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Japan Report

(FOUO 13/81)

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MILITARY

ARMS EXPORT CRITICIZED BY 'DAILY YOMIURI'

Tokyo DAILY YOMIURI in English 12 Jan 81 p 2

[Editorial: "Danger of Arms Exports"]

[Text]

Hotta Hagane Company, which exported what are believed to be gun barrels to South Korea, is being investigated by the International Trade and Industry Ministry (MITI) on suspicion of violating the government's "three principles banning export of arms."

Prime Minister Suzuki in this respect has reconfirmed the government's stand of adhering to the three principles. However, MITI's administrative guidance in this instance alone will not solve the problem. The coming Diet session is most likely to take up the issue of arms exports. Debate is also expected to stir up among the public.

Voices are growing in the government and business community calling for relaxation or abolition of restrictions on arms exports. The three principles, worked out in 1967 by the then prime minister Eisaku Sato, ban arms exports to communist nations, countries to which arms sales have been banned under a UN resolution and countries engaged in hostilities or likely to become involved in armed conflicts. Former prime minister Takeo Miki expanded the scope of these principles in 1976, thus totally banning arms exports.

Those who advocate relaxation of the ban on arms exports contend that (1) mass production of arms will reduce production costs, resulting in reducing the people's financial defense spending burden; (2) lifting of the ban will facilitate growth of the defense industry and strengthen the nation's self-defense capability; (3) arms exports can be used as a diplomatic means to maintain military balance in crucial regions as well as ensure peace, and (4) arms exports to the Mideast oil-producing states are decisive in ensuring stable oil supplies from them.

Change In Govt Policy

The argument calling for a turnaround in the government's arms exports policy must be flatly rejected. However, we find that some proposals seeking relaxation of the rigid ban are not completely off the mark.

Nevertheless, when we reflect upon what is truly beneficial to Japan's national interest and what is truly conducive to the world peace, we believe it is more advisable for this country to continue to stick to the present policy of banning arms exports in principle.

The basic reason for this stems from the ideal for Japan as a state. Also, there is a national consensus that Japan as a peace-loving country should never become a military power and that it should contribute to world peace not through military strength but through good use of its economic power.

A change in the government's present arms exports policy would undermine this nation's ideals as well as mar its image abroad of a peace-loving country.

Invitation To War

Arms exports by such countries as the US, Britain, Italy and the Soviet Union might have been originally meant to maintain a regional military balance. But the Iran-Iraq war, for example, clearly shows that those weapons actually induced wars which would have otherwise been prevented. In addition, the Iran-Iraq war has also dealt a severe blow to oil production and supplies. It is the industrially advanced countries which now find themselves on the other end of the barrel after having provided the Mideast countries with weapons in large amounts.

Japan should appeal to the world to restrict exports of conventional weapons, taking advantage of its own policy of banning arms exports. This is not just a sentimental argument but a realistic suggestion based on Japan's own national interest.

(December 12)

CSO: 4120

MILITARY

STATEMENT ON ARMS DEALS OKAYS INSTALLATIONS

Tokyo DAILY YOMIURI in English 28 Jan 81 p 1

[Text] A cabinet meeting Tuesday approved a newly drafted "government view" on Japan's weapons exports which authorizes Japanese companies to undertake construction of military installations for foreign countries within the bounds of the government's "three principles" on arms deals.

The government also reaffirmed its stand that no restrictions should be imposed on export of those "general purpose" industrial products that could be used either for military or nonmilitary purposes.

The government statement came in reply to written questions that a Socialist and a Komeito Dietmen jointly filed last week over the recent disclosure of exports of a large amount of semifinished artillery barrels to South Korea by a Japanese special steel export firm.

As far as the artillery barrel exports are concerned, the government's written reply suggested that the Osaka-based export firm, Hotta Hagane, should be interrogated by the authorities on suspicion of violating the three principles on arms exports.

The three principles, which was laid down in 1967 under the Sato administration, stipulate that Japan will never export weapons or parts of weapons to (1) countries in the communist bloc, (2) regions with armed conflicts or those likely to have such conflict and (3) countries to which arms exports are banned by a UN resolution.

Besides these three categories, the Japanese Government has officially been following the antiarms export policy declared by the Miki cabinet in 1976, to the effect that Japan, in line with the spirit of the war-renouncing constitution, should restrain from exporting weapons to any foreign country.

Tuesday's government statement in reply to the opposition Dietmen reiterated that the three principles concerning arms exports should be observed as before.

However, it said the three principles should not be applied to the so-called "general purpose" industrial products that could be used for a wide range of purposes, military and nonmilitary.

At the time of shipment of such products, it is technically impossible to ascertain whether they would be used for military purposes or not in the foreign countries importing them, the statement said.

The written government replies also have given "fundamental approval" to possible participation of Japanese companies in projects to construct military installations for foreign troops.

In case such projects should involve construction of structure directly related to production of weapons, no Japanese firms could be allowed to undertake the construction projects under the three principles against arms exports, according to the government.

Military installations however, the statement said, also comprise such facilities as hospitals and boarding quarters of troops.

It would be inadvisable to indiscriminately apply the three antiarms export principles to such construction projects not directly related to weapons, the statement said.

Rifle Exports Bared

The written replies also made public for the first time the amount of exports from Japan of swords, rifles and related weapons to the US, Canada and other countries not covered by the three principles against arms exports.

A breakdown showed that during last year Japan exported 120,417 shotguns and 117,007 rifles, all as "general purpose" products and not as military weapons.

According to a reliable government source, however, the government had one time allowed a gun maker to export an unspecified number of rifles of the kind now being used by Japan's self-defense forces to South Korea under the name of "rifles for hunting purposes."

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ECONOMIC

BIG BUSINESSES' STRATEGIES TO SURVIVE 1981

Tokyo INDUSTRIA in English Jan 81 pp 8-16

[Text]

For Japanese businesses, 1981 will not be an easy year. Trade frictions with other countries may intensify as exports increase. There is no assurance that domestic demand will rise. The primary reasons are that taxes, direct or indirect, will increase under the Government's policy of reconstructing deficit-ridden state finances and that consumer spending may stagnate in 1981.

Under these circumstances, enterprises continue frantic efforts to find what will sell and what they should sell. Their research efforts that began in the latter half of 1980 will intensify after the turn of the year. Structural reorganizations big businesses have been carrying out since last year are good examples of their efforts. So, we will introduce here some of the "survival strategies" of Japanese enterprises. These strategies would cover not only 1981 but also five to 10 years ahead.

New Organizations

Recently conspicuous is that enterprises are establishing new organizations and new divisions.

Of the 952 enterprises listed on the First (Major) Section of the Tokyo Stock Exchange, a total of 323 firms announced plans for organizational reforms during the period from March 1 to October 31, 1980. This means that one out of every three is engaged in organizational reform.

Of the 323 firms, 84 expanded marketing or sales divisions; 55 firms established or expanded research and development divisions; 39 firms were trying to establish business bases overseas; 21 others were engaged in research on the development of energy sources; 10 others were giving priority to marketing, survey and public relations; seven others had plans to promote development of new materials and new technologies; seven others were stepping up controls on funds and materials; seven others intended to strengthen quality control of their products; six others were increasing investments; five were placing emphasis on the development of human resources and training; three others were expanding business with China and the Soviet Union; and another three were expanding patent divisions. The other 76 firms were reorganizing other fields.

The largest number of firms – 84 in all and 26% of the total – expanded the front line areas, such as marketing and sales divisions. One out of every four firms was placing emphasis on selling products.

The second largest was the expansion of research and development divisions – 55 in all – 17% of the total. Their interest lies in how cheaply they can make products that sell well.

The third group aims at expanding overseas business. However, this would involve "country risks" as seen in the case of the Iraq-Iran war. That could cause trade frictions as seen in exports of automobiles and electric appliances to the United States and European Economic Community nations. External business conditions facing Japan are

growing increasingly harsh. To be sure, Japan is a trading country. "We will fully take local conditions into account in developing overseas markets." "We will cooperate in the development of local industries." "We have established the overseas business headquarters to study conditions involved in overseas production." These are some of the statements made by executives of leading manufacturers who are engaged in overseas business. It appears that the executives now recognize the problems facing them.

The fourth group is engaged in operations to develop new energy sources. Atomic energy development and the development of coal liquefaction techniques are typical projects being tackled by the electric power, steel, petroleum and general chemical industries. Big general trading houses are also organizing new groups for those development projects. They are really challenges to the new age.

Shigetaka Ikeda, managing director of Mitsubishi Research Institute Inc., has this to say: "When we work out business strategy, it needs to be a long-range or medium-range strategy that will cover five or 10 years ahead. It also has to be a scrupulous one. It will be important to develop new products and new techniques. And we have particularly strong interest in projects to develop new energy sources and save energy." A good example of this is the creation of the "Energy Administrative Division" by Mitsui & Co. Until two years ago Mitsui did not have any solid division to deal with energy problems. And a new division was established in October, 1979, to promote business related to energy – oil, coal, gas, atomic energy and other new energy sources. This division, however, was replaced only in a year by the Energy Administrative Division, which was inaugurated on October 1, 1980. The new division promotes and administrates all energy-related projects from scratch to execution of business. Mitsui says this was merely an organizational change to carry out energy development projects more smoothly in the future. Behind this move, however, is obviously the management's determination to defeat its arch rival, Mitsubishi Corp., to win the crown of the world's largest trading firm.

Just as the development of new energy sources is a challenge to the new era, so is the establishment of a new materials processing division by Nippon Mining Co. and of an optical communications division by Nippon Electric Co.

Similarly, an increasing number of firms are establishing new departments to deal with China and the Soviet Union, while other firms are expanding offices handling legal affairs and patents.

New Technological Development

Asahi Chemical Industry Co. created a "Functional Products Business Division" within the "Resin Business Headquarters" in May, 1980. A newly-developed DFR (photo-sensitive dry film resist) and hole element are two outstanding products handled by the new division. Both are electronic products – a kind of products the company had never handled before.

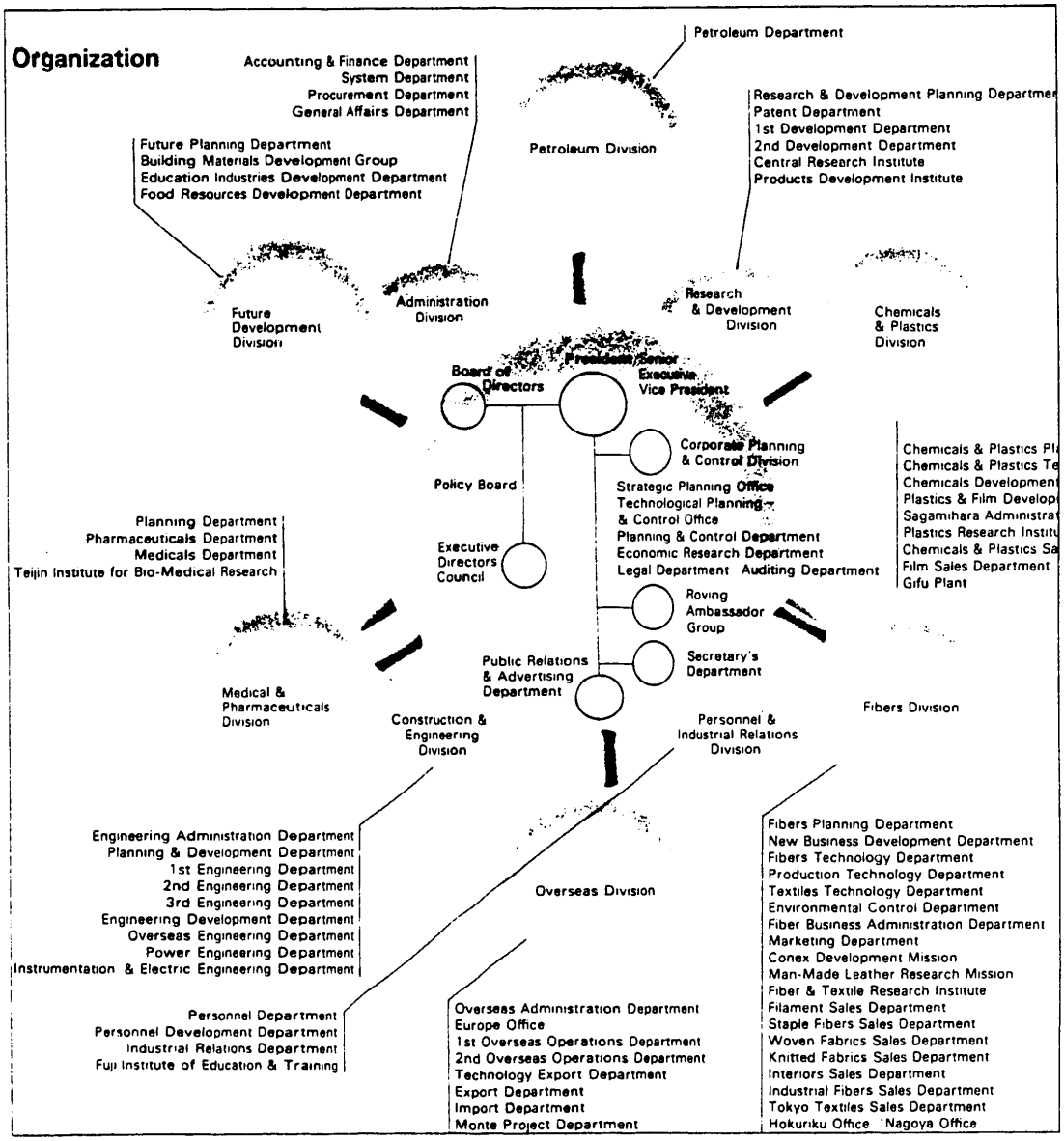
In the past Du Pont of the U.S. had dominated the world's DFR market. Because of its patent problem, no other firms were able to produce the material. But Asahi Chemical has finally broken the barrier. It has already obtained a patent for its product in the United States. Its mass production facilities are under construction at the site of the Fuji Plant. The company plans to market the product mainly on the domestic market.

