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Japan Report

(FOUO 38/81)

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ECONOMIC

TRADE FRICTION, JAPAN'S DISTRIBUTION SYSTEMS DISCUSSED

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19, No 956, 26 May, No 957, 2 Jun 81 pp 19, 20, 24

[Article by Sueo Sekiguchi]

[26 May 81 pp 24, 19]

[Text]

It has often been claimed that distribution systems in Japan differ widely from those in Western countries and that the difference has primarily been the obstacle blocking entry of foreign products into the Japanese market. No exact economic analysis, however, has been conducted on the actual nature of deficiencies, if any, of the Japanese distribution systems. Prof. Sueo Sekiguchi of Osaka University addresses this serious oversight in the following article.

Western criticisms

When Japan enjoyed big surpluses in its current transactions balance in 1978 and 1979, the country was subjected to a series of strong criticisms from Western countries, especially the United States, that Japan's import and domestic distribution systems were preventing foreign products from entering the Japanese market. Such criticism, however, was primarily fueled by the panic Westerners felt about the serious trade imbalance between Japan and the United States and the comfortable surplus in Japan's current transactions balance. When Japan started running big deficits in its current transactions balance in the 1980-81 period, criticism against Japan's distribution systems more or less died down.

Whether a country is chalking up fat surpluses or running deficits in its current transactions balance, however, ought to have nothing to do with that country's distribution system. It must always be important government policies to channel good quality, low-priced commodities to consumers whether the commodities are from domestic manufacturers or their foreign counterparts.

Foreign critics were often misinformed when they attacked Japan for its "complex" distribution systems. One of the most glaring mistakes committed by foreign critics was the claim that Japan's "convoluted" distribution systems themselves comprised non-tariff barriers.

The defenses put up by the Japanese against foreign criticism also lacked true persuasiveness as they were not backed by convincing data. Distribution systems comprise only an insignificant section in economic textbooks and there have never been enough positive studies of the subject.

Major cases of criticism against Japanese distribution policy do not include such government-to-government problems as Nippon Telephone & Telegraph Public Corp.'s procurement, although they have much to do with Japanese distribution policy.

Foreign criticisms can be catalogued into two major groups: 1) cartels and import regulations which have direct effects on imports, and 2) domestic distribution policies which have indirect effects on imports.

The present state of Japanese distribution systems and regulations as well as how pertinent foreign criticisms are to the future improvement of Japan's distribution systems is assessed below.

FTC's Guidances of Foreign Suppliers to Alter Sole Agency Contracts in Fiscal 1978

Business sector	Case of contracts guided	Restrictions on: Tech. revision	Sales of competing products	Base materials-parts procuring sources	Sales channels	Re-sale prices	Check on parallel imports	Restrictions on: Business activities Ad.	Business activities	Others	Total	Share (%)
Manufacturing	99	3	46	1	9	36	13	1	5	16	130	96.3
Food	20	1	5			10	5			2	23	17.0
Textile	4		1		1		1			1	4	3.0
Chemicals	9		6	1	2	3				1	13	9.6
Oil-coal	2		1			1					2	1.5
Rubber-leather	5		1		1				4	4	10	7.4
Ceramics, clay & stone	1					1		1			2	1.5
Metals	2					1	1			1	3	2.2
General machinery	18		14		3	4	1				22	16.3
Precision machinery	10		4			6	2				12	8.9
Electrical machinery	17		7		1	7	2		1	4	22	16.3
Transport machinery	3		2			1					3	2.2
Others	8	2	5		1	2	1			3	14	10.4
Service	3		3								3	2.2
Others	1									2	2	1.5
Total	103	3	49	1	9	36	13	1	5	18	135	100.0
Share (%)		2.2	36.3	0.7	6.7	26.7	9.6	0.7	3.7	13.4	100.0	

Source: Annual Report for 1979 by the Fair Trade Commission

It must be reiterated in this connection that distribution policies should be implemented on their own merits and never for the purpose of manipulating a country's foreign transactions balance. Such work should strictly be reserved for foreign exchange policies.

Anti-recession cartels

The annual report for fiscal 1979 by the Fair Trade Commission shows that there are a considerable number of anti-recession cartels in existence in Japan and that Japan is rather permissive of such cartels. The cartel in the phenol industry is only one of the typical examples. Domestic manufacturers in the phenol industry are permitted under the cartel to jointly control imports. What are the exact economic effects of such a cartel, then?

Phenol manufacturers themselves can of course enjoy comparatively high prices for their products because of the protective effects of the cartel. Phenol users, on the other hand, have to bear the adverse effects (high prices) of the cartel and will eventually need their own anti-recession cartel, unless phenol manufacturers achieve phenomenal technological advances, cut back heavily on their production costs and lift import controls.

Protective measures are highly likely to breed new protective measures. A typical case in point is raw silk and silk products. Import controls on raw silk have now grown to cover all silk products.

What will happen if no protective measures are taken for the phenol industry? Phenol makers will inevitably be forced to cut back their production but phenol users are likely to have a longer lease on life.

Enterprise group

Enterprise groups in Japan have often been accused of breeding implicit but similar import controls as users of some commodities in an enterprise group are often morally prohibited from scurrying toward low-priced imports if the same commodities are available, though at higher costs, from member corporations of the same group.

Whether the accusation is warranted cannot easily be determined, however, as there is not yet enough positive data on the true functions of enterprise groups. It is highly difficult to judge whether A Company in an enterprise group will really sacrifice its own long-term profits by refraining from importing competitive products from foreign suppliers for the sake of B Company in the same enterprise group. It is highly possible, however, that corporations in a certain enterprise group will sacrifice short-term profits for the sake of long-term solidarity and mutual cooperation among themselves. The existence of presidents' meetings in virtually all of the enterprise groups strongly suggests this possibility.

In order to break down such implicit import barriers not sanctioned by the government, bolstering of the Anti-Monopoly Act or/and direct entry of foreign manufacturers and exporters into the Japanese market is mandatory.

Direct investment in Japan

Japanese corporations have made aggressive advances into foreign markets on the strength of the Japanese Government's powerful export promotion policy, which lasted until the 1960s.

It is only from the middle of the 1970s, however, that Japan lifted controls on direct foreign investments into this sector of industries and market. Japan should, therefore, admit that foreign corporations are at a great disadvantage in selling their products in Japan. Although controls on direct foreign investments in Japan started in 1967, it took some 10 long years for the action to come full circle in five well-spaced waves. Distribution sectors were among the last to see investment controls lifted.

Many Western corporations may now be hesitating to commit themselves fully to the Japanese markets in their belief that investment returns will not be big enough for the sizes of financial commitments they will have to make. Their hesitation may only be natural in view of the serious language barriers and wide social and cultural differences between Japan and Western countries.

The American Chamber of Commerce in Japan, however, has made a highly interesting revelation on this subject (in its white paper on Japan-U.S. trade for 1979). The profit rate of overseas subsidiaries of U.S. corporations is nowhere higher than in Japan, according to the ACCJ. This report suggests that foreign corporations' investments in Japan are likely to be amply rewarded sooner or later, although the initial costs may look forbidding.

Discriminatory policies

Foreign producers of monopolistic products, on the other hand, often establish sole sales agents in Japan and follow highly discriminatory marketing policies. The Fair Trade Commission reports that many sole agent contracts infringe upon the Anti-Monopoly Act and are later subjected to alterations (see accompanying table). Most frequent infringements include controls on handling of competing products, controls on sales channels, restrictions on resale prices and prohibition of imports from competing sources (parallel imports).

What distribution policies should Japan take in the future, then? First of all, Japan should cut back as much as possible on import cartels and other import restrictions. Second, it should never block foreign corporations' direct investments in the Japanese distribution sectors. Domestic competitors will naturally try to obstruct the entry of foreign corporations into the Japanese markets. The Japanese Government, however, should stand firm and work for discouraging such obstructions.

[2 Jun 81 p 20]

[Text]

Ultra-small retailers

It has long been claimed that Japanese distribution systems are inefficient. What are the actual data behind such a contention? One obvious yardstick is per employee retail sales. According to *A Textbook on Distribution* edited by Yoshihiro Tajima, per employee retail sales in Japan were only slightly higher than ¥4 million in 1972 as compared with ¥12 million in the United States.

The per employee wholesale amount, on the other hand, stood at ¥36 million in Japan as against ¥52 million in the United States. The comparatively high wholesale amount in Japan is primarily due to the existence of *sogo shosha*, powerful general trading companies.

Creating effective marketing systems is of utmost importance regardless of the origin of the commodities to be handled. Among foreign criticisms against Japan is that distribution margins in Japan are exhorbitantly high and that this fact is having crippling effects on consumer demands.

If the "high margins" are applicable to both domestic and foreign products alike, there are no discriminating effects on foreign products. If Japanese authorities are forcing Japanese sales agents on foreign corporations bringing their products into Japan, however, that constitutes discrimination against foreign corporations.

For a long time, Japanese scholars in commerce and the International Trade & Industry Ministry have tended to consider efficiency improvement in distribution in terms of engineering such as computerization and so on. The true problem involved, however, is whether effective competition is in force or not in the distribution sectors.

The three most serious problems now troubling the Japanese distribution systems are: 1) protective measures for cottage-level, extremely inefficient retailers, 2) strong vertical affiliations of sales channels and competition-restrictive practices by durable goods manufacturers, and 3) lack of efficiency improvement efforts in the highly complex and multi-layered wholesale sectors.

Although cottage-level retail establishments are now protected by special govern-

ment measures, they will at least for some time be allowed to exist because of unique economic mechanisms now at work in Japan even if the protection is lifted immediately. As long as the Japanese continue to live in relatively small houses and use midget refrigerators, they will have to keep on making small-lot purchases at neighborhood retailers, especially when most wives do not hold regular jobs and stay at home.

On the supply side, some small retailers will continue to exist against the tide of modernization as many part-time farmers still exist. As long as they hold precious land (for which they expect mounting prices) and enough spare workforce in the form of family workers, part-time farmers have enough reason to stick to running small stores as a side job at least for some more time.

The Japanese Government has long restricted sales floor expansions by department stores in their efforts to protect small and medium sized establishments and to prevent unemployment from rising. When supermarkets made their aggressive debut, the Government also formulated laws (in 1973) to control their runaway expansion. Although the Government downgraded its controls on large-scale retail establishments (such retailers are now required only to file in new establishment and expansion instead of seeking Government permission first), they have to seek the International Trade & Industry Minister's arbitration if their plans go afoul of local small-scale retailers.

Vertical affiliations

Vertical affiliations of sales channels by durable goods manufacturers will appear as formidable barriers to foreign corporations wishing to enter the Japanese market. Fully aware of this fact, the Fair Trade Commission in 1980 announced a warning in the form of a report entitled "Vertical Affiliation of Distribution and the Anti-Monopoly Law."

Coming under the warning are resale price maintenance practices (outright violation of the Anti-Monopoly Law), one-sales-outlet systems followed by new entrants and lowly-ranked manufacturers and sales territory systems. The latter two belong to a category which is in violation of the law in principle but is allowed where either new entrants or those who have small market shares take these actions.

Manufacturers' investments in sales systems, however, cannot and should not be restricted. If such actions are restricted, existing sales networks are likely to be fossilized to the detriment of consumers.

As is pointed out in the articles contained in *Industrial Organization in Japan* edited by Hisao Kumagai, the competitive positions of durable goods manufacturers tend to be determined by their respective strengths in advertising and sales capacity when their technological standards are more or less on a par with one another. This indicates that, in order for foreign entrants to succeed in the Japanese market, they have to conduct massive sales and advertising campaigns.

One significant countervailing power to manufacturers' own sales channels are mass sales companies now concentrated in Tokyo's Akihabara district (for home electric appliances) and Shinjuku area (for cameras).

If such independent mass sales companies increase in number, they will greatly improve consumers' access to various products, foreign or domestic, and promote competition among sales firms.

As to complex and arcane wholesale systems in Japan, no rash judgment seems warranted. There may well be cases where inter-wholesaler transactions contribute to stabilization of prices. If such wholesale systems are truly uneconomical in nature and have nothing to compensate for it, new entrants will be in a position to inaugurate their own powerful direct distribution channels by eliminating all the intervening distribution processes. Coca-Cola bottling companies, as a matter of fact, have made a huge success out of their own independent distribution systems.

Little positive analysis

What policy conclusions should one draw from all the above facts, then? One obvious conclusion is that the Government should never easily sanction import cartels and other import-restricting proposals by domestic industries. Another is that the Government should become all the more receptive to foreign corporations' investments in sales activities in Japan.

In the field of domestic distribution policies, the Government first of all should dismantle protective measures for cottage-level retail outlets.

Some argue that the Government should continue its protective measures in order to prevent unemployment from increasing and to keep regional communities from being robbed of their intimate neighborhood shops. Unemployment, however, should and can be handled by other policy measures, while there is little sufficiently convincing reason for protecting neighborhood stores at such economic costs. There is no guarantee, moreover, that neighborhood shops will forever keep their present management policy to be open till late at night.

Such neighborhood stores will have to bow out of the scene anyway if there are further changes in the Japanese social structure and housewives start working in greater numbers and the standard sizes of Japanese housing units become far bigger than they are today.

As to vertical affiliations of sales outlets by durable goods manufacturers, stiffer application of the Anti-Monopoly Law is mandatory vis-a-vis any competition-restricting practices. Import cartels should also be reduced both in number and scale through stiffer application of the same law.

As to the complex and arcane distribution systems, little positive studies have so far been made despite the problem's having been talked about so heatedly for so long. Are there truly any industry-wide practices blocking innovations designed to streamline the existing wholesaling systems?

Some industries and individual corporations, especially in the field of synthetic detergents, report of greatly streamlined distribution systems through the use of electronic computer systems. Such innovations, however, are different stories from welfare improvement of the economy. We must investigate whether or not they will increase competition. (End of Series)

CSO: 4120/247

SCIENCE AND TECHNOLOGY

ENERGY DEVELOPMENT, CONSERVATION PROJECTS REVIEWED

Alternative Energy Supplies

Tokyo ENERRUGI FORAMU in Japanese No 313, Vol 27 Jan 81 pp 158-159

/Text/ (I) Petroleum-Substitute Energies and Their Supply Goals

The Types and the Target Supply Quantity of Various Petroleum-Substitute Energies Which Need To Be Developed and Introduced (Refer to the table.)

Other Matters Related to the Supplies of Petroleum-Substitute Energies

1) This goal was set under the premise that an ever stronger cooperation between government and people will prevail as a result of the maximum understanding and effort by the people and implementation of priority and deliberate policies by the government. We will make every effort to achieve this goal while paying proper attention to the protection of the environment.

2) If necessary this goal may be revised in the future according to the changes in the energy demand, the long-range prospect of petroleum supply, the state of affairs of the development of petroleum-substitute energies, and other matters.

(II) The Outline of the Guideline for the Introduction of Alternative Energies

This guideline was drafted by taking into consideration the supply situation, the technological standard, and other matters related to the petroleum-substitute energies. It must be understood that the guideline remains flexible for each individual enterprise according to the actual conditions of its energy usage.

The Types, the Characteristics, the Supply Situations, and the Standard of Utilization Technology of the Petroleum-Substitute Energies That Must Be Introduced.

The Guideline for the Introduction of Alternative Energies for the Enterprises Which Are the Terminal Users

The terminal users of energy, especially those enterprises which consume a large quantity of energy such as iron and steel industry, petrochemical industry, paper and pulp manufacturing industry, cement industry, aluminum industry, and chemical fiber industry, must make every effort to secure smooth and reliable petroleum-substitute energy sources. Cooperation among the related enterprises and neighboring enterprises is highly desirable during the process of introducing the petroleum-substitute energies.

(1) Coal

1) These enterprises which engage in the manufacture of iron using blast furnaces must make every effort to replace their heavy oil burners with all-coke, pulverized coal, or coal oil mixture (COM) burners in order to introduce coal as the alternative energy.

2) Pulverized coal may be used in the cement-baking furnace and the artificial, lightweight aggregate-baking furnace while both pulverized and block coals may be used in the coal-baking furnace and dolomite-baking furnace. Furthermore, coal may be burned in existing furnaces by remodeling their burners. Enterprises engaged in cement manufacturing must make plans to use coal over an extended period of time.

3) Except for a small number of boilers designed especially to burn oil for which transformation may be rather difficult, almost all other boilers for the generation of steam and power generation can be converted to burn coal. Every enterprise must make an effort to introduce coal as fuel for its boilers. A large-scale change-over can be expected to take place especially in paper and pulp manufacturing industry.

4) Coal can be introduced to the various furnaces of nonferrous metal refining processes, including baking furnace, sintering furnace, smelting furnace, refining furnace, and heating furnace. Enterprises now having these furnaces or contemplating new construction must make every effort to introduce coal as fuel.

5) Before introducing coal, make every effort to a) plan for long-range coal utilization, by taking into consideration the coal storage problem including utilization of coal centers, securing sites for the disposal of coal ash, and making positive utilization of coal ash; b) take appropriate environmental protection measures in order to reduce or prevent dust, air and water pollution, and vibration problems associated with the use of coal.

(2) Natural Gas

Introduction of city gas consisting mainly of natural gas through the city gas supply system can be expected. City gas has many useful applications such as fuel for boilers, and fuel for various types of heating and heat-treatment processes. Every enterprise must make an effort to introduce city gas as an alternative energy. Introduction of city gas has many advantages, such as the fact that there are very few restrictions on the application site and the relatively small initial investment cost. For these reasons, introduction of city gas is more attractive to the medium- and small-scale enterprises and enterprises located in a densely populated area.

(3) Hydropower

It is desirable that hydroelectric power generation be increased through development of undeveloped areas and redevelopment of existing facilities.

In developing hydropower, every effort must be made to: 1) fully utilize river water, existing dams and waterways, and to plan for medium- and small-scale power plants so that a central management is possible; 2) promote harmony of operation through adjustment and negotiation with other users of the river; and 3) carry out appropriate measures of environmental protection to prevent water pollution, and to preserve the natural environment.

(4) Geotherm

The shallow geotherms having a temperature in excess of 200°C at the bottom of the geothermal well can be used for thermal power generation. Those having a temperature below 100°C may be used for the purpose of preheating high temperature water and water for hot baths, air conditioning, and horticultural applications. Every enterprise must make an effort to utilize geotherms by carefully studying their utilization potentials.

In utilizing geothermal energy, every effort must be made to 1) minimize the impact of buildings and mechanical equipment on the natural scenery, and prevent pollution of water and soil by hydrogen sulfide and arsenic; 2) avoid conflict with other rights and interests such as the hot spring rights, through adjustment and negotiation.

(5) Solar Energy

Solar energy can be utilized through use of the solar system in many areas of application such as preheating high temperature water and water for hot bath and air conditioning; for drying purposes in the food processing industry, agriculture, forestry, and marine products industry; and in the fish culture industry. Every enterprise must make an effort to utilize solar energy by carefully investigating its utilization potentials.

(6) Waste Matter and Waste Heat

Every enterprise must make a positive effort to utilize the waste matter and waste heat by understanding their energy characteristics. The waste liquid and wood chips of paper and pulp manufacturing plants and the wood chips of sawmills and plywood manufacturing processes, in particular, must be utilized continuously. At the same time, effective measures must be taken to protect the environment from air and water pollution, and foul odor.

The Guideline for the Introduction of Alternative Energy for the Enterprises Which Are the Suppliers of Energy

Those enterprises which engage in the business of supplying electricity, gas, and heat, bear an important responsibility of supplying energy. Introduction by them of petroleum-substitute energy promotes indirectly the introduction of petroleum-substitute energy by those enterprises which are the terminal users of energy, and thus contributes toward lowering Japan's dependency on petroleum.

(1) Electric Power Enterprises

The electric power enterprises consume one-third of the total energy demand, so that introduction of petroleum-substitute energy by the electric power enterprises holds the key to the success or failure of Japan's effort to introduce petroleum-substitute energies.

Therefore, the electric power enterprises must make the greatest effort to introduce petroleum-substitute energy. They must: 1) make plans to diversify the electric power sources by first of all promoting the construction of nuclear power plants, and the introduction of various forms of power generation including coal thermal, LNG thermal, hydropower, and geothermal; 2) not, as a rule, design any more new power plants which burn oil, except for those already underway; 3) make an effort to convert from oil to coal or LNG burning in existing plants, or to increase the ratio of coal or LNG to oil in mixed burning furnaces; 4) engage in the development of photovoltaic power generation, fuel cells, and other electric power sources as part of their long-range plan.

In doing so, they must also: 1) make sure to maintain safety and carry out effective measures to protect the environment; 2) promote the situation by improving the public acceptance; 3) secure stable and diversified sources of fuels for the nuclear power generation, coal thermal power generation, and LNG thermal power generation; 4) join the nation in an effort to promote the situation and to develop the technology, and to play an active role in the development and establishment of technology by putting to good use each individual's store of technological knowhow.

(2) Gas Enterprises

The gas enterprises must further promote the introduction of petroleum-substitute energies by: 1) aggressively promoting the introduction of imported natural gas, while the local enterprises must also do the same; 2) making every effort to maintain utilization of coal and domestic natural gas; 3) develop technologies which will promote the introduction of petroleum-substitute energies in the future.

In doing so, they must also: 1) properly maintain the receiving bases and the pipeline network, and promote the industrial LNG supply by making good use of the price system; 2) make an effort to expand the utilization of LNG which tends to slow down during the hot summer months by promoting the popularization of gas air-conditioning equipment; 3) establish a system in which the users, including the electric power enterprises, can accommodate one another; 4) promote the development of small gas air-conditioning equipment and the development and introduction of fuel cells; 5) maintain the existing coke furnace facilities in order to maintain coal utilization; 6) aggressively pursue, in close cooperation with the government, the development of high calorie gasification technology and the complete gasification technology in which cokes are not formed as part of their medium- to long-range plan.

(3) Heat Supply Enterprises

The heat supply enterprises must make every effort to introduce waste heat as a petroleum-substitute energy.

石油代替エネルギーの供給目標(昭和68年度)

	(A) 石油代替エネルギーの種類	(B) 石油代替エネルギーの供給数量の目標(単位 万kl)		(C) 備考	(D) (参考) 昭和53年度 (単位 万kl)	
(1)	石炭	12,300	35.4%	石炭の供給数量は、16,350万tである。	5,681	50.9%
(2)	原子力	7,590	21.8%	原子力の供給数量は、原子力発電による電気の供給数量であり、原子力発電に係わる設備の出力は、5,100万kWないし5,300万kW、年間発電電力量は2,920億kW時である。	1,542	13.8%
(3)	天然ガス	7,110	20.4%	天然ガスの供給数量は、輸入される天然ガスの供給数量4,500万tと本邦において生産される天然ガスの供給数量760万klとの合計数量である。	1,940	17.4%
(4)	水力	3,190	9.2%	水力の供給数量は、水力発電による電気の供給数量であり、水力発電に係わる施設の出力は、一般水力2,600万kW、揚水2,700万kW合計5,300万kW、年間発電電力量は1,230億kW時である。	1,941	17.4%
(5)	地熱	730	2.1%	地熱の供給数量のうちには、地熱を利用する火力発電による電気の供給数量が含まれており、当該火力発電に係わる施設の出力は、350万kW、年間発電電力量は245億kW時である。	16	0.2%
(6)	その他の石油代替エネルギー	3,850	11.1%	その他の石油代替エネルギーとは、太陽熱、石炭液化燃料等をいう。	38	0.3%
(7)	(参考) 合計	石油換算3.5億kl	100.0%		石油換算1.12億kl	100.0%

The Supply Goals of Petroleum-Substitute Energies (1990)

Key: (A) Type of petroleum-substitute energy
(B) Target supply quantity of petroleum-substitute energy (unit: 10,000 kl)
(C) Remark (D) Reference: 1978 (unit: 10,000 kl)

(1A) Coal
(1C) The supply quantity of coal is 163.5 million tons

(2A) Nuclear power
(2C) The supply quantity of nuclear power is the supply quantity of the electricity generated from use of nuclear power. The output of nuclear power generating facilities is in the range of 51-53 million kW, and the annual electricity output is 292 billion kWh.

(3A) Natural gas
(3C) The supply quantity of natural gas represents the sum total of imported natural gas of 45 million tons and domestically produced natural gas of 7.6 million tons.

(4A) Hydropower
(4C) The supply quantity of hydropower represents the supply quantity of electricity generated by the hydropower generation. The output of hydropower facilities is 53 million kW consisting of 26 million kW from the ordinary hydropower and 27 million kW from the elevated water, and the annual electricity output is 23 billion kWh.

(5A) Geotherm
(5C) The supply quantity of the geothermal energy includes the electricity generated by the thermal power generation using geothermal energy. The output of the related thermal power generation facilities is 3.5 million kW and the annual electricity output is 24.5 billion kWh.

(6A) Other petroleum-substitute energies
(6C) Other petroleum-substitute energies include solar heat and the fuel obtainable from liquefaction of coal.

