JPRS L/10166

7 December 1981

Japan Report

(FOUO 69/81)

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APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000400080020-7

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CONTENTS

ECONOMIC

U.S. TO BE ASKED TO END NONTARIFF BARRIERS

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 980, 10 Nov 81 pp 1, 4

[Text]

While the U.S. up to this time has been the one urging Japan to do away with so-called non-tariff barriers, Japan now is going to submit a 14-point request asking the U.S. to do some removing on its own.

This was decided by the Japanese Government last week, and its "counter-demand" will list such as the following points as non-tariff barriers: 1) administration of its trade system, such as its anti-dumping checkups; 2) restriction in issuance of visas to Japanese company personnel; 3) the unitary tax system, such as practiced by the State of California.

So far, it has been the U.S. that has strongly done the criticizing, such as by citing Japan's import inspection system to be a non-tariff barrier.

The Japanese Government thus intends to submit its views to the U.S. during this month with the aim of obtaining a response from the U.S. side on the matter at the second meeting of the Japan-U.S. Trade Group, scheduled to be held in Tokyo from December 7 to 9.

The first topic it takes up is the anti-dumping investigation practice and the U.S. Government's administration of laws and regulations related to trading, such as tariff and trade laws.

This is because it is held that the U.S. Government's broad interpretation of laws has given cause to moves for ousting Japanese products on the alleged grounds of unfair competition.

One of the recent cases is considered to be the provisional judgment by the International Trade Commission in September that the contract won by Nippon Electric Co. for supplying Communications Satellite Corp. (COMSAT) with satellite communication equipment constituted a case of dumping.

The Japanese Government's feeling is that if the U.S. and its enterprises repeatedly raise suits against Japanese goods from an arbitrary interpretation of legalities, Japan's exports to the U.S. can be "frozen," commercial negotiations actually can be disrupted, and Japanese businesses may be called upon to submit such a voluminous amount of counter-data as to obstruct their daily work.

The 14-point request also considers the "Ship American" and "Buy American" policies as being typical non-tariff barriers as well that a problem exists, procedural or otherwise, as to the obligation of making a declaration on place of origin of a product, and manner of tariff classification.

As to the regulation specifying place of origin, the Government will point out that customs clearance often is withheld from such reasons as "lack of clarity" of the declaration, and some Japanese businesses even have given up exports to the U.S. of small items because of the difficulty of filling all of the data needed.

The Government also will cite as an example in the problem of tariff classification the case of polyethylene decorative mats. U.S. customs officials have been divided as to whether they should come under tariffs set for chemical products or for textile products.

Other "barriers" are regarded to be the unitary tax which provides for imposing an income tax on the earning of the local enterprise together with the earning of its parent firm.

CSO: 4120/63

ECONOMIC

GOVERNMENT DRAFTS PLAN FOR BOOSTING IMPORTS

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 980, 10 Nov 81 p 1

[Text] The Government last week worked out a drastic plan for expanding imports from the U.S. and the European Communities countries to correct the huge unfavorable balance of their trade with Japan. The draft plan is slated to be formalized during the course of this month.

The program for reducing trade surplus comprises two phases - short-term, and medium and long range.

The short-term step envisages employment of the system for lending foreign currency for realizing emergency imports of airliners, uranium, metallic ores, power generation barges, and tied-in ships and also promoting governmental stockpiling of rare metals and grains.

The Government anticipates setting the scale of the emergency imports at $5 billion, or roughly half of the surplus of the fiscal 1981 current account payments estimated at $9 billion.

Of this amount, it hopes to set the framework for foreign currency lendings at around $2 billion.

With regard to the medium- and long-term aspect, the Government intends to lower tariffs for whisky, biscuits, chocolates, confectionery, machine tools and auto parts.

It also eyes abolishing the farm products which it left on the residual import restriction list in the Tokyo Round of multilateral trade negotiations and also carry out a review of various import procedures relating to product standards and inspection which the Western nations consider to be non-tariff barriers.

Furthermore, Japan is planning to strengthen industrial cooperation in the field of high technology in the areas of nuclear reactors, nuclear fusion and space-aviation which Etienne Davignon, visting vice president of the European Communities Commission, has proposed to the International Trade & Industry Minister Rokusuke Tanaka.

This is in addition to industrial cooperation which Japan already is offering for autos, household appliances and machine tools.

CSO: 4120/63

ECONOMIC

COMPETITION IN GAS BOOSTER SALES TO SOVIET UNION

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 978, 27 Oct 81 p 11

[Text]

Three teams of Japanese industrial and trading companies, long engaged in fierce rivalry with their West European counterparts in selling natural gas pipeline booster station facilities to the Soviet Union, are likely to lose this competition in face of the West Europeans' determined undercutting rivalry, sources close to such Japanese plant makers reported of late.

According to them, two of the three teams — a Kawasaki Heavy Industries, Ltd. and Mitsui & Co. team and a Mitsubishi Heavy Industries, Ltd., Toshiba Corp., and Mitsubishi Corp. team — have been recently notified by Moscow's Mashinoimport (national machine import corporation) of the latter's decision to delist them from its choice of eligible suppliers of the booster station facilities. The two teams thus have lost the competition. The last remaining Japanese team of Hitachi, Ltd. and Marubeni Corp., though attempting a rollback, is also certain to lose out.

