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Extract

Trend Study Chemical Recycling

Technologies – Market Factors – Plants & Projects

2nd Edition, April 2023

ecoprog GmbH

Trend Study Chemical Recycling

For the second edition of this Trend Study, ecoprog has tracked close to 180 chemical recycling plants and projects around the world. Market information that spans over a period of 8 years has been analysed to gain insights about this technology.

Chemical recycling involves splitting of polymer chains into their monomers and using them for respective applications. It is often projected to promote circularity for plastic waste that cannot be treated through traditional recycling methods. Furthermore, material recycling, which is often affiliated with downcycling, is alleged to be prevented by chemical recycling.

However, the current standards for traditional recycling set higher barriers for the establishment of chemical recycling. With many uncertainties, including its associated CO_2 footprint and classification, the future of chemical recycling is also being questioned by specific organisations.

The Trend Study Chemical Recycling includes on more than 130 pages:

- A description of the technologies and implementation of chemical recycling as well as an outlook on their strengths and weaknesses in comparison to the traditional methods.

- An analysis of key factors and trends in the global plastic production and recycling market with regard to chemical recycling.

- An account of nearly 180 chemical recycling plants and projects worldwide, including descriptions of capacities, inputs and technologies (as far as known).

- An outlook in terms of their market regions and an analysis of the key competitors in this market.

- A **monthly update** for the first 12 months in the form of short news on chemical recycling and an MS Excel file for plants and projects (abbreviated version).

The study is available **starting at a price of 1.800.– EUR***. Customers of our *waste & bio Infrastructure Monitor* will receive a discount of 600.– EUR (1,200.– EUR discount in case of a company version). **Please see the end of this extract for detailed price and product information.**

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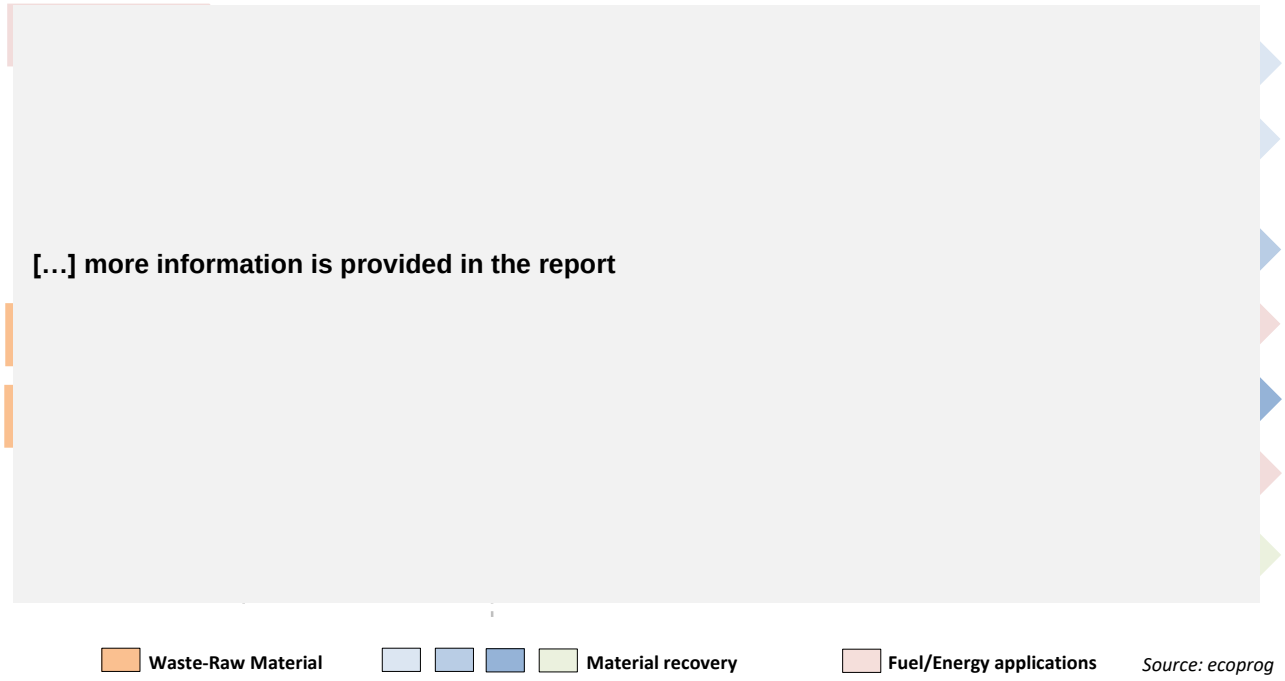
2.3 Chemical Recycling

