEs continue to push their recycling solutions to the next level and prove their technical viability and potential. This is particularly evident in the fact that a new record was set in the second year for the number of abstracts submitted to the ARC. So, let's get a clearer picture of where we stand and where our joint journey can take us.

Now we are looking forward to a lively exchange, critical discussions, and extensive networking with all participants, online as well as offline.

Lars Krause
Senior Expert

Michael Carus
CEO

ARC Warm Up:

Join Us for a Site Visit at Chemiepark Knapsack

To get you into the mood for the Advanced Recycling Conference and provide a hand-on perspective on recycling solutions, nova-Institute and YNCORIS, kindly invite you to an exclusive site tour at the Chemiepark Knapsack in Hürth near Cologne.

advanced-recycling.eu

Tour Highlights

- Plant-Tour along the Recycling Cascade (approx. 1 hour)
- Thermal Utilisation: EEW
- Mechanical Recycling: Palurec
- Advanced Sorting and Recycling: LyondellBasell (Depending on Feasibility and Construction Progress)
- Property for Chemical Recycling: matterr
- Plastics Production: LyondellBasell (PP) & Westlake Vinnolit (PVC)
- Closing Lecture and Refreshments

Excursion Details

DATE
Tuesday, 18 November 2025

DEPARTURE
13:00 CET

RETURN
17:00 CET

POINT OF DEPARTURE
Maternushaus
Kardinal-Frings-Straße 1
50668 Cologne

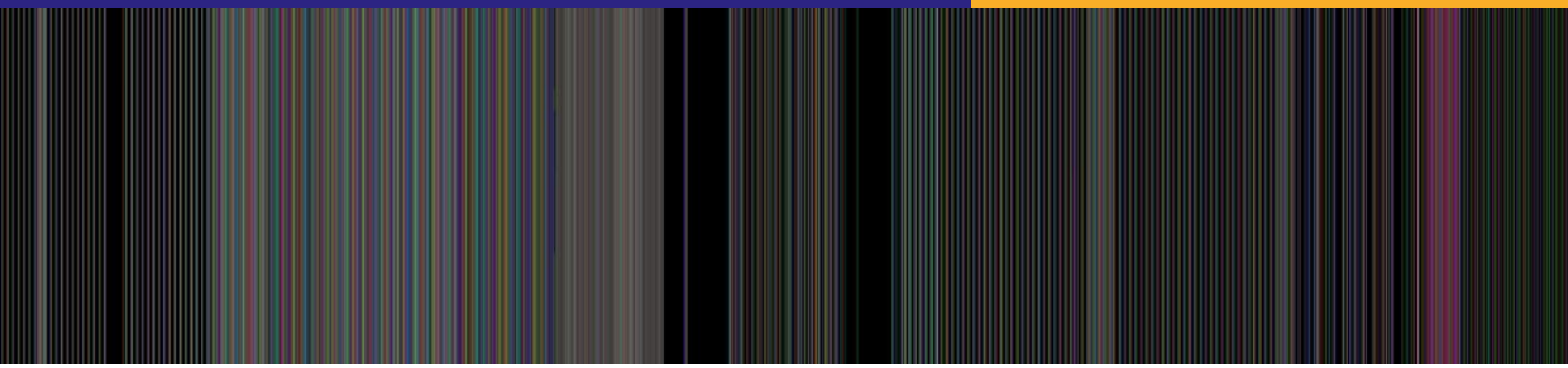
DURATION
approx. 4 hours

NUMBER OF PARTICIPANTS
limited to 20 persons

This tour experience is exclusive for ARC participants and free of charge. An organised bus-ride will secure your safe arrival and return to the meeting location.

Registration

Due to limited capacity, registration is binding. Kindly register by **31 Oct 2025** using the following email: **contact@nova-institut.de**



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Conference Organiser

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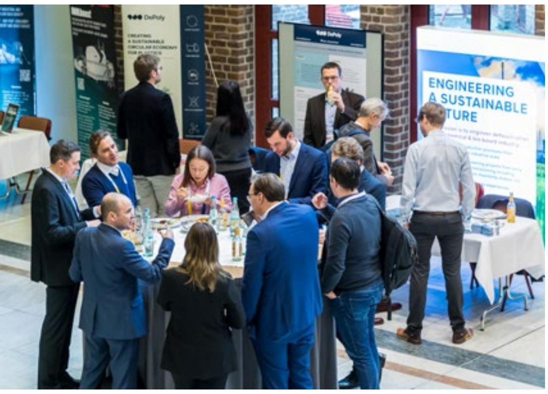
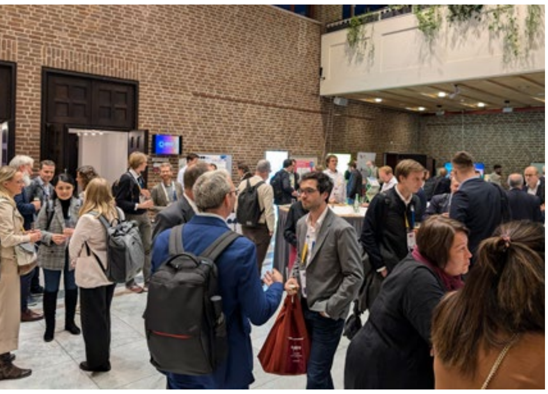
Program

The Advanced Recycling Conference is packed with a variety of relevant topics.
You can look forward to the following content:





DAY 1

**19 November 2025,
9:45–17:00 (CET)**

P. 23

Advanced Recycling as Pillar of Renewable Carbon and its Challenges

Setting the stage for the status quo of advanced recycling and its potential role in securing raw material that can be supplied to the chemical and material sector which is critical in background of changing geopolitics. This session will give an overview of advanced recycling technologies, their complementary use and its input and recent production capacities.

Thermochemical Recycling (Part 1)

Pyrolysis is a versatile tool able to complement mechanical recycling and produce a wide range of different products that can be utilised in the chemical and plastics industry. The boundaries between advanced recycling and other thermochemical processes are often fluid, as they can occur under similar reaction conditions. Depending on the reactor and reaction design, various products of different qualities can be obtained, enabling both open and closed recycling loops.

Biochemical Recycling (Part 1)

Enzymolysis represents a technology based on biochemical processes in which different kinds of biocatalysts are utilised to depolymerise a polymer into its building units (e.g. monomers). Being in an early development phase, this technology is mainly available at lab-scale.

Depolymerisation Technologies for PU, PET, and PS

This session covers a range of different depolymerisation technologies capable of turning PU-, PET-, or PS- waste into monomers that can be utilised to produce new polymers or intermediates for the production of other materials and chemicals.

Textile Sorting and Recycling

Although the European Union has made notable strides, challenges remain, particularly in scaling technologies and the lack of collection and sorting systems for handling textiles made from mixed fibres. This session gives new insights into sorting and chemical recycling technologies as well as overall strategies for textile recycling.

DAY 2

20 November 2025, 9:00–17:30 (CET)

P. 26

From Py-Oil Quality to Valuable Resources and the Chain of Custody in Advanced Recycling

The session provides insights into important aspects of pyrolysis oils by addressing the analysis of complex pyrolysis oils, the relationship between raw material and product quality, and the question of how a higher proportion of high-quality products can be achieved without upgrading. Additionally, the session deals with methods for traceability and chain of custody.

Digital Solutions for Process Optimisation and Market Forecasting

This session focuses on digital solutions utilising AI to improve productivity of mechanical and chemical recycling, cloud-based data collection and management to enable cost-efficient and sustainable process control, or AI supported forecasting models for the recyclate market.

Recycling Solutions for End-of-Life Vehicles (ELV)

The EU Proposal on Circularity Requirements for vehicle design and on management of End-of-Life vehicles considers a mandatory recycled content of 25% for plastics of which 25% must come from End-of-Life vehicles. This session explores the demand for pioneering recycling solutions for automotive plastic waste and End-of-Life tyres.

Thermochemical Solutions for the Recovery of Valuable Resources and Energy

Pyrolysis and Gasification technologies are thermochemical recycling solutions that can recover carbon in form of valuable chemicals and energy via closed and open loop recycling. In gasification, the integration of emission-free electricity can reduce CO_2 emissions and achieve higher product yields.

Thermochemical Recycling (Part 2)

See Part 1 on Day 1

Physical Recycling via Dissolution

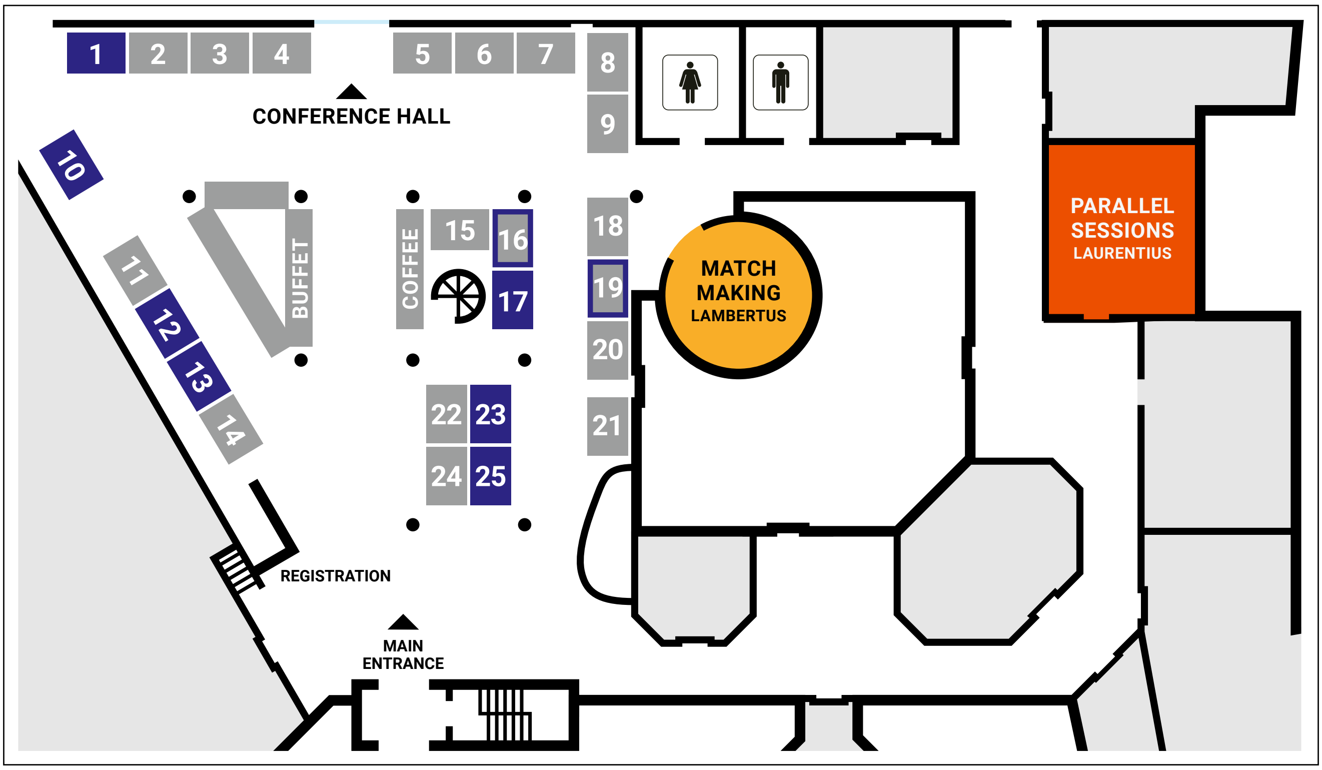
Dissolution describes a solvent-based technology that is based on physical processes. Targeted polymers from mixed plastic waste can be dissolved in a suitable solvent while the chemical structure of the polymer remains intact. Other plastic components (e.g. additives, pigments, fillers, non-targeted polymers) remain undissolved and can be cleaned from the dissolved target polymer. The session covers a wide range of different dissolution technologies for different polymers.

Biochemical Recycling (Part 2)

See Part 1 on Day 1

Exhibition

Free   Reserved for Sponsors   Booked



List of Exhibitors

02 GSF Upcycling and Entzimatiko (ES)
03 BUSS ChemTech (CH)
04 EREMA (AT)
05 Siemens (DE)
06 nova-Institute (DE)
07 Starlinger Recycling Technology (AT)
08 Media Table
09 BHS-Sonthofen (DE)
11 CPM Crown (US)
14 Pall (DE)
15 LIST Technology (CH)
18 Matchmaking
20 Poster Session
21 Poster Session
22 YNCORIS (DE)
24 Aduro Clean Technologies (CA)

Book your booth:
advanced-recycling.eu/exhibition-booking

Status:
18 November 2025
More exhibitors expected: advanced-recycling.eu/exhibitors

Poster Session

The poster session will take place at 17:00 (CET) on Day 1, 19 November with a few minutes presentation at a special poster area at booth numbers 20 and 21 of the exhibition space.

Robert Kunzmann
AC Biode (LU)
Hydrolysis of Electronic Waste

Eric Appelman
Aduro Clean Technologies (CA)
Unlocking the Full Value of Plastic Waste with Hydrochemolytic™ Technology (HCT)

Roh Pin Lee
Brandenburg University of Technology Cottbus (DE)
Divergence in Perception of Gasification Technologies in UK, Germany and China

Marc Spekreijse
Circular Plastics NL (NL)
Circular Plastics NL | Accelerate the Transition

Caroline Hargarten
Currenta (DE)
Analytics in the Cycle of Plastic Recycling

Maike Lambarth
Cyclize (DE)
Carbon Circularity – Your Waste Shapes the Future of Chemistry

Martin Pillich
ETH Zurich (CH)
Closed-loop Polyurethane Waste Supply Chains Utilizing Catalytic Pyrolysis in Germany

Antje Lieske
Fraunhofer IAP (DE)
Towards a Genuine Circular Production of Flexible PLA-Grades in Germany

Marta Del Giudice
IFP Energies Nouvelles (FR)
Towards the Upgrading of Plastic Pyrolysis Oil: Operating Condition Effects on Hydrodechlorination of Model Chlorinated Molecules in Diesel

João Zambujal-Oliveira
NOVA LINCS (FCT) | University of Madeira (FCS) (PT)
Circular Supply Chains: Aligning Environmental Strategies with Organizational Capabilities

Aditya Chauhan
Politecnico di Milano (IT)
Rapid Disassembly of Metalized Multilayer Packaging Films Using Acid Based Formulations

Ann-Katrin Emmerich
Technische Universität Darmstadt (DE)
Integrating Life Cycle Assessment into the Development of Iron-Manganese-Based Activators for Pyrolytic Plastic Recycling

Ivana Ivanova
University St. Cyril and Methodius,
Faculty of Economics, Skopje (MK)
Mapping Plastics Trade Flowers Between Germany and the Western Balkans for Advanced Recycling and Circular Economy Solutions

Kathy Elst
VITO (BE)
Upcycling Mixed Textile Waste into Clean Materials for the Next Use Cycle – Pesco-up

Dmitrii Didenko
Weatherford (AT)
Collaboration Platform for Financial and Recycling Data Management

advanced-recycling.eu/posters

Find your Perfect Match now!

Welcome to nova's Matchmaking System for the Advanced Recycling Conference 2025.

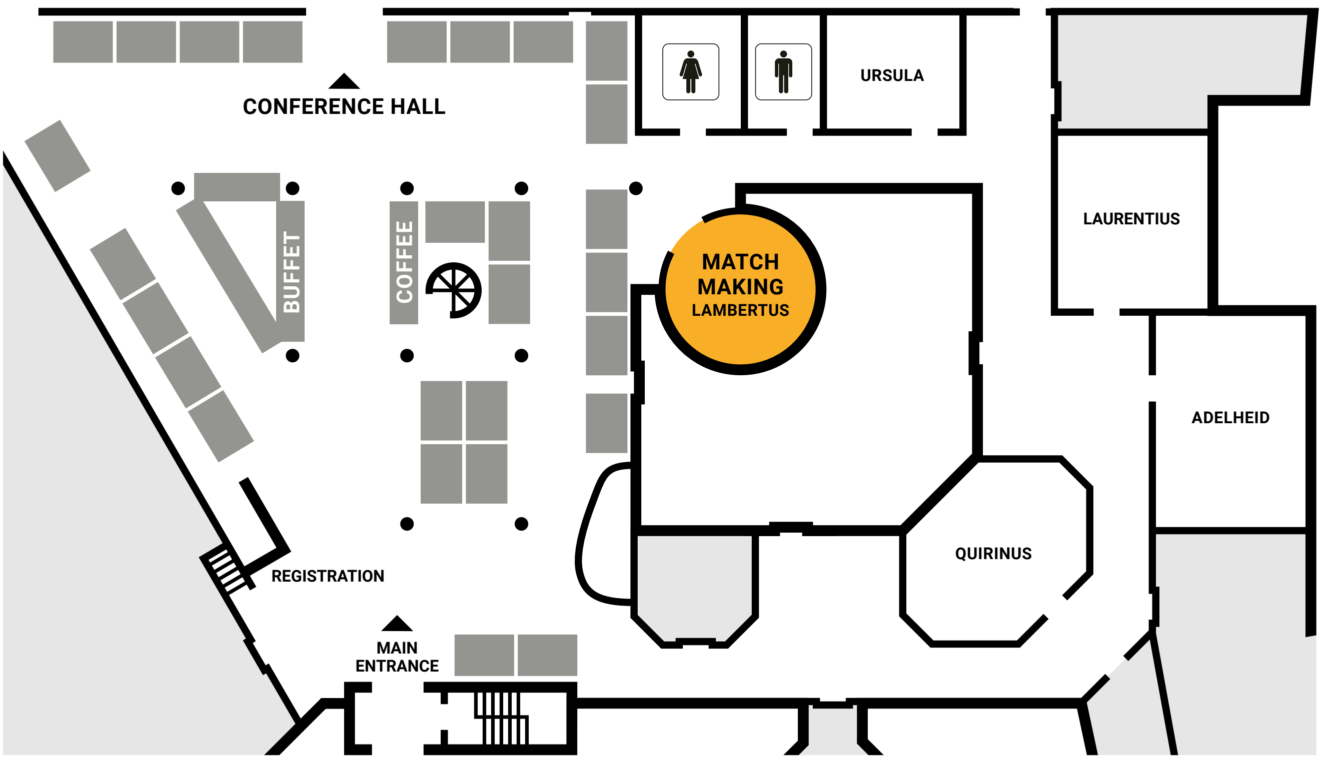
Through this Platform, you will have the Opportunity to:

- Schedule personalised 1:1 on site meetings with other attendees, speakers, and industry experts.
- Build valuable connections tailored to your professional interests and goals.
- The matchmaking system is web-based – easy access without an extra app is guaranteed.
- Save time by meeting the people who matter most to you.

