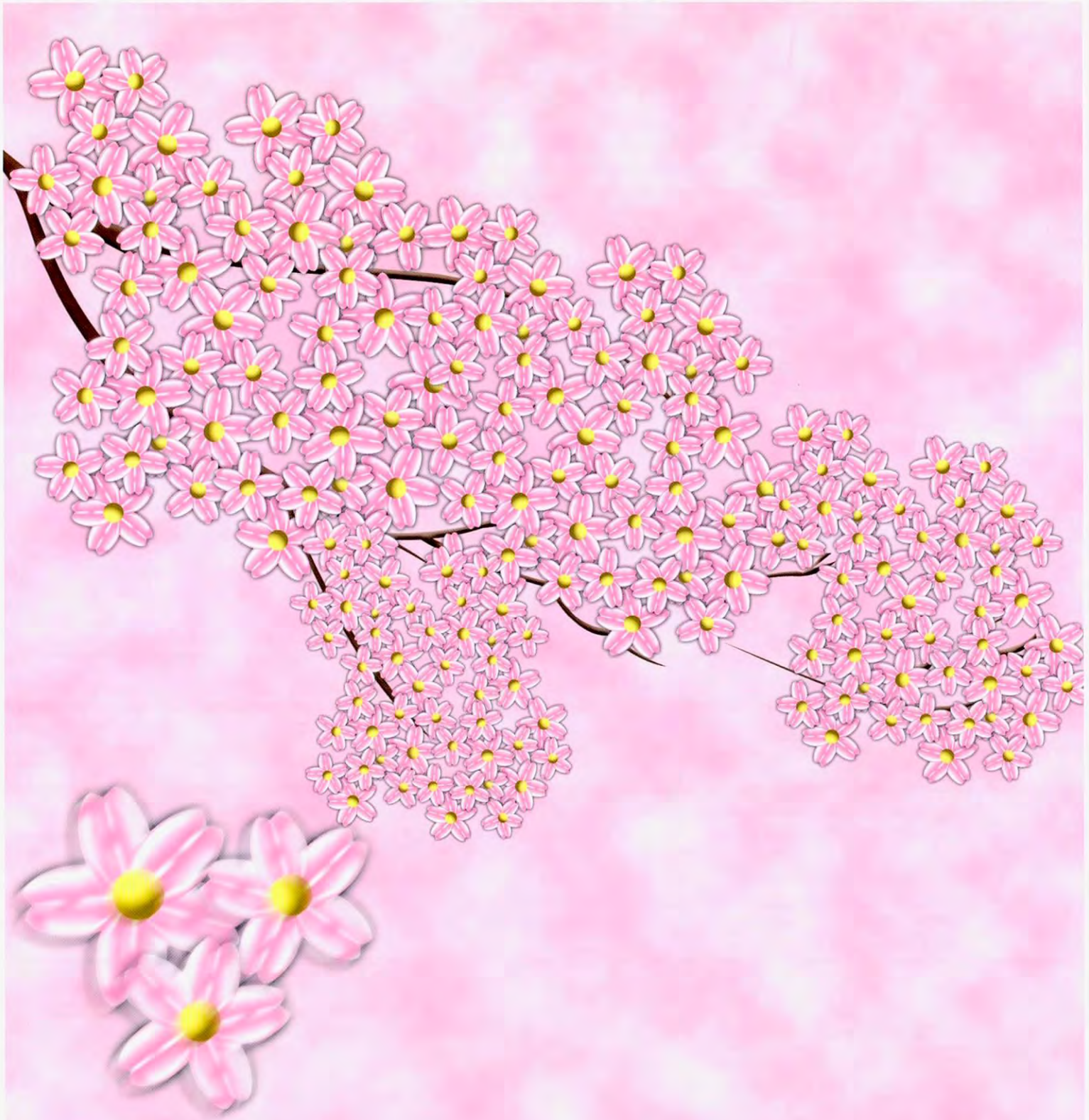
INTERNATIONAL CENTER FOR ENVIRONMENTAL TECHNOLOGY TRANSFER



ICETT NEWS

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ICETT Celebrates its 10th Anniversary with a Grand Ceremony

Taking its first steps into the 21st century, ICETT looks back on 10 years of accomplishments.

On October 19, 2000, ICETT celebrated its 10th anniversary at Yokkaichi Civic Hall in Mie prefecture. The theme of the celebration was "Toward the Future — People, the Earth and ICETT". The ceremony was organized jointly with the Mie Prefectural Government, the Yokkaichi Municipal Government, and the Aeon Group Environment Foundation. Support was provided by the Ministry of International Trade and Industry and the Japan International Cooperation Agency (JICA).

At the commemoration ceremony, ICETT presented certificates of appreciation and hosted a panel discussion on the theme "International Environmental Cooperation Towards 21th Century". Through sincere global discussion, ICETT impressed the guests and others of its achievements and significance.

Presentation of certificates of appreciation

In the second half of the ceremony, attorney Kohei Nakabo delivered a commemorative speech titled "Environmental Issues on Teshima Island." He delivered a powerful message to the 1,500 persons in attendance.

Mr. Kohei Abe, Chairman of the Board of Directors

At the beginning of the ceremony, Mr. Kohei Abe, Chairman of the Board of Directors, delivered a message in which he stated, "Having evaluated the projects it has implemented over the past decade, ICETT would like to mark a new beginning as it carries forward its activities into the 21st century." Mr. Masayasu Kitagawa, Chairman of the Executive Board and Governor of Mie prefecture, next presented his message as an organizer. He was followed by Mr. Yuzo Ichikawa, Director-General of the Chubu Bureau of International Trade and Industry, who delivered a congratulatory message on behalf of the honored guests.

Mr. Masayasu Kitagawa, Chairman of the Executive Board

ICETT then presented certificates of appreciation to 32 individuals, organizations, and corporations as a way of expressing its sincere gratitude for the tremendous support and cooperation they have provided to ICETT through various projects.

