

**IDEATION CENTER INSIGHT** 

## Circular economy

A new source of competitive advantage in the chemicals industry

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#### **EXECUTIVE SUMMARY**

The traditional and dominant linear economic model of "take, make, use, and waste" is unsustainable. The linear model is wasteful and environmentally damaging. Plastic use, for example – often epitomizing both single-use convenience and pollution – globally has increased twentyfold in the past half-century and is forecast to double again in the next 20 years.<sup>1</sup> Customers want an end to the linear model and are demanding environmentally friendly products. The linear model's successor is the circular economy (CE), which seeks to reuse products and treats waste as a loss of value. Companies are adopting the CE as it can lead to competitive advantage, offers a response to customers, and is less damaging to the environment. The CE can lower operating costs and create new products and services that facilitate incremental value creation and sustained growth.

The CE is particularly important for chemicals companies, which can adopt different methods for competitive advantage: circular procurement, customer value chain integration, circular products, and end-product recycling. Circular procurement extends the relationship between buyer and seller beyond one-off transactions, turning suppliers into partners and products into services that can be leased, shared, or used again. Customer value chain integration is when a chemicals manufacturer expands its role beyond the production and after the sale of chemicals to provide specialist expertise under long-term management contracts. Circular products mean more-durable, energy-efficient items that are recyclable at the end of their life. End-product recycling consists of mechanical or chemical recycling of used products, with materials and components extracted for reuse during this process.

Chemicals companies should begin by deciding their commercial rationale for moving to the CE. Once they define the business objectives, they can consider pilot projects that are likely to reap short-term rewards and inspire the confidence to continue within the organization. They also need to change their corporate culture so that the CE becomes second nature to their staff.

#### MOVING TO A CIRCULAR ECONOMY

Executives within the chemicals industry are moving away from the linear economy approach. This formerly dominant economic model of "take, make, use, and waste" has been associated with rapid growth. However, the model is unsustainable, both for countries and for individual companies, as it creates large amounts of waste, depletes resources, and is inefficient. For example, according to the World Economic Forum, garbage processing fails to capture an estimated 32 percent of plastic packaging, leading to environmental damage and pollution. Furthermore, the widespread use of plastic packaging is extremely costly, with the immediate destruction of 95 percent of its material value, worth around US\$80 to \$120 billion annually, after initial use.<sup>2</sup>

By contrast, the CE establishes a closed loop for materials along the entire production and consumption cycle, with waste being treated as value leakage. If introduced effectively, the CE could promote economic growth through the more efficient use of resources and through innovation, while the environmental benefits would comprise a substantial reduction in emissions and in the consumption of raw materials.

The principles of the CE model are that it dictates the usage of finite resources, the maximum utilization of products, and the recovery of by-products and waste.

In the past, companies adopted CE initiatives only to further their corporate social responsibility agenda. Now, they have started to believe that such projects can be a source of competitive advantage. Various other factors are also pushing companies to act. Technological breakthroughs, and a customer base that is increasingly sympathetic to environmental concerns, pave the way for profitable innovation that capitalizes on the CE concept. If these reasons were not sufficient by themselves, stricter local and international environmental standards leave companies little option but to focus more on circular approaches.

Once companies do act, the CE provides many forms of competitive advantage. The CE model can reduce operating costs by introducing processes designed to optimize resource use and recover used materials. Companies can offer new products and service ideas that are more in line with changing customer demands. New business models and disruptive technologies can lead to innovation and sustained growth. The CE can reduce companies' environmental footprint through optimizing resource use. Finally, companies can sell to new customer segments and obtain new revenue streams from circular products and services.

