

## Overview of the communication tools

### Sustainability Report 2017

Easy-to-understand brochure on environmental initiatives



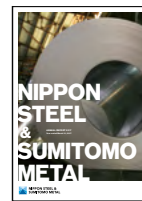
Sustainability Report 2017  
(Book form and PDF file)<sup>1,2</sup>

Brochure on the compact overview of the company



Company Brochure  
(Book form and PDF file)<sup>1</sup>

Brochure on the overall businesses and management for investors



Annual Report 2017  
(Book form and PDF file)<sup>1,2</sup>

Details on environmental initiatives



Environment & CSR  
<http://www.nssmc.com/en/csr/>

Details on the following subjects



<http://www.nssmc.com/en/>

- Products
- Research & Development
- About NSSMC
- Recruiting information

Details on business and management



Investor Relations  
<http://www.nssmc.com/en/ir/>

Various reports

- PR brochures "Quarterly Magazine: NSSMC"<sup>2</sup>
- Picture book "A New Story About Iron"<sup>2</sup>
- Technical articles and technical reports<sup>1</sup>



PR brochures  
"Quarterly Magazine: NSSMC"  
(only in Japanese)



Picture book "A New Story About Iron"  
(only in Japanese)

Various reports for shareholders<sup>1</sup>

- Fact Book
- Financial Results
- Securities Reports
- Corporate Governance Reports
- Reports for Shareholders



Fact Book 2017

<sup>1</sup> PDF files are available for downloading from the website.  
<sup>2</sup> Printed copies are available upon request from the website.



# Sustainability Report

## In Step with Progress toward SDGs

# 2017



## Corporate Philosophy

### Our Values

Nippon Steel & Sumitomo Metal Corporation Group will pursue world-leading technologies and manufacturing capabilities, and contribute to society by providing excellent products and services.

### Management Principles

1. We continue to emphasize the importance of integrity and reliability in our actions.
2. We provide products and services that benefit society, and grow in partnership with our customers.
3. We pursue world-leading technologies and manufacturing capabilities.
4. We continually anticipate and address future changes, innovate from within, and pursue unending progress.
5. We develop and bring out the best in our people to make our Group rich with energy and enthusiasm.

### Basic Environmental Policy (Established in October 2012)

Under the principle of "Ecological Management," NSSMC is committed to contributing to the creation of an environmental-preservation oriented society with lower environmental impact. For this purpose, the company will conduct business activities based on the viewpoint of environmental preservation in local communities, which includes the maintenance and improvement of good living environments and the promotion of reduction and recycling of waste. The company will also address challenges on a global scale including response to issues of global warming as well as the maintenance and improvement of biological diversity.

1. Reducing environmental impacts at every stage of operations (eco process)
2. Offering of environment-oriented products (eco products)
3. Proposing environmental preservation solutions from a global perspective (eco solution)
4. Development of innovative technologies
5. Development of a rich environment
6. Promotion of environmental relations activities

### Editorial policy

This Sustainability Report is the 20th since the former Nippon Steel Corporation issued what is the first sustainability report by a Japanese steel manufacturer, in 1998. The report presents NSSMC's progress in ecological management and details of our various initiatives.

### Period covered

The period covered in the report is fiscal year 2016 (from April 2016 to March 2017). For some activities, the period from April 2017 to June 2017 is included.

### Scope of report

- Environmental and social aspects: Activities of NSSMC and its group companies in Japan and overseas
- Economic aspects: The Annual Report 2017 (issued in July 2017) also covers the contents of the economic report.

### Reference for guideline

- GRI (Global Reporting Initiative)  
"Sustainability Reporting Guidelines Version 4.0"
- "Environmental Reporting Guidelines," by the Ministry of the Environment

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### The role of steel in forming the future of the earth

### Column

Iron is believed to be one-third of the Earth's weight. While the majority of iron exists in the Earth's inner core, we have been fortunate to have an abundant resource of iron in the Earth's surface layer. Steelmaking technology has a history as long as 4,000 years, but it was the Industrial Revolution in the 18th century and subsequent technological innovations that have enabled steel to be mass produced and supplied at cheap prices. Since then, steel has been extensively used in goods for the daily life of people and the underlying infrastructure of the society, whereby the metal enriches people's lives to an extent beyond estimation. While steel demand is expected to keep growing, in good part due to improvement of living standards in emerging countries, we do not need to worry about a supply shortfall, given as there are ample reserves. Being recyclable, steel is a reliable material that will continue to be an essential part of our lives in the future.

Aiming to become the best steelmaker with world-leading capabilities, NSSMC has been dedicated to steelmaking with a particular emphasis on its contribution to preservation of energy and other resources, and steel-related reduction in environmental burden. We have also expanded our steelmaking technologies geographically, across the world. Going forward, we are intent on properly capturing increasing global demand and providing our outstanding steel products to users all over the world, for the betterment of people's lives.

Eco-friendly steel and steelmaking will form a great part of the future of the earth.



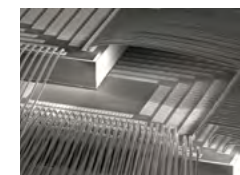
### Cover photo

Yawata Works and Hometown Forest



# NSSMC Group's Businesses

Based on the long accumulation of technology through steelmaking, the Nippon Steel & Sumitomo Metal Corporation (NSSMC) Group operates businesses in five areas: steelmaking, engineering, chemicals, new materials, and system solutions, with the core business being steelmaking.



## New materials business 34.5 billion yen

Nippon Steel Sumikin Materials Co., Ltd., etc.

Based on materials expertise gained from steelmaking, Nippon Steel & Sumikin Materials provides original materials and components that are indispensable to leading-edge technology fields, with primary focus on the three areas of semiconductor and electronics industry materials and components, basic industrial materials and components and environmental and energy-related materials and components.



## Chemicals business 174.2 billion yen

Nippon Steel & Sumikin Chemical Co., Ltd., etc.

Nippon Steel & Sumikin Chemicals is developing demand for functional materials for electronic materials such as for displays, epoxy resins, circuit boards, and organic electroluminescence (OEL), on top of a variety of original coal-based products, including needle coke and various aromatic products.



## Engineering and construction business 267.5 billion yen

Nippon Steel & Sumikin Engineering Co., Ltd., etc.

Based on long-accumulated steelmaking and other technologies, Nippon Steel & Sumikin Engineering undertakes many projects worldwide in six fields: steelmaking plants; environment; energy; offshore steel structures; building construction and steel structures; and pipelines.



## System solutions business 232.5 billion yen

NS Solutions Corporation, etc.

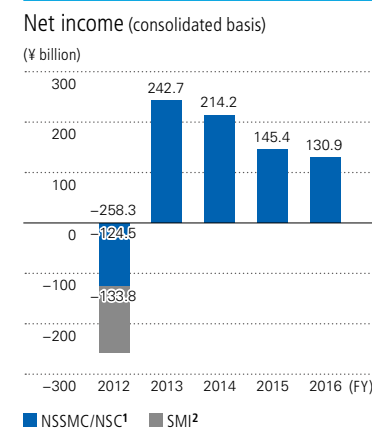
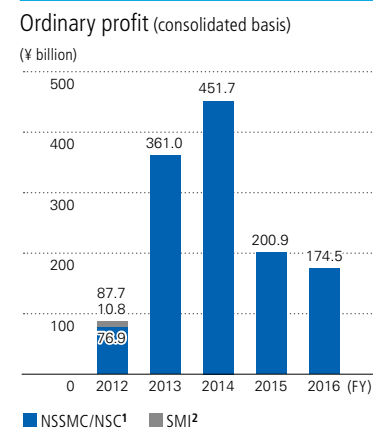
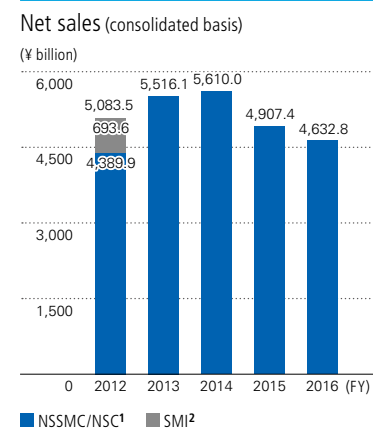
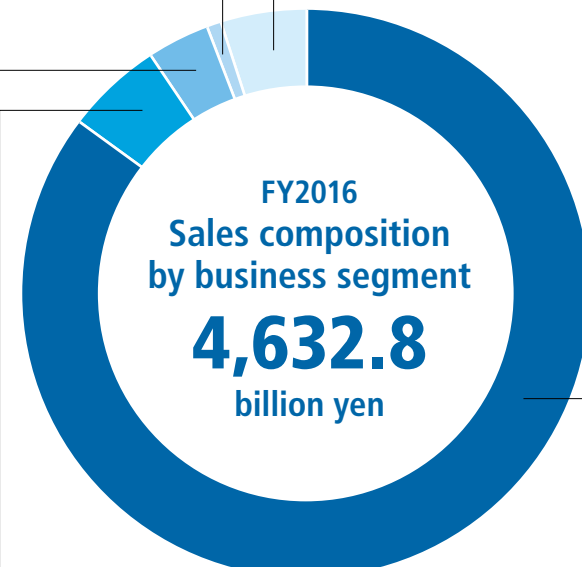
In keeping with the advent of widespread use of digital innovations in IT for business, NS Solutions provides IT business solutions, including uses of the cloud, IoT, and AI, to a wide range of sectors by applying its extensive insight and advanced practical IT capabilities acquired in the steel manufacturing business.



## Steelmaking and steel fabrication business 4,052.2 billion yen

Nippon Steel & Sumitomo Metal Corporation, etc.

Enhancing technological superiority, NSSMC provides a variety of high-grade steel products (i.e., steel plates; flat products; bar & wire rod; construction products; pipe & tube; railway, automotive & machinery parts; and titanium & specialty stainless steel) to many customers in Japan and overseas.



The NSSMC Group is steadily progressing in establishing a global business structure that enables it to capture overseas growth markets and to readily respond to customers' overseas expansion.

### Topics



**1 KNSS (Indonesia)**  
A joint venture with Krakatau Steel, the largest steelmaker in Indonesia, for the manufacture of steel sheets for vehicles. Planned start of operation, August 2017.



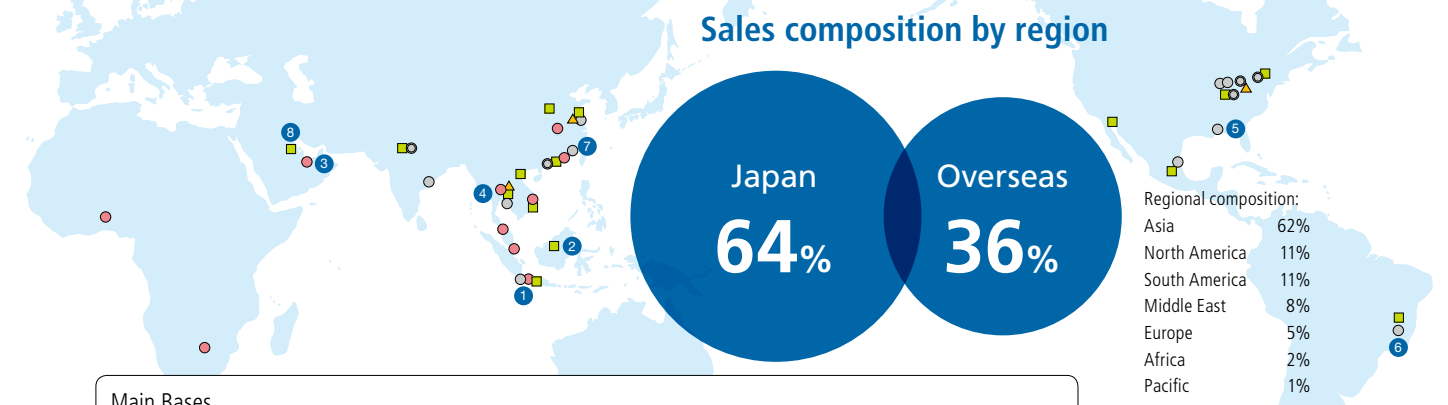
**2 VAM®BRN (Brunei)**  
Established a company to provide threading services for connections of the oil country tubular goods (OCTG) pipes for oil and natural gas development. Began operation in November 2016.



**3 AGIS (UAE)**  
A joint venture to produce hot-dip galvanized steel sheets in the United Arab Emirates (UAE). A new expanded continuous galvanizing line started operation in October 2016.



**4 NS BlueScope (Thailand)**  
A joint venture with Australia's BlueScope Steel, for manufacture of steel sheets for construction materials in Southeast Asia and North America. It has decided to install a third metal coating line.



### Main Bases



**5 AM/NS Calvert (USA)**  
Acquired this plant, formerly operated under ThyssenKrupp, with ArcelorMittal in 2014 to enhance supply of automotive steel sheets in the U.S.



**6 Usiminas (Brazil)**  
Began operation in 1962 as an integrated steelworks with blast furnace.

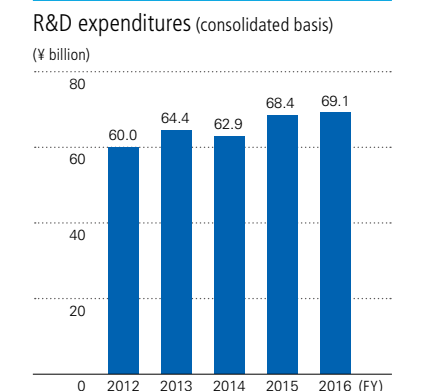
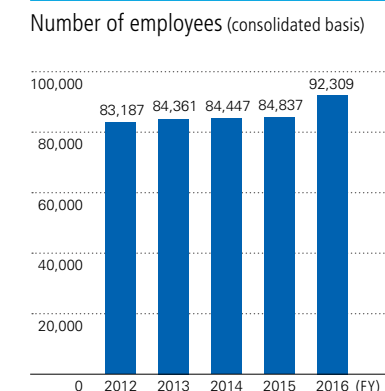
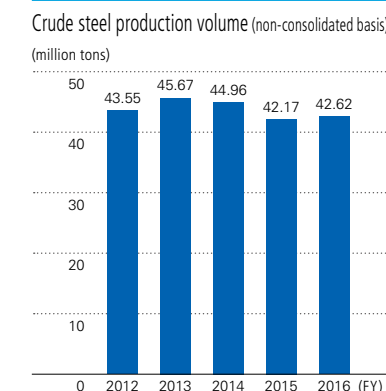


**7 BNA (China)**  
Established a joint venture company with Baoshan Iron & Steel for manufacture and sale of automotive hot-dip galvanizing steel sheets and began operation in 2005. Began operation of a new galvanizing line in September 2015.



**8 NPC (Saudi Arabia)**  
A company for manufacture and sale of welded pipes for pipelines at the point of demand. Began operation in 1980. Shipments reached 5 million tons on a cumulative basis in June 2017.

- Sales and manufacturing of automotive steel sheet
- Sales and manufacturing of non-automotive steel sheet
- Sales and manufacturing of pipe & tube, and construction materials
- ◎ Sales and manufacturing of railway, automotive & machinery parts
- ▲ Processing and services of bar & wire rod





# A Message from Top Management



## Contributing to the Development of a Sustainable Society

The international community has advanced toward building a sustainable society as evidenced by adoption of the Sustainable Development Goals (SDGs) at the United Nations Summit in September 2015 and by the Paris Agreement, a global agreement on reducing climate change, which took effect in November 2016. Many of the 17 SDGs incorporate environment-related goals and targets, indicating the importance of environmental initiatives for achieving a sustainable society.

Having identified environmental management as critical for corporate management, based on its Ecological Management Policy, Nippon Steel & Sumitomo Metal (NSSMC) has been fulfilling its commitment to contribute to the creation of a society oriented toward environmental preservation and lower environmental impact. We have been actively engaged in various environmental issues, which encompass some at the local community level and others of global scale. They include efforts on behalf of the maintenance and improvement of good living environments, the promotion of reduction and recycling of waste, measures that address global warming, and the maintenance and improvement of biological diversity.

Concerning global climate change, by the Paris Agreement all participating countries, including emerging countries, agreed on a framework to deal with greenhouse gas emissions mitigation. Although it is not clear if or how the United States will abide by the agreement, The government in Japan has compiled a plan to cut greenhouse gas emissions by 26% from the fiscal 2013 level by fiscal 2030. To achieve this goal, NSSMC and the steel industry are voluntarily making sincere efforts to implement the Initiatives for Achieving a Low Carbon Society. From a long-term perspective, we intend to pursue innovative technological development, including separation and collection of CO<sub>2</sub> and effective use of CO<sub>2</sub>, which can become revolutionary countermeasures to climate change.

We keep reminding ourselves that environmental risk management, including prevention of unexpected events and accidents, is one of the critical challenges for our sustainable operations. We comply with laws and regulations, adapt to ordinances, bylaws, and standards, and carry out measures to reduce environmental burden with due consideration to the situation at each point of operations. We will keep addressing the issues of environmental preservation in terms of hard and soft aspects.

In recent years, lighter materials than steel have been receiving lots of attention but I strongly believe that steel continues to be recognized as an outstanding material. Steel has overwhelmingly lower environmental impact during manufacturing than other light-weighted materials and can be reborn many times in whatever form is desired. In terms of Life Cycle Assessment, from manufacturing to disposal and recycling, steel is an environmentally-friendly material. Through our pursuit of the full potential of steel and by promoting three ecos, namely, Eco Process (The way we manufacture is eco-friendly), Eco Products (What we produce is eco-friendly) and Eco Solution (Sharing our eco-solutions), we are contributing to building a sustainable society.

We also intend to continue to further enhance the quality of our ecological management by developing two-way communication with all stakeholders, i.e., local communities, customers, shareholders, investors, researchers, and environmental NGOs. Desiring to be ever more trusted and relied upon by society, we will fulfill our corporate social responsibility (CSR) to contribute to society by carrying out our corporate philosophy to "pursue world-leading technologies and manufacturing capabilities, and to contribute to society by providing excellent products and services."

We hope that this *Sustainability Report* helps you better understand our environmental and other initiatives.

A handwritten signature in black ink, reading "K. Shindo".

**Kosei Shindo**

Representative Director and President



# In Step with Progress toward SDGs

## The NSSMC Group's contribution to SDGs

The United Nations Sustainable Development Summit was held during September 25-27, 2015 in New York and adopted the theme of "Transforming Our World: the 2030 Agenda for Sustainable Development." As a plan of action for people, the planet, and prosperity, this Agenda was declared while 17 Sustainable Development Goals (SDGs) and 169 targets were announced.

The NSSMC Group's values are to "Pursue world-leading technologies and manufacturing capabilities, and contribute to society by providing excellent products and services." We have been striving to cope with various initiatives so that we can play an important role in supporting social infrastructure through steelmaking.

We believe our contribution to developing a sustainable society through our initiatives also contributes to achieving the United Nation's SDGs, which are scheduled to be globally resolved by 2030.



