

**Top Message**

**Adhering closely to its Corporate Philosophy, the Mitsubishi Rayon Group will continue to fulfill its social responsibility and thereby contribute to a sustainable society and the realization of KAITEKI.**



Around the world today, we face multitude of issues. In addition to environmental issues, such as global warming, climate change and air pollution, concerns of natural resource and energy depletion, and biodiversity destruction, other issues include rapid population growth, food and water shortages, aging populations with declining birthrates, severely lopsided wealth distribution, human rights abuses, and religious and racial unrest. Of course, there is no way that any one corporation could singlehandedly find solutions to all these issues. Nevertheless, the Group believes that every corporation bears a responsibility to confront such issues and to work to help find needed solutions through its corporate activities. We also believe that pursuing such activities is essential to the survival of any corporation in modern society.

As a member of the Mitsubishi Chemical Holdings (MCHC) Group, Mitsubishi Rayon Group's aim as a corporate group is to realize a well-balanced and truly sustainable condition, that is to say, KAITEKI, for people, society and the earth. To this end, we practice KAITEKI management based on three management concepts—Management of Economics (MOE), Management of Technology (MOT), and Management of Sustainability (MOS), which we employ to clarify targets and results, and the understanding thus gained enables us to improve our activities further. In this way, we will continue to fulfill our social responsibility as a company, thereby developing into a corporate group that helps to realize KAITEKI.

The Group's Corporate Philosophy is "Best Quality for a Better Life." "Best Quality" is not something we insist on only when it comes to products and services. We are working to help customers to realize a "Better Life" by applying the "Best Quality" standard to the development of personnel and other management resources as well as when dealing with business partners, customers and members of global and local communities. In this sense, our Corporate Philosophy expresses our commitment to pursuing "Best Quality" and contributing to sound social development. By acting on this commitment we realize a society that is truly KAITEKI.

We consider safe and stable operations to be an important factor in fulfilling our responsibility to society in this way, through business activities aiming for KAITEKI. In accordance with the Mitsubishi Rayon Group's Basic Policies and Action Guidelines on safety, the environment, and quality assurance, we make safety and the environment our top priorities as essential prerequisites for corporate existence. We comply with all relevant laws and regulations. We will continue to place the highest priority on assuring safety and protecting the environment in all our corporate activities, allocate human resources and equipment appropriately and adequately, and maintain and improve safety.

\* KAITEKI is an original concept of the Mitsubishi Chemical Holdings Group, meaning a sustainable condition which is comfortable for people, society and the Earth, transcending time and generations.

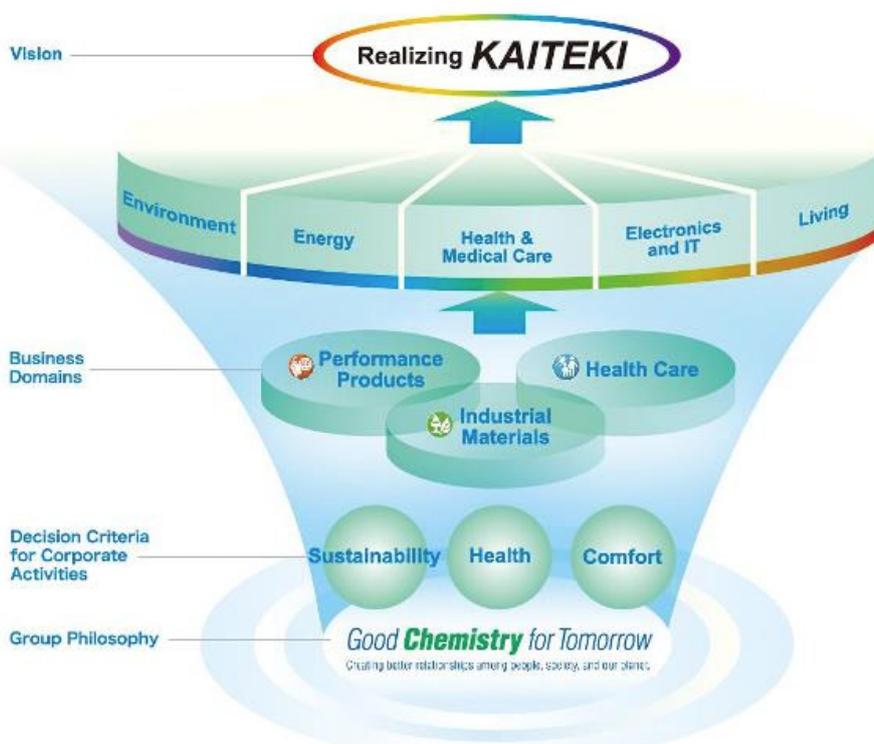
Hitoshi Ochi  
President  
Mitsubishi Rayon Co., Ltd

The MCHC Group's Vision and CSR

The Mitsubishi Rayon Group's holding company, Mitsubishi Chemical Holdings Company ("MCHC"), seeks to achieve sustainable development for society and the planet, in addition to serving as a guide for solving environmental and social problems, under the MCHC Group's original concept of KAITEKI, while moving ahead with corporate and CSR activities in an integrated manner.

|        |  |                              |                               |
|--------|--|------------------------------|-------------------------------|
| Vision | Awareness of solving environmental and social issues | CSR Activities and Direction | CSR Activities and Management |
|--------|--|------------------------------|-------------------------------|

Our vision is to realize KAITEKI, "a sustainable condition which is comfortable for people, society and the earth, transcending time and generations."



KAITEKI as advocated by the MCHC Group means "a sustainable condition which is comfortable for people, society and the earth, transcending time and generations." It is an original concept of the MCHC Group that proposes a way forward in the sustainable development of society and the planet, in addition to serving as a guide for solving environmental and social issues.

The MCHC Group has made realizing KAITEKI its vision and based on the Group Philosophy of Good Chemistry for Tomorrow has set Sustainability, Health and Comfort as its decision criteria for Group corporate activities. Group companies with chemistry as the basis of their activities gather their collective strengths in the three business domains of Industrial Materials, Health Care, and Performance Products to provide a wide array of products, technologies and services.

Through our corporate activities, we contribute to the realization of KAITEKI through various fields including Environment, Energy, Health and medical care, Electronics and IT, and Living. This is the corporate ideal that the MCHC Group seeks to realize.

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**The MCHC Group aims to realize sustainable development based on addressing issues on a global scale and also healthcare and medicine issues.**

Moreover, the human race has advanced to where it is today as a result of diverse economic activities as well as scientific and technological progress. However, we have fallen out of balance with the global environment, and are confronted by complex problems spanning from climate change to natural resource/energy depletion and an uneven distribution of food and water. While addressing these global issues, we are being asked by society to contribute to the fields of healthcare and medicine, and to explore ways to improve convenience and advance technology in coexistence with the planet.

In light of these social needs, the MCHC Group aims to achieve sustainable development through systems that recycle materials derived from natural resources, use of natural energy sources, support of healthcare beyond the treatment of illnesses, and solutions that satisfy diverse values.

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**Sharing Issues and Targets Through Dialogue With Stakeholders**

The MCHC Group considers its stakeholders to include all the people who support our corporate activities: our customers, shareholders and investors, communities, employees and business partners, as well as society, and even the Earth, which is the foundation of our lives. To realize sustainable development among people, society and the earth, working in concert and engaging in dialogue with our stakeholders is indispensable to jointly identify issues and set targets for the short, medium and long term, and gear our corporate activities to their fulfillment.

As part of such activities, in May 2006, MCHC expressed support for the United Nations Global Compact, which stated 10 principles in the areas of human rights, labor, the environment, and anti-corruption, and the MCHC Group is promoting its corporate activities in accordance with the norms of the 10 principles.

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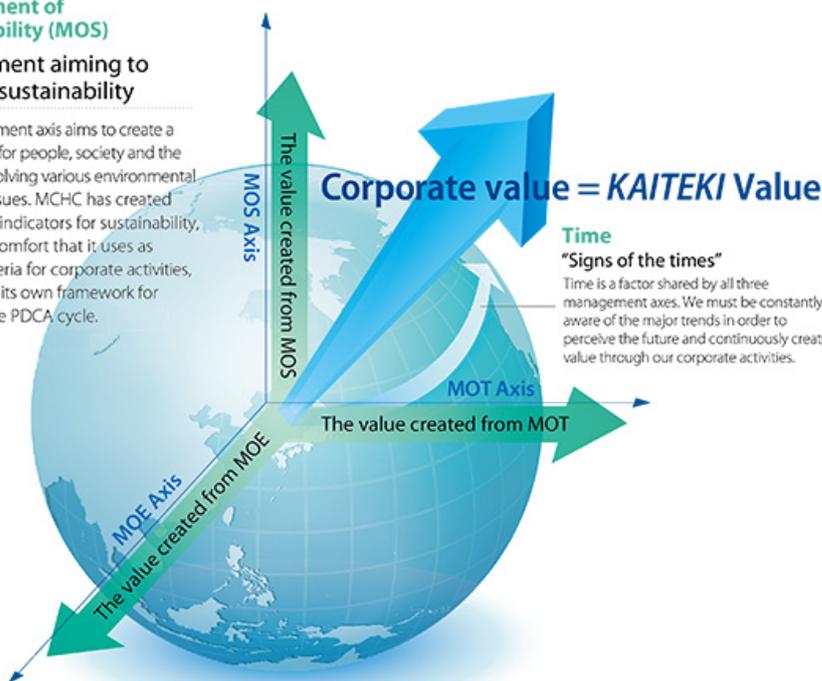


Applying KAITEKI Management, Our Own Management Method Based on Three Management Axes

Management of Sustainability (MOS)

Management aiming to improve sustainability

This management axis aims to create a better future for people, society and the planet by resolving various environmental and social issues. MCHC has created quantitative indicators for sustainability, health and comfort that it uses as decision criteria for corporate activities, and has built its own framework for engaging the PDCA cycle.



Management of Economics (MOE)

Management which focuses on capital efficiency

This management axis aims to increase profits and enhance economic value through the efficient allocation of capital, including personnel, assets and funds.

Management of Technology (MOT)

Management which strives to create innovations for society

This management axis aims to create innovations that lead to improvements in economic and social value through the development of new technologies and differentiate existing technologies. In addition to in-house development, this style of management emphasizes time-sensitive outcomes by building open and shared business models through alliances with other companies around the world.

The MCHC Group decided that a different set of values and management methods were needed for it to advance corporate activities with a view to solving environmental and social issues, while comparing the Group philosophy and decision criteria for corporate activities.

As a result, we created our own management method based on three management axes: (1) Management of Economics, which aims to increase economic value by focusing on capital efficiency; (2) Management of Technology, which aims to foster innovation that leads to higher economic and social value; and (3) Management of Sustainability, which aims to enhance social value through improvements in sustainability. Management along these three axes is implemented systematically with an awareness of major trends and opportunities throughout time. KAITEKI Management is the name we have given to this unique management method for lifting corporate value from a broad-based perspective.

The MCHC Group discloses results of (1), (2) and (3) and progress reports of activities in the KAITEKI Report issued yearly.

## The Mitsubishi Rayon Group's CSR

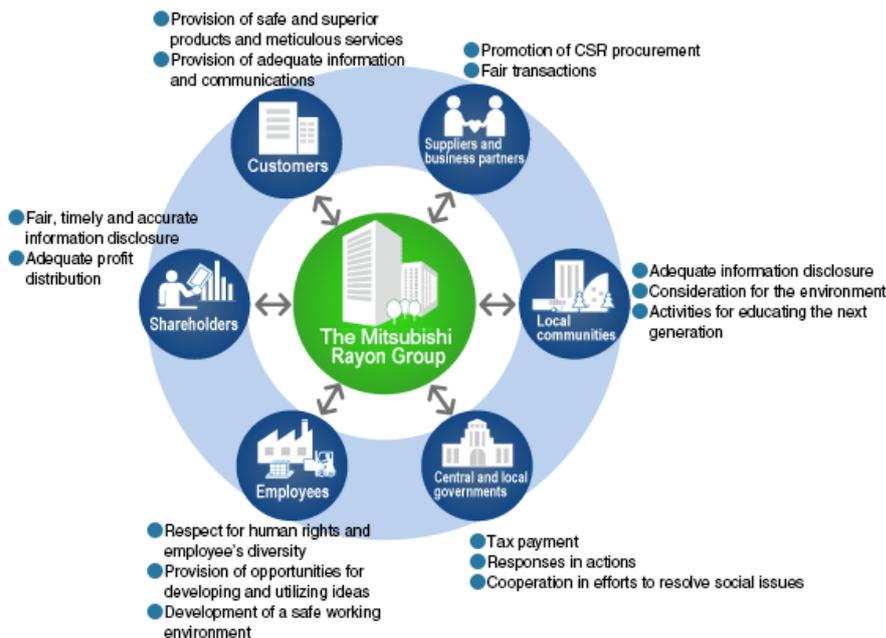
- ↳ [Basic Concept](#)
- ↳ [The Mitsubishi Rayon Group and Its Main Stakeholders](#)
- ↳ [CSR Implementation Structure](#)

### ■ Basic Concept

As a member of the Mitsubishi Chemical Holdings (MCHC) Group, Mitsubishi Rayon Group's aim as a corporate group is to realize a comfortable and truly sustainable condition, that is to say, KAITEKI, for people, society and the earth. To this end, the Mitsubishi Rayon Group strives to encourage each and every employee to practice its corporate philosophy of "Best Quality for a Better Life" as embodied in the Group's "[Corporate Behavior Charter](#)," and actively works toward global business development. In doing so, the Group strives to create expected value by obtaining a higher level of trust from various stakeholders and global society.

### ■ The Mitsubishi Rayon Group and Its Main Stakeholders

Building relationships of trust with stakeholders is the most important aspect in carrying out CSR activities. Building on a cumulative process of interactive dialogue, the Mitsubishi Rayon Group will accurately reflect the opinions, expectations and needs of stakeholders in our business activities and cooperate with stakeholders in an effort to ensure the sustainable development of society.



## ■ CSR Implementation Structure

The Mitsubishi Rayon Group's CSR structure has instituted a CSR Management Meeting as a decision-making meeting mechanism that encompasses CSR activities as a whole. CSR Management Meetings are chaired by the president and comprised of Management Meeting members, which includes corporate auditors. In addition to sharing and evaluating the CSR activity details and progress, CSR Management Meetings serve as a forum to deliberate on and determine Group CSR activity plans.

The CSR Management Meeting oversees a CSR activity proposal and promotion structure that comprises the Risk Management Committee, Safety, Environment & Quality Assurance Committee, Compliance Committee, and Information Security Committee. Each of these committees formulate activity plans on an individual presiding theme basis. Once a matter is determined at the CSR Management Meeting level, each committee then works diligently to promote specific activities.



As of April 1, 2016

For details on the activities below, please click on the following links:

- [Corporate Governance](#) 
- [Compliance](#) 
- [Risk Management](#) 

## Corporate Governance

### Basic Perspective

The Mitsubishi Rayon Group is working to enhance its corporate governance by undertaking fair business activities in compliance with laws and with a high standard of corporate ethics.

### Fundamental Policy on Internal Control System

The Company hereby establishes its "internal control system" as below, which shall be reviewed and improved going forward as necessary. The purpose of this fundamental internal control system is to contribute to the achievement of MRC's corporate philosophy and to maximize the Company's corporate value by securing proper execution of business activities, ensuring efficiency of business activities and managing business risks.

#### 1. System to ensure business operation by Board Directors ("Directors") to comply with laws and the Articles of Association

- Directors shall act as a role model for others and execute their duties in accordance with the "Corporate Behavior Charter" whose purpose is to achieve the Company's corporate philosophy.
- Directors shall not only make business decisions but also make business reports and share information necessary for execution of Company's business at regular Board Meetings and at special Board Meetings.
- Directors shall mutually monitor and oversee other Directors' execution of duties to ensure entire legal compliance thereof. Should Director(s) be in violation of laws or Articles of Association committed by other Director(s), such instances must be immediately reported to the Corporate Auditors and to the Board and corrective measures shall be taken.

#### 2. System to store and manage information related to business execution by the Directors.

- The Company shall establish the "Important Documents Retention Regulations" and place appropriate controls on important documents related to business execution by the Directors (e.g. Shareholders' Meeting minutes, Board Meeting minutes, etc.).
- The Company shall establish the "MRC Information Security Committee," which shall supervise MRC Group's information security and management activities.
- The Company shall appropriately manage all of the MRC Group's information assets by establishing a basic information management policy and the "Mitsubishi Rayon Group Information Security Policy" and "Information Asset Management Regulations."
- Online Document Management System consisting of online "Bulletin Board", online "Koshin", etc. shall be utilized to transmit promptly and accurately the minutes of the Board Meetings and resolutions of the Management Meeting and other matters to be announced to other MRC Group companies.

#### 3. Regulations and other system to manage risk of loss

- The Company shall capture and categorize external risk factors; political and economic conditions, natural disasters and other significant risks concerning overall business operations i.e. production, sales, products, finances, R&D, systems, etc. The Company shall implement a system to prevent risks appropriately and mitigate risks.
- The Company shall establish the "Risk Management Committee," which shall supervise MRC

Group's risk management activities.

- The Company shall specify managerial responsibilities and management methods concerning the important risks related to the Company's business operations in the "Risk Management Regulations", and Directors and the head of each department shall take managerial responsibility for prevention and treatment of material risks in the business operations assigned to them. As to individual operational risks, the Company shall standardize business activities in the "Business Operations Regulations" and put the risk prevention system in operation on a daily basis.
- As to disaster, accident, incident and other crisis management, the Company shall, pursuant to the "Risk Management Regulations," set up a Crisis Task Force as needed for organisational response. The Company shall prepare a risk management system for all conceivable risks, and develop and update the Crisis Management Procedures.

#### **4. System to ensure efficiency of business operation by the Directors**

- In addition to the regular and special Board Meetings, the Management Meeting, chaired by the President, shall be held to deliberate important matters concerning business operations of all the Group Companies and Departments for the purpose to improve the efficiency of performance of respective duties of each of the Directors.
- The President shall promptly transmit the resolutions by the Board and the decisions by the Management Meeting to all Executive Officers and concerned departments using the online bulletin board. Operations based on those resolutions and decisions shall be executed quickly by the employees in accordance with the authorities and responsibilities defined by the "Office Organisation Rules" and "Segregation of Duties Rules".
- The Company shall establish the "CSR Management Meeting," which oversees the activities of the Risk Management Committee, Safety, Environment & Quality Assurance Committee, Compliance Committee, and Information Security Committee. Each such committee shall enhance efficient business operations and compliance systems.

#### **5. System to ensure business operation by employees to comply with laws and the Articles of Association**

- The Company shall endeavor to spread the "Corporate Behavior Charter" and the "Compliance Code of Conduct," and shall disseminate employees the significance and purposes of all types of internal regulations concerning the execution of other business operations and improve the employees' understanding thereof.
- To further ensure strict adherence to the "Corporate Behavior Charter" and compliance requirements, the Company shall establish the "Compliance Committee". The "Compliance Committee" shall be the cornerstone of the compliance framework. Each of the Executive Officers, General Managers, and Directors shall promote compliance activities within their organisations on a daily basis in accordance with the policies implemented by the "Compliance Committee".
- The Company shall establish the "Safety, Environment & Quality Assurance Committee," which shall oversee the risk management related to safety, environment and quality assurance and compliance activities in accordance with "Safety, Environment & Quality Assurance Regulations".
- Audit Office shall submit internal audit reports to the President and to the concerned departments in accordance with the "Internal Audit Regulations" and exchange information with the Corporate Auditors.
- Should Director(s) discover serious violations of laws and material facts concerning compliance, such instances must be immediately reported to the Corporate Auditors, the Board, and the Management Meeting.
- The Company shall establish the Compliance Hotline System pursuant to the "Compliance Hotline System Regulations" for early discovery of violation of compliance issues and proper treatment thereof.

#### **6. System to ensure proper operation by the Corporate Group**

- The Company and its Group companies shall adhere to the "Charter of Corporate Behavior" and

related policies etc. set forth by its parent company Mitsubishi Chemical Holdings Corporation and seek its approvals on, and report to it, any important management matters.

- The Company shall ensure that all the Directors and employees of both the domestic and overseas Group Companies comply with the "Corporate Behavior Charter" and the "Compliance Code of Conduct" as their common norm.
- Group Company President (CEO) shall oversee and be responsible for the compliance activities of such group company in accordance with the "Corporate Behavior Charter" and the "Compliance Code of Conduct".
- In order to properly manage the operations of Group Companies, the Company shall establish the "Group Companies Management Regulations", which shall apply to all Group Companies. While honouring the independent activities of Group Companies, the Company shall ensure it receives reports and notifications from Group Companies, and provide guidance, etc., to Group Companies.
- Risk management at each Group Company shall be incorporated into the risk management system of its parent company.
- The Company shall regularly hold meetings that are attended by its Group companies' presidents and share the Online Document Management System consisting of online "Bulletin Board", online "Koshin", etc.
- In addition to as provided for in Paragraph 5. (6), MRC shall position the Compliance Hotline System as an internal reporting system for all Group Companies and as a reporting channel for cases of compliance issues with the business management or management guidance of the parent company.
- Internal audit of Group Companies shall be conducted in accordance with the "Internal Audit Regulations". The Audit Office shall share information with Corporate Auditors of Group Companies through communication and consultation concerning auditor's duties.

#### **7. System to ensure credibility of Financial Reporting**

- To ensure reliable financial reporting, MRC shall develop and operate an internal control system and report the results of assessments of its effectiveness based upon the "Operation Rules for Internal Control over Financial Reporting".

#### **8. Matters for Employees that assist duties of Corporate Auditors**

- MRC shall appoint audit assistants who will assume the position in charge of support auditing duties and responsibilities of Corporate Auditors.
- When deciding personnel issues such as appointment, evaluation, transfer, etc. of audit assistants, prior consent of the Corporate Auditors shall be required and such decisions shall remain independent from the Directors.
- The audit assistants shall follow corporate auditors' instructions and orders and assist in execution of corporate auditors' duties.

#### **9. Reporting systems to Corporate Auditors.**

- With regard to important issues concerning operation of business such as matters reported to or resolved at the Management Meeting, the personnel in charge for such issue shall be caused to provide explanation to the Corporate Auditors upon request by the Corporate Auditors to enhance effectiveness of the report to the Corporate Auditors.
- The Company shall secure a system whereby Corporate Auditors is entitled, in addition to receiving reports from the Directors, to attend important meetings and express their opinions, and conduct separate meetings with Management Meeting members, etc. including the President and the Corporate Auditors on a regular basis to collect information.
- The Company shall mandate the Internal Control Department to report to the Corporate Auditors concerning each instance raised through the Compliance Hotline System.
- The Company shall have the responsible department(s) report to Corporate Auditors concerning

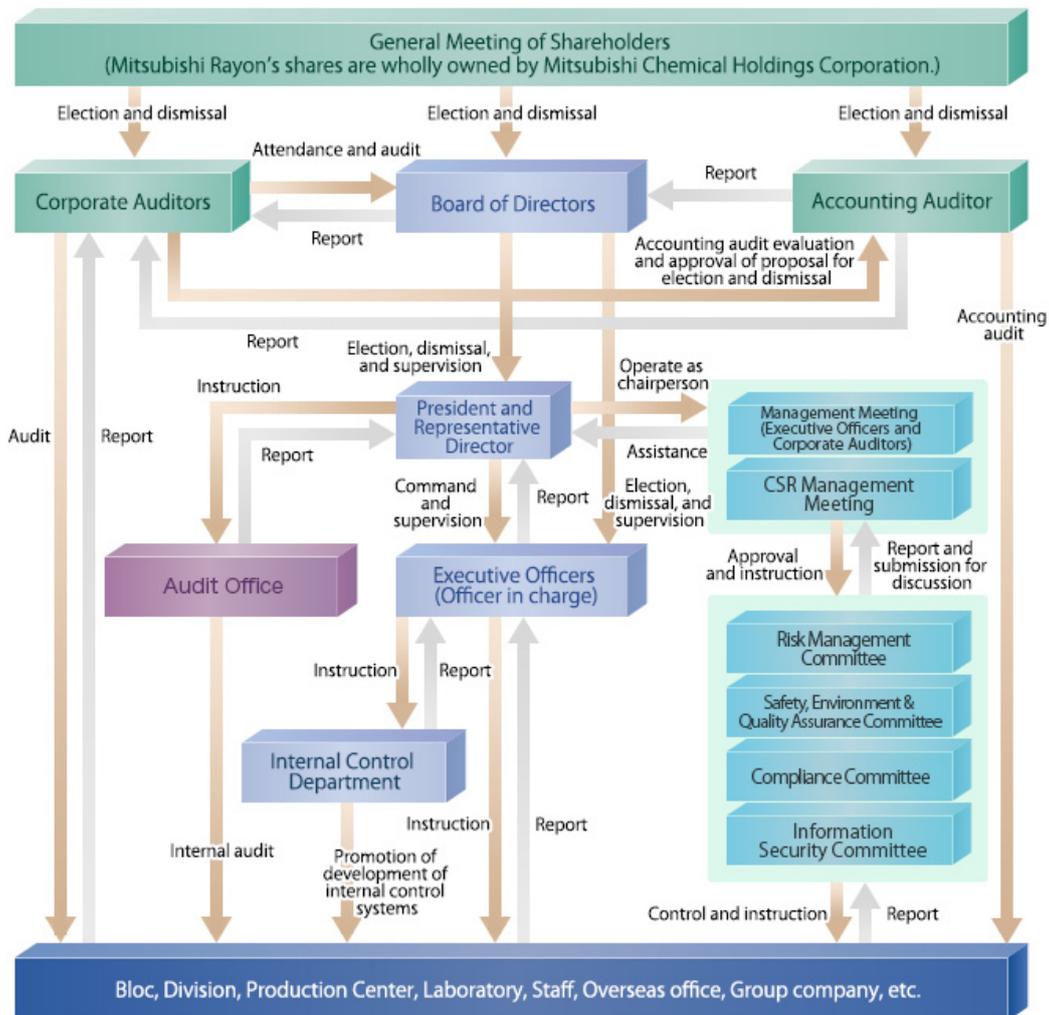
status of implementation of the internal control system approved at the Board Meeting, and whether such system is functioning effectively. The status of risk management shall also be reported regularly to the Corporate Auditors.

- The Company shall ensure directors or employees not to be given any disadvantageous treatment because of the reports that they make to the corporate auditors by setting forth a relevant provision in "Rules on Compliance Consultation Desks."

### 10. Other systems to ensure effective Audit by Corporate Auditors

- Corporate Auditors, Accounting Auditors and Audit Office shall regularly exchange information. The Company shall ensure a system whereby Corporate Auditors, Accounting Auditors and Audit Office can maintain close liaison, conduct effective audit, and exchange theme specific information when carrying out audit work. In conducting internal audit, the Audit Office shall maintain close contact and coordination with the Corporate Auditors and cooperate with Corporate Auditors' audit. In addition, the Corporate Auditors shall focus on strengthening the effectiveness of the audit system for auditing Group Companies including overseas subsidiaries and affiliates.
- The Company shall be responsible for the payment of costs, among the costs paid by corporate auditors, which are deemed adequate to regard as costs necessary for conducting audit.

2015/06/23



**Compliance**

The Mitsubishi Rayon Group is expanding its autonomous activities to steadily raise the compliance awareness of every employee by positioning compliance in its corporate endeavors as one of its top priorities and through the formulation of the Business Code of Conduct and Compliance Code of Conduct.

**Compliance promotion system**

The Mitsubishi Rayon Group has established the Compliance Committee to determine the group's policies and plans regarding compliance promotion activities under the direction of the Chief Compliance Officer. At the same time, for the purpose of upgrading the group's compliance promotion activities, the group has assigned employees in charge of compliance promotion who manage the progress of compliance promotion activities, confirm the effectiveness of such activities, and develop improvement measures, etc. Furthermore, the group aims to enhance its compliance promotion activities by developing and improving compliance-related rules and monitoring circumstances relating to disciplinary actions, reports provided to compliance consultation desks, etc.

**Compliance Promotion System**



## **Thorough Compliance Education, Training and PR**

We make every effort to regularly conduct education, training and PR at each workplace to fully instill an awareness of shared values and our Business Code of Conduct in each employee.

Every year, basic compliance training via e-learning is conducted specifically for assistant sales managers and new managers in order to test their knowledge and understanding of compliance in such areas as customers, partners, competitors and society. In addition, we hold workshops for approximately 400 managers and group leaders given their key role in promoting compliance. The workshops focus on increasing one's own sensitivity towards compliance and becoming more attuned to the latest information on this topic. We also conduct group discussions mainly on workplace issues with the purpose of raising awareness of compliance among employees and deepening communication during daily operations at every workplace.

Using internal databases, we publish the Compliance Report every month to showcase good compliance actions as well as publicize such issues as relevant laws and behaviors subject to disciplinary action. The Compliance Report serves as part of our employee education and awareness raising activities.

