Steps toward Building an Environmentally Advanced Steel Works

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As a steelmaker, NKK has continually taken advanced environmental measures based on the recognition that environmental preservation is one of the most important issues for society. This paper introduces the results of past environmental activities as well as various measures and technologies NKK is currently developing in order to mitigate new environmental problems such as global warming.

1. Introduction

The Japanese steel industry has continued to meet the increasing demand for steel, both quantitatively and qualitatively, ever since the reconstruction era following World War II and throughout the country's period of high economic growth. The company has continued to respond to social needs by actively promoting the cost reduction in production systems through the oil crises, yen appreciation, and economic depressions.

While pursuing its industrial activities, one of the most important responsibilities of any manufacturer with regard to society is environmental protection. Current environmental problems have many facets, from local issues such as air and water quality to wider ones of waste recycling, and further afield to global problems caused by humankind's daily activities worldwide which lead to ozone layer depletion and global warming. The detrimental effects on the ecology caused by various artificial chemical substances are gradually surfacing, for example problems caused by endocrine disrupters.

NKK has always maintained keen sensitivity to societal changes. The company has continued to develop the required technologies in a timely manner and contributed to the progress of society. NKK intends carrying out its business activities in harmony with society, fully utilizing its potential.

This paper introduces those environmental activities carried out to date based on the above philosophy at NKK's steel works, as well as the future development of technology designed to mitigate the environmental problems society is currently facing and will face in future.

2. Promoting energy saving

In response to society's energy-saving needs, intensified by the two oil crises, NKK has actively promoted energy-saving activities, in which all the employees, working at the company's steel works, have participated. **Fig.1** shows the energy-saving activities carried out at the Keihin and Fukuyama Works, and the cumulative energy-saving effect achieved to date at the Fukuyama Works, which reduced energy consumption rate by 45% from 1973 to 2000. During the same period, there were factors that worked to increase energy consumption, for example, the production of more energy-intensive, high-quality products increased, and strengthened environmental measures themselves tended to increase energy consumption. Therefore, the amount of energy saving achieved per ton of crude steel production was approximately 20%[1].

In retrospect, the era since the first oil crisis in 1973 to today, can be divided into four periods according to the main types of energy-saving activities carried out.

(1) The 1st period (1973 to 1978)

Energy was saved mainly by improving operational methods such as reducing the fuel ratio for operating blast furnaces, controlling the air-fuel ratio for operating reheating furnaces, and hot charging the reheating furnaces.

(2) The 2nd period (1979 to 1985)

During this period, large-scale waste heat recovery equipment such as TRT (Top-pressure Recovery Turbine) at blast furnaces, waste heat recovery boilers at sintering coolers, and CDQ (Coke Dry Quenching) at coke ovens were introduced to save energy. NKK is the only steelmaker in the world that has equipped all of its blast furnaces, sintering machines, and coke ovens with waste heat recovery systems.

(3) The 3rd period (1986 to 1994)

Energy saving was achieved mainly by making the production processes continuous or eliminating some of the

