CITEO
prospective

Second International "Plastic Solutions" Forum:

Exploring the future of new plastics recycling technologies in 2020

Monday 11 May and Tuesday 12 May 2020

INTRODUCTION

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- Second edition of the International Forum "Plastic Solutions" which brought together 300 participants in Paris last year
- Spotlight on pyrolysis and gasification technologies
- The complete value chain—actors from the plastics recycling, consumer goods, distribution, finance and industrial sectors—gathered for the two-day event
- Targeted presentations to better grasp the range of available technical solutions
- Exclusive meetings with major project developers in Europe and North America
- Development opportunities for companies that use plastic packaging
- A forum that fosters individual meetings and direct interactions between manufacturers, plastic users, financiers and project developers

Plastics recycling: an industrial and environmental issue

The rapid growth of plastic waste, low recycling rates and their high impact when leaked into the environment have made plastics a global issue.

Global plastics production has surged over the past 50 years, from 15 million tonnes in 1964[1] to 350 million tonnes in 2019 and is expected to double again over the next 20 years. Rapid production growth combined with low collection rates and on-going technical and economic barriers to plastics recycling have made plastics a global issue.

Pollution caused by the accumulation of plastic waste and its leakage into the environment is the most concerning environmental problem in many countries[2] and has focused the attention of public and private actors worldwide. In recent years, many governments and international institutions have set ambitious waste reduction and recycling targets. As part of this growing trend, France recently implemented additional measures to increase recycling of materials and limit single-use plastics under its Circular Economy Act.

Companies are also committed to using more recycled plastics in their production processes and to increasing the use of recyclable materials in their packaging.

This general movement is driving the transition from the linear "produce, consume, throw away" model to a circular model in which plastic waste is diverted from landfills and oceans and fed back into the economy as recovered feedstock. This transition is dependent, however, on technological breakthroughs and greater cooperation between actors in the plastics value chain.

This general movement is driving the transition from the linear "produce, consume, throw away" model to a circular model

This international Forum[3] aims to promote the development of new forms of recycling for plastics that stem from research and development in polymers.

A product of the oil industry, plastic is composed of organic molecules commonly combined with additives, mineral fillers and colorants to make them suitable for packaging. Although many polymers are in principle recyclable, mechanical recycling does not remove all additives. This impacts the quality of recycled feedstock and alters some of its key properties, such as purity and mechanical qualities.

Other techniques, however, can be used to break down polymer molecules and then extract specific components. These chemical recycling technologies can be used to process a wide range of plastic waste, including packaging, that are not recyclable with currently known methods. A growing number of observers see their development as key to overcoming barriers to plastic waste recycling.

1-Ellen MacArthur Foundation, *New Plastics Economy: Rethinking the Future of Plastics & Catalysing Action* (Barcelona: GAM Digital, 2017), 12.
2-EDF, IPSOS. "Obs'COP 2019: Résultats de l'observatoire international climat et opinions publiques. Mobilisation, inquiétude ou indifférence : où en sont les citoyens de 30 pays avec le changement climatique ?". 2019. https://www.edf.fr/sites/default/files/contrib/groupe-edf/obs-climat/
3-The first Forum was organised in Paris by Éco-Entreprises Québec (ÉEQ) and Citeo in 2019

Pyrolysis and gasification of plastic waste: fast-developing technologies

The second Plastic Solutions Forum[4] will focus on pyrolysis and plastic waste gasification technologies. These "thermal conversion" techniques for plastic waste are already used in multiple projects in Europe and North America. But these technologies also need a new economic and industrial model to realise their full potential.

All projects presented at the Forum have completed the pilot facility stage. Several have - or will shortly have - industrial demonstration facilities and a number are already operating commercial entities.

The basic process—thermal conversion—consists in heating plastics to break down polymer molecules and obtain hydrocarbon mixtures of varied composition. Each project applies this technology in different ways, depending on the target product types and business model. Some aim for partial depolymerisation and combine pyrolysis with other purification, distillation and hydrogenation processes to obtain high-end compounds. Others use gasification to further break down polymers into hydrogen and carbon monoxide. An intermediate process, conventional pyrolysis produces pyrolysis liquids used by petrochemists to produce plastics and fuels.

