



Global and China Carbon Fiber Industry Report, 2009-2010

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2. Overview of Global Carbon Fiber Market

2.1 Current Development

The mass production of carbon fiber originated from Japan. Japan's Toray began the industrial production of PAN carbon fibers in 1962, and Kureha Chemical put pitch-based carbon fiber into production in 1970. With the cooperation and competition of the U.S. and Japanese enterprises in raw material supply as well as the production, supply and marketing of carbon fibers, the carbon fiber industry has grown up rapidly. In 2009, the global carbon fiber capacity reached about ** tons. At present, carbon fiber and its composite materials, by virtue of their excellent performance, have been widely applied to aerospace, sports & leisure, wind power and other fields, and become important strategic organic materials pursued worldwide. The global carbon fiber industry has entered an initial stage of mature development.

However, as carbon fibers are new materials for both civil and military uses, and are technology-intensive and politically sensitive key materials. In 1990s, Coordinating Committee for Multilateral Export Controls (CoCom) led by the U.S. imposed an embargo policy on socialist countries. Although CoCom was dissolved in March 1994, it had seriously restricted the development of carbon fiber industry in socialist countries including China.

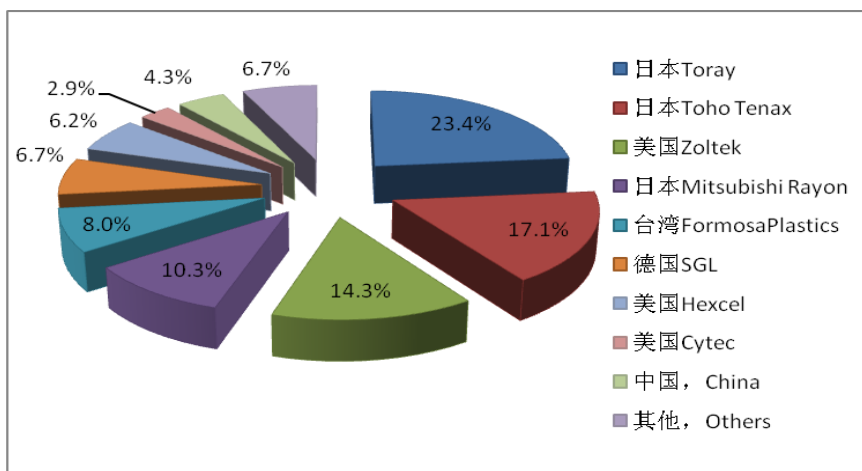
At present, the world's carbon fiber technology and production are still controlled by the U.S. and Japanese enterprises. Japan's Toray, Toho and Mitsubishi Rayon as well as the U.S. Zoltek account for about 65.1% of the global carbon fiber capacity. From the perspective of regional distribution, there are less than 20 countries and regions capable of carrying out industrial production of carbon fibers, featuring high regional concentration. However, with the loosening of the global carbon fiber technology introduction market, the relative saturation of the markets of developed countries like Japan and the U.S., and the breakthroughs in key carbon fiber technologies made by other developing countries, the monopoly in the global carbon fiber industry is gradually weakened, and the regional concentration of production capacity is gradually declining.

2.2 Competition Pattern

As carbon fiber production process is complicated and requires high technology, and the introduction of technologies and equipment has been restricted by political factors, the global carbon fiber production has been rather concentrated in the past two decades. There are less than a dozen of large-scale enterprises, including Japanese Toray, Toho Tenax, Mitsubishi Rayon, U.S. Cytec, Hexcel, Zoltek, Amoco, German SGL, South Korean Taekwang Industrial Co., Ltd. and Taiwanese Formosa Plastics.

According to the capacity of carbon fiber tow, Japanese Toray, Toho Tenax, U.S. Zoltek, and Japanese Mitsubishi Rayon are the world's top four producers of carbon fibers, accounting for 23.4%, 17.1%, 14.3% and 10.3% respectively of the global capacity in 2009.