Mr. Yuzo Ichikawa Director-General of the Chubu Bureau of International Trade and Industry

Panel Discussion

Theme: "International Environmental Cooperation Towards 21st Century"

Coordinator:

Dr. Takashi Ibusuki, Director, Atmospheric Environment Protection Dept., National Institute for Resources and Environment

Panelists:

Mr. Dewo Putranto, Head of the Asian Cooperation Division, Bureau for Bilateral Foreign Cooperation, National Development Planning Agency, Republic of Indonesia
Ms. Angelina Cantimbuhan, Municipal Planning and Development Coordinator, Municipality of Imus, the Philippines
Mrs. Kasemsri Homchean, Manager, Map Ta Punt Industrial Estate Office, Thailand
Mr. Takanori Kitamura, Managing Director, Planning and Evaluation Department, JICA
Mr. Koshin Kura, Executive Director, ICETT

Panel Discussion

At the panel discussion, a variety of opinions were raised from different perspectives regarding the ideal vision of international environmental cooperation in the 21st century, the role ICETT should play, and ICETT's potential.

Mr. Koshin Kura

First, Executive Director Kura addressed ICETT's recent activities, saying, "During the past 10 years, ICETT has implemented training

programs for 2,300 persons. In recent years, working jointly with people in developing nations, we have been tackling the development of technologies targeting global warming and developing nations. We have done this in addition to providing the advantage of our experience overcoming the so-called Yokkaichi Pollution."


Mr. Dewo Putranto

Mr. Putranto added, "Indonesia is planning to resolve the environmental destruction taking place in all parts of the nation over a five-year period beginning in 2001. ICETT has supported us with training and seminars on how to manage the environment."

Ms. Cantimbuhan announced that "We are laying down environmental code and action plans to resolve the problems in the municipality of Imus near Manila, which has a population of about 240,000.


Ms. Angelina Cantimbuhan

Mrs. Homechean also commented, saying, "Although the petrochemical industry developing in Thailand has triggered a situation similar to that of Yokkaichi, the technologies transferred from ICETT worked very well to resolve the issue."


Mrs. Kasemsri Homchean

Panelists fom overseas emphasized the importance of the role of ICETT in resolving environmental problems in developing nations. Mr. Kitamura pointed out the task of ICETT, saying, "The great challenge for ICETT is determining how to provide its experience, technology, and expertise most effectively."


Mr. Takanori Kitamura

Dr. Ibusuki wrapped up this active discussion by saying, "We are concluding the discussion with expectations for the further progress of ICETT in the 21st century."


Dr. Takashi Ibusuki

Commemorative Speech

Environmental Issues on Teshima Island

Mr. Kohei Nakabo, Attorney-at-law


Mr. Kohei Nakabo, Attorny-at-law

In the second half of the event, following the opening speech by Mr. Tetsuo Inoue, Vice Chairman of the Executive Board and Mayor of Yokkaichi, the following speech was delivered by Mr. Kohei Nakabo, Attorney-at-law. Mr. Nakabo was involved in a significant effort to settle the Teshima Case, in which people living on Teshima Island suffered from a serious problem with industrial waste.


Mr. Tetsuo Inoue, Vice Chairman of the Executive Board

"Teshima is a small island located in the Seto Inland Sea. It has a population of less than 1,600. From 1983 through 1990, an enormous amount of industrial waste was dumped there illegally.This incident reveals the large flows of capitalism that lead to mass production, mass consumption, and mass disposal. This issue also demonstrated the basic stance of the government. I was enraged not only at the contamination of the island by the illegal acts of industrial waste handlers, but also at the Kagawa Prefectural Government for ignoring the residents as a result.

"This is not an issue unique to Teshima; it is relevant to all of us. We see the same problems in all parts of the country. It seems that the world is in chaos and that the black smoke of ego has blanketed the nation. However, we must have the power to blow away this smoke. To maintain hope for tomorrow, we must stand up and act even when there is little prospect of succeeding.

"The treatment of 500,000 metric tons of industrial waste and the remnant dumped on Teshima Island has been decided. In June 2000, the Governor of Kagawa visited the island to issue an apology. The residents and the government have reached a final agreement. The waste will be removed in 10 years. I sincerely expect you to recognize again that you must protect the environment, and that you should now re-examine your alternatives on your own."

Following Mr. Nakabo's speech, the 10th anniversary ceremony concluded with a closing speech by Mr. Takuya Okada, Chairman of the Board of Directors of the Aeon Group Environment Foundation.


Mr. Takuya Okada, Chairman of the Board of Directors of the Aeon Group Environment Foundation

Surveys for the Development of Master Plans for Industrial Pollution Control in Vietnam (Wastewater)

Introduction

Vietnam is an agricultural nation with fertile land and abundant natural resources. About 80% of its population of 80 million lives in villages, where they are engaged in agriculture and related industries. The country has a land area of about 332,000 square kilometers, which is about 80% the size of Japan. It is bordered to the north by China, and to the west by Laos and Cambodia. This S-shaped country extends 1650 kilometers from north to south along the South China Sea, occupying most of the eastern coast of Indochina. The northern area, with the capital Hanoi, is visited by the four seasons, while the southern area and Ho Chi Minh City (Saigon) belong to the tropical zone, which is characterized by the dry and rainy seasons. Vietnam's people, who are socialist and 90% of whom are Buddhists, maintain the good social customs of working diligently from early in the morning and taking care of their families. It is generally said that Vietnamese people are serious and polite and they are known as tenacious and tough negotiators.

Historically, Vietnam has experienced many wars and domination by other races. In particular, the decade-long Vietnam War, which ended in 1975, continues to affect this seemingly rich land, the national economy and the industrial infrastructure, even though the nation won the war. In 1986, Vietnam began transforming its economy into a market-oriented one under its *Doi Moi* (innovation) policy focusing on economic development. Vietnam maintained high growth rates during the 1990s as a nation, and was one of the most vibrant economies of Southeast Asia.

1. Outline of the Surveys

At the request of the Japan International Cooperation Agency (JICA), ICETT undertook the "Surveys for Master Plans for Industrial Pollution Control in Vietnam (Wastewater)" from October 1999, and completed all the processes by submitting the final report and related documents in October 2000.

Through a series of surveys, we investigated the state of environmental pollution caused by expanding industrial activities; the pollution control measures implemented; production processes in five industries; and industrial productivity. We also examined the principles and policies taken by the Vietnamese government as well as the trends in the institutions involved. From these results, we prepared drafts of the master plans necessary for pollution control measures, mainly for wastewater, to be implemented by the national government.

2. Backgrounds and Purposes

Since the late 1980s, Vietnam has focused on economic development under its *Doi Moi* policy of introducing a market economy and a policy of sequential market opening. However, pollution of rivers and canals as well as air pollution are serious because, since World War II, the country has been expanding its industries mainly through manufacturing processes using outdated production equipment.

Although the Vietnamese economy grew to its highest-ever level in the 1990s, it is still low compared to other nations. Therefore, little investment has been made in pollution control measures.

