Japan’s Manufacturing Industry

July 2010

Ministry of Economy Trade and Industry
A look at the situation of the global market shows that emerging countries have increased their share of the global GDP as a result of population growth and rising income. **Emerging countries have also increased their presence as both production bases and markets.**

Although manufacturing industry has led the Japanese economy and has been responsible for 90% of Japan’s exports, **Japan has not fully taken advantage of business opportunities in growth markets around the world.**

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**[Changes in Nominal GDP Share of World’s Major Regions]**

**[Growth of Asian Emerging Countries and Increase in Value of Exports by Major Countries]**

Remarks: On a U.S.$ basis. Major Asian nations/regions excluding China refer to ASEAN, India, South Korea and Taiwan.

Source: IMF, "World Economic Outlook Database, April 2010"
In China and other Asian countries, production is increasing as they have adapted to the combination of various production technologies.

With regard to intermediate goods, for which Japan is said to be maintaining a strong competitive edge, South Korea and China have gradually been raising their competitiveness, and their industrial infrastructures are becoming more advanced due to progress in the international division of labor.

In addition, Japanese companies are encountering challenges such as severe competition with other Japanese companies, and technology leakage.

[Changes in the Competitiveness of Manufacturing Industries of Countries and Regions (changes in the share of total value added by manufacturing industries of countries and regions)]

While the shares of Japan and the United States declined, those of emerging Asian countries grew.

[Changes in the Export Specialization Index of Intermediate Goods]

Remarks: Export specialization index = (Exports of intermediate goods - imports) / (exports of intermediate goods + imports)

Source: Research Institute of Economy, Trade and Industry, “RIETI-TID 2009”
Regarding our country as a manufacturing base, due to the development of emerging countries, maturation of the domestic market and the relative rise of domestic production costs, Japanese companies have been accelerating overseas operations, increasing overseas production percentages and manufacturing jobs have been decreasing.

As this trend continues, it may harm Japan’s economic growth, breaking employment and technological clusters.

[Changes in Number of Japanese Companies’ Local Subsidiaries (manufacturing sector)]

[Overseas production percentage]

[Manufacturing jobs]

Source: METI, “Basic Survey of Overseas Business Activities”
Japan’s manufacturing industry needs the following in order to continue leading the economy:

- **Demand from emerging nations**, which are growing swiftly and suddenly
- **A strengthened industrial base for Japan’s manufacturing industry, in order to ensure that the country’s position can be strengthened and maintained as a supply base for high-level parts and products.**

### Action Plan I – Ensuring demand from emerging nations

- **Ensure demand from emerging nations**, which are the new frontier of growth.

1. **Upgrading of development and production systems for products aimed at emerging markets, and support for creation of sales channels**
   - Strategy for introducing products optimized to the needs of local markets
   - Development of brand in emerging country markets
   - Utilization of financial support such as JBIC, NEXI
   - Public/private sector partnerships to enable planning/promotion of social infrastructure development

2. **Work on improving profitability**
   - Prevention of technology leaks (raise awareness within companies, etc.)
   - Strategic standardization (black boxes for core technologies, multi-purpose components and open interfaces, etc.) in support of reformation of business models
Action Plan for Japan's Manufacturing Industries II

Action Plan II – Strengthening the industrial base for Japan’s manufacturing industry

- Japan’s manufacturing industry needs to maintain its position as a center for domestic research and product development, as well as a manufacturing location for high-level components and products, and to continue to accumulate both employment and technical ability so as to continue to provide high added value. In order to do this, it is vital that we **strengthen the industrial base of the manufacturing industries.**

1. **Upgrade the domestic competitive environment**
   - Review corporate taxes based on international standards, and improve the competitive environment through a research and development tax system, etc.
   - Appropriate response to the problem of global warming, with consideration given to international competitiveness

