#### CSR Report 2016

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Home > CSR > Environmental Impact and Resource Reduction, and Climate Change Countermeasures / Environment and Safety (Related Data)

Environmental Impact and Resource Reduction, and Climate Change Countermeasures

# **Environment and Safety (Related Data)**

FY: Fiscal Year means the year ending March 31.

For example, FY2016 means April 1, 2015 - March 31, 2016

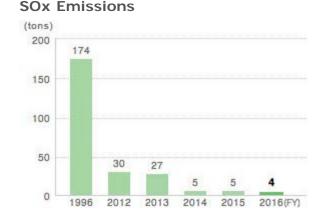
- 1. Protection of the Atmospheric Environment
- 2. PRTR Support
- 3. Preservation of Water Quality
- 4. Assessment of Soil and Groundwater Pollution
- 5. Asbestos Measures
- 6. PCB Management
- 7. Environmental Accounting
- 8. Improving the Local Environment
- 9. Other

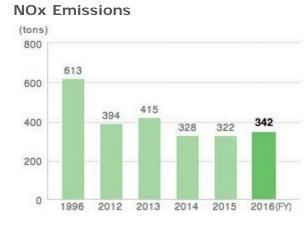
# 1. Protection of the Atmospheric Environment

## (1) Boiler Emissions Countermeasures

At the Yokkaichi Plant, which generates its own power, we installed fuel gas desulfurizers to reduce emissions of sulfur oxides (SOx). We also substantially cut emissions of nitrogen oxides (NOx) by installing burners with low NOx emissions and denitrification equipment. In FY2014, the fuel conversion (from heavy oil to public utility gas) change implemented at the Kashima Plant (Kashima Joint Power Generator) resulted in a reduction of both SOx and NOx emissions, an achievement that was maintained in FY2016.

JSR will continue to adopt the best emissions reduction technologies, and will continue to make improvements.





# (2) Initiatives for the Reduction of VOCs\*1 Emissions into the Atmosphere

Having set a high voluntary goal for the reduction of emissions of volatile organic compounds (VOCs) by 75% from FY2001 levels, JSR undertook large-scale investment between FY2007 and FY2010 to install five dried-synthetic rubber waste incinerators in three plants. We also carried out meticulous maintenance and management activities, including enhancing the airtightness of release points, improving the working method by adopting a closed system for chemical sampling and preventing leakage from bulbs. As a result, our VOCs emissions in FY2016 were 971 tons (77% reduction as compared to FY2001), in so doing, we reached our internal target. As we ramp up our production volume, we will maintain the level of the current voluntary goal (75% reduction from FY2001) without large-

### **CSR Report 2016**

Editorial Policy

Top Message

JSR Group CSR

•

Dialogue with Stakeholders

Priority issues identified by the JSR Group

Management

**JSR Group CSR Priority Issues** 

Safety and Disaster Prevention

JSR Group CSR Priority Issues

Environmental Impact and Resource Reduction, and Climate Change Countermeasures

Environmental Impact Reduction

Resource Recycling

Climate Change Countermeasures

Biodiversity Conservation

Environment and Safety (Related Data)

Responsible Care Activities by Group Companies

JSR Group CSR Priority Issues

Sustainable Society where People Can Enjoy Health and Longevity

JSR Group CSR Priority Issues

Communication with Stakeholders

**About the JSR Group** 

Evaluation by Outside Organization, Third-Party Opinion, and Independent Review scale investment by ensuring the proper operation of dried-synthetic rubber waste incinerators and finely tuned maintenance and management.

\*1 VOCs = Volatile Organic Compounds.

# Reference: VOCs reduction targets

- (1) Air Pollution Control Act (enforced in April 2006): To achieve a 30% reduction in the amount of VOCs released into the atmosphere from the FY2001 level by FY2011 with the effective application of laws and regulations, along with operators' independent activities.
- (2) Japan Chemical Industry Association: To prevent any further negative impact over FY2011 levels by FY2016.