Asahi Chemical is a mass energy consuming chemical manufacturer whose lines of products are centered on materials. But the company, in fact, aims at a general chemical producer turning out less energy consuming higher value-added products – mainly specialty chemicals and electronic component products. The company has also established a coal development department – a move to launch full-scale research on coal liquefaction.

A "break with oil" – discovery of major energy sources that can replace oil – is a national task for Japan. Even the oil industry cannot stay away from the national effort to find substitute energy sources. Idemitsu Kosan and Mitsubishi Oil have already embarked on projects to develop coal mines overseas to import their coal to Japan on a commercial basis. Nippon Oil, which had been reluctant to engage in business other than oil, has mapped out a plan to import Australian coal under a development formula.

In July, 1980, Daikyo Oil inaugurated a "coal business department." This indicates that coal has become a permanent line of business for the company in contrast to the past when it was being studied by a single project team alone. Daikyo officials said that energy sources other than oil would inevitably dominate future energy supplies and that the company, as an energy supplier, should handle coal and other energy sources.

Coal business would involve risks for oil refining companies. They buy oil only from oil producing countries or major oil companies. In the case of coal they would take part in coal development projects which would often



The administrative structure of a leading textile company.

involve high risks.

Why then did Daikyo establish a new coal business department? This is because some of the major corporate oil consumers began switching their fuel from oil to coal. Mitsubishi Chemical Industries established an atomic energy department and a coal liquefaction and development department in August, 1980, and a life science department in October. The atomic energy department aims at effective use of its technologies and products in the field of atomic energy. A typical product is an ion exchange resin developed with its own technology. It is said to have 10 times the absorption capacity of titanium oxide to enrich uranium in sea water. The company is also engaged in joint research projects with the Shikoku Industrial Experiment Station of the Ministry of International Trade and Industry. It has also invested in Japan Atomic Fuel Service, which is processing used nuclear fuel.

The coal liquefaction and development department is in charge of business concerning Nippon Brown Coal Liquefaction Co. – a joint venture established in August, 1980, by Kobe Steel, Mitsubishi Chemical, Nissho Iwai, Asia Oil and Idemitsu Kosan. The department will also take charge of technological development, survey and planning to prepare for a possible full-scale advance in this field.

The life science department will concentrate its effort on biotechnology, which will be taken by MITI in 1981 as a project for technological innovation. The main subjects of research are bioreactor and the rearrangement of genes. In 1977, Mitsubishi Chemical set up a life science research institute. It was the first among Japanese enterprises to enter research in life science. It also has a biochemical laboratory in its central research institute. The department coordinates interdepartmental problems on related subjects, negotiates with other firms and organizations, and works out business strategy.

Ishikawajima-Harima Heavy Industries has also taken an active posture, now that it has generally completed a "fat-trimming rationalization program" and has a backlog of orders for shipbuilding amounting to two years work.

In July, 1980, it set up a new system under which the council of managing directors oversees eight business divisions – the machinery, energy, plant construction, shipbuilding-ocean development, aircraft and space, and overseas operation division as well as the domestic business operation division and the export division. The new system is much like the previous setup of business headquarters. But it is so designed as to promote interdivisional coordination and consultations as well as personnel exchanges between the head office and the divisional headquarters. Efforts are expected to be made to achieve interdivisional consensus through daily activities conducted on interrelated matters.

The long-range strategy is to strengthen the overall competitiveness. But the aims for the immediate future are to raise earnings from overland machinery and give priority to rapidly-growing areas of business – more specifically, aircraft and space, plant construction and energy-related business.

Survival Strategies

Kansai Paint's organization reform has two features. One is an expansion of the technology division. The other is the establishment of a new department within the production division. The technology division will have eight new divisions – technical research institute, automotive paint technology department, anti-corrosive marine paint technology department, general-purpose paint technology department, industrial paint technology department, PCM paint technology department, can paint technology department and paint engineering technology department. This reform, of course, is aimed at expanding the research system. And the area of responsibility to be assumed by the research staff is clearly defined to conduct research more effectively.

The production division set up a production technology department under its control. It was formerly a production technology section. The new department is responsible for studying productivity problems on the production line.

The emergence of synthetic resin after the end of the World War II has led to a considerable advance in the painting industry. As a result, the thickness of painting has been reduced from the unit of millimeter to that of micron. Behind the expansion of the technology division is the technical advance of the times.

Meanwhile, Hitachi Ltd. in 1980 inaugurated four new business promotion divisions – for medical equipment, defense equipment technology, office automation and fiber optical communications.

As a result, the number of promotion divisions rose to 12. The system of promotion division is a provisional setup. The divisions are placed directly under the president, but each of them differs in nature. For example, the China CPT, China Paoshang and SNS Divisions handle big overseas projects. In contrast, the medical equipment business and office automation divisions are a sort of coordinating machinery designed to provide the direction for given issues.

The increase of the promotion divisions indicates the existence of various problems that are beyond control under the "vertical" administrative system. The promotion division is a staff branch and small in scale – five or six staffers are assigned to each office.

Nippon Kokan established new divisions engaged in shipbuilding planning and ocean development planning to widen the company's capabilities of technological development. Shinagawa Refractories, the top manufacturer of fire bricks in Japan, established production technology, materials and other new departments to prepare for the export of plant and equipment as well as technology. Japan Storage Battery established the business headquarters and the research and development headquarters. Sekisui Chemical reorganized branch offices by products to be handled by them with a view to achieving more efficient business operations. Thus "survival strategies" quite vary in different enterprises.

Particularly unique is the establishment of a cultural business department by Wacol, a leading manufacturer of women's underwear. It consists of two business offices. One will prepare the establishment of a "culture center." The other is an "apparel research office." The company hopes to open the culture center in November, 1984, when it marks the 35th anniversary of its founding. This is an expanded version of the original plan, which was designed to build an apparel museum. Whether enterprises will succeed in survival strategies will probably be known before long.

Tsutomu Ohno, an economic critic, comments on the issue as follows:

"Recently many businesses are carrying out organizational changes. The form of changes differs with firms. Some are heading for consolidation, while others are subdividing their organizations. And common to many is the effort to develop new areas of business. They are pursuing research development, technological development, product development, market development and the like. The pursuit of new areas of business is likely to be the initial trend in the 1980s.

"It is often said that enterprises should trim their fat in their organizations and then switch their management posture from the defensive one to the offensive one. The active organizational reform now going on among Japanese businesses, along with a rise in the employment of new university graduates, clearly shows a shift in their management posture. What is conspicuous in the development-oriented organizational reform is that the top management's will is reflected in every level of business structure, starting from the very beginning of the reform to personnel changes and specific actions."

Even this kind of reform has two types, according to him. One is a new development system to be placed directly under the top management, separate from other organizations within the enterprise. The other type is based on conventional activities and related to other organizations.

Research and development are something like groping for the new in a black box. Therefore, they would run high risks and often end in failure. Gains from a successful development would be great, but there is no guarantee for a success. "The reality of research and development is something like taking over a chess game from someone else. Chessmen have already been set on the board by the predecessors over the 30 or 50 years. Tens of players may have already played the game which is still continuing," said Shunkichi Shirosaka, senior managing director in charge of technology at Matsushita Electric Industrial Co.

He probably meant that a jump in the progress of technology cannot exist without past achievements. Considering such jumps in research activity and the continuity of research, what conditions would lead a given research project to a success or failure becomes extremely important. And success or failure depends largely on the integration of the ambivalent factors.

The point of organizational changes now taking place in many enterprises would be how deeply the problem of integration is taken into consideration. It is up to the judgment of the top management. In other words, it is where the quality of the aggressive management appears.

Research and Development Expenses

The research and development expenses of 1,170 leading companies for fiscal 1979 totaled ¥1,531,400 million, up 15.7% over the previous year, but the ratio of these expenses to aggregate sales dropped from 1.66% in fiscal 1978 to 1.64%, according to the survey of the *Nihon Keizai Shimbun*, the nation's influencial economic daily.

Those 1,170 companies (consisting of 1,015 manufacturers and 155 non-manufacturers) are among all the companies, whose stocks are listed on stock exchanges in Japan, on which the survey was conducted. Banks, securities companies and insurance companies are excluded.

The research and development expenses of Japanese enterprises are small compared with that of the United States. The survey conducted by *Business Week* magazine suggests that the aggregate expenses for research and development of 723 leading American companies in 1979 are 3.3 times as large as those of the said Japanese companies and the ratio to sales of American companies stands at 1.9%.

In Japan, top 10 companies, in terms of the expense amount, are automakers and electric equipment manufacturers, with the exception of Mitsubishi Heavy Industries which ranks eighth. On the contrary, only four companies are listed from the automobile and electric equipment sectors among top 10 of the U.S. They are General Motors, Ford, IBM and General Electric.

R&D Expenditures in FY1979

Rank	Company	Amount (in ¥1 billion)	Ratio to Sales (%)
1.	Toyota Motor	104.0	3.7
2.	Hitachi	98.7	5.8
3.	Nissan Motor	90.0	3.3
4.	Toshiba	69.0	4.8
5.	Matsushita Electric	50.0	2.9
6.	Nippon Electric	43.0	6.0
7.	Mitsubishi Electric	43.0	4.0
8.	Mitsubishi Heavy Industries	38.2	2.8
9.	Honda Motor	38.0	3.6
10.	Sony	32.8	7.0
11.	Fujitsu	30.5	6.1
12.	Nippon Steel	27.0	1.0
13.	Toyo Kogyo	20.5	2.5
14.	Nippondenso	20.5	4.5
15.	Takeda Chemical	20.1	4.8
16.	Fuji Photo Film	18.8	6.0
17.	Isuzu Motors	18.6	2.9
18.	Bridgestone Tire	18.0	4.1
19.	Kobe Steel	17.7	1.7
20.	Tokyo Electric Power	15.2	0.7

Source: *The Nihon Keizai Shimbun*

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ECONOMIC

ENERGY INVESTMENT IN PRIVATE INDUSTRY IN 1979, 1980

Tokyo ENERUGI FORAMU in Japanese Vol 26 No 312, Dec 80 pp 117-122

[Article by Yutaka Iijima, member of the Survey Section, Japan Developmental Bank]

[Text] The Actual State of Energy-Saving and Energy Source Conversion Investments in Private Industry

Expansion Is the Keynote of Energy Countermeasure Investments

The second oil shock, which began with the Iranian revolution, set in motion the wheels of energy countermeasure activities by private industry. The reaction of private industry was to take a step forward from engaging in less costly countermeasures, and it has been moving vigorously in an unprecedented manner by applying energy-saving countermeasures centered on investments in slightly larger facilities, by converting energy sources, and by other activities. In order to grasp the actual situation with regard to the energy countermeasures of this segment of private industry, and in particular to understand the general trend in investments for energy countermeasure facilities, the Japan Developmental Bank has conducted comprehensive surveys on energy-saving and energy source conversion investments during JFY 1979 and JFY 1980 by obtaining responses from 961 companies (each with more than 1 billion yen capitalization). This article presents the recent trends of investments for energy countermeasure facilities, based on results obtained by this survey.

Investments for Energy Countermeasure Facilities Increasing Rapidly

Investments for energy countermeasure facilities for energy-saving and energy source conversion purposes have increased rapidly, as witness the program in JFY 1980 to spend 701.6 billion yen, which is a 58-percent increase over the performance for JFY 1979. This increase substantially surpassed the growth rate of 23 percent in private industry's overall investments on facilities. With the rapid increase in the ceramics/earthenware, chemical, transportation machine, and other industries, the manufacturing industries' [investments] increased in JFY 1980 by 450.2 billion yen; this was a little more than twice the increase for JFY 1979.