Chemical recycling processes, unlike mechanical recycling processes, split up polymer chains in plastics. The objective is to produce petrochemical basic materials that can be used to produce new plastics or for other purposes. This material, in a best case, shall be of the same quality than naphta that is produced from crude oil. If successful chemical recycling would therefore enable the production of new, high-quality plastics from recycling materials.

Basically, chemical recycling, too, requires segregated waste collection and pre-sorting of plastic waste. In some visions however, chemical recycling also aims to remove pollutants not before, but *within* the chemical recycling process. If successful, this might enable chemical recycling to use waste streams that are not suitable for material recycling.

Figure 1: Overview of Chemical Recycling



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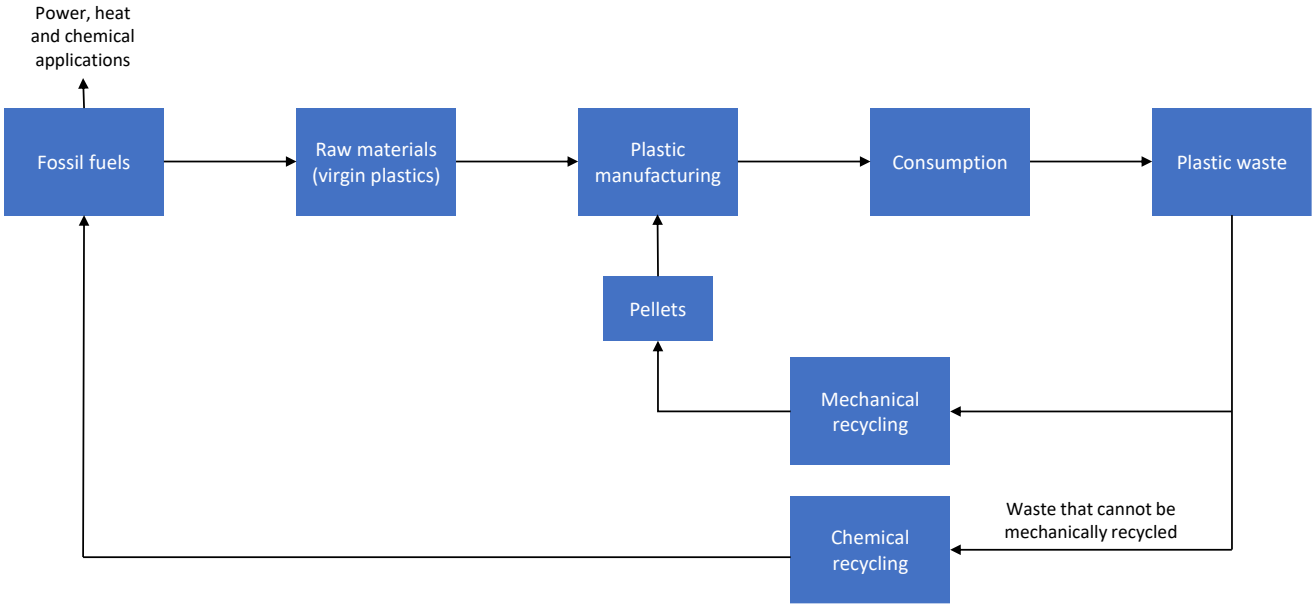
3.3 Chemical vs Material recycling

For [redacted] of plastic waste and the higher demand for recycling – the assessment is clear. [redacted] the chemical recycling market. Although, how strong and how soon it would occur remains open, nevertheless, the growth impact is certain.