15

2016(FY)

# Acrylonitrile (tons/year) 250 227 200 150

2013

6 2012

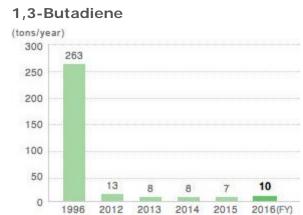
1996

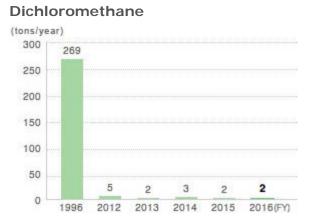
14

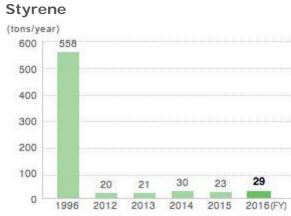
2014

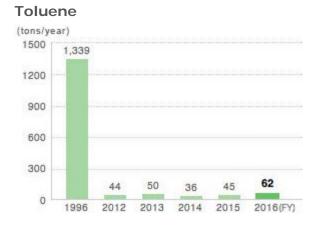
2015

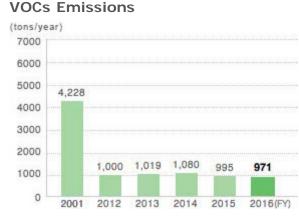
50











# (3) Measurement of Ozone-depleting Substances

As part of compliance with the Freon Emission Reduction Act established in April of 2015, all businesses that use designated products, including industrial air conditioners, refrigerators, and freezers, must perform basic inspections, periodic maintenance, and create inspection records. A total annual leakage of 1,000 t or more of CO<sub>2</sub> must be reported to the acting minister.

For this reason, JSR has created management standards for devices that use freon and has mandated a policy that such devices be managed in accordance with these standards. The amount of freon leakage in FY2016 was 252 t of CO<sub>2</sub>.

# 2. PRTR Support

# (1) PRTR\*2 Activities

Based on the Act on Confirmation, etc. of Release Amounts of Specific Chemical Substances in the Environment and Promotion of Improvements to the Management Thereof, JSR aggregates the amount of designated chemical substances emitted into the environment (atmosphere, water and soil), transferred

GRI Guidelines and
Global Compact
Content Index

Print Version of the
CSR Report

Send Opinions on the
CSR Report

Evaluation
by Outside Organizations



by manufacturing, or used in the previous year, and notifies the government of Japan of the results. We have systematically implemented a range of measures primarily for substances that are emitted in significant amounts and have a great impact on the environment. Such measures include enhancing the airtightness of substance release sources, rendering substances harmless by incineration, and improving manufacturing processes. In FY2016, as a result of taking such measures, we reduced emissions of the substances designated by the PRTR (287 tons) by 89% from the FY1996 level.

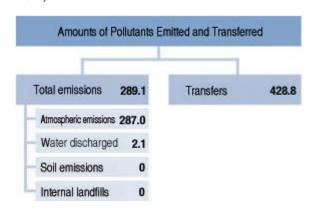
\*2 Pollutant Release and Transfer Registers (PRTR): A system for registering the emission and transport of environmental pollutants

Outline of PRTR is shown in Ministry of Economy, Trade and Industry web site; <a href="http://www.meti.go.jp/policy/chemical\_management/english/prtr.html">http://www.meti.go.jp/policy/chemical\_management/english/prtr.html</a>

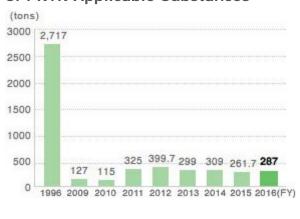
# (2) Amounts of pollutants emitted and transferred in FY2016 and PRTR atmospheric emissions

# Amounts of Pollutants Emitted and Transferred in FY2016 (tons/year)

(Including Techno Polymer Co., Ltd. KRATON JSR ELASTOMERS K.K. Japan Butyl Co., Ltd. Kashima Plant)