Are you already registered for the matchmaking tool?
Arrange your appointments here: **advanced-recycling.eu/matchmaking**

You are not registered yet, but want to take part in the matchmaking tool?
Please contact Mr Dominik Vogt: **dominik.vogt@nova-institut.de**

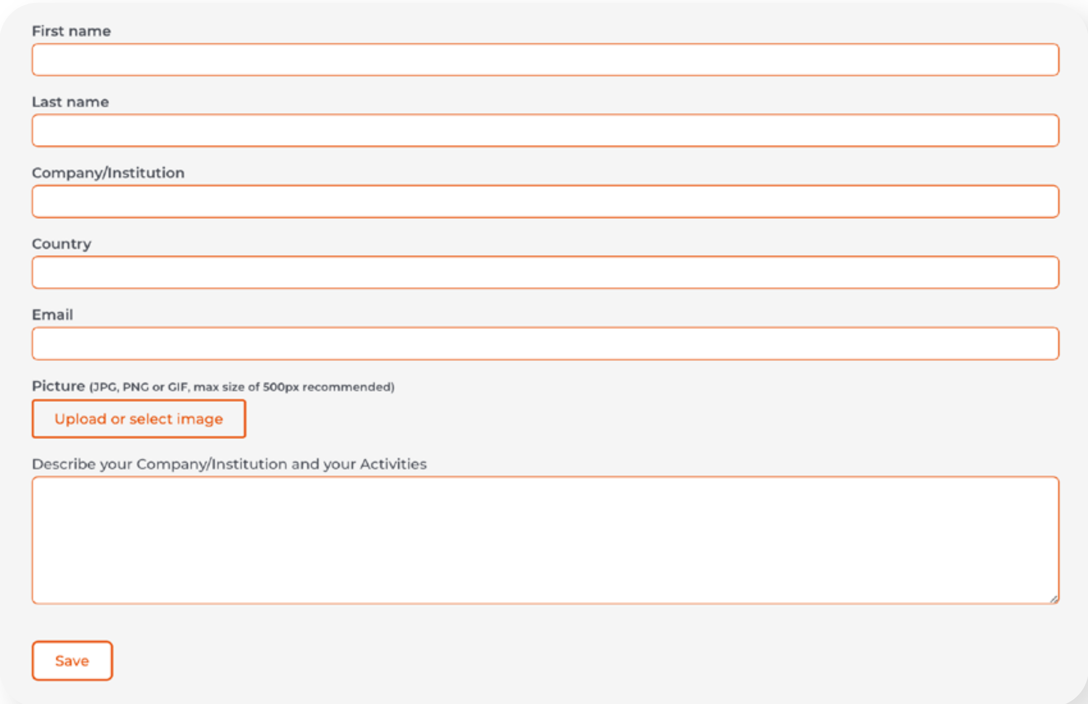
Matchmaking Room Overview



How to use the Matchmaking Tool:

1 Your Profile

Fill out your profile as completely as possible and describe your company/institution and your activities.
Briefly describe the cooperation opportunities and project collaboration you are looking for.


First name

Last name

Company/Institution

Country

Email

Picture (JPG, PNG or GIF, max size of 500px recommended)

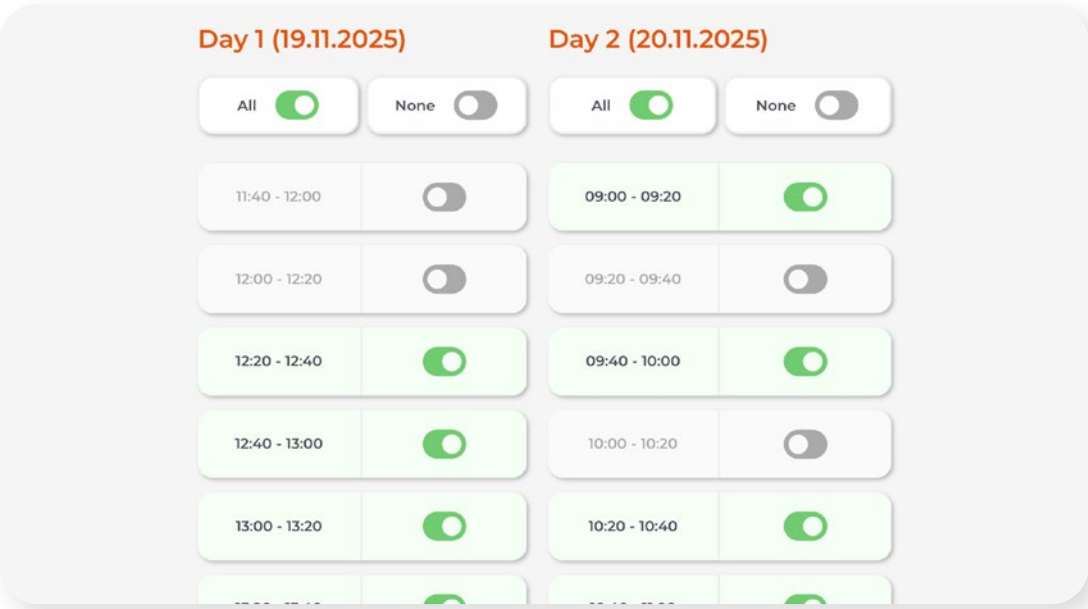
Upload or select image

Describe your Company/Institution and your Activities

Save

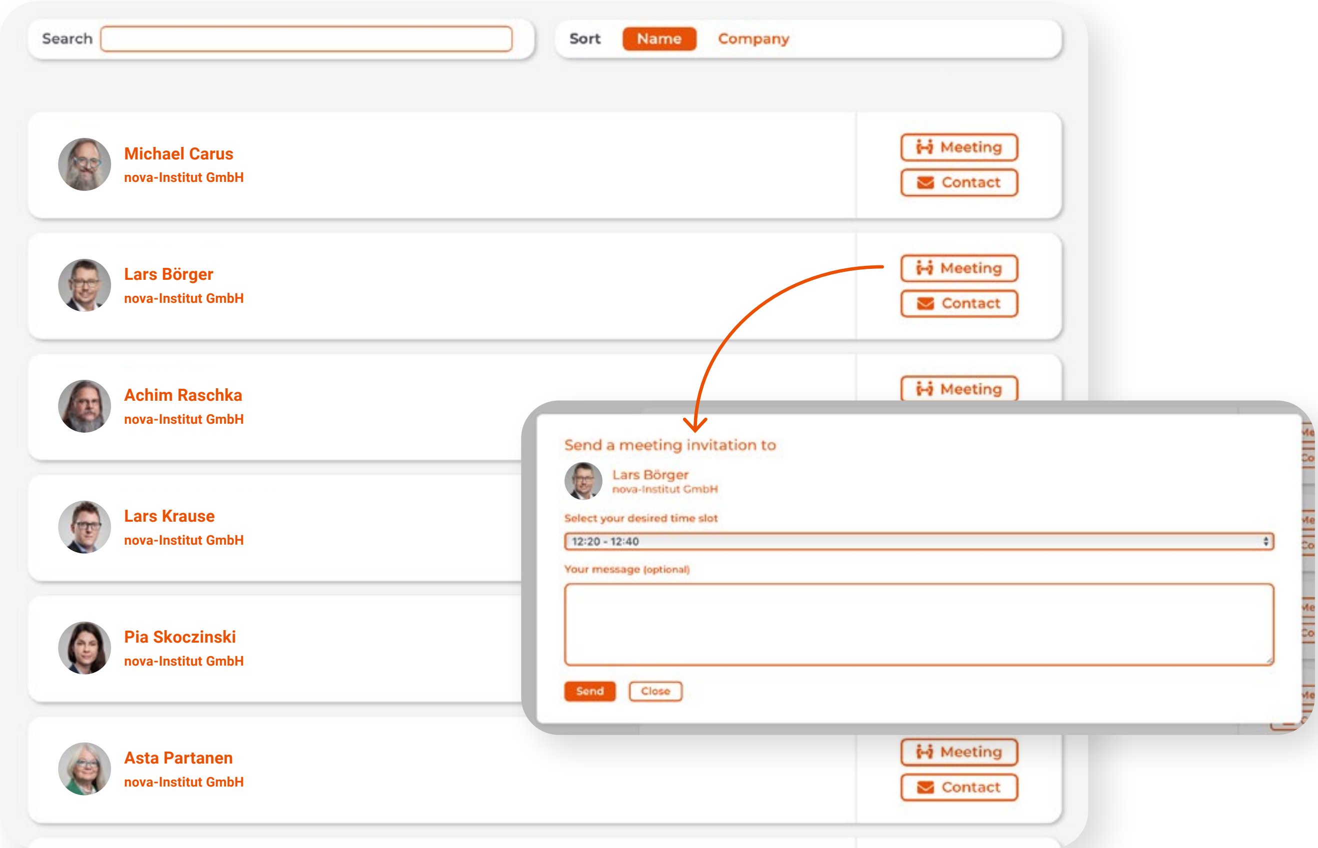
2 Your Availability

Please enter as many time slots as possible in which you could potentially have a meeting.
Please grey out the time slots that are not suitable for you.



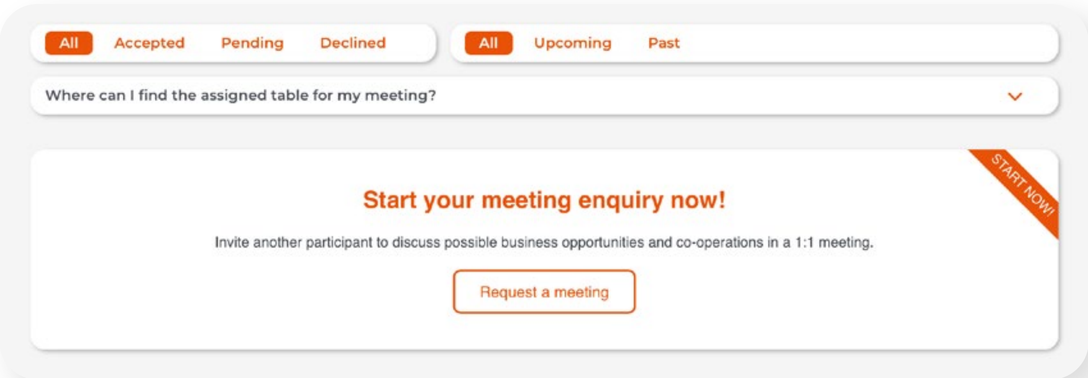
3 Request a Meeting

You can search for names, companies or keywords. The “Meeting” option will suggest time-slots you both are available. You can leave a message for the requested person in the contact field.



4 Your Meetings

All accepted, pending and cancelled meetings can be found in this overview.
Click on ‘Where can I find the assigned table for my meeting?’ to quickly find the location of the meeting room.



Don’t miss this opportunity to make meaningful connections!

Study on Global Advanced Plastic Recycling Capacities

New Report Shows the Latest Global and European Market Data on the Dynamic Advanced Recycling Sector – Including 390 Planned, Installed and Operating Plants.

Chemical and physical recycling are essential to keeping carbon in the loop and fully establishing a circular economy. Despite delays in policy regulations and investment, experts foresee a bright future for new ca-pacity, both globally and in Europe.

The development of advanced recycling technologies is very dynamic and at a fast pace, with new players constantly appearing on the market, from start-ups to chemistry giants and everything in between. New plants are being built, and new capacities are being achieved. Due to these dynamic developments, it is difficult to keep track of everything. The nova report **"Mapping of global advanced plastic recycling capacities"** aims to clear up this jungle of information. A comprehensive evaluation of the global input and output capacities was carried out for which 390 planned as well as installed and operating plants including their specific product yields were mapped to provide an overview about global advanced recycling capacities in the past, present, and future.

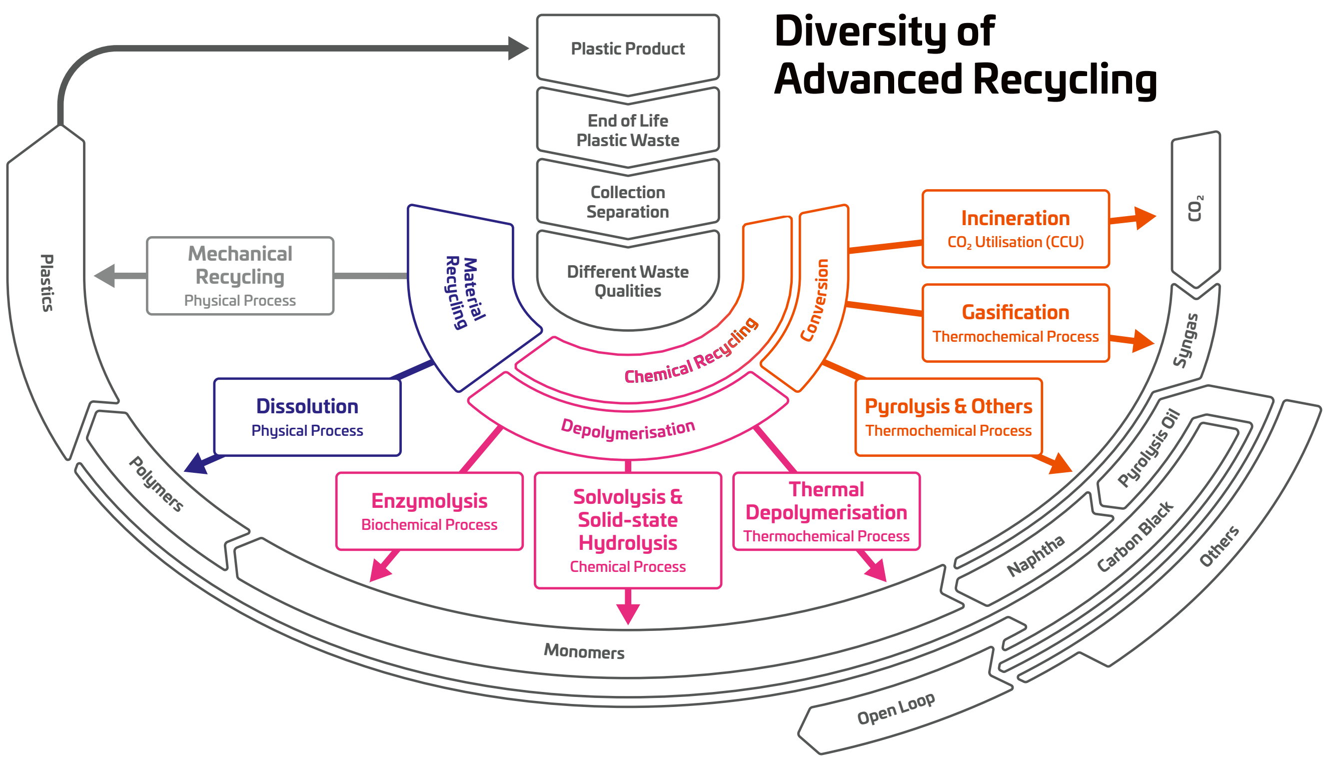


Figure 1: Full spectrum of available recycling technologies divided by their basic working principles.

Advanced Recycling Technologies to Complement Mechanical Recycling

With advanced recycling a toolbox of versatile technologies is available to address plastic waste streams in different compositions and qualities in order to transform them into a range of different raw materials that can be reintroduced at different positions along the value chain of polymers and plastics. The technologies include material recycling based on dissolution (physical process) from which polymers can be obtained. Furthermore, numerous chemical recycling technologies are available that are capable to depolymerise a targeted polymer to its building units (monomers) via enzymolysis (biochemical process), solvolysis (chemical process), and thermal depolymerisation (thermochemical process). Another group of chemical recycling technologies are thermochemical processes which currently achieve the largest capacities. These technologies are based on pyrolysis, gasification and incineration coupled with Carbon Capture and Utilisation (CCU) which are capable to convert plastic waste into secondary valuable chemicals as well as naphtha, syngas, and CO_2 which can be used as feedstock for the production of new polymers.

The majority of identified plants are located in Europe including first and foremost the Netherlands and Germany, followed by rest of the world, Commonwealth of Independent States (CIS), North America, Middle East & Africa, Latin America, Japan, and China.

76 Installed Advanced Recycling Plants in EU27+3

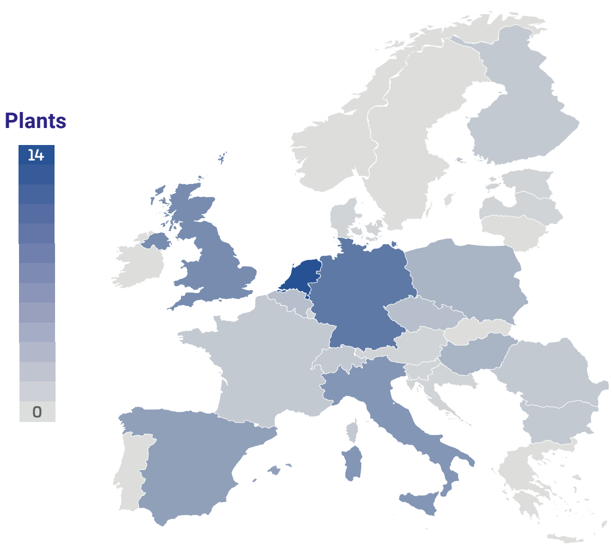


Figure 2: Overview showing all installed and running advanced recycling plants in EU27+3.

Evaluation of Global Capacities and the Role of Advanced Recycling in Europe

Overall, 390 planned as well as installed and operating plants were mapped worldwide providing a total input capacity of 1,438 kt per annum in 2024. In Europe, there is already a considerable potential of know-how and providers for chemical and physical recycling technologies which is reflected in the comparison with the globally installed plants and capacities. From all installed chemical and physical recycling plants worldwide more than 70 and therewith the majority is operating in Europe covering 20% of the worldwide input capacity which ranks Europe at the top of the global comparison. Under the consideration of specific yields and losses, the global production capacity of advanced recycling is 1,051 kt per annum with products ranging from polymers, monomers, naphtha, Secondary Valuable Chemicals (SVC), and fuels & energy. Europe's circular strategy becomes evident by setting the product shares of polymers, monomers, naphtha, and SVC from chemical and physical recycling into the global context. Here, Europe is capable to cover 26% of the installed global capacity.

EU27+3 Advanced Recycling Waste Input Capacity

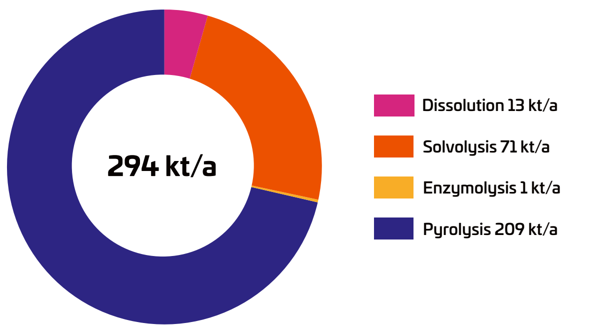


Figure 3: Installed input capacities for different advanced recycling technologies in EU27+3.

EU27+3 Advanced Recycling Product Output Capacity

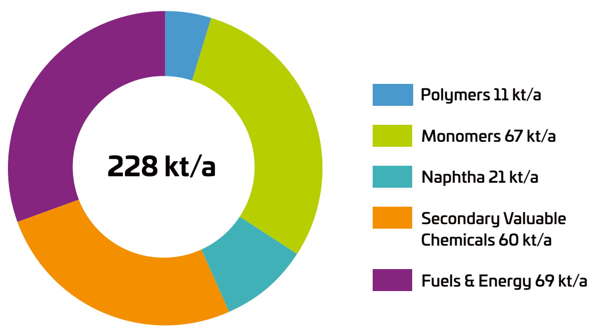


Figure 4: Installed advanced recycling output capacities for different products in EU27+3.

Installed and Future Advanced Recycling Production Capacities EU27+3

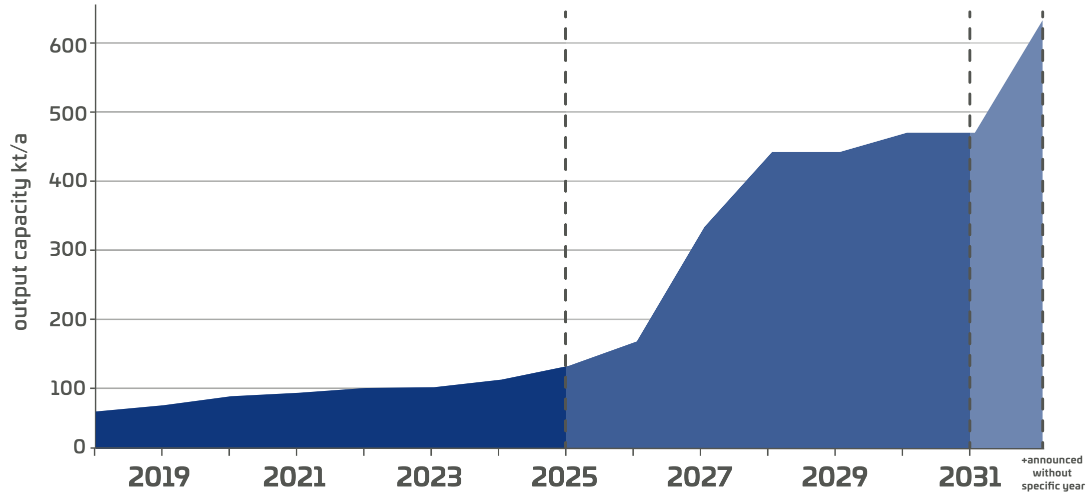


Figure 5: Installed and future advanced recycling production capacities of products in EU27+3 that can be used for the production of new polymers and plastics.