On the other hand, nonmanufacturing industries, because of a decline in aeronautics, which normally evokes an image of investments to augment its capacity,

were limited to a 10.1-percent increase over the previous fiscal year. With aeronautics excluded, however, the rate of increase was 1.8 times that of the previous fiscal year. Thus, as with manufacturing industries, a large increase was experienced in nonmanufacturing industries. (See Table 1)

Table 1. Percentage Increase of Investments for Energy Countermeasure Facilities, by Industry Classification

表-1 産業別エネルギー対策設備投資伸び率

(単位：億円)

(1)業種	54年度 (12)	55年度 (13)	55/54 (%) (14)
全(2)産業	4,749	7,016	157.7
全(3)産業(除航空)	3,005	5,965	198.5
製(4)造業	2,171	4,502	207.3
非(5)製造業	2,278	2,514	110.3
非製(6)造業(除航空)	833	1,463	175.6
素(7)材型産業	1,648	3,683	223.4
加工組(8)型産業	392	662	168.8
(9)エネルギー産業	573	1,055	184.0
非製造業(除エネルギー(10)	818	1,615	88.8
非製造業除(11)ギー,航空)	373	565	151.1

(16)

(表-1注) 素材型産業……繊維，紙パルプ，化学，窯業・土石，鉄鋼，非鉄鉱 (17)

加工組立型産業……食品，一般機械，電気機械，輸送用機械，その他製造業 (18)

エネルギー産業……石油，電力・ガス (19)

非製造業(除エネルギー)……建設，卸・小売，不動産，運輸通信，サービス，その他非製造業 (20)

Key:

1. Industries
2. All industries
3. All industries (excluding aeronautics)
4. Manufacturing industries
5. Nonmanufacturing industries
6. Nonmanufacturing industries (excluding aeronautics)
7. Materials type industries
8. Processing/assembly type industries
9. Energy industries
10. Nonmanufacturing industries (excluding energy industries)
11. Nonmanufacturing industries (excluding energy and aeronautics)
12. JFY 1979
13. JFY 1980
14. Percentage increase, 1980 over 1979
15. Unit value: 100 million yen
16. Addendum to Table 1
17. Materials type industries...textiles, paper/pulp, chemicals, ceramics/earthenware, steel, and nonferrous ore [probably meaning nonferrous metals]
18. Processing/assembly type industries...foodstuffs, general machinery, electrical machinery, transportation machines, and other manufacturing industries
19. Energy industries...petroleum and electric/gas
20. Nonmanufacturing industries (excluding energy)...building/construction, wholesale/retail, real estate, transportation/communication, services, and other nonmanufacturing industries.

It is worthy of note that the survey results indicate that 15 of the 19 industries had a high percentage of increase in investments for energy countermeasure facilities.

Percentage of Increasing Investments for Energy Countermeasure Facilities

On reviewing the percentages of investments for energy countermeasure facilities as against overall investments for facilities, as shown in Table 2, industries in general increased 7.3 percent in JFY 1979 and 9.4 percent in JFY 1980--an increase [in the latter period] of more than 2 percentage points.

Table 2. Percentage Increase of Investments for Energy Countermeasure Facilities as Compared With Overall Increase in Investments for Facilities

表-2 総設備投資に占めるエネルギー対策設備投資の割合 (単位：億円) (13)

業(1)種別	年度(6)	総設備投資額 (7)		エネルギー対策設備投資額 (8)	省エネルギー関連投資 (9)	主目的省エネルギー投資 (10)	従目的省エネルギー投資 (11)	エネルギー源転換投資 (12)
全(2)産業	54	60,646	100.0	7.3%	7.0%	1.7%	5.3%	0.4%
	55	74,806	100.0	9.4	7.7	2.8	4.9	1.7
製(3)造業	54	29,991	100.0	7.2	6.8	3.1	3.7	0.4
	55	36,706	100.0	12.3	10.3	5.1	5.2	2.0
非(4)製造業	54	30,654	100.0	7.4	7.1	0.3	6.8	0.3
	55	38,100	100.0	6.6	5.2	0.5	4.6	1.4
非製造業(除航空)(5)	54	28,387	100.0	3.0	2.6	0.3	2.3	0.4
	55	35,760	100.0	4.1	2.6	0.6	2.0	1.5

Key:

1. Industries
2. All industries
3. Manufacturing industries
4. Nonmanufacturing industries
5. Nonmanufacturing industries (excluding aeronautics)
6. JFY 54=1979 55=1980
7. Total amount of investments for facilities
8. Total amount of investments for energy countermeasure facilities
9. Energy-saving investments
10. Energy-saving investments as primary objective
11. Energy-saving investments as secondary objective
12. Investments for energy source conversion
13. Unit value: 100 million yen

Whereas the percentage of energy-saving investments as a secondary objective dropped because of the decline in aeronautics, energy-saving investments as a primary objective, because of the rise in such industries as ceramics/earthenware, textiles, chemicals, and steel, and energy source conversion investments, because of the rise in such industries as ceramics/earthenware, electric power, and chemicals, have both expanded.

From here on, signs of full-scale investments for energy countermeasure facilities can be discerned. It is to be noted that investment percentages of the

manufacturing industries in particular have increased from 7.2 percent to 12.3 percent, or more than 5 points, and in all cases there have been increases in investments for energy countermeasure facilities.

Percentages of Energy Countermeasure Investments for High Energy Consumption and Materials Type Industries

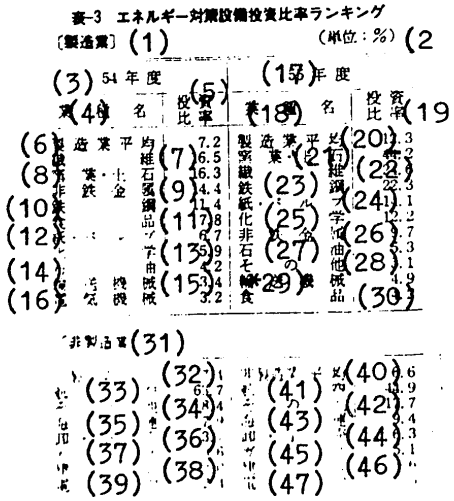
A review of the listing of percentages of energy countermeasure investments reveals that the following five manufacturing industries exceeded 100 percent of investments: ceramics/earthenware, textiles, steel, paper/pulp, and chemicals.

Ceramics/earthenware, leader of the manufacturing industries, has converted to the NSP kiln, converted to usage of coal, etc., and 44 percent of its total investment is utilized for energy countermeasure facilities.

The textile industry, along with rationalized investments and raw material conversion investments for the purpose of saving energy, has converted to coal independently, resulting in a high investment of 24.6 percent. The steel industry, along with construction to recover the exhaust heat, exhaust pressure, and exhaust gas from blast furnaces, coke furnaces, etc., has made investments to rationalize the process of continuous casting, etc., resulting in an investment of 22.3 percent. The paper/pulp industry, besides strengthening construction and other facilities to recover "black liquid," has reorganized processing to reach an investment of 3.1 percent. The chemical industry, in addition to accumulating small-scale investments on such enterprises as the recovery of exhaust heat from ethylene plants and other facilities, has installed new facilities for petrochemical derivatives, etc., and these have boosted the investments for energy countermeasure facilities. (See Table 3)

Table 3. Percentages of Investments for Energy Countermeasure Facilities

表-3 エネルギー対策設備投資比率ランキング



[Key on following page]

Key:

1. Manufacturing industries
2. Unit value: percentage
3. JFY 1979
4. Types of Industries
5. Investment percentage
6. Average of manufacturing industries
7. Textile
8. Ceramics/earthenware
9. Nonferrous metals
10. Steel
11. Foodstuffs
12. Paper/pulp
13. Chemical
14. Petroleum
15. Transportation machines
16. Electrical machinery
17. JFY 1980
18. Types of industries
19. Investment percentage
20. Average of manufacturing industries
21. Ceramics/earthenware
22. Textiles
23. Steel
24. Paper/pulp
25. Chemicals
26. Nonferrous metals
27. Petroleum
28. Others
29. Transportation machines
30. Foodstuffs
31. Nonmanufacturing industries
32. Average of nonmanufacturing industries
33. Aeronautics
34. Others
35. Shipping
36. Wholesale/retail
37. Gas
38. Building/construction
39. Electrical power
40. Average of nonmanufacturing industries
41. Aeronautics
42. Others
43. Shipping
44. Wholesale/retail
45. Gas
46. Building/construction
47. Electric power

On reviewing the listing by industry classification on the amount of investments for energy countermeasure facilities, the manufacturing industries that rank high are ceramics/earthenware, steel, chemicals, and paper/pulp, but the transportation machines industry, which is centered on the automobile, has gained part of the prominence.

On the other hand, of the nonmanufacturing industries, high on the list are the aeronautics industry, which has added a part of the imported large-size aircraft materials; the electric power industry, which has carried out fuel conversion with the already established thermal facilities; and the shipping industry, which has converted and equipped its principal machines.

Wholesale/retail, building/construction, real estate, and services, hitherto unqualified to make the listing, have engaged in various energy countermeasures, and the fact that part of these activities are tied in with investments for facilities bears watching. (See Figure 1)

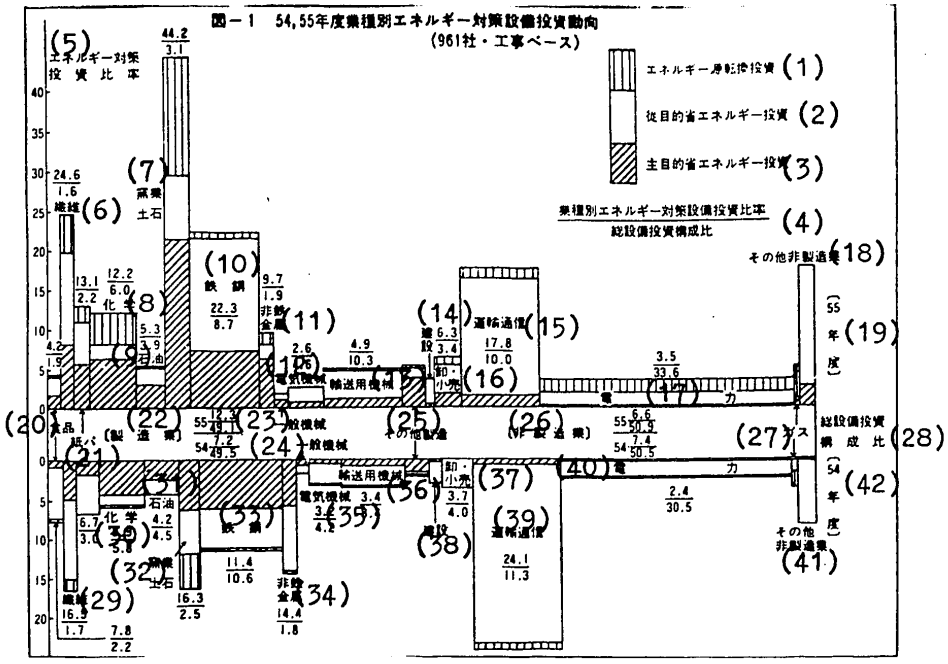


Figure 1. Trend of Investments for Energy Countermeasure Facilities for JFY 1979 and JFY 1980, by Industries (Projects of 961 companies used as basis)

Key:

1. Investments for Energy Source Conversion
2. Energy-Saving Investments as Secondary Objective
3. Energy-Saving Investments as Primary Objective
4. Percentage of Investments for Energy Countermeasure Facilities by Industry Classification
   Ratio in Relation to Total Investment for Facilities
5. Percentage of Energy Countermeasure Investments
6. Textile
7. Ceramics/earthenware
8. Chemicals
9. Petroleum
10. Steel
11. Nonferrous metals
12. Electrical machinery
13. Transportation machines
14. Building/construction
15. Transportation/communication
16. Wholesale/retail
17. Electric power
18. Other nonmanufacturing industries

[Key continued on following page]

19. JFY 1980
20. Foodstuffs
21. Paper/pulp
22. Manufacturing industries
23. General machinery
24. General machinery
25. Other manufacturing industries
26. Nonmanufacturing industries
27. Gas
28. Ratio in relation to total investment for facilities
29. Textile
30. Chemicals
31. Petroleum
32. Ceramics/earthenware
33. Steel
34. Nonferrous metals
35. Electrical machinery
36. Transportation machines
37. Wholesale/retail
38. Building/construction
39. Transportation/communication
40. Electric power
41. Other nonmanufacturing industries
42. JFY 1979

Energy-Saving Investments as Primary Objective for Full-Scale Conversion in All Industries

The following is a review of the trend of investments for facilities according to the investment objective classification.

On energy-saving investments as a primary objective, as shown in Table 4, the amount of 207.7 billion yen for all industries in JFY 1980 is truly an increase of more than twice the performance in JFY 1979. Following this, the percentage of total investments for facilities rose from 1.7 percent to 2.8 percent. The energy-saving countermeasures which coped with the rise in energy costs that occurred one after another, following the oil shock, changed over from less costly measures in improving management and operations to a gradual improvement and renovation of machinery and tools, facilities, and processes. Fulfillment of these activities is evidence of full-scale growth.

In reviewing the growth of investments in JFY 1980 as compared with the previous fiscal year, whereas the materials type industries were limited to less than a twofold increase, nonmanufacturing industries, excluding the energy industries, increased 3.3 times and the processing/assembly industries 2.6 times.

Heretofore, energy-saving investments were applied principally in the energy-producing and materials type industries, but from the results of this survey, one can discern that the various processing/assembly industries, as well as the nonmanufacturing industries of building/construction, wholesale/retail, real estate, etc., which hitherto did not command attention, are now on a full-scale level. This is a manifestation of the expansion of energy-saving investments in all industries.