Capacity Percentage of Carbon Fiber Manufacturers Worldwide, 2009 (Based on the Capacity of Carbon Fiber Tow)



Source: ResearchInChina

Furthermore, the global production of carbon fibers mainly focuses on the production of PAN-based carbon fibers. In 2009, PAN-based carbon fiber accounted for about ** of the global carbon fiber capacity. Japanese Toray, Toho Tenax and Mitsubishi Rayon are mainly engaged in the production of small-tow ($\leq 24K$) PAN-based carbon fibers and accounted for ** of the global small tow capacity in 2009, while the U.S. Zoltek is mainly engaged in the production of large-tow ($> 24K$) PAN-based carbon fibers and accounted for ** of the global large tow capacity in 2009.

Capacity Percentage of Global Small-tow ($\leq 24K$) PAN-based Carbon Fiber Manufacturers, 2009



Source: Hi-Tech Fiber & Application, ResearchInChina

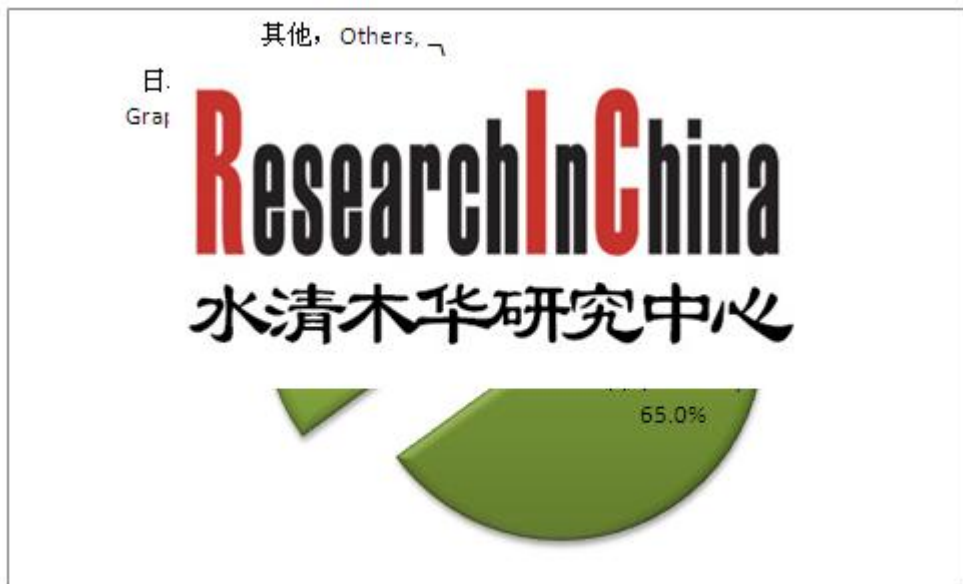
Capacity Percentage of Global Large-tow ($> 24K$) PAN-based Carbon Fiber Manufacturers, 2009



Source: Hi-Tech Fiber & Application, ResearchInChina

In addition, the pitch-based carbon fiber production capacity and output are limited. In 2009, pitch-based carbon fiber only accounted for about ** of the global carbon fiber capacity in 2009. Japanese Kureha accounted for ** of the global pitch-based carbon fiber market with an annual capacity of ** tons in the year, followed by the U.S. Cytec with a 17.9% share in the pitch-based carbon fiber market of the year.