Compared to a technology already quite established in the waste market, like mechanical recycling, chemical recycling is a fairly new technology and poses many open questions. Therefore, its prospects seem rather indescribable, especially as current standards set by mechanical processes create higher barriers for the establishment of chemical recycling.

Figure 2: Mechanical and chemical recycling process cycle



Source: ecoprog

More than chemical recycling as a competitor to traditional material recycling, there is potential for both methods to work together in practice. Ultimately, the goal of the combined application should enable the use of waste streams, ecologically as well as [redacted].

Main aspects of this discussion will be highlighted subsequently.

(…)

8.5 North America & the Caribbean

Inhabitants [million]	411.1	Municipal waste [1,000 t/a]	XXX
Plastic waste composition [%]	14-16%	Current MSW recycling rate [%]	XXX
Number of plants	XXX	Number of projects	XXX

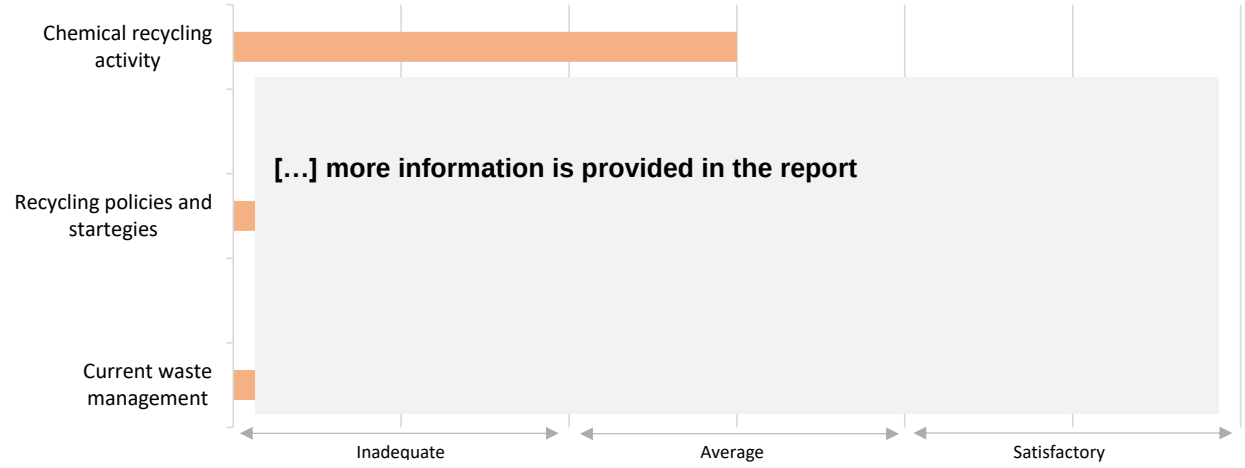
Overview

The major countries that are part of this region are USA and Canada. Apart from these two northern countries, we have the Caribbean islands with [redacted]

There [redacted] in this region. Following the region of Europe, chemical recycling activity [redacted] (USA mainly). There is currently [redacted] However, there was recognition [redacted] by the local states in USA and some proposals for developments in Canada.

On the other hand, the members of the Caribbean islands are facing problems with urbanization and tourism, which is posing a risk to their solid waste management as well. There is currently [redacted] chemical recycling in the Caribbean.

Figure 3: General findings with respect to chemical recycling in North America



Source: ecoprog

Plastic facts

North America is one of the highest producers of plastic waste, next to Asia. Also, the major reason for the high plastic production can be related to the presence of industries. (…)

Plants

We [redacted] that are under operation in this [redacted] are located in Canada while the rest are in USA. With an estimated input capacity [redacted] in total, most of the plants treat multiple plastic streams. [redacted] have an input capacity of [redacted] Technologies implemented for [redacted]. However, [redacted] gasification by one.