### Some specific initiatives

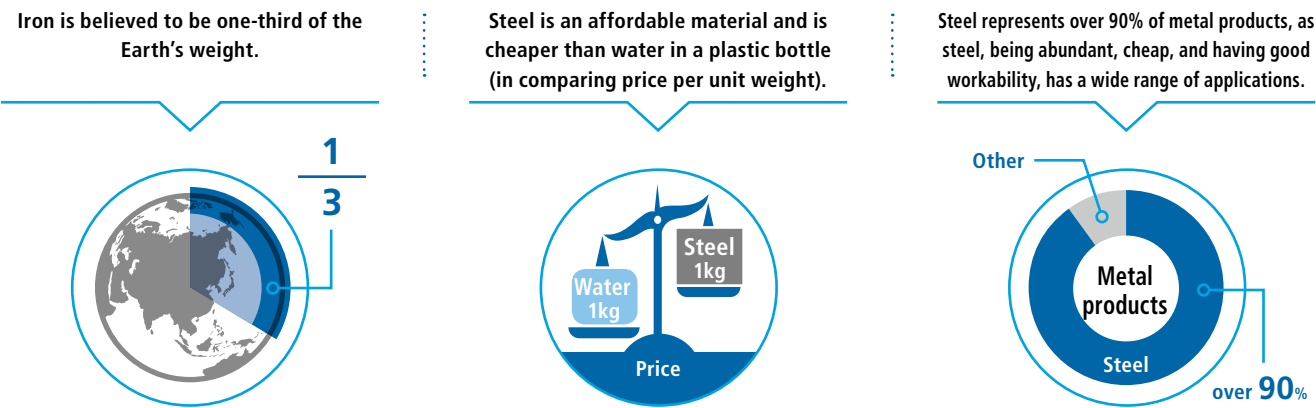
	<ul style="list-style-type: none"><li>• Job creation through establishment of operating companies in emerging countries ● p. 3</li><li>• Reduction of vulnerability to disaster based on use of Nonframe method (construction method to stabilize slopes without damaging the natural environment)</li></ul>
	<ul style="list-style-type: none"><li>• Use of converter slag fertilizer, a by-product of steelmaking, to improve farming productivity and salt damage in farmland ● p. 33</li><li>• Provision of titanium and stainless steel, which have excellent seawater corrosion resistance, for seawater desalination plants, securing agriculture water</li></ul>
	<ul style="list-style-type: none"><li>• Promotion of air, water, soil risk management and chemical substance management ● pp. 28-31</li><li>• Development and provision of steel products that contain no substances of concern, such as lead and hexavalent chromium</li><li>• Development and provision of high-tensile steel sheets with excellent collision safety performance ● p. 19</li><li>• Promotion of health management programs for employees (i.e., health enhancement and preventive measures) ● p. 38</li></ul>
	<ul style="list-style-type: none"><li>• Promotion of employee training to raise skills (i.e., OJT, Off-JT, sending trainees to Junior College for Industrial Technology), hosting technology triathlon</li><li>• Study sessions for teachers, internship for students</li><li>• Conducting science classes, sending lecturers, hosting Tata steelmaking experiments to promoting interest in manufacturing ● p. 38</li></ul>
	<ul style="list-style-type: none"><li>• More hiring of women in production and other workplaces</li><li>• Establishment of infrastructure in manufacturing worksites for women to work comfortably</li><li>• Establishment of in-house 24-hour nursery to support working women ● p. 39</li><li>• Awareness raising to prevent power harassment and sexual harassment in the workplace</li></ul>
	<ul style="list-style-type: none"><li>• Recycling and reuse of limited water resources ● pp. 16, 28, 31</li><li>• Promotion of water quality risk management ● pp. 28-31</li><li>• Provision of titanium and stainless steel for seawater desalination plants</li><li>• Provision of lining steel pipes for delivery of clean water</li></ul>

	<ul style="list-style-type: none"><li>• Efficient use of energy, such as 100% use of by-product gas ● pp. 16, 17</li><li>• Provision of materials for fuel cells that produce energy from hydrogen ● p. 22</li><li>• Development and provision of steel materials for high-pressure hydrogen to support a hydrogen-oriented society ● pp. 19, 22</li><li>• Expansion of use of biomass fuels, such as woody biomass, in the electricity wholesale business ● p. 23</li><li>• Diffusion of CDQ that generates power from waste heat and waste power generation in emerging countries ● p. 21</li></ul>
	<ul style="list-style-type: none"><li>• Taikan Program (an experience-based safety education program) ● p. 38</li><li>• Promotion of health management programs for employees ● p. 38</li><li>• Enhanced measures to support the work-life balance, such as for the leave system and life support</li><li>• Support for workplaces, voluntary operational improvement activities. Introduction of an award system</li></ul>
	<ul style="list-style-type: none"><li>• Pursuit of Eco Processes™ to help raise resource/energy efficiency and reduce environmental impacts ● pp. 16, 17</li><li>• Introduction of advanced technologies through bilateral cooperation (India, ASEAN, etc.) ● p. 20</li><li>• Use of steel slag in road materials and materials for civil engineering ● p. 26</li></ul>
	<ul style="list-style-type: none"><li>• Thorough compliance training, such as for the Anti-Monopoly Act</li><li>• Promotion of employment of people with handicaps</li><li>• Expanded hiring of women and non-Japanese</li></ul>
	<ul style="list-style-type: none"><li>• Provision of various indispensable Eco Products™ for daily lives ● pp. 18, 19</li><li>• Provision of earthquake-resistance steel products</li><li>• Development of Nonframe method, which protects houses from disaster while maintaining views of nature</li><li>• Conservation and management of the Yawata Works, an industrial world heritage site</li></ul>
	<ul style="list-style-type: none"><li>• Promotion of air, water, soil risk management and chemical substance management ● pp. 28-31</li><li>• Full recycling of by-products, including slag, dust, and sludge ● p. 26</li><li>• Promotion of recycling of waste plastics and waste tires ● p. 27</li><li>• Curbing the used amount of steel materials, by making steel stronger and thinner in application, last longer to reduce the frequency of replacement, and other means ● pp. 18, 19</li><li>• Curbing the used amount of rare metals while ensuring high performance ● pp. 18, 19</li><li>• Thorough control of environmental burden substances contained in purchased materials and products ● p. 39</li></ul>
	<ul style="list-style-type: none"><li>• Pursuit of Eco Processes™ at the world's highest-level energy efficiency ● pp. 16, 17</li><li>• Development and provision of Eco Products™, such as high-tensile, light-weighted, energy-efficient steel sheets and light-weight railway wheels and axles for high-speed railways ● pp. 18, 19</li><li>• Promotion of Eco Solutions™ to expand use of energy-efficient technologies across the world ● pp. 20, 21</li><li>• Promotion of innovative technology development, such as reduction of iron ore by hydrogen, separation, collection, and use of CO<sub>2</sub> ● pp. 24, 25</li><li>• Technological development of CO<sub>2</sub> fixation through regeneration of seaweed beds based on the use of steel slag ● p. 33</li><li>• Provision of steel products and solutions to help adjust climate change, including disaster prevention and minimizing disaster impact</li></ul>
	<ul style="list-style-type: none"><li>• Promotion of water and soil risk management and chemical substance management ● pp. 28-31</li><li>• Regeneration of seaweed beds with the use of steel slag ● pp. 32, 33</li><li>• Promotion of sea area environmental improvement with the use of steel slag ● pp. 18, 26</li><li>• Development of a large-scale offshore aquafarming system (experiment in progress)</li><li>• Voluntary clean-up activities at seashore nearby steelworks</li><li>• Collaboration with an NPO, "Mori wa Umi no Koibito" (participation in tree-planting, etc.) ● p. 39</li></ul>
	<ul style="list-style-type: none"><li>• Promotion of air, water, soil risk management and chemical substance management ● pp. 28-31</li><li>• "Creation of Hometown Forests" to promote greenery within steelworks ● pp. 32, 33</li></ul>
	<ul style="list-style-type: none"><li>• Raising awareness of and compliance with anti-bribery guidelines</li><li>• Elimination of antisocial forces</li><li>• Thorough confirmation of no use of conflict materials ● p. 39</li><li>• Thorough management of security export control</li><li>• Compliance with the OECD Guidelines for Multinational Enterprises across a wide range of topics such as human rights, employment, and labor relationships, environment, and competition</li></ul>
	<ul style="list-style-type: none"><li>• Eco solutions to transfer and spread environmental, energy-saving technologies to emerging markets ● pp. 20, 21</li><li>• Japan-India and Japan-ASEAN regular exchanges among public and private steel-related parties</li><li>• Support for human resources development to build an energy management system in emerging countries</li><li>• Active participation in various activities of the World Steel Association (LCA, CO<sub>2</sub> data collection, environmental committee, etc.)</li></ul>



# Steel's Attractiveness

## Steel is a familiar material that supports our daily lives



## Steel can be reborn many times in whatever form.

One of distinctive features of steel is to be recyclable many times in whatever form.

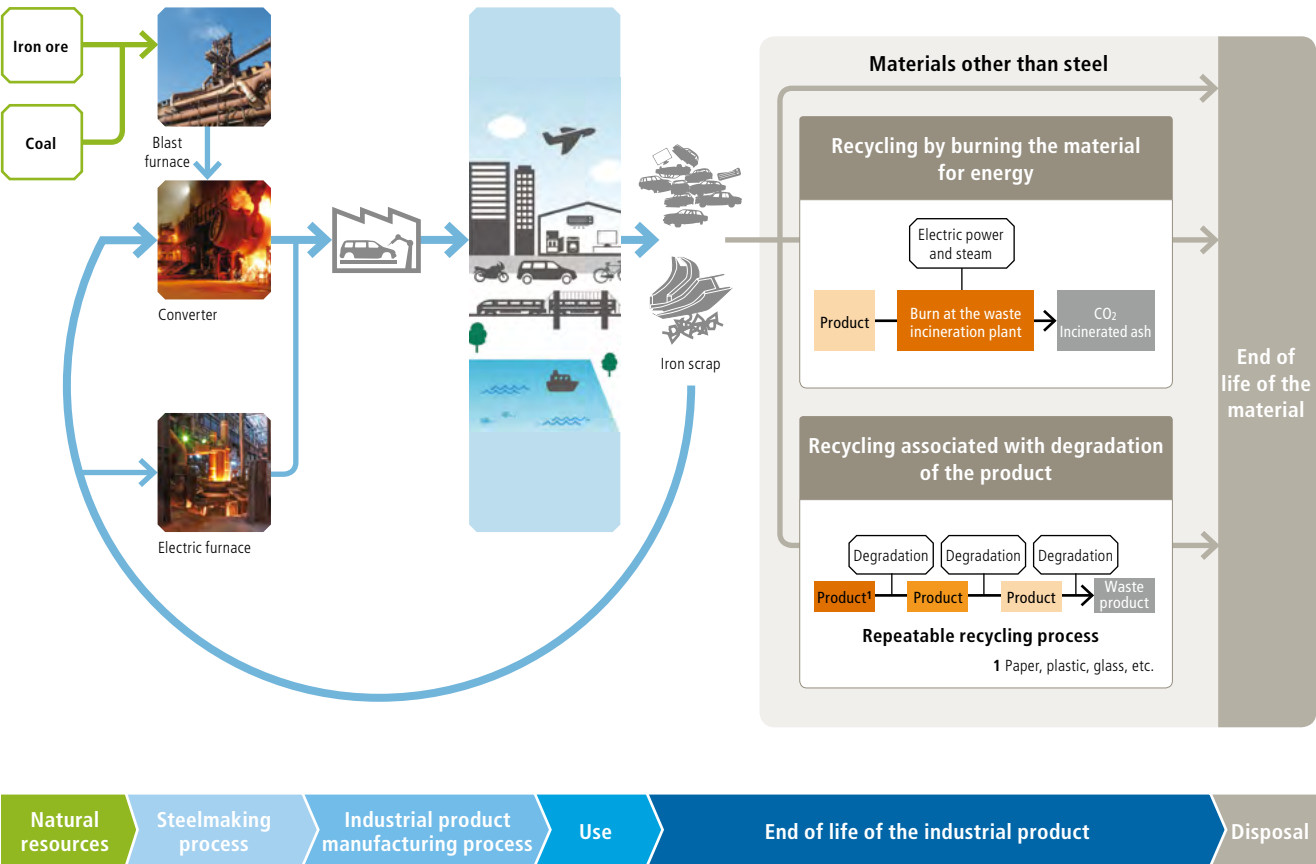
When the life of an industrial product ends, the life of steel of the product does not end. It becomes steel scrap to be recycled back to the steelmaking process, and is reused as a new product many times.

Steel can be easily sorted out from among other metals and materials (by use of a magnet).

Steel degrades little when recycled.

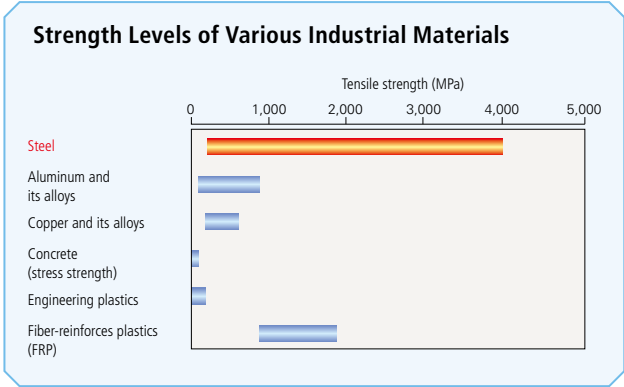
Steel can be recycled into various products.

Steel therefore is an optimal material for recycling.



## Steel is a material of great potential

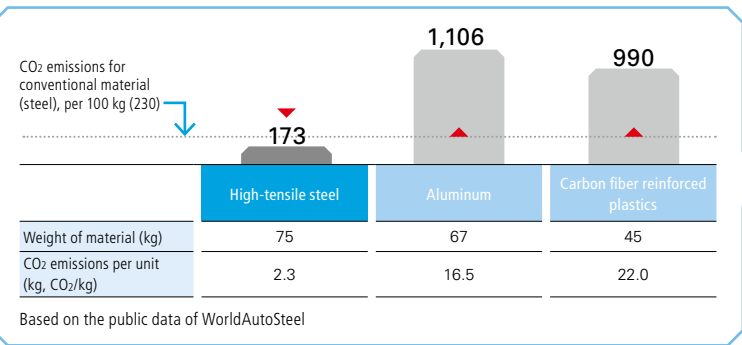
Steel's strength and toughness can be adjusted by marginal changes of its component materials and control of cooling in and after rolling. Steel is the only material that can have a wide range of strength while maintaining workability and toughness. The maximum tensile strength of commercially-used steel is currently approximately 2.5 gigapascal (4-5 gigapascal for extra-fine wires). This suggests the potential to raise the strength by about four times, which would reach the theoretical strength.



## Steel is an outstanding material from the perspective of the Life Cycle Assessment (LCA)

### Let's think about burden in manufacturing materials

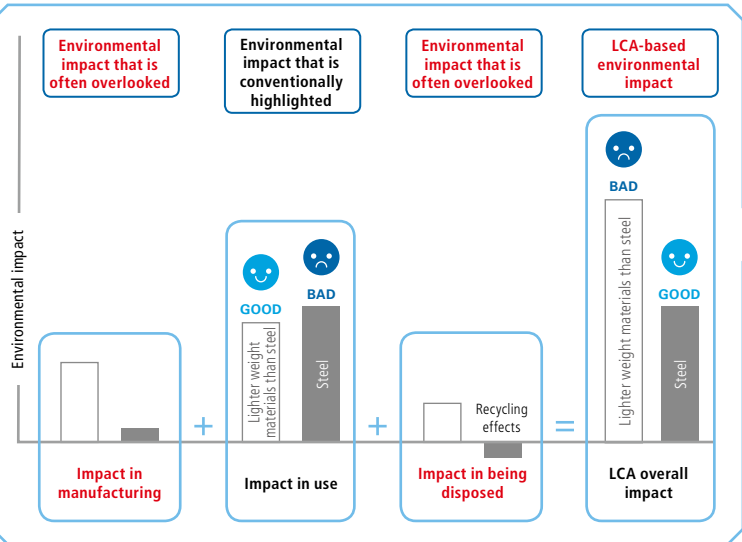
Comparison of CO<sub>2</sub> emissions in manufacturing for same vehicle component, per 100 kg



While some materials are lighter than steel, **steel has an extremely lower environmental burden in manufacturing.**

Note: High-tensile steel is about 25% lighter than conventional steel and has a lower environmental burden. [p. 19](#)

### Let's consider the overall life cycle



When the Life Cycle Assessment (LCA), from production of material to disposal and recycling of product, is included in considering environmental burden, steel is seen to be a very superior material.

# NSSMC's History as an Eco-friendly Steelmaker Represented by "Three Ecos and Innovative Technology Development"



## ECO PROCESS

The way we manufacture is "eco-friendly"

NSSMC uses world-leading resources and world-leading energy efficiency to manufacture steel products and aims to develop eco-friendly steelmaking processes by further improving efficiency.



## ECO PRODUCTS

What we produce is "eco-friendly"

We produce and offer eco-friendly "products" using our world-leading technological capabilities, thus conserving resources and energy and thereby contributing towards building a sustainable society.



## ECO SOLUTION

Sharing our "eco-solutions"

We contribute to the reduction of CO<sub>2</sub> emissions and other environmental burdens on a global scale by diffusing our Group's world-class environmental and energy-saving technologies in Japan and overseas.



Based on the objective of offering to society technologies and products that contribute to the saving of resources and energy and the reduction in environmental burden, we are developing innovative advanced technologies from a medium- to long-term perspective.

### 1960's

Steel supported high economic growth

- Enhanced dust collection measures Adopted dust collectors and significantly controlled emission of dust and soot [p. 30](#)
- Introduced converter furnaces The milling process time was reduced from 3-4 hours to 30 minutes, raising productivity by 10 times
- Introduced continuous casting machines Boosted energy efficiency by continuous processing of mold-injection, heating, and rolling



### 1970's

Energy saving challenge

- Developed Cokes Dry Quenching (CDQ) (1976) [p. 21](#)
- Developed the Top-pressure Recovery Turbine (TRT)



The pressure of blast furnace gas is utilized to generate power

### 1980's

Respond to the yen's sharp appreciation

- Dry desulfurizing and denitrating system using activated carbon [p. 30](#)
- Energy Center's introduction of timetable demand management of power and steam, and a power prediction system
- Began Pulverized Coal Injection (PCI) to a blast furnace Energy saving by more use of low-quality materials and cut in coke usage

### 1990's

Support in the era of concern for the global environment

- Developed regenerative burners (1996)



A pair of burners alternately heat the air or absorb the heat in the heating furnace, achieving about 25% energy saving

### 2000's

Support for customer's global expansion

- Advanced waste water risk management (i.e., installation of waste water closing gate) [pp. 28, 30](#)
- Developed Rotary Hearth Furnace (2000) Recycled dust and sludge, generated in steelmaking process [p. 26](#)
- Highly-efficient GTCC power generation (2004) Generated more power than by conventional thermal means, using the same amount of fuel



### 2010's

Toward becoming the world-leading steelmaker with comprehensive strengths

- Expansion of usage of biomass resources (2010) Utilize wood palette for packing, thinned wood, coffee grounds, and other resources as coal alternative fuel for power generation [p. 23](#)



Coffee grounds

- Adoption of railway wheels and axles and powertrain equipment for the Tokaido Shinkansen trains (1964) [p. 19](#)
- Use of steel sheet for consumer durables such as cars, coolers, and color TVs
- Oriented electrical steel sheets (1968)



Began production of oriented electrical steel sheets which is used in transmission/distribution transformers and reduces their energy loss

- Wires for steel tire cords (1978) Enhanced strengths enabled reduction in wire for tires, contributing to higher fuel economy
- Stainless steel



NSSMC developed corrosion-resistant, heat-resistance stainless steel with strong adaptability to match design specifications

- High-tensile steel sheets for automobiles [p. 19](#)
- Began manufacturing and sales of titanium materials (1984) NSSMC began production and sales of outstanding corrosion-resistant, light, and strong titanium
- Steel tubes for automobile door impact beams (1987)
- High-strength wires and steel plates for the Akashi Kaikyo Bridge (1988) [p. 18](#)

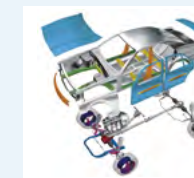


- Resin film steel sheet (1994)
- HIAREST steel (1996)

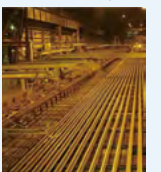


- Steel House (1996) Balanced features of seismic resistance, fire resistance, durability, and thermal retention
- Lead-free bar and wire rod (1999)

- SuperDyma® (2000)
- Lead-free galvanized steel sheets for fuel tanks (2005)
- Stainless steel boiler tube (2007)
- Ultra-high-tensile steel sheet for automobiles Satisfied requirements for both collision-safety and weight-reduction functionalities [p. 19](#)



- High-speed railway wheel for heavy freight
- Establishment of production and shipment system for 150 meter long rails (2014)



- HRX19™ stainless steel for high-pressure hydrogen (2015) [p. 22](#)
- 7% Ni steel plate for LNG tanks Slashed the amount of nickel by about 20% but ensured the equivalent safety and strength to conventional levels [p. 19](#)

- Thai Steel Pipe began operation (1965)



Supported the development of the automobile industry in Thailand, as one of the oldest Japanese companies to be active in Thailand

- "Creation of Hometown Forests" began (1971)



The world's first forest was created by using the Miyawaki method.

- [pp. 32, 33](#)
- Began operation of the first waste direct-melting and resource recovery system (1979)

- Began technology transfer of Coke Dry Quenching (CDQ) (1985) [p. 21](#)
- Cooperated in construction of Shanghai Baoshan Steel (1985)



Deng Xiaoping, China's Deputy Prime Minister, visited the Kimitsu Works in 1978

- I/N Tek (USA) began operation (1990)
- ICI (USA) began operation (1992)
- The Smart Community Creation Project of Kitakyushu City was launched (1994)



Participated in creation of a city under the theme of harmonious existence in Kitakyushu City, Fukuoka Prefecture

- Began waste plastic recycling (2000) [p. 27](#)



- Creation of sea forests Beverly™ Series (2004) [pp. 32, 33](#)
- Japan-China Steel Industry Advanced Technology Exchange Meetings for Environmental Preservation and Energy-saving (from 2005) [p. 20](#)
- Asia Pacific Partnership (APP; precursor of GSEP; 2006-2011)

- Global Superior Energy Performance Partnership (GSEP; from 2011)
- Public and private collaborative meeting between the Japanese and Indian iron and steel industries (from 2011) [p. 20](#)



- Public and private collaborative meeting between the Japanese and ASEAN iron and steel industries (from 2013) [pp. 20, 21](#)

- Introduced computer control of blast furnace operation (1968)

- Continuous annealing furnace Shortened the processing time from 10 days to 10 minutes
- The steel industry's first online system began operation (1973)



- TMCP (Thermo Mechanical Control Process for plate rolling) (1985) Realized the increased strength and productivity improvement by meticulous control of rolling and water-cooling

- Start development of CO<sub>2</sub> separation and recovery technologies (2005)
- SCOPE21 (2008; Oita)

- SCOPE21 (2013; Nagoya)
- Completion of the first commercial model of CO<sub>2</sub> separation and recovery facility (2014; Muroran Works) [p. 25](#)
- COURSE50 (2015; construction of an experimental blast furnace) [p. 24](#)

- Opening of the Meishin Expressway (1963)
- Opening of the Tokaido Shinkansen Line (1964)
- Tokyo Summer Olympics (1964)

- Japan World Exposition (Osaka Expo'70) (1970)
- Sapporo Winter Olympics (1972)
- The Plaza Accord (1985)
- The International Exposition, Tsukuba, Japan (1985)
- Opening of the Seikan Submarine Tunnel (1988)
- Opening of the Great Seto Bridge (1988)
- Introduction of 3% consumption tax (1989)

- Opening of the Tohoku and Joetsu Shinkansen Lines (1982)
- The Plaza Accord (1985)
- The International Exposition, Tsukuba, Japan (1985)
- Opening of the Seikan Submarine Tunnel (1988)
- Opening of the Great Seto Bridge (1988)
- Introduction of 3% consumption tax (1989)

- The United Nations Conference on Environment and Development (UN Earth Summit) (1992)
- The Great Hanshin-Awaji Earthquake (1995)
- Consumption rate hike to 5% (1997)
- Nagano Winter Olympics (1998)

- FIFA World Cup Korea/Japan (2002)
- The 2005 World Exposition, Aichi, Japan (2005)
- Lehman Shock (Global Financial Crisis) (2008)

- The Great East-Japan Earthquake and Tsunami (2011)
- Opening of the entire line of the Kyushu Shinkansen Line (2011)
- Opening of the Tokyo Skytree (2012)
- Consumption rate hike to 8% (2014)
- Opening of the Hokuriku Shinkansen Line (2015)
- Opening of the Hokkaido Shinkansen Line (2016)



# NSSMC's Value Chain Contributes to Society with Its "Three Ecos"

NSSMC creates value for society at every stage of the life cycle of steel with its "three ecos."

