Plastics recycling
PET and Europe lead the way

Petrochemicals special report
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Plastics recycling’s profile has been steadily growing in recent years, with 2018 a pivotal year for the industry as legislation, industry initiatives and consumer awareness led to a focus on plastic waste, and recycling as a key solution to the problem.

While Europe and the polyethylene terephthalate market have been leading the way in developing recycling as a sustainable business, many questions remain, with 2019 demonstrating that underlying concerns around profitability and cost continue to weigh against the drive to use more recycled plastics.

Demand for recycled plastics over the longer term is expected to grow due in part to European Union policy initiatives to increase the recyclability and recycled content of packaging. Currently, however, the market’s true commitment to sustainability will be tested in the face of unfavorable economics.

**Bearable Virgin Makes Switching from R-PET Attractive**

The virgin vs recycled PET disconnect

There has been much talk about a growing disconnect between pricing in the recycled PET flake market and the virgin PET market. Flake prices have traditionally held a wide and fairly steady discount to the virgin market, making using flakes economically viable as well as being a win-win for marketing. However, 2019 saw virgin resin prices sink, at first to parity with flake prices, and then below.

Virgin PET spot prices had not previously fallen as low as spot flake prices since S&P Global Platts first began assessing flake prices back in February 2008. In December of that year, virgin spot prices fell to a Eur10/mt premium over flakes, but that is as close as they had come to parity until this year, according to Platts data. Since February 2008, spot virgin PET has on average been Eur214/mt more expensive than flake and most market participants see a triple-digit discount to the virgin price as necessary to make recycled flake prices competitive, given the additional costs required in processing recycled flakes.

This year, though, a combination of high virgin stocks, bearish feedstock prices and relatively weak demand over the summer have seen virgin resin prices fall. Recycled flakes, on the other hand, have proved more resilient in 2019. A tighter supply of good quality recycled material and the need for buyers to secure recycled supply chains has kept recycled PET prices more stable.

On the surface, this looks positive for food-grade R-PET demand growth, but it may also have a less positive impact if these dynamics were to continue in the long term.

Converters have been eyeing the possibility of switching much of their flake buying capacity into cheaper virgin resin for certain end uses such as sheet and film. For sheet producers, this has begun to take place. For bottle producers, however, this is easier said than done.

**Will Switching Work?**

“It comes down to whether the consumer is really willing to pay substantially more for a 100% recycled bottle or not,” a recycler said. “There comes a price point at which it is not economically sustainable.”

Although this is a concern, the market is skeptical about the ease with which companies can quickly switch their buying activities away from R-PET to virgin resin. In part, this is down to the difficulty in running different blends of virgin resin and R-PET for individual packaging through existing machinery – which requires some level of packaging redesign. More importantly, it may prove difficult to reverse big brands’ decisions of increased recycled content, set to last over many decades, just because of poor economics over a relatively short time frame.

**The Future is Clear**

Despite these unfavorable economics, the industry remains positive about complying with recycled contents legislation, driving sustainability initiatives and building on current recycling rates.

From the recycling side, Europe appears well placed to meet upcoming legislation. Christian Crepet, Executive Director of Petcore, an industry body representing the whole PET value chain, says there is currently a 300,000 mt overcapacity of mechanical recycling in Europe. To hit a recycled content level of around 40–50% in bottles, the infrastructure is there, he believes.
Chemical recycling, whereby post-consumer plastic is depolymerized to its original state, is also progressing well in Europe. Crepet says there are seven chemical recycling startups associated with Petcore and big recycling companies are also seeing good progress in this field. He sees the two recycling forms working well together in the future.

There are challenges that need to be addressed, however. Crepet’s top priorities include moving away from colored PET and sticking to clear packaging; moving to single polymer packaging to avoid mixing different polymers; and improving collection rates across Europe.

This final point is being well addressed in Europe. The UK government, for instance, proposed in March 2018 the introduction of a deposit return scheme as a means of increasing collection rates within the UK.

According to the UK government’s Commons Select Committee environmental audit, a deposit return scheme in the UK could significantly increase recycling rates from around 57% to between 80%-90%, as in countries with successful deposit return schemes.