(7A) Reference, Sum total
(7B) 350 million kl of equivalent petroleum
(7D) 112 million kl of equivalent petroleum.

Energy Budget

Tokyo MAINICHI SHIMBUN in Japanese 6 Jan 81 p 9

/Text/ Ninety Points Out of One Hundred for Full Mark

"Rating the most recent budget of the Ministry of International Trade and Industry, a certain member of the Diet gave it 120 points, but I would say it deserves at least 90 points," appraised Yano, the permanent vice minister of the Ministry of International Trade and Industry, as soon as the government's original bill was drafted. The energy budget which constitutes the major part of the budget of this ministry increased a whopping 17.3 percent, well over the increase of the entire general account of 9.9 percent. No wonder he held his head so high. "We must be satisfied with this budget which accomplished so much under the severe circumstances of financial reconstruction. I am grateful for it," added Tanaka, the minister of the international trade and industry, with a smile.

Let us relate in figures this inclination toward the energy budget. The total energy budget of the general account is 496.5 billion yen, amounting to an increase of 73.4 billion yen (17.3 percent) over 1980. Excluding increases of 25.3 percent for the national debt, whose expenditures increases naturally by design and for the payment of the past interest, and 18.7 percent for the local financial fund, this item has shown the largest growth of all general expenditure items. The energy problem has been given maximum weight among all policy funds. The amount added to the petroleum special account is 380 billion yen with an increase of 26.2 percent, and the scale of the petroleum special account is 671.9 billion yen with an increase of 20.7 percent.

The background which favors the energy budget is none other than today's severe energy situation, especially the uncertainty of the petroleum supply. The Iraqi-Iranian conflict, which started last September and became, contrary to the general expectation, a prolonged war, caused the daily supply of 6 million barrels of oil to stop flowing. Although the petroleum exports from these two countries have been partially restored, the volume remains very small. The world's daily oil supply is said to be 1.5 million barrels (1 barrel - 159 liters) under the demand. With this insufficiency of supply as the background, the OPEC nations raised the oil price $4 per barrel at a meeting held last September at Bali Island, Indonesia. "The age of $40 oil will certainly be here early this year."

Amidst an Uncertain Oil Supply

In short, we have received the double shock of uncertainty in the oil supply plus heretofore-unheard-of high prices. It is expected that some national petroleum companies will have difficulties allocating oil starting this spring. It is imperative for Japan, without losing a moment, to push forward various energy-saving measures, and to develop and secure a number of petroleum-substitute energy resources. These have resulted in the preparation of the recent "extravagrant" budget.

The fact that the Ministry of Finance was about to favor the budget in relation to the energy matters could be seen clearly in the tax system reform which preceeded the budget preparation. The investment tax exemption requested by the Ministry of International Trade and Industry, in spite of strong objection from some quarters as being a preferential enterprise tax system, was approved based on the fact that it will be beneficial to the implementation of various energy-saving measures but with one condition that the name be changed to "Energy Measures Promotional Tax System" and its content shifted to favor the investments related to energy matters. This tax system allows deductions of an amount equal to 7 percent of the capital invested in the equipment, or a special 30 percent depreciation. The enterprises are free to choose one of these two rules. This bill, different from the original bill proposed by the Ministry of International Trade and Industry which involved only the tax reduction, was brought up before the formal adoption in the LDP's tax reform bill and was passed in an instant.

Now then, what is it that is emphasized most strongly in this energy budget which received such attention? It is the fund for the petroleum-substitute energy measures. The government passed a bill outlining the "goals of petroleum-substitute energies and their supply" during a cabinet meeting held on 28 November 1980. Fifty percent of the total energy supply of 1990 is to be furnished by nonpetroleum energy (it was 27 percent in 1978). This budget is to promote, according to this goal, the utilization of nonpetroleum energy resources such as coal and nuclear power. Especially large increases in the budget were found among the following items: fund for the development of coal liquefaction technology increased to 23 billion yen which is 2.3 times that in 1980; fund for the development of overseas coal increased to 6.5 billion yen, amounting to an increase of 50 percent; fund for the development of the technologies related to nuclear power increased to 7.8 billion yen, amounting to an increase of 70 percent; fund for the development and stockpiling of petroleum, including some brand-new undertakings such as oil shale extraction has also increased 23 percent.

Some of the problems associated with this budget include payments to the peripheral areas of the nuclear power generating facilities and to the prefecture exporting electricity. The former represents the payment to the inhabitants and the enterprises of the cities, towns, and villages at the site of nuclear plants and neighboring areas. This payment is an extremely unprecedented case of distributing tax money directly to people. Although the governors of the urban and rural prefectures feel that direct payment to the people ought to be abolished and the payment be used for the local development projects, direct payment to the people is likely to continue because this practice originated, in the first place, in demands for a discount in the electricity bill.

On the other hand, the latter payment is made to those prefectures whose electricity generation exceeds more than 50 percent of its own consumption. That both payments ought to be the responsibility of the power company itself remains the strongly held public opinion, so it appears that there is a need to minimize the said payments.

Surveillance for Extravagance

In any case, the energy budget was passed with the mood that "as long as it is for energy measures, it is unavoidable," so that the possibility of extravagance is even higher. It is conceivable that domestic private enterprises may refuse to use the coals developed overseas according to this national plan. Therefore, in implementing various items of the energy budget, we must also take other, fine-grained, related measures and, at the same time, people must keep a keen eye on these activities in order to prevent any form of wastefulness to occur.

Oil Shale Exploitation

Tokyo NIHON KEIZAI SHIMBUN in Japanese 8 Jan 81 p 7

/Text/ The Petroleum Public Corporation (president: Hisaji Tokunaga) has assigned this year as the "first year of oil shale," and made plans to begin development of oil shale in Japan. This activity has never before been taken up seriously in Japan. However, since a fund for the research and development of oil shale appeared for the first time in the 1981 budget, development of dry distillation technology has already started, and an inspection party has been dispatched to Australia in order to materialize the overseas oil shale development project. All the necessary technologies for extracting oil from oil shale will be established during the next 5 years. The oil shales of Augstralia, China, and Brazil will then be exploited, and approximately 44 million barrels of shale oil in 1990 and approximately 107 million barrels in 1995 will be imported.

Experimental Plant by 1983-84

According to the plan made by the Petroleum Public Corporation, approximately 13 billion yen will be invested over a period of 5 years from 1981 to 1985 in the development of a uniquely Japanese technology to build and operate an experimental plant. A pilot plant with a capacity of 300-500 tons a day is to be constructed inside Japan during the year 1983-84. With a budget of 1.2 billion yen for 1981 for research and development, various technologies necessary for the extraction of oil, including mining, grinding, and dry distillation, will be developed by private enterprises, which specialize in machinery, plant, and petroleum refining, entrusted with this responsibility. An environmental protection investigation, including the waste shale treatment method, will also be a part of the activities.

The subject areas to be explored include, tentatively, those areas having large potential reserves such as Australia, China, and Brazil, which is said to contain one-fourth of the world's known exploitable reserves today.

These countries have been sounded out on their interest in cooperating. From Australia, the Petroleum Public Corporation has received an invitation from the Southern Pacific Petroleum Company for a joint oil shale development in the Condor District on the east coast of Queensland. The Condor District is a hopeful area with approximately 6 billion barrels of primeval reserves. The mine bed thickness is said to range from 300 to 400 meters, buried under 30-350 meters of topsoil.

Investigation and a feasibility study are being carried out today. A daily production of 500,000 barrels is the final goal. The Petroleum Public Corporation is to send an inspection team to Australia in order to investigate the possibility of importing shale oil in case Japan participates in the joint venture.

When President Tokunaga visited China last October, he made an offer to investigate China's oil shale reserve situation. Japan's proposed plan will be presented to the Chinese Government in January. China is producing shale oil on a small-scale today at Fushun, Dongbei, and also at Maoming in southern Guangdong, but the process is outdated and also costly. The annual production at Maoming is 700,000 barrels today, and its confirmed reserve is said to be approximately 1.5 billion barrels. China is making plans to expand its production to 3 million barrels a year. In addition to reconstruction of Maoming, the Petroleum Public Corporation considers that there is room for Japan's cooperation in the brand-new development projects in the Shandong and Shanxi areas.

In Brazil, its nationally-owned petroleum company, Petrobras, has a plan to build a commercial plant with a capacity of 500,000 barrels a day, and they are at the stage of running an experimental plant having a capacity of 1,000 barrels a day. President Tokunaga has received an invitation from President Ueki of Petrobras to participate in a joint venture after inspecting the site, and the Petroleum Public Corporation has a positive plan to participate in this venture.

Oil shale, like tar sand, is considered to have a reserve comparable in size with petroleum itself. However, it is quite difficult to extract oil from shale at low cost by means of dry distillation, so that no countries of the world have ever succeeded in large-scale commercialization of this operation so far. Japan has participated in the development of Canada's tar sand, but oil shale is a totally undeveloped area in Japan. While tar sands are concentrated in Canada and Venezuela, oil shales are widely distributed over the earth. Therefore, a successful development of a low-cost process will contribute greatly to Japan's supply of petroleum-substitute energy; the Petroleum Public Corporation thinks so.

Technical Cooperation

Tokyo NIHON KEIZAI SHIMBUN in Japanese 9 Jan 81 p 1

/Text/ The Ministry of International Trade and Industry has broken the shell of a policy, "refining at the location of consumption," and changed the petroleum policies to liberalize the import of oil products from the oil-producing countries and to offer technical cooperation to the oil-producing countries in the areas of oil refining and the sale of oil products. This is a partial opening of Japan's policies, which heretofore have been closed to the oil-producing countries, responding to their changeover from exporting crude oil to exporting oil products, with much higher added value, presently being attempted by the oil-producing countries. However, under the present situation, there is a danger that the oil-producing nations may keep the three intermediate products, which have a greater demand, for their own domestic consumption and export only the heavy oil. Therefore, the Ministry of International Trade and Industry is planning to use the heavy oil cracking

technology (an advanced technology of obtaining three intermediate products from heavy oil) as the mainstay for cooperation with the oil-producing countries in order to promote an export posture of the oil products which satisfies the demand structure of the consuming nations such as Japan.

The petroleum policy of the Ministry of International Trade and Industry used to uphold the doctrine, "refining at the site of consumption," so that as a rule only crude oil was imported and the refining was done in Japan, therefore the technical cooperation offered by the petroleum department to the oil-producing countries was limited to exploration and development of crude oil. Because, if refining oil is entrusted widely to the other nations, a supply system which satisfies the domestic oil products demand structure cannot be met and an insufficient supply of a certain type of oil product cannot be avoided. The reason for changing the policy at this time is because the Ministry of International Trade and Industry has been convinced that the movement and the desire of the oil-producing countries to launch the export of oil products can no longer be halted.

The oil-producing nations centered around OPEC have, since 1979, started to make plans one nation after another for the construction of oil refineries to produce oil products for export. Export of oil products, as compared with the present policy of export of crude oil only, has many merits as far as the oil-producing nations are concerned, such as a much higher added value, domestic industrialization, and the creation of jobs. By doing so, the oil-producing nations aim to control the entire petroleum circulation system from crude oil to refining and to the sale of various oil products. After the Iranian-Iraqi war, when their oil refining facilities are reconstructed, this trend is expected to accelerate significantly.

The oil-producing nations will reduce their crude oil export by the same amount they increase their export of oil products. When this happens, the supply and demand of crude oil will become very tight. And what is even more troublesome is the possibility that the oil products exported by these nations may be weighted in favor of heavy oil, because the demand for heavy oil is small in the oil-producing nations where industrialization is lagging. On the other hand, modernization of national life is quite advanced, so that the demands for the three intermediate oil products such as kerosene for heating and light oil have increased significantly. Therefore, there is a danger of not having a sufficient supply of the three intermediate products to be imported by the consumer nations.

To prevent it from happening, the Ministry of International Trade and Industry considers that "we cannot do otherwise but to cooperate with the oil-producing nations and aid them in expanding their oil refining and export posture to match the world's demand structure." Therefore, the ministry will begin to offer technological education to engineers of the oil-producing nations concerning refining and sales at the "Oilman Center" which will be built next year. Each year, approximately 60 engineers and government representatives in charge of petroleum affairs will be invited over to Japan while approximately 30 Japanese engineers will be dispatched to the oil-producing nations to train their workers on site.

The center of training and technical cooperation will be the heavy oil cracking technology. In order to prevent the shortage of three intermediate products such as kerosene, technological research with governmental assistance was initiated in

1979 and, if everything progresses smoothly, the new technology is expected to be in a usable state by 1983. The Ministry of International Trade and Industry will try to popularize this advanced technology among the oil-producing nations. When new oil refineries are to be built by the oil-producing nations, Japan will be ready to offer cooperation by building this cracking facility for the oil producing nation.

When such technological cooperation materializes, import of various oil products currently restricted by the import quota system shall be relaxed. The Ministry of International Trade and Industry believes that the medium- to long-range stability of crude oil and oil products supplies can be strengthened by strengthening the mutual dependency relationship between the oil-producing nations and the oil-consuming nations.

Biomass Energy Projects

Tokyo NIKKAN KOGYO SHIMBUN in Japanese 10 Jan 81 p 1

/Text/ Japan's economic and technological cooperation with the developing nations for the development of biomass energy is moving toward materialization. The Overseas Economic Cooperation Fund (president: Kaneo Ishihara) and the International Cooperative Business Group (president: Keisuka Arita) have approved a loan of 150 million yen as the No 1 financing policy to the International Manjoca Development Company (president: Kenji Nakanishi), which is to carry out a joint venture with a local enterprise to manufacture alcohol from manjoca (a kind of potato) in Brazil. The Japanese Government is to launch a feasibility study of the Philippines' biomass energy development project also.

A Loan of 150 Million Yen Approved by the Overseas Economic Cooperation Fund and the International Cooperative Business Group

As soon as a loan of 150 million yen by the Overseas Economic Cooperation Fund and the International Cooperative Business Group (JICA) is carried out, the International Manjoca Development Company will begin to carry out experiment on manufacture of alcohol from the Brazilian manjoca (a kind of potato), and the project is scheduled to last 1 and 1/2 years. As a measure to counter the soaring petroleum prices, the Southeast Asian nations such as Philippines, Thailand, and Indonesia in addition to Brazil, have begun to look to the development of alcohol as a petroleum-substitute energy source. While Japan's financial aid or plant and allowance in kind to these developing nations has begun to materialize, the recent fund loan was the first of its kind.

Manjoca is a kind of potato, and alcohol can be produced from it by means of a series of processes including grinding, hydropressing, steam-cooking, and fermenting.

The International Manjoca Development Company, which represents the opening on the Japanese side, was organized in June 1979, from a joint investment of 22 related Japanese enterprises, with an authorized capital of 500 million yen and a paid-up capital of 220 million yen.

After the fund financing is approved, this company will work side-by-side with a local Brazilian enterprise, the Copamasa (organized in August 1979; headquarters at Belem in Para Province) to make preparation for the development of manjoca alcohol.

The local enterprise has already experimentally cultivated a total of 117 varieties of manjoca in the Tomeas District of Para Province, and chosen 22 high-yield varieties. These varieties can yield 40 tons per hectare a year compared with an ordinary manjoca variety which yields only 10 tons per hectare.

This company and the local enterprise will soon begin the first phase of the experimental alcohol production using the high-yield manjoca. The content of the activities include the feasibility study of mass cultivation, the study of alcohol production technology, and evaluation of the petroleum saving effect. After this plant begins to operate, Brazil will be able to produce 550 kl of alcohol a year.

In order to reduce the amount of petroleum import, Brazil drafted a national alcohol plan in 1975, and the plan is being implemented today. As one of the links of this plan, production of alcohol from sugarcane yielded 579,000 kl in 1975 and 3.9 million kl in 1980. The alcohol yield is targeted for 10.7 million kl by 1985, and manjoca will be utilized in addition to the sugarcane.

Feasibility Study To Be Carried Out in Philippines Too

The Japanese Government has been requested by the Philippines Government to carry out a feasibility study of Philippines' biomass energy development plan, and the study will begin next month. The results of the study will be summed up and presented to the Philippines Government. According to the Ministry of Foreign Affairs, the governments of Indonesia and Thailand have also sounded the Japanese Government about a feasibility study of their biomass energy development plans. If the Philippine biomass energy development plan can be realized, then "requests to carry out a feasibility study" from the member nations of the Southeast Asian Alliance besides the Philippines are expected to pour in.

The Philippine Government which has to manage 85 percent of its energy consumption each year with imported oil, last year launched a 5-year "national alcogas plan," with this aim to get rid of the "oil-dependent economy" by producing ethanol, which will be mixed with gasoline and used as the automobile fuel, from biomass raw material such as sugarcane and cassava. The biomass energy development project belongs to one of the links of this master plan.

Specifically, this plan includes construction of factories (farms) for the production of the raw materials for biomass energy such as sugarcane and cassava, and the construction of 25 medium-size ethanol manufacturing plants with a capacity of 50-60 kl per day scattered all over the country. During the recent visit to the Philippines, Prime Minister Suzuki received a request from the President Marcos for cooperation with the Philippines' national alcohol project.

Oil Exploratory Drilling Projects

Tokyo NIKKAN KOGYO SHIMBUN in Japanese 10 Jan 81 p 4

/Text/ The Resources and Energy Office of the Ministry of International Trade and Industry disclosed on the 9th in the 1981 "Basic Investigation of Domestic Petroleum and Natural Gas: in what relation the government intends to promote the development of domestic petroleum and natural gas. It revealed the specific 20 year projects as part of the "fifth 5-year development plans for the domestic petroleum and combustible natural gas resources." According to this, a basic exploratory drilling will be carried out at Kuromachiuchi-cho, Doto Peninsula, Hokkaido. This is the first exploratory drilling carried out on land in 7 years. On the other hand, the basic exploratory drilling project carried out at sea since 1980 will be carried out this year along the coast of the Sea of Japan in Tohoku District. Drilling will be carried out to the depth of 4,500 meters in order to investigate the geological structure of the area. Moreover, the 1981 budget for the domestic petroleum and natural gas basic exploration is 5,796,000,000 yen; an increase of 57 percent compared with the previous year.

The Coast of the Sea of Japan in Tohoku District Chosen as Ocean Exploration Site

According to the basic investigation project, the exploratory drilling on land will be carried out at Kuromachiuchi-cho on Doto Peninsula. Kuromachiuchi is situated on a line connecting the area on the coast of the Sea of Japan in Tohoku where petroleum and natural gas have either been discovered or been in production and an area around Saharin Island in Russia (exploratory activities are being carried out today). Therefore, the possibility of having petroleum and natural gas reserves there is considered quite high. (Although small in quantity, natural gas is actually being produced at Chomanbu which is adjacent to Kuromachiuchi.)
The depth of drilling will be 3,300 meters, and the budget for this project is 693 million yen. The operations associated with the exploratory drilling will be carried out by the Petroleum Resources Development Co which is the holder of the mining rights.

Exploratory drilling on land had taken place until 1975. It has been discontinued since then, so that this drilling will be the first in 7 years.

The basic exploratory drilling in the ocean will be carried out along the coast of the Sea of Japan in Tohoku District. The specific location has not been revealed on account of the fishing adjustment. The drilling depth will be 4,500 meters (ocean depth: 230 meters) and the possibility of reserve being discovered in the green rough will be investigated. The operations associated with the exploratory drilling will be carried out by the owner of the mining rights in that area. The basic exploratory drilling in the ocean is an extension of the drilling activity (which is still going on) offshore near Miyako-jima in Okinawa.

In addition, according to the plan, the basic physical investigation will be carried out in the ocean along "the coast of the Sea of Japan in the southwest area," a linear length of approximately 3,000 km from south of Sado in Niigata Prefecture of the Sanin area. The budget for this project is 488 million yen. In addition to drilling at Doto Peninsula in Hokkaido which started last year, exploratory drilling at the Tokatsu area in Hokkaido will be emphasized this year, and a physical investigation of the area will be carried out. Including Doto Peninsula, the total linear length of the work will be 130 km with a budget of 394 million yen.

Furthermore, the 1981 basic magnetic investigation includes a budget of 57 million yen to carry out an investigation in preparation for a basic exploratory drilling of two wells in the ocean to be carried out next year.

Underground Oil Storage Plan

Tokyo MAINICHI SHIMBUN in Japanese 10 Jan 81 p 1

/Text/ The Resources and Energy Office of the MITI and the Petroleum Public Corporation are jointly carrying out the research and development of an underground storage base as a safe way of storing oil, and four locations have surfaced as possible sites for the construction of practical storage tanks. A feasibility study will be carried out by the Resources and Energy Office and the Petroleum Public Corporation in 1981 at such places as Kuji-shi in Iwate Prefecture, the homestate of the Prime Minister Suzuki, and construction will begin in 1982 after the experimental results obtained from the demonstration plant, which is being constructed at Kikuma-cho in Ehime Prefecture, are processed. Both sites are expected to become state-controlled storage sites eventually.

Feasibility Study To Begin this Fall, Carried Out by the Energy Office and the Petroleum Corporation

There are four possible sites for construction of underground storage according to the Resources and Energy Office and the Petroleum Public Corporation. These are Kuji-shi in Iwate Prefecture, Kushikino-shi and Yakujima in Kagoshima Prefecture, and Kikuma-cho where the demonstration plant is being constructed. From a total of 67 selected spots all over the country considered to be suitable for the construction of large-scale underground storage, the number was eventually narrowed down to 4, after the detailed investigations were carried out, including investigation of earthquake resistance, the geological properties, and the bedrock and also listening to local opinion. Although the exact scope is not yet decided, the storage capacity is expected to be in the range of 2-5 million kl. The feasibility study is expected to begin this fall with a budget of 100 million yen.

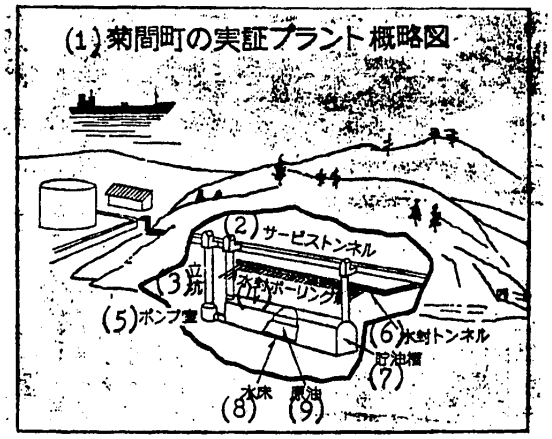
The concept of underground oil storage was developed first in Scandinavia, especially in Norway and Sweden. A huge hole is bored in the bedrock and the hole is used as an old storage tank. The oil is prevented from leaking by the hydraulic pressure of the underground water. The safety of the underground storage is said to be very good. It can withstand earthquakes quite well, because it is surrounded by hydraulic pressure. Furthermore, it requires very little land area, therefore it is generally considered to be more effective than the aboveground tank storage or storage in the ocean.

Research in this field was started in Japan in 1976, and the Petroleum Public Corporation started construction of a demonstration plant with a 25,000 kl capacity at Kikuma-cho in 1979. The work is still continuing and it is expected to be finished this fall. An experiment will be carried out by storing oil for a period of 1 year. As soon as the experiment is finished, construction of a practical underground storage tank will be undertaken. It is estimated that 20-30 percent of the 30 million kl of national oil stockpiled in the future will be stored underground.

More than 30 years experience in underground oil storage has been accumulated in the Scandinavia. Today, underground oil storage is becoming popular over all of Europe and even in the United States. In France, an underground storage tank of more than 5 million kl capacity has been constructed.

Since this construction technology was first introduced to Japan from the Scanska Co of Sweden by the Kiyomizu Construction Co in August of 1976, there have been approximately 20 firms engaged in the introduction of this technology in preparation for the construction of practical storage tanks.

The demonstration plant being built at Kikuma-cho utilizes a rocky mountain by the shore of the Seto Inland Sea. It consists of a tank, 15 m wide, 20 m deep and 110 m long, situated at a depth of 40 m below sea level. The tank is located below sea level in order to apply hydraulic pressure. The excavation of a service tunnel has been finished and excavation of the tank itself is under way.



Key: 1. Schematic diagram of demonstration plant at Kikuma-cho
2. Service tunnel
3. Vertical shaft
4. Water seal boring
5. Pump room
6. Water seal tunnel
7. Oil storage tank
8. Water bed
9. Crude oil

Oil Conservation Target

Tokyo NIHON KEIZAI SHIMBUN in Japanese 14 Jan 81 p 3

/Text/ The Japanese Government determined on the 13th that the 1981 Oil Conservation Target will be 25 million kl. In view of a probable shortage in oil supply in the latter half of this year as the Iranian-Iraqi war drags on and the need to strengthen

the energy saving posture, the government decided to increase the oil conservation target by 5 million kl over the 1980 target (7 percent, 20 million kl). Conservation efforts by the production department of various industries are especially mandated. The conservation target for the general industry excluding the electric power industry has been increased to 6 million kl which is twice last year's target. On the other hand, conservation of energy related to national life such as the adjustment of thermometer settings for heating and cooling and self-discipline by those who own private cars, is considered to have reached its limit so that the target this year is 14 million kl, up only 1 million kl from last year. This national goal is expected to be approved by the cabinet meeting which will convene on 23d to discuss the consolidated energy measure promotion problem.