2. **Measures to increase profitability through improvements to Japanese corporations’ excessive competitiveness**
   - Complete overhaul of support strategies for business restructuring, co-habitation, consolidation, etc., based on an understanding of the reality of globalization.
   - Support for strategic standardization and other improvements to business models
   - Prevention of technology leaks (increased knowledge of business confidentiality management policies, reorganization of claims procedures, improved corporate awareness, etc.)
   - Strategic and effective intellectual property rights within companies

3. **Development and strengthening of next-generation growth industries**
   - Prioritized distribution of domestic resources in support of technical development and rollout of next-generation growth industries, etc.
   - Promotion of activities to attract companies engaged in next-generation growth industries (subsidies for land acquisition, etc.)
   - Industrial support for social needs such as environmental and ageing society issues (systems reform, fiscal support, etc.)
High-level products and components

◆ High-level products
  ① Vehicles
  ② Aircraft
  ③ Robots

◆ High-level components
  ④ Fine Chemicals
  ⑤ Carbon Fiber
Vehicle industry

- Japan’s technical strength is widely recognized and Japan’s auto companies sell globally, especially in emerging countries. **Japan’s auto companies maintain about 30% global market share.**

- As trends toward green vehicles has been accelerated in developed markets, we formulated the Next-Generation Vehicle Plan 2010.

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**World market**

(Number of vehicles in 10,000s)

- **Emerging market**: 31mil.
- **Japan**: 5mil.
- **European market**: 15.6mil.
- **North America**: 16.2mil.

- **Total**: 67.96mil. (2008)

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**The transition of world market share**

<table>
<thead>
<tr>
<th>Year</th>
<th>Japan</th>
<th>Europe</th>
<th>U.S.</th>
<th>China</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>30.1%</td>
<td>12.3%</td>
<td>28.9%</td>
<td>3.5%</td>
</tr>
<tr>
<td>2005</td>
<td>30.8%</td>
<td>13.1%</td>
<td>28.2%</td>
<td>3.7%</td>
</tr>
<tr>
<td>2006</td>
<td>31.0%</td>
<td>16.1%</td>
<td>26.7%</td>
<td>4.3%</td>
</tr>
<tr>
<td>2007</td>
<td>31.3%</td>
<td>19.6%</td>
<td>25.6%</td>
<td>5.0%</td>
</tr>
<tr>
<td>2008</td>
<td>32.0%</td>
<td>23.5%</td>
<td>23.1%</td>
<td>5.4%</td>
</tr>
</tbody>
</table>
External factors affecting the auto industry

- Increase in fuel prices (for enhancing public transportation)
- Create an environment for structural change in the auto market
- Set diffusion targets (for enhancing public transportation)
- Develop post-lithium-ion batteries
- Achieve economies of scale production by promoting EVs
- Create an environment for secondary use of batteries

Next-Generation Vehicle Plan 2010 (Outline)

- Rapid growth of emerging markets and trends toward green vehicles in developed markets

- Developed markets
  - Increase in the vehicle-buying population, along with economic development
  - Mature, stable markets
  - Diversifying users and social needs

- Emerging markets
  - Increase in the vehicle-buying population, along with economic development
  - Mature, stable markets
  - Diversifying users and social needs

Emergence of ultra-low-price vehicles

Trends toward greater fuel efficiency

Potential need to use different-power trains for different markets

Overall plan
next-gen. vehicle development and production

Batteries
Secure battery R&D and technology

Rare metals
Secure rare metals and build resource recycling systems

Infrastructure
Install 2 mil. normal chargers & 5,000 quick chargers

Systems
vehicles with systems (smart grid, etc.)

International standards
strategic international standardization

Six Plans

Battery R&D Target (set in 2006)

Resource Strategy Roadmap

Infrastructure Development Roadmap

International Standardization Roadmap
Necessity of advanced eco-friendly vehicles

- Diffusion projections assuming private-sector efforts (scenario where auto makers make the utmost efforts to improve fuel efficiency and develop next-generation vehicles) were made.
- Next-generation vehicles will account for less than 20% of new vehicle sales in 2020 and 30-40% in 2030.