As for industries with a high percentage increase, the manufacturing industries include ceramics/earthenware with a rapid increase in conversion to the NSP kiln; minor manufacturing industries that utilize dry-method firefighting facilities and engage in boiler remodeling; paper/pulp industries that have augmented construction of "black liquid" recovery apparatus, etc.; transportation machine industries that have shifted over to energy-saving furnaces and pushed for the improvement of painting processes, etc.; general machinery where there has been

Table 4. Percentage Increase of Energy-Saving Investments as a Primary Objective, by Industries

表-4 産業別主目的省エネルギー投資伸び率

(1)金額：百万円)

	54年度 (2)	55年度 (3)	55／54 (4)
全(5)産業	102,854	207,702	201.9%
製(6)造業	94,306	186,830	198.1
非(7)製造業	8,548	20,872	244.2
素(8)型産業	79,009	154,595	195.7
加(9)・組立型産業	8,867	23,401	263.9
エネ(10)産業	9,633	12,053	125.1
非(11)製造業(除エネルギー産業)	5,345	17,653	330.3

Key:

1. Unit Value: 1 million yen
2. JFY 1979
3. JFY 1980
4. 1980 Increase Over 1979
5. All industries
6. Manufacturing industries
7. Nonmanufacturing industries
8. Materials type industries
9. Processing/assembly type industries
10. Energy industries
11. Nonmanufacturing industries (excluding energy industries)

a rapid increase in construction of facilities to recover exhaust heat from the cupolas; and foodstuff industries that have full-scale operations to recover exhaust heat.

Nonmanufacturing industries include wholesale/retail with a rapid increase in electricity-saving countermeasure projects; minor nonmanufacturing industries engaged in saving energy aboard fishing craft and remodeling boilers for mining work; the gas industry with a substantial combustion management program; shipping with its conversion and equipping of the principal machines; and services that have begun to complete electricity-saving countermeasures.

Energy-Saving Projects About To Become Large in Size

Energy-saving projects will form the majority by upgrading the efficiency of machinery, equipment and facilities, by effectively utilizing exhaust heat and insulating heat, and by upgrading the efficiency of the revised section of the process, etc. The bulk of them will be small and medium investments.

For this reason, with the exception of the NSP kiln in the cement industry and the various types of exhaust heat and pressure recovery projects in the steel

industry, the amount of money to be expended per project is not necessarily large; yet it is to be noted that the number of recorded projects exceeding the cost of 100 million yen per project is comparatively great.

Popularizing the Use of Microcomputers in Energy Savings

Among the specific projects employed by private industry, the largest number deal with renovation and improvement of furnaces and the heat-transfer related equipment using exhaust heat for preheating. Among the others, a distinctive example is the widely practiced use of computers for combustion management, processing management, and electric power management. Moreover, the recovery and use of heat have greatly progressed, but full-scale countermeasures to save electricity have just begun to be instituted in many industries.

Firmly Established Energy-Saving Investments as Primary Objective

A review of the energy-saving investment plans of various private enterprises over the next several years shows that the majority of private industries are scheduling an increase in investments. Noted as moves by some of them, in anticipation of sudden jumps in the cost of energy, are projects for recovery that would somewhat require a long-range program. (See Table 5)

Table 5. Outline of Energy-Saving Investments, by Types of Projects (Specific projects assumed by 332 companies)

表-5 工事種別省エネルギー投資の概要（具体的工事内容記載332社分）

(1) 工事の種類	(12)(13) 業種数（小分類）		(14) 会社数	(15) 件数	金額（百万円） (16)(17) 合計	54年度 (18)	55年度 (19)
(2) 1. 機器・設備の効率向上	製造業	33	119	172	34,409	12,388	22,051
	非製造業	4	28	37	19,798	6,921	12,877
	合計	37	147	209	54,207	19,279	34,928
(3) 2. プロセスの効率向上	製造業	22	56	84	48,400	8,820	39,580
	非製造業	5	12	16	2,498	100	2,398
	合計	27	68	100	50,898	8,920	41,978
(4) 3. 排熱の有効利用及び保温工事	製造業	37	134	178	37,947	11,428	26,519
	非製造業	6	9	10	990	242	748
	合計	43	143	188	38,937	11,670	27,267
(5) 4. 廃棄物の有効利用	製造業	13	21	25	3,528	1,405	2,123
	非製造業	0	0	0	0	0	0
	合計	13	21	25	3,528	1,405	2,123
(6) 5. システム化による効率向上	製造業	4	4	5	126	97	29
	非製造業	5	10	10	2,925	97	2,828
	合計	9	14	15	3,051	194	2,857
(7) 6. その他	製造業	26	70	92	14,668	5,015	9,653
	非製造業	9	16	21	2,480	1,034	1,446
	合計	35	86	113	17,148	6,049	11,099
(8) 1.～6. 合計	製造業	45	271	556	139,078	39,123	99,955
	非製造業	17	61	94	28,691	8,394	20,297
	合計	62	332	650	167,769	47,517	120,252

(20)(21) (注) 1. 上表は具体的工事内容記載会社の数字である。
2. 会社数合計は重複分を控除してある。

[Key on following page]

Key:

1. Types of Projects
2. Upgrading efficiency of machinery, equipment, and facilities
3. Upgrading efficiency of processing
4. Projects for effective utilization of exhaust heat and heat insulation
5. Effective utilization of waste materials
6. Upgrading efficiency through systemization
7. Others
8. Total (2 through 7)
9. Manufacturing industries
10. Nonmanufacturing industries
11. Total
12. Number by industries
13. (subdivision)
14. Number of companies
15. Number of projects
16. Amount (in million yen)
17. Total
18. JFY 1979
19. JFY 1980
20. Remarks 1. The above table is based on figures of specific projects furnished by the companies.
21. 2. Overlapping has been avoided when counting totals for companies.

Energy-Saving Investments Showing Total Spectrum

Scope of Energy-Saving Investments as Secondary Objective Which Had Been Vague

Next will come a description of energy-saving investments as a secondary objective.

Energy-saving investments as a secondary objective, coupled with energy-saving investments as a primary objective, can be considered to constitute Japan's entire energy-saving investments. Heretofore, however, there were various theories on the scope of energy-saving investments as a secondary objective, and it can be said that explanations were not entirely clear. For this reason, the percentage of energy-saving investments in Japan's overall investments for facilities was subject to various theories, from a high of 30 percent to about 4 or 5 percent.

During this survey, the various industries were asked to denote energy-saving investments as a secondary objective, based on their decisions.

Energy-Saving Investments as Secondary Objective Are Increasing Rapidly in Manufacturing Industries

According to the results of the survey, energy-saving investments as a secondary objective for all industries in JFY 1980 was 367.5 billion yen, a 15.2-percent increase over the figure for JFY 1979. A comparison of manufacturing versus nonmanufacturing industries shows that whereas the total for manufacturing industries was 191.4 billion yen, or an increase of 74.5 percent over that in JFY 1979,

for nonmanufacturing industries there was a decline of 15.8 percent when compared with the total for the previous year.

Within the manufacturing industries, the rapid increase occurred in the materials type industries. These increases were high, as witness continuous casting in the steel industry, with a 2.8-fold increase over the previous fiscal year; kiln remodeling in the ceramics/earthenware industry, with a 2.2-fold increase, and newly installed facilities for petrochemical derivatives in the chemical industry, with a 2.2-fold increase. On the other hand, processing/assembly type industries had a 30.1-percent increase over the previous fiscal year. Of all the industries in this category, an increase was observed only in the transportation machine industry, centered on the automobile industry, which is remodeling and newly establishing assembly lines.

The energy industry, centering on the petroleum industry with its remodeled reformer and the electrical power industry with its improvement (boosters) of power transmission facilities, had a 17.5-percent increase over the previous fiscal year.

As for nonmanufacturing industries excluding the energy industry, whereas there have been increases in the building/construction industry, with its newly installed facilities to manufacture prefabricated homes, the wholesale/retailing industry, with its remodeling of existing stores, and the nonmanufacturing industry related to the building of fishing crafts, there has been a decline in the transportation/communication category--as witness the decline of rolling stock purchases in the railroad industry, the lack of income for the construction of new boats in the maritime transportation industry, and the decline in the purchase of large aircraft materials in the aeronautics industry.

Thus, in the trend of energy-saving investments as a secondary objective and the trend of energy-saving investments as a primary objective, noncoordination can be recognized, but this same tendency can also be seen in the manufacturing industries.

Percentages for Energy-Saving Investments Are 7 Percent for All Industries and 10 Percent for the Manufacturing Industries

In most cases, the bulk of investments for new facilities have a built-in sort of energy-saving effect. For this reason, according to the judgment of private industry, energy-saving investments as a secondary objective, as described previously, are recognized as being applied on a wide scale, but on reviewing the contents of this survey, with regard to energy-saving investments as a secondary objective, except for the anomaly of importing aircraft materials as a primary objective to strengthen capacity, all of the energy-saving effects will be recognized as conspicuous investments.

As a result, the percentages of energy-saving investments, combining the primary and secondary objectives of Japan's overall investments for facilities, as described in Table 2, are about 7 percent for all industries in JFY 1980, and more than 10 percent for the manufacturing industries.

This is to say that light has been shed on the total picture of what hitherto was considered uncivilized energy-saving investments.

Progress in Energy Source Conversion

Because of the sudden and repeated price jumps in oil costs, the increases in electric rates, the positively encouraging measures involved in energy source conversion, the maintenance of promotional measures, etc., the conversion of coal, LNG, and so forth as energy substitutes has recently progressed at a fast pace. This survey shows that investments for energy source conversion in JFY 1980 was 126.4 billion yen--a rapid increase of 5.4-fold compared with the 23.2 billion yen which was the actual performance in JFY 1980 [as published].

On reviewing the percentage increase for JFY 1980 when compared with that for the previous fiscal year, the energy industry, centering on the electric power industry, which began the full-scale task of energy source conversion with existing thermal facilities, had a 9.5-fold increase. As for the materials type industries, the cement industry, which centered on coal conversion, increased 5.8-fold; the processing/assembly industry, based principally on fuel conversion of the automobile, and nonmanufacturing industries excluding the energy industry, centered on the shipping industry with its installation of AC blenders, each had a more than twofold increase. (See Table 6)

Table 6. Percentage Increases of Investments for Energy Source Conversion by Industries

表-6 業種別エネルギー源転換投資伸び率

(1)(単位：百万円)

	(2)54年度	(3)55年度	(4)55/54
全(5)産業	23,205	126,436	544.9%
製(6)造業	13,138	71,997	548.0
非製(7)造業	10,067	54,439	540.8
(8)素材型産業	11,786	68,729	583.1
加工組立型産業	(9)1,352	2,873	212.5
エネルギー産業	(10)508	42,683	946.8
(11)非製造業(除エネルギー産業)	5,559	12,151	218.6

Key:

1. Unit value: 1 million yen
2. JFY 1979
3. JFY 1980
4. 1980 increase over 1979
5. All industries
6. Manufacturing industries
7. Nonmanufacturing industries
8. Materials type industries
9. Processing/assembly type industries
10. Energy industries
11. Nonmanufacturing industries (excluding energy industry)

As for the percentage of investments for energy source conversion versus overall investments, there has been an increase from 0.4 percent in JFY 1979 to 1.7 percent in JFY 1980.

As for classification by industry, in the manufacturing industries the percentage is highest with the ceramics/earthenware, textile, chemical, and paper/pulp industries which are grouped in coal conversion. As for nonmanufacturing industries, the percentage is high with the gas industry, which will convert its raw materials, with the shipping industry, which plans to use a mixture of various fuels, and with the electric power industry, which plans both coal and LNG conversions.

Diverse Energy Source Conversions

A diversity in the contents of energy source conversions of 88 firms was noted in their investment descriptions. As shown on Table 7, more than 30 types of conversions were described.

Table 7. Types of Investments for Energy Source Conversion (Specific examples)

表-7 エネルギー源転換投資の種類（具体例）

転換内容 転換前	転換内容 転換後	具体的記載例 転換前	具体的記載例 転換後	件数	実施業種（小分類）
石7油	石8炭	石(7)油	石(8)炭	44	繊維，紙パ，有機化学工業製品，セメント，普通鋼，電力(10)
		重(11)油	(8)炭	12	紙パ，化学肥料，セメント，その他製造業
		重(11)油	石炭・オイルコークス	1	セメント(14)
	(15)	重油・コークスガス	石炭・重油・コークスガス	1	普通鋼(17)
		重(18)気	コークス(19)	2	四輪車(20)
石7油	(21)	石(7)油	(23)	18	ガラス，その他電気機械器具，四輪車，電力，非鉄，ガス(23)
		灯(21)油	〃	2	ゴム金属圧延，電線・ケーブル(25)
	(26)	重 油	〃	3	製品，特殊鋼，部品(27)
		軽 油	(28)〃	1	その他窯業・土石(29)
	(30)	灯油・都市ガス	〃	1	普通鋼(31)
		石(7)油	都市ガス(32)		食品，鉄体，不動産(33)
	(26)	重(11)油	(35)ス	1	食品(34)(36)
		電(18)気		2	食品，不動産
		石(7)油	石油・ガス(37)		産業用電機器具(38)
	(21)	灯 油	LNG灯油(39)		有機化学工業製品(40)
	(41)	LPG(42)	NG	3	石油，その他電気機械器具，部品(43)
石7油	(41)	石(7)油	LPG(41)	12	ガラス(44)
		灯(21)油	(24)	1	医薬品
	(46)	ジェット			化学肥料，ガス(45)(47)
		石(7)油	プロパン(48)	4	
	(49)	ケロシン	ブタン(50)		非鉄金属圧延(51)
		灯(21)油	灯油・ブタン(52)	1	特殊鋼(53)
石7油	廃棄物(54)	石(7)油	(55)粉		木材木製品(56)
		〃	木(57)屑	7	
		〃	木(58)皮		非鉄金属製錬(59)
		〃	古タイヤ(60)		〃
石7油	(61)	重(11)油	(61)	1	その他電気(62)
	コークスガス	〃	炉ガス	5	普通鋼(17)
	高炉ガス(63)	軽(24)油	高炉ガス(63)	2	〃，その他鉄鋼(64)
		〃 (50)		2	〃
		軽 油(28)		1	〃
石7油	COM	重(11)油	COM	1	無機化学工業製品(65)
石7油	太陽エネルギー(66)	石(7)油	太陽エネルギー(66)	13	産業用電機器具，民生用電機電子機器，四輪車，建設業(67)
		ガス(35)			四輪車(20)
		重(11)油	〃		卸・小売(68)
				135	