# Amounts of Atmospheric Emissions of PRTR Applicable Substances



#### FY2016 Emissions of Chemical Substances (PRTR)

Ordinance designated number	Substance	Amounts handled <sup>*3</sup> (t)	Atmospheric emissions (t)	Water discharged (t)	Transfers <sup>*4</sup> (t)
1	Zinc compounds (water-soluble)	1.4	0.0	1.4	0.0
2	Acrylamide	97.7	0.0	0.0	0.0
4	Acrylic acid and its water-soluble salts	1,353.6	0.0	0.0	0.0
7	n-Butyl acrylate	2,011.6	0.0	0.0	0.0
9	Acrylonitrile	42,267.6	14.3	0.0	0.0
13	Acetonitrile	132.1	0.1	0.5	9.1
20	2-Aminoethanol	5.6	0.0	0.0	0.0
28	Allyl alcohol	4.8	0.0	0.0	4.8
30	n-Alkylbenzensulfonic acid and its salts (limited to those with 10 to 14 alkyl group carbons and their mixtures)	1,128.9	0.0	0.0	0.0
36	Isoprene	80,704.4	0.7	0.0	5.2
71	Ferric chloride	19.3	0.0	0.0	0.0
80	Xylene	2.4	0.0	0.0	0.0
83	Cumene	32.3	0.2	0.0	0.0
86	Cresol	5.6	0.0	0.0	0.0
150	1,4-Dioxane	3.0	0.0	0.0	2.6
186	Dichloromethane	20.7	1.6	0.0	2.5
190	Dicyclopentadiene	12,902.5	0.1	0.0	28.6
202	Divinylbenzene	30.5	0.0	0.0	0.0
203	Diphenylamine	2.3	0.0	0.0	0.0
207	2,6-di-tert-butyl-4-	759.6	3.3	0.0	15.7

	cresol				
220	Water-soluble salts of dimethyldithiocarbamic acid	81.4	0.0	0.0	0.0
230	N-(1,3-dimethylbutyl)- N'-phenyl-p- phenylenediamine	256.7	0.0	0.0	0.0
234	Bromine	2,110.6	0.0	0.0	0.0
240	Styrene	125,670.1	29.1	0.0	0.8
274	Tert-dodecanethiol	951.5	0.1	0.0	0.0
276	3, 6, 9-triazaundecane- 1, 11-diamine (also known as tetraethylenepentamine)	9.6	0.0	0.0	1.0
300	Toluene	2,913.5	62.4	0.2	243.2
309	Nickel compounds	0.8	0.0	0.0	0.0
321	Vanadium compounds	42.7	0.0	0.0	42.1
330	Bis (1-methyl-1- phenylethyl) peroxide	14.5	0.0	0.0	0.0
337	4-Vinyl-1-cyclohexene	91.8	0.0	0.0	0.5
351	1, 3-Butadiene	560,906.6	10.3	0.0	0.9
355	Bis (2-ethylhexyl) phthalate	35.4	0.0	0.0	0.0
366	Tert-butyl hydroperoxide	8.5	0.0	0.0	0.0
392	n-Hexane	1,222.0	161.1	0.0	71.7
395	Water-soluble salts of peroxodisulfuric acid	1.4	0.0	0.0	0.0
411	Formaldehyde	1.4	0.0	0.0	0.0
415	Methacrylic acid	62.7	0.0	0.0	0.1
417	2, 3-Epoxypropyl methacrylate	8.6	0.0	0.0	0.0
420	Methyl methacrylate	5,187.3	2.0	0.0	0.0
436	a-Methylstyrene	9,741.7	1.7	0.0	0.0
440	1- Methyl-1-phenylethyl hydroperoxide	198.0	0.0	0.0	0.0
448	Methylenebis (4,1- phenylene) = diisocyanate (MDI)	1.4	0.0	0.0	0.0
	Total	851,004.0	287.0	2.1	428.8
243	Polychlorinated- dibenzo-p-dioxins*5	-	0.0313	0.0003	0.0000

<sup>\*3</sup> The handling amount represents the value after base deduction (1 ton/year per place of business)

# 3. Preservation of Water Quality

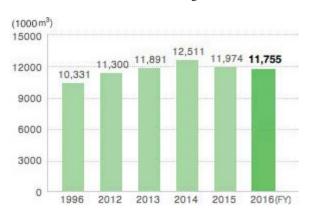
JSR performs rigorous wastewater management at all of its plants, and strives to maintain and improve water quality. JSR is in full compliance with the 7th Total Pollutant Load Control that was put into operation in April 2012. We will continue to strictly monitor water quality and strive to further reduce our impact on water.