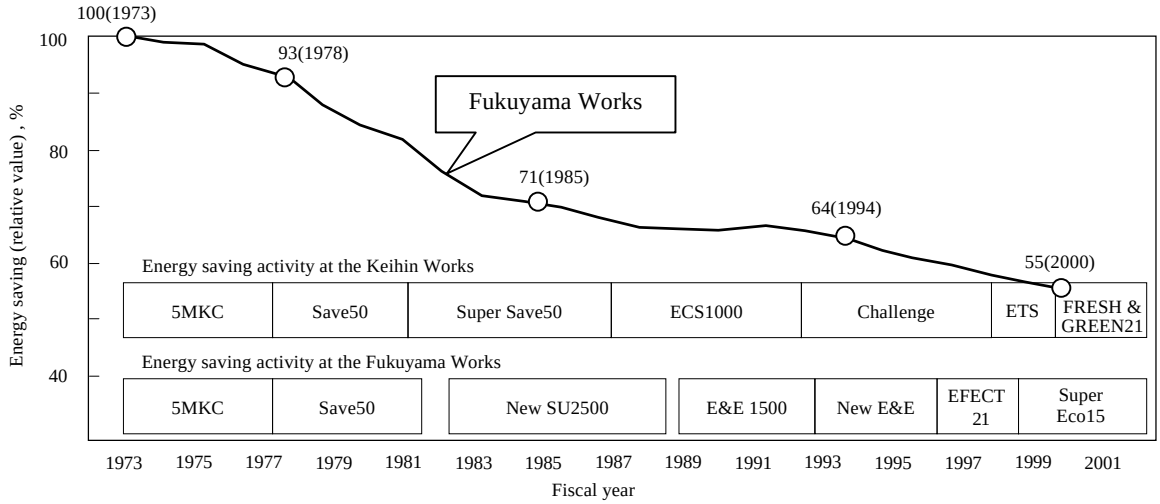

Fig.1 History of NKK's energy-saving activities

processes as represented by continuous casters and continuous annealing lines. Energy was also saved by such measures as: PCI (Pulverized Coal Injection) to blast furnaces; VVVF (Variable Voltage Variable Frequency) control; advanced oxygen production plant; combined cycle power generation; and effective use of energy equipment through centralized energy control.

(4) The 4th period (1995 to today)

With increasing concern over the global warming problem, the target was shifted from energy saving to CO_2 reduction, and new technological development was promoted based on viewpoints different from those in the past such as environmentally-friendly production technologies and waste recycling technologies. Efforts were also made to identify the seeds of new technological development.

Typical technologies developed and put into practice during this period are utilizing waste plastics at blast furnaces as an alternative and iron ore reducing agent; and an environmentally-friendly regenerative burner heating system that achieves highly efficient waste heat recovery, and ultra-low NOx combustion, using ceramic honeycomb regenerators. The results of these activities were reported at the National Energy Saving Conference held by the Energy Conservation Center of Japan[2]. **Table 1** lists the titles of researches that were reported at this conference over recent years and won awards. In particular, since COP3, technological development has been focused on the environment and energy. NKK has been awarded the MITI (Ministry of International Trade and Industry) Minister's Award for four years in a row, from 1997 to 2000.

Table 1 Titles of award-winning papers presented at the energy saving conference (◎:MITI Minister's Award)

Year		Title
1985		Measures of increase of recovering steam in sintering factory
1986		Improvement of steam saving of No.2 degassing plant in refinement process
1987		Energy saving by removing the scale of the slab
1989		Improvement of power saving of basement fan in batch-type annealing oven
1989		Reduction of high pressure air consumption of sensors
1990		Augment of productivity of cokes at CDQ plant
1990		Energy saving in middle diameter seamless pipe mill
1991		Reduction of electric power consumption in an industry-owned thermal power plant
1991	◎	Reduction of heating energy of furnace in hot strip mill
1992		Total energy saving by reducing scale loss in butt-welded pipe mill
1993	◎	Advanced utilization of low temperature un-used waste heat from sintered ore cooler
1994		Cost reduction by the improvement of drying burner for blast furnace PCI
1995		Development of optimal pressure control system for power saving of air compressor
1996		Improvement of power saving at No.1 CGL
1997	◎	Application of regenerative burner to EF ladle heating
1998	◎	Development of regenerative burner heating system and application to large scale reheating furnace
1999	◎	Development of measuring method of hot metal temperature at blast furnace tapping hole
2000	◎	The technology utilizing waste plastic as BF material
2001		Development of environmentally-friendly steel-making process by zero-slag operation in BOF

3. Promoting environmental conservation

3.1 Activities and results to date

3.1.1 Environmental measures and results at steel works

Associated with the rapid economic growth after World War II, environmental pollution became a serious social problem in Japan. This was particularly so after the period of high economic growth in the 1960's. In response, starting with the Basic Law for Pollution Control enacted in 1967, the Japanese government established a series of environmental laws, including the Air Pollution Control Law, and intensified measures associated with environmental conservation.