The oil conservation target is a measure of the difference between oil consumption with and without conservation efforts. When it is expressed in "percentage," it is often confused with the rate of cutback from the previous year's consumption. The government has not decided whether or not to use this expression of conservation rate this year. However, according to a source at the MITI, the conservation target of 25 million kl amounts to a "8 percent conservation rate."

The domestic oil situation today is rather relaxed thanks to the strengthening of stockpiles and the reduction in demand as a result of conservation efforts. Nevertheless, the government has set a target exceeding that of 1980 in order to further strengthen the conservation effort. The reasons why such action is taken include the following: 1) The trend of the world's oil supply and demand in the latter half of 1981 is unclear. 2) The IEA (International Energy Agency) has reduced its estimated total oil import by member nations during the first quarter of 1981 from the original 254 million tons to 238 million tons, and has demanded that each member nation practice conservation. 3) There is an urgent need to establish a genuine oil conservation system by promoting introduction of various energy-saving equipment by industries.

The detail of the conservation target is as follows: 1) The saving of 14 million kl (13 million for 1980) to be achieved by the general conservation measures carried out in homes and the business departments of industries by properly setting the thermostat temperature for heating and cooling: 2) The saving of 5 million kl (4 million for 1980) to be achieved by the electric power industry by switching from oil to an alternative fuel; 3) The saving of 6 million kl (3 million for 1980) to be achieved by the production departments of industries by rationalizing their energy usage and switching to an alternative fuel.

Oil conservation to be achieved by the production departments of industries is expected to be achieved mainly through the introduction of energy-saving equipment. For 3 years starting in 1981, a consolidated energy investment promotional tax law will be implemented by the government. This tax law allows a reduction in tax equivalent to 7 percent of the total investment related to energy-saving and alternative energy equipment (or a special 30 percent 1st year depreciation for the equipment). The government is counting on the effect of this investment tax reduction system on industries, expecting that a significant investment will be made in energy-saving equipment so that oil consumption by the production department of various industries can be reduced significantly. While the oil conservation measures taken by industries in the past used to be centered around incidental

measures such as recovery and reuse of waste energy, this new effort will be centered around positive measures such as conservation achieved by the production facilities themselves, for example, from an introduction of energy-saving industrial furnaces.

Popularization of gas cooling systems and solar systems is an additional new measure for general energy conservation. A thermostate setting of 28°C for air-conditioning and a 20 percent reduction in the use of elevators remain in force as before. It is considered that the conservation measures applicable to the national life in general have reached a limit and not much more can be done in this area.

LPG Stockpile Plan

Tokyo NIKKAN KOGYO SHIMBUN in Japanese 14 Jan 81 p 3

/Text/ Petroleum Stockpile Reform Bill To Be Introduced

The Resource and Energy Office of MITI is preparing to introduce in early February a Petroleum Stockpile Reform Bill to the Diet mandating the stockpiling of liquefied petroleum gas (LPG) by the LPG importers starting in early 1981. The amount to be stockpiled is 2 and 1/2 days' supply. The mandatory stockpile will be increased to 15 days' supply by 1 April, 1982, according to the Resource and Energy Office. When this LPG stockpile law is put into effect, Japan's petroleum and oil product stockpile system will be roughly complete and a foundation for steady oil supply will have been laid.

Starting Out With Two and a Half Days' Supply in 1981

There are two kinds of LPG: that which is produced by the domestic oil refineries and that which is produced by an effective utilization of the oilfield gas by the oil-producing countries. The latter is imported LPG transported to Japan in special tankers. Domestic LPG demand used to be satisfied by LPG produced domestically. As the demand for LPG increased, more and more LPG was imported, and at present, the imported LPG surpasses the domestic LPG.

The Middle East is the center of the source of imported LPG and Saudi Arabia supplies the largest share. According to the official "long-range perspective of energy supply and demand," the volume of imported LPG is expected to be 20 million tons in 1985, 26 million tons in 1990, and 33 million tons in 1995. LPG is valued as a "clean gaseous fuel."

The domestic demand on LPG is widespread. In addition to the 18 million households--approximately 60 percent of the families of more than 2 persons nationwide--which use LPG as family fuel, the demand is expanding in such areas as raw material for city gas, and fuel for taxis and industries. Its importance as a part of the total energy requirement is increasing rapidly. Therefore, in addition to a movement to diversify the LPG supply source, an opinion concerning mandatory LPG stockpiling as a means of stabilizing its supply has grown stronger in recent years, and the question of stockpiling was deliberated in the Petroleum Council as early as late 1979.

According to the plan, a stockpile target of 50 days' supply will be achieved by 1989. The 1981 governmental budget includes funds for assisting in the purchase of stockpiled LPG, the construction of a stockpile base, and cooperative stockpile (among the LPG importers). The Resources and Energy Office will in early February introduce the present Petroleum Stockpile Reform Bill to the Diet. The law will be implemented 4 months after its passage, or 3 months after, if its passage is delayed.

With a stockpile of 2 and 1/2 days' supply each in the first half and the second half of 1981, or a total of 5 days' supply plus a stockpile of 10 days' supply in the private sector, the total stockpile will be 15 days' supply by 1 April, 1982.

Feasibility Study on Sites

Tokyo NIKKAN KOGYO SHIMBUN in Japanese 15 Jan 81 p 1

/Text/ The Resources and Energy Office of MITI and the Petroleum Public Corporation will determine the five prospective sites for the national petroleum stockpile which will be the objects of the third feasibility study. Together with the first and the second feasibility-study sites and the underground stockpile sites, preparation for the establishment of a 30 million kl (actual capacity of 40 million kl) system will be completed by the end of 1988. On the other hand, in addition to these land stockpile bases, the tanker storage of 7.2 million kl will be expanded to 10 million kl in 1982 and a decision on the selection of new tanker stockpile bases will be made this summer.

Oil stockpiling as a measure of guaranteeing energy security is being emphasized by every nation of the world. In Japan, since 1978 the strengthening of the national stockpile has been undertaken cooperatively with the realization of a 90-day stockpile by the private sector and a stockpile of 7.2 million kl by the Petroleum Public Corporation in the form of tanker stockpiles. However, for long- and medium-range stockpiles, construction of permanent land stockpile bases is necessary. Therefore, the Resources and Energy Office and the Petroleum Public Corporation have jointly selected prospective sites and carried out feasibility studies as follows: The first feasibility study was carried out at the following four sites: Mutsuogawahara, Jogojima in Nagasaki Prefecture, Rinko in Fukui Prefecture, and Shirojima in Fukuoka Prefecture. The second feasibility study was carried out last fall at the following four sites: eastern Urakoboku, Kanezawako, Umagejima and Yakujima in Kagoshima Prefecture. Furthermore, the following sites have been chosen for feasibility studies as possible underground stockpile sites: Kuji in Iwate Prefecture, Kikuma in Ehime Prefecture, Kushikino and Yakujima in Kagoshima Prefecture.

However, not every site studied can become an actual site for the construction of a stockpile base. There is so far only one site--Mutsuogawahara area--where actual construction work is under way. A portion of the work will be completed in 1982. Kanezawako and Yakujima have been abandoned completely, while Umagejima, Jogojima, and Fukui Rinko are still pending. Shirojima and eastern Urakoboku have been chosen as construction sites and construction work will begin within this year, undertaken by the Stockpile Company.

As a result, the stockpile bases expected to be completed by the end of 1988 will have a total capacity of 23 million kl. In order to be able to establish as planned, a 30 million kl stockpile system by the same time, a total capacity of 40 million kl with a 30 percent reserve capacity will be necessary. Therefore, it will be necessary to construct stockpile bases having an additional 17 million kl capacity.

In view of this, the Resources and Energy Office and the Petroleum Public Corporation will by the end of this month select five new prospective sites for the third feasibility study. Ten areas including Shibushiwan in Kagoshima Prefecture, Akita Prefecture, and Ikijima in Nagasaki Prefecture have been named as the candidate sites. However, at the Petroleum Public Corporation, a hearing is being conducted by the "National Stockpile Base Planning Committee" (chaired by Toshie Okumura, honorary professor at Tokyo University). They are accelerating the selection of the five sites based on the geographical conditions and the economical considerations.

When this is finished, various measures for the establishment of the 30 million kl national oil stockpile plan will be finished for the time being. As soon as these permanent land stockpile bases are completed, the handling of the oil becomes most important. The Resources and Energy Office and the Petroleum Public Corporation are planning to transfer the 7.2 million kl of oil currently stockpiled in a total of 26 tankers in Tachibana Bay in Nagasaki Prefecture and offshore of Iwo Jima to the land bases. In the meantime, before 1982, when the Mutsuogawahara base is expected to be completed, at least 10 million kl of tanker storage capacity is considered to be necessary therefore, more tankers must be added to the existing fleet, and negotiations are under way to secure a mooring site for these new tankers. Oita Prefecture is among the prospective mooring sites.

Oil Import Goals

Tokyo NIHON KEIZAI SHIMBUN in Japanese 20 Jan 81 p 3

/Text/ The head of the Resources and Energy Office of MITI revealed on the 19th that the 1981 oil import (crude oil and oil products) as part of the 1981 petroleum supply plan which will be drafted this spring "will probably be significantly smaller than the planned volume for this year (5.4 million barrels a day)," and the figure will be in the order of 5.2-5.3 million barrels a day. In view of the fact that the actual 1980 oil import fell short of 5.05 million barrels, the government is going to "make an energy-saving plan in accordance with the actual condition." The same official also indicated that the plan for 1985 oil imports that will also be discussed at the same time will be on the smaller side than Japan's 1985 Oil Import Control Target (6.3 million barrels a day) determined by an international agreement.

As a result of this policy, established by the Resources and Energy Office, the Japanese Government will be able to cope with a cutback on Japan's oil import control target which will be discussed at the IEA (International Energy Agency) Ministerial Conference to be held in May. Furthermore, the tentative perspectives of long-range energy supply and demand which were based on a figure of 6.3 million barrels a day for the 1985 oil import (drawn up in August of 1979) and the petroleum substitute energy supply goals, e.g., Japan's main energy policies, are expected to be completely revised within a year.

The oil supply plan which constitutes a guide for Japan's oil policy is revised each year to cover the next 5 years (1981 plan covers a period ending in 1985). The plan deals specifically with the amount of oil to be imported, the amount of crude oil to be refined, and the amount of oil products to be sold. According to the 1980 plan, the volume of oil import was to be approximately 5.4 million barrels a day (316 million kl a year; 1 barrel = 0.159 kl) for 1980, approximately 5.6 million barrels a day (approximately 330 million kl a year) for 1981, and 6.2 million barrels a day (approximately 360 million kl a year) for 1984.

Japan's oil import goals (5.4 million barrels a day for 1980 and 6.3 million barrels a day for 1985) determined at the Tokyo Summit (a conference of the heads of states of the advanced nations) held in 1979 were followed and the import volume was increased 3-4 percent each year from 1980 to 1985. However, as a result of the development in the energy-saving efforts, the actual oil import last year was approximately 8 percent below the planned figure. At the same time, the movement to further cutback oil import goals is very strong worldwide, therefore the government has decided to revise this plan by substantially reducing the oil import figures.

The head of the Resources and Energy Office added: "There were a few special reasons in 1980 such as general slowdown in business activities and shortage of oil supply due to the Iranian-Iraqi war which contributed to the reduction in oil import, thus it will be unreasonable to expect to reduce the 1981 oil import to the level of 1980." However, it is considered feasible to achieve the 1981 import goal set in 1980, or an amount of 5.2 million barrels a day (approximately 300 million kl a year; anticipating that the 1981 oil conservation target of 25 million kl will be met) which is well below the 1980 planned import figure.

Along the same line of thought, the 1985 import quota of 6.3 million barrels a day is expected to be reduced significantly. It appears very likely that the quota will be on the order of 5.7-5.8 million barrels a day. The MITI will be explaining the outline of this guideline on 23d at the Consolidated Energy Measure Promotional Cabinet Meeting. It will then publish the plan in March or April.

Petrochemical Industry

Tokyo NIKKEI SANGYO SHIMBUN in Japanese 23 Jan 81 p 10

/Text/ The Association of Petroleum Industry (chairman: Takeshi Dokata, president of Sumitomo Chemical Industry) on the 22d summarized the raw material situation, international competition, and overseas investment related to the petrochemical industry and also what the petrochemical industry ought to do in the future. This report was compiled by a society for the study of problems related to the petrochemical industry (chief investigator: Tsutomu Shudo, managing director of Mitsubishi Petrochemical Industry) over a period of a year. According to this report, the specific weight of the material cost in the total cost is rising rapidly and the difference in the material cost is eroding Japan's competitive edge in the international competition of the petrochemical industry. The report pointed out that the most important problem today is how to obtain the raw material cheaply. As countermeasures, the report suggested that we must eliminate Japan's institutional factors which raise the cost over the international price on the one hand, and try to import intermediate products at moderate cost by cooperating with overseas manufacturers or by overseas operation on the other.

The outline of the report is as follows:

Analysis of the Operational Environment

1) Resources and Energy: What came out at the end of the first and the second oil crises was not the "shortage of oil" but the "fear of shortage" and the "inflated price." Therefore, the problem is not so much one of "supply insecurity" but of "price inflation." The greatest problems faced by Japan's petrochemical industry today are the inflating raw material cost and the widening of the cost differential.

2) Petrochemical Raw Material: Worldwide the main raw material is naphtha. Even in the United States, the proportion of ethane used as raw material is declining in favor of naphtha and light oil. Increasing use of new energy resources such as tarsand, coal gasification and coal liquefaction plus nuclear power and coal will soon produce surplus heavy oil. And as the technology of heavy oil cracking is improved further, production of naphtha as a byproduct will also increase. Moreover, if the demand for gasoline remains low while use of ethane and LPG as raw material increases with the supply of natural gas liquid (NGL), there is a strong possibility that surplus naphtha may be created by 1990.

The ratio of the cost of imported naphtha (approximately equal to the international price) to the cost of imported crude oil varies as follows:

1) During a period in which the price of crude oil is stable, the relative price of naphtha (the ratio of naphtha price to the crude oil price) will be low.

2) During a period of oil crisis, the relative cost of naphtha will rise sharply. This is due to the fact that the supply and demand of naphtha is quite loose under normal circumstances. When surplus naphtha exists its cost reflects the fact that it is a byproduct of manufacturing gasoline. When there is a shortage of naphtha its price is the price of gasoline less the cost of reforming or more. The limiting nature of naphtha is reflected in its price in the movement on the Rotterdam spot market, while the international price of naphtha is considered to be based on the long-term contract price of the European chemical firms.

3) Overseas Petrochemical Industry: The United States has a strong competitive edge over the European countries because it is able to purchase naphtha $50 per ton cheaper and ethane $90 per ton cheaper. In the background of this is the U.S. energy price control policy. However, this price differential will diminish after the decontrol of energy prices (decontrol of oil prices will become effective in October of this year and decontrol of natural gas prices, in 1985). Reduction in the use of ethane as raw material will be significant. The U.S. predominance in olefin products will diminish after 1985. In the aromatic products, the competitiveness of Japan-U.S.-Europe will become more evenhanded even sooner.

In Europe, naphtha remains in the main current as in the past. If a country with ethane resource were to begin its petrochemical industry based on ethane, it could arouse a great competition in the product price. However, the world's ethane resource can satisfy less than one-fourth of the total ethylene demand of the world in 1990, and the rest must be supplied by ethylene manufactured from naphtha, light oil and LPG.

4) Present State of Japan's Petrochemical Industry: There are problems related to raw material and many other things. Japan's domestic naphtha is more expensive than the international price during a stable period and less expensive during a period of oil crisis. Japan is different from the West in that naphtha may not be imported by the petrochemical firms themselves (administrative directive) so that there is a lack of power in negotiating price and the market mechanism fails to work in this instance. The price is determined in Japan by a system completely independent of the international price. When a system in which naphtha may be imported freely is established, the price of domestic naphtha will also follow the international price. A price system linked with the international price is desirable from the viewpoint of maintaining an international competitive edge.

A principle of tax-free raw material exists internationally. However, Japan's petrochemical industry is subjected to the impact of import tax and oil tax. The total tax in 1980 was estimated to be as much as 38.8 billion yen. At the same time, there is a mandatory stockpiling of raw materials and its cost was estimated to be as much as 24.4 billion yen in 1980. Furthermore, naphtha is stockpiled in the form of crude oil and there is no assurance in the stability of the naphtha supply so it cannot be used as a powerful weapon by the petrochemical industry.

Moreover, the practice by some electric power industries of burning naphtha and crude oil as raw fuel must be phased out as soon as possible from the viewpoint of effective utilization of these resources.

The domestic demand for ethylene was significantly less in 1980 than in 1979. In addition to the actual drop in demand, we can also cite the effects of a cool summer and a reaction to the false demand as the reasons. A reduction in the international competitive edge due to high material cost resulted in a reduction in export and an increase in import. These forces caused various ethylene facilities to operate less.

In addition to a decrease in domestic demand for petrochemical products. A significant drop in export to the Southeast Asian countries, and inflow of basic chemicals, Japan's petrochemical industry, which is in a bind as a result of a raw material cost which is higher than the international price and a product price which is comparable with the international price, has the following problems as well: low profit, low equity capital ratio, aging equipment, excessively competitive constitution, and a research and development investment which is only one-fourth that of the United States.

Future Image of the Petrochemical Industry

A petrochemical industry based on ethane has a strong competitive edge as far as cost is concerned but it is limited by the raw material resource. Therefore, the petrochemical industry of the world is overwhelmingly based on naphtha--a raw material derived from oil. If Japan's petrochemical industry is to survive in such an atmosphere it is absolutely necessary that its industry be able to procure raw material at a cost comparable with the international price. Since there does not seem to be insecurity as far as the availability of naphtha is concerned, with domestic naphtha more emphasis ought to be put on its price than its volume. And if there is still a shortage of naphtha after the domestic naphtha and the imported naphtha are put together, the shortage ought to be made up by importing the intermediate product at the international price. This is what will enable it to cope with the internationalization of the industry.

Furthermore, those products with small added values ought to be imported from the oil-producing countries in the form of either intermediate or final products at low cost. One disadvantage of overseas operation is that Japan will lose its economic independence. A desirable choice is to maintain a proper balance between the export of products and overseas operation so that at least the domestic demand on petrochemical products may be made self-sufficient. To regain the competitive edge, the industry must strive to diversify the raw material at every level of operation, develop new technology using new raw material, practice strategic purchasing and stockpiling of the raw material, produce distinguished products and products with high added values.

Suggestions Concerning Raw Material Problem

To the administration: 1) the regulation that naphtha may not be freely imported (a question of "import right"), 2) the oil tax and custom's tax levied on the raw material--naphtha, 3) mandatory stockpiles, and 4) use of crude oil and naphtha as raw fuel--system, restrictions, and practice peculiar to Japan--ought to be improved or abolished. An administrative special treatment measure is not necessary. Improvement or abolition of the aforementioned regulations is necessary in order to maintain an international competitive edge. The petrochemical industry on the other hand must strive to solve its raw material problem and put more effort in its operation.

Cooperation in Oil Industry

Tokyo NIKKEI SANGYO SHIMBUN in Japanese 29 Jan 81 p 3

/Text/ Seven months after the pending question of capital coalition between Daikyo Oil Company and Ajia Oil Company had surfaced we were able to see the final settlement. The president of Kyodo Oil Company, Hiroshi Ohbori, the president of Daikyo Oil Company, Zentaro Nakayama, and the president of Ajia Oil Company, Ryutaro Hasegawa, the concerned parties gathered on 29th and signed an agreement including transfer of assets in the presence of Minister Tanaka of the MITI and Secretary Moriyama of the Resources and Energy Office. As a result, the Ajia Oil Company has now separated itself from the Kyodo Group and joined the Daikyo Group. Taking a clue from this coalition, more and more soft linkages are expected to take place in Japan's oil industry circles regardless of foreign capital group or national group. The structural changes brought about by the 1973 oil crisis have been slowly but steadily spreading over the entire oil industry. The national group in particular will probably have to employ every available means in order to strengthen its constitution in the future. In that sense, this coalition drama should ring an alarm for the companies belonging to the national group (reporter Mamizu).

Eight Shares Transferred to Tokunaga

The contents of the agreement are as follows: 1) Daikyo will gain 48.7 percent of Ajia's share and Ajia will join the Daikyo Group. 2) Kyodo and Ajia will settle their shares between themselves and Ajia's personnel dispatched to Kyodo will be withdrawn. 3) The products of Ajia will be handled by Kyodo as in the past. 4) Eight shares of Ajiakyo Oil Company (headquartered in Tokyo; president: Ryutaro Hasegawa; capital: 9.6 billion yen) which is jointly invested by Ajia and

Kyodo, corresponding to 0.1 percent of the stocks out of the 33.4 percent of total stocks owned by Kyodo will be transferred to Kuji Tokunaga, president of the Petroleum Public Corporation, and 5) Kyodo will cooperate with the Ajia-Daikyo group on various matters including crude oil supply. The contents are basically in agreement with the arbitration plan suggested by MITI. The problem concerning Ajiakyo stocks for which the Daikyo-Ajia side showed disapproval was solved by the introduction of Tokunaga, president of the Petroleum Public Corporation, into the picture so that the veto power over any special resolution could be retained by Kyodo.

The eight shares (equivalent to 0.1 percent of the stocks) which could affect the special voting power of Kyodo which was the focal point of disagreement must be transferred. Several names were given as candidate for recipient, including Yoshihiro Yoneyama, president of Federation of Economic Organizations /FEO/; Toshio Tsuchimitsu, former president of FEO; Yoshimitsu Fujita, president of Petroleum Problem Investigation Committee of Liberal Democratic Party; and Tokunaga, president of the Petroleum Public Corporation. Tokunaga was chosen as the recipient eventually, because 1) he is the elder OB in the MITI; 2) he is well-versed in the situations inside the oil industry, and 3) he is an impartial third party. The shares are to be owned strictly by the private person of Tokunaga and not in its capacity as the president of the Petroleum Public Corporation. Therefore, there will be no danger of forming any special relationship between the Daikyo-Ajia Group and the Public Corporation.

After the agreement was signed by the concerned parties, President Tokunaga said: "I understand that any problems related to Ajia will be solved peacefully among those concerned. I will take good care of these stocks entrusted to me."

Details by the End of March

The Immediate Problems

In relation to the final agreement among the three parties, there are still some details that need to be ironed out in future negotiations. These details include settlement of the Ajia stocks, a contract concerning the dealing of oil products produced by Ajia and Ajiakyo, and the use of a distribution base at the Ajia Yokohama Refinery by Kyodo. The concrete details of these contracts will be drawn up before the end of March by an investigative committee represented by both sides--Kyodo and Daikyo-Ajia. About the length of the contract concerning the dealing of oil products, Kyodo wants a 10-year period while Daikyo-Ajia wants a 5-year period. There is also disagreement on the prices; Ajia prefers Kyodo's settlement of account rule while Kyodo insists on settlement of account rule minus alpha. A similar problem exists even on the volume of dealing. Some expressed doubt that the details can be ironed out before the end of March. Furthermore, President Ohbori had expressed that "after the separation, supply of crude oil to Ajia will have to change of course," hinting that crude oil supply to Ajia will be reduced. Together with the contract concerning dealing of the products, the question of who will be responsible for the crude oil supply constitutes another focal point. This problem solved in conjunction with a contractual adjustment with Daikyo which deals 30 percent of Fuji products and 42 percent of Shikajima products.

On the other hand, how the 27.2 percent of stocks returned by Ajia to Kyodo will be distributed among its shareholders is also worth watching. As shown in the diagram, Nippon Kogyo owns 40.8 percent of the Kyodo stocks. Suppose 27.2 percent were all distributed to Nippon Kogyo according to its refining capacity, its total stockholding would exceed the 50 percent mark and a "Nikko-Kyodo" image would become very strong. Nikko is a member of the group since Kyodo was first organized in 1965. Now that Ajia has separated itself from Kyodo following in the footsteps of Toa, Nikko is showing more color these days. It is generally considered improper for Nikko to become too prominent.

When Toa separated itself from the Kyodo Group, President Ohbori raised the investment rate of Fuji and Shikajima significantly while raising that of Nikko and Ajia only slightly. By doing so, he was able to avoid the criticism of "Nikko-Kyodo." This time too as in the past, the investment rate of Fuji and Shikajima can be raised substantially or the stocks may be distributed among the 21 financial institutions which hold 1.9 percent of the Kyodo stocks.

Extension of Industrial Bank Conception.