The sources said why the two Japanese groups have been turned down is not clear yet. But they believed their jet engine and ordinary electric motor driving formulas for their booster plants have been found too costly for operation because an equivalent West European formula to use a gas turbine developed by General Electric Co. of the U.S. are said to have been favored by Mashinoimport.

The Hitachi-Marubeni team, whose offered plant is of the same G.E.-developed gas turbine formula, was believed certain to win quite a large contract. But in what is believed to be the last round of its competitive talks with Mashinoimport, the team found three rival West German, French and Italian teams, respectively led by Mannessmann AG, Creusot-Loire Enterprises, and Nuovo Pignone Industrie Mercaniche e Fonderia, were offering still lower prices.

Of the facilities of the entire 41 stations to be built for ¥400 billion in purchasing cost, at least those for 15 stations, worth ¥140 billion, had been expected to be purchased from one of the Japanese teams. The only remaining hope for the Japanese is to sell about ¥50 billion worth of piping valves and joints.

CSO: 4120/63

ECONOMIC

OIL-PRODUCING NATIONS START ORDERING REFINERIES AGAIN

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 978, 27 Oct 81 p 7

[Text]

Japanese industrial plant builders recently have been receiving a succession of inquiries from the oil-producing countries for large oil refining facilities.

This is because these countries have been changing their export stress from selling crude oil to oil products and are anxious swiftly to bolster their refining capacity.

Hardening of such negotiations is ascribable in a large part also to the fact that the international oil companies solidly are backing up the new strategy of the oil nations.

The inquiries for large facilities tend to be centered on Chiyoda Chemical Engineering & Construction Co. and JGC Corp. However, industry people feel that the latest "revival" of commercial talks for oil refining equipment, key item in Japan's plant exports, indicates that the present favorable trend of the nation's plant exports is due to prolong.

Informants say that a big deal that is approaching the signing stage is that pertaining to modernizing Venezuela's state-run Meneven S.A.'s Puerto La Cruz oil refinery. The scale of this deal is put at about ¥100 billion.

Venezuela's state-managed oil corporation is hoping to boost this refinery's capacity from 80,000 barrels daily to 100,000 barrels daily and, at the same time, to newly set up a fluid catalytic cracking facility. This project is being backed by Gulf Oil Corp.

On July 29, this year, four companies took part in its international tender. They are JGC of Japan, Fluor Corp. and Foster Wheeler Corp., both of the U.S., and Snamprogetti S.p.A. of Italy. Venezuela is now screening the tender, and prospects are that the winner will become known within this year at the latest.

International tenders which loom shortly are two. One is that by Kuwait National Petroleum Co. for modernization of the Mina Abd Allah oil refinery at a cost of about ¥100 billion.

The other is that by the Libyan Government for setting up new oil facilities at a cost of about ¥400 billion. The Mina Abd Allah project envisages doubling refining capacity to 300,000 barrels daily. JGC and Chiyoda are participating in this deal from Japan. The American companies taking part include Fluor, Foster Wheeler, C.F. Braun & Co., Parsons Corp., and M.W. Kellogg. This bidding is due to be closed in early December.

As for Libya, it is intending to construct a 220,000-barrel daily oil refinery. It is the first time in five years for Libya to decide on building a new oil plant. JGC and Chiyoda also are taking part in this deal. Snamprogetti, and Technip of France, both national policy firms, are also aiming to win this deal.

Aside from these, it is understood other commercial talks are underway with Thailand for an oil refinery at a cost of ¥100 billion, and with Nigeria, Argentina and Ecuador.

In fiscal 1977, contract for export of oil plants reached a value of $1,960 million, according to certified export statistics. Thereafter, in the period from fiscal 1978-1980, exports remained extremely sluggish.

In fiscal 1981, plant exports are expected to reach an all-time high of around $12-13 billion. Many quarters point out that in the back of this are brisk exports of cement and fertilizer plants to the developing nations and the "revival" of oil plant exports.

CSO: 4120/63

ECONOMIC

GOLD INGOT TRUST BUSINESS TO BE INAUGURATED

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 979, 3 Nov 81 p 3

[Text] Japan's first gold ingot trust service is due to be inaugurated shortly by Sumitomo Metal Mining Co., together with Sumitomo Trust & Banking Co.

According to the big non-ferrous metal mining and smelting company, the unprecedented business in Japan with its sister trust and banking firm is essentially intended for offering a storage service to individuals who hold gold ingots and find it troublesome to keep them. Many Japanese had been calling for a storage service.

But if a depositor wants to sell his ingots at the time of depositing his ingots, the company will switch the trust service to buying at the prevailing domestic market price.

The new service unofficially approved by the Government, will be a tripartite structure with Sumitomo Metal Mining working as the trustor, Sumitomo Trust & Banking as the trustee (depositary), and a given client as the beneficiary.

The certificate to be issued to each client by the trustor, in 100 gram units, for a five-year period automatically extendable year to year thereafter, will not be transferrable to a third party, but always cashable or convertible back to ingots and returned to the owner by the trustor, if so requested by the latter.

Sumitomo Metal Mining plans to open the service during November through its six branch offices and Sumitomo Trust & Banking's 48 offices throughout Japan.

Last September 11, the Government decided to list gold ingots as the eighth commodity to be traded under Japan's Commodity Exchange Law, effective September 24, paving the way for inauguration of Japan's first officially-recognized gold exchange(s) in Japan before the year-end.