In the coming years a strong growth of the market is expected although some of previously announced projects are cancelled or postponed. However, according to remaining announcements, the amount of installed chemical and physical recycling plants is expected to steadily grow. An analysis of these announcements shows that the European production capacity of polymers, monomers, and naphtha in, that is expected to quadruple by 2031 while globally the capacity will triple.

However, the projection for Europe may change depending on additional political measures. For example, the revision of relevant directives and the establishment of incentives and investment programmes are ongoing. All carbon molecules entering Europe as raw materials, intermediates or products must remain in Europe and, via all recycling technologies, become part of the circular economy and renewable feedstock for industry. Keeping all the carbon in the cycle will not be possible without innovative, strongly implemented advanced recycling. The European Commission is increasingly aware of this, and hopefully a secure investment framework will be in place by early next year.

Exploring the Patent Space

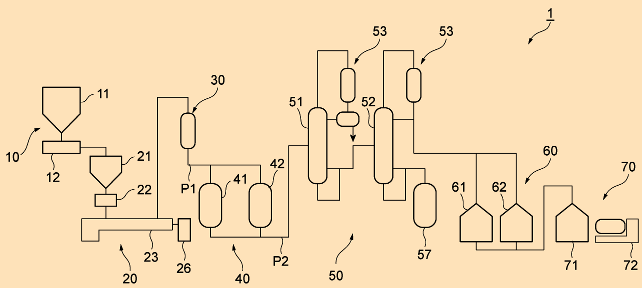
Our novanaut is taking you to a tour through recent innovations from the recycling world

JP7555511B1

Pyrolysis Equipment

Assignee: Sumitomo Chemical Co Ltd
Publication: 2024-09-24

A thermal decomposition apparatus is provided that can stably operate the thermal decomposition apparatus and send condensate to an appropriate process depending on the concentration of impurities.

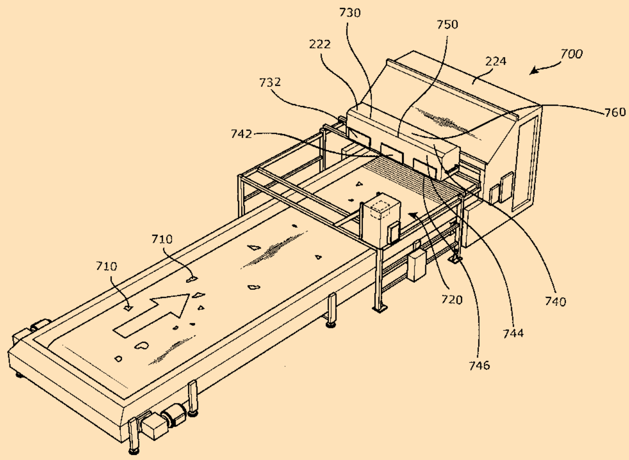


WO2024260883A1

A Method and System for Obtaining a Purified Textile Material from a Mixed Textile Stream, such as a Stream of Singulated Garment

Assignee: Tomra Sorting GmbH
Publication: 2024-12-26

The present disclosure relates to a method (100) for obtaining a purified textile material (10) from a mixed textile stream (MS).

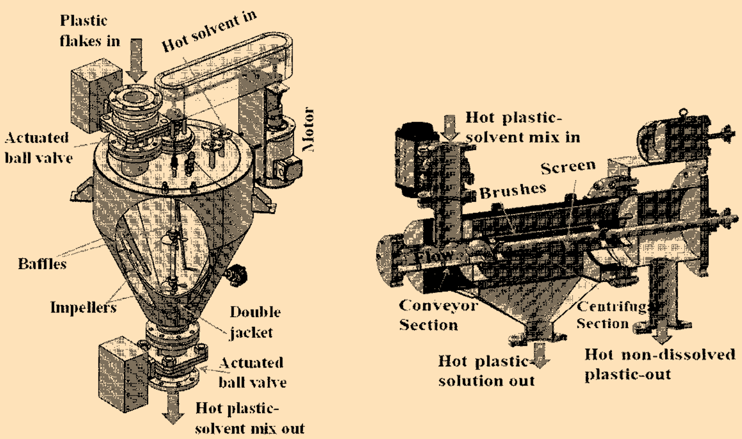


WO2024044529A1

Plastic Recycling System Using Solvent-targeted Recovery and Precipitation (STRAP)

Assignee: Wisconsin Alumni Research Foundation
Publication: 2024-02-29

A system to carry out solvent targeted recovery and precipitation (STRAP) to recover individual polymers from multilayer plastic films or mixed plastic wastes.

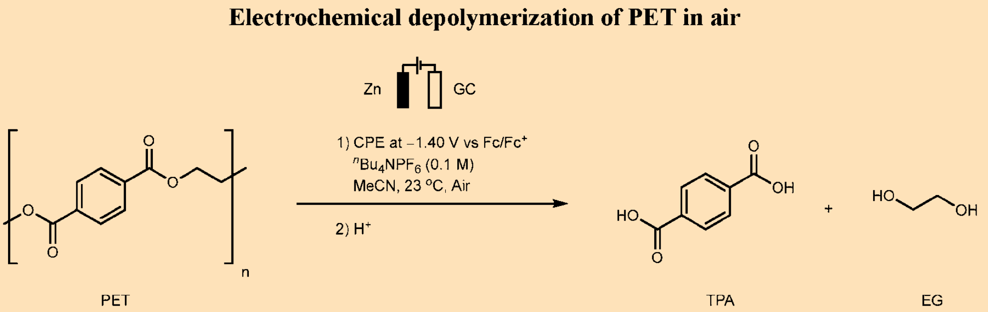


WO2024238960A1

Methods for the Electrochemical Degradation of Polyester Polymers

Assignee: The Regents of the University of Colorado, A Body Corporate
Publication: 2024-11-21

The present disclosure relates to methods of using electrochemically-generated superoxide to break down polyesters into their monomers. These methods can be used, for example, to recycle polyester polymers.

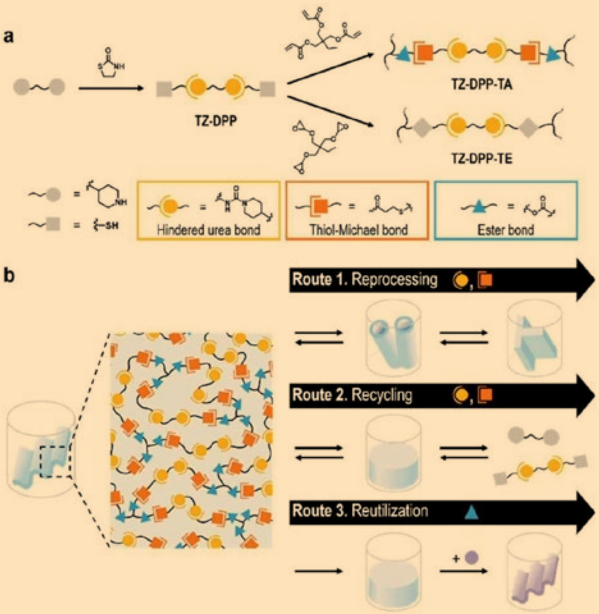


KR102744396B1

Non-isocyanate Polyurea Polymer and Recycling Method Thereof

Assignee: Korea Research Institute of Chemical Technology (KRICT)
Publication: 2024-12-19

The present invention relates to a non-isocyanate polyurea polymer and a method for recycling the same. The polyurea polymer has a faster reactivity than conventional polymers, is environmentally friendly because it does not use isocyanates, and can minimize the use of toxic substances.

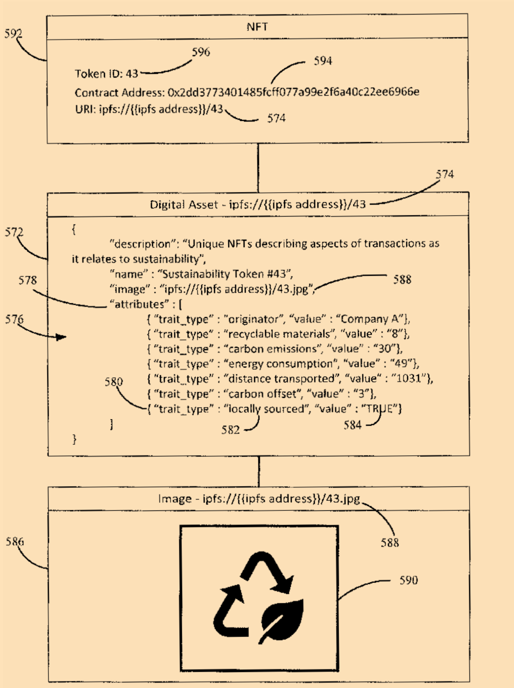


WO2024121170A1

Systems and Methods for Creating and Using Sustainability Tokens

Assignee: Puma SE
Publication: 2024-06-13

A method of managing digital assets is provided. A composite sustainability score is generated based on the attributes of the sustainability digital assets associated with the sustainability tokens, which is compared to a first benefit criteria and when the composite sustainability score meets the benefit criteria, a first benefit is provided to an owner of the first digital wallet.

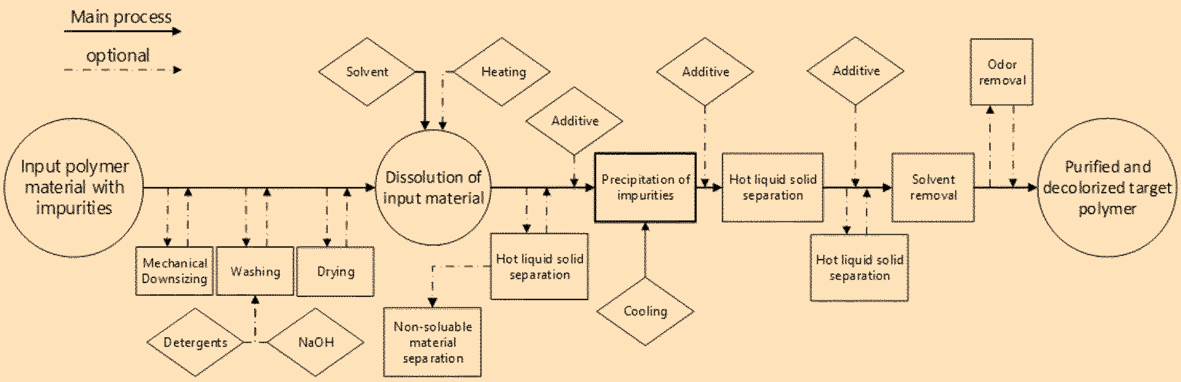


WO2024170455A1

Method for Purification of a Polymer Material from Polymer Waste and Purified Polymer Material

Assignee: APK AG
Publication: 2024-08-22

The present invention relates to a method for purification of a polymer material from plastic waste, wherein said polymer material comprises at least one target polymer, at least one non-target polymer and at least one impurity.

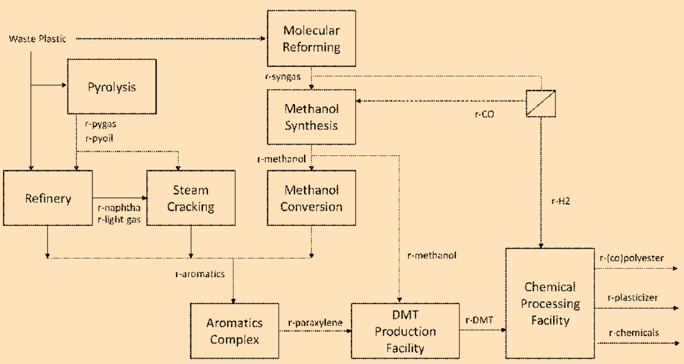


WO2024030751A1

Recycled Content Dimethyl Terephthalate and Related Chemical Components from Waste Plastic

Assignee: Eastman Chemical Company
Publication: 2024-02-08

Processes and facilities for producing a recycled content organic chemical compound directly or indirectly from waste plastic. Processing schemes are described herein for converting waste plastic (or hydrocarbon having recycled content derived from waste plastic) into useful intermediate chemicals and final products.

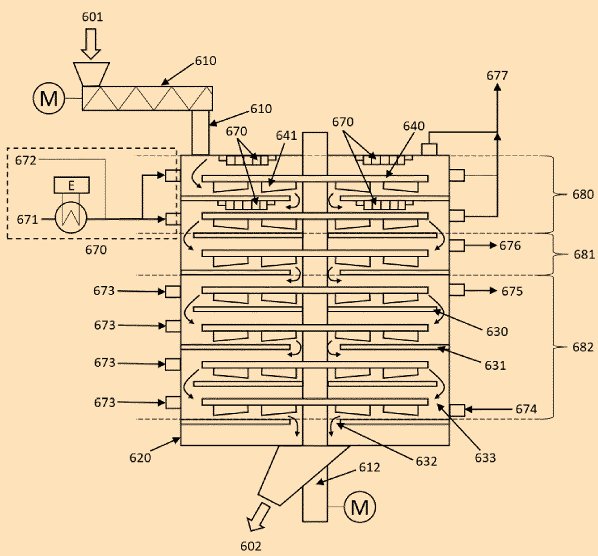


EP4582377A1

Pyrolysis and Gasification of Rubber Granulate

Assignee: Orion Engineered Carbons GmbH
Publication: 2025-07-09

The present invention relates to a method for providing treated carbon black. A particulate carbon black-containing feedstock, such as waste tire rubber granulate, is used as a feedstock for a pyrolysis process and a subsequent gasification of the pyrolyzed material. It is believed that the obtained treated carbon black has a lower coke content and thus, the resulting rubber articles have improved properties.



Day 1
19 November 2025
9:45 – 17:00 (CET)

9:45
Michael Carus
nova-Institute (DE)
Conference Opening
and Keynote: Importance of Advanced Recycling for the Circular Economy
and the Defossilisation of the Chemical Industry

10:10–11:50
Advanced Recycling as Pillar of Renewable Carbon and its Challenges
Grand Hall

Chairpersons: Michael Carus & Lars Krause, nova-Institute (DE)

10:10
Uwe Lahl
BZL Kommunikation und Projektsteuerung (DE)
Europe After 2030 – The Development of Waste Management into an Industrial Location Factor

10:30
Lars Krause
nova-Institute (DE)
Mapping of Advanced Recycling Technologies and Global Capacities

10:50
Sneha Verma
AEB Amsterdam (NL)
Circularity Caught in the Crossfire: How Geopolitics is Disrupting Markets, Investments
and Waste to Energy Transitions

11:10
Thomas Blocher
BUSS ChemTech (CH)
Will the Chemical Recycling Industry Regain its lost Credibility?

11:30
Panel Discussion with all Session Speakers

11:50 Lunch Break

13:30–14:50

Thermochemical Recycling (Part 1)

Grand Hall

Chairpersons: Achim Raschka & Lars Krause, nova-Institute (DE)

13:30
Ian Temperton
Plastic Energy (UK)
Powering the Circular Transition with Chemical Recycling in Europe and Beyond

13:50
Marco Tomasi Morgano
ARCUS Greencycling Technologies (DE)
Transforming Contaminated High-volume Waste Streams Through ARCUS Greencycling Technologies' Pyrolysis Technology

14:10
Pieterjan Van Uytvanck
BlueAlp (NL)
Unlocking the Shift: Feedstock, Product, Profit

14:30
Panel Discussion with all Session Speakers

13:30–14:50

Biochemical Recycling (Part 1)

Room Laurentius

Chairpersons: Pia Skoczinski, nova-Institute (DE) & Lars Blank, RWTH Aachen University (DE)

13:30
Nick Wierckx
Forschungszentrum Jülich (DE)
Bio-upcycling of Plastics Through Enzymatic and Biological Conversion

13:50
Kristina Schell
Covestro (DE)
Enzymatic Polymer Recycling

14:10
Ren Wei
University of Greifswald (DE)
Recent Advances in Enzymatic Plastic Recycling and Upcycling

14:30
Panel Discussion with all Session Speakers

14:50 Coffee Break

15:20–17:00

Depolymerisation Technologies for PU, PET, and PS

Grand Hall

Chairpersons: Lars Börger & Lukas Albrecht, nova-Institute (DE)

15:20
David Rapp
KraussMaffei Extrusion (DE)
Chemical Recycling of Polyurethane Foams

15:40
Christine Weiß
Evonik Operations (DE)
Polyurethane Recycling: Key Influences and Challenges in the Circular Economy

16:00
André Heeres
Hanze (NL)
Upcycling of PET-containing Waste Streams Towards Terephtalamide and BTX Aromatics: A Novel Example of a Plastic Refinery!

