Recession prompts shift in chemical strategies

Downturn triggers strategy shift

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The downturn is motivating companies to redesign their innovation pipelines to take advantage of major trends, such as the drive to cut carbon emissions

AFTER A tough 2009, the chemical industry is looking for new ways to grow. In particular, companies are seeking to capitalize on long-term societal "megatrends," including renewable energy and the need for improved food and water supplies.

Increasingly, firms are realigning their research and development (R&D) capabilities with these trends. US major **DuPont** allocated more than three quarters of last year's $1.4bn R&D budget to three megatrends: increasing food production, decreasing dependency on fossil fuels and protecting people, assets and the environment.

The global economic recession is marking a shift in companies' long-term strategies, said Paul Hodges, chairman of consultancy **International eChem**. There is increased pressure on the world's resources, and this is prompting firms to identify growth opportunities in areas such as energy, food and water, he said.

"Downturns of this scale are generally periods of transition," Hodges remarked. As we emerge from the downturn, in three or four years, companies will be focusing more on low carbon technologies, he said. "Sustainability is going to be fantastically important. It hasn't been important until now because we've always had a buffer stock of spare oil production. Today, supply and demand are closely balanced."

Hodges points to two other periods of transition during his career in the chemical sector. The first, in the early '80s, was the move from national to global businesses. The second, in the early '90s, involved the increased focus on consumption-related products, resulting in the development of new products for the housing, automotive and electronics markets.

It is important "not to waste a good crisis," **DuPont** CEO Ellen Kullman stated last year. DuPont has evolved through three transformations during its 207 years, emerging stronger after each economic downturn, she told delegates at the Wharton Leadership Conference in Philadelphia, Pennsylvania, US, in June. "We must be prepared for the world the way it was before the recession, but prepare to succeed in the different world that we'll encounter when the recovery eventually comes," she added.

The chemical industry has been adept at developing products aimed at improving efficiencies and has the skills required to optimize supply chains and adapt to new feedstocks, said Hodges.

"It started off using coal as a feedstock, then moved to oil. A move to bio-based products should be no great surprise and should not cause great difficulties," he explained

The current transition involves "doing more with less," continued Hodges. Increased food production, for example, will require an analysis of the supply chain, with the emphasis moving "away from obesity and towards a more responsible outlook."

A **study conducted by research group McKinsey**, commissioned by the International Council of Chemical Associations (ICCA), shows the contribution that products developed by the chemical industry are making to cut carbon emissions. For every unit of carbon dioxide or equivalent greenhouse gas (CO2e) emitted in chemical industry production processes, the resulting products save two to three units of CO2e emissions, the study says. In other words, McKinsey calculates that in 2005, without the innovative products of the chemical industry, there would have been 8-11% more emissions of CO2e. Products that achieve these carbon savings include building insulation materials, lighting, marine coatings, automotive plastics and low-temperature detergents.

Cutting long-term global greenhouse gas emissions "will require greater use of innovative, energy-saving chemical products and technologies," said the ICCA's president, Christian Jourquin.

Increasing urbanization is driving many of the megatrends, says Peter Cartwright, global executive director for environment, health and safety (EHS) at US-based silicon technology company **Dow Corning**. Quite soon, 50% of the global population is expected to be in big cities, he says. "Big towns are going to need secure energy supplies and clean water, and will have to deal with climate change, too."

Dow Corning says much of its innovation efforts will be linked to trends involving green energy, clean and accessible water and a sustainable urban environment. "Our solar silicon is a key provider of low carbon and renewable energy," said Cartwright.

Other firms designing their innovation pipelines around megatrends include **Bayer**, **Dow Chemical** and **Evonik** Industries.

German chemical and pharmaceutical major Bayer is focusing on health care, nutrition and climate protection, with an overall commitment to sustainability. "We are making specific contributions to balance commercial success with the protection of the environment and the needs of society," states chairman Werner Wenning.

US-based **Dow Chemical** has said that it is focusing its organic growth on four global megatrends: energy, transportation and infrastructure; health and nutrition; and consumerism. In transportation, for example, the company has introduced new plastics and bonding solutions to make cars tougher and lighter, increasing efficiency and safety.

German specialties producer Evonik is developing new business activities around megatrends including: energy efficiency; globalization and demographic change; and health and wellness.

MEGATREND: RENEWABLES

The chemical industry has played a vital role in the development of renewable energy technologies, from photovoltaics for solar panels to composite materials for wind turbine blades.

About 80% of the energy consumed globally today relies on fossil fuels and nonrenewable energy resources, says Peter Cartwright, Dow Corning's global executive director for environment, health and safety (EHS). "As those resources are depleted and climate change regulations come in, the market for renewable energy is enormous." Solar energy, for example, accounts for just over 1% of today's energy consumption, he notes.

Global petrochemicals firm **ExxonMobil** estimates that wind, solar and biofuels will grow sharply through 2030, at an average of nearly 10% per year. However, they are starting from a small base which means their contribution by 2030 will remain relatively small, perhaps 2.5% of total energy, the US energy group said in its **"Outlook for energy: a view to 2030"** report.