It has also indicated its willingness to permit domestic banking and securities houses to join transactions on the exchange.

CSO: 4120/63

ECONOMIC

BRIEFS

KOMATSU GETS USSR ORDER--Komatsu Ltd. was recently awarded a $160 million (about 36 billion yen) order by the Soviet Union's Machine Import Corporation (Mashinoimport) for many natural gas pipeline laying machines and bulldozers. The export contract is connected with the Soviet Union's so-called Yamburg natural gas pipeline project. Komatsu's sale of pipeline layers and bulldozers to Russia is already promised financing by the government Export-Import Bank of Japan in the form of supplier's credits. [Text] [Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 978, 27 Oct 81 p 7]

AUGUST MACHINERY EXPORTS--The Japan Machinery Exporters Association said that exports of machinery, including automobiles and electric-electronic appliances, in August reached $7,705 million (or 1,810 billion yen) on a customs clearance basis, up 14.0 per cent (or up 19.8 per cent) from a year earlier. Exports of heavy machinery in August rose by 12.8 per cent over the same 1980 month to $4,878 million, while those of light machinery climbed by 16.1 per cent to $2,827 million. Among the notable gainer items of the heavy machinery sector were aircraft and firearms ($12 million, up 79.9 per cent), machining centers ($37 million, up 73.7 per cent), ships ($585 million, up 64.3 per cent), and chemical machines ($138 million, up 59.1 per cent). As for light machinery, exports of scientific instrument, video tape recorders and electro-static duplicators increased by 190.3 per cent, 81.4 per cent and 33.3 per cent to $51 million, $293 million and $115 million, respectively. [Text] [Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 979, 3 Nov 81 p 6]

CSO: 4120/63

SCIENCE AND TECHNOLOGY

U.S. SENATE MOVE CAUSES GOVERNMENT CONCERN

Toyko JAPAN ECONOMIC JOURNAL in English Vol 19 No 981, 17 Nov 81 p 1

[A NIHON KEIZAI SHIMBUN Roundup]

[Text]

The Japanese Government is becoming worried over the recent move of the U.S. Senate to limit imports of Japanese communications equipment and is planning to express strong concern to the U.S. that such a move may violate the General Agreement on Tariffs and Trade (GATT) and the Japan-U.S. Treaty of Commerce and Navigation.

Officials said the Government will soon notify the U.S. Government its anxiety in written form.

Last December, the Government decided to open equipment procurement by Nippon Telegraph & Telephone Public Corp. to free competition — thereby to foreign firms — and signed a bilateral agreement with the U.S. and a government procurement code of the GATT. But despite the bilateral agreement, Japan's surplus on trade of communications equipment with the U.S. has been continuing and totaled ¥80.1 billion during the first eight months of this year, compared with ¥81.6 billion for entire 1980. The U.S. insists that the increase in its deficit is caused by Japan's complicated procurement procedures which make it difficult for U.S. and other foreign firms to get access to the NTT market.

Recently, the U.S. Senate approved a revised telecommunications equipment from any country whose trade barriers have hindered research and development, sale, investment and the market strategy of U.S. firms, even if there is a bilateral reciprocal agreement between the U.S. and the country concerned. Specifically, the bill says the U.S. Federal Communications Commission will either impose special control or reject imports of products of any country which the U.S. Trade Representative said might have hindered exports of U.S. products.

The bill was not specifically aimed at imports from Japan, but the Tokyo Government believes the bill is "a retaliation" against Japan and is likely to be approved by the House of Representatives and made into law since the U.S. Government is backing the bill. If the bill is passed, Japan, it is said, will lose most of the U.S. market which occupies one-third of Japan's total exports of communications equipment because the U.S. import control will cover almost all Japanese equipment, including terminal units, microwave equipment, private-branch exchanges (PBX) and carrier current line systems equipment.

International Trade & Industry Minister Rokusuke Tanaka already has expressed such concern to U.S. Commerce Secretary Malcolm Baldrige, who visited Japan in late October. Government officials said the impact of the bill on the U.S.-Japan trade could be considerable since the U.S., while demanding further opening of Japanese market by asking abolition of non-tariff barriers and others, is trying to take a protectionist measure against Japanese communications equipment. Observers cited as another reason for the government protest the recent failure of Fujitsu Ltd. to be awarded an order by American Telephone and Telegraph, even though the Japanese company made the lowest bid in a tender called by AT&T for optical fiber communications equipment.

CSO: 4120/66

SCIENCE AND TECHNOLOGY

INTERNATIONAL COMPETITION OVER ADVANCED TECHNOLOGY DISCUSSED

Tokyo SHUKAN TOYO KEIZAI in Japanese 19 Sep 81 pp 38-41

[Text] Currently technological development strength in the world is polarized in three regions--Japan, the United States and Europe--and the respective merits and weaknesses of these regions are becoming more conspicuous. One of the deciding factors is the "technological climate." It is believed that commercial warfare with advanced technology playing the axial role is inevitable in the future. Thus, in order to stave off "friction" beforehand, the three poles are rushing to establish trialogues among themselves.

As far as technological development is concerned, this has become an era in which the world is divided into three poles--the United States, Europe (EC--European Community) and Japan. If we exclude the USSR's military technology, these three poles are indeed the modern "engines" of advanced technology.