Capacity Percentage of Global Pitch-based Carbon Fiber, 2009



Source: ResearchInChina

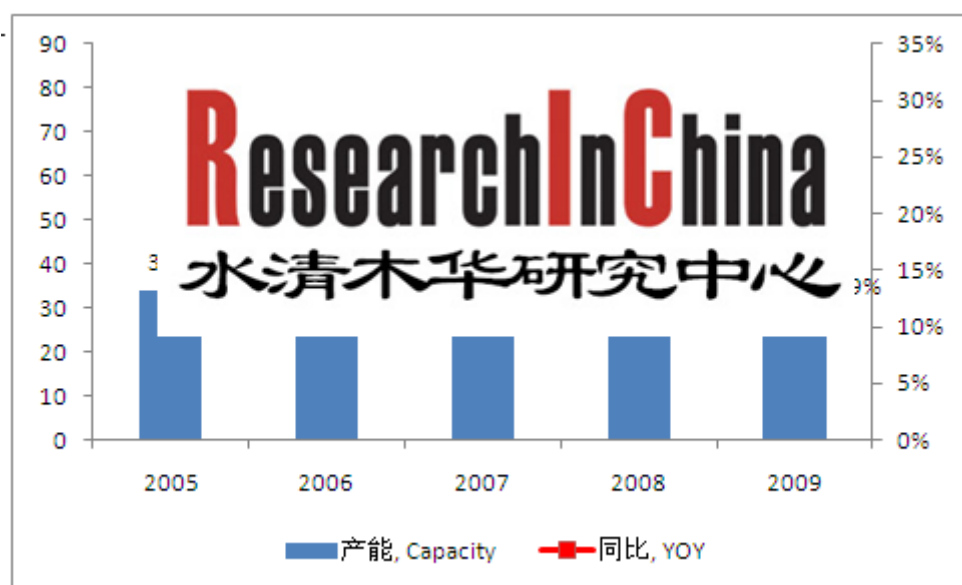
2.3 Supply & Demand

2.3.1 Supply

Promoted by the planning of Boeing and Airbus S.A.S to adopt carbon fiber reinforced plastics as the main materials for the production of new aircrafts as well as the increasing demand for carbon fibers from wind turbine blades, pressure vessels and other fields, global carbon fiber capacity has expanded rapidly since 2006. The global carbon fiber capacity has been growing at an annual average rate of 24.7% in 2005-2008, and reached ** tons in 2008.

However, the financial crisis and the H1N1 flu have hampered the development of global tourism, aviation and other industries, which has further reduced the demand for carbon fibers. In 2009, major carbon fiber enterprises delayed expansion plans and reduced operating rates to address the crisis. The global carbon fiber capacity was ** tons, up 15.9% year on year but down 8.8 percentage points compared with the annual average growth rate of 24.7% in 2005-2008.

Capacity & Growth Rate of Global Carbon Fiber, 2006-2009 (Unit: 1,000 Tons)



Source: Hi-Tech Fiber & Application, ResearchInChina

2.3.2 Demand

As carbon fibers have excellent performance, the market demand has always been strong. In 2003-2008, the global demand for carbon fiber has been growing at an annual average rate of 15%, and reached ** tons in 2008. However, the financial crisis in October 2008 and the H1N1 flu in March 2009 made the aviation manufacturing, tourism, leisure and other industries in trouble, resulting in a sharp decline in the market demand for carbon fibers. The global demand for carbon fibers was about ** tons in 2009, down 9% year on year.

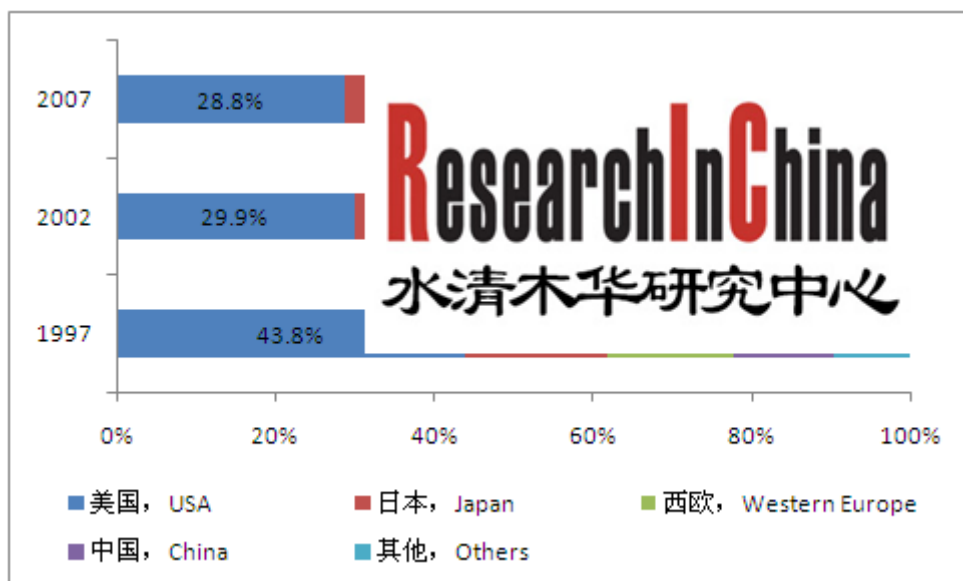
Demand & Growth Rate of Global Carbon Fiber, 2003-2009 (Unit: 1,000 Tons)



