ADVANCED RECYCLING Conference 2024

20–21 November • Cologne (Germany)

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19 November 2024, 19:00 (CET)
On the eve of the conference

Meeting Point for a Social Evening Gathering

Kölsch Brewery
Brauhaus Päffgen
Friesenstr. 64–66, 50670 Köln (Cologne)
(20 minutes walk from Cologne Central Station)

Join at sli.do
for real time questions and comments

Main Sessions
Grand Hall
#2024ARC

Parallel Sessions
Room Laurentius
#2024ARC-2

Zoom Events
We sent you the link to Zoom Events.

All details:
Please see page 12.

Your Conference Team

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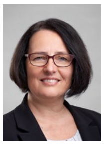

Brigitte Hellwig
Representative of the
nova-Institute at Booth No. 6
brigitte.hellwig@nova-institut.de

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
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Entrance Fee

2 Days • 20–21 November 2024
Ticket for on site (and online) attendance
incl. dinner buffet on the first day
1495 €

Day 1 • 20 November 2024
Ticket for on site (and online) attendance
incl. dinner buffet
895 €

Day 2 • 21 November 2024
Ticket for on site (and online) attendance
695 €

2 Days Online Ticket • 20–21 November 2024
Ticket for virtual attendance
695 €

2 Days Student Ticket • 20–21 November 2024
Ticket for on site attendance
incl. dinner buffet on the first day
350 €

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

Now in its third year, the ARC is still expanding at several levels. Therefore, it is time to recap not only on our observations of the recycling industry over the past year, but also to look at some of the milestones since the conference's debut.

This year nova was involved in a number of activities that shaped the advanced recycling sector at several levels.

Report – "Mapping of Advanced Plastic Waste Recycling Technologies and their Global Capacities"

With the "Mapping of Advanced Plastic Waste Recycling Technologies and their Global Capacities"[1], one of nova's best-selling commercial market studies of 2024 was published. The interest is higher than ever and not only due to the new and updated company and technology profiles. Rather we see an increasing demand for detailed data to trace the current and future worldwide capacities – from waste input to different product outputs, which was a new addition to the report and will be extended in future.

Due Diligence Exercises

For our customers, we successfully conducted due diligence exercises associated with the realisation of advanced recycling projects. Some of these initiatives have been highlighted in various press releases, which conference participants may have come across. From our perspective, the most successful projects were those where the initiators identified and collaborated with strong partners for specific technical aspects throughout the entire recycling process and the plastics value chain. This approach acknowledges that there is no universal solution, emphasising the importance of partnerships to effectively address different challenges.

Position Paper on Chemical and Physical Recycling

The members of the Renewable Carbon Initiative (RCI) have published their Position Paper on Chemical and Physical Recycling[2]. This work allowed the members to establish common positions, and we are hopeful that it will significantly influence public discourse. nova, commissioned by the RCI, supported the challenging process of formulating these common positions, given the diversity of sectors represented by RCI members. This diversity is one of the initiative's strengths, as the RCI is not a sector-specific interest group, allowing it to present a comprehensive and balanced view of the industry rather than a biased one.

European Commission Support on Mass Balance Attribution

We have followed with interest the procedures of the European Commission on the calculation, verification and reporting of data on recycled plastic content in single-use plastic beverage bottles. The draft EU document indicated support of Mass Balance Attribution (MBA) under the fuel-use exempt rule which was long-awaited by the chemical recycling industry. This is a clear first signal in the direction of planning security, and it is to be expected that such mass-balance accounting rules will be applied beyond single-use plastic beverage bottles – for example in the context of all packaging recycling (PPWR), end-of-life vehicles (ELV) recycling and the Ecodesign for Sustainable Products Regulation (ESPR). In combination with the dedicated recycling quotas for contact sensitive applications in the revised PPWR, which are considered an implicit target for chemical recycling, considerable progress has been made in the last two years on the legislative front. nova will monitor the latest developments closely.

nova Webinar on Textile Recycling

In one of our webinars we explored together with leading industry experts the textile recycling sector which is facing challenges since textiles are difficult to recycle due to their complex composition of mixed fibres that can be natural and/or synthetic. Together with the attendees of the webinar we learned that currently only 15 % of the textile waste is treated with recycling and backfilling whereby the majority is downcycled into lower-value applications, such as insulation or cleaning cloths. So, there is plenty of room for improvement which can be driven through regulatory framework and new strategies that utilise advanced and fibre-to-fibre recycling.

ARC Recap

The founding idea for the ARC was to establish an event that reaches far beyond chemical recycling and further presents various new and innovative solutions, that collectively complement and enable each other and thus advance recycling. All participants should learn and discuss more about new technological success stories and discuss future developments. We are strongly convinced that a successful evolution of the circular economy will continue to be driven but only by collaborative thinking of stakeholders as well as complementary approaches. The perfect solution is not to be found in one recycling technology, rather we have to ask ourselves how we can integrate the strengths and weaknesses of all technologies into a working concept that is economically viable and ecologically sustainable. In such a concept, solutions further upstream and downstream of the actual recycling process are also of equal importance when it comes to increasing yields and qualities as well as establishing new pathways.

Following this approach, and after three years we have managed to bring together a large number of experts in one place to talk about all relevant technologies, be it mechanical recycling or dissolution, enzymolysis, solvolysis, thermal depolymerisation, pyrolysis, gasification, incineration coupled with CCU, pre- and post-treatment, upgrading, digital solutions, and many others that lie somewhere in between or are unique. With ARC we also provided a space to talk and discuss LCAs, politics and markets as well as the latest research findings. From academia to start-ups to large-scale chemical industry, from NGOs to political decision-makers, from founders to investors, all these groups have now a new home at the ARC to recapitulate the past year together and look ahead to the new year with new ideas, insights, and partners.

As the nova-Institute is always informed about the latest advanced recycling developments and very well connected through its consulting activities, we also use this advantage to attract speakers for high-quality presentations at the conference. We are particularly interested in up-to-date and detailed content in order to create a unique conference experience and at the same time avoid repetitions that have already been encountered in many other occasions.

Especially this year it was a challenge to create a program due to the sheer number and variety of submitted abstracts. For this reason, we have assembled an Advisory Board for ARC with experts from various sectors, including industrial chemistry, waste disposal, brand manufacturing, industrial association, and academia. The feedback of the advisory experts ensures a program that provides a well-balanced insight into the versatile world of advanced recycling.

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 packed program, lively exchange, critical discussions, and extensive networking with all participants, on-site as well as online.

Lars Krause
Senior Expert

Michael Carus
CEO

[1] https://renewable-carbon.eu/publications/product/mapping-of-advanced-plastic-waste-recycling-technologies-and-their-global-capacities/
[2] https://renewable-carbon.eu/publications/product/rci-position-paper-on-chemical-and-physical-recycling/

Program

The Advanced Recycling Conference is packed with a variety of relevant topics, which are grouped into nine sessions.

You can look forward to the following contents:

DAY 1

20 November 2024, 10:00–17:00 (CET)

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Perspectives of Advanced Plastics Recycling

Advanced recycling offers a versatile toolbox of technologies tailored to address the varying requirements and challenges of plastic waste recycling associated with different polymers and waste stream. In this session you will learn more about the available recycling technologies and capacities, their complementary use as well as specific requirements, approaches, and solutions for engineering and commodity thermoplastics as well as e-waste plastics.

Dissolution Technologies for Recycling of PS and Engineering Plastics

Dissolution describes a solvent-based technology that is based on physical processes. Targeted polymers from mixed plastic wastes 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 polymer extraction or purification from PS and engineering plastics (e.g. ABS) through physical recycling using dissolution technologies.

From Polymer to Building Units and Back to Polymer – An Excursion Through Different Depolymerisation Technologies

Assisted by heat, radiation, the use of catalysts or addition of chemicals and enzymes, depolymerisation breaks plastic waste and even textiles into its building units (e.g. monomers) that can be fed back into polymer production. Learn more about thermal depolymerisation, solvolysis, and Enzymatic recycling.

Thermochemical Recycling (Part 1)

Pyrolysis is a versatile tool that is 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.

From Recovery of Feedstocks to Products

The recovery of feedstocks is one of the very first and crucial steps before polymers are recycled and find into new products and the quality of the feedstock is often a limiting factor. This session takes a closer look into evolving feedstock specifications, strategies and technologies for improving the recovery rate, and the role of chemical recycling technologies for the production of new plastics.

DAY 2

21 November 2024, 9:00–17:30 (CET)

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Markets, Investments and Funding

Learn more about the price dynamics and market evolution in the plastics recycling industry as well as about funding and the perspective of investors.

Different Approaches, Challenges, and Expanded Use of Physical Recycling Technologies

Physical recycling technologies offer a wide spectrum of solutions which includes amongst others delamination technologies for multilayer material, thermomechanical technologies for glass fibre reinforced thermoplastics or twin-screw extrusion for degassing and mixing in a recycling process. In addition to solutions, there are also challenges to address, such as obtaining food contact approval for recyclates derived from physical recycling.

Depolymerisation Technologies for PET

Assisted by solid or liquid chemicals as well as enzymes, depolymerisation breaks PET waste, and even textiles into its building units (e.g. monomers) that can be fed back into polymer production. Learn more about solid-state hydrolysis, solvolysis, and enzymolysis.

Dissolution Technologies for Recycling of Commodity Plastics

Dissolution describes a solvent-based technology that is based on physical processes. Targeted polymers from mixed plastic wastes 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 polymer extraction or purification from PE, PP, and PVC through physical recycling using dissolution technologies.

Thermochemical Recycling (Part 2)

Thermochemical recycling is able to complement mechanical recycling and to produce a wide range of different products that can be utilised in the chemicals and plastics industry. The boundaries between the thermochemical processes are usually fluid, but can occur under similar reaction conditions. Depending on the reactor and reaction design, different products in different qualities can be obtained to realise open or closed recycling loops.

Insights into Policy, Sustainability, Mass-balance and Alternative Naphtha

Get the latest updates on EU policy on Chemical Recycling and Mass Balance & Attribution as well as deeper insights into Chemical Recycling for the Production of Alternative Naphtha and the status quo of Life Cycle Assessment (LCA) of Recycling.

Pre-/Post Treatment and Upgrading

Pre-processing, post-processing, and upgrading technologies serve as enablers for all advanced recycling technologies. These processes provide for higher yields of end products and higher product quality, thus improving overall effectiveness and potential of recycling operations.

Exhibition

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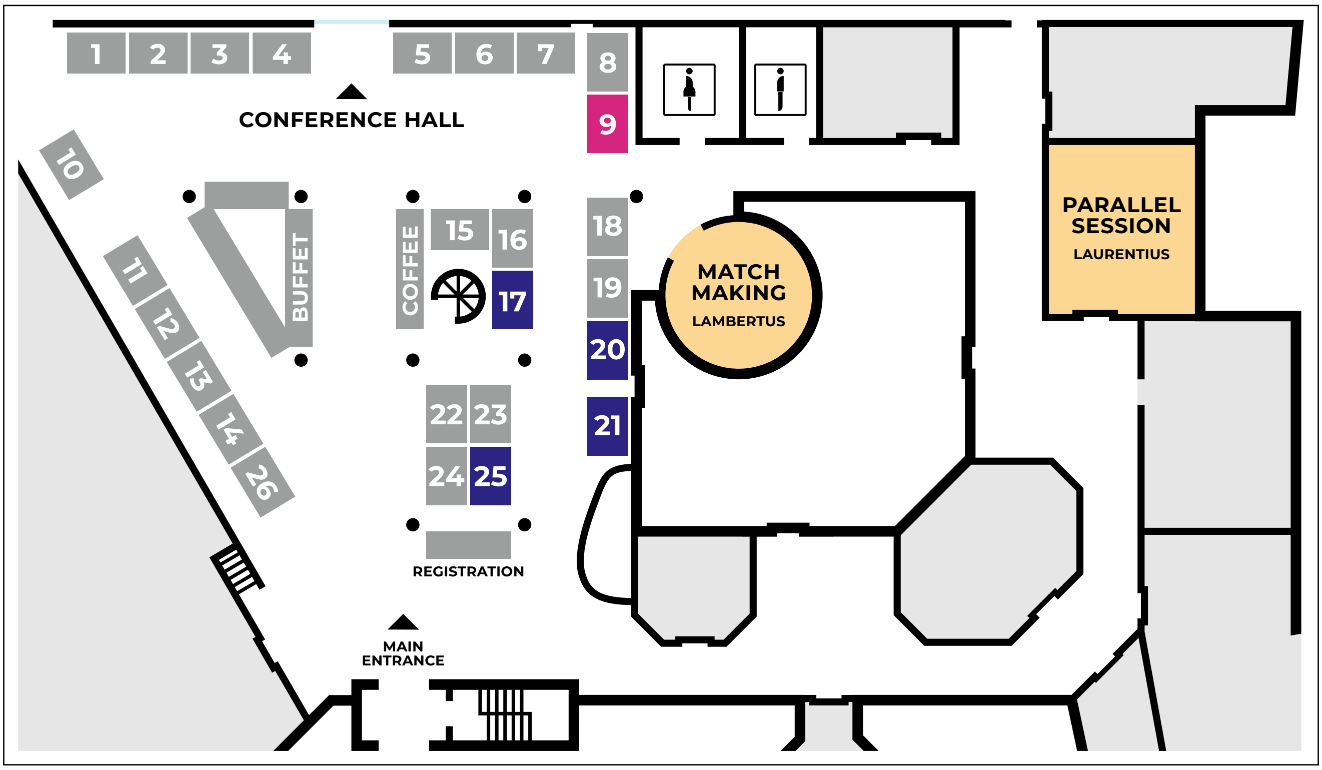

List of Exhibitors

01 Coperion (DE)
02 BUSS ChemTech (CH)
04 EREMA (AT)
05 DePoly (CH)
06 nova-Institute (DE)
07 Starlinger Recycling Technology (AT)
08 Media Table
10 AIMPLAS (ES)
11 PYSOLO (EU-Project)
12 Yncoris (DE)
13 Zenton (NL)
14 matterr (DE)
15 LIST Technology (CH)
16 Fraunhofer UMSICHT – Institute for Environmental, Safety, and Energy Technology UMSICHT (DE)
19 Poster Session
22 Aduro Clean Technologies (CA)
23 Promeco (IT)
24 VEGA Grieshaber (DE)

Book your booth:
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Status:
30 October 2024
More exhibitors expected: advanced-recycling.eu/exhibitors

Poster Session

The poster session will take place at 17:10 (CET) on Day 1, 20 November with a few minutes presentation at a special poster area at booth number 19 of the exhibition space.