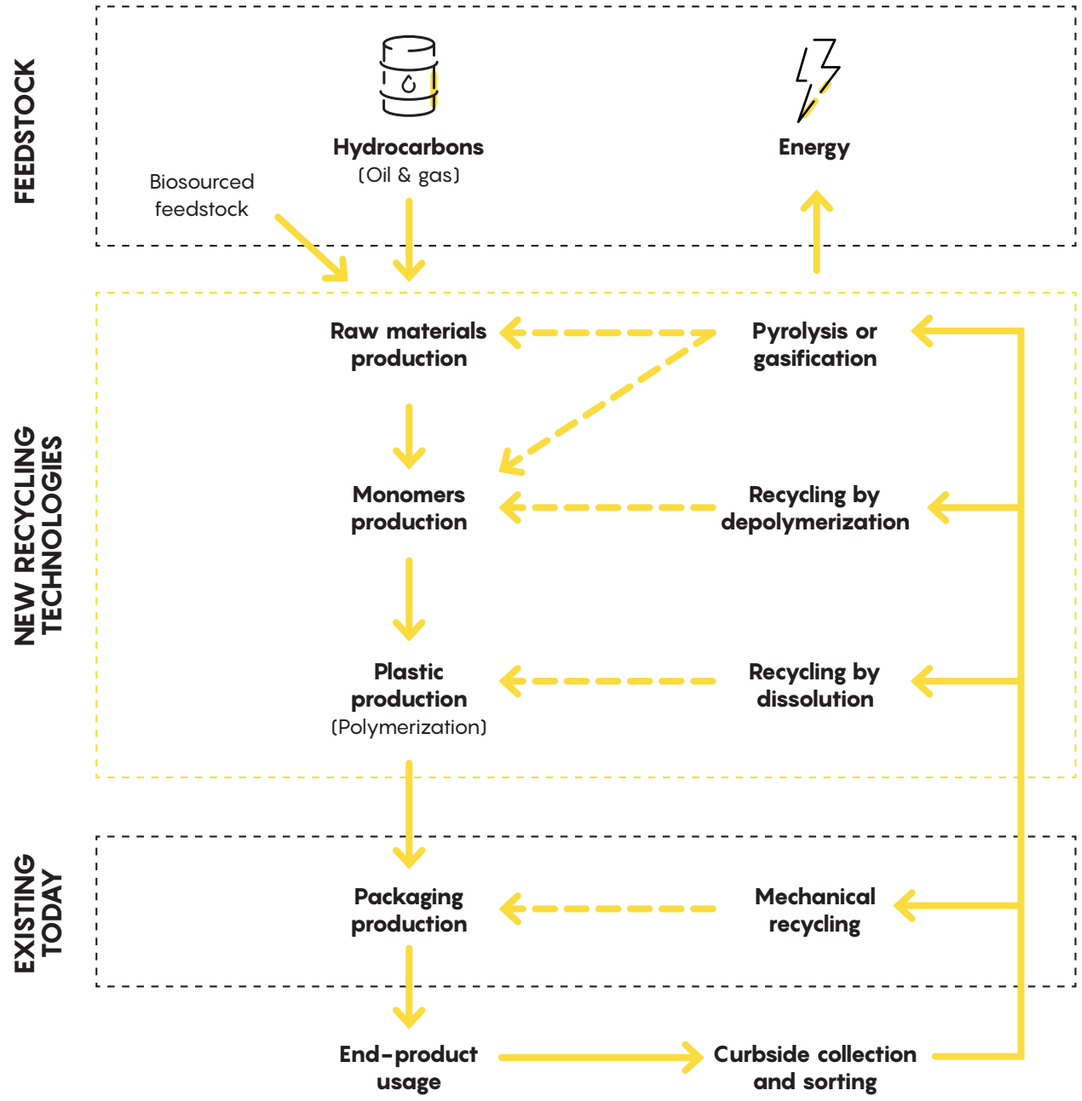
The use of pyrolysis products in refineries to produce fuels and chemical compounds and polymers raises a number of questions. Is the use of these technologies a form of plastics recycling? If so, in what proportions? How do we measure and certify it? What is the environmental footprint of these energy-consuming processes?

As with all recycling technologies, only some products can be processed by thermal conversion and not all plastics are eligible. PVC is almost always ruled out due to its chlorine content, while the oxygen content of PET makes it unsuitable for pyrolysis. Thermal conversion can nevertheless process a wider range of plastic waste than mechanical recycling, including certain mixtures.

In the medium-term, pyrolysis and gasification could round out the existing range of mechanical and chemical recycling channels, allowing the treatment of multi-resin products that are difficult to process using other techniques. For this reason, these technologies are of particular interest to producers and users of complex, multi-resin packaging.

4-Depolymerisation and polymer dissolution processes formed the primary focus of the first Forum in February 2019. Recycling by depolymerisation describes technologies that break down polymer chains into elementary components—monomers and oligomers—which can then be re-used to make new plastics. An alternative is recycling by dissolution in which polymers are selected and purified using specific solvents.

TECHNICAL SCOPE



Forum objectives

The Plastic Solutions Forum showcases practical solutions to current challenges in plastics recycling.

On May 11 and 12, Citeo is organising, for its clients and main partners, an international forum in Paris on the theme of "Plastic Solutions: Exploring the future of new plastics recycling technologies in 2020".