Considering this situation, we tried to devise measures to reduce environmental costs by improving production processes in order to enhance industrial productivity and by reducing environmental loads discharged as a result of industrial development. In short, we studied the possibility of promoting industrial pollution control measures by implementing cleaner production.

The surveys were conducted to investigate the situation surrounding industrial wastewater and production processes, as well as supply and demand for funds for pollution control measures. The final aim was to prepare drafts of master plans for industrial pollution control.

3. Target Areas and Industries

The surveys were conducted in the northern area surrounding the capital Hanoi, the central area

around the City of Danang, and the southern area surrounding Ho Chi Minh City. We surveyed 104 corporations in five industries in these areas.

Five on-site surveys were implemented as follows. In the second survey, 104 corporations were preliminarily studied, while 23 model corporations were studied in detail in the third survey. A seminar was held in Ho Chi Minh City in the third survey, and workshops on improving productivity were arranged in Hanoi in the fourth survey. In the fifth survey, seminars were conducted in Hanoi and Ho Chi Minh City in order to explain in detail the evaluation of survey results and the measures to take as well as to encourage master planning and its implementation.

Seminar during the third on-site survey (Ho Chi Minh City)

1. First on-site survey (October 27–November 3, 1999)
2. Second on-site survey (November 16–December 20, 1999)
3. Third on-site survey (February 20–March 20, 2000)
4. Fourth on-site survey (June 1–10, 2000)
5. Fifth on-site survey (July 23–August 4, 2000)

These surveys were applied to five industries: textiles, chemicals, pulp and paper, food processing, and metal machining.

4. Method

(1) System and study team

ICETT and Mitsubishi Chemical Engineering Corp. jointly conducted a series of surveys. Headed by ICETT Executive Director Koshin Kura, the mission comprised 15 members: 12 experts, one interpreter, and one coordinator. The Vietnamese counterpart was the Ministry of Industry (MOI). The steering committee in Vietnam comprised 12 members from MOI, the Ministry of Science, Technologiy and Environment (MOSTE), and the Ministry of Planning and Investment (MPI).

(2) Content

1) Factory wastewater

To determine the quality of wastewater, 5-10 samples were collected at each factory. They were analyzed at local institutions not only for COD, BOD and oil but also for phosphorus, nitrogen, heavy metals and other parameter. Contamination was thoroughly investigated, with the source checked at each factory by means of tracking of the production processes and their operating conditions. In addition, the water quality of major rivers was measured to determine the general water environment.

The To Lich River, Hanoi's most contaminated river

2) Factory management

The team conducted interviews with managers and engineers in each factory to collect information on management principles and the condition of pollution control measures, as well as production control and management of equipment maintenance. This revealed problems regarding industrial pollution and competitiveness in Vietnam.

3) Legal regulations

We also obtained information on legal regulations and environmental monitoring in Vietnam from the authorities concerned and from environmental research and testing institutions. This information enabled us to propose future regulations and administrative policies.

Packaging process in the detergent factory

4) Demand for funds

In Vietnamese industry, investment in pollution control measures is hindered by the difficulty of securing funds. The team conducted surveys of the Vietnamese government, international organizations, and financial institutions, in addition to conducting interviews at factories. The information gathered revealed the potential and problems regarding demand for pollution control funds.

5) Productivity improvement

In order to devise concrete measures for improving productivity, we examined productivity by studying the data provided by corporations and the results of interviews, and by checking the equipment.

5. Results of the Surveys

(1) Industry in Vietnam

Although Vietnam's primary industry is agriculture, industrialization has been accelerating since the *Doi Moi* policies were implemented. In general, however, the current level of industrial advancement is equivalent to that of Japan in the 1950s and 1960s. The chemical industry, for example, has not fully launched a petrochemical industry. Little progress has been seen in industrial modernization, introduction of advanced production processes, and maintenance of the industrial infrastructure.

Industrial productivity in Vietnam is significantly below that of developed nations, and still lower than that of the ASEAN countries.

Assembly process in the battery factory

(2) Industrial Wastewater in Vietnam

According to the survey, the wastewater of each industry is, in many cases, improperly or insufficiently treated before being discharged into rivers. Wastewater is treated mainly by primary processes in sedimentation and neutralization tanks only. Few factories employ treatments advanced enough to reduce the environmental load or have sufficient treatment capacities. As a result, water contamination of the rivers is significant. Clearly, any increase in production capacity without an attendant improvement in treatment methods would likely further aggravate environmental pollution in Vietnam.

(3) Industrial Pollution Control Measures in Vietnam

Most of the corporations we surveyed were national in scope. However, the necessary investment for installation of proper wastewater treatment equipment has not been made because the generally low productivity does not generate sufficient profits. Consequently, they have not implemented appropriate pollution control measures for exhaust gas and industrial waste.

Wastewater drainage in the fertilizer factory

(4) Results of On-site Surveys

We conducted preliminary and detailed surveys of corporations in the pulp and paper, chemical, textile, food processing, and metal machining industries. On-site guidance on ways of improving productivity and treating wastewater was also given to some model corporations.

According to the data we obtained through these surveys, wastewater from many factories does not satisfy thewastewater criteria. The surveys also revealed that inefficient production systems resulted in a high unit production cost in spite of the low cost of the labor force. As well, disadvantages in terms of energy and distribution costs reduced the competitiveness of product costs.

Wastewater treatment equipment at pesticide plant

6. Assessment of Industrial Pollution

(1) Problems regarding industrial pollution control

In Vietnamese industry, the pollution control measures taken are not necessarily sufficient. Consequently, most of the pollutants discharged from outdated production equipment are released into the environment. The direct causes are as follows: low production efficiency increases the pollution load of the wastewater discharged; existing wastewater treatment facilities are not fully operational; and the introduction of appropriate wastewater treatment equipment is not promoted. Another fundamental problem is the lack of will to invest in pollution control because of the low industrial competitiveness.

(2) Pollution control measures and evaluation

Devising proper pollution control measures

requires a greater effort to determine the causes of environmental pollution. Specifically, the monitoring of wastewater discharged from corporations should be strengthened, and the required analysis institutions and technicians should be increased. Little administrative guidance or action is evident in response to situations in which toxic substances exceed the environmental standards. Therefore, effective improvement of the environment is possible by implementing administrative measures focusing on corporations responsible for large total amounts of discharged pollutants.