In continental Europe, many countries already have successful deposit return schemes and there are plans, particularly in Germany, to increase their scope further by accepting a wider range of plastic packaging.

Crepet’s first point is that the future of PET is clear. Colored packaging, he says, will simply not be accepted in years to come because people are aware now of the difficulties in recycling it. Brands and consumers are recognizing the fact that the industry must return to clear packaging in order to boost recyclability. Coca-Cola, for instance, is switching its Sprite branded bottles from light green to clear in order to boost recyclability and make it easier to incorporate 50% R-PET in their manufacture.

The PET bottle industry is well placed to deliver on targets. The tray industry, however, has further to go. A key issue in this market is the use of mixed polymers in packaging, with around 50% of plastic tray packaging using a mix of different polymers that makes them difficult to recycle, according to Crepet. There is progress being made, however, to move towards single polymer trays and Crepet believes that in a few years around 75% of plastic trays will be a monomer material and that chemical recycling could provide a solution to the remaining 25%.

Cross value chain collaboration is key

There are also positive signs coming from the consumer side too. Sander Defruyt, who heads the New Plastics Economy initiative set up by the Ellen Macarthur Foundation, believes it is the end consumers and big brands that have driven and will continue to drive sustainability initiatives in plastics.

“The starting point of our initiative was cross value chain collaboration. We need everyone to work together. We see a big role for brands and retailers, who decide what packaging they put on the market and whether they go for single-use or reuse models, and it needs enabling policies as well. We can already see leading companies stepping forward, but you will also have the slower adopters,” said Sander Defruyt, Ellen Macarthur Foundation.

Since the launch of the initiative, over 400 organizations have signed up. For Defruyt, recycling is just a piece of the puzzle. He believes that to have a true circular economy, reuse will be key.

“It is more than 40 years since the recycling symbol was introduced and yet we still only recycle 14% of plastic packaging today.”

— Sander Defruyt

“On reuse, there has been significant innovation. When you look at the huge projected growth of the plastics packaging market for the coming years it would require major investments just to keep recycling rates constant at today’s very low levels. It is clear that recycling alone will not get us out of the waste and pollution crisis we see today. Shifting to reuse business models can drastically reduce the amount of single-use plastic packaging.”

The growth in plastics packaging, highlighted by Defruyt, is at odds with the efforts that consumers and brand owners are making to reduce plastic pollution. He argues that, ultimately, in a true circular economy, there will be very little virgin plastic production. Efficient recycling systems will provide the feedstock for plastic products, while reuse will see demand for plastic drastically reduce.

This is perhaps why only a few of the more than 400 signatories to the New Plastics Economy Global Commitment are chemicals and plastics producers.
“There is a contradiction between where brands and retailers are going, with their commitments to eliminate problematic items, increase recycled content, and shift to reuse business models, and the many billions of investments plastic producers are investing in increasing virgin fossil plastic production capacity,” Defruyt says.

**US shale boom overlooks sustainability**

Nowhere is the contradiction between sustainability and growth in virgin plastics production more prevalent than in the US.

The North American shale boom sharply reversed the US chemical industry’s fortunes, unearthing ethane feedstock so cheap that a region that had been naphtha-fed plant shutdowns and petrochemical imports saw the cost advantage of home-fracked gas shaping its future as a global petrochemical supplier.

As such, the focus has overwhelmingly centered on ethane-fed crackers and derivative polyethylene, the resin used to make the most-used plastics in the world, and less so on how to deal with the plastics they produce after use. Fourteen new ethane crackers that are operational, under construction or planned from 2017 beyond 2020 will add nearly 18.5 million mt/year, or 52%, more US ethylene capacity, while 28 new PE plants starting up or planned in the same span will increase capacity by nearly 60%, or 13.67 million mt/year. Other derivatives are accompanying some of the new crackers, such as monoethylene glycol or alcohols units, and a new polypropylene plant under construction.

The companies that went all in on these projects include the biggest global names in petrochemicals: Dow Chemical, ExxonMobil, Chevron Phillips Chemical, LyondellBasell, Formosa Plastics USA, Sasol and Ineos.

