Field Seminar in the Boso Area (8th, December)

Guided by SUDO Sadahisa and ARITA Masafumi (Geological Survey of Japan, AIST)

Study Object

1. Many sand pits are working in the Boso area and extracted sand are utilized for construction of airports, buildings and roads. We will visit one of the sand pit factory and learn geological setting, sewage disposal and planning after closing sand pit.

2. Costal erosion is one of the big problem in the Boso Area. We will look at two coasts (Ichinomiya and Hasunuma Beach) to discuss about how to protect for costal erosion.

Schedule

8:00	Leave Tsukuba
10:30	Sand Pit
12:15	Lunch
13:00	Ichinomiya Beach
14:30	Hasunuma Beach
18:00	Arrive at Tsukuba

Field Seminar in the Tohoku Region (11th-13th, December)

Guided by MARUMO Katsumi

Study Object

There were many mines but almost closed in Japan. Some companies protect environment in and around mine and turnabout recycle business.

We will look at a old mine museum to study history of mining company and current business situation. Then, we will visit two old mining area to discuss about environmental protect for disused mines.

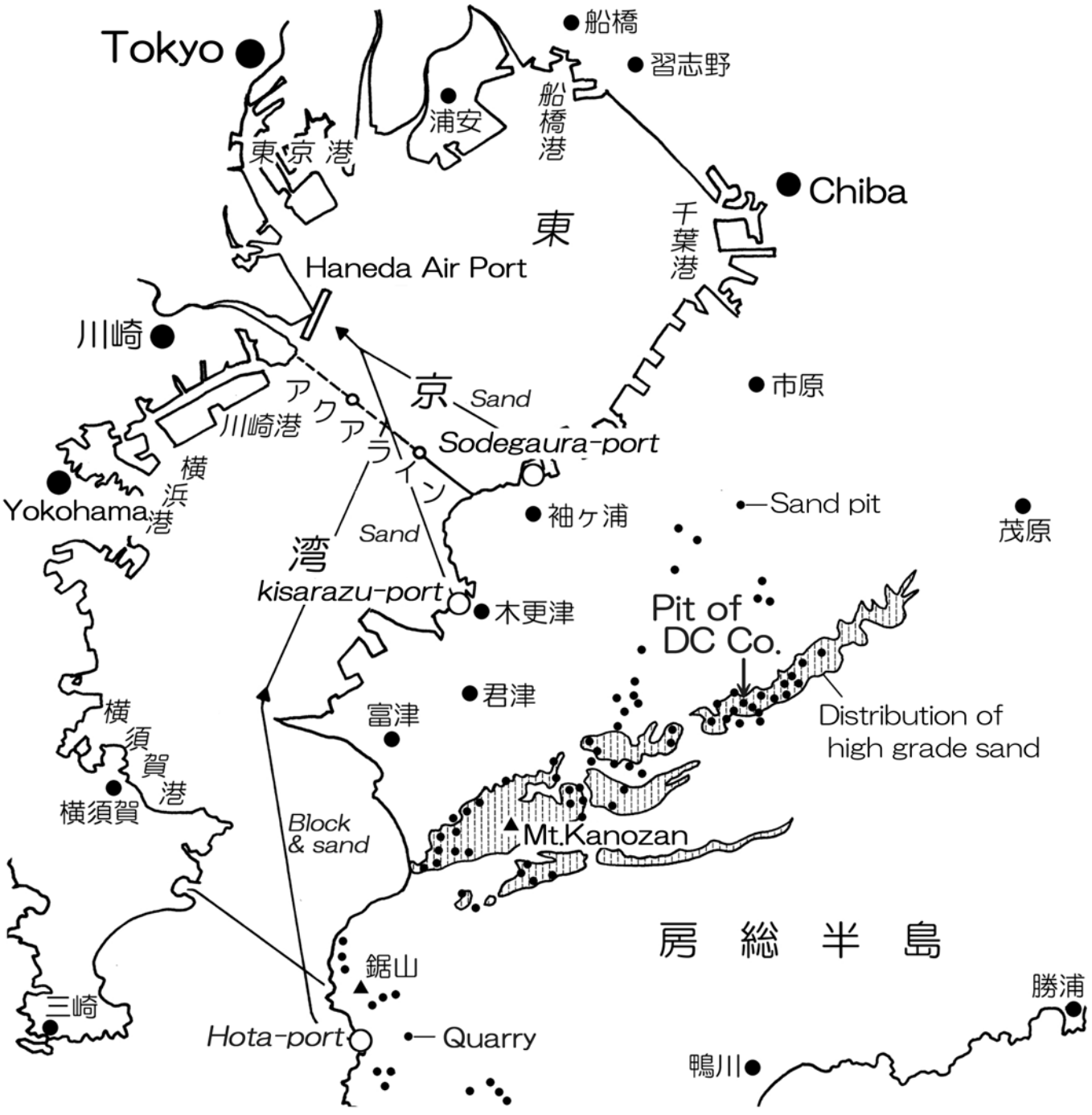
Schedule

December 11 (Tue)	Nikko Kinenkan (Old mine museum), stay at Iwate Prefecture
December 12 (Wed)	Matsuo Mine Office, stay at Yamagata Prefecture
December 13 (Thu)	DOWA Eco System Company (Hanaoka old mine), depart to Tsukuba

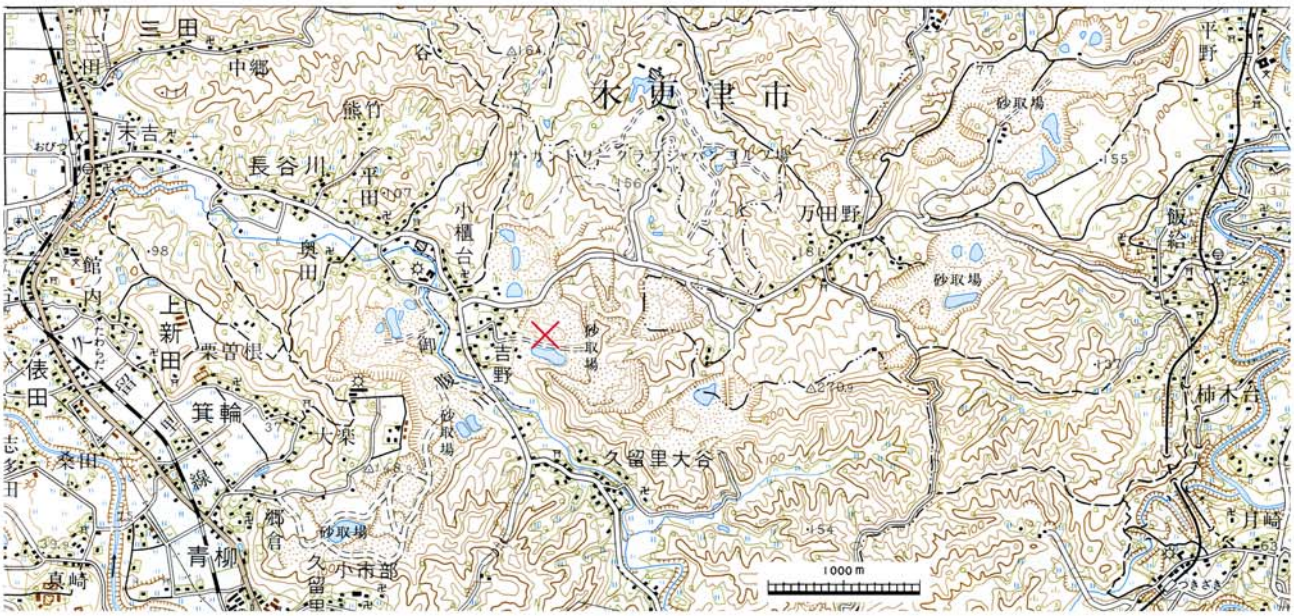
Field trip for Boso area

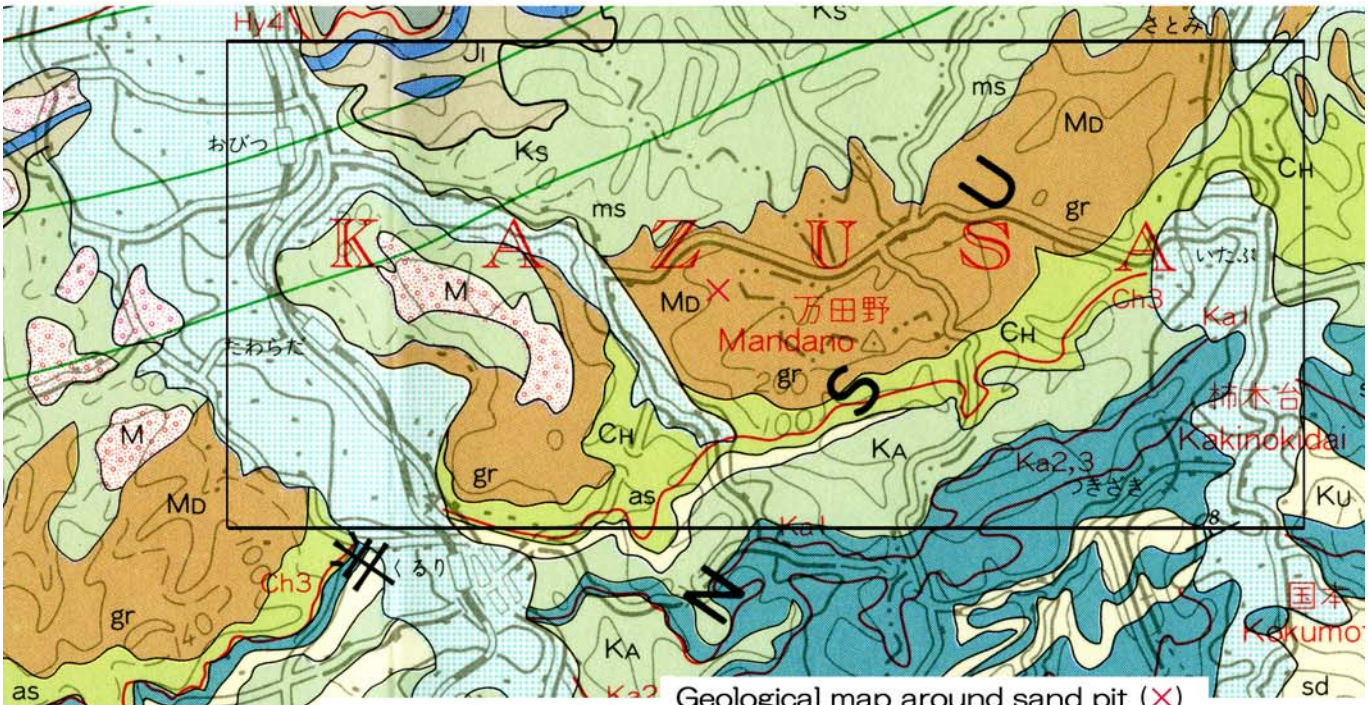
8/12/2007

① Sand pit of Yoshino factory, DC Co. at Kimitsu city



Geographic map around sond pit (1:50000)





Geological map around sand pit (×)

第四紀 Quaternary
中—後期更新世 Middle-Late Pleistocene
相模・下総層群 Sagami-Shimōsa Group

Jl 地蔵堂層(砂・礫・泥), 泉谷泥層 Jizōdō Formation (sand, gravel, mud) underlain by
Iz Izumiyatsu Mud

1000m

中期鮮新世—前期更新世 Middle Pliocene-Early Pleistocene
上総層群 Kazusa Group

sm 砂質泥岩 Sandy mudstone
ms 泥質砂岩 Muddy sandstone
sd 細粒ないし中粒砂岩 Fine and medium sandstone
gr 礫岩及び含礫砂岩 Conglomerate and pebble-bearing sandstone
as 砂岩優勢砂岩泥岩互層 Sandstone dominated alternation of sandstone and mudstone

Ks：笠森層 Kasamori Formation
Md：万田野層 Mandano Formation
Ka：柿ノ木台層 Kakinokidai Formation
Ku：国本層 Kokumoto Formation
U ：梅ガ瀬層 Umegase Formation


保安
第一
345B
CAT

② Ichinomiya Beach

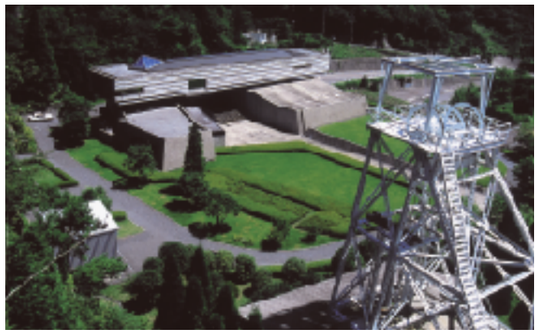
↓ Aero-phot.

