

Toray Profile: Overview and Philosophy

We are involved in global manufacturing, marketing and sales in three business categories covering six segments: Foundation Businesses (Fibers & Textiles, Plastics & Chemicals), Strategically Expanding Businesses (IT-related Products, Carbon Fiber Composite Materials) and Intensively Developing and Expanding Businesses (Environment & Engineering, Life Science).

Our products are found in many everyday items, including apparel, interior products, home appliances and electronic products, as well as in materials and parts for automobiles and aircraft, IT products and water treatment facilities.

Today, we are active in 23 countries and regions. To successfully conduct our day-to-day operations, we rely on the strong chemistry that we have created with our stakeholders, including Toray Group employees, our customers and business partners, the people of the countries and regions in which we are active, our stockholders and people working for financial institutions.

“Contributing to society through the creation of new value with innovative ideas, technologies and products”—this is Toray Group’s corporate philosophy. We will continue to put this philosophy into practice by creating new value in the spirit of respect for all of our stakeholders.

Corporate Philosophy

Contributing to society through the creation of new value with innovative ideas, technologies and products

Corporate Missions

For our customers To provide new value to our customers through high-quality products and superior services

For our employees To provide our employees with opportunities for self development in a challenging environment

For our stockholders To provide our stockholders with dependable and trustworthy management

For society To establish ties and develop mutual trust as a responsible corporate citizen

Imagine it...

CAUTIONARY STATEMENT WITH RESPECT TO FORWARD-LOOKING STATEMENTS

Descriptions of predicted business results, projections and business plans contained in this annual report are based on forecasts and assumptions regarding the future business environment made at the present time. This annual report is not a guarantee of the Company’s future business performance.



We believe that Toray can help to improve the quality of life for people everywhere by creating value in the form of advanced materials.

Materials have the power to transform society. For example, the strength and lightness of carbon fiber have dramatically reduced the energy consumed by passenger jets. As a result, we now live in an era in which we enjoy the freedom to travel the world on highly efficient medium-sized aircraft. Our advanced functional synthetic fibers are used to produce light yet warm innerwear.

However, the creation of new materials is never an easy task. All of the various high-value-added materials that Toray has brought to the world are the results of a relentless commitment to research and technology development. New materials developed by Toray have started to transform many aspects of society.

walk together

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MESSAGE



Reducing weight

Weight reduction has always been a priority for designers of all kinds of vehicles. Whether in automobiles, aircraft or space rockets, less weight means lower fuel consumption and greater range. Our continual quest for lighter materials has led from iron to alloys of aluminum, titanium and other metals, and to plastics and other substances.

The most promising solution to our need for lighter materials is carbon fiber. With only one-quarter the weight of steel, carbon fiber is 10 times stronger. This combination of strength and lightness has resulted in the use of carbon fiber in a growing range of aircraft parts. Carbon fiber composite materials make up 50% by weight of the fuselage of the Boeing 787 passenger jet, which went into service in 2011 and has started to cross the world's skies.

Carbon fiber—a light, strong body material

Although carbon fiber is attracting renewed interest today, its industrial development began around 50 years ago. Since then, many companies have started to develop commercial applications to capture the many advantages of carbon fiber, including **its lightness and strength and the fact it never rusts**. However, most of these companies have since abandoned carbon fiber because of the many years required to recover investments, and because of the difficulty of producing high-quality fibers reliably.

Toray believes in the future potential of carbon fiber and has worked relentlessly to create markets and develop technology. We anticipated the emergence of major new markets based on carbon fiber applications in such fields as aerospace, sports and general industry. We have since worked to harness the growth of these markets by building **global operations based on production facilities in Japan, North America and France**. With a market share in excess of 30%, Toray is today the **world's top* manufacturer of carbon fiber**.

*By sales volume, based on Toray estimates

TEEWAVE® AR1—Concept Electric Vehicle

Can carbon fiber composite materials revolutionize the automobile? Toray responded to this question by unveiling the electric TEEWAVE® AR1 concept vehicle at the 2011 Tokyo Motor Show. The TEEWAVE® AR1 was designed by Gordon Murray, former chief designer for the McLaren Formula 1 team. By using carbon fiber composite materials, the body weight was reduced to just 846 kg. Toray materials were also used in the battery, motor and other parts to create a concept vehicle that would embody Toray's total capabilities.