Robert Kunzmann
AC Biode (LU)
Chemical Recycling of PET into Methanol

Kathy Elst
Flemish Institute for Technological Research (VITO) (BE)
Catalytic Chemical Recycling of Plastics

Izotz Amundarain
GAIKER Technology Centre (ES)
Chemical Upcycling of Complex Polyester Textile Wastes

Mika Härkönen
VTT Technical Reserach Centre of Finland (FI)
UrbanMill 2022–24 – Advanced Pyrolysis-based Chemical Recycling of Mixed Plastic Waste

advanced-recycling.eu/poster-session

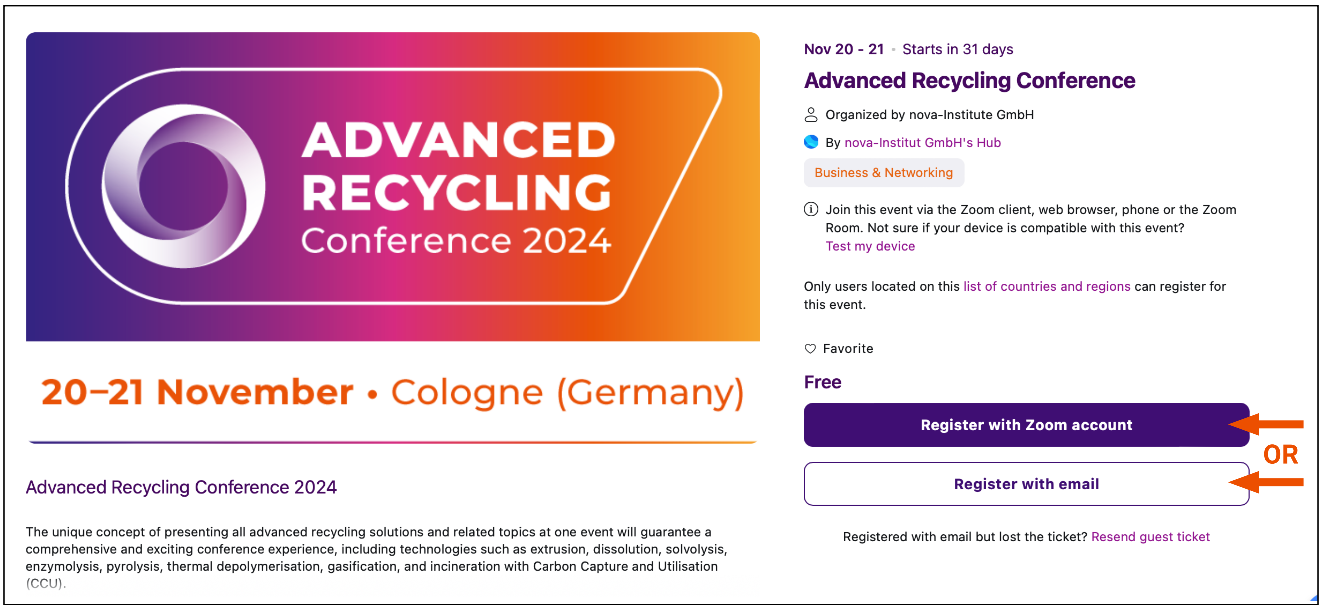
Networking and Streaming Platform

Zoom Events offers all participants, speakers, exhibitors and sponsors the opportunity to network and chat.

How to Enter

1. The use does not require a Zoom account. Register either with your Zoom account or with your email address.

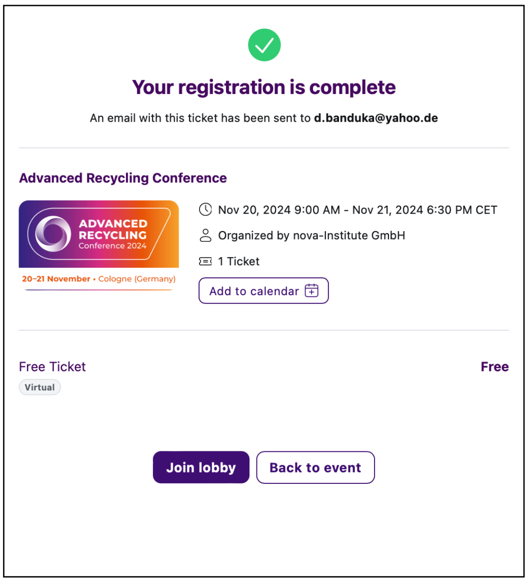
   Use the link in your participation confirmation email to register with the Zoom Events platform.
   There, you can get in contact with other participants, speakers, exhibitors and sponsors.

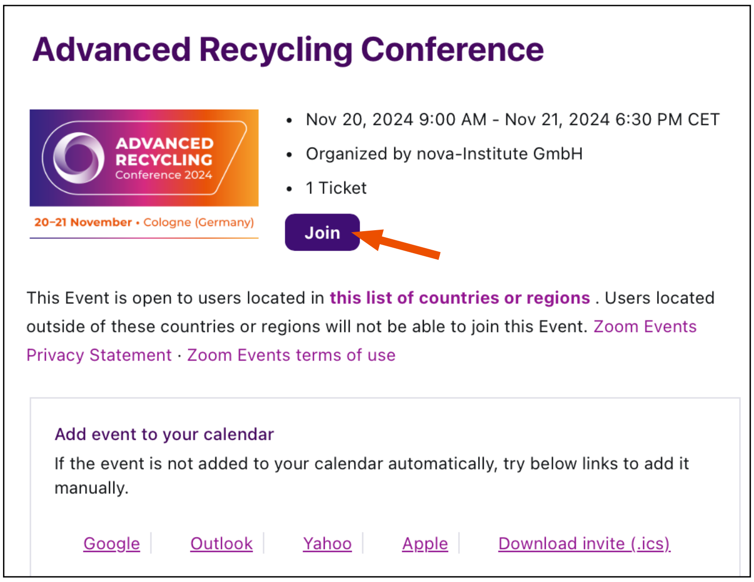


2. If you have a Zoom account, please use it to login. Otherwise please login with your email account, a verification code will be sent to you via email.

3. After registration, you will then receive a second email which contains a "Join" button.

   Please use this path to (re)enter throughout all conference days.





Your Profile

Adding more information allows others to find and contact you, by entering for example key words.

Make sure to activate the “Feeling Social” function. This way, all participants can network and arrange meetings via this platform.

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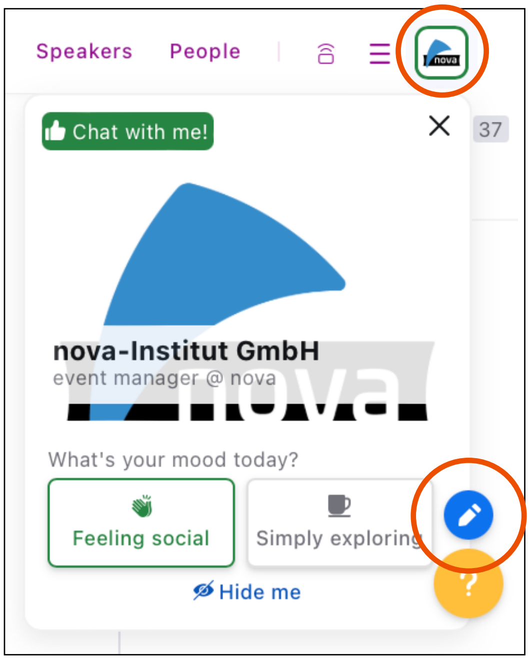
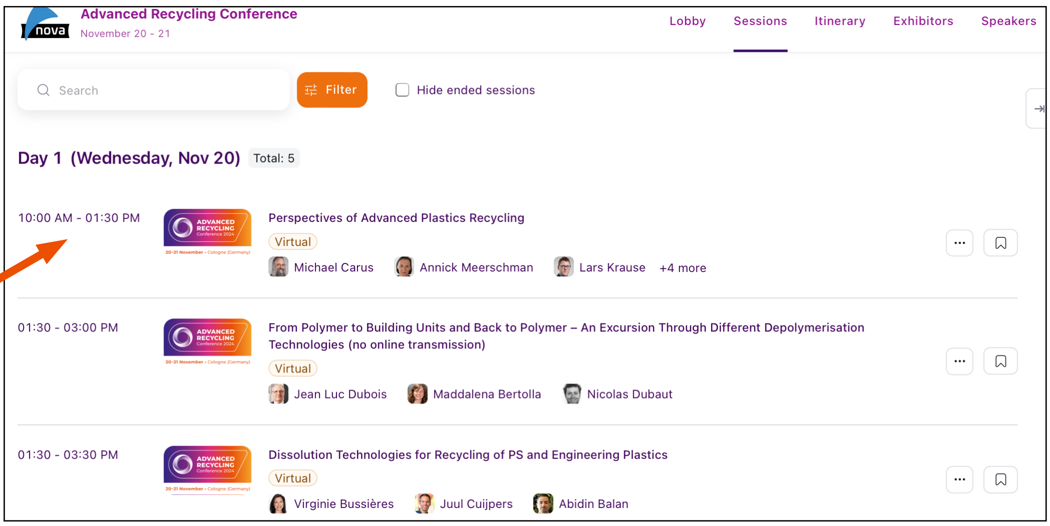


Elevate Your Networking Game

Make connections by clicking on “people”, schedule meetings and stay in touch with people you meet.

How to Follow the Livestream

Sessions in the main event hall will be streamed in the lobby, but you can view a larger screen by clicking on “sessions” and entering the individual session.



Zoom Events Notification

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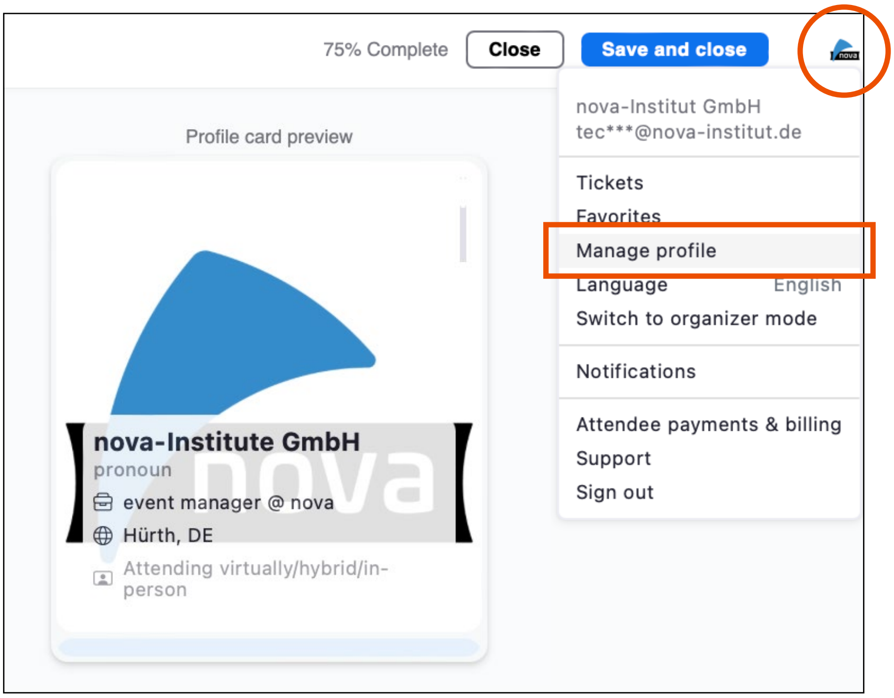
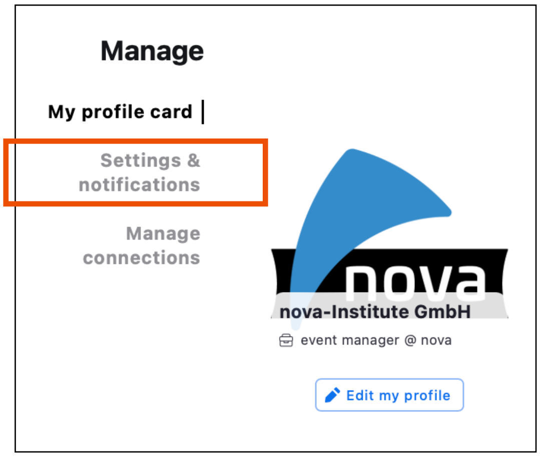
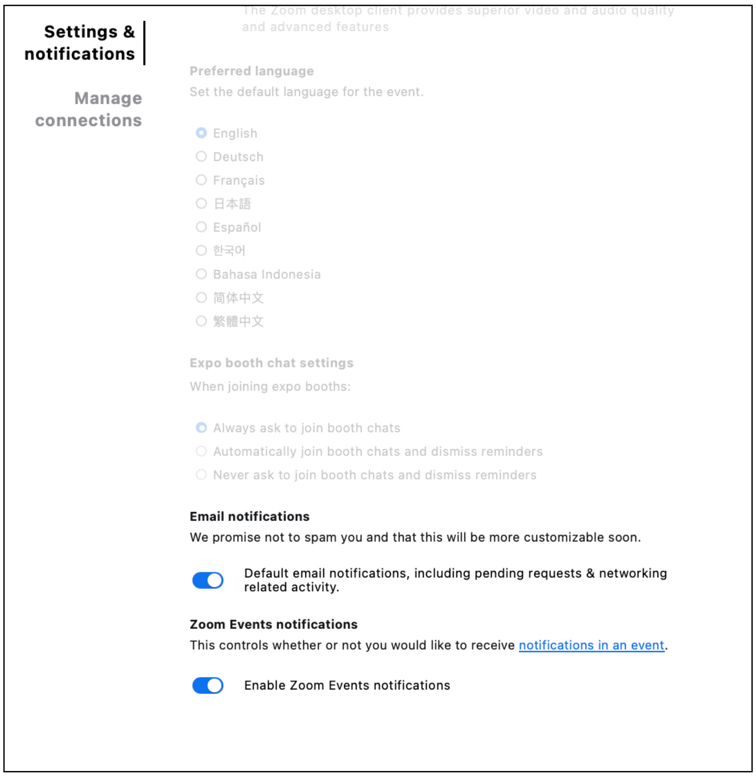


2. Click on the tab “notifications and settings”.



3. Select the Zoom notification settings to your liking.



Study on Advanced Plastic Waste Recycling Technologies and Their Global Capacities

The study "Mapping of Advanced Plastic Waste Recycling Technologies and Their Global Capacities" presents more than 130 technologies that are available on the market or will be available soon. Most of the identified technology providers are from Europe, led by the Netherlands and Germany, followed by North America.