Haw do you think ?

Bearch was protected or Beach and mach maney were lost

Nippon Mining Holdings Group

Nippon Mining Museum



Information

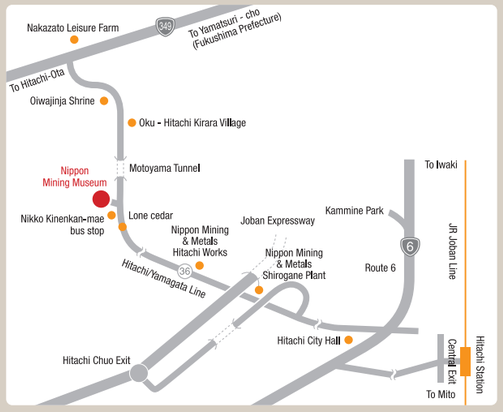
Address	3585 Miyatacho, Hitachi, Ibaraki 317-0055
Tel.	0294-21-8411
Website	http://www.shinnikko-hd.co.jp/museum/
Opening Hours	9am - 4pm (last admission 3:30pm) Closed on Mondays, national holidays, year-end and New Year holidays
Admission	Free

*Please contact us in advance for group visits

Access

By public transport: From the central exit of Hitachi station (JR Joban line),
take the Hitachi Dentetsu bus bound for Higashi-goudo
and get off at “Nikko Kinenkan-mae”.
The museum is in front of the bus stop. (Total time 30 minutes)
Alternatively, take a taxi from Hitachi station. (Total time 20 minutes)

By car: 10 minutes from the Hitachi Chuo Exit of the Joban Expressway



Nippon Mining Holdings Group

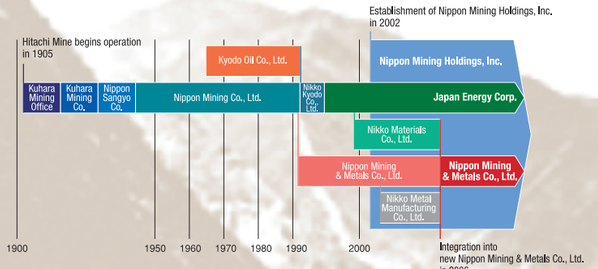
Nippon Mining Museum

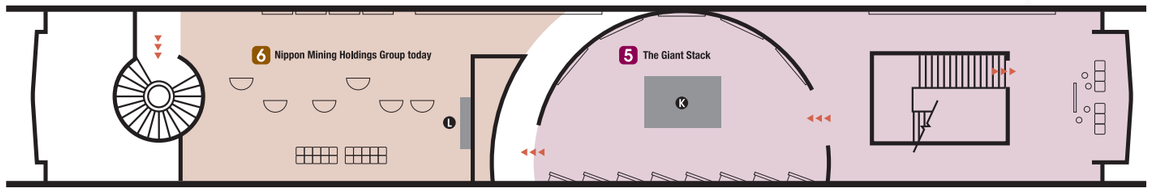
Nippon Mining Holdings Group

Nippon Mining Museum

In 1905, founder Fusanosuke Kuhara acquired the Akasawa Copper Mine and started operation as Hitachi Mine. This was the very beginning of Nippon Mining Holdings Group. The founding of Hitachi Mine was also the starting point of the development of Hitachi as an industrial city, and of the modern mining and manufacturing industry in Ibaraki Prefecture. Nippon Mining Museum was built in 1985 at the old site of Hitachi Mine in commemoration of the Group's 80th anniversary of its founding. It is a showcase of the history of Nippon Mining Holdings Group and the strong spirit of our founder. It is also an account of Japan's industrial and management histories, as well as of the local history of Hitachi. We invite you to take a historical tour and experience the flow of time from the past to the present.

■ History of Nippon Mining Holdings Group





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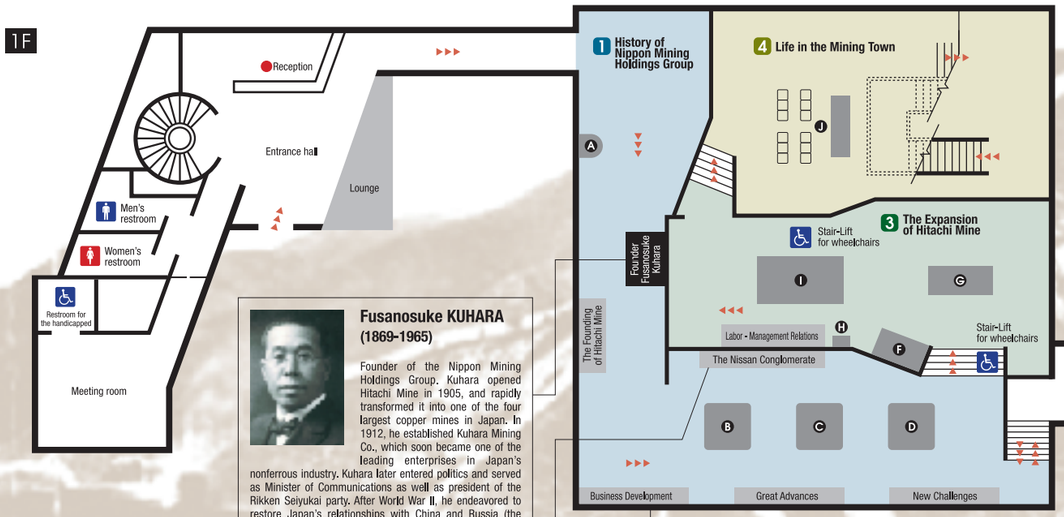


Fusanosuke KUHARA (1869-1965)

Founder of the Nippon Mining Holdings Group. Kuhara opened Hitachi Mine in 1905, and rapidly transformed it into one of the four largest copper mines in Japan. In 1912, he established Kuhara Mining Co., which soon became one of the leading enterprises in Japan's nonferrous industry. Kuhara later entered politics and served as Minister of Communications as well as president of the Rikken Seiyukai party. After World War II, he endeavored to restore Japan's relationships with China and Russia (the Soviet Union).

Yoshisuke AIKAWA (1880-1967)

Succeeded his brother-in-law Fusanosuke Kuhara and became the second president of Kuhara Mining Co. Aikawa reorganized Kuhara Mining Co. into Nippon Sangyo Co., Japan's first public stockholding concern and formed the Nissan Conglomerate that rivaled the Mitsui and Mitsubishi conglomerates. After World War II, he became a member of the House of Councilors and president of the Political League of Small and Medium Enterprises.

Namihei ODAIRA (1874-1951)

Founder of Hitachi, Limited. Odaira played an important part in the construction of power plants and other projects as the first manager of the Engineering Department in the early days of Hitachi Mine. Hitachi, Limited has its origin in the electric machinery repair shop of Hitachi Mine and was incorporated as an independent company in 1920.

1 History of Nippon Mining Holdings Group

The Group's history from the inauguration of Hitachi Mine by founder Fusanosuke Kuhara up to the present is introduced through panels and historical materials.

- A The last ore from Hitachi Mine
- B Perspective model of ore deposits and shafts
- C Resource development in Japan
- D Resource development throughout the world

6 Nippon Mining Holdings Group today

Corporate activities of the Group focused around efforts for harmony between the Group and the environment/local community are introduced here.

- L Social Contribution

4 Life in the Mining Town

Measures for improving living standards in the mining town and the unique atmosphere based on the spirit of "the mine as one big family" are introduced here.

- J Living with Mines (video presentation)

5 The Giant Stack

Episodes of the construction of the Giant Stack and the history of the efforts made by Hitachi Mine and the local residents to overcome the air pollution problem are introduced here.

- K Smoke Cabin

2 Reproduction of the Underground Scene

This recaptures the inside of a mineshaft. Changes in mining technology from hand digging to machine mining are shown here, using real machines and lifesize figures.

- E Hands-on ore exhibit*

*Visitors can see and touch real mineral ore samples.

3 The Expansion of Hitachi Mine

The overall picture of Hitachi Mine, the root of the expansion of Hitachi as an industrial city, is shown here.

- F Diamond drill
- G Hitachi's mineral ore
- H Mining operations (video presentation)
- I Three-dimensional model of Hitachi

Kuhara's Head Office

This is the house where founder Kuhara lived in the early days of Hitachi Mine and where he toiled over business schemes with his key staff. The house is designated as a historical monument of Ibaraki Prefecture.

Jingaido

This building is made from an old cedar that stood on the planned site of the Daioin Refinery. The wood from the temple that stood on the grounds of Kuhara's Kobe home was also used to build this temple after his relocation to Tokyo.

Sanjinsha Shrine

This shrine commemorates Kanayamahikonomikoto and Kanayamahimenomikoto, gods of craftsmanship, and dates back to the days of the Satake family, Hitachi's local ruling clan. It was rebuilt by Kuhara in 1909.

Electric Locomotive

This electric locomotive was an important mode of transportation inside and outside the Hitachi Mine's smelter and refinery for 50 years until 1960. Built by Hitachi, Limited.

Shaft No. 1

Shaft No. 1 operated as the main shaft of Hitachi Mine for 75 years, from 1906 until the closing of the mine in 1981.

Shaft No. 11

Opened in 1951, Shaft No. 11 was different from conventional shafts in that it had a circular cross section and featured reinforced concrete walls.

Nippon Mining Museum Main Exhibition Hall

The first floor exhibits the achievements of Fusanosuke Kuhara and Yoshisuke Aikawa, the history of Hitachi Mine and Nippon Mining Holdings Group, and scenes from life in the mining town of Hitachi.
A reproduction of mining operations inside the mineshaft is displayed on the basement floor. The second floor displays exhibits related to the Giant Stack and the activities of Nippon Mining Holdings Group today.

Mining Exhibition Hall

This building houses an air compressor room built during World War II (1944). Collections of large compressors, rock drills, ore samples and other equipment are exhibited.

Summary of the Matsuo Neutralization Plant

JOGMEC
Japan Oil, Gas and Metals National Corporation

Summary of Waste Water Treatment at the Abandoned Matsuo Mine

Restoration of the Kitakami River

The Kitakami River is the longest river in Tohoku Province of Japan. The Matsuo Mine was located in the Hachimantai area along the upper stream of the Akagawa River, which is one of the tributaries of the Kitakami River.

Since the discovery of big outcrop of native sulphur in 1882, the Matsuo Mine produced such abundant sulphur and iron sulphide, that it was called "Paradise on Heaven" by its prosperity for a while. But as the management went from bad to worse, the operation was stopped in 1971, moreover the mining claim was abandoned in 1972, and at last the Matsuo Mine was actually closed.