## **Compliance Awareness Survey**

In order to confirm the status of compliance promotion, the compliance awareness survey was conducted for the first time targeting Mitsubishi Rayon employees in conjunction with each Mitsubishi Chemical Holdings Group company. Survey results are conveyed to employees, used to confirm current compliance status and promote future compliance promotion activities.

## **Compliance Consultation Desk**

In order to rapidly identify and appropriately address compliance infringements, the Mitsubishi Rayon Group has set up two external compliance consultation desks staffed by attorneys and operated by a specialist management company and two in-house desks staffed by corporate auditors and operated by the Internal Control office. All of these desks form a consultation and reporting system that the Company utilizes in its efforts to appropriately manage and promote compliance. The privacy and human rights of everyone using this service is protected, the information gathered is not handled in a disadvantageous manner, and steps are taken under the direction of the Chief Compliance Officer (CCO) to remedy problems as soon as possible.

## **Compliance Activities in Overseas Group Companies**

The legal framework, culture, and social system are different in each country or area, and therefore, it is necessary to carry out compliance promotion activities that meet the circumstances of each country or area. Mitsubishi Chemical Holdings America Inc. in North America, Mitsubishi Chemical Holdings Europe GmbH. in Europe, Mitsubishi Chemical Holdings (Beijing) Co. and other regional supervisory companies of the Mitsubishi Chemical Holdings Corporation group in China, and key companies in other Asian countries are playing a central role in providing training and e-learning services to managers and employees at group companies. In addition, Mitsubishi Rayon (Shanghai) Co. is developing and promoting compliance plans in China.

## Risk Management

The Mitsubishi Rayon Group is aware that in order for the Group to meet public demands and sustain its development, it is essential for it to establish a mechanism for thoroughly understanding and managing various key risks both within and outside its business, in other words a "risk management system." With this awareness, the Mitsubishi Rayon Group has undertaken the following activities for managing risks.

### Risk Management System

The Mitsubishi Rayon Group's risk management initiatives respond to both important operational risks from a companywide perspective and risks inherent in each business activity undertaken by the Group.

#### (1) Risks That Significantly Impact Operations

Taking into account the social environment and other factors, the Risk Management Committee sets important companywide risks yearly and appoints the competent department to implement key measures in response to each risk.

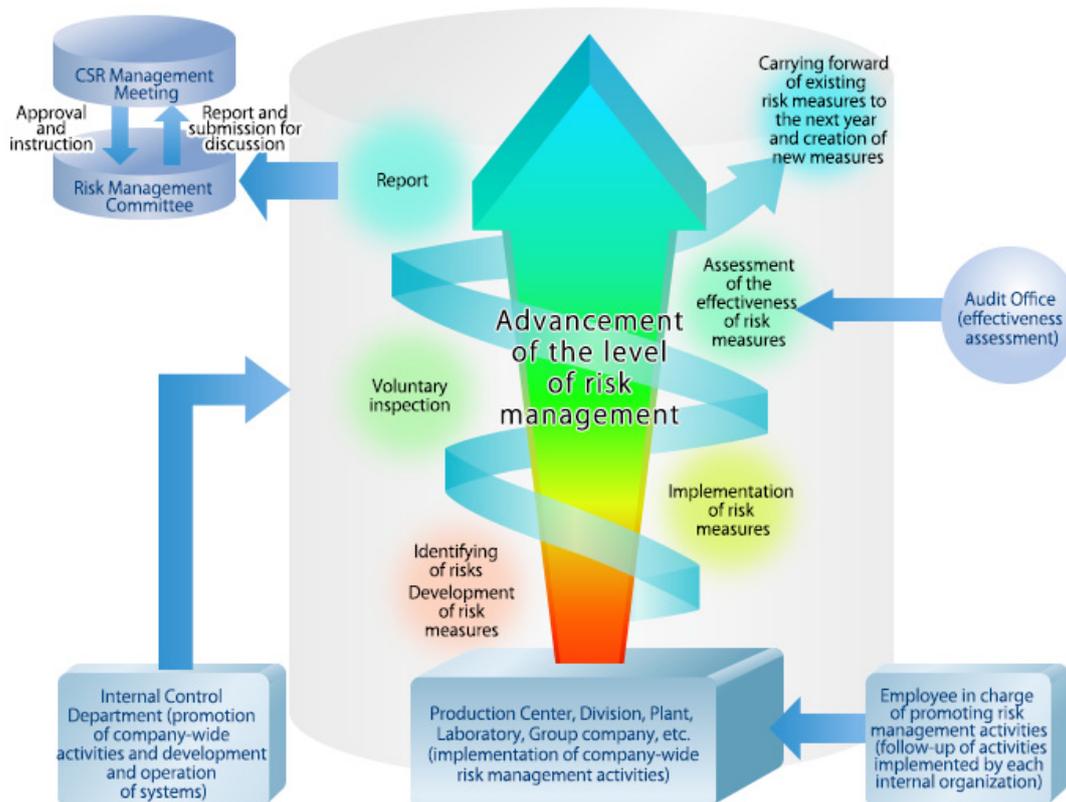
#### (2) Risks specific to each department

Each department, division, production center, plant, or laboratory develops its own risk measures in accordance with the company-wide risk management standards and manages risks with a bottom-up approach.

Specifically, each department, division, production center, plant, or laboratory is endeavoring to reduce risks by implementing the PDCA (plan-do-check-act) cycle consisting of (1) identifying risks, (2) developing risk measures, (3) implementing risk measures, (4) assessing the effectiveness of risk measures, and (5) carrying forward existing risk measures to the next year and creating new measures.

For each risk, the Audit Office checks the effectiveness of activities to develop and implement risk measures, aiming to improve the level of risk management activities. The progress of risk management activities is managed using a database system, with the aim of effectively and efficiently carrying out risk management operations by sharing risk information within the group, including overseas group companies. In addition, the level of risks identified is evaluated based on a matrix consisting of the degree of influence and the frequency of occurrence, and the results of this evaluation are reported to the Risk Management Committee.

## Risk Management Chart



### Risk management activities at overseas group companies

We are facing a need to carry out global business operations, covering global markets, by promoting cooperation among production and marketing centers in Japan, Asia, the U.S., Europe, and other countries and regions in the world. Consequently, from the perspective of securing the soundness of business management, it is becoming more and more important to develop and strengthen risk management and corporate governance functions.

The Mitsubishi Rayon Group manages risks on a unified, group-wide basis, covering both domestic and overseas group companies. For overseas areas where there are many group companies, and a high level of risk management is required, the group is carrying out risk management activities together with Mitsubishi Chemical Holdings America Inc. (in North America), Mitsubishi Chemical Holdings Europe GmbH. (in Europe), and Mitsubishi Chemical Holdings (Beijing) Co. (in China) and other regional supervisory companies of the Mitsubishi Chemical Holdings Corporation group. Furthermore, one of the most important challenges regarding the Mitsubishi Rayon Group's business operations is to develop and strengthen risk management and corporate governance functions in China. The group is dealing with these challenges by providing Mitsubishi Rayon (Shanghai) Co. with functions to develop and promote risk management plans.

### Business Continuity Plan (BCP)

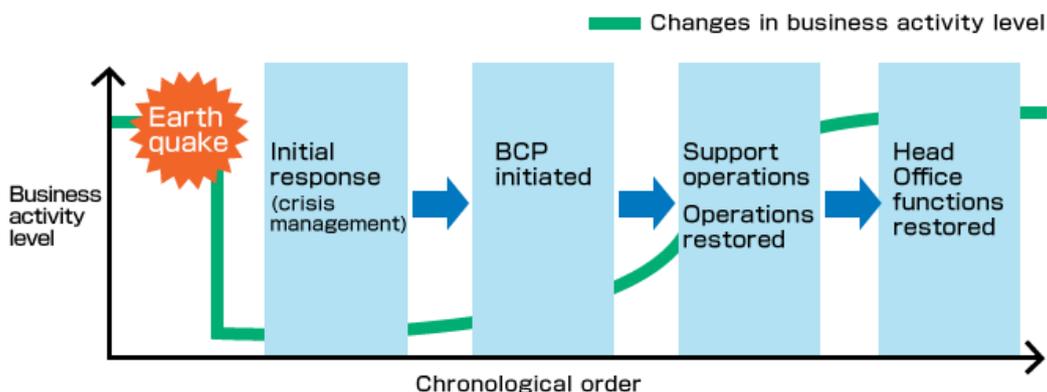
#### ■ Activities relating to an initial response (crisis management) plan and a business continuity plan (BCP) to prepare for a huge earthquake directly hitting the Tokyo metropolitan area and a major Nankai Trough earthquake

In order to prepare for a situation where the functions of the Head Office are lost because a huge earthquake hits the Tokyo metropolitan area or a situation where the functions of production centers and other offices located in the part of Japan that is west of Shizuoka Prefecture are lost because a major Nankai Trough earthquake occurs, we have developed a crisis management plan to secure the

safety of employees and a BCP-related basic action program covering all departments, etc., of the Mitsubishi Rayon Group.

Under the BCP-related basic action program, each department of Mitsubishi Rayon has separately assigned a supporting department that will take over its operations in case it is hit by an earthquake. After a BCP is implemented, supporting departments in each area will voluntarily launch support operations and will provide business continuity support until the earthquake-stricken departments restore their operations. Through these activities, we aim to restore the lost functions as fast as possible.

### Chronological Order and Business Activity Level



\*The green line indicates the fastest possible restoration of pre-earthquake operations.

#### ■ Crisis management training

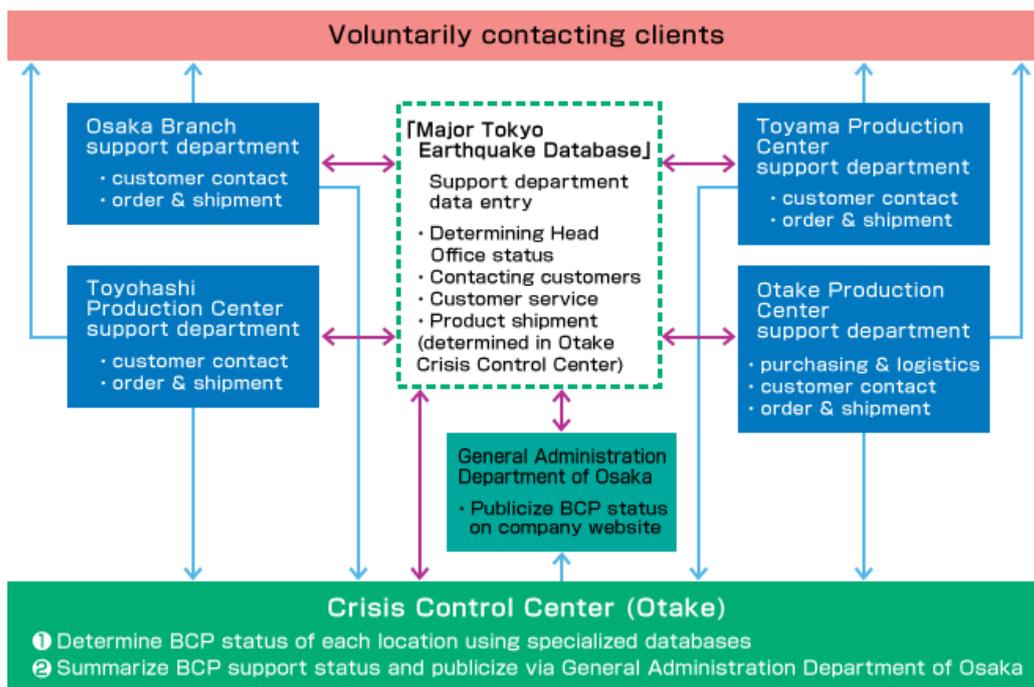
We periodically provide crisis management training simulating a situation where a huge earthquake directly hits the Tokyo metropolitan area or a major Nankai Trough earthquake occurs during work hours. If challenges are discovered and clarified through training, they are incorporated in the next crisis management plan (the revised edition), aiming to improve its effectiveness.

#### ■ BCP training

We periodically provide BCP training simulating a situation where a huge earthquake directly hits the Tokyo metropolitan area, based on cooperation among supporting departments for the Osaka Branch, the Toyohashi Production Center, the Toyama Production Center, the Otake Production Center, and the Sakaide Production Center, departments at the Head Office (which is assumed to be damaged by the earthquake), and the Otake Crisis Control Center.

In the training, a responsible person at a supporting department confirms failure of the functions of the Head Office in Tokyo due to an earthquake, implements a BCP, and instructs a person in charge to begin support operations. Subsequently, the person in charge at the supporting department notifies a client (in the training, a department in charge at the Head Office acts as a client) of the taking over of operations by the supporting department, carries out shipment and other operations on behalf of the Head Office, and enters the results of these operations into an in-house "database for a huge earthquake hitting the Tokyo metropolitan area." Then, the responsible person at the supporting department reports the results of these operations, which are carried out on behalf of the Head Office under the BCP, to the Otake Crisis Control Center, and a person in charge of public relations at the Osaka Branch provides information to outside parties through the website.

Meanwhile, to prepare for a major Nankai Trough earthquake, the Otake Production Center, the Toyohashi Production Center, and the Yokohama Production Center are eagerly examining BCP-related training programs by carrying out activities such as determining the level of anticipated damage in each area and creating BCP-related manuals.



### ■ Distribution of handbooks

We have created a handbook describing basic actions to be taken if a huge earthquake occurs and distributed it to all employees of the Mitsubishi Rayon Group. (The first edition was published in October 2014.)

### ■ Challenges under review

Improvement of the effectiveness of the crisis management plan and the BCP in order to prepare for a huge earthquake directly hitting the Tokyo metropolitan area

Establishment of a crisis management plan and a BCP at each production center in order to prepare for a major Nankai Trough earthquake

## Information Security

The Mitsubishi Rayon Group established its Information Security Policy in fiscal 2004 and is undertaking activities centered on the Information Security Committee to increase information security. From the perspective of internal control (J-SOX), the Group inspected mobile devices and tightened control of information access rights in fiscal 2009. The Group has expanded the application of improved physical security measures in areas such as facilities, equipment and devices, with the use of IC cards<sup>※1</sup> called PIAS<sup>※2</sup>. We will continue to promote PDCA cycles to reinforce information security activities.

※1 IC card: A card mounted with integrated circuits (ICs) for data storage and computation

※2 PIAS: Physical Security Integrated Admission System, the Mitsubishi Rayon Group's unified access control system

# CSR

## Activity Highlights

**Activity 12** | Global Carbon Fiber Business



Globally strengthening our carbon fiber business to promote energy conservation

**Activity 11** | Strengthen the MMA Monomer Production System



Further strengthening the stable supply of MMA as the world's No. 1 supplier

**Activity 10** | Establish Mitsubishi Rayon Aqua Solutions

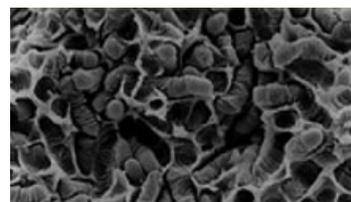


Developing a comprehensive aqua solutions business to realize a sustainable society

## Back number



**Activity 9** | Promotion of Fuel Conversion



**Activity 8** | Global Development of Acrylamide Manufacturing Technology



**Activity 7** | Promotion of Skylights Made From Acrylic Resin



**Activity 6** | Groundwater Membrane Filtration System



**Activity 5** | Expansion of the Market for Artificial Carbon Dioxide Baths



**Activity 4** | Next Stage of Development in DNA Chips (Genopal)



**Activity 3** | Development of Core-sheath Acetate Fiber (KIST)



**Activity 2** | Promoted Cleansui Long-Term Storable Water



**Activity 1** | Further Evolved Golf Shafts



## Globally strengthening our carbon fiber business to promote energy conservation

The world today is acting with strong resolve to make energy use cleaner and more efficient. A key material for the success of these efforts is carbon fiber, combining strength with light weight. Mitsubishi Rayon Group, as the world's only manufacturer of both PAN-based and coal pitch-based carbon fibers, provides solutions to many different kinds of industries, even as we work to further strengthen our global value chain.

### Environmental and Societal Issues

#### Expanding demand for strong and lightweight carbon fiber products for reduced environmental burden

For human society to avoid the crisis of global warming and climate change, it is essential to use energy effectively and to achieve major reductions in emissions of CO<sub>2</sub> and other greenhouse gases. Global efforts for promoting energy conservation and introducing new cleaner energy are activated at the moment and a key material in these initiatives is carbon fiber, combining strength with light weight.

In the automotive field, for example, an important theme is to reduce vehicle body weight for better fuel efficiency. CFRP (Carbon Fiber-Reinforced Plastic), combining ten times the strength and a fourth of the weight of steel, is increasingly being used by automakers as a structural material in vehicles to reduce weight. Lowering body weight is also an effective way to extend the range of electric vehicles and those powered by fuel cells. CFRP is thus expected to see expanded use in these next-generation eco-cars. Naturally the expectations for lower weight and greater fuel efficiency from wider CFRP use are not limited to automobiles, but extend to railways and other transportation means and to the aerospace field.

CFRP and other carbon fiber composite materials are further seen as having worldwide growth potential in the energy field. They are essential advanced functional materials for tanks that transport natural gas and shale gas in the alternative energy field, and for products such as hydrogen gas tanks for fuel cells and wind turbine blades in the next-generation clean energy field.

## Providing diverse solutions with the most sophisticated carbon fiber lineup and original processing technology

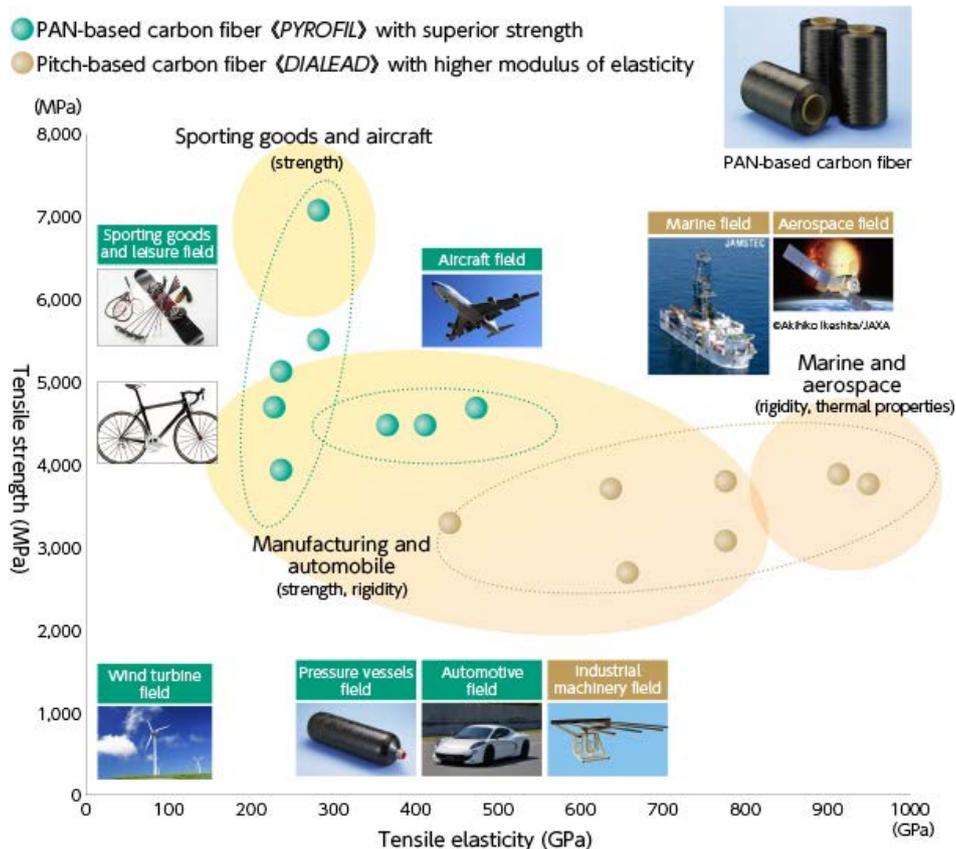
Exceptionally strong PAN-based carbon fibers are made from acrylic fibers carbonized at high temperatures. Pitch-based carbon fibers, made from coal tar as raw material, are known for their high rigidity (modulus of elasticity). Drawing on their respective advantages, these two main types of carbon fiber are put to diverse uses in the various fields such as aerospace, sports, leisure and automobile. Mitsubishi Rayon is the world's only manufacturer of both PAN-based and pitch-based carbon fibers. In the wide-ranging lineup, the PAN-based «PYROFIL» series includes products with the highest strength grade in the world, while the pitched-based «DIALEAD» series boast the highest rigidity (modulus of elasticity). The «PYROFIL» series, moreover, features high-performance large tow\* fibers having performance similar to that of regular tow\* fibers but with major cost advantages. These are attracting notice in a wide range of industries.

As processing technologies, in addition to the conventional AC (autoclave) and RTM (resin transfer molding) techniques, we developed the PCM (prepreg compression molding) technique with greatly reduced molding time while maintaining the same properties as AC. We have also succeeded for the first time in developing mass production SMC (sheet molding compound) technology for carbon fibers. This processing method goes beyond even the PCM technique in its ability to mold complexly shaped parts in a short time. With its uniform mechanical characteristics similar to metal, lighter weight and higher strength can be achieved relatively easily utilizing existing expertise in parts design.

Applying these carbon fibers and processing technologies, Mitsubishi Rayon is creating diverse solutions while strengthening our global value chain, for quickly meeting the varied needs of customers.

\* regular tow/large tow

Carbon fiber is a bundle of fibers up to 10 microns in diameter. Carbon fiber of 24,000 or fewer filaments is called regular tow, and that of 40,000 or more filaments is called large tow. Generally, the former offers superior performance while the latter offers superior processing capability and cost.



## Strengthening the value chain and developing highly competitive business

### ● Production Plants in Japan and U.S.

#### Increased Japan-U.S. production capacity in anticipation of robust demand

Mitsubishi Rayon has developed "high-performance large tow," a unique carbon fiber that supports high productivity in the molding of large components while exhibiting the physical and quality properties equivalent to regular-two carbon fibers. It has been cultivating applications in fields such as the aircraft industry and compressed gas tanks since the launch of operations at the Carbon Fiber Plant at Otake Production Center (Hiroshima Prefecture) in 2011. As a result, it is the world's first large tow to be adopted for aircraft flooring (in the Airbus' A320neo), and the product has been gaining market recognition and seeing a rapid increase in high-end applications.

Lately, the demand for large tow has increased particularly for use in wind turbine blades.

High-performance large tow is regarded as the optimal replacement for glass to dramatically reduce weight and ensure rigidity in the larger blade designs required for off-shore turbines and for low-wind-speed sites onshore.

This growing demand for wind applications has ensured the high utilization of Mitsubishi Rayon's production facilities. In the short term, increased interest in various intermediate materials using high-performance large tow such as weight-reducing materials for automobiles has led to the decision to increase production capacity for large tow carbon fiber at the Otake Production Center from the current 2,700 tons per year to 3,900 tons. When operations commence in the second quarter (July - September) of fiscal 2017, the carbon fiber plant will be the world's largest single line to produce carbon fibers.

As part of its efforts to bolster the value chain in its carbon fiber and composite materials business, Mitsubishi Rayon has also begun reinforcing the carbon fiber production facilities at its wholly owned U.S. subsidiary, Mitsubishi Rayon Carbon Fiber and Composites, Inc. (MRCFAC). At the regular tow carbon fiber plant in Sacramento, California, scheduled to commence production in fiscal 2016, annual production capacity will double to 4,000 tons per year.

This combined increase in production capacity in Japan and the U.S. is expected to increase the company's total carbon fiber production capacity in 2017 by approximately 30%, from 10,100 tons per year to 13,300 tons.

### ● Automotive Markets in Europe

#### Contribute to environmental response of European automotive manufacturers through new SMC intermediate materials plant

In Europe, many automobile manufacturers produce luxury and ultra-luxury vehicles in addition to mass-produced cars. Because the region leads the world in terms of CO<sub>2</sub> regulations and other environmental aspects, many car manufacturers are focusing on their environmental response. Against a backdrop of tighter fuel efficiency regulations, there is a particular focus on vehicle weight reduction, and the full-fledged adoption of carbon fiber-reinforced plastic (CFRP) with its high strength and light weight is being accelerated, not only for luxury cars whose production volume is limited, but also for mass-produced vehicles.

Under these circumstances, Mitsubishi Rayon has developed and commercialized high-performance large-tow carbon fiber — suitable for automobile applications and quick-cure prepregs — intermediate materials with which elaborate exterior panel parts can be press-molded in a short time. To strengthen and expand its carbon fiber and composite materials business in Europe, Mitsubishi Rayon has developed a production base for CFRP-made automotive parts and intermediate materials by acquiring Wethje Carbon Composites GmbH and TK Industries GmbH. It has also established a CF Marketing and Technical Center and increased marketing staff.

In October 2015, Mitsubishi Rayon decided to build a new SMC intermediate materials production plant in Bayern, Germany. The new plant will be built on the Wethje premises and is expected to begin commercial operations in 2016. The construction of this new plant is aimed at satisfying the need for high-end solutions for luxury cars, as well as those for solutions for mass-produced cars that are low cost and technically easily accessible.



## Further strengthening the stable supply of MMA as the world's No. 1 supplier

### Environmental and Societal Issues

#### Establishing a supply chain for the growing global demand for MMA monomers

Acrylic resins, the primary derivative product of MMA (methyl methacrylate), offer high transparency, excellent weatherability and excellent processability. This material can be recycled through a technology known as depolymerization. Therefore, it is widely used in a broad range of applications including signage for convenience stores, automobile lamp covers, LCD covers for mobile phones, light guide plates for LCDs, aquarium tanks, coating, and building materials. As the No.1 supplier of MMA in the world with an approximately 40% share of global production capacity, Mitsubishi Rayon has developed a value chain that is global in scope. Beginning with MMA monomers, we supply a wide array of products worldwide, from commodities to high-performance products, including polymer processing products such as molding materials, resin sheets, resin improvers, plastic films, coating materials, optical fiber, and rod lenses that we carefully customize based on customer needs. We are No.1 in the world for the capability of these products.

Current global demand for MMA monomers, the raw material of acrylic resin, now exceeds 3 million tons annually and stable demand growth in line with each country's GDP is expected. To continue fulfilling its responsibility of reliable supply as the No.1 supplier, Mitsubishi Rayon is expanding its global production structure.

### The Mitsubishi Rayon Approach

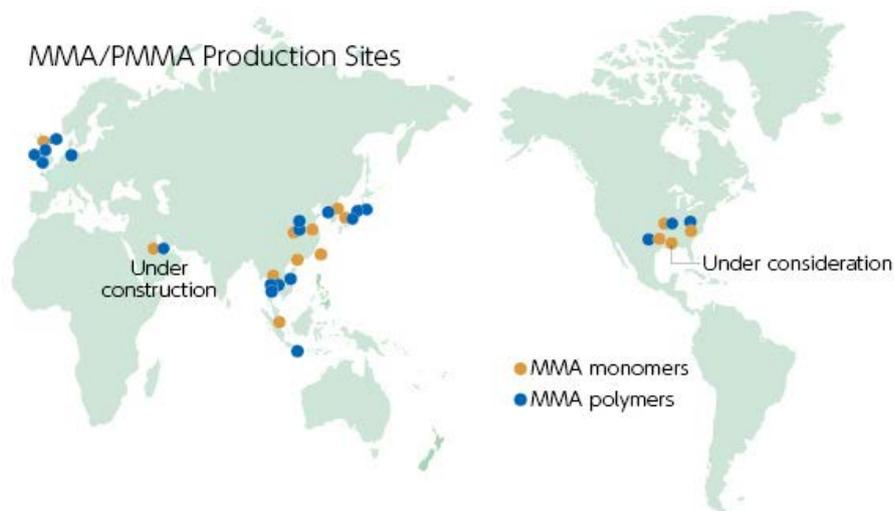
#### Optimizing production by leveraging production bases in the U.S., Europe, and Asia

To fulfill its responsibility of reliably supplying MMA monomers globally, Mitsubishi Rayon is currently focusing on the creation of a globally optimized production system underpinned by various manufacturing technologies that are the source of its competitive edge.

Mitsubishi Rayon is the only company that possesses all three of the main production methods that use different production raw materials. In addition to the traditional ACH method, it has the C4-direct oxidation process first industrialized in 1983, and the innovative ethylene-based MMA production process, "Alpha Technology" successfully industrialized in 2008. Leveraging its strengths in these various manufacturing technologies and supply chain development from monomers to polymers, Mitsubishi Rayon is building an optimized production system at more than 30 of its manufacturing bases throughout the U.S., Europe and

Asia. The system will monitor in an integrated manner the accessibility of raw material procurement, costs, market needs, trends and other factors.

To make this unique business model more robust and raise our supply and competitive capabilities, we are making timely and appropriate capital investments. In fiscal 2014, we finished expanding production capacity at our base in Shanghai, China, and started new projects in Saudi Arabia and the U.S.