Source: Hi-Tech Fiber & Application, ResearchInChina

From the perspective of global consumer of carbon fibers, the demand from Europe and the U.S. is declining, while the demand from Japan and China is picking up. China and Japan have similar carbon fiber market consumption structure, which is mainly concentrated in the sports & leisure field.

Consumption Structure of Carbon Fiber (by Region) Worldwide, 1997-2007

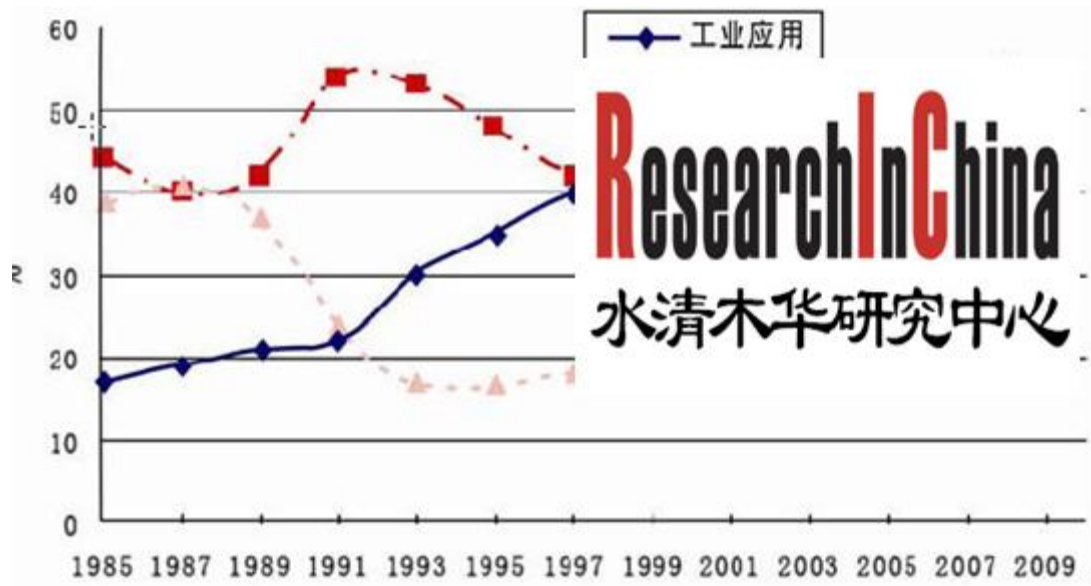


Source: ResearchInChina

Aerospace, industrial application, and sports & leisure are the three main consumption areas of carbon fiber, accounting for more than 60% of total consumption. Sports and leisure mainly refers to fishing rods, golf clubs, tennis rackets, winter sports equipment, and water sports equipment; industrial application refers to the repair, renewal and reinforcement of infrastructure; new energy development such as the drilling platforms, pipelines and cables of costal oil and gas fields and deep-sea oil fields; propellers and blades of wind turbines; brake systems, axis of rotation and bodies of automobiles.