7. Suggested Improvements

(1) Fundamentals and goals of pollution control measures

In keeping with the goal of sustainable development in Vietnam, we have devised a draft of master plan. It focuses on 1) reduction of environmental loads by reviewing production process and adopting cleaner production technologies and 2) enhancement of industrial competitiveness by reducing costs.

The annual industrial growth rate in Vietnam is 10%, while the annual population growth rate is less than 2%. This indicates that the industrial pollution load will increase more than the household pollution load. Therefore, for items related to the protection of human health, the goal for industry is to meet the wastewater standards. As for items related to the living environment, effluent from homes should be reduced, as household effluent has a significant effect in urban areas. More stringent final goals should be established in consideration of the levels achieved, with the current standards being regarded as interim targets.

Downtown Ho Chi Minh City

(2) Suggestions of the Master Plans

Regarding the effects of the measures, urgency levels, possibilities of implementation, and past achievements as preconditions, we made concrete suggestions for policies and activities in each area. These were intended for better environmental regulations and corporate support as well as for improvement of the environment.

As for regulations, we offered suggestions for revisions to the standards; the setting of targets for reducing pollutants in major river systems; the establishment of monitoring systems; and the training of pollution control managers. For support to corporations, we suggested training; productivity improvement and other technical guidance; assistance for investment in pollution control measures; and tax reductions or exemptions. In addition, we concretely referred to revision of industrial policies, fostering of the pollution control equipment industry; promotion of ISO 9000 and ISO 14000 series registration; advancement of environmental training and university research; and partnerships among administrative agencies.

Stands along the street in Ho Chi Minh City

8. Prospects for the Future

We have made numerous concrete suggestions through our master plan surveys. However, implementing all of them in a short period is impossible. We expect them to initially take those measures that require a small investment yet which have a significant effect. From a long-term perspective, the continuous action is necessary for the training of personnel, transfer of expertise on management systems and etc.

Concretely, we have offered the following two suggestions as provisional practical measures and are awaiting the request of the Vietnamese government: By dispatching experts from Japan for short and medium terms, we can (1) establish production and quality management centers to promote cleaner production and provide technical guidance, and (2) promote technical guidance at corporations for the introduction of productivity improvement activities.

Vietnam is expected to develop further in the 21st century, taking full advantage of its abundant natural resources, fertile land, patient and diligent population, active industries, and geographic importance for marine transportation in East Asia, Southwest Asia, the Middle East and Australia. The nation will be able to learn from the experiences encountered by developed nations and advanced developing nations in their development processes; in other words, little attention was paid to pollution control measures and economic growth and industrial expansion were given first priority. It is hoped that Vietnam will establish a new type of development process in which the modernization of agriculture and industrialization are pursued in harmony with environmental conservation.

Research & Survey on Effective Use of Desulfurization Byproducts

Introduction

At the request of the Mie Prefectural Government and the Yokkaichi Municipal Government, ICETT, working with Yokkaichi University undertook research and a survey on the effective use of desulfurization byproducts in Tianjin, People's Republic of China. This project began in 1997 and extended over a three-year period.

This project was implemented in order to enlighten the Tianjin Municipal Government regarding the importance of pollution control measures and the need for further promotion of such measures, and to assist in awareness-raising activities, all in support of the municipality's goal of sustainable development.

Background and Scope

The demand for coal, which contributes 75% of China's primary energy, will likely increase due to China's expanding energy consumption. Although flue gas desulfurization equipment is essential to factory pollution control, installation of such equipment has not been promoted because of the high cost of the equipment. We presume that air pollution due to sulfur dioxide (SO_2) has already begun to affect public health in China. Should the pollution grow more serious, the resulting damage to public health and attendant cost would place a tremendous social burden on the municipality, similar to what occurred in the city of Yokkaichi, Japan.

On the other hand, research has shown that desulfurization gypsum — a byproduct of flue gas desulfurization with the lime gypsum method — can be used to improve alkaline farmland and enhances crop production.[1]

From these two perspectives, we focused our survey and research on confirming that the introduction of flue gas desulfurization equipment would contribute a cost benefit and that environmental conservation measures would produce a positive economic effect.

We requested the Tianjin Social Science Institute and the Soil and Fertilizer Laboratory of the Tianjin Municipal Agricultural Science Institute to participate in this project as our counterparts.

Methods and Results

We conducted the survey in the following four phases:

1. Estimate of the current coal usage in Tianjin and compilation of the data required for a simulation;
2. Simulation applying the "Yokkaichi model"[2] ;
3. Improvement experiment with desulfurization gypsum; and
4. Production using the improved soil and confirmation of the benefit to the economy of Tianjin.

(1) Estimate of the current coal usage in Tianjin and compiling of the data required for a simulation

To determine the discharge of sulfur dioxide in Tianjin, estimates were made of the respective consumption of coal by industry and power plants; homes; and businesses. In order to obtain meshed data for the simulation, we created a mesh in square kilometers for an area extending across almost all the six densely populated wards located in the center of the city as they require pollution control measures most urgently. Then, we regarded the sulfur dioxides discharged from three large factories including power plant as having been reduced by 90% after flue gas desulfurization. Further, we regarded the change from coal to briquettes by homes and businesses as having reduced the discharge of sulfur dioxide by 50%. In addition, we estimated the distribution of the population in order to determine the health damage caused by sulfur dioxide. Applying the Xuchang Xu (1999) calculation, the cost of desulfurization was considered to be 2.5 yuan per kg of SO_2.

Estimated Consumption of Coal in Tianjin

	All of Tianjin	Six wards
Power plants	Approx.6,000,000t	Approx.1,500,000t
Industries	Approx.5,000,000t	Approx.2,150,000t
Homes	Approx.5,000,000t	Approx.1,200,000t
Businesses	Unknown	Approx.2,500,000t