[Key on following page]

Key:

1. Conversion Items
2. Before conversion
3. After conversion
4. Concretely documented examples
5. Number of cases
6. Industries involved (subclassifications)
7. Petroleum
8. Coal
9. Textile, paper/pulp, industrial products from organic chemistry, cement
10. Ordinary steel and electric power
11. Heavy oil
12. Paper/pulp, chemical fertilizer, cement, and other manufactured items
13. Coal and oil coke
14. Cement
15. Heavy oil and coke gas
16. Coal/heavy oil and coke gas
17. Ordinary steel
18. Electricity
19. Coke
20. 4-wheel vehicles
21. LNG
22. Glass, electrical machines and equipment, 4-wheel vehicles, and electric power
23. Nonferrous and gas [as published]
24. Kerosene
25. Rubber and rolled metal, electric wire/cable
26. Heavy oil
27. Manufactured products, special steel and components
28. Light oil
29. Ceramics/earthenware
30. Kerosene/city gas
31. Ordinary steel
32. City gas
33. Foodstuffs, chassis, and real estate
34. Foodstuffs
35. Gas
36. Foodstuffs and real estate
37. Petroleum/gas
38. Electrical machinery and equipment for industrial use
39. LNG kerosene
40. Industrial products from organic chemistry
41. LPG
42. LNG
43. Petroleum, electrical machinery and equipment, and components
44. Glass
45. Medical and pharmaceutical products
46. Naphtha
47. Chemical fertilizer and gas
48. Propane
49. Kerosene
50. Butane
51. Rolled nonferrous metals
52. Kerosene/butane
53. Special steel
54. Waste matter
55. Wood flour
56. Wood products
57. Wood scraps
58. Bark
59. Refined nonferrous metal
60. Scrapped tires
61. Coke
62. Minor electrical industry
63. Blast furnace gas
64. Ordinary steel and other types of steel
65. Industrial products from inorganic chemistry
66. Solar energy
67. Electrical machinery and equipment for industrial use, electrical machinery and equipment for public welfare use, 4-wheel vehicles, and building/construction
68. Wholesale/retail

The conversions can be grouped as petroleum to (1) coal, (2) LNG, (3) LPG, (4) coke oven/blast furnace gas, (5) waste matter, (6) COM, (7) solar energy, etc.

Coal conversion is mostly from heavy oil, and this is true in the cement, electric power, paper/pulp, steel, nonferrous metal, and other industries.

Also, there are moves to switch from electric furnaces to cupolas in industries such as the transportation machine industry.

Coal prices since about 1979, even including faulty coal, have been cheaper than heavy oil, and it is felt that utilization of coal has been greatly promoted through such supplementary systems as low-interest loans for coal conversion offered by the Japan Developmental Bank.

LNG conversion has occurred in many industries because of the recognition of the special rate system for industrial use LNG since JFY 1979, the inauguration of the system for low-interest loans for LNG conversion by the Japan Developmental Bank, and the existence of policy inducements and guidelines for its introduction by entrepreneurs, based on the substitute energy law.

The preponderance of the conversion is from petroleum fuels such as heavy oil, light oil, and kerosene, but some industries such as foodstuffs and real estate have converted from electricity to gas.

Vigorous Use of New Energies and Technologies

COM is a fuel under development which only recently has reached the stage of practical utilization. In this survey, one input was for investments to manufacture and use a fuel mixture of pulverized coke and heavy oil.

Also, the number of industries utilizing solar energy has increased. Heretofore, except for the solar heat distributors, solar systems have just reached the stage of practical utilization, and the general thinking has been that the economic and reliability factors have not been substantially proven. Yet, this survey indicates that private industry is actively utilizing solar systems, and there are moves to substantiate the benefits derived. On further probing into the use of solar systems, it is to be noted that they are not limited to welfare institutions, but are also for use in factories and stores.

As described previously, the energy-saving policies of Japan's private industry are concentrated mainly around investments for facilities. And along with having the scope of investments somewhat larger in size in anticipation of a rise in energy costs, the investments will be made on a somewhat long-range basis for the recovery of the investments. This trend was observed in the survey, which showed the energy-saving investments of primary objectives in JFY 1980 to be twice those of the previous year. And given the countermeasures of the various industries, the increasing momentum of energy-saving investments will continue for a while.

On the other hand, energy source conversions at present can compete against the cost of petroleum, and a good number of industries have acted vigorously, focusing

on coal conversion and LNG conversion policies provided by supplementary aid programs. Also, the conversion to such new energy sources as solar energy is beginning to thrive, and a growth trend is predicted.

In this manner, full-scale investments for energy countermeasure facilities for the purpose of saving energy and converting energy sources is said to have just begun, and in any case the keynote is said to be expansion.

For this reason, the trend of energy countermeasure investments will not only furnish a basis for determining the state of supply and demand hereafter, but since these investments presently have reached 10 percent of total overall investments, then from the standpoint of gaging the course of private industry's investments for facilities, these activities will increasingly bear watching.

9510
CSO: 8111/0400

ECONOMIC

TARGET RAISED FOR SAVING OIL

Up 20 Million Kiloliters

Tokyo DAILY YOMIURI in English 24 Jan 81 p 1

[Text] The government has set the oil conservation target for fiscal 1981 at more than 25 million kiloliters, up from the 20 million kiloliters for the current fiscal year ending in March.

The goal was announced Friday at a cabinet meeting.

A spokesman pointed out that crude supplies remained unstable due to the Iran-Iraq war with the price hikes by producer countries compounding the problem.

The target for private households was fixed at 11,200,000 kiloliters (10,350,000 kiloliters for fiscal 1980), the transportation sector 2,800,000 kiloliters (2,650,000 kiloliters) and the industrial sector 11 million kiloliters (7 million).

The spokesman said the accent would be on a switch in the industrial sector to energy sources other than oil.

Japan reportedly has sufficient crude stockpiles to last for 107 days.

Iran, Iraq War Feared

Tokyo MAINICHI DAILY NEWS in English 14 Jan 81 p 5

[Text] The government will set the oil conservation target for fiscal 1981 at 25 million kiloliters, in its first cabinet meeting on energy countermeasures Jan 23.

The volume is 5 million kiloliters more than last year.

The step will be taken because the international oil situation is expected to become turbulent due to the protracted war between Iran and Iraq.

Government agencies concerned are now making final adjustment on the matter under instruction from Prime Minister Zenko Suzuki.

The conservation measures will be almost the same as in last year--heating temperature at less than 18 degrees centigrade, cooling temperature at more than 28 degrees centigrade, plus reduction in the operation of elevators.

But the government will further intensify conservation in industrial production, including a shift away from oil as a power source, and energy rationalization.

This is because a tax cut has been approved for industries in fiscal 1981 to encourage energy saving measures.

With this step, the Japanese industries are expected to reduce further energy usage.

CSO: 4120

ECONOMIC

COMMENT ON ELECTRONIC EQUIPMENT, AUTOMOBILES, SHIPPING

Tokyo INDUSTRIA in English Jan 81 pp 28-30

[Text] Electronic Equipment

Statistics of the Ministry of International Trade and Industry show that the nation's semiconductor production during the January~June period of 1980 totaled ¥396,646 million, up 33.5% over the corresponding term of the previous year. Of the total, the output of transistors, diodes and other non-integrated items amounted to ¥138,110 million, up 11.4%, and that of ICs ¥258,536 million, up 49.5%. Although the production of non-integrated semiconductors in 1979 increased only by about 1.1% from the previous year's level, it began to pick up in 1980 with the growth in VTR production. Brisk production is expected to continue for some time to come.

In the field of ICs, the output of MOS-ICs was especially active, showing an increase of 64.5% over the same period of the previous year. This is due to the active turnout of calculators, watches, cameras and electronic translators.

About one-third of the semiconductors produced in Japan is exported. Since more than 40% of the exports is directed to the U.S. market, the market trends there greatly influence the exports from Japan. The nation's semiconductor exports between January and June, 1980, totaled ¥123,017 million, up 82.6% from the like period of the previous year. However, the export growth rate tends to slow down. The exports in January, 1980, were up 103.3% from the same month of 1979, but the increase rate declined to 78.7% in May and to 58.5% in June.

In 1979, Japan's share for ICs in the U.S. market was only 5%, but as far as the 16 K-bit RAMs were concerned, the share of the Japanese products reached 40%. This is due to successful attempts by Japanese semiconductor manufacturers to concentrate on the 16 K-bit RAMs, which were in great demand in the United States. Japan's IC exports during the January~June period of 1980 showed a 120% increase over the previous corresponding term. The increase was due mostly to the boost in 16 K-bit RAM exports. And such a sharp increase in Japan's semiconductor shipments to the United States has created friction between the two countries since last year.

To cope with the situation, four semiconductor manufacturers – Nippon Electric (NEC), Toshiba, Hitachi, and Fujitsu – have been building semiconductor plants in the United States, some of which have already gone into operation. The first main products of these makers will be 16 K-bit RAMs. They plan to produce 50% of the ICs they sold in the United States.

At the same time, Japanese semiconductor manufacturers are trying to establish production bases in Europe quickly. NEC, which established NEC Ireland Ltd. in July, 1974, and started its operation in April, 1976, plans to set up another new company, NEC Semiconductors U.K. Ltd. (a tentative name), in Scotland in early 1981. A plant on the site of 11,000 m^2 in Livingston is scheduled to start assembly in April, 1982, and produce 3 million units of LSIs monthly in 1985. At that time, the employees would number 800. Hitachi and Fujitsu are constructing plants in West Germany and Ireland, respectively. The former will go into operation in December, 1980, and the latter in February, 1981. Toshiba is also looking for a site for semiconductor production in Europe.

The start of the mass production of 64 K-bit RAMs in Japan has resulted in the rush of the Japanese makers to IC production in the United States and Europe. The 64

K-bit RAM is four times as integrated as the conventional 16 K-bit RAM and is believed to become a main product in the near future. Since delicate processing is required for the 64 K-bit RAM, it is said to be necessary to invest tens of billions of yen for the construction of one line. But NEC, Hitachi, Fujitsu, Toshiba, Mitsubishi Electric and Oki Electric Industry are already building plants for 64 K-bit RAMs. Three US-affiliated manufacturers in Japan – Texas Instruments Japan, IBM Japan, and Motorola Semiconductors Japan – are also going to start the production of 64 K-bit RAMs in Japan. Japan is now likely to become a base for the supply of very large scale integration memories to the world.

Automobiles

Japan's automobile production during the January~June period of 1980 totaled 5,464,019 units, up 18% from the year-earlier level. The rise is attributed to favorable export business. Exports during the period increased by 37.9% to 2,929,000 units (excluding 209,366 units for "knock-down" exports – up 9.8%), while the number of new cars registered at home rose only 0.3% to 2,555,431 units. All figures for the first half-year period – production, domestic sales and exports – showed record highs. In the second half-year period, however, Japanese automakers had to cut production due to various unfavorable business conditions. The output in August was 710,926 units, a 31.6%-fall from July. The figure represented a rise of 3.2% over the previous corresponding month, but it was the lowest year-to-year growth rate in 1980.

After having peaked in March, domestic car demand leveled off and then turned downward. Since May, domestic demand has remained below the year-earlier level. In August the annual rate of decline marked 16%. The biggest reason was an increasingly dim business outlook, and the sluggish demand was accelerated by a sharp increase in fuel costs since late 1979.

The fall in demand for regular trucks is especially big. Domestic sales of these trucks in August were 9,150 units, down 21.7% from the previous corresponding month. It was the first fall below 10,000 units in 31 months. The fall in annual comparison was 26.9% for large trucks with maximum load capacities over 5 tons, and 16.5% for those with load capacities of 3.5~5 tons. These figures indicate that controls on public works projects are one of the reasons for sluggish demand for regular trucks.

Domestic sales of passenger cars in August were also down with about 141,000 units, a fall of 16% from the year before. While subcompact cars with 1,000~1,500-cc piston displacement enjoyed persistent popularity, compact cars with 2,000 cc or more suffered a sharp setback of 31%. Newly-designed fuel efficient passenger cars marketed since around 1973 have generally replaced old-type cars manufactured to meet emission control standards.

Manufacturers are making all-out efforts to expand domestic sales. How much new cars marketed in 1980 can serve for sales expansion is not known. There are few factors that could contribute to raising domestic demand. During the second half-year period, a fall of about 10% in sales appears to be inevitable.

Export business now going well is not free from unstable factors, either. The U.S. International Trade Commission issued a favorable conclusion on imports of Japanese cars. But a governmental agreement between Tokyo and Washington might result in export controls. Japanese automakers, in fact, have already reduced their production scales somewhat to curb the increase in exports to the United States. However, if export controls were actually placed, automakers would suffer a great impact. Opposition to Japanese car imports is also rising in Europe. If the United States took severe control measures, European countries would follow suit. That would force sharp production cuts on the manufacturers. Even if there were no import restrictions by the United States and Europe, competition would intensify as compact car production in the U.S. gets into gear.