...in Action



Boeing 787

Toray carbon fiber composite materials make up 50% by weight of key components of the Boeing 787, including its wings and fuselage. The result is dramatic reduction in weight. Fuel savings and reductions in carbon dioxide emissions resulting from reduced weight are not the only benefits to result from the extensive use of carbon fiber in this aircraft. Because the fuselage is stronger, it has also been possible to increase the size of the windows. In addition, the fact that carbon fiber never rusts means that the humidity level in the cabin can be maintained at a more comfortable level. By using carbon fiber, Boeing has been able to create the most comfortable passenger aircraft ever produced.

MESSAGE



Functional apparel

Natural fibers such as cotton, wool, silk and flax have been used in apparel since ancient times. Each of these materials has been used for different purposes, based not only on fashion perspectives but also on specific advantages, such as warmth, moisture resistance, the capacity to absorb perspiration and ease of drying.

With the emergence of synthetic fibers, it became possible to use chemistry to create fibers with the same functions as these natural materials. The ability to supply synthetic fibers cheaply and reliably has made a major contribution to the world of apparel. Synthetic fibers have continued to evolve, and today they offer increasingly diverse and sophisticated functions to enhance wearer comfort.

There are thin, light synthetic textiles that not only conserve heat produced by the wearer's body, but also generate heat when worn and have excellent perspiration absorption characteristics. Products such as these are changing our perceptions of apparel and transforming our lifestyles.



HEATTECH—amazing apparel that creates its own warmth

Many people became aware of the potential of functional apparel when they first encountered HEATTECH. Developed jointly by Toray and UNIQLO, it offers a range of functions that include not only heat retention, perspiration absorption and rapid drying, but also the ability to create heat from the wearer's perspiration.

HEATTECH first appeared in 2003. Initially, it was made by combining acrylic fibers, which have excellent heat retention properties, with rayon, which can generate warmth from water vapor. In the following year, polyester fiber was added to provide perspiration absorption and rapid drying characteristics. In 2007, polyurethane fiber was added to give the material stretchability. In that year, consumers bought 20 million items made from HEATTECH, a combination of four different fibers. The product has continued to evolve, and sales volumes have risen to 50 million in 2009 and **100 million in 2011.**

In 2006, Toray and UNIQLO formed a strategic partnership, under which they have since created a total industry, including planning, development, production and distribution at all stages from raw materials to finished products. Under a subsequent strategic partnership agreement, signed in 2011, the two companies aim to **achieve cumulative transactions amounting to ¥400 billion by 2015.**

Under this strategic partnership, Toray and UNIQLO have created many hit products, including not only HEATTECH, but also Silky Dry and Ultra Light Down.



MESSAGE



Expanding “New energy”

Electric power is an essential source of energy for society, industry and individuals. To ensure the reliable and sustainable supply of electric power in the future, we will need to make increased use of renewable energy, including solar power, wind power and fuel cells, which have high energy efficiency and qualify as low-emission devices. This will require the development of revolutionary devices and materials that can be used to create a new generation of practical and efficient power generation systems under the heading of “New energy.”

There is also renewed awareness of the importance of storage batteries in ensuring the efficient use of valuable electric power. Traditionally batteries were used mainly to power electronic devices and other small items, or in auxiliary roles, such as power for motor vehicle starter motors. In the future they will be the prime sources of power for electric vehicles. Storage batteries are also expected to be used increasingly to stabilize the supply of electric power from sources that are affected by weather conditions by storing power when demand is low and supplying it at peak times.



...in Progress

Advanced materials the key to a new future for batteries

The core technologies for Toray's research and development efforts in the field of advanced materials are organic synthetic chemistry, polymer chemistry, biotechnology and nanotechnology. Toray has identified a number of product categories as offering opportunities for the application of its technology development capabilities in the next-generation energy technology. We are focusing in particular on battery materials, solar cells, lithium-ion batteries and fuel cells.

By 2020, the solar cell market is expected to reach ¥12 trillion. Toray supplies a range of advanced functional materials, including polyester film for use as back sheets. The growing popularity of hybrid and electric vehicles is expected to boost the market for lithium-ion batteries to **over ¥5 trillion by 2020.** Toray Tonen Specialty Separator Godo Kaisha, which manufactures and sells battery separator film, was made a wholly owned subsidiary, and Toray Battery Separator Film Co., Ltd. was established. Toray is also developing fuel cell materials. By offering a wide range of materials, **Toray aims to become the world's leading integrated manufacturer of battery materials.**

MESSAGE



New advances in medical care

New advances in medical technology not only help to open up new fields and provide cures for previously incurable diseases, but also contribute to improvements in the safety and quality of medicine, including the reduction of the burden on patients. For example, the evolution of dialyzers for use in hemodialysis is providing improvements in the effectiveness of this treatment.