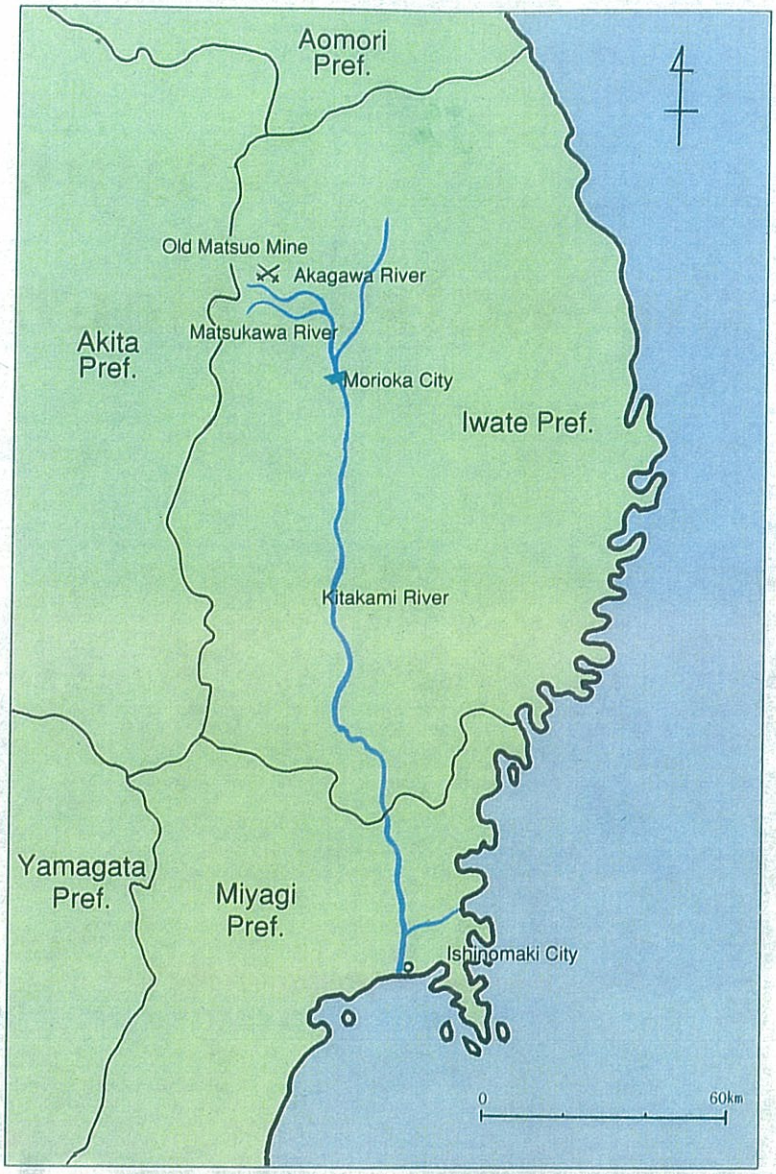
After that, a large quantity of acid mine drainage discharged into the Akagawa River from the abandoned Matsuo Mine, and as a result, polluted the Kitakami River. It caused a grave social problem for the people living along the riverside.

In this situation, the purifying of the Kitakami River was seriously desired and " the establishment of countermeasure to prevent the Kitakami River permanently from water pollution" was petitioned to the National Government in Jul. 1971 by the Iwate Prefectural Government. Immediately, the National Government established " the conference held by connections of Ministries and Agencies concerned" in Nov. 1971.

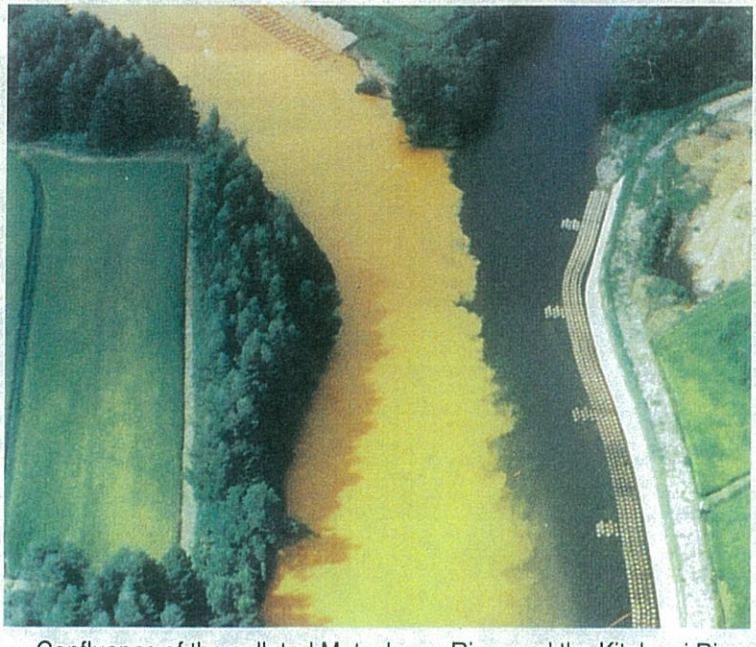
The conference decided to construct a neutralization plant at the abandoned Matsuo Mine in Aug. 1976. This plant was planned to neutralize the acid drainage(pH=2) with a combined system of Bacterial Oxidation and Calcium Carbonate Neutralization, to improve water environment. The Iwate Prefectural Government started the construction of the New Neutralization Plant with financial support from the national budget of MITI in Aug. 1977, and completed the project in Nov. 1981 which required about 6.2 billion yens for the neutralization plant and about 3.1 billion yens for the sludge storage dam.

The Iwate Prefectural Government entrusted the maintenace and operation of the Neutralization Plant to MMAJ since Apr. 1982. Thus, by this neutralization, the Kitakami River restored clean water once again.

(integrated into JOGMEC Feb. 29th, 2004).



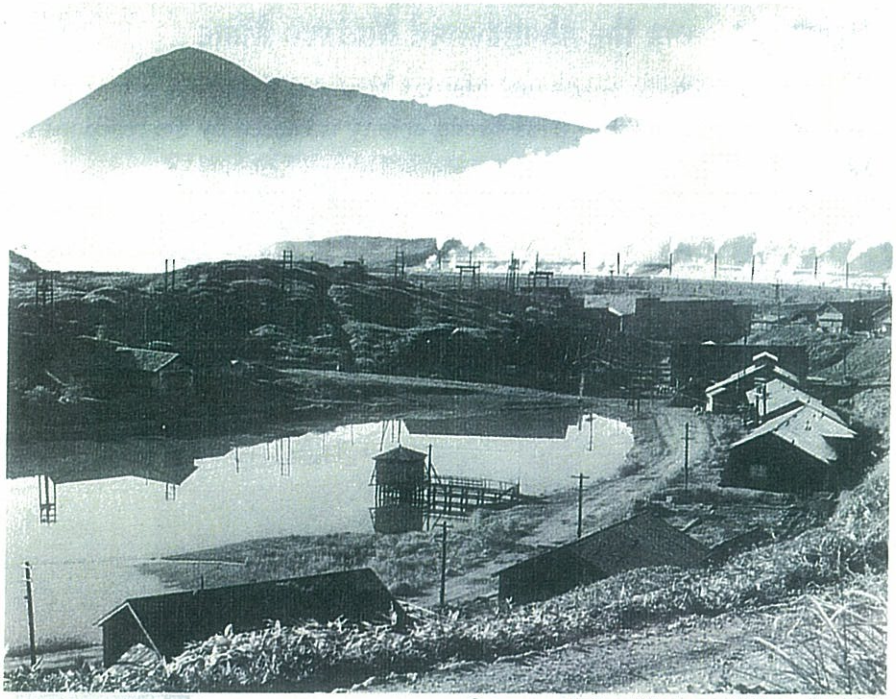
Location of the old Matsuo Mine



Confluence of the polluted Matsukawa River and the Kitakami River

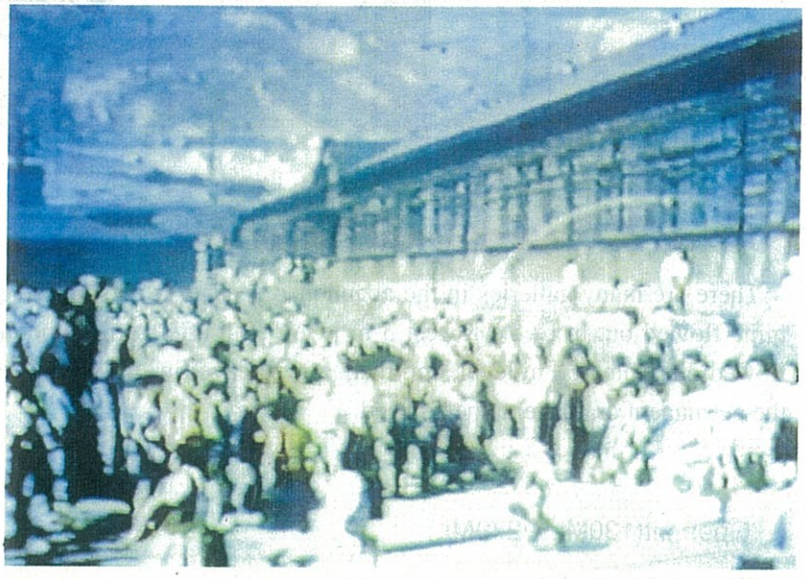
The Largest Sulphur Mine in Asia

The abandoned Matsuo Mine was located in the north-west of Mt. Iwate on halfway of Hachimantai mountains, about 1,000 m above sea level. The ore body extended about 1,500 m in east-west, 1,500 m in north-south, with the thickness of 25～150 m , and was said to be the largest sulphur mine in whole Asia. A big outcrop of native sulphur was discovered in 1882, and exploitation started in 1901. And finally, mining operation started on the establishment of Matsuo Mine Ltd., in 1914.



Scene of the Matsuo Mine (1960)

In the period of prosperity around 1955, mining of crude ore reached up to 1 million t/year, and refined sulphur was produced 80,000t/year. In those days, about 4,000 men worked at the mine, and about 15,000 people lived around there including their families. It was so-called "The Golden Age" of the Matsuo Mine.

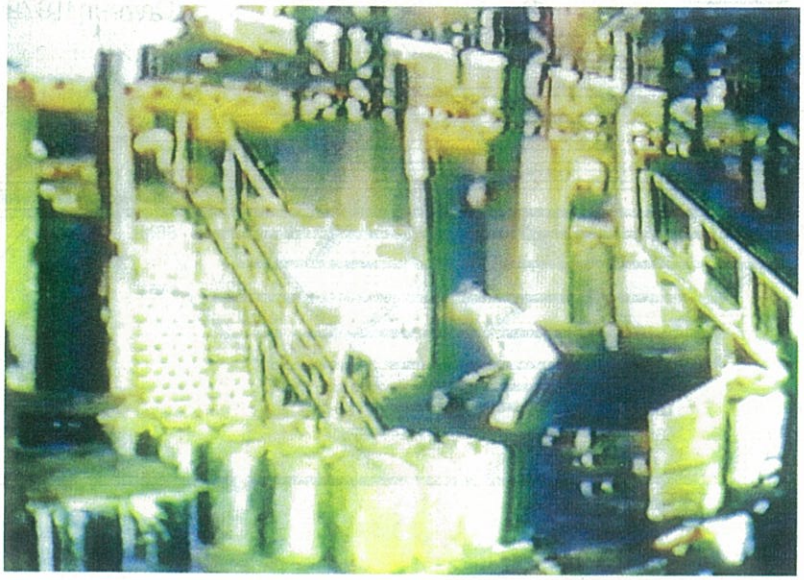


Crowd of people at the Matsuo Mine

However, since 1958, a serious recession of principal sulphur users, such as the chemical fiber industries, gradually deterioyated the management of sulphur mining. And what was worse, along with the regulations on environmental pollution, sulphur was collected from heavy oil at lower price. In consequence, such cheaply collected sulphur came into the market and gave a great damage to the management of the Matsuo Mine.

To tide over the difficulties, Matsuo Mine Co. switched to open-pit mining to rationalize operations. But as the Company Resuscitation Law was applied, at last, their mining right had to be abandoned in Apr. 1972.