Raw materials mining

Steelmaking

Transportation

Processing and production

Usage

Disposal

Recycling

Overseas



Resource-saving by enhancing the strength of materials and reducing their weight

Demonstrate the equivalent performance with less use of precious rare metals

Provide high-strength steel materials most suitable to exploration and transportation of raw materials



Abrasion resistant steel plate ABREX™



Provide steel materials most suitable for LNG carriers and carriers for raw materials, contributing to marine safety and enhanced fuel economy

- NSGP™-1, 2 [p. 18](#)
- Steel with resistance to high cracks
- NSafe®-Hull



Steel production at the world's top-class energy efficiency [pp. 14, 15](#)

Significant improvement in production efficiency as the latest technology enabled dephosphorization and decarburization to be performed by one converter instead of two.



Coke Dry Quenching (CDQ) [p. 21](#)



Converter [p. 10](#)

Using by-product gas generated within its works, the NSSMC Group generates electric power for internal use and supply to local communities.

[p. 17](#)



Highly-efficient GTCC power generation [p. 11](#)

Improved fuel economy and reduced CO<sub>2</sub> emissions, due to light-weighted transportation equipment



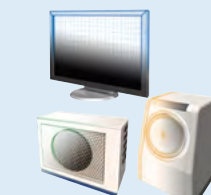
Railway wheels and axles [p. 19](#)



Less CO<sub>2</sub> emission by promoting the modal shift (from truck carrier to coastal shipping and railroad carrier) [p. 15](#)



Supply steel materials that make it easy for customers to process, weld, and work on materials, and save production processes



Prepainted VIEWKOTE® steel sheet



Connecting rods and dividing surface (cracking surface)

Contribution to energy preservation and reduction in CO<sub>2</sub> emissions at the point of use of products, due to reduction in product weight caused by enhanced material strength

Titanium sheet for aircraft  
Titanium alloy rods for aircraft engines



Airbus A350XWB ©AIRBUS



Tokyo Gate Bridge

Steel materials for offshore wind power generation



Offshore wind power generation

Use steel slag, by-products of steelmaking for materials for cement, broken-up pieces of pavement, etc.



KATAMA™ SP [p. 26](#)

Theoretically infinite recycling [pp. 8, 9](#)

The end of a product life does not end the life of steel as material.

Steel products have some superior functionalities, and steel materials have superior recyclability. Steel scrap is a vital raw material for the production of new steel products.

Recycling rate of steel materials for automobiles

95%

(Estimate on steel materials for automobiles in Japan in fiscal 2015)

Recycling rate of steel cans

93%

(Japan Steel Can Recycling Association; fiscal 2015)

[Reference]

Aluminum cans	90% (FY2015)
PET bottles	83% (FY2014)
Glass bottles	70% (FY2014)
Drink cartons	45% (FY2014)



Transfer of Japan's world-leading environmental conservation and energy preservation technologies to overseas steelmakers [pp. 20, 21](#)

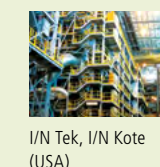
Coke Dry Quenching (CDQ) system in Shougang Jingtang Iron & Steel United Co., Ltd.



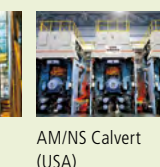
CDQ system at Tata Steel, India



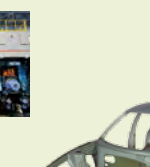
Stable supply of NSSMC's eco products to its customers' overseas production bases



I/N Tek, I/N Kote (USA)



AM/NS Calvert (USA)



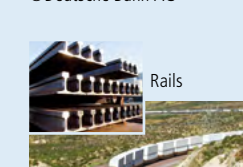
Tenigal (Mexico)



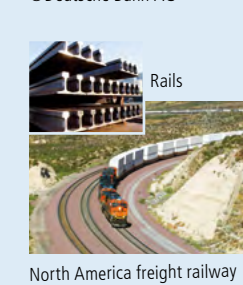
High-tensile steel for automobiles [p. 19](#)



Railway wheels



Germany's Inter-City-Express (ICE) Train ©Deutsche Bahn AG



North America freight railway



Global Warming Countermeasures

CO2 emissions reduction through three ecos and innovative technology development

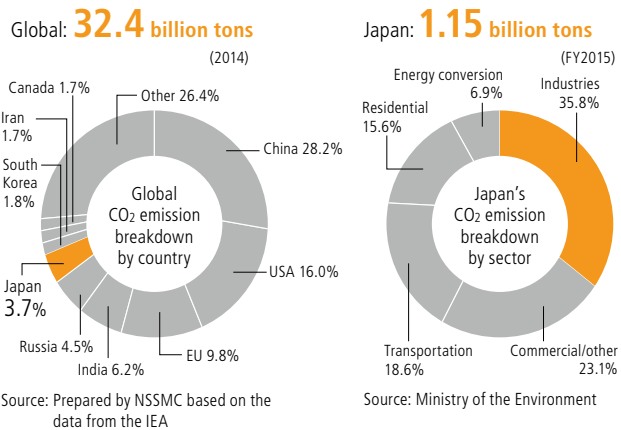
Nippon Steel & Sumitomo Metal Corporation (NSSMC) promotes energy conservation and CO2 emissions reduction throughout the entire supply chain: manufacturing, transportation, and final use of products. We also actively work at innovative technology development and transfer of established technology to our overseas operations, helping them to contribute to CO2 reduction over the medium- and long-term.

Continue CO2 emission reduction by implementing the three ecos

Based on the 32.4 billion metric tons of CO2 emissions from world-wide fossil fuel combustion in 2014, Japan's product emissions represent 3.7% of global CO2 emissions from combustion of fossil fuels. Japan also accounts for 2.7% of worldwide greenhouse gas emission, according to estimates by the International Energy Agency in 2010.

According to the latest data available, Japan's CO2 emissions from fossil fuel combustion amounted to 1.15 billion metric tons in 2015 and the industrial segment accounted for roughly one-third of that. As a member of the Japan Iron and Steel Federation, NSSMC has been playing a part in CO2 emission reduction of the industrial segment through implementing "eco processes," and introducing "eco products" and "eco solutions" in Japan and overseas.

Breakdown of CO2 emissions from fossil fuel combustion



Japan Iron and Steel Federation's Action Plans for a Low-Carbon Society ("Three ecos and innovative technology development")

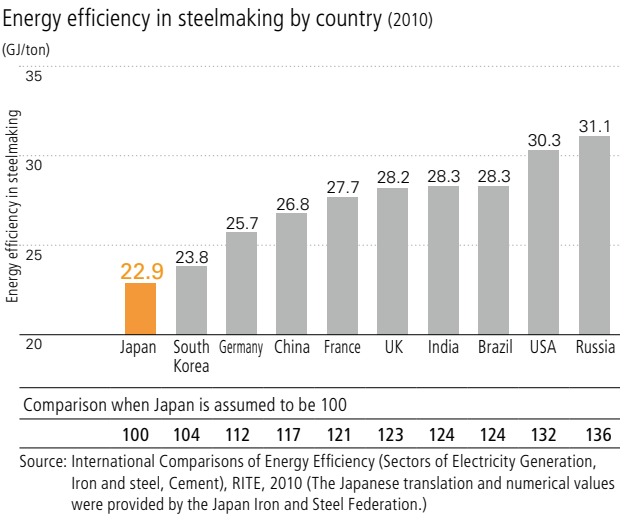
	Eco process	Eco products	Eco solution
CO2 emission reduction plans	Aim at improving energy efficiency	Contribute to emission reduction when steel materials are used in final products	Contribute to worldwide energy reduction by technology transfer and diffusion
Phase I FY2020	5 million tons <sup>1</sup> (3 million tons + α) <sup>2</sup>	34 million tons	70 million tons
Phase II FY2030	9 million tons <sup>1</sup>	42 million tons	80 million tons

Development of innovative steelmaking processes (COURSE50) ▶ p. 24

1 The target reductions in CO2 emission volume are based on a certain crude steel production assumption.  
2 Within the target for the 5 million ton reduction in CO2 emissions, the primary focus is on a 3 million ton reduction in CO2 emissions by steelmakers' own initiatives for efficient use of energy and other ways. Concerning collection of waste plastics and other ways, only an increase in the collected volume compared to FY2005 is counted as the amount of reduction in emissions.

Achieved the world's top-class energy efficiency

From the time of the first oil crisis until around 1990, NSSMC intensively promoted continuous processing, exhaust heat recovery, and other measures, all to enable significant energy conservation. This has led to NSSMC and Japan's steel industry as a whole achieving the world's top-class energy efficiency.

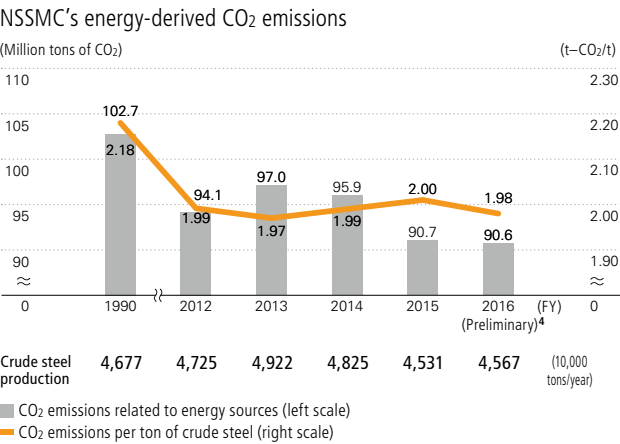
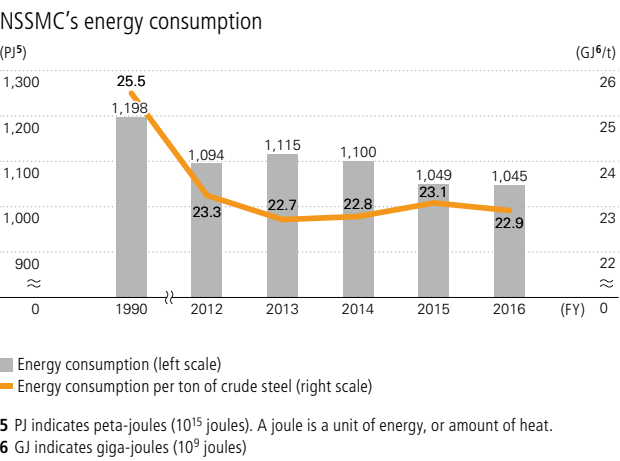


In the Voluntary Action Plans up to FY2012, energy consumption for FY2008 through FY2012 was reduced by 11.1% relative to the FY1990 level (CO2 emission in total was reduced by 11.2% in volume and CO2 emission per ton of crude steel was reduced by 10.0%), achieving participants' goals.

From FY2013 on, NSSMC has been participating in the Action Plans for the Realization of a Low-Carbon Society for further CO2 reduction by means of the three ecos. The Phase I of the Action Plans for a Low-Carbon Society targets a 5 million ton reduction in CO2 emissions by FY2020. The Japan Iron and Steel Federation is focusing on a 3 million ton reduction in CO2 emissions at the steelmakers' own initiatives for maximum adoption of advanced technologies based on its production assumption. The additional 2 million ton reduction is to be achieved by an increase in the collected volume of waste plastics compared to FY2005, as the amount of reduction in emissions.

The most effective measure against global warming is energy conservation, and therefore NSSMC is striving to improve energy efficiency by using energy generated in steelmaking processes, including power generation through use of by-product gas or exhaust heat recovery, or by reusing waste plastics and discarded tires. As a result of these efforts, the NSSMC and affiliated electric furnace companies<sup>3</sup> consumed 1,045 PJ of energy and emitted 91 million tons (preliminary)<sup>4</sup> of CO2 in fiscal 2016.

3 Affiliated electric furnace and other companies: Osaka Steel Co., Ltd., Godo Steel, Ltd., Nippon Steel & Sumikin Stainless Steel Corporation, Nippon Coke & Engineering Co., Ltd, 5 cooperative thermal power companies, and 2 sanso centers, and others.  
4 A provisional value based on the assumption that the CO2 level in a unit of purchased electricity in FY2016 is the same as in FY2015.



Promote innovative technology development

In addition to promoting the three ecos, the industry has worked at developing the innovative steelmaking process (COURSE50) from a medium- to long-term CO2 emission reduction perspective. From 2023 onward, under the Action Plans for a Low-Carbon Society, the global warming countermeasures will be steadily implemented on the basis of the three ecos and COURSE50. ▶ p. 24

Work to achieve further CO2 emission reduction by raising efficiency in logistics

Maintain and further improve NSSMC's high modal shift ratio<sup>7</sup> of 95.3%; improve transportation efficiency by using larger vessels (changing from 700 tons to 1,500 ton vessels) in domestic coastal transport and taking other measures; and improve fuel economy by introducing energy-saving timetable management, lightweight vehicles, etc.

Logistics sector's ton-kilometer achievements for FY2016<sup>8</sup>

	Transportation quantity: 10,000 tons/year	Million ton-kilometers/year	g-CO2/ton-kilometers (Reference)
Ship	1,884 (54%)	11,176 (87%)	39
Railway	8 (0%)	50 (0%)	25
Truck and trailer	1,570 (46%)	1,563 (13%)	211
Total	3,462 (100%)	12,789 (100%)	

7 Modal shift rate: A modal shift indicates the domestic freight transport shift from truck carrier to coastal shipping and railroad carrier as a countermeasure against global warming. A modal shift rate is a percentage of cargo volume transported over a distance of 500 km and more by rail or sea (including ferry) (as defined by the Ministry of Land, Infrastructure, Transport and Tourism).  
8 ton-kilometer: Total sum of the weight of load (ton) transported multiplied by transport distance (km). The reference amounts (in grams) of CO2 emissions per ton kilometer travelled are the average for all industries (Ministry of Land, Infrastructure, Transport and Tourism)

Promote energy saving efforts in offices and at home

A policy of lights-out during lunch breaks, a business-casual dress code during summer, eco-no-working days, etc. has been implemented in offices. So as to encourage employees make energy-saving efforts at home and actually reduce emissions, keeping records in a Household Energy Diary has been promoted.



https://www.kankyo-kakeibo.jp/ (only in Japanese)

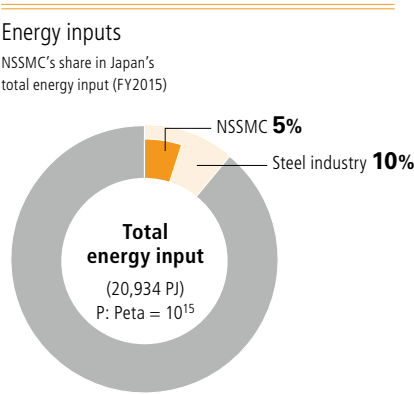
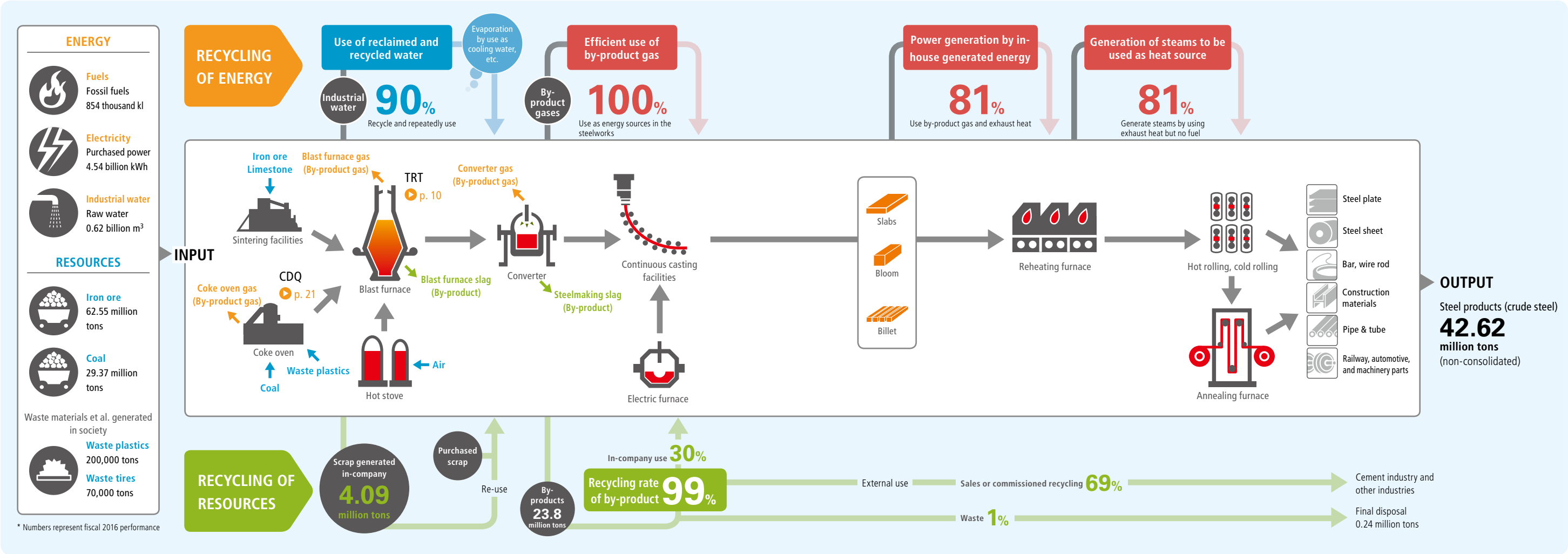
Not wasting any resources and energy

Nippon Steel & Sumitomo Metal Corporation (NSSMC) is committed to reduction of the environmental burden created by production activities and manufacturing processes. We make continuous efforts in all processes to not waste limited resources and energy.

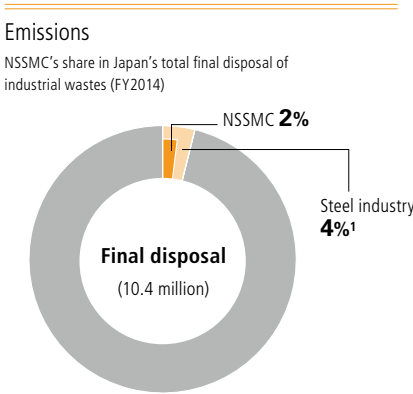
NSSMC uses iron ore mined overseas, coal as an iron ore reductant, and scrap generated by society as its main raw materials for steel production.

By-product gases, such as coke oven gas generated by dry distillation of coal in the coke manufacturing process and blast furnace gas generated from blast furnaces, are fully utilized as fuel gas for steel heating furnaces or energy sources for power generation plants on the premises of steelworks.

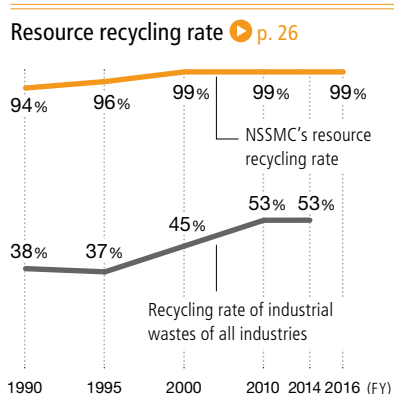
In addition, NSSMC itself generates 86% of the electricity it uses at steelworks, 81% of which is from internally generated energy sources such as waste heat and by-product gases. 90% of water used for cooling and cleaning products and manufacturing equipment is repeatedly re-used. [▶ p. 31](#)



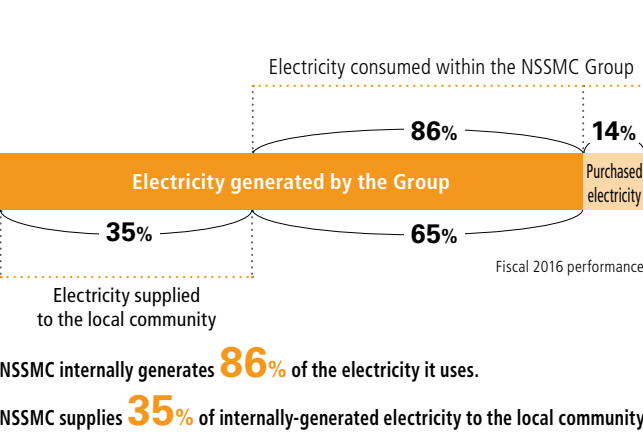
Source: "General Energy Statistics" by the Agency for Natural Resources and Energy JISF (Japan Iron and Steel Federation)



Source: "Annual Report on the Environment in Japan 2017" by the Ministry of the Environment  
1 Estimate



Source: "Annual Report on the Environment in Japan 2017" by the Ministry of the Environment



When one ton of iron is produced, the amount of by-products generated exceeds 600 kg, but the steel slag, dust, and sludge are reused in-house as raw materials, or are used by society or other corporations as raw materials for cement, construction materials, and so forth. These efforts have resulted in the achievement of a very high recycling rate of approximately 99%.