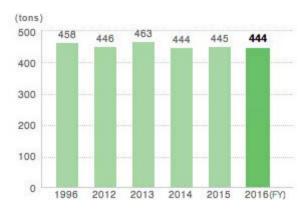
Total amount of waste water

Chemical Oxygen Demand Emissions

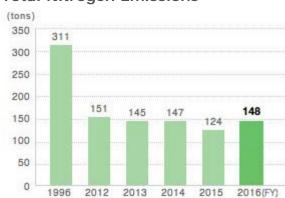
<sup>\*4</sup> The transfer amount is the amount committed to intermediate waste service companies plus the amount discharged into public sewers

<sup>\*5</sup> Dioxin category unit: mg-TEC

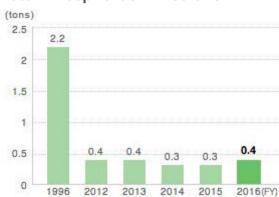








**Total Phosphorus Emissions** 



## 4. Assessment of Soil and Groundwater Pollution

Groundwater (Environmental Quality Standards for Groundwater Pollution) and soil (major items regulated under environmental standards) at all three of our plants are periodically inspected. As in previous years, no problems were found in FY2016.

## 5. Asbestos Measures

In accordance with the Ordinance on Prevention of Hazards due to Asbestos, JSR has conducted checks at all of its facilities (office, manufacturing, R&D and employee amenity areas), including those of all Group companies, where asbestos containing materials have been sprayed. Subsequently, at locations in plants where asbestos was found, we completed removal and enclosure projects in FY2007. In addition, we are investigating the replacement of asbestos containing gaskets with non-asbestos containing types and are progressively carrying out replacements when the safety of their use in production has been confirmed.

We will continue to act properly to prevent workers engaged in building demolition work from acquiring health problems caused by asbestos exposure in accordance with air pollution prevention laws and asbestos disability prevention regulations. In order to accommodate requests from the Labour Standards Bureau of the Ministry of Health, Labour and Welfare to thoroughly inform our employees of various systems, including the issuance of the asbestos-related health care handbook and the provision of special benefits as industrial workers' compensation for bereaved families, we introduced the relevant leaflet released by the Ministry of Health, Labour and Welfare on our website.

# 6. PCB Management

JSR stores and manages PCB waste in an appropriate manner in accordance with the "Act on Special Measures concerning Promotion of Proper Treatment of PCB Wastes" and subsequently carries out detoxication treatment in accordance with the law.

Electrical devices	Number of devices	Oil containing PCB (liter)
Devices in storage (not in use)	33	40,401

Devices in operation	0	0
Total	33	40,401
Total number of devices treated Current treatment status (%)	276 (89.3)	144,532 (78.2)

As of March 31, 2016

# 7. Environmental Accounting

## Policy

JSR introduced environmental accounting in FY2000 with the following two objectives

- 1. To strive to quantify the amount of resources invested into the environment and implement sound measures for the environment.
- 2. To publish environmental accounting and increase corporate transparency.