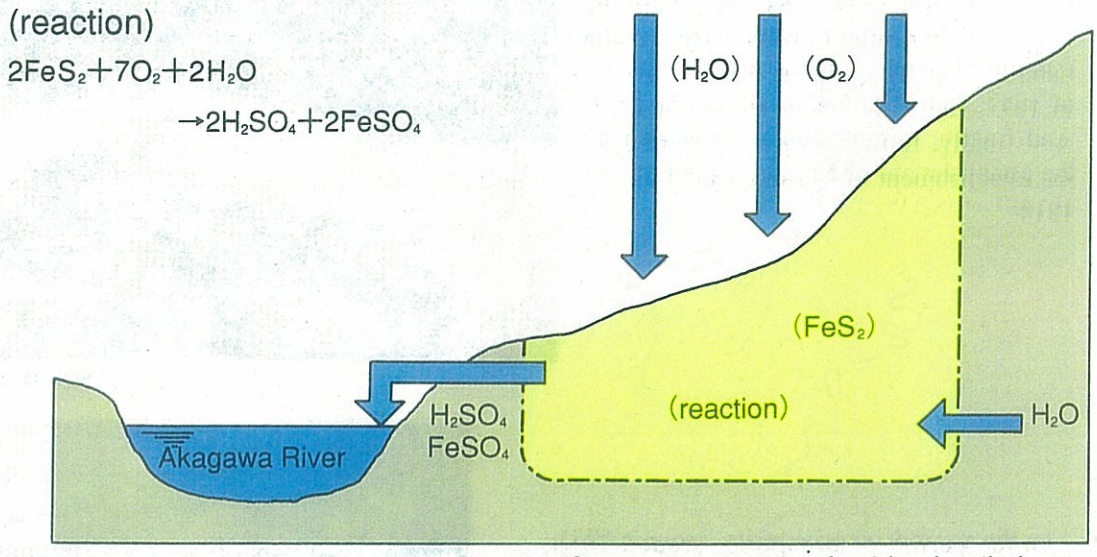
The Matsuo Mine mined about 29 million tons of sulphur and sulfide ore, and produced 10 million tons of sulphuric acid and 2.5 million tons of refined sulphur over a period of 60 years(since 1914), thus closing a long and productive history.



Smellting work of sulphur

Drainage from the abandoned Matsuo Mine

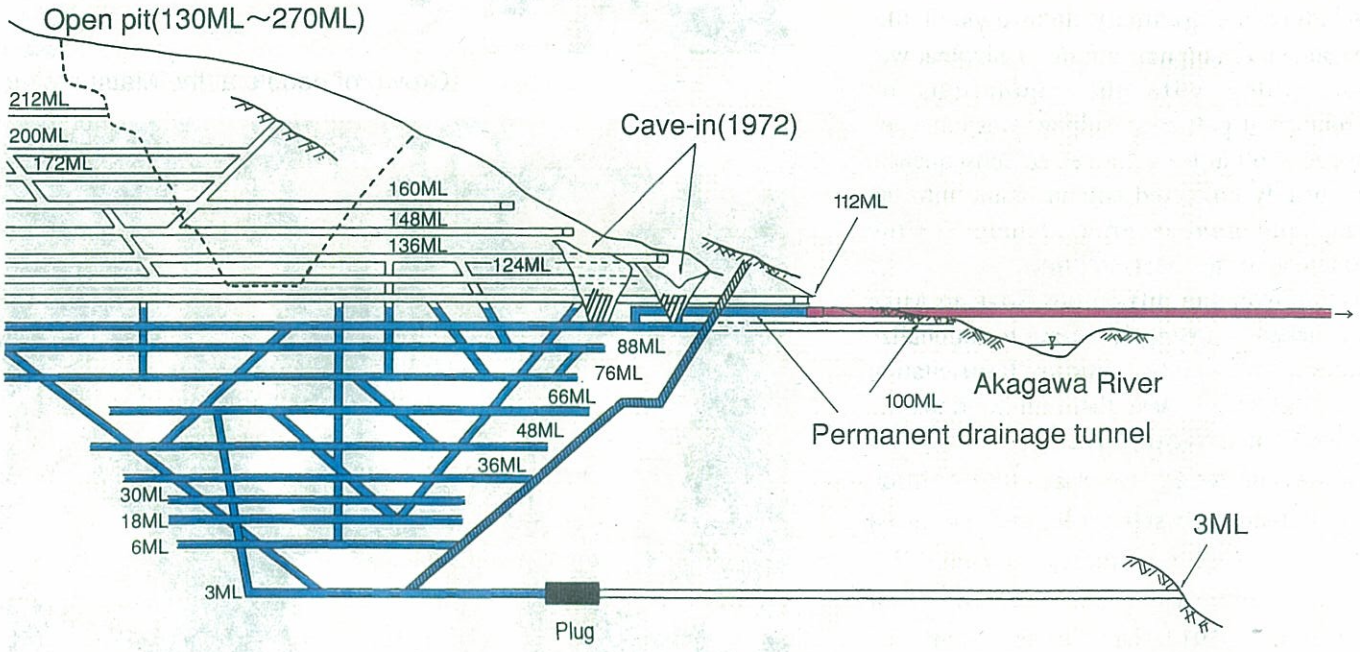
Drainage from the abandoned Matsuo Mine has strong acidity as pH=2, containing numerous iron and harmful arsenic. This strong acidity is caused by the reactions of pyrites, water and oxygen in the air.



Generation system of acid mine drainage

Galleries of the abandoned Matsuo Mine

There are many galleries in the abandoned Matsuo Mine. In the early years, drainage from the mine flowed out from the lowest 3 m level. But after setting the closing plug in 1970, drainage flowed out from 100 m level, and then, after a cave -in, flowed out from 112 m level. At present, the permanent drainage tunnel is used.



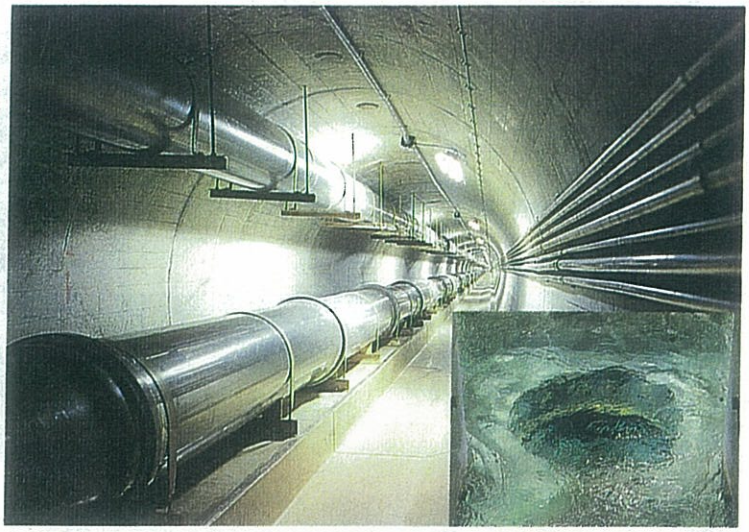
Section of the old Matsuo Mine

Summary of the Matsuo Neutralization Plant

1. Permanent drainage tunnel

Permanent drainage tunnel is a facility to send acid mine drainage to the Neutralization Plant. In early times of neutralization work, acid drainage was led from the adit at 112 m level. But as it was considered not secure enough, more stable drainage tunnel was constructed to be used semi permanently. It took them 18 months and finally completed in Mar. 1984 at the expense of 600 million yens.

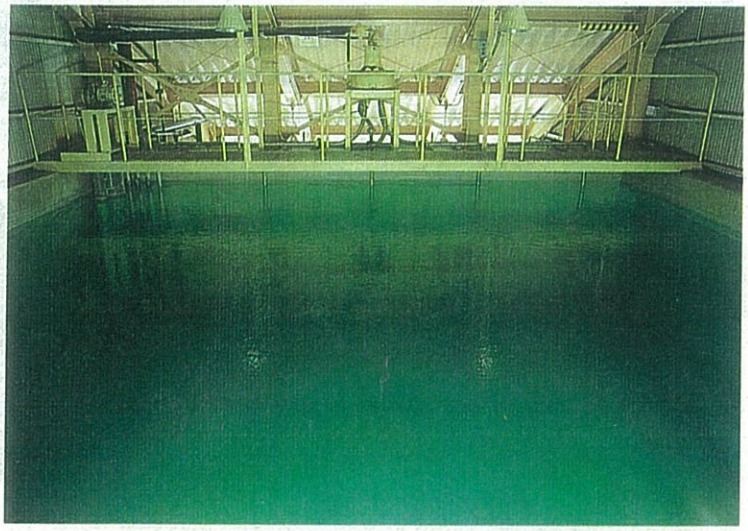
The tunnel was made of concrete with a hard vinyl chloride tube at 600 mm in diameter inside. The total length of the tunnel reaches to 322m. The acid drainage is sent to the drainage receiving tank through the vinyl chloride tube and then pumped up to the distribution tank.



Permanent drainage tunnel

2. Distribution Tank

Drainage is equally distributed into each parallel line in the distribution tank. There are 3 parallel lines in this plant. (No 4 line is for emergency only) Each of these 3 lines has a maximum treatment capacity of $12m^3/min$.



Distribution Tank

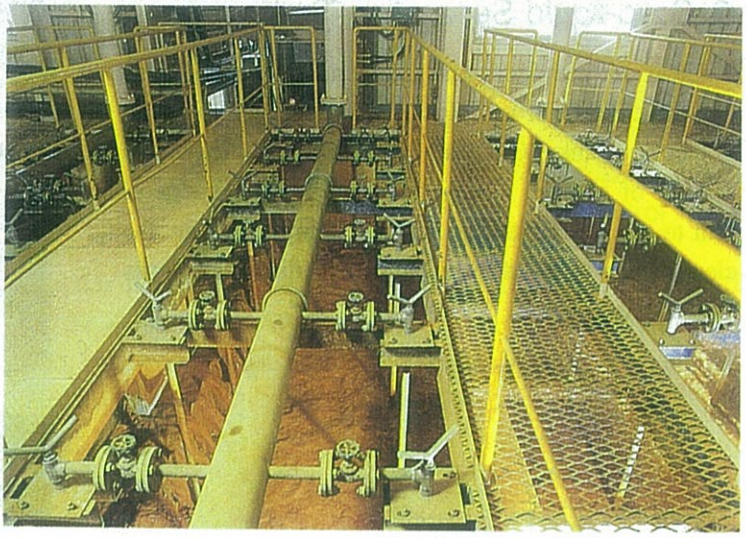
3. Oxidizing Tank

Ferrous iron in acid drainage is oxidized into ferric iron in this tank by the functions of concentrated Thiobacillus ferrooxidans.

Reaction is as follows.

$$4FeSO_4 + 2H_2SO_4 + O_2 \rightarrow 2Fe_2(SO_4)_3 + 2H_2O$$

Iron sludge is effectively utilized as a carrier of Thiobacillus ferrooxidans.



Oxidizing Tank

4. Bacteria Recovering Tank

In this tank, iron sludge with bacteria is concentrated and settled, and then recycled to the oxidizing tanks.