## Key Measures toward Realizing KAITEKI

### Strengthening the production structure in Saudi Arabia and the U.S.

#### ● Saudi Arabia

#### The world's largest plant for MMA monomers and acrylic resin molding materials is under construction

In June 2014, Mitsubishi Rayon established The Saudi Methacrylates Company, a joint venture in Saudi Arabia with Saudi Basic Industries Corporation (SABIC). Annual production capacity for MMA monomers will be the world's largest at 250,000 tons, while acrylic resin molding materials will be at 40,000 tons. Construction on a plant in Saudi Arabia is progressing smoothly ahead of a start to commercial operations in mid-2017. The new plant is expected to be a strategic supply base for emerging markets with growth potential, including Eastern Europe, India, the Middle East and Africa.

Taking full advantage of utilizing highly competitive and secured gas feedstock, utilities and other infrastructure in Saudi Arabia, and applying the innovative ethylene-based MMA production process, "Alpha Technology", MMA monomer and PMMA businesses of overwhelming competitive strength will be materialized.

#### ● United States

#### MMA monomer production facility project started amid the shale gas and oil revolution

In June 2014, Mitsubishi Rayon and Mitsui & Co., Ltd. signed a memorandum of understanding to commence detailed feasibility studies for the establishment of a joint venture in the United States to produce and sell MMA monomers.

The project brings together the integrated strengths of both companies. Mitsubishi Rayon brings its innovative ethylene-based MMA production process, "Alpha Technology" while Mitsui brings its network with overseas companies. The goal is to achieve a highly competitive MMA monomer business in the United States amid the shale gas and oil revolution.

The joint venture intends to secure access to the raw material ethylene from the shale gas and oil-derived ethylene production and supply network developed by Dow Chemical along the U.S. Gulf Coast and build an MMA monomer production facility with an annual capacity of 250,000 tons.



## Developing a comprehensive aqua solutions business to realize a sustainable society

Mitsubishi Rayon Aqua Solutions Co., Ltd. was launched in April 2015 following the restructuring of the Mitsubishi Rayon Group's aqua business.

As a comprehensive engineering company for water treatment, separation and purification capable of responding to the needs of a wide range of industries with an all-in-one package system, we will contribute to the sustainable development of a global society.

### Environmental and Societal Issues

#### **Demand for "water treatment" and "separation and purification" is expanding globally**

Global water demand is increasing at an accelerated pace along with population growth and economic development. In emerging countries with continuing rapid economic growth, in addition to water for domestic and agricultural use, demand for high quality, high-purity water for use in power stations and various types of factories is growing significantly. Further, in some emerging countries, pollution of rivers, seas, lakes and reservoirs and pollution of groundwater have become serious social issues. In these regions, it is necessary to maintain purification equipment for industrial wastewater that contains numerous impurities, and recycling equipment. Comprehensive water treatment solutions that handle everything from various types of water purification to water filtration and wastewater treatment.

In addition, reflecting growing health consciousness in developed markets and the rising living standards of emerging countries and in developed markets, there is a steadily growing need for equipment to perform separation and purification required in the manufacturing processes of pharmaceuticals and intermediates and in food production including sugar and functional foods.

### The Mitsubishi Rayon Approach

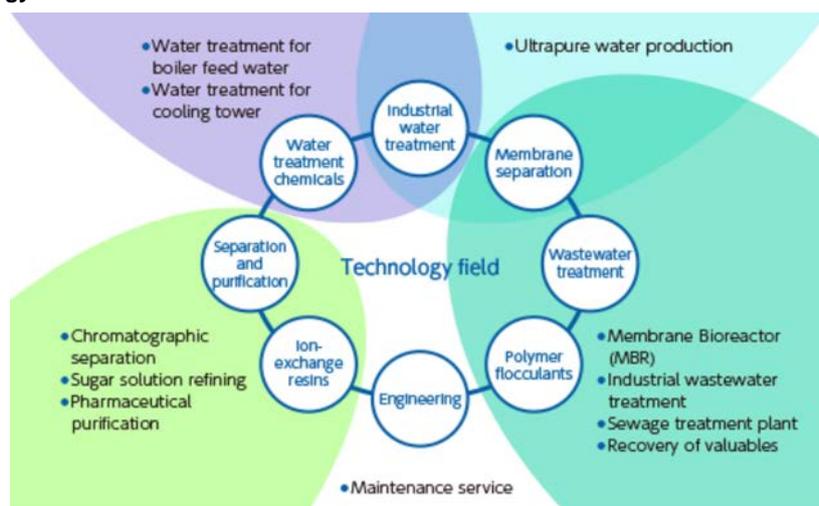
#### **Providing all-in-one package solutions in response to wide-ranging industry needs**

On April 1, 2015, the Mitsubishi Rayon Group restructured the former "Aqua Business Block" and changed it to the "Aqua Solution Block", aiming at strengthening water environment business and high performance separation business where market expansion is expected globally. Mitsubishi Rayon Aqua Solutions Co., Ltd. was launched following this business restructuring.

This company is the parent organization of Nippon Rensui Co., which developed its business around the core water treatment and separation and purification technologies that utilize Mitsubishi Chemical's ion-exchange resins. The company is making a new start through transfer of control of nearly all of Mitsubishi Rayon's water treatment business. Since its establishment in 1952, Nippon Rensui has developed a comprehensive engineering business that covers everything from equipment development to design, construction and maintenance primarily in the two fields of water, comprising pure and ultra pure water, and separation and purification equipment, which is used in pharmaceutical and food manufacturing processes. On the other hand, making full use of its propriety materials technology, Mitsubishi Rayon has pursued the development and sales of hollow fiber membranes mainly used in water purification and wastewater treatment, as well as of treatment equipment.

Through the fusion of these products, expertise and engineering technology, Nippon Rensui and Mitsubishi Rayon's water treatment business division were transformed into a comprehensive water treatment engineering company that not only sells parts and equipment, but is also capable of providing integrated solutions extending to design, construction and maintenance in a wide range of water treatment fields, from service water to wastewater, and the separation and purification fields, Mitsubishi Rayon Aqua Solutions intends to proactively develop diverse water treatment and separation and purification solution businesses in Japan, as well as in regions undergoing rapid economic development and industrialization, such as China and Southeast Asia. It will continue to contribute to the sustainable development of an industrial society through high-value-added businesses that make full use of its technologies and products.

### ● Technology Platforms



### Key Measures toward Realizing KAITEKI

#### Order received for separation and purification equipment from large Southeast Asian plant

##### ● Thailand

#### Order received from world's largest liquid sugar refining plant

In Southeast Asia, the consumption of soft drinks is increasing with recent population growth and rising living standards. Demand for liquid sugar, which enables the sugar dissolving process to be omitted in the soft drink production process, is growing. Mitsubishi Rayon Aqua Solutions (Nippon Rensui at the time) has a delivery record of supplying refining equipment in the sugar solution field to many refining plants in Japan. In recent years, leveraging this technology and knowhow, we have focused on sales activities in Thailand, Asia's largest sugar exporting country.

As a result, in September 2014, we received an order from Kaset Thai International Sugar Corporation Public Company Limited (KTIS) of Thailand for liquid sugar refining equipment that employs ion-exchange resins. KTIS is a major sugar production and sales company of Thailand. In 2013, Sumitomo Corporation

and Nissin Sugar Co., Ltd. made a capital participation in the company, which is increasing the scale of its business in Southeast Asia. The sugar solution refining equipment has been installed in KTIS's refining plant in Nakhon Sawan Province in northern Thailand, which has one of the world's largest production capacities for a standalone plant.

Mitsubishi Rayon Aqua Solutions views the sugar processing field in Southeast Asia, China and other regions as an important growth business and will continue to proactively expand business while taking advantage of the Mitsubishi Chemical Holdings Corporation Group's overseas bases and network of business partners.

## ● Indonesia

### Order for Southeast Asia's largest secondary brine purification system received from Indonesia's No. 1 caustic soda manufacturer

In the Southeast Asian market, where rapid economic development continues, demand is increasing for caustic soda, the raw material for a wide range of industrial products. In response to this increasing demand, PT. ASAHIMAS CHEMICAL (ASC), a caustic soda and vinyl chloride manufacturing and sales subsidiary of Asahi Glass in Indonesia, has been actively expanding its production capacity in recent years.

As a result, Mitsubishi Rayon Aqua Solutions (Nippon Rensui at the time) received an order in December 2014 for a secondary brine purification system from ASAHIMAS CHEMICAL, which boasts the leading market share for caustic soda and vinyl chloride in Indonesia. The system pre-treats ion-exchange membrane electrolysis equipment in the caustic soda manufacturing process (removing Ca, Mg and Sr) and has the largest purification capacity in Southeast Asia.

Mitsubishi Rayon Aqua Solutions has already delivered two secondary brine purification systems to ASAHIMAS CHEMICAL. The high-performance and space-saving benefits of the equipment are highly regarded and a third system was delivered. At the same time, we also received an order for a pure water system for processing and both systems began operating from the start of 2016.

Mitsubishi Rayon Aqua Solutions will continue to contribute to industrial development in Japan and abroad by providing high-value-added separation and purification equipment.



Secondary brine purification system  
Two-tower type

Activity Highlights | Activity 9  
Promotion of Fuel Conversion

## Using fuel with little environmental impact to realize a sustainable society

### Environmental and Societal Issues

#### CO<sub>2</sub> emission reduction through active fuel conversion

Reduction of the CO<sub>2</sub> emissions that can lead to global warming is an important theme when it comes to increasing the sustainability of society. In recent years, fuel conversion, or switching to fuels that place a lighter burden on the environment than conventional fuels and has attracted attention as a measure for reducing CO<sub>2</sub> emissions in corporate activities.

For example, a comparison of the amounts of CO<sub>2</sub> emitted by fuels shows that while coal will emit 1 unit, oil emits 0.8 and natural gas emits 0.6. What that means is that converting to fuels using natural gas instead of coal or oil will significantly reduce CO<sub>2</sub> emissions arising from business activities. Fuel conversion has a variety of other benefits, such as atmospheric pollution countermeasures involving conversion to fuels containing less sulfur, or resource-saving measures involving conversion to renewable fuels instead of disposable plastics or oil.

### The Mitsubishi Rayon Approach

#### Toyama Production Center and Toyama City Eco Town initiatives

Mitsubishi Rayon's Toyama Production Center is implementing various initiatives in collaboration with the adjacent Toyama City Eco Town<sup>\*1</sup> Industrial Zone.

For example, one company operating in this zone is Toyama BDF Co., Ltd., which manufactures biodiesel fuel (BDF) from used edible oils discharged from food factories and meal supply centers. BDF is an environment-friendly fuel that is carbon neutral<sup>\*2</sup> and emits a very minimal amount of sulfur oxide (SOX) compared with diesel oil. The Toyama Production Center started collaborating with Toyama BDF in 2007. The center supplies Toyama BDF with used edible oil from its company cafeteria, which had previously been thrown away, and is then processed into BDF (around 5,000 liters per year in FY2015) for use in some of Toyama Production Center's on-site vehicles.

At Toyama Green Food Recycle Inc., biogas (methane) produced from food waste and other material is used to fuel on-site generators. Biogas is attracting attention as a renewable energy but there are issues in expanding its application. The Toyama Production Center has been



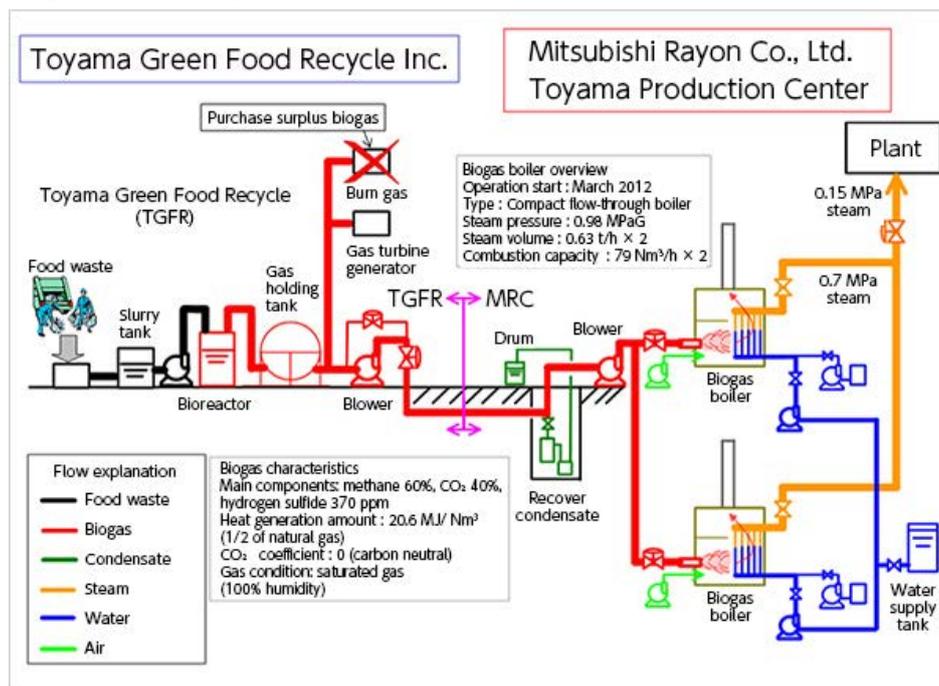
BDF is used as a fuel for vehicles used within the center

working on this problem in cooperation with Toyama Green Food Recycle Inc. and Toyama City in a collaborative project between industry and government to examine the effective uses of surplus biogas. Since 2012, the surplus biogas has been used effectively as a portion of the fuel for a steam boiler to prevent degradation of the hydrogen sulfide that includes biogas. The result was a reduction of 990 tons of CO<sub>2</sub> emissions in FY2015.

\*1 Toyama City Eco Town: Based on the Eco Town System established in 1997, projects operated by local authorities to support advanced environment-conscious town building through cooperation with local residents and industries.

\*2 Carbon neutral: When CO<sub>2</sub> emissions from plant-based fuels or combustion of raw materials are equal to the CO<sub>2</sub> emissions absorbed by plants during the photosynthesis stage and not resulting in an increase of CO<sub>2</sub> in the atmosphere.

**Fig.1: Biogas Use in the Toyama Production Center**



## Key Measures toward Realizing KAITEKI

### Reducing various environmental burdens by installing city gas boilers

At the Toyama Production Center, degraded heavy oil boilers (used together with petroleum coke boilers) were replaced in June 2014 by six compact flow-through boilers fueled by city gas. The fuel conversion from heavy oil to city gas using natural gas can reduce annual CO<sub>2</sub> emissions by 700 tons. In addition, it also led to significant decreases in substances such as nitrogen oxide (NOX) found in exhaust gases.

Installing the compact flow-through boilers also have a variety of other benefits that reduce the impact on the environment. Conventional heavy oil-fired boilers are not readily responsive to load fluctuations, so when there is a rapid reduction in factory volume use, there is no option other than to release surplus steam generated into the atmosphere. The newly installed compact flow-through boilers have outstanding load following characteristics, and detailed control of boiler numbers creates a reduction in the amount of surplus steam generated, so the amount of water used can be held down to about 1/100th of the past. Furthermore, cost and energy reductions are possible as launch times are reduced from two hours to about three minutes and detailed controlling of each boiler enables flexible operation of each device.

When installing the compact flow-through boilers, the city gas pipeline was also installed at the Toyama Production Center. This has further opened up possibilities for reducing CO<sub>2</sub> emissions through fuel conversion to city gas. We will continue to examine further fuel conversions.

Activity Highlights | Activity 8  
 Global Development of Acrylamide Manufacturing Technology

## Deployment of world's first production method to reduce environmental impact

### Environmental and Societal Issues

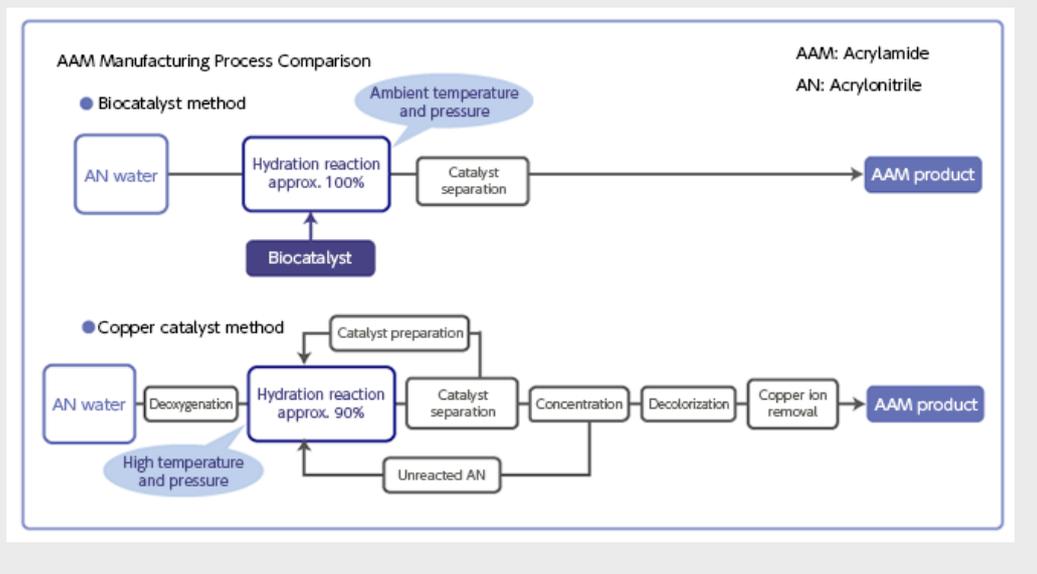
#### Significant reductions of energy consumption in acrylamide production

Acrylamide (AAM), a derivative of acrylonitrile, is used in a wide range of areas including as a raw material in flocculants for water treatment, in oil-recovery agents, in paper strengthening agents and as a raw material synthetic for various chemical compounds.

The typical production method of AAM used to be the copper catalyst method. However, the manufacturing process using the copper catalyst method to react at high-temperature and high-pressure required considerable energy. On the other hand, the biocatalyst method using microorganisms that have enzymes allows production at ambient temperature and pressure. The process is simpler and superior in terms of energy savings. (Fig. 1)

In 1985, Mitsubishi Rayon launched the world's first biocatalyst industrial production of acrylamide (AAM). This was the world's first instance of the biocatalyst method industrial production of a commodity chemical.

**Fig. 1 Comparison of Biocatalyst Method and Copper Catalyst Method Manufacturing Process**

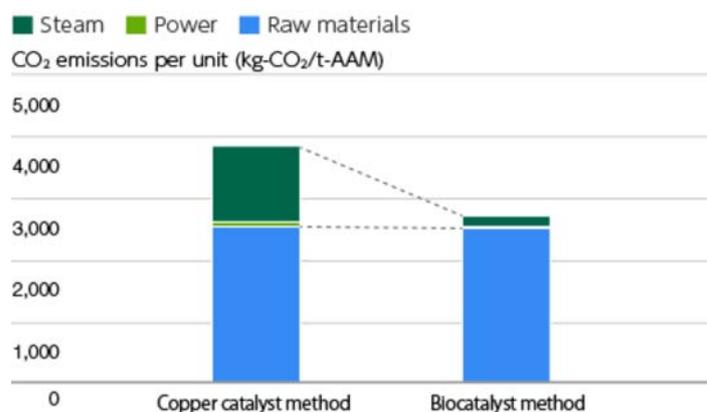


## Significant reductions in CO<sub>2</sub> emissions

Mitsubishi Rayon started R&D into the biocatalyst method in 1976. At the time, the study to decompose harmful substances in the soil using microorganisms made progress, but was unable to confirm the existence of microorganisms appropriate for the AAM production process. While solving the various technical problems to discover effective microorganisms, to establish the cultivation conditions and develop a more compact process we completed the world's first production technology over about nine years.

Subsequently, Mitsubishi Rayon took on the challenge of developing production methods linked to resource and energy saving. As a result, it has succeeded the development of the high-performance catalyst that is more stable and more active, in addition to making the process more compact. These developments have enabled a reduction in CO<sub>2</sub> emissions during the AAM production process to less than a fifth of the emissions from the copper catalyst method. (Fig. 2)

**Fig. 2 Comparison of CO<sub>2</sub> Emissions**



Source: Environmental Information Science: 25(3)61, 1996

## Key Measures toward Realizing KAITEKI

### Delivering production processes reducing environmental impact to the world

Mitsubishi Rayon not only manufactures and sells AAM using the biocatalyst method, but also supplies the biocatalyst and technology licensing the manufacturing process. The needs for resource and energy-saving chemical production processes are growing across the globe and about 40% of the world's current AAM is produced using Mitsubishi Rayon's biocatalyst method. In recent years, other companies have also started using the biocatalyst method, and new AAM production plants built around the world have all switched to using the biocatalyst method. By taking on the challenge of creating the most advanced processes and innovations, Mitsubishi Rayon will contribute to realizing KAITEKI.

Activity Highlights | Activity 7

Promotion of Skylights Made From Acrylic Resin

## Utilizing natural light gentle to people and the Earth

### Environmental and Societal Issues

#### Reducing energy consumption with skylights

To control global warming, society as a whole needs to reduce greenhouse gases including CO<sub>2</sub>. Therefore, it is important to create environments that minimize the amount of power used for lighting in homes or offices. From that standpoint, there has been renewed attention focused on natural lighting through skylights in recent years.

Mitsubishi Rayon, through Group company Ryoko Co., Ltd., provides offices, factories, stores and public facilities such as schools and hospitals with skylights (TOPLIGHT «Acrydome») made of Acrylic sheet. Effectively utilizing natural light contributes to controlling power consumption volumes. The skylight's retractable roof allows cool air in during the summer and keeps cold air out in the winter through high insulation ability, creating a more KAITEKI environment. To be sure, skylight has been designed with safety in mind and can be installed with netting able to catch people from falling.

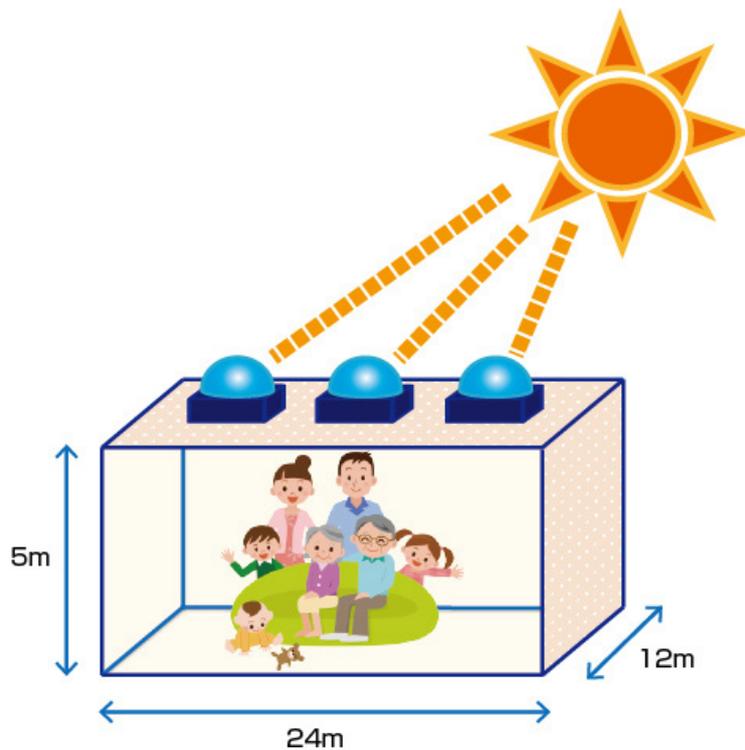


### The Mitsubishi Rayon Approach

#### Molding technology maximizing the characteristics of acrylic resin

Acrylic resin allows light to pass through better than glass, and possesses better weatherability than other transparent plastics, thus minimizing sunlight deterioration even when installed outdoors. The skylight (TOPLIGHT «Acrydome») is made by molding acrylic sheet into a dome shape that takes in the natural light.

Using an original shape appropriate for taking in natural light makes it possible to do without artificial lights on sunny days. For example, when three 2 m<sup>2</sup> skylights are installed equally on the roof of a room a roughly t 25 m swimming pool, this equals the brightness of lighting used in a typical office.



Installing the TOPLIGHT «Acrydome» can reduce CO<sub>2</sub> emissions by 388 kg\*1 per year, which translates into the annual volume of CO<sub>2</sub> absorbed by nearly 28 cedar trees. Communicating these environmental effects to customers could lead to reducing the impact on society as a whole has on the environment. From 2012, reviews of the TOPLIGHT «Acrydome» manufacturing process have resulted in shortening the formation cycle to about one-third of the previous cycle. By this and other measures, energy is being saved in the production process itself.

\*1 Calculation Conditions

1. A room of 24 m wide x 12 m long x 5 m high, dome with a shaft of 0.6 m and window area of 1 m x 5 m in six places, covering a total of 30 m<sup>2</sup>
2. TOPLIGHT «Acrydome» 3 units (cream-colored domes with netting and polished glass 6.8) 2 m wide 2m long
3. Concrete flooring, white-painted ceiling and white plasterboard walls

\*2 One cedar tree (50-years-old and 20-30-meters-high) absorbs 14 kg of CO<sub>2</sub> yearly (Forestry Agency website)

## Key Measures toward Realizing KAITEKI

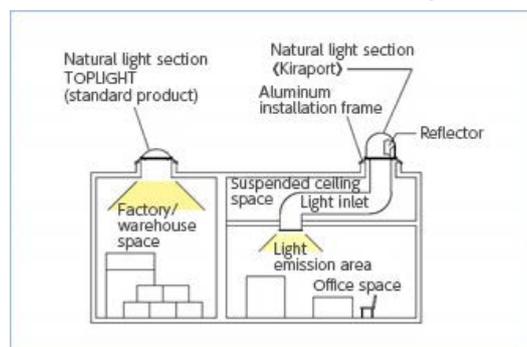
### Strengthening the lineup to further expand usage

If natural lighting through skylights spreads more throughout society, it could drastically reduce the power consumption for lighting. The Mitsubishi Rayon Group is strengthening its skylight product lineup, including the TOPLIGHT «Acrydome», so that the products can be installed under a greater variety of conditions.

In fiscal 2014, we added the «Kiraport» solar in-room system to the product lineup. This system uses light inlets built into ceilings to shine natural light into places like offices and corridors getting the natural light until now had been through windows, and into offices etc. with suspended ceilings that could not use skylight. (Fig. 1)

Going forward, we will use sales of skylight utilizing natural energy from sunlight to provide even greater KAITEKI spaces for people, the Earth and society.

**Fig. 1: Example of Using a Combination of TOPLIGHT and «Kiraport»**



Activity Highlights | Activity 6  
 Domestic and Overseas Expansion of Groundwater Membrane Filtration System

## Responding to global needs for infrastructure to provide safe and reliable water supply

### Environmental and Societal Issues

#### Unique water treatment and supply system to ensure safe and reliable water supply

The Earth is often referred to as the "water planet," and is thought to be blessed with rich water resources. However, the vast majority of water on the Earth is actually seawater and the total amount of water that can be used for drinking and other domestic purposes is less than 1%. In addition, in recent years, the rapid increase in the global population together with industrial development has increased demand for water. Moreover, water pollution due to lack of industrial water treatment facilities has become more serious, making it difficult to preserve safe and reliable water resources more than ever.

In Japan, there is an increasing risk of natural disasters such as massive earthquakes or volcanic activities, and in recent years there have been questions about how to respond to the water shortages that such disasters will cause. As one of the technical solutions to respond to such societal needs, WELLTHY CORPORATION, a Mitsubishi Rayon Group company, developed the Groundwater Membrane Filtration System that is drawing attention of the media recently.

The system draws water from a well that is usually around 100 meters deep and treats the water with an advanced filtration unit to provide safe and reliable drinking water to clients. The idea of water supply by two different channels, combining with public water supply, is drawing attention from the perspectives of four benefits, including business continuity planning (BCP) and CSR, and the system has been installed in hospitals, nursing homes, supermarkets, factories, hotels, railway stations and recently in local government premises.

#### Four Benefits of the Groundwater Membrane Filtration System



## Seeking safer and more reliable water as the pioneer and leading company

Wellthy started developing the Groundwater Membrane Filtration System in the mid-90s. Against a backdrop of the Great Hanshin-Awaji Earthquake and an outbreak of food poisoning caused by the O157 pathogen, the importance of securing safe and reliable water supply had become a societal issue at the time.

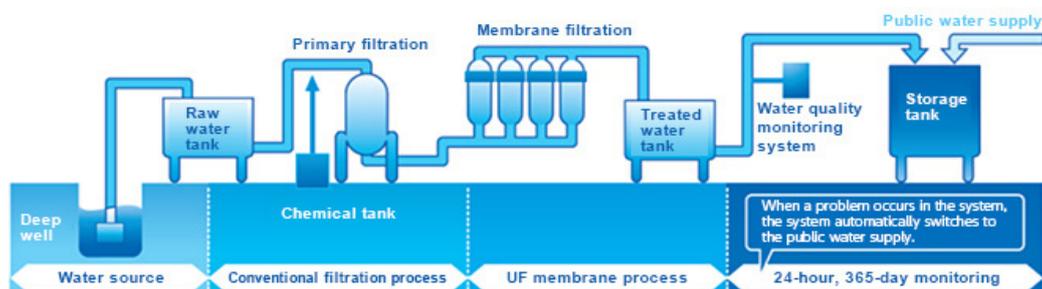
From the beginning, Wellthy had the idea of utilizing groundwater, but achieving the required quality for drinking water was not an easy task at the time. Therefore, Wellthy started joint research with Mitsubishi Rayon, which had developed a filtration technology using hollow fiber membrane. In 1997, after numerous trials and errors, the partners developed a system to supply safe and reliable water: sand filtration cleaned the water to the level of normal drinking water, and further membrane filtration eliminated bacteria and microbes. In this way, the company finally developed a system that can deliver safe and reliable water.