Figure 4: Country wise split up of active plants in North America and the Caribbean

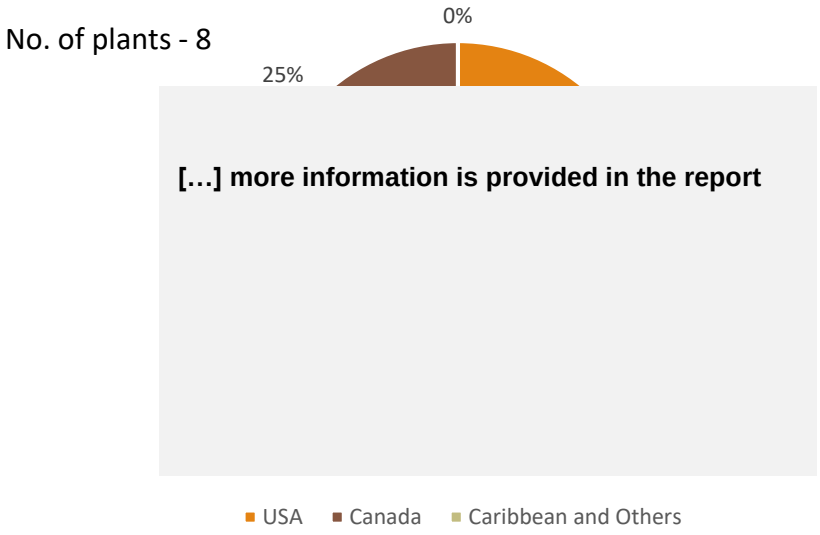


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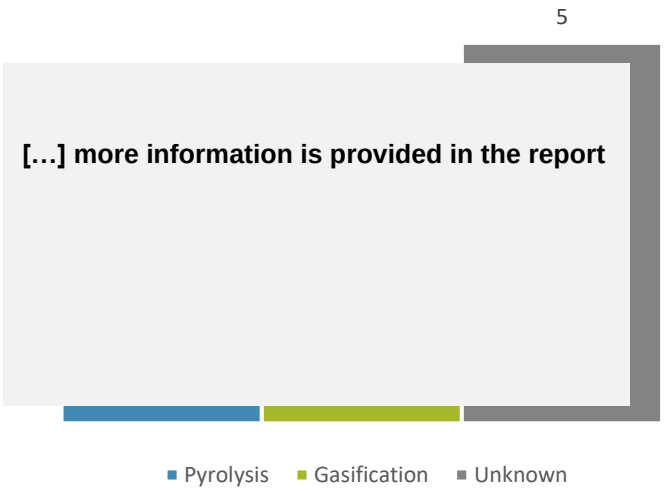
Figure 5: Plants in North America based upon their technologies



North America and the Caribbean is [redacted] plants in this region.

Figure 6: Chemical recycling plants in North America

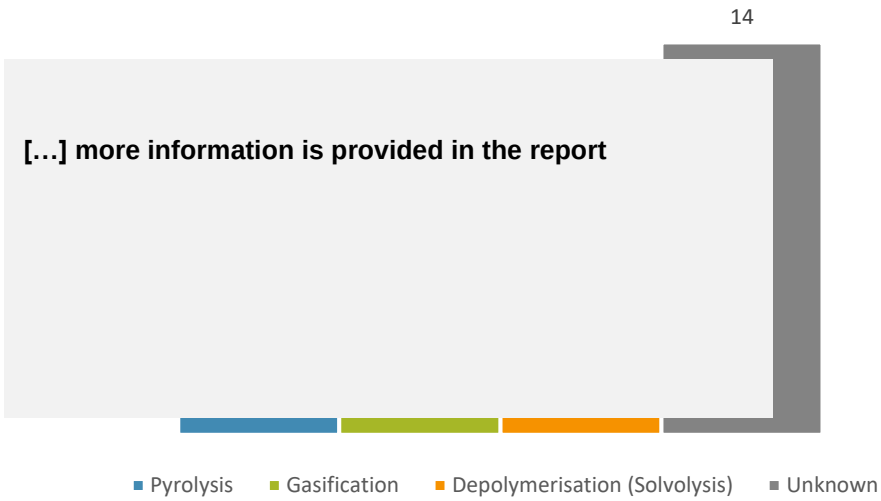
#	Plant name	Country	Operators/Partners	Start	Capacity (tpy)	Technology	Scale
1.	Anjou Montreal	Canada	Polystyvert	2018	600	Unknown	Pilot plant
2.	Edmonton, Alberta	Canada	Enerkem	2016	n/a	Unknown	Commercial
3.	Akron Ohio	USA	Alterra Energy	n/a	21900	Pyrolysis	Commercial
4.	Baytown Texas	USA	ExxonMobil	2022	36288	Pyrolysis	Uncertain
[…]							

Projects

As of [redacted] in this region. All of the tracked projects are from [redacted]

(…)

Figure 7: Technologies of the identified projects in North America



Of the [redacted], we do not have [redacted] solvolysis techniques.