Concerns about climate change and future supplies of petrochemical raw materials are also helping to speed up the development of new bio-based materials. Global demand for bioplastics - defined as bio-based or biodegradable or both - is expected to rise fourfold to 900,000 tonnes, valued at $2.6bn, in 2013, according to market research company **Freedonia**.

SOLAR ENERGY

Solar silicon producers are expanding their production capacities to meet rising demand for photovoltaic panels. Global polycrystalline silicon production is expected to reach 150,000-180,000 tonnes/year in 2012 compared with approximately 80,000 tonnes/year in 2009, according to **Wacker Chemie**.

The German specialty chemical producer plans to build a plant in Cleveland, Tennessee, US, and is expanding its German production. In Germany, the company has expanded its production capacity in Burghausen by 10,000 tonne/year plant to 25,000 tonnes/year and intends to build additional capacity in Nunchritz, said spokesman Christof Bachmair. The 10,000 tonne/year Nunchritz plant is scheduled to start up in 2011.

Dow Corning subsidiary Hemlock Semiconductor, the global leader in solar silicon production, also plans to build a plant in Tennessee. Located in Clarksville, the project is expected to require a $1.2bn investment. Hemlock is also expanding its production capacity in Hemlock, Michigan, US, to approximately 36,000 tonnes/year.

MEGATREND: FOOD

The United Nations is predicting that agricultural output will need to double and food production will need to increase by 70% by 2050 to adequately feed the expected global population of 9bn people.

Sustainable, increased productivity will need to occur as available arable land and resources shift, remain unchanged or, in some areas, decrease, says DuPont. The company has identified increasing food production as a key megatrend, and allocated about half of its $1.4bn R&D budget to this area in 2009.

Innovations in biotechnology can help address the growing global demand for food and fiber and reduce dependence on fossil fuels, DuPont says. Biotechnology will play a critical role in doubling agricultural output by 2050, when the world's population is expected to reach 9bn people, executive vice president James Borel told delegates at the BioJapan World Business Forum in October.

Other areas of focus at DuPont include advancing the nutritional content derived from crops, supplying innovative packaging to preserve food quality and developing efficient quality-testing systems to ensure safe food supply.

DuPont's seed business, Pioneer Hi-Bred, has been working with small-scale farmers to help improve productivity, for example via the West African Seed Alliance (WASA).

The Alliance is a partnership between organizations including aid agencies, seed companies, public and private sector plant breeders and governments.

"To sustainably increase small-scale farmer productivity, we must start with the context of the local agriculture practices, infrastructure, culture and government policies," said DuPont vice president and Pioneer Hi-Bred chairman Dean Oestreich.

Local public-private collaborations can help to increase local agricultural productivity and, ultimately, global food security, said Oestreich, who retired at the end of last year.

"By bringing additional focus to the food security and the potential of collaborative, integrated approaches, we can better feed the hungry and contribute to stability and security around the globe."

MEGATREND: ENERGY EFFICIENCY

Energy efficiency is critical in meeting growing energy needs, asserts Rich Kruger, president of ExxonMobil Production. The US energy group estimates that energy demand will be about 35% higher in 2030 than in 2005 as economies grow and living standards improve worldwide. "We estimate that by 2030, the amount of energy saved through efficiency gains will be equivalent to approximately 145m barrels of oil a day, or about twice the amount of new energy from all sources," Kruger says.

Products helping to cut energy consumption include Evonik's flexible ceramic membrane technology, designed to make large-scale lithium-ion batteries safer and more efficient. Li-Tec, a joint venture between Evonik and Daimler, uses the technology to produce large-scale lithium-ion battery cells for automotive and industrial applications in Kamenz, Germany.

There is a wide range of high-tech insulation products for cutting energy losses from buildings. Germany-based Wacker Chemie supplies dispersible polymer powders to the construction sector for use in exterior insulation systems. The powders are added to mortars to protect the outside of the insulation systems from weathering and enable a solid bonding between the insulation system and the building walls.

MEGATREND: WATER

The World Economic Forum has warned that many places in the world are on the verge of "water bankruptcy."

About one in three people in the world are affected by water scarcity and the situation is expected to worsen, says Peter Cartwright, Dow Corning's global executive director for environment, health and safety (EHS). "The population is growing. Unless something is done about this, in the next 20-25 years or so that one third could increase to a half."

Dow Corning is developing products that can contribute to water conservation. In the textiles sector, the company has created a silicon-based softening technology that allows a reduction in the amount of water and energy used to process and soften denim. The technology can save about 4 gallons (15 liters) of water for every pair of jeans made, potentially saving 7.5bn gals/year of water, based on 1.9bn pairs of jeans sold worldwide, the company estimates.

Dow Corning is also marketing powdered shampoo, which requires a fraction of the water normally needed for shampooing, and has a rubber technology used in water irrigation that can cut water usage by 40%, Cartwright says.

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