From now on, Ajia is order the Daikyo Group investment-wise, but a greater part or even all its products will be sold as in the past through Kyodo. This arrangement appears to be a desperate measure and such an irregular form of arrangement is unhealthy from a long- to medium-range point of view. Although the idea was to avoid giving a shock to the existing sales system, it is inevitable that a link between the production and sales departments of Daikyo-Ajia will grow stronger in time.

The refining capacity of Daikyo-Ajia is 480,000 barrels a day, amounting to 8 percent of the national capacity. It occupies third place in the national group after Shukko Kosan and Kyodo and in front of Maruzen (see Table 1). Its sales share is 5.1 percent (1979 figure). If the products of Ajia were to be added immediately, a gap between production and sales will be created. That is why the Ajia products will be sold by Kyodo for the time being so that the Deikyo-Ajia merger may take off smoothly. Fully aware of this, President Nakayama expressed: "They would like to coordinate matters related to the import of crude oil and the allocation of tankers with Kyodo in the meantime."

At this juncture what appears to be most uncanny is the move taken by the Japan Industrial Bank, a major backer of Daikyo. Various plots of the bank have been talked about openly and in private. Some have even gone so far as to label it a "representation war between the MITI and the Industrial Bank." President Nakayama insisted: "Under no circumstances did Daikyo act according to the command of the Industrial Bank. Besides, the bank supports both Daikyo and Kyodo. It cannot team up with either side."

However, the head of the Industrial Bank has been heard to say: "The oil companies belonging to the national group are desirably formed into a number of small groups: Shukko Kosan as a group and the rest formed into two or three groups." Once, an idea of coalition between Maruzen-Kaikyo-Ajia was advanced by the Industrial Bank. There is no doubt about the capital coalition drama enacted this time being right on the extension of the idea advanced by the bank. In this case, the future development of Daikyo-Ajia coalition is interesting to follow.

Toward Internationalization and Open System

The Future of the MITI and Kyodo Oil Company

After the signing of the agreement by the three parties, the head of the Resources and Energy Office of MITI said: "From now on, every enterprise must strive to improve quality through cooperation with other groups unprejudiced by the framework or affiliation of the group." He has thus made it clear that "soft linkage" among all oil companies regardless of their affiliation with the national group or the foreign capital group will be sanctioned in the future.

This signals a turnaround in Japan's oil policy from preferential cultivation of the national policy company Kyodo. It is awkwardly explained that "it is not so much a loss for Kyodo but a gain for the other groups." As symbolized by the view held by the head of the Resources and Energy Office immediately after the second oil crisis that "a good cat (oil company) is a cat which can catch a mouse (crude oil) no matter whether it is a black cat (foreign capital) or a white cat (national)," the recent policy makes no distinction between the national group and the foreign capital group. Though a little too late, the oil industry circle is also entering the age of internationalization and an open system.

However, it does not appear that MITI has any special plans for the future oil policy now, especially about strengthening the constitution of the oil companies. The subjects over which cooperation among the groups is most urgently in need today include the crude oil supply and the heavy oil cracking technology. Even in this area, no concrete visions which will drastically change the status quo can be conceived.

Rather, the MITI policies seem more inclined toward letting the private sector take the initiative on matters related to coalition. The capital coalition drama enacted this time appears, after all, to be the capture of 48.7 percent of Ajia stocks by Daikyo. From the very beginning, there were many in MITI who insisted that "transaction of stocks ought to be done by private firms and the administration should stay out of it." This was agreed to by Kyodo as well which was under strong support by MITI. Kyodo cannot help but to undertake the task of strengthening its own constitution just as any other oil company.

Strengthening of the Operational Base--An Urgent Task

The Lesson to be Learned from this Capital Coalition Drama

The reasons why this capital coalition drama dragged on and on for as long as 7 months may be boiled down to the following two factors: All parties concerned exchanged shouts from the very beginning and failed to talk to one another calmly and all parties were too conscious of their faces. However, the reasons may be more deeply rooted. When the fresh Sakade Refinery of Ajiakyo (refining capacity: 150,000 barrels a day; 1 barrel = 59 gallons) was completed in 1973, it was only a while before the first oil crisis was to strike. At that time, not only Ajia, but every other oil company was in a high growth period and demand for oil was expected to grow vigorously. Therefore, when the demand for oil decreased because of the oil crisis, Ajiakyo did not know what to do with its newly built facility and its cumulative debts inflated at one time to as much as 38 billion yen.

One company which was in worse shape than Ajiakyo was Toakyo (Chita Oil Company today; refining capacity: 100,000 barrels a day) of the same Kyodo Group. The facility was completed in October of 1973 immediately before the oil crisis was to strike and by the same reason its cumulative debts surpassed 40 billion yen. The Toakyo reconstruction project was therefore given priority over Ajiakyo within the Kyodo Group and Ajiakyo was shelved while Toakyo was given priority treatment. In the meantime, there was a change in the presidency of Kyodo and the business of Ajiakyo gradually became better so that the Ajiakyo problem did not surface then.

However, President Hasegawa of Ajia sought cooperation with oil companies outside the Kyodo Group based on the reasoning that "to establish the operational base, the operation rate of the refining facilities of Ajia and Ajiakyo with a total refining capacity of 275,000 barrels a day must be significantly raised," and Daikyo, which was operating under a reversed production-sales gap (sales share exceeding the refining share), caught his attention. Ajia and Daikyo were already in a business cooperation relationship in such matters as entrusted refining and accommodation of stockpile tanks as early as June of 1979 while reconstruction work of Toakyo was underway. They entered into a capital coalition 1 year later by timing it with the conclusion of the Taokyo reconstruction project.

If the first oil crisis brought a sense of crisis to the members of the national group, the second oil crisis triggered by the political change in Iran aroused a determination in them to take whatever action that was necessary to overcome the situation. As can be seen in Table 2, the examples of capital coalition inside the oil industry circles have increased rapidly in number since February of 1979 when the second oil crisis struck. These are caused by the changes that have taken place in the environment surrounding the oil industry. Take the case of Shukko Kosan purchasing Okinawa Refinery stocks from the U.S. Gulf Oil, for example. Okinawa Refinery was originally built by Gulf in 1970 so that it could sell crude oil to Japan. When it could no longer supply the crude oil, the Okinawa Refinery stocks were sold to Shukko Kosan which was a partner in the venture.

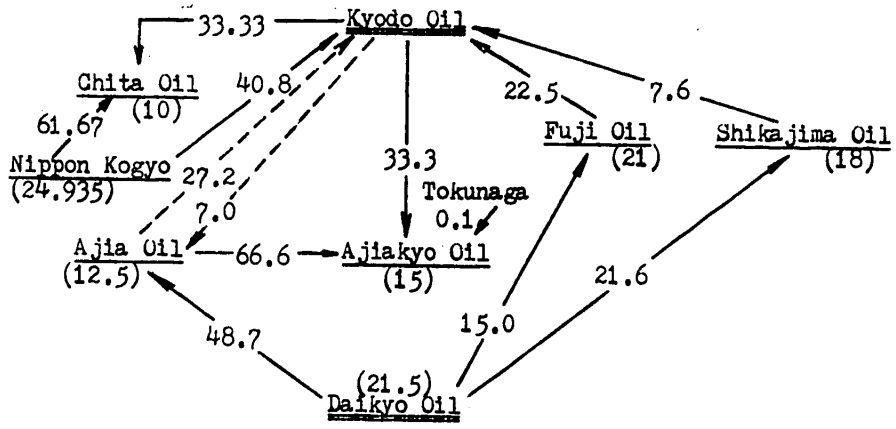
The reason Kyodo Group is so conspicuous during the talk of capital coalition is the fact that it had aggressively expanded its refining facilities during the high-growth period. Other groups of the national group will have to cope with a similar problem sooner or later. It is quite obvious that refining facilities with a total capacity of 5.94 million barrels a day nationwide are no longer needed now that the total 1980 oil import including crude oil and oil products was down to 5 million barrels and the figure for this year can only be crawling sideways. In addition, the oil-producing countries are expected to export more oil products and less crude oil in the future, so that surplus facilities will continue to increase.

The national group is more handicapped in the area of crude oil supply than the foreign capital group. Although they may be able to obtain all the oil they need, they must often rely on the more expensive spot market oil. Therefore, the national group which has a smaller share of the imported Saudi oil than the foreign capital group is obliged to buy crude oil costing $3-$5 more per barrel.

The 1980 mid-year period account (June-November, 1980) published by Daikyo on the final day of signing indicated a sale of 545 billion yen with a profit of only 400 million yen. In contrast, the top foreign capital oil company, Nippon Sekiyu, made a profit of 60.5 billion yen in the same period of time.

The foreign capital oil companies were said to be smiling while casting a side glance at the confusion of the capital coalition drama played by the national group. However, after things have settled down, not much has changed in the status quo, and some consider that the status of foreign capital oil companies is even more secure. In order to strengthen their operational foundation which appears to be crumbling under their feet, it is time for the oil companies belonging to the national group to search in earnest every available means for survival toward the 21st century.

New coalition relationship between Kyodo Group and Daikyo Group



——→ Investment relationship; Numbers indicate investment ratio

- - - → Cancelled investment relationship

====== Petroleum wholesale company _____ Petroleum refining company

( ) Numbers in parentheses indicate refining capacity in 10,000 barrels a day.

Table 1 Strength of Japan's oil company groups

National group	Refining share	Sales share
Shukko Kosan	15.2	15.2
Kyodo Oil	14.2	13.9
Daikyo Oil	8.2	5.1
Maruzen Oil	6.6	8.0
Kyushu Oil	2.9	2.1
Taiyo Oil	1.1	1.2
Fuji Kosan	1.3	0.8
Teiseki Topping	0.1	--
Total	49.6	46.3

Foreign capital group	Refining share	Sales share
Nippon Oil	15.1	18.9
Shell Oil	11.6	11.9
Toa Fuel Industry	11.5	12.1
Mitsubishi Oil	8.0	7.6
General Oil	4.2	4.0
Total	50.4	53.7

(Note) Sales share is based on 1979 fuel oil sales of 233.4 million kl. Refining share is based on a total refining capacity of 5.94 million barrels a day.

Table 2 Examples of recent capital coalition in the oil industry circles

September, 1978	Maruzen Oil and U.S. Union Oil capital coalition dissolved. General Oil and Exxon capital coalition.
August, 1979	Toakyo Oil joins Nippon Kogyo (changes name to Chita Oil later). Toa Oil joins Shell-Showa Group
October, 1979	Maruzen Oil and Kansai Oil merger.
June, 1980	Shukko Kosan purchases Okinawa Oil Refinery from U.S. Gulf Oil and Mitsubishi Chemical Industry; Okinawa Oil joins Shukko Kosan.
July, 1980	Arabia Oil becomes No 1 shareholder of Fuji Oil (from 10 to 19%).
October, 1980	General Oil absorbs General Oil Refinery and General gas.
December, 1980	Nippon Oil increases its holding of Kyushu oil stocks from 2.75 to 10%.
January, 1981	Ajia Oil joins Daikyo Oil.

Interviews with Energy Chiefs

Tokyo NIKKAN KOGYO SHIMBUN in Japanese 2 Feb 81 p66

/Interview with Taro Nakayama, Director General of Administratives Affairs, in the Prime Minister's Office; Shingo Moriyama, Head of the Agency of Natural Resources and Energy of MITI; and Chikara Watamori, Director of the New Energy Comprehensive Development Organization; Date and Place Not Specified/

/Text/ Energy conservation is a national concern for Japan which depends on imported oil for 99.7 percent of its oil needs. Consciousness of the need for energy conservation has slowly but steadily permeated the private sectors and business circles, and has begun to show some results. In its recent Consolidated Energy Measures Promotional Cabinet Meeting, the government decided the 1981 energy conservation consolidation measures centered around an energy conservation target of 25 million kl a year. Both the government and the people are expected to exert themselves more than ever for success in this energy conservation campaign. In addition to be conservation efforts, both governmental organizations and private sectors are also expected to make a significant progress in research and development of alternative energy and new energy.

Therefore, in relation to the energy conservation month which began on the 1st, questions relative to the methods for promoting energy conservation and the directions of alternative and new energies development were brought before the following three governmental officials: Taro Nakayama, secretary of general affairs, Office of the Prime Minister; Shingo Moriyama, head of the Resources and Energy Office of MITI; and Chikara Watamori, director general of the Consolidated New Energy Development Organization.

/Question/ What aspirations do you have concerning the energy conservation policy?

/Nakayama/ The 1980 energy conservation target was 25 million kl and the actual saving was 40 million kl. We owe this achievement to the energy conservation policy and especially to the proper administrative instruction of MITI. The target for this year is set at 25 million kl and we would like to forge ahead in order to achieve this goal. While energy consumption in the United States is centered around the national life, the proportion in Japan is industrial production second and national life first. Conversion from oil-burning to coal-burning furnaces carried out by the cement manufacturers and utilization of waste gas carried out by Sakai Iron Work of Shinnichi Iron and Steel have contributed significantly to the conservation of energy. Sakai in particular had greatly impressed the visiting British members of Parliament.

The energy conservation efforts by the governmental offices are insufficient compared with the private sectors. A liaison conference attended by the concerned offices was held in November of 1980 and various energy conservation efforts were stipulated. Some of the specific topics stipulated include the following. Design of new public buildings must be based from the standpoint that oil will not be used. Energy conservation commemorative stamps will be issued. Energy conservation public relation activities will be developed in the metropolises as well as in the districts. These measures and activities will be pursued fully and continuously in the future.

/Question/ How will the alternative energies such as nuclear power and coal be developed?

/Nakayama/ There is limit to how much conservation can do, so that development of alternative energies is quite necessary. Nuclear energy, no doubt, is important but it takes time to develop. The leadtime is said to be 10 years. Therefore, development of coal ought to be emphasized for the time being. Today, oil supplies 73 percent of the total energy requirement. In the electric power industry the proportion is 46 percent. However, there is a problem: we have to depend on the imported coal. Domestic coal is 8,000 yen per ton more expensive than imported coal. We must think about how to develop coal in such countries as China, Australia and Indonesia and import these coals stably at low cost. However, I do not mean to slight nuclear energy. The electricity rate of Kansai Electric Power is the lowest in Japan today, and 20 percent of their total power generating capacity is nuclear. On the other hand, Okinawa Electric Power is 100 percent oil, so that its rate is naturally high. Okinawa is having difficulty attracting industries to locate there. They are trying many different ways to convert from the use of oil.

Accelerating electric power source location is another urgent task. The Liberal Democratic Party has established a headquarters for the promotion of electric power source location and begun to tackle this problem in earnest. The problem concerns maintenance after the promotion period expires. That is to say that after a period of 5 years, the electric power source location reverts to the district. If a gymnasium or a park was built by a grant, they have difficulty with maintenance cost after the period expires. Therefore, we must study and develop a system of assistance in proportion to the size of the power source. We must also have a new understanding of lowhead hydropower generation. This is the so-called local energy. This type of energy source is especially suitable for rural villages. Oil consumed by rural villages today occupies 10 percent of the total requirement. The problem in this case is the present system of law. Namely, no matter how small the scale of power generation, the electricity generated must be sold to the nine major electric power systems and then resold by them. We ought to change this law so that the electricity generated by the lowhead hydropower generation may be used directly locally. Besides these, we must also establish steady a LNG supply system, construct high speed breeder reactors, establish uranium recycling systems, and carry out surveys to map the geothermal distribution. Talking about geotherms, we have diagrams for the hot spring distribution but we do not have diagrams for the geothermal distribution. We ought to carry out a nationwide survey of geothermal distribution.

/Question/ In this age of tax increases, an energy conservation investment tax reduction is to be implemented; how is this applied and what are the considerations given to the medium and small enterprises?

/Nakayama/ According to the opinion of business circles, in order to give incentive to the development of an alternative energy such as solar, "financing is ineffective; tax reduction is more effective" is the general consensus. We are expecting a huge policy effect from the energy conservation investment tax reduction law. As a result of this tax law, the raw material price is expected to be lower. By supplying raw materials to the medium and small enterprises we believe that the medium and small enterprises will be sufficiently benefited by this tax law. Therefore, the investment tax reduction is beneficial to the large as well as to the medium and small enterprises.

/Question/ How will the energy saving facilities and equipment be developed?

/Nakayama/ It is very important that the government, the industry, and the university work together. On the part of government, the Industrial Technology Institute is carrying out the development of new energies. Private enterprises have also taken financial measures. The problem is the university. Universities insist on "autonomy" and do not want to exchange with the outside. I think this is improper. In the United States, joint business-university research projects are positively supported financially by the government. Since I came to occupy this office, I tackled this problem and organized a council which will work to promote cooperation among the three. Prime Minister Suzuki is also strongly in favor of this idea.

/Question/ How will the international cooperation on matters related to energy conservation be conducted?

/Nakayama/ The immediate problem is how to achieve an international cooperation on coal liquefaction. In Japan, the investigation fund for "SCR-2" (coal liquefaction project) has been appropriated. We must draw up specific plans as soon as possible. West Germany announced recently that it would withdraw from this project. We must decide as soon as possible which country will be responsible for this 25 percent of the development fund. In relation to the development of coal, an "international strategic" scheme must be drawn up as soon as possible. What moves ought to be taken, including diplomatic ones, must be determined as soon as possible.

/Question/ Although oil supply is said to be secure this winter, how do you assess the oil supply situation today?

/Moriyama/ It is true that during the months of January through March when oil is most needed, there is no problem about its availability so that we can tide over this period safely. Price-wise we can also manage thanks for the high value of yen. In the background of this is the oil stockpile of 107 days' supply by the end of last December, which gave spiritual and psychological support. At the same time, energy conservation has firmly settled in the consciousness of the people and the enterprises are also aggressively pursuing rational energy usage and energy conservation. During this period of increased oil demand, the actual oil consumption was 10 percent below the same period last year. This is not accidental but is a result of the efforts by the people and enterprises as well as the governmental policies. We are enjoying the good results that have come out of all these today.

/Question/ How will the situation be after April?

/Moriyama/ We are not totally confident of the situations after April, especially the oil prices. At the OPEC conference held in Bali late last year, they agreed on a three-stage hike of the oil price to a maximum of $41 per barrel. Since the 1st of January most OPEC countries have already raised their oil prices.

As a result, Japan's import oil price in January has risen $2 per barrel on average. Since the price was $34.80 in late December, the price during the period of January through March is clearly on the order of $37. This high oil price may also act as a restrictive force.

If left alone, the crude oil price can only rise, so that the peoples of oil-consuming nations must strengthen their efforts to conserve energy and accelerate the development of alternative energies.

/Question/ On the 23d, a bill setting the 1981 energy conservation target at 25 million kl was passed by the Consolidated Energy Measures Promotional Cabinet Meeting. Will more energy conservation measures such as this one be implemented in the future?

/Moriyama/ If Japan's economy maintains a constant rate of growth on the order of 5.3 percent, the amount of oil required will also increase. So long as the growth in energy flexibility as a result of energy conservation and the growth of oil consumption remain constant, strengthening of energy conservation will continue in its present form. We do not know when these two curves will cross.

/Question/ Please tell us the aim for an increase of 5 million kl energy conservation.

/Moriyama/ Strictly adhering to the thermostat settings recommended for heating and cooling, and turning off lights near a window, the people are doing their share of energy conservation and we are approaching the physically bearable limit. Therefore, instead of inventing new ideas each year and forcing upon the people the austere lifestyle with encouraging shouts, we wish that what is being practiced today might become fixed in people's lifestyles. Therefore, no further reduction is expected from the national life.

Only utilization of solar energy and introduction of gas air-conditioning are to be included in the new policy for next year. We expect the support of the people.

/Question/ That means the greater part of the 5 million kl of energy conservation is expected to be borne by business circles?

/Moriyama/ Conversion to coal burning by electric power circles is progressing steadily. Central to 1981 policy is the energy measure promotional tax reduction. With the backing of this law and the alternative energy law and the energy conservation law introduced last year, we expect that business circles will try harder.

/Question/ Does energy conservation include the positive side--development of alternative and new energies--besides conservation of oil consumption?

/Moriyama/ Yes it does. It is not so much to cope with the oil shock but to meet the challenge of establishing a new energy structure. Both the industrial structure and the structure of national life are required for reform.

/Question/ You have kept emphasizing the necessity of local energy resources including "lighting the hand lantern of Gion with solar energy;" no doubt it is based on the same idea.

/Moriyama/ Ninety percent of the people live in the district, so that the energy problem is not the problem of the central government but a problem much closer to home. There are abundant energy resources all over Japan, such as rivers, waste treatment, solar energy, and geothermal energy. But only shouting an encouraging word will not be effective. A mood to utilize locally available energy resources has recently been running high in the districts. We should like to draw up governmental policies which are in harmony with this mood so that we won't swing and miss.

/Question/ What do you expect from business circles and the people?

/Moriyama/ Every business must believe that the source of competitiveness in the future lies in overcoming the energy problem. The political measures are also drawn up with the same belief. We hope that everybody will understand this intention and work harder than ever. We wish that the people will not just endure but make it a part of their lives. Energy conservation is meaningless unless it is carried out honestly and lastingly.

Now that the budget has been approved, the business of your organization can start in earnest, can it not?

/Watamori/ Since this organization was established only in mid 1980, the formal budget requested for the organization is for 1982, because we need a budget with blood circulating, so to speak. The 1981 budget overall was compact. Yet that portion assigned for the field of energy was quite generous. This generous energy budget, to be sure, was based on the viewpoint that the future development of Japan's economy hinges on the successful solution of the energy problem. Therefore, I personally have no complaint whatsoever about the budget and, at the same time, feel keenly the weight of responsibility.

/Question/ What are the outstanding features of this budget?

/Watamori/ The "accent" of the 1981 budget is that a large share is assigned to coal liquefaction. According to a perspective of energy demand 10 years hence, nuclear power, natural gas, and coal are seen to be the major energy sources. Therefore, it is quite fitting to emphasize coal liquefaction today. The second accent is solar photovoltaic power generation. This form of power generation is expected to become practical 20 years hence, or 1990-2000. In order to be able to realize photovoltaic power generation as an effective energy source, we must do the groundwork starting right now. Utilization of geothermal energy is also expected to become practical 20 years hence. Therefore, its groundwork must also be carried as soon as possible.

/Question/ What are the problems and methods of developing these three energy resources?

/Watamori/ The 1980 budget included drilling two wells 3,000 meters deep as part of a large-scale deep well geothermal development project. Drilling technology is quite different from that for drilling of oil. More severe conditions such as a temperature as high as 500°C and high pressure are encountered. This will be the first attempt to reach a depth of 3,000 meters in the exploration of geotherm.

The future of coal liquefaction may take the form of liquefying coal overseas and importing the liquid fuel. If coal is transported, the cost of transportation will come to approximately 60 percent of the overall cost. It is more rational to liquefy coal near the mine and then transport the liquid fuel. Besides, coal contains an ash component so that it does not make sense to transport the ash at high cost. First of all, we must find a better method of liquefying coal. It is difficult to tell the difference looking at the seeds. After the sprouts are transplanted into pots, we can watch them grow and cultivate them. We are also undertaking a coal liquefaction project jointly with the United States. Since it is too expensive to carry out large-scale experiment alone on our own farm, we are riding the U.S. wagon.

/Question/ What are the differences between alternative energy and new energy?

/Watamori/ Alternative energy is used to substitute for oil. Nuclear energy is one. New energy is energy yet to be developed. For example, the geothermal energy exploited today is from wells of no more than 800 meters deep and this energy belongs to the category of alternative energy. However, when we are able to exploit geothermal energy at a depth of 3,000 meters, this energy will be a new energy. Of the solar energy, photovoltaic power generation will be a new energy source. I believe Japan is leading the world in these technologies. Japan is poor in energy resources but rich in brains. Japan is probably one country in the whole world which is most urgently in need of the new energy. I believe that Japan is leading the world in the area of new energy development.

New projects introduced this year include the development of large-capacity coal gasification plant. Large-scale windpower generation having a capacity of 1,000-5,000 kW range will also be studied. When an alternative energy evolves into something much bigger, it becomes a new energy resource. Large-scale utilization of the ocean energy can also be added to the list.

/Question/ As the oil situation become more and more critical, the necessity for energy conservation is more keenly felt.

/Watamori/ If I were a champion of energy conservation, I would push still harder. Energy conservation must be continued and even improved. However, conservation is for what can be conserved, but where energy is needed we must use it. There is no need to harm one's eyes by studying by the light of fireflies. In order to develop new energy, money, brains, and time are needed. We must not be impatient, expecting only an early result. If we can contribute to the peace of Japan 10 years hence, a large sum of money spent today will be worthwhile. Here is an example. A number of wells were drilled without getting any oil. A few years later, more wells were drilled in the vicinity with the same luck. For the third time a well was drilled at the last spot available for drilling, and oil was found there. If we are afraid of risks when we attempt to develop new energies, we will never win. I believe a large sum of capital must be spent on this worthy cause.