There [redacted], there are [redacted] are expected to begin operation. There are [redacted] are under construction, [redacted], while rest of them in their planning phases.

Figure 8: Projects for chemical recycling in North America

#	Project	Country	Operators/Partners	Start	Capacity (tpy)	Technology	Status
1.	Edmonton, Alberta	Canada	Enerkem & Nova Chemicals	n/a	230000	Gasification	planned
2.	Ashley Indiana	USA	SK Global chemical & Brightmark	2021	100000	Pyrolysis	planned
3.	Augusta	USA	PureCycle Technologies	n/a	n/a	Unknown	discussed
[…]							

Competition

Most of the highly funded and large-capacity projects that we tracked for this study are from this region. This can be regarded to the big players involved in most of the projects. Also, to the not so strict waste regulations existing for recycling in this region. There currently, is no appropriate way to evaluate the outputs of chemical recycling, either to be considered as ‘incineration’ or ‘recycling’ remains open to the owners of the facilities.

Figure 9: North America & the Caribbean, operators and partners by industry

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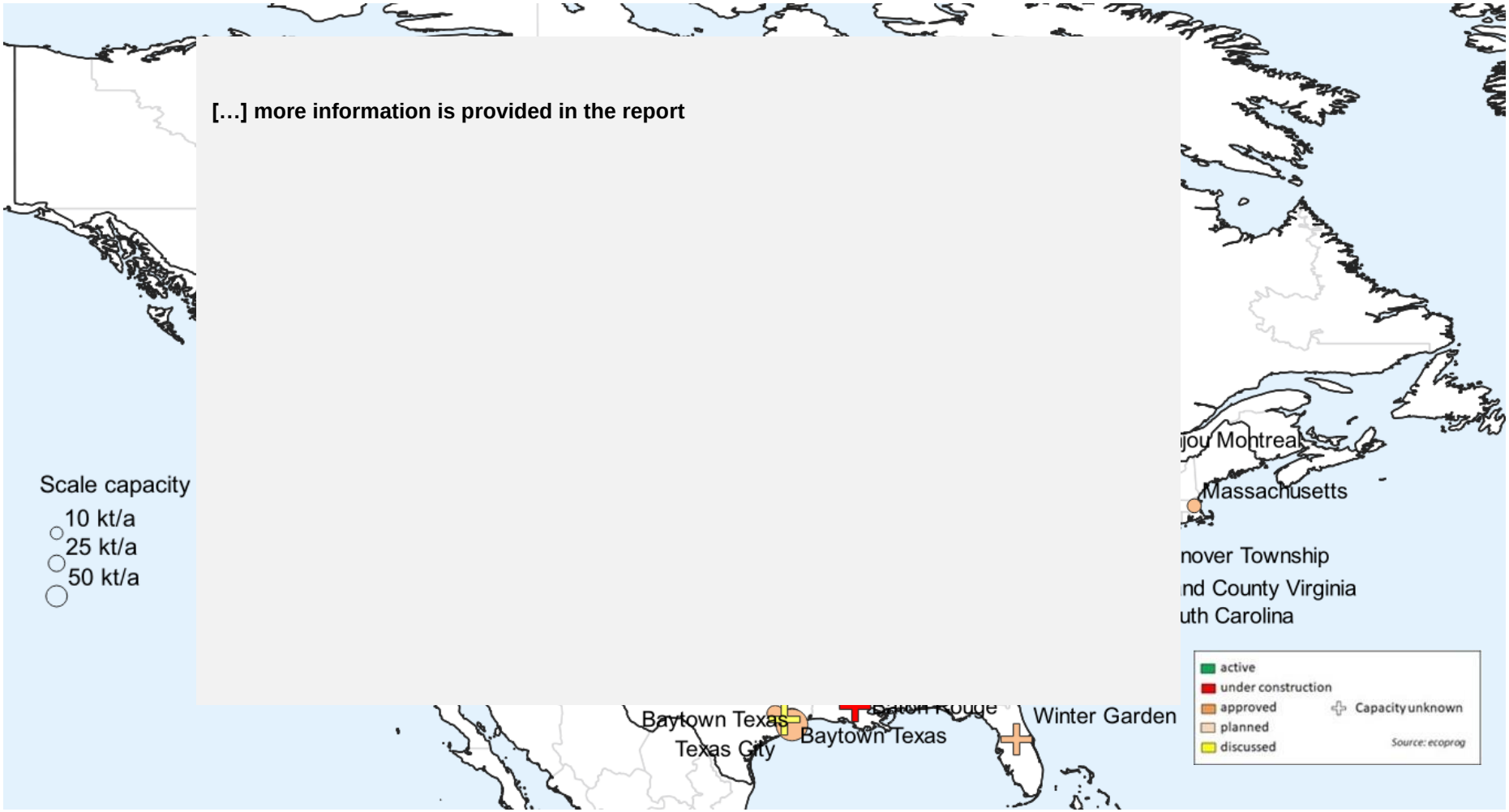
Figure 10:Overview of plant and projects in North America & the Caribbean