We are also engaged in the recycling of various types of by-products generated by society or other industries by utilizing our steelmaking processes that are carried out at high temperature and high pressure. In recent years, we have been actively recycling waste plastics, waste tires, and other waste materials. [▶ p. 27](#)



## NSSMC's eco-friendly products help reduce environmental burden

Our Group's products have advanced functions and reliability, which are based on our superior technological capabilities, and are used in diverse areas including energy, transportation and construction equipment, and household products. They typically help our customers become more efficient while making their products lighter or lengthening product life. That translates into the saving of resources and energy, and into a reduction in CO<sub>2</sub> emissions at the point of use at our customers, thereby contributing to lessening the environmental burden.

### High-strength wires for suspension bridges

High-strength wires are widely adopted in long-span suspension bridges across major straits in Japan and abroad. By realizing compact bridge designs and shorter construction periods, these wires help curb CO<sub>2</sub> emissions and contribute to the prevention of global warming.



### Anti-corrosion processing with titanium foil for steel lighthouses

The method of applying titanium foil to the edges of steel materials and metal surfaces at points where the form of the metal changes, where there is potential for problems related to paint durability, blocks the intrusion of water and salt. This helps prolong the life (over 50 years) of a lighthouse, which is exposed to a harsh corrosive environment.



Kakezuka Lighthouse after the foil installation

### Hat-type steel sheet piles

Hat-type steel sheet piles are adopted in various applications, including earth-retaining walls for rivers, quay walls, and cut-off walls. The piles weigh 11% less than conventional U-shaped steel sheet piles and help reduce the number of piles to knock in the earth by one-third. They thus help curb CO<sub>2</sub> emissions and prevent global warming.

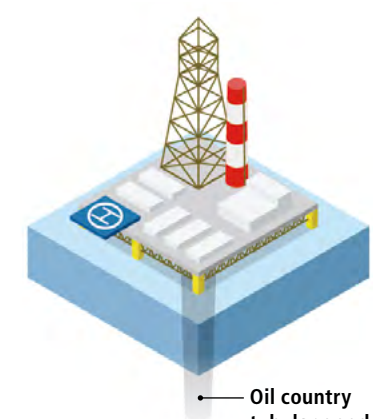


### Fuel tanks made of titanium steel sheet

Titanium has distinctive features such as being lightweight, strong, and highly corrosion resistant. It is used in the fuel tanks of leading mass-produced lightweight motocross bikes and helps improve fuel efficiency and driving performance.



Photo: Honda Motor Co., Ltd.



Oil country tubular goods

### CLEANWELL™ DRY

CLEANWELL™ DRY is an environmentally-friendly premium connection used in connecting oil country tubular goods, without using grease called dope, which contains heavy metals, such as lead. It is used as thread compounds for conventional seamless pipes for oil and natural gas development.

### Calcia modified soil

Calcia modified soil, a mixture of steelmaking slag and dredged soil, inhibits the elution of phosphorus and the generation of hydrogen sulfide in dredged soil, which cause red tide occurrence, etc. It has the beneficial effect of improving the marine environment, including the restoration of seaweed beds and the creation of wetlands and tideland.

### Corrosion-resistant steel plates for crude oil tankers (NSGP™-1, NSGP™-2)

For the oil tanks of oil tankers, NSGP™-1 steel plates, which do not require coating, reduce the speed of hemisphere-like localized corrosion on the tank bottom to about one-fifth compared to conventional plates, while NSGP™-2 steel plates, used on the bottom of the upper deck, show high performance without coating. As there is no need for coating, both products help reduce the environmental burden.

### Sea-spanning bridge

### Anti-corrosion titanium foil

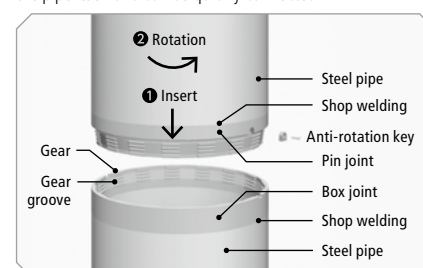
### Hat-type steel sheet piles

### Crude-oil tanker

### Steel pipe piles with Gachi-cam Joint

### Gachi-cam Joint

Gachi-cam Joint is a mechanical joint that does not need to be welded on the worksite and can be connected in a short time. This joint meets the need for larger, thicker, and stronger steel pipe piles and the problem of the decline in welding technicians. The Gachi-cam Joint has similar or higher strength than the pipe itself and can be quickly connected.



### SuperDyma™

SuperDyma™ is highly corrosion-resistant and lasts four times longer than conventional products. As coating and painting on cut-end surfaces are unnecessary, all such costs are eliminated. The sheets weigh less, and are an eco-friendly building material well suited for various applications.



Exterior material of the new Kobe plant of Rock Field, Co., Ltd.

### Electrolytic zinc-coated ZINKOTE® Black steel sheet

Featuring corrosion resistance and aesthetic appeal, the ZINKOTE® Black is used in the back covers of flat screen TVs and other electric appliances. Reduction of CO<sub>2</sub> emissions has been achieved by eliminating some coating processes, enabling thinner coating, and adopting a special low-temperature drying coating.



ZINKOTE® Black being used in the back cover of a flat screen TV

### Tough Guard™ Hard, high-corrosion resistant cord wires

Tough Guard™ Hard coated wires have higher corrosion resistance than conventional Zn-Al alloy coatings. The wires can contribute to significantly longer service lives for related products and equipment and to a reduction in the generation of industrial waste due to less frequent replacement.



### Wheelsets (wheels and axles) for high-speed railways

NSSMC manufactures almost all wheels and axles used by railways in Japan. We are pursuing weight reduction by developing hollow axles, for example, and contributing to energy conservation in railway transport.



### Seamless pipe for steel accumulators

This seamless pipe has the strength and toughness needed for high-capacity accumulators used in hydrogen stations. Together with HRX19™ stainless steel for high-pressure hydrogen environments, this pipe is contributing to the realization of a hydrogen-oriented society.

### Hydrogen station

### Automobile

### High-tensile-strength steel materials

High-tensile-strength steel materials for automobiles help overcome two challenges: improvement in fuel efficiency by reduction of vehicle body weight, and ensuring the safety of passengers at the time of a collision. These materials are also superior in workability.



Drop impact test (the middle two products are high-tensile-strength steel materials)

### 7% nickel steel plates for LNG storage tanks

Steel for LNG storage tanks requires high fracture resistance and strength under extremely low-temperature (under -196 degrees) conditions. Steel with 9% Ni content had been used for such situations but NSSMC's new 7% nickel steel plates, which contain about 20% less nickel, have achieved a similar performance to conventional steel, thereby contributing to the saving of resources.

### Permanent magnet-type retarder

NSSMC's permanent magnet-type retarder is installed as the auxiliary brake system on many heavy-duty trucks and buses. Once the retarder is installed, the frequency of accelerating or decelerating of the speed decreases, which results in better fuel efficiency, while the frequency of applying the foot brake decreases, reducing brake dust caused by abrasion.





Technical cooperation and technology transfer promoted on a worldwide scale

With the understanding that the transfer of Japan’s advanced energy-saving technologies overseas can be one of the most effective ways to globally reduce CO<sub>2</sub> emissions, Nippon Steel & Sumitomo Metal Corporation (NSSMC) is participating in many energy-saving and environmental initiatives in Japan and overseas. For example, we work with the World Steel Association and directly with countries such as China and India.

Contribute to reduction of CO<sub>2</sub> emission on a worldwide scale

Japan’s steel industry, including NSSMC, plays a leading role in the Global Sectoral Approach<sup>1</sup>, a worldwide initiative to preserve the environment and conserve energy based on technologies accumulated in the steel-working industry. Japan’s steel industry can contribute to reduction of CO<sub>2</sub> emission on a worldwide scale by transferring its advanced energy-saving technologies to emerging countries where there is the potential to improve energy efficiency. The reduction effects of CO<sub>2</sub> emission by transfer of Japanese steelmakers’ energy-saving technologies have amounted to 54.58 million ton reduction in CO<sub>2</sub> emissions per year in total. This is equivalent to 4% reduction in Japan’s annual CO<sub>2</sub> emission. Japan’s steel industry, including NSSMC, is working on various projects to introduce Japan’s advanced technology in this area to other countries.

<sup>1</sup> Global Sectoral Approach is a method to help solve global warming problems by seeking CO<sub>2</sub> reduction potential based on sector-specific technologies and adopting the world’s best energy-saving technologies.

Standardization of methods to calculate CO<sub>2</sub> emission

NSSMC also participates in the Climate Action Program of the World Steel Association, which uses universal methods to calculate and report on the CO<sub>2</sub> emitted by steel-works. We have been selected as a Climate



Action member. Recently, quite a few customers have sought confirmation that their steelmakers are Climate Action members. Efforts to standardize these calculation methods as ISO have been spearheaded by the Japanese steel industry. This had resulted in international standardization of the procedure as ISO14404 “Calculation method of carbon dioxide emission intensity from iron and steel production” in March 2013. It has enabled steelworks not participating in the World Steel Association to calculate CO<sub>2</sub> intensity using universal methods. This marked the first step forward in greatly facilitating the global sectoral approach sought by the steel industry. NSSMC is promoting diffusion of ISO14404 through the initiatives taken by Japan and India, Japan and Southeast Asia, and other relations.

Bilateral collaboration

As a core member of the Japan Iron and Steel Federation (JISF), NSSMC is involved in multinational projects such as for the Environment Committee of the World Steel Association. In addition, the JISF is promoting (1) joint meetings of public and private steel-related parties, (2) customized list of technologies, and (3) assessment of steelworks as to energy-saving status. These are the three pillars of collaboration for bilateral energy-saving and environmental cooperation with India, Southeast Asia, and other countries and regions.

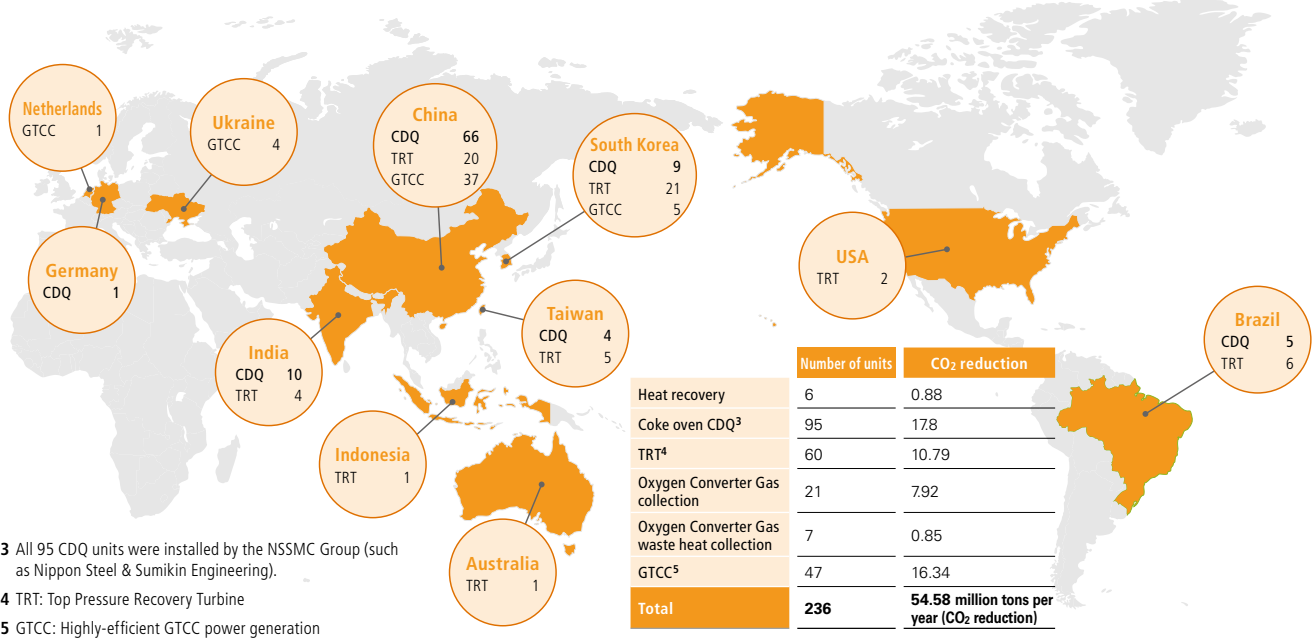
In the case of transfer of Japan’s energy-efficient technology to emerging countries, it is important to understand the actual conditions in the countries’ steel industries and to introduce technology that is relevant and effective to them. Moreover, in addition to cooperation of private parties on both sides, cooperation of the public and private parties of both countries is critical for prompt introduction of Japan’s energy efficient technology. In the joint meetings of public and private steel-related parties of both countries, the list of technologies mentioned below, the results of assessment of steelworks based on the list, and the conditions of both parties are shared. At the same time, technical details and monetary aspects were presented from the Japanese side.

The customized list of technologies is a list of energy-efficient technologies, which are identified as appropriate for the target country or region, and the provided information included a technology outline and supplier information. The list was prepared for the purpose of promoting Japan’s energy-efficient technology transfer and is used as reference in doing assessment of steelworks.

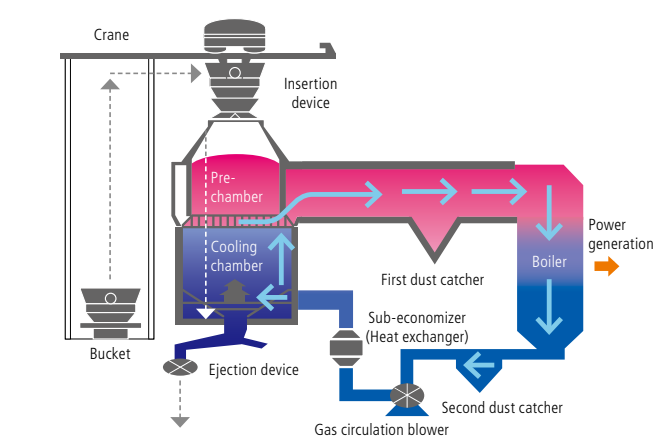
In the assessment of steelworks specifically regarding their energy-saving status, experts in this field in Japan’s steel industry visit the foreign steelworks in order to make proposals on technology based on the list and to give advice on operational improvement according to the list and to give advice on operational improvement according to the utilization status of facilities. The experts also analyze the status of energy usage by using an international standard, ISO14404, which specifies calculation methods for the CO<sub>2</sub> intensity of steelworks.

The JISF has so far conducted seven meetings and assessment of 10 steelworks in India, and 8 meetings and assessment of 12 steel-works in six ASEAN countries. The JISF began similar initiatives in Mexico in fiscal 2016. Under these initiatives, Nippon Steel & Sumikin Engineering in the NSSMC Group is introducing its energy-efficient facilities such as Coke Dry Quenching (CDQ) to China, India, and other emerging countries.

Japanese steel industry’s energy-saving technologies are spreading globally (units installed in numbers)



Coke Dry Quenching (CDQ): system and features



Hot coke made in the coke oven is transported in a bucket to the CDQ equipment where it is injected from its top part down to the chamber. The coke is quenched with inert gas, while the hot gas (approx. 950°C) from the exhaust heat is collected, and transferred to the boiler where it generates steam for power generation. The hot gas can be fully recycled by being quenched and circulated back to the chamber. By not using water as a cooling medium, the CDQ method raises the strength of the coke and contributes to stable operation of the blast furnace, an increase in tapping quantity, and reduction in consumption of the reducing agent.

VOICE



**Jun Arima**  
Professor of the Graduate School of Public Policy, the University of Tokyo

In light of the enforcement of the Paris Agreement, all countries, both developed and emerging, are launching efforts to realize the targets for reduction of greenhouse gas (GHG) emissions. As GHG emissions of a country is an aggregate amount of emission of various sectors, the sector-by-sector approach with a focus on heavy energy-use sectors, including the steel industry, is critically important to effectively address emission reduction. Japan’s steel industry has already achieved the top-class energy efficiency in the world, leaving limited potential in CO<sub>2</sub> emission reduction within Japan. In contrast, the steel industry in China, representing a half of global steel production, and the steel industries in India, Southeast Asia, Central and South America, which are expecting an increase in production, have a relatively low energy efficiency. Transfer of Japanese environmental and energy-efficient technology to the steel industry of these countries contributes to reduction in CO<sub>2</sub> emissions of the global steel industry in a cost-effective way. Japan’s steel industry, including NSSMC, is striving for proactive initiatives to internationally standardize calculation of the amount of CO<sub>2</sub> emissions, preparation of lists of energy-efficient technologies for each country, and assessment of steelworks energy-saving status. This can be regarded as a model case of the sector approach. I would like to see these efforts to be maintained and enhanced and I also wish Japan’s steel industry to continue the COURSE50 and other innovative technology development with a longer-term perspective. Industry knowledge and technology are indispensable for countering global warming. I believe that the government should establish the business environment that facilitates industries undertake those initiatives.



## Contributing to the diffusion of new energy

The NSSMC Group provides advanced materials for the realization of a Hydrogen-Based Society. The Group also makes use of biomass resources for the reduction of CO<sub>2</sub> emissions.

### Advanced materials for fuel cell vehicles

The commercial launch of fuel cell vehicles (FCV), which run on hydrogen instead of gasoline, and construction of the first hydrogen stations for fueling FCVs began in the year under review. Progress has been made recently toward the realization of a Hydrogen Society.

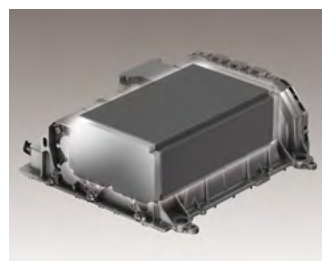
In this use of titanium, that has outstanding lightness, strength, and corrosion resistance, is of great importance. NSSMC has developed a method of manufacturing special rolled titanium foil. The foil has been adopted for fuel cell parts (the parts that make up the cells inside the fuel-cell stack) of the Mirai FCV and Tokyo metropolitan fuel cell buses produced by Toyota Motor Corporation.

Just like an electric vehicle or a hybrid vehicle, a fuel cell vehicle is powered by a motor, a device that converts electrical power to motive force. NSSMC's electromagnetic steel sheet is made for use in motor cores and contributes to world-class efficiency of this part, and has been adopted for the Mirai car as well.

Other NSSMC materials too are used in FCVs. They include high-tensile high-strength steel sheets which help reduce automobile weight while ensuring collision safety performance.



Fuel-cell bus made by Toyota Motor Corporation  
Photo: The Bureau of Transportation, Tokyo Metropolitan Government



Mirai's fuel-cell stack  
Photo: Toyota Motor Corporation



Mirai's motor  
Photo: Toyota Motor Corporation

### Stainless steel for high-pressure hydrogen environments, HRX19™—a revolutionary product for a Hydrogen-Based Society

For eco-friendly fuel-cell vehicles to become used in significant numbers requires certain infrastructure, including hydrogen stations, to be established. NSSMC and Nippon Steel & Sumikin Stainless Steel Pipe Co., Ltd. (NSSMC's fully-owned subsidiary), have jointly developed a stainless steel for high-pressure hydrogen environments, HRX19™, that has already been used for pipes, joints, and valves in the high-pressure hydrogen environments of hydrogen stations.

Nippon Steel & Sumikin Pipeline & Engineering in the NSSMC Group has entered the hydrogen station construction business. The second HRX19™ station was constructed in Shikaoi Machi, Hokkaido in January 2017.



Hydrogen Station (Shikaoi Machi, Hokkaido)

As hydrogen is a small molecule, it can be introduced into the metal but there it can cause brittleness and a tendency for fracture to occur. By blending additives to stainless steel and developing a new heat treatment method during manufacturing, HRX19™ overcomes the problem of embrittlement and both made a longer product life possible and improved the safety of pipes for hydrogen stations.

Moreover, HRX19™ is approximately twice as strong as conventional SUS316L stainless steel, enabling the design of thinner pipe walls even for high-pressure hydrogen environments, and for pipes to be made with greater inside diameters, resulting in larger capacity and shorter hydrogen filling times. Furthermore, it is lightweight and provides the additional merit of reducing CO<sub>2</sub> emission while transported.

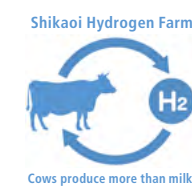
Moreover, welding can be done to HRX19™, without requiring joints, whereby a contribution is made to reduction of construction and maintenance costs.