Next-Generation Vehicle Plan 2010 (Diffusion Projections for 2020 and 2030; Government Targets)

- The government has set diffusion targets to pursue for each type of vehicle for accelerating the spread of next-generation vehicles.
- Next-generation vehicles should account for up to 50% of new vehicle sales in 2020.
- To achieve this target, the government should provide effective incentives.

Diffusion projections by type of vehicle (with private-sector efforts)

<table>
<thead>
<tr>
<th></th>
<th>2020</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional vehicles</td>
<td>80% or more</td>
<td>60 - 70%</td>
</tr>
<tr>
<td>Next-generation vehicles</td>
<td>Less than 20%</td>
<td>30 - 40%</td>
</tr>
<tr>
<td>Hybrid vehicles</td>
<td>10 - 15%</td>
<td>20 - 30%</td>
</tr>
<tr>
<td>Electric vehicles</td>
<td>5 - 10%</td>
<td>10 - 20%</td>
</tr>
<tr>
<td>Plug-in hybrid vehicles</td>
<td>Miniscule</td>
<td>1%</td>
</tr>
<tr>
<td>Fuel-cell vehicles</td>
<td>Miniscule</td>
<td>- 5%</td>
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<tr>
<td>Clean diesel vehicles</td>
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</tbody>
</table>

Diffusion targets by type of vehicle (government targets)

<table>
<thead>
<tr>
<th></th>
<th>2020</th>
<th>2030</th>
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<tbody>
<tr>
<td>Conventional vehicles</td>
<td></td>
<td></td>
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<tr>
<td>Next-generation vehicles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hybrid vehicles</td>
<td>20 - 50%</td>
<td>50 - 70%</td>
</tr>
<tr>
<td>Electric vehicles</td>
<td>15 - 20%</td>
<td>20 - 30%</td>
</tr>
<tr>
<td>Plug-in hybrid vehicles</td>
<td></td>
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</tr>
<tr>
<td>Fuel-cell vehicles</td>
<td>- 1%</td>
<td>- 3%</td>
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<tr>
<td>Clean diesel vehicles</td>
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</tbody>
</table>

Expected model changes
- Only 1-2 changes expected by 2020

Secure international competitiveness
- Continued dominance of conventional vehicles in international, especially emerging, markets.

Risk for auto makers
- High risk involved in focusing on specific technologies, due to variations in diffusion projections

Higher costs arising from the use of advanced technologies
- Even if green vehicles are available, whether to buy them depends on users.

Effects of eco-friendly vehicles subsidies and tax breaks
- Apr. 2009: Eco-vehicles account for 42.5% (next-generation vehicles 5.7%)
- Feb. 2010: Eco-vehicles account for 73.1% (next-generation vehicles 9.3%)

The government seeks to make advanced eco-friendly vehicles account for 80% of new vehicle sales in 2020, provided that effective policy support is offered.

Advanced eco-vehicles ("post-eco-vehicles")

Next-generation vehicles
- HV, EV, PHV, FCV, CDV, CNG, etc.

Future conventional vehicles whose eco-friendly features are excellent in light of the technical standards of the time
Next-Generation Vehicle Plan 2010 (Roadmap)

Battery R&D Targets (set in 2006)

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<thead>
<tr>
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<tbody>
<tr>
<td>Small EVs for power companies</td>
<td>Commuter EVs for limited use</td>
<td>Commuter EVs for general use</td>
<td>Full-fledged EVs</td>
</tr>
<tr>
<td>Cost</td>
<td>High-performance HVs</td>
<td>Fuel-cell vehicles Plug-in HVs</td>
<td>Government-industry-academia collaboration</td>
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<tr>
<td>1</td>
<td>1</td>
<td>1.5-fold</td>
<td>7-fold</td>
</tr>
<tr>
<td>1/2</td>
<td>1/7</td>
<td>Universities &amp; research institutes</td>
<td></td>
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<tr>
<td>Led by private sector</td>
<td>Led by private sector</td>
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</tbody>
</table>