Interview With Committee Chairman

Tokyo NIKKAN KOGYO SHIMBUN in Japanese 3 Feb 81 p 3

/Interview with Hikaru Matsunaga, Chairman of the Energy Conservation Special Committee of the LDP, by Hiroshi Ono, Reporter, and Editorial Committee Member; Date and Place Not Specified/

/Text/ To tackle in earnest the development of electric sources, LDP last week established an Electric Source Location Promotion Headquarters (Chief: Yoshitake Sasaki, former minister of MITI). Based on a viewpoint that "development of electric source and energy conservation are two wheels of a vehicle" (Chief Secretary Sakuranouchi), the same party has been working on various energy conservation policies through its Energy Conservation Special Committee. To find the view of its chairman Hikari Matsunaga, a few questions were brought to him. (Reporter: Hiroshi Ono, member of the editorial committee)

/Question/ How is the energy conservation line running these days?

/Matsunaga/ The greater part of energy used today is oil and no mistake about it. You are quite aware of how critical the oil situation is. The political situations of the oil producing countries are unstable and OPEC is constantly raising the price of oil. It is not too much to say that the oil-consuming nations are threatened by both quantity and price of oil. Conservation of oil is the only effective countermeasure. As a result of this measure, oil supply has stabilized on one hand and has shown a surplus on the other. In fact, conservation of oil has been proved to be an effective decisive factor which stabilizes long-range oil supply and also suppresses the price rise. In spite of the fact that oil supply is unstable today because of

the Iranian-Iraqi war, we are able to maintain a stockpile of 107 days' supply because a 10 percent reduction in supply is countered by a 10 percent conservation so that a balance between supply and demand can be maintained. We can appreciate the importance of energy conservation.

/Question/ How is the development of nuclear power, coal, and hydropower as an alternative energy progressing?

/Matsunaga/ A considerably long period of time will be required before nuclear, coal and hydropower can completely replace oil energy. In the meantime, the most important thing is nothing but energy conservation. Reducing the amount of energy consumed has the same effect as developing an alternative energy. This line has been actually running for some time.

/Question/ How is it done in specific terms?

/Matsunaga/ If we compare the energy conservation efforts by industry, transportation, and national life, we can see that energy conservation by industry is by far the most advanced. Especially the manufacturing industry. This is why the industrial products have a strong international competitive edge. Some one has said that energy conservation is the only lifeline for the manufacturing industry and I concur wholeheartedly. If we assign 100 to the 1973 energy cost required per unit production, the 1979 per unit production energy cost has been reduced to 61.3 percent for iron and steel, 75.0 percent for automobiles, and 75.2 percent for the aluminum industry. These are the results of various energy-saving technologies developed since we started to tackle this problem in earnest. For example, in the field of iron and steel, thefurnace top pressure power generation, recovery of waste heat, rationalization of the production process such as continuous casting process, just to name a few. The important achievement made by the manufacturing industry in conserving oil resulted from conversion to the use of alternative energy. For example, the cement industry converted from oil to coal burning. This way, it can save more than 25 million kl of oil.

/Question/ These are the large enterprises, what are the guidelines for the medium and small enterprises to achieve energy conservation?

/Matsunaga/ You may be aware of the policy of implementing investment tax reduction in 1981. The medium and small enterprises will be benefited by this. It is expected that new technology, improved equipment and other energy-saving facilities will be aggressively introduced by the medium and small enterprises. The purpose of implementing this investment tax reduction policy is to strengthen the energy conservation effort one step further and to expand its range wider in the medium and small enterprises than in the large enterprises.

/Question/ What form of energy conservation is being contemplated in the field of transportation?

/Matsunaga/ In case of freight transportation, if the unit energy consumption by railway is taken to be 1, then truck is 9.4, domestic shipping is 1.6. In case of passenger transportation, if railway is taken to be 1, then bus is 1.4, passenger car is 7.3, and airplane is 6.7. Although use of railway is highly desirable, it cannot be made compulsory in a free economy. However, consolidated regulations can be carried out. We need in the future a consolidated transportation system which is based on the standpoint of energy conservation. We need it badly indeed.

There are some noteworthy statistics about passenger cars. Namely, the percentage of cars of 1,000 cc or less is 17 percent in Japan, 30 percent in France, and 50 percent in Italy. If it reaches the French level in Japan, this alone is said to amount to a saving of 5 million kl of oil. In fact, I noticed to my surprise that there are more small cars abroad than in Japan. We will watch users' movement carefully in the future. I personally drive a small diesel car.

/Question/ How is energy conservation done in the field of national life?

/Matsunaga/ Restrictions on space cooling and heating and use of elevators, and promoting introduction of solar systems, both government (public buildings) and people (private dwellings) are getting the desired results. The government is providing subsidized and low interest loans in order to popularize gas air-conditioning and solar systems. For the purpose of introducing solar systems to public buildings in 1981, 3.6 billion yen have been funded (for a project of 7.2 billion yen). To the private sector, 1.8 billion of interest subsidy has been funded to provide a loan at an interest of 5.5-6.0 percent to be paid back in 50 years. As to the self-control on privately owned cars, the private sector is doing better than the government. This situation must be corrected as soon as possible.

/Question/ Can we abide by the decision made in June 1979 at the Tokyo Summit that we limit our import to 6 million barrels (a day) in 1990?

/Matsunaga/ The quota of "6.3 million barrels" represents the amount that we "may import." It certainly will be difficult to try to get more. However, if we follow the conservation line practiced today, I don't think the demand will far exceed today's level of 5 million barrels a day so that a balance between supply and demand is expected to be achievable.

Coal Use Policy

Tokyo NIKKAN KOGYO SHIMBUN in Japanese 3 Feb 81 p 3

/Text/ As a link of promotional measures to introduce alternative energy, the MITI has expanded the demand for coke furnace gas manufactured by various city gas companies to include the industrial consumers. Specifically, 1) starting next year, a survey will be conducted to find out the industrial demand on coke furnace gas and low calorie gas, and 2) a 3-year project will be launched to study and develop an optimum process for manufacturing gases fit for industrial application. At present, coke furnace gas is manufactured and sold by a number of major city gas companies located in Tokyo, Osaka, Toho, and Hiroshima. However, expanding demand to include industrial applications cannot be done so easily because, first of all, its heating value is low (4,500-5,000 kcal) and secondly there is no prospect for an expanded coke market. MITI has decided, with the support of city gas industrial circles, to put emphasis on popularization of coal gas for industrial application, because coke furnace gas does not pollute and it fits perfectly with the planned expansion of coal utilization.

Survey of Demand and Development of Technology

Conversion of coal is an urgent theme in industry as a whole, but conversion has not progressed significantly in all areas except for the iron and steel industry and the cement industry. What makes conversion to coal so difficult for each individual industry is the huge sum of money needed to purchase land and pollution prevention equipment. In the meantime, various city gas companies are gasifying coal and providing a fuel which is pollution-free. They do not have problems with the manufacturing technology either. That is why MITI decided to popularize coal gas for industrial application as a link in the expanding utilization of coal.

Inside the city gas industrial circles, the four major companies--Tokyo, Osaka, Toho, and Hiroshima--manufacture and sell approximately 10 percent of the total supply in the form of coke furnace gas. However, coke furnace gas is low in heating value, only 4,500-5,000 kcal compared with 11,000 kcal for liquefied natural gas (LNG). Furthermore, 70 percent of the weight and 80 percent of the energy of coke are produced as byproducts of manufacturing coke furnace gas. Therefore, unless the coke market is expanded and the heating value is raised, increased production of coke furnace gas will not be practical.

However, according to a preliminary investigation made by MITI, the latent industrial demands for coke furnace gas include on the annual basis 20 million m^3 in Tokyo, 14 million m^3 in Osaka, 87 million m^3 in Toho, and 4 million m^3 in the Shikoku and Fukuyama areas. There is an opportunity to expand industrial utilization of coke furnace gas as evidenced by an agreement between Tokyo Gas Co and Showa Electric Industry for an expanded use of coke furnace gas.

Based on these facts, MITI with the cooperation of the city gas industrial circles will, starting next year, undertake a survey of industrial demand, development of manufacturing method and supply format, and a feasibility study. In order to facilitate conversion by the coke furnace gas industrial circles to improve their coke furnaces and to lay special pipelines, the gas industry will be assisted by the government. The users will also be subsidized with the coal conversion fund.

Continental Shelf Exploration

Tokyo NIKKAN KOGYO SHIMBUN in Japanese 4 Feb 81 p 3

/Text/ According to the "Fifth 5-Year Domestic Oil and Combustible Natural Gas Resources Development Plan" which started in 1980, on average 15 exploratory wells are to be drilled every year. However, in 1981 no more than six or seven wells (including the Japanese-Korean Continental Shelf) will be drilled. These figures are even smaller than the eight wells actually drilled in 1980. Two years in a row Japan's Continental Shelf oil and natural gas exploration effort will fall short of the planned level. Background facts of this area that not much is expected of this reserve, there is a lack of desire to develop it by the oil developing industry because of the "good settlement of accounts" due to rising oil prices, and on the practical side the unsettled drilling rig assignment adjustment. If these situations prevail, the 5-year plan will end in failure. That is why the Resources and Energy Office of MITI is trying so hard to ward off delay of the plan.

MITI Pressed With Taking Urgent Countermeasures

Development of oil and natural gas on Japan's Continental Shelf and drilling of exploratory wells in particular is, as a rule, contracted to Japan's only drilling contractor--Nippon Kaiyo Kussho /Japan Marine Drilling/ Company. According to the 1981 contract, there are only four wells which are "guaranteed" to be drilled during the year.

These four wells consist of three wells located north and off shore of Naoezu offshore, north of "Aga," and one undetermined location along the coast of Niigata Prefecture and one well located at the Japanese-Korean Continental Shelf. The development of three wells located along the coast of Niigata Prefecture are all planned by the Shukko Oil Company. Drilling of the two wells located north of Aga and at the undetermined location will be done by the "Second Hakuryu /white dragon/" of a semisubmergence type. Actual exploratory drilling north and offshore of Naoezu offshore will be carried out by the mining-right holder--Shukko Oil Company. Drilling will be done by the "Fifth Hakuryu" which is in operation offshore of Miyakojima in Okinawa and has a contract to operate for 3 months in Philippines. The drilling operation offshore of Naoezu therefore will not begin until June.

The operation at the Japanese-Korean Continental Shelf will also be done by the Fifth Hakuryu after the work north and offshore of Naoezu is finished. The work is expected to begin around October. Nippon Kaiyo Kussho has four more rigs in operation today. The "Third Hakuryu" and the "Fourth Hakuryu" will be operating offshore of Indonesia all year long, while the "First Hakuryu" and the "Sixth Hakuryu" will be retained in the Middle East for several more years.

Therefore, besides the four wells which will be definitely drilled, drilling of any additional wells depends on the schedules of the Second Hakuryu and the Fifth Hakuryu. Suppose after finishing the operations already scheduled, the two Hakuryus can stay home and drill two or three more wells, the total number of exploratory wells drilled in 1982 cannot be greater than six or seven wells (according to the contract, in addition to one which is already scheduled, two more wells may be drilled at the Japanese-Korean Continental Shelf.)

Assignment of overseas rigs as a countermeasure has been suggested after a negotiation among the industrial circles and the persons concerned. The oil development enterprises pointed out on one side that a medium- to long-range plan ought to be made and insist on the other side that the government ought to take some drastic measures concerning promotion of oil development including the rig assignment problem. MITI and the Petroleum Public Corporation are pressed with taking some urgent countermeasures.

Geothermal Power Generation Plant

Tokyo NIKKEI SANGYO SHIMBUN in Japanese 4 Feb 81 p 5

/Text/ Much is expected of geothermal power generation as one of the alternative energy sources. Just as Arab nations are living atop the oilfield Japan is living atop a volcanic belt, and geothermal energy is considered by many as Japan's No 1

domestic energy resource which will yield as much as you wish if you only exploit it. In reality, however, our domestic geothermal power generation is under strict control in connection with the natural environmental protection regulations. Including those being developed today, the total facility capacity is only approximately 220,000 kW amounting to 5 percent of the world's total geothermal power generation.

Seventy-seven Percent of World's Share

However, the strength of Japan's plant manufacturers is the mightiest in the world today. They are exporting geothermal power generating plants one after another to every part of the world. Today, jointly they hold 77 percent of the world's share of the market, fully demonstrating the competitive edge of Japan's manufacturers of various heavy electric plants. In a recent geothermal power plant negotiation involving a super large-scale (capacity: 440,000 kW), Cerropriet Power Plant in Mexico, Tokyo Shibaura Denki was able to win the bid in the end. Even the world's largest geothermal power generating plant--U.S. Geyser Geothermal Plant--with an operating capacity of 900,000 kW today and a total capacity of 1.43 million kW including the facilities that have been ordered, was almost completely captured by Toshiba which won by pushing away the native General Electric Co.

There are many secrets to this strength, including first of all the rich experience and business showings of various manufacturing companies. Geothermal power generation employs a steam turbine to drive the generator just as any ordinary thermal power generation. The difference lies in the nature of steam used. Unlike steam generated in a boiler in an ordinary thermal power generation, the quality of steam used in geothermal power generation is not constant. Depending on the location of the well, it may be a hot water, or steam, or steam containing toxic gases and metals. Generally speaking, the conditions are different from one location to another so that a manufacturer with rich experience can obviously conduct himself better. Although they are from medium to small in scale, there are six geothermal power generating plants operating in Japan today. Several sites are under development. The quality of steam varies widely from steam only to hot water only. Once an order for a large-scale plant such as the Geyser is filled, it becomes a business showcase and the volume of orders tends to grow with a snowballing effect.

Though They May Be Somewhat More Expensive than the Western Group

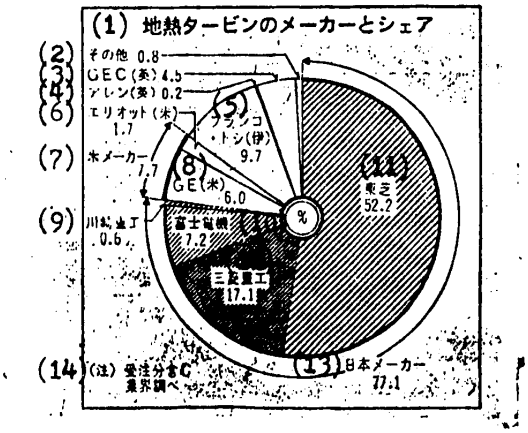
The difference in technological strength is also quite significant. Geothermal steam contains a corrosive mixture and its pressure is usually much lower than the vapor pressure of an ordinary thermal power generating plant. Much more steam will be required to obtain the same amount of output so that the piping tends to be bulky. Therefore, a technology to clean the steam before use so that the power generating plant may be made compact becomes indispensable. As far as accumulated technological know-how related to the thermal power and nuclear power plants and chemical plants is concerned, Japanese companies are definitely more dominant than others. As a result, the operational rate of the power generating plant is said to be in the range of 95-98 percent with very few shutdowns if the plant is manufactured in Japan, while the rate is on the order of 60 percent if it is manufactured in England (major manufacturer). Although some may consider that a somewhat lower operational rate can be tolerated because the fuel cost is almost nil, more and

more users are demanding higher and higher operational rate from the viewpoint of "what would be the substitution cost if oil is burned?" now that the age of $40 crude oil has arrived. That is why the plants manufactured in Japan are eagerly sought after even though they are somewhat more expensive than those manufactured by the Western group.

Market Characteristics Are in Japan's Favor

The market characteristics of a geothermal power generating plant are said to be further in Japan's favor. While units of a million kW class are common in an ordinary thermal power generating plant, the maximum geothermal power generating capacity is of the order to 100,000 kW. The new market created each year is no more than a million kW, equivalent to the capacity of a single nuclear power plant. Although there is a bright prospect, the scale of the market is too small for the world's giant manufacturers to be bothered. On the other hand, the load is too heavy for weak manufacturers to bear because of technological difficulties. In this respect, Japanese manufacturers who maintain a close cooperative realtionship with the electric power companies who are pushing for the development of alternative energy are found to possess sufficient quantities of both the desire and the ability.

The Resources and Energy Office of MITI has included development of geothermal energy as part of the Sunshine Project and last fall launched a New Energy Development Organization which constitutes the nucleus of the project. On the other hand, inside industrial circles, a number of enterprise groups have been formed, one after another, the core of which consists of a plant manufacturer and a consolidated commercial firm which undertake everything from exploration of a geothermal site to construction of the power plant. Thus, literally by the combined effort of the government and the people, development of technology related to geothermal utilization is being accelerated. The competitive edge of the Japanese manufacturers can only be strengthened and never will it be weakened. (Reporter Nishioka)



Key: 1. Manufacturers of geothermal turbines and their share
2. Others
3. GEC (England)
4. Allen (England)
5. Franco-Tosi (Italy)
6. Elliot (U.S.)
7. U.S. manufacturers
8. GE (U.S.)
9. Kawasaki Heavy Industry
10. Fuji Electric
11. Toshiba
12. Mitsubishi Heavy Industry
13. Japanese manufacturers
14. (Note) Based on survey conducted by the industrial circle including orders received.

We Have Reached an "Uncatchable State"

After Japanese manufacturers' strength has reached what it is today, even the Western giants cannot compete with us costwise. Even if one wishes to take part in bidding in an international negotiation, one may be rejected for lack of business showings during the preliminary examination of qualifications. Japan's dominance probably will continue for some time to come.

However, we are far from sitting idle. Technological development for the purpose of popularizing geothermal power generation is being conducted in many areas.

For example, in order to lower the plant price, it is necessary to build larger plant and also to standardize the plant. Investigation is under way with a 200,000 kW plant as a target. Furthermore, in order to improve the utilization efficiency in utilizing hot water of low temperature and low quality, which heretofore has been returned to the well unutilized, a secondary power generating cycle is being studied, and in order to improve the durability of the plant, research into corrosion resistant materials is being done in earnest.

(By Hiroo Ichiyi, Head of Thermal Turbine Department, Tokyo Shibaura Electric Company)

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SCIENCE AND TECHNOLOGY

CONTINUED GROWTH EXPECTED FOR ELECTRONICS INDUSTRIES

Computer Industry

Tokyo NIKKEI ELECTRONICS in Japanese 13 Apr 81 pp 264-267

[Article by Kiyoshi Otani of NIHON KEIZAI SHIMBUN]

[Text] Superlarge New Instruments Continually Appearing on the Market

In the midst of the worsening economic environment engulfing the industrial world as a result of the deteriorating export picture and the stagnation of consumer demand, the computer industry will probably maintain its high rate of growth of 15-20 percent through JFY 1981. Although this is a young industry which just broke through the 1 trillion yen level as an industry in JFY 1979, it has been sustained by the industry's tenacious manpower conservation, power conservation, and rational funding mentality, and it is anticipated that the production volume for JFY 1981 will exceed 1.5 trillion yen.

The item to be watched in JFY 1981 is the so-called "H series" which IBM plans to put on the market, and the rival products which domestic makers will use to counter the IBM line; this competition may start before the end of the year. The IBM "3081," Hitachi Limited's "M-280H," Nippon Electric's "ACOS 1000," and Fujitsu's "S series" (announcement expected) all possess computing speed and memory capacity 1.5-2 times those of instruments of the past, and these superlarge units are expected to appear every 3-4 years. This will be an epochmaking year in which medium and large types of computers for regular use will be replaced by new-generation instruments.

The factor which has made the increase in speed and capacity possible is, without doubt, LSI technology, which provides this important factor. High-speed logic circuits with speeds and gate numbers 1.5-2 times those of the old instruments, and the "entrance to super LSI" in the form of the 64 K RAM, are the most recent developments in LSI technology. The new series put out by each company includes a CPU unit which can be contained in a 1.2-cubic-meter box for the medium-size unit; moreover, miniaturization and lower cost will be offered to the users.

Nor can the exacting movements in software be lost sight of. The question of whether the lowering in relative cost of hardware can be supplemented to make the computer business a "paying business" will depend a great deal on the degree to which the exacting nature of this software can be implemented.

A strategy involving various types of office automation (OA), which contributed to the introduction of the dispersed treatment-microcomputer age, is also a major prospect this coming JFY. This may be the year in which some degree of prediction will become possible as to the future of office computers and personal computers, word processors, and various terminal equipment which appeared with explosive impact in 1980, and whether the 1980's will be the age of OA.

Superlarge Instruments at Stage of Replacement of Old for New

Large computers for ordinary use are greeting the fourth year, in which there is replacement of old by new, and fierce competition for orders may ensue. IBM will offer its "3081" and the following H series as its strategic weapons, Fujitsu will come out with its soon to be announced S series, Hitachi has its "M-280H," and Nippon Electric its "ACOS 1000." These are all the newest and most sophisticated instruments, laying claim to "the world's greatest and fastest." Each company is developing performance comparisons that are advantageous to its own instruments, and the market involving universities, banks, and large manufacturers is the stage upon which a fierce sales battle has begun.

It is estimated that there are presently about 3,000 general-use large computers in operation in Japan today. Assuming that one-third of these units will be replaced by new ones, a life cycle of 4 years will mean the development of a giant market of 1 trillion yen (calculated on the basis of an average 1 billion yen per unit). Since it is said that it takes at least a year from placement of the order to delivery, orders for a new instrument are usually concentrated in the year after the announcement of the new model. In this respect, this is the year for "preparations" (Takeo Tsuchina, president of Japan IBM), and all efforts will be directed at collecting orders.

It has been reported that orders have piled up at Japan IBM to the extent that the order of shipment will have to be determined by lottery; this comes as a result of the success this company has achieved in selling the "3081." Hitachi, revealing its ambitious plans, stated that "we would like to receive orders for a minimum of 120 units over a 4-year span" on its "M-280H" (director Katsumi Fujimoto of Hitachi's Computer Industry Headquarters). Response to the new instruments of the different companies seems to be good. With the exception of Fujitsu, which has encountered delays in announcing its new units, the sales confrontation between the other large general-use computers has become one step more fierce with this fight for orders, but it is anticipated that this competition will have the favorable impact of expanding the market for new instruments.

It is possible that this also will be the important year in which there will be great changes in the flow patterns of the past in the area of software which determines speed (computing speed), size (memory capacity), and "ease of use." This is symbolized by Hitachi's move to place the software for its "M-280H" and "M-240H," which heretofore had been included in the cost of the hardware, on the market as OS (operating system) for use as the backbone of the control program.

OS for large instruments is drawn along together with improvements in hardware performance and has expanded with the years through the fierce sales competition, in line with the highly developing computer utilization technology on the part of

the user. The most recent OS has expanded to the magnitude that a force of 3,000 technologists will require 2 years to put the packet together. Assuming the cost of a single technologist to be 5 million yen per year, a new series OS can be expected to cost 30 billion yen.

As long as it does not seem possible to increase the sales margin on the hardware through innovations in LSI technology and excessive sales competition, these tremendous OS development costs can be recovered only through the sale of the software itself. The unbundling of the control program is the forerunner of this trend and is an indication that the ground has been broken for users to accept this situation.

On the other hand, rational developmental methods have been introduced in OS production, which has been exposed to the cost explosion that pervades the field, and brakes are being applied to cost expansions through the accumulation of production control methods. For example, Fujitsu has stated, "In the next 2 to 3 years, the number of commands in the control program is expected to peak at 9 million steps, and it is clear that this will be the maximum" (Shoichi Ninomiya, head of the Computer Industry Headquarters of Fujitsu). These advances in product sales and the beginning of a rationalization of production processes are indications that the software industry has great potential for achieving a business status.

A 20-Percent Increase in Medium, Small, and Minicomputers

A high growth rate of about 20 percent in general-use medium and small computers and in the minicomputer market--even surpassing that of large computers--is predicted. The markets for these units differ, in that general-use medium and small computers are used in businesses, while minicomputers are used for scientific calculations and control applications. Minicomputer performance, as represented by a 32-bit minicomputer, has improved so greatly that the performances of these two types of computers have narrowed to the point whereby they are almost impossible to distinguish from each other.

There has been a sharp increase in the demand for medium and small computers as dispersed control system's terminal controllers, as opposed to the host computer for a central, concentrated treatment system. This is why both Oki Electric Industry, which abandoned development of general-use instruments, and Mitsubishi Electric, which is pushing the development of new medium and large series instruments that will be interchangeable with IBM, are taking the forefront in developing new instruments under the theme of "development of terminal controllers" (Director Namio Hashimoto of Oki Electric; Director Hideo Ota of the Electronic Computer Industry, Mitsubishi Electric).

What Oki Electric and Mitsubishi Electric are zeroing in on is the demand that will accompany the third on-line conversion of banks. The present banking system, which has the metropolitan bank as its apex, has a large central computer tied together with several hundred terminal units and CD's (cash dispensers). Major city banks have divided their systems so that there would be no impediment to service should some long-shot incident occur. On the other hand, even such a system can suffer a malfunction, as evidenced by the stoppage of Fuji Bank's on-line system for about 2 hours in an incident which occurred near the end of February.

This is an example of the weakness of a system in which a malfunction of the large central computer can bring a halt to the operations of branch banks all over the country.

The third on-line system has a mainstream concept, in which terminal controllers are deployed to the branch stations in such a way that each branch station can conduct at least 1 day's business should the central large computer malfunction.