16:20
Irina Yarulina
Sulzer Chemtech (CH)
Jaakko Martikainen
Valmet (FI)
EcoStyrene™ – Enabling Circularity for Contaminated Polystyrene Waste

16:40
Panel Discussion with all Session Speakers

15:20–17:00

Textile Sorting and Recycling

Room Laurentius

Chairpersons: Asta Partanen & Narendar Poranki, nova-Institute (DE)

15:20
Hans Chan
Matoha (UK)
Smarter Sorting for a Circular Future: The Role of AI and Data in Feedstock Identification for Textile Recycling

15:40
Manuel Steiner & Leonard Sylla
LIST Technology (CH)
Processing Technology for the Elephant in the Room: Chemical Recycling of Mixed Textiles

16:00
Christian Schimper
Josef Ressel Centre ReSTex, University of Applied Sciences Wiener Neustadt (AT)
RESTEX: Josef Ressel Centre for Recycling Strategies for Textiles

16:20
Hannah Mangold
BASF (DE)
Complementary Paths in Plastics Recycling at Scale

16:40
Panel Discussion with all Session Speakers

17:00 Poster Pitches (Booths 20 & 21) and Beer on Tap

19:00 Gala Dinner

21:00 German Bowling

Day 2
20 November 2025
9:00 – 17:30 (CET)

9:00
Stefanie Fulda
nova-Institute (DE)
Day Opening

9:00
Lars Krause
nova-Institute (DE)
Day Opening

9:10–10:50
From Py-Oil Quality to Valuable Resources and the Chain of Custody in Advanced Recycling

Grand Hall

Chairpersons: Stefanie Fulda & Gillian Tweddle, nova-Institute (DE)

9:10
Adam Sköld
Chalmers University of Technology (SE)
A Pragmatic Approach for Analysis of Complex Pyrolysis Oils

9:30
Geoff Smith
Itero Technologies (UK)
Mixed Waste Plastic Pyrolysis: Connecting the Dots Between Feedstock Quality and Oil Quality

9:50
Geoff Brighty
Mura Technology (UK)
From Plastic Waste to Ethylene: Steam Cracking of Supercritically Produced Naphtha

10:10
Haridharan Krishnan
ISCC System (DE)
Methodologies for Traceability and Chain of Custody in Advanced Recycling: Aligning with ISCC Standards and Upcoming Regulatory Frameworks

10:30
Panel Discussion with all Session Speakers

9:10–10:30
Digital Solutions for Process Optimisation and Market Forecasting

Room Laurentius

Chairpersons: Kristijan Mrsic & Lars Krause, nova-Institute (DE)

9:10
Matthias Hermann
Citrine Informatics (US)
Making Chemical and Mechanical Recycling More Productive using AI

9:30
Martina Walzer
Siemens (DE)
Turning Trash into Treasure. Optimizing Recycling Operations with Digital Solutions for Carbon Material Loops

9:50
Peter Jetzer
Recycario Data Science Institut für wirtschaftliches Kunststoffrecycling | Recycario Data Science Institute for Economical Plastics Recycling (DE)
Recycario Market Forecasts as a Decision Compass for the Recyclate Market

10:10
Panel Discussion with all Session Speakers

10:50 Coffee Break

11:20–12:40

Recycling Solutions for End-of-Life Vehicles (ELV)

Grand Hall

Chairpersons: Pauline Ruiz & Nadja Wulff, nova-Institute (DE)

11:20
Lukas Killinger
Fraunhofer Institute for Chemical Technology (DE)
ELV Directive Demands: Pioneering Recycling Solutions for Automotive Plastic Waste

11:40
Fergal Byrne
Addible (IE)
Oxycycle: Oxidation-based Tyre Recycling

12:00
Abidin Balan
Trinseo (NL)
Advancing Circularity through Dissolution-Based Upcycling for ABS and PC Waste

12:20
Panel Discussion with all Session Speakers

11:20–12:40

Thermochemical Solutions for the Recovery of Valuable Resources and Energy

Room Laurentius

Chairpersons: Achim Raschka & Lars Krause, nova-Institute (DE)

11:20
Judit Fortet Casabella
Chalmers University of Technology (SE)
Towards Full Carbon Recovery in a Dual Fluidized Bed Steam Cracker for Thermochemical Recycling of Plastic Waste

11:40
Peter Eisele
Ambra (DE)
A Chemical Recycling Process to Turn Non-recyclable Waste into High Grade Chemical Materials

12:00
Antonia Helf
TU Bergakademie Freiberg, Institute of Energy Process Engineering and Chemical Engineering (DE)
Status of Gasification-based Chemical Recycling and Perspectives Using Electrification

12:20
Panel Discussion with all Session Speakers

12:40 Lunch Break & Networking

14:10–15:30
Thermochemical Recycling (Part 2)

Grand Hall

Chairpersons: Gillian Tweddle & Lars Krause, nova-Institute (DE)

14:10
Eric Appelman
Aduro Clean Technologies (CA)
Making the Most of Plastic Waste

14:30
Shibashish Devidutta Jaydev
BUSS ChemTech (CH)
Industrial-scale Continuous Chemical Recycling of Mixed Plastic Waste into Cracker-ready Oil via Thin-film Pyrolysis

14:50
Jens Becker
LyondellBasell (DE)
MoReTec Chemical Recycling Technology

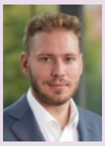
15:10
Panel Discussion with all Session Speakers

14:10–15:30
Physical Recycling via Dissolution

Room Laurentius

Chairpersons: Pauline Ruiz & Nadja Wulff, nova-Institute (DE)

14:10
Nicolas Cottenye
UpSolv (CA)
Economically Viable Thermoplastics Recycling by Dissolution



14:30
Paul Aschauer
Fraunhofer IVV (DE)
Innovative Solvent-Based Recycling Process: Advancing Towards Industrial Scale and Circular Economy

14:50
Juul Cuijpers
ReSolved Technologies (NL)
Unlocking Circularity through Dissolution Technology

15:10
Panel Discussion with all Session Speakers

15:30 Coffee Break

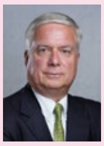
16:00–17:30

Biochemical Recycling (Part 2)

Grand Hall

Chairpersons: Pia Skoczinski, nova-Institute (DE)
& Lars Blank, RWTH Aachen University (DE)

16:00
Mariana Rangel Pereira
Evoralis (UK)
From Hits to Hotspots: Ultra-High-Throughput Directed Evolution for Nylon Depolymerisation



16:20
Oliver Borek
Entzimatiko (ES)
Entzimatiko, a Single Step Enzymatic Hydrolysis for the Low Cost Production of Monomers

16:40
Ronny Frank
Ester Biotech (DE)
Accelerating Enzyme Engineering for Plastic Recycling with Electrochemical Impedance Spectroscopy and Advanced Computational Methods

17:00
Panel Discussion with all Session Speakers

17:20
Final Words

17:30 End of Conference

Recycling Complexity: The Evolving Challenge of Automotive Materials

The recycling of End-of-Life vehicles (ELVs) is a cornerstone of Europe's circular economy ambitions. While metals such as steel and aluminium are long-established in recycling systems, complex materials like polymers, composites, and multi-material assemblies have made the recovery of vehicle components significantly more challenging. To secure valuable resources and reduce environmental impacts, automotive recycling must evolve to address these materials with precision, efficiency, innovative technology and scientific rigour.

Policy Landscape and the Urgency for Action in the Automotive Sector

The European Union's Directive 2000/53/EC on End-of-Life Vehicles laid the foundation for vehicle recycling more than two decades ago. However, with the European Green Deal and Circular Economy Action Plan pushing for improved material circularity, a new regulatory framework is emerging. The proposed End-of-Life Vehicles Regulation (COM (2023) 451) will extend obligations across the full vehicle lifecycle, including a requirement for a minimum of 25% recycled plastic content from EOL vehicles in new vehicles and mandatory design provisions for the removability of large mono-plastic parts (European Commission, 2025).

In March 2025, the Council of the European Union endorsed these measures, underlining that future vehicles must be designed for dismantling, reuse, and high-value recycling (Council of the EU, 2025). Industry associations have responded: EuRIC (2024) supports lifecycle-based implementation, while the European Composites Industry Association (EuCIA, 2023) stresses the need for proportionate targets that reflect composite material realities.

Complexity in Automotive Materials

This evolving policy context is reshaping the automotive recycling sector. What was once a linear end-of-pipe activity is now a design and materials-management challenge across the entire vehicle value chain.

Plastics and Polymers

Plastics account for nearly 20% of a modern car's mass, mainly including PP, PE, PA, ABS and blends. Mechanical recycling remains limited by paints and additives, but solvent-based and other chemical recycling routes show promise for the recovery of high-quality products (Zambrano et al., 2024; Ravina et al., 2023).

Fibre-Reinforced Composites

Glass- and carbon-fibre reinforced polymers provide lightweight strength but resist conventional recycling. Pyrolysis and solvolysis can recover fibres, yet, cost and quality losses remain barriers (Khan et al., 2021; Mbatha et al., 2024).

Lightweight Alloys

Aluminium use is expanding, yet alloy mixing leads to downcycling. Sorting advances such as spectroscopy-based classification can support a closed-loop recovery (Shankar et al., 2024; Tiwari et al., 2025).

From Dismantling to Digital Traceability

Modern vehicles combine bonded composites, embedded electronics, and mixed joints that complicate disassembly. The proposed ELV regulation introduces design-for-disassembly obligations, requiring non-destructive removal of large polymer parts before shredding Research into "active disassembly" using smart fastening materials could further improve component recovery.

A promising pathway is improved sorting and advanced separation. After shredding, the automotive shredder residue (ASR), a mixture of plastics, foams, glass, textiles, and metals, remains a key bottleneck. Advanced sorting technologies using near-infrared or hyperspectral sensors can separate valuable polymer fractions for reuse or chemical recycling.

References

Council of the European Union (2025), Circular economy: Council adopts position on recycling of vehicles at the end of their life, https://www.consilium.europa.eu/en/press/press-releases/2025/03/25/circular-economy-recycling-of-vehicles/

EuCIA (2023) New ELV Directive: Considerations from the Composites Value Chain Perspective, https://eucia.eu

EuRIC (2024) Recommendations on the ELV Regulation proposal, https://euric-aisbl.eu

European Commission (2025) Proposal for a Regulation on circularity requirements for vehicles (COM (2023) 451). Available at: https://environment.ec.europa.eu/topics/waste-and-recycling/end-life-vehicles_en

Khan et al. (2021), Advances of composite materials in automobile applications – A review,' Journal of Engineering Research Volume 13, Issue 2, June 2025, Pages 1001-1023, https://www.sciencedirect.com/science/article/pii/S2307187724000440

Mbatha, A. et al. (2024), The use and recycling of natural and synthetic fibre-reinforced polymeric composites in the automotive industry, International Journal of Engineering Trends and Technology 72(4):269-278 https://www.researchgate.net/publication/380076177_The_Use_and_Recycling_of_Natural_and_Synthetic_Fibre-_Reinforced_Polymeric_Composites_in_the_Automotive_Industry_A_Review

Ravina, M. et al. (2023) Hard-to-recycle plastics in the automotive sector: Economic, environmental and technical analyses of possible actions, Journal of Cleaner Production, 394: 136227, https://iris.polito.it/handle/11583/2976250

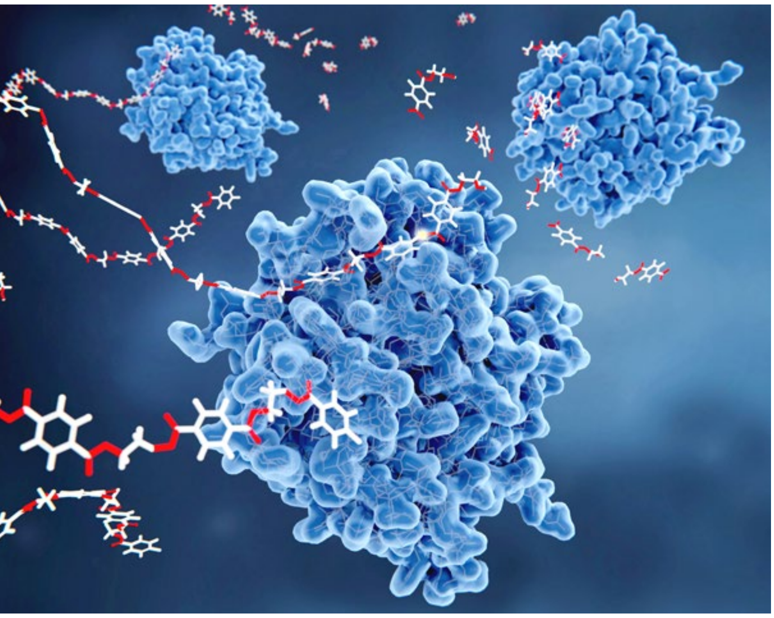
Shankar et al. (2024), Classification of automotive aluminium scrap into cast and wrought alloys via particle size analysis, Journal of Sustainable Metallurgy, https://link.springer.com/article/10.1007/s40831-024-00989-x

Tiwari et al. (2025), Facilitating recycling of 6xxx series aluminium alloys by machine-learning-based optimisation,' Journal of Sustainable Metallurgy Volume 11, pages 2323–2334, (2025), https://link.springer.com/article/10.1007/s40831-025-01112-4

Zambrano et al. (2024) Recycling of Plastics in the Automotive Sector and Methods of Removing Paint for Its Revalorization: A Critical Review, Special Issue Sustainable Polymers for a Circular Economy. Available at: https://www.mdpi.com/2073-4360/16/21/3023

Enzymatic Recycling: Sustainable Valorisation of Plastic Waste

Plastic pollution has become one of the most urgent environmental issues of modern societies. While conventional mechanical recycling often results in lower material qualities, making it unsuitable for high-value applications, chemical recycling offers an alternative path to recycle plastic waste but typically involves high energy consumption (e.g. for the production route from waste to plastic) and operation under harsh conditions (e.g. higher temperature levels). Recently, enzymatic recycling has emerged as a promising approach for plastic waste valorisation rooted in biotechnology, offering a more sustainable and effective route to reclaim and utilise plastic monomers for the production of new polymers.



Understanding Enzymatic Depolymerisation

At the core of enzymatic recycling are (engineered) enzymes. These biological molecules catalyse chemical reactions with high specificity and efficiency. Engineered enzymes selectively break down polymers into monomers under mild conditions, offering new avenues for true circularity. Specifically, in the context of plastics, enzymes called PET hydrolases catalyse the breakdown of PET, a common thermoplastic used in bottles and textiles.

Unlike traditional chemical processes, enzymatic depolymerisation operates under mild conditions, typically below 70 degrees Celsius and at atmospheric pressure. It hereby significantly reduces energy requirements and greenhouse gas emissions. Additionally, the process can handle plastic waste with contaminants such as dyes or residual adhesives, provided the polymers consist predominantly of PET.

From Laboratory to Pilot Scale: A Catalyst for Transformation

Importantly, enzymatic recycling research extends beyond PET. Plastics such as polyamides (found in textiles and automotive parts) and polyurethanes (used in foams and coatings) are promising targets due to their amide and urethane bonds, which some enzymes can selectively cleave. Xu et al. emphasize the comprehensive strategy leveraging microbial processes to transform mixed plastics of fossil-derived polymers such as PP, PE, PU, PET, and PS, most notably polyesters, in conjunction with potential biodegradable alternatives such as PLA and PHA (Xu et al., 2025). Other polyesters with similar ester bonds also hold potential for enzymatic treatment (Utomo et al., 2022).

Enzymatic recycling is advancing rapidly. Cutting-edge enzyme engineering, process optimisation, and microbial upcycling are translating lab breakthroughs into industrial applications, highlighting the sector's potential to revolutionise plastic waste management. Large-scale pilots will showcase efficient treatment of complex, mixed plastics, producing high-purity monomers for reuse and upcycling. As research lowers costs and improves stability, enzymatic recycling is poised to become a cornerstone of sustainable, circular plastics systems.

References

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Xu et al. (2025), Exploring biotechnology for plastic recycling, degradation and upcycling for a sustainable future, in Biotechnol Adv 2025 Jul–Aug, 81:108544. doi: 10.1016/j.biotechadv.2025.108544 https://pubmed.ncbi.nlm.nih.gov/40024585/

Interview

New Players in Advanced Recycling

Innovators at Work

Sustainability Gains Through Enzymatic Recycling

1. Innovation & Sustainability

The research of your department of applied microbiology combines metabolic engineering and microbial biotechnology to advance enzymatic recycling. In this process plastic monomers are used as alternative carbon and energy source and thereby replace sugars, contributing to an envisaged land-free biotechnology. Working with experts in pyrolysis, technical chemistry or enzyme catalysis generates such plastic monomer mixtures. For example engineered enzymes act like molecular scissors to break down polymers such as PET into their original building blocks: the monomers ethylene glycol (the E in PET) and terephtalic acid (the T in PET).

What are the main challenges and opportunities when using engineered microbes and/or enzymes to turn plastic waste into valuable biochemicals? How does this approach help create a more sustainable circular economy?

Lars Blank: Often, the low energy conditions required for biocatalysis are mentioned, however, depending on the catalytic route process engineers can do heat integration and many more tricks to become energy efficient. For me the application for biotechnology can find its niche where chemistry struggles, e.g., plastic/monomer mixtures into a single product. We can engineer microbes that can utilize such different molecules as alcohols, organic acids, and aromatics into bioplastic or other products of value. The challenges in biotechnology are manifold, and we have to learn not to repeat all again and again. The idea of using polymers, degrading them to monomers, and using these monomer mixtures as food for microbes is not at all new. After four decades or so are second generation carbon sources such as wheat straw and corn stover still not a reality. Why I am hopeful? We can identify plastic fractions which do not contain all the possibilities, like chlorine from PVC or bromides from flame retardants.

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Lars Blank
RWTH Aachen

Surely, these additives are a challenge we have to tackle when moving from PET to more mixed plastics.

How do such approaches contribute to sustainability? André Bardow and his group educate us that about 500 million tons of virgin plastic per year CAN BE produced sustainably, however, only if recycling quota above 75% are reached. Surely, we do not have nice, clean, sorted plastic at the 75% of all plastic used, hence, we need any technology that keeps the carbon in the loop.

2. Sustainability Gains Through Breakthrough Technology

Enzymatic recycling offers a gentler, more precise alternative to chemical recycling options by using biological catalysts to selectively break plastics down at the molecular level. Studies[1] have shown that enzymatic PET recycling can reduce greenhouse gas emissions by up to 43% and total supply-chain energy use by as much as 83%, compared to making new plastic from fossil resources.

What do you see as the main challenges and opportunities in applying microbial and enzymatic technology to plastic waste valorisation, especially in delivering measurable sustainability gains in a circular economy? What key breakthroughs have you as a professor observed in recent research to improve the efficiency and reduce environmental impact of such processes?

Lars Blank: While the enzymatic degradation of PET, and to some extent PLA made incredible strides, from some observable activity in specialised laboratories to few hours at industrially relevant scales, the challenges are in the detail. How about the purification of both PET monomers? Yes, terephthalic acid can be cheaply recovered, however ethylene glycol not so cheap. And, are additivized PET like opaque PET also possible? A different challenge is the production of an acid. Is the enzyme low pH stable or is pH control required? If the latter, how is the atom efficiency of the process, as a base has to be added? Again, we, as microbiologists can work with all technologies that can break down the polymer to its monomers. Hence, the best suited technology can be chosen, taking environmental impact directly into account.

Laboratory reactor for enzymatic plastic degradation.

3. Challenges & Opportunities

Scaling up enzymatic recycling brings both efficiency and economic challenges, such as enzyme production cost, the need for precise process control (temperature, pH, reaction time), and difficulties with mixed or contaminated waste streams. Industrial analysis estimate that process innovations can lower costs by as much as 74% compared to earlier approaches[2].

What specific obstacles do research and industry face in bringing enzymatic recycling from laboratory to pilot scale, and what market or policy changes would help accelerate industry adoption?

Lars Blank: The PET market is gigantic, hence, to make any impact one requires a large plant of at least 50,000 tons of plastic and ideally larger. This comes with invest risks, with all the market uncertainties including changes in policies and such simple aspects as tax. More generally, in biotechnology, we would profit if we would get on the same playing field. Carbon pricing, as implemented in the EU is such a measure to guide us in such a future. Is it happening? The CO_2 price is still to low to become on pair with the traditional routes.

4. Collaboration & Industry Partnerships

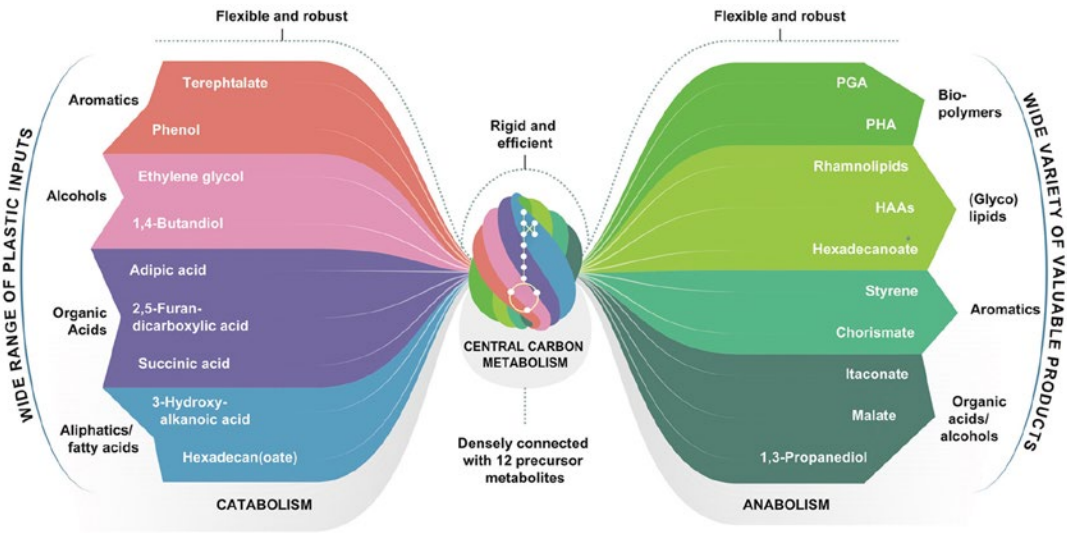
Successful enzymatic recycling technologies require input from biotechnology, the chemical industry, and the waste management sector. In consequence, partnerships have proven critical in optimising feedstock sourcing, logistics and process control.

How do you approach building these collaborations, e.g. in research- or industrial consortia? What kinds of industry partnerships or cross-sector exchanges appear most valuable for scaling and validating enzymatic recycling in settings of the industrial world?