## HRX19™



Left: Conventional SUS316L stainless steel pipe  
Middle and right: HRX19™ stainless steel pipe  
(All pipes have the same strength)

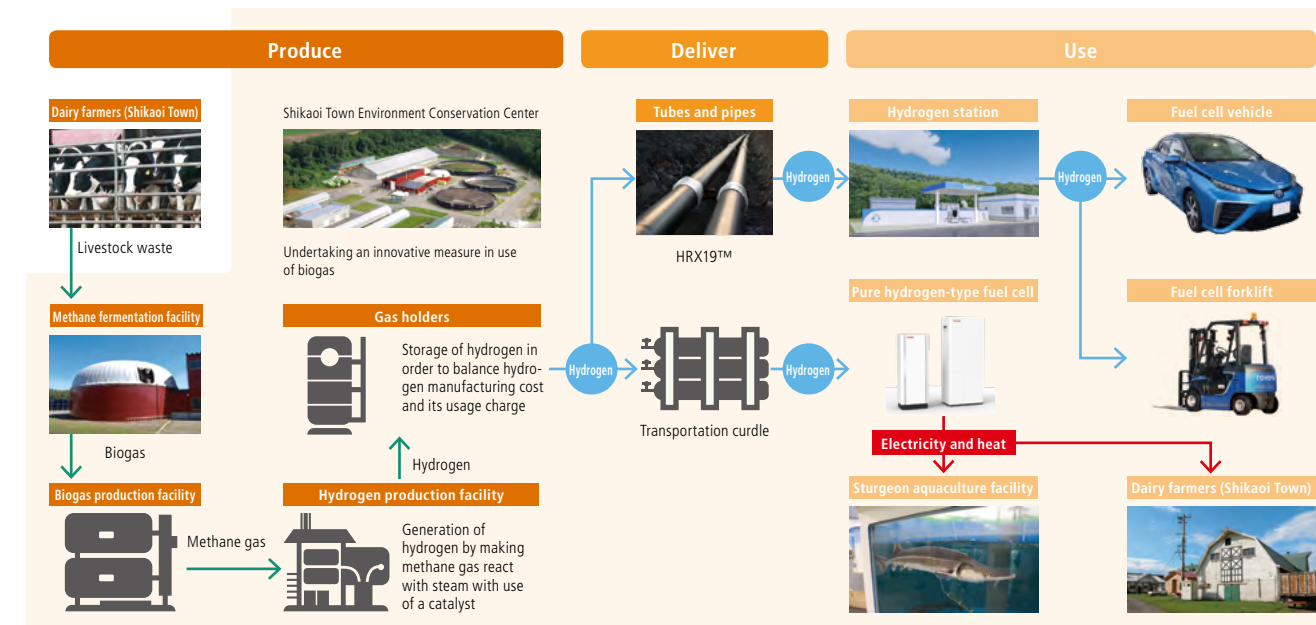
### CO<sub>2</sub>-free hydrogen initiative, derived from livestock biomass waste



Fuel cells, which use hydrogen as fuel and emit no CO<sub>2</sub>, have begun to be used commercially in various ways. While most of hydrogen is currently derived from fossil fuel, CO<sub>2</sub>-free hydrogen derived from renewable energy and others, which do not emit CO<sub>2</sub> during production processes, is highly desired for the future.

A project to use livestock biomass for production and use of hydrogen began in Tokachi, Hokkaido (Shikaoi Town and Obihiro City) as a test business entrusted by the Ministry of the Environment. Nippon Steel & Sumikin Pipeline & Engineering (NSSPE) in the NSSMC Group is participating in collaboration with Air Water, Kajima Corporation, and Air Products Japan. NSSPE is in charge of energy infrastructure with a focus on cost reduction and enhancement of safety and reliability of the hydrogen stations, contributing to the creation of a hydrogen-oriented society.

### [Hydrogen Supply Chain in Tokachi, Hokkaido: From hydrogen production to its use]



### Received the 2016 New Energy Award (METI Minister's Award) from the New Energy Foundation

NSSMC, jointly with IHI Corporation, received the 2016 New Energy Award (METI Minister's Award) from the New Energy Foundation, for its visionary approach to expand biomass mixed combustion in pulverized-coal-fired thermal power generation.

NSSMC's Kamaishi Works has been using selectively felled trees for biomass mixed combustion in coal-fired thermal power generation since 2010 and is currently operating at one of Japan's highest mixed combustion ratio (10% or more by weight.)

Specifically, in cooperation with IHI, which manufactures boilers, at Kamaishi we have demonstrated a high biomass mixed combustion ratio (25% by heat amount and 33% by weight) at the largest scale in a Japanese coal-fired thermal power plant (149 MW in output). In addition, we have established a company, jointly with local companies, for procurement of a massive amount of biomass resources from

a wide area in alliance with forest cooperatives and have created jobs in the community on a continuing basis. These activities are highly evaluated as a visionary approach by which significant CO<sub>2</sub> emission reduction and greater use of forestry biomass can be anticipated.

NSSMC will continue to use wood biomass resources for energy conservation and CO<sub>2</sub> emission reduction. At the same time, we intend to contribute to revitalize local economies through the maintenance and development of forests, and job creation.

NSSMC's Kashiwa Works and Oita Works also use biomass fuel energy in their coal-fired thermal power plants.



Kamaishi Works coal-fired thermal power plant



Wood for biomass use

## Research & development for global warming prevention

With the aim of preventing global warming, Nippon Steel & Sumitomo Metal Corporation (NSSMC) is taking on a challenge in the form of the “CO<sub>2</sub> Ultimate Reduction in Steelmaking Process by Innovative Technology Project,” in addition to making efforts to reduce CO<sub>2</sub> by further improving its world’s highest energy efficiency.

### The COURSE 50 Project (Technological Development and Innovative Steelmaking Process)

Since FY2008, four blast furnace steelmakers including us, and Nippon Steel & Sumikin Engineering, have been working on the “CO<sub>2</sub> Ultimate Reduction in Steelmaking Process by Innovative Technology for Cool Earth 50 (COURSE 50) Project” which is aimed at developing dramatically new CO<sub>2</sub> reduction technology. Its goal is to develop technology to reduce CO<sub>2</sub> emissions in the steelmaking process by 30% through technology that reduces iron ore using hydrogen amplified coke oven gas to curb CO<sub>2</sub> emissions from blast furnaces as well as technology that uses hitherto-unused exhaust heat to separate and recover CO<sub>2</sub> from blast furnace gas.

In Phase 1, up to FY2012, we gained an understanding of hydrogen reduction characteristics at a laboratory bench level, and participated the property elucidation and performance qualification tests of the hydrogen reduction process at a test blast furnace in Sweden, and the verification tests of hydrogen amplification of coke oven gas

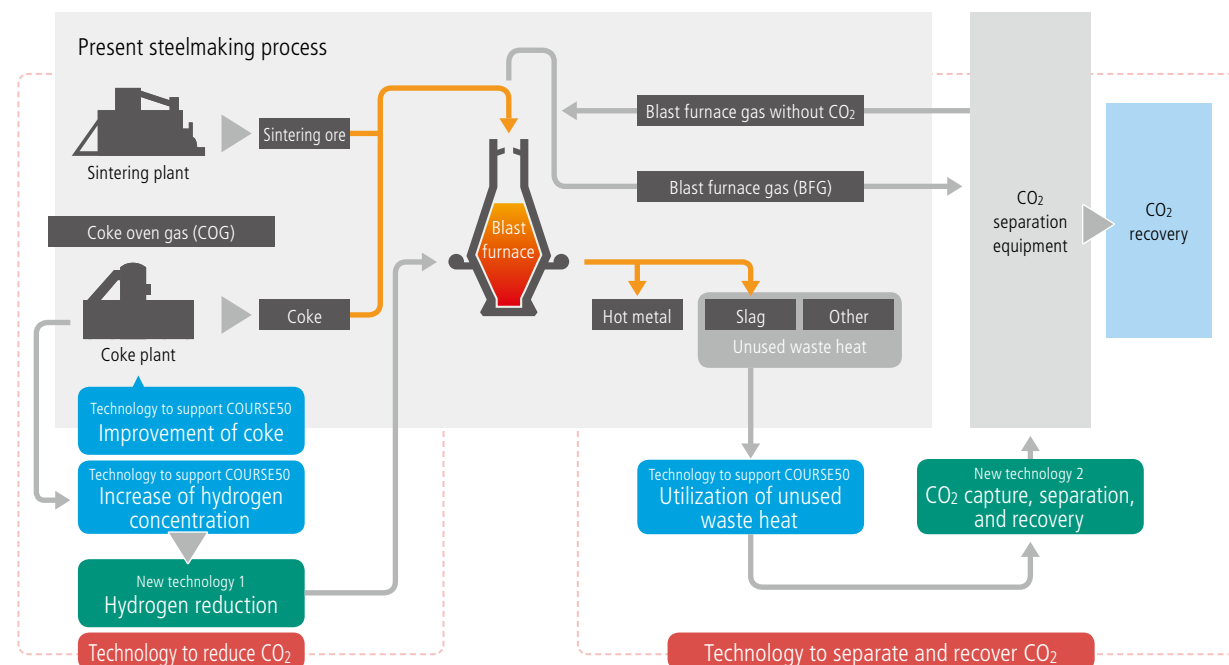
at the Kimitsu Works. We also carried out verification tests of CO<sub>2</sub> separation and recovery from blast furnace gas, also at the Kimitsu Works, while low-temperature exhaust heat recovery verification tests were conducted at Kashima Works, among others. These tests played a substantial part in obtaining the desired research results of Phase 1.

In Phase 2 (FY2013–2017), our main focus is to verify technology to reduce CO<sub>2</sub> emissions from a blast furnace in a comprehensive manner. By using a 12 m<sup>3</sup> test blast furnace constructed at the Kimitsu Works, in 2016 we successfully conducted basic verification of technology to control blowing that offsets the endothermic reaction of hydrogen. We are committed to R&D efforts of the COURSE50, mainly in the following research areas: bench-scale testing test and research that targets optimal hydrogen amplification of coke oven gas (Muroran Works); a project to enhance efficiency of CO<sub>2</sub> separation and recovery processes; and a project to develop highly-efficient heat exchanges.



COURSE 50 pilot blast furnace

### Environmentally Harmonized Steelmaking Process Technology Development “COURSE 50”: Structure and Features



## Leading energy saving CO<sub>2</sub> absorption process; achievement in non-steel business development of the COURSE50 technology

While being an innovative technology project, COURSE50 continues to promote development in the area of chemical absorption solution for CO<sub>2</sub> collection, Nippon Steel & Sumikin Engineering succeeded in making functioning equipment named “Energy Saving CO<sub>2</sub> Absorption Process” or ESCAP™, in the non-steel business domain, in which economic rationality, such as for the carbon dioxide gas business, works even in the development stage.

ESCAP™ is a technology to separate and collect high-purity CO<sub>2</sub> from atmospheric gas of low CO<sub>2</sub> concentration, such as blast furnace gas in steelworks and emission gas from thermal power stations. Compared to the conventional method, ESCAP™ has achieved an over 40% reduction in thermal energy cost.

### ESCAP™

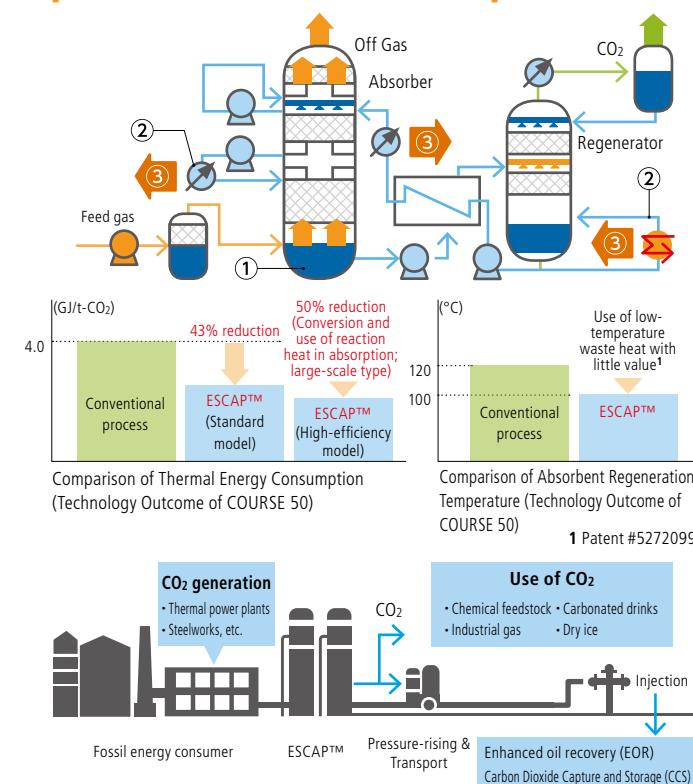
#### Energy Saving CO<sub>2</sub> Absorption Process

- ① Absorbent performance improvement**  
Used the absorbent jointly developed by NSSMC and the Research Institute of Innovative Technology for the Earth (RITE). Reaction characteristics and durability are substantially improved.
- ② Process optimization**  
Temperature and pressure are optimally controlled in the absorption process and regeneration (reboiling) process in order to maximize performance of the absorbent.
- ③ Conversion and use of reaction heat in absorption (first in the world<sup>2</sup>)**  
Low-temperature reaction heat in CO<sub>2</sub> absorption is converted to high-temperature and used as regenerated heat (jointly developed with the University of Tokyo).



**ESCAP™ No.1 Commercial Unit (Muroran)**  
This is the world's first facility to collect high-purity CO<sub>2</sub> from the waste gas of a hot blast furnace by the chemical absorption method. It has achieved efficient energy consumption as well as meeting the strict quality standard needed for use in the food industry.

### [ESCAP™ Structure and Features]



### VOICE



**Hitoshi Dohnomae**  
General Manager, Environment Research Lab.  
Advanced Technology Research Laboratories,  
Technical Research & Development Bureau

### R&D project for drastic CO<sub>2</sub> reduction

NSSMC is undertaking R&D on reducing CO<sub>2</sub> emissions from a long-term view, in addition to the COURSE50 project. We aim at drastically curbing CO<sub>2</sub> emissions by reuse of CO<sub>2</sub> or use of renewable energy. For example, we have been jointly working with Tohoku University on a process to synthesize the precursor for plastics called dimethyl carbonate from CO<sub>2</sub> since 2007 and have commercialized it. We have also jointly worked with the Osaka City University Research Center for Artificial Photosynthesis on research to convert CO<sub>2</sub> to CO<sup>3</sup> and with the National Institute of Advanced Industrial Science and Technology on research to convert H<sub>2</sub>O to H<sub>2</sub><sup>3</sup>. As a responsibility of a company which emits a massive amount of CO<sub>2</sub>, we intend to accelerate R&D efforts, ultimately aiming for zero CO<sub>2</sub> emissions.

<sup>3</sup> If CO and H<sub>2</sub>, acting as reducing agent to fuels and iron ore, can replace coal, CO<sub>2</sub> emissions can be reduced.

[For reference] NSSMC's R&D capacity

Approximately **800** researchers in the R&D group; Approximately **27,000** patents, issued in about **70** countries



# Contributing to Creation of a Recycling-oriented Society

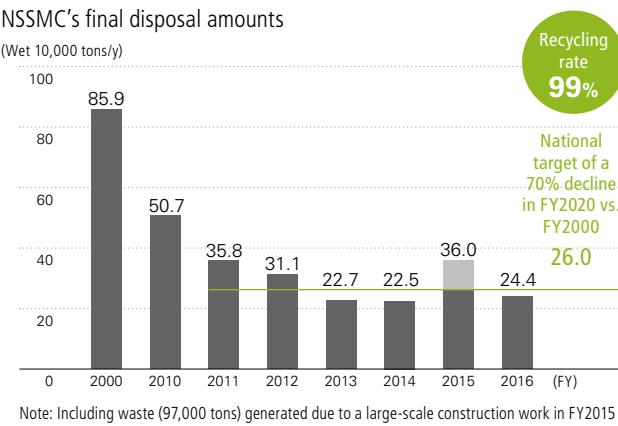
## Recycling of in-house by-products

Nippon Steel & Sumitomo Metal Corporation (NSSMC) not only works for the realization of zero emissions and low environmental impacts, and recycling of in-house by-products, but also is actively engaged in recycling of waste generated by society or other industries, by utilizing its iron-making process.

### Promotion of in-house zero emissions

#### By-products generated and the amount finally disposed

In the iron-making process, over 600 kg of by-products are generated for every ton of iron produced. In FY2016, NSSMC produced 42.62 million tons of crude steel and generated 23.8 million tons of by-products. The majority of these by-products were recycled inside and outside the company. NSSMC's final disposal of industrial wastes amounted to approximately 240,000 tons and maintained a very high recycling rate of 99%.



#### Recycling of steel slag

Steel slag is almost entirely utilized. Approximately 70% of blast furnace slag is used for cement, while steelmaking slag is used for materials for road bases, civil engineering work, fertilizer, soil improvement, etc. For example, Calcia modified soil, a mixture of steelmaking slag and dredged soil, has the beneficial effects of

improving the strength and inhibiting the elution of phosphorus, the generation of hydrogen sulfide, etc. in dredged soil. It has also been used to improve the marine environment, including restoration of seaweed beds and creation of wetlands and tideland. NSSMC's pavement materials, KATAMAT<sup>TM</sup> SP, taking advantage of characteristics of steel slag, are used for forest roads and farm roads, as well as for weed preventive pavement to be installed near mega-solar panel installations and other locations.

"Blast furnace cement," a mixture of pulverized blast furnace slag and ordinary Portland cement, contributes to a 40% reduction of CO<sub>2</sub> emissions during manufacturing, since the cement-making process can be omitted. It also exhibits superior long-term strength and is registered as an Eco Mark product. Due to the effects of reduction in mining of natural crushed stone and less energy consumption in the cement making process, steel slag products are designated as a "designated procurement item" under the Green Purchasing Law, and included in the Common Specifications for Civil Engineering Work compiled by the Ministry of Land, Infrastructure, Transport and Tourism.

#### Recycling of dust and sludge

To recycle the dust and sludge generated in the iron manufacturing process to be used as raw materials, NSSMC operates a dust reduction kiln (RC: Resource circulating oven) at Kashima Works and a rotary hearth reduction furnace (RHF) at Kimitsu Works, Hirohata Works, and Hikari Works<sup>1</sup>. This enables us to recycle all internally-generated dust. In March 2009, we obtained special approval for RHF under the Waste Disposal Act to carry out recycling of externally-generated dust as well.

<sup>1</sup> Hikari Works: Transferred to Nippon Steel & Sumikin Stainless Steel Corporation.

#### By-products and recycling

By-product	Process of generation	Amount generated (wet weight – million tons)		Recycling application	Recycling rate	
		FY2015	FY2016		FY2015	FY2016
Blast furnace slag	Components other than iron melted in blast furnace	12.65	12.29	Blast furnace cement, fine aggregate, road base, etc.	100%	100%
Steelmaking slag	Substances other than steel generated in the steelmaking process	5.65	5.33	Road base, civil engineering materials, fertilizer, etc.	98%	99%
Dust	Fine dust collected with a dust collector	3.41	3.30	Raw materials for use in-house and also zinc refining	100%	100%
Sludge	Water treatment sludge, residue from plating solution, road cleaning sludge	0.40	0.41	Raw materials for in-house use	87%	89%
Coal ash	Ash from coal-fired power plants	0.51	0.48	Cement raw materials	100%	100%
Waste furnace materials	Refractories from steelmaking facilities and furnace facilities	0.28	0.27	Reuse, road base, etc.	65%	66%
Others	Scale, etc.	1.82	1.71	In-house use, others	94%	97%
Total		24.71	23.80	Total recycling rate	99%	99%

## Recycling of waste generated by society

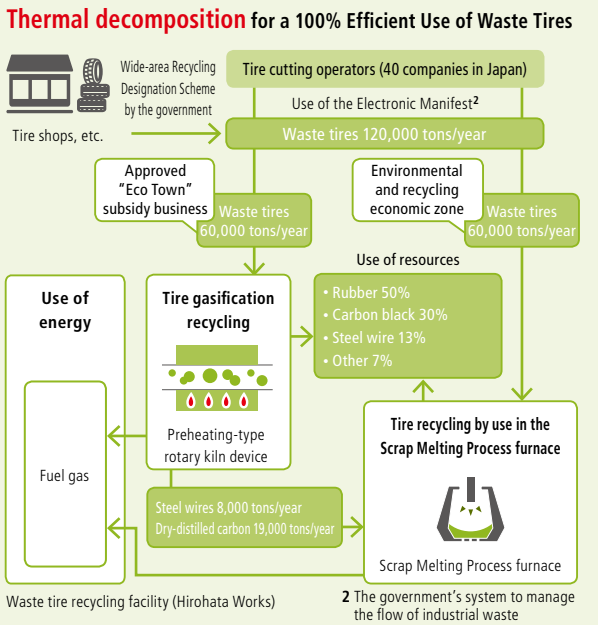
### Recycling of waste plastics and waste tires

NSSMC collects plastic containers and packaging collected used at general households and treats them at the coke ovens at seven steel-works to be recycled 100%, complying with the Act for Promotion of Use of Recycled Resources.