When it comes to midget cars with a piston displacement of less than 550 cc and motorcycles, business continues growing. Sales of midget cars during the January~July period of 1980 totaled 569,000 units, up 18.3% from the year-earlier level. Exports nearly doubled to 48,963 units.

Domestic sales and exports of motorcycles are also on the rise. Their production during the January~August period increased 45.4% to 4,033,225 units. Domestic demand for small bikes is especially strong. Honda Motor marketed scooters again. Brazil, Spain and other countries ban the import of assembled motorcycles, while Italy is

imposing import controls. Different from the case of automobiles, motorcycle manufacturers have no strong rivals overseas. Japanese manufacturers are operating more than 60 assembly plants overseas and they have caused no trade frictions.

Shipping

The shipping industry which was hard hit by the prolonged slump has finally begun to show signs of an unexpected recovery from the latter half of last year thanks to upward trends of tanker and tramp markets and exchange gains arising from the depreciation of the yen against the dollar. Transportation volume of Japanese merchant fleet, including chartered foreign ships, during 1979 totaled 572,760,000 tons, up 6.6% from the year before, thereby surpassing the growth rate of global seaborne traffic which stood at 5.2%. Such increases in the transportation volume by the Japanese merchant fleet resulted from booming exports centering on automobiles.

The booming exports from Japan continue, but there are many anticipated minus factors for the shipping industry as witnessed in a slowdown of cargo traffic due to global business recession, upward trends of the yen's exchange value in and after April, 1980, and a steep rise in fuel costs. Consequently, trends of shipping markets for tankers and tramps will pose a big problem.

In late August, however, freightage of coal shipments from the U.S. to Japan rose from $24 to $27.70 per 1 ton of coal. This was due to the fact that demand for coal has grown as a new energy source to substitute oil, thereby prompting increases in seaborne haulage of coal. Since coal carriers have so far been assigned to haulage of grains and automobiles in an attempt to cope with overtonnaging trends of such ships in the trade, these coal carriers were increasingly called on for haulage of coal. This led to boosts in the freightages of coal. This was also caused by the prolonged strikes by Australian coal and port workers which produced a far-reaching effect on freightage levels of dry cargo as a whole. It is difficult to predict as to whether or not such steep rises in freightage of the tramp market will continue as views and opinions of the interested parties over the matter are divided.

In the meantime, favorable factors related to the tramp market have begun to emerge. The Ministry of International Trade and Industry (MITI) and the Japan National Oil Corp. have decided to increase floating crude oil stockpiles by tankers by 50% within this year. Currently Japan has crude oil stockpiles amounting to 5 million kiloliters by utilizing 20 VLCCs (very large crude oil carriers). It means that 10 more VLCCs will be additionally chartered to increase stockpiles. Since only 30 VLCCs out of a total of 750 such tankers now existing in the world are free from long-term charter contracts, it is anticipated that planned long-term charter contracts involving 10 VLCCs will have a stimulating effect on the tanker market, especially in winter season when crude oil will be in great demand.

Container traffic by liner ships continues to remain brisk, and the industry offsets its deficit-ridden tramp and tanker divisions by earnings derived from liner divisions. Although favorable factors have come out of the tramp and tanker markets, the future market prospect is far from reassuring. Particularly noteworthy in this context is that the Hong Kong shipowners who have expanded their sphere of influence are now threatening Japanese shipping industry's competitive edge.

It is recalled that Hong Kong shipowners have been expanding their business by actively placing newbuilding orders on Japanese shipyards under charter contract arrangements made with Japanese shipping firms. The total bottoms now under control of the Hong Kong shipowners are estimated at 53 million deadweight tons. This figure is close to 89 million deadweight tons owned by the Japanese shipping industry, thereby exceeding 48 million deadweight tons of the U.K. Therefore, Hong Kong now ranks fourth in the world in terms of deadweight tonnage, following Greece, the U.S. and Japan.

An average age of Hong Kong-flag ships is estimated at about 5 years whereas that of Japanese-flag ships at 7 or 8 years. Since it is feared that should Japanese shipping firms suspend chartering Hong Kong-flag ships, it will invite deterioration of the current freightage level in the market, the Japanese shipping industry is trying hard to work out countermeasures against Hong Kong shipowners whose ship operating costs are low as those ships were mostly built at the time of shipbuilding recession.

CSO: 4120

SCIENCE AND TECHNOLOGY

GENETIC ENGINEERING FOR MASS PRODUCTION

Tokyo INDUSTRIA in English Jan 81 pp 19-20

[Text] Ajinomoto Co., Inc., a world renowned manufacturer of amino acids, has announced that it has successfully constructed Escherichia coli, which produces amino acids, by applying genetic engineering for the first time in the world. The announcement was made on November 12, 1980. Scientists in a number of countries have been conducting research on the application of genetic engineering, the technology to produce living things with new characteristics. Insulin and interferon have already been produced by means of the genetic engineering, and they are contributing to the welfare of the people.

Genetic engineering is a new technology whose potential application is immense. An increasing number of scientists at various organizations, including research institutes of universities and large enterprises as well as small venture businesses, are engaged in the research in this field. And their successful results have been reported one after another.

Insulin and interferon, important pharmaceutical products, are a sort of internal active metabolites and are traded in several milligrams. But amino acid is an ordinary chemical product whose minimum unit of trading volume is a kilogram. Unlike expensive medicines, production in small quantity does not pay in the case of amino acid. Ajinomoto developed the production technology to mass-produce amino acids in almost pure state at low costs. It is a new application of genetic engineering.

According to the method developed by Ajinomoto, part of DNA (deoxy ribonucleic acid) which forms gene existing in a strain of Escherichia coli is spliced and inserted in a plasmid that will become a vector (vehicle). Then the inserted DNA part is transformed into another Escherichia coli to obtain transformant, and the transformant thus obtained is cultured to make enzyme protein. A large quantity of amino acids is produced from the enzyme proteins thanks to the property of the gene. The more enzyme proteins are made, the more amino acids are produced efficiently. While insulin and interferon are produced in accordance with recombinant DNA, enzyme protein is first made in the case of amino acid, and amino acid is mass-produced by means of enzyme action; this is a big difference in producing insulin and interferon, and amino acid.

In addition to amino acids, the conventional fermentation method produces various by-products which require complicated processes to be

separated later. But Ajinomoto's new method produces amino acids alone, thereby simplifying the production process. As a result, nearly pure amino acids can be obtained at low costs.

In applying genetic engineering, it is important to increase the number of plasmids. Under the conventional method, a large number of plasmids are cultivated by means of antibiotics, such as chloramphenicol. This method, however, causes to raise production costs, because chloramphenicol has to be removed from the finished products. Ajinomoto has succeeded in obtaining many plasmids by adjusting the components of the culture solution and without using any medicine.

Japan boasts the most advanced fermentation technology in the world, and Ajinomoto is the world's largest manufacturer of amino acids. The company's amino acids exceed more than 20 kinds, most of which are produced by the fermentation methods. At its Central Research Laboratories in Kawasaki, adjacent to Tokyo, many microorganisms with a wide variety of characters are kept for continued research. The recently announced production method of amino acids is the result of the company's rich experience and advanced technologies.

Ajinomoto pioneered the way for application of genetic engineering to the mass production of general industrial chemicals. The company will conduct research and development of production technology to stabilize the production fungi and put such a technology into practical use.

The newly developed technology which uses genetic engineering is expected to contribute to further growth of Ajinomoto, since the company needs to develop new production methods without sticking to the old methods in order to maintain its position as the foremost producer of amino acids. There is also a strong possibility that the company's new technology will be applied to other fields of production.

CSO: 4120

INTERFERON TO BE MADE IN QUANTITY

Tokyo THE JAPAN TIMES in English 31 Jan 81 p 2

[Text]

OKAYAMA (Kyodo) — A private institute here plans to start the nation's first commercial production of interferon (IF), a cellular protein claimed to be effective in fighting cancer, in February.

Hayashibara Biochemical Laboratories, Inc. will produce 10 billion to 20 billion units of IF a month initially for supply to laboratories and hospitals in Japan and overseas, an institute spokesman said.

He said a cancer patient needs an injection of three million to 10 million units of IF at a time.

The institute succeed in extracting IF by implanting cancerous cells of Leukemia patients into hamsters in 1979.

Scientists described the method as an epochmaking IF production technique.

The institute has set up a plant valued at ¥600 million to produce IF with 2,000 hamsters.

"With this method," the spokesmar said, "We can obtain enough IF for a cancer patient from 10 hamsters."

He said some scientists have claimed IF is effective against some types of cancer.

There is not adequate clinical data available, however, to prove this because IF has been produced in very limited quantities so far, from human white blood cells, the spokesman said.

He said mass production of IF will help determine how effective the antiviral substance is against cancer and other diseases caused by viruses.

CSO: 4120

SCIENCE AND TECHNOLOGY

SUPER-SCHOTTKY DIODE MADE IN GOVERNMENT LAB

Tokyo THE JAPAN ECONOMIC JOURNAL in English 20 Jan 81 p 13

[Text]

New efficient artificial satellite communications, including those of remote-sensing resource satellites, radio telescopes and other means of radio communications have been promised by a Japanese governmental laboratory in the form of a super-sensitive type of Schottky diode.

According to the developer, the Electrotechnical Laboratory of the Ministry of International Trade and Industry's Agency of Industrial Science and Technology, its Super-Schottky Diode (SSD) created on a trial basis is the first to be developed in a reliable, lasting device although the idea is not new.

Its basic principle using the phenomenon of superconductivity (loss of electric resistance of metals) at close to absolute temperature of minus 273.16 degrees C. had been used in a similar Schottky diode breakthrough using lead for its metal part. But that American precedent failed to be perfected in applicable form due to the uncertainty of its service life.

SSD which follows the basic Schottky law that when some kinds of metal and semiconductors are brought into contact with each other, the diode will detect radio waves.

The best conventional Schottky diode is made of gold and a gallium arsenide semiconductor. It is now chiefly applied to making the radio wave detector in telecommunication apparatus, but its uses have been limited to only about 100 gigahertz in radio wave frequency and moderate degrees of power output of such apparatus.

Some better versions of the Schottky diode, sensitive enough to catch feeble radio waves and more resistant to noises, had long been sought in satellite communications and radio telescopy involving extremely great distances.

As the laboratory described its SSD as an answer to such problems, its new creation featuring the use of niobium, a metallic element, for the metal part, and gallium arsenide as the semiconductor part, although requiring refrigeration with liquid nitrogen close to absolute temperature for operation just like the conventional ones, has proved to be about 40 times as sensitive as the latter in detecting micro- and milli-levels of radio waves, besides being noise-resistant and long-lived enough for practical application.

According to the known rule that the smaller the point of contact between the metal and the semiconductor parts, the greater the diode's radio wave sensitivity, SSD's gallium arsenide semiconductor, built on a substrate, and its niobium section meet each other at an infinitestimally small point only 3 by 4 microns in the center of the diode which is flat and mechanically stable. A greater sensitivity is now being sought by further miniaturizing the contact point by the application of very large-scale integration electronic circuitry building technology.

According to the developing research team, SSD is producible at low temperatures below 100 degrees C. and is hard to degenerate. If modified into an electric current flow-controlling three-terminal type, SSD will be applicable to computers and radio wave oscillators and amplifiers. Patent is being sought for the basic SSD technology.

The SSD development project is subsidized by the Government.

A University of Tokyo professor has envisioned wide scientific applicability for the SSD, dismissing the trouble of refrigeration as nothing compared with its great efficiency.

CSO: 4120

EXPORT INSURANCE SYSTEM TO BE EXPANDED

Tokyo THE JAPAN ECONOMIC JOURNAL in English 20 Jan 81 p 3

[Text]

The Minstry of International Trade & Industry has decided to expand the present export insurance system to cope with an increase in plant exports by consortiums of Japanese enterprises, American and European firms and an increase in imports of resources under the develop-and-import formula.

Under plans considered by MITI, debt guarantees made to a joint firm by the parent company in the event a trading house sets up the joint firms or a subsidiary for import of oil or coal in a develop-and-import formula will become applicable for export insurance.

A company which receives orders for plants jointly with a foreign firm also will be able to subscribe to the insurance even if the ratio of order received by the Japanese firm is below 50 per cent.

In addition, the rate of insurance amount for damages suffered will be raised to 95 per cent from the present 90 per cent.

MITI plans to submit a bill for revision of the Export Insurance Law to the current regular Diet and implement the new system during fiscal 1981.

In the case of the petrochemical complex construction project being undertaken by Iran-Japan Petrochemical Co. (IJPC), a joint venture of the Mitsui interests and Iran, the some ¥110 billion which Mitsui & Co. has invested or loaned to IJPC will become the object for payment of overseas investment insurance if work on the project is suspended under an agreement with Iran's National Petrochemical Co., the Iranian partner, under the present system.

But debt guarantees made by Mitsui for borrowings made from the Euro market by IJPC will not become applicable for insurance.

The revision of the Export Insurance Law is aimed to include such risks as objects for insurance payments.

As the first step, debt guarantees made by Japanese enterprises for projects involving development of resources abroad will be added to those applicable for overseas investment insurance.