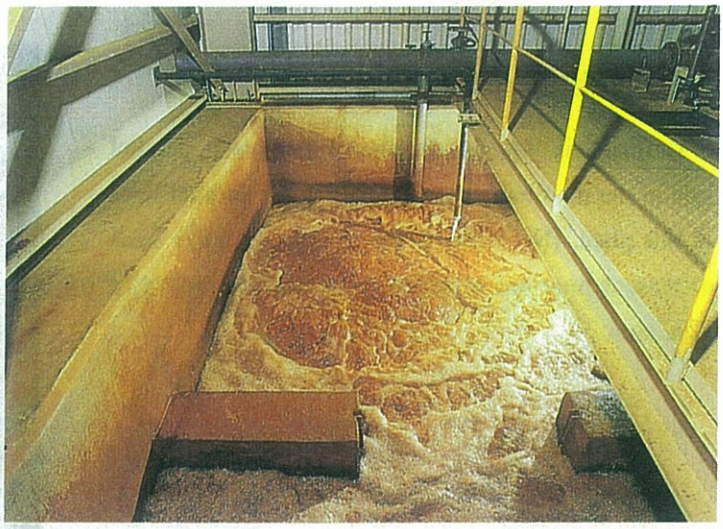
Bacteria Recovering Tank

5. Neutralizing Tank

After the bacterial oxidation, drainage is neutralized in this tank by adding $CaCO_3$ slurry to raise its pH value to 4.0. Air is sent in and stirred in this stage of neutralization. Reaction is as follows.

$$Fe_2(SO_4)_3 + 3CaCO_3 + 3H_2O \rightarrow 2Fe(OH)_3 \downarrow + 3CaSO_4 \downarrow + 3CO_2 \uparrow$$

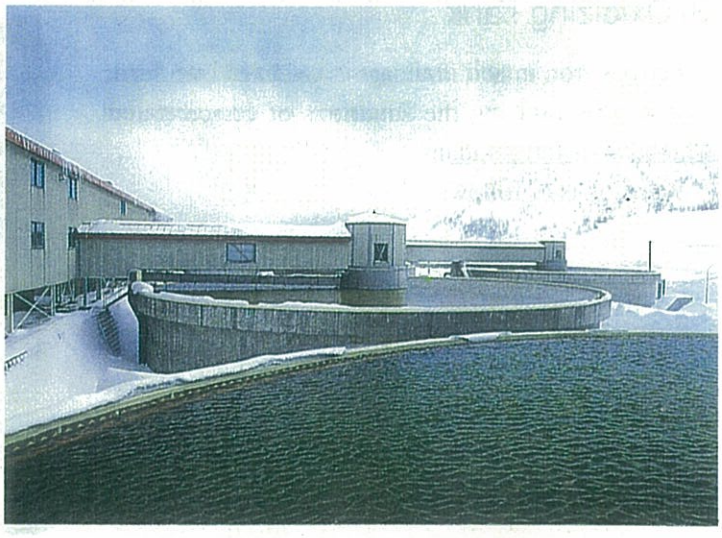
A large amount of iron sludge is generated by this reaction.



Neutralizing Tank

6. Solid-liquid Separation Tank

Clean surface water and sediments generated in the neutralizing tank are separated in this solid-liquid separation tank. Coagulant is added to quicken the settling of sludge. Coagulated and settled sludge is sent to the sludge storage dam by pumping while the clean water is overflowed and then discharged into the Akagawa River.

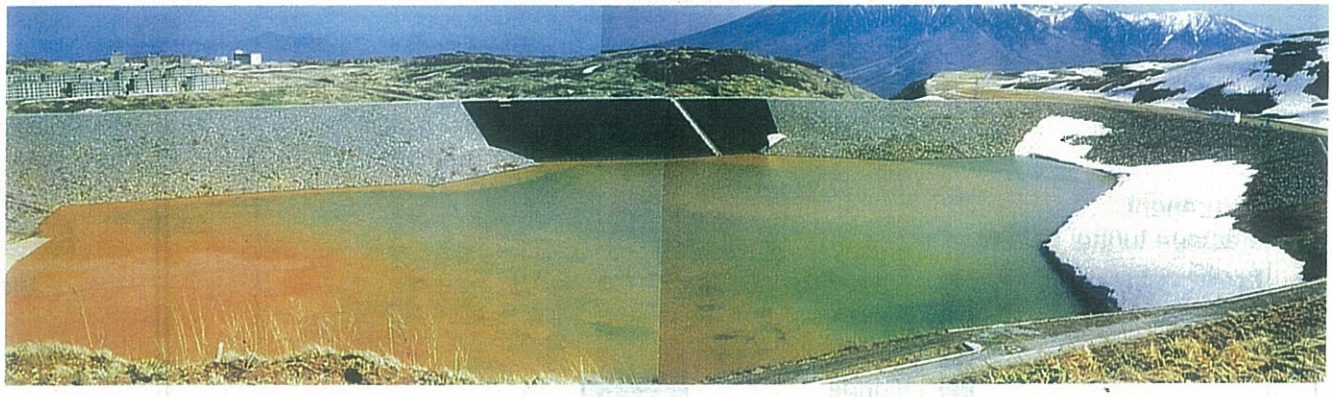


Solid-liquid Separation Tank

7. Sludge Storage Dam

Settled sludge is accumulated in the sludge storage dam. The dam was constructed by dredging and excavating a natural marsh adjacent to the plant. It is an inclined, core type rock-filled dam. Its eastern and western bank is constructed utilizing its natural topography. Earth and rock, excavated from the western slope, are used to construct its northern and southern bank. Also to prevent from erosion by the waves, the inside of the bank is lined with flat stones, which is so-called "the Rip-Rap method".

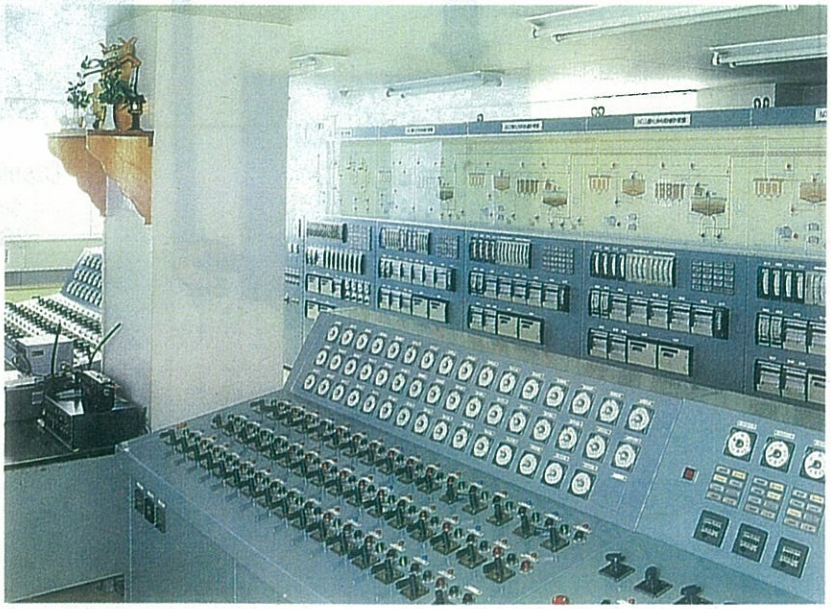
The total capacity of the dam is as large as 2 million cubic meters, and about 30,000 cubic meters of sludge is accumulated per year.



Sludge Storage Dam

8. Control Room

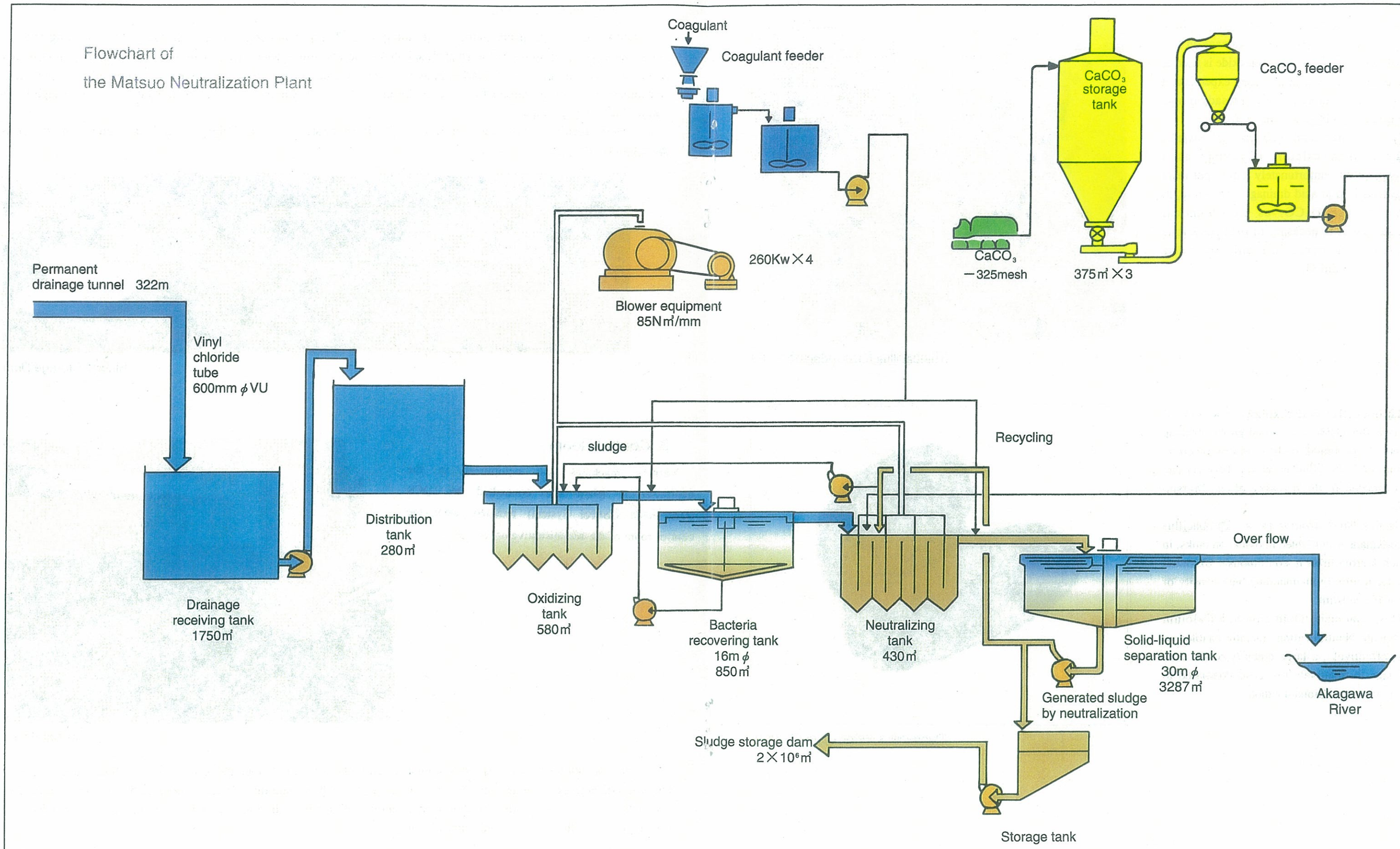
Various machines and equipment in the neutralization plant are controlled by DCS (Distributed Control System) remotely from the control room of the administrative office.



Control Room

The Neutralization Plant is operated continuously 24 hours a day throughout the year. About 9 million cubic meters of the acid drainage per year are now being neutralized by all these facilities. Water quality of the Kitakami River has attained to satisfactory standard by this neutralization. pH is within the range of 6.5 to 8.5, and arsenic contents low enough to satisfy the environmental standard value.

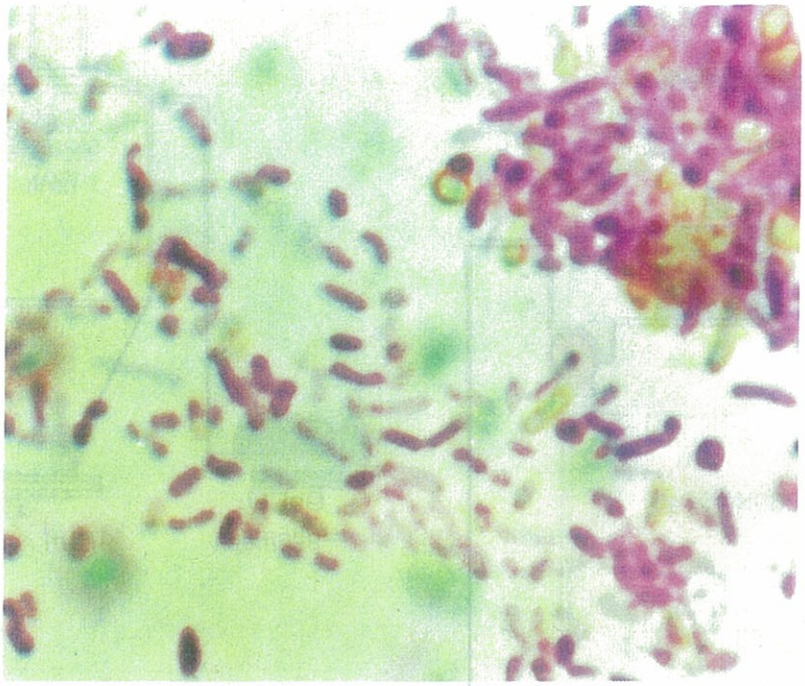
Flowchart of
the Matsuo Neutralization Plant



"Bacterial Oxidation and Calcium Carbonate Neutralization" System

Iron oxiding bacteria is effectively utilized to the treatment of the acid drainage in this plant. In general, calcium hydroxide is used as the neutralizer. But as it is very expensive, it brings about an economical disadvantage when dealing a large amount of drainage.