Once the first filtration system was completed in 1997, Wellthy has continued improving the system through raising the level of filtration technology, substantiating the maintenance system and establishing its own water analysis center etc. Wellthy has also endeavored to secure the trust of third parties through obtaining certification for "Membrane Module for Drinking Water Use" from the Association of Membrane Separation Technology, Japan and "Clean Water Equipment Certification" from the Japan Water Research Center. Furthermore, in May 2014, in the context of heightened interest in BCPs in the society, Wellthy became the first groundwater treatment business entity to have acquired the ISO 22301 certificate for business continuity, and is still continuing every possible efforts to pursue safer and more reliable water supply.

### An example of Groundwater Membrane Filtration System



### Basic treatment process of Groundwater Membrane Filtration System



## Delivering safe and reliable water

In the Kumamoto earthquake that occurred in April 2016, the Groundwater Membrane Filtration Systems that had been installed in Kumamoto City continued to operate while the surrounding area was out of water. Under these circumstances, four local hospitals equipped with the system provided water to neighboring residents for free of charge through their emergency faucets. The Groundwater Membrane Filtration System contributed to securing the lifeline in the event of a disaster, and the effectiveness of the system was demonstrated also in the Kumamoto earthquake following the 2011 Great East Japan Earthquake. As a result, the system had been adopted in 1,160 facilities as of the end of March, 2016. Based on this track record in Japan, Wellthy is working on providing safe and reliable water supply infrastructure to places facing severe water shortages overseas.

The first step was taken in 2013 when Wellthy worked with the United Nations Development Programme (UNDP) to provide a slow sand filtration system to a small agricultural community of 40 households in Machakos County, Eastern Kenya. The system purifies water from the canal by utilizing height difference without using electric power.

In April 2015, Wellthy started a pilot project in a private hospital in Vietnam on a membrane filtration system for supplying drinking water sourced from the public water supply. The system is equipped with a newly developed remote monitoring system that enables real-time monitoring of operating status and water quality. After a year-long pilot project, the hospitals is now using water treated by the system for not only drinking, but also for uses in their kitchens, operating rooms, laboratories and in delivery rooms. Technical expertise needed to maintain the system has been transferred to the local staff, and a maintenance structure was created to ensure the stable supply of safe water.

In June 2015, Wellthy partnered with the municipal water company in Ruiru Town, located on the outskirts of Nairobi, Kenya, to begin a pilot project to provide safe water to 400 households in the city. This pilot was carried out as part of the Promotion and Demonstration Project in Kenya for Water Purification under the contract with Japan International Cooperation Agency (JICA) in October 2013. During the one-year period of the pilot project, a membrane filtration system was used to purify highly turbid river water, successfully providing a safe supply of water that met the local standards for drinking water quality. The project also contributed to improving skills of the staff employed by the



A slow sand filtration system set up in a Kenyan village (2013)



Water purified by the slow sand filtration system is sold at a village market (2013)



Membrane filtration system supplying water to the town of Ruiru (2015)

water company for the operation and maintenance of the water treatment equipment.

In November 2015, a water purification plant near Nairobi also employed Wellthy's WeLLDAS remote monitoring system, designed to monitor water quality and volume. According to the staff member in charge at the water company, the system has proven very useful in enabling them to check on the status of water supply and system operations at the water purification plant, even when from the office away from the plant. They hope to install the same system to cover the network of water supply distribution pipelines running from the purification plant to urban areas.

Wellthy will continue its efforts to supply safe water overseas, utilizing its water filtration and remote monitoring systems.

Activity Highlights | Activity 5

Expansion of the Market for Artificial Carbon Dioxide Baths

## Expanding into further markets as an artificial carbon dioxide bath pioneer

### Environmental and Societal Issues

#### Making artificial carbon dioxide baths more familiar and enjoyable for people

Japan is one of the world's countries where hot springs occupy a prominent position and their physiological and psychological effects and benefits have been known since long ago. Used by the samurai to heal battle wounds in past centuries, hot springs remain popular throughout Japan. Going back even further, tradition has it that hot springs were used in the ancient times of the Kojiki chronicles and Fudoki reports.

In conjunction with increased health awareness, people in recent years have started to think again about the various therapeutic, cosmetic and other benefits of hot springs. In particular, carbon dioxide springs are attracting attention. The carbon dioxide spring is a standard type of Japanese hot spring, in which CO<sub>2</sub> diffuses into bath water. In general, natural carbon dioxide baths are physiologically beneficial, especially for stimulating one's metabolism, detoxification and relaxation. Many natural carbon dioxide hot springs can be found in places such as Germany and Italy, and many people travel from around the world to seek such natural-spring cures.

Because of their high temperatures, however, Japan has very few natural, highly concentrated carbon dioxide baths since CO<sub>2</sub> does not easily diffuse into high-temperature water. In addition, producing artificial versions has proven to be quite difficult. We at the Mitsubishi Rayon Group have resolved these issues using proprietary technology so that everyone can now enjoy artificial carbon dioxide baths.

### The Mitsubishi Rayon Approach

#### Utilizing hollow fiber membrane technology to create a device producing highly concentrated carbonate bath water

Carbon dioxide effects become apparent with a greater concentration, in particular, these benefits increase in highly concentrated carbon dioxide baths containing over 1,000 ppm of CO<sub>2</sub> per liter of bath water. Dissolving large volumes of gas into high temperature spring waters, into which gas does not dissolve easily, had been the biggest issue to resolve in producing artificial carbon dioxide water.

When the Mitsubishi Rayon Group was looking into the development of practical applications for hollow filter membrane modules used in things like degassing, we focused our attention on artificially carbonated water. We started R&D under a new business theme of a CO<sub>2</sub> dissolution module. Later, as the result of many years of



A hot-spring facility featuring the Ryusenji no Yu carbon dioxide bath (Chigasaki City, Kanagawa Prefecture)

research, in 1997 we successfully developed a device that artificially generated highly concentrated carbonate dioxide bath.

Now, Mitsubishi Rayon Cleansui Co., Ltd. is in charge of sales and presents a KAITEKI environment depending on a facility's needs, whether that be the installation of a personal-use bath type for inns or nursing facilities, or the type large-scale tub baths for sports facilities.



CO<sub>2</sub> dissolution module

## Key Measures toward Realizing KAITEKI

### Expanding markets with the development of a new brand for the beauty industry

Mitsubishi Rayon Cleansui is examining conducting various business developments including cooperating with the Mitsubishi Chemical Holdings Group to deliver the KAITEKI effects of carbon dioxide baths to as many people as possible.

In February 2015, we launched the new brand WATERCOUTURE targeting the beauty industry, and its first product was the SODA SHOWER WS101, a carbonated spa for beauty salons. In the beauty industry in recent years, carbon dioxide baths and services using carbonated showers and the like have been attracting attention. WS101 responds to this increasing demand as a product that is compact and easily operable while still capable of producing concentrations as high as existing products. It is mainly targeted for installation in beauty parlors and esthetic salons. Looking ahead, to enable carbon dioxide baths to become a more familiar part of people's lives we are moving ahead in developing business in various field and expanding sales channels overseas.



SODA SHOWER WS101

### Key Person's Voice



#### Masanori Itakura

Manager, Technology Division  
Mitsubishi Rayon Cleansui Co., Ltd.

During the development of the triple-layer membrane design used in Mitsubishi Rayon Cleansui's artificial carbon dioxide baths, we combined the Mitsubishi Rayon Group's polymer, dilution, production, evaluation and other nurtured proprietary technologies to create membrane production technology based on a new melt spinning method.

Since the Group did not initially possess the physiological expertise or relevant evaluation system at that time, we sought outside experts to summarize data on the effect of artificial carbon dioxide baths on the body, application methods and equipment requirements. As a result, we accumulated advanced expertise not found at any other company.

Looking ahead, by introducing as many people as possible to the artificial carbon dioxide baths, we are providing various KAITEKI values through health and beauty. In addition, the artificial carbon dioxide baths help promote bathing at a lower water temperature since artificial carbonation baths feel to be around 2 to 3°C warmer than regular bath water. This helps reduce thermal energy consumption while allowing us to make a modest contribution to a KAITEKI global environment.

Activity Highlights | Activity 4

Next Stage of Development in DNA Chips 《Genopal》

## Entering the diagnostics field by leveraging the characteristics of DNA chips 《Genopal》

### Environmental and Societal Issues

#### Genetic analysis technology raising expectations about personal medical treatment

In recent years in Japan, the onset of the superaged society has been accompanied by a rapid spread of the concept of healthy longevity, that is, maintaining a high quality of life for as long as possible. Medical care including preventive medicine is indispensable to continue a KAITEKI lifestyle without any health worries in old age. Much attention has been directed toward personal medical treatment depending on personal medical conditions and physical constitutions.

The key is the evolution of a genetic analysis technology. Every person has a different sequence. Analyzing an individual's genes can clarify the constitution of the person, such as their susceptibility to certain diseases or the effects of medicines.

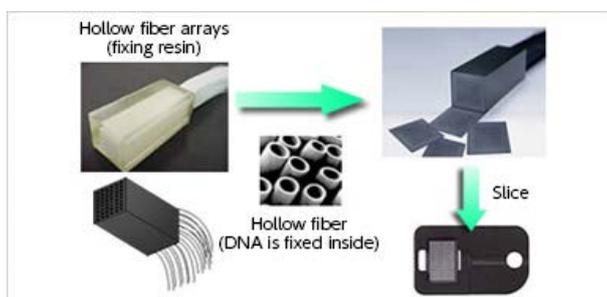
Applying fiber technologies developed over many years, Mitsubishi Rayon has started developing the highly sensitive and reproducible DNA chip 《Genopal》. We have successfully developed the fiber DNA chip 《Genopal》 which possesses a creative structure that differs from conventional chips. We provide various products focused on genes.

### The Mitsubishi Rayon Approach

#### Proposing an original chip structure by utilizing fiber technologies

DNA chips are analytic tools used to analyze the state of genes. DNA chips have numerous DNA fragments arrayed in high density on a plastic or glass board. Conventional DNA chips are mainly arrayed in two dimensions on a flat testing surface, but Mitsubishi Rayon used expertise accumulated through fiber technologies to create a three-dimensional structure using (3D) hollow fibers. The DNA probes are crosslinked gel in the fibers. It will be useful to improve the reliability and effectiveness of the genetic analysis. When the DNA chip 《Genopal》 is used, DNA probes have molecular mobility in the fibers. (See Fig. 1) This development was highly evaluated for its originality and assured performance. Mitsubishi Rayon was awarded the Special Technology Prize at the 45th Annual JCIA Technology Award in 2013.

Fig. 1 《Genopal》 production method



## Entering the oral care market as the first step into the diagnostics field

Now, Mitsubishi Rayon is not only active in its traditional role in market research support, but is also seeking to leverage the characteristics of 《Genopal》 to enter the diagnostics field. In fiscal 2014, as the first step in that direction, we developed the oral care chip, a DNA chip used to inspect oral bacteria. This can help prevent gum disease, of which at least 80% of adult Japanese are affected.

There are unlimited numbers of bacteria present in the mouth, but only about 0.1% of these cause gum disease. As the oral care chip is capable of simultaneously analyzing the total number of bacteria and the gum disease-causing bacteria, it is easy to discern whether there is a risk of easily contracting gum disease. Looking ahead, we will be able to compare clinical data and bacteria detection data as well as move ahead on examining market entry under the concept of preventative dentistry.

### Key Person's Voice



**Ai Nozawa**

Assistant Manager  
Bio Device Research Group  
Yokohama Research Laboratories

Mitsubishi Rayon began exploratory research into DNA chips in about 2000. Initially, the main motherboard design development and application development was divided between the Corporate Research Laboratories (Otake) and the Chemicals Development Laboratories (Yokohama), but in 2003, the development work was integrated in the Yokohama Research Laboratories and full-scale development started. We successfully commercialized the product in 2008 and started to support basic research on functional foods and cosmetics and provided it for evaluating the components of food. Since joining the MCHC Group in 2010, Mitsubishi Rayon has entered drug discovery-support applications and has moved ahead on full-scale development in the diagnostics field. Motivation for development is increasing more than ever by developing to the field where "Helping others" can be directly felt. Going forward, we will strive to develop healthcare products that contribute to improving the quality of life of people.

Activity Highlights | Activity 3

Development of Core-sheath Acetate Fiber 《KIST》

## Development of a highly functional fiber that controls human perspiration

### Environmental and Societal Issues

#### Realizing KAITEKI even after perspiring

In recent years, there has been increasing needs for highly functional clothing to realize a KAITEKI lifestyle. Against this backdrop, an important trend has been the need to eliminate the discomfort caused by perspiration. Among consumers, there has been a call for clothing with superior functionality that can quickly absorb and dry perspiration, and maintain freshness, even while the wearer engages in sports or experiences the heat of the summer.

To respond to these requirements, Mitsubishi Rayon Textile developed 《KIST》, a highly functional core-sheath acetate fiber with quick-dry and cool-touch functionality as well as high moisture absorbency and release performance.

### The Mitsubishi Rayon Approach

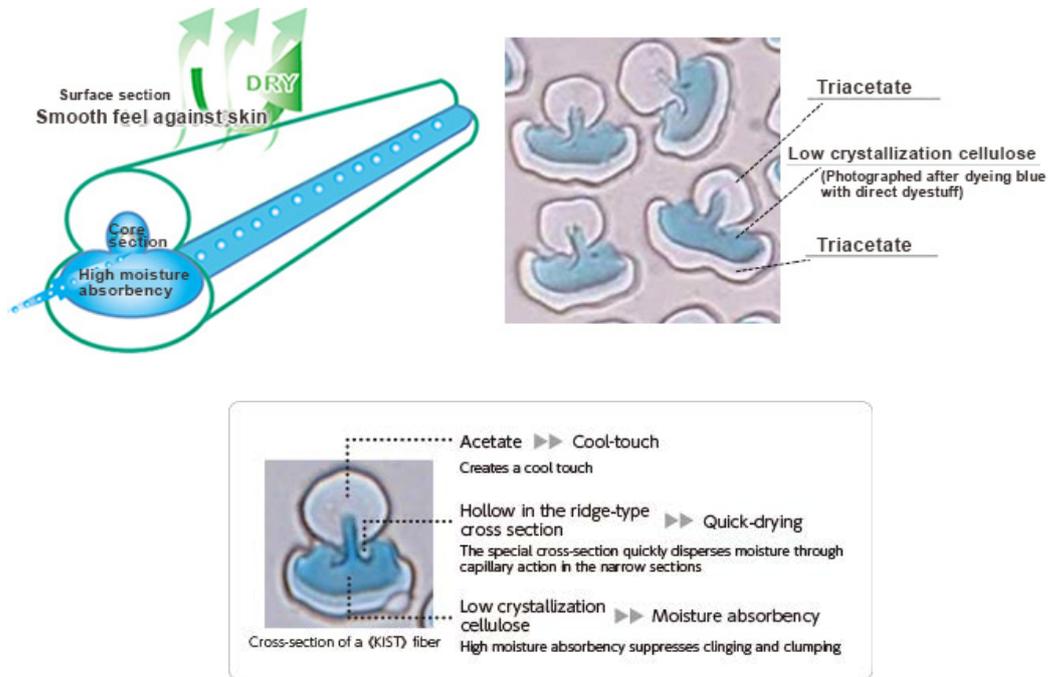
#### High functional products with unique structure by original spinning technology

To realize the concept of 《KIST》 controlling moisture (perspiration), we used our proprietary composite spinning technology. The greatest features of this are the special sheath core-type and ridged-type shapes.

The sheath-core type shape consists of a structure made up of the core and the sheath that surrounds it. By using a different material for each part, it realizes a hitherto unseen degree of functionality. The low crystallization cellulose core realizes high moisture absorbency and release, suppressing clinging or clumping. The triacetate sheath has vaporization heat that creates a cool touch as well as realizes outstanding luster and vibrant color. In addition, the original structure of the cross-sectional ridge-type quickly disperses moisture through capillary action in the narrow sections. (Fig. 1)

Having such a complicated structure required a complicated spinnerette structure during production when using conventional composite spinning technology. However, Mitsubishi Rayon was able to use its original composite spinning technology for simplification of the fiber production process and make it easier to enter the market.

**Fig. 1: Structure of «KIST»**

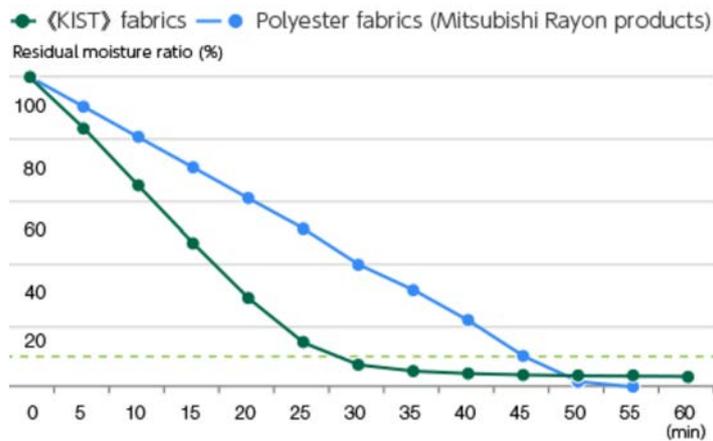


**Key Measures toward Realizing KAITEKI**

**Developing highly functional materials for fashionable clothing**

Initially, «KIST» was developed as a material for sportswear, but after its release in May 2013, it began to attract attention as a fashionable clothing material due to its outstanding functionality including absorption, quick-drying and cool touch characteristics (Fig. 2 and Fig. 3). In light of that, we started sales of luxury women's blouses ahead of the 2014 Spring-Summer season. We plan to expand items sequentially after taking into account the market evaluation.

**Fig. 2 Quick-drying Data of «KIST»**



Test method

- Dispersed residual moisture ratio (dripped under approx. 0.3 g of water)
- Residual moisture ratio (%)

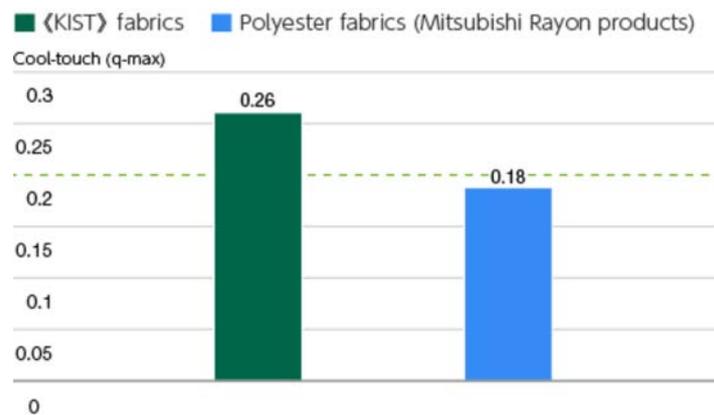
= Moisture amount (g) at each time / moisture amount (g) immediately after dripping water × 100

20°C / 65% relative humidity

Quick-drying performance evaluation condition (Mitsubishi Rayon standard)

- Time taken to reach moisture content ratio of 10%

Fig. 3 Cool-touch Data of 《KIST》



Test method

•Precise and Fast Thermal Property-Measuring Instrument

(KES-F7, Thermos Labo II) used

20°C / 65% relative humidity

Evaluation condition (Mitsubishi Rayon standard)

•Maximum heat absorption speed (q-max) more than 0.200 J/cm<sup>2</sup>·sec

### Key Persons' Voice

Front row center:

**Mr. Nomura** (Spinning Section at the Acrylic Fiber Plant)

This is a KAITEKI fiber that applies technology developed for sportswear to fashionable clothing.

Front row left:

**Mr. Ohno** (Safety, Environment and Quality

Management Department at the Toyama Production Center)

We have created this fiber by pursuing balance in functionality. We hope you will try it for yourself.



Activity Highlights | Activity 2

Promoted Cleansui Long-Term Storable Water

## Providing long-term storable, and safe drinking water in case of disaster

### Environmental and Societal Issues

#### Responding to societal needs for safe drinking water in case of disaster

Water is a resource indispensable for people's lives and industrial activities, but amid a backdrop of such matters as population growth and water pollution there are a growing number of places around the world where water shortages are becoming an increasingly serious societal issue. Even in Japan, which is blessed with water resources, awareness of the need to ensure water resources is increasing following the March 2011 Great East Japan Earthquake. It is crucial to deal with the matter of securing a safe water supply in the event of lifelines being cut off due to factors such as a natural disaster. In April 2013, the Tokyo Metropolitan Government issued an ordinance to assist people who would have difficulty returning home in the event of a disaster. The ordinance calls on businesses to take the steps necessary to ensure that a three-day supply of food and water are stored on their premises.

Consequently, in response to society's demands, in 2012 Mitsubishi Rayon Cleansui Co., Ltd. became the first water purifier maker to release its own brand of storable drinking water, Cleansui Long-Term Storable Water.

### The Mitsubishi Rayon Approach

#### Utilizing expertise to realize long-term storage

Activated carbon filters used to be the mainstream type of water purifiers, but in 1984 Mitsubishi Rayon launched «Cleausui», the world's first water purifier using a hollow fiber membrane filter. The purifying capabilities, which included being about to eliminate rust and even bacteria, were highly regarded and we gained a greater market share. Water quality management techniques nurtured in the water purifier field were applied in the storage water field, and Cleansui Long-Term Storable Water enabled long-term storage in the event of the unexpected occurring.



In the event of a disaster, Cleansui Long-Term Storage Water can not only be used safely for drinking, of course, but also for meals, preparing baby and infant formulas or baby foods.

Generally, drinking water stored in PET bottles has a life of two years, but using well-sealed and outstandingly durable PET bottles improves the stability of the contents, and this enables the water to be preserved for a longer term of five years.

## Always continuing to improve based on customer feedback

Cleansui Long-Term Storable Water initially sold to corporate clients was well received and we started selling it to general consumers from 2013. To avoid it being stored beyond its use-by date we changed over to a new package for general consumers' disaster-use water that prominently displayed in large characters the month preceding the use-by date on the top and all sides of the packaging. In addition to the 2-liter size used for storage we also added a 500-millileter easy-to-carry bottle to the lineup. Furthermore, based on results of customer questionnaires we always continue to update, such as by revamping the product by using natural water from Okuchichibu, which we named Cleansui Gonen Hozonsui, water that can be preserved for up to five years.

### Key Person's Voice



**Ken Goto**

Manager in charge of the Creative Planning Department Sales Office  
Mitsubishi Rayon Cleansui Co., Ltd

Mitsubishi Rayon Cleansui's mission is to deliver reliable, safe and tasty water, and the company does not restrict itself to only providing water purifiers. We are not limited to be a water purifier manufacturer, but rather aim to be a water solutions company providing consumers with safe and tasty water in a variety of ways, as well as continuing to seek out the possibilities of new business. Selling drinking water in PET bottles has been a new business idea of ours for quite some time. The Great East Japan Earthquake and the Tokyo Metropolitan Government's ordinance requiring assistance be given to those having difficulty returning home in the wake of a disaster were undoubtedly major catalysts for launching this business. Intending to provide safe water for customers in times of need, the number one reason for launching this business was to deliver Cleansui-quality water in an easy-to-use form.

At first, we were mainly selling to companies, but recently we have had more buyers from the general public and growing numbers of public organizations are also starting to use our products. Looking ahead, to respond to the needs of a wide array of customers, and we will continue to provide our products in a variety of ways to contribute to people, society and the earth.

## Cutting-edge golf shafts produced with an integrated framework

### Environmental and Societal Issues

#### Making golf more attractive through the development and production of golf shafts

Developing an affinity for sports has a variety of benefits as regards the improvement of people's quality of life (QOL), including promoting better health, relieving stress, and achieving community bonding. Among the different sports, golf can be enjoyed by men and women of all ages, and the game has now become so popular it is now said to be a national sport.



《Diamana BF》

The history of golf is also the history of golf equipment evolution. Golf shafts used to be manufactured from hickory, but later on steel was substituted to meet the need for greater durability and driving distance. Recent advances in golf clubs focused on the use of new materials in response to the demands of golfers. The representative of these is carbon fiber composite materials using carbon fibers that are stronger than steel and lighter than aluminum. Mitsubishi Rayon uses originally developed carbon fiber compound materials to create golf shafts that are highly rated by golfers all around the world.

### The Mitsubishi Rayon Approach

#### Utilizing rich expertise and technologies from carbon fibers to create the ideal golf shaft

Mitsubishi Rayon started R&D on carbon fibers from the late 1960s and possesses a product chain stretching from 《PYROFIL》 carbon fiber — made from polyacrylonitrile (PAN) filaments produced in-house — to intermediate materials and molded products based on carbon fibers. Mitsubishi Rayon's Carbon Fibers & Composite Materials business provides carbon fiber products used in a wide range of applications.

Golf shafts are one of the developments to have arisen from that. Mitsubishi Rayon leverages its strength of being able to develop and produce carbon fiber products by an integrated framework from raw materials

to finished product. Mitsubishi Rayon employs precision design engineering, paying detailed attention to design that incorporates rigidity and twisting mechanisms into shafts from the base to tip in pursuit of the ideal shaft for golfers (Fig. 1).

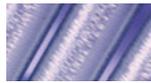
《Diamana》 was first released in 2004 to provide golfers around the world with the fun and excitement of golf and continued to evolve. Today the product has reached its FOURTH GENERATION. From the THIRD GENERATION, super-elastic 《DIALEAD》 ultra-thin sheets enable even more precise and rigid designs than ever before. This pitch-based carbon fiber business was transferred from Mitsubishi Plastics, Inc., a Mitsubishi Chemical Holdings Group company, in a collaboration among Group companies, and has enabled the further evolution of 《Diamana.》

#### Integrated development and production framework



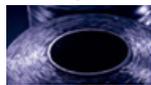
##### Monomer

Basic raw material derived from acrylonitrile



##### Precursor (acrylic yarn)

The main raw material acrylonitrile and acrylic fiber



##### Carbon fiber

Highly functional material produced from polyacrylonitrile fibers carbonized at high temperature



##### Resin

Matrix resin with functions heightened through combination with carbon fibers



##### Prepreg

Carbon fibers in a sheet and permeated with resin



##### Shaft

Mold using carbon fibers, each with a different performance depending on the part

### Key Measures toward Realizing KAITEKI

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#### Further strengthening the line-up with a new brand

Mitsubishi Rayon always strengthens its product line-up to respond to the diverse and advanced requirements of golfers. In August 2016, the flagship 《Diamana》 brand moved into the FOURTH GENERATION with the launch of the new BF Series. We continue to pursue KAITEKI by constantly updating our products in line with changing technologies and trends in clubs, ball and player capabilities. We also provide an extensive line-up in response to wide-ranging needs, including our 《KURO KAGE,》 《FUBUKI》 and 《BASSARA》 concepts as well as brands targeting different groups of golfers.

In December 2014, we launched the new 《OT iron》 brand, created using a "braiding" technique that braids carbon fiber bundles together with a new method designed to achieve a level of performance that defies conventional wisdom and brings new innovation to carbon fiber shafts.

Going forward, repeating research and development, we will continue to realize KAITEKI for golfers all over the world.

## Key Person's Voice



**Akinari Ito**

Manager in Charge of Marketing

Our main brand «Diamana» is a professional brand that targets relatively advanced golfers as well as those possessing considerable power. «GRAND BASSARA», the newest in the «BASSARA» lightweight shaft series, offers an ultra-lightweight shaft less than 30 grams unfinished, while still providing strength and performance, enabling senior golfers and those less confident in their hitting power to easily extend their distance. While the population of golfers has crested or is even falling, we hope to create products that contribute to a rise in the population of junior and women golfers, as well as allowing senior golfers an additional five or ten years of play. We will continue providing a diverse range of KAITEKI.

**Safety, Environment and Quality Assurance Management Structure**

- ↓ [Basic Policy](#)
- ↓ [Organization to Promote Safety, Environment and Quality Assurance Management](#)
- ↓ [Audit on Safety, Environment and Quality Assurance in Fiscal 2015](#)

**■ Basic Policy**

Based on the Responsible Care\* policy, The Mitsubishi Rayon undertakes business activities under the Basic Policy on Safety, Environment, and Quality Assurance, Action Guidelines on Safety and Environment and Basic Policy on Quality Management.