In 1980s, carbon fibers were mainly applied in sports & leisure and aerospace fields; since 1990s, the consumption of carbon fibers in industrial application field has been on the rise, the consumption in the aerospace field has been relatively stable while that in the sports & leisure field has almost plummeted. As of the end of 2009, industrial application, aerospace and sports & leisure fields accounted for **, ** and ** of the total consumption of the three major fields.

Proportions for Top 3 Application Fields of Global Carbon Fiber, 1985-2009 (Unit: %)



Source: China Securities Company (CSC), ResearchInChina

2.4 Price Trend

Market supply and demand is the primary factor affecting the carbon fiber market prices. For example, ST carbon fiber experienced three price hikes in 1985-2009, reaching USD44/kg in 1985-1986, USD30/kg in 1996-1997, and USD35/kg in 2006-2007. All the three price hikes were caused by the undersupply of carbon fibers. In April 2010, Toray, the global leading carbon fiber enterprise, raised the carbon fiber price by ** mainly over global carbon fiber demand market recovery and profitability concerns.

Average Price of Global ST Carbon Fiber, 1985-2010 (Unit: USD/kg)



Source: Hi-Tech Fiber & Application, ResearchInChina

Meanwhile, the differences in carbon fiber prices generally result from the differences in carbon fiber performance. High-performance small-tow carbon fibers enjoy high prices while large-tow carbon fibers see lower prices.

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3. Overview of China Carbon Fiber Market

3.1 Current Development

For the application field of carbon fiber involves in national defense and military industry, so all the countries keep confidential of carbon fiber technologies and production equipment. China can not introduce advanced technologies from Japan and America, and only rely on its independent R&D. Although China always takes industrialization of carbon fiber technology as its strategic task, the total strength is still lagged behind the developed countries, and the industry is still in its initial development stage.

In 2009, there were more than ** manufacturers specialized in carbon fiber precursor and carbon fiber production in China, such as ZhongFu ShenYing Carbon Fiber Limited Liability Company, Jiaying Sino-Dia Carbon Fiber Co., Ltd., Jilin Jiyan High-tech Fibers Co., Ltd., Jilin Qifeng Chemical Fiber Co., Ltd., Weihai Tuozhan Fiber Co., Ltd., Shanxi Hengtian New Textile Fiber Tech Co., Ltd., NPC Jilin Chemical Group Company, and so on. The total capacity reached ** tons, but the actual output was lower than that because of technology factors, and the quality was not as good as expected. Limited by domestic supply, the demand of carbon fiber basically relied on import, and reliance rate in 2009 was as high as **.

With the breakthrough of carbon fiber industry technology, continuous policy issuing of carbon fiber industry development and stimulated by the large gap between supply and demand, many carbon fiber projects and 1000 tons industrialization projects start up continuingly. According to incomplete statistics, the invested amount of proposed carbon fiber projects and projects in progress has already reached RMB9 billion up to June 2010, and the capacity (including some composites capacity) totaled about ** tons. Among them, above ** tons capacity is proposed to be operated before the end of 2010 (including the capacity already operated before June 2010). However, China is still lacking core industrialized technology with independent intelligence right, there will be not many projects that can be successfully operated and also realized stable production. Nevertheless, it is already the time for China's carbon fiber industry development.

3.2 Supply & Demand

3.2.1 Supply

Also because of lacking of core industrialized technology, China's carbon fiber is in short supply as always. Till the end of 2009, China was capable of ** tons PAN precursors and ** tons carbon fiber, but the actual output of carbon fiber was only over 900 tons, and import reliance rate reached **.

Stimulated by national policy support and great supply-demand gap, also with industrial technology progress, the carbon fiber capacity increases by times, and it is estimated to be 9280 tons up to the end of 2010, up 3.76 times based on 2009 and nearly four times based on 2008. However, the actual output will not be over 3000 tons limited by immature technologies.

Capacity & Growth Rate of China Carbon Fiber, 2008-2010 (Unit: ton)



Source: ResearchInChina

3.2.2 Demand

China's demand for carbon fiber was always very strong, and the annual growth rate of carbon fiber demand from 2000 to 2009 kept at 12.4%. Affected by the financial crisis, the downstream demand for carbon fiber was soft, thus which made the demand down 9.0% yr-on-yr to be ** tons in 2009.