#### COMPETITIVE ADVANTAGE FOR THE CHEMICALS INDUSTRY

Although advantages related to circular approaches can be sought by companies throughout the economy, CE may be particularly beneficial for the chemicals industry. A 2018 Strategy& Middle East poll of chemicals executives found that much of the chemicals industry grasps the potential competitive advantage from CE. Around half of industry representatives said that CE was a growing priority on the corporate agenda, while a similar percentage stated that circular projects will create value. One executive reflected a more general view by stating that "we are approaching CE with a profitability lens rather than as part of our CSR (corporate social responsibility) agenda." Furthermore, PwC's Chemical Trends 2019, part of PwC's 22nd Annual Global CEO Survey series, confirms that CEOs' sustainability concerns surpass those about economic conditions: 54 percent of chemicals company CEOs expect that resource and materials substitution will have a transformational impact on the way they do business, and 46 percent of them expect that the decarbonization of the economy will have a considerable impact. Indeed, such resource and materials substitution, and the decarbonization of the economy, are expected to have a pronounced influence on the industry.<sup>3</sup>

There are four priority areas in which the CE concept can have an immediate effect and create significant competitive advantage for chemicals companies – circular procurement, customer value chain integration, circular products, and end-product recycling (see *Exhibit 1*).

#### **Circular procurement**

Procurement has traditionally been a cost center. It has been a function focused on sourcing and purchasing goods and services required for a company's operations. However, companies paid little if any attention to the question of what happens to the product once it reaches the end of its life, which typifies the linear mind-set of "take, make, use, and waste."

Circular procurement, on the other hand, treats suppliers as partners in creating further value for products beyond the one-off transaction envisioned by the linear model. Instead of products being sold as items to be used and then discarded, in this circular approach procurement "dematerializes," turning products into services that can be leased, reused, sold back, or shared.

Circular procurement generates a greater incentive for energy efficiency, hence also cuts operating costs.

#### EXHIBIT 1



#### High-impact circular applications can be adopted in the chemicals industry

Source: Strategy&

Reinventing procurement in this way serves several purposes, all of which are consistent with the principles of the CE model. It extends the lifetime and performance of products through reuse, maintenance, and refurbishment. Circular procurement generates a greater incentive for energy efficiency, hence also cuts operating costs. It reduces damage to the environment because of its strong recycling component. An additional benefit for companies in such markets as the Gulf Cooperation Council (GCC)<sup>4</sup> is that circular procurement will encourage them to bolster local production through refurbishment and manufacturing activities (see "The pallet pooling and barrel reconditioning opportunity").

One example of the product-as-a-service approach is practiced by tire manufacturer Michelin. Customers can purchase the right to use tires rather than the actual products. Transportation companies can opt for a billing system that tracks the distances the tires have traveled, the weight the tires have moved, or how many times aircraft have landed using Michelin tires.<sup>5</sup>

### The pallet pooling and barrel reconditioning opportunity

Barrels and pallets are widely used in the chemicals industry for storage and distribution of goods. The shift to a circular procurement approach is creating new markets for barrel reconditioning and for pallet pooling.

The barrel reconditioning market enables chemicals companies to use reconditioned used barrels instead of new barrels. Chemicals companies can opt for either a "buy" or "lease" model depending on whether they sell their products with or without the barrel. Companies can recondition barrels multiple times and can achieve the same attributes as newly manufactured barrels. This is particularly true for plastic barrels, which are also increasing in demand due to their growing popularity in the petrochemical industry.

In Saudi Arabia, for instance, the market for barrel reconditioning remains underdeveloped. Used plastic barrels mostly end up in landfills. Metal barrels usually go to steel mills for low-value recycling. Reconditioning services are mainly offered by small companies with limited capacity. Yet there are significant cost-saving opportunities from using reconditioned barrels. In Saudi Arabia, the price of a reconditioned barrel is between 50 percent to 60 percent of that of a new metal barrel, and between 60 percent and 70 percent of the cost of a new plastic barrel (see *Exhibit 2*).

The same goes for pallets. In the traditional model, suppliers do not have the scale or the network to retrieve pallets from their customers, so the customers throw away the pallets. Instead, using a CE model, pallet pooling companies now offer rental or leasing services to chemicals companies, while managing pallet redistribution. Pooling companies act as intermediaries, owning a large number of high-guality pallets and managing their transfer between customers and suppliers. This model allows end-users to reduce costs. As GCC countries start individually to adopt standards for the quality, use, and disposal of pallets, the demand for pallet pooling should grow.