Lars Blank: In the EU projects we coordinated we had industrial partners that had (and still have) the plastic recycling challenges in house. Here, even “clean” plastic fractions of defined origin can only be incinerated. Working directly with the challenge owners is very fruitful. I am not starting with the German waste system as I understand it, as here everything will work with the companies handling the waste, as long as someone pays for it. With a step towards such a novel value chain, our colleagues Regina Palkovits and Jürgen Klankermayer started the WSS funded research canter catalaix. In catalaix 17 groups from RWTH Aachen University and FZ Jülich cover all disciplines from plastic sorting, to catalysis, and system analysis. You will see many collaboration between disciplines.

[1] https://www.nrel.gov/news/detail/press/2021/analysis-shows-enzyme-based-plastics-recycling-is-more-energy-efficient-better-for-environment

[2] https://www.nrel.gov/news/detail/program/2025/plastics-recycling-with-enzymes-takes-a-leap-forward



Plastic monomers as carbon and energy source for microbes.
The monomers are converted through dedicated pathways into central carbon intermediates and from there to the product of choice.

5. Future Innovations

Enzymatic recycling works especially well for plastics such as PET (e.g. from bottles, textiles) but faces major hurdles with other plastics or mixed waste streams, due to the need for different enzymes or pre-treatments.

Which plastic wastes or composite streams do you consider best/less suited for enzymatic recycling today? How transferable is the process to other waste categories, and what further improvements or research would make enzyme-based recycling viable for a broader range of materials? Painting an ideal scenario, what does the future of biochemical recycling bring?

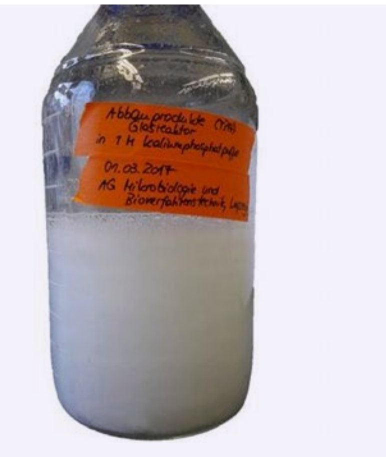
Lars Blank: As mentioned, enzymatic depolymerisation is just one possible route to come from polymers to the monomers. The high selectivity, and in the case of PET, the high rate of plastic degradation is clearly arguing in favour. We see much progress on other polyesters, while first encouraging reports exist on other heteroatomic bonds, like polyamides (PA), polycarbonates (PC), and polyurethanes (PU). While the technologies are slow and often only work on oligomers, the progress will be rapid, I am sure. We will see which technology will prevail.

What I have to date a strong opinion about, which would need truly interesting new developments, is the enzymatic degradation of olefins, carbon-carbon bond containing plastics such as PE and PP. While the literature reports a lot, I am still convinced that most reports are artifacts or utilize non-relevant PE derivatives (e.g., low molecular weight, containing oxygen).

To further extent to other materials? Some plant material like the mentioned wheat straw would be great, but the technology is complex and hence not commercially competitive until the current market conditions.

How about having biodegradable material for material we put by purpose into the environment? We should not leave any plastic in the environment, but if we lose, it will at least disappear. An example are seed coatings, where plastic is required to date. These small amounts of plastic have to be biodegradable in the future.

How about taking the End-of-Life of the material into its original design? We argue for recycling-privileged polymers that come with bonds that can in a recycling environment easily be broken. The vision is clear, non-fossil feedstocks (i.e., biomass, CO_2, plastic waste) are converted to polymers that allow high recycling quota, and come with bonds that allow emergency biodegradation.



PET hydrolysate from Prof. Zimmermann, Leipzig

Interview

New Players in Advanced Recycling

Innovators at Work

Successful Scale-up and Efficiency Gains Through Digital Solutions and Artificial Intelligence

1. Innovation & Sustainability

While Weatherford has recently advanced digital solutions especially in the energy sector, for example through intelligent completions and electronic inflow control valves (e-ICVs), digital transformation is reshaping all industries by enabling smarter, more efficient, and sustainable operations. Weatherford's innovations range from e-ICVs to comprehensive data models, that integrate operational and financial metrics and demonstrate how combining real-time data with automation can reduce energy consumption and greenhouse gas (GHG) emissions.

What are the key opportunities you see for digitalisation to drive measurable sustainability gains in advanced recycling? How can integrated data-driven approaches help recycling stakeholders improve environmental outcomes while maintaining operational viability?

Dmitrii Didenko: Digitalization is no longer just a "nice-to-have" but is essential in complex fields like advanced recycling, enhancing both efficiency and sustainability. At Weatherford, we have seen real-time data and automation reduce energy use and emissions in oil and gas, and we are confident these tools can deliver similar benefits in recycling.

Our EcoVisor platform, originally developed to track emissions and energy at oil and gas sites, can be adapted to provide recycling facilities with real-time visibility into their environmental impact. Combined with our Unified Data Model (UDM), which integrates operational and financial data, it delivers a comprehensive view to support informed business decisions.

Dmitrii Didenko
AI Solutions Lead, Weatherford

With this data-driven approach, recyclers can demonstrate the impact of their sustainability efforts and identify opportunities to reduce energy consumption and lower costs. It helps link environmental goals to real business outcomes.

2. Sustainability Gains Through Breakthrough Technology

Centralised digital platforms that unify data sources, such as SQL databases (Structured Query Language), spreadsheets like Smartsheets, and live sensor inputs, are significantly improving performance monitoring and decision-making. Techniques like Extract, Transform, Load (ETL) ensure data accuracy and completeness, while advanced statistical algorithms estimate missing or untagged waste metrics. Your company has highlighted the role of downhole insights and data-driven analytics to maximise system efficiency in energy production. Recycling processes face a comparable challenge with variable and unpredictable feedstocks (e.g., mixed and contaminated plastic waste) that impact yields and product stability.

Which digital breakthroughs offer the most immediate and scalable benefits for improving sustainability in recycling operations? Could you illustrate how predictive analytics, real-time dashboards, or weight allocation algorithms enhance transparency and decision-making across diverse recycling contexts, e.g., help operators stabilise and optimise recycling processes facing highly inconsistent input streams?

Dmitrii Didenko: One of the greatest opportunities in recycling today is using digital tools to streamline data management and clarify complex processes. However, a major challenge is managing the vast amount of data collected. Sensor outputs, production logs, and financials often exist in separate systems, making it hard to connect and use for quicker, better decisions.

Predictive analytics has delivered gains, especially in planning and scheduling. Instead of reacting, operators address issues proactively. They can forecast downtime, predict when systems need maintenance, and model how process changes affect outcomes.

Our UDM consolidates disparate data sources into a single framework. It draws from spreadsheets, databases, and live equipment data, then utilizes analytics to transform raw data into actionable insights.

These digital tools not only improve sustainability but also simplify facility operations. They are scalable because they provide operators, managers, and executives with the visibility needed to make informed decisions that reduce waste, conserve energy, and improve efficiency.

3. Challenges & Opportunities

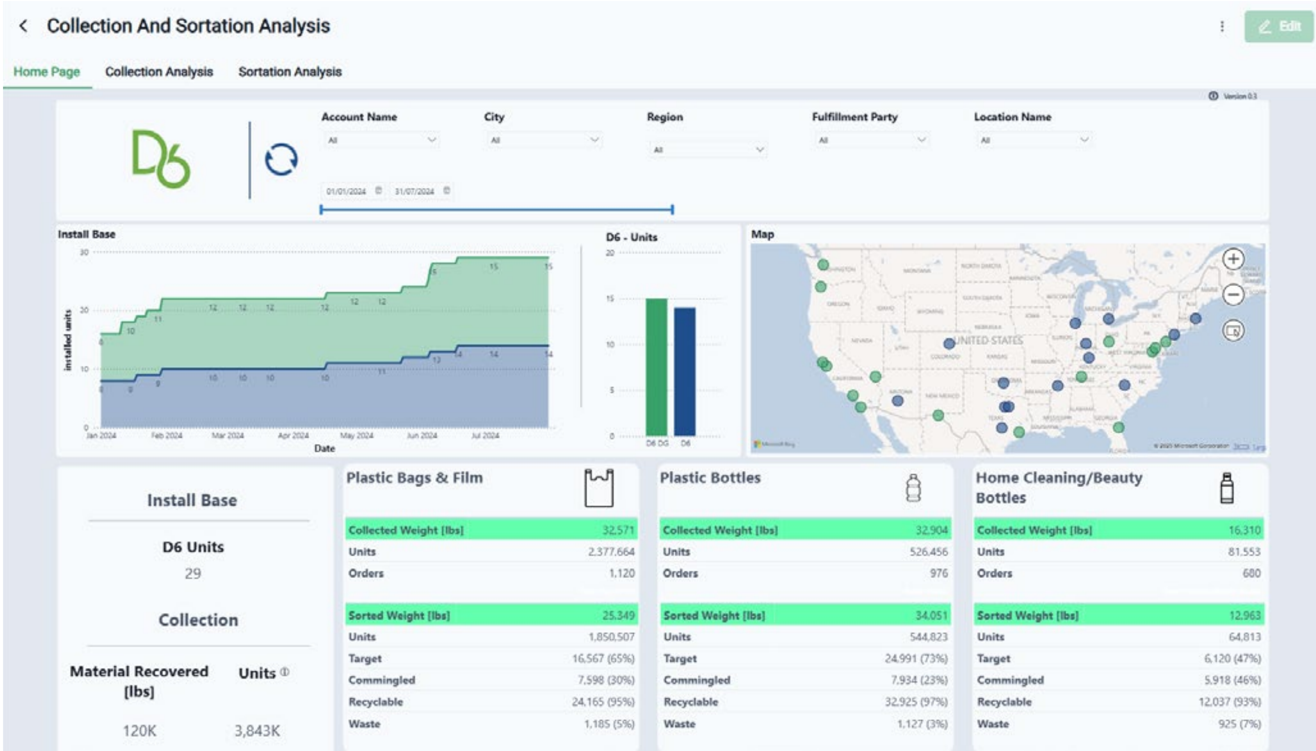
Despite their potential, digital and AI systems present integration challenges, especially when they depend on data from heterogeneous and sometimes incomplete sources. The scalability of these solutions also depends on aligning operational workflows with technology. However, access to unified, accurate, and real-time financial and performance data can empower operators to optimise scheduling, reduce costs, and forecast more effectively.

What are the primary hurdles operators face in implementing extensive digitalisation in advanced recycling? Conversely, how can overcoming these challenges through well-structured data integration and analytics create new opportunities for operational and financial improvements sector-wide?

Dmitrii Didenko: In the process of digitalising recycling, one of the primary challenges is the fragmentation of existing systems. Many plants still rely on separate Excel spreadsheets, old databases, or even manual logs, making data integration challenging. We addressed this fragmentation by developing the UDM. It creates a common data language without a complete system overhaul. This makes it easier to layer on analytics and forecasting tools on top.

In addition to data fragmentation, limited digital skills and tight IT budgets add to the challenge. Automation helps here. For example, EcoVisor processes data in the background, notifying personnel only if action is needed. Ultimately, by overcoming these barriers, organizations can achieve significant benefits, including real-time cost tracking, reduced downtime, smarter scheduling, and overall leaner, greener operations.

Omni Recycling Center – Sortation



General Overview of Collection and Sortation Data

4. Collaboration & Industry Partnerships

Successful digital transformation requires coordinated efforts among technology providers, recyclers, waste handlers, and investors. Weatherford's history of cross-functional partnerships highlights the crucial role of blending expertise in data engineering, process optimisation, and finance to realise integrated digital platforms.

How do you foster collaboration across these sectors to build integrated, scalable digital solutions in recycling? What types of industry alliances or cross-sector exchanges are most effective for driving the validation and adoption of digital systems in the industry?

Dmitrii Didenko: Digital transformation does not happen alone. At Weatherford, we have learned that building ecosystems by bringing together data experts, engineers, operators, and regulators is key. This approach is also being applied in our recycling initiatives. A notable example is our customer D6 Inc., which, through its partnership with Walmart, integrates recycled content into packaging for Walmart shelves. This creates a closed supply chain that is both economically and environmentally sustainable. Such collaborations between recyclers and major retailers accelerate adoption and engage end users to participate.

We apply the same ecosystem-building approach in recycling by partnering with retailers, recyclers, waste handlers, and technology companies. Our open and flexible UDM acts as a centralized data platform, encouraging other vendors and partners to plug in and collaborate. To support these efforts, our EcoVisor platform offers transparent and reliable reporting for investors, regulators, and operators.

D6 Inc. Collection Unit at Parking Lot in US

5. Future Innovations

The future of advanced recycling may lie in "smart factories" leveraging artificial intelligence (AI)-enabled predictive maintenance, dynamic inventory management, and automated scheduling based on material flows. Innovations such as expanded Internet of Things (IoT) networks, advanced analytics for missing data estimation, and real-time operational tracking promise to transform recycling plants into adaptive, efficient, and transparent enterprises.

Looking ahead, what are the key innovations that will define digitally optimised recycling facilities? How will these advances translate into sustainability, efficiency and economic benefits not only for operators but for broader recycling value chains, including investors, regulators, and consumers?

Dmitrii Didenko: Smart, adaptive recycling facilities, powered by AI, are revolutionizing the industry. By predicting maintenance needs, managing inventory, and scheduling tasks, digitalization optimizes material flow and drives more effective recycling operations.

We are already utilizing AI-driven maintenance prediction in oilfields, identifying problems early to prevent downtime. Recycling lines are next. IoT sensors with edge computing will further enhance these facilities by bringing decision-making directly to the factory floor, reducing delays and improving responsiveness.

By incorporating UDM features that address missing data and detect anomalies, plants can implement monitoring systems that enhance efficiency, transparency, and resilience. These improvements benefit operators, investors, regulators, and consumers by supporting cleaner and more reliable recycling systems.

In summary, digitalization extends beyond operational improvements and is a critical step toward achieving a circular economy. Weatherford remains committed to advancing this progress.

Omni Recycling Center

ESG Performance Analytics

Interview

New Players in Advanced Recycling

Innovators at Work

Innovative Chemical Recycling Pathways for Sectors with Complex Materials, e.g. Automotive and Textiles

Fergal Byrne
CTO, Addible

1. Innovation & Sustainability

Advancements in chemical recycling offer sustainable solutions to complex materials and various additives commonly found in automotive applications like tyres, plastics, and composite parts. Traditional recycling methods like mechanical shredding or incineration often fall short in efficiently recovering such valuable materials. Addible's OxyCycle technology uses a process called oxidative devulcanisation, a chemical reaction with oxygen designed to break down End-of-Life tyres at the molecular level.

Could you explain how it contributes to transforming challenging automotive waste streams into valuable raw materials? What are the key sustainability advantages of your approach over traditional recycling methods, and how do these innovations support the broader circular economy ambitions within the automotive sector?

Fergal Byrne: The recycling of rubber from End-of-Life tyres remains one of the biggest challenges in the circular economy. Current routes such as mechanical shredding and pyrolysis have clear limitations: shredded rubber faces upcoming EU restrictions and can only be down-cycled into low-value infill or flooring materials, while pyrolysis consumes large amounts of energy yet recovers only a fraction of the rubber as low-grade oils and carbon black containing ash. Our OxyCycle process overcomes these limitations through a proprietary oxidative devulcanisation step that breaks the sulfur crosslinks binding the rubber polymers under mild, energy-efficient conditions. This enables complete disassembly of tyres into clean, separate streams: virgin-quality carbon black, high-purity steel and textiles, and unsaturated rubber polymers that can be re-vulcanised or compounded into new high-performance products.

Unlike thermal or mechanical routes, OxyCycle typically recovers more than 98% of the input mass as valuable materials rather than waste residues. When applied to unprocessed whole tyres, the process can even separate the different layers, yielding defined polymer grades ready for reintegration into manufacturing. By drastically improving both the quality and quantity of recovered materials, OxyCycle transforms tyres, hoses, seals (even tennis balls!) from an environmental burden into a strategic raw-material source, a practical step toward a true circular economy in mobility and beyond.

2. Sustainability Gains Through Breakthrough Technology

Enzymatic recycling and other innovative technologies have the potential to significantly reduce greenhouse gas emissions and energy consumption compared to conventional recycling. In practice, how has Addible's technology translated these possibilities into real-world gains? Could you share insights from your experiments or industrial trials on specific improvements in process efficiency, product purity, or lifecycle environmental impacts? Furthermore, how do you integrate environmental considerations when choosing between different recycling routes for tyres and/or other waste streams?

Fergal Byrne: Quantifying total lifecycle impacts is ongoing, but from a chemical-engineering and green-chemistry perspective, the sustainability gains of OxyCycle are already clear. Traditional recycling methods depend on high-temperature pyrolysis or chemical reagents with limited recovery potential. In contrast, OxyCycle operates at mild temperatures and employs a reagent system that is largely recyclable and inherently low-toxicity. In our trials, over 99% of our active proprietary reagent is recovered and reused, with only small additions of fresh oxidant (H_2O_2) required to maintain performance. The reagent itself can be synthesised from bio-derived feedstocks, enabling a renewable supply chain from the outset.

The chemistry was developed under safe-and-sustainable-by-design principles, avoiding persistent or hazardous compounds and ensuring that all input and output streams can be handled safely. Operating at a fraction of the energy demand of thermal routes, OxyCycle substantially reduces CO_2 emissions, waste generation and water use. Because the system can treat mixed or contaminated rubber feedstocks without pre-sorting, it delivers high recovery at minimal environmental cost, turning a waste problem into a renewable resource opportunity aligned with emerging EU sustainability frameworks.

3. Challenges & Opportunities

Automotive recycling is complicated by the presence of diverse polymers, additives, and contaminants which impede straightforward recovery processes. From your experience, what are the most critical technical and operational challenges encountered in processing such complex waste streams? How do your chemical recycling solutions overcome issues of material heterogeneity and contamination to produce outputs meeting industry-grade standards?

Fergal Byrne: Automotive rubber waste is highly heterogeneous. Tyres alone contain multiple polymer types, steel, textiles, plasticisers, fillers and environmental contaminants, and traditional approaches struggle with this complexity. OxyCycle was designed for exactly such mixed waste. The process combines controlled swelling, selective extraction, oxidative devulcanisation and staged separation, each step exploiting intrinsic material differences, for example, swelling removes additives and surface dirt before the devulcanisation step cleaves sulfur crosslinks. Differences in polymer reactivity, particle size and density then enable clean separation of metals, textiles, carbon black and rubber fractions. Because the process deconstructs materials in a sequence of mild, selective reactions, it can handle variable feedstocks and still deliver consistent, high-purity outputs.

The OxyCycle process can separate waste tyres into its constituent parts, rubber, carbon black, and textiles.

4. Collaboration & Industry Partnerships

The success of advanced recycling technologies hinges on an ecosystem of cross-sector partnerships involving manufacturers, recyclers, chemical engineers, and policy makers. From your perspective, what forms of collaboration have proven most effective in overcoming market and regulatory barriers, and achieving commercial scalability? How does Addible proactively engage with different stakeholders across the value chain to align incentives and foster trust? Additionally, could you shed light on current market dynamics, e.g., evolving customer demand, supply chain shifts, or policy frameworks shaping the landscape for advanced recycling?

Fergal Byrne: Collaboration is essential for scaling any new recycling technology. At Addible, we work closely with tyre manufacturers, compounders, and recycling operators to ensure that the materials we recover meet the specifications required for reintegration into production. We view recycling as a systems challenge: efficient logistics for collecting and pre-sorting waste are as important as the chemistry itself. By aligning with existing collection networks and rubber waste feedstocks, we ensure that OxyCycle can plug seamlessly into today's infrastructure. Our partnerships with carbon-black producers and rubber converters allow real-world validation of product performance, while engagement with policymakers helps shape frameworks that reward high-value, low-impact recycling routes. Market demand for recycled, traceable rubber and carbon black is accelerating under upcoming EU End-of-Life Tyre and sustainable-materials regulations, and OxyCycle positions us to deliver those materials at the quality levels the industry demands.