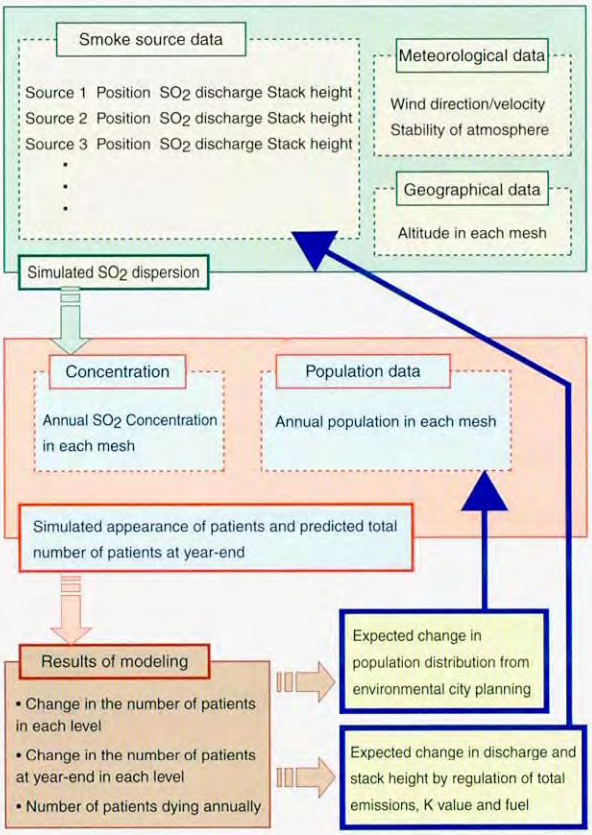
(2) Simulation applying the "Yokkaichi Model"

On the basis of the above assumption and the data obtained, the simulation with the "Yokkaichi Model" and the calculation were made. As a result, the concentration of sulfur dioxide was determined as 0.06–0.19 ppm, which would be reduced to 0.02–0.06 ppm if desulfurization measures were

[1] A field test conducted by Tokyo University and Central Research Institute of Electric Power Industry at Kang Ping Xian, Shenyang City, China showed that desulfurization gypsum was effective as an alkali soil conditioner.

[2] Yokkaichi University developed the "Value Simulation Model of the Air Pollution and Economy of Yokkaichi" as part of its academic study of how air pollution in Yokkaichi had been overcome.

implemented. Projecting the number of patients and estimating the costs to the Tianjin Municipal Government of paying compensation to the victims, we examined the interrelation between the costs and benefits of desulfurization. The data showed that the effect would be realized in about 10 years, which highlighted the need to take measures without delay. However, the model arranged here is a prototype in the present phase. Collection of more detailed data and further investigation are required.



Integrated Simulation of the Effects of Environmental Policy

(3) Soil improvement experiment with desulfurization gypsum

Field tests to determine whether desulfurization gypsum would improve the alkali soil in Tianjin and enhance crop production were undertaken for two years at three locations in Tianjin. As a result, production was increased at all locations, although the increase differed by experimental farm and by type of crop. Specifically, the production of corn increased a maximum of 53%, while production of Chinese cabbage increased a maximum of 9%. We also conducted pot experiments with six types of soil from various parts of Tianjin. From these achievements, it is expected that corn production will increase about 35% on average, while Chinese cabbage production will increase about 5% as a benefit of the desulfurization gypsum.

(4) Production with improved soil and confirmation of the benefit to the economy of Tianjin

Assumptions and analyses of various cases suggest that the production of corn would increase about 4.3% if one-quarter of the current corn field soil is improved, which is the most advantageous case. The data show that the increased income from agricultural products would have the most positive effect on industry. However, the secondary distribution of corn as feed was not considered in this project and further examination is required.

Suggestions for the Future

Sustainable development should be considered from the perspective of cost benefit. This research and survey project proved that flue gas desulfurization measures should be taken without delay and that the byproduct of the process, desulfurization gypsum, would improve the soil of Tianjin. We expect that the prefectural agricultural bureau and other public institutions will voluntarily conduct crop-raising experiments at large-scale farms. Activities to raise farmers' awareness of desulfurization gypsum as a soil conditioner are also needed.

Environmental Technologies: Japanese Corporations' Efforts

Centralized Treatment of Wastewater from the Petrochemical Complex
High-Efficiency Joint Wastewater Treatment Facilities

— Kasumi Kyodo Jigyo Co., Ltd. —

1. Efficient operation of the Kasumi Industrial Complex and environmental conservation measures

Kasumi Kyodo Jigyo Co., Ltd. is located at the third petrochemical complex (commonly known as the "Kasumi Industrial Complex") in the city of Yokkaichi, Mie prefecture. It was established in 1971 to contribute to efficient operation of the complex by providing comprehensive management of common facilities.

Kansumi Industrial Complex

For the Kasumi Industrial Complex, an artificial island has been constructed to separate the industrial zone from the residential area in consideration of its effects on residents near the zone. A green buffer has been provided between the industrial zone and the residential area located on the other side of the canal. Equipment incorporating the latest technologies to prevent air and water pollution was put into full-scale operation in 1972. This is a joint venture with every company in the Kasumi complex providing capital. As a company dealing in issues related to environmental conservation and security for companies of the complex — including wastewater treatment, waste treatment, management of common green areas, and fire-fighting and disaster prevention — we carry out the following operations:

1.Management and operation of common facilities in the Kasumi Industrial Complex

(1) Wastewater treatment
(2) Industrial waste treatment
(3) Common berths
(4) Ground maintenance
(5) Clinic

2.Disaster prevention at the Kasumi Industrial Complex

(1) Fire-fighting squad
(2) Security offices and facilities

3.Commercial business operations

(1) Sales and maintenance of fire extinguishing equipment
(2) Security service
(3) Travel agency
(4) Sales

In light of the environmental destruction taking place on a global scale, we regard conservation of the global environment to be a critical issue. With the goal of achieving a society whose economic activities are in harmony with the natural environment, we achieved registration of compliance with ISO 14001 in February 1999. Recognizing that the 21st century will be the "Environmental Century," all our employees are continuing to address the need to improve the environment.