During the 1960's, local governments also started to implement environmental measures enacting ordinances that were sometimes more stringent than the national laws and regulations, such as the Pollution Control Ordinance enacted in 1951 by the government of Kanagawa Prefecture, which incidentally is the birthplace of NKK.

In response to these changes, NKK promoted cooperation with both national and local governments by implementing their policies, and actively pushed forward those activities that would eradicate pollution and meet environmental standards under the pollution control agreements with local authorities.

To date, NKK has invested a total of 400 billion yen in environmental equipment throughout the company. In particular, a revolutionary environmentally-friendly, urban steel work was completed in 1976 in the Ogishima area adjacent to the Keihin Works, replacing obsolete equipment in the old area. In this replacement project, thorough environmental measures were taken based on the new environmental technologies developed by the company, and modern environmental management systems were incorporated.

As shown in **Fig.2**, SOx emissions were reduced to about one-fourth of 1973 levels by measures such as conversion to low-sulfur fuels and installation of the world's first, highly efficient flue gas desulfurization equipment using the unique ammonia sulfide method developed under the initiative of the company.

In order to reduce NOx emissions, sintering flue gas denitrification equipment was installed. This technology, also developed in-house, decomposes NOx into nitrogen and water by using an iron ore catalyst. As a result of this installation, NOx emissions were reduced by more than 40% from 1978 pre-installation levels. Please see **Fig.3** for the transition.

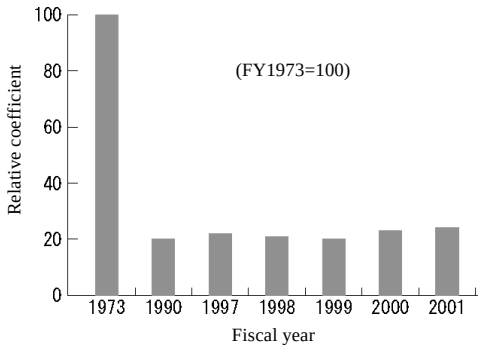

Fig.2 Transition of SOx emissions

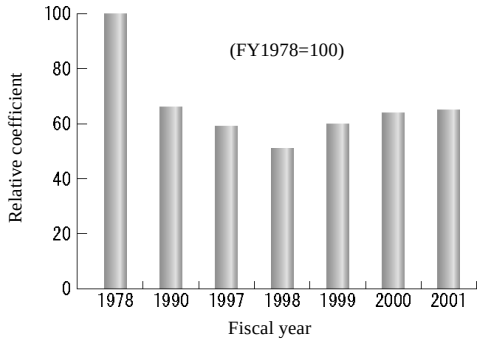

Fig.3 Transition of NOx emissions

Dust generation was suppressed by water spraying on iron ore and other raw materials held in the storage yards, as well as tight sealing of the conveyer connections. High-performance dust collectors were also installed at the sintering machines, coke ovens, blast furnaces, and steelmaking converters. As a result, dust generation was reduced to about one-fourth of the levels before the Ogishima replacement project was completed.

More than 90% of the water used in NKK's steel works is recirculated. Before recirculated or discharged from the works, wastewater is thoroughly treated in accordance with its properties. Pollutants are completely removed. The COD value, an index of organic water pollution, was reduced to about one half of the levels before the Ogishima replacement project was completed.

Once industrial pollution control measures for reducing the release of environmental pollutants were fully in place, society's concern began to shift to urban-type or daily-life-related pollution. The environmental measures at the steel works also shifted to further reduction in the release of environmental pollutants, and reduction in noise and visible smoke.

In response to social requirements, NKK has successively established new environmental goals, in consultation with local authorities, promoted technological development, and introduced new equipment for substantially reducing pollutant emissions. Further, the company has promoted communication with local communities, and encouraged its employees' voluntary activities such as cleaning of public roads and rivers.

3.1.2 Environmental management activities

In order to support these environmental conservation activities, NKK began establishing internal environmental management regulations in the early 1970's. ISO14001, an international standard on environmental management systems, was published in September 1996. The Keihin Works acquired the ISO certification soon after in May 1997. The Fukuyama Works followed suit by acquiring certification in March 1998. Since then, each steel work has continually promoted voluntary environmental management activities.