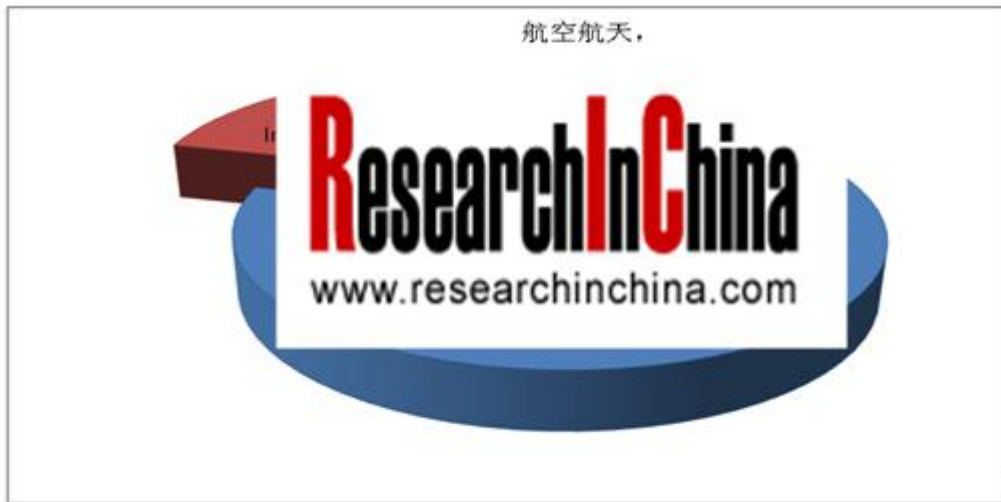
Demand of Carbon Fiber in China, 2006-2009 (Unit: ton)



Source: ResearchInChina

Seen the consumption structure, China is similar with Japan, carbon fiber is mainly applied in sports & recreation, such as golf club and fishing rod. Such products are mainly for export because of their high price. These "Made-in-China" products account about 60-80% to global market. The second application field is civil engineering and precise apparatus. For China's aviation manufacturing industry is still in development stage, the consumption volume is not so large. The demand from sports & recreation, industry and aviation & aerospace held **, ** and ** correspondingly in 2009.

Carbon Fiber Consumption Structure in China, 2009



Source: China National Chemical Information Center, ResearchInChina

3.3 Import & Export

3.3.1 Import

Before 2008, the import of carbon fiber and its products was always up. In 2008, it imported 8128.1 tons, up 0.3% yr-on-yr; imported value amounted to USD268 million, up 10.9% yr-on-yr; unit price was USD33/kg, up 10.4%. This was mainly caused by the lagged production technology in China and the increasing market demand.

Affected by the financial crisis and bid drop of downstream demand, the import volume of carbon fiber and its products in 2009 was down 15.2% to be 6892.6 tons, imported sum decrease 22.4% to be USD208 million; the unit price was also down 8.5% to be USD30.2/kg. Entering 2010, although the import volume of carbon fiber and its products increased, the unit price was down 10.9% yr-on-yr to be USD26.9/kg affected by oversupply of global carbon fiber market.

Import Volume, Sum & Unit Price of China Carbon Fiber and Its Products, 2005-2010H1



Source: China Customs, ResearchInChina

The import source of China’s carbon fiber and its products are very concentrated, mainly from Japan, Taiwan, Korea and America. In recent years, the import volume from above mentioned four countries accounts about 90% of total import volume of that year, and was 91.9%, 89.4% and 86.5% in 2008, 2009, 1H 2010 respectively.