Devulcanised rubber in a round-bottomed flask in Addible lab.
© Addible

5. Future Innovations

As the automotive industry shifts towards electric vehicles and lightweight designs, the use of advanced polymers and composites is growing, making recycling even more complex. At the same time green chemistry, which focuses on creating safer and environmentally favourable chemical processes, is becoming increasingly vital. Looking ahead, which advances in green chemistry or chemical technologies do you believe will have the greatest influence on closing the recycling loop? Are there specific materials where you see the most significant opportunities for breakthrough innovations, and what role will cross-industry collaborations play in achieving these goals?

Addible also addresses difficult waste-groups like multi-layer packaging, which shares complexity and contamination challenges with automotive materials. Could you discuss how insights or technologies from packaging recycling might be translated to automotive recycling? What opportunities do you see for cross-sector collaboration to accelerate circularity and sustainability across both industries?

Fergal Byrne: There are many materials currently in use that are easily recycled and more that are almost impossible to recycle. The future of recycling has to depend on designing materials and processes together. Advances in green and safe-by-design chemistry now allow us to introduce technology such as reversible bonds or other built-in "release" mechanisms into polymers, enabling controlled de-crosslinking or delamination at End-of-Life. At Addible we see huge potential in chemically smart, bio-based materials, where rubbers, composites and packaging can be dismantled and reused through mild chemical steps similar to those used in OxyCycle. Our work in recycling processes directly informs our approach next-generation polymer design, where multilayer or composite structures pose similar recycling challenges. By transferring knowledge between sectors and partnering with manufacturers at the design-for-circularity stage, we can collectively ensure that new materials we design are fit for circularity from the outset. Achieving this vision requires cross-industry collaboration between polymer chemists, product designers, recyclers and policymakers, creating a truly circular materials economy rather than treating recycling as an afterthought.

New Agglomeration Technology for Advanced Recycling

"It is our job to build machines that support chemical recyclers in the recovery of low-grade waste fractions," explains Klaus Lederer, Business Development Manager Chemical Recycling at EREMA. Petrochemical environments require standardised, pourable input material. "AGGLOREMA closes the gap between highly contaminated, heterogeneous and often thin-film waste streams, and reliable feedstock for the reactor. This is a particularly robust and energy-efficient system," says Klaus Lederer.

The AGGLOREMA builds on the proven Countercurrent PreConditioning Unit, feeding into a short extrusion step, providing semi-molten mixed plastic feedstock into a customized cooled melt-mill allowing for high densification levels up to 380kg/m³ (mixed polyolefins) and 500kg/m³ (PET fibre). The process is designed to process highly contaminated and moist feedstocks as often targeted by chemical recyclers.

The technology today is available up to 2,3 tons and will be scaled to 3,5 tons/h and more in the future. A 500 kg/h demoplant is available for customer trials at the Erema headquarter in Ansfelden / Austria.

Interview

New Players in Advanced Recycling

Innovators at Work

Mastering Complex and Difficult Mixed Plastic Waste Through Innovative Technologies

1. Innovation & Sustainability

Chemical recycling is a vital technology for processing mixed plastic waste streams which traditional recycling struggles to manage. BUSS ChemTech's patented PyroFilm Reactor uses precise heat transfer to convert such waste efficiently while minimising energy use and by-products.

Could you explain how BUSS ChemTech's PyroFilm technology overcomes the difficulties of recycling mixed plastic waste? How does this innovation add sustainable value to your business partners, specific industry sectors and the broader advanced recycling industry?

Thomas Blocher: The main challenge in a pyrolysis reactor process is to deliver the required amount of heat to the molten polymer quickly and uniformly. There are several pyrolysis reactor types, but most of them all have the same particular challenge: mass transfer. Whether the plastic is pushed along the heat transfer surface as in a screw- or rotary kiln reactor, or an agitator promotes good mixing between the plastic and the heat transfer fluid directly, these systems are mass-transfer limited. This results in longer residence times (lower throughput) or lower quality pyrolysis oil (lower selling price). We take the novel approach of applying thin-film technology to pyrolysis. Since we are applying the heat to a minimal defined volume of molten polymer, there is virtually no mass transfer limitation. Thus, the heat is transferred evenly and very rapidly. This results in higher quality oil with lower CAPEX and OPEX.

Thomas Blocher
Business Manager Chemical Recycling,
BUSS ChemTech

Small commercial facility and demo plant.
© BUSS ChemTech

2. Sustainability Gains Through Breakthrough Technology

Effective chemical recycling requires optimised heat transfer and integrated systems to produce consistent, high-quality pyrolysis oils, while managing energy consumption and emissions. BUSS ChemTech's process is engineered for these goals, with equipment for solids separation and energy recovery, balancing operational reliability with product quality.

What are the main sustainability advantages of BUSS ChemTech's process? How do these sustainability gains help recyclers, product manufacturers, and regulators achieve their environmental targets and circularity commitments?

Thomas Blocher: Another key feature of our technology is the continuous removal of the solids with no requirement of periodic shutdowns for cleaning purposes. This allows for truly continuous operations (with only an annual maintenance shutdown to check and replace wear parts, if necessary). This eliminates frequent startups minimizing wear and tear on the equipment as well as minimizing utility consumption. In our process, solids and halide-free non-compressible gas is produced which can be used directly in an engine which produces the electricity needed to power the pyrolysis unit. This minimizes or even eliminates the need to draw power from the grid. And contrary to popular belief in some quarters, pyrolysis – when done correctly – is not a "source of toxic waste". Dangerous substances come from the waste plastic stream itself and any that remain in the output of our process, are regulated substances and are handled accordingly.

3. Challenges & Opportunities

Contaminated mixed plastics impose huge operational challenges. Feedstock heterogeneity, difficult impurities removal, and maintaining product quality result in low-recycling quotas. BUSS ChemTech's operational experience includes the development of robust process controls and patented separation methods, addressing these issues.

What are the key practical challenges BUSS ChemTech has faced with these waste streams? How have you turned these challenges into opportunities to improve process resilience, yield, and material circularity?

Thomas Blocher: Feedstock variability is a feature of the industry. Furthermore, ongoing materials and product development – as well as changes in human behaviour – will change the composition of today's plastic waste streams. So, even the variability is unpredictable! Any pyrolysis technology must take this into account. One way we "build in" process flexibility is through the design of the process control. The temperature profile, as well as the residence time of the plastic in the reactor, can be adjusted for different feedstock compositions or even to adjust product characteristics depending on the off-taker's needs. And as analytical techniques improve, and operational experience is accumulated, we are moving towards virtual real-time process parameter adjustments to maximize product uniformity.

4. Collaboration & Industry Partnerships

Scaling chemical recycling technologies requires strong collaboration among technology providers, waste management companies, regulators, and brand owners, especially with evolving regulatory frameworks such as the EU's Packaging and Packaging Waste Regulation (PPWR). Despite its potential, chemical recycling has faced criticism and challenges regarding its environmental footprint, costs, and operational viability, which have affected its reputation in the industry and public perception.

Could you share how BUSS ChemTech builds and sustains collaborative partnerships to support technology adoption and regulatory compliance? Additionally, how does your company address the negative perceptions surrounding chemical recycling, and what strategies do you believe are essential to improving its reputation and accelerating broader acceptance within the recycling community?

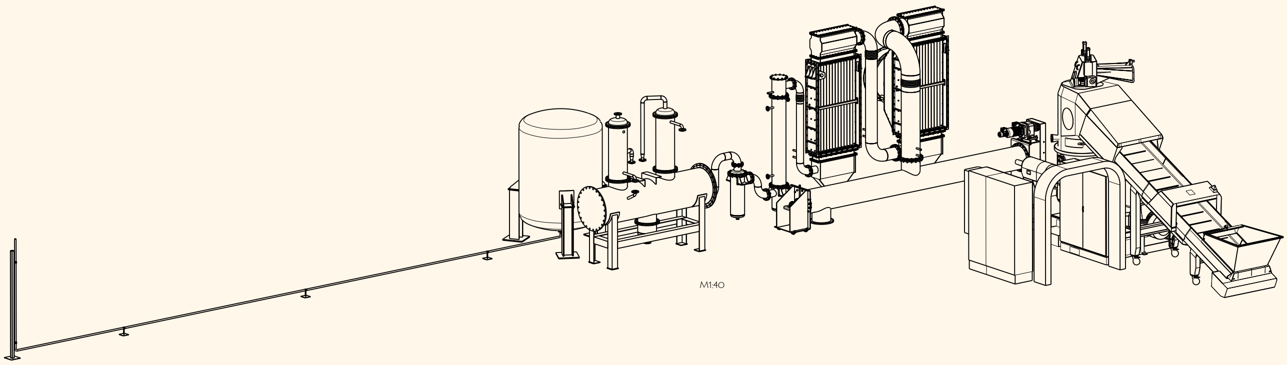
Thomas Blocher: Most chemical recycling technology providers are SMEs or start-ups and alone, cannot effectively get their views heard. We are fortunate to have an active industry association, Chemical Recycling Europe, that facilitates discussions between the various stakeholders, as well as to aggregate our voices into a uniform message to the regulators. Chemical recycling's less than stellar reputation results not just from mis- and dis-information, but more from our past mistakes, which I loosely describe as "overpromising and underdelivering". To correct this, we need to make our case with facts – countering with sourced-based information, make the case with integrity – highlighting the limitations of our technologies and not just the advantages, and make the case with transparency – providing real and not idealized performance data.

5. Future Innovations

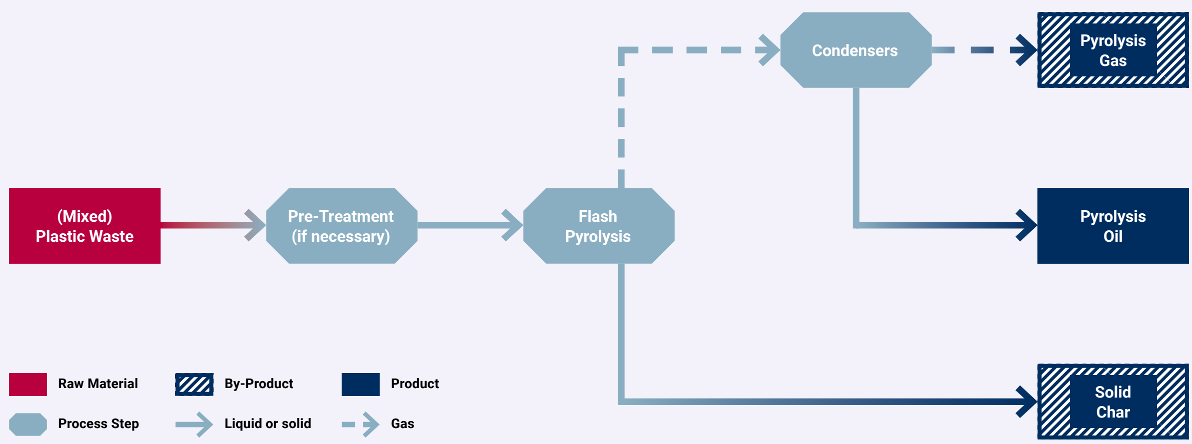
As chemical recycling matures, innovations such as feedstock flexibility enhancements, advanced product fractionation, and digitalised plant monitoring will be critical. BUSS ChemTech continues to invest in these areas to increase adaptability and environmental performance.

What specific technological and digital innovations is BUSS ChemTech prioritising to further enhance pyrolysis recycling of mixed plastics? In your view, how will these developments create sustainable value across the advanced recycling sector?

Thomas Blocher: Our technology has already shown that it can provide off-taker ready oil without post-process for some feedstocks. We have just embarked on a long-term project which, if successful, will result in our technology achieving naphtha drop-in quality for the same feedstocks, and perhaps more importantly, the same oil quality with feedstocks of lower quality. Only then will we realize our target of successfully handling the type of waste present in most regions of the world, and not just the "clean" waste produced in much of western Europe. A secondary project will piggyback off of the work being done to develop inline analytical techniques that would then tie directly into the pyrolysis plant process control system to adjust the reactor parameters according to the incoming feedstock. Both projects are ambitious, but we are moving ahead eagerly and with optimism!



Layout of a typical plant.



Flow chart of the pyrolysis process.
© BUSS ChemTech

Transformation in the South of Cologne – Live and in Colour

Sebastian Trunk
Site Development
YNCORIS

Mr Trunk, the chemical industry in Germany is under pressure. We are seeing high energy costs, rising CO_2 prices and high dependencies in raw material procurement. Why does it still make sense to invest in a new plant for a chemical recycling process right now and here in the Rhineland?

Sebastian Trunk: It is no secret that energy costs in Germany are high. And yes, we face challenges in areas such as the energy transition and transformation. But it is precisely against this backdrop that we should reflect on the advantages of our region: in the Rhineland, we have an extremely strong petrochemical industry with large-scale crackers in an excellent location.

In addition, as the Knapsack/Wesseling chemical cluster, we are located in the so-called "hinterland" of the Dutch and Belgian deepseaports and are already connected to the Europe-wide pipelines. Not least thanks to the Rhine, we benefit from perfect transport conditions by ship, rail, road and air. In addition to the extremely high population density, we also have the highest industrial density in Europe – this means that, particularly when it comes to recycling, feedstock suppliers and consumers can come together directly and relatively easily.

And last but not least, targeted investments in industrially suitable sorting infrastructures here in the Rhineland mean that we can tap into materials that are often referred to as "waste" as a valuable raw material fort he chemical industry.

That sounds like a fundamentally good starting point based on the "hardware", but can this also be found in other parts of the world, such as the USA?

Sebastian Trunk: There is hardly any other region that is as mature in terms of infrastructure as the Rhineland. The hardware mentioned should not be underestimated. Other parts of the world would have to catch up massively in this respect – which, incidentally, is often difficult or impossible due to various geographical factors.

Apart from that, we have relatively stable political and social conditions, coupled with a federal and state government in Europe that is committed to the transformation of Germany as an industrial location. Laws such as the Clean Industrial Deal and the Circular Economy Act, as well as targeted funding projects in the Rhineland mining area ("Rheinisches Revier") for circular economy, are clear signs of the strong prevailing will for transformation.

The EU, Germany and the state of North Rhine-Westphalia have recognised the importance of waste as a raw material in terms of resilience and independance – now it is time to occupy the markets and take advantage of the strategic momentum despite all the uncertainties and what is likely to be initially slow growth in demand.

What exactly does the transformation in the Knapsack/Wesseling chemical cluster look like?

Sebastian Trunk: Looking back, we are extremely happy with our decision to adress alternative resource flows and the vision of a sustainable chemical park in transition at a relatively early stage. For example, the substitute fuel power plant in Knapsack, which thermally recycles waste, has been making a significant contribution to the site's electricity and steam supply since 2009. With this expertise and knowledge in handling the raw materials used there, we were able to attract Palurec, a company specialising in the mechanical recycling of beverage cartons, to Knapsack in 2021.

However, the biggest milestone in circular economy was the development of the site section "Hürth-Süd" with the global player LyondellBasell to establish an integrated recycling hub for the Knapsack/Wesseling combined site. Over a period of several years, a large-scale advanced sorting plant will be built in Knapsack, which will provide pre-sorted plastic waste sorted by type. This waste will then be converted into naphtha via pyrolysis at the MoReTec plant in Wesseling, LyondellBasells main plant, approximately 10 kilometers away, and the fed back into the existing crackers.

In addition to this advanced sorting plant, LyondellBasell plans to build further innovative recycling technologies in Knapsack. In 2025, matterr, another complementary company specialising in chemical PET recycling, was acquired for Chemiepark Knapsack. The recycling company will build a semi-industrial depolymerisation plant with an annual capacity of around 10,000 tonnes. The plant marks an important step towards a fossil-free circular PET industry. LyondellBasell's advanced sorting and matterr's side streams for LyondellBasell will greatly complement the existing material network at Chemiepark Knapsack.

What is special about the south of Cologne?

Sebastian Trunk: Of course, chemistry is not only found in Knapsack and Wessling, but our early openness to the topic of recycling is now paying off. In addition to our expertise, the strategic site development with LyondellBasell in the new site part "Hürth-Süd", which was deliberately developed for innovative and sustainable chemistry and circular economy, has certainly helped us. For new companies such as matterr, it was helpful that, as an experienced multi-user site with clear rules and a comprehensive service portfolio, we are able to integrate precisely such companies well into the chemical park. For us, "welcome" is more than just a cliché.

About YNCORIS

As one of the leading industrial service providers, YNCORIS is the ideal partner for the chemical and pharmaceutical industry. Whether planning, building, operating or maintaining, our 1,200 employees and 100 trainees develop the right solution for every challenge. With the energy of a young company that can draw on over a hundred years of industrial experience, we create the optimal environment for future-proof production.

In addition to our headquarters in Hürth, we have further locations throughout Germany in Dormagen, Duisburg, Düren, Cologne, Krefeld and Leverkusen. Our services range from planning and construction to efficient and legally compliant operation and future-oriented plant maintenance. In this way, we help our customers to be successful in the market today and tomorrow. In addition to all these services, YNCORIS is the operator of the Chemiepark Knapsack.

Further information can be found at **www.yncoris.com**

YNCORIS
Always at your site.

Chemiepark Knapsack in Hürth

The Fossil Fuel Trap: Why Defossilising Chemistry is Essential – and Feasible!

Author:
Michael Carus,
Founder and CEO of nova-Institut GmbH in Hürth

Two things are needed to achieve a net-zero chemical industry: decarbonisation of energy and defossilisation of feedstock. Firstly, the process energy – the chemical industry is one of the three largest energy consumers in the EU – must be generated sustainably. This can be achieved by electrifying steam generation and other process steps, for example through electric steam crackers. And yes, it will require large amounts of renewable electricity. Secondly, the raw materials and thus the materials used in the chemical industry itself must be converted to renewable carbon.

It is not only important to maintain a strong, innovative and sustainable chemical industry in Europe, but to also prepare and transform it for the future, because chemistry is the backbone of all industrial production. In 2023, the chemical industry in the European Union had a turnover of around 665 billion euros (Statista 2025). This figure is twice as high when indirect effects are included. In many EU countries, the chemical industry is one of the most important sectors in terms of value added. When considered alongside the derived rubber and plastics industries, it is even the largest industrial sector in some member states. And together with the pharmaceutical sector, the chemical industry employs 3.4 million people, accounting for 12.3% of total employment in the manufacturing sector in the EU27 (CEFIC 2025). It is estimated that indirect jobs along the value chain number up to 20 million.