The proof of this is found in an informal proposal that the United States Trade Representative's Office has made to Japan and the EC to discuss commercial questions involving Japan, the United States and the EC--a call for a "tripolar conference (trialogue)" for a priori prevention of trade frictions. Periodic cabinet-level meetings to confer on preventive measures to avoid trade frictions involving advanced technology have been suggested. The proposed participants are: U.S. Trade Representative (USTR) Brock, MITI Minister Tanaka and EC Vice Chairman Haferkamp. As attested by this move, we have entered an era in which these three polarized regions have exclusive powers in today's technological development competition.

Japan's MITI intends to accept this proposal by the United States and has begun speeding up the consolidation of views with the Ministry of Foreign Affairs and other related agencies. But within the United States, the Defense Department and the Department of Commerce consider this proposal to be "a solo action" by the USTR; and there is strong feeling that prior to tripolar discussion, Japan-U.S. comprehensive trade negotiations should take place. That is to say, U.S. "pragmatism--a move away from tripolar discussions in favor of Japan-U.S. bipolarism--has surfaced.

In any event, the Japanese Government has concluded that a tripolar technological discussion among Japan, the United States and the European Community is indispensable for the future, and through the exchange of ideas with U.S. Trade Representative Block, who arrived in Japan 1 September, it is hastening to lay the foundation for establishing a regular "meeting platform for collaboration."

In the meantime, in Japan itself, the Fifth-Generation Computer Conference involving Japanese, U.S. and European computer professionals will be held in Tokyo in October. Already, leading European and American businesses such as IBM, TI (United States), and Siemens (West Germany) have sought participation, and there is a possibility that this conference will result in political-level discussion above and beyond the discussion of technological developments. This is so because the development of the fifth-generation computer is closely tied to questions of national security and military preparedness.

Inasmuch as the industrial world today revolves around "technology," it would not be an exaggeration to say that advanced technology is beginning to be used as a "trump card" on the international political scene.

"Technological Climate" Constitutes an Important Point

Though we use the term "tripolar," the United States, Japan and the European Community each has its respective specialties and weak spots. Historical background and national traits have something to do with it. The recent technological reformation has tended to be polarized between micro and macro technologies. Thus the "climate" of a given country surfaces as a dominant factor in deciding the technology to be developed in that country.

For example, Japan is strong in tools that can be mass produced, such as cameras, household electric appliances, and semiconductors. The reason for this, as it is frequently pointed out, is closely tied to the Japanese workers' industriousness and superiority. On the other hand, the United States is supreme in the fields of aircraft, space exploration and genetic engineering. This is not unrelated to the American frontier spirit and the adventurousness of its people. The European Community--in particular, West Germany--has traditionally excelled in chemistry and industrial machines. This is tied in with the European maester system and nationalism.

In this fashion, the technological climate that the national character nurtures significantly affects technological development--especially the advanced technologies. In recent years, the distinguishing characteristics are becoming more and more pronounced. Import-export totals of the three polarized areas and the traffic of technicians are indicative of conspicuously distinctive features of these regions.

In considering the direction of Japanese industry in the future, it is important to acknowledge such international differences in technological development. This is becoming an era in which broad-based software--such as a given country's national character and/or daily coenesthesis--are actually determining technological developments.

Then, in concrete terms, what is Japan's technological strength, and where is its weakness? According to a survey conducted by the "Scientific Technology and Economic Association" and the Nomura Comprehensive Research Institute, Japanese technology's strengths and weaknesses may be summarized as follows:

1. Japan has quite strong international competitive strength in steel, ceramics, automobiles, and precision instruments.

2. Japan has acquired the world's top-level technological skill in such advanced technology fields as semiconductors, communications equipment and robotics.

3. Conversely, Japan is technologically somewhat inferior in chemical industry, petroleum-related fields and industrial machines.

4. Japan is quite backward in terms of aircraft, atomic energy-related fields and in the military instruments sector.

That is to say, Japan is extremely strong in improved or applied technology and production processing technology but weak in innovative or traditional industries. These, then, are the contrasting elements in the technological climate of Japan.

Of course, the differences are clearly demonstrated in the research developments which support the technological strengths. A comparison of research development spending by industries in Japan, the United States and the major European nations is presented in Table 1. The emphasis of a given nation and the distinctive characteristics of that nation can be discerned from this chart.

For example, the United States spends a tremendous amount for aviation and space industries. Its total spending in these fields equals the total industrial development spending of all other countries. In the chemical industry sector, West Germany is unquestionably the leader. This is understandable in the light of West German monopoly of three of the biggest chemical firms in the world--Bayer, BASF, Hoechst. For Japan, electric appliances and automotive industries receive surpassingly dominant shares of the development funds.

In this manner, a look at a country's technological development spending ratio will tell us that country's emphasis and its specialty; and the background of that is not unrelated to national character and technological climate.

Steel Technology Is Well Suited to Japanese Character

In the same context, Mr Masaru Ibuka (honorary chairman of the Sony Corporation) commented on the Japanese technological climate in the following words: "The Japanese person does not act out of loyalty to the state; he does what he does with his heart and soul in order to bring profit to the company." "Unless the merchandise has wide public appeal, it cannot constitute a true industry." "The generating force of Japanese 'consumer goods' is competition." "'Cost down' is indeed the great 'innovation'" and so on. (Fall Issue of CHUO KORON on Economic Questions)

These comments are not academic utterings by a scholar or a critic. They were based on his real experience as a businessman, and thus are sterling practical

economic truths. It is the summation of the Japanese technological climate: "Before all else, there is the national character."