On the other hand, calcium carbonate is cheaper than calcium hydroxide as a neutralizer, but unfortunately it does not react to ferrous iron in acid drainage. Therefore, in order to use $CaCO_3$ as an econmical neutralizer, it is necesary to oxidize ferrous iron into ferric iron, as the ferric iron reacts chemically to $CaCO_3$.

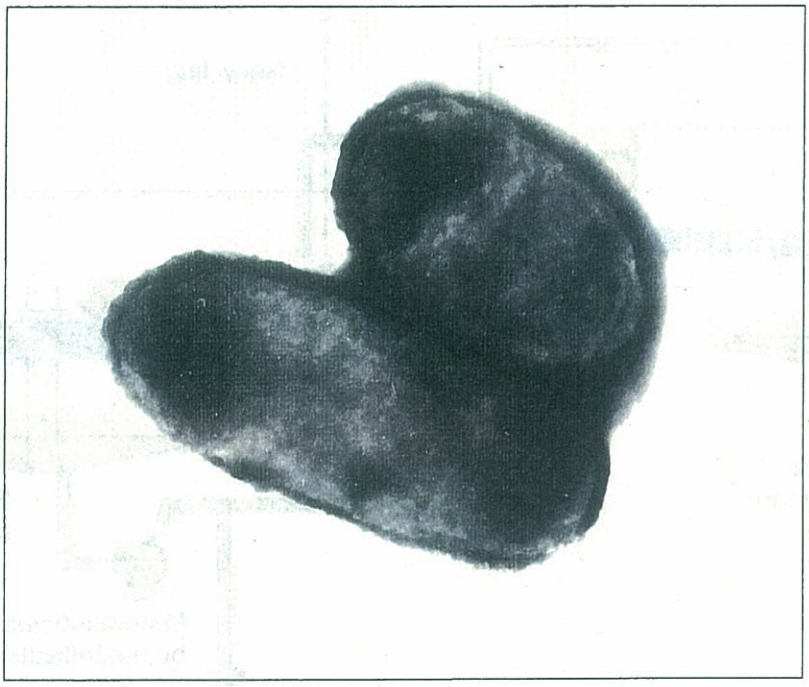


Thiobacillus ferrooxidans(5×10^3)

Thiobacillus ferrooxidans is a type of bacteria that oxidizes iron, and grows utilizing its energy generated in the oxidizing reaction. About 2.5×10^5 cells/ml. of this bacteria can be observed in the drainage of the Matsuo Mine.

In this Neutralization Plant, Thiobacillus ferrooxidans is cultivated in oxidation tanks, in which ferrous iron is continuously oxidized into ferric iron by maintaining high density of about 10^8 cells/ml.

This "Bacterial Oxidation and Calcium Carbonate Neutralization" method enabled to treat effectively, a large quantity of the acid drainage, in relatively low costs compared to the previous traditional method.



Thiobacillus ferrooxidans(7×10^4)

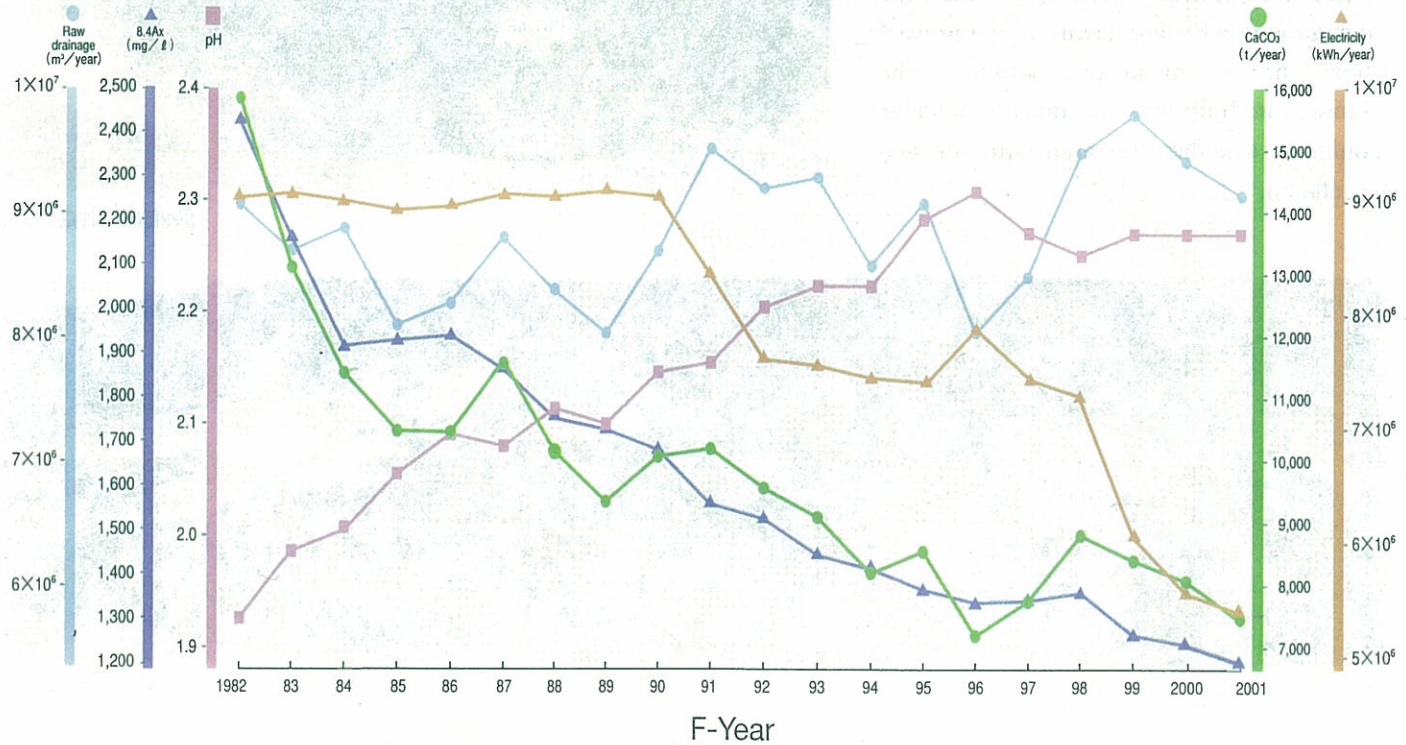
Annual variation in raw drainage

specification designing value / F-Year	Quanity (m^3/min)	pH	8.4Ax (mg/ℓ)	T-Fe (mg/ℓ)	Al (mg/ℓ)	As (mg/ℓ)
	20	1.6	4,240	795	189	5.77
1982	17.2	1.93	2,453	504	114	2.84
1985	15.6	2.06	1,926	392	75	1.85
1988	16.0	2.12	1,776	354	85	1.83
1990	16.6	2.14	1,698	335	74	1.78
1992	17.6	2.21	1,532	304	72	1.70
1994	16.4	2.23	1,411	286	70	1.68
1996	15.4	2.31	1,351	276	69	1.67
1999	18.6	2.27	1,279	254	69	1.57
2000	18.1	2.27	1,245	246	69	1.30
2001	17.4	2.27	1,196	237	70	1.31

Annual variation in treated water

specification designing value / F-Year	Quanity (m^3/min)	pH	8.4Ax (mg/ℓ)	T-Fe (mg/ℓ)	Al (mg/ℓ)	As (mg/ℓ)	SS (mg/ℓ)
	20	4.0	786	13	130	0.02	30
1982	17.2	4.20	509	2.3	81	0.02	5.5
1985	15.6	4.14	452	1.9	59	0.01	4.5
1988	16.0	4.16	435	2.5	61	0.01	5.7
1990	16.6	4.14	416	2.2	62	0.01	4.7
1992	17.6	4.14	399	2.0	57	0.01	4.4
1994	16.4	4.11	369	1.8	57	0.01	4.3
1996	15.4	4.14	351	2.3	59	0.01	5.9
1999	18.6	4.14	331	2.2	57	0.01	5.3
2000	18.1	4.13	325	2.5	58	0.01	5.9
2001	17.4	4.13	322	2.2	58	0.01	4.5

Quantity and quality of raw drainage,quantity of $CaCO_3$ and electricity



Construction Works against Pollution Sources

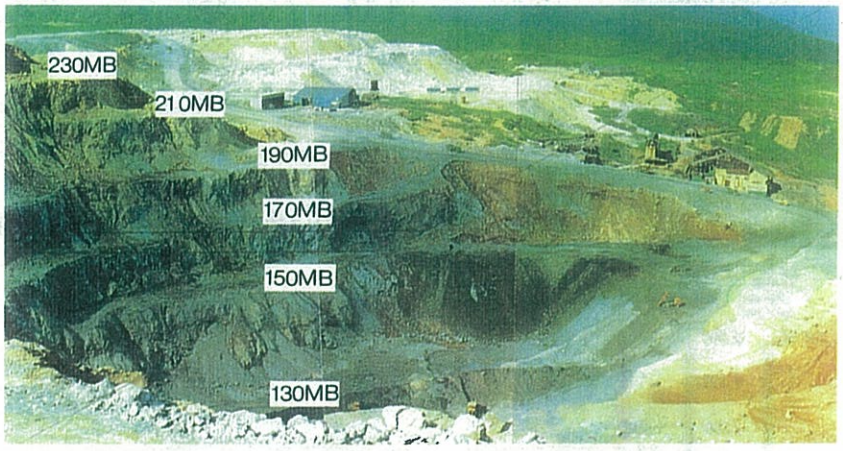
In addition to the neutralization of acid drainage, construction works for prevention of mining-related pollution are carried out to keep the sufficient water quality of the Kitakami River and to restore a green environment. These works aim at decrease of underground water and penetrating water by preventing tailings and waste dumps from collapse and overflowing, and also protecting it against infiltration of surface water.

Contents of the construction works of the abandoned Matsuo Mine and Kashiwadai area are as follows:

(1) Burying and covering works of the open pit site.
(2) Treatment works of tailings and waste dumps.
(3) Construction works of channels on halfway of slope.
(4) Construction works of protection channel in the Akagawa River.

(1) Reclamation of Tailings and Waste Dumps

The open pit site is a large horseshoe shaped basin, where spontaneous combustion often occurred. Also, surface water frequently infiltrated into the underground adits and cavities. To prevent these phenomena entire surface of the exposed ore body was reclaimed to a stable condition, and then covered with soil and vegetation.