The two-day Forum in Paris will be attended by:

- a dozen European and North American companies working at the cutting edge of technology in the chemical recycling of plastics,
- major consumer goods and retail actors,
- financiers and investors,
- industrial partners,
- policy makers.

The Forum provides new and insightful information and expertise on rapidly growing technologies for companies, decision-makers and investors.

It also fosters direct contact between potential partners in order to promote the rapid development of new forms of plastics recycling on an industrial scale.

It will showcase leading projects in North America and Europe, and provide participants with the opportunity to:

- **Attend presentations** on these technologies and projects;
- **Meet the brains** behind these technologies in individual meetings (registration required);
- **Listen to representatives** of public authorities and industrial actors as they present their plans to foster plastics recycling;
- **Expand their knowledge of the technological, economic and environmental issues** raised by this new type of recycling.

OBJECTIVES

Project developers at the Forum

(Provisional list on 25 January 2020)

A limited number of companies have been selected to attend, in an effort to promote only the most relevant recycling projects.

The participants will receive a complete folder with a presentation sheet of each project developer, and they will have the opportunity to set up a schedule of personalised meetings with them.

COMPANY	PLASTICS[5]	WEBSITE	COUNTRY
AGILYX	PS, PE, PP	www.agilyx.com	USA
CARBOLIQ	Mixed plastic waste	www.recenso.eu/de/	Germany
CLARITER	PE, PP	www.clariter.com	Poland/South Africa
ENERKEM	Mixed plastic waste	www.enerkem.com	Canada
E.T.I.A	PE, PP, PS	www.etia-group.com	France
GREENMANTRA	PE, PP, PS	www.greenmantra.com	Canada
INDAVER	PE, PP, PS	www.indaver.com	Belgium
NEXUS	PE, PP, PS	www.nexusfuels.com	USA
PLASTIC ENERGY	PE, PP, PS	www.plasticenergy.com	UK, Spain
QUANTAFUEL	PE, PP, PS	www.quantafuel.com	Norway
VADXX	PE, PP, PS	www.vadxx.com	USA

Provisional list: other potential participants have been contacted, and some companies with which Citeo is currently leading R&D projects on pyrolysis technology will also be present including: **Pyrowave** (Canada) and **Recycling Technologies** (UK).

5-The scope of application for each technology will be outlined by project developers.

The Forum program

The two-day Forum is divided into two parts:

1. Plenary presentations where project developers speak about their skills and experience, and round table debates with industry and institutional actors.
2. Individual business meetings between participants.

DAY 1

Monday 11 May 2020

1.30pm–2.15pm	Welcome
2.15pm–2.45pm	**Opening of the Forum:** By a representative of the French Ministry of Ecological and Inclusive Transition and Jean Hornain, CEO of Citeo
2.45pm–3.15pm	**New plastics recycling technologies: what are we talking about?** An overview of technical, economic and environmental issues
3.15pm–4.45pm	**Project developer presentations** on their company and technologies **Session 1:** Six 15-minute presentations
4.45pm–5.15pm	Coffee break
5.15pm–6.45pm	**Project developer presentations** on their company and technologies **Session 2:** Six 15-minute presentations
6.45pm–9pm	Cocktail buffet

PROGRAM

DAY 2

Tuesday 12 May 2020

Alongside individual meetings with project leaders, participants can attend three round table debates and presentations

8.30am–9am	Welcome coffee	
9am–10.30am	**Individual meetings** Organised in advance, with project developers **Three 30-minute meetings**	**Round Table 1** **Contribution of pyrolysis and gasification technologies to plastics recycling: potential opportunities and partnerships** Attended by consumer goods manufacturers, retailers and petrochemical companies
10.30am–11am	Break	
11am–12.30pm	**Individual meetings** Organised in advance, with project developers **Three 30-minute meetings**	**Round Table 2** **Environmental review, recycling calculation methods and the "mass balance approach": current knowledge and issues** Attended by plastics recycling experts
12.30pm–2.30pm	Cocktail buffet	
2.30pm–3pm	**Flashback Forum 2019** **An update on the projects presented at last year's forum**	
3pm–4.30pm	**Individual meetings** Organised in advance, with project developers **Five 30-minute meetings**	**Round Table 3** **Public policy and regulation: current framework and planned developments** Attended by representatives of the French government and the European Commission
4.30pm–5pm	**Conclusion and acknowledgements**	

How to get to the Forum

Venue: Forum des images, 2, rue du Cinéma, 75001 Paris, in the Forum des Halles (Level -3).