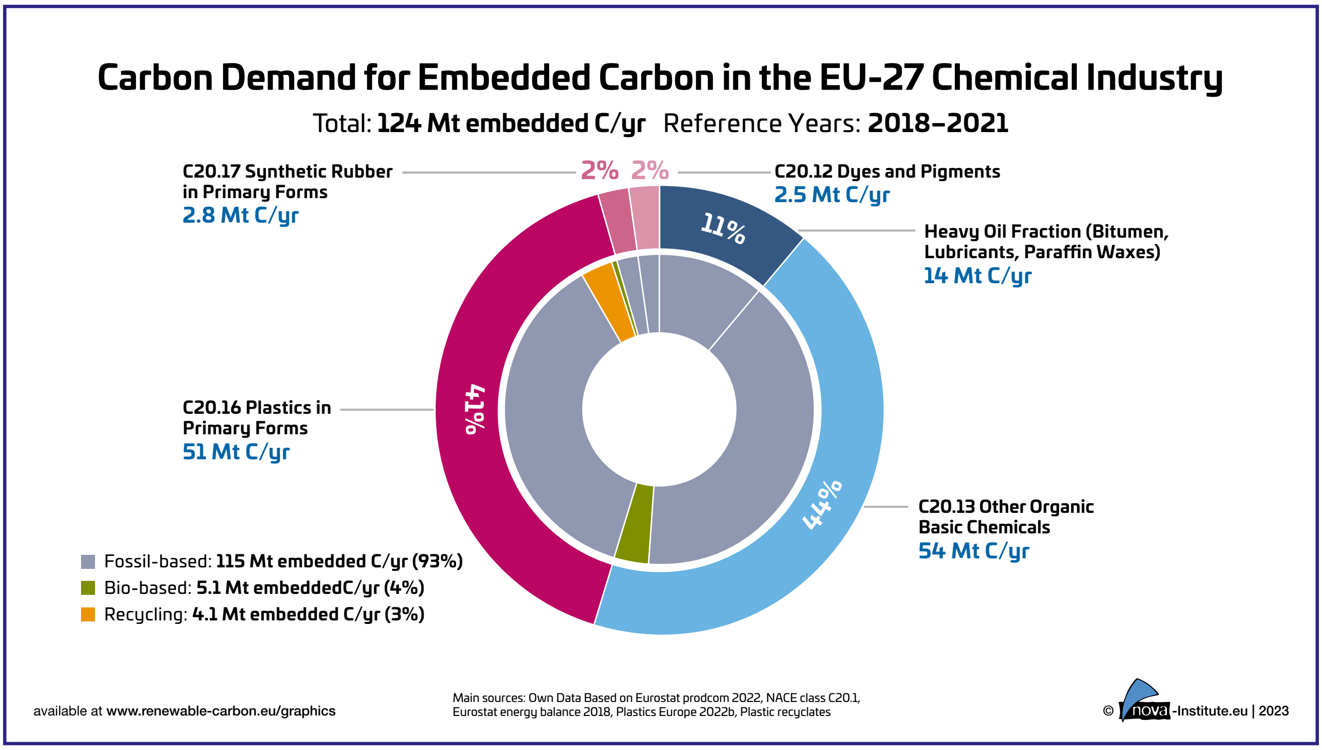
Fossil carbon, extracted from the ground in the form of crude oil, natural gas and coal, is not only the main cause of climate change, accounting for around 90% of emissions, it is also becoming an increasingly significant problem for the chemical industry in Europe. In particular, the continuing high demand for oil and natural gas makes Europe vulnerable, as it creates dependencies on imports and thus on the producing countries and the changing global political landscape. These, in turn, determine availability and prices.

Although oil consumption in the European Union fell from 400 million tonnes in 2014 to 355 million tonnes in 2023, imports still accounted for between 82–84% of consumption during this period. Depending on the EU member state, around 10 to 15% of oil is used for chemical and plastics production. Natural gas consumption also fell from 330 million tonnes in 2014 to 230 million tonnes in 2023. However, the EU's own production of natural gas has fallen even more sharply, with the import share rising from 83% in 2014 to 89% in 2023.

Nuclear energy cannot overcome this dependency. Demand for uranium has remained constant at around 12,000 tonnes per year in the EU for the past ten years, but is 95% based on imports – mainly from Russia and out of scope of any current sanctions or restrictions. The decline in demand for oil and natural gas is mainly due to the rise of renewable energies and efficiency measures, as well as the relocation of energy-intensive production outside of Europe, primarily to Asia. Nevertheless, this decline is still not sufficient to achieve net-zero targets by 2050.

The transition to a resilient and independent energy supply for the EU has so far only been successful in the electricity sector. Despite the increasing number of electric cars and heat pumps, electricity demand has fallen from 2,600 TWh in 2014 to 2,420 TWh in 2023, mainly due to efficiency measures and structural change in industry. At the same time, the share of renewable energies in the electricity sector has risen from 28–30% in 2014 to an impressive 46–47% 2024, with a further upward trend. A share of 66–69% is expected by 2030. The current target of the EU Commission's is even 90% by 2040. China has similar plans, with the share of renewable electricity set to reach around 95% by 2050.

Is the high share of renewable electricity generation the reason for the comparatively high electricity prices in Europe? Not at all. In fact, solar and wind power are the cheapest sources of electricity in the EU. However, these sources can only be realised on the market if the necessary infrastructure with powerful distribution networks, large (battery) storage facilities and electrolysis plants for hydrogen production is fully implemented. If the energy transition is implemented only hesitantly, the result would be the most expensive option: high investments in infrastructure are already made, but without full implementation we will not be able to harvest cheap renewable energy. This will jeopardise EU industrial production.



Cheap Renewable Electricity in Germany

Grid bottlenecks and the lack of battery, pump and pressure storage systems cost German taxpayers hundreds of millions of euros each year. For example, in 2024 renewable energy producers received compensation payments of 553.94 million euros from the federal government for wind and solar power that was not produced ("phantom electricity"). The reason was that operators had to shut down their plants because the electricity could not be fed into the grid due to bottlenecks in the power grid and a lack of demand – for example, from battery storage systems and electrolysers. At such times, solar and wind power prices fall below 5 cents per kWh, sometimes even reaching negative prices on the electricity stock exchange.

Cheap electricity from renewable energies is only possible over longer periods if Germany has large battery storage facilities – used electric car batteries are a cost-effective option – as well as electrolysers and hydrogen. A half-hearted implementation of the energy transition is the most expensive option. China has recognised this and is systematically expanding its battery storage facilities. The country already accounts for 50% of the world's battery capacity. However, the new German government is prioritising the construction of 40 natural gas-fired power plants instead.

The widespread use of battery, pump and pressure storage would enable a 24-hour price of 3 to 7 cents per kWh in Germany during the six summer months, with significantly lower fluctuations. This would stabilise and buffer prices. However, it would require accelerated expansion of storage capacity to over 100 GWh by 2030, as well as regulatory adjustments such as the Solar Peak Power Act, to promote direct marketing and grid-friendly storage management.

In order to make surplus solar energy from summer available for electricity and heating in the winter months, hydrogen (or methanol from green hydrogen and CO_2) is needed as a long-term storage medium.

Defossilisation is also essential to achieve the climate targets of a "net-zero" chemical industry. If "Scope 3" emissions of industry are also included in future CO_2 footprint calculations, the substitution of fossil carbon with renewable carbon in raw materials will play a central role.

What does this mean for the future of the plastics industry?

The future of the chemical and plastics industry in the European Union depends primarily on energy and raw material prices, research and development, and the scaling up of innovations in Europe. If the energy transition is implemented consistently, including grid expansion, (battery) storage and hydrogen, attractive electricity prices are on the horizon in the medium term. However, energy and raw material supplies are still far too dependent on fossil fuels such as oil, natural gas and coal, with imports accounting for 80–90% of the total. This makes European industry vulnerable in terms of access and prices. Simply put, the EU will never obtain fossil carbon at the price level of the producing countries and their allies. Since the most advanced technologies for the high-volume production of chemicals and plastics are available everywhere, countries with cheap access to oil and natural gas have a natural advantage. Europe cannot overcome this competitive disadvantage as long as the chemical and plastics industry relies on fossil carbon for over 90% of its feedstock.

Is there a way out? Yes, Europe can become a pioneer in defossilising the chemical and plastics industry through the use of renewable carbon, thereby freeing itself from the fossil fuels trap. Renewable carbon means carbon from the recycling of plastics, biomass and CO_2. Europe is well positioned in terms of research and development in all three areas. Unfortunately, however, only in a few cases has it been possible to scale up innovations towards market implementation ("implementation gap"). In most cases, conditions for actually building market-size plants for new innovations are better in other regions of the world.

Defossilisation is also essential to achieving climate targets through a net-zero chemical and plastics industry. Replacing fossil carbon with renewable carbon in chemicals and plastics will play a key role to tackle industry's Scope 3 emissions, as the embedded carbon is responsible for the majority of the carbon footprint of chemicals and plastics.

Mechanical, Physical and Chemical Recycling

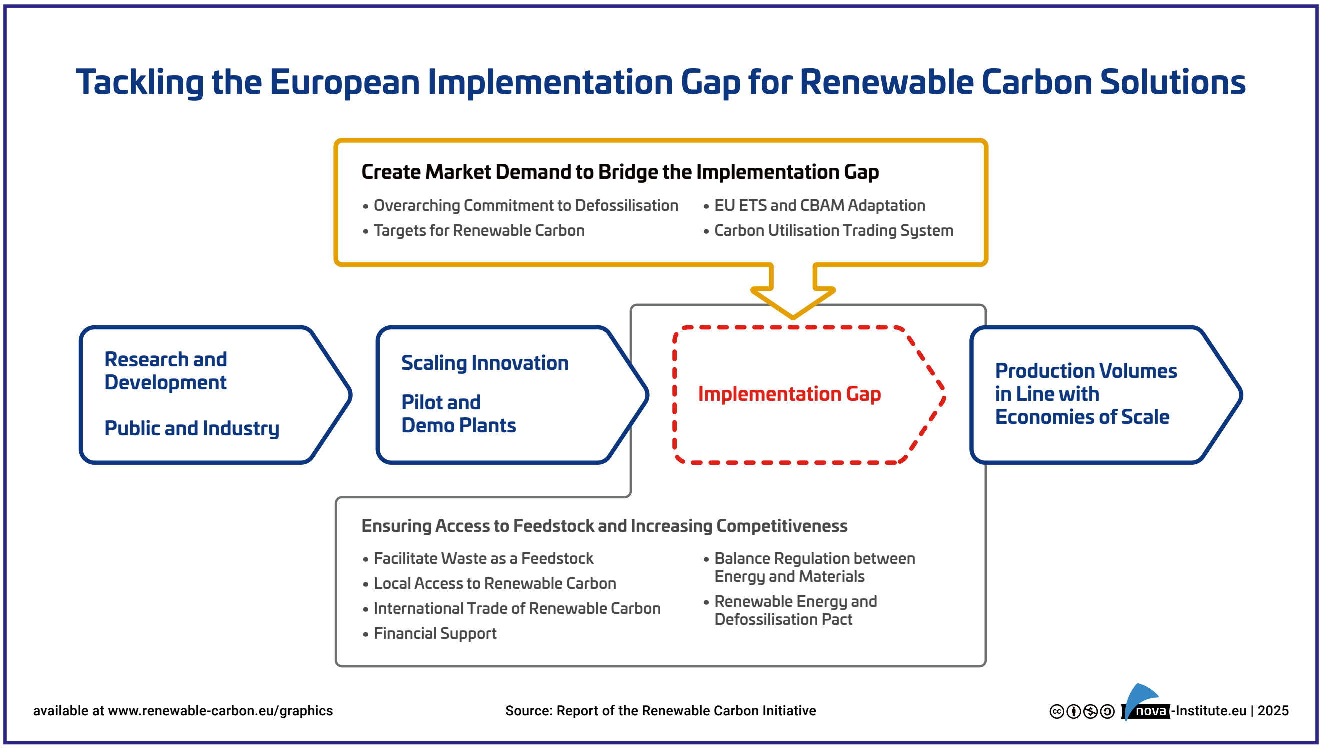
Approximately 50 million tonnes of plastics are used in the EU each year, most of which comes from domestic production. Around 10–15 million tonnes were imported in 2023 as primary plastics, semi-finished products or end products. In 2022, a total of around 16.2 million tonnes of plastic waste was generated in the EU in the packaging sector alone, of which 40.7% was recycled – however, 1.3 million tonnes of this was outside the EU.

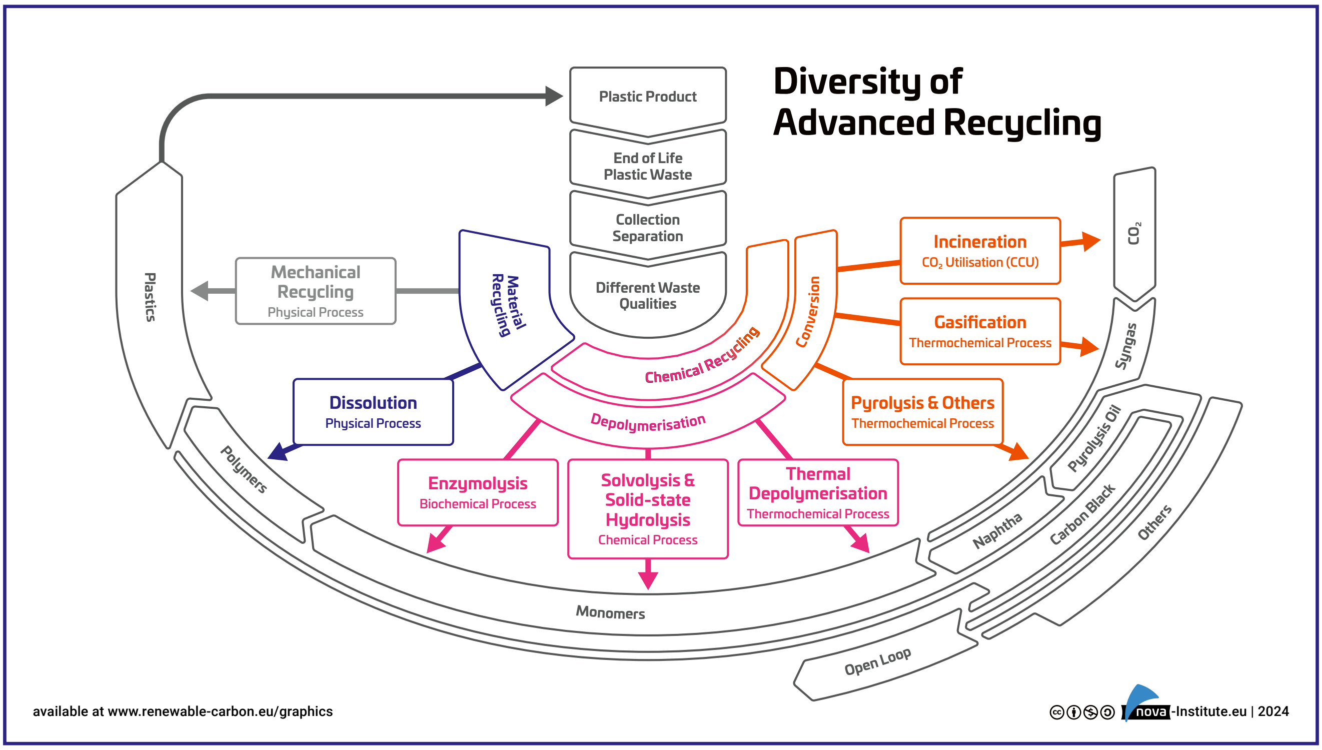
https://www.europarl.europa.eu/topics/en/article/20181212STO21610/plastic-waste-and-recycling-in-the-eu-facts-and-figures)

Plastic waste will therefore play a key role in the transition to renewable carbon, as it can replace significant amounts of imported fossil carbon. All plastics that reach the EU are valuable resources which should remain in the EU and be used as efficiently and to as high a standard as possible and kept in the loop, creating a circular economy.

What needs to be done to realise this potential? All recycling technologies – from mechanical recycling to gasification (see chart) – must be implemented quickly, as they are all needed for the various waste streams and target products. The substantial investments required for this require clear, reliable and demandgenerating framework conditions from policymakers. This includes introducing quotas in all areas of application, clarifying which recycling processes are accepted for quota fulfilment, and recognising massbalanced plastics within these quotas. In addition, harmonised standards for the labelling and transport of plastic waste within the EU are required.

Only then can the potential and importance of recycling be fully realised. The EU recycling industry is currently in a very difficult position due to unfavourable framework conditions and cheap imports of new materials. It is hoped that the EU will adopt the necessary framework conditions this year, which would lead to a sharp increase in investment.





Recycling Quotas in the EU for Packaging and Cars

The EU has already taken relevant steps to adapt the regulatory framework. For example, the EU Packaging Regulation (PPWR) introduced minimum quotas for the use of recycled raw materials in packaging for the first time: the recycling share of general plastic packaging must be 30% by 2030 and 65% by 2040. The Single-Use Plastics Directive (SUPD) contains targets for the proportion of recycled material in plastic beverage bottles. Specifically, the proportion of recycled material in PET bottles is to be increased to 25% by 2025 and 30% by 2030. The amendment to the End-of-Life Vehicles Directive (ELV-R) currently under discussion also proposes introducing a recycling quota for plastics. This is to apply from 2030, with the exact level (20–25%) still to be negotiated.

Bio-based and CO_2-based Plastics

Even in an ideal world, recycled carbon will never be enough to completely replace fossil carbon (see image). Today, only 10% of plastics are made from recycled materials. Under ideal conditions, this share could be increased to 50–70%. However, there will always be unavoidable losses during collection and processing. This means that additional non-fossil carbon sources are needed. These are biomass and CO_2.

Today, worldwide there are 17 commercially available bio-based plastics that can be used in almost all applications. Despite high R&D spending, Europe has been falling behind as a manufacturing location for bio-based plastics for years and is expected to only achieve a 13% market share in 2024 – compared to 59% in Asia. Investments are flowing into countries with the right political framework and, above all, where market demand has been created. Europe will need to follow suit quickly if it wants to exploit this option for defossilisation. Currently, Europe is discussing its first own bio-based quotas, initially looking to set a low quota (for example 5%) by 2030 or 2035 for packaging and potentially automobiles. These first steps must be introduced urgently if Europe does not want to fall behind in the bioeconomy. And in addition, further clear and reliable rules must be established: acceptance of the use of agricultural raw materials such as starch, sugar or vegetable oils (which actually increase food security as they can serve as emergency reserve), the use of established sustainability criteria from the biofuel sector, and acceptance of mass balance and attribution (MBA).

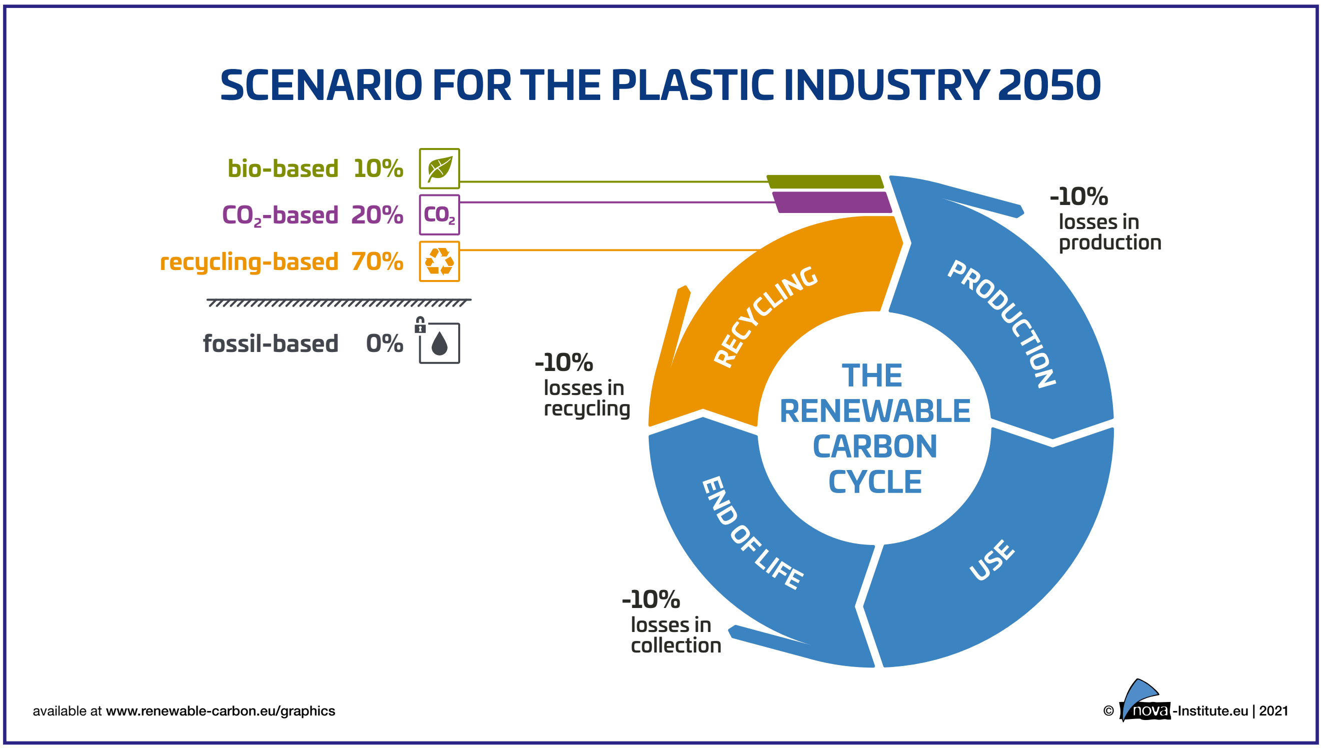
CO_2-based plastics should also be eligible for counting towards the quotas. This applies both to the use of fossil CO_2 in the recycling quota and to biogenic or atmospheric CO_2 in the bio-based quota, in order to give them market access as well. They do not yet play a role in the market, but with increasingly available, inexpensive solar and wind energy, they will become a real option. With an electricity price of 3–4 cents/kWh, hydrogen prices could fall so low that production from this hydrogen and CO_2 from point sources (fossil and biogenic, e.g. pulp and paper industry, bioethanol and food fermentation) would become competitive with biogenic or recycling routes. In addition to special routes, the methanol route is of particular interest as it can be used flexibly as either a fuel or a chemical raw material. Furthermore, side streams from the production of sustainable aviation fuels from CO_2 (secured by quotas) can be utilised in plastics production. It is important to open the doors early on in order to cover these expected side streams in a forward-looking regulatory manner.