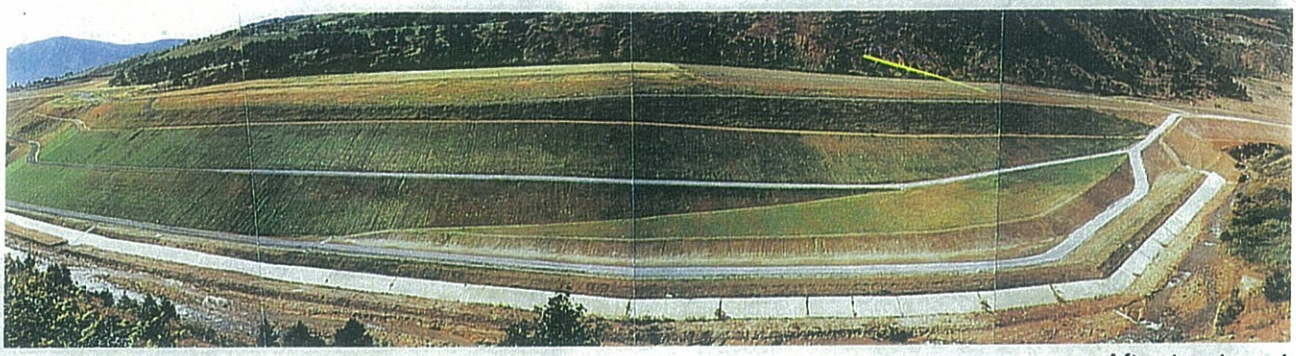
Before treatment

After treatment

(2) Stabilization of Tailings and Waste Dumps

Tailings and waste dumps are prevented from collapsing, overflowing, scattering and being affected by the infiltration of surface water to keep in stable condition.

Before treatment



After treatment

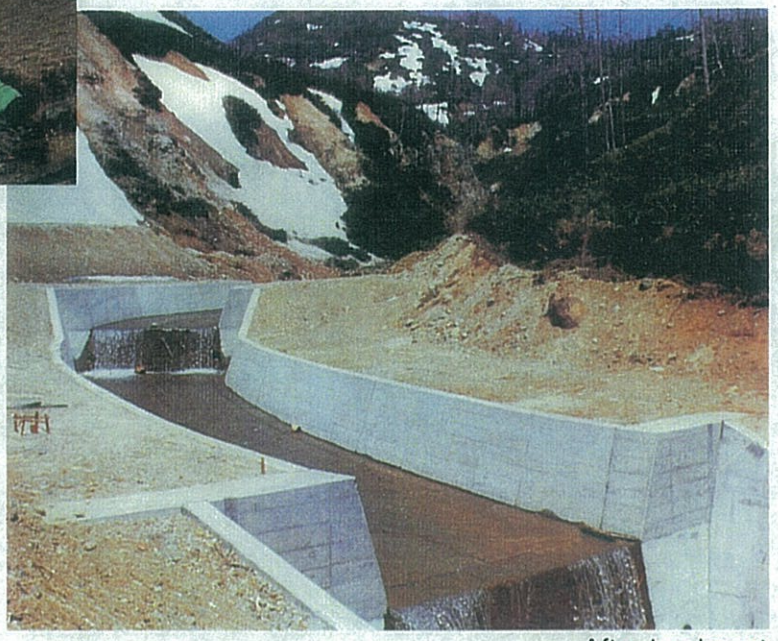
(3) Construction Works of Channel on Halfway of Slope

In the upper part of the old mining site, the water channels were set up along the mountainside to discharge surface water, which flowed into the site.

After treatment

(4) Construction Works of Protection Channel in the Akagawa River

Upper stream from the mine, three sided planes inside the stream of the river were covered with concrete lining to prevent some infiltrating water from the Akagawa River into the underground.



After treatment

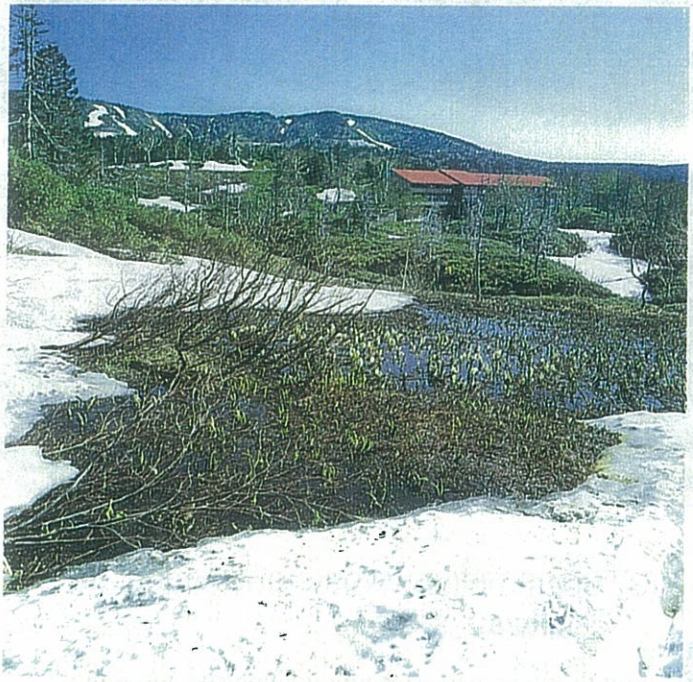
The Beauties of Hachimantai

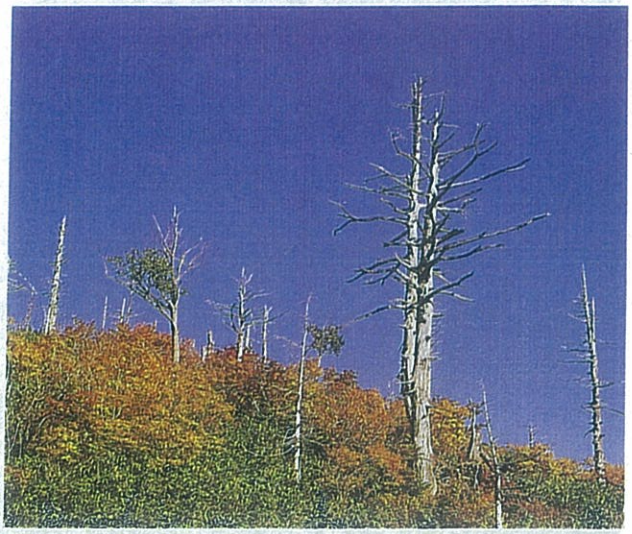
The extensive Hachimantai highland covers 404.89 km² and belongs to the southern part of the Towada-Hachimantai National Park which locates in the Iwate and Akita Prefecture. Hachimantai highland belongs to the Nasu volcanic zone. It consists of the highest peak of 1613.6 m above sea level and ranges of Mt. Morobi, Mt. Ohbuka, Mt. Chausu and Mt. Mokko, etc.

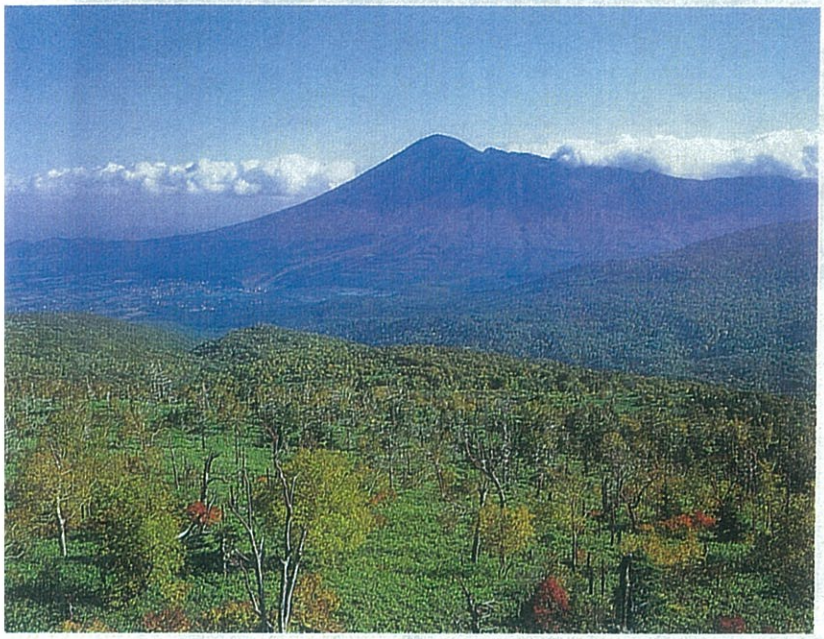
There are many scattering marshes related to the volcanic topography. Marshy plants and alpine plants bloom lovely flowers from early May to the middle of September every year. Trees of the Aomori white fir along the range of peaks symbolize the solemnity of nature.

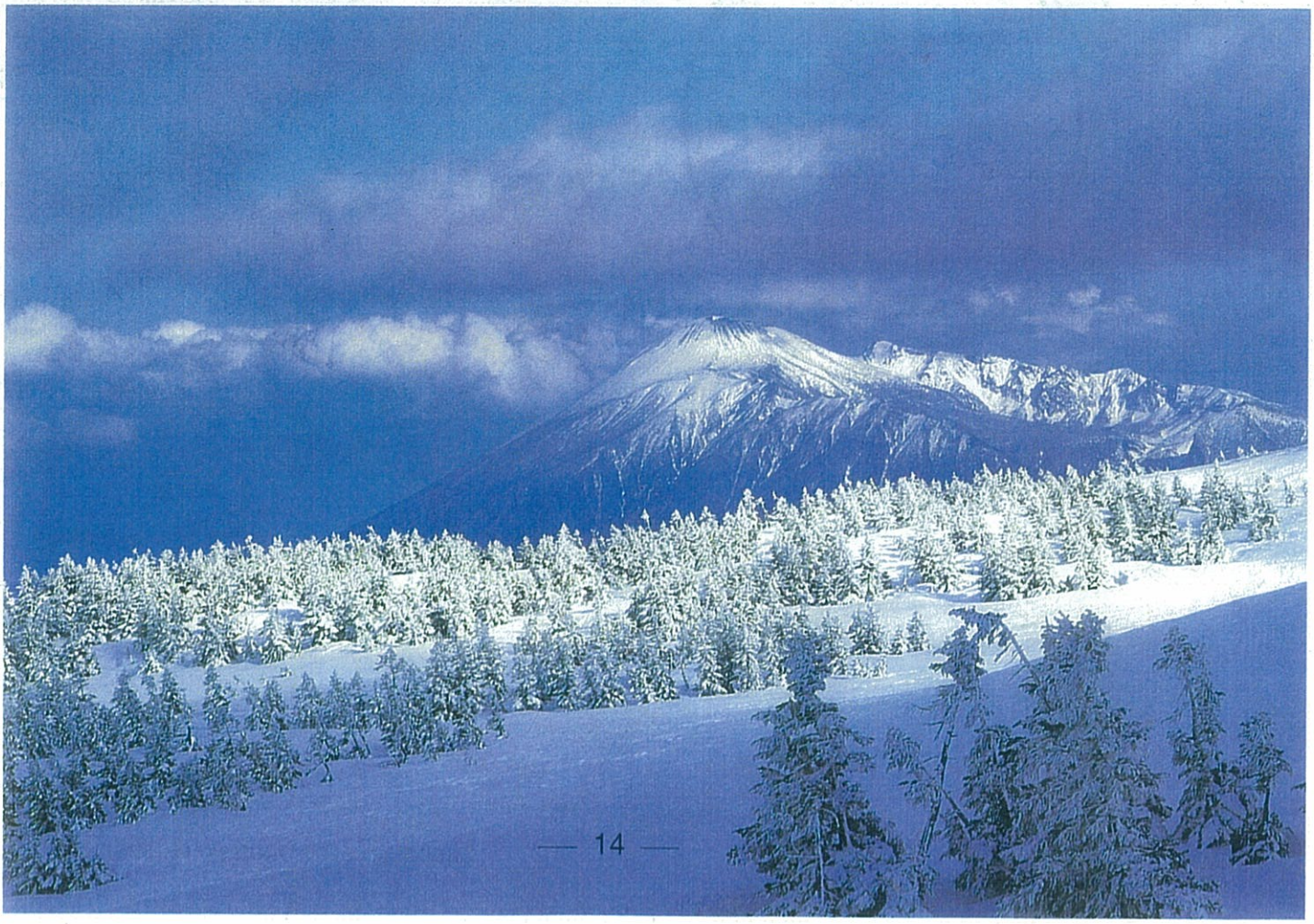
In winter, trees are entirely covered with ice which is famous for its wondrous shapes among silver shining snow, and said to be one of the greatest scales in Japan.