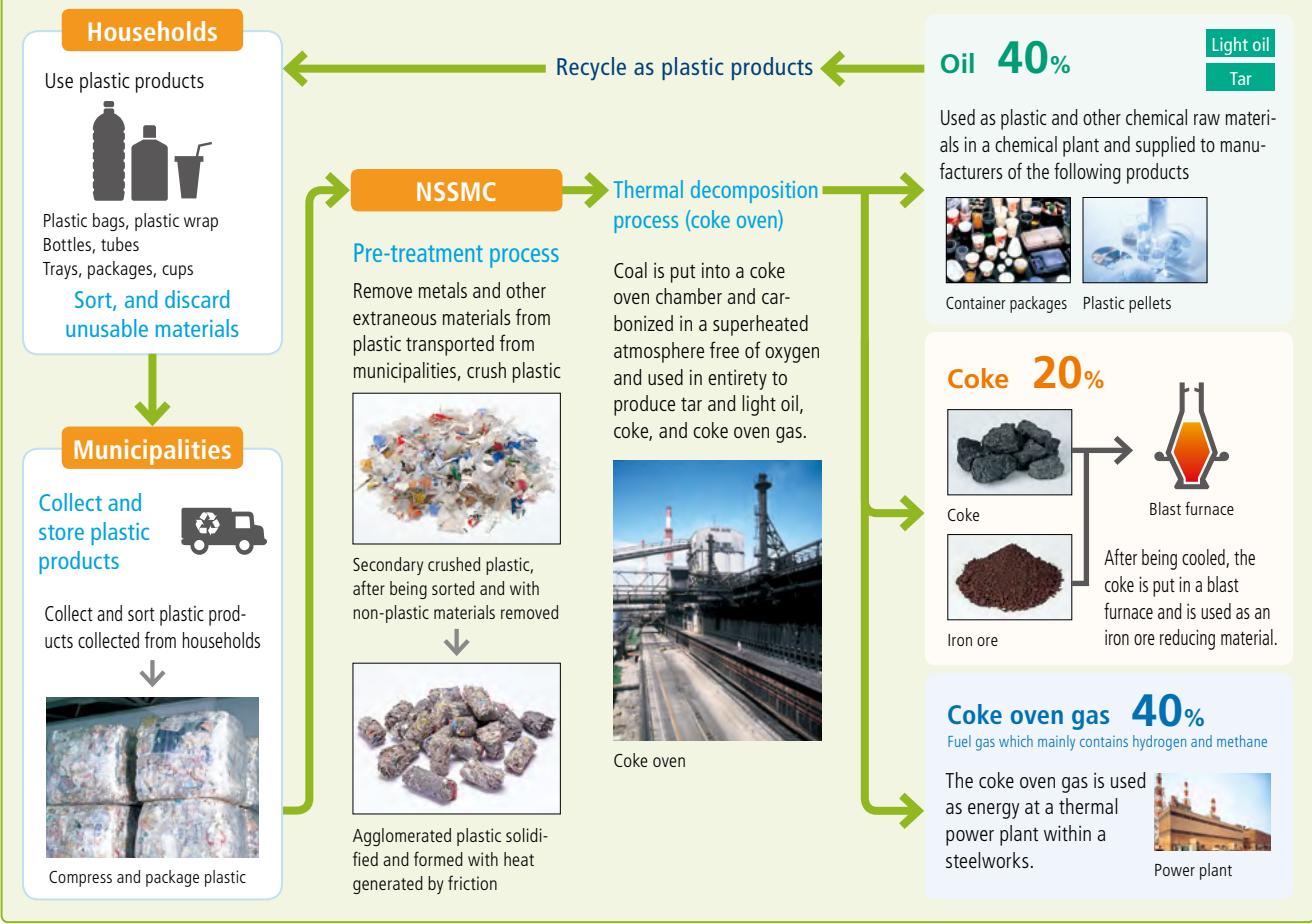
NSSMC has established a system to receive waste plastics from municipalities nationwide and is handling about 200,000 tons per year, equivalent to roughly 30% of waste plastics collected all over Japan. The cumulative amount for fiscal 2000–2016 is approximately 2.68 million tons, equivalent to 8.54 million tons in terms of reduction in CO<sub>2</sub> emissions. Recently, we have begun to recycle chemical fibers and food trays mainly into petrochemical products under the same Recycling Act.

Discarded tires are fully recycled in the Hirohata Works as raw material in the Scrap Melting Process and through thermal decomposition in the gasification recycling facility. The treated amount is 120,000 tons per year, meaning recycling of roughly 10% of discarded tires in Japan.

**Point!** Unlike burning, thermal decomposition enables 100% effective use of products made from plastics and waste tires.



### Thermal decomposition enables 100% effective re-use of plastics



Promotion of Environmental Risk Management

Promotion of environmental risk management

NSSMC is promoting management of environmental risk with the aim of continually enhancing preservation of the environment in various regions, with due consideration of environmental risks, which differ by each steelworks and factory, and with due consideration to compliance with Japan’s Air Pollution Control Act and other regulations. We also are engaged in reducing environmental risk throughout the Group.

Activities for reducing environmental risks

Atmospheric risk management

In order to reduce emissions of sulfur oxides (SOx) and nitrogen oxides (NOx), NSSMC is taking measures such as using low-sulfur fuel, adopting low NOx generating burners and installing effective equipment, including equipment that reduces SOx and NOx emissions. To curb emissions of soot and dust generated from factories and raw material yard, we try to enhance their collection by installing dust collectors and prevent scattering of particles by installing windscreens and sprinklers, based on air pollution risk analysis through scientific simulation. We also conduct constant monitoring and regular patrols to ensure that no abnormal emissions are released outside.

With regard to mercury, mercury contained in waste gas can be effectively removed and captured by dust collectors, either an electric type or a bag filter type, and the SOx/NOx emission reduction device. We therefore maintain proper performance of these devices and strive to prevent emission of mercury into the air.

Moreover, we are promoting voluntary initiatives, in keeping with the policy of the Japan Iron and Steel Federation, as specified in the Revised Air Pollution Control Act (enforced in 2018). Specifically, we have established a voluntary management standard concerning emission of mercury and regularly measure the amount of emission.

Water quality risk management

NSSMC uses approximately 6 billion m³ of freshwater a year at all of our steelworks and factories combined. Approximately 90% of this is re-circulated or reused. We try not to waste precious water resources,

and to control wastewater discharge. To achieve this, we make daily efforts to maintain and improve the performance of wastewater treatment equipment, and the inspection and control of wastewater quality. In consideration of the importance of preventing water pollution, we have installed devices such as detectors, control valves, and emergency water storage pits. We also strive to check, repair, and maintain equipment in order to prevent water pollution, and to train our personnel in methods of checking of operations and controlling work procedures.

Soil risk management

We are taking appropriate measures in compliance with the Soil Contamination Countermeasures Act, guidelines issued by the Ministry of the Environment, local government ordinances, and so on. We report to the local government when performing landform modification work such as excavation which is required to be reported. We conduct pollution surveys when needed.

Chemical substances discharge control

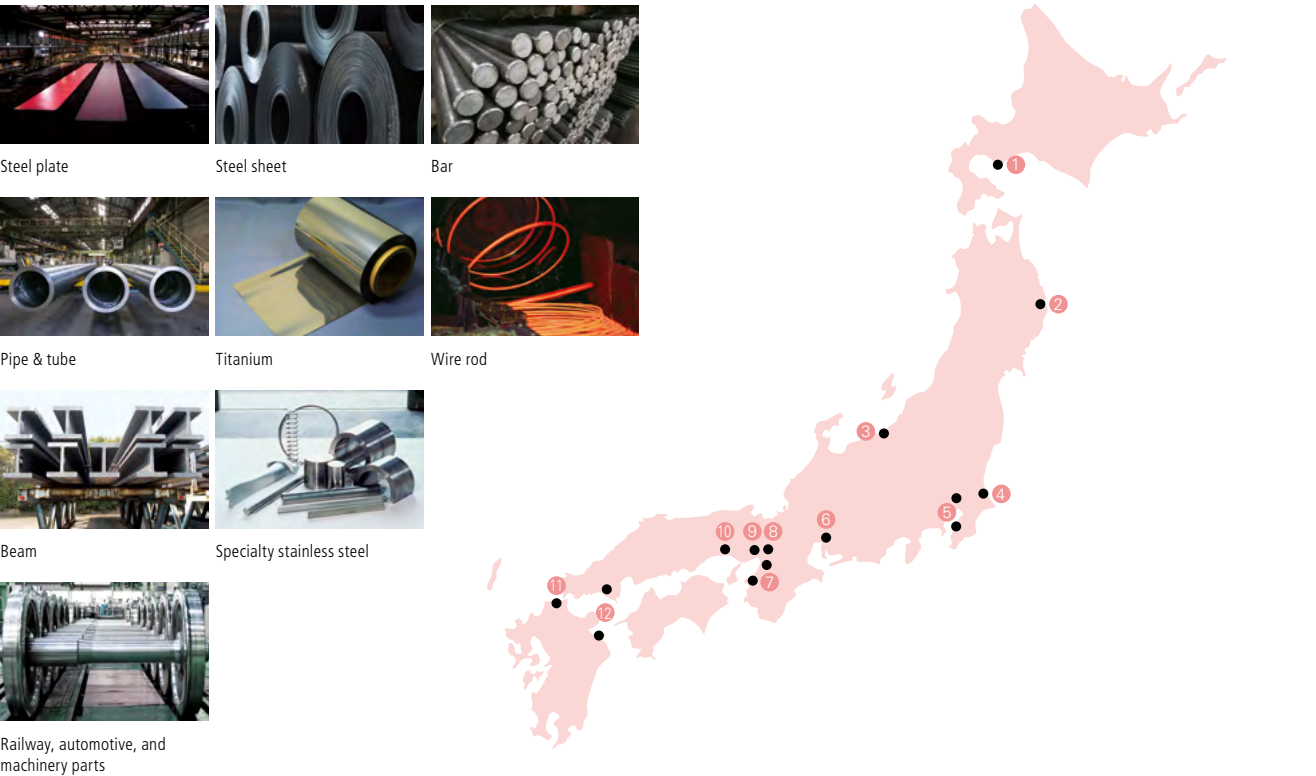
Comprehensive control of discharge

NSSMC appropriately manages and tries to improve the production, handling, and discharge or disposal of chemical substances in accordance with the PRTR Act<sup>1</sup>, Chemical Substance Control Law<sup>2</sup>, Volatile Organic Compounds (VOC)<sup>3</sup> voluntary management, and other laws concerning the management of chemical substances as well as following the voluntary management procedures set by the Japan Iron and Steel Federation (JISF) and NSSMC.

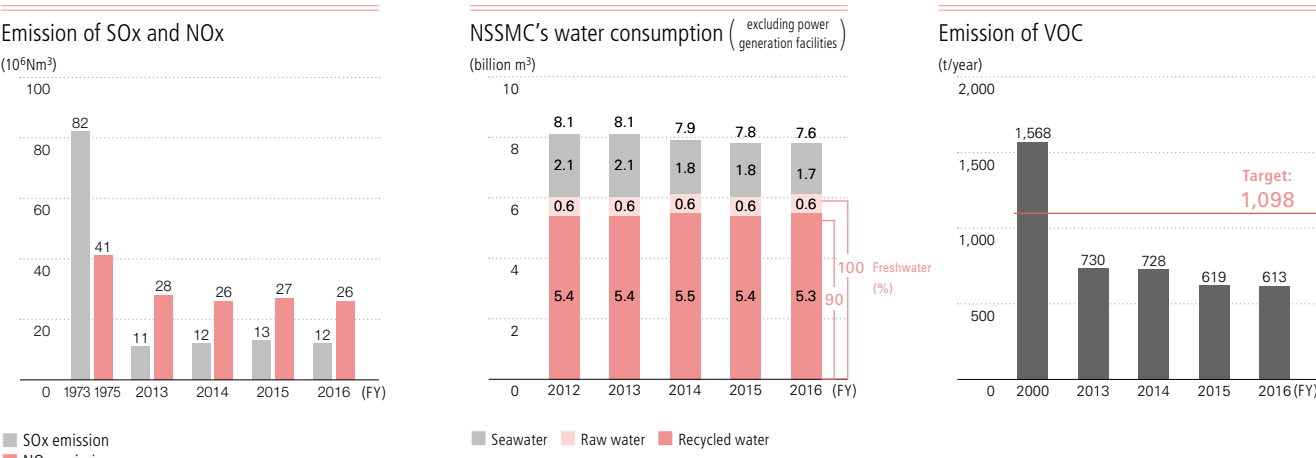
NSSMC also took the lead to promote use of alternatives to steel-making materials and equipment that contain hazardous materials such as asbestos and polychlorinated biphenyl (PCB). We have been replacing or disposing of possibly risky parts and materials, according to handling standards that ensure safety.

1 PRTR Act: An abbreviated name of the Act on Confirmation, etc., of Release Amounts of Specific Chemical Substances in the Environment and Promotion of Improvements to the Management Thereof. PRTR stands for Pollutant Release and Transfer Register.  
2 Chemical Substance Control Law: An abbreviation of the Law Concerning the Examination and Regulation of Manufacture of Chemical Substances.  
3 Volatile organic compounds (VOC): Organic chemical compounds emitted into the atmosphere in the form of gases, which are considered to be the source of undesirable airborne particles and photochemical oxidants, which became subject to control under the Air Pollution Control Act of 2004, as amended.

Steelworks and major products



Steelworks			①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫					
Products			Muroran Works	Kamaishi Works	Naoetsu Works	Kashima Works	Kimitsu Works	Tokyo	Nagoya Works	Wakayama, Kainan	Sakai	Osaka Steel Works	Amagasaki Works	Hirohata Works	Tobata, Yawata	Kokura	Oita	Hikari	
Type of products	Steel plate																		
	Steel sheet	Hot-rolled sheet																	
		Cold-rolled sheet																	
		Electromagnetic steel sheet																	
		Tinplate																	
		Hot-dip galvanized sheet																	
		Electrogalvanized sheet																	
	Bar & wire rod	Bar																	
		Wire rod																	
	Beam	H-beam																	
		Sheet pile																	
		Rail																	
		Hot extrusion																	
	Pipe & tube	Forged welding pipe and tube																	
		Welded pipe and tube																	
		UO pipe																	
		Seamless pipe																	
	Railway, automotive, and machinery parts	Wheel, axle, and bogie truck																	
		Forged products																	
	Titanium																		
	Specialty stainless steel																		



4 Welded pipe and tube 5 Hot-extruded pipe and tube



## Environmental measures at steelworks

### Prevention of scattering of materials and dust

Coal yard operations



The surface of coal piles is pressed to restrain the scattering of coal fines.

Spraying of water and chemical in coal yards



Water and chemical are sprayed on piles of iron ore and coal to restrain the scattering of raw materials.

Windbreak net at yards



A windbreak net is installed to reduce the strength of wind and restrain the scattering of raw materials.

Rainwater tank (for spraying)



Rainwater is not wasted but used for spraying in coal and ore yards.

Electric dust collectors



Dust generated in the burning process is collected by two types of dust collectors (electric or with bag filter), depending on the characteristics of the dust (i.e., particle size distribution, emission gas concentration.)

Dust collectors with bag filters



Sprinkler trucks



These trucks spray water on the road and empty lots or clean the road within works to restrict the secondary scattering of dust.

Road cleaning trucks



Smoke and soot measuring equipment



Smoke and soot are regularly measured in compliance with the laws and regulations.

Wet type desulfurization equipment



The wet desulfurization method enables SOx in emission gas to be eliminated.

Active coke dry type desulfurization equipment



The dry desulfurization and denitrification methods, using active coke, enables SOx and NOx in emission gas to be eliminated.

Low NOx regenerative burners



Burners featuring reduced levels of NOx generation and outstanding fuel savings have been installed.

Waste water coagulating sedimentation treatment equipment



Fine undissolved matter is coagulated into bigger masses by chemical treatment, permitted to settle, and is removed.

Pressurized flotation system



Floating oil is removed by tiny bubbles formed by released air.

Activated sludge treatment equipment



Organic matter is decomposed and eliminated by bacteria.

Filtration equipment (secondary treatment)



Undissolved residues in the treated waste water are filtered by a sand layer and removed.

Waste water automatic monitoring equipment



The water quality of waste water is automatically monitored.

Waste water closing gate



Waste water flow is shut in case of trouble.

### Water purification; prevention of abnormal waste water

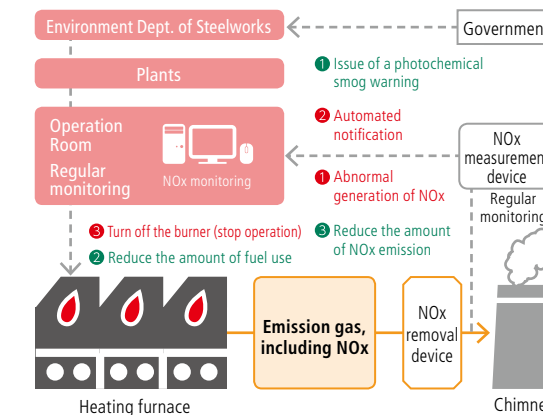
### Countermeasures against air pollution

## Examples of Environmental Initiatives at Steelworks

## Column

### Measures against Risks of Abnormal Generation of NOx

NSSMC is taking measures to prevent abnormal gas emissions even in the case of occurrence of operational trouble.



Procedures in red: Measures against abnormal generation of NOx

Procedures in green: Measures when there was a photochemical smog warning

In the heating furnaces where we heat steel materials, generation of NOx is controlled during the heating process of fuels by maintaining an appropriate burning status and adopting burners that produce less NOx. We have also installed NOx removal devices to enable us to operate the furnaces at a lower NOx density than the prescribed level.

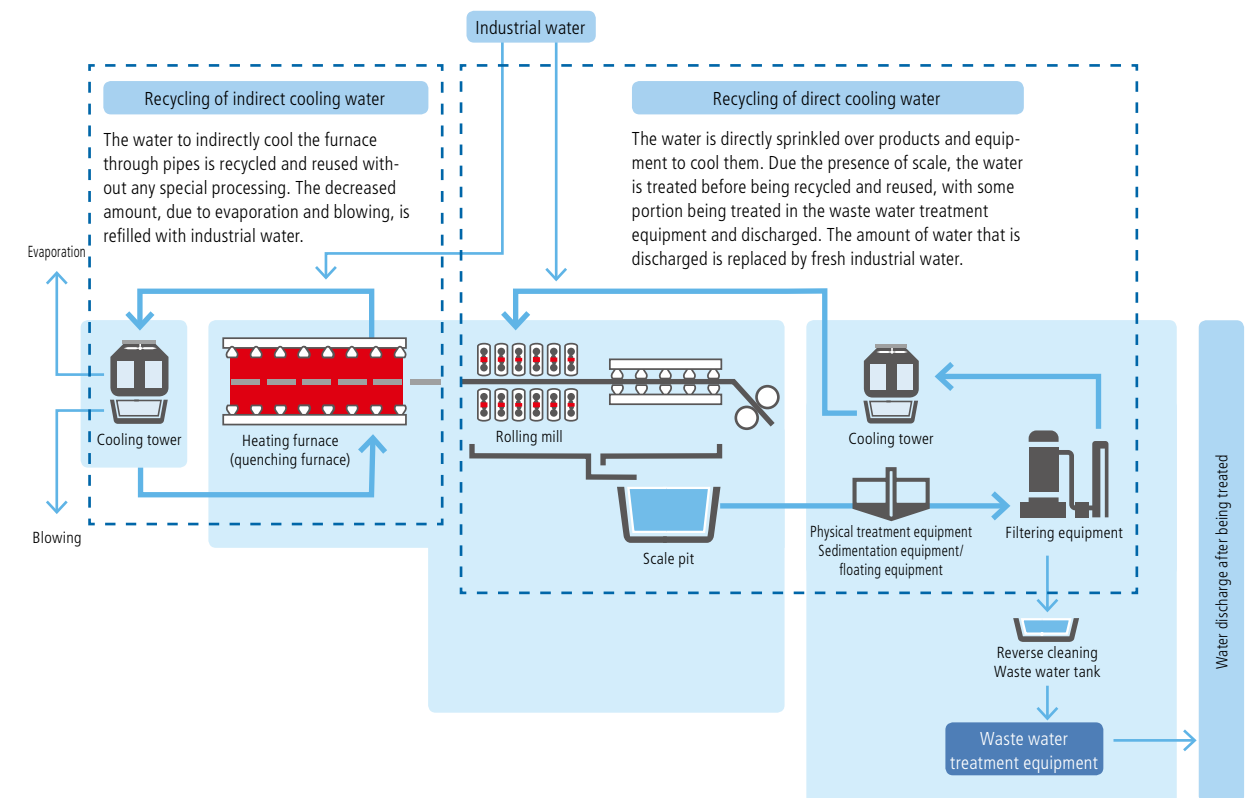
Moreover, the operating room of the plant constantly monitors the level of NOx in emission gas. If an abnormal level of NOx (exceeding the operating limit) is detected, after operating trouble or due to some other reason, workers are required to promptly put out the burner.

While we are controlling the amount of NOx emissions and running at a lower level than the prescribed level, if a photochemical smog<sup>1</sup> warning is issued in the area where the steelworks is located, we make adjustment operations, such as by cutting the amount of fuel used, to reduce NOx emissions.

<sup>1</sup> Photochemical smog is the chemical reaction of sunlight, NOx (emitted from vehicles, plants, etc.), and hydrocarbon in the atmosphere. It tends to be generated when it is sunny, warm, and little wind.