In-house certified experts experienced in environmental and energy management internally audit these activities. The secretariat office for environmental management activities at each steel work is audited by the company's head office staff as well as external auditors in order to obtain a highly transparent evaluation. These environmental auditing procedures are finalized by external auditing by certifying organizations.

3.2 Other activities designed to reduce the environmental effect

In recent years, social concern is increasing in terms of harmful chemical substances. Those include substances that deplete the ozone layer or cause global warming, carcinogenic substances such as chlorine-based organic substances and dioxins, and air-polluting substances. Two laws concerning these substances were recently enacted in rapid succession: the Law Concerning Special Measures against Dioxins in January 2000 and the PRTR Law in March 2000.

NKK is constantly promoting measures for suppressing the release of dioxins. These measures include modifying equipment such as incinerating furnaces, electric furnaces, and sintering machines.

With regard to other chemical substances, measures are being taken on a daily basis to reduce their release into the environment. The chemical substances designated by the PRTR Law are handled under strict control in accordance with the legal requirements. The government of Kanagawa Prefecture, in which the Keihin Works is located, implemented its policy of suppressing the release of specific chemical substances under the Provisional Guideline for Environmental Measures at Locations of High-tech Industries, in February 1990. This move was 10 years before the implementation of the PRTR Law by the national government. This provisional guideline was later modified and officially put into practice in March 1991 as the Guideline for Environmental Safety Management of Chemical Substances. Since that time, the internal management system, in line with this guideline, has been established in the Keihin Works for managing designated chemical substances and collecting data on the amounts being used in the works and the amounts released into the environment. Later, when the Keihin Works was requested by the national government to be one of pilot project sites for refining the details of the legal system in preparation of the official enactment of the PRTR Law, the Works was able to respond to the request promptly, and chemical substances were placed under strict management systems with a view to the future.

3.3 Dealing with information disclosure

The company's environmental information is made public through the annual publication of environmental reports and the company's home page. Individual external communication is handled in accordance with ISO14001 requirements. Furthermore, an environmental accounting system is being established. This system will help expand the scope, and improve the quality of information that is to be disclosed to the public.

4. Dealing with resource recycling

4.1 Activities for resource saving and recycling at steel works and results

4.1.1 Zero waste activities and results

NKK's Keihin Works has been actively promoting voluntary activities for resource saving and recycling aimed at minimizing the final disposal amount of wastes. These activities were highly valued by society as represented by the fact that in 1986, the company received the MITI Minister's Award in the program operated by the Clean Japan Center for commending excellent resource recycling technology. The activities are continuing. In fiscal 2001, the amounts of by-products that were not recycled and finally disposed of by landfilling, were only about 0.7% of the total generated by the iron and steel making process. In other words, the resource-recycling rate was more than 99%.

NKK achieved the high by-product recycling rate of 98.7% as early as 1990. In the following year, 1991, the recycling rate reached 99%. Ever since then, the rate has been maintained at levels exceeding 99%. The recycling rates of major by-products in 2000 are shown in **Table 2**.

Table 2 Actual results of by-product recycling

	Amount (kt/y)	Ratio (%)	Landfill (kt/y)	Recycling ratio (%)
Slag	6191	78.4	19	99.7
Dust	1308	16.6	0	100.0
Sludge	321	4.1	21	93.3
Others	80	1.0	12	85.6
Total	7900	100.0	52	99.3

4.1.2 Dealing with water recycling

Iron and steel production consumes huge amounts of water, and wastewater with varieties of properties is generated from each production process. The wastewater is properly treated in accordance with its properties, and recirculated for use in permissible applications based on purity by cascading or recirculating in order to minimize the volume of water discharged from the mills. Both of NKK's two steel works, Keihin and Fukuyama, have maintained a water recirculation ratio of more than 90% since 1976 as shown in **Fig.4**.