Also featured are initial suppliers of post-processing and upgrading technologies, which play a particularly important role in the conversion of secondary valuable materials into chemicals, materials and fuels. Various technologies at different scales are covered, including gasification, pyrolysis, solvolysis, dissolution, and enzymolysis. All technologies and the companies are comprehensively presented. Depending on the technology, different products can be obtained and re-introduced into the cycle at different points in the plastics value chain (Figure 1). The largest capacities that can be covered by a single plant are currently found in thermochemical processes.

Furthermore, the study describes technical details, the suitability of available technologies for specific polymers and waste fractions, and the implementation of existing pilot, demonstration and even (semi-)commercial plants. In addition, all recent developments as well as partnerships and joint ventures are systematically described.

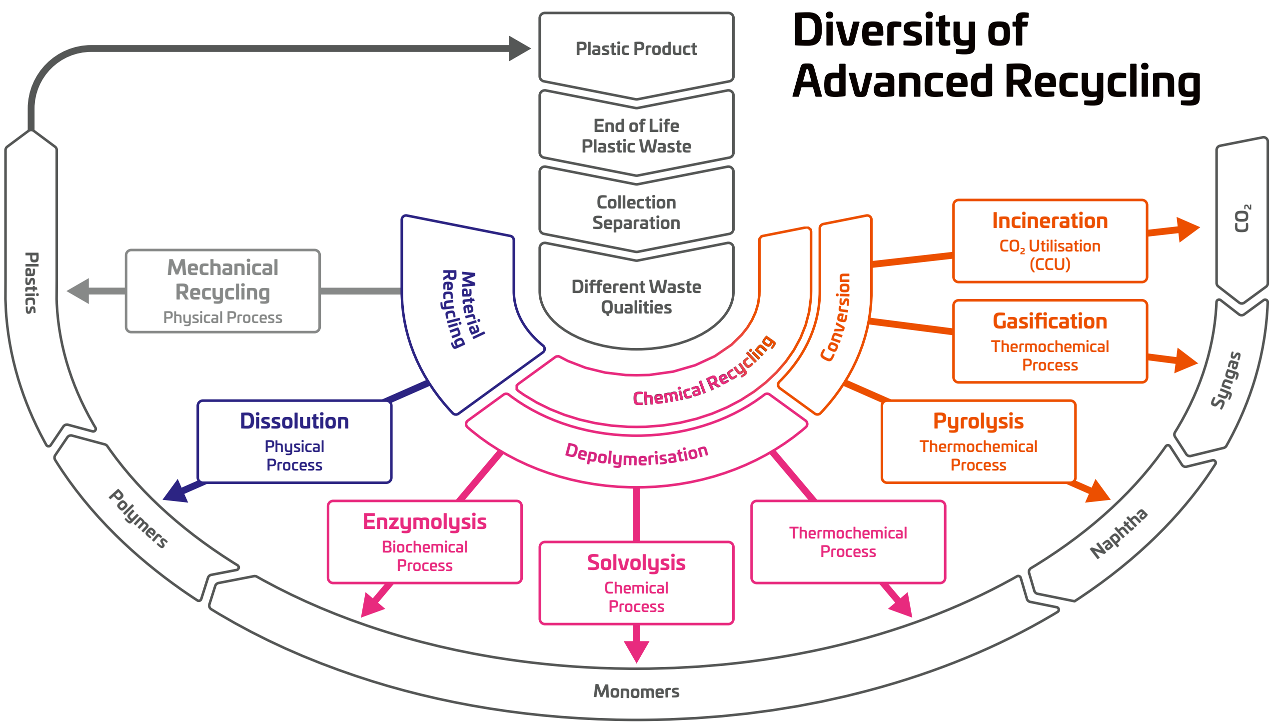


Figure 1: Full spectrum of available recycling technologies divided by their basic working principles and their products.

For the first time a comprehensive overview about the worldwide advanced recycling capacities provides deep insights into the status quo

From all installed advanced recycling plants more than 60 and therewith the majority are operating in Europe[1] (Figure 2), followed by the Rest of the World, CIS, NAFTA, Middle East & Africa, China, Latin America, and Japan. With advanced recycling, Europe addresses 358 kt plastics waste[2] per annum which corresponds to nearly one quarter of the worldwide input capacity of advanced recycling. In Europe, with 275 kt per annum the majority is addressed via pyrolysis, followed by solvolysis, dissolution, and enzymolysis (Figure 3).

In Europe 271 kt of products are obtained from advanced recycling. A detailed evaluation of the products (Figure 4) reveals that 41 % can be utilised for the production of new polymers and plastics in the form of purified polymers, as well as monomers/oligomers and naphtha. Additionally, 35 % of the products are representing Secondary Valuable Chemicals (SVC, such as pyrolysis oil, carbon black, wax, and other), which can have a wide range of applications. With that, only 24 % of the obtained products are falling into the fuels and energy category.

A detailed overview of the technologies and their suppliers

Pyrolysis

Pyrolysis represents a thermochemical recycling process in which mixed plastic waste (mainly polyolefins) and biomass are converted or depolymerised into liquids, solids, and gases in the presence of heat and absence of oxygen. The products range from various liquid fractions such as oils, diesel, naphtha and monomers to syngas, coal and waxes. Depending on the nature of the products, they can be used as renewable feedstocks to produce new polymers.

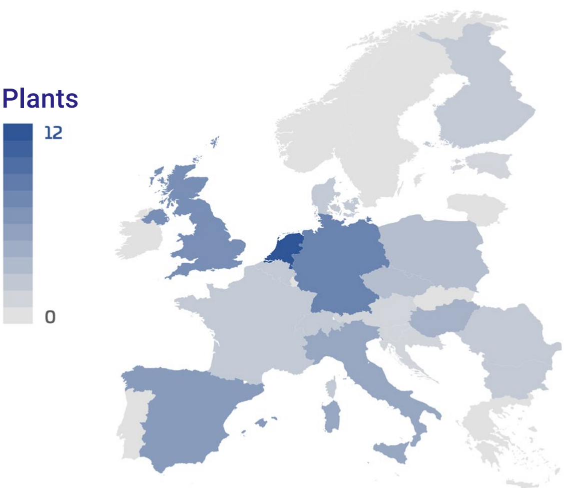


Figure 2: Number of Installed Advanced Recycling Plants in EU 27+3.

[1] EU 27+3 including Norway, Switzerland, and United Kingdom
[2] All kind of synthetic plastics and polymer wastes such as plastic packaging, tyres, polyester textiles

Here, a majority of the 81 identified technology providers are from Europe, followed by North America. With 31 companies, the majority of suppliers are small companies, followed by micro/start-up, medium and large companies such as BlueAlp (Eindhoven, Netherlands), Demont (Millesimo, Italy), INEOS Styrolution (Frankfurt, Germany), Neste (Espoo, Finland), Österreichische Mineralölverwaltung (OMV) (Vienna, Austria), Repsol (Madrid, Spain), Unipetrol (Prague, Czech Republic), VTT (Espoo, Finland) and Chevron Phillips (The Woodlands, TX, USA). At 40,000 tons per year, pyrolysis currently achieves the second largest capacity amongst recycle technologies.

Solvolysis

Solvent-based solvolysis describes a chemical process based on depolymerisation that can be carried out with various solvents. In this process, polymers (mainly PET) are broken down into their building blocks (e.g. monomers, dimers, oligomers). After the breakdown, the building blocks are separated from the other plastic components (e.g. additives, pigments, fillers, non-targeted polymers). After purification, the building blocks are polymerised to synthesise new polymers.

Compared to pyrolysis, there are fewer suppliers active on the market, who also offer smaller capacities of up to 10,800 tons per year. Of the 24 identified solvolysis technology providers, the majority are based in Europe, followed by North America. With nine companies, the majority of suppliers are among the small companies, followed by large, medium and micro/start-up companies.

EU27+3 Advanced Recycling Waste Input Capacity

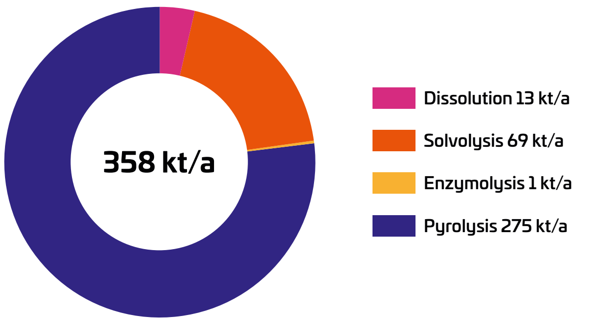


Figure 3: Advanced Recycling Input Capacities by Technology.

EU27+3 Advanced Recycling Product Output Capacity

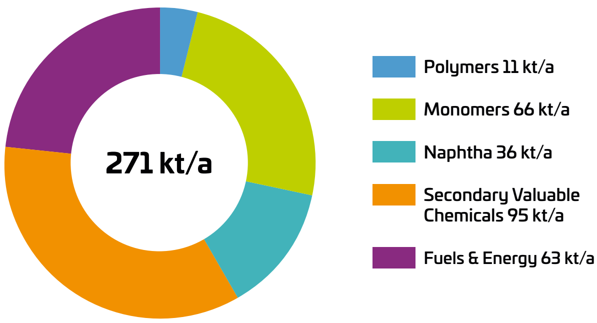


Figure 4: Advanced Recycling Output Capacities by Product Group.

Large companies include Aquafil (Arco, Trentino, Italy), Eastman Chemical Company (Kingsport, TN, USA), IFP Energies Nouvelles (IFPEN) (Rueil-Malmaison, France), International Business Machines Corporation (IBM) (Armonk, NY, USA), DuPont Teijin Films (Tokyo, Japan), and Dow (Midland, MI, USA).

Gasification

Gasification is another thermochemical process that can convert mixed plastic waste and biomass into syngas and CO_2 in the presence of heat and oxygen. Currently, the largest capacities achieved are up to 100,000 tons per year. Most of the suppliers are based in North America. With four companies each, most of the suppliers are small and medium-sized enterprises. The only large company identified was Eastman (Kingsport, TN, USA).

Dissolution

Dissolution describes a solvent-based technology based on physical processes. It allows targeted dissolution of polymers from mixed plastic waste in a suitable solvent, while retaining the chemical structure of the polymer. Other plastic components (e.g. additives, pigments, fillers or non-targeted polymers) remain undissolved and can be separated from the dissolved target polymer. An antisolvent is then added to initiate precipitation of the target polymer. The polymer can thus be obtained directly; unlike solvolysis, this process does not require a polymerisation step.

Currently, the process reaches a maximum capacity of 8,000 tons per year, with most technology suppliers coming from Europe, followed by North America. With four companies, most of the suppliers are small companies, followed by micro/start-up, medium-sized and one large company, which is represented by Shuye Environmental Technology (Shantou, China).

Enzymolysis

An alternative route is offered by enzymolysis, a technology based on biochemical processes that use various types of biocatalysts to depolymerise a polymer into its building blocks. The technology is currently at an early stage of development and is only available at a laboratory scale. Currently, only one supplier of an enzymolysis technology has been identified, which is a small company in Europe.

Comparison to Previous Release:

Published	Feb 2024	Jun 2022
Pages	276 (+76)	200
Total Company Profiles	132 (+27)	105
Dissolution	9 (+1)	8
Solvolyis	24 (+2)	22
Pre-/ Post-Processing	1 (+1)	–
Pyrolysis	79 (+17)	62
Pre-Processing	1 (+1)	–
Post-Processing	4 (+2)	2
Gasification	12 (+2)	10
Enzymolysis	1 (–)	1
Uncategorised	1 (+1)	–
Worldwide Statistics (e.g. Input/Output Capacities)	Yes	–

Interview with DePoly

New Players in Advanced Recycling

Innovators at Work

1. Innovation & Sustainability

How does DePoly's chemical recycling technology help reduce plastic waste and promote sustainability? Can you share specific examples where this has had a significant environmental impact?

Dr. Christopher Ireland: Our technology recycles PET plastic into its monomers of purified terephthalic acid and mono ethylene glycol using sustainable chemicals that can be found at home, and no additional heat or pressure. Our technology targets PET specifically, meaning we can handle mixed plastic, contaminated waste, both post-industrial and post-consumer waste and polyester containing textiles – no sorting is required. We therefore complement mechanical recycling by targeting waste that isn't currently recycled. A recent project involved taking waste that was rejected from the recycling system, and with partners, developing it into a jar that could be used for cosmetics – something we are all very proud of.

2. Breakthrough Technology

What breakthrough technologies form the groundwork of Depoly's recycling process, and how have they improved both efficiency and environmental outcomes compared to traditional mechanical methods?

Dr. Christopher Ireland: Our core tech was developed in the lab towards the end of 2018; initially testing water bottles, we saw the monomers being produced, so then went on to test any PET based product we could think of, from shampoo bottles, peanut butter containers to one of my shirts. We built a pilot plant in 2021, validating our process with various PET products at scale, and recently started construction of our Showcase Plant in Monthey, Switzerland. Along the way, we've developed innovative ways of purifying and forming the monomers using sustainable chemicals and as little energy as possible. This allows us to avoid recrystallisation with organic solvents and helps lower our environmental footprint. Unlike mechanical methods, we are not restricted in our feedstock, which allows us to complement mechanical methods as opposed to replacing them.

Dr. Christopher Ireland
CSO & Co-Founder
DePoly

DePoly

3. Challenges & Opportunities

What have been the biggest challenges in scaling your recycling operations, and what opportunities in the industry have been key to DePoly's growth?

Dr. Christopher Ireland: We have a strong engineering and R&D team which has allowed us to scale from grams, to kilograms, to our showcase plant which will begin operations in 2025, handling tonnes. Our core technology of recycling the PET uses a patented continuous reactor; the rest of the process uses off the shelf equipment such as filters, shredders etc. A key challenge is ensuring the equipment works well and complements each other when the plant is built. We still have a strong R&D focus, but we limit our research to ensure all the innovations needed to be at scale are both environmentally and economically viable; although this is restrictive, it also allows us to produce stunning innovations.

4. Collaboration & Industry Partnerships

Can you elaborate how partnerships with other companies or sectors have helped DePoly expand its impact, and what types of new collaborations are you seeking to further your mission?

Dr. Christopher Ireland: We completed our seed round last year, led by BASF and Founderful VC; Beiersdorf, Syensqo and Qemetica are also investors amongst others. This gives us exceptional scope, with traditional venture capital firms, chemical manufacturers and brands all helping with our strategy and focus as we scale. We can take unwanted PET waste, sell chemicals for PET polymerisation, or complete the circle and with partners, create the PET again from the initial feedstock. We therefore are looking at partnering waste collectors (post-consumer and post-industrial) PET manufacturers and brands, wanting to create circularity.