2. Joint Wastewater Treatment

1) Outline of the treatment process

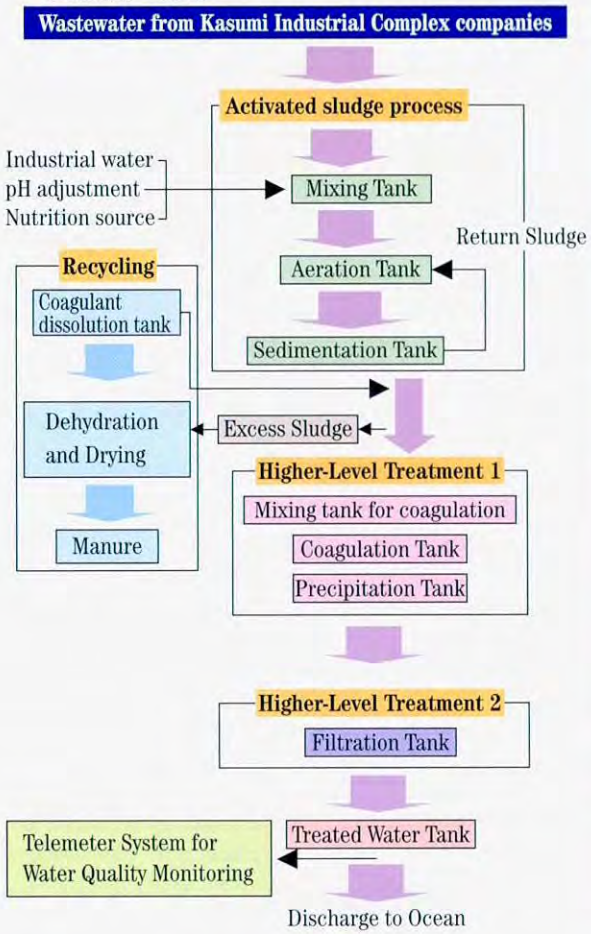
To reduce load fluctuation and to enhance treatment efficiency, we accept the wastewater of six corporations in the Kasumi complex discharge through pipelines from their plant production facilities and provide centralized treatment. BOD contained in the wastewater is dissolved and purified with microorganisms added to the joint wastewater treatment equipment, which employs a step-aeration-type[1] activated sludge process based on the up-to-date technology and our ripe experience. The wastewater is coagulated, precipitated, and further treated with a sand filter before being released into Ise Bay.

Wastewater treatment facility

[1] The BOD load in each aeration tank can be controled by the divided introduction of wastewater into the aeration tanks. This approach has the advantage of standardizing loads by changing the way the wastewater flows in.

2) Treatment Capacity

Water quantity: 16,500m^3/D
BOD:11,520kg/D
Elimination rate:
BOD:98~99%
COD:80~85%



3) Enforcement of the monitoring system

By having a "Memorandum on the Use of Joint Wastewater Treatment Facilities" with the corporations we have clarified shared responsibilities and obligations for efficient treatment of wastewater without causing pollution.

(1)What each plant is responsible for

To meet the criteria for each item, each plant is obliged to undertake pretreatment to eliminate toxic substances (items related to the protection of human health); to eliminate 27 substances inhibiting organisms (under the standard values specified in the Memorandum); to adjust pH (to neutral); to eliminate oily substances (20 ppm max.); to abjust water temperature (upper limit: 35°C); to provide separate treatment for rainwater; and to store abnormal wastewater.

(2) What Acceptor (we) monitors

Items Monitored for Effluent and Treatment Water
Toxic substances (health items), BOD, COD, TOC, SS, water temperature, oily substances, nitrogen, phosphorous, evaporation residue, coliform groups, and other items

Items Monitored at the Aeration Tank
DO, water temperature, MLSS, MLVSS, SV, biota inspection with the microscope, and other items

Operators of the wastewater treatment facilities monitor the conditions in shifts over a 24-hour period according to the "Guideline for Operation of Activated Sludge." Data from the automated continuous measuring equipment installed at the outlet of the treated water tank are transmitted to the on-line comprehensive monitoring system of the Mie Prefectural Government.

4) Cost sharing

According to the terms of the Wastewater Treatment Facilities Utilization Criteria specified and exchanged between the joint venture partners and corporations involved, all the costs of the treatment are covered by charges levied according to the BOD, COD and SS loads and the water quantity ratios, which ensures coverage of actual costs.

5) Recycling of excess sludge

Excess sludge generated during the treatment process is dehydrated, dried and crushed to produce raw material for fertilizer. It is sold to ensure effective use of the resource and to reduce operating costs.

6) Future targets

In making every effort to qualify for ISO 14001 registration, we have undertaken a variety of initiatives to achieve targets such as energy conservation and waste reduction. We are planning to address the following items for the future:

(1) Introduction of a high-oxygen dissolved air diffuser to enhance the treatment efficiency of organisms at the wastewater treatment equipment (aeration tank) and to reduce the energy consumption of the aeration blower.

(2) Testing of decolorizing treatment of colored effluents with aerobic microorganisms, and introduction of treatment equipment according to the test results.

(3) Installation of automated nitrogen and phosphorous monitoring equipment and introduction of treatment technologies to prevent eutrophication of Ise Bay

(4) Research and introduction of treatment technologies on control of excess sludge generation and volume reduction with mineralization treatment technology.

Specially offered Training Course
Environmental Management Technology in Petrochemical Industries

Introduction

At the request of the Japan International Cooperation Agency (JICA), ICETT implemented the above training program over a 55-day period from September 25 to November 18, 2000. This program included a revised and re-titled course originally consigned to ICETT beginning in 1995, "Environmental and Safety Technologies for Petrochemical Industries." This is the only training program focusing on environmental management technologies in the petrochemical industry for ICETT. For this program, we accepted nine participants (six administrative officers, two representatives from governmental institutions, and one representative from a corporation) from nine nations (Brazil, China, Egypt, Indonesia, Iran, Romania, Thailand, Tunisia and Vietnam).

Scope and Content

The petrochemical industry is considered a key industry supporting economic growth in developing countries. The industry is also a source of pollution. Therefore, in devising the curriculum, we focused on imparting a good understanding of how Japan's petrochemical industry has improved its environmental management technologies in order to ensure harmony between the economy and the environment. Thus, we anticipated that this program would help the participants to resolve their own pollution problems.

First, we introduced the features of the Japanese petrochemical industry, particularly the tendency of many corporations to construct petrochemical complexes in coastal areas, close to residential areas, due to the limited amount of land available in the country. We tried to impart the understanding that a strict legal system had been established for its severe fulfillment because, should an accident occur, the possibility existed of a major life-threatening disaster.

In the second half of the program, the latest technological trends in environmental management in the petrochemical industry, including security management technologies were introduced. A special focus was maintained on the concepts of cleaner production; energy conservation; recycling; pollutant release and transfer register (PRTR); responsible care; risk communication; the ISO 14000 series of environmental management standards; and environmental accounting.

The whole program was divided into five sessions and those introducing the latest technological trends were welcomed by almost all the participants, although the topics of interests differed depending on the participants' countries of origin. Some of the topics were not smoothly accepted because significant differences exist between the situation of Japan and that of the participants' countries (including legal systems and nationality). Nonetheless, the participants seemed to have learned much from the program. Their achievements were reflected in their final reports and the action plans they devised for achieving their goals upon returning to their respective home countries.