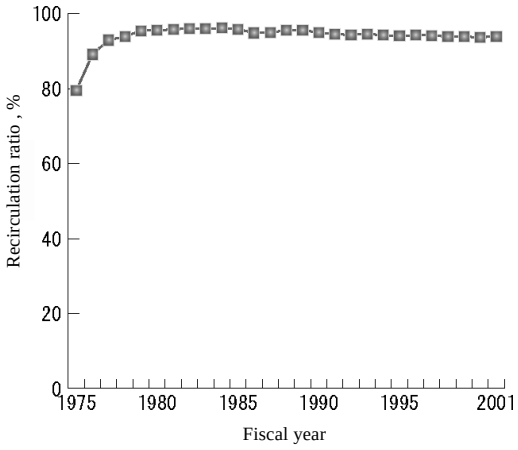

Fig.4 Transition of water recirculation ratio at the steel works

4.2 Waste plastics

Waste plastics generated from industrial, commercial, and residential sources in Japan amounted to approximately 9.5 million tons in 1997, of which approximately 4 million tons, or 42% of the total, was effectively recycled. The Waste Containers and Packaging Recycling Law was enacted in April 2000 to increase the waste plastic recycling rate.

In April 2001, the Electrical Appliances Recycling Law was fully enforced. Thus, the legal framework for promoting the recycling of waste plastics is gradually being established.

NKK was successful in developing techniques for recycling waste plastics as blast furnace injection. Waste plastics are used as a reducing agent of iron ore instead of coke or pulverized coal.

Blast furnace injection of waste plastics began in October 1996 using waste plastics from industrial sources. In response to the full implementation of the Waste Containers and Packaging Recycling Law in April 2000, further capital investment was made at both the Keihin and Fukuyama Works. These Works now have the combined capability of recycling 150000 tons of waste plastics per year.

5. Dealing with global warming prevention (CO_2 reduction)

5.1 Outline of Kyoto Protocol and measures taken by Japan

(1) Outline of Kyoto Protocol

In December 1997, COP3 was held in Kyoto and adopted the Kyoto Protocol defining the first international goal for reducing GHG (Greenhouse Gas) emissions (six substances including CO_2) believed to cause global warming. For Japan, the Kyoto Protocol set the national target of 6% reduction in GHG emissions by 2010, down from the 1990 level. **Table 3** shows the reduction target for each country.

Table 3 Numerical target for reducing GHG emissions for each country

Nation	Kyoto target (base 1990)
Japan	Δ6%
Canada	Δ6%
USA	Δ7%
EU	Δ8%
Australia	+8%
Norway	+1%
NZ	±0%
Russia	±0%
Ukraine	±0%

These targets will come into effect when the Kyoto Protocol is ratified by more than 55 countries and also when the CO_2 emissions of ratified countries sum up to more than 55% of total emissions from 41 countries listed in Annex I.

Heated debate has occurred on the Protocol at the United Nations Johannesburg Summit held in September 2002, and in the end, its enforcement was postponed due to the delay in Russian ratification and other reasons.

(2) Measures taken by Japan

Japan is developing domestic legal systems in preparation of the enforcement of the Kyoto Protocol. In March 2002, the Guideline for Measures to Prevent Global Warming was adopted by a cabinet meeting. Further, the Law for Promoting Measures to Prevent Global Warming and the Law for Ratifying the Kyoto Protocol were enacted in June 2002.

Table 4 summarizes the principal policy expressed in the Guideline for Measures to Prevent Global Warming for achieving a 6% reduction. The reduction target for CO_2 from energy is set at zero with regard to the 1990 level, but the target for the industrial sector is a 7% reduction.

Table 4 Principals for global warming prevention

Curtailment ratio	Item
Δ 2.5%	CO_2, Methane, CO (1) ±0% : CO_2 from energy origin (2) Δ 0.5% : Methane, CO, from waste (3) Δ 2% : ・Development of innovative environmental and energy technologies ・Efforts of people
+2%	Substitute chlorofluoro carbon (HFC, PFC, SF6)
Δ 3.7%	CO_2 sinks, such as afforestation
Δ 1.8%	Practical use of Kyoto mechanism

In the new scheme, the period from now to the start of first commitment period of 2008 to 2012 will be divided in two steps. For the time being, mainly voluntary measures will be promoted. The introduction of new measures will be studied in light of progress made.