An instance of an industry well suited to the Japanese personality is the iron and steel industry. Needless to say, Japan has the top-level iron and steel technology in the world. In recent years especially, it has managed to obtain the most modern facilities, superior work force, high productivity, high yields and cost competitiveness. It far excels its counterparts in the United States and Europe. Japan's technological development potential in this field is the focus of worldwide attention.

The iron and steel industry has a processing breadth which turns iron ore into 80,000 different steel products. In terms of complexity of task, it is foremost among all industries. This complex process production is actually very much suited to the Japanese personality. Masaki Moritani (Nomura Soken--Comprehensive Research Institute) attributes this to the following three factors ("Japan-U.S.-European Community's Technological Development War," TOYO KEIZAI):

First of all, though there is lack of pretentiousness in system fundamentals, the Japanese national character tackles portional improvement of solid technology with enthusiasm. Second, steel plants are quite complex and therefore a high degree of operational technology is needed. Japan is particularly strong in this regard. Third, Japan's strength is in producing 80,000 different products efficiently and supplying them to consumers in a close-textured supply and demand transaction.

Moritani concludes that, "the steel industry is characterized by the complexity of its merchandise categories and processing method and the fact that its development is tied to improving and bettering. Furthermore, superior manpower at the production site is the big decisive factor. On these counts, it is an industry well suited to Japan.

Space and Aviation for the United States, Nuclear Power for Europe

A survey of other Japanese specialty fields--measuring devices, home electric appliances, cameras and watches--all have inevitable features well suited to the Japanese national character. As Mr Ibuka's comments, it is an endowment resulting from Japan's technological climate borne of Japanese respect for "proficiency at one's work place."

Whereas the Japanese salient characteristics are close fellowship among themselves, collective action and exclusiveness, the Americans have a national character of meeting everything in a spirit of challenge. American businesses change dynamically, and expansion and reduction of operational scope are daily occurrences. Genetic technology which has very recently been elevated to stardom is no exception. Venture capital activities are amazing. Americans are enamored of biological technology which can make overnight billionaires.

In recent years, the United States has been particularly enthusiastic about space and aviation technology. The Americans have never shed the spirit of adventurousness which is closely akin to their yearning for gigantic technology. The research and development funds poured into this sector last year were 5.5 trillion

yen--far in excess of Japan's total research and development spending. This macrotechnology requires a vast system. Social mores such as respect for specialization, promotion of division of labor and the prominence given to each contract thoroughly permeate American society. Once a big project is finished, then according to contract, one's services are terminated. This has an indelible imprint on the American technological climate.

In terms of pride, West Germany, France, and England--the EC countries--are just as haughty. West Germany, which lives by the creed of steadfastness, is currently tops in the world in the field of nuclear power generation. France also seeks to be the first in high-speed reactor technology. The European Community as a whole is strong in the nuclear power field. England has traditionally excelled in this sector as well. Each country is staking its own national prestige.

The United States was the world leader in nuclear energy technology originally, but as it was dominated by the military technology and as a result of problems with commercial reactors, at present it is at a low ebb. The success of the EC countries is a result of breaking away from dependence on the United States.

Unlike Japan, which operates on a follow-the-U.S.-lead mode, the EC countries put their faith in independent development. In the EC countries there has traditionally been strong reliance on the technology of one's own country, and in the case of nuclear energy generation, it has brought about exceptional success. European self-confidence is remarkable. The superlative union of their peculiar technological climate and West European rationalism led to the success of the nuclear energy technology. This is a good instance of "self-confidence" and "pride" playing decisive roles in technological development.

Focal Point Is the Competing Japanese and U.S. Semiconductor Industries

What about the current focus--the semiconductor industry. Aside from the military technology related sector, Japan has now grown to equal the United States in this field. Especially in terms of the axial machine types today-- 16 K RAM and super-LSI development--Japan holds its own alongside the United States. The IC is regarded as the industry's staple commodity. Japan's position in the competition is quite solid.

But there is an unfathomable quality about the proficiency of the United States--the true home of semiconductors. In this field, creativity and development capability are crucial, and it is a field that can easily be tied in with the weapons industry. The United States' predominance appears to be unshakable. Moreover, a new business boom backed by venture capital is tailormade for America. The production shares of the major semiconductor manufacturers are shown in Figure 1.

Though the Japanese enterprises are fighting a good battle, the situation may become difficult. It all depends on the United States' future moves. That is to say, the semiconductor industry in the United States is beginning to be reexamined within the context of the munitions industry and is regarded as an important factor in the national policy. As far as Japan is concerned, its only way to survive may be in focusing its attention on medium-range technology centered around civilian demand and to aim for repletion of the peripheral maintenance technology.

Right now, there are no pressing commercial frictions, but trade imbalance between Japan and the EC is becoming noticeable, and there is concern that the trade friction on the European front will flare up again this fall. At present, automobiles, color television sets and machine tools are under supervision. IC, VTR, two-wheeled vehicles, and vessels are about to be targeted for regulation. There is concern that this situation will expand into a full-scale trade war.

With regard to this Japan-Europe situation, a mission composed of Japan's major industrialists (led by Yoshihiro Inayama) will be sent to Europe in October to prevent possible friction. Between the United States and Japan, a series of talks--beginning with the Shimoda session at the beginning of this month, a high administration-level conference in Washington D.C. during the middle of the month, the Japan-U.S. Harmonious International Trade Council and so on--are planned.