Purified monomers produced from DePoly's solvolysis technology

5. Future Innovations

Looking ahead, what advancements or innovations is DePoly focusing on to enhance the efficiency and scalability of your technology?

Dr. Christopher Ireland: We are continually improving our core tech, and really excited for next year to see our Showcase Plant up and running in Monthey, Switzerland. The next step is to start building our First of a Kind Plant (FOAK) – we are already starting the planning of this. Our goal is to be able to handle all types of plastic, and so our R&D team is developing techniques to recycle plastic such as PU, HDPE/LDPE and PP. Our goal is to follow the same trend from Lab to Pilot to Showcase to FOAK.

Type of plastic that can be recycled with the DePoly technology in raw (A) and shredded (B) form

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DePoly

Plastics Made Pure

About DePoly

Recognized as 2024 Technology Pioneer by the World Economic Forum, and winner of the Top 100 Swiss Startup Award in 2024, DePoly is a Swiss cleantech company committed to tackling the plastic waste problem.
Our ambitious and dedicated team is made up of people challenging the status quo and striving for excellence, with a shared passion for making an impact!

The Problem We Are Facing

PET plastic is made from fossil fuels, and only perfect PET, like clean beverage bottles, can be recycled, representing <10% of all plastics.
The remaining 90% are incinerated, landfilled or polluted in our environment, forcing the production of new plastics from oil.

Our Vision

As the construction of our 500 T/year showcase plant is underway and paving the way for our future 50K T/year commercial plant, we are looking towards the horizon and knowing that our solution is creating a more sustainable future by reducing the carbon footprint, increasing the supply of recycled PET and creating a circular economy for plastics.

Awards & Recognition

WORLD ECONOMIC FORUM — 2024 Technology Pioneer

TOP 100 STARTUP AWARD — Winner of the 2024 Top 100 Swiss Startup Award

Our Competitive Advantage

DePoly has developed a novel, clean technology to recycle PET and Polyester. Our process can handle a large variety of mixed or separated plastic waste streams. This creates a "drop-in" solution for direct textile-to-textile and PET recycling with adaptability to client's supply chain.

- We treat waste streams that are not sorted, washed or pre-processed
- Our PTA and MEG are virgin-grade quality, equivalent to the oil-based counterparts, and are drop-in solutions for creating recycled products
- Our patented reaction happens at room temperature without additional heat and pressure
- Our process is energy efficient and reduces up to 66% CO_2 emissions compared to virgin equivalents

2020 — DePoly SA Founded

2021 — Operational TRL7 Pilot plant

2023 — 12.3M CHF Seed round

2025 — 500 T/y Showcase plant

2027 — 1st 50K T/y commercial plant

w/ depoly.co

Inquiries: contact@depoly.co

DAY 1

20 November 2024 • 10:00 – 17:00 (CET)

10:00 **Michael Carus**
nova-Institute (DE)
Conference Opening

10:10

Annick Meerschman
Cefic (BE)
Keynote

10:20 – 12:00

Main Session
Perspectives of Advanced Plastics Recycling

Grand Hall

Chairpersons: Michael Carus & Lars Krause, nova-Institute

10:20

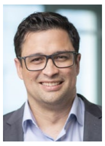
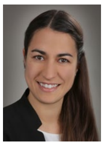
Lars Krause
nova-Institute (DE)
Mapping of Advanced Recycling Technologies and Global Capacities

10:40

Peter Schwarz
Covestro Deutschland (DE)
Advanced Recycling of Engineering Thermoplastics – A Differentiated View on Recyclability

11:00

Robert Kunzmann
AC Biode (LU)
Chemical Recycling of PE and PVC – Current Trends and New Technologies

11:20


Oscar Vernaez & Laura Strobl
Neste (DE) & Fraunhofer IVV (DE)
E-Waste Plastics Valorization: A Symphony of Advanced Recycling Technologies

11:40
Panel Discussion with all Session Speakers

12:00
Lunch Break & Networking

13:30 – 14:50

Main Session

Dissolution Technologies for Recycling of PS and Engineering Plastics

Grand Hall

Chairpersons: Lars Krause & Narendar Poranki, nova-Institute

13:30

Virginie Bussières
Polystyvert (UK)
Economically Viable Polystyrene Recycling by Dissolution

13:50

Juul Cuijpers
ReSolved Technologies (NL)
Advanced Solvent-Based Technology for the Closed-Loop Recycling; Purity is the Key to Circularity

14:10

Abidin Balan
Trinseo (NL)
Revolutionizing Plastics by Groundbreaking Physical Recycling Methods: Trinseo's Infinite Recycling Technology for a Sustainable Future

14:30

Panel Discussion with all Session Speakers

14:50 Coffee Break & Networking

13:30 – 14:50

No Online Transmission

Parallel Session

From Polymer to Building Units and Back to Polymer – An Excursion Through Different Depolymerisation Technologies

Room Laurentius

Chairpersons: Asta Partanen & Pia Skoczinski, nova-Institute

13:30

Jean Luc Dubois
Trinseo – Altuglas International (FR)
PolyMethylMethAcrylate (PMMA) Depolymerization by Trinseo

13:50

Maddalena Bertolla
Aquafil Group (IT)
The ECONYL® Regeneration System – Chemical Recycling of PA6

14:10

Nicolas Dubaut
Plasticentropy France (FR)
Plasticentropy, Recycling Multilayers Plastic Waste

14:30

Panel Discussion with all Session Speakers

15:20 – 17:10

Main Session
Thermochemical Recycling (Part 1)

Grand Hall

Chairpersons: Lars Krause, nova-Institute & Gillian Tweddle, Stripe Consulting (BE)

15:20

Marco Karber
AES Autonome Energiesysteme (DE)
Economical Assessment of Small-Scale Pyrolysis Plants

15:40

Martin Seemann
University of Technology Chalmers / Energy Technology (SE)
Direct Steam Cracking of Heterogeneous Plastic Waste – A Solution to Transform Chemical Clusters

16:00

Valentijn de Neve
BlueAlp (NL)
Accelerating Plastic Recycling – Close to the Waste or Close to the Cracker?

16:20

Jelle Ernst Oude Lenferink
Fluor (NL)
Developing Plastic (Pyrolysis) Recycling Projects – An EPC Contractor's Perspective

16:40
Panel Discussion with all Session Speakers

17:10
Poster Pitches (Booth 19) and Beer on Tap

15:20 – 17:10 No Online Transmission

Parallel Session
From Recovery of Feedstocks to Products

Room Laurentius

Chairpersons: Michael Carus & Achim Raschka, nova-Institute

15:20

Richard von Goetze
Interzero (DE)
Evolving Feedstock Specifications in the Circular Economy

15:40

Sneha Verma
AEB Amsterdam (NL)
Transforming Waste for a Circular Future

16:00

Javier Grau Forner
AIMPLAS (ES)
RECLAIM: A Portable, Robotic Material Recovery Facility

16:20

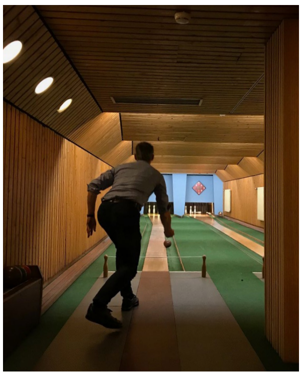
Stephan Roest
Borealis (AT)
Chemical Recycling Important Part of Borealis' Transition to a Circular Economy

16:40
Panel Discussion with all Session Speakers

19:30
Gala Dinner

Grand Hall

22:00
Bowling – Get Together in the Party Room beneath Maternushaus



DAY 2
21 November 2024 • 9:00–17:30 (CET)

9:00 Gillian Tweddle
Stripe Consulting (BE)
Conference Opening

9:10 – 10:50
Main Session
Markets, Investments and Funding
Grand Hall

Chairpersons: Narendar Poranki, nova-Institute & Gillian Tweddle, Stripe Consulting (BE)

9:10

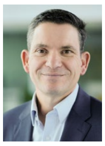
Peter Jetzer
jrp collaboration promotion (DE)
Price Dynamics and Market Evolution in the Plastics Recycling Industry

9:30

Gerben Hieminga
ING (NL)
Let's Talk Economics: How Recycling Stacks Up Against CCS, Hydrogen, and Electrification

9:50

Jan-Willem Muller
Infinity Recycling (NL)
Advanced Recycling from a Investor's Perspective

10:10

Marc Spekreijse
Circular Plastics (NL)
Accelerate the Transition

10:30
Panel Discussion with all Session Speakers

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

9:10 – 10:50
No Online Transmission
Parallel Session
Different Approaches, Challenges, and Expanded Use of Physical Recycling Technologies
Room Laurentius

Chairpersons: Lars Krause & Achim Raschka, nova-Institute

9:10

Julien Davin
Saperatec (DE)
How Delamination Recycling Can Enable the Access to Underutilized Feedstocks for Recycled Plastics

9:30

Aditya Prakash Shembekar
University of Edinburgh (UK)
Sustainable Solutions for the Automotive Industry: Thermomechanical Recycling of Continuous Glass Fibre (GF) Reinforced Polyamide-6 (APA6) Composites

9:50


Patrick Trubic & Dan Zebergs
Coperion (DE)
Approaching Advanced Recycling Challenges with Twin Screw Extrusion Technology Innovations

10:10

David Rapp
KraussMaffei Extrusion (DE)
Challenging the "Challenge-Test": Are Physical Recycling Methods Suitable for Food-Grade Polyolefins?

10:30
Panel Discussion with all Session Speakers

10:50
Coffee Break & Networking

11:20 – 12:40

Main Session

Depolymerisation Technologies for PET

Grand Hall

Chairpersons: Asta Partanen & Pia Skoczinski, nova-Institute

11:20

Mathias Kirstein
matterr (DE)
Beyond Bottle Recycling: Achieving Full Circularity for Polyester

11:40

Olivier Cardon
Michelin (FR)
WhiteCycle: An Innovative European Project to Process and Recycle PET from Complex Waste

12:00

Pelin Uran
DePoly (CH)
Chemical Recycling of Polyester-based Products into Monomers

12:20

Panel Discussion with all Session Speakers

11:20 – 12:40

No Online Transmission

Parallel Session

Dissolution Technologies for Recycling of Commodity Plastics

Room Laurentius

Chairpersons: Michael Carus & Narendar Poranki, nova-Institute

11:20

Wiebe Schipper
PureCycle (BE)
Closing the Loop on Polypropylene

11:40

Eric Romers
INEOS Inovyn (BE)
Advanced Recycling of Post-Consumer PVC Waste

12:00

Emmeline Aves
Reventas (UK)
Solvent-based Purification of PE, PP, and ReVentas Technology for Purification of Waste Polyolefins

12:20

Panel Discussion with all Session Speakers

12:40
Lunch Break & Networking

14:10 – 15:30

Main Session

Thermochemical Recycling (Part 2)

Grand Hall

Chairpersons: Lars Krause & Achim Raschka, nova-Institute

14:10

Geoff Brighty
Mura Technology (UK)
Mura Technology – Aiming to be the Leading Provider of Recycled Oils for EU Circular Value Chains with Hydrothermal Treatment

14:30

Eric Appelman
Aduro Clean Technologies (CA)
An Effective Alternative to Pyrolysis in Chemical Recycling

14:50

Gonzalo Izquierdo
Blueplasma Power (ES)
Turning Waste into CO_2-free Hydrogen and Circular Carbonates

15:10
Panel Discussion with all Session Speakers

14:10 – 15:30

No Online Transmission

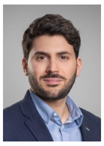
Parallel Session

Insights into Policy, Sustainability, Mass-balance and Alternative Naphtha

Room Laurentius

Chairpersons: Matthias Stratmann & Nadja Wulff, nova-Institute

14:10



Luciano Proto Cassina & Michael Carus
nova-Institute (DE)
EU Policy Update on Chemical Recycling and Mass Balance & Attribution

14:30

Gillian Tweddle
Stripe Consulting (BE)
Chemical Recycling for the Production of Alternative Naphtha

14:50

Nadja Wulff
nova-Institute (DE)
LCAs of Recycling Processes – a Status Quo

15:10
Panel Discussion with all Session Speakers

15:30
Coffee Break & Networking

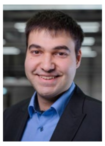
15:50 – 17:30

Main Session
Pre-/Post Treatment and Upgrading

Grand Hall

Chairpersons: Michael Carus & Lars Krause, nova-Institute

15:50



Alexander Hofmann
Fraunhofer UMSICHT (DE)
Methods for Pre- and Posttreatment of Feedstocks for Chemical Recycling of Plastic Wastes – Different Methods and Novel Approaches

16:10

Outi Teräs
Neste (FI)
Refinery Upgrading to Enable Scale-up of Chemical Recycling

16:30

Luis Hoffmann & Emmanuelle Chauveau
Sulzer Chemtech (CH)
Pioneering Purity: Transformative Advances in Chemical Polymer Recycling

16:50
Panel Discussion with all Session Speakers

17:10
Final Words

17:20
Get Together

Interview with Blueplasma Power

New Players in Advanced Recycling

Innovators at Work

1. Innovation & Sustainability

BluePlasma Power seems to be at the forefront of innovation in waste management and recycling. Could you share some insights into how your technology or approach differs from traditionally larger scale gasification projects and other recycling methods, and how it contributes to sustainability goals?

Gonzalo Izquierdo: BluePlasma Power has developed and patented a gasification technology that has the following unique characteristics:

- Feeding flexibility: It can operate using different waste sources such as plastics, paper, foams, biomass, digestate and textile among others, also these materials can be processed alone or mixed in any order.
- Capable of producing many end-products:
  - CO_2-free hydrogen (or with a negative footprint depending on the waste),
  - Carbonates such as soda ash, caustic soda, potassium carbonate and hydrochloric acid, all of them having a low CO_2 footprint and in some cases 80% lower than those produced by conventional technologies.
  - Liquid chemical products such as methanol, formaldehyde and oxy-methylene ethers among others.
- Profitable at small scale: the process is modular, profitable and scalable, starting with a capacity of 2,000 Tn/year of waste (250 kg/h waste).
- Increases circularity when the products are made from waste, and at the same time, these products contribute to decarbonize the atmosphere by avoiding the extraction of fossil material required to manufacture the same products. Furthermore, the process has zero or negative CO_2 footprint.