5.2 Measures taken by Japanese steel industry

The Japan Iron and Steel Federation adopted the Voluntary Action Program in 1996 that systematically promotes energy saving in the Japanese steel industry by targeting a 10% reduction of energy consumption by 2010, down from the 1990 level. Further, 1.5% was added to the reduction target making the total to be 11.5%. The added 1.5% is expected to be achieved by utilizing 1 million tons of waste plastics into blast furnaces and coke ovens.

This Voluntary Action Program has achieved about 6% reduction in energy consumption over the past ten years. In addition to direct energy saving by the steel industry through such means as waste plastics utilization, the development of new steel products such as high strength steel sheets and electrical steel sheets contributes to society's energy saving. The transfer of energy-saving technologies to developing countries also contributes to worldwide energy saving. The energy savings achieved by these indirect measures are almost equal in magnitude to those achieved directly in the iron and steel making process. The energy-saving measures being continually undertaken by the energy-intensive steel industry are returning steady results both within and outside the industry as shown in **Fig.5**.

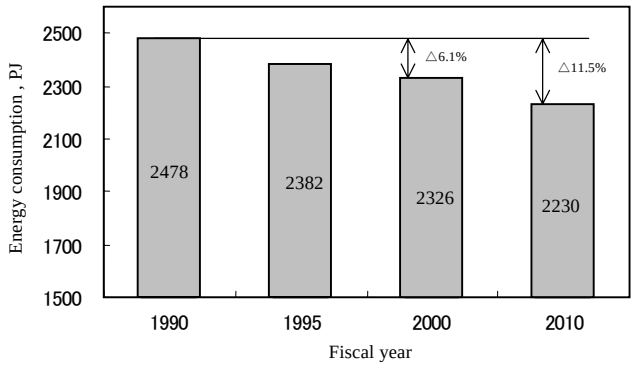

Fig.5 Transition of energy consumption

5.3 NKK's activities for dealing with global warming

(1) Basic philosophy

In order to deal with the environmental problems across the company, NKK clearly defined its corporate philosophy and policy as NKK's Environmental Charter, and established the Corporate Environmental Committee chaired by the President, along with three subcommittees. The NKK Group Environmental Liaison Committee was also formed in order to expand the activities to the companies within the NKK Group and to exercise the Group's collective strength in addressing environmental issues.

"NKK's Environmental Charter"

・Environmental Philosophy

NKK upholds a corporate philosophy that emphasizes the creation of rich and rewarding human environments through building of industry- and people-oriented infrastructures. Toward this end, NKK is committed to promoting business activities that contribute to the establishment of a society that is in harmony with the environment.

・Environmental Policy
(a) Environmental Management Systems
(b) Environmental Protection
(c) Energy and Resource Conservation and Resource Recycling
(d) Coexistence with Society
(e) International Cooperation

In the 1970's, NKK established a system of mutual cooperation and information exchange between its individual works in order to facilitate quick responses to environmental issues across the company.

(2) Dealing with global warming

The majority of NKK's energy consumption is coal-based. Energy consumption needs to be curtailed in order to reduce GHG emissions. The most effective way is to reduce energy consumption in the production processes, and activities have been promoted toward this end.

The energy-saving measures implemented to date have brought about impressive results. It is expected that in the near future, revolutionary new iron and steel making processes will be developed such as the direct iron ore smelting reduction process, next-generation coke making process, massive scrap melting technology, and partial reduction sintering process. These new technologies, currently under development, are likely to make a substantial contribution to energy saving and thus to global warming prevention.

NKK's contributions to global warming prevention are not limited to these types of direct energy saving in the production processes. The company is also active in developing ecological steel products that save energy while used by customers, thus indirectly contributing to energy saving. Examples of these products are: high strength automotive steel sheets, coated automotive steel sheets; high-performance electrical steel sheets; high strength structural steel sections; and high strength shipbuilding steel plates.