### About 90% of water used in steelworks are reclaimed and reused

NSSMC reclaims and reuses most of the water used in the steelmaking process, with a small remaining portion to be properly treated and discharged out of the steelworks. We strive to not waste precious water resources and restrain the amount of discharged water by recycling 90% of water used by the entire company.





Initiatives on Conservation of Biodiversity

"Creation of Hometown Forests" and "Creation of Sea Forests"

As a member of Nippon Keidanren (Japan Business Federation), NSSMC participated in preparing the "Declaration on Biodiversity by Nippon Keidanren," published in March 2009, and has taken initiatives according to its declaration and action policy. Among them, interesting programs thus far are "Creation of Hometown Forests" and "Creation of Sea Forests," the world-leading pioneer projects.

Some animal inhabitants of the Hometown Forests

Muroran	Ezo deer, Ezo red fox, Ezo squirrel, Eagle, buzzard, magpie
Kamaishi	Moon bear, Japanese serow, deer, hare, black-tailed gull
Naoetsu	Japanese dace, carp
Kashima	Pheasant, shrike, duck
Tokyo	Raccoon, spot-billed duck
Kimitsu	Bulbul, pheasant, little tern, swallow, egret
Nagoya	Raccoon, Pheasant, bulbul, shrike, swallow, great tit
Osaka	Weasel, starling

Photos of birds and animals on this page were photographed within NSSMC's steelworks.

Gray heron, Buzzard, Japanese dace, Bulbul, Whooper swan, Great tit, Black-tailed gull, Pheasant

Creation of Sea Forests

Wakayama	Raccoon, marten, bulbul, tiger keelbuck
Sakai	Duck
Amagasaki	Heron, bulbul, lizard, killifish, white-tailed skimmer
Hirohata	Buzzard, shrike, Oriental turtle dove, bulbul, starling, Bunting
Hikari	51 species of birds including black-tailed gull and herring gull
Kokura	Gull, Japanese wagtail, Graphium sarpedon
Yawata	Weasel, pheasant, gray heron, Japanese cormorant
Oita	Whooper swan, kingfisher, killifish, mayfly, firefly

"Creation of Hometown Forests"

Reproducing a forest similar to a nearby grove of the village shrine in steelworks

We have carried out the "Creation of Hometown Forests" projects at our steelworks and factories in Japan under the guidance of Dr. Akira Miyawaki (professor emeritus of Yokohama National University), with the aim of facilitating harmonious coexistence between nature and humans. This project comprises research on the natural vegetation inherent to a certain area in a nearby grove associated with a historical shrine, careful selection of suitable trees, growth of their saplings in pots, and planting them in designated places by local residents and our employees.

This was the first project by a private company in Japan to create a forest that harmonizes with the local scene and is based on an ecological approach. This is one way we try to raise the awareness of our employees regarding the environment. At present, our forests in aggregate have grown to total around 900 ha (about the size of 190 Yankee Stadiums).



Tree-planting by new employees

Conserving biodiversity and sequestering CO2

Wild birds such as bulbuls and eagles gather and animals such as Ezo red fox and deer visit the forests we make and maintain at our steel works sites across Japan. Wild birds and animals inherent to the land return to the forests. Thus, the "Creation of Hometown Forests" helps conserve biodiversity, and sequester CO2.

Creation of forests in the area of each steelworks

Each of NSSMC's steelworks is undertaking the task of creating a local forest, mainly as part of the above "Creation of Hometown Forests" project, which is based on natural, native vegetation.

NSSMC's Amagasaki Works has participated in the Amagasaki 21st Century Forest Project co-sponsored by the City and Hyogo Prefecture since fiscal 2007 and has contributed to establishing about 1.2 km of roadside greenery. In 2016 the Amagasaki Works received the Charming Machikado (Street-corner) Award (the Industrial Town Division, commemorating the 100th anniversary of the foundation).

In Nagoya, the Love Green Day 2016 was held as a part of the project that helps promote biodiversity using the expansive green spaces of companies along the coast of the Chia Peninsula near the city. Many families visited the environmental conservation forest of the Nagoya Works.



Amagasaki Works roadside greenery



Visit to Nagoya Works conservation forest

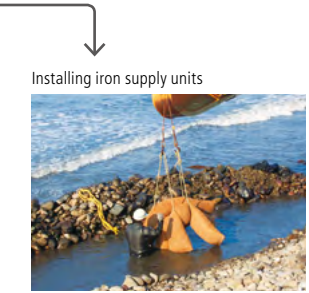
"Creation of Sea Forests"

Implemented in 37 spots in Japan to improve sea desertification

Sea desertification, a problem of the sea bed losing ability to support life due to a decline in kelp, brown seaweed, and other varieties of seaweed, is happening along about 5,000 km of the sea shore in various parts of Japan. To offset a part of the decline in the supply of iron from nature, which is said to be one of the causes for sea desertification, NSSMC has developed "Beverly® Series," iron supply units composed of steel slugs, humus, and soil and steel slag and has been promoting regeneration of seaweed beds by use of these units.



Deserted sea bed



Installing iron supply units



After one year, kelp is flourishing at Mashike Town in Hokkaido

By mixing with humus, the iron eluted from steel slug is prone to be absorbed by plants without becoming oxidized.

Measures against salt damage and restoration of habitats

NSSMC donated about 20 tons of converter slag fertilizers, a by-product of steelmaking, to cooperate for research by Tokyo University of Agriculture for salt removal in tsunami-devastated farmland. Deposition of salt occurred at the time of the Great East Japan Earthquake of March 2011 in the Soma area of Fukushima Prefecture. The university applied converter slag fertilizers on strawberry fields and 1.7 ha of rice fields and proved its effectiveness in rapid and efficient salt removal. This has thereby been established as the Soma method. Since then, the Soma Project was launched by Tokyo University of Agriculture, Soma City in Fukushima Prefecture, and the agricultural organization JA Soma. The application area was expanded, NSSMC donated about 500 tons of converter slag fertilizers, and approximately 50 ha of rice fields was restored by this method. The restoration of rice fields also means to restore habitats for birds, frogs, and various other living things.

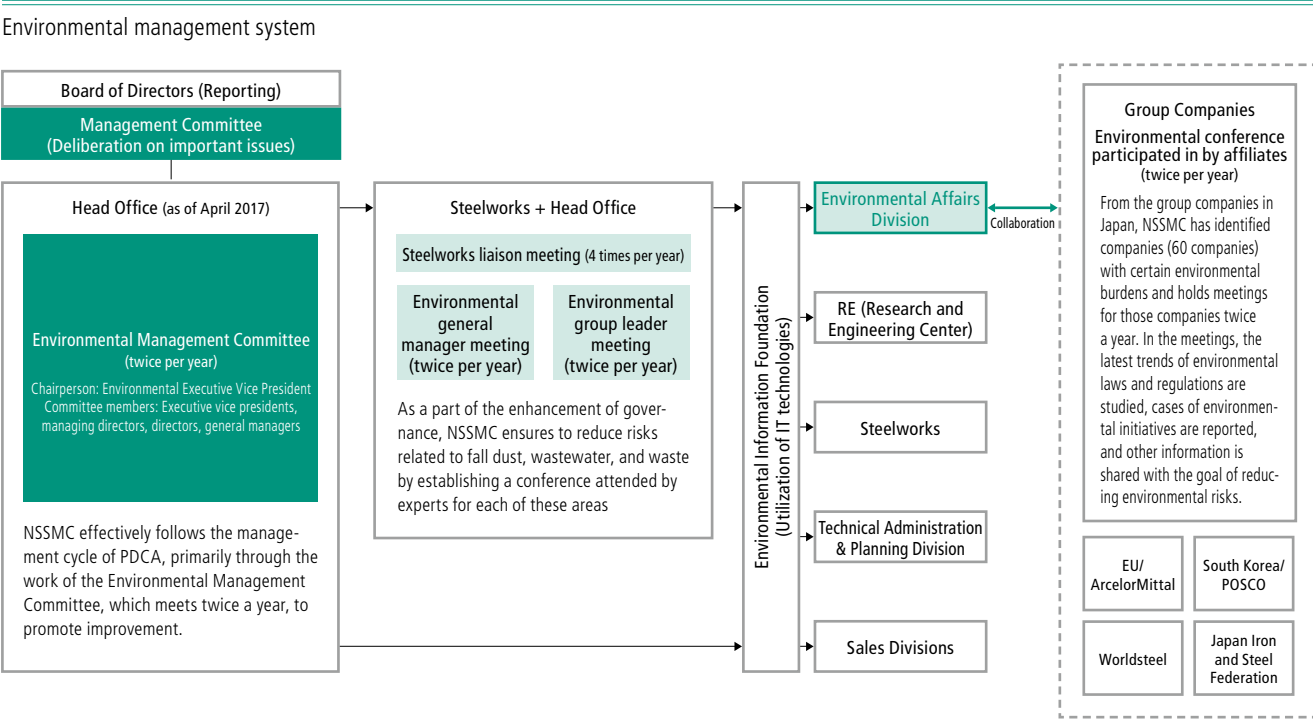


Well-grown rice paddy with steel slag fertilizers

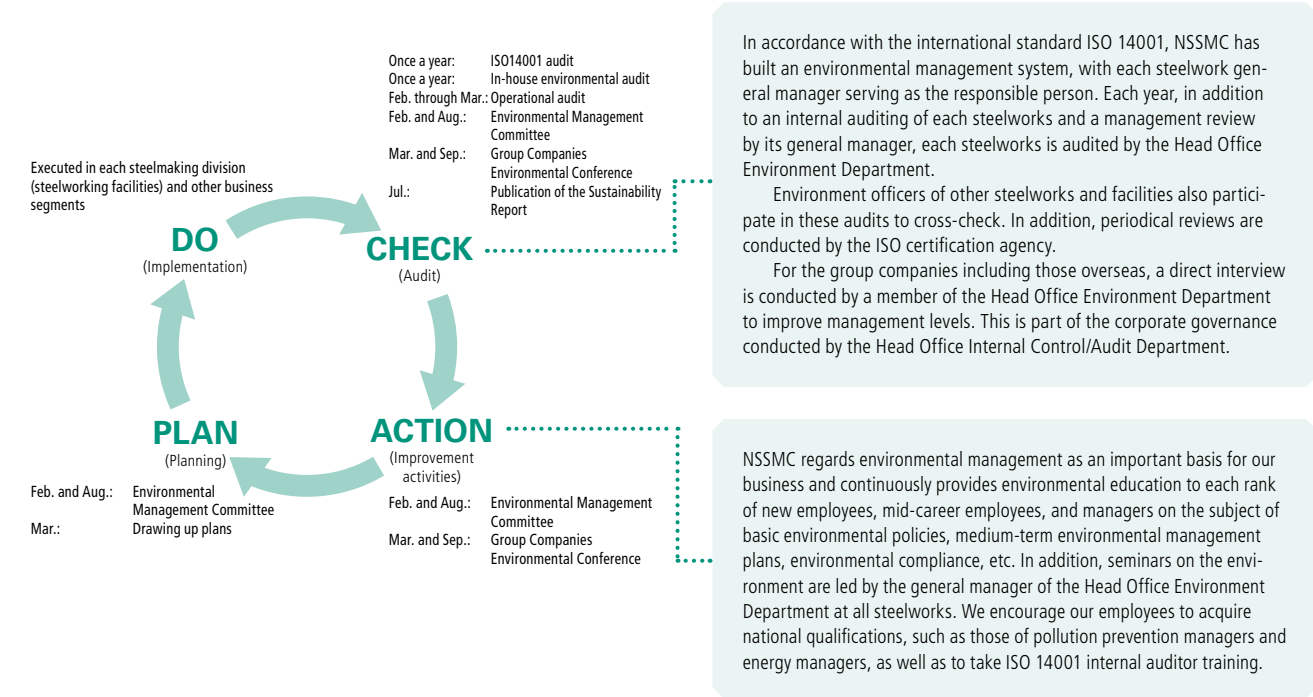


# Promotion of Environmental Management

Nippon Steel & Sumitomo Metal Corporation (NSSMC) has built an environmental management system that includes not only its own steelworks and factories, but also its group companies in Japan and abroad. Activities to reduce environmental risks are promoted by combining internal and external audits and following the plan-do-check-act (PDCA) cycle.



Annual environmental management cycle



## Environmental accounting

### Philosophy of environmental accounting

NSSMC has adopted environmental accounting to be used as guidelines for corporate activities, and to accurately track the environmental costs and effects. The iron and steel industry is an equipment-intensive industry. We have achieved environmental preservation and energy conservation by installing environmental-friendly equipment such as dust collectors and improving the efficiency of production equipment. Costs of environmental preservation are quantified by adding the costs of capital investment associated with environmental measures, energy-saving measures, and recycling measures to expenses incurred to preserve the environment.

### Environmental preservation costs

Capital expenditures for environmental preservation amounted 22.5 billion yen in total for FY2016: 20.5 billion yen for investment in equipment for environmental measures and 2 billion yen for investment in energy-saving equipment. The aggregate amount accounted for approximately 6% of the total cost of equipment investment.

As environmental measures, we invested in preventive measures for dust emissions, visible smoke emitted from steelworks stacks, abnormal water discharge from drain outlets, and leakage of water from the revetments and quay walls at steelworks.

For saving of energy, measures were taken to improve the efficiency of heating furnaces as well as overall energy-saving measures in each manufacturing process.

In fiscal 2016, the environmental preservation costs totaled 84.5 billion yen, including 40.5 billion yen in atmospheric pollution prevention costs, 11.2 billion yen in water pollution prevention costs, and 11 billion yen in environmental R&D costs.

Among the environmental preservation costs, atmospheric prevention costs including measures to prevent scattering of dust generated at steelworks accounted for the largest share. We also promote in-house recycling to reduce expenses on waste disposal.

### Effects of environmental preservation

It is difficult to quantify environmental preservation effects in monetary terms, since such calculation would require many assumptions. Therefore, environmental preservation performance is reported as effects vs. costs of taking environmental measures in this report and on our website.

For example, reduction in energy consumption is shown on page 15 and water consumption volume and reductions in water consumption and various resources spent are shown on page 28. For atmospheric substances, SOx and NOx emissions are shown; for water quality and soil, individual performance indicators are used; for hazardous chemical substances, actual reduction volume of substances such as dioxins, benzene, and VOCs are stated; and for waste products, reduction in final disposal volume is stated.

NSSMC will continue efforts to improve accuracy in environmental accounting and use it as a management benchmark to effectively invest in equipment and attempt to further preserve the environment and conserve energy.

Environmental preservation costs

		Definition	FY2016	
			Capital investment	Expense
Pollution Prevention Costs	Countermeasures against air pollution	Dust collection equipment running costs, maintenance costs, exhaust gas desulfurization and denitration treatment, raw materials yard dust preventive measures costs, etc.	17.2	Total 40.5
	Countermeasures against water pollution	Electricity charges incurred for treatment of waste water discharged from steelworks, chemical costs, maintenance costs, working expenses (excluding expenses required for treatment of circulated water)	3.3	20.5 11.2
Global Warming Prevention Costs	Energy saving measures	Running costs and maintenance costs of energy-saving facilities	2.0	3.2
Costs of Recycling Resources	Treatment of by-products and industrial waste	Expenses incurred in landfill work, incineration, and treatment of by-products and industrial waste commissioned to third parties	–	7.2
	Treatment of general waste from business activities	Expenses incurred in the treatment of general waste from business activities	–	0.8
Environmental Management Activities Cost	Construction of EMS and acquisition of ISO14001 certification	Expenses required for the construction and maintenance of EMS	–	0.02
	Monitoring and measurement of environmental loads	Expenses required for monitoring air, water, etc., at steelworks	–	1.2
	Personnel expenditures related to environmental measures	Personnel expenditures for employees in charge of environmental matters	–	2.7
Research and Development Costs	Development of eco products	R&D costs (including personnel costs) for environment-friendly steel products	–	4.3
	Development of products which have low environmental impact during manufacture	Development costs (including personnel costs) required for measures for by-products and energy conservation technology during manufacture	–	6.7
				Total 11.0
Social Activity Costs	Greening, supporting environmental organizations, and advertising	Expenses required for creating green areas at steelworks, environmental publicity, and participation in exhibition	–	2.6
Other Environmental Costs	SOx levy	Payments to health damage prevention businesses specified by the Law Concerning Pollution-Related Health Damage Compensation and Other Measures	–	4.1
Total			22.5	84.5
Reference: Net income (consolidated basis)			130.9	

## Targets and Achievements in FY2016

After achieving goals of its voluntary action plan (FY2008 to FY2012) on measures against global warming, Nippon Steel & Sumitomo Metal Corporation (NSSMC) are committed to continue working on energy saving to achieve the goals in the context of action plans for a low-carbon society.

With the aim of creating a recycling-oriented society, we maintained a high recycle ratio of 99% by reducing the volume of final disposal through increased recycling of by-products. With regard to environmental risk management, the management cycle is efficiently implemented with the Environmental Management Committee at the core of its efforts, raising the level of environment management of the entire group. Eco products and eco solutions were successfully developed and offered to the market in an active manner.

