

Helping protect tomorrow, today

ExxonMobil Chemical Company's sustainability efforts are found on the road and in the stores.

- ▶ Imagine an automotive tire made with a new lightweight impermeable material that could potentially help save more than a billion gallons of fuel every year, the equivalent of taking a million cars off U.S. roads.
- ▶ Imagine a new lighter, thinner plastic used to shrink-wrap shipping pallets, cover greenhouses and produce heavy-duty bags. And imagine manufacturing it using fewer resources than existing materials and saving enough energy to power more than 900,000 U.S. homes.
- ▶ Imagine a new film technology for lithium-ion batteries that could help usher in a new generation of hybrid and electric vehicles.

Chemicals make all this happen. They enable many forms of energy savings and foster a higher standard of living. Because every society wants the benefits that chemical products can deliver, demand is increasing, and chemical companies understand they have a responsibility to present and future generations.

ExxonMobil Chemical is committed to the principles of sustainable development, which is defined as meeting the needs of the present without compromising the ability of future generations to meet their own needs. It balances economic growth, social development and environmental protection. That balance is reflected in how ExxonMobil Chemical operates its business and promotes its products.

Key to turning these principles

into action is the company's application of efficiency improvements and technology advances throughout its operations and product offerings. For example, last year ExxonMobil spent more than \$1 billion in research, development and technology applications to improve manufacturing processes, lower energy use and emissions, increase product yields, and develop new and better products for customers.

"The demand for chemicals is expected to continue to grow," says Bob Davis, vice president of technology for ExxonMobil Chemical. "As demand grows, we keep improving the technology to process different feedstocks, to reduce energy consumption and emissions, and to increase product output."

During the last five years, the energy consumed per unit of output across ExxonMobil Chemical has decreased by approximately 10 percent.

Sustainability from greenhouses to stores

"Consumers are demanding products packaged in a way that is environmentally responsible without sacrificing strength and durability," says Dave McConville, polyethylene global market development manager. "ExxonMobil Chemical provides the raw materials to meet this demand with innovative products and technologies that are leading to thinner films for everything from food packaging to greenhouse covers to heavy-duty fertilizer bags."



A typical light vehicle (above) contains more than \$2,000 worth of chemical products that help improve fuel economy and performance.

ExxonMobil Chemical provides the raw materials that make food packaging (right, below) strong and durable while sealing in freshness for a wide range of everyday products.





Tom Upton, global manager, product research, studies a polymer sample in his Baytown, Texas, laboratory.

ExxonMobil Chemical's new *Enable Mpe* products are recyclable and help make strong but significantly thinner films that use fewer raw materials and less energy than conventional films. Energy efficiencies are seen across the entire life cycle, from manufacturing, to product transportation, to prolonged shelf life and finally to recycle and disposal.

"These new products reduce the amount of film needed by about 20 percent, improve film performance and, at the same time, reduce energy consumption because they can be processed at lower temperatures," says Margaret Mattix, global marketing vice president. "In fact, these products can have significant greenhouse-gas reductions, equivalent to saving enough energy to power 900,000 homes."

ExxonMobil products are also used to keep people warm. Many believe that cotton is a better choice for fabric because it's a natural fiber and renewable; however, cotton requires large amounts of water compared to other crops such as rice, wheat and corn. Cotton's supply growth will be challenged by competition for land and water as world population increases and economies continue to develop.

Polyester production uses only about 0.1 percent of the water used to grow cotton. Not only is it more sustainable, but it is preferred by the consumer. "Polyester has become a popular choice over cotton because of its lower cost and superior performance," says T.J. Wojnar, senior vice president for Basic Chemicals, Intermediates and Synthetics. "The developing world – notably China, where

demand for consumer goods is growing – has shown a clear preference for clothing made from polyester, thanks to its lower cost and wide range of product choices."

ExxonMobil Chemical has recently developed a proprietary catalyst to improve the overall manufacturing process for polyester, making it more efficient and cost effective. The innovation, now being licensed by ExxonMobil under the name *PxMax*, significantly lowers the cost of producing xylene, the primary ingredient to manufacture polyester. The process also generates less waste and requires less energy than previous methods, which, in turn, lowers CO₂ emissions from the eight ExxonMobil and licensee plants where *PxMax* technology is being used.