However, Thailand-based Indorama Ventures largely bypassed that cracker/polyethylene rush, except for refurbishing a long-mothballed Louisiana cracker to feed its own operations. The world’s largest polyethylene terephthalate (PET) company instead doubled down on its forte, increasing its reach with the 100% recyclable and most-recycled plastic in the world used to make beverage bottles, polyester fibers and increasingly other plastics.

The US is a net importer of PET, having received more than 2.2 million mt overall in 2018. Mexico was by far the top source, followed by Canada and Thailand.

This may change, however, as a major PET complex under construction in Corpus Christi, Texas, will sharply reduce that import need. Indorama owns one-third of the project, which will be the largest such complex in the world with a 1.1 million mt/year PET plant and a 1.3 million mt/year purified terephthalic acid (PTA) unit. The owners of the other two-thirds are Mexico’s Alpek, the largest PET producer in the Americas, and Taiwanese textile conglomerate Far Eastern New Century.

The three companies are not partners, however. They will procure their own feedstock and market their own third of the output. CEO Aloke Lohia has said Indorama expects the PET plant to start up in mid-2020, followed by the PTA plant a year later.

Yet despite the growth in virgin plastic production, Indorama, one of the New Plastics Economy signatories, has been progressing in making recycling a key part of its future business model.

“All our customers are in touch with us and demanding that we improve and increase the recycling content in our PET. We’re allocating a budget of $1 billion to recycling so that by 2025, when the brand owners want 25% content in the packaging, [Indorama Ventures] would be able to deliver them,” said CEO Aloke Lohia, during an August conference call with investors.

The company has been actively making deals and forging partnerships aimed at increasing its own integrated recycling capabilities to provide recycled PET to customers who use it to make bottles, fibers and other products.

Those include its acquisition of Wellman International in 2011, which had two bottle washing facilities and a fiber plant that used recycled bottles flake as its primary feedstock. The company has more recently added greenfield bottle washing capacities in Thailand and Mexico and acquired two other PET recycling companies: in 2018, Sorepla in France, and this year Custom Polymers in Alabama. The Alabama facility processes post-consumer and post-industrial PET by grinding, washing and turning the plastic into pellets so it can be used as a feedstock for food-grade packaging and other end uses.

**Closing the loop**

Indorama also last year announced a joint venture with Canada’s Loop Industries to manufacture and commercialize sustainable polyester resin for beverage and consumer packaged goods companies. The venture aims to “perpetually recycle” increasing amounts of PET plastic and polyester fiber, using Loop’s technology, with commercial production of 100% sustainably produced

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**TOP PET IMPORTERS TO THE US**

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US is a net PET importer, with 30% of inflows coming from Mexico

Source: US International Trade Commission
PET resin and polyester fiber targeted for the first quarter of 2020.

Lohia said during the August call that Indorama’s customers want PET to remain their main packaging choice, and the company sees more plastic packaging diverting to PET from other resins because PET is easier to recycle. For example, PET is being used to package more orange juice and make other non-beverage containers, like shampoo bottles, which would traditionally be made with polyethylene.

“That is good news for us. We just have to ensure we can deliver 25% recycled content,” he said.

For all these efforts, however, the US faces the same issue as Europe: collection rates.

Edmund Ingle, CEO of Indorama’s recycling segment, said in an interview that about 20 million mt of PET resin is sold into global packaging markets, and about 55% to 57% of that is recycled. In the US, the collection rate is much lower, about 28% to 30%, he said.

Ingle also said that in the next two to three years there will be a shortage of recycled PET due to a lack of extrusion and solid state polycondensation (SSP) capacity to turn PET flakes, which have been sorted, washed and ground from waste bottles, into recycled PET resin suitable for direct contact with food. Extrusion involves melting raw plastic, and SSP of PET flakes increases the weight of and purifies recycled PET so it can be used to make packaging for food and beverages.