Ⓜ Les Halles, Line 4 (Saint-Eustache, Place Carrée exit) and Châtelet, Lines 1, 7 and 14 (Place Carrée exit)
RER Châtelet-Les Halles, Lines A, B and D (Rambuteau exit then Forum - Place Carrée)

Contact: chloe.godefroy@citeo.com | +33181690625

How to sign up for the Forum

Admission to the Forum is by personal and nominative invitation only. Anyone wishing to attend should send a request to Citeo, detailing their company's business and the type of cooperation they plan to discuss with project developers.
Places are limited and registration is final only when confirmed by the organisers.
Registration form: http://bit.ly/forum-plastiques-2020

The chemical recycling of plastics in the News

Pyrolysis and gasification technologies leverage many projects and partnerships between actors in the plastics recycling value chain, underlining the strong interest for these fast-growing technologies.

More updates and detailed press reviews are available on the websites of the project developers attending the Forum.

"In the Netherlands, a consortium of world-leading companies comprising Air Liquide, Nouryon {...}, Enerkem and the Port of Rotterdam—has announced that Shell will join as a partner in Europe's first advanced waste-to-chemicals facility in Rotterdam, the Netherlands."

Read more in

***Shell joins Air Liquide, Nouryon in Enerkem waste-to-chemicals project in Rotterdam: the complete story*, 1 March 2019, Biofuels Digest.**

Shell announces a partnership with Nexus Fuels, a marketing agreement and a circular recycling strategy. Shell announced it has successfully made high-end chemicals using a liquid feedstock made from plastic waste. Atlanta-based Nexus Fuels LLC recently supplied its first cargo of pyrolysis liquid to Shell's chemical plant in Norco, Louisiana, USA.

For more information, see

***Shell uses plastic waste to produce chemicals,* 21 November 2019, Markets Insider.**

Plastic Energy Limited has reached an agreement with the province of West Java in Indonesia for the construction of five chemical recycling plants. The memorandum of understanding (MoU) signed by the Governor of West Java, Ridwan Kamil, is in line with a series of campaigns to reduce plastics pollution, and in particular oceans' pollution to which Indonesia is highly exposed.

For more information, see

***Plastic Energy to build five chemical recycling plants in Indonesia,* 8 April 2019, European Plastic Product Manufacturer.**

"GreenMantra Technologies has commissioned a demonstration facility to process scrap EPS into specialty polymers. [...] the end products from the PS will be chemicals used in foams, inks and coatings."

Read more in

Plastics recycling technology roundup: 31 October 2019, Plastics Recycling Update.

"Geminor has signed a contract with Norwegian company Quantafuel, committing to delivering 20,000 tonnes of waste plastics to Quantafuel's plant for chemical recycled feedstock for new plastic production."

Read more in

***News in brief*, 11 december 2019, Resource Magazine.**

INEOS Styrolution and Agilyx announced today they are advancing the development of a polystyrene (PS) chemical recycling facility in Channahon, Illinois. The facility will be capable of processing up to 100 tons of post-consumer polystyrene per day.

For more information, see

***INEOS Styrolution and Agilyx Advance Polystyrene Chemical Recycling Plant in Channahon, Illinois,* December 9, 2019, PR Newswire.**

"As part of a call for projects launched by Citeo to identify recycling solutions for all types of plastic packaging, a consortium of players in the packaging value chain—Total for the production of plastic resins, Mars and Nestlé, which use them, Citeo, which finances recycling, and Recycling Technologies, which has developed a pyrolysis-based recycling process—will study the technical and economic feasibility of recycling complex packaging.*"

Read more in

***Total, Nestlé, Mars and Citeo Allied in the Chemical Recycling of Complex Plastics*, 10 December 2019, L'Usine Nouvelle.**

* Translation suggested by Citeo

A successful first edition of the Forum in 2019

The first edition of the Forum, held in February 2019, brought together more than 300 participants gathered around 13 project developers coming from 8 different countries. Citeo set up this international Forum to identify solutions to overcome current technical and economic obstacles to plastics recycling.

Project developers, key actors in the consumer goods and distribution sectors, financiers, investors, manufacturing partners and policy makers discussed the opportunities created by these new technologies over two days and formed partnerships.

The organiser of the Forum: Citeo

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Citeo acts to reduce the environmental impact of packaging and paper by transforming these materials into new resources.

With its subsidiary Adelphe, Citeo provides advice and solutions to its customers—industry, trade, distribution and consumer goods companies—in order to help them exercise their responsibility related to the end-of-life of packaging and paper, in optimal economic conditions.

In nearly 30 years, businesses have invested more than €10 billion to finance selective collection and to create recycling industries with municipalities and industrial and recycling channels.

Today, 70% of packaging materials and 59% of paper are recycled in France thanks to sorting, which has become the No. 1 community action for the environment.

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Accelerating innovation and informing the sorting and recycling of tomorrow

The Citeo Prospective program fosters innovation to accelerate the transition to the circular economy. It aims to anticipate developments and to identify materials and recycling innovations, develop the eco-design and recyclability of packaging and paper, lead multi-actor R&D projects and share information and the conclusions of these actions.

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