In any event, there is no doubt that the outcome of these exchanges will affect the future of Japanese industry. The need for a platform for talks at various levels has never been more important to Japan; and it should take the initiative in these talks. The technological development competition among Japan, the United States and Europe is at a critical point this fall. This is the time for civilian and governmental bodies to work out the counterplans.

(Reporter: Tsuneyoshi Maruyama)

Table 1. Industry Differentiated Research Development Spending Comparison Among the Major States

	(1)	(2)	(3)	(4)	(5)
	日本	アメリカ	イギリス	西ドイツ	フランス
(6)化学	17.6	10.9	16.6	26.3	15.1
(7)石油・石炭	1.1	3.0	1.4	—	2.8
(8)窯業	2.5	1.0	1.3	0.6	1.5
(9)鉄鋼	4.7	0.9	2.1	1.4	1.2
(10)機械	7.0	13.2	5.5	11.7	3.6
(11)電機	25.3	19.8	23.6	25.2	27.7
(12)自動車	14.5	11.0	6.6	11.1	11.3
(13)精密	3.0	4.7	1.6	2.0	1.3
(14)航空・宇宙	—	23.6	21.8	9.0	18.3

(15)(出所)『科学技術便覧』

Key:

1. Japan
2. United States
3. Great Britain
4. West Germany
5. France
6. Chemical
7. Petroleum/Coal
8. Ceramics
9. Iron/Steel
10. Machinery
11. Electric Appliance
12. Automobile
13. Precision
14. Aviation/Space
15. (Source) SCIENTIFIC TECHNOLOGY MANUAL

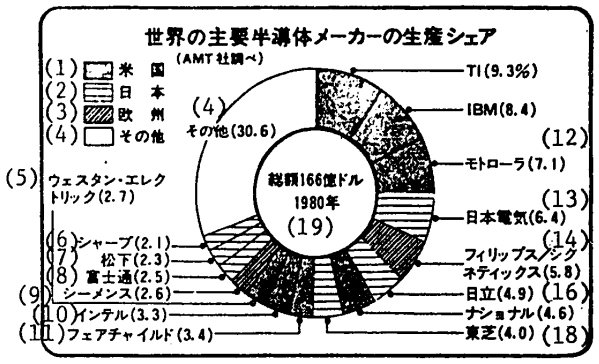


Figure 1. Production Shares of World's Major Semiconductor Manufacturers (AMT Corporation Survey)

Key:

1. United States
2. Japan
3. Europe
4. Other
5. Western Electric
6. Sharpe
7. Matsushita
8. Fujitsu
9. Siemens
10. Intel
11. Fairchild
12. Motorola
13. Japan Electric
14. Phillips
15. Signetics
16. Hitachi
17. National
18. Toshiba
19. Total Amount: 16.6 billion dollars 1980

11460
CSO: 4106/13

SCIENCE AND TECHNOLOGY

AUTO INDUSTRY MUST PREPARE FOR STRONG COMPETITION

Tokyo BUSINESS JAPAN in English Vol 26 No 10, Oct 81 pp 57-60, 63-64, 67-70

[Article by Yoshio Sakurai, Executive Director and Secretary-General, Japan Automobile Manufacturers' Association]

[Text]

THE Japanese automobile industry has achieved rapid growth following World War II. As is generally known, this industry occupies a very important position in the Japanese economy because (1) the amount of production is large (more than 10% of all manufacturing industries) and its influence on related industries is extensive, (2) it contributes greatly to exports (more than 20% of total Japanese exports), and (3) it absorbs a large labor force (a little over 10% of the people employed in all industries).

On the international scene, Japan has been the top automobile supplier in the world since 1974. In 1980, Japanese automobile production exceeded 11 million units, and Japan now ranks first in automobile production, as the U.S. automobile industry has receded. The trends of the Japanese automobile industry in the 1980s will continue to attract attention particularly in the international context.

This article will outline the prospects and problems of the Japanese automobile industry based on conditions today.

Prospects for the 1980s

As the world approached the 1980s, interest was focused on all aspects of the Japanese automobile industry.

The domestic automobile market in 1980 entered a mature stage as expected, and, affected by business stagnation, moved sluggishly. Domestic car sales totaled 5,010,000 units, registering a decrease of 2.7% from the preceding year. Details are as follows:

The advantages of light automobiles as energy savers became more apparent, and the sales of light passenger cars increased by 2.2%. Light truck sales grew sharply by 22.3% over the previous year. On the other hand, sales of general passenger cars decreased by 6.5%, ordinary trucks by 16.8%, and small trucks by 6.3% from the year before.

Although the export climate was unfavorable with worldwide business stagnation and trade friction, as the world car market rapidly moved toward small cars of low fuel consumption, demand for Japanese cars which are highly efficient in fuel consumption and seldom develop trouble continued to grow. Car exports in 1980 totaled 5,960,000 units or US$24,900 million, a steep increase of 30.8% over the previous year. (In addition, 438,000 knock-down units were exported, registering an increase of 9% over the previous year.)