\* Responsible Care:

"Responsible Care" is a voluntary initiative in which companies ensure environmental friendliness, safety and health at all stages of chemical substance usage-from development to production, distribution, use and final disposal-while communicating with the public about these activities and achievements.

**Basic Policies on Safety, Environment, and Quality Assurance**

- Top priority shall be placed on safety and environment in all business activities, as these are essential for corporate existence.
- We shall supply our customers with satisfactory, safe, and reliable products.

(Established in 1998)

**Action Guidelines on Safety and Environment**

- (1) Comply with any laws and regulations and should take measures over the legal requirement when it is considered necessary.
- (2) Any incidents can be prevented and should take measures as it is responsibilities of each individual.
- (3) Act with self-responsibility and self-management.
- (4) All business activities shall be carried out under consideration for environmental sustainability.
- (5) Every possible effort shall be made to uphold safety and reduce environmental burden throughout the entire life cycle of each product.
- (6) Education shall be used to improve awareness of safety & environment, with the result put to practical use at the workplace.
- (7) Active communication shall be maintained with society to raise the level of corporate transparency.
- (8) Scientific and technical means shall be utilized to make improvements on a constant step-by-step basis.

(Established in 1998 and partially revised in 2001)

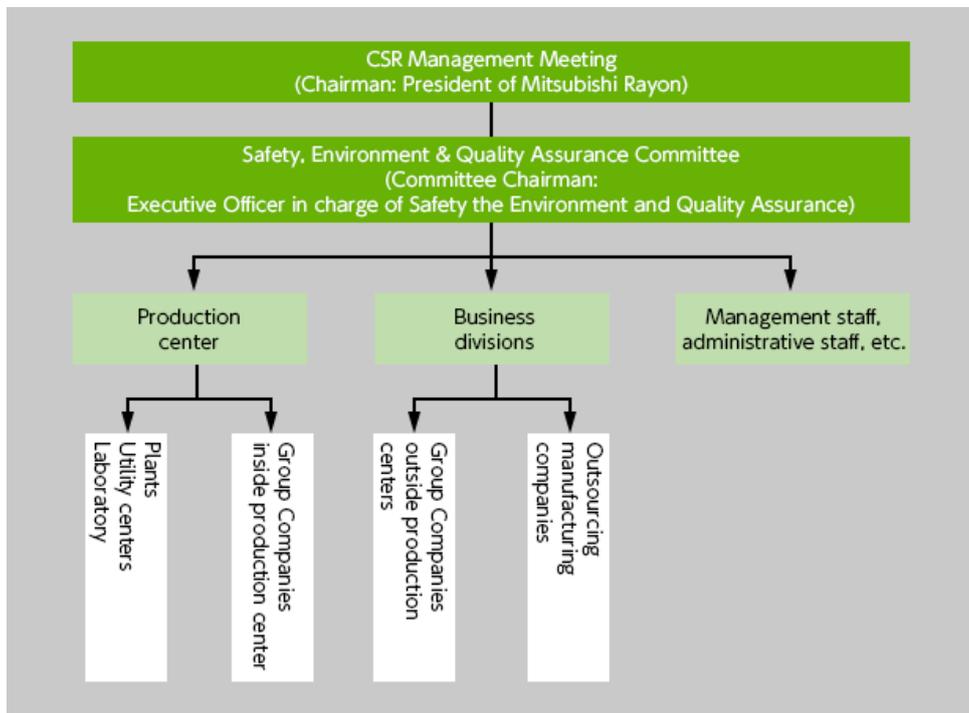
**Policy of Quality Management**

To manufacture and supply products that satisfy customers and meet their requirements, the Mitsubishi Rayon Group has established its Safety, Environmental and Quality Management Regulations. The Group takes a thorough approach to quality management through promoting cooperation between the relevant departments, and does its utmost to ensure quality both effectively and economically, thereby achieving its goal of quality assurance.

(Established in 1984)

## Organization to Promote Safety, Environment and Quality Assurance Management (as of April 1, 2016)

The Mitsubishi Rayon Group's basic policy and measures of Safety, Environment and Quality management are determined by CSR Management Meeting (Chairman: President of Mitsubishi Rayon) which is the decision making body for all CSR activity. And according to these decisions, SEQ committee is established as the body to promote basic policy and measures by top-down type management.



### ● Establishment of the Safety, Environment and Quality Assurance Committee

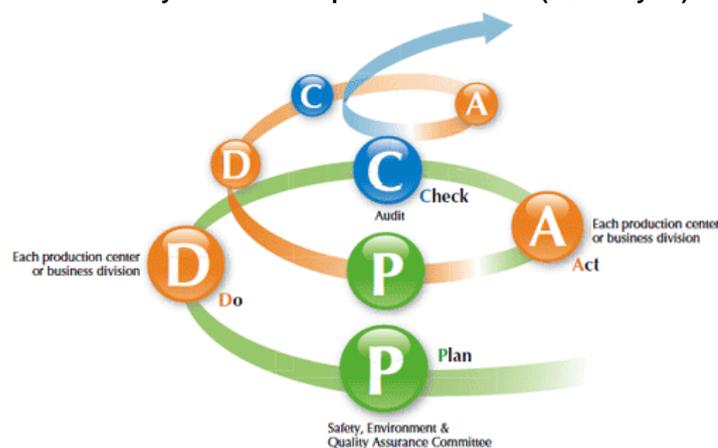
The Mitsubishi Rayon Group has established the Safety, Environment and Quality Assurance Committee to comprehensively decide and implement policies related to the management of safety, environment and quality assurance, to formulate an annual plan and review all these, and to discuss and decide the evaluation and confirmation of their implementation.

The committee shall discuss and decide on:

- (1) Basic policy and plans related to the company's safety, environment and quality assurance management
- (2) Comprehensive policy related to the company's safety, environment and quality assurance management
- (3) Countermeasures and policies for important issues related to the company's safety, environment and quality assurance management
- (4) Regulation formulation, revision or abolition related to the company's safety, environment and quality assurance management that affect the whole company
- (5) Audits the contents of the safety, environment and quality management, and product liability

Each production center and division as well as Group companies falling under the jurisdiction of a division shall conduct specific activities in compliance with matters decided by the Safety, Environment and Quality Assurance Committee.

### Safety, Environment and Quality Assurance Implementation Flow (PDCA Cycle)



## ■ Audit on Safety, Environment and Quality Assurance in Fiscal 2015

### ● Audit Types

| Audit type  | Audit target  |
|---|---|
| <p><b>General audit</b><br/>The audit conducted by management under the Safety, Environment &amp; Quality Assurance Committee (with corporate auditors and executive members of the union as observers)<br/>Conducted annually for four production centers</p>    | MRC*, The Lucite International Group  |
| <p><b>Safety and environment audit</b><br/>The audit to supplement the general audit; this is a detailed audit on the sampled departments<br/>Conducted in cycles of 3-5 years</p>  | MRC*  |
| <p><b>Group company audit</b><br/>The audit that implemented as part of the Group's management under approval by the Safety, Environment &amp; Quality Assurance Committee<br/>Conducted in cycles of 3-5 years</p>   | Group companies, (The Lucite International Group excluded)                        |
| <p><b>High Pressure gas safety audit</b><br/>The audit that is conducted by the Head Office on production centers authorized in accordance with the High Pressure Gas Safety Act<br/>Conducted annually for applicable production centers</p>                     | Production centers authorized in accordance with the High Pressure Gas Safety Act |
| <p><b>Special audit</b><br/>The audit that is implemented under the direction of the Chairman of the Safety, Environment &amp; Quality Assurance Committee in the event of a serious injury or incident</p>   | The Mitsubishi Rayon Group  |
| <p><b>Extraordinary audit</b><br/>The audit of the production centers and/or the Group companies that is implemented under the direction of the Chairman of the Safety, Environment &amp; Quality Assurance Committee</p>   | The Mitsubishi Rayon Group  |
| <p><b>Product liability and quality audit</b><br/>The audit that is implemented on all aspects of business activities from marketing to production under approval by the Safety, Environment &amp; Quality Assurance Committee<br/>Conducted in 3-year cycles</p> | MRC* product lines  |
| <p><b>Quality audit of outsourcing manufacturing companies</b><br/>The quality audit of the companies manufacturing MRC* products as subcontractors<br/>Conducted in cycles of 3-5 years</p>  | Outsourcing manufacturing companies   |

\* Please refer to "Scope of environment related data collection" for the scope of audit.

● List of Audits Executed in Fiscal 2015

| Audit type   | Department/Company   | Audit target                              |
|--|--|---|
| General audit  | Otake Production Center, Toyohashi Production Center, Toyama Production Center, Yokohama Production Center and Lucite International Group (major sites)  | Safety and environment                    |
| Safety and environment audit                         | Otake Production Center (eight departments), Toyohashi Production Center (five departments), and Toyama Production Center (five departments and Yokohama Production Center (three departments)                         | Safety and environment                    |
| Group company audit                                  | Group companies overseas (two companies) and Group companies in Japan (four companies)   | Safety, environment and quality assurance |
| High Pressure gas safety audit                       | Otake Production Center (one department)   | Safety                                    |
| Special audit  | No applicable department in the fiscal year under review   | Safety                                    |
| Extraordinary audit                                  | Otake Production Center (one department), Toyama Production Center (three departments), and Group companies outside production centers (two companies)   | Safety                                    |
| Product liability and quality audit                  | MMA AN Business Bloc (two departments), Specialty Chemicals, Resins & Plastics Business Bloc (two departments), Fibers Business Bloc (seven departments), Group companies outside production centers (three companies) | Product liability and quality             |
| Quality audit of outsourcing manufacturing companies | Outsourcing manufacturing companies (twelve companies)   | Quality                                   |

● Audit Results for Fiscal 2015

| Audit type                                   | Report  |
|--|---|
| <p><b>General audit</b></p>                  | <p>Audits were implemented at four production centers in Japan and at the major sites of The Lucite International Group. General audits of the domestic production centers were conducted based primarily on the reports from each site using the results of site internal audits, safety and environment audits, and safety, environment and quality assurance section's internal audits based on internal audit self-check sheets. Overall, it was found that the centers tackled safety and security management with seriousness. It was recommended that operators constantly check their daily operations and environmental conditions, and work to improve their frontline standards for safety activities, while managers were required to raise employees' safety awareness and were reminded of their responsibility to ensure a safe and secure working environment.</p>  |
| <p><b>Safety and environment audit</b></p>   | <p>In safety and occupational health, the results of internal audits based on a checklist of 1,500 items were checked, and audits conducted with an emphasis on frontline inspections. A check of internal audit items provided a visualization of the strengths and weaknesses of each workplace. Each department was required to make improvements where necessary. Safety, environment and quality assurance audits were held separately, covering company-wide issues for the fiscal year, and separating the progress with priority items at production centers into safety and environment categories, with the head office safety, environment and quality assurance department conducting audits at each location.</p>  |
| <p><b>Group company audit</b></p>            | <p>At targeted domestic companies, safety activities were being promoted with the participation of all employees, and the communication with employees was good. At companies overseas, a high level of safety management activities were being conducted, included regular meetings between workplace managers and workers, "Know-why" training based on operating manuals, plant safety checks via internal audits and external audits by third parties, and a system of preventative maintenance and regular equipment inspections. Audited companies were each required to provide safety instructions to new employees, ensure skills are passed from retirees to younger workers, and engage in technology exchanges with other Group plants regarding security, disaster prevention and safety management.</p>   |
| <p><b>High pressure gas safety audit</b></p> | <p>The audit focused on the safety rules for industrial complexes and other facilities stipulated by safety management systems, status of conformity with certification notices, and the effectiveness of safety management activities. While conformity with rules for safety management systems and the effectiveness of safety management activities were good, the department was required to make improvements where deficiencies were found in execution of those activities. The adequacy of countermeasures against injuries and troubles, the outbreak and investigations into the cause were verified in order to enhance the audit effectiveness and eliminate the cause of incidents and injuries. The status of compliance with certified safety management inspections was also audited and found to be good. However, instructions were given on how to further raise the quality of inspection management work.</p> |

|  |  |
|--|--|
| <b>Special audit</b>                       | Not implemented in the fiscal year under review  |
| <b>Extraordinary audit</b>                 | Extraordinary audits under the safety and environmental audit rules were conducted at the departments and group companies where there were concerns about injuries and incidents. These included verifications and discussions about approaches to identify the causes of injuries and incidents and the status of countermeasures, along with discussions of safety management systems, and sites were required to conduct risk prevention training covering safety measures and work within safety fences. |
| <b>Product liability and quality audit</b> | Audits were conducted on a total of 14 departments, including five target product lines, business divisions, factories, R&D departments and group companies. The audit focused on compliance in the areas of product liability, risk management system, screening status until new product release, management of change, contract manufacturing partner management and chemical substance management during new product development. Each department was given specific instructions to make improvements.  |

#### **Scope of environment related data collection**

Only companies that mainly engage in manufacturing and processing are subject to the aggregation of environment-related data. See (1) through (4) below for expressions used in this report.

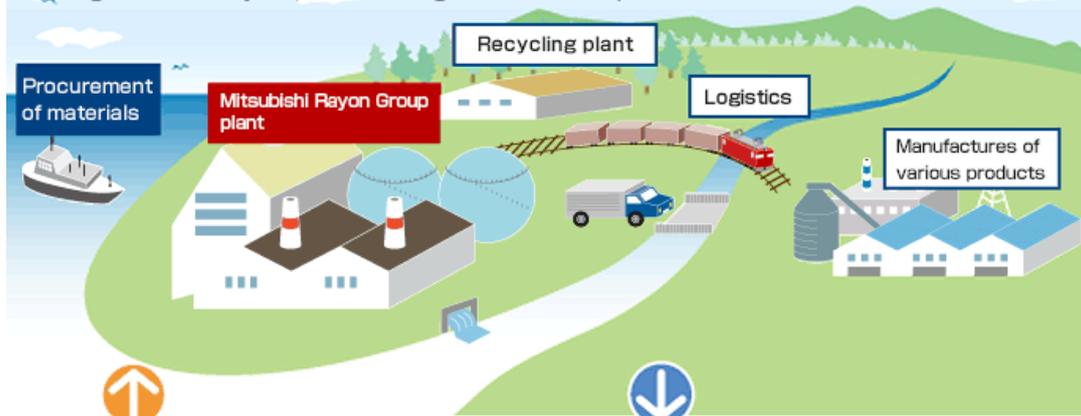
- (1) MRC Group: companies that come under the following categories (2) to (4)
- (2) MRC: Mitsubishi Rayon and Group companies operating at Mitsubishi Rayon's production centers
- (3) Domestic Group: consolidated subsidiaries in Japan other than those which come under the above category (2)
- (4) Overseas Group: consolidated subsidiaries in other countries

#### Subject companies and data

**Material Balance**

**Overview of Environmental Burdens at the Mitsubishi Rayon Group\***

The Mitsubishi Rayon Group is gaining an understanding of the environmental impact of its products throughout their lifecycles, and is working to reduce this impact.



| INPUT  |   | OUTPUT  |   |  |  |
|--|---|---|---|--|--|
| Energy consumption<br>(Converted into crude oil)<br>MRC 288,000 kℓ<br>Domestic Group 10,000 kℓ<br>Overseas 461,000 kℓ<br>Group               | Total wastewater volume<br>MRC 91 million m <sup>3</sup><br>Domestic Group 4 million m <sup>3</sup><br>Overseas 1 million m <sup>3</sup><br>Group | Chemical substances<br>MRC 1,198 tons<br>Domestic Group 43 tons<br>Overseas 132 tons<br>Group | Greenhouse gases<br>(converted into CO <sub>2</sub> )<br>MRC 1,170,000 tons<br>Domestic Group 27,000 tons<br>Overseas 1,777,000 tons<br>Group |  |  |
| Water consumption<br>MRC 109 million m <sup>3</sup><br>Domestic Group 4 million m <sup>3</sup><br>Overseas 4 million m <sup>3</sup><br>Group | BOD level<br>MRC 30 tons<br>Domestic Group 0 tons<br>Overseas Group 9 tons  | COD level<br>MRC 637 tons<br>Domestic Group 155 tons<br>Overseas Group 57 tons                | NOx emissions<br>MRC 1,683 tons<br>Domestic Group 26 tons<br>Overseas 484 tons<br>Group   |  |  |
|  |   |   | SOx emissions<br>MRC 546 tons<br>Domestic Group 71 tons<br>Overseas 1,679 tons<br>Group   |  |  |

\* The Mitsubishi Rayon Group:  
 Companies that come Mitsubishi Rayon, Domestic Group and Overseas Group. (Subject companies)

## Proper Management of Chemical Substances

- ↓ [Chemical Emission Reduction](#) ↓ [Management of Chemical Substances in Procured Goods](#)
- ↓ [Commencing Treatments to Eliminate Polychlorinated Biphenyl \(PCB\)](#) ↓ [Providing SDS](#)
- ↓ [Promoting Global Product Strategy Activities](#) ↓ [Proceeding of REACH Registration](#)
- ↓ [Ensuring GHS Compliance in Individual Countries](#)

### ■ Chemical Emission Reduction

The Mitsubishi Rayon Group\* is reducing chemical emissions in accordance with its Fifth Chemical Substance Reduction Plan, with fiscal 2015 as the target year.

\* The Mitsubishi Rayon Group:

Companies that come under Mitsubishi Rayon, Domestic Group and Overseas Group companies. (Applicable companies)([Subject companies](#))

#### <Targets>

1. Reduction of total emissions (target year: fiscal 2015)

By the target year, total emissions of MRC-PRTR substances\* (442 substances) by the MRC Group (excluding Lucite International Group) shall be reduced to 70% of the emissions recorded in fiscal 2005 (reference year).

2. Reduction of emissions of specially managed substances (target year: fiscal 2015)

Reductions made in the specific substance groups detailed below:

- i) Twelve volatile organic compound (VOC) substances that account for most of MRC's air emission volume
- ii) Five substances that the MRC Group emits the most

\* MRC-PRTR substances:

433 substances subject to the PRTR research conducted by the Japan Chemical Industry Association (JCIA) on its corporate members (including substances subject to legal notification) and 9 other substances emitted by MRC in high volumes for a total of 442 substances.

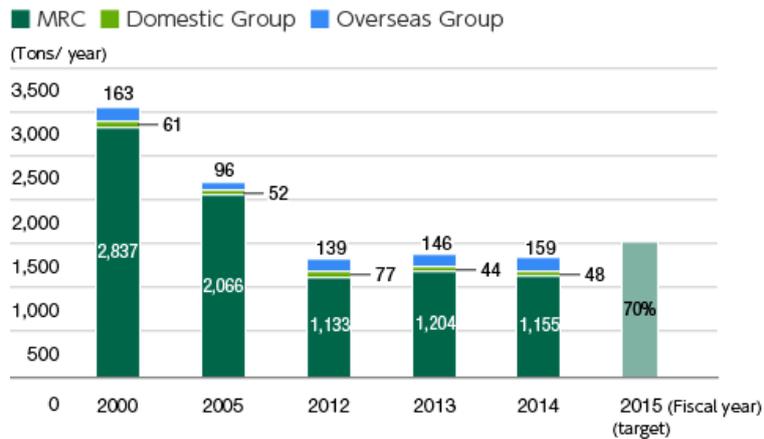
#### <Fiscal 2015Activities and Results>

The Mitsubishi Rayon Group achieved its total emissions target under the Fifth Chemical Substance Reduction Plan, with total emissions of 1,374 tons in fiscal 2015 against a target of 1,550 tons. Emissions are less than half of the 3,061 tons in fiscal 2000.

Overall emissions of chemical substances in fiscal 2015 increased by 12 tons compared with the previous fiscal year due to increased domestic production despite expansion however strengthening of the wastewater treatment facility at the Otake Production Center that significantly reduced the amount of chemical substances in wastewater.

For fiscal 2016 onward, we plan to implement planned reduction measures to further advance on reducing chemical substances.

## Chemical Substance Emissions



[▶ Click here for a detailed explanation of the chart and graphs](#)

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### ■ Management of Chemical Substances in Procured Goods

The Mitsubishi Rayon Group began conducting green procurement surveys in fiscal 2005 for all procured items to fully comprehend and manage substances that affect the environment (including raw materials and other procured goods) and have the potential to pose a health hazard. The Group will continue conducting green procurement surveys as well as take the steps necessary to effectively manage chemical substances.

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### ■ Initiatives to Eliminate Polychlorinated Biphenyl (PCB)

In order to comply with the Act on Special Measures against PCB Waste established in 2001, the Mitsubishi Rayon Group adopted a policy of removing all equipment containing PCB by fiscal 2025, and is systematically proceeding with treatment. Furthermore, any equipment containing PCB that is in storage is stored and managed properly according to the law, in order to prevent any loss or theft.

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### ■ Providing SDS

In the sale and delivery of chemical products, the Mitsubishi Rayon Group provides information on the properties, proper handling and disposal of the products by supplying Safety Data Sheets (SDS), to enable customers to safely handle the chemical products.

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### ■ Promoting Global Product Strategy Activities

As a member of the Mitsubishi Chemical Holdings Corporation Group, Mitsubishi Rayon is actively promoting a global product strategy (GPS)\* focused on the voluntary initiative in the chemical industry of risk-based chemicals management throughout supply chains and disclosure of information of risk management on chemical products.

Risk assessment has been conducting for the chemical products which Mitsubishi Rayon manufactures. And with the result of it, appropriate management is progressing. Risk assessments are summarized in safety summaries and published in Japan.

So far, we have published safety summaries for eight substances. We will continue to conduct risk assessments going forward.

\* Global product strategy (GPS):

In order to minimize the risk of chemical substances through the supply chain, risk assessment is enforced for the own chemical substances and appropriate management are required. Also the safety and risk information are disclosed to the customers and also to the public.

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## ■ Proceeding of REACH\* Registration

The registrations of deadline 2013 have been completed for the chemical substances the volume is over than 100 tons/year which was manufactured or imported to Mitsubishi Rayon. Now we are exceeding registration for the chemical substances over than 1 ton/year by the 2018 deadline.

\* REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals):

An EU regulation to protect human health and the environment.

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## ■ Ensuring GHS\* Compliance in Individual Countries

Reflecting GHS results into the Safety Data Sheets (SDS) have been completed in Japan and now in the world wide the establishing of legal framework for GHS are activated. The Mitsubishi Rayon Group is approaching to provide GHS in each country with searching for the routes to obtain GHS information of each country.

\* GHS:

Globally Harmonized System of Classification and Labelling of Chemicals

**Preventing Global Warming**

↓ [Energy Saving Activities to Reduce CO<sub>2</sub> Emissions](#) ↓ [Initiatives in Logistics Operations](#)

**■ Energy Saving Activities to Reduce CO<sub>2</sub> Emissions**

CO<sub>2</sub> accounts for the majority of greenhouse gases emitted by the Mitsubishi Rayon Group\*<sup>1</sup> in the course of its business activities. Eighty percent of CO<sub>2</sub> emitted by the Group comes from energy use. Consequently, we are applying fuel conversion and resource-saving activities centered on energy conservation as part of efforts to reduce CO<sub>2</sub> emissions.

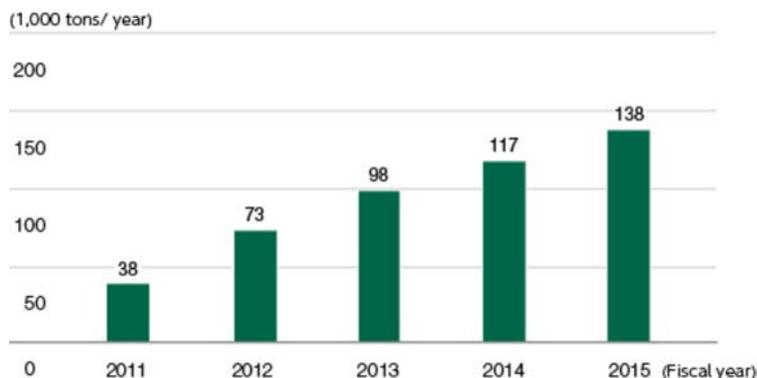
\*1 The Mitsubishi Rayon Group:

Companies that come Mitsubishi Rayon, Domestic Group and Overseas Group. ([Subject companies](#))

**● Energy Saving Activities**

The Mitsubishi Rayon Group sets specific numerical targets when promoting energy-saving activities. To achieve those targets, each production center has established an energy-saving activity committee and is tackling the issue from the divisional level. In the five years since fiscal 2011, MRC\*<sup>2</sup> has reduced CO<sub>2</sub> emissions cumulatively by 138,000 tons.

**MRC CO<sub>2</sub> Reductions (Cumulative from Fiscal 2011)**



\*2 MRC:

Mitsubishi Rayon and Group companies operating at Mitsubishi Rayon's production centers.

**<Target>**

Reduce energy consumption per unit of production by 3% by fiscal 2015, compared with the fiscal 2012 level

**<Fiscal 2015 Activities and Results>**

The Mitsubishi Rayon Group is promoting energy conservation in production divisions, including by installing energy-saving equipment in plants, undertaking equipment-related measures to promote fuel conversion, and changing manufacturing conditions.

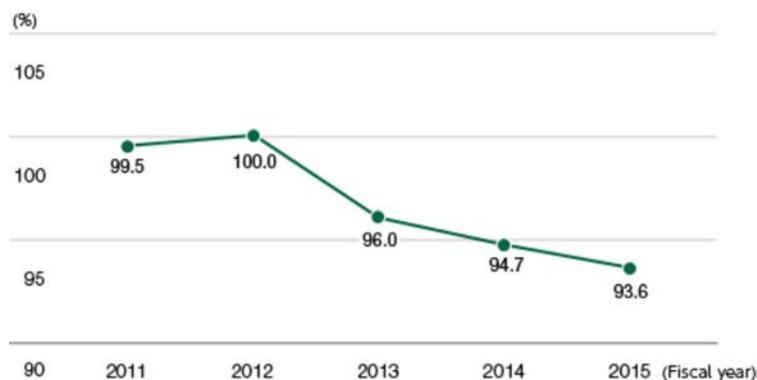
As a result, energy consumption per unit of production in fiscal 2015 decreased 1.0% compared to the previous fiscal year. That result was a 5.6% reduction from fiscal 2012, thereby achieving the

targeted 3% reduction compared to fiscal 2012.

Going forward, each division will continue to move ahead with energy conservation activities.

### Energy Consumption per Unit of Production by MRC

Units: Crude oil converted kℓ/t-Production output converted into base product units (Based on chemicals plant production output at Otake Production Center in fiscal 1990)



[▶ Click here for a detailed explanation of the chart and graphs](#)

## ■ Initiatives in Logistics Operations

The Mitsubishi Rayon Group is promoting modal shifts from truck transport to marine and rail transport, which has less environmental impact.

Mitsubishi Rayon became a certified "Eco-Rail Mark" company in April 2010 under a program promoted by the Ministry of Land, Infrastructure, Transport and Tourism. At the same time, Mitsubishi Rayon's acetate tow for cigarette filters, 《DIANAL》 acrylic coating material and 《ACRYPET》 acrylic molding material were certified as products allowed to carry the Eco-Rail Mark.

In fiscal 2015, modal shifts from truck to rail or marine transportation continued together with mutual fusion of products made by other companies in the same industry, thereby enabling delivery from bases closer to customers to facilitate a reduction of transportation distances. As a result, CO<sub>2</sub> emissions decreased by 1,400 tons compared to the previous fiscal year.

Looking ahead, The Mitsubishi Rayon Group will continue to promote eco-friendly logistics operations.

### CO<sub>2</sub> Emissions in Logistics (outsourced) (1,000 tons of CO<sub>2</sub>/year)

| Fiscal year               | 2011 | 2012 | 2013 | 2014 | 2015 |
|---------------------------|------|------|------|------|------|
| CO <sub>2</sub> emissions | 9.5  | 11.4 | 14.2 | 14.6 | 13.2 |



## Preventing Air Pollution, Water Quality and Soil Pollution

### ■ Initiatives for Preventing Pollution

Chemical substances are indispensable for the Mitsubishi Rayon Group's corporate activities. However, chemical substances may possibly cause air pollution, water quality and soil pollution if they are not handled properly. We endeavor to reduce the emission of chemical substances into the air or water, and to take measures to prevent leaks, as well as rigorously manage emissions.

As a result of these efforts to reduce emissions and the introduction of environment-related equipment, we have significantly reduced emissions of sulfur oxide (SO<sub>x</sub>) and nitrogen oxide (NO<sub>x</sub>) and VOC into the air, and the chemical oxygen demand (COD) in waste water.

▶ [Click here for a detailed explanation of the chart and graphs](#)

## Preserving Water Resources

- ↓ [Efforts to Contribute to Resolving Water Supply-and-Demand Issues](#)
- ↓ [Efforts to Contribute to Water Supply-and-Demand Issues in terms of products](#)

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### ■ Efforts to Contribute to Resolving Water Supply-and-Demand Issues

The Mitsubishi Rayon Group endeavors to preserve water sources and maintain the water quality of seas and rivers, through managing wastewater quality appropriately and other measures.