#### Scope

JSR Corporation - JSR Head Office, Yokkaichi Plant, Chiba Plant, Kashima Plant and Research Laboratories

#### Target Period

Wednesday, April 01, 2015 - Thursday, March 31, 2016

#### • Underlying Assumptions regarding Aggregation and Calculation

- 1. Calculations are performed in accordance with the Environmental Accounting Guidelines, 2005 edition (Ministry of the Environment) and environmental guidelines used in the chemical industry (issued by the Japan Chemical Industry Association and the Japan Responsible Care Council).
- 2. While the calculation of costs was based mainly on actual results, the calculation of some expenses was based on underlying assumptions.
- 3. Economic effects were substantial and did not include conversions of risk aversion effects or deemed effects into monetary amounts.
- \* Units of one million yen
- \* Abbreviations YP: Yokkaichi Plant, KP: Kashima Plant, CP: Chiba Plant

# (1) Environmental Protection Costs

(Unit: one million yen)

Category		Inv	estment <sup>*6</sup>	Expense		
		FY2015	FY2016	FY2015	FY2016	
(1) Business area costs		396	549	4,787	4,540	
Breakdown	(1) -1 Pollution prevention costs	330	Investments: YP: Bag filter cloth replacement for boiler #6 (80), Updated infrastructure for waste water treatment facilities (147). Tsukuba Research Center: Aboveground piping for research drainage (30)	1,963	1,866  Expenses: YP: Air pollution prevention (670), water pollution prevention (297), odor control (230). KP: Water pollution prevention (350)	
	(1) -2 Global environmental protection costs	44	Investments: YP: Energy conservation costs due to self-generation of power (146)	1,155	1,014  Expenses: YP: Energy conservation due to self-generation of power (880), global warming prevention and energy conservation (99). CP Costs: Global warming prevention and energy conservation (29)	

Re	) -3 esource rculation ests	22	Investments: YP: Bag filter replacement for sludge drying equipment, ash treatment facility updates (90)	1,669	1,660  Expenses: YP: Industrial waste recycling (366), Treatment/disposal of industrial waste (751). Head Office: Industrial waste recycling (164). KP: Treatment/disposal of industrial waste (156)
(2) Upstream/do	ownstream	0	0	0	0
(3) Management costs	t activity	17	Investments: Preparation of green areas (4)	490	Expenses: YP: Environmental impact monitoring (78), ISO14001 certification maintenance/operation (55), Labor (69). CP: Environmental improvement activities (34)
(4) Research and development costs		0	0	1,636	1,550  Expenses: Development of environmentally friendly products (1,365), environmental impact analysis and tests for legal applications (182)
(5) Social activit	ty costs	0	0	48	Expenses: YP: Amaike pump maintenance costs (16). Head Office: Support for the International Center for Environmental Technology Transfer (ICETT) (17), organizational charges (7)
Total	I	413	555	6,961	6,626

<sup>\*6</sup> Refers to the amount of the orders placed

# (2) Environmental Protection Effects

Effect	Index	Unit	FY2015	FY2016	Difference <sup>*7</sup>	Related information
Environmental effects related to resources used in business activities	Total energy consumption (crude oil equivalent)	kL	265,400	268,100	2,700	For more information
	Use of resources designated under PRTR Act	tons	865,430	835,961	-11,469	For more information
	Water consumption	1,000m <sup>3</sup>	14,900	14,600	-300	For more information
Environmental protection effects related	CO <sub>2</sub> emissions	tons	658,600	650,900	-7,700	For more information
to environmental impact and	SOx emissions	tons	5	4	-1	For more information
waste emitted from business activities	NOx emissions	tons	322	342	20	For more information
activities	PRTR substance emissions	tons	262	287	25	For more information
	Total amount of waste water	1,000m <sup>3</sup>	11,974	11,755	-219	For more information
	Chemical Oxygen	tons	445	444	-1	For more information

	Demand emissions					
	Total nitrogen emissions	tons	124	148	24	For more information
	Total phosphorus emissions	tons	0.3	0.4	0.1	For more information
	Waste materials from plants	tons	25,803	23,874	-1,929	For more information
	Off-site recycling	tons	24,154	23,548	-606	For more information
	Reduced volume of waste treated off-site	tons	1,649	326	-1,323	For more information
	Waste materials from plants disposed of by landfill	tons	0	0	0	For more information
	PRTR materials transported	tons	330	430	100	For more information
Other environmental effects	Products transported	million ton- kilometer	523	511	-12	For more information
	During transport CO <sub>2</sub> emissions	tons	23,984	23,333	-651	For more information
	Number of environmental complaints (Odor, noise, and vibration)	cases	0	0	0	For more information

<sup>\*7</sup> Improvement from previous years has not been corrected in terms of the production volume.