In its recent follow-up report on the Voluntary Action Program by the Japanese steelmakers, the Japan Iron and Steel Federation announced the result of its trial calculation that the contributions to society made through these ecological steel products may possibly far exceed 5% of the energy consumption by the entire Japanese steel industry.

Steel products are basic materials that must meet the needs of society and as such, it is our mission to continually undergo progress in order to contribute to the global environment.

Furthermore, the technologies and knowledge accumulated through iron and steel making will contribute to reduce GHG emissions across the entire society. Examples are: the environmentally-friendly regenerative burner system that can significantly improve heating furnace thermal efficiency; highly functional ecological steel products; waste plastics injection to blast furnace; DME as a new energy source; wind power generation systems, and fuel cell power generation systems. All of these developments can contribute to society in a variety of fields.

Also, the transfer to overseas countries of excellent technologies such as highly efficient iron and steel making equipment will contribute to international improvement in energy use efficiency.

As a company that possesses these leading-edge technologies, NKK believes that it is responsible to promulgate these worldwide in order to mitigate the global warming problems of concern to every country.

6. Future measures

6.1 Technology for preventing global warming

As indicated in the section on energy saving measures at steel works, it is necessary to identify new technological themes from viewpoints different from those used in the past and develop these new initiatives for furthering energy-saving measures. The development focus needs to shift from quantitative energy-saving to qualitative improvement of energy use efficiency. For example, technology that needs to be developed in the future includes a method of supplying energy that has the particular properties (calorific value or temperature) customized to specific energy use, as well as a method of recovering waste heat without degrading energy quality. Production processes need to be more compact, streamlined, and simpler. In some cases, a single process may need to be functionally separated; an upstream process may need to be added in order to perform thorough preliminary treatment, thus reducing the load on the subsequent process. These unique technological developments must be continually promoted and upgraded incrementally.

Some examples of the new technologies are introduced below in light of the points focused on in their developments, potential applications, and future expectations.

(1) Environmentally-friendly regenerative burner system[3),4)]

Conventional methods of recovering heat from high-temperature waste energy need to be reviewed in order to raise the heat recovery efficiency to maximum lev-

els and to use recovered heat directly in its own process. The environmentally-friendly regenerative burner system mentioned earlier has the potential of achieving these objectives. This system can recover heat as pre-heated air at a temperature of more than 1250°C from waste gas of 1300°C. NKK has installed 11 systems to date, achieving energy savings of about 30% and reducing NOx emissions by more than 50%. This technology is gathering attention not only in Japan but also from overseas, particularly in European countries, as a means of preventing global warming by reducing CO_2 emissions and acid rain through the reduction of NOx emissions.

(2) Low-temperature waste energy recovery system

Technological development is underway aimed at achieving the cascading use of low-temperature waste energy with temperatures below 100°C in residential and commercial applications. This is particularly intended to meet increasing air conditioning demand. In order to achieve these objectives, NKK has developed a high-density latent heat air conditioning system that uses hydrate slurry with a melting point in the temperature range of 5 to 12°C typically applied in air conditioning. This newly developed hydrate slurry has a latent heat in the same temperature range (5 to 12°C) as cold water used in conventional air conditioning systems. Its large thermal density allows the flow rate to be reduced to less than half that of the cold-water system. Thus, the pumping power requirement is reduced by up to one-fifth. It can also store heat of two to four times of the amount that can be stored by the cold-water system. In total, up to 50% electric power is saved as compared to conventional air conditioning systems. This system is currently undergoing experimental operation in the Energy Center at the Keihin Works providing air conditioning to a room with 1700 m^2 floor area. NKK plans to market this technology in 2003.

(3) From sensible to latent heat recovery

In future, new technology needs to be developed for producing H_2 from waste timber and waste plastics. Technological development for producing H_2 using sensible heat discharged from the iron making process (coke oven gas) was recently given national project status.