Table 1. Evaluation of 1978 Model Cars by Owners

	U.S cars		Imported cars		Japanese cars	
	%		%		%	
Very much superior to average cars	0	0	20	50	15	68
Superior to average cars	10	11	15	38	7	32
Average quality	47	51	3	8	0	0
Below average	20	22	1	2	0	0
Very much below average	15	16	1	2	0	0
Total	92	100	40	100	22	100

Source: Consumer Report, April 1980

By destination, exports to North America, the main overseas market for Japanese automobiles and accounting for a 43.4% share of Japanese car exports, increased by 20.8% over the year before; Europe, the second largest export market accounting for a 20.6% share, an increase of 28.2%; Southeast Asia, the third with a 9.7% share, an increase of 46.7%; the Middle East, the fourth with a 9.1% share, an increase of 39.5%; Latin America, the fifth with a 6.4% share, an increase of 84.9%; Africa, the sixth with a 5.4% share, an increase of 37.9%; and Oceania, the seventh with a 5.3% share, an increase of 36.3%. The trend was favorable in all markets.

Production Changes

In 1980, with the exception of Japan, the world's automobile industries were inactive, mainly because of inflation, business recession and high

Automobile Statistics For Major Countries in 1980

Four-wheeled cars

		Japan			U.S.			West Germany		
		Passenger cars	Trucks & bus	Total	Passenger cars	Trucks & bus	Total	Passenger cars	Trucks & bus	Total
Production	1980	7,038	4,005	11,043	6,375	1,633	8,008	3,521	378	3,879
	1979	6,176	3,460	9,636	8,434	3,047	11,481	3,933	317	4,250
	'80/'79 (%)	114.0	115.8	114.6	75.6	53.6	69.8	89.5	119.2	91.3
Domestic sales	1980	2,854	2,161	5,015	8,977	2,487	11,464	2,426	177	2,603
	1979	3,037	2,117	5,154	10,660	3,480	14,140	2,624	170	2,794
	'80/'79 (%)	94.0	102.1	97.3	84.2	71.5	81.1	92.5	104.1	93.2
Exports	1980	3,947	2,020	5,967	560			1,873	211	2,084
	1979	3,102	1,461	4,563	741	296	1,037	1,997	178	2,175
	'80/'79 (%)	127.2	138.3	130.8	75.6			93.8	118.5	95.8
Ownership	1979	22,667	13,564	36,231	120,485	33,927	154,412	22,614	1,548	24,162
Diffusion rate (Population/ number of cars owned)		5.1		3.2	1.8		1.4	2.7		2.9

interest rates caused by the sharp rise in crude oil prices. Consequently the demand for automobiles dipped sharply. In the United States, automobile production decreased by more than 30% from the year before to 8 million. The U.S. car industry was compelled to lay off more than 200,000 employees. The Big Three all ran up deficits: GM $800 million, Ford $1,600 million and Chrysler $1,700 million. Of these, Chrysler was reported to be in serious difficulty.

In Europe, too, economic conditions were unfavorable, and automobile production decreased by nearly 10% from the year before: West Germany 3,870,000 units, down by 8.7% from the year before, France 3,380,000 units, down by 6.7%, Great Britain 1,310,000 units, down by 11.2%, and Italy 1,610,000 units, down by 1.2% from the previous year. It was reported that 11,000 employees in automobile industries such as Ford and Opel were laid off in West Germany, 8,000 employees at Peugeot and Citroën in France, 52,000 employees at BL and others in Great Britain and 25,000 employees at Fiat in Italy.

As mentioned before, Japanese automobile production was supported by favorable growth in exports and totaled 11,040,000 units, registering an increase of 14.6% over the preceding year. Of this figure, passenger cars accounted for 703,000 units, up 14% from the preceding year; trucks 3,910,000 units, up 15%; and buses 910,000 units, up 46%. Thus Japan outstripped the United States in automobile production and ranks as the top car producer of the world, accounting for a 28% share of the total world automobile production.

As the Japanese automobile industry prospered in inverse proportion to the slump in other major car producing countries of the world, the danger of an international economic issue developing into a political issue became apparent. Criticism of Japan by other countries began increasing.

In the United States, the United Automobile Workers (UAW) and Ford Motor Company appealed to the International Trade Commission (ITC),

Unit: 1,000 cars

France			U.K.			Italy		
Passenger cars	Trucks & bus	Total	Passenger cars	Trucks & bus	Total	Passenger cars	Trucks & bus	Total
2,939	440	3,379	924	389	1,313	1,445	167	1,612
3,220	396	3,616	1,070	408	1,478	1,481	151	1,632
91.3	111.1	93.4	86.4	95.3	88.8	97.6	110.6	98.8
1,873	296	2,046	1,514	272	1,786	1,717		
1,976	290	2,118	1,716	306	2,022	1,355		
94.8	102.1	96.6	88.2	88.7	88.3	126.7		
1,530	178	1,708	450*	112*	462*	511	80	591
1,698	162	1,860	389*	132*	521*	647	78	725
90.1	109.9	91.8	115.7	84.8	88.7	79.0	102.6	81.5
18,440	2,550	20,990	14,926	1,933	16,859	17,110	1,250	18,360
2.9		2.5	3.7		3.3	3.3		3.1

seeking import control on Japanese cars on the grounds that the automobile industry slump in the United States was caused by a sharp increase in imports of Japanese cars. Opposing this, the Japanese automobile industry maintained that the real causes of the slump in U.S. automobile industry were business recession in the United States, a sudden shift of demand to small cars, and the delay by U.S. auto manufacturers to cope with this situation. The claims of the Japanese automobile industry were considered valid and the ITC delivered judgment on November 10, 1980, ruling that no damage was done by Japan, to the relief of Japanese industry. However, various moves have been made by parties dissatisfied with this ruling to impose controls over Japanese cars.