# (3) Economical Effects of Environmental Protection Measures\*8 -Substantial Effect-

(Unit: million yen)

Eff	Benefit		
		FY2015	FY2016
Cost reduction	By saving energy	202	33
	By saving resources	285	46
	By treating waste on-site	534	475
Total	1,021	554	

<sup>\*8</sup> The economic effects of energy and resource saving compared to the previous year.

# (4) Consolidated Accounting

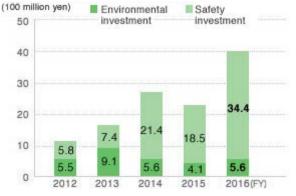
(Unit: one million yen)

	Investments		Ехре	Expense		Benefit	
	FY2015	FY2016	FY2015	FY2016	FY2015	FY2016	
JSR	412	555	6,961	6,626	1,021	554	
Total of 14 Group companies	557	99	2,315	2,422	435	509	
Total	969	654	9,276	9,048	1,456	1,063	

# (5) Development of New Environmental Protection Technologies

# 1. Amount of Capital Investment

JSR makes continuous investments in the environment and safety. Investments made in FY2016 reached 4.0 billion yen. This consisted of plant and facility investment aimed at various environmental improvements such as energy-saving equipment, and safety improvements such as workplace accident prevention. JSR will



continue to make ambitious investments to maintain and improve the environmental, safety, and health aspects of operations in accordance with its medium-term capital investment plan.

# 2. Main Areas of Environmental & Safety Capital Investment (Year in parentheses represents the investment year)

- Large-scale, natural gas-fired turbine cogeneration system (FY2010)
- Full-scale anti-seismic measures for facilities (FY1996-2015)
- Ground flare installation (FY2000, FY2008)
- Renovation of sludge dehydrator and upgrading efficiency (FY2001)
- Facilities to reduce hazardous atmospheric pollutants (FY1999-2008)
   (Dichloromethane solvent recovery facilities, 1,3-Butadiene treatment facility, incinerators for dry synthetic rubber dry exhaust, etc.)
- Augmented comprehensive facilities to treat wastewater (FY2006, FY2008)
- Sludge dryer system (FY2013)

#### 3. Development of New Environmental Protection Technologies

Led by its Process Development Center, JSR is actively engaged in the development of new technologies to promote environmental protection. The following are recent themes in technological development approached by JSR. We deploy technologies as they are developed.

# 4. Main Areas of Environmental & Safety Technology Development(1) Development of Energy-saving Processes

- Computer-assisted optimization of heat recovery (pinch technology)
- Computer-assisted optimization of energy use in control systems
- Energy-saving through changes in heat recovery and solvent types across multiple plants

## (2) Other Technologies to Reduce Environmental Impact

- Development of solution polymerization manufacturing facilities and a new solvent recovery process (to reduce hydrocarbon emissions into the atmosphere)
- Development of synthetic rubber manufacturing facilities and dry exhaust systems (to reduce odors near plants and hydrocarbon emissions into the atmosphere)
- Development of polymerization technologies to combat total nitrogen emissions (measures to prevent eutrophication of ocean waters)
- Development of environmental technology through more effective use of microbes (to reduce odors near plants and to improve the quality of wastewater)
- Incineration technology for dry synthetic rubber dry exhaust (measures for harmful atmospheric pollutants)
- Installation of a sludge dryer system (to reduce CO<sub>2</sub> emissions and promote effective utilization of waste)

# 8. Improving the Local Environment

JSR values the opinions of local residents and considers high transparency of plant operations to be the key to improve the local environment. With this in mind, we have strived to improve

the local environment by implementing monitoring and tours of environmental equipment at regular intervals. In FY2007 and FY2008, we installed equipment to incinerate dry synthetic rubber dry exhaust (RTO\*9) at the Yokkaichi, Kashima, and Chiba plants to prevent