In any event, "terminal controller," which under the present classification will fall in between medium and small computers, will make a fresh appearance possibly by the end of the year. While they were not announced as terminal controllers, medium and small computers which actually had been used as such found "their market expanded fourfold by the appearance of the IBM 4300 series (commonly called E series)" (CSI Survey, American survey company). Thus, this has become a very active market.

In another direction, a high growth rate is anticipated for minicomputers in industrial, public, and social system controller applications, such as for power lines, water lines, plants, and traffic control. Indicative of the size of the domestic market demand, large manufacturers such as DEC's Japan branch, Japan Data General, Tokyo Shibaura Electric, Hitachi Limited, and Mitsubishi Electric are planning for a more than 50-percent increase in sales, and this is the target of the American manufacturers in their plans to invade the Japanese market.

A 300-Billion-Yen Market for Office Computers

It seems definite that office computers will undergo even further growth and show a rapid growth rate of more than 30 percent over last year. If special equipment is included, the market may reach a scale of 300 billion yen. At the same time, peripheral equipment and terminal equipment, including printers, displays, magnetic disks, magnetic tape, and intelligent terminals, should see a more than 20-percent rate of growth, with some differences between items.

What were initially designed to be standalone type OA instruments, but which eventually are expected to be utilized as dispersed network terminals, are personal computers and Japanese word processors. Both are expected to show a large increase in sales over last year; it is almost certain that personal computers will chalk up sales of 50 billion yen and word processors 30 billion yen. The industry is at sea trying to decide whether this is a flash in the pan or whether these will assume major roles in the handling of OA in the 1980's. But there is a consensus that while there may be differences in the rate of popularization, it is inevitable that the age of microcomputers and OA will arrive.

Year of Computer Export Rush

The final item for consideration is export. The large Japanese companies have been continually girding themselves to develop export systems directed to the United States and Europe (Fig 2), and this is likely to be the year when there will be an all-out drive to export all types of computers, including the general-type large, medium, and small computers, office computers, terminals, and personal computers. The American corporation formed jointly by Fujitsu and TRW will finally start

actual sales activity. At the same time, Hitachi Limited will expand OEM exports to National Semiconductor of the United States and to BASF and Olivetti of Europe, with the intention of increasing its export rate 20 percent by 1985.

In the matter of exporting general-use instruments, Nippon Electric, which is very active in this area, established an "Information Treatment Overseas Business Headquarters" in 1980 and plans to increase its present export total fivefold in 5 years (to about 15 billion yen). One phase of this program is the establishment of a resident corporation in Australia, while another is the receipt from China of a single order for eight medium computers, indicating the company's active dealings early in the game. In addition to its general-use computers, this company has started to export office computers to the United States and small-size printer-type terminal equipment destined for the Western world, and it plans to finally start export of personal computers to the United States.

Among the foreign-capital families, Japan IBM is expected to add its superlarge "3081" computer and increase its export line. This is an interesting speculation just when Fujitsu, Hitachi, or Nippon Electric, Japan's large domestic manufacturers, will see its export total overtake that of Japan IBM (slightly below 60 billion yen in 1979). Other foreign capital systems such as (Valos) or Japan N. C. (Earl) have established policies to set up plants of their Japanese corporations which would become important bases for their exports aimed at Asia; if everything goes well, they may begin to export by the latter half of this year.

One also cannot disregard the export desires of the exclusive manufacturers of personal computers or terminal equipment manufacturers. Their unit costs are low, they require little maintenance cost compared to general-use instruments, and they have the maximum advantage that they can be exported as a line with household electric products. There is a probability that there will be a big rush of exports to the Western world this year.

Table 3. Projected Production of Electronic Equipment for Industrial Use
(Numbers: unit. Monetary unit: 1 million yen)

	54年度(実績)		55年度(推定)		56年度(予測)		55/54年度(%)		56/55年度(%)	
	数量	金額	数量	金額	数量	金額	数量	金額	数量	金額
産業用電子機器合計*1 8	—	2,792,890	—	3,252,600	—	3,715,400	—	116.5	—	114.2
(電卓を除く合計) 9	—	2,600,947	—	3,038,100	—	3,494,400	—	116.8	—	115.0
●コンピュータおよび関連装置 10	—	1,141,179	—	1,365,000	—	1,636,000	—	119.6	—	119.9
▷ディジタル型 11	—	1,016,491	—	1,194,600	—	1,433,300	—	117.5	—	120.0
コンピュータ本体 11a	19,202	450,228	21,500	526,000	26,500	626,800	112.0	116.8	123.3	119.2
一般用 12	17,932	438,581	18,700	494,000	23,100	588,000	104.3	112.6	123.5	119.0
制御用 13	1,270	11,647	2,800	32,000	3,400	38,800	220.5	274.7	121.4	121.3
周辺装置 14	—	305,013	—	354,600	—	422,000	—	116.3	—	119.0
外部記憶装置 15	169,312	202,712	261,000	237,000	321,000	286,000	154.2	116.9	123.0	120.7
入出力装置 16	74,707	102,301	90,500	117,600	112,700	136,000	121.1	115.0	124.5	115.6
通信制御装置 17	1,080	13,404	1,500	19,000	1,800	22,500	138.9	141.7	120.0	118.4
端末装置 18	144,926	247,846	219,000	295,000	278,000	362,000	151.1	119.0	126.9	122.7
▷補助装置 18a	80,653	45,137	86,500	48,400	99,500	55,700	107.2	107.2	115.0	115.1
▷コンピュータ応用装置*2 19	28,209	79,551	45,000	122,000	54,000	147,000	160.0	153.4	120.0	120.5
●電子応用装置*3 20	—	178,248	—	214,300	—	245,000	—	120.2	—	114.3
▷X線装置 21	21,764	79,540	25,800	88,700	29,400	97,300	118.5	111.5	114.0	109.7
医用 22	20,149	74,553	24,100	83,000	27,500	91,000	119.6	111.3	114.1	109.6
その他 23	1,615	4,987	1,700	5,700	1,900	6,300	105.3	114.3	111.8	110.5
▷超音波応用装置 24	—	50,418	—	65,500	—	78,300	—	129.9	—	119.5
▷電子顕微鏡 25	1,481	16,071	1,680	20,000	1,800	22,000	113.4	124.4	107.1	110.0
▷放送用VTR 26	681	7,824	1,150	9,600	1,300	10,800	168.9	122.7	113.0	112.5
▷産業用テレビ装置 27	203,580	24,395	234,000	30,500	269,000	36,600	114.9	125.0	115.0	120.0
●医用電子装置*4 28	—	92,080	—	106,000	—	117,700	—	115.1	—	111.0
●電子式卓上計算機(電卓) 29	52,447,572	191,943	64,000,000	214,500	67,000,000	221,000	122.0	111.8	104.7	103.0

*1 1) Computers and related equipment, 2) electronic applied equipment, 3) medical use electronic equipment, 4) desk calculators, 5) electric measuring equipment (Table 4), 6) communication equipment, total (Table 4)

*2 Includes NC (numerical control) equipment

*3 Does not include high-frequency electric power application equipment, radioactivity measuring instruments, or medical use measuring equipment listed in the Ministry of International Trade and Industry statistics

*4 Total of bodily phenomena measuring and recording equipment, bodily phenomena observation and diagnosing equipment, health examination equipment, medical data treatment equipment, nuclear medicine measuring equipment, medical use television and applied equipment, and other electronic application equipment for medical use. Ultrasonic application equipment is included partly under ultrasonic application equipment and recorded twice.

Key:
1. JFY 1979 (actual record)
2. JFY 1980 (estimated)
3. JFY 1981 (projected)
4. JFY 1980/1979 (%)
5. JFY 1981/1980 (%)
6. Number
7. Monetary value
8. Total of electronic equipment for industrial use

[Key continued on following page]

9. Total excluding desk calculators
10. Computer and related equipment
11. Digital type
11a. Computer main body
12. General use
13. Control use
14. Peripheral equipment
15. External recorders
16. Input-output facilities
17. Communication control equipment
18. Terminal equipment
18a. Accessory equipment
19. Computer application equipment
20. Applied electronic equipment
21. X-ray equipment
22. Medical use
23. Other
24. Ultrasonic application equipment
25. Electron microscopes
26. Broadcast VTR
27. Industrial use TV equipment
28. Medical use electronic equipment
29. Electronic desktop calculators (tabletop calculators)

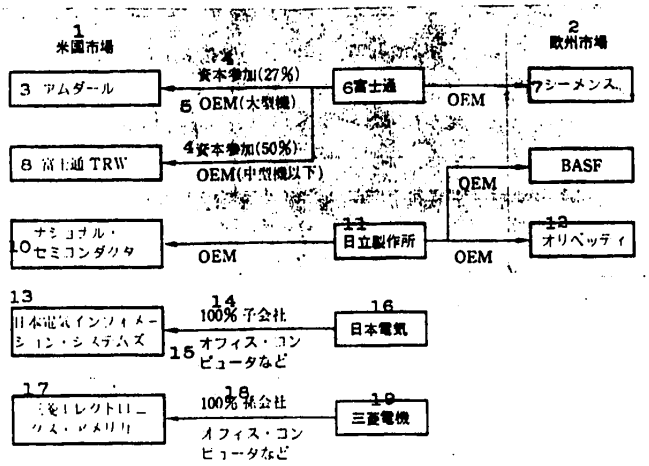

Figure 2. Japanese Manufacturers' System for Exports to the West

Key:

1. American market
2. European market
3. Amdahl
4. Capital participation
5. OEM (large computer)
6. Fujitsu
7. Siemens
8. OEM (medium and smaller)
9. Fujitsu TRW
10. National Semiconductor
11. Hitachi, Limited
12. Olivetti
13. Japan Electronic Information System
14. 100% subsidiary company
15. Items such as office computers
16. Nippon Electric
17. Mitsubishi Electronics America
18. 100% involved company
19. Mitsubishi Electric

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Electronic Medical Equipment

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[Article by Shigenori Miyata of NIHON KEIZAI SHIMBUN]

[Text] Break in High Growth Rate

Electronic equipment for medical use (ME), which had continued its brilliant rate of growth of 20-30 percent per year, slowed to 15 percent in 1980, and the question has arisen whether a double-digit level of growth can be attained in JFY 1981. That is to say, the X-ray CT (computer-aided cross-section photography equipment) and ultrasonic-wave diagnostic equipment, which had been referred to as the "flower type" ME, are now thought by many people to be undergoing a "lateral rate of growth."

It was the X-ray CT and ultrasonic diagnostic equipment which were responsible for this high ME growth rate during the past 2-3 years. Now, the number of X-ray CT's in Japan has proliferated to the point where more than 1,000 units were in use by the first half of 1980, and the majority of maternity hospitals were equipped with ultrasonic diagnostic equipment. Then there was the incident at the Fujimi Maternity Hospital in Tokorozawa city, Saitama Prefecture. This incident cooled users' ardor for ME--particularly for X-ray CT's and ultrasonic diagnostic equipment--and had the effect of casting cold water on ME manufacturers.

Ultrasonic diagnostic apparatus has suffered a very large decrease in growth rate in the domestic market. According to industry estimates, the sales volume of this equipment during 1979 was 19 billion yen, which was a 46.2-percent increase over the previous year. This total was expected to increase to 22.5 billion in 1980 for a 18.4-percent increase. It was further expected to increase by a double digit value in 1981 if things went well, and at worst to undergo lateral growth.

The performance of Japanese-made ultrasonic diagnostic equipment is such that it is highly regarded throughout the world, and top manufacturers of this equipment, such as Tokyo Shibaura Electric and Aloka, have put great effort into exports, as a result of which there has been a sharp increase in exports. The export value of ultrasonic diagnostic equipment was about 7 billion yen in 1979, but this was expected to increase to 12.5 billion yen (projected) in 1980. It was further expected that orderly growth would continue in 1981, and that ultrasonic diagnostic equipment might develop to be the strategic export item in the category of ME, outdistancing the other ME.

Feeling of Saturation of X-ray CT Market

The high rate of growth of X-ray CT equipment was the result of the successive marketing of low-cost equipment which was the top specialty of Toshiba, Hitachi Medico, and Shimazu Seisakusho. What used to cost close to 200 million yen per unit was lowered to about 50 million yen, and this can be said to have helped create a "CT introduction boom." However, there were already 1,200 of these units in use throughout the country at the beginning of 1981. Looking at this distribution in terms of a per capita basis, Japan's per capita availability of X-ray CT's

is even greater than that of the United States. This is why voices are heard in the Ministry of Health and Welfare calling for regulation of these high-cost ME, and there is a feeling of saturation in the X-ray CT field.

The market scale is expected to increase to more than 43 billion yen in 1980 and come close to half that of X-ray diagnostic equipment (roentgen), which is the largest among ME. Replacement demands are expected to start 2-3 years in the future at the earliest, and there is a small possibility that this market will continue this high rate of growth. Such being the case, the concern over the growth of X-ray CT, whose weight certainly has increased, is that its decline may drag down the growth of the entire ME market.

The same situation of a transition period between a high rate of growth and a stable rate of growth also exists in patient observation equipment. Such equipment is used for ICU (intensive care patients' centralized treatment facility) and CCU (cardiac patients' centralized treatment facility) to monitor admitted patients. Accompanying the increase in admittance of older patients, there was an annual growth rate of more than 30 percent in this equipment for the 3 years up to 1980, but here again, the number of orders displayed a marked decrease from the latter half of 1980 as the result of the Fujimi Hospital incident. There seems to be considerable feeling that JFY 1981 will experience a considerable decrease in the rate of growth.

High Growth Rate for Automated Cardiographic Analysis

The item in the ME market which still maintains a high rate of growth as before, even in the midst of present trends, is automated electrocardiogram apparatus. There are two types of this apparatus: one incorporating a micro-computer, which spits out the analytical results on the spot; and a terminal type (Shindenkei [literally, electric cardiac meter]), where the unit is tied by telephone to a central computer which makes the detailed analysis. Both types are in great demand. This market is expected to expand to 10 billion yen in 1980, and considerable growth is expected thereafter. On the other hand, the feeling of inadequate power cannot be denied when the question arises whether this item can continue to pull the ME market up.

Earnest sales confrontations are expected to begin in 1981 where the laser scapel is concerned. The selling point of this device is its ability to perform surgery without loss of blood by utilizing laser beams. This is high-priced ME equipment, costing about 30 million yen apiece, and many companies, headed by Mochida Seiyaku, have high hopes for this product. The industry is holding to a dream which envisions a 100 billion yen business in the future, but judging from the reactions of users and from other factors, this does not seem to be an area where there will be sudden expansion.

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Electronic Measuring Devices

Tokyo NIKKEI ELECTRONICS in Japanese 13 Apr 81 pp 267-269

[Article by Junichi Ogino of NIKKEI KEIZAI SHIMBUN]

[Text] Maintaining Growth Rate Close to 20 Percent

Electrical measuring devices (industrial equipment, electricity measuring devices, electrical instruments) are being sustained by a strong demand in 1981 and seem able to maintain a rate of growth exceeding 15 percent over the previous year. More specifically, orders for electrical measurement devices are expected to exceed 400 billion yen, and sales are expected to come close to 400 billion yen.

The factor most responsible for this increased demand is the favorable trend in private industry for investing in plant facilities in order to restructure the plants. The policies aimed at cutting costs in order to compensate for the rising cost of oil and the interindustry competition under stable growth rate conditions are becoming more and more important to the various industries. The increase in orders for measuring devices designed to abet energy conservation and power conservation measures is spurring an expansion in the market for these instruments.

Industrial instruments, which make up more than 50 percent of electrical measuring instruments, showed about a 17-percent increase during JFY 1980, and it is expected that a double-digit level of growth will continue into 1981. It is generally true that industrial instruments require from half a year to 1 year from receipt of order to delivery; comparison with trends for orders of heavy electrical industry items reveals that the peak seems to come about a year later.

The demand for heavy electrical goods is firm and orderly at the present time, and it is estimated that orders for industrial measuring equipment will total 260-270 billion yen in 1980. Estimating the trend for the coming year on the basis of past results and the present situation, there are strong indications that production of industrial measuring devices during 1981 may well exceed the figures for the preceding year by 20 percent.

While there is no direct relationship with market trends, the fact that development of the international-scale measuring equipment industry in Japan will take place during 1981 may be one of the major subjects of the year.

Sharp Recovery in Equipment for Heavy Chemical Plants

Let us now consider some changes in demand. What comes sharply into focus first of all is the sharp recovery in demand for the large type of plants in the heavy industrial chemical industry, such as steel and petrochemicals, which are the largest users of industrial measuring equipment and which up to 1979 had been wallowing about. Where steel is concerned, there has been some "replace" (facility renovation) in blast furnace related areas tied in with increased production in the crude steel base, but all the manufacturers are devoting might and main to the introduction of continuous casting facilities into their production lines in order to improve production and conserve energy. As a result, orders are

increasing for industrial measuring equipment to control the continuous casting facilities.

In another direction, the renovation of ethylene plants which appeared in considerable magnitude in the scale of orders was the highlight of 1980. Control systems using digital equipment appeared during this renovation.

Ever since the first oil shock in 1973, no new petrochemical plants have been constructed, and the aging of the present petrochemical plants is a problem of deep concern. This is why the petrochemical industry considers it necessary to renovate its facilities, if only to maintain international competitive strength.

In addition, the demand for industrial measuring equipment is increasing without exception in the machinery and cement industries and in food and other industries. The private sector demand overall is very active and moving forward, and it is more difficult to locate distressed areas.

On the other hand, government-related demands, such as for water treatment, reflect the fiscal difficulties of the local self-governing bodies and may well see some difficulty in growth during 1981. At the same time, power rates could not be raised, as had been planned initially, and this has resulted in a lack of capital on the part of power companies, with the result that they have had to suppress their orders. These are factors responsible for the break.

A major movement which may be classed as a most recent highlight is the expansion in the area of industrial instruments for energy conservation and power conservation on the part of the ventilation industry. The measuring equipment industry may well consider this a very promising future market.

Uncertainty in Materials for Export of Industrial Measuring Equipment

As a whole, the export situation is orderly, but projects tied in with the infrastructure (facilities which are the foundation for an urban structure such as railroads and harbors) of the Middle and Far East, which make up a large fraction of the total volume of this type of instruments, had just about been completed when the Iran-Iraq war put a stop to exports destined for Iraq. These clearly are minus factors.

Furthermore, plant exports to China, which had increased greatly since 1979, are undergoing difficulties, with the result that orders which had already been received have been canceled due to the new economic policies of the Chinese Government, which is selectively reassessing its plant construction plans and suppressing new orders.

In particular, three specialty companies--Yokogawa Electric Works, Yamatake-Honeywell, and Hokushin Electric Works--established service centers in China and had been eyeing large orders for industrial equipment, but they are now faced with the need to readdress their market strategies.

The strong tendency of the yen to increase in value is also adding considerable uneasiness to future export trends.

Along the technological front, there is growth in the use of digital control modes. A model example of the dispersed-type digital control mode is the single loop controller, in which the number of control points (loops) under a single controller is minimized. This type of controller was announced near the close of 1979 by Fuji Electric, Tokyo Shibaura Electric, and Mitsubishi Electric. In 1980, two specialty companies, Yokogawa Electric and Hokushin Electric, along with Hitachi Limited, Meidensha Electric, and Shimazu Seisakusho, also entered the picture, and a fierce fight for orders is being waged.

Expectations in Area of Optical Fiber Measuring Equipment

The electrical measuring equipment group, which now follows industrial measuring equipment, may undergo growth during 1981 that may surpass that of industrial measuring equipment. An item in the list of electrical measuring equipment which showed outstanding growth during 1980 was the LSI tester. Activity in this item does not seem to be diminishing in 1981. This is the result of the strong demand for the testing and researching of semiconductors; Takeda Riken Kogyo, Ando Electric, and Minato Electronics are leaders in this field.

Oscilloscopes, which have recorded the highest sales among general-use equipment, had sales which totaled 18 billion yen in 1980. This was an increase of 15 percent (projected) over the preceding year, but the proportion of the entire measuring equipment industry taken up by oscilloscopes is decreasing.

Measuring equipment associated with the use of optical fibers is expected to provide a new area for measuring equipment. Adachi Electric and Ando Electric have entered the market with products developed through joint efforts with the Nippon Telegraph and Telephone Public Corporation. Both of these companies are projecting annual sales of 1 billion yen, indicating their high hopes.

Table 4. Projected Production of Electronic Measuring Equipment for Industrial Use
(Monetary unit: 1 million yen)

	1	54年度 (実績) 2	55年度 (推定) 3	56年度 (予測) 4	55/54年度 (%) 5	56/55年度 (%) 6
		金額	金額	金額	金額	金額
7	●電気計測器	310,740	365,600	430,000	117.7	117.6
8	▷電気計器(電力量計, メータなど)	34,908	36,600	38,000	104.8	103.8
9	▷電気測定器	121,896	148,500	178,000	121.8	119.9
10	電圧・電流・電力測定器 (ディジタル・マルチメータなど)	9,202	10,400	11,500	113.0	110.6
11	回路計(サーキット・テスタ)	5,142	5,600	6,000	108.9	107.1
12	周波数時間測定装置(周波数カウンタなど)	3,836	4,300	4,700	112.1	109.3
13	波形測定器(オシロスコープなど)	24,655	30,000	36,000	121.7	120.0
14	電子管・半導体・回路素子材料測定器 (LSIテスタ, インピーダンス・メータなど)	20,169	29,000	40,000	143.8	137.9
15	伝送特性・電波測定器 (選択レベル計, 電界強度測定器など)	5,843	6,300	6,600	107.8	104.8
16	総合測定装置(PCM誤り率測定装置など)	4,607	4,900	5,200	106.4	106.1
17	測定用補助機器(信号発生器, レコーダなど)	28,902	34,000	39,000	117.6	114.7
18	その他の電気測定器	19,540	24,000	29,000	122.8	120.8
19	▷工業計器	153,936	180,500	214,000	117.2	118.6
20	プロセス用工業計器(発信器, 受信器など)	75,733	86,000	100,000	113.6	116.3
21	その他の工業計器	57,259	68,000	80,000	118.8	117.6
22	データ処理装置	20,944	26,500	34,000	126.5	128.3
23	●通信機器	878,700	987,200	1,065,700	112.3	108.0
24	▷有線通信機器	571,000	622,700	664,100	109.1	106.6
25	電話機	40,200	40,800	40,700	101.5	99.8
26	交換機	210,900	220,900	228,000	104.7	103.2
26a	電子交換機	112,300	122,300	139,200	108.9	113.8
27	クロスバ交換機	81,900	82,900	73,700	101.2	88.9
28	その他	16,700	15,700	15,100	94.0	96.2
29	電話応用装置	93,400	106,600	115,100	114.1	108.0
30	電話付属装置	73,400	85,300	91,700	116.2	107.5
31	インタホン	10,400	11,500	13,000	110.6	113.0
32	その他	9,700	9,800	10,400	101.0	106.1
33	電信装置	79,100	100,400	120,100	126.9	119.6
34	電信宅内装置	3,200	3,700	3,700	115.6	100.0
35	ファクシミリ	66,900	87,700	106,900	131.1	121.9
36	その他	9,000	9,000	9,500	100.0	105.6
37	搬送装置	148,500	154,000	160,200	103.7	104.0
38	符号伝送装置	27,100	36,000	44,000	132.8	122.2
39	広帯域端局装置	72,600	66,000	58,000	90.9	87.9
40	搬送電信端局装置	27,500	31,000	34,700	112.7	111.9
41	その他	21,300	21,000	23,500	98.6	111.9
42	▷無線通信機器	307,700	364,500	401,600	118.5	110.2
43	放送装置	38,600	43,600	48,000	113.0	110.1
44	ラジオ放送機器	3,600	3,600	4,000	100.0	111.1
45	テレビジョン放送機器	35,000	40,000	44,000	114.3	110.0
46	無線通信装置	173,300	205,400	227,100	118.5	110.6
47	固定局通信装置	104,900	124,000	137,000	118.2	110.5
48	移動局通信装置	68,400	81,400	90,100	119.0	110.7
49	無線応用装置	95,800	115,500	126,500	120.6	109.5
50	レーダ装置	29,800	34,500	38,000	115.8	110.1
51	無線位置測定装置	17,900	18,000	19,500	100.6	108.3
52	その他	48,100	63,000	69,000	131.0	109.5

53 注) 通信機器の実績, 推定, 予測は通信機械工業会(有線通信機器)と日本電子機械工業会(無線通信機器)の調べによる. 有線通信機器には有線通信機器用部品を含まない

[Key on following page]

Key:

1. JFY 1979 (actual record)
2. JFY 1980 (estimated)
3. JFY 1981 (projected)
4. JFY 1980/1979 (%)
5. JFY 1981/1980 (%)
6. Monetary value
7. Electricity measuring instruments
8. Electricity measuring devices (such as power meters, meters)
9. Electrical measuring devices
10. Voltage, current, power measuring devices (such as digital multimeters)
11. Circuit meters (circuit tester)
12. Frequency-time measuring devices (such as frequency counters)
13. Waveform measuring devices (such as oscilloscopes)
14. Electron tubes, semiconductors, circuit element measuring devices (such as LSI testers, impedance meters)
15. Transmission characteristics, radiowave testing devices (selective level meters, electric field intensity measuring devices)
16. Comprehensive measurement facility (PCM error rate measurement device)
17. Auxiliary measurement devices (such as signal generators, recorders)
18. Other electrical measuring equipment
19. Industrial instruments
20. Process use industrial equipment (such as transmitters, receivers)
21. Other industrial equipment
22. Data processing facility
23. Communications equipment
24. Telephone and telegraph equipment
25. Telephones
26. Exchanges
26a. Electronic exchanges
27. Cross bar exchanges
28. Other
29. Applied telephone equipment
30. Telephone accessories
31. Interphones
32. Other
33. Telegraph equipment
34. Home telegraph devices
35. Facsimiles
36. Other
37. Conveyer devices
38. Signal transmission devices
39. Broadband terminal pole devices
40. Carrier telegraph terminal devices
41. Other
42. Radio communication equipment
43. Broadcast devices
44. Radio transmitters
45. TV transmitters
46. Radio communication equipment
47. Fixed station communication devices
48. Movable station communication devices
49. Applied radio equipment
50. Radar equipment
51. Radio direction finders
52. Other
53. The data on actual, estimated, and predicted values for communications equipment were from the surveys conducted by the Communications Equipment Industrial Association (telephone and telegraph equipment) and the Japan Electronic Equipment Industrial Association (radio communication equipment)

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Communications Equipment

Tokyo NIKKEI ELECTRONICS in Japanese 13 Apr 81 pp 271-273

[Article by Hisashi Arai of NIKKEI ELECTRONICS]

[Text] Anticipate Reaching 1 Trillion Yen Through Stable 8-Percent Growth Rate; Rapid Growth in Optical Fiber Communications

Communications equipment growth is completely stabilized. It is estimated that sales of telephone and telegraph equipment (Communications Instrument Industrial Association) and of radio communications equipment (Japan Electronic Equipment Industrial Association) together will total 987.2 billion yen--a 12.3-percent increase over the previous year. At the same time, the 1 trillion yen mark is expected to be attained in 1981, and an 8-percent rate of increase--65.7 billion yen--is expected to be realized. Furthermore, an average annual rate of growth of 9.1 percent is anticipated through the next 4 years ending in 1984. This industry may be said to be in a stage of stable growth.