#### EXHIBIT 2

**Reconditioned barrels lead to cost savings on packaging costs** Savings per barrel (%)



<sup>1</sup> Based on an open-head 210 liter metal barrel of 0.9mm thickness. <sup>2</sup> Based on an open-head 210 liter plastic barrel. Source: Expert interviews; Strategy& analysis

#### **Customer value chain integration**

In the established way of operating, sales functions would sell products in bulk to customers through annual volume contracts. After this transaction, they would have no further involvement in how the purchaser used the chemical products. Under a CE approach, however, collaboration between the companies would continue after the sale, with supplier and customer interests aligned under long-term management contracts.

This approach leads to cost saving for the customer, and more efficient use of resources. Customers and chemicals companies agree on a fee for chemical management services, payable for each unit of product treated. For example, in chemical management for water treatment, the basis for payment is cubic meters of purified water.

There are other benefits too. This outsourced chemical management model helps the companies that buy chemicals to reduce health risks.<sup>6</sup> Similarly, these companies can improve environmental practices by achieving a lower concentration of polluting chemicals. Chemical suppliers are also better equipped to ensure safe transportation and storage of hazardous chemicals contributing to further health, environmental, and cost benefits.

PPG Industries, which supplies paints, coatings, and specialty materials, offers one example. Its value-added approach to automotive clients can be observed in its remodeled relationship with the car manufacturer Opel. Instead of an annual agreement stipulating the supply of paint from PPG Industries to Opel, there is a partnership based on a long-term service commitment. In this new arrangement, PPG Industries has a large team of specialist employees embedded at an Opel plant in Poland, which manages the painting process and handles the relationship with some 50 of Opel's second-tier paint suppliers. The result has been a 30 percent reduction in wastewater sludge measured by weight and 70 percent less chloride concentrated in wastewater. The accuracy of the painting process now consumes 30 percent fewer resources. There are monthly cost savings of €100,000 for Opel.<sup>7</sup> As such, chemicals companies participating in chemical management activities can unlock value for their customers and support them to operate in a more sustainable manner as they apply the CE principles. The chemicals companies themselves gain a substantial differentiation advantage, unlocking sustained revenue streams with long-term customers.

Chemicals companies can further integrate in their customers' value chains across industries, improving the economic and environmental performance of both chemicals companies and their customers (see *Exhibit 3*):

- Utilities and oil and gas companies can improve how they use chemicals in water and wastewater treatment, and how they cut down on waste.
- Food companies can spend less on the cleaning of pipes and vessels, decontaminating water, conveyor lubrication, and packaging.
- · Metal companies can save money on abrasives management.
- Manufacturing companies can upgrade the protection of appliances, enhance wastewater treatment, and reduce waste and the need for degreasing equipment.
- Automotive and aerospace manufacturers can optimize processes related to cleaning metal parts, painting, and coating.

Under a CE approach, collaboration between companies would continue after a sale, with supplier and customer interests aligned under long-term management contracts.

#### EXHIBIT 3

Energy, industry, food, transportation, and other sectors can benefit from chemical management services



Source: Strategy&

#### **Circular products**

In the linear model, products and chemicals tend to be disposable, energy-intensive, and non-recyclable. The CE model reverses that approach, creating products that are suitable for extended use and sharing, which are energy efficient during use and recyclable or biodegradable at the end of their life. This achieves the specific aims of the CE, increases product differentiation, responds to changing customer priorities, and encourages innovation and growth.

Chemicals companies have a major opportunity to create circular products that can offer vital solutions and strengthen several sectors. For example, chemicals companies could serve a developing aerospace and automotive industry by developing paints and coatings that protect from corrosion and that contribute to durability. The chemicals sector must respond to a general public that is becoming more conscious of environmental concerns. Such a dynamic could encourage chemicals companies to innovate, such as by introducing new recyclable or biodegradable products and packaging to replace existing ones.