From the auto world

One of the company's most exciting new technologies is in the design of the battery separator film within lithium-ion batteries for hybrid and electric vehicles. "The challenge given to us by our customers was clear – enhance battery performance by improving safety, reliability and power density," says Jim Harris, senior vice president of Polymers. "We responded with an innovative polymer film that combines our advanced manufacturing process with our proprietary polymer technology." Powering hybrid and electric vehicles with lithium-ion batteries will improve energy efficiency and reduce emissions. "We have committed some of our brightest minds to help make the next generation of lower-emission, fuel-efficient vehicles a reality," says Harris.

Another innovation for

ExxonMobil Chemical is a new blend of synthetic rubber and nylon that enables tires to retain air pressure longer. This superior air retention technology makes tire innerliners as thin and light as a plastic bag – about 80 percent lighter than traditional innerliners but with superior air retention.

According to the U.S. Department of Energy, American drivers waste more than a billion gallons of gasoline every year just from underinflated tires. “This breakthrough not only means that tires stay properly inflated longer but also makes them lighter, which has significant potential to reduce vehicle fuel use,” Harris says.

The average light vehicle produced in the United States con-

tains more than \$2,000 worth of chemical products. A large and growing portion of that chemistry is in plastic and composite components, mostly replacing steel. ExxonMobil Chemical works closely with leading automakers and suppliers worldwide to help reduce the weight of today’s automobiles. This improves fuel efficiency, and helps lower greenhouse-gas emissions and manufacturing costs.

“Today’s plastics have reduced the weight of the average automobile by about 10 percent, and the Department of Energy estimates this weight reduction leads to about a 6.6 percent improvement in fuel economy,” says Harris. “The lightweighting



Andy Winesett, senior physicist, tests the tensile strength of a polymer sample. The rate at which it stretches and the force required to break it are important measures of polymer performance.

Product life cycles

In its chemical operations, ExxonMobil applies a science-based approach to its sustainability efforts. One tool the company promotes is called Life Cycle Assessment. As opposed to looking at one aspect of a chemical’s use, this method follows a product from raw material extraction and manufacturing through distribution, recycling and disposal. It measures the total energy and other resources consumed by a product, while analyzing the emissions and waste generated.

“The chemicals business is all about transforming hydrocarbon molecules to improve the quality of our lives,” says Steve Pryor, president of ExxonMobil Chemical Company. “The chemical industry makes everyday life better by providing raw materials for more than 70,000 products that help keep us safe, healthy, warm, cool, on time, in motion and connected.”

Pryor says, “The value to society is measured not only by the performance of our products, but also by the environmental footprint associated with their manufacture and use. At ExxonMobil, we are committed to reducing our environmental footprint through increasing our own energy efficiency, advancing current technologies and developing breakthrough technologies. We also help manufacture many products that play a fundamental role in ensuring that society is more energy-efficient and environmentally responsible.”

features of our products enable auto manufacturers to improve a car’s performance while maintaining affordability and reducing fuel consumption.”

Sustainability from within

Energy efficiency, a key pillar of the Chemical Company’s sustainability efforts, is core to the company’s operations. For example, the company’s cogeneration plants, operating at more than 30 ExxonMobil sites throughout the world, generate enough energy to power more than 2 million households and provide a significant greenhouse-gas reduction.

Another example of efficiency contribution can be found at ExxonMobil Chemical’s Baton Rouge plant. More than 60 years ago, the company began operating the world’s first steam cracker

there. Many regard steam cracking as the engine of most chemical complexes. Today, that same unit consumes less than half the energy per ton of olefin produced than it did when it started up in 1941.

“Our product innovations and internal efficiencies, applied throughout the company, lead to better products, less energy usage and reduced environmental impact,” says ExxonMobil Chemical Company President Steve Pryor. “These efforts demonstrate our ability to not only provide better products for our customers, but also enable ExxonMobil to operate more efficiently over the long term.”

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