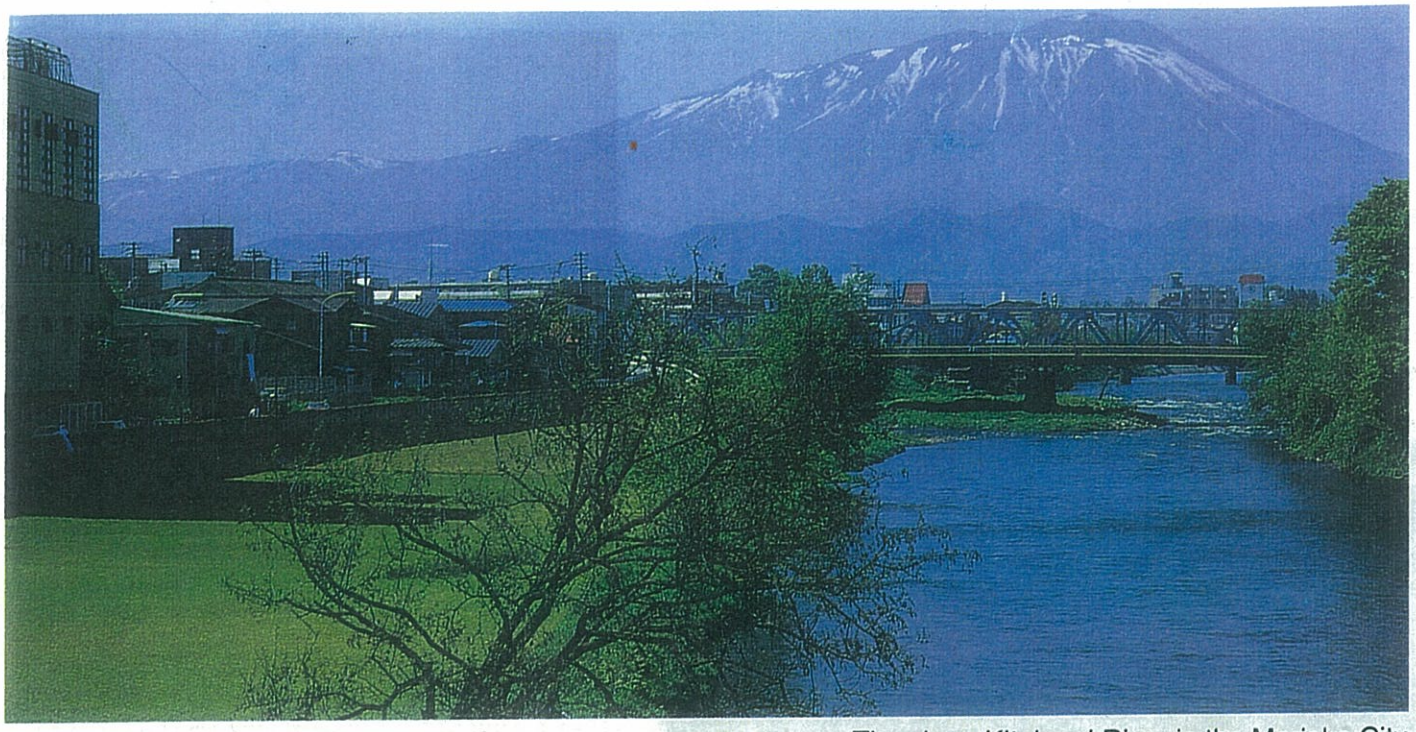
It expands the pleasures of ski-tourists in the Hachimantai highland .











The clean Kitakami River in the Morioka City

Location of the Matsuo Neutralization Plant
March 1995

DOWA ECO-SYSTEM Co., Ltd.
Comprehensive Environmental Risk Containment

Japanese Chinese

DOWA ECO-SYSTEM Co., Ltd. is a subsidiary company of Dowa Mining Co., Ltd., that was established in October 2006 in order to focus more specifically on Environmental Management & Recycling. Dowa Mining Co., Ltd. was originally established in Japan in 1884 as a mining & smelting company.

Dowa Mining Co., Ltd. was quickly able to position the Environmental Management & Recycling division as a leading company in this field by utilizing the proven technologies, infrastructure, experience and problem-solving methodology accumulated from their 120 years of mining & refining operations.

Currently, DOWA ECO-SYSTEM provides core services in Resource Recycling, Waste Management, Soil Remediation, and Environmental Consulting. The Company approaches a wide range of Environmental Management & Recycling projects as an Integrated Environmental Company, organically connecting all of the services necessary to tackle environmental risks as a whole.

The Age of Globalization requires us to operate with a global viewpoint about limited resources and fragile environments. DOWA ECO-SYSTEM Co., Ltd. considers the environment globally, and acts locally with communities and business organizations towards the reduction of environmental risks and the realization of a recycling-oriented society.

DOWA ECO-SYSTEM Core Businesses

We are a continually evolving leader and pioneer in the Environmental Management & Recycling Business.

DOWA ECO-SYSTEM has gained the trust of our clients by balancing top-quality environmental efficacy and economic efficiency.

DOWA ECO-SYSTEM is the premiere soil remediation company thanks to the synergy of experienced human resources, technological flexibility, and a well-developed infrastructure.

Environmental risks are controlled by the most effective methods applicable to the specific task.

Environmental Consulting

DOWA ECO-SYSTEM's consulting branch, E & E Solutions, Inc., acts as an integrated technical consultant to provide solutions for environmental and energy problems.

Global Network

DOWA ECO-SYSTEM works effectively as an organic combination of service units to provide the optimal solutions for preserving the environment as well as developing the economy.

Resource Recycling

DOWA ECO-SYSTEM's Environmental Management & Recycling Business

Our aim is to be a continually evolving pioneer and leader in the field of resource recycling.

DOWA ECO-SYSTEM's Environmental Management & Recycling Division has the broad-based expertise and high level of technology that allows the recapture of seventeen (17) different metals, including gold and silver, derived from the refinement techniques developed in the metal mining and smelting industry. We are promoting the formation of a Recycling-Oriented Society by our treatment technology and our recycling network.

Recycling of 17 Different Metals

DOWA ECO-SYSTEM takes advantage of our advanced technology which was originally developed in DOWA's long-standing mining and refinement operations to extract precious metals such as gold and silver that are present in ores in very small concentrations. Currently, the Company recycles as many as seventeen (17) different metallic elements using advanced metallurgical technologies. The recovered metal resources are brought back into society as newborn products such as accessories, electric substrates, films, electrical wires, and so forth.

The wide variety of metal recycling

Platinum Group Metals Recycling

In 2003, DOWA Group established a new company in the United States, Nippon PGM America, Inc., which

recycles platinum group metals, such as platinum, palladium and rhodium, from the catalytic converters used to purify automobile exhaust fumes.

Nippon PGM America, Inc., maintains a dominant share of the catalyst recycling business, not only in the domestic (Japanese) market, but also in the world market.

Waste Electrical and Electronic Equipment Recycling

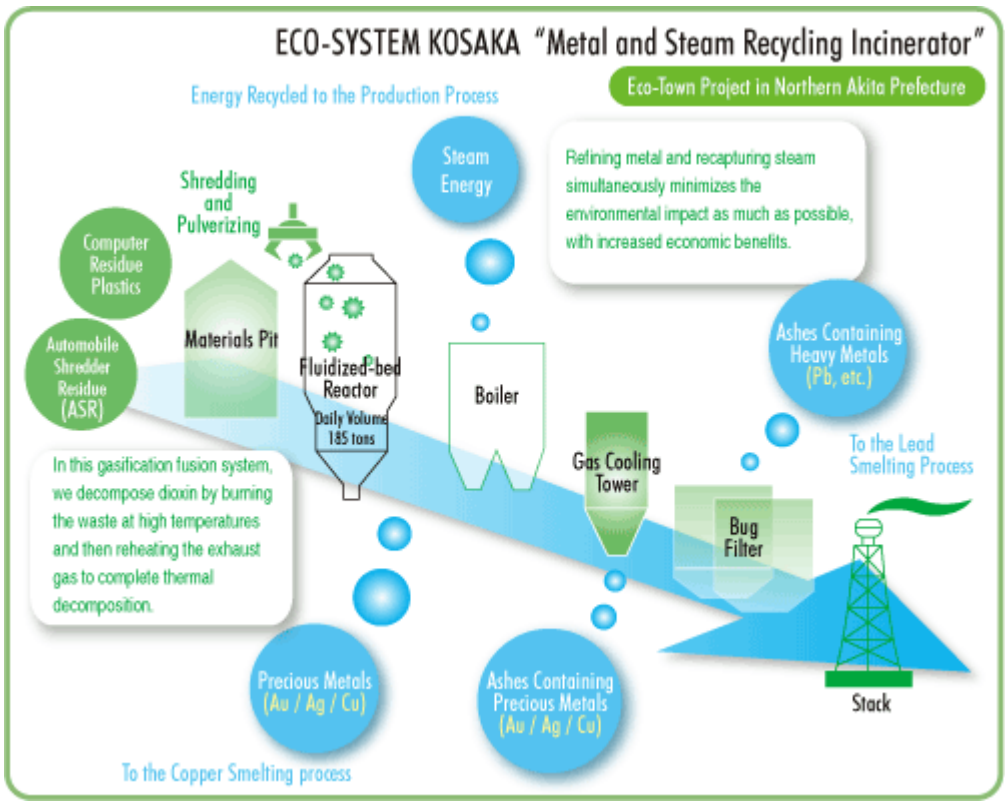
Two DOWA group companies, Eco-Recycle Co., Ltd. and Act-B Recycling Co., Ltd. , disassemble or pulverize obsolete or inoperable home appliances (televisions, refrigerators, washing machine, air-conditioners, etc.), automobiles and office equipment (computers, copiers, phone systems, etc.) in order to recover recyclable material for DOWA Group's Kosaka Smelting & Refining Co., Ltd. The Kosaka facility makes efficient use of the incineration heat generated by the adjacent waste treatment facility operated by DOWA Group's ECO-SYSTEM AKITA to decompose ozone-depleting substances and greenhouse gasses (chlorofluorocarbons) in the end-of-life automobiles, refrigerators and air conditioners by thermal treatment.

End-of-Life Vehicle Recycling Law-Compliance

DOWA Group quickly responded to the Law for Recycling End-of-Life Vehicles which became effective in Japan on January 1st, 2005. At ECO-SYSTEM KOSAKA facility, precious metals are recovered from Automobile Shredder Residue (ASR), which formerly was disposed of as simple waste, by using their “Metal and Steam Recycling Incinerator”.

The facility also recaptures the steam heat that is required for the process of refining the Automobile Shredder Residue and reuses it for energy in the recycling system. This method of collecting metal and steam simultaneously realizes a net reduction of environmental burdens and generates economic efficiencies.

In 2005, DOWA Group built an additional incinerator in West Japan, ECO-SYSTEM OKAYAMA, which established another location in Japan (in addition to ECO-SYSTEM KOSAKA in Northern Japan) for the processing of Automobile Shredder Residue.



ECO-SYSTEM KOSAKA “Metal and Steam Recycling Incinerator”

Recovery of Precious Metals by Wet Process

DOWA Group's ECO-SYSTEM RECYCLING recaptures precious metals, such as gold, silver and platinum, out of high-grade recyclable materials through the Wet Process.

Current operations are based at Saitama and Okayama, and expansion of operations to China is moving forward, promoting the safe treatment of wastes and recycling of metal resources in China itself.

New Recycling-Only Furnace Currently Under Construction

Kosaka Smelting & Refining Co., Ltd. of DOWA Holdings Co., Ltd. is currently constructing a new furnace for the exclusive purpose of recycling, which is targeted to commence full-fledged operations in the spring of 2008. Materials to be processed include electronic substrates, scraps and residue containing precious metals and refractory ores. A total of 19 elements will be extracted (including for the first time, tin and nickel). The new furnace system is designed efficiently; it contributes enormously to the reduction of environmental burdens by reducing the amount of waste generated and utilizing slag efficiently.

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