Annex

Plants

Anjou Montreal
Operators / Partners: Polystyvert

Status: active
Country: Canada

Capacity: 600
Technology: Unknown
Start of Operation: 2018
Scale: Pilot plant

Remarks: The facility is expected to recycle 600 tpy of polystyrene. The Canadian company claims to recycle polystyrene using a patent-pending dissolution and separation process. This, it asserts, produces a better quality of PS recyclate. As part of the conversion, the polymer is dissolved in a natural essential oil, then separated from the oil and conditioned. The company is also planning to build a larger polystyrene recycling plant in Montreal.

Edmonton, Alberta
Operators / Partners: Enerkem

Status: active
Country: Canada

Capacity: n/a
Technology: Unknown
Start of Operation: 2016
Scale: Commercial

Remarks: The Enerkem operated facility in Edmonton, Alberta, is a waste-to-biofuels producer. Jointly owned by Enerkem and the City of Edmonton, it uses gasification technology to treat waste to provide bio methanol and cellulosic ethanol. With an agreement with the local authorities the facility would treat 100,000 tpy of waste. The plant is now responsible for diverting about 30% of Edmonton's waste. The syngas produced from the waste is purified and refined until it is to the point where it can either be turned into biofuels or into high-grade syngas that can later be made into chemicals like ammonia. Meanwhile, the company tries to set up similar facilities in Europe, amongst others in cooperation with Shell, Air Liquide, the Port of Rotterdam and Suez.

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Price and product information

You can order the market report here:

https://www.ecoprog.com/publikationen/energiewirtschaft/chemisches-recycling/order-chemisches-recycling.htm

Price models:

- Single-user version: 1,800.– EUR*
- Company version: 3,600.– EUR*
- Corporate version: Price on request

Product information:

Single-user copy:	personal copy (personalized and password-protected PDF file, sent via email)
Company version:	company-wide copy (legal entity), PDF file, sent via email
Corporate version:	Copies for different, but legally connected companies (e.g. sister companies, investments abroad). The price depends on the number of companies and persons.

Add-on:

All the versions include a **monthly update** of chemical recycling announcements in the form of short news and an Excel file for plants and projects for the first 12 months.

Subscribers of ecoprog's waste & bio Infrastructure Monitor (Info | Order) will receive a discount starting from 600.– EUR.

Options:	Additionally, you can order all detailed information on plants and projects in MS Excel: 1,800.– EUR*
	Additionally, you can order a printed copy: 150.– EUR*

Find all our prices at a glance, including all discounts here.

* (plus VAT, if applicable)

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