Gonzalo Izquierdo
CEO
BluePlasma Power

BLUEPLASMA POWER
Enabling circularity and decarbonisation

2. Breakthrough Technology in Action

BluePlasma Powers "Waste to CO_2-free Hydrogen and Carbonates technology" represents a significant advancement in waste management and renewable energy production. Could you elaborate on how this technology works and its potential impact on both the recycling sector and the broader renewable energy landscape? You promote your Hydrogen and Carbonates as CO_2-free products. Please explain.

Gonzalo Izquierdo: Our technology uses very compact equipment and very mild conditions: the process temperature is about 650 degrees Celsius and the pressure is close to atmospheric: 1 bar. In addition, we avoid the use of air with nitrogen in the gasification system to increase thermic efficiency and to avoid nitrogen oxides.

The cracking system allows us to obtain clean and tar-free syngas containing more than 50 % hydrogen and wherein CO is approximately 25 %. This clean and rich in hydrogen syngas can be separated into the hydrogen and the rest of the gases which circulate back to the autocombustion chamber in order to provide the required heat to the gasifier and to convert this process into an autothermic one. Combusted gases containing carbon dioxide and steam, are separated and the CO_2 is then captured to be transformed into carbonates.

The syngas can be used for chemical synthesis and produce methanol, OMEs, and other products, without the need for external contributions of hydrogen. Due to the compact characteristic of the plants they can be located in the facilities of industrial companies that generate waste with high management cost, or in the facilities of waste managers, landfills or incineration plants, to make their current processes more profitable.

3. Challenges & Opportunities

Start-ups often face unique challenges when entering established industries like recycling. What are some of the biggest hurdles that emerging companies encounter in the recycling sector, and conversely, where do you see the most promising opportunities for new ventures to thrive and how do you estimate the potential of small scale measures?

Gonzalo Izquierdo: There are several problems for start-ups related to the world of recycling:

- The first one is related to the culture of some industrial sectors when they come to incorporate or support new technologies. The industries don't want to take risks unless economical help is in sight.
- The second one is processes to obtain permits for the construction and operation of plants and when the technology has innovation then the decision process becomes slower. It seems to me that an effort must be made to make the processes as agile as possible, because it is the only way to help accelerate the decarbonisation objectives established by the European Union.

In the waste to chemicals value chain an agreement of the off-takers should be made with the distributors of the manufactured circular products, etc..

BluePlasma Power's Gasification Plant

4. Collaboration & Industry Dynamics

Collaboration among stakeholders seems crucial for driving progress in recycling and waste management. How does BluePlasma Power collaborate with other players in the industry, such as municipalities, corporations, or research institutions, to further innovation and improve recycling infrastructure on a larger scale?

Gonzalo Izquierdo: We have collaborated with companies and institutions that can help us to move faster towards our development goals. Since our beginnings, we have collaborated with technology centres and universities in order to be able to use their facilities and knowledge, we have signed agreements with start-ups on issues that complement our work, we also have obtained letters of interest from large companies that follow up on our project... in summary, if a company wants to have a disruptive proposal and reach the market it has to have the way to obtain immediate access to funds or grants.

Your VALUE+ pilot plant was co-financed by the European Commission Projects H2020 and LIFE. Could you elaborate on the importance of public funding for the successful development of innovative technology?

Gonzalo Izquierdo: The European projects (H2020 and Life) helped us to build our two pilot plants, in which we have tested hundreds of feedstocks and mixtures for more than 1,000 hours to ensure that our technology is consistent. They have been a great help because they allowed us to reach TRL6-7. We are now in the phase of financing the first industrial plant that we will operate 24/7 to be able to reach technological maturity and be able to commercialize BPP's technology in a reliable way.

RCI Position Paper on Chemical and Physical Recycling

May 2024

- **Chemical and physical recycling are essential for the realisation of the Green Deal and the circular economy.** These are core technologies for the green transition. Different chemical and physical recycling processes are needed to keep the carbon embedded in plastics, other materials, and chemicals in the cycle to achieve the required volumes of the circular economy.

- Figure 1 shows the diversity of advanced recycling, in particular the **different chemical recycling routes (gasification, pyrolysis and three types of depolymerisation) and dissolution as a physical process.** The different routes are defined by different inputs, different processes and different outputs (syngas, naphtha, monomers or polymers).

- **Chemical and physical recycling can utilise waste streams** that cannot be mechanically recycled and are currently sent to incineration or landfill. Chemical and physical recycling are the only ways to keep these waste streams in a cycle – incineration and landfill should be as much as possible replaced by chemical recycling.

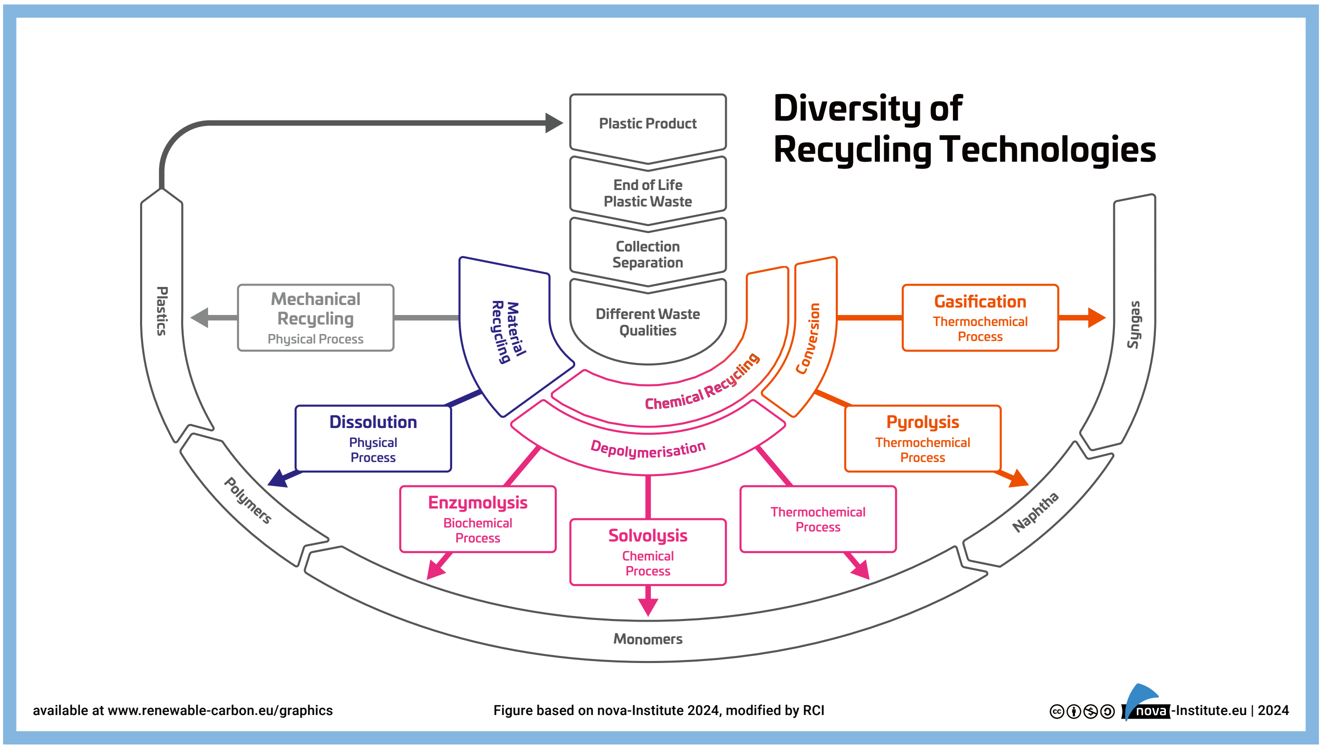


Figure 1: Diversity of Recycling Technologies

- **Mechanical recycling can only provide plastic-to-plastic recycling.** Mechanical recycling is highly efficient, but depending on the quality of the waste and the target products, it is not sufficient to stay at the level of plastics[1]. Chemical and physical recycling can also provide plastic-to-polymer, plastic-to-monomer and plastic-to-chemical recycling, including high value chemicals.

- Too narrow a focus on plastic-to-plastic recycling only will exclude renewable[2] feedstock solutions needed to **defossilise the chemical industry.** A holistic approach is needed that focuses on keeping as much carbon in the cycle as possible, with the ultimate aim of preventing the use of more virgin fossil carbon from the ground and to create sustainable carbon cycles.

- In terms of volume, chemical recycling is probably in the medium to long-term even more important than biomass and CO_2 in **providing renewable carbon feedstocks to the chemical industry,** which is crucial for the transition from fossil from the ground to renewable carbon. Renewable, non-fossil carbon feedstock is the key.

- Chemical recycling is a key technology for a **comprehensive carbon management.** Carbon management goes beyond CO_2 emissions, capture and long-term storage. It decouples the whole industry from fossil feedstocks, eliminates the use of fossil carbon wherever possible and allocates renewable carbon (from biomass, CO_2 and recycling) as efficiently and effectively as possible where carbon use is unavoidable.

- **Mechanical, physical, and chemical recycling are complementary** due to differences in waste stream composition, sorting needs, target products and economics. Each technology has very specific strengths and weaknesses in terms of processable input and output qualities and quantities, as well as the environmental footprint of the technology. Only a complementary approach can achieve the recycling of the maximum possible amount of carbon while retaining the maximum possible value in a cycle, thereby diverting it from landfill or incineration.

Chemical and physical recycling are therefore of fundamental importance to the circular economy, sustainable carbon cycles, the defossilisation of the chemical industry and carbon management, and have a potentially high volume, but significant investment is needed to exploit it. To achieve this, secure demand must be created, in particular through the policy framework.

[1] Plastics are polymers with additives and fillers, polymers are made from monomers.
[2] RCI defines renewable carbon as carbon from biomass, CCU and recycling (vom Berg, C., Carus, M., Dammer, L. and Stratmann, M. 2022: Renewable Carbon as a Guiding Principle for Sustainable Carbon Cycles. nova-Institut GmbH (Ed.), Hürth, Germany, 2022-02. https://doi.org/10.52548/QUHG1295).

Our Requirements for Creating Secure Demand

- A **mandatory recycled content for all polymers/plastics in all applications** – in packaging, automotive, textiles and all other sectors. The recycled content should include all types of mechanical, physical and chemical recycling.

- RCI calls for the **general acceptance, recognition and clarified rules for chemical and physical recycling technologies in the calculation of recycling rates** for all sectors, building on established tracing and certification systems.

- RCI supports the political agreement between EU institutions to introduce **minimum recycling quotas also for "contact sensitive packaging"** of between 10% and 30%, depending on the polymer and application. Physical and chemical processes will play a crucial role here as they are currently the only option capable of removing contaminants from waste streams and satisfying food contact requirements. These quotas in the Packaging and Packaging Waste Regulation (PPWR) could create a market pull for chemical recycling technologies.

- **Closed-loop recycling** is a noble goal for sectors such as packaging, textiles and automobiles, but it should not be approached too dogmatically because it can lead to environmental and economic misallocations. If the waste stream of one sector can be better used in another, it should be possible.

- **End-of-Waste (EoW) status should already be recognised across Member States for intermediates and chemicals.** As long as the products from the plastics recycling process meet the requirements and specifications for the production of new polymers or chemicals, the criteria for EoW status should be met.

- **Pre-consumer waste must be recognised as a legitimate input for recycling and should be included in mandatory content targets.** Every effort should be made to avoid production waste. However, there will still be unavoidable waste streams. These waste streams are characterised by their high quality and are therefore perfectly suitable for various recycling options and food contact approval, provided that the relevant requirements are met. However, clear rules and definitions are needed to prevent greenwashing.

- **Full acceptance of "Mass Balance & Attribution with Fuel-Use Excluded"** (equivalent to credit based mass balance approach in EU discussions) is needed for recycled chemical intermediates and products to ensure that the transition can use the already existing infrastructure of the chemical industry. On the basis of certified third-party rules, the chemical and materials industry should be allowed to transparently attribute the recycled content – after deduction of losses, process energy and, if applicable, produced energy carriers (fuel-use excluded) – to products in order to be credited and to market content accordingly. (see Fig. 2) Following this logic, it is ensured that a transparent amount of fossil feedstock is replaced by recycled feedstock in the production process, and that only recycled feedstock that actually ends up in products can be attributed.

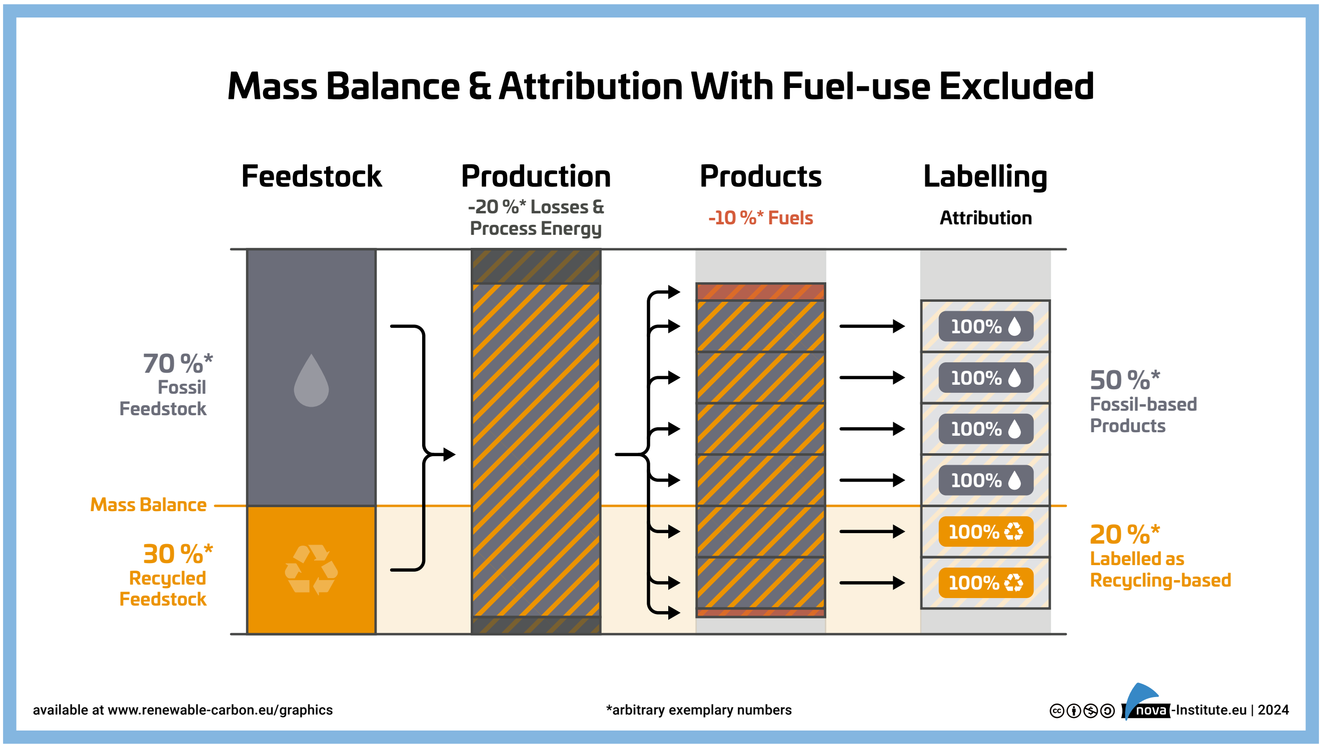


Figure 2: Mass Balance & Attribution With Fuel-use Excluded

- **Faster approval of new chemical and physical recycling facilities** – all the technologies and infrastructure are available in Europe. Today, chemical recycling is still associated with low yields and high energy consumption, but the entire sector is developing rapidly; innovation and optimisation must be integrated directly into the implementation process.
- **EU Member States** must open the door to chemical and physical recycling with "Mass Balance & Attribution with Fuel-use Excluded" or they will miss out on investment, taxes and jobs.
- Specific financing instruments are needed to create **recycling infrastructures for all sectors beyond packaging.** This includes collection, sorting and delivery to the appropriate recycling facilities.
- **Waste incineration and landfill must be made unattractive to divert waste streams towards recycling.** RCI therefore supports the extension of CO_2 pricing for waste incineration in the ETS and ban of landfilling.