Alpek, which owns US PET producer DAK Americas, is also working to increase its recycling capacity, under similar customer pressure to increase recycled PET content in its products. In the first quarter of 2019 Alpek acquired a 45,000 mt/year PET recycling plant in Indiana, adding to its fiber PET recycling operation in North Carolina and a food-grade PET recycling facility in Argentina.

However, Alpek CEO Jose de Jesus Valdez said during the company’s quarterly earnings call in July that the key for a circular economy is to improve the collection rate and ability to sell recycled PET at a price similar to that of virgin PET, which currently is significantly cheaper.

“A lot of bottles are not recovered, particularly in North America... Improving collection is going to be important so that we can increase our offer of recycled products,” he said.

Indorama has such technologies and is working to grow them. Ingle also noted that the cost of recycling remains a challenge, particularly with the poor quality of inputs from curbside collections. When that material is collected, it goes to a material recovery facility (MRF) to be sorted into different commodities, including PET, then baled and sold.

Some items cannot be recycled, such as small plastics like straws and packaging for mascara or toothbrushes that can get caught up in recycling machinery.

Plastic grocery bags can be recycled, as long as they are collected in bulk – a few tossed in a curbside bin can, like smaller plastics, get caught up in recycling equipment. Even PET bales made up of bottles that came from curbside bins can be of poor quality, Ingle said.

“However, the technology has advanced rapidly in the recent years, and allows companies with the latest equipment to sort more PET out of a bale, and thus improve yields and margins,” he said.

R-PET export opportunities from Latin America

In parts of South and Central America solutions to plastic waste have progressed significantly over recent years, bringing social and economic benefits to South American countries as well as much needed supply of R-PET to the mature markets of Europe.

In many of the parts of Central and South America, bottled water consumption is high, creating a huge amount of plastic waste. The problem is what to do with it. The solution, it appears, is to collect it, process it, and export it.

This has created viable business models for many recycling plants in Central and South America, but the model depends on export.

“At the moment, while R-PET production is highly developed, there is not the internal extrusion infrastructure to allow many developing countries to use the high quality recycling that they produce,” said Raffi Schieir, director of Bantam Materials, a distributor of recycled bottle materials.

For Europe, there are two key reasons why Schieir believes we should take recycled material from Latin America. The first, is Europe is running a deficit for good quality recycled material.

“...In Europe, there are studies that say even if we recycle all the plastic bottles we can into flakes, we could only hit 16% recycled content in plastic bottles, not the 25% that will soon be legislated."

— Raffi Schieir

Despite this, there remains some pushback in Europe to importing R-PET from places like South America. Whether this is based on the belief that European R-PET is better quality or the complications and risks of importing, only a relatively small portion of R-PET in Europe is imported.
But growing awareness of the global plastic waste problem, continued tight supply in Europe and the sustainability drives in the New Plastic Economy may well change this.

Much of the growing awareness of the global nature of the plastic waste problem centers on years of European plastic waste exports to developing countries in Asia and Latin America.

Subsidized under schemes such as the UK’s Packaging Waste Export Recovery Notes (PERNs) it has been more economic for the recycling industry to export waste than to recycle it. This is because waste exports are treated as 100% recycled, and so receive a 100% PERN note, even though it is not possible to recycle 100% of waste – there is always waste that goes to landfill.

But recent refusals by the governments of the developing countries, most notably China, accepting this waste has forced Europeans to think differently about their own waste problems.

There is now a push to help these countries with the plastic pollution that Europe has helped create. “Europe has been shipping plastic waste to these areas for years but now we need to find room in our supply chains for material from these ‘at risk’ areas for ocean plastic,” Schieir says.

Governments are now taking notice, according to the Ellen MacArthur Foundation’s Defruyt. “It is climbing up their agendas. In the last 18 months we have launched Plastics Pacts in the UK, France and Chile, and more are on the horizon. These pacts bring together policymakers, industry leaders and other players in the system, to develop local solutions that contribute to a shared global vision,” he said.

Europe can help economically and socially with the global waste plastic problem. Firstly, by importing quality R-PET from Latin America, “We in Europe are benefitting from good recycle and taking it from at-risk areas for ocean plastic,” according to Schieir. “Those exporters benefit because they build a business model, which in the future will allow for domestic recycled plastic production.”