(4) Large-scale new technologies with great potential

This technology category includes revolutionary iron and steel making processes such as: (a) the direct iron ore smelting reduction process that simplifies the iron making process allowing a 5 to 10% reduction in CO_2 emissions; (b) the next-generation coke making process that increases coke oven productivity by 300% and allows 20% savings of coke making energy, while at the same time reducing CO_2 emissions; (c) the new steel making process that uses massive amounts of scrap and allows about 40% reduction of reducing energy by cutting the energy consumed for removing impurities; and (d) the partial reduction sintering process that is being developed based on a completely new idea aiming at a 10% reduction of energy, while reducing CO_2 emissions at the same time, and recently given national project status. Certain types of large-scale technological development need to be promoted in cooperation with other industries such as machinery manufacturers. One example is the technology needed for improving the efficiency of gas turbines using coal-based by-product gas to a level comparable to natural-gas-firing gas turbines that have recently demonstrated dramatic improvements in efficiency. Another example is the technology for achieving a substantial improvement in production efficiency of oxygen, a gas indispensable for iron and steel making

6.2 Towards a recycling-oriented society (Core technology for community networks)

The steel industry has a large technological and knowledge base potentially useful for the establishment of a recycling-oriented society. These include technologies for high-temperature heat treatment, as well as those for the efficient production and use of various utilities. Iron and steel making inherently consumes large amounts of energy due to the high-temperature reactions and treatments required in the processes such as the iron ore reducing reaction. The Japanese steel industry lacks indigenous natural resources in its own country and thus has actively promoted energy and resource conserving activities by such means as recycling and cascading use. These activities have not been limited to steel works, and have expanded into other areas. The steel works are now positioned as the regional centers for recycling resources and energy. NKK established the Environmental Solutions Center for promoting environmental businesses and began the comprehensive recycling business for promoting resource recycling.

These developments and activities will contribute not only to the progress of the steel industry but also to improving the quality of society as a whole by mitigating global warming, acid rain, and other environmental problems. Please refer to **Fig.6** for the image of total energy & material control[5].

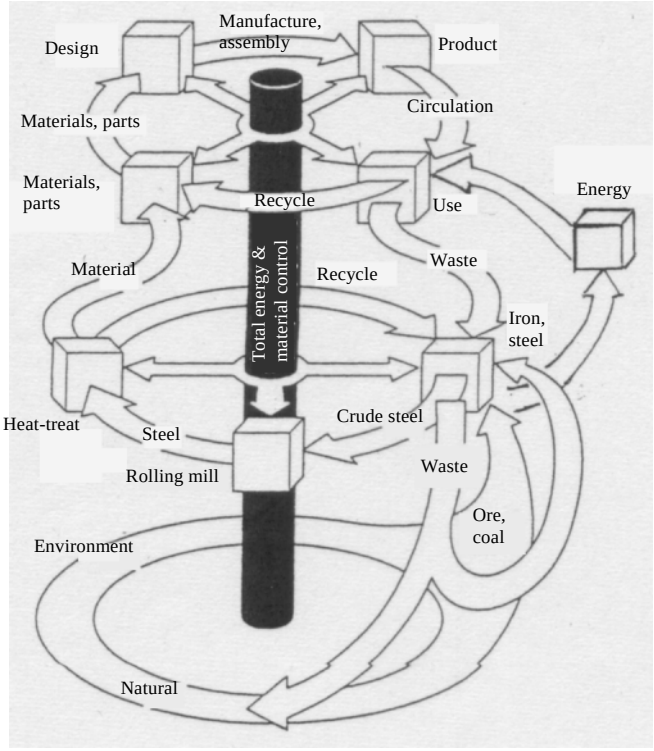

Fig.6 Image of total energy & material control

7. Conclusions

Japan made dramatic progress after World War II, and became one of the most highly industrialized countries in the world, completing the economic system that is based on mass production, mass consumption, and mass disposal. As a result, it has become a society that embraces various problems including those of an environmental nature. Many of these problems cannot be countered by the conventional social systems. The entire society needs to tackle these problems by establishing new systems.

NKK has positioned its steel works as centers of regional networks for recycling energy and resources and intends to further cultivate the high potential of such technologies and knowledge accumulated within the company. As a member of society, NKK will endeavor to establish new social systems and to contribute to finding solutions for problems society is facing.

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