About Renewable Carbon Initiative (RCI)

The Renewable Carbon Initiative (RCI) is a global network of more than 60 prominent companies dedicated to supporting and accelerating the transition from fossil carbon to renewable carbon for all organic chemicals and materials.

The overall mission of the Renewable Carbon Initiative (RCI) is to fully replace fossil carbon with renewable carbon sources, including biomass, CO_2 and recycling. This is the only way for chemicals and materials to become net zero and part of the circular economy – part of a sustainable future! RCI is led and supported by a wide range of different stakeholders in the chemicals and materials industry. These include brands, major suppliers, large manufacturers, SMEs, start-ups and research institutes. RCI has established a unique approach supported by a broad alliance of stakeholders from different sectors.

Within RCI, the Recycling Working Group (WG) addresses specific recycling issues. As a first step and as one of its first activities, the WG Recycling publishes this position paper.

Disclaimer:
RCI members are a diverse group of companies addressing the challenges of the transition to renewable carbon with different approaches. The opinions expressed in these publications may not reflect the exact individual policies and views of all RCI members.

Textile Recycling: Transforming Fashion, Automotive, Construction, and Healthcare for a Sustainable Future

Authors:
Lars Krause, Kristijan Mrsic
& Asta Partanen (nova-Institute)

Fibre-to-Fibre Recycling: The Future of Sustainable Textiles

The textile industry is at a pivotal moment, where sustainability is no longer an option but a necessity. As the environmental impacts of textile production and disposal become increasingly clear, the pressure to adopt circular economy principles is mounting. One promising solution is fibre-to-fibre recycling, a process that transforms old textiles into new, high-quality fibres, effectively closing the loop on waste. Although the European Union has made notable strides, challenges remain, particularly in scaling technologies, the lack of collection systems and the handling of textiles made from mixed fibres. In Europe, currently approx. 6.95 million tonnes of textile waste are generated annually, of which only 1.95 million tonnes are collected separately and 1.02 Mt are treated with recycling or backfilling (Figure 1).

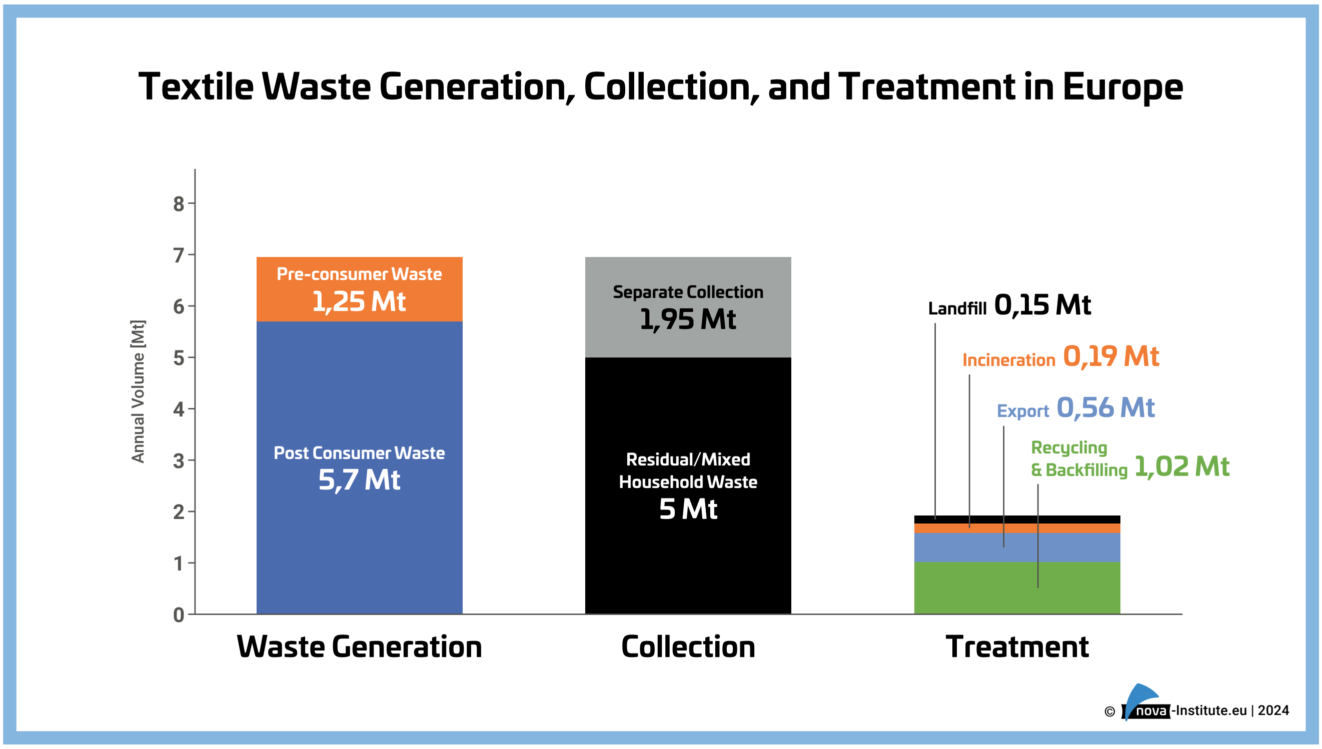


Figure 1: Textile waste generation, collection and treatment in Europe (Modified from European Environment Agency (EEA) 2024: Management of used and waste textiles in Europe's circular economy. European Environment Agency (EEA), (Ed.), Copenhagen, Denmark, 2024-05-21. Download at https://www.eea.europa.eu/ds_resolveuid/eb67d586e6fe4c9f819f03d22ac2b8b0).

The Challenge of Fibre Blends in Textiles

One of the most significant challenges the industry faces is dealing with mixed fibres. Most textiles today are made from a combination of natural (~33%) and synthetic fibres (~66%) (Table 1), making separation and recycling difficult. This is where technological innovation becomes crucial. Advances in cellulosic fibre recycling, which turn textile waste into new, high-quality fibres, are showing great promise. These technologies can help create a truly circular system, where discarded textiles are seen not as waste but as valuable raw materials.

The pressure from environmentally conscious consumers is also driving this change. As awareness of the environmental toll of fast fashion rises, consumers are demanding more sustainable options. This has forced brands and manufacturers to reconsider their production methods and has led to increased collaboration across the entire textile supply chain from fibre producers to policymakers.

The Fibre-to-Fibre Recycling Revolution

Currently, about 15 % of textiles are treated with recycling and backfilling whereby the majority is downcycled into lower-value applications, such as insulation or cleaning cloths. An immense problem is that only less than 1 % of clothing worldwide is recycled back into fibres for new garments. However, recent technological advancements and increased political support in Europe signal that this could change. To achieve a reasonable share of fibre-to-fibre recycling, continuous research and development are needed to handle mixed fibres, lower costs, and improve the quality of the recycled fibres. Innovations like removing zippers or other hardware in pre-processing, and improving sorting systems, will be key to scaling up these technologies.

EU Strategy for Circular Textiles

The European Union is playing a leading role in driving the shift toward more sustainable textile production. The EU Strategy for Sustainable and Circular Textiles, part of the European Green Deal and Circular Economy Action Plan (CEAP), aims to overhaul the entire lifecycle of textile products. This strategy promotes using recycled fibres, extending the lifespan of clothing, and making products easier to repair and recycle.

The introduction of a Digital Product Passport, which will provide essential information about a product's composition and environmental impact, is one of the key initiatives under this strategy. Another important regulation is the Ecodesign for Sustainable Products Regulation, which will come into force at the end of 2024, and requirements for textiles are expected to be finalised by mid 2025.This law will enforce stricter eco-design requirements for textiles, ensuring that products are designed with recyclability and longevity in mind.

Global Major Fibre Types by Production in %

	Cotton	Bast Fibre	Wool	Cellulosics	Synthetics	Others	Total in Mio. tonnes	kg/head
2030 forecast	19	3	1	8	69 Biosynthetics: 1–2	1	143	16.8
2020	23	3	1	6	66 Biosynthetics: < 0.5	1	113	14.6
2010	28	5	1	5	59	1	80	11.6
2000	34	6	2	5	51	2	56	9.1
1990	40	9	5	7	37	2	43	8.2
1980	40	12	4	10	31	3	35	7.9
1970	43	14	6	14	18	5	26	7.2
1960	50	21	7	13	3	5	20	6.6

Table 1: Textile composition from 1960-2020 and forecast. (Modified from the Fiber Year 2023, editor: The Fiber Year Consulting).

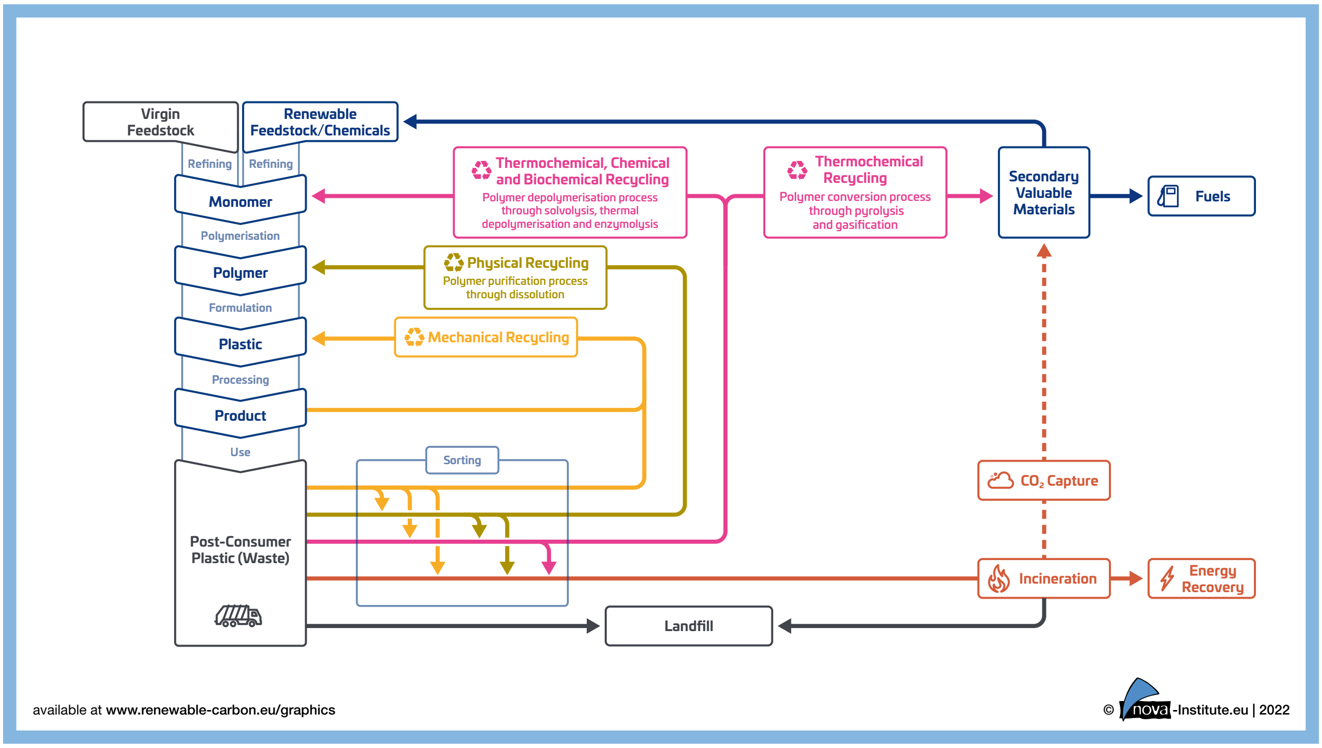


Figure 2: Life of a polymer from the production to its disposal (e.g. landfill) indicated with black arrows including various recycling and recovery routes indicated in different colored arrows, source: nova-Institute.

Advanced Recycling Technologies: Driving Growth

To address the growing textile waste crisis, advanced recycling technologies have emerged as a game changer (Figure 2). These include a range of physical and chemical processes designed to purify fibers and polymers from textile waste (via dissolution) and/or to break down the polymers from textile waste into its building units e.g. monomers (via enzymolysis and solvolysis). Additionally, further advanced recycling technologies utilizing thermochemical processes that are capable of transforming textile waste into secondary valuable chemicals including naphtha and biofuels (via Pyrolysis and Gasification).

While mechanical recycling has been the traditional method, other advanced physical recycling processes like dissolution or a wide range of chemical recycling processes are expanding the possibilities by enabling the recycling of synthetic fibres and blends that are difficult to handle mechanically. This broadens the scope of what can be recycled and increases the purity and performance of the recycled materials, making them suitable for high-quality applications.

The Path Forward to a Sustainable Textile Industry in Europe

As Europe moves towards a circular textile economy, the role of fibre-to-fibre recycling will be critical in reducing waste and environmental impact. New EU regulations will accelerate this transformation, and brands will need to adapt quickly to stay competitive. From technological innovation to regulatory frameworks, the push for textile recycling represents a monumental shift for the industry.