Often overlooked, CO_2-based plastics should also be eligible for counting towards the quotas. This applies both to the use of fossil CO_2 (counted in the recycling quota) and to biogenic or atmospheric CO_2 (counted in the bio-based quota), in order to provide them market access as well. They do not yet play a role in the market, but with increasingly available, inexpensive solar and wind energy, they will become a real option. With an electricity price of 3–4 cents/kWh, hydrogen prices could fall so low that plastic production from this hydrogen and CO_2 from point sources (fossil and biogenic, e.g. pulp and paper industry, bioethanol and food fermentation) would become competitive with biogenic or recycling routes. In addition to many specific routes, the methanol route is of particular interest as it can be used flexibly either as a fuel or a chemical raw material. Furthermore, side streams from the production of sustainable aviation fuels from CO_2 (secured by quotas) can be utilised in plastics production. It is important to open the doors early on in order to cover these expected side streams in a forward-looking regulatory manner.

Conclusion

In the long term, recycling, together with biogenic carbon and CO_2, can completely replace fossil carbon from crude oil or natural gas as a raw material for plastics production. This will enable the European Union to become independent of fossil carbon imports and increase its resilience and competitiveness. To achieve this, it is crucial to shape the transition phase in a politically astute and rapid manner so that the transformation of the chemical industry in Europe is successful – after all, Europe is the birthplace of modern chemistry. This is the only way to prevent the EU from remaining stuck in a fossil fuel trap while other regions successfully transform their economies.

Europe was the innovation driver of the global chemical industry and can become so again – this time on the basis of its own raw materials, innovation and sustainability. This will allow a larger share of value creation to be retained in the EU, which will ultimately also support and protect Europe's political system.



Artificial Intelligence Reshaping Recycling

Artificial intelligence (AI) is rapidly transforming recycling technologies by enabling a new level of process control and efficiency. Machine learning algorithms are capable of continuously analysing sensor, spectroscopy, and image data. This allows for more precise modelling of reaction processes and dynamic adjustment of key parameters such as temperature, pressure, and catalyst dosage. The goal: stable process control despite highly variable feedstock qualities. At the same time, AI improves the analysis of waste streams and supports automated pre-sorting and material preparation.

State of the Art

AI has already become a core enabler in industrial recycling. Modern sorting plants use near-infrared sensor systems combined with deep learning to distinguish and separate various plastic types with high precision. In process control, AI systems dynamically optimise operating parameters in real time, cutting energy consumption and stabilising product quality. Predictive maintenance has also proven valuable: continuous evaluation of machine data allows early detection of potential failures and prevents unplanned downtime. Research initiatives are now advancing digital models that simulate depolymerisation reactions, enabling faster selection of suitable solvents and catalysts while reducing costly trial-and-error experimentation.

Automated, AI-Driven Recycling Cascades

The next major step goes beyond optimising single processes. Semi-autonomous, AI-driven systems can manage complete recycling cascade – multi-stage process chains in which materials are automatically directed to the most suitable recovery route. The system determines whether a stream is better suited for mechanical, solvent-based, or chemical recycling. Residual fractions from one process can seamlessly move to the next, creating flexible combinations of processes that maximise resource use, improve energy efficiency, and increases output quality.

Potentials and Current Limitations

AI-based control offers clear advantages: higher efficiencies, improved yields, and consistent product quality. Operating costs and energy demands drop, strengthening both the ecological and economic case for technologies such as depolymerisation. However, data availability remains a limiting factor. Many recycling facilities still lack sufficiently long and consistent data sets to train advanced machine-learning models. Integration into existing plants can also be challenging, requiring adjustments across sensor systems, data infrastructures, and staff training.

Depolymerisation as a Key to Circularity

Depolymerisation belongs to the class of ‘advanced recycling’ processes and differs from thermal conversion routes such as pyrolysis or gasification. Instead of completely breaking polymers into basic molecules or synthesis gases, depolymerisation aims to recover the original monomers. These monomers can then be reused in high-quality applications equivalent to virgin materials – a critical step toward circular material cycles. The figure “Diversity of Advanced Recycling” (see page 53) illustrates the variety of advanced recycling technologies and shows the role of depolymerisation within this spectrum.

Preview of the AI Circular Economy Conference 2026

Looking ahead, the AI Circular Economy Conference 2026, which takes place on 4–5 March in Cologne, will focus specifically on the role of AI in enabling a fossil-free circular industry. Discussions will extend from AI-based depolymerisation control and catalyst modelling to applications in bio-based processes, supply-chain management, and sustainability assessments. The conference aims to connect stakeholders from chemistry, materials science, biotechnology, recycling and IT – turning AI into a practical driver of circular innovation.

Valuable Quotes

Fergal Byrne
Addible (IE)
"The Advanced Recycling Conference is a valuable platform to showcase our new tyre recycling process, OxyCycle, and to engage with partners driving innovation in the circular economy."

Sneha Verma
AEB Amsterdam (NL)
"Circularity will only succeed when waste is seen not as a burden to manage, but as a strategic asset."

Peter Eisele
Ambra (DE)
"As plastic production and consumption continue to challenge global environmental sustainability, it is imperative to explore innovative recycling technologies that can strengthen the circular economy by generating new products from plastic waste as 'waste is only waste if you waste it'."

Marco Tomasi Morgano
ARCUS Greenrecycling Technologies (DE)
"nova organizes a beautiful science-based conference, where I look forward meeting notable experts and colleagues from academia and industry."

Hanna Mangold
BASF (DE)
"I'm looking forward to the Advanced Recycling Conference as a valuable forum to exchange insights on cutting-edge recycling technologies, discuss recent trends in polymer recovery, and explore collaborative pathways toward scalable circular solutions."

Pieterjan Van Uytvanck
BlueAlp (NL)
"The advanced recycling industry is at a pivotal moment as the PPWR regulation moves forward."

Thomas Blocher
BUSS ChemTech (CH)
"The conference has quickly become one of the most important events for industry stakeholders in Europe."

Shibashish Devidutta Jaydev
BUSS ChemTech (CH)
"The one-stop shop for the latest tech in advanced recycling with the most niche constellation of enthusiasts."

Uwe Lahl
BZL Kommunikation und Projektsteuerung (DE)
"This conference is a must for anyone concerned with the question of how to successfully defossilize the chemical industry."

Judit Fortet Casabella
Chalmers University of Technology (SE)
"This conference is a unique opportunity to connect academic research with industry and technology leaders driving the energy transition."

Adam Sköld
Chalmers University of Technology (SE)
"Using wastes as a resource builds resilient, self-sufficient supply chains for a sustainable future."

Matthias Hermann
Citrine Informatics (US)
"Making Chemical and Mechanical Recycling More Productive using AI."

Oliver Borek
Enzimatiko (ES)
"The nova Advanced Recycling Conference is a benchmark for the showcasing of developments and technologies and offers participants an excellent insight into the state of the industry."

Ronny Frank
Ester Biotech (DE)
"Advanced recycling is key to the responsible use of the Earth's resources, and we should engage in intensive dialogue on this topic."

Christine Weiss
Evonik Operations (DE)
"The event is truly commendable, featuring outstanding presentations on various aspects of advanced chemical recycling, accompanied by engaging discussions."

Nick Wierckx
Forschungszentrum Jülich (DE)
"We urgently need new and better recycling technologies and I'm excited to catch up on the latest at the Advanced Recycling Conference."

Lukas Killinger
Fraunhofer Institute for Chemical Technology (DE)
"The problem of plastic recycling can only be solved by a combination of different technologies and I am excited to discuss the opportunities with other research associates."

Paul Aschauer
Fraunhofer Institute for Process Engineering and Packaging IVV (DE)
"Accelerating to true circular economy with solvent based recycling."

André Heeres
Hanze (NL)
"I'm looking forward to hearing and discussing the latest developments in advanced recycling!"

Geoff Smith
Itero Technologies (UK)
"Itero has long followed nova-Institute's thought-leading work, and we're excited to connect in person with industry pioneers driving circularity and sustainable innovation."

Haridharan Krishnan
ISCC System (DE)
"Eager to join the Advanced Recycling Conference — a key platform to discuss scalable recycling technologies, market integration, regulatory developments, and pathways to upscaling circular solutions."

Christian Schimper
Josef Resser Centre ReSTex (AT)
"Textile recycling is creating a new market in Europe and is becoming an important economic factor. This conference will help to accelerate this evolution."

David Rapp
KraussMaffei Extrusion (DE)
"Conferences like this are essential to bridge research and industry, accelerating the transition from innovative recycling concepts to scalable solutions for a true circular economy."

Jens Becker
LyondellBasell (DE)
"If you don't shape your future, others will do for you."

Ian Temperton
Plastic Energy (UK)
"It is an honour to participate in this year's Advanced Recycling Conference and join other like-minded industry leaders driving innovation in the chemical recycling field."

Peter Jetzer
Recycario Data Science Institute for Economical Plastics Recycling (DE)
"It is always remarkable how the conference opens up new perspectives year after year. What was celebrated as a novelty just recently is already evolving into new and equally valuable pathways for the circular economy."

Joeri Dieltjens
Sulzer Chemtech (CH)
"Derisking progress in chemical recycling through technology advancements, knowledge sharing and partnerships."

Antonia Helf
TU Bergakademie Freiberg (DE)
"I'm excited to see how chemical recycling technologies — especially gasification — are evolving and driving the developments towards a circular carbon economy."

Nicolas Cottenye
UpSolv (CA)
"The Advanced Recycling Conference has become the leading international forum for showcasing cutting-edge recycling technologies and industrial innovations driving the future of sustainable materials."

RENEWABLE CARBON INITIATIVE

Bio-based CO2-based Recycling

Circular Economy

Shape the Future of the Chemical and Material Industry

WHY JOIN RCI?

RCI is an organisation for all companies working in and on renewable chemicals and materials – plastics, composites, fibres and other products can be produced either from biomass, CCU or recycling. RCI members profit from a unique network of pioneers in the sustainable chemical industry, creating a common voice for the renewable carbon economy.

To officially represent the RCI in Brussels, the RCI is registered in the EU's transparency register under the number 683033243622-34.

LinkedIn:
www.linkedin.com/showcase/renewable-carbon-initiative
#RenewableCarbon

Executive Managers:
Christopher vom Berg & Michael Carus

Contact: Verena Roberts
verena.roberts@nova-institut.de

JOIN NOW

Become a part of the Renewable Carbon Initiative (RCI) and shape the future of the chemical and material industry
www.renewable-carbon-initiative.com

Find all current RCI members at:
www.renewable-carbon-initiative.com/network

MEMBERS OF THE INITIATIVE

LARGE SUPPLIERS

ADM, alcogroup, Alfa Laval, Arkema, Bakelite Synthetics, BASF*, Beckers, Borealis, Braskem, Cerdia, Clariant, Cosun Beet Company*, Covestro*, CropEnergies, Givaudan*, Peter Greven, H&R, iff*, Kemira, Kuraray, Lenzing*, Lubrizol, Mane, Mercer, Neste*, NG Nordic, PCC, PrimientCovation, SCGC, Stahl*, Stepan, Sulzer, Syensqo, Symrise, TÜV Austria, Uniper, UPM*, Verbio, Wacker

SME

AllocNow, avantium, Fibenol, FKuR, futerro, LanzaTech*, nova, SCSglobal, Sylko

BRANDS

Beiersdorf, Continental, Henkel*, IKEA, LEGO, L'ORÉAL Groupe, Mercedes-Benz, Michelin, On, P&G, Vaude

START-UPS

Aduro Clean Technologies, amynova polymers, BioBTX, Chaincraft, Colipi, dab, Dioxycle, econic, evoco, Greenlyte Carbon Technologies, loop co., Modern Meadow, Oxylus Energy, TripleW, vioneo

RESEARCH INSTITUTES

Danish Technological Institute, IKT Kunststofftechnik Stuttgart, ITA RWTH Aachen University, Leibniz-Institut für Verbundwerkstoffe

* Board Member

PARTNERS

C.A.R.M.E.N., CCU-Alliantie, CHANGE chemistry, Chemie Cluster Bayern, Circular Rubber Platform, CO2 Value Europe, ECBF, ecp-news, EIHA, ePURE, Global CO2 Initiative University of Michigan, GO!PHA, IBB Netzwerk GmbH, Renewable Carbon Plastics Magazine, Textile Exchange, WWF

ADMINISTRATIVE OFFICE

nova-Institute
- Initiator and scientific backbone
- Organisation, management and coordination of RCI

MEMBERS

Board
- Strategic direction
- Budget allocation
- Highly active
- Max. 20 members

General assembly
- 2–3 main representatives per member
- Identify / define priorities of RCI
- Decide on future projects

PARTNERS

- Support and promote each other
- Advise on specific topics

ACTIVITIES

- Advocacy
- Scientific background reports
- Position papers
- Networking

WORKING GROUPS - Involvement of all interested members

WG Labelling
- Development of a renewable carbon share (RCS) certificate and label

WG Policy
- Position papers
- Factsheets
- Stakeholder dialogues
- Public consultations of regulations

WG Recycling
- Chemical and mechanical recycling
- Position papers
- Strategic reports

WG Sustainability
- Deep understanding and harmonisation of sustainability assessment and reporting
- Position papers
- Strategic reports

MEMBERSHIP BENEFITS

Advocating for renewable carbon

RCI is at the forefront of advocating for the transition from fossil to renewable carbon. As a member, you'll actively contribute to shaping future policy and driving the transition, ensuring your voice is heard in the movement towards defossilisation.

Contribute to leading scientific reports and positions

RCI's publications are instrumental in advocating for renewable carbon. As a member, you contribute your knowledge and insights, shaping the discourse and decisions that are transforming our economy.

Connect with a vibrant network

Joining RCI means connecting with a diverse network spanning the entire value chain, fostering collaboration and innovation. Supported by our partners, you'll be at the heart of a growing community that drives positive change in the renewable carbon landscape.

Shape the future of the RCI

Your membership gives you the opportunity to shape the direction of RCI, by proposing new ideas, participating in ongoing projects or joining the board. Your membership funds RCI's activities, actively enabling collaboration towards a sustainable future.

Join specialised working groups

Engage in specialised working groups focused on critical aspects such as policy, labelling, recycling, and sustainability. Together, as a trusted pool of expertise, you'll tackle challenges and drive solutions forward.

Increase your visibility

As an RCI member, you'll be recognised as a leader in the transition to renewable carbon. Benefit from increased visibility through our communications activities and share your own successes to build credibility on your path to sustainability.

Enjoy exclusive discounts

Benefit from exclusive discounts on conferences and commercial market reports by nova-Institute, along with additional benefits through our partners. Your membership brings added value beyond just networking and collaboration.

Get cloud access to internal RCI documents

Gain access to the internal RCI cloud, containing draft documents, policy consultations, presentations, and factsheets. It's everything you need to stay ahead of the curve.

THE AIM

The aim of the Renewable Carbon Initiative (RCI) is to support and speed up the transition from fossil carbon to renewable carbon for all organic chemicals and materials.

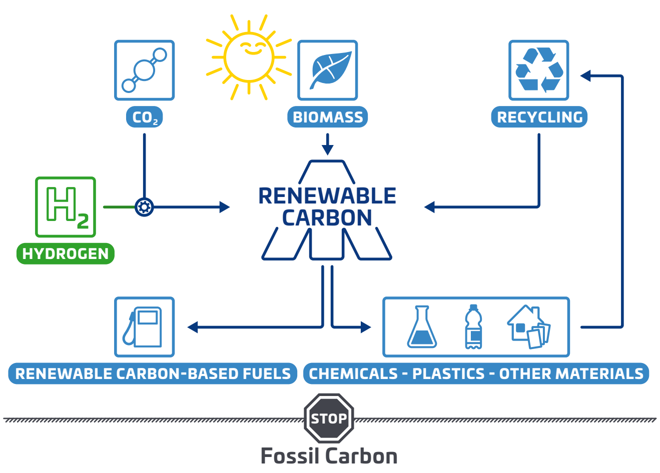
RCI addresses the core problem of climate change, which is extracting and using additional fossil carbon from the ground that will eventually end up in the atmosphere. Companies are encouraged to focus on phasing out fossil resources and to use renewable carbon instead.

The initiative wants to drive this message, initiating further actions by bringing stakeholders together, providing information and shaping policy to strive for a climate-neutral circular economy.

THE VISION

Fossil carbon shall be completely substituted by renewable carbon, which is carbon from alternative sources: biomass, CO_2 and recycling.

RENEWABLE CARBON



nova-Institute
for Sustainability and Innovation

Technology & Markets
Achim Raschka (achim.raschka@nova-institut.de)

- Market Research
- Market & Trend Reports
- Innovation & Technology Scouting
- Trend & Competitive Analysis
- Supply & Demand Analysis
- Feasibility & Potential Studies
- Customised Expert Workshops
- Business Plan Services

Communications
Stefanie Fulda (stefanie.fulda@nova-institut.de)

- Comprehensive Communication & Dissemination in Research Projects
- Communication & Marketing Support
- Network of 60,000 Contacts to Companies, Associations & Institutes
- Targeted Newsletters for 19 Specialty Areas of the Industry
- Conferences, Workshops & nova Sessions
- In-depth B2C & Social Acceptance Research

Sustainability
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- Life Cycle Assessments (ISO 14040/44, PEF Conform)
- Carbon Footprint Studies & Customised Tools
- Initial Sustainability Screenings & Strategy Consultation
- Holistic Sustainability Assessment (incl. Social & Economic Impacts)
- GHG Accounting Following Recognised Accounting Standards
- Critical Reviews for LCA or Carbon Footprint Reports
- Sustainability Reporting & Claims (CSRD, Green Claims)

Economy & Policy
Lara Dammer (lara.dammer@nova-institut.de)

- Strategic Consulting for Industry, Policy & NGOs
- Political Framework, Measures & Instruments
- Standards, Certification & Labelling
- Micro- & Macroeconomics
- Techno-Economic Evaluation (TEE) for Low & High TRL
- Target Price Analysis for Feedstock & Products

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nova-Institute is a private and independent research institute, founded in 1994. nova offers research and consultancy with a focus on the transition of the chemical and material industry to renewable carbon.

What are future challenges, environmental benefits and successful strategies to substitute fossil carbon with biomass, direct CO_2 utilisation and recycling? What are the most promising concepts and applications? We offer our unique understanding to support the transition of your business into a climate neutral future.

Our subjects include feedstock, technologies and markets, economy and policy, sustainability, communication and strategy development. Multidisciplinary and international team of 45 scientists.

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