And at a government level, both in Europe and South and Central America and South East Asia, there are efforts to “restrict the import and export of plastic waste… as part of the Basel Convention [on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal]. This is an opportunity for countries to take responsibility for their own waste and build local, circular economy systems, instead of shipping it elsewhere,” according to Defruyt.

**Colombia reducing single-use bag consumption**

Looking beyond PET, initial signs of government action in South America show progress as well. Colombia has already implemented programs, either by outright bans or taxes, that have sharply reduced single-use plastic bag consumption at major stores in the past 18 months.

A plastic bag tax introduced by Colombia’s Ministry of Environmental Affairs to reduce the use of plastic bags in large stores and supermarkets resulted in a 54% decrease in consumption of single-use plastic bags over that time frame, the ministry said in mid-August.

And such deterrents could ramp up, Minister of Environmental Affairs Ricardo Lozano said in an interview on local television in August: “The government will even consider increasing the tax from the current 50 pesos/bag (1.56 cents/bag) to 100 pesos/bag (3.13 cents/bag),” he said.

According to the ministry, the program aims to end consumption of single-use plastic bags and to replace them with compostable, more environmentally friendly raw materials by the end of 2020.

“I am positive we can achieve the goal we set for 2020, as the same people rapidly have found substitutes to replace the oil-based single-use plastic bags,” Lozano said.

**More plastics targeted**

In addition to the initiatives to reduce single-use plastic bag consumption, some members of the Congress of Colombia are leading a project that seeks to ban other single-use plastics, such as cutlery and straws. The proposed legislation would prohibit the manufacture, importing, sale and distribution of single-use plastics by 2021, and by 2025 the entire use of plastic bags.

Given the ample spectrum of derivatives from polyethylene involved, the petrochemicals industry – represented by Acoplásticos – is worried about the bill gaining traction among lawmakers.

“Before entering into a complete ban on plastics, Colombia should study carefully the substitutes for fossil and organic origin polymers,” Daniel Mitchell, Acoplásticos’ president, said during the last meeting of the task force on July 26. “Plastic itself is not dangerous but the manipulation and final destination of the plastic that ends up in the ocean is where Colombia should focus its attention.”

A robust recycling system should be implemented in Colombia to achieve the desired objective of avoiding plastic waste ending up in the ocean, the trade association said.

Be it PET or polyethylene, the drive towards increased recyclability across all plastics is a global movement that has captured the attention of consumers, legislators and brand owners, and looks set to be a long-term movement, as legislation and industry initiatives continue to gather pace.
Dozens of companies worldwide, including major petrochemical manufacturers Dow, BASF, Chevron Phillips Chemical, LyondellBasell, Sabic, Braskem, Sinopec, Sasol, Shell, NOVA Chemical and Reliance Industries, have joined the Alliance to End Plastic Waste, committing more than $1 billion to find solutions to the plastic waste problem. The 27 founding companies and a dozen more that have since joined maintain that plastics remain critical for their “sanitary, safety, health preservation and convenience benefits,” but those benefits can be wiped out by irresponsible disposal.

The alliance includes chemical and resin manufacturers, those that transform resins into plastics, retailers and waste management companies. While they continue to make and sell virgin resins used to manufacture plastics worldwide, they also have focused attention, research and funding on addressing waste as well, to be part of a solution.

LyondellBasell CEO Bob Patel, who leads the alliance with Proctor & Gamble CEO David Taylor and Veolia CEO Antoine Frerot, discussed a common theme among the group members during the company’s quarterly earnings call in August – to embrace sustainability without sacrificing profitability:

“We do see a business model here in terms of capturing the value that exists in plastic waste, and it’s going to come through in a range of forms. So it’s going to be mechanical recycling. We’re also doing some research on chemical recycling. And I think this is going to be a growing area for us and one that will create value over time.”

In Europe, 2019 has challenged the commitment of companies to sustainability, as weak virgin prices have lessened the appeal of R-PET from a purely financial perspective. This will be a test case for the industry as it looks ahead to further developing plastics recycling.