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### ■ Efforts to Contribute to Water Supply-and-Demand Issues in terms of

**products**  
 Water shortages resulting from increased populations and climate change brought about by global warming together with water pollution due to water for industrial use are becoming social issues across the world. The Mitsubishi Rayon Group develops and markets purifying products enabling the possibility of reusing wastewater. Through such measures and other steps, the Group helps society as a whole to preserve water resources.

Example: [Aqua solutions](#)

## Waste Reduction

[↓ Zero Emission Activities](#)  
 [↓ Resource Conservation Activities \(Biomass Energy Recycling\)](#)

### ■ Zero Emission Activities

The Mitsubishi Rayon Group is working to realize the fiscal 2015 waste reduction target of its Group-wide Zero Emissions Plan in order to decrease its external landfill volume.

#### <Targets>

Zero emissions\*<sup>1</sup> will be achieved throughout the Mitsubishi Rayon Group in Japan (involving each production center and Group company\*<sup>2</sup>) by fiscal 2015. Data calculation includes all waste, excluding combustion ash from power generation.

\*1 The term "zero emissions" refers to the ratio of landfill volume accounted for by waste that is 1% or below.

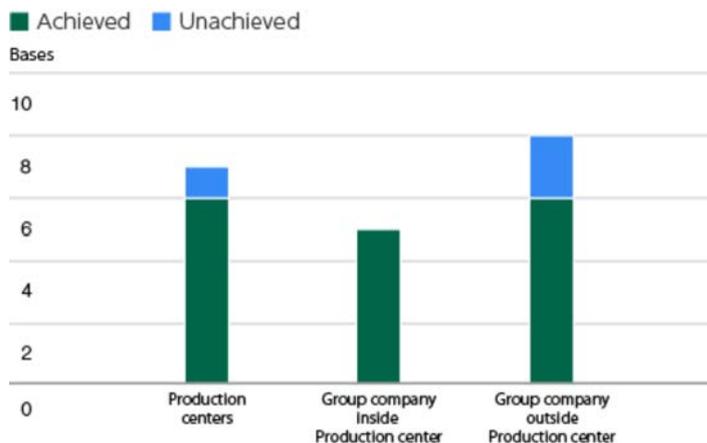
\*2 Data for seven production centers in Japan, five on-site Group companies and eight off-site Group companies in Japan

#### <Fiscal 2015 Activities and Results>

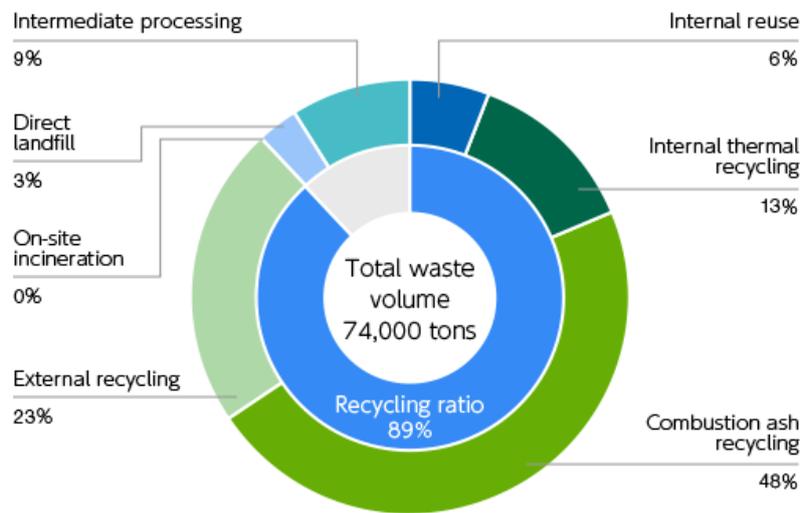
Efforts were made to achieve zero emissions at MRC production centers in Japan and among Group companies with achievement of zero emissions at six production centers and 11 Group companies. However, one production center and two off-site Group companies were not able to achieve zero emissions.

We will continue to strive for zero emissions from fiscal 2016 onward.

#### Zero Emission Achievement Status in Fiscal 2015



### Breakdown of Waste Produce by MRC in Fiscal 2015



### ■ Resource Conservation Activities (Biomass Energy Recycling)

At Toyama Production Center, waste cooking oil from the cafeteria was previously treated as waste, but since July 2007, it has been supplied to companies in the neighboring Eco Town industrial complex. Biodiesel fuel (BDF) produced at the complex is used in some of the transport vehicles used on the site. In fiscal 2015, about 5,000 liters of BDF was used for the year. Furthermore, as a renewable energy project, the center has installed two biogas boilers that run on biogas generated in the adjacent Eco Town industrial complex. The boilers generate some of the steam used by the center. In fiscal 2015, the center used about 550,000 m<sup>3</sup> of biogas.

Case study: [Biogas Boiler](#)

**Biodiversity Preservation**

↳ Initiatives for the Preservation of Biodiversity

■ **Initiatives for the Preservation of Biodiversity**

The preservation of biodiversity is the foundation that is essential to realizing prosperous, comfortable human societies. It brings a host of benefits, including providing rich resources, mitigating climate change and alleviating natural disasters, and inspiring unique cultures and scientific discoveries rooted in nature.

With awareness of this, the Mitsubishi Rayon Group endorsed the Declaration of Biodiversity by Keidanren in 2010 and works for the preservation of biodiversity. We are also focused on developing new technologies, products and services that contribute to preserving diversity.

The Mitsubishi Rayon Group conducts biodiversity preservation activities at each production center. The Otake Production Center in Otake City, Hiroshima Prefecture, and Toyama Production Center in Toyama City, Toyama Prefecture, periodically conducted clean-up activities in the center area, while the Toyohashi Production Center in Toyohashi City, Aichi Prefecture conducted clean-up activities, along with tree planting and maintenance activities, near the Asakura River, where wastewater is released from the production center.



Toyohashi Production Center: Asakura River clean-up activities



Otake Production Center: Clean-up activities

Each production center strived to add greenery and a green curtain was made on a building at the Toyohashi Production Center. The green curtain has an energy-saving effect as it shuts off direct rays from the sun inside the building and keeps temperature under control instead of rising. The Toyama Production Center, meanwhile, was awarded with an Outstanding Greenery Factory Award in 2013. There is a forest on the grounds of the Toyama Production Center that is home to a diverse ecosystem including raccoon dogs, foxes, pheasants, cuckoos, migratory birds and even endangered stoneworts.



Toyohashi Production Center: green curtain activities



Toyama Production Center: Greenery activities

Example: Clean-up activities

## Safety and Disaster Prevention Initiatives

- [↓ Safety Measures](#)  
 [↓ Overview of Activities for Fiscal 2015](#)  
 [↓ Fiscal 2016 Action Plan](#)  
[↓ Disaster Readiness Measures](#)  
 [↓ Environmental Complaints](#)

### ■ Safety Measures

The Mitsubishi Rayon Group has been improving safety and disaster prevention under the principle of "Safety and Environment are the inevitable issue prior to any other issues for the sustainability of the company".

#### ● Main Initiatives for Ensuring Safety

1. Safety conventions, at which managers directly talk about the importance of safety
  - The president and the management team visit production centers every year to talk directly to employees about the importance of safety.
  
2. Enhance education
  - The Company has a systematic education program starting from when people join the Company. The program provides the necessary education to ensure safe operations and general safety. This training develops staff and operators to possess high technical knowledge and to be sensitive to for the process.
  - We also have an education program where employees can actually experience the feeling of danger, in order to increase their sensitivity to danger.
  - We conduct standardization activities to correctly pass on safe and assured operational techniques, by using experienced operators' knowledge and by documenting the reason and grounds for operations in a work standardization booklet.
  - The operation management division actively resolves operational issues, investigates the cause of any incidents or troubles, and takes countermeasures to prevent their recurrence.
  
3. Strengthening facility management
  - Operation department and maintenance department are ensuring keeping and improving of security with close communication.
  - We are maintaining soundness of equipment by investing resources and adapting new technologies.
  
4. Ensuring Safety
  - When we make changes to the existing patterns, such as changes in operating procedures and facility upgrades, we utilize risk assessment methods and other means to check for any issues in terms of ensuring safety and protecting the environment.
  - We use incident information from inside and outside the Group for inspections and survey activities (in fiscal 2012-2013 we conducted safety inspections of the reaction process in the Company and Group companies as well as a monomer tank survey and a survey of the risk of getting caught by rotating machinery and necessary equipment measures were implemented based on the survey results from fiscal 2014 to fiscal 2015). Looking ahead, we will continue to make effective use of information to ensure safety.
  
5. Support for contractors
  - We work together with contractors to ensure safety by establishing General Safety Management Meetings.

- For contractors, we take part in work risk assessments and also provide both human and logistical support for safety training, such as providing risk information on the substances we handle, as well as operations.

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## ■ Overview of Activities for Fiscal 2015

In line with the new APTSIS 15 medium-term management plan (target year fiscal 2015), the Group promoted and improved safety and disaster prevention initiatives. These initiatives centered on two goals set out in the plan:

- 1) Eliminate injuries of lost work days and eliminate serious incident
- 2) Support for Group companies

### ● 1) Eliminate Injuries of Lost Work Days and Eliminate Serious Incident

#### Activities Mostly Carried Out at Domestic Production Centers

1. Safety conventions, at which managers directly emphasize the importance of safety
  - Conducted at four production centers on July 2, 2015.
2. Uniform patrols at workplaces by managers were conducted daily between 1:00 p.m. and 1:30 p.m.
  - Continued safety inspections by management as an opportunity for communication between employees and management.
3. Continued implementation of the management of change system (MOC)
  - 4M MOC (man, machine, material and method) was established and applied. The status of each department was confirmed through monitoring at each business location.
4. Enhancement of maintenance management
  - Continued support for the devices and equipment that have not been inspected over the long-term and continued to confirm the progress of the overall project. Corrective measures were applied to equipment failures, deterioration of piping exteriors and piping racks were painted based on the plans for each production center. We are building a system to move ahead on measures regarding deterioration risk by introducing repair cost budget formation based on the proposal process for planned business generation accompanying risk extraction and risk assessments.
5. Workplace Safety Measures
  - We conducted the safety emphasis month (in July, December) by means of raising up the awareness of operators and managers. We rebuilt the on-site training system to enhance frontline capabilities to secure a safe and secure foundation. Employees engaged in production activities were given appropriate knowledge, including about chemical processes and control, and we set technical levels, clarified assessment methods and carried out rank-based training.
  - Conducted identification of non-routine work.
6. Enhancement of construction safety accompanying isolations.
  - Before starting work on the construction accompanying isolations of equipment, we confirmed the start of strengthened Group standards regarding the safety management to eliminate risk or causes of hazard related to constructions.
7. Clarified the causes of incidents and injuries and implemented assured recurrence prevention steps
  - Used cause and effect diagrams to clearly identify the causes of incidents and injuries that had occurred at each production center and set and implemented recurrence prevention measures. Measures were implemented horizontally for serious incidents and injuries.

## Activities Undertaken Including Group Companies

1. Integrated training for safety personnel of Group companies in Japan
  - Conducted twice annually. Shared the information on incidents and injuries in the Mitsubishi Rayon Group and promoted measures to prevent recurrences.
2. Safety assessments of new equipment and renewed equipment (expansion of the scope of assessment)
  - Revised facility safety and environmental assessment rules, and continued the safety assessment of new equipment and renewed equipment.
3. Safety checks of plants with chemical reaction and of monomer tanks
  - For safety inspections of plants that have chemical reaction, follow-up checks were made for departments which have been inspected from fiscal 2012 to fiscal 2013. Safety checks were also conducted for Group companies in domestic and overseas.
  - Monomer tank inspections were conducted based on MRC Group policies as countermeasures to abnormal polymerization.
4. Measures for human error
  - Enabled employees working on the front lines to gain an understanding of human error, conducted awareness-raising activities for action, gave examples of incidents where human error caused incidents or injuries and gave training on examples of measures.

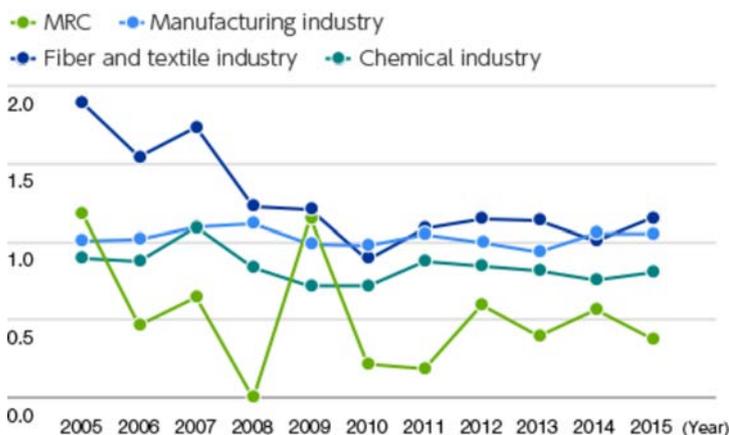
## Injury

The total number of occupational injuries increased by 2 cases from the previous fiscal year, and injuries that resulted in work absence increased by 9 cases from the previous fiscal year. Additionally, continuing on from the previous fiscal year, serious injury (absence of 4 days or more) occurred. Since the start of the previous fiscal year the number of injuries due to less experienced workers increased, and there was an increase in injuries at Group companies, so training and guidance for young and less experienced workers were strengthened. As had happened in the previous fiscal year, human error measures and equipment management strengthening were continued at the four production centers.

Furthermore, similarly, there was an increase in injuries resulting from falls, getting pinched or caught in equipment.

To ensure that such accidents are never repeated we will implement thorough preventative measures throughout the Group and continue working to reduce occupational injuries.

### Injury Frequency Rate with Lost Work Days (Absence of 1 Day or More)

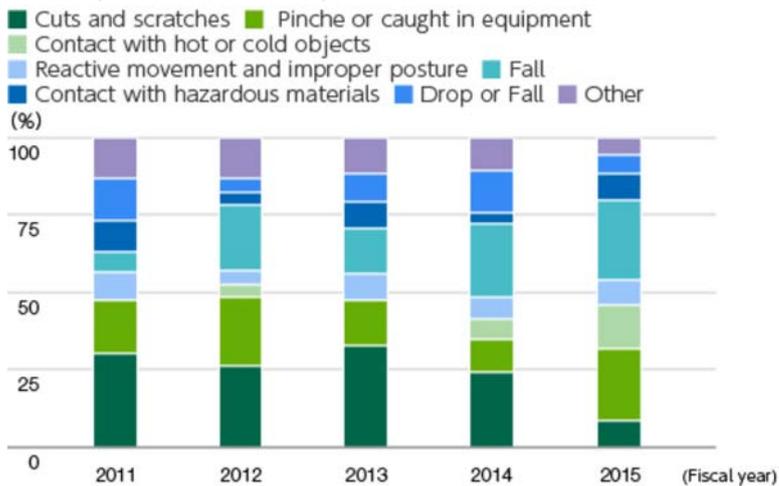


\* Injury frequency rate:

Number of injuries with lost work days / 1 million work hours

## Causes of Occupational Injuries (MRC Group)

\* Excluding contractors, but including the Lucite International Group

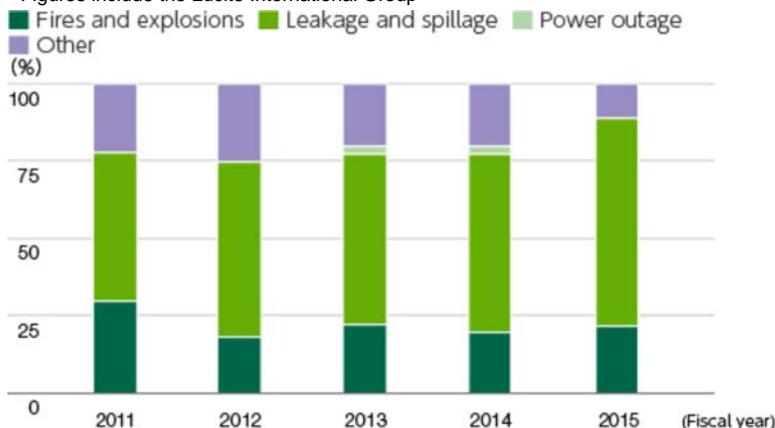


## Incident

In fiscal 2015, there were 3 safety incidents and 4 environmental accidents across the Mitsubishi Rayon Group, but the overall number of accidents decreased by 3 cases compared to the previous fiscal year. An overseas Group company caused a serious accident involving a leakage of toxic gas. As there were many minor leaks resulting from the lack of facility management, we are working to strengthen our facility management. We are also planning to strengthen our work management to reduce incidents related to workers. We will continue to implement safety and environment risk assessments with third parties during plant constructions and at times of large scale facility renovations.

## Incident Causes (MRC Group)

\* Figures include the Lucite International Group



## 2) Support for Group Companies

Since fiscal 2008, we have continued to hold training sessions for safety/environment personnel at domestic Group manufacturing companies.

In main land of China, Mitsubishi Rayon (Shanghai) Co., Ltd. implemented various measures in fiscal 2014 and fiscal 2015, primarily through its Safety, Environmental and Quality Products and Compliance Promotion Office, which included strengthening and expansion of safety management systems, audits and training.

## 3) Strengthen Safety Management at Production Centers

At Otake Production Center, safety management policies were formulated and safety management as to handling high-pressure gas was strengthened to prevent serious incidents. Furthermore, risk assessments have been done for processes involving the handling of hazardous materials and toxic substances. We have also continued to conduct process risk assessments for non-routine work since fiscal 2014.

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## ■ Fiscal 2016 Action Plan

### ● 1) Aim to Eliminate Injuries with Lost Work Days and Eliminate Serious Incidents.

We will promote the full penetration and adherence to the countermeasures that we have implemented since fiscal 2013. In MOC for work, we will instruct improvements for the contents deemed to be insufficient and stabilize more appropriate MOC. For strengthening of facility management, we will continue horizontal expansion of the planned coating system and equipment management system based on the results of consideration. We will also start the operation of the preservation plan based on a risk assessment ahead of the operation of repair cost evaluation criteria.

Furthermore, continuing on from fiscal 2016, we plan "safety emphasized month" for the purpose of raising awareness of human error reductions, responsibility for ensuring workplace safety, enabling management to ascertain comprehensive risk in their divisions and to ensure safety.

### ● 2) Support for Group Companies

We will continue providing environmental and safety-related support to Group companies.

### ● 3) Strengthen Safety Management at Production Centers

Guided by basic policies concerning safety, environment and quality, Mitsubishi Rayon is implementing measures to prevent serious incidents by strengthening the safety management in such areas as high-pressure gas or hazardous materials handling in accordance with the following safety management policies.

#### **Safety Management Policies**

1. Raise the level of process operational management and enhance facility management to prevent incidents, natural disasters and abnormalities and overlapping by implementing appropriate preventive measures for hazards, including the leakage of harmful substances and so forth. In addition, we will conduct a risk assessment for a large-scale disaster and promote disaster prevention and limitation of disaster damage and safety and security to realize efficient production activities.
2. Improve the level of each employee's safety management by entrenching, expanding and continuously improving safety management systems.
3. Comply with safety-related laws and voluntary standards, and take measures that exceed legal statutes when necessary.

With respect to the handling process for harmful substances including high pressure gas equipment, we have conducted a risk assessment using guidelines for non-routine work including emergency shutdown procedures, start-up and shutdown operations, and operational error assumptions. In fiscal 2016, we plan a risk assessment for response operations to the emergency shutdown of utilities including of electric power and steam.

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## ■ Disaster Readiness Measures

The Mitsubishi Rayon Group conducts disaster prevention activities, including safety training for employees, equipment improvements and disaster prevention drills. In addition, the Group plans and implements disaster drills and other events jointly organized with local organizations and public firefighters. The Group is also endeavoring to prevent incidents and disasters during transport and is adopting logistic safety measures should any incident occur. For example, we regularly conduct disaster prevention drills, as well as drills on safe emergency stop procedures at plants, checking on the safety of team members, and evacuations. In this way we are constantly ready to deal with a major earthquake. Moreover, we are carrying out earthquake resistance analysis of our plant and factory buildings and systematically strengthening places that require reinforcement.

Mitsubishi Rayon's earthquake resistant high-pressure gas facilities have all been built to meet the legal standard at the time of construction. For equipment and buildings constructed before current legal standards, we have confirmed and investigated their compliance with the current law and implemented a reinforcement plan based on the findings. In fiscal 2015, a third-party survey determined that facilities and structures comply with current standards and necessary important reinforcements. Going forward, we will implement reinforcement work in line with the reinforcement plan while piping systems will also be surveyed to check for compliance with current legal standards, and we will draft the necessary reinforcement plans for these as well.

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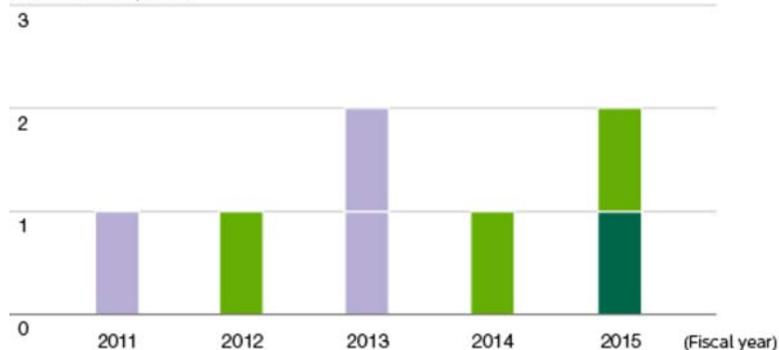
## ■ Environmental Complaints

In fiscal 2015, there was one complaint each about noise and about air pollution, and we responded appropriately. Going forward, we will strive to conduct business activities showing consideration for the life of local residents.

### Number of Complaints Received by the MRC Group

■ Air pollution ■ Noise ■ Water quality ■ Odor ■ Other

(number of complaints)



**Environmental Data and References**

- ↓ [Scope of Aggregation for Environment-Related Data](#)
- ↓ [Initiatives for Preventing Global Warming](#)   ↓ [Environmental Data by Production Center](#)
- ↓ [Major Environmental Index](#)   ↓ [Total Chemical Emissions](#)
- ↓ [Major Chemical Emissions and Transfer Volumes](#)   ↓ [Initiatives for Reducing Waste](#)
- ↓ [Environmental Accounting](#)   ↓ [Green Purchasing](#)

■ **Scope of Aggregation for Environment-Related Data**

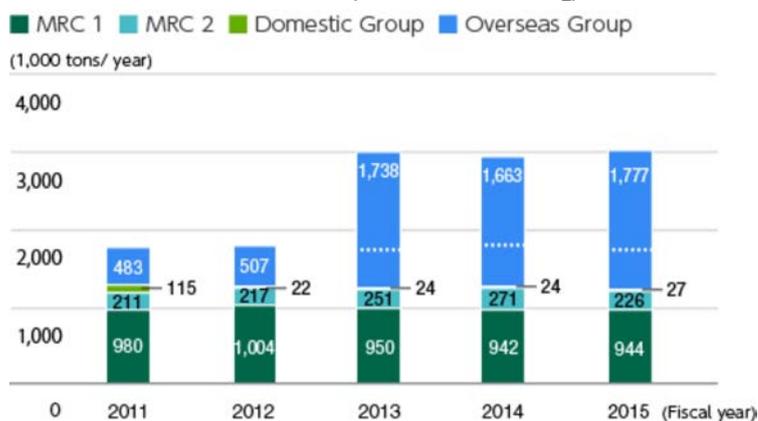
● **Scope of Data Collection Related to Environment in Fiscal 2015\*1**

|                 |  | Reduction of Chemical Substances Emission |                             | Zer o emissions of waste | Prevention of Global Warming              |                          | Major Environmental Index |                          |               |               |               | ISO Certification*3 |          |
|-----------------|--|---|-----------------------------|--------------------------|---|--------------------------|---------------------------|--------------------------|---------------|---------------|---------------|---------------------|----------|
|                 |  | Total emission targets                    | pecially managed substances |                          | Energy consumption per unit of production | Greenhouse gas emissions | Water consumption         | Total waste water volume | BOD emissions | COD emissions | SOx emissions | NOx emissions       | ISO 9001 |
| M R C G r o u p | (1) Otake Production Center and onsite Group companies     | ○   | ○                           | ○                        | ○   | ○                        | ○                         | ○                        | -             | ○             | ○             | ○                   | ○        |
|                 | (2) Toyohashi Production Center and onsite Group companies | ○   | ○                           | ○                        | ○   | ○                        | ○                         | ○                        | ○             | ○             | ○             | ○                   | ○        |
|                 | (1) Toyama Production Center and onsite Group companies    | ○   | ○                           | ○                        | ○   | ○                        | ○                         | ○                        | -             | ○             | ○             | ○                   | ○        |
|                 | (2) Yokohama Production Center and onsite Group companies  | ○   | ○                           | ○                        | ○   | ○                        | ○                         | ○                        | -             | ○             | ○             | ○                   | ○        |
|                 | Mizushima AN Plant   | ○   | ○                           | ○                        | ○   | ○                        | ○                         | ○                        | ○             | ○             | ○             | ○                   | ○        |
|                 | Kurosaki NVF Polymer Plant                                 | ○   | ○                           | ○                        | ○   | ○                        | ○                         | ○                        | ○             | ○             | ○             | ○                   | ○        |
|                 | Sakaide Carbon Fiber Plant*2                               | ○   | ○                           | ○                        | ○   | ○                        | -                         | -                        | -             | -             | ○             |                     |          |
|                 | MRC Unitec Co., Ltd.                                       | ○   | ○                           | ○                        | ○   | ○                        | ○                         | ○                        | -             | ○             | ○             | ○                   | ○        |
|                 | Diatec Co., Ltd.   | ○   | ○                           | ○                        | ○   | ○                        | ○                         | ○                        | ○             | ○             |               | ○                   | ○        |
|                 | ToeiKasei Co., Ltd.  | ○   | ○                           | ○                        | ○   | ○                        | ○                         | ○                        | ○             | ○             | ○             | ○                   | ○        |



## ■ Initiatives for Preventing Global Warming

### ● Greenhouse Gas Emissions (Converted into CO<sub>2</sub>)



\* MRC 1 is the volume of CO<sub>2</sub> emissions derived from energy use at the six production centers in Japan.

\* MRC 2 is the volume of CO<sub>2</sub> emissions derived from items added to comply with the revised Law Concerning the Promotion of the Measures to Cope with Global Warming and the revised Law Concerning the Rational Use of Energy.

\* Aggregate amounts of domestic onsite Group companies are included in Mitsubishi Rayon proper.

\* The number of overseas Group companies included in the scope of data aggregation has increased significantly from fiscal 2013.

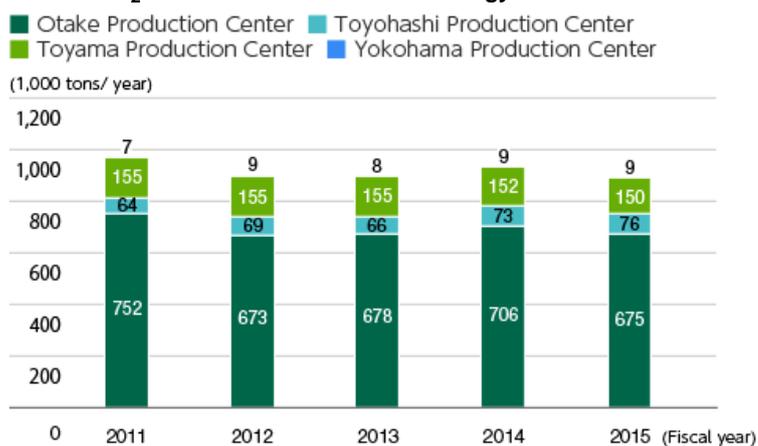
\* Figures revised for fiscal 2012-2014.

The dotted line in the graph shows the fiscal 2012 standard of the scope of data aggregation.

### ● Greenhouse Gas Emissions (Converted into CO<sub>2</sub>)

| Breakdown for fiscal 2014 (1,000 tons/year) | CO <sub>2</sub> |                            | Five other gases |
|---|-----------------|----------------------------|------------------|
|   | Energy-derived  | Derived from other sources |                  |
| MRC   | 944             | 221                        | 4.6              |
| Domestic Group                              | 24              | 3                          | 0.4              |
| Overseas Group                              | 1,080           | 692                        | 5.0              |

### ● MRC CO<sub>2</sub> Emissions Attributable to Energy Use

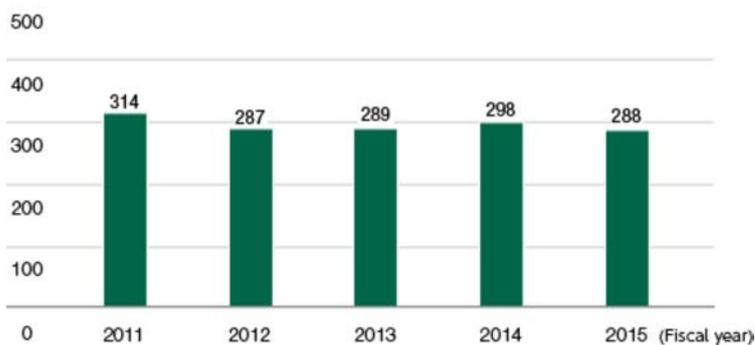


\* Figures revised for 2014.