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4. Global & China Major Enterprises of Carbon Fiber

4.1 Toray

4.1.1 Profile

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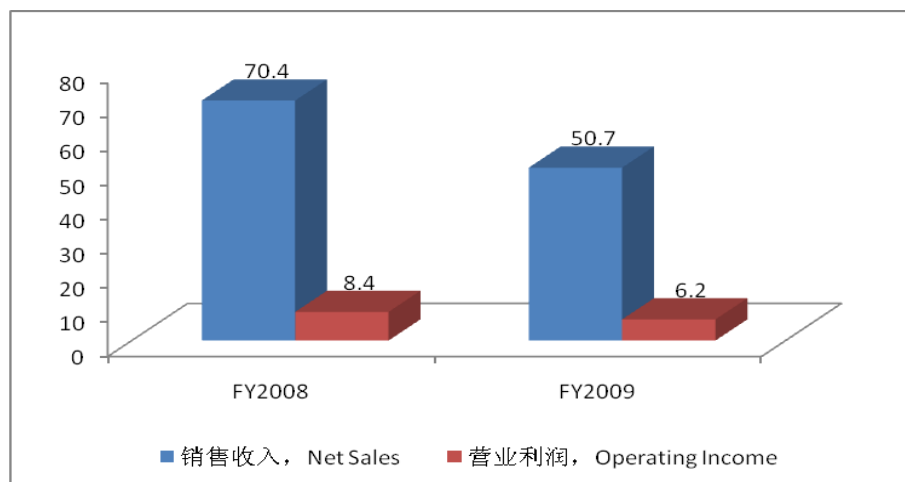
4.1.2 Operation

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4.1.3 Carbon Fiber Business

The comprehensive competitiveness of Toray ranks No.1 around the globe. As a result of the suspended orders of carbon fiber for aviation and sport leisure, both sales revenue and operating income of the company decreased in FY2009, arriving at JPY50.7 billion and JPY6.2 billion respectively, down 28% and 26.2%.

Net Sales & Operating Income of Toray's Carbon Fiber Business, FY2008-FY2009 (Unit: JPY bn)



Source: Annals of Toray, ResearchInChina

The sales revenue of Toray from carbon fiber was mainly generated from overseas subsidiaries, Toray’s parent company and local subsidiaries, with the contribution shares down **, ** and ** respectively in FY2009 due to the economic crisis. Additionally, carbon fiber operating income of Toray showed a different trend against FY2008, and the operating income of Toray headquarters amounted to ** billion, more than three times that in FY2008; while the operating income of Toray’s overseas subsidiaries and local subsidiaries decreased by ** and ** respectively to** and ** respectively.

Revenue of Toray’s Carbon Fiber Business (by Company), FY2008-FY2009 (Unit: JPY bn)



Note: the sales revenue this time gets unadjusted. Overseas subsidiaries mainly refer to France-based Soficar, America-based CFA and TCA; and Japanese subsidiaries mainly relate to Toray International, Inc.

Source: Annals of Toray, ResearchInChina

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By application, carbon fiber composites of Toray is primarily applied in aviation, industries and sports, from the three of which its sales in FY2009 achieved ** billion, ** billion and ** billion respectively, with a share of 44.2%, 36.7% and 19.1% in the company’s revenue from carbon fiber composites in the year.

Revenue of Toray's Carbon Fiber Business (by Sector), FY2008-FY2009 (Unit: JPY bn)



Note: the sales revenue this time gets adjusted.

Source: Annals of Toray, ResearchInChina

4.1.4 Development Outlook of Carbon Fiber Business

4.1.4.1 Orders from Boeing and Airbus S.A.S Secure Long-term Steady Development of Toray

Toray, the sole supplier of carbon fiber and epoxy prepreg materials for Boeing B787, have signed with Boeing the 18-year contract on the supply of Torayca prepreg materials till the year of 2021.

In 2010, Toray signed the 15-year contract with EADS on the supply of carbon fiber prepreg. From 2011 on, Toray begin to supply the carbon fiber composites requisite for the wings and body of Airbus S.A.S.

4.1.4.2 Orders from Daimler Speed up the Application of Toray's CFRP in Automotive Sector

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4.1.4.3 Carbon Fiber Capacity of Toray Keeps Expanding

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