If a Japanese enterprise plans to import oil, coal or natural gas on a develop-and-import formula, it normally sets up a wholly-owned subsidiary or a joint firm with local interests in the country concerned.

Under the present system, investments or loans made by the parent firm in the subsidiary and joint company are covered by the the overseas investment insurance.

If the law is revised, the insurance will become applicable also to debt guarantees of the parent firm made in respect to the subsidiary or joint firm.

As measures to expand insurance for plant exports, orders received by Japanese firms taking part in international consortiums will be covered even if the ratio of the orders received by the Japanese firms is less than 50 percent.

Under the present system, only "Japanese firms" are covered and only those Japanese partners in the consortiums whose export ratio

exceeds 50 per cent are regarded as "Japanese firms."

In addition, the rate of insurance amount for damages suffered will be raised to 95 per cent from the present 90 per cent for ordinary export insurance which is being utilized the most.

Through this, the amount of insurance to be paid to a Japanese firm in the event a contract is invalidated or becomes impossible to be carried out will be raised.

Parallel with the revision of the system, MITI plans to increase the premium amount for the insurance.

CSO: 4120

BEGINNING OF SOLAR THERMOELECTRIC GENERATION DISCUSSED

Tokyo ASAHI EVENING NEWS in English 21 Jan 81 p 3

[Article by Yukiko Okuma: "Solar Thermoelectric Generation"]

[Text]

It is by no means an exaggeration to say that the year 1981 is the "first year of solar thermoelectric generation," because there are six plans—in Japan, the United States, France, Spain, the International Energy Agency and the European Community — aiming to generate power by this method for the first time within this year. In the lead and in for the honor of becoming the "world's first" is the plant under construction on the site of a former salt farm in Nio Town on Shikoku Island.

Riding on a train on the Japanese National Railways' Yosan Line for about one hour from Takamatsu, Shikoku's main gateway, one arrives at Takuma Station in an area which is known for the legendary figure Taro Urashima. Traveling west by car for about 15 minutes from the station, one reaches the site where the solar thermoelectric generating plant is being constructed — a site nestling among mountains covered by tangerine trees. The site is about 100,000 square meters in area. The first object that one sees on arrival is a 69-meter-high light-collecting tower rising into the sky. Next, one sees a group of mirrors lined up like panels in a mass game. The Mitsubishi Electric Corp. and the Hitachi, Ltd. are technologically vying with each other with respect to the tower light-collecting system and the paraboloid light-collecting system. According to plans, the plant is to be operated on a trial basis until the end of this year, and from next year, ways to cut down on costs will be sought by replacing the components with improved ones.

Solar energy, which is much sought after because there is an inexhaustible supply of this energy and because it is clean, has, in fact, two flaws. The first drawback is that the volume of energy per area is small.

In other words, solar energy is like energy from "low-grade ore." In the case of the plant at Nio Town, the energy from "low-grade ore" is to be concentrated by means of more than 15,000 sheets of mirrors that are used in the two systems. A maximum of 1,000 kilowatts of power are to be generated by each system. In the present stage, however, the plant can collect only one/several hundredths of the energy the sun is releasing. Moreover, quite a lot of energy and money are required for the manufacture of the mirrors.

The second shortcoming is that the supply of energy ceases with the falling of rain or snow. At the plant in Nio Town, the plan is to accumulate energy in the form of hot water or molten salt, but this works only for three hours at most.

Such being the case, the power-generating cost at this plant is about ¥600 per kilowatt-hour, which is far higher than the ¥17.70 entailed in generating power by using petroleum, the ¥12.40 by using coal and the ¥8.08 by nuclear energy. Because of much rainfall and because its latitude is not low, Japan cannot be said to be a country best suited for solar thermoelectric generation.

However, only technology nurtured strictly under such unfavorable conditions can demonstrate its true worth abroad. In actuality, Australia, China and countries in the Middle East and Southeast Asia are placing great expectations on Japan's technological capability, and calls for technical cooperation are pouring into this country.

An international solar energy symposium was held in Japan in February, 1979. On this occasion, the representatives of developing countries spoke on why they were plac-

ing their hopes on solar energy.

A representative of Bangladesh said: "The advanced nations say, 'We have coal and nuclear energy even if the price of petroleum rises.' However, we have no coal in our country, and harnessing nuclear energy is too difficult for us."

An Indian representative pointed out that "there is coal in the northeastern part of our country, but there is no means to carry this coal from there to where it is needed."

A representative from Senegal stated: "We have used up our firewood. As we have to travel far to obtain it, we have no idea when we can get back."

All of them looked as if they were driven into a corner.

Memo 1: Construction schedules of various countries:

Countries constructing facilities to generate power for the first time with solar energy within this year are the United States (10,000 kilowatts or 10 megawatts), France (2,000 kilowatts), Spain (1,000 kilowatts), four countries in the European Community (a 1,000-kilowatt facility on Sicily), and 10 member countries of the IEA (two 50-kilowatt units in Spain).

Also, planning to build facilities are the Soviet Union (a 5,000-kilowatt facility in 1983) and West Germany (a 20,000-kilowatt facility in 1985).

Memo 2: Tower light-collecting method and paraboloid light-collecting method:

In the tower method, mirrors are lined up around the tower, and by precision adjustment of the direction the mirrors are facing, sunlight is gathered in the heat collector on top of the tower. This method is suited for a large power-generating station of 100,000-kilowatt level or for low-latitude areas which have the sun beating down upon them from the top.

In the paraboloid method, sunlight is gathered in heat-collecting pipes by means of paraboloid mirrors.

The units can be separated and used in factories and buildings operating on a small scale as well as in high-latitude areas and on mountainsides. The method of generating electricity from heat is the same as thermal power generation and nuclear power generation.

CSO: 4120

SOLAR HEATERS SAID LOSING POPULARITY

Tokyo DAILY YOMIURI in English 25 Jan 81 p 2

[Text]

Lately the demand for solar water heaters, which once experienced a boom, has been slowing down.

It was only six months ago that the demand for the devices skyrocketed as a result of the increasing price of kerosene.

Many consumers, bothered by the increasing price of oil products, were attracted to the new device which is placed on a roof and which provides hot water by using "free" solar energy.

About 500,000 solar water heaters were sold from last spring to autumn.

This marked a very high increase—377,000 were sold during the previous one-year period.

The demand for the devices, however, suddenly "cooled off" after last autumn, despite the approach of winter.

According to an industrial source, the average sales reached around 100,000 a month until last summer.

Their sales this January were only 25,000, it is believed.

In order to conserve energy, the International Trade and Industry Ministry introduced a low interest loan of 5.5 percent for consumers to buy the device.

The ministry prepared the loan for 10,000 devices in the current fiscal year which ends soon, but only 1,000 persons have requested the loan so far.

Regarding its decreased demand, a maker believes it is related to the decrease in new house construction.

However, the rather high cost of the device is believed to be the main reason for its decreasing demand.

Even the simplest type costs a total of ¥200,000.

There is one type which costs more than ¥1,000,000 in total.

When this amount is considered, it becomes expensive for consumers to use hot water heated by "free energy" from the sun.

CSO: 4120

SCIENCE AND TECHNOLOGY

DEVELOPMENT SET FOR ICEBREAKING TANKER FOR ARCTIC OIL

Tokyo DAILY YOMIURI in English 24 Jan 81 p 2

[Text]

Japan will shortly join the international race to develop a large tanker with icebreaking ability by conducting research at a ship test basin now being constructed at the Transport Ministry's Ship Research Institute in Mitaka, Tokyo.

The five-year research project, envisaged by the ministry, will be participated in by the Japan Petroleum Development Corporation and leading shipbuilding companies.

The project is scheduled to start in March.

The demand for tankers with icebreaking ability has been increasing as exploration and drilling of oil in the Arctic Ocean accelerated in the wake of the oil crisis.

There is reportedly an estimated reserve of 100 to 200 billion barrels of oil in the Arctic Ocean.

Construction on the test basin, started four years ago, is now in its final stage with completion scheduled for late February. The construction cost is estimated at ¥1,300 million.

CSO: 4120

NEW SHIPS WILL USE 50 PERCENT LESS FUEL

Tokyo DAILY YOMIURI in English 2 Feb 81 p 2

[Text]

Several leading steelmakers plan to introduce dry bulk carriers whose fuel efficiency is 50 percent better than those of conventional ships.

Nippon Steel Corporation, Nippon Kokan and Sumitomo Metal Industries have already decided to build two such ships each under the 37th (fiscal 1981) government-sponsored shipbuilding program (keikaku zosen).

Kawasaki Steel Corporation and Kobe Steel are studying such plans.

The exceptional fuel efficiency will be attained by the combination of the following methods and devices:

- A screw whose diameter is about 50 percent longer than that of the conventional screw and whose pitch is controllable will be used to minimize the loss of energy.
- A fuel-efficient engine will be developed.
- Exhaust gases and exhaust heat produced by the ship will be recycled for heating and power generation.
- Fuel will be saved by operating the ships at a reduced speed.
- Antifouling paint (paint to prevent the encrusting of the ship bottom with barnacles, oysters, etc) will be used to reduce surface resistance.
- A hull shape which minimizes the wave-making resistance will be employed.
- Sails will be used concurrently with an internal combustion engine.

Nippon Steel Corporation plans to build two 200,000-ton bulk carriers, and Sumitomo Metal Industries plans to construct two 170,000-180,000-ton ships.

Nippon Kokan's two ships will be of 140,000 tons each.

The increasing costs of bunker oil are hurting the steelmakers as they must reimburse shippers who carry their ore for any increases in the cost of the oil under long-term charter contracts.

CSO: 4120

SCIENCE AND TECHNOLOGY

JNOC TO PARTICIPATE IN OIL SHALE DEVELOPMENT

Tokyo THE JAPAN ECONOMIC JOURNAL in English 20 Jan 81 p 4

[Text]

The Japan National Oil Corporation is planning to engage in projects to develop oil shale resources, a sector which was virtually ignored by Japan so far.

Since funds for research and development of oil shale resources have been set aside in the fiscal budget for the first time, the corporation plans to start technological development for oil shale and work for realization of overseas projects by sending missions to Australia and other countries.

It hopes to develop technology for producing shale oil from oil shale in the next five-year period and import some 44 million barrels of oil shale in fiscal 1990, and some 107 million barrels in 1995 from Australia, China and Brazil.

The corporation intends to spend some ¥13 billion in the five years beginning fiscal 1981 for the purpose of constructing an shale oil plant and develop Japan's own technology for operating the plant.

It also plans to build a pilot plant with a daily output capacity of 300 to 500 tons in fiscal 1983-84.

As countries for development of oil shale resources, the corporation regards Australia, China and Brazil as the most promising.

Both Australia and China have large potential deposits of oil shale while Brazil possesses one-fourth of the world's proven oil shale resources.

The three countries already have indicated their readiness to cooperate with Japan in development of resources.

Southern Pacific Petroleum Co. of Australia also has sought the participation of the JNOC on a project to develop oil shale resources along the eastern coast of Queensland State.

China is producing small amount of shale oil in wushun in the northeastern part of the country and in Maoming, in the southern part of Guangdong Province. Production costs are high because of the out-of-date methods used.

Maoming, where 700,000 barrels of oil shale are being turned out annually, is said to have confirmed deposits of some 1.5 million barrels.

China is planning to boost output in the area to 3 million barrels annually.

The JNOC believes there is room for Japan to cooperate with China in improving production at Maoming and in projects for development of new oil shale resources in the Shangdong and Shanxi Provinces.

In Brazil, the state-owned oil company Petrobras is planning to construct a commercial plant with a daily output capacity of 50,000 barrels.

It is now operating a test plant with a daily output capacity of 1,000 barrels.

CSO: 4120

IBM TOPPED IN DOMESTIC SALES BY FUJITSU

Tokyo THE JAPAN ECONOMIC JOURNAL in English 20 Jan 81 p 11

[Article by Kiyoshi Otani]

[Text]

Fujitsu Ltd. became the talk of the town when its computer sales in fiscal 1979 (ended March, 1980) were found to have surpassed those of IBM Japan Ltd. for the first time. Many believed that the event epitomized the spectacular rise of the Japanese computer industry. Fujitsu's success may have been natural in view of its powerful corporate potential and the market's changing needs, especially for multipolar treatment and disposal of data and information.

The growing popularity of computers resulting from technological advances in semiconductors, communications equipment and computers themselves seem to make changes mandatory.

Strong sales campaigns

"It is futile to be excited about mere changes in figures," stated President Takeo Shiina of IBM Japan when he learned that his company's sales trailed those of Fujitsu in the last fiscal year, "because the contents of our sales are considerably different from those of our Japanese competitors." Shiina, however, frankly admitted that Japanese computer manufacturers have greatly bolstered their corporate prowess in recent years.

There is barely any need to emphasize the great strides made by Japanese computer companies in their international competitiveness. Nobody is more keenly aware of this than IBM Japan, which has so much in common with its Japanese competitors in managerial and other practices.

Fujitsu's serious efforts to develop its own computers started in 1960, ironically the year when its request for technological assistance to IBM was flatly turned down.

Ironically again it was IBM itself which provided an unwitting helping hand to Fujitsu when the latter was being forced to fight a losing battle against the world's leading computer maker. An instant and runaway bestseller, IBM's "System 360," first announced in 1964, offered compatibility in software with other machines — a tradition handed down to later generations of computers. This proved to be a godsend for Japanese computer makers, including Fujitsu.