Two such examples are Dow Chemical Company, which collaborated with a sustainable products manufacturer to produce recyclable dishwasher pod packaging; and Akzo Nobel, a manufacturer of paints and performance coatings, which created an additive for asphalt so that less energy is required to pave roads.

Similarly, DSM, a science-based company that promotes sustainable living, has developed high-performance plastics that help furniture companies to design longer-lasting products. The company also believes in using materials that lend themselves to recycling, and more generally to meeting consumers' demand for products that are better for the environment. Also, DSM has formed a joint venture with Niaga to make carpets that can be completely recycled because they avoid the use of latex as an adhesive. The process also uses almost no water and just 5 percent of the energy needed for standard carpet manufacturing.<sup>8</sup>

#### **End-product recycling**

Consumers and companies tend to get rid of products in their original state in landfills or other disposal sites. With a CE approach, however, companies put end-of-life products through mechanical or chemical recycling, recovering materials and components during the process. This prolongs the life of these components, potentially reduces negative environmental effects, and helps economies to become more self-sufficient. With a range of recycling opportunities at their fingertips, chemical companies need to start recognizing their pivotal role in enabling recycling and start acting on it. Recycling of basic chemicals, polymers, and metals are all within the chemical industry's know-how. Already some players are seeing the opportunity and taking the lead to gain competitive advantage and help solve environmental problems.

The chemicals company LyondellBasell Industries has established a joint venture with the resource management company Suez to operate a manufacturer for recycled plastics called Quality Circular Polymers. The plant, based in the Netherlands, can convert previously used plastics into 25,000 tons of polypropylene and high-density polyethylene each year, with the objective of reaching 100,000 tons per year by 2020. In this way, plastics can become more sustainable.<sup>9</sup>

Similarly, in 2016, the materials manufacturer Covestro opened a new factory in Germany that takes  $CO_2$  from a nearby power plant that burns coal. The Covestro plant uses the waste  $CO_2$  to manufacture essential material for use in mattress and upholstery foam.<sup>10</sup>

# The tire recycling opportunity

Tire recycling presents a promising opportunity for chemicals companies in the GCC region. Kuwait has the world's largest graveyard of used tires containing over 20 million tires. In response, the ministry of commerce and industry is encouraging tire recycling. Similarly, we estimate that Saudi Arabia scraps around 30 million tires annually, of which only a third are recycled — compared to an average 50 percent worldwide.<sup>11</sup> There are many ways to recycle tires. In Canada, Environmental Waste International extracts value through reverse polymerization — the direct application of high-energy microwaves which breaks down used tires into their chemical components: oil, gas, steel, and carbon black. The company is able to use the extracted gas to help generate electricity for this process. Environmental Waste International can sell the extracted steel to processing and recycling plants for use in new products. Similarly, Lehigh Technologies, which Michelin purchased in 2018, uses an innovative technique to recover material from used tires in order to produce new tires or other items.<sup>12</sup> Evonik Industries in Germany, the world's largest specialty chemicals company, now manufactures a process additive, Vestenamer, which turns waste tires into a rubber powder for use in asphalt mix to produce durable roads.<sup>13</sup> Chemicals companies in the GCC region could use the materials from tires as material for flooring, insulation, and soundproofing.

In line with Saudi Vision 2030's commitment to sustainability, the National Industrial Development and Logistics Program is actively promoting investment in the downstream rubber industry. Given the development of new roads and a growing transport sector, there is demand for tire recycling (see Exhibit 4). New roads mean more demand for asphalt. Rubber's share within asphalt is forecast by Strategy& Middle East at approximately 90,000 tons between 2018 and 2021 with a value of SAR 240 million (\$64 million). Reclaimed or recycled rubber can substitute for natural or synthetic rubber in the energy, water, and automotive sectors. Recycled tire powder can also serve in high-performance anti-corrosion coating and protection of pipelines. A factory pioneering tire recycling in Saudi Arabia can expect a feedstock of over 10 million scrap tires and an annual revenue of approximately SAR 30 million (\$8 million) per year.14

#### **EXHIBIT 4**

There is a rubber recycling opportunity in Saudi Arabia Tire recycling market size projections



Note: 2018 = actuals, 2021 = Strategy& forecasts. KTA = Kilotons per annum. Source: Strategy& analysis

#### ADOPTING A CIRCULAR STRATEGY

The first stage for chemicals companies in advancing the CE agenda is to set out clear business objectives and the rationale for a circular strategy, before deciding on a specific portfolio of circular initiatives. At this stage, it is essential that the leadership team fully supports the approach, and gets ready to champion the strategy throughout the organization.