During their stay in Japan, the participants deepened their understanding of Japanese culture and society by willingly participating in various events such as Japanese language classes, visits to elementary schools (including a Halloween party), cultural festivals (staged by neighborhood community), an international friendship party, a dance party, a *KOTO* concert and a tea ceremony.

At a meeting convened to evaluate the program, some of the participants requested to increase the case studies and discussions to ensure more effective training. We will consider these opinions as we seek to provide a more productive program next year.

Project to Promote Development of Industrial Technologies for Global Environmental Conservation

Introduction of R&D Completed in 1999

Theme: Technologies for detoxifying difficult-to-decompose organochlorine substances contained in petroleum

Group Y, Nakago Laboratory, ICETT
Nippon Soda Co., Ltd.

Period
1998–99

Scope

Metallic sodium is widely used in industry for soap manufacturing and for dye synthesis, thanks to its high reactivity. Compared with other alkali reagents, it offers better reactivity to dechlorination. This makes possible relatively mild reaction conditions, such as temperature and pressure.

Our laboratory develops technologies for decomposing and detoxifying difficult-to-decompose organochlorine substances — recent subjects of controversy for their effect on the environment — through the reaction with metallic sodium. PCBs are typical difficult-to-decompose organochlorine substances, and the risk of the PCBs entering the environment increases year-by-year the longer they are in storage. In this project, we set out to develop basic technologies for decomposing and detoxifying highly concentrated PCBs by order of %, and to design a portable plant using the knowledge obtained.

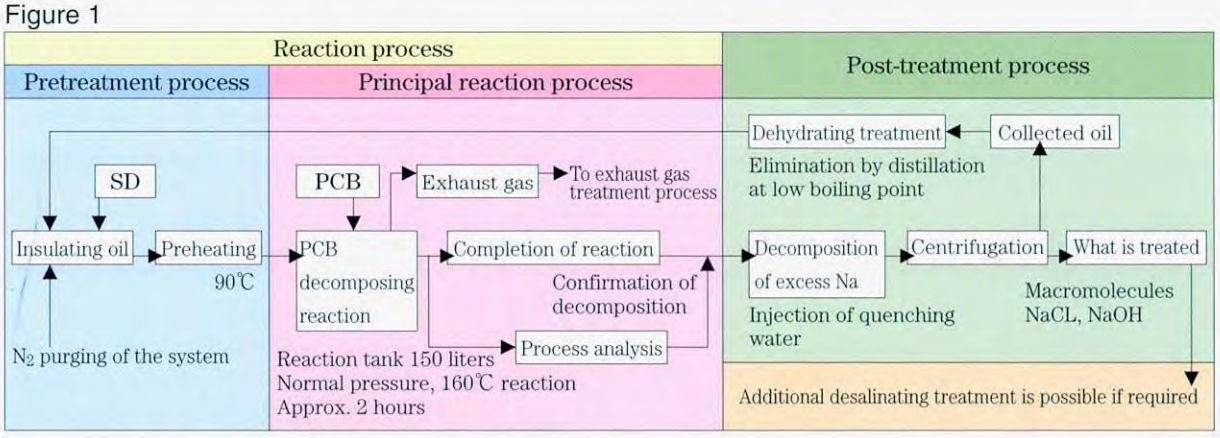
Details

1) The PCB detoxification process

Figure 1 shows the process for detoxifying PCBs used in this project. For dechlorination of the PCBs, 100% PCB is added to a sodium dispersion (metallic sodium of 5–10 μm dispersed in insulating oil, with a sodium content of 20wt%) from a low concentration under nitrogen atmosphere.

The reaction temperature is maintained at 160 ±10°C, and the PCB solution is dripped for one hour. Dechlorination is completed after another one-hour reaction. Every batch undergoes process analysis to verify the non-toxicity of the PCB. The minimum amount of quenching water is then added to change

Figure 1



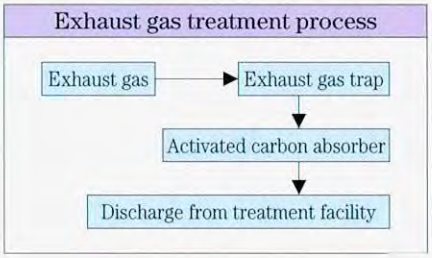


Figure 2. Confirmation of the Process for Eliminating Toxic Substances

Toxic substance		Collected oil		Solid matter	
Experiment No.		1	2	1	2
PCB	Actual concentration (μg/kg)	N.D.<1	N.D.<1	N.D.<0.2	N.D.<0.2
Co-PCB	Actual concentration (μg/kg)	N.D.<1	N.D.<1	N.D.<0.2	N.D.<0.2
	Toxicity equivalent(μg-TEQ/kg)	0	0	0	0
Hydroxy PCB	Actual concentration (μg/kg)	N.D.<5	N.D.<5	N.D.<5	N.D.<5
PCDD	Actual concentration (μg/kg)	N.D.<0.5	0.37	0.68	N.D.<0.1
	Toxicity equivalent(μg-TEQ/kg)	0	0	0.002	0
PCDF	Actual concentration (μg/kg)	5.9	5.8	0.85	0.84
	Toxicity equivalent(μg-TEQ/kg)	0.027	0.026	0.0038	0.0036

Figure 3. Property of Exhaust Gas

Experiment No.		1	2
PCB	Actual concentration (ng/m^{3}N)	75	9.4
Co-PCB	Actual concentration (ng/m^{3}N)	3.6	0.3
	Toxicity equivalent(μg-TEQ/m^{3}N)	0.00058	0.00003
PCDD	Actual concentration (ng/m^{3}N)	0.49	1.4
	Toxicity equivalent(μg-TEQ/kg)	0.00046	0.019
PCDF	Actual concentration (ng/m^{3}N)	0.67	2.2
	Toxicity equivalent(μg-TEQ/kg)	0.0053	0.029

the remaining excess Na to NaOH.

Polyphenylene-type macromolecules, NaCl, NaOH and others are produced. They are then separated into insulating oil and solid matter through centrifugation. No water is produced in this process, as it is absorbed by the solid matter. The solid matter can be desalinized with a hot water washing treatment, if necessary. Chlorobenzene mixed in the PCBs is also dechlorinated, and no chlorobenzene separation treatment is required before reaction.

Finally, nitrogen gas is treated with exhaust gas treatment equipment and activated carbon before being discharged from the system.

2) Verification Test

A test for verifying the decomposition of the PCB was conducted as a specific development goal.