One of the new surgical techniques that have helped to reduce the impact on patients in recent years is catheter surgery. New treatment methods result both from advances in medical technology and also from the development and improvement of new products.

Medical science will continue to move forward in directions that help to reduce the burden on patients.

Advanced hollow-fiber membrane purifies blood

Dialyzer-TORAYLIGHT™ NV

Hemodialysis involves the external circulation of the blood through dialyzers. During this process, hollow-fiber membranes are used to purify the blood by removing waste matter and excess water. **Toray first began to sell hollow-fiber membrane dialyzers in 1977.** Since then we have used our unique technology to contribute to the improvement of medical care. In 2011, we commenced sales of the TORAYLIGHT™ NV, which offers improvements in functionality. Platelet adhesion to the surface of the hollow-fiber membranes has been reduced by **a factor of 100** compared with earlier Toray products, allowing the TORAYLIGHT™ NV to function throughout the treatment.

We have commenced construction of a dialyzer factory in Jimo City, Qingdao, China. This new facility will allow us to keep pace with expanding demand for dialyzers in Asian emerging countries. Products from the new plant, which will **double Toray Group's production capacity** for the TORAY-LIGHT™ series, will go on sale in 2014.

Embolic protection filters

A problem that has affected medical care for many years is the tendency of platelets to cease functioning properly and solidify within the blood. In addition, when the blood flow is restricted platelets and proteins in the blood can adhere or become activated as blood clots. If blood clots pass through the blood vessels and enter the brain or lungs, they can cause brain infarctions or pulmonary thromboembolism.

Embolic protection filters are used to prevent this risk. However, they become clogged by blood clots in a relatively short time. In March 2012, Toray released filters that can be left in place for **over 20-times** longer than earlier products, developed by successfully using its original polymer design technology. Toray is continuing to use this technology to develop embolic protection filters and will explore other applications, including medical devices for use in other areas of the cardiovascular field.

...in Support



MESSAGE



Securing water resources

The Earth is sometimes described as a “water planet.” However, 97.5% of the Earth’s water is seawater, and freshwater resources make up only 2.5% of the total. The amount of freshwater available for use by human beings for daily life and industrial activities is even smaller, at just 0.01% of the total. Freshwater is a precious resource, and yet the amount available continues to shrink due to climate change and environmental damage. At the same time, demand for water continues to expand because of world population growth and economic development in emerging countries. Water shortages have become a serious social problem in many parts of the world. Efforts are now being made to mitigate water shortages through water conservation, environmental preservation and other measures. However, seawater desalination is increasingly seen as a more effective solution in the many regions that are naturally short of water resources. The key product in a desalination plant is the reverse osmosis membrane.



...in Conception

Reverse osmosis membranes—turning seawater into drinking water

Desalination plants traditionally used evaporation to turn seawater into drinking water. Today, however, systems based on water treatment membranes are being used increasingly because of advantages that include lower energy consumption and costs. Toray developed reverse osmosis (RO) membranes that are ideal for desalination by improving related technologies, including nanotechnology-based polymer separation membrane technology. As a result, Toray has gained **a 30%*1 share of the world market.**

In addition to RO membranes, there are three other types of membranes that differ according to their water permeability and the substances that they can remove. Toray enjoys an important advantage because it develops and manufactures all types of these membranes. Because it can offer the most suitable membranes for any application, Toray has established a substantial track record, not only in the area of seawater desalination, but also in other fields, such as wastewater reuse.

Toray has gained an excellent reputation for water treatment membrane technology. In recent years we have achieved **considerable success in the control of microscopic structures**, as evidenced by **our ability to create holes with sub-nanometer precision.** We have used this technology to produce RO membranes with the world best boron-removal performance*2 and the capability to produce large amounts of drinking water. Toray membranes have been used in major projects, including the largest desalination plants in Africa (Algeria) and Asia (Singapore). They are also being used increasingly in the rapidly expanding Chinese market. RO membranes already shipped by Toray produce **sufficient drinking water for 98 million people around the world.**

*1 Estimated by Toray on the basis of shipment volumes

*2 Boron levels in drinking water are regulated because of its harmful effects when ingested, including toxic effects on the reproductive system.