The selection of circular initiatives should be based on an analysis of the organization's current situation. Chemicals companies would benefit from a visual representation of the flow of materials in their value chain, detailing circular flows within the organization and externally within the broader ecosystem. In this way, executives can see the various inputs and outputs, and pinpoint where the main value leakages are to be found.

Having analyzed these flows, the next practical step should be to identify pilot projects that are likely to produce impressive results in a relatively short time frame, thus building confidence and belief in the broader CE agenda throughout the organization.

A successful circular strategy requires more than formulating initiatives and then executing them efficiently. Practical implementation must be accompanied by far-reaching internal change (see *Exhibit 5*).

#### **EXHIBIT** 5

A circular transition relies on internal transformation starting with a solid strategy and objectives Governing a circular transition

	Create an implementation	Monitor and incentivize progress
Develop a circular strategy	team	Develop the culture
_	Allocate dedicated funding	
Formulate business objectives	Incorporate CE considerations	Structure the organization to promote circularity
<ul> <li>Foster leadership sponsorship and innovation</li> </ul>		Install a governance structure to promote circularity
Focus on pilot projects	close supply chain loops	Fully transform
-	Scale-up	
Initiate		

Source: Strategy&

The culture of the organization must encourage CE ways of thinking. The chief executive of Interface, which manufactures modular carpet tiles for commercial and residential applications, promotes this approach with the motto "There has to be a better way." This constantly reminds employees of the need to question current methods. The company aims to have no emissions by 2020.<sup>15</sup>

Conformity to circular practices should be a key factor in judging the success and applicability of relevant processes. The Dow Chemical Company developed an eco-efficiency compass that managers must consider during every decision. For example, they must assess whether offerings are being dematerialized into services, or whether they have increased energy efficiency.

It is vital that companies maintain discipline and focus throughout the transformation to a CE approach. For this to happen, it is essential that they measure progress rigorously, so that successes can be learned from and failing initiatives are quickly discarded before they become a drain on resources. Moreover, the requisite internal culture can be reinforced by taking circular initiatives into account when assessing individual performance. Philips has created a circular economy scorecard and incorporated sustainability targets into the performance evaluation of leaders.<sup>16</sup>

To expand the number of viable proposals for the company's CE strategy, it pays to reach beyond the confines of the organization. In addition to its own research and development department, the chemicals company BASF has strengthened relationships with a network of universities, research institutes, and industry partners to benefit from their knowledge.<sup>17</sup>

Links with government are also essential. Companies cannot go it alone if the surrounding environment does not facilitate the circular economy. They must engage with policymakers, regulators, and government agencies to support the establishment of an ecosystem of suppliers and customers for the circular chemicals industry. Such an ecosystem will require that companies put in place the right incentives and regulations.

Chemicals companies would benefit from a visual representation of the flow of materials in their value chain, detailing circular flows within the organization and externally within the broader ecosystem.

#### CONCLUSION

The CE is about more than reducing the adverse impact on the environment or enhancing corporate reputations. It is about using sustainable methods that are consistent with competitive advantage. Chemicals companies can exploit wholly new avenues for revenue generation by offering chemical management expertise or products as a service, or by developing high-quality durable or recycled products. These changes go beyond products and processes; they require a change in mind-set and corporate culture, along with the building of relationships with partners and governments. Successful pilot schemes and then wider implementation of circular initiatives should allow first movers to secure an advantage over slower-moving rivals.

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