• PCB Decomposition Test

About 10% of the PCB (KC-400) is made to react with SD, and the concentration of PCB contained in the detoxified oil and the solid matter is measured (Figure 2). The data show that the PCB is decomposed into N.D.<1 μg/kg. It also indicates that dioxins and other difficult-to-decompose organochlorine substances are decomposed, as well.

PCB and other toxic substances contained in the solid matter are also under the detection limits, confirming the safety of the procedure (Figure 2).

As for the content of the exhaust gas, the PCB is below the temporary standard for the atmosphere, and dioxins are below the guideline standards for ambient air quality as specified by the Ministry of the Environment. This proves the safety of the process (Figure 3).

• Recycling

The possibility of recycling the treated oil and solid matter was investigated.

It was confirmed that the normal recycling treatment for insulating oil rendered the treated oil recyclable. As for the solid matter, the powder remaining following desalinization is roughly equivalent to coke in terms of the calories given off in combustion. It is easy to make tablets, and we have found that the solid matter can be pelletized. These data show that the treated insulating oil and the solid matter discharged from this process are recyclable.

3) Extracting PCBs from their containers

Many highly concentrated PCBs are stored in closed containers such as capacitors and transformers. To detoxify them, it is necessary to extract the PCBs from their containers. In response, we have developed a device for extracting the PCBs easily without contaminating the environment. The device cannot extract any PCBs adhering to the container or absorbed in the insulation. We asked Z.E.R.O. Japan Corporation, which has expertise in vacuum heating, to extract the PCBs from the containers and insulation in order to detoxify the containers.

The toxicity of the PCBs contained in the washing oil resulting from the above-mentioned treatment was examined. The data showed that the toxicity was eliminated in both cases (Figure 4).

Figure 4. Test for Detoxifying PCBs (Treatment of Container)

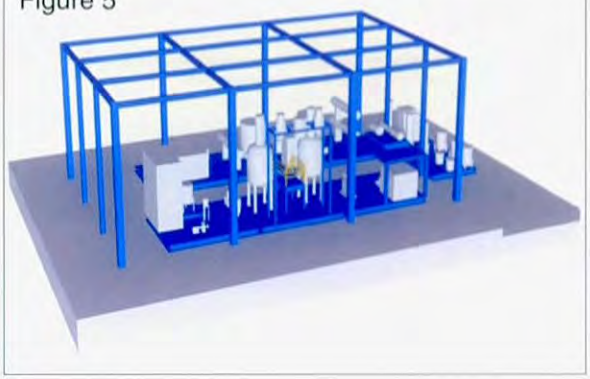
Type of experiment	Extracted oil	Extracted oil	Z.E.R.O. Japan's cleaning oil
Type of PCBs	KC-400	KC-300	KC-300
Concentration of PCBs	10wt%	10wt%	7wt%
Quantity of reaction liquid	240g	240g	112g
Quantity of Na	24g	24g	4.6g
Quantity of residual PCBs	N.D.	N.D.	N.D.

Extracted oil :The concentration of the PCBs extracted with the PCB extractor was adjusted with insulating oil for the reaction.
Z.E.R.O. Japan's cleaning oil: Contaminated oil accumulated by Z.E.R.O. Japan Corporation during treatment of toxic containers

4) Portable Plant Design

From the results of this development, we examined the design of the plant. The plant can be made portable if it is configured as two units for transportation by trailer (Figure 5).

Figure 5



Conclusion

The achievements of this development are as follows. The results show that we have accomplished the goals completely.

1) PCBs by order of % are dechlorinated almost completely with metallic sodium dispersion.
2) The treated oil and the solid mater produced during the process are recyclable as insulating oil and solid fuel.
3) Oil containing PCBs removed from the containers is completely detoxified with this technology.
4) A portable plant configured as two units has been designed for transport by trailer.

We would like to develop this as a more practical technology after evaluating the economic factors.

The Seasons of Japan

Setsubun : The Bean-Throwing Ceremony

One of the features of Japan's climate is its four clearly defined seasons. The actual distinctions between the four seasons are called *setsubun*. The original meaning of the word is the points that separate the seasons into spring, summer, autumn and winter. Today, however, *setsubun* refers only to the change from winter to spring, especially to the day (around February 3) :before the traditional "beginning of spring". People across the nation celebrate this event at shrines and temples as well as in their homes.

It is the custom on *setsubun* night to toss *setsubun* beans (roasted soybeans) while shouting, "Out with the devil! In with good fortune!" After scattering the beans, we eat a number of beans equal to our age. This is believed to prevent disease. We eat *setsubun* beans while praying for a year of good health.

Today, although not everyone follows the custom of tossing beans, stores and supermarkets sell *setsubun* beans along with devil masks during *setsubun* season.

We do not eat any particular food at *setsubun*. Some families eat sardines for supper because they believe that a twig of holly stuck in the head of a grilled sardine should be placed at the entrance, with the smell of the sardine and the prickles of the holly driving the devil from the house.

futomaki

In some regions, people believe that their wishes will come true if they pray and eat *futomaki*, a thick cylindrical sushi, while pointed in the direction of good fortune, or *ehou*. (The direction in which the god Saitoku exists is determined annually according to Chinese astrology.) Many people follow this practice. The origin of this custom is not known, but seaweed and sushi makers actively promote this custom with posters displayed in store windows.

The 2001 Training Program (Tentative)
April 2001 – March 2002

Training in Japan

Course Title	Duration	Number of Participants	Sponsored by	Countries that participants selected from
Technology for Industrial Exhaust Gas Treatment and Energy Saving	May – July, 2001	8	JICA	Asia, Near and Middle East Africa, and Central and South America
Environmental Management Technology in Petrochemical Industries	June – August, 2001	10	JICA	Asia, Near and Middle East Africa, Central and South America, and East Europe
Training Program of Environmental Cooperation Program for Asia	September – October, 2001	10	Mie Prefecture	Thailand
Regional Environmental Monitoring for the Arab Republic of Egypt	September – November, 2001	5	JICA	Egypt
Environmental Management System for Tianjin, the People's Republic of China	October, 2001	6	Yokkaichi City	China
Pollution Control Manager System for the People's Republic of China	November – December, 2001	8	JICA	China
Regional Environmental Administration for Jordan	February, 2002	15	JICA	Jordan
Technology for G.H.G.s Emission Mitigation	February – March, 2002	10	JICA	Asia, Near and Middle East Africa, Central and South America, and South Pacific Region

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