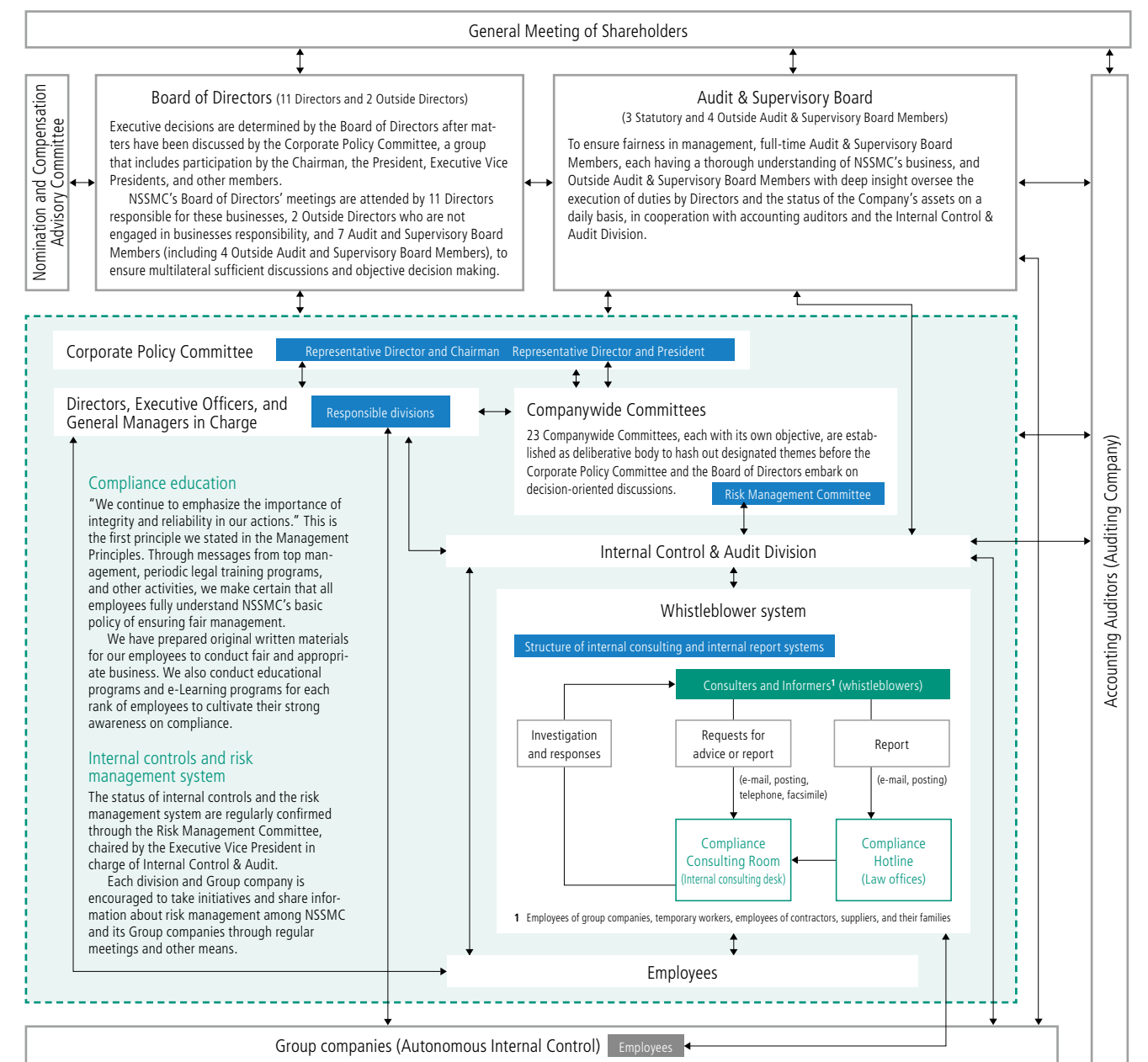
Medium-Term Environmental Management Plan and Priority Targets			Achievements in FY2016 (by NSSMC and some group companies)	Evaluation	Pages or website
Promotion of environmental management system	Enhance and promote an environmental management system		<ul style="list-style-type: none"> <li>Thoroughly implemented the NSSMC Group Guidelines on atmospheric air, water, and waste materials</li> <li>Regularly held meetings of groupwide issue-based working groups</li> </ul>	○	28, 34
	Conduct environmental management in coordination with group companies		<ul style="list-style-type: none"> <li>Regularly held the environmental conference of group companies to enhance their ability to respond to environmental risks</li> <li>Sequentially conducted hearings on environmental issues to group companies in Japan and overseas</li> </ul>	○	34
	Renew ISO 14001 certification		<ul style="list-style-type: none"> <li>Naoetsu, Nagoya, Hirohata, and Yawata Works had respective certifications renewed</li> </ul>	○	34
Promotion of global warming countermeasures	1) Eco process: enhance efficiency of natural resources and energy		<ul style="list-style-type: none"> <li>¥2 billion invested in energy saving</li> <li>Expansion of biomass-mixed combustion in coal-fired thermal power generation</li> </ul>	○	35 23
	2) Eco products: Develop products that help preserve natural resources and energy		<ul style="list-style-type: none"> <li>Adoption of titanium steel sheets for the fuel tanks of motorcross bikes to contribute to weight reduction</li> <li>Development of vehicle body frame components by three-dimensional hot bending of rectangular steel tubes</li> </ul>	○	18 WEB
	3) Eco solution: Internationally contribute through overseas transfer of CO <sub>2</sub> reduction technologies		<ul style="list-style-type: none"> <li>Participated in a national research project for transfer of energy conservation technology to India and ASEAN countries and contributed to the development of a master plan for feasible technology transfer and the assessment of energy conservation</li> </ul>	○	20
	4) Advance development of innovative technologies for CO <sub>2</sub> reduction on a longer-term basis		<ul style="list-style-type: none"> <li>Comprehensive verification of technology to reduce CO<sub>2</sub> emissions from a blast furnace during the development period, up to FY2017</li> </ul>	○	24
Participation in creating a recycling-oriented society	Reduce the final disposal volume of by-products by 260,000 tons by 2020		<ul style="list-style-type: none"> <li>Recycled 99% of the 23.8 million tons of the by-products generated</li> <li>The final disposal volume continued to decrease to 240,000 tons/y in FY2016.</li> </ul>	○	16, 26 17, 26
	Promote the effective use of waste plastics and discarded tires from the viewpoints of recycling and CO <sub>2</sub> emission reduction		<ul style="list-style-type: none"> <li>About 200,000 tons of waste plastics were recycled (corresponding to about 30% of the nationwide recycling level)</li> <li>About 70,000 tons of discarded tires were recycled (corresponding to about 10% of the nationwide recycling level)</li> </ul>	○	16, 27
	Reduce environmental risks of the air, water, soil, etc.		<ul style="list-style-type: none"> <li>¥20.5 billion capital expenditures as environmental measures</li> </ul>	○	35
Initiatives for environmental risk management	Maintain and enhance preservation of the local environment		<ul style="list-style-type: none"> <li>Each steelworks cooperates with local governments and the Maritime Safety Agency.</li> </ul>	○	30–31
	Benzene: Voluntary reduction based on national voluntary management plan (168 tons/y)		<ul style="list-style-type: none"> <li>Achieved the self-management target for emissions (94 tons/y)</li> </ul>	○	WEB
	Dioxins: Voluntary reduction based on Japan Iron and Steel Federation guidelines (16.1 g-TEQ/y)		<ul style="list-style-type: none"> <li>Achieved the voluntary target (4.6 g-TEQ/y) set by the Japan Iron and Steel Federation</li> </ul>	○	WEB
	Promote control of specified chemical substances in accordance with the PRTR Act		<ul style="list-style-type: none"> <li>The amounts discharged were 401 tons/y to the atmosphere and 37 tons/y to public waters; the amount transferred outside the worksites was 6,479 tons/y</li> </ul>	○	WEB
	VOC: Voluntary reduction (1,098 tons/y)		<ul style="list-style-type: none"> <li>Continuously achieved the voluntary emission target (613 tons/y)</li> </ul>	○	28
	Environment management jointly with group companies		<ul style="list-style-type: none"> <li>Sequentially conducted hearings on environmental issues to group companies in Japan and overseas</li> </ul>	○	34
	Understand the trend of law revision and appropriately deal with it		<ul style="list-style-type: none"> <li>Responded to the Revised Air Pollution Control Act (to be enforced in 2018)</li> </ul>	○	28
Environmental and energy solution business operation	Environmental contribution through business in each sector	Engineering and construction business	<ul style="list-style-type: none"> <li>Completion of construction and start of operation of the conversion of sewage sludge to fuel in the Ashida River area, Hiroshima Prefecture</li> <li>Nippon Steel &amp; Sumikin Pipeline &amp; Engineering: Participated in the Shikaoi Hydrogen Farm™ Business in Hokkaido</li> </ul>	○	WEB 23
		Chemical business	<ul style="list-style-type: none"> <li>Development of a new porous carbon material for vehicle fuel cells</li> <li>Initiatives for elimination of halogen (circuit board materials, epoxy plastics)</li> </ul>	○	WEB
		System solutions business	<ul style="list-style-type: none"> <li>Electricity saving by expansion of cloud business, mainly of advanced data centers located in the Eastern and Western Japan</li> </ul>	○	WEB
		New materials business	<ul style="list-style-type: none"> <li>Launch of NS-TEPreg™, a new material with beneficial thermosetting and thermoplastic qualities</li> </ul>	○	WEB
	Contribute to national resilience and infrastructure development with consideration to the natural environment and the scenery		<ul style="list-style-type: none"> <li>Nippon Steel &amp; Sumikin Metal Products received the Best Resilience Award of the Japan Resilience Award 2017 for its telescopic drainage pipe.</li> </ul>	○	WEB
	Accelerate contribution to the environment and energy saving overseas by using the Group's advanced technologies		<ul style="list-style-type: none"> <li>Continuously received orders for five Coke Dry Quenching (CDQ) units in China (amounting to 95 units in overseas cumulative orders)</li> </ul>	○	21
	Contribute to recycling of resources by expanding use of steel slag and other steel by-products		<ul style="list-style-type: none"> <li>Use of calcia modified soil for conservation of the sea area</li> </ul>	○	18
Promotion of environmental relation activities	Appropriately and timely disclose environmental information and actively communicate to be trusted in society		<ul style="list-style-type: none"> <li>Further improved the Environment &amp; CSR section of NSSMC's corporate website</li> </ul>	○	WEB
	Steadily enhance environmental relation activities through exchanges and dialogues with stakeholders		<ul style="list-style-type: none"> <li>Participated in Eco Products 2016 and presented NSSMC's three eco-friendly initiatives and other initiatives.</li> </ul>	○	39
	Create hometown forests by planting trees and sea forests by restoring seaweed beds as for contributing to local communities		<ul style="list-style-type: none"> <li>Each steelworks continued to work on its "Creation of a Homeland Forest" initiative.</li> <li>In the "Creation of Sea Forests," spread efforts to restore seaweed beds across the country (37 locations)</li> </ul>	○	32–33
	Enhance training of environmental staff and thorough awareness of environmental compliance for each career level, from workers in steelworks to managers		<ul style="list-style-type: none"> <li>Conducted environmental education tailored to the local community's conditions at respective steel works and other plants</li> <li>Provided an e-learning program based on the booklet of easy-to-understand case examples on what should not be done and produced a sequel.</li> </ul>	○	WEB

## Corporate Governance Structure

The NSSMC Group aims to respond to confidence and trust extended by shareholders, business partners, and all other stakeholders, and to achieve healthy sustainable growth and medium- to long-term improvement in corporate value. For that purposes, the Group has established a corporate governance structure appropriate for its businesses.

NSSMC, with its core business being steelmaking, has adopted a structure in which a Board of Directors, mainly comprised of Directors with a thorough understanding of NSSMC's business, makes decisions on basic management policy and important business activities, while Audit and Supervisory Board Members, who hold strong legal authority, oversee from independent positions the execution of duties by Directors. Believing that this structure ensures efficiency and fairness in management and is effective for the Company, NSSMC has adopted the company system form of organization with an audit and supervisory board. In addition, the Company has Outside Directors, who have vast experience in fields such as corporate management, to enhance decision making from diverse perspectives at the Board of Directors' meetings and through oversight of management. The Company's notifications of all Outside Director and Outside Audit and Supervisory Board Member appointments have been submitted to each of the stock exchanges in Japan.

### Corporate governance structure and internal control system





# Nippon Steel & Sumitomo Metal Corporation Group and Its Stakeholders

The NSSMC Group treasures its partnership with all its stakeholders and aims to improve its corporate value by enhancing its relationships with them through better exchanges and communication.

We hope to help all stakeholders understand the importance of “*monozukuri* (product manufacturing)” and our various initiatives on environmental issues and through that understanding to be a company trusted by them all the time. For those objectives, we seek to offer sufficient opportunities for constructive communication, ensure timely disclosure of information, and continue to make social contribution activities that are closely tied to local communities. We also strive to create workplaces in which employees can work with pride and enthusiasm, and fulfill our corporate social responsibilities as a member of society.



## Promotion of safety and sanitary measures

As for safety training, our Taikan Program (an experience-based safety education program), which allows employees to experience worksite risk through simulation, has been enhanced. As for healthcare management, we are promoting preventive measures, including a measure to better follow up with employees who had abnormal finding on medical check-up.



## Community-based educational support Providing education on the environment and manufacturing

NSSMC hosts a number of programs in its steelworks nationwide and nearby elementary and junior high schools, such as “*tatara ironmaking*” demonstrations, workshops, and lectures in classroom.

<sup>1</sup> *Tatara ironmaking* is a traditional Japanese method of making iron that uses iron sand as the source material. A bellows is used to help burn charcoal to make iron.



Promoting women's active participation

## Empowerment of women in the workplace

We proactively hire women even for manufacturing worksites. Three steelworks established 24-hour in-house nurseries in order to support early return of female workers from maternity and baby care leave.



Kimitsu

Oita



Yawata



## Contribute to society through materializing sustainable corporate activities

Diverse communication activities

## Participation in Eco-Products 2016

In December 2016, NSSMC exhibited products and technologies at Eco-Products 2016, the largest ecological exhibition in Japan, which was held at Tokyo Big Sight (Tokyo International Exhibition Center). Our presentations showed how we addressed environmental and energy issues through our focus on three ecos, and attracted the attention of many visitors.



## Partner awards

The partner awards were established to extend our appreciation to our suppliers' efforts in quality and cost improvement in procurement of materials and equipment. We also wish to encourage them to make proposals more actively in the future.



## Eco-friendly purchasing

We have participated in the Green Purchasing Network since its establishment in 1996. The Network's basic policy is to consider environmental impacts and preservation of resources and the environment in purchasing. Jointly with governments, NGOs, academics, businesses, and other organizations, we are leading the efforts to favor purchasing of products and services which have less environmental impact. Concerning materials, we confirm no use of conflict materials with our suppliers.

Mecenat

## Kioi Hall

The Nippon Steel & Sumitomo Metal Arts Foundation operates the Kioi Hall (in Chiyoda-ku, Tokyo), where it holds classical concerts by Kioi Sinfonietta Tokyo.

The foundation also helps popularize traditional Japanese music by using the Kioi Hall's small hall exclusive for Japanese music performance, a rare type of hall even in Japan.



## Collaboration with an NPO, “Mori wa Umi no Koibito”



Since 1989, Mr. Shigeatsu Hatakeyama, a fisherman cultivating oysters and scallops in Kesennuma City, Miyagi Prefecture, and the Chairman of the NPO, “*Mori wa Umi no Koibito*” (which literally means “The forest is longing for the sea, the sea is longing for the forest”), along with his fellow fishermen, commenced “*Mori wa Umi no Koibito*” campaign to plant trees in the vicinity of the upper reaches of the Okawa River, which flows into Kesennuma Bay. In June 2017, approximately 1,500 students and others, including employees of our Group, joined their tree-planting festival.

## Community activities through sports

We support community-based sports teams, such as for soccer, volleyball, rugby, judo, and baseball. In various parts of Japan, we help develop junior sports teams, give sports classes for children, and make our sport facilities available for them.





# Third-party Opinion



**Yuko Sakita**  
Journalist and environmental counsellor

## Overall ecological management

Japan is entering a super-aging, population-declining society but if you look around the world, the global population keeps increasing and the creation of a sustainable society based on environmental, economic, and social perspectives is becoming an urgent task. The Sustainable Development Goals (SDGs) were adopted at the United Nations’ Summit in 2015 and presented 17 goals and 169 targets to be achieved by global concerted efforts of both developed countries and emerging countries by 2030. This has given significant implications at work sites, through policy formation, corporate management, community planning, and other areas in each country.

As mentioned in “A Message from Top Management,” the NSSMC Group, with its core business in steelmaking, has made its position clear: to emphasize environmental responsibility and to adhere to its “Ecological Management” policy, and has set many targets concerned with the future global environment. I highly regard NSSMC’s attitude as being very powerful and determined.

In fiscal 2016 the NSSMC Group generated 64% of sales in Japan and 36% overseas. I believe that contribution to the world should be one of important mission of NSSMC. In this Sustainability Report, NSSMC has shown its initiatives categorized by 17 goals of SDGs, at the global-standard for high transparency. I was impressed with this effort and the willingness to disclose its present situation. I hope NSSMC will continue to monitor the progress of its contribution and share its achievement and issues with society.

## Specific environmental management measures

As measures against climate change, the NSSMC Group has emphasized three ‘Ecos,’ has adopted (1) Eco process, and has produced (2) Eco products. As one of the specific measures to share energy-efficient technology with other companies in Japan, or (3) Eco solutions, this year’s Sustainability Report introduced NSSMC’s initiative to prepare a list of technologies and conduct assessment of overseas steelworks on energy-saving status. As this initiative can be incorporated in developing bilateral alliance with each country, I am hoping to see actual impacts on the reduction of carbon emissions by the global steel industry.

I would also like to encourage NSSMC to continue its contribution toward formation of a hydrogen-oriented society. A number of industries are working at development of fuel-cell cars and buses that are operational at the time of the Tokyo Olympic and Paralympic Games in 2020 and work is also being done to prepare for construction of hydrogen stations. The government is studying deregulation that would encourage these efforts. As preconditions for these technological advances there are development of high-performance steel products that enable safe use of high-pressure hydrogen and the technology to provide mechanical parts that provide functionality, safety, and reliability. NSSMC is committed to contributing to these undertakings, and has other ambitious model projects, which I hope will yield eye-opening results. One example is a project to construct a hydrogen station to supply CO<sub>2</sub>-free hydrogen, derived from livestock biogas, which was launched in a ranch in Tokachi, Hokkaido.

NSSMC achieved Japan’s highest biomass-to-coal co-firing ratio in a coal-fired power station. The Company’s initiative to procure woody biomass resources in alliance with forest cooperatives has received the 2016 New Energy Award (METI Minister’s Award). It is contributing to CO<sub>2</sub> reduction and to promote employment in local community due to use of domestic resources. These activities can result in the creation of a sustainable recycling-oriented symbiotic community. I would like to see this project’s multi-aspect achievements in the community to become visible and tangible, and quantified, in the future.

Toward the realization of a recycling-oriented society, NSSMC is recycling plastic containers and packaging, as the importance of recycling these products have been increasing in recent years. It is therefore important for NSSMC to continue advanced initiatives, including its already-implemented recycling of waste tires. While steelmaking facilities are not considered as “mercury-emitting facilities” based on the Minamata Convention on Mercury, the steel industry’s ongoing efforts to minimize emissions of mercury are mentioned in this report. The voluntary efforts to conduct similar monitoring as required of specified industries are anticipated to help build greater relationships of trust for the steel industry with society. As I mentioned this subject in the Third-party Opinion of last year’s Sustainability Report, I am very pleased to find such information and that the PDCA cycle is being effectively implemented.

In the areas of biodiversity, NSSMC has participated in the Declaration of Biodiversity by Keidanren (Japan Business Foundation) and has spearheaded the efforts by undertaking the Creation of Hometown Forests and the Creation of Sea Forests. Both initiatives have been thoroughly established and I believe the Company’s consistency in implementing them is important.

## Social reporting

While steel, in its roles extending from manufacturing to urban infrastructure, is indispensable for daily life of the people and society in general, I had the impression that steel has a higher environmental burden compared to various new materials. However, in the lead-off article of this Sustainability Report, the highly environmental-friendly characteristics of steel as evident in the entire life cycle perspective, from production to use, disposal, and reuse as recycled resources for many times, makes it clear that steel is a superior material. I was impressed with NSSMC’s determination and commitment to make the best possible use of steel’s attractive features, for the ultimate benefit of society. Partnership with various stakeholders and emphasis on two-way communications are also mentioned prominently in this report. I would like to see the trust extended to the NSSMC Group be sustained and enhanced in this changing era, through being trusted in the community, developing the next-generation workforce, cooperating with NGOs, and being understood by shareholders and investors.

I saw that the PDCA cycle is well implemented under the Ecological Management arrangement. In particular the primary targets in all 30 identified areas were achieved in fiscal 2016.

NSSMC is supporting employees’ healthcare management and has established nurseries to support female employees’ return from maternity leave. I highly regard what NSSMC is doing to improve its such human resources programs every year, especially at this time when workstyle innovation is a topic being addressed in society at large. I would like to sincerely encourage the NSSMC Group’s sustainable corporate management that allows employees to continue working with pride.

## Awards received in FY2016 (in chronological order)

Award name	Sponsor	Detail
The 66th JSAE Award: Excellent Technical Paper Presentation Award	Society of Automotive Engineers of Japan	Development of fracture prediction technology of a set of different steel plates of different types by use of welding simulation (NSSMC)
Nippon Keidanren Chairman’s Innovation Prize 2016	Japan Institute for Promoting Invention and Innovation	Development of ultra-high-tensile PWS steel wires for reduction of environmental burden of bridges (NSSMC)
2016 Outstanding Achievement Award	Japan Society of Steel Construction	Development of the structure system of a steel-frame housing complex by use of the outer frame CFH method (NSSMC, Takenaka Corporation)
Excellent Supplier 2015 (10th time)	TTX (USA)	Supply of high-end railway wheels for high-load-bearing freight cars with a long service life and excellent performance in load bearing and resistance to wear (NSSMC, Standard Steel)
Excellent Quality Award (second consecutive year)	General Motors (USA)	Stable continuous supply of high-quality forged crankshafts (Huizhou Sumikin Forging Co., China and SMI Amtek Crankshaft, India)
Best Supplier Award 2016	Pioneer Electronic AsiaCenter	Excellent delivery performance and contribution to stable production in supplying electro-galvanized steel in Malaysia (Nippon EGalv Steel)
Japan Society and Spring Engineers Award (Technology Award)	Japan Society and Spring Engineers	Development of high-performance stainless-steel spring steel sheet for exhaust gaskets (NSSMC)
Excellent Partners Meeting 2016 ECO-VC Gold Award (7th consecutive year)	Panasonic Corporation	Development of a new electro-magnetic steel sheet that satisfies both high efficiency and good scrap recycling of compressor VA (NSSMC)
Special Award for Consideration Action Plan Against Global Warming in Chiyoda Ward	Chiyoda Ward	Measures for summer lifestyle innovation by early start of work and early return home during the summer in the head office area (NSSMC)
New Energy Award (METI Minister’s Award)	New Energy Foundation	Visionary approach to expand a biomass-to-coal co-firing ratio in pulverized-coal-fired thermal power generation (NSSMC, IHI Corporation) <a href="#">p. 23</a>
METI Minister’s Price in the Grand Prize for Excellence in Energy Conservation	Ministry of Economy, Trade and Industry (METI)	Significant reduction in per-unit energy consumption by change in the pre-coating process (NS Okamura)
2016 IT General Award	Japan Institute of Information Technology	Large-scale system integration and construction and development of an advanced production management system model (NSSMC)
Top 100 Global Innovator 2016 (5th consecutive year)	Clarivate Analytics (USA)	Innovative R&D activities and outstanding intellectual property activities for many years (NSSMC)
49th (2016) Ichimura Industrial Award (Contribution Prize)	New Technology Development Foundation	Development of black photoresist ink for high-definition LCD display (Nippon Steel & Sumikin Chemical)
2017 MEXT Minister Prize for Science and Technology (Development Division) (11th consecutive year)	Ministry of Education, Culture, Sports, Science and Technology (MEXT)	Application of a permanent magnet-type retarder that controls the braking force to a steel rotor with no contact (NSSMC) <a href="#">p. 19</a>

## Corporate profile

Company name	Nippon Steel & Sumitomo Metal Corporation
Head office	2-6-1, Marunouchi, Chiyoda-ku, Tokyo 100-8071, Japan Phone: +81-3-6867-4111
Date of Establishment	March 31, 1970
Chairman	Shoji Muneoka
President	Kosei Shindo
Capital	¥419.524 billion (Total number of shareholders: 461,102)
Stock listings	Tokyo, Osaka, Nagoya, Fukuoka, and Sapporo
Number of employees	92,309 (consolidated basis)
Group companies	366 consolidated subsidiaries and 113 equity-method affiliates

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## NSSMC’s Logotype

The central triangle in the logo represents a blast furnace and the people who create steel. It symbolizes steel, indispensable to the advancement of civilization, brightening all corners of the world. The center point can be viewed as a summit, reflecting our strong will to become the world’s leading steelmaker. It can also be viewed as depth, with the vanishing point representing the unlimited future potential of steel as a material. The cobalt blue and sky blue color palette represents innovation and reliability.