When they are given a definite goal to strive for, Japanese corporations show extraordinary versatility. The Japanese Government also provided financial assistance in tens of billions of yen. The result has been the debut of a series of high quality computers operative under IBM software. This, together with aggressive sales campaigns by Japanese computer makers,

has led to brisk marketing of made-in-Japan computers. It has been not uncommon among Japanese computer firms to offer from 50 to 80 per cent price reductions. Some go so far as to install their machines virtually free of charge in expectation of future patronage.

IBM, on the other hand, has never resorted to price reduction tactics on the grounds that it has built its reputation on its steadfast adherence to regular prices. This tactic, however, is finally beginning to lose its mythical effectiveness in the face of many Japanese users who have tasted the sweetness of huge price cuts offered by Japanese computer makers.

Smaller models

Domestic computer makers also have benefited from the changing needs of the market. In parallel with the sharply growing number of small and medium size corporations using computers, the focus of demand has definitely shifted from centrally-controlled large-scale machines to their locally-controlled varieties. Many factories and branch offices of major corporations also are beginning to actively use locally-controlled computer systems. In other words, demand has been sharply curving upward for small computers, terminal equipment and communications equipment and technology. As Japanese computer makers have mostly grown out of communications equipment manufacturers, they are particularly skilled in such small-scale machines. This, together with their extraordinary versatility in development and bold price reductions, have allowed Japanese computer makers to virtually clean up the market for small and medium size users.

Active recruitment

"We have failed to fully anticipate the sophisticated and changing demands of the Japanese market as to terminal equipment for banking corporations," admits President John Opel of IBM of the United States. "We are very sorry that development of Chinese character systems has taken so much time."

IBM Japan, a subsidiary once removed of IBM of the United States, is handicapped by the necessity of seeking approval of its higher-ranked organization across the Pacific on any important new strategic decisions. The company is definitely in a poorer position than its Japanese counterparts in promptly and meticulously responding to the unique demands of the Japanese markets.

A major reversal also is seen in personnel strategies of IBM Japan and its Japanese competitors. In the two decades since about 1955, IBM Japan has actively employed able personnel, with recruitment in a single year running up to more than 1,000 at times. Some informed sources go so far as to claim that IBM Japan once monopolized top-notch personnel. From about 1975, however, IBM Japan has been following a highly modest employment policy with next year's recruitment of new university graduates limited only to some 100.

Fujitsu, on the other hand, has been constantly recruiting more than 500 new university graduates every year. President Taiyu Kobayashi claims that the true "flowering" of such new employees will come in the near future.

Office automation

Informed sources believe that the focus of demands in the Japanese computer market will further shift to smaller machines for local processing and dispoal of data and information.

According to a survey by the Japanese computer industry, the number of displays used in the United States is now more than 20 times as high as that in Japan, although the number of CPUs used in America is only 2.5 times that in Japan. Industry informants are of the firm belief that Japanese corporations will sooner or later follow their American counterparts in actively installing displays in their efforts for further automation of their office work.

Whether IBM Japan can regain the top sales position in the Japanese computer industry depends on the degree of its success in correctly gauging the particular office automation demands of the Japanese markets and quickly responding to them.

Fujitsu also will not be able to continue its rapid growth unless it makes sure that it is more than well prepared in the field of office automation. Computer makers have so far dealt exclusively with a highly limited number of experts walled in what is usually referred to as computer rooms.

From now on, however, they should be prepared to deal with amateurs as the age of truly popularized computers seems imminent, thanks to great advances made in LSIs, microcomputers and new communications technologies. When such an age actually comes around, easy handling, rather than performance and prices, will become the decisive factor in choosing new computers.

CSO: 4120

COMPUTER MAKERS COMPETING FOR BADGE CONTRACT

Tokyo MAINICHI DAILY NEWS in English 28 Jan 81 p 5

[Text] Leading computer makers are intensifying competition to get the attractive contract for a newly designed Base Air Defense Ground Environment (BADGE) system estimated to cost 200 to 300 billion yen.

The cost will be ten times as much as that for the current BADGE system which was introduced 12 years ago.

In addition to huge profits from the BADGE-X project, the makers are also zeroing in on technical spillover from the system apparently requiring the most advanced computer knowhow.

The BADGE system controls the nationwide air radar network through computers, and guides combat fighters to intercept unidentified and enemy fighters, coming into territorial air space.

The Defense Agency said it would pick up a contractor for the project during fiscal 1981, after working out designs of the new BADGE computer system.

It is hoped the new BADGE will be in operation until fiscal 1984 in accordance with the DA's middle-term defense buildup program.

In the fiscal 1981 budgetary framework, the DA put forward studies for setting up a new BADGE.

The present BADGE system with 24 radars was produced by Nippon Electric Co. with the help of licensed technologies from the Hughes Co. of the U.S.

In the hope of securing the BADGE-X project once again, the company says it can meet technical needs for the new system with its independently developed computer knowhow.

Also, Hitachi Ltd. last August established a new research section for defense technologies, geared to win the BADGE-X contract.

Fijitsu Co. followed the move, and is reported to consider technically tying up with U.S. General Dynamics for the new BADGE business.

These makers, plus Toshiba Ltd. and Mitsubishi Electric Co., share the view that at stake surrounding the BADGE-X project is not only the 200 to 300 billion yen business itself but also the future business of their companies.

CSO: 4120

SCIENCE AND TECHNOLOGY

LATEST HIGH WATER ABSORPTION RESIN

Tokyo TECHNOCRAT in English Vol 13, No 11 Nov 80 pp 53,54

[Text] One very interesting topic to appear recently in the chemical industry, is that of a high water absorption resin. This resin can absorb water from some hundred to 2,000 times as heavy as its own weight and retain it under a pressure to some extent. Thus, it is attracting much attention. Although this resin is at present finding limited applications such as in hygienic napkins, dehydrants for waste oil and water retainers for agricultural soil, it is expected to be made applicable in a wide variety of fields including paper diapers, gel bases for aromatic essenses having the additional purpose of deodorization, water retainers for transplantation of saplings, coagulants for sludge, heavy-metal absorbents, hygienic materials for surgical operations, condensation-proof materials for ceilings, filters for artificial kidneys for controlling water content in blood and collapse accelerators for pills. In Japan, this resin was first commercialized by Sanyo Chemical Industries, Ltd. Following this, such companies as Seitetsu Kagaku Co., Sumitomo Chemical Co., Japan Exlan Industries, Kao Soup Co., Kuraray Co., the Nippon Synthetic Chemical Industry Co., Showa Denko, Nippon Shokubai Kagaku Kogyo Co. and Nichiden Kagaku Co. have been in stiff competition in commercialization of the resin. Only some of them have started actual commercial operations, leaving many others still in the stage of developing products and applications. Successful developments may be completed in a few years, which will be an important period to these companies.

Here, current high-water absorption resin systems will be described with the problems about them to be taken up.

Water absorption resin systems vary in composition and function with the companies making them. One from Sanyo Chemical Industries consists of a bridged polymer of starch and acryl acid. In appearance, it is a white powder, with a specific gravity of 0.3 and a pH of 7, and absorbs water appreciably by the second. The company is promoting the construction of a plant having a capacity of 1,000t/year. A product from Seitetsu Kagaku consists of a bridged polymer of acryl acid and has a water absorption capacity of 400 times its weight. (A more recent product has a capacity of 1,000 times.) It is a white powder (32-200 mesh) pH neutral. The company is planning to construct a plant having a capacity of 1,000t/year. A product from Sumitomo Chemicals consists of a copolymer of vinyl alcohol and acryl acid. It has spheric granules with a particle diameter of 10-300μm, a water absorption of some hundred to 1,500 times it weight; and has high strength. The particular characteristics of this product is that its variants with different

rates of water absorption and strength can be made by varying the percentage of acryl acid in its composition. Furthermore, it can be produced in sheet and powder form by reprocessing with an additive of olefine resin. The company is developing markets, while planning to increase production to 1,000t/year in 3 years. Japan Exlan has commercialized a number of high-water absorption resin systems, fibrous and powdered, using acrylonitrile, a material for acryl fibers, as a component. Kao Soup is producing a system consisting of an acryl acid polymer with a water absorption of 600 times. In addition, Showa Denko and Nippon Shokubai Kagaku Kogyo have developed technology for producing acryl acid polymer systems and Nichiden Kagaku, in cooperation with Sanyo Chemical Industries, starch-acryl acid bridged polymer systems.

Overseas, on the other hand, there are such companies as Henkel (1,800t/year) and Superabsorbent (680t/year). Their products are all bridged polymers of starch and polyacrylonitrile. Of course, other developments are being promoted elsewhere.

The greatest demerit of water absorbing resins is high price. Also, the drawback of loss of water absorption by inclusion of salt. However, it seems they have a bright future, though much time and labor is still required.

CSO: 4120

SCIENCE AND TECHNOLOGY

BRIEFS

HEAT PUMP USES SOLAR HEAT--Kajima Corp. has developed a heat pump system utilizing solar heat, which is used at its Shikoku branch. The system features solar heat and air heat absorption in winter and heat released to the open air and night time radiation in summer, which annually can save electricity costs by 40%. Conventional collector type solar heat utilization methods need auxiliary heat sources such as electricity or by burning oil. On the contrary, the newly developed system does not neet any auxiliary heat source because of its full use of atmospheric heat and night time radiation in addition to solar heat. [Text] [Tokyo TECHNOCRAT in English Vol 13, No 11 Nov 80 p 57]

NEW PAINT FOR OIL TANKS--A new surface coating treatment by Toyo Rubber Ind. has been applied to a 100,000 km crude oil tank at the Mizushima refinery, Okayama Ken, of Mitsubishi Oil. The paint, based on a corrosion resistant polyester resin and containing glass flakes, was used on the bottom and sides of the tank. The new coating has already been applied to surfaces totaling 30,000 square meters, on ships, bridges, and tanks for petroleum products. In the case of crude oil tanks, the new coating will cost twice as much as the conventional epoxy plus tar products, but the time required for painting is shorter and life is estimated to be more than five times longer. [Text] [Tokyo TECHNOCRAT in English Vol 13, No 11 Nov 80 p 82]

LEGAL PROTECTION OF SOFTWARE--The Software Industry Promotion Association will shortly start a "special committee for surveying legal protection of software." The rapid circulation of software, particularly since 1980 has invited infringements of use, such as copying and use without permission, and there have been increasing opinions about the need for the legal protection of software. In response to this, the association has decided to establish a committee. First, the association aims to prevent trouble in transaction, by preparing a model agreement stating the prohibition of copying and the responsibilities of software houses including maintenance. Also, efforts are observed to make a request to the government for new legislation to cover copyrighting of software. [Text] [Tokyo TECHNOCRAT in English Vol 13, No 11 Nov 80 p 74]

CAPTAIN SYSTEM TEST--The Ministry of Posts and Telecommunications is planning in 1981 to expand on a test scale the "CAPTAIN system" services which were started in December 1979. First, the number of monitor terminals will be increased from the present number of about 1000 to 2000. 2) The number of frames available by monitors will be increased to about 200,000. The ministry already conducted a survey in May, 1980, questioning monitors about their use of time, and requesting

information and opinions about rates when the system is made fully practical. It considers that before the system can be advanced to such a stage, it will be necessary to recognize how the system is utilized by including more monitors and increasing the number of frames. Thus, the ministry has decided to find the possibility of commercialization on the basis of connector data by carrying out these steps. [Text] [Tokyo TECHNOCRAT in English Vol 13, No 11 Nov 80 p 72]

CNC JIG GRINDING MACHINE--Mitsui Seiki Kogyo Co. has developed their 3-GBN type CNC jig grinder. The machine is designed to satisfy the requirements of improved accuracy and productivity from metal die manufacturing industry, with only complicated contour grinding and fine hole grinding being performed by the machine. The features of the machine are as follows, (1) precision contour grinding is realized with the CNC control, (2) for the first time in the world, automatic cycle grinding is realized with electric automatic infeed equipment, (3) high precision positioning accuracy with a fully closed loop system. A CNC grinding machine is being marketed by the Moor Co. (U.S.A.) and the development of the company is the second in the world. Main specifications of the 3-GBN are: table area, 600 x 320mm; table travel, 400 x 250mm; wheel spindle speeds, 9,000~25,000 r.p.m.; positioning accuracy, X,Y $\pm$ 0.002mm, C $\pm$ 30 sec. [Text] [Tokyo TECHNOCRAT in English Vol 13, No 11 Nov 80 p 66]

SPECIAL PURPOSE CNC LASER MACHINING--Amada Company Ltd. has developed and begun marketing their "LC-644" type special purpose laser machining machine with built in computer numerical control equipment. The machine has been developed for an expansion of the metal plate working section of the company. The macine is composed the mechanical equipment manufactured by Amada and a model 971 type CO_2 gas laser oscillator (1.2 kw) manufactured by Spectra Fisique Co. (U.S.A.) The machine is designed with emphasis on contouring plate cutting: the maximum cutting thickness is 6.0mm and 3.0mm in carbon steel and stainless steel respectively, and the maximum machining dimensions are 1,000 x 2,000mm. The company produces 10~20 sets of the machine a month and 50% of these are exported. For domestic users, the CO_2 gas laser oscillators are replaced domestically made ones. [Text] [Tokyo TECHNOCRAT in English Vol 13, No 11 Nov 80 p 66]

CSO: 4120 END