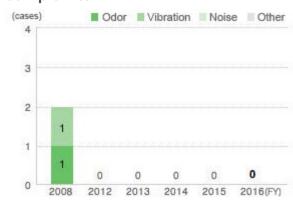
Dried-synthetic rubber waste incinerator (Kashima Plant)

foul odors. In FY2009, a ground flare was installed at the Yokkaichi Plant to prevent noise and flashes. As a result, there have been no environmental complaints from FY2009 to FY2016.

We will continue striving to maintain our basic policy of improving the local environment.

\*9 RTO (Regenerative Thermal Oxidizer): A device that combusts breaks down VOCs into water and CO<sub>2</sub> to make emissions clear

# Number of environmental complaints





Ground flare (Yokkaichi Plant)

# 9. Other

\* Only Japanese version available.

# (1) Maintenance management information regarding waste treatment facilities (Yokkaichi Plant)

- 1. Maintenance management information
- FY2017 (PDF 88.0KB) 🔁
- FY2016 (PDF 90.2KB)
- FY2015 (PDF 96.0KB) 🔁
- FY2014 (PDF 95.0KB)
- FY2013 (PDF 83.8KB) 🔁
- FY2012 (PDF 53.4KB)
- FY2011 (PDF 34.3KB) 🔁

## 2. Periodic inspection notifications

- Incinerator #1 (primary reactor) Industrial Waste (PDF 272KB)
- Incinerator #2 (Fluidized bed incinerator #1) Industrial Waste (PDF 260KB)
- Incinerator #4 (Fluidized bed incinerator #2) Industrial Waste (PDF 259KB)
- General Waste (PDF 263KB)

## 3. Licensing

- Industrial Waste Disposal Permits (PDF 313KB)
- Special Control Industrial Waste Disposal Permits (PDF 369KB)
- Specific Waste Treatment Facilities License (PDF 911KB)

# (2) By-product Reduction Plan Based on Laws Promoting the Effective Use of Resources

• By-product Reduction Plan Based on Laws Promoting the Effective Use of Resources (PDF 15.4KB)



This information is provided in PDF files. Adobe Acrobat Reader is required to view these documents. Use this link to download Adobe Reader.

TOP A

#### **CSR**

CSR News Editorial Policy Top Message Corporate Mission and CSR Philosophy Dialogue with Stakeholders

#### JSR Group CSR Priority Issues and FY2016 Progress of Initiatives

- Safety and Disaster Prevention
- RC (Management)
- Safety and Health (General)
- Environmental Impact and Resource Reduction, and Climate Change Countermeasures
- Environmental Impact Reduction
- Resource Recycling
- Climate ChangeCountermeasures
- Biodiversity Conservation
- Environment and Safety (Related Data)
- Responsible Care Activities by Group Companies

- Sustainable Society where People Can Enjoy Health and Longevity
- Life Science Businesses
- Communication with Stakeholders
- Customers and BusinessPartners
- Employees Fundamental Philosophy
- Employees Diversity
- Employees Work-Life Management
- Employees Healthy Mind and Body
- Employees HumanResources
- Communication withCommunities and society
- Shareholders

# Management

- CSR Management
- Corporate Mission and CSR Philosophy
- Compliance
- List of Targets and Results
- Process to Identify JSR Group CSR Priority Issues
- Corporate Governance
- Risk Management
- Guidelines, Review etc.
- GRI Guidelines and Global Compact Content Index
- Evaluation by Outside Organizations
- Third-party Opinion
- Independent Review

# About the JSR Group

- JSR Group Profile
- JSR Group Products
- > Financial data on the IR site

## Print Version of the CSR Report

- CSR Report 2016
- RC Site Report(Japanese version only)
- Annual Report
- CSR Report (Backnumber)
- Corporate Profile
- CSR Report of the Group Companies

CSR Report Online Version
Back Number

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▲ Top of Pag