The future of fashion lies in closed-loop systems where waste is no longer an inevitable byproduct, but a resource to be harnessed. Through fibre-to-fibre recycling and advanced recycling technologies, the textile industry has an unprecedented opportunity to reshape its future—one that is sustainable, efficient, and environmentally responsible. The race towards a circular textile economy is on, and with the right innovations, it is one that the industry can win.

The recycling of textiles into new cellulose fibres is an important factor in promoting the use of fibre-to-fibre recycling on a wider scale: using existing resources is a circular strategy for the cellulose fibre industry. Several industry players are already using the cellulosic part of mixed textiles as a raw material in addition to wood pulp. Find out more about the latest innovations in the industry at the **Cellulose Fibres Conference 2025 – New with Biosynthetics in Cologne, 12–13 March 2025: www.cellulose-fibres.eu**

Interview with ReVentas

New Players in Advanced Recycling

Innovators at Work

Emmeline Aves
Commercial Manager
ReVentas

1. Innovation & Sustainability

How does the conversion of plastic into sustainable Polyethylene and Polypropylene resins contribute to sustainability, and can you share specific examples of projects where this has led to significant environmental benefits and waste reduction?

Emmeline Aves: There are several factors when considering the sustainability of PE and PP. We have to minimise the need for virgin polymers derived from fossil fuels, we then need to ensure we design new products with end of life in mind and finally consider the environmental footprint of how the waste is treated and its End of Life. For example, avoiding high environmental impact that can be generated through incineration or landfilling.

ReVentas' mission is to deliver a low-carbon process that can return waste plastics at end of life back to a virgin-like state, which allows them to be reused in the application from which they came, whether that be food or consumer packaging, automotive and construction applications. This ensures we break the cycle of down-cycling plastics into lower and lower value applications that is inherent in mechanical recycling and that we deliver high-quality recyclate without the need for the polymer to be broken down to oil for reprocessing, minimising GHG emissions.

This philosophy is key to dissolution technologies such as ReVentas. A huge amount of energy and cost has gone into producing the long carbon chains that make up polymers, by retaining these chains whilst removing the contaminants and additives, ensures the plastic can be recycled at the lowest cost and GHG production.

Last year we completed a successful feasibility project to recycle single-use milk pouches, in conjunction with the Indian Plastics Pact. Discarded milk pouches is a specific issue in India, with an estimated 30,000 tonnes of waste milk pouches dumped in Pune alone in 2022. As you can imagine, one of the key challenges for thin films containing milk residue is odour. The ReVentas technology could not only remove all odour, but produce a virgin-like high quality PE pellet from this waste suitable for new packaging.

2. Breakthrough Technology in Action

What breakthrough technologies have you implemented to produce new sustainable Polyethylene and Polypropylene resins at scale, and how have these technologies improved both operational efficiency and environmental sustainability?

Emmeline Aves: The challenge to overcome when considering a solvent-based dissolution approach to plastic recycling is how to dissolve the polymers quickly, filter the contaminants and recover your solvent and polymer. ReVentas have developed a unique dissolution system which can dissolve polymers extremely quickly at low temperatures and pressures and which can work for high density rigid polymers as well as low density film polymers. This ensures plant size and solvent inventory are minimised along with the energy usage resulting in lower operating and capital cost.

By keeping the CAPEX and OPEX at a minimum, smaller plants can be built where the waste is generated. This ensures consistent feedstocks can be sourced whilst minimises transportation costs and impact.

3. Challenges & Opportunities

What were some of the biggest challenges you as a young enterprise faced in creating sustainable resins, and what opportunities have you identified in this niche that have driven your growth?

Emmeline Aves: ReVentas are currently in the scale-up phase of the technology, so access to funding to enable us to build and operate plants is our next big challenge. We have built a coalition of great partners to support us in these efforts, but we will continue to need to identify scaling partners as we look internationally to deploy ReVentas technology.

Early collaboration with future customers is also an area we've found extremely fruitful. By working with customers now, understanding their needs and requirements, allows us to feed that information back into our engineering and R&D teams to ensure we can deliver the product specification they need at scale.

Bottle cap plastic purified by Reventas to produce virgin-like recycled plastic

4. Collaboration & Industry Dynamics

Considering your successful collaborations with companies like Amazon and Decathlon, what types of new collaborators or industry partners are you looking to engage with to further your mission, and how do these partnerships help advance the broader recycling and sustainability agenda?

Emmeline Aves: There is a wide range of companies we're collaborating with, of course polymer producers looking to access our technology and product are one large group, as are brands and manufacturers looking to access our material. By engaging early with these companies, we can help guide their strategy going forward on recycling and recyclate sourcing as we move through the 2020s, and validate our material in their products, so we can be specified into their supply chains as our materials come online.

5. Food Contact Approval

How keen are you about the performance of your technology in removing contaminants and recovering PE and PP with food contact approval?

Emmeline Aves: Food contact is going to be a key market for us. The technology is being designed to deliver material of a suitable quality for food contact and we're already working on validating this with the relevant agencies over the course of the next couple of years.

ReVentas technology pilot plant

BRONZE SPONSOR

Pyrolysis Oil as Alternative Naphtha

Closing the Loop for Plastics and Tyres – Pyrolysis Oil as a Chemical Feedstock

Authors:
Gillian Tweddle (Stripe Consulting)
& Michael Carus (nova-Institute)

For the defossilisation of the chemical industry it is crucial to find alternatives to fossil-based naphtha. The "alternative naphtha" concept makes use of existing refinery, steam cracking and chemical industry infrastructure where a proportion of fossil-based feedstocks – crude oil or fossil-based naphthas can be replaced by renewable carbon alternatives derived from the three sources of renewable carbon: CO_2, biomass and recycling. A new report by nova-Institute presents an analysis of the routes, associated technologies, market players and volumes by which renewable carbon can be introduced to refinery and steam cracking operations as replacement for fossil-based feedstocks. The following sections will explore pyrolysis oil as alternative naphtha feedstock.

Pyrolysis oil generated via the chemical recycling (advanced recycling) of waste plastics and tyres is an important "alternative naphtha" feedstock for refineries and steam crackers. For the recycle of tyres, additional possibilities exist as part of the chemical recycle process to recover carbon black (a major component of tyres) and/or use the pyrolysis oil as a feedstock for new carbon black.

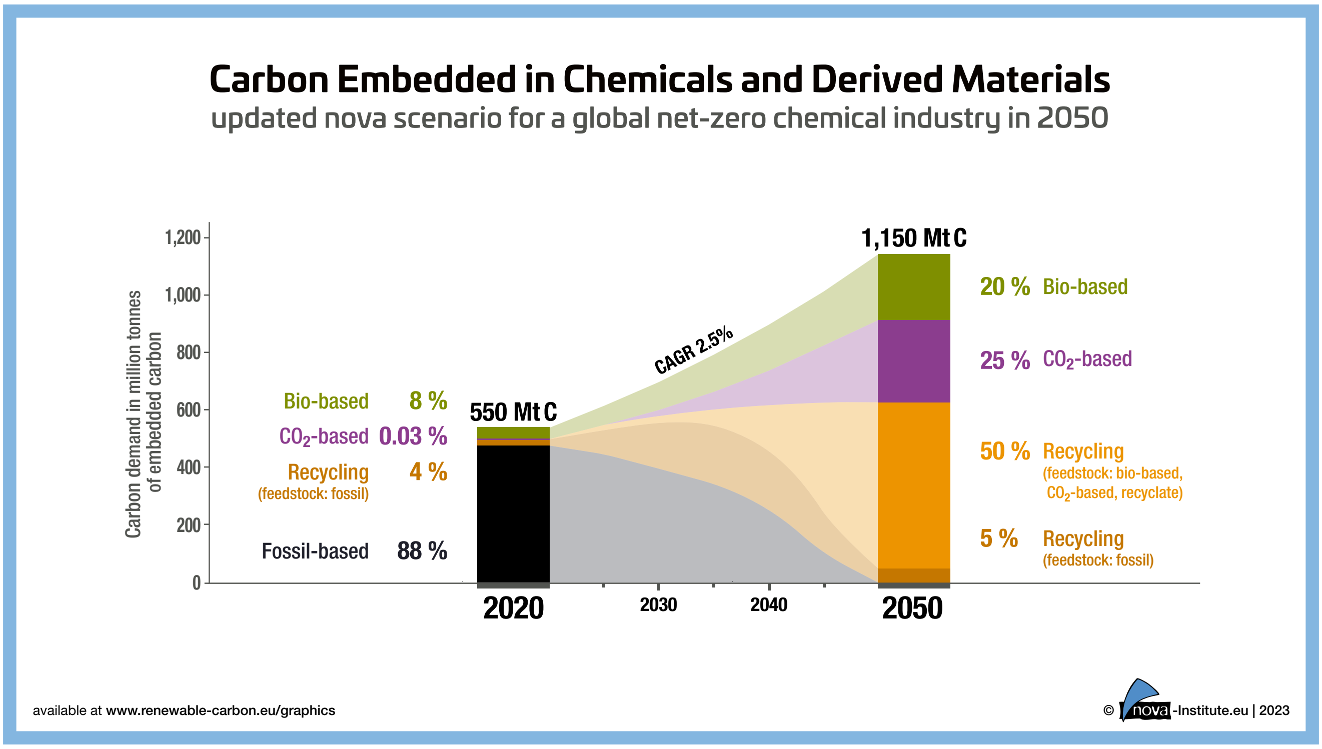


Figure 1: The nova October 2023 update shows a steady increase in the share of bio-based chemicals from 8 % in 2020 to 20 % in 2050. CO_2-based chemicals require a lot of investment to become relevant after 2030, with strong growth between 2040 and 2050. The recycling of virgin fossil chemicals and plastics dominates the recycling sector until 2035. After 2035, bio-based, CO_2-based and recyclates increasingly dominate the recycling sector.

Why is Plastics Recycle Important & Necessary?

To achieve global net zero for chemicals by 2050, nova-Institute presents one scenario in Figure 1. With an expected overall growth in the demand for chemicals and derived materials through to 2050, an overall 55 % of the carbon requirement for these materials comes from recycling by 2050 given the limitations in availability of bio-based carbon and the higher cost of CO_2 based routes. This scenario is, of course, speculative however the need for significant contribution from recycling is echoed in multiple papers and publications examined by nova-Institute.

Pyrolysis Processes & Upgrading

A wide range of sources of plastic from post-industrial, post-consumer plastics and mixed wastes including mixed or multilayer thermoplastics and thermosets, bio-based plastics, to used tyres can be processed via pyrolysis to produce a very broad range of outputs.

The chemical composition of the whole liquid fraction produced and termed PyOil thus reflects the plastic feedstock the pyrolysis technology used and operating conditions. A wide range of different C-chain length hydrocarbons from C1–C34 can be produced with high levels of unsaturated hydrocarbons and high levels of contaminants including:

- N, O, S, Cl, Br, F (described as heteroatoms)
- Si, P and metals

Pyrolysis oil generated per tonne of waste plastics processed varies considerably. A typical conversion factor of 50–60 % could be assumed based on data reported by technology providers.

Non-upgraded (but typically pre-treated, fractionated) pyrolysis oils in small volumes may be fed to steam crackers (light fraction C5–C9) or refineries (co-processing) and rely on the feedstock volumes being sufficiently small that a dilution effect allows processing to be achieved despite impurity levels and differences in composition with the conventional feedstocks.

The processes which must be carried out to achieve upgrading allowing for much greater % mix with conventional feedstocks for steam cracker feeds are very similar to those carried out in a conventional fossil fed refinery – hydroprocessing, consisting of hydrotreating – treating with hydrogen and hydrocracking or isomerisation to reduce the carbon chain lengths to ~ C5–C9 naphtha-like pyrolysis oil similar to fossil naphtha. Additional and alternative catalysts are required for the removal of poisons and heteroatoms are required compared with the processes which are carried out within existing refineries to process conventional feedstocks.

Pyrolysis oil co-processed in refineries may be processed in the refinery hydrotreating, hydrocracking or fluid catalytic cracking (FCC) units. Propylene is one output via FCC processing. Figure 2.

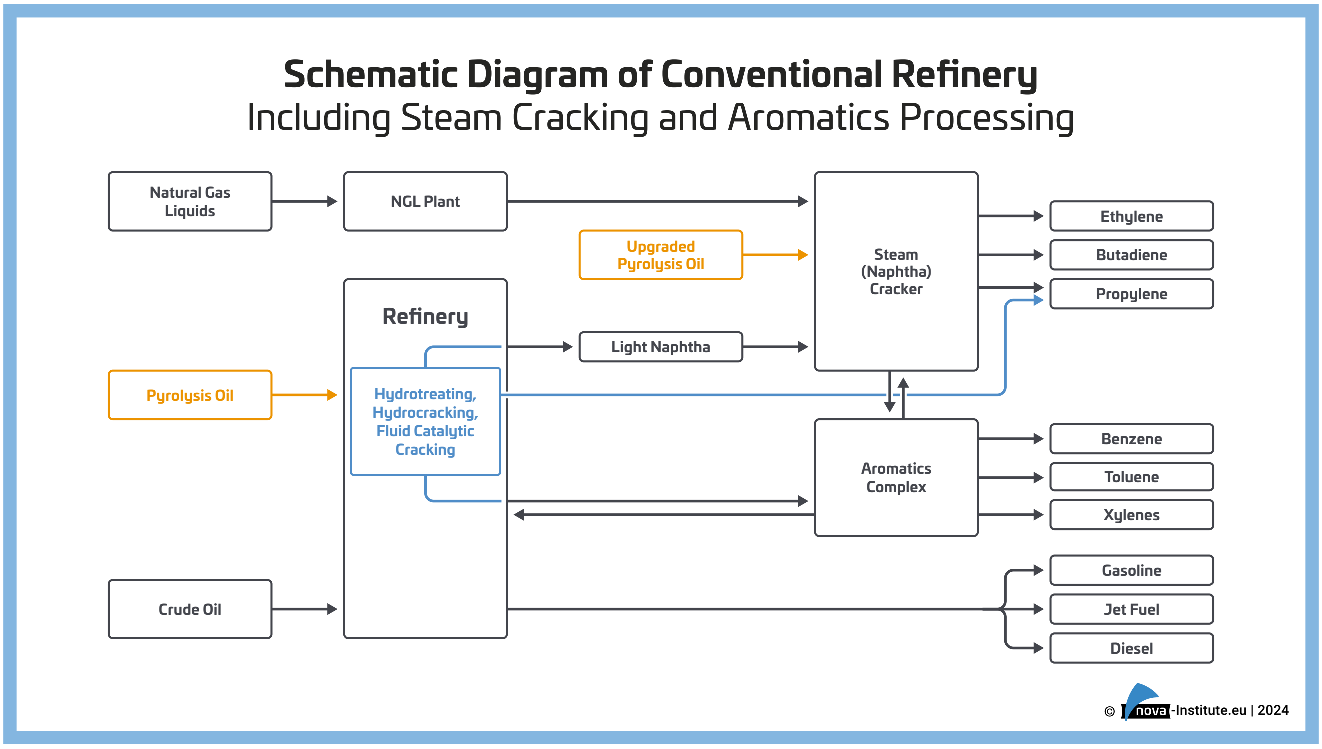


Figure 2: Schematic diagram of conventional refinery including steam cracking and aromatics processing