● Amount of Energy Used by MRC (Converted into Crude Oil)

■ Amount of energy used

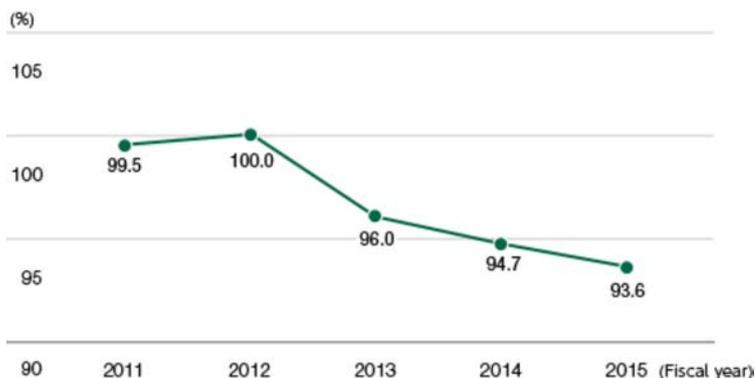
(1,000 kJ/ year)



\* Figures revised for 2014.

● Energy Consumption per Unit of Production by MRC

Units: Crude oil converted kJ/t-Production output converted into base product units (Based on chemicals plant production output at Otake Production Center in fiscal 1990)



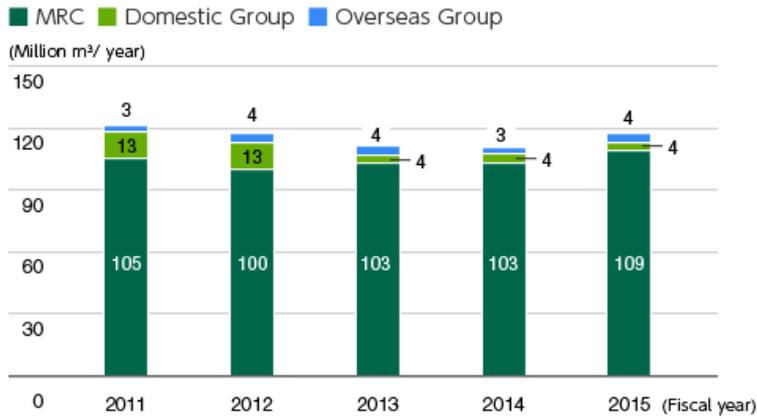
■ Environmental Data by Production Center

● Environmental Data for Fiscal 2015 by Production Center

| Production Center Name   | Otake Production Center                     | Toyohashi Production Center                    | Toyama Production Center                   | Yokohama Production Center                                 |
|--|---|--|--|--|
| Location   | Miyukicho, Otake City, Hiroshima Prefecture | Ushikawadori, Toyohashi City, Aichi Prefecture | Kaigandori, Toyama City, Toyama Prefecture | Daikokucho, Tsurumi-ku, Yokohama City, Kanagawa Prefecture |
| Chemical emissions (tons)<br>(Figures in brackets show the number of substances) | 783(83)                                     | 37(28)   | 353(20)                                    | 3(11)  |
| SOx emissions (tons)   | 483   | 21   | 42   | 0  |
| NOx emissions (tons)   | 1,160                                       | 158  | 297  | 0  |
| COD emissions (tons)   | 623   | 6  | -  | 2  |
| BOD emissions (tons)   | -   | 3  | 27   | -  |
| Water Consumption (million m <sup>3</sup> )                                      | 89  | 5  | 11   | 0  |
| Water drainage (million m <sup>3</sup> )   | 76  | 5  | 10   | 0  |
| External landfill volume (excluding power combustion ash) (tons)                 | 164   | 1  | 18   | 2  |
| Energy use per unit (year-on-year change)  | Down 1.5%                                   | Up 1.8%  | Down 3.4%                                  | Down 16%   |

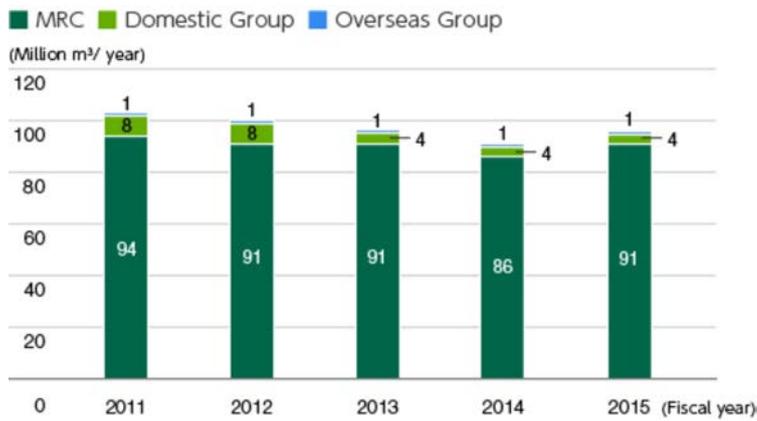
## Major Environmental Index

### Water Consumption

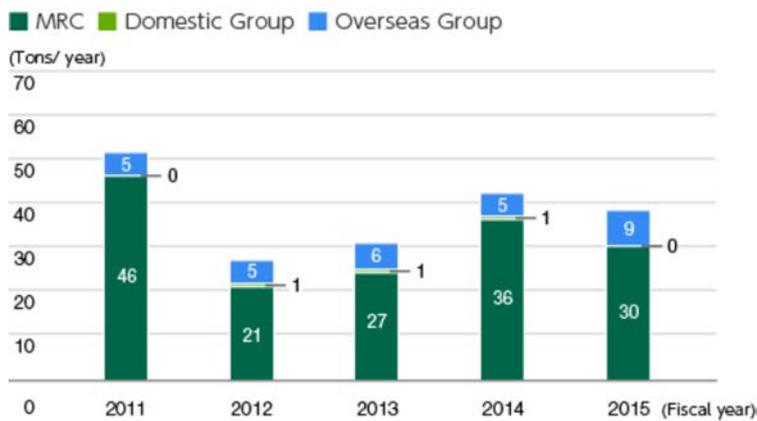


\* Data has been revised to reflect the inclusion of domesticGroup companies in fiscal 2014.

### Total Drainage Volume



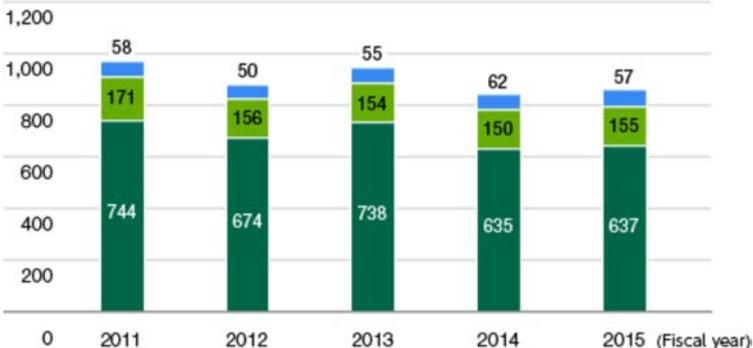
### BOD Emissions



**COD Emissions**

MRC Domestic Group Overseas Group

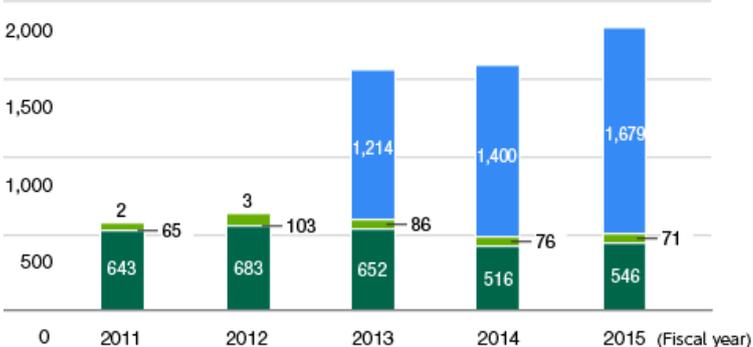
(Tons/ year)



**SOx Emissions**

MRC Domestic Group Overseas Group

(Tons/ year)



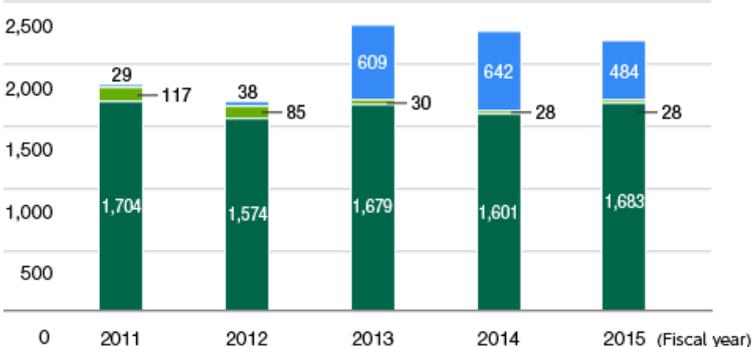
\* The number of overseas Group companies included in the scope of data aggregation increased significantly in fiscal 2013.

\* Data has been revised to reflect the inclusion of overseas Group companies in fiscal 2013 and fiscal 2014.

**NOx Emissions**

MRC Domestic Group Overseas Group

(Tons/ year)



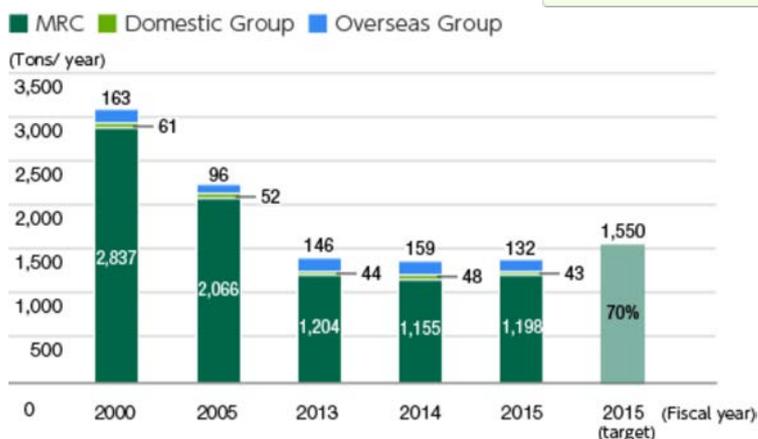
\* The number of overseas Group companies included in the scope of data aggregation increased significantly in fiscal 2013.

\* Data has been revised to reflect the inclusion of overseas Group companies in fiscal 2013 and fiscal 2014.

## Total Chemical Emissions

### Total Chemical Emissions (5th Plan Target 1)

[Detailed explanation](#)



### List of Individually Managed Substances (5th Plan Target 2)

i) Twelve VOC Substances that Mitsubishi Rayon Released into the Air in Large Volumes

| Substance             |
|-----------------------|
| Acrylonitrile         |
| Dichloromethane       |
| 1,3-Butadiene         |
| N,N-dimethylformamide |
| Styrene               |
| Toluene               |
| Methyl alcohol        |
| Propylene             |
| Isopropyl alcohol     |
| Tert-butyl alcohol    |
| Vinyl acetate         |
| n-hexane              |

ii) Five Substances That the Mitsubishi Rayon Group Emits the Most

| Substance                   |
|-----------------------------|
| Methyl methacrylate         |
| Acetone                     |
| Dimethylacetamide           |
| Inorganic cyanogen compound |
| Dimethyl ether              |

## Major Chemical Emissions and Transfer Volumes

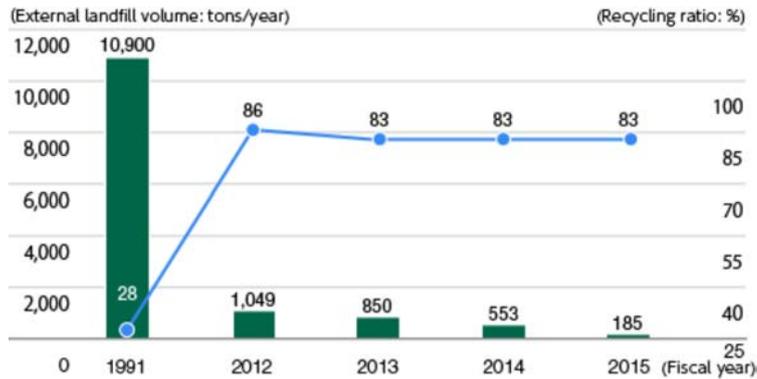
### Emissions and Transfer Volumes of MRC-PRTR Substances in Fiscal 2015 (Tons/year)

| Substance                                      | Atmosphere            | Water        | Soil       | Total Emissions | Transfer Volume |              |
|--|-----------------------|--------------|------------|-----------------|-----------------|--------------|
| Dimethylacetamide                              | 322                   | 21           | 0          | 343             | 196             |              |
| Acetone  | 287                   | 25           | 0          | 313             | 171             |              |
| Propylene                                      | 116                   | 0            | 0          | 116             | 0               |              |
| Methyl methacrylate                            | 77                    | 34           | 0          | 111             | 199             |              |
| Dimethyl ether                                 | 24                    | 51           | 0          | 74              | 0               |              |
| Dichloromethane                                | 73                    | 0            | 0          | 73              | 4               |              |
| Tert-butyl alcohol                             | 47                    | 0.7          | 0          | 48              | 0               |              |
| Inorganic cyanogen compound                    | 36                    | 0            | 0          | 36              | 0               |              |
| N,N-dimethylformamide                          | 25                    | 1            | 0          | 26              | 176             |              |
| Ammonia  | 25                    | 0            | 0          | 25              | 0.8             |              |
| Other substances                               | 157                   | 51           | 0          | 209             | 1,517           |              |
| <b>Total</b>                                   | <b>1,189</b>          | <b>185</b>   | <b>0</b>   | <b>1,374</b>    | <b>2,263</b>    |              |
| <b>(Including revised PRTR Law substances)</b> | <b>(683)</b>          | <b>(96)</b>  | <b>(0)</b> | <b>(778)</b>    | <b>(1,294)</b>  |              |
| <b>Breakdown</b>                               | <b>MRC</b>            | <b>1,043</b> | <b>155</b> | <b>0</b>        | <b>1,198</b>    | <b>1,218</b> |
|  | <b>Domestic group</b> | <b>43</b>    | <b>0</b>   | <b>0</b>        | <b>43</b>       | <b>402</b>   |
|  | <b>Overseas group</b> | <b>102</b>   | <b>30</b>  | <b>0</b>        | <b>132</b>      | <b>643</b>   |

\* Includes MRC-PRTR substances and substances added under the revised PRTR Law

## ■ Initiatives for Reducing Waste

### ● External Landfill Volume (Excluding Power Combustion Ash) and Recycling Ratio



\* Data on external landfill volume has been revised for fiscal 2013 and fiscal 2014

## ■ Environmental Accounting

### ● Aggregate Results for Environmental Accounting in Fiscal 2015

(Million yen)

| Aggregate items established in the Ministry of the Environment guidelines |   | Investment | Cost  |
|---|---|------------|-------|
| Environmental conservation costs  | [1] Pollution prevention costs              | 423        | 2,626 |
|   | [2] Global environmental conservation costs | 14         | 26    |
|   | [3] Resource recycling costs                | 4          | 1,461 |
|   | (2) Up / Down stream costs                  | 0          | 298   |
|   | (3) Administration cost                     | 0          | 653   |
|   | (4) Social activity cost                    | 9          | 128   |
| (5) Environmental remediation cost  | 0   | 75         |       |
| Total   |   | 450        | 5,268 |

(Million yen)

| Aggregate items established in the Ministry of the Environment guidelines |   | Investment |
|---|---|------------|
| Economic benefit  | (1) Proceeds from recycling activities            | 939        |
|   | (2) Expense reductions due to energy conservation | 431        |
|   | (3) Reduction in waste disposal expenses          | 72         |
| Total   |   | 1,442      |

(Million yen)

|   |     |
|---|-----|
| Wastewater measures costs (disposal costs, etc.) shown as an amount within compliance costs (operation and maintenance expenses) related to pollution control/environmental laws and agreements | 122 |
| Waste disposal costs shown as an amount within waste reduction and resource management promotion costs (operation and maintenance expenses)   | 439 |

### ● Basic Information on Environmental Accounting

#### Environmental Accounting in General

- Scope of aggregation:
  - Costs and benefits of activities mainly aimed at environmental conservation
- Scope of companies:
  - Mitsubishi Rayon Co., Ltd.
- Period:
  - fiscal 2015

#### Environmental Conservation Costs

- Scope/Classification:
  - Conforms to the Ministry of the Environment's "The Establishment of an Environmental Accounting System (2000 report)"

Cost includes personnel costs.  
 Depreciation costs of facility investments are excluded.  
 Research and developments costs are excluded.

### Economic Benefit

- Scope/Classification:  
Results of environmental and safety-related activities in fiscal 2015, which can be calculated rationally.
- Revenues:  
Cash proceeds from the sale of valuable material and trading in scrap materials, etc.
- Energy conservation:  
Amount of energy savings derived from energy conservation initiatives in production activities
- Waste disposal:  
Amount of cost reduction compared with the previous fiscal year

## Green Purchasing

Mitsubishi Rayon promotes green purchasing through the purchase of environment-friendly products used internally, including stationery and office equipment.

### Green Purchasing Results at Mitsubishi Rayon

(Fiscal year)

|                  |   | 2011 | 2012 | 2013 | 2014 | 2015 |
|------------------|---|------|------|------|------|------|
| Paper            | Copy paper  | 100% | 95%  | 97%  | 96%  | 100% |
|                  | Toilet paper  | 100% | 100% | 100% | 100% | 100% |
| Stationery       | Notebooks   | 64%  | 81%  | 90%  | 100% | 100% |
|                  | Pens  | 95%  | 95%  | 88%  | 92%  | 91%  |
|                  | Files   | 94%  | 86%  | 63%  | 95%  | 93%  |
| Office equipment | Personal computers  | 100% | 100% | 91%  | 88%  | 100% |
|                  | Printers  | 100% | 100% | 78%  | 85%  | 100% |
|                  | Facsimiles, copying machines and multifunctional printers | 100% | 100% | 100% | 100% | 100% |
| Other items      | Lighting equipment  | 73%  | 97%  | 99%  | 95%  | 100% |
|                  | Fluorescent lights  | 84%  | 87%  | 85%  | 86%  | 95%  |

\* Figures above are totals for MRC

[▶ Click here for more information on the scope of aggregation for environmental data](#)

**Relationships with Local Communities**

■ **Basic Concept**

The Mitsubishi Rayon Group strives to make a social contribution through its business activities based on the Mitsubishi Chemical Holdings Group Corporate Citizenship Activities Policy. At the same time, it deepens understanding of the culture and customs of the countries and communities in which it engages in business, and contributes to the development of local communities by proactively promoting activities that live up to the demands and expectations of each community as a good local citizen.

● **Exchanges with Local Communities**

The Group conducts factory tours mainly for government officials and nearby residents as part of its efforts to interact with local communities both in Japan and abroad. These activities proactively provide opportunities to promote understanding of the Group's businesses as well as its environmental and safety measures.



Plant Tour  
(Toyohashi Production Center)



Vocational experience program for junior high school students during Career Start Week  
(Otake Production Center)

● **Volunteer Activities by Overseas Group Companies**

Overseas Group companies are engaged in volunteer activities that incorporate the needs and requirements of local people.

Thai MMA Co.,Ltd. (TMMA) with an emphasis on employees' participation in the community is working on a project "New Table with TMMA" to repair school children's desks and chairs using the off-grade acrylic sheet under the concept to contribute to society by using own products.



● **Exchanges with Local Communities through Sports**

Each production center and Group company makes its grounds, gymnasiums and other facilities available to the local community, and they are used by many local residents. In addition, each production center and Group company organizes sports tournaments in an effort to foster exchanges with local residents and promote the development of young people.

### ● Clean-Up Activities

To keep local communities clean, Mitsubishi Rayon carries out clean-up activities in neighboring areas on a regular basis. Through these efforts, we are undertaking environmental beautification activities that reflect local interests but efforts are not limited to internal activities as we join clean-up campaigns organized by local governments and non-profit organizations.



(Yokohama Production Center)



(Toyama Production Center)



(Toyohashi Production Center: near the Asakura River)

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## ■ Activities for Nurturing and Educating the Next Generation

The simple questions "Why?" and "How?" that children ask are the origins of manufacturing. Wishing for many children to gain these capabilities and to convey the wonders and delights of science using its products and everyday items, the Mitsubishi Rayon Group conducts various science experience lessons.

### ● Science Experience Lessons

Volunteers participated as members of the Mitsubishi Chemical Holdings Corporation Group in the chemistry event held yearly by the Yume Kagaku 21 Committee. At the "Kids Summer Chemistry Experiment Show" held by the Science Museum (Tokyo) in August 2016, "Color Changing Slime under the ultraviolet light" was popular among children. Another experiment, mixing salt and vinegar into the slime was also well received by the children.



The Mitsubishi Rayon Group company, ACRYSDAY Co., Ltd. holds "ACRYCLUB" at the home center outlets and public facilities through the year. It is an event that participants experience handiness and enjoyment of processing acrylic sheets with hands-on workshops provided by an instructor so that the participants who experience processing of acrylic sheet for the first time can be comfortable with working on the acrylic sheets.



We are participating in manufacturing classes for junior high school students held by the Toyama Prefectural Machinery and Electronic Industries Association, which is comprised of manufacturers located within Toyama Prefecture. We gave an experiment class using the optic fiber produced at the Toyama Production Center to let them know our role in the relationship between work and society.



"Ran-Ran College Summer School" organized by Otake City is a highly regarded workshop for local elementary school students each summer. In 2016, children created the only kaleidoscopes in the world using our colorful acrylic resin pellets with lots of imagination. Everybody appeared to be very satisfied with their kaleidoscopes.



#### ● Supporting the 《Soalon》 Design Contest

Mitsubishi Rayon Textile Co., Ltd. supports a design contest for Bunka Gakuen students, who are expected to eventually play an active role in the fashion industry. Mitsubishi Rayon Textile supplied 《Soalon》, a rare triacetate fiber that is environmentally friendly, for the textiles used in the contest.



#### ● Supplying Carbon Fiber to Schools Competing in Japan's Student Formula SAE Competition

Lightweight and strong, carbon fiber has gained attention as a material that enables massive weight reduction for increased mobility. In Student Formula SAE Competition of Japan, teams of students compete in a test of their overall manufacturing capabilities as they plan, design and produce car bodies. Mitsubishi Rayon supplies carbon fiber as a material for the car body and parts to Toyohashi University of Technology's Automotive Research club, one of the competitors.



**Relationships with Customers / Product Safety**

- ↓ [Product Safety](#)
- ↓ [Communicating with Customers](#)
- ↓ [Establishing a Customer Service Hotline](#)
- ↓ [Supporting Customers' CSR Activities](#)

**Product Safety**

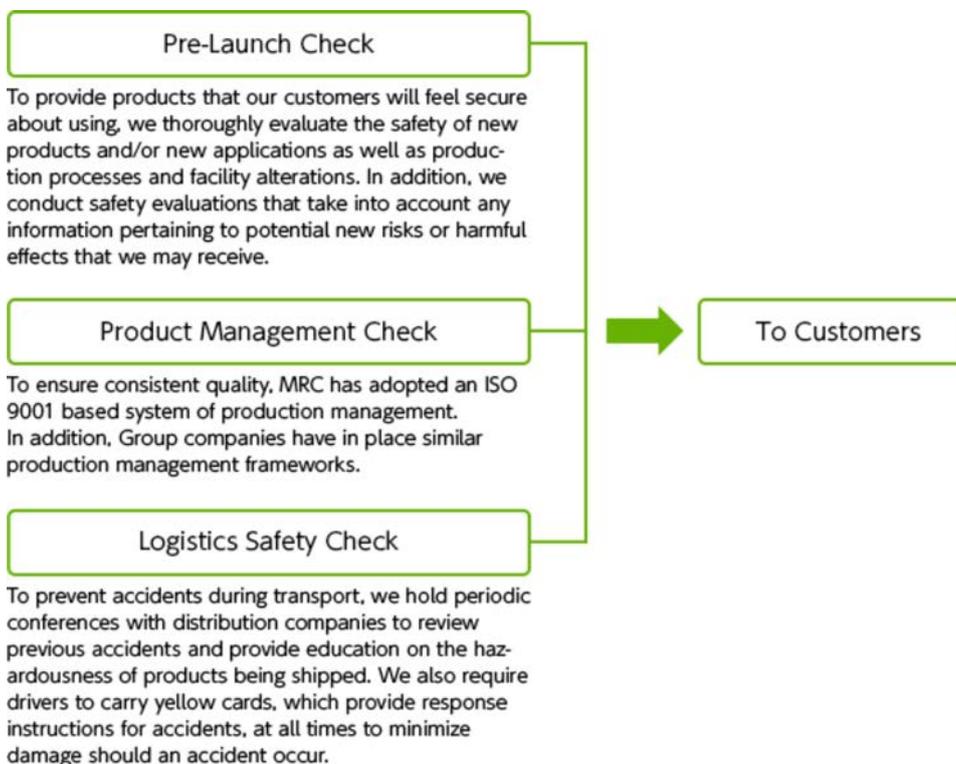
**Approach and Initiatives regarding Product Safety**

Mitsubishi Rayon aims to prevent product accidents and ensures customer safety by complying with related laws and regulations as a matter of course and endeavoring to improve product safety at every stage from pre-launch to production and distribution based on the Product Safety Basic Policy through such measures as holding joint safety conferences with distribution companies and conducting periodic product liability audits.

**Basic Policy on Safety of Product**

The Mitsubishi Rayon Group has established the basic management policy of providing safe products that are reliable and satisfactory from our customers' perspective.

Established in 1995



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## ■ Communicating with Customers

### ● Utilizing the Open Laboratory

Applying fiber, resin and biotechnologies developed over many years, Mitsubishi Rayon developed the highly sensitive, reproducible, highly operable DNA chip «Genopal». This is provided to a variety of markets, including pharmaceutical development support, health care and medical care.

For the development, Mitsubishi Rayon opened a special open laboratory in 2001 within our Yokohama Research Laboratories to reflect the voice of the researchers from companies and universities to the maximum extent. We communicate with customers by explaining how to use devices and giving a demonstration.

### ● Participation in Exhibitions

The Mitsubishi Rayon Group is working to initiate direct dialogue with a greater number of customers by proactively taking part in exhibitions. To provide products and services that achieve greater customer satisfaction, the Group reflects feedback from customers in its product safety and quality improvement initiatives.



Automotive Engineering Exhibition

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## ■ Establishing a Customer Service Hotline

### ● Operating a Customer Service Hotline

Mitsubishi Rayon Cleansui Co., Ltd. has established, Cleansui Service Center, a toll-free hotline to opinions, inquiries, and complaints from customers in relation to our «Cleansui» home water purifiers. Inquiries are also possible via email through our website.

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## ■ Supporting Customers' CSR Activities

### ● Cooperation with Green Procurement

To help customers with green procurement, Mitsubishi Rayon cooperates by maintaining a structure to provide rapid replies in response to requests for inspections for various types of environmentally hazardous substances in products and the like. To do that, we maintain a database of information on environmentally hazardous substances obtained from raw materials suppliers, and produce Safety Data Sheets (SDS) for each product.

## Relationships with Suppliers

[↓ Basic Concept](#)
[↓ CSR Procurement](#)
[↓ CSR Logistics](#)

### ■ Basic Concept

The Mitsubishi Rayon Group acts in line with its basic policy of fair and transparent transactions with all suppliers in Japan and overseas. The Group has formulated the CSR Procurement Policy and CSR Logistics Policy to ensure compliance with laws and regulations, to preserve the environment, to ensure safety, and to respect human rights, throughout the entire supply chain.

### ■ CSR Procurement

#### ● Principles

The Mitsubishi Rayon Group acts in line with its basic policy of undertaking fair and transparent transactions and strives to build healthy business relationships with business partners. In October 2008, we formulated the CSR Procurement Policy to work together with our supplier to contribute to better lives and realize a sustainable society. Based on this policy and with the collaboration of our suppliers, we are engaged in promotion of activities such as compliance with laws and regulations, preservation of the environment, ensuring safety and respecting human rights.

#### CSR Procurement Policies

The Mitsubishi Rayon Group's corporate philosophy is "Best Quality for a Better Life." "Best Quality" refers to our products, services, and the quality of each individual employee, while "Better Life" is meant to imply all people in society, including all of our stakeholders. In keeping with this philosophy, we keep a very open attitude to suppliers when purchasing and procuring raw materials, components and construction work, and operate on a basic policy of fair and transparent transactions.

We promote CSR activities Group-wide in order to realize our corporate philosophy, and in our purchasing and procurement activities, the cooperation of our suppliers of products and services is essential. We ask them to understand the main tenets of CSR procurement and to cooperate with us in order to contribute to a richer future and realize a sustainable society.