(1) Development of advanced lithium-ion batteries (FY 2007-2011)
- Aim to improve the performance, and reduce the cost, of lithium-ion storage batteries as the power source of hybrid and electric vehicles.
- FY 2010 budget: ¥2.48 billion (FY 2009 budget: ¥2.61 billion)

(2) Development of innovative batteries (post-lithium-ion batteries)(FY 2009-2015)
- Aim to elucidate the reaction mechanism of the storage battery through comprehensive joint studies by government, industry and academia, and become the front-runner in post-lithium-ion battery development.
- FY 2010 budget: ¥3 billion (FY 2009 budget: ¥3 billion)

Resource Strategy Roadmap

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<tbody>
<tr>
<td>Secure rare metals by forming a mutually beneficial relationship (infrastructure building, regional development, industrial promotion, human resource development, etc.) with resource-producing countries through a nationwide effort</td>
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<tr>
<td>Support private companies through resource surveys and the provision of risk money by JOGMEC</td>
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<td>Revision of JOGMEC Act</td>
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<tr>
<td>Develop technology for resource conservation and substitution</td>
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<tr>
<td>Basic research in innovative storage batteries (post-lithium-ion storage batteries) (2009FY - 2015FY)</td>
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<tr>
<td>Develop dysprosium-free magnets</td>
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<tr>
<td>Develop technology to reduce dysprosium usage (2007FY -)</td>
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<tr>
<td>Develop technology to reduce platinum group metal usage in exhaust gas purification catalysts (2009FY -)</td>
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<tr>
<td>Develop rare metal recycling technology and promote recycling-oriented design</td>
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<tr>
<td>Develop technology for rare earth recycling from motors, etc.</td>
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<tr>
<td>Develop technology for lithium-ion storage battery recycling</td>
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<tr>
<td>*Need for flexible actions according to international trends and technical development</td>
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International Standardization Roadmap

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<td>Standardization activities</td>
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<tr>
<td>*Issue of international standards by ISO/IEC</td>
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<td>Regular charger Standardization activities</td>
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<td>*Issue of international standards by IEA (Three drafts by Japan-US, Germany and Italy)</td>
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<td>Quick charger Standardization activities</td>
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<td>Japan-US joint demonstration</td>
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<td>*Issue of international standards by ISO/IEC</td>
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Infrastructure Development Roadmap

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<td>Market preparation</td>
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<td>Market development</td>
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<tr>
<td>Wide diffusion</td>
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<tr>
<td>Support for intensive infrastructure development mainly in EV/PHEV towns (priority allocation of CEV subsidies)</td>
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<tr>
<td>Intensive and systematic infrastructure development based on demonstration results</td>
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<tr>
<td>Efficient infrastructure development based on experiences in EV/PHEV towns</td>
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<td>*Need for regularity</td>
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<td>National government</td>
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<td>Local government</td>
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<td>Other ministries</td>
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<td>Private companies, R&amp;D facilities</td>
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<tr>
<td>Installation targets</td>
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<tr>
<td>2 million normal chargers</td>
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<td>5,000 quick chargers</td>
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<tr>
<td>Self-reliant infrastructure development by making charging service a viable business (fee dealers, commercial facilities, gas stations, expressway SAS, convenience stores, etc.)</td>
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<tr>
<td>Promotional activities mainly through CHAdeMO Association (launched in Mar. 2010)</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Organize quick charger location information</td>
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<tr>
<td>Develop CHAdeMO protocol certification system</td>
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<tr>
<td>Formulate safety measures and installation guidelines for quick chargers</td>
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<tr>
<td>Conduct international standardization activities</td>
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</tbody>
</table>

Secure Rare Metals by Forming a Mutually Beneficial Relationship

- Infrastructure building, regional development, industrial promotion, human resource development, etc. with resource-producing countries through a nationwide effort

Support Private Companies through Resource Surveys and the Provision of Risk Money