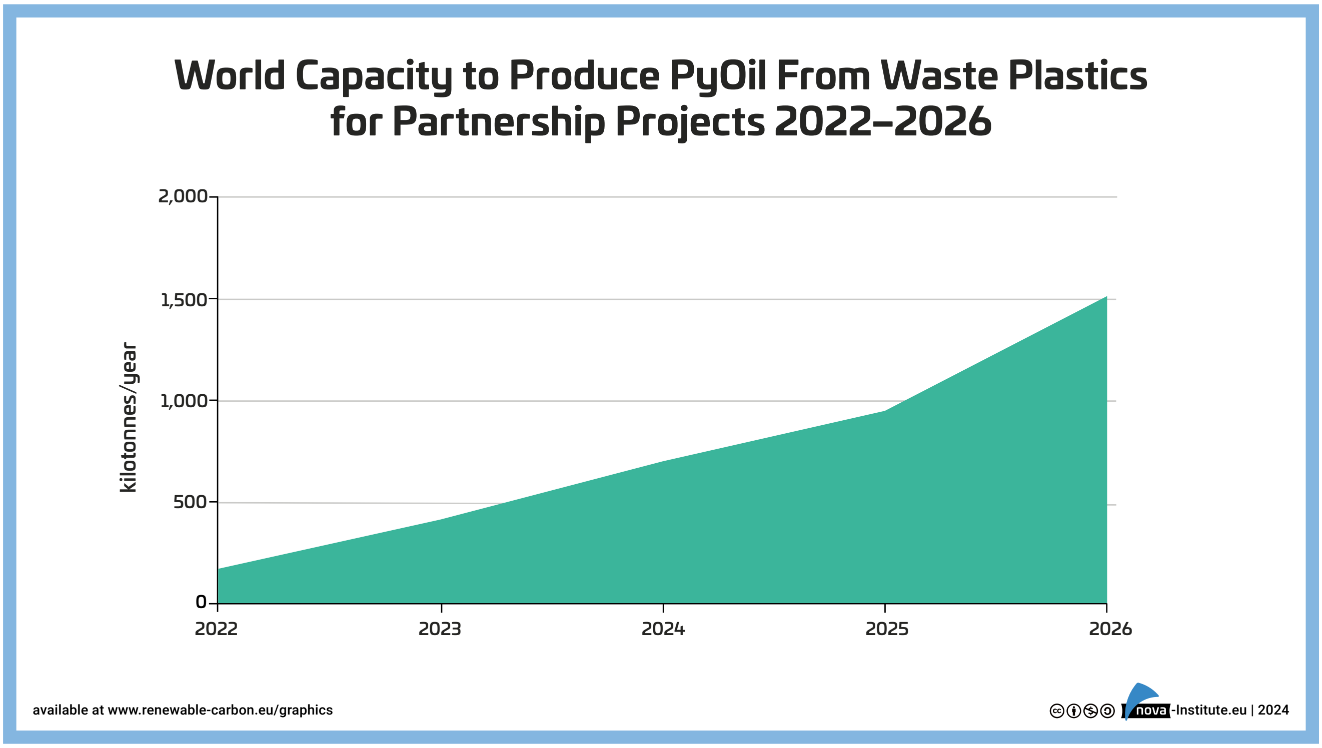


Figure 3: World Capacity to Produce PyOil from Waste Plastics for Partnership Projects 2022-2026.

Market Aspects

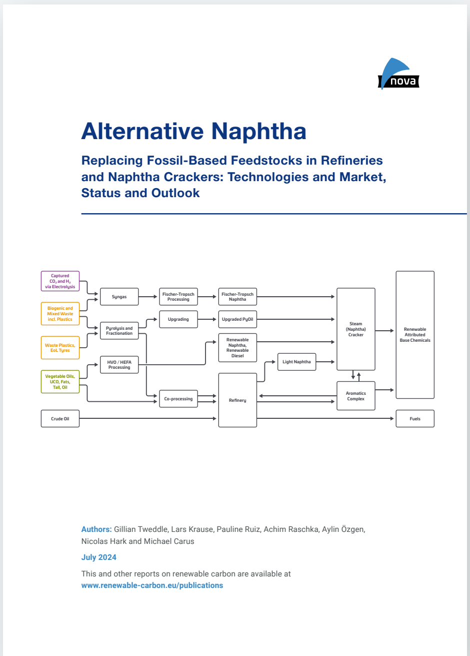
World capacity for PyOil production in partnership with refineries and steam crackers intending to use this material was estimated at below 500 ktpa as of 2023. By 2026 more than 50 projects linked to offtake partners (refineries and steam crackers) worldwide are on paper to take overall capacity to produce PyOil to 1500 ktpa. However, not all of these projects are expected to be completed as factors such as technology development and production cost, availability of suitable feedstock and transport costs all remain issues.

For PyOil, outputs from pyrolysers can be collected and mixed to obtain larger feedstock volumes, as 20 ktpa is a typical plastic waste processing capacity per plant.

Finally, increased costs over fossil-based production due to smaller scale processes and new technologies mean that end use customers need to pay premiums for products to which the renewable feedstock is attributed. And customers have to be prepared to accept the "Mass Balance Approach" and attributed renewable carbon.

New Report: Alternative Naphtha – Technologies and Market, Status and Outlook

With 188 pages, 22 tables and illustrated by 48 graphics the report provides a comprehensive view on the growth in capacity for these alternative sources of naphtha as chemical industry feedstock, production routes and the need for "upgrading", key companies and partnerships and the regulatory environment.



Valuable Quotes

Sneha Verma
AEB Amsterdam (NL)
"Driving circular economy through innovation."

Robert Kunzmann
AC Biode (LU)
"I am excited to share the newest developments in chemical recycling with like-minded people!"

Eric Appelman
Aduro Cleantech (CA)
"The key to a successful transition to a circular future lies with scaleable solutions along the circle as a whole, where material, labor and capital deployment are optimized for the whole system."

Marco Karber
AES Autonome Energiesysteme (DE)
"Let's use the advanced recycling conference to take chemical recycling to the next level!"

Javier Grau Forner
AIMPLAS (ES)
"The conference is a great opportunity to exchange opinions on new technologies related to recycling and to listen to new points of view and approaches."

Maddalena Bertolla
Aquafil (IT)
"This conference is a good occasion to exchange ideas and keep updated on the state of the art of plastics recycling."

Olivier Cardon
Axelera (FR)
"WhiteCycle: An Innovative European Project to Process and Recycle PET from Complex Waste."

Valentijn de Neve
BlueAlp (NL)
"The Advanced Recycling Conference organised by nova-Institute stands as a premier event in the industry, bringing together key players across the value chain, providing a platform that enables in depth presentations and discussions that drives action to the future of advanced recycling."

Gonzalo Izquierdo
BluePlasma Power (ES)
"Turning Waste into CO_2-free Hydrogen and Circular Carbonates."

Stephan Roest
Borealis (AT)
"One of the best industry conferences on recycling advancements today."

Annick Meerschman
CEFIC (BE)
"The Advanced Recycling Conference is a great platform to explore the latest innovations in key recycling technologies, such as chemical recycling, that are driving the transition to a circular economy. I look forward to learning about the latest breakthroughs and value chain collaborations that are turning the EU's objective of going fully circular into reality."

Marc Spekreijse
Circular Plastics (NL)
"As we face increasing pressure to meet ambitious EU recycling targets and address the growing demand for renewable feedstocks, this event provides an invaluable opportunity to explore the latest technologies, innovations and partnerships for driving the circular plastics economy."

Patrick Trubic
Coperion (DE)
"We shape what matters tomorrow."

Peter Schwarz
Covestro (DE)
"There will be no full circularity without advanced recycling – the more specific, the better."

Pelin Uran
DePoly (CH)
"DePoly's enhanced recycling process can recycle all PET plastic items including multi-layer packaging and multi-colour fibres without the need to pre-sort, pre-wash, or separate out other plastics."

Alexander Hofmann
Fraunhofer UMSICHT (DE)
"The best combination of pretreatment, conversion technology, and downstream processing is necessary to increase the yield and quality of chemical recycling products. This is a significant subject in our ongoing research projects."

Eric Romers
INEOS Inovyn (BE)
"The Advanced Recycling Conference 2024 is having a very high technical level."

Jan Willem Muller
Infinity-Recycling (NL)
"The nova conference is a critical platform for advancing discussions on sustainability and innovation. It's a chance to connect with key players who are committed to reshaping industries through circular economy solutions and pushing the boundaries of what's possible in advanced recycling."

Gerben Hieminga
ING Research (NL)
"Greening the plastics industry is one of our toughest challenges, making this type of knowledge sharing among experts crucial for the much-needed transformation."

Richard von Goetze
Interzero (DE)
"The Advanced Recycling Conference perfectly links academic and Industry views on the growing field of chemical Recycling!"

Peter Jetzer
jrp (DE)
"At the ARC Conference 2024, innovative recycling technologies and global networks converge – with a strong focus on shaping the markets of tomorrow."

Mathias Kirstein
matterr (DE)
"The ARC provides a glimpse into the near future of material pathways."

David Rapp
KraussMaffei Extrusion (DE)
"Looming regulatory pressure makes diligent safety evaluation of recycling processes obligatory – are current approaches suitable? The PPWR could lead to changes in overall recycling process landscape."

Outi Teräs
Neste (FI)
"I look forward to attending nova's Advanced Recycling Conference for the first time."

Nicolas Dubaut
Plasticentropy France (FR)
"The existing solutions to fight plastic pollution are insufficient to contain plastic waste accumulation globally. We need to keep searching, trying and confronting new ideas from science and from the industry. The Advanced Recycling Conference is the perfect platform to do that."

Virginie Bussières
Polystyvert (UK)
"Recycling by dissolution is gaining momentum as a drop-in solution, low environmental footprint and ready-to-market today!"

Juul Cuijpers
ReSolved Technologies (NL)
"The Advanced Recycling Conference provides a unique opportunity to connect with peers and experts to discuss the latest developments and next steps on advanced recycling."

Julien Davin
saperatec (DE)
"Being strongly committed to the industrial transformation towards a climate friendly economy myself, the Advanced Recycling Conference is for me one major event to exchange with other professionals who share the same passion."

Luis Hoffmann
Sulzer (CH)
"Attending this conference has become essential for staying up-to-date with the latest advancements and trends in chemical polymer recycling."

Abidin Balan
Trinseo (NL)
"The Advanced Recycling Conference in Cologne is a pivotal event that fosters dialogue among industry leaders and innovators, driving the future of circular economies through cutting-edge recycling technologies and sustainable practices."

Jean-Luc Dubois
Trinseo (FR)
"The ARC is an industry platform for chemical companies, technology providers, waste management companies, scientists, brand owners, policy makers, investors and stakeholders to convene and start their collaborations."

Aditya Shembekar
University of Edinburgh (UK)
"ARC seamlessly connects laboratory innovation with industry needs, driving forward the principles of sustainability and the circular economy."

RENEWABLE CARBON INITIATIVE

Bio-based | CO_2-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/members

MEMBERS OF THE INITIATIVE

LARGE SUPPLIERS

ADM, Alfa Laval, Arkema, BASF*, Beckers, Borealis, Braskem, Cerdia, Clariant, Cosun Beet Company*, Covation Bio, Covestro*, CropEnergies, Dow, Fortum, Givaudan*, Peter Greven, H&R, IFF*, Kemira, Kuraray, Lenzing*, Lubrizol, Mane, Mercer, Neste*, PCC SE, SCGC, SHV Energy*, Stahl*, Stepan, Südzucker Group, Sulzer, Syensqo, Symrise, TÜV Austria, Uniper, UPM Biofore*, Verbio, Wacker

SME

AllocNow, Fibenol, FKuR, Futerro, LanzaTech*, nova, SCS Global Services

BRANDS

Beiersdorf, Continental, Henkel*, IKEA, LEGO, Michelin, On, P&G, Reckitt, Vaude

START-UPS

Aduro Clean Technologies, Amynova Polymers, BioBTX, Chaincraft, Clariter, Colipi, Dab, Dioxycle, Econic, Evoco, Greenlyte Carbon Technologies, Modern Meadow, TripleW

RESEARCH INSTITUTES

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

* Board Member

PARTNERS

C.A.R.M.E.N., Chemie Cluster Bayern, Circular Rubber Platform, CO_2 Value Europe, ECBF, ecp-news, EIHA, ePURE, Global CO_2 Initiative, 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.

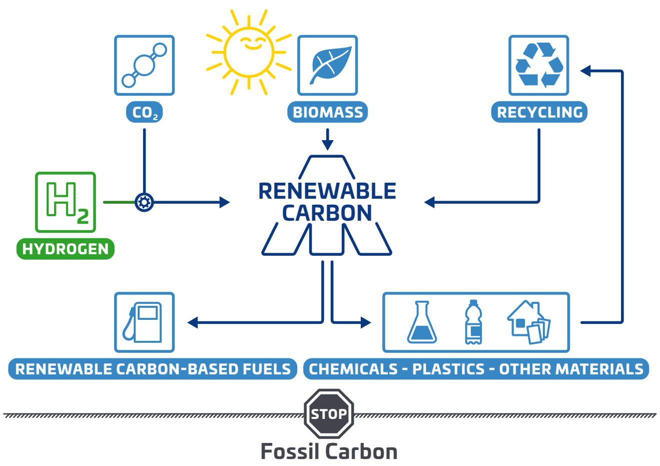
RCI addresses the core problem of climate change, which is extracting and using additional fossil carbon from the ground that will eventually end up in the atmosphere. Companies are encouraged to focus on phasing out fossil resources and to use renewable carbon instead.

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

Matthias Stratmann (matthias.stratmann@nova-institut.de)

- 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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