On the other hand, the total procurement value for the Nippon Telegraph and Telephone Public Corporation, which accounts for close to half of the domestic communication equipment market, has registered the low rate of growth of 3-4 percent over the past 2-3 years. This has been the result of a decrease in the number of new telephones being installed. There was a time when more than 3 million new telephones were installed every year, but this number dropped to 1.35 million in 1980. At the same time, developments in the data communication and facsimile transmission area are nowhere close to the telephone demand. Consequently, this period of low growth for the Nippon Telegraph and Telephone Public Corporation is expected to continue for a while.

Furthermore, there is the problem of developing sources for procurement of materials with respect to the Nippon Telegraph and Telephone Public Corporation. This is a problem on which there was a provisional consensus between Japan and the United States (see this journal of 2 March 1981, No 259, pp 183-185). There are still many unclear points as to just how this situation will affect Japanese communication equipment manufacturers. For the time being, the effect is expected to be small in 1981, at least; it is certain there will be fierce competition for the business of the Nippon Telegraph and Telephone Public Corporation with its low rate of growth.

Despite this situation, the growth rate for communications equipment in 1980 exceeded the predicted value and attained a double-digit rate of growth, and it is expected to increase by another 8 percent in 1981. This is the result of an expansion of domestic private industry demand and external demand. Without exception, manufacturers are looking toward "disengagement from the public corporation." For example, many companies now are venturing into the information treatment and facsimile markets. While it may be said that the rate of growth in facsimiles is high, about 20 companies are crowding into this field.

"Limiting ourselves to the communications equipment market for 1981, this will be another year when the trend will not be clear," said Shingei Urakawa, director of

the Communications Industry of Fujitsu. The reason for this is that there has been little increase in the budgets of the different government ministries and agencies, and particularly of the local self-governing bodies. The manufacturers have recently developed, through the medium of communications technology, disaster handling systems, public information systems, dam control systems, traffic control systems, and building control systems. On the other hand, sales of these control systems are highly dependent on increased budgets for the local self-governing bodies. In the midst of this situation, about the only items which show a potential for increased sales this year are electronic exchanges and facsimiles. Although no clearcut classification has been assigned as yet, optical fiber communication has finally become a commercial item.

Electronic Exchanges Increase by 13.8 Percent; Facsimiles Exceed 100 Million Yen

Electronic exchanges are expected to exceed the previous year's record by 13.8 percent and reach sales of 139.2 billion yen. Since the increase in all exchanges has slowed to 3.2 percent as a result of the decreasing number of new telephone subscribers, this is an indication of the sharp drop in crossbar exchanges. Crossbar exchanges were just edged out by electronic exchanges in 1979; 1981 sales will probably be about 73.7 billion yen, or about half of 1979. Already, nearly all new installations are electronic exchanges, but a crossbar can be installed at less cost where there previously was a crossbar.

At the same time, a shift is presently underway in the area of electronic exchanges, from a space-divided type of exchange that uses mechanical switches to a time-divided type of exchange that uses electronic switches. These are called digital exchanges. The entire network and the transmission pathways are going the way of digitalization. It has already reached the point where digital exchanges are a must if one is to survive in the fight for orders from developing nations.

Fujitsu Director Shingei Urakawa said, "In one sense, there seems to be a shadow on the growth rate of facsimiles." Facsimiles have shown about a 30-percent rate of growth over the past few years. This rate is expected to be 21.9 percent in 1981, for total sales of 106.9 billion yen, and there are prospects that the rate of growth is settling down. "Be that as it may, breaking the 100 billion yen mark was forever in our minds in the past, and we have achieved one of our nodal points" (Director Tadashi Kojima of the Plans Department, Matsushita Denso Kiki). Following circuit development by the Nippon Telegraph and Telephone Public Corporation, the 100 billion yen mark was attained in short order.

There is still a continuing effort to lower the cost of facsimiles. The G III unit (1 minute), which formerly cost about 3.5 million yen, now costs less than 2 million yen and is pointing in the direction of 1 million yen. Among the different types, G II (3 minutes) and G III (joint use unit) are showing sharp increases. The G II units of the past have now come to be used together with the G I (6 minutes). There is very little production of the G I alone.

The Nippon Telegraph and Telephone Public Corporation's minifax is about to initiate service at any time. Its appearance does not seem likely to cause great turbulence in the market, as in the past. There is likelihood that a new-based market is developing.

Optical Fibers Will Be in a "Doubling Game" for a While

"It can be said that 1980 was the year in which optical fiber communications took off from the research and development stage to the commercial stage. At the present time, this product is in an annual doubling game as its market expands" (Hajime Mizuguchi, manager and director of Optical Cable Communications Development Headquarters of Nippon Electric). The scale of all the domestic manufacturers is not clear, but sales by Nippon Electric were roughly 2.5 billion yen in 1979 and 10 billion yen in 1980, and they are expected to reach 15 billion yen in 1981. The large growth during 1980 was the result of an order for more than 7,000 km of fiber core for a project in Argentina.

In February 1981 the Furukawa Electric Industry and the Fujitsu group received an order for fiber core cable totaling about 4,000 km for a project in Hong Kong. There are trade talks for 1981 on optical fiber communications with North America, the Near and Middle East, and Southeast Asia. The increase in foreign orders is very large at the present time.

On the domestic scene, the Nippon Telegraph and Telephone Public Corporation has announced a plan to commercialize optical fiber communications. This project will link the telephone centrals of Otemachi and Aoyama, a distance of 8 km, and 12 centrals deployed over the country for a total distance of about 110 km. Construction will begin this August. The number of cores in an optical fiber cable varies from 12, 18, 24, 36, 42, and 48 cores, and the information transmission speed is 32 M or 100 M bit/sec.

At the same time, the public corporation will conduct on-site experiments in large volume communications between its Musashino Electrical Communications Laboratory and its No 4 Electrical Communications Laboratory (provisional name), which is presently under construction at Atsugi city in Kanagawa Prefecture, over a distance of 80 km. This on-site experiment, which will use the single mode fiber, is a forerunner in the world; its information transmission speed will be 400 M bit/sec and its relay interval 20 km.

The optical fiber mode has already made possible lower costs in nearly all transmission pathways, compared to past modes to parties other than subscribers. This is why the public corporation plans to use its 1981 business as the foothold for sharp increases in the number of construction [undertakings] for 1982. External demands will make up the greater part of the business for 1981, but demands by the Nippon Telegraph and Telephone Public Corporation may well take over the larger share starting in 1982.

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Electronic Parts Industry

Tokyo NIKKEI ELECTRONICS in Japanese 13 Apr 81 pp 274-278

[Article by Shimei Matsuoka of NIHON KEIZAI SHIMBUN]

[Excerpts] The electronic parts industry has been dubbed with the worthy but not very frequently heard expression "an industry with a favorable structure." Looking at the statistics for 1980, any industry whose sales exceeded the previous year's sales by 20 percent is not that outstanding. "This is not a boom; this is a scale-up" (President Katsutaro Kataoka of the Alps Electric Company), and the overall picture is one of a clearly upward trend. The heads of this industry are confident that this growth will continue in an orderly manner through 1981. For example, Matsushita Electronic Parts, whose sales [last year] of 200 billion yen exceeded 1979 sales by 40 percent, expects to see sales "increase by 35 percent" in 1981 (Taro Kuninobu, president of Matsushita Electronic Parts Co). Alps Electric also recorded a 35-percent gain in 1980 and expects to increase by 20 percent in 1981 to a total sales figure of 170 billion yen. The strong position of these companies is evident.

The electronification of machinery, or the so-called mechatronics, refers to the merging of electricity and machines. It is the electronics parts industry, centered on the microcomputer, which has supported this trend. The electronic parts industry has advanced not only into the mechatronics market but also into the watch, office machinery, automated vending machinery, automobile, camera, electronic musical instrument, and toy business areas as well.

Looking at electronics and electrical appliances from the past, household appliances include the VTR, which has really come into its own, the video disk which will appear this summer, and the soon-to-appear digital audio disk (DAD)--a succession of "new hotshot items" that are emerging. It is vital that this increase in demand for electronic parts continue for a while. There are some who say that "this is the peak period." Furthermore, foreign set manufacturers' evaluation of Japanese electronic parts is rising, from the standpoint of both quality and low cost, and Japan's position as the world's electronic parts supply base is being reinforced.

On the other hand, this continual expansion in the activity stage is not always a bed of roses where the individual parts manufacturer is concerned. Any expansion of this stage requires just that much more technological strength, and the industry is being tested over a wide area with regard to manpower, planning strength, and financial strength. Even though the industry's overall situation is good, there are wide differences among individual companies. These trends were evident in the statistics for 1980. In this respect, 1981 may be considered the start of a truly selective weeding-out period.

The electronic parts industry probably will go more and more into block formation and systematization from here on. There are already a number of systematized parts, such as electronic tuner systems and set mechanisms and printers. Many of these use custom (special order) LSI. This is why it is becoming necessary for parts manufacturers who are users of these custom LSI products not only to design but even to go as far as mask design.

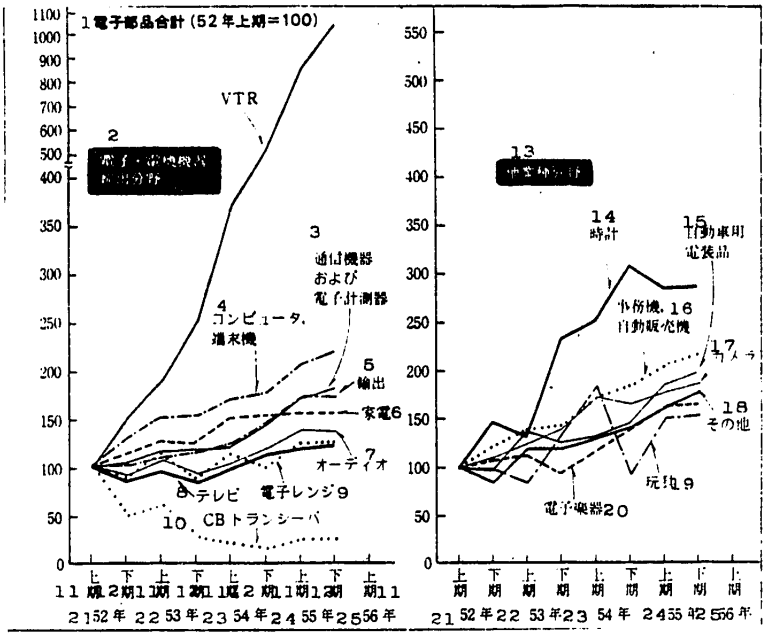

Figure 3. Rate of Growth by Markets of General Electronic Parts Industry (Excluding Magnetic Tapes) as Compiled by Electronic Machine Industry Association Questionnaire. The VTR-Related Industry, Which Showed Large Rate of Growth, Accounted for 19.1 Percent and Audio Use Parts for 26.5 Percent During the Same Period

Key:

1. Total electronic parts (first half of 1977 = 100)
2. Electronic and electrical parts export area
3. Communication and electronic measuring equipment
4. Computers, terminals
5. Exports
6. Household electrical goods
7. Audio
8. Television sets
9. Electronic ranges
10. CB transceivers
11. First half
12. Latter half
13. Compilation of other industries
14. Watches
15. Electric parts for automobiles
16. Office equipment; automated sales machines
17. Cameras
18. Other
19. Toys
20. Electronic musical instruments
21. 1977
22. 1978
23. 1979
24. 1980
25. 1981

Table 5 (a). Projected Production of Electronic Parts (1)
(Volume number: 1,000 units. Monetary unit: 1 million yen)

	1 54年度(実績)		2 55年度(一部推定)		3 56年度(予測)		4 55/54年度(%)		5 56/55年度(%)	
	6 数量	7 金額	6 数量	7 金額	6 数量	7 金額	6 数量	7 金額	6 数量	7 金額
●半導体素子	1		257,290	—	297,450	—	329,500	—	115.6	—	110.8
▷ダイオード	2	4,841,740	34,858	6,784,000	44,250	7,886,000	49,900	140.1	126.9	116.2	112.8
ゲルマニウム・ダイオード	3	715,926	3,918	844,000	4,250	886,000	4,300	117.9	108.5	105.0	101.2
シリコン・ダイオード	4	4,125,814	30,940	5,940,000	40,000	7,000,000	45,600	144.0	129.3	117.8	114.0
▷整流素子（100mA以上）	5	1,967,506	50,535	2,270,500	53,100	2,496,000	55,300	115.4	105.1	109.9	104.1
シリコン整流素子	6	1,946,700	46,706	2,250,000	50,000	2,475,000	52,500	115.6	107.1	110.0	105.0
その他	7	20,806	3,829	20,500	3,100	21,000	2,800	98.5	81.0	102.4	90.3
▷トランジスタ	8	4,442,892	101,357	5,835,500	114,500	6,694,700	122,700	131.3	113.0	114.7	107.2
ゲルマニウム・トランジスタ	9	107,945	3,411	93,000	2,800	82,700	2,300	86.2	82.1	88.9	82.1
シリコン・トランジスタ	10	4,208,766	93,223	5,570,000	106,000	6,400,000	114,000	132.3	113.7	114.9	107.5
電界効果型トランジスタ	11	126,181	4,723	172,500	5,700	212,000	6,400	136.7	120.7	122.9	112.3
▷サーミスタ	12	107,135	4,131	125,000	5,000	137,500	5,400	116.7	121.0	110.0	108.0
▷バリスタ	13	361,048	4,456	325,000	4,000	325,000	4,000	90.0	89.8	100.0	100.0
▷サイリスタ	14	105,374	19,436	140,000	22,000	161,000	24,500	132.9	113.2	115.0	111.4
▷光電変換素子	15	1,079,420	35,953	1,460,000	47,200	1,992,000	59,700	135.3	131.3	136.4	126.5
発光ダイオード	16	999,592	25,497	1,350,000	34,000	1,850,000	44,000	135.1	133.3	137.0	129.4
その他	17	79,828	10,456	110,000	13,200	142,000	15,700	137.8	126.2	129.1	118.9
▷その他の半導体素子	18	158,163	6,564	180,000	7,400	196,000	8,000	113.8	112.7	108.9	108.1
●集積回路	19	—	418,379	—	601,000	—	768,900	—	143.6	—	127.9
▷半導体集積回路	20	1,873,465	375,701	2,694,000	545,000	3,600,000	700,000	143.8	145.1	133.6	128.4
アナログIC	21	918,307	101,180	1,224,000	140,000	1,600,000	180,000	133.3	138.4	130.7	128.6
ディジタルIC	22	955,158	274,521	1,470,000	405,000	2,000,000	520,000	153.9	147.5	136.1	128.4
バイポーラ型	23	405,319	53,938	530,000	75,000	680,000	90,000	130.8	139.0	128.3	120.0
MOS型	24	549,839	220,583	940,000	330,000	1,320,000	430,000	171.0	149.6	140.4	130.3
▷混成集積回路	25	91,111	42,678	119,500	56,000	154,300	68,900	131.2	131.2	129.1	123.0
厚膜集積回路	26	4,704	6,237	6,500	7,000	7,300	7,600	138.2	112.2	112.3	108.6
厚膜集積回路	27	86,407	36,441	113,000	49,000	147,000	61,300	130.8	134.5	130.1	125.1

*1 製品分類および生産実績の基礎数字は，通産省機械統計月報に準じた。56年度は56年4月～57年3月（各年度は3月期）28

[Part of Table 5 (b)]

Key:

1. Semiconductor elements
2. Diodes
3. Germanium diodes
4. Silicon diodes
5. Commutating elements (100 mA or more)
6. Silicon rectifiers
7. Others
8. Transistors
9. Germanium transistors
10. Silicon transistors
11. Electric field effect transistors
12. Thermistors
13. Varisters
14. Thyristers
15. Photoelectric conversion elements
16. Light-emitting diodes
17. Others

[Key continued on following page]

18. Other semiconductor elements
19. Integrated circuits
20. Semiconductor integrated circuits
21. Analog IC
22. Digital IC
23. Bipolar types
24. MOS type
25. Mixed integrated circuits
26. Thin film integrated circuits
27. Thick film integrated circuits
28. The basic data for parts classification and production were based on the Ministry of International Trade and Industry's monthly machine statistics report. JFY 1981 = April 1981-March 1982 (each JFY ends in March).

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Semiconductor, Integrated Circuits

Tokyo NIKKEI ELECTRONICS in Japanese 13 Apr 81 pp 278-282

[Article by Takahide Nonaka of NIKKEI KEIZAI SHIMBUN]

[Text] Entering the Ranks of 1 Trillion Yen Industries

The high rate of growth of integrated circuits, including mixed integrated circuits (hybrid IC), is riding the wave of electronification, which is expected to continue into 1981. Prospects are for increased production of 30 percent on the total monetary base, to 760 billion yen. The overall picture is an orderly one, but there are bright and dark spots according to the various products. MOS memory, which for the past several years had been dragging the IC market development along, has shown signs of being a one-puff affair and is causing considerable concern. The price of the 16 K bit dynamic RAM, the main part of MOS memory, suffered a drop to one-fourth its previous price in the market during the course of 1980. At the same time, the 64 K bit RAM, which appeared on the scene as top batter for super LSI, has not created the expected demand in the computer industry.

The industry feels that the MOS memory market will stage a comeback about the latter half of 1981. On the other hand, should this situation of marking time be dragged down by association with the economic picture in the United States during the latter half of JFY 1981, there may be a need to downgrade the IC growth rate somewhat.

Another product is the semiconductor element, which became very active during JFY 1980 as the result of the great increase in production of VTR's for home use, creating a shortage of transistors; this trend may continue into the latter half of this JFY. As a result, production may increase 10 percent over the previous year to 330 billion yen. On the other hand, here again is an uncertain situation. There is the possibility that the small signal transistor for VTR use may be replaced by IC.

In this manner, there are some unstable items in part of the MOS memory picture and in transistors, but it can be stated with confidence that the national production of IC and the various semiconductors will total over 1 trillion yen. That is to say, domestic production of transistors, which became practical a little over 20 years ago, and the IC industry, which started to take off 10 or so years ago, have contributed to the Japanese semiconductor industry's entry into the ranks of a "trillion yen industry" in a short time and at recordbreaking speed.

Transistor Production Increases for First Time in Long While

In the area of various semiconductor elements, the situation of catching up with the demand will continue from the previous JFY and will be the case with the silicon transistor. The demand for small signal transistors is particularly large. The semiconductor industry has placed great emphasis on investing in LSI-related facilities in recent years, and the production capability of transistors had crawled sideways. At this time, the household-use VTR's, a multiple consumer of transistor parts, has displayed a rate of growth far beyond the expected level.

It seems likely that conversion to IC will gradually set in at the end of JFY 1981 and that there will be an expansion in the number of units produced, as a result of which there may be some shortage during the first part of the year. To this will be added part of the sound equipment and the good demand for electronic instruments, along with video disks and digital audio, and these are all expected to pull together and activate the market. Other than the areas listed above, there is the so-called mechtronics area, and power transistors are enjoying a favorable rate of growth.

Given this background, the various companies of this industrial world are all reinforcing their systems to increase production of transistors. Matsushita Electronics Industry and Tokyo Sanyo Electric increased their production 50 percent over the previous year, setting up a production capability of 200 million units per month. At the same time, Tokyo Shibaura Electric plans to produce 100 million units per month from its Malaysia plant and its Himeji plant (Hyogo Prefecture). Nippon Electric is pointing toward setting up a plant with a capacity for producing 100 million units--expected to be the largest single unit of its kind in the world--at its subsidiary company Yamagata Nippon Electric (Yamagata Prefecture).

Other than the above, photoelectric conversion elements centered on LED (light-emitting diodes) may show a growth of 30-40 percent, both in volume and in monetary value. While different companies are reinforcing their systems for increasing production, Sanyo Electric has initiated full-scale operation of its display device at the newly constructed plant of its subsidiary company Tottori Sanyo Electric (Tottori Prefecture) in January of this year. It is following a pace designed to produce 100 million LED per month by the end of JFY 1981, and it aims to grab a top share of the domestic market.

High Hopes for Diverse LSI Products Such as Static

The one item which is of greatest concern to Japanese IC manufacturers, who constitute a strong segment of the industrial world, is the cloud being cast over the demand situation in the American market, the primary market for Japanese exports.

The "orders versus goods-shipped value ratio," obtained by dividing the value of orders received by the value of orders shipped, is often taken to be the business index for the future of the IC industry. This value for the American market broke below the 1.0 level in June 1980. When this value drops below 1.0, there is an excess of products on the market, and there is good possibility of a price reduction.

Recovery to 1.0 or better was finally attained in January 1981, but there are strong indications that this situation of the dividing point between demand and supply being on the ragged edge is expected to continue through the first half of 1981. This is why every company is reworking its American sales strategy. In addition, this dulling of IC demand that has accompanied the economic recession in the United States forced the American Texas Instruments Company (TI) to reduce its operations starting in December 1980, and this spearheaded a curtailment in operations which has been the most severe since the recession of 1974.

As if to lend backing to the above situation, President A. Federman of the American Monolithic Memory Company, who visited Japan recently, said, "It will be difficult to attain the 17-percent growth rate in the world market for semiconductors in 1981 as indicated in the data compiled by SIA" (American Semiconductor Industrial Association). Thus he clearly demonstrated his pessimistic outlook.

On the other hand, the various Japanese IC companies are considering the state of oversupply in the American market to be limited to MOS memory as represented by the 16 K bit RAM. The situation with regard to microprocessors and CMOS application products, whose fields of application are not limited to the industrial market but apply to the private area as well, continues to be favorable.

This 16 K bit RAM is considered to have been the instigator of the Japanese-American semiconductor war--which the Japanese manufacturers won, thereby managing to capture 40 percent of the American market. The American manufacturers belatedly took up the challenge and greatly expanded their production capabilities as of the end of last year. The net result of these activities has been a precipitous decrease in the market price, from $5 in 1980 to the present level of $1.

In view of this shifting situation, large Japanese manufacturers such as Nippon Electric, Hitachi Limited, and Tokyo Shibaura Electric are heading a group of Japanese companies which are shifting their strategy from exporting to the United States only the 16 K bit RAM to one of exporting diverse product groups of various memories and microcomputers, such as static RAM and EPROM.

One additional factor in the background of this active shift in Japanese companies' strategy regarding their exports to the United States is the lag in the entry to the memory market of the 64 K bit RAM, which is expected to replace the 16 K bit RAM. However, there is a consensus that this 64 K bit RAM will actually enter the market on a practical scale in 1982.