- Support private companies through resource surveys and the provision of risk money by JOGMEC

Revise the JOGMEC Act

- Revise the JOGMEC Act

Develop Technology for Resource Conservation and Substitution

- Basic research in innovative storage batteries (post-lithium-ion storage batteries) (2009FY - 2015FY)
- Develop dysprosium-free magnets
- Develop technology to reduce dysprosium usage (2007FY -)
- Develop technology to reduce platinum group metal usage in exhaust gas purification catalysts (2009FY -)

Develop Rare Metal Recycling Technology and Promote Recycling-Oriented Design

- Develop technology for rare earth recycling from motors, etc.
- Develop technology for lithium-ion storage battery recycling

*Need for flexible actions according to international trends and technical development
1. Japanese manufacturers account for **35%** in the new B787 construction, which is **the most fuel-efficient** aircraft of its type in the world.

2. Taking charge of **the Main Wing**
   - 1st time for Boeing to outsource the Main Wing of a passenger plane

Cf.1) B787
   - 20% increase in fuel efficiency compared to B767 by drastic decrease in weight, using carbon fiber composites in 50% of the aircraft.
   - Firm orders for 866 (May 2010) are the fastest-selling pace in the history of the airliner.

Cf.2) Transition of Construction Share of Japanese Manufacturer
   - Steady Increase in Construction Share (B767: 15% → B777: 21% → B787: 35%)

**29,000 new deliveries and $3,220 billion market value** from 2008 to 2028 in the passenger plane market

The number of fleet will double in the next 20 years (29,000 new deliveries and $3,220 billion market value)

过渡时间的数量的转变

Robots

- Robot production has reached an almost industrial level. Based on shipments, **Japan’s robot makers have more than 70% of the global market**.
- Due to declining labor forces, increases in workloads and demands to improve quality of products &/or services, it is highly expected that next-generation robot technology will improve both industrial productivity and the quality of life of people.

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Global shipments of industrial robots

<table>
<thead>
<tr>
<th>Year</th>
<th>Other</th>
<th>Japan</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>61%</td>
<td>-</td>
</tr>
<tr>
<td>2002</td>
<td>71%</td>
<td>-</td>
</tr>
<tr>
<td>2003</td>
<td>78%</td>
<td>-</td>
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<tr>
<td>2004</td>
<td>78%</td>
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<tr>
<td>2005</td>
<td>70%</td>
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<tr>
<td>2006</td>
<td>72%</td>
<td>-</td>
</tr>
<tr>
<td>2007</td>
<td>71%</td>
<td>-</td>
</tr>
<tr>
<td>2008</td>
<td>70%</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: Japan Robot Association, IFR SD 「World Robotics 2009」

- Robot production is now a 700 billion-yen market & the value will increase to 2.9 trillion-yen in 2020 and 9.7 trillion-yen in 2035.
Japan’s chemical companies maintain large shares in the chemical material market, which is itself growing rapidly with technology innovation. Although each market is not so big, maintaining strong shares in each core materials market brings the Japan’s fine chemical industry strong competitiveness. For example, Japanese companies has a huge share in each lithium-ion battery component market.
【Lithium-Ion Battery Components】

Global production (millions of Yen)
Share of the global market

Cathode material

Japan 79%
Others 21%
China 6%
Belgium 16%
U.S. 2%
Others 9%

Anode material

Japan 100%
Others 17%

Separator

Japan 73%
Others 4%
US 26%

Electrolyte solution

Japan 81%
Others 19%
Japan 69%
Others 31%

(Source) 2007-2010 Battery Market Analysis: Comprehensive Survey for Current Aspect and Estimation by Chemicals Division, METI
Japanese enterprises maintain international competitiveness for high-value-added materials such as carbon fiber and aramid fiber. It is necessary to expand the market of these high-value-added materials in the future.

1. World market share of carbon fiber
   Japanese manufacturers represent about 70% of the market.

2. Market transition of carbon fiber
   As is lightweight and tough, the market will increase especially for industrial use.