#### 1. Compliance with laws and social standards

We will maintain high ethical standards and adopt a basic stance of complying with laws and social standards to conduct sound purchasing and procurement and we will endeavor to operate fairly and equitably.

#### 2. Securing the ecological soundness and safety of products purchased

We will always place top priority on environmental considerations and maintenance of safety when purchasing and procuring products and services.

#### 3. Respect for human rights and improvement of working conditions

In purchasing and procurement, we will respect the fundamental human rights of workers and carry out our operations without unjust discrimination. In parallel, we will strive to ensure the safety and health of all those working in the Mitsubishi Rayon Group's workplaces and to improve working conditions.

#### 4. Development of partnerships

We will maintain mutual relationships of trust with all the business partners under the fundamental awareness that we are working together, mutually for business implementation and for conducting fair and transparent purchasing and procurement.

#### 5. Requests for business partners

In promoting the CSR activities of the Mitsubishi Rayon Group, we will ask our business partners to undertake appropriate corporate activities with respect to the following points.

- (1) Compliance with laws and social standards
- (2) Provision of products and services whose ecological soundness and safety have been ensured
- (3) Initiatives for raising respect for human rights and improving working conditions
- (4) Provision of satisfactory quality and prices, reliable delivery periods and timely information

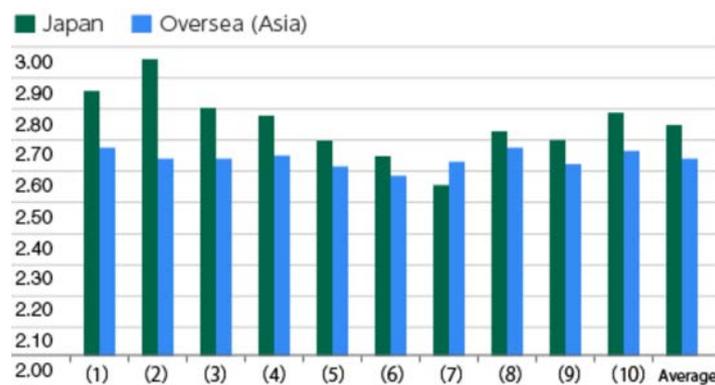
#### ● CSR Procurement Questionnaire

Mitsubishi Rayon conducted a CSR Procurement Questionnaire among suppliers from fiscal 2008 to fiscal 2010. The three times the questionnaire was conducted covered 98% of purchase amounts and 91% of orders. In providing feedback, we explained statistical results during commercial talks while from fiscal 2014 to fiscal 2015 visits were conducted to exchange opinions on future policies with suppliers that had given a low self-evaluation in questionnaire responses.

In fiscal 2013, through our six main Group companies in Asia, we conducted our CSR Procurement Questionnaire for countries including China, South Korea and Thailand, covering the same material as the questionnaire we use in Japan. Questionnaire results showed that there were issues with items such as ensuring safety and reducing environmentally hazardous substances so we asked through Group companies for improvements to be made.

Going forward, we will further raise the level of communication on both sides and further strengthen CSR initiatives in the supply chain.

#### Suppliers' Self-Evaluation for CSR Procurement Questionnaire Q1-10



▶ [CSR Procurement Questionnaire](#) 

#### ● Using the MCHC Group's Common Guidelines

To promote CSR procurement, it is crucial for business partners to understand its importance. In November 2014, the Mitsubishi Rayon Group held a briefing for business partners using the Mitsubishi Chemical Holdings Company (MCHC) Group's newly formulated and Groupwide CSR procurement guidelines, Developing Cooperative Business Practices with Suppliers and Business Partners, outlining the scope of sharing.

## ● Response to the Subcontract Act

The Mitsubishi Rayon Group strives to comply with the Act against Delay in Payment of Subcontract Proceeds, Etc. to Subcontractors (Subcontract Act) in order to respect the rights of business partners and maintain a healthy relationship.

A specific example of this is management of payment methods and settlement conditions through a subcontractor management database to prevent irregularities from occurring. Periodic training for buyers is also carried out to prevent abuse of a superior bargaining position.

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## ■ CSR Logistics

### ● Basic Policy

The Mitsubishi Rayon Group acts in line with its basic policy of undertaking fair and transparent transactions and strives to build healthy business relationships with business partners.

In November 2010, we formulated the CSR Logistics Policy to work together with our business partners commissioned to undertake distribution operations to contribute to better lives and realize a sustainable society. Based on this policy and with the collaboration of business partners, we are engaged in promotion of activities such as compliance with laws and regulations, preservation of the environment, ensuring safety and respecting human rights.

#### CSR Logistic Policy

The Mitsubishi Rayon Group's corporate philosophy is "Best Quality for a Better Life." "Best Quality" refers to our products, services, and the quality of each individual employee, while "Better Life" is meant to imply all people in society, including all of our stakeholders. In line with this philosophy, we keep a very open attitude to suppliers in our logistics activities, and operate with a basic policy of conducting fair and transparent transactions.

We promote CSR activities Group-wide in order to realize our corporate philosophy, and in our logistics activities, the cooperation of our suppliers of services is essential. We ask our suppliers to understand the main tenets of CSR logistics and to cooperate with us in order to contribute to a richer future and realize a sustainable society.

#### 1. Compliance with laws and social standards

We will maintain high ethical standards and adopt a basic stance of complying with laws and social standards to conduct sound logistics and we will endeavor to operate fairly and equitably.

#### 2. Securing ecological soundness and safety in logistics activities

We will always place top priority on environmental considerations and maintenance of safety when conducting logistics activities.

#### 3. Respect for human rights and improvement of working conditions

In logistics, we will respect the fundamental human rights of workers and carry out our operations without unjust discrimination. In parallel, we will strive to ensure the safety and health of all those working in Mitsubishi Rayon Group workplaces and to improve working conditions.

#### 4. Development of partnerships

We will maintain mutual relationships of trust with all business partners under the fundamental awareness that we are working together, mutually for business implementation and for conducting fair and transparent logistics activities.

#### 5. Requests for business partners

In promoting the CSR activities of the Mitsubishi Rayon Group, we will ask our suppliers to undertake appropriate corporate activities with respect to the following points.

- (1) Compliance with laws and social standards
- (2) Provision of logistics services whose ecological soundness and safety have been ensured
- (3) Initiatives for raising respect for human rights and improving working conditions
- (4) Provision of satisfactory logistics quality and prices, reliable delivery periods and timely information

● **CSR Logistics Questionnaire**

Mitsubishi Rayon conducted a CSR Logistics Questionnaire among business partners in the logistics field four times from fiscal 2010 to fiscal 2013.

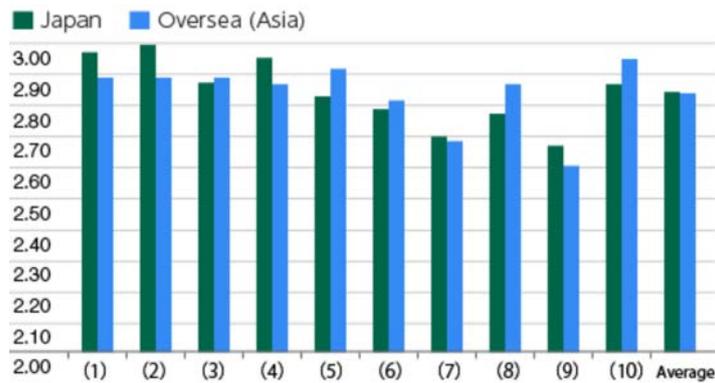
From fiscal 2012, we also conducted surveys of distribution companies' energy conservation initiatives. The survey results confirmed that respondents were implementing new initiatives that include obtaining qualifications, particularly the Safe Workplace (G-Mark) Certification and Green Management Certification, as well as introducing eco drive recommendations, and energy saving vehicles and equipment.

In fiscal 2013, through our six main Group companies in Asia, we conducted our CSR Logistics Questionnaire for countries including China, South Korea and Thailand, covering the same material as the questionnaire we use in Japan.

In providing feedback, we introduced the energy saving measures of each logistics company, and promoted replication of exemplary qualifications and activities between all companies. We also communicated our intention to include each company's stance on energy-saving initiatives in our supplier evaluations.

In fiscal 2014, we visited Japanese logistics companies that had overall low self-evaluations for the Global Compact to exchange opinions. At the same time, we held discussions with them on ways to reduce CO<sub>2</sub> emissions and cooperate as consigners, such as adoption of eco-cars and practice of environmentally conscious driving styles as well as shortening waiting times and fuel surcharges.

**Business Partners' Self-Evaluation for CSR Logistics Questionnaire Q1-10**



Toyo Wharf and Warehouse Co., Ltd. being awarded a prize for zero accidents at the Hazardous Materials Logistics Safety Conference.

▶ [CSR Logistics Questionnaire PDF](#)

## Relationships with Employees

- ↳ [Basic Policy](#)    ↳ [Human Resource Development](#)    ↳ [Work-Life Balance](#)
- ↳ [For a More Enjoyable Working Environment](#)    ↳ [Health Management](#)

### ■ Basic Policy

The Mitsubishi Rayon Group follows a basic policy of "Business Management utilizing people's capabilities." We respect employee diversity and aim to create workplaces where each employee can play an active role with a high level of enthusiasm.

### ■ Human Resource Development

#### ● Approach to Human Resource Development

Based on its view that the capabilities of people and organizations are the key source of corporate growth and competitive ability, the Mitsubishi Rayon Group views human resource recruitment, training and utilization, and fair evaluation as important management challenges, and focuses its efforts on these areas.

#### ● Basic Policy for Employing Human Resources

The conditions in which companies operate are changing on a daily basis along with social frameworks. Only companies that can sensitively detect these changes and respond adequately will be able to win out against the fierce competition and survive.

In recognition of this, the Mitsubishi Rayon Group seeks to continue hiring diverse individuals who can help it to realize its goal of being a "highly profitable corporate group that continues to grow." To this end, the Group aims to hire "individuals who will not be satisfied with the status quo, and will work ceaselessly to transform their surroundings;" that is, individuals with the "power to change things."

#### ● Training Programs

The Mitsubishi Rayon Group supports employees' efforts to develop their capabilities and skills by combining daily on-the-job (OJT) training with training programs and activities that assist in personal development.

The Group has adopted human rights education, legal compliance, thorough enforcement of corporate ethics, the promotion of safety and environmental management, and the strengthening of mental health care, as common themes of the stratified training programs according to employees' career background.

In addition, in view of the Group's increasing global operations, it is increasing its efforts to develop global leader who can serve as managers based on their understanding of the cultures and systems of each region.

## Main Training System

| Positions   | Changes of roles                                   | Training  |  |                                       |   |  |   | Common and self-directed learning   |
|---|--|---|--|---------------------------------------|---|--|---|---|
|   |  | Reinforcement of management/organizational capabilities | Global program   | Training by level                     | Training by objective   |  |   |   |
|   |  |   |  |                                       | Human skills  | Technical skills   | CSR-Related   |   |
| (Executive officer)<br>Division general managers<br>Laboratory general managers<br>Plant directors<br>Department directors<br>Group leaders<br>Managers | High-level experts<br>Specialists<br>Line managers | MCHC Management seminar                                 | Global leadership training   | Training for newly appointed managers | Seminars to support second careers<br>Career development training       | Labor management foundational training   | Compliance promotion training   | Annual Groupwide TOEIC testing<br>Correspondence education and systems for supporting the acquisition of licenses and certificates<br>Various e-learning programs |
| Mid-career employees  | Operational promotion                              | MCHC Junior management seminar                          | Global business training   | Training for mid-career employees (2) | Coaching/foundation training<br>Team building training                  | Manufacturing leadership training<br>Training on intellectual property<br>Innovation creation course | Harassment consultation<br>Risk officer training<br>Risk management implementation training<br>Information security education |   |
| Junior employees  |  | Cross-cultural understanding, language training         | Training for mid-career employees (1)                                | Mentorship training                   | Production engineering courses - applied studies and foundation studies | e-learning for upgrading qualifications  |   |   |
| New employees   |  | Overseas assignment training                            | Training for third-year employees<br>New employee/follow-up training | Various training related to laws      | Technical lectures for new employees                                    |  |   |   |

### ● COM-PAS Personnel Evaluation System

The Mitsubishi Rayon Group takes the view that strong unity of direction across all Group members while leveraging the capabilities of each individual, based on the Corporate Behavior Charter, is critical for its sustained development in the years ahead.

Based on this view, in fiscal 2006 the Group introduced a personnel performance evaluation system that stimulates communication within its organization, provides employees with common organizational targets, and accurately rates individuals who work hard and succeed in achieving the targets. This system is nicknamed COM-PAS (Communication, Plan, Action & Success).

Under the system, there is an initial period (February-March), in which employees set individual targets based on consultation with management, an intermediate period (September-October) for progress checking, and a final period (February-March the following year) during which the employee and management evaluate and confirm the achievement of the individual targets. In this way targets are managed with a PDCA cycle. The Mitsubishi Rayon Group believes that utilizing this target-based personnel management process maximizes the capabilities of individual employees and, by extension, allows the entire Group to display its organizational strength.

Furthermore, to make the system more effective, the Group offers manager-focused training to evaluators on an annual basis in order to increase the fairness, persuasiveness and transparency of the evaluations. In fiscal 2015, the training was conducted for managers twice (two days each) and for shift team leaders four times (one day each).



Target-based (evaluator) training

## ● Career Development

To promote management that makes the most of people's abilities, Mitsubishi Rayon promotes career plan development for career-track employees from their third year in the Company onwards. The objective is to foster their awareness of self-initiated skills development by having them envisage their future roles.

The career plans are created while filling out future information (plans) on a "career sheet" that records their past information (work history, qualifications, etc.)

The human resource information that is systematically compiled on the career sheet is utilized by human resource management throughout the Company to help increase our organizational strength.

## ● Internships

Mitsubishi Rayon offers an internship program that is available mainly to students from universities, graduate schools and technical colleges. Across the Company, 10 to 20 students are accepted every year, which gives the students the opportunity to gain firsthand experience in manufacturing and research on-site and to consider their career options. Mitsubishi Rayon makes the internship program available to foreign students in Japan as well.

In fiscal 2015, the internship program was held for 17 themes for two weeks between August 31 and September 11, as a public invitation.

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## ■ Work-Life Balance

### ● Action Plan for Supporting the Nurturing of the Next Generation

To boost employees' vitality and fulfill its responsibility to society, Mitsubishi Rayon is striving to develop better working conditions for employees, which includes supporting their efforts to manage work and family life. As part of this, from 2005, Mitsubishi Rayon established and implemented its Action Plan for General Business Operators in accordance with the Act on Advancement of Measures to Support Raising Next-Generation Children. With the Fourth Action Plan (fiscal 2012-fiscal 2013) we have also been certified by the Tokyo Labor Bureau as a General Business Operator Conforming to Standards, in 2014 we received the Kurumin Certification Mark for a third time following on from 2008 and 2010.

The measures of our Fifth Action Plan (fiscal 2014-fiscal 2017), which we started in fiscal 2014, are as follows.



Next Generation Kurumin Certification Mark

### **Action Plan for General Business Operators in accordance with the Act for Measures to Support the Development of the Next Generation (Fifth)**

The following action plan has been formulated to enable all employees to reach their full potential by achieving a harmonious balance between their work and family life, and by creating positive working environments.

#### **1. Four-year plan from April 1, 2014 to March 31, 2018**

##### **2. Overview**

<Objective One>

Create an environment that makes it easier for male and female employees to manage work and family life and, in turn, fosters an ongoing sense of enthusiasm toward for their duties

The following measures will commence from April 2014:

- Create an environment that will dispel employees' concerns over managing work with child rearing and enable them to work with a vision for the future
- Encourage male employees to participate in child rearing
- Promote understanding regarding managing engaging both work and nursing care

<Objective Two>

Undertake measures to create enthusiastic and dynamic workplaces

The following measures will commence from April 2014:

- Implement measures to reduce overtime work and encourage employees to take paid holidays
- Conduct initiatives to realize a highly productive and efficient, flexible working style that is not tied to a fixed approach
- Undertake measures to increase mutual understanding and cooperation among employees with diverse backgrounds

<Objective Three>

Implement measures that foster the development of the next generation

The following measures will commence from April 2014:

- Provide opportunities for children to tour workplaces and so forth
- Provide opportunities for youth to think about what's it like to be a working adult and receive hands-on work experience

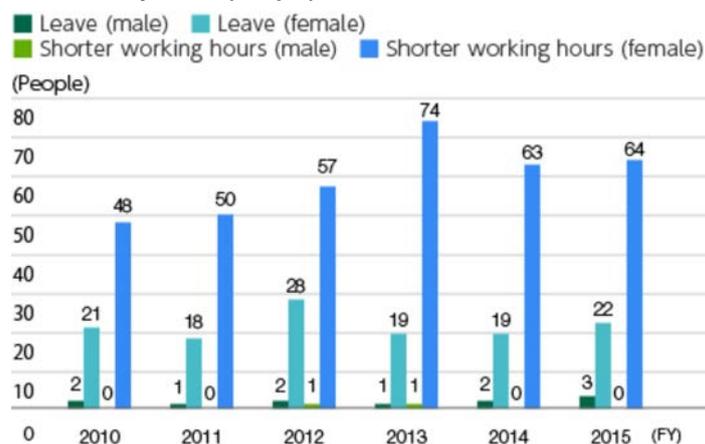
● **Measures for Supporting Efforts to Balance Work and Family Life**

Mitsubishi Rayon has a flexible support system that goes far beyond the legally mandated standards. In addition to childcare leave, we also have a system for shortened working hours for childcare that employees can use up until the end of their child's third year at elementary school, as well as a nursing care leave system that can be used with 60% of the employee's salary. We have worked to promote knowledge and use of these systems, and recently almost 100% of employees who have given birth have taken childcare leave.

These initiatives have been positively evaluated, and in 2010 the Company received the Tokyo Labor Bureau Director's Excellence Award from the Ministry of Health, Labour and Welfare at the Commendations for Equal and Balancing Promotion Companies (Family-Friendly Company category).

The Company aims to create conditions that enable employees to fulfill their family responsibilities while working enthusiastically to reach their full potential. To support those taking childcare leave, the Company conducts three-party consultations (between the individual taking leave, their supervisor and the HR department manager). This aims to maximize alleviation of anxieties about a work-life balance and supports a positive attitude toward returning to work.

**Use of Childcare Related Systems (People)**



\* Leave is based on the fiscal year when it was initially taken

\* Shortened working hours are based on the fiscal year when the system was used

### ● Measures for Supporting both Work and Nursing Care

Mitsubishi Rayon has maintained programs to support employees engaging in both work and nursing care, including a nursing care leave system that allows up to a maximum of one year's leave or divided leave, a system of shortened working hours for nursing, and a financial assistance (nursing) system. These programs exceed legal standards by a significant margin.

Since 2012, we have partnered with external NPOs to enhance information provision systems, such as a free telephone consultation service, intended to alleviate nursing care-related anxiety and difficulties. Through these efforts, we are striving to ease the mental and physical burdens placed on employees providing nursing care and create an environment that makes it easy to engage in both work and nursing care.

### ● Welcome Back Scheme

Mitsubishi Rayon maintains the Back-To-Work Registration Scheme ("Welcome Back Scheme") to give former employees who had left voluntarily the opportunity to return to work with the Company. Registration is open to all former employees who have worked for three consecutive years or longer, regardless of their reason for leaving, including childbirth and nursing.

When recruitment needs arise in the Company, we send recruitment notices to registered employees who suit the position and skills (for up to five years after registration).

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## ■ For a More Enjoyable Working Environment

### ● Respect for Human Rights

The Mitsubishi Rayon Group expresses its fundamental policies on human rights in the Corporate Behavior Charter and Compliance Behavior Standards, and has formulated the Human Rights Enlightenment Policy. The Mitsubishi Rayon Group respects human rights and strives to create fair working environments for employees. In addition, the Mitsubishi Rayon Group is seeking to raise awareness of the need to respect human rights by conducted regular lectures for management-level personnel, as well as giving human rights education lectures in stratified training programs. With regard to sexual harassment and power harassment, the Company makes it clear to all employees that such behavior is prohibited. All managers are required to take e-learning programs regarding these issues, and in fiscal 2015, we held harassment prevention training for all managers at head office. In fiscal 2016, this training will be held at other 5 business locations. The Mitsubishi Rayon Group is also raising awareness of these issues through in-house magazines and various employee training programs. In addition, the Mitsubishi Rayon Group has set up compliance consultation desks, as well as harassment counseling desks in head offices, branch offices and production centers, and establishes a committee to formulate countermeasures in a bid to develop a system able to rapidly respond to any form of harassment if such a situation were to occur.

### ● Diversity Promotion

Mitsubishi Rayon established the Diversity Promotion Department in April 2015, with the aim of enhancing its organizational strength by recruiting and appointing diverse human resources, regardless of nationality, gender, or the presence of a disability. We will formulate human countermeasures to cope with the globalization of our businesses, and take steps to raise awareness over human rights, encourage active participation by women, and promote the employment of people with disabilities.

### ● Promoting Affirmative Action for Women

To provide a wider scope for participation by women, the Diversity Promotion Department is leading initiatives such as 1) changing the awareness of management, 2) changing the awareness of women themselves, and 3) providing opportunities.

### ● **Employment of People with Disabilities**

To carry out CSR through our main business, we support people with disabilities in finding work and are expanding our employment opportunities for them. We coordinate with special needs schools and other facilities to proactively provide work experience opportunities, and carefully match jobseekers with workplaces to ensure they settle in to the workplaces.

We will continue aiming to achieve and exceed the statutory employment ratio of people with disabilities through recruitment activities and take steps to establish suitable workplace environments.

### ● **Reemployment System**

Mitsubishi Rayon Group reemploys workers who have reached retirement age in accordance with the intention of the revised Act on Stabilization of Employment of Elderly Persons. In principle, all employees who wish to continue working, including managers, are eligible for reemployment after the age of retirement based on the conditions specified by the Company. Approximately 80% of employees have used the reemployment system.

Mitsubishi Rayon has established a compensation system based on work style, such as appointing the target management system for those who wish to continue in a similar work style to before their retirement so that they can continue to feel as motivated as ever.

### ● **Mentoring Program**

In fiscal 2010, Mitsubishi Rayon introduced the Mentoring Program, under which senior employees provide ongoing support and guidance to young employees.

The system aims to provide indirect support for new employees and help them adapt to the work environment, learn new ideas as a member of society and improve their job performance.

### ● **Support for Resuming Work after Forced Absences Due to Illness and Injury**

It is important to prevent physical and mental illness and injury through lifestyle improvements and everyday care. However, if employees do become ill or injured, it is essential to create an environment that allows them to concentrate on their treatment for the required length of time and then return to work without any problems.

Accordingly, Mitsubishi Rayon has established a work recovery and return support system for employees who have been away from work due to personal events, injury, or sickness, or on leave.

We offer follow-ups to employees in cooperation with occupational physicians while they are undergoing treatment. In addition, we produce a work resumption program for each employee following his or her application to resume work. Based on the program, Mitsubishi Rayon workers can return to work in two stages, which consist of working on a trial basis and shorter working hours upon returning to work. These support initiatives allow employees to return to full-time work smoothly.

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## ■ **Health Management**

### ● **Establishment of the Health and Hygiene Group**

The Health and Hygiene Group was established within the Human Resources Division in 2012 to oversee Group-wide activities concerning employee hygiene and health. In cooperation with occupational physicians and occupational health staff members the Health and Hygiene Group devises activity principles and policies as well as common measures regarding improvement of working environments and methods, and employee health maintenance and improvement. In addition, internal policies are formulated in accordance with the Industrial Safety and Health Act and other health-related laws to proactively promote measures in such areas as overwork-related health disorder prevention and mental health strategies.

Up until now we have standardized procedures for the entire Company with regard to determining work categories, guidance categories and monitoring measures based on physical check, and measures to prevent health problems from overwork. We have also actively undertaken initiatives

including horizontal development of initiatives to prevent second hand smoking.

Looking ahead, the Mitsubishi Rayon Group will expand in stages the scope of its health-related activities to all Group companies, including those located overseas. The Group will strive to create KAITEKI workplaces where all employees can continue working in a safe, secure and healthy manner.

#### ● KAITEKI Health Management Initiatives

In May 2016, Mitsubishi Rayon made the following President's Declaration on KAITEKI Health Management.

Since 2011, the Mitsubishi Rayon Group has been enhancing corporate value by providing "KAITEKI," a sustainable condition which is comfortable for people, society and the Earth. People are an important resource, and we feel that the health of people and health of the organization are the most important factors in providing this KAITEKI and contributing to sustainable development. Mitsubishi Rayon declares that employees, worker's unions, health insurance society and the company will work as one for "healthy people and organizations" with KAITEKI Health Management incorporating health management as part of KAITEKI management led by the president and positions health as an important management strategy.

Promotion of KAITEKI Health Management will take into account the three material areas of wellness and advance specific measures going forward.

#### ● Self Wellness

<Being Healthy>

We will promote self-driven health management to be able to work in a lively manner based on the principle of each person managing their own health.

#### ● Workplace Wellness

<Having a Healthy Workplace>

We recognize the personalities of our colleagues to provide a foundation of mutual support to create workplaces with vitality and creativity through improvements of workplace environment and operations.

#### ● Social Wellness

<Having a Healthy Family and Cherishing Connections with Local Communities>

We aim to contribute to society widely as a member of a family and a local community by enhancing our self wellness and workplace wellness.

## Editorial Policy

The Mitsubishi Rayon Group utilizes its website to enable its many shareholders to understand the Company's initiatives related to corporate social responsibility (CSR) and to enable information to be easily searchable. Contents of the website have been compiled into a book issued in PDF format.

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### ■ Reporting Period

**April 1, 2015 - March 31, 2016**

However, compilation periods of some documents may differ slightly.

● **Date of issue: October 2016**

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### ■ Reporting Boundary

The scope covered in the report is Mitsubishi Rayon and domestic and overseas Group companies. Please refer to the Environmental Data page for the scope of data aggregation of Responsible Care Activities regarding environment-related data collected.

## Site map

### › **CSR Top**

#### › **Top Message**

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- › [The Mitsubishi Rayon Group's CSR](#)
- › [Corporate Governance](#) 
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- › [Activity 11 Strengthen the MMA Monomer Production System](#)
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- › [Activity 9 Promotion of Fuel Conversion](#)
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#### ■ **Responsible Care Activities (Safety, Environment and Quality)**

- › [Safety, Environment and Quality Assurance Management Structure](#)
- › [Material Balance](#)
- › [Proper Management of Chemical Substances](#)
- › [Preventing Global Warming](#)
- › [Preventing Air Pollution, Water Quality and Soil Pollution](#)
- › [Preserving Water Resources](#)
- › [Waste Reduction](#)
- › [Biodiversity Preservation](#)
- › [Safety and Disaster Prevention Initiatives](#)
- › [Environmental Data and References](#)

#### ■ **With Stakeholders**

- › [Relationships with Local Communities](#)
- › [Relationships with Customers / Product Safety](#)
- › [Relationships with Suppliers](#)
- › [Relationships with Employees](#)

#### › **Editorial Policy**

#### › **Previous Issues of CSR Report**

## Previous Issues of CSR Report

### ■ KAITEKI Report 2016

The Mitsubishi Chemical Holdings report can be accessed here.

[KAITEKI Report 2016](#) 

### ■ Mitsubishi Rayon Group CSR Report

From fiscal 2011, the method of reporting on CSR initiatives changed from a printed format to a website.

[2016 Report]

Reporting period: April 1, 2015-March 31, 2016

However, some reported examples may contain content from after April 1, 2016.

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[2016 Report](#)  (PDF 4.39 MB)

\*Please be aware that the file may take some time to open due to the large file size.

### ■ Previous Issues

#### ■ 2015 Report

Reporting period: April 1, 2014-March 31, 2015

However, some reported examples may contain content from after April 1, 2015.

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[2015 Report](#)  (PDF 4.02 MB)

#### ■ 2014 Report

Reporting period: April 1, 2013-March 31, 2014

However, some reported examples may contain content from after April 1, 2014.

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[2014 Report](#)  (PDF 2.77 MB)

#### ■ 2013 Report

Reporting period: April 1, 2012-March 31, 2013

However, some reported examples may contain content from after April 1, 2013.

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[2013 Report](#)  (PDF: 6.02 MB)

#### ■ 2012 Report

Reporting period: April 1, 2011-March 31, 2012

However, some reported examples may contain content from after April 1, 2012.

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[2012 Report](#)  (PDF: 4.40 MB)

■ Previous Reports from 2011 and Earlier



[2011 Report](#)



(PDF: 3.46 MB)



[2010 Report](#)



(PDF: 4.36 MB)



[2009 Report](#)



(PDF: 3.79 MB)



[2008 Report](#)



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[2007 Report](#)



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[2006 Report](#)



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[2005 Report](#)



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[2004 Report](#)



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[2003 Report](#)



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[2002 Report](#)



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