In the memory area, there are some who feel that the dynamic type may give way to the static type as the main item for microcomputers because of the interrelationship with the computers.

Investments in LSI Facilities Breaking New Records

In direct antithesis to the instability of exports is the domestic demand for IC, which has a strong trend toward continuing the high rate of growth [it achieved] in JFY 1980. With the development of the "Mycon revolution," which knows no way to dally, IC, which has played the main role in its development, is being used in all kinds of facilities and equipment, so that its demand seems nowhere close to saturation. Its use will probably accelerate even more from here on, particularly in the area of mechatronics.

Every company seems to be in a fever state in the matter of investment in facilities, in an attempt to cope with this expected market expansion. The facilities investment plans of this country's 10 largest IC manufacturers will definitely include investing a sum in excess of 200 billion yen in JFY 1981; this will be about 30 percent greater than the historical maximum, which was registered in JFY 1980.

Nippon Electric plans to invest several billion yen more than its 32 billion yen investment of JFY 1980, while Kyushu Electric (Kumamoto Prefecture) and other domestic production strongpoints are reinforcing their mass production systems and are planning a bold move to invest in plants in Europe and the United States. The large manufacturers, such as Hitachi Limited and Tokyo Shibaura Electric, and the companies which are rapidly narrowing the gap between themselves and the large manufacturers, including such companies as Fujitsu, Matsushita Electronic Industry, and Sharp, are also planning record capital investments.

Furthermore, when the investments in semiconductor-related facilities by the manufacturers who produce semiconductors for internal consumption, such as Pioneer, Suwa Seikosha, and Nippon Gakuki, and by the electronic parts manufacturers including Toko and Sanken Electric are added to those of the above 10 companies, total investments seem capable of exceeding 250 billion yen.

The main theme of the production plans of these large companies is to start mass production of super LSI, including the 64 K bit RAM. Nippon Electric has initiated actual production on a scale of several tens of thousands of units per month at the LSI line in its Sagamigahara plant in Kanagawa Prefecture. The mass production system of the new "No 6 diffusion line" of Kyushu Electric, with a monthly production of 100,000 units, is planned to enter operation in JFY 1981. Hitachi Limited has assigned its LSI production to its Musashi plant (Tokyo Prefecture), while Toshiba has placed its LSI plant at its Oita plant (Oita Prefecture).

Microcomputers To Expand by 50 Percent or More

The microcomputer market, including microprocessors, memory, and peripheral equipment, is expected to see a large expansion of more than 50 percent during JFY 1981. Total sales are projected at the 280 billion yen level.

Looking at this situation from the standpoint of individual applications, public welfare, household electrical appliances, desk calculators, electronic registers, and POS which use 4 bit units account for more than 70 percent. In another direction, the 16 bit microcomputer, which comes close to the capability of the minicomputer, will see its time come. Following in the footsteps of the American Intel,

Motorola, and Zylog companies, which already have set up their mass production lines, the various Japanese companies have been announcing a series of new products, beginning at the end of last year and continuing through this spring.

The Intel Company, which is leading the way, announced its next-generation microcomputer family concept, named the "iAPX series," and introduced its "8086" 16 bit microcomputer, already in mass production, as its first shot at the Japanese market. On the other hand, Nippon Electric has developed the "μCOM 1600" by its own efforts and will market its Intel-type "μPD 8086" this spring. Hitachi is marketing its Motorola family "HD68000," while Matsushita Electronics is marketing its "MN1613," said to be the "realization of the fastest computing speed in the world." Toshiba, Sharp, and Mitsubishi Electric also are planning mass production of 16 bit units. The microcomputer competition among the different IC manufacturers has resolved into a 16 bit unit contest.

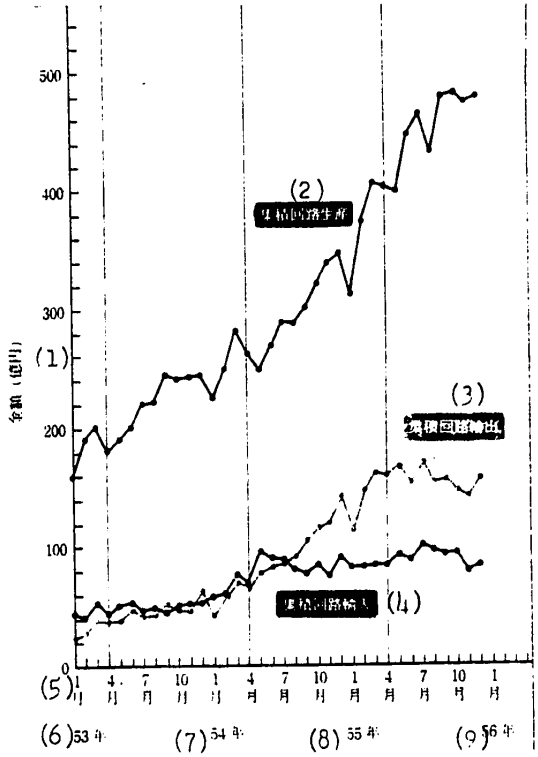

Figure 4. Production Trends and Export-Import Trends in Integrated Circuits (Excluding Mixed Integrated Circuits). Production Values Taken From the Ministry of International Trade in Industry's Monthly Statistics; Export-Import Data Taken From Ministry of the Treasury Statistics.

Key:

1. Total value (100 million yen)
2. Production of integrated circuits
3. Exports of integrated circuits
4. Imports of integrated circuits
5. Month
6. 1978
7. 1979
8. 1980
9. 1981

SCIENCE AND TECHNOLOGY

USE OF ROBOTS IN INDUSTRY EXPECTED TO INCREASE

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19, No 956, 26 May, No 957, 2 Jun 81 pp 11, 15

[Article by Katsuhiko Hirano]

[26 May 81 p 15]

[Text]

The age of robots is now rapidly evolving in Japan. Although the diligence and the strong sense of quality of the Japanese workers are widely believed to account for the overwhelming international competitiveness of Japanese automobiles, home electric appliances, semiconductors, machine tools and many other products, there is another important factor contributing to the phenomenal success of many made-in-Japan products in the international market — sharply rising use of industrial robots.

Robots work all the day round without demanding any pay hikes and liberate human workers from monotonous drudgery and poor working conditions. The day may not be too far off when "bluecollars" completely bow out of the production scene to be replaced by uncomplaining "steelcollars."

Major Robot Producers in Japan

(Functions)	(Forerunners)	(Newcomers)
Welding	Kawasaki Heavy Ind., Yaskawa Electric Mfg., Hitachi, Mitsubishi Heavy Ind., Shin Meiwa Ind., Toshiba Seiki, Nachi-Fujikoshi, Kobe Steel	Matsushita Sangyo Kiki, Mitsubishi Electric, Osaka Transformer, Dainichi Kiko, Okamura
Painting	Kobe Steel, Tokico, Mitsubishi Heavy Ind., Hitachi, Nachi-Fujikoshi, Kawasaki Heavy Ind.	Taiyo Tekko
Assembling	Hitachi, Fujitsu-Fanuc, Kawasaki Heavy Ind., Dainichi Kiko, Taiyo Tekko	Nippon Electric, Nitto Seiko, Yamaha Motor, Sankyo Seiki Mfg., Pentel, Sumitomo Heavy Ind.
Machine tool	Fujitsu-Fanuc, Ikegai Iron Works, Shinko Electric, Toyoda Machine Works	Dainichi Kiko
Pressing	Aida Engineering, Orii Daido Steel, Shinko Electric, Toshiba Seki	
Others	Hitachi, Mitsubishi Electric, Mitsubishi Heavy Ind., Fuji Electric, Oji Seiki Kogyo	Pilot Pen, Kobe Steel, Ishikawajima-Harima Heavy Ind.

'Elephants' trunks'

Toyota Motor Co. has recently opened to the press for the first time the Tahara No. 2 Works, the top automaker's newest plant widely known for its liberal use of robots in all its production stages.

When a gleaming, unpainted autobody carried on a conveyor comes to a stop, a cluster of four or five robots immediately go to work. The welding guns attached to the robots emit a mechanical whine as they touch off sparks. The welding lines, which produce Toyota's latest sporty car line 'Soarer,' currently sold only in Japan, has 18 separate work processes, each of which takes only three minutes. Here, a total of 80 welding robots work confidently and appear ready to take up additional work loads if necessary.

The automatization ratio of the welding lines has zoomed to 90 per cent with the introduction of robots. The only human worker is the overseer stationed at one end of the line to check on the robots' work. Toyota Motor claims that it has successfully cut more than 50 workers through the use of robots.

Human workers are about to disappear from the painting factory of Honda Motor Co.'s

Sayama Works in Saitama Prefecture also. The works specializes in producing passenger vehicles. Each of the two painting lines located in the factory currently use eight industrial robots. Shaped like elephants' trunks, the robots snake into every cranny, under the chassis, inside the body and even the backside of a door, applying paint deftly. In no other automobile plant in the world has the painting process been so perfectly automated.

Age of diversification

It is not only to cut back on their workers that Japanese automakers now use a sharply increasing number of industrial robots in their manufacturing plants. Angling merely for personnel reduction effects is an option for the past decade. What makes Japanese automakers' robot-oriented attitudes revolutionary and ominous for other auto-making countries is that it is primarily aimed at improving the quality of their products and preparing themselves for the arrival of the age of small-lot demands for a wide variety of different products.

In order to manufacture so many different models, production lines have to be frequently modified. This leads not only to higher production costs but also to unwitting errors if human workers are used. Robots, however, are impervious to such human errors once their brains — namely, micro computers — are programmed. It requires only modification of the original program for robots to turn out different models of motor vehicles.

Small companies

At Fujitsu-Fanuc Co.'s Fuji Works located at the foot of Mt. Fuji, robots are turning out other robots and NC (numerical control) machine tools around the clock. Although the plant building there is about twice the size of Tokyo's Korakuen ball park, only 100 workers are at work even during the day. When night falls, the plant becomes completely automated with only one worker tending the shop along with a single guard from a security-patrol company. The number of robots working in this plant also is limited to less than 10.

The monthly production of this plant currently stands at slightly less than ¥2 billion. President Seiemon Inaba vows to boost monthly production to some ¥5 billion in the near future with a total workforce of some 120. In other words, the per capita annual production will zoom up to some ¥500 million. The Fuji Works presents a completely different image from a machinery plant of the past — a plant bustling with humanity.

The use of robots is by no means limited to big businesses. Even cottage-level factories having only family workers are now beginning to use robots. This development may be only natural in view of the fact that supply if high-quality labor is particularly short in small operations. As an average industrial robot costs only about ¥10 million, even a cottage-level workshop can afford one and write it off in a couple of years if it foregoes employing a human worker.

Small and medium size operations, as a matter of fact, now account for some 70 per cent of all the welding robots in use.

New models include "menial robots" designed to clean and do other household chores and "secretary robots" which write letters and apply signatory stamps. Designing also has started for "construction site robots" and "atomic power plant robots" designed to tackle supervisiry and repair works.

A cylindrical machine measuring one meter in diameter and 30 centimeters, in height scurries around the floor, reversing whenever it hits walls and other obstacles, cleaning all the time. The machine is the No. 1 model of the "cleaning robot" developed by Automax Co. of Tokyo, a venture in the field of robot technology.

Although floor space cleaning is its primary duty, the robot does a night-watchman's job as well. Having eyes, ears and a nose of its own, the machine emits a warning sound when it senses unusual light, sound or smoke, according to Executive Director Sueo Matsubara of Automax. The robot has a roller brush and a roller cleaning cloth in its belly and moves around on an automobile battery. As it has five small "fingers" at strategic places, it can sense walls and other obstacles and turn around to go the other way.

The robot has, on its top side, a light sensor (which detects strange light), microphone (which catches strange sounds) and a smoke detector (which senses unusual smoke), and warns when fire breaks out or a prowler gets into the building. The Automax people claim that smaller versions of its new robot will be ideal for home use.

'Cybernetic' secretary

Another new speciality robot is the "secretary robot" designed for office use. Administrators in big businesses and government ministries are now being required to apply signature stamps to a variety of official papers several hundred times a day — a highly tiring practice. In the hope of freeing busy executives from this chore, Fujitsu Ltd.'s Research Institute has recently come up with an experimental model of a "stamp-applying robot" which places the executive's signature stamp always in the right places. When he first saw this remarkable machine, Fujitsu's President Taiyu Kobayashi was reportedly heard to sigh that he would

have nothing to do at the office.

Fujitsu's robot has three "hands" — one for leafing the papers over, the other for holding the papers down and the [illegible] for actually applying

petrochemical complex jointly with Saudi Arabia Basic Industries Corp. and Dow Chemical. The Ministry of International Trade & Industry favored a 50:50 share of the Government and industry's investment in SPDC, which will invest a [illegible]

gives out warnings when departure or interview time comes around. Director Hiroshi Yamada of Fujitsu, Ltd. predicts that the days will not be too far away when robot workers do much of the office work.

Prof. Ichiro Kato of Waseda University is now engaged in developing "medical robots," especially one for tactile detection of breast cancer. Equipped with 25 "fingers," Prof. Kato's robot relays its tactile feelings to an electronic computer system which, in its turn, immediately detects cancerous growths and other abnormalities.

In its recent report, the Nomura Research Institute predicted that Japan's robot industry will chalk up ¥300 billion sales in 1985 and that the figure will zoom up to ¥600 million in 1990. The industry's total sales last year stood at ¥60 billion (21,000 units). Informants believe that the industry will keep on attaining 40-50 per cent growth every year in the next several years and that the total sales may hit a respectable ¥1,000 billion level by 1990. This possibility is by no means remote especially now that the use of robots is rapidly expanding from welding, painting and similar other simple works to far more complicated jobs at home, in factories and offices and in medical establishments.

[2 Jun 81 p 11]

[Text]

Japan is by far the largest robot-using country in the world accounting for some 70 per cent (75,000 units) of all the industrial robots now at work throughout the world. Last year, Japan produced a total of 12,000 new robots, up nearly 50 per cent over 1979. Industry sources believe that robot production will keep on growing at an annual pace of 40-50 per cent for the time being.

Fierce fight

The highly promising nature of the robot industry has not been lost on Japanese entrepreneurs. At present, as many as 130 corporations, both big and small, are engaged in a fierce fight for a piece of the pie. Not only machinery makers and electric and electronic appliance manufacturers but also stationary and other corporations have already committed themselves to robot development.

Kawasaki Heavy Industries, the largest manufacturer of welding robots, has recently muscled into the field of painting robots. Kawasaki, moreover, is now planning to start marketing, from next fall, giant robots now in joint development with Unimation Inc., a leading U.S. robot manufacturer. Although the company's robot sales for the current year stand at slightly more than 600 units, the figure will be doubled to 1,200 units next year.

Yaskawa Electric Mfg. is close upon the heels of the pace-setting Kawasaki Heavy Industries. The company is planning to manufacture some 600 robots, mostly welding robots, in the course of the current year, counting on active sales of a lightweight model (weighing about one-fourth of the conventional model) announced only last April.

Hitachi, Ltd. and Fujitsu-Fanuc are giving a strong chase to the above two leaders and the fight for the top spot in the newly-rising industry will become all the more severe in the days to come among the four companies.

IBM may join the fray

IBM recently sent a research team to Japan for an on-the-spot observation of the Japanese robot industry at work. The team also placed an order with a Japanese maker for two of its robots. Informants believe that the giant U.S. electronic data processing systems manufacturer will closely study the Japanese industrial robots.

The maker which received IBM's order was not a big company but a small outfit called Dainichi Kiko K.K., capitalized at a mere ¥50 million and located in the mountainous prefecture of Yamanashi. The company, however, is widely known among specialists for its superior robot manufacturing

technology, although its employees number only some 120. The company is currently turning out superior robots equipped with microcomputers.

Dainichi Kiko completed a new plant in Yamanashi Prefecture at the beginning of this year at a total cost of ¥1.5 billion. The company now plans to introduce 40 of its own robots into this plant and start manufacturing robots through the use of robots. Although the current monthly output stands at 15 units, the Yamanashi-based robot maker will increase production to some 50 units before the end of the current year, thereby joining the group of leading manufacturers. Some 70 per cent of the company's products will go to overseas clients.

President Kono of this highly promising venture business is still at the "tender" age of 41. "We aim at an annual sales of ¥10 billion in the near future. It won't be so difficult to raise it to ¥100 billion in the following five years, I believe. We want to make what Sony and Honda accomplished in their businesses in the last two decades," boasts Kono whose hobbies are yachting and boxing.

Efficiency

The primary reason for the amazingly rapid popularization of industrial robots, of course, is efficiency.

According to automobile manufacturers, the first large-scale users of robots, labor productivity in the highly automized welding processes increased nearly fourfold in the course of the recent 10-year period, while that of the entire automobile industry grew only twofold.

Thanks to the rapid progress now being made by microcomputers, robots' performances are steadily improving, while their costs are constantly coming down. Robots are currently priced in the neighborhood of ¥10 million per unit. This means that annual costs stand at a low of only ¥2 million if depreciation is to be completed in five years. The per capita annual wage of an automobile worker, on the other hand, stands at some ¥4 million. Informants, moreover, claim that a robot usually does two or three men's work single-handedly.

According to Director Kozo Kumeno of Hitachi, Ltd., Japanese corporations are singularly amenable to introduction of robots. For one thing, management is highly positive toward technological innovation, while labor unions show exceptional understanding of management's keen interest in technological improvement.

As Japanese corporations follow life-time employment systems, moreover, personnel relocations are comparatively easy and face little opposition from labor unions.

Hitachi, Ltd., as a matter of fact, has already formulated a five-year program to introduce a great number of robots in its assembly processes.

(End of series)

CSO: 4120/246

SCIENCE AND TECHNOLOGY

GOVERMENT-INDUSTRY OPTO-ELECTRONICS IC RESEARCH DUE

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19, No 957 2 Jun 81 pp 1, 9

[Text]

A joint government-industry project to develop opto-

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n Tuesday.

The R&D institute will be initially staffed by around 30 experts dispatched from the governmental Electrotechnical Laboratory of the Agency of Industrial Science & Technology (AIST) and nine leading companies — Fujitsu Limited, Furukawa Electric Co., Hitachi, Ltd., Matsushita Electric Industrial Co., Mitsubishi Electric Corp., Nippon Electric Co., Oki Electric Industry Co., Sumitomo Electric Industries, Ltd. and Toshiba Corp. The number of staffers will be increased to about 50 in and after fiscal 1982, the association said.

The new R&D institute is the second government-industry semiconductor development project after the successful fiscal 1976-79 program to develop very large-scale integrated circuits (VLSIs) at the Cooperative Laboratories of the VLSI Technology Research Association.

In the United States, the Defense Department is going to start a six-year project to develop super high-speed ICs jointly with International Business Machines Corp., General Electric Co. and other leading American businesses. This indicates that Japan and the U.S. will compete in development of super-efficient ICs in the early 1980s by forming a similar setup.

The OEIC development project is in line with AIST's ¥18 billion eight-year (fiscal 1979-84) project to develop opto-electronics applied measuring and controlling systems. The association (OAS) itself was set up in January, 1981 actually to work out a part of the project on a commissioned basis. The association, headed by Fujitsu President Taiyu Kobayashi, consists of 14 companies and an association.

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SCIENCE AND TECHNOLOGY

MACHINE TOOL BUILDERS PLAN TO GO INTO U.S. PRODUCTION

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 957, 2 Jun 81 p 7

[Text]

Japan's machine tool builders are now eager to launch production in the U.S. as a step to shorten delivery time and thereby chalk up more sales. Also behind the industrywide move is the aim of smoothing out possible friction with indigenous producers that may stem from direct exports.

Hitachi Seiki Co. is scheduled to wind up constructing a plant in Congers near New York City in early June to produce lathes equipped with numerical control devices. The new factory will turn out 20 units a month initially with some 30 employees. Hitachi envisions adding machining centers to the production list there sometime in the future.

This is a follow-up to a similar operation of another Japanese machine tool builder, Yamazaki Tekkosho K.K., whose factory has already gone on stream in Florence, Kentucky.

Makino Milling Machine Co. recently signed a contract with Leblond Machine Tool of Cincinnati, Ohio to take over the latter's 51 per cent holdings. In return, the Ohio company will receive technological license from Makino to produce machining centers, starting next year.

Okuma Machinery Works, Ltd. has decided on production in the U.S. Okuma President Takeo Okuma said, "We are now out to find a site by summer to build a NC lathe plant." New York State is considered the most promising place to construct the projected plant, a spokesman for Okuma said.

Meanwhile, Mitsubishi Heavy Industries, Ltd. and Okamoto Machine Tool Works Co. are studying when to go into U.S. operations.

Also, Ikegai Iron Works, Ltd. is planning to embark on American production with local interests a few years hence on a joint venture basis.

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SCIENCE AND TECHNOLOGY

EAST GERMANY BIDS TO BUY ROBOT FROM FUJITSU FANUC

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 957, 2 Jun 81 p 7

[Text]

Fujitsu Fanuc Ltd. has received an inquiry from the East German Government for 20 to 30 industrial robots.

Some officials, who accompanied East German State Council Chairman Erich Honecker during his first state visit to Japan in late May, had a first-hand look at Fujitsu Fanuc's Fuji Works of Yamanashi Prefecure.

The Fuji Works, called the "robot-producing robot factory," has attained all-out plant automation.

East Germany, now suffering from a shortage of workers, plans to buy 45,000 robots, not only handling robots but welding and painting robots, from abroad by 1985.

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SCIENCE AND TECHNOLOGY

AMADA WILL SELL FM SYSTEMS AIMED AT ALL-OUT AUTOMATION

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 957, 2 Jun 81 p 7

[Text]

Amada Co. of Isehara and its group have recently started marketing, both in Japan and abroad, the group's Flexible Manufacturing System, robotized and computerized machine production and processing line for making machinery and equipment.

The leading Japanese industrial machine producing group has recently commercialized various types of FMS in reponse to mounting local demands for such new facilities.

According to the group, Wasino Machine Co. of Komaki, a major member, has recently started selling five types of FMS. Each is an almost completely computerized and automated machine-processing and building system featuring a tripod combination of various machine tools, industrial robots and an automatic monitoring device.

The robots take care of feeding materials into a given machine tool, taking out the finished materials and transferring them to another machine tool, and piling up the completed products.

The monitoring device automatically distinguishes different materials, sorts and makes the machine tools process them differently according to the production schedule. It operates without a break. The device also automatically detects and adjusts any disorder in the machine tools or halts all production activities in case of a serious disorder.

The company has already booked orders for its FMS facilities by General Electric Co. and Dunsite Tool & Inc., a major machine part maker, both of the U.S. It expects a continual climb in both international and domestic demands for such products.

Amada itself has commercialized its own press machine type of FMS and sold and delivered the first units of the new product to Japan's Hitachi, Ltd. and Tokyo Sanyo Electric Co., visualizing a similar expansion in sales. The new product is a similarly computerized and unmanned system of press machinery connected by hauling robots.

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SCIENCE AND TECHNOLOGY

PLASTIC TO BE USED TO PACKAGE RADIOACTIVE WASTES

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 957, 2 Jun 81 p 13

[Text]

Tokyo Electric Power Co. has decided to replace its conventional cement solidifying and packing method for low-radioactivity waste matter coming out of its nuclear power plants with a new Japanese-developed plastic method that will sharply reduce the bulk of such hardened and packed matters, it was recently learned.

The company's decision is to be implemented as soon as its application filed last March for the Government's permission for the introduction of the new method is granted. The new method will be applied, beginning with the company's Fukushima Second Nuclear Electric Power Station, north of Tokyo.

Such a technological innovation by the leader of Japan's power industry is expected to be emulated by all other regional power companies. Cement has been used as a solidifier by Tokyo Electric Power and others using BWR (boiling water reactor) types of N-power generators, while asphalt has been applied by some others using PWR (pressurized water reactor) generators. The new plastic method could replace both processes.

According to Tokyo Electric Power, such low-radioactivity wastes, as distinguished from spent uranium fuel bars and other "very hot" wastes sent to reprocessing factories, chiefly consist of used ion exchange resin of steam-into-water converters, drains from radioactivity washing-off jobs, and some radioactive cloth and paper. They are left alone to lose some radioactivity and then packed into steel cylinders after being hardened with cement or asphalt.

Japan's 21 existing N-power generators had produced 227,000 steel cylinders packed with such solidified waste by the end of last year. The annually growing number of such steel drums is posing a problem of storage space as well as the ultimate question of what to do with them.

According to the nation's largest electric power utility, the plastic method, developed in or around 1977 jointly by Japanese power and nuclear engineering companies to dry and pulverize such waste, mix it with a plastic solidifier, and pack it into steel cylinders, compared with the results of the cement method, can reduce the volume of liquid and soild waste to one-sixth and one-fourth, respectively. An annual total of 2,800 steel drums (each containing 200 liters of wastes) usually coming out of a single N-power generator, thus, could be minimized to about 600.

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