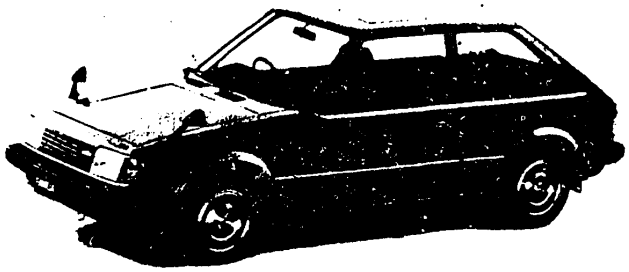
On the other hand, the Japanese have taken constructive countermeasures deserving special mention such as sending a government-private joint mission to the United States to promote purchase of automobile parts from the United States.

As regards relations with the European automobile industry, in addition to the Japanese-British talks on January 29 and 30 in Acapulco and on September 9 and 10 in Tokyo, a conference with the CCMC, an association of manufacturers with national capital in the European Community, was held in Tokyo on November 18 and 19. It is to the credit of both parties that they exchanged their views on the present state of automobile industry and its future prospects, determined that both the Japanese and the Europeans would make efforts to solve the problems lying between them.

Immediate Outlook

The outlook for the Japanese automobile industry for 1981 probably depends on economic developments in Japan and in the world, particularly in the United States.

According to the prospects for economic developments in 1981 reported by the Economic Policy Committee of the OECD in late November 1980, in the 24 member countries as a whole, as the second oil crisis after the revolution in Iran has been overcome more smoothly than the first oil crisis, inflation has passed its critical stage and prices will begin to stabilize in 1981. However, the business slowdown will last into the first half of 1981, the economic growth rate will remain at about 1%, and unemployment will increase. It is forecast that the annual inflation rate in 1981 will be held



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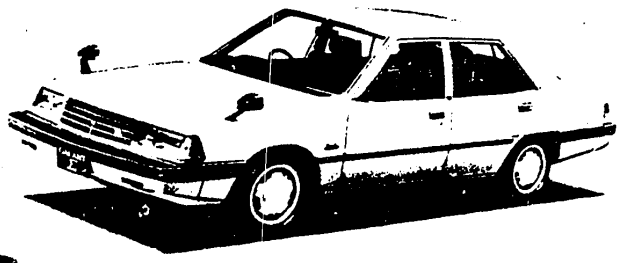

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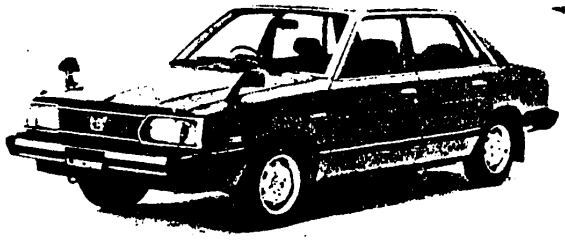


SUBARU NEW LEONE

down to 9%-9.5%, a lower rate than the 12.6% in 1980. The economic growth rate will turn upward to 2.5% in the latter half of 1981, but, for 1981 as a whole, it will remain 1%. As this growth rate is lower than the 1.2% registered for 1980, the economic climate will be rigorous and unemployed will increase by 1 million.

Economic Development in Japan

In Japan, as the wage increase rate won by the spring labor offensive exceeded that of the year before, and the rise of consumer prices decelerated, it is expected that real income will increase and consumption will gradually take an upward turn.

As mentioned before, the world economy will also recover in the latter half of this year. And, will recovery of domestic business conditions, exports and investment in plant equipment will expand gradually along with corporate earnings.

However, as business in fiscal 1981 is still in the phase of adjustment after the second oil crisis, the forecast says, it is inevitable that the actual growth rate will be lower than the expected growth rate at the level of 5% and 5.5% growth estimated in the seven-year program of the new economic society.

Under these circumstances, domestic demand is expected to level off or increase very slightly. The reasons are: (1) The commodity tax on passenger cars has been raised by 2.4% since May 1, and a commodity tax of 10% will be newly imposed on light vans (5% in the case of small-displacement models) from October 1, 1981. (2) Interest rates for installment buying are still at a high level. (3) As domestic demand for automobiles is now stabilized, a large growth in demand cannot be expected for the time being.

In 1980, automobile exports from Japan showed an increase of 30% from the year before. This was mainly because of the advantages of Japanese cars in performance including high fuel-efficiency and trouble-free operation. In 1981, however, it is predicted that the export environment will be more severe, and business conditions throughout the world will show little growth. For these and other reasons, any large growth in exports cannot be expected.

Especially as regards exports to the United States, the largest overseas mar-

Domestic Demand for Automobiles (Four-wheeled cars)

Years	Passenger cars				Trucks				Buses			Grand Total
	Ordinary cars	Small four-wheelers	Light four-wheelers	Total	Ordinary cars	Small four-wheelers	Light four-wheelers	Total	Large models	Small models	Total	
Jan.–Dec., 1980 (A)	71,931	2,608,215	174,039	2,854,185	154,472	1,144,167	839,279	2,137,918	9,414	13,973	23,387	5,015,490
Jan.–Dec., 1979 (B)	84,721	2,781,889	170,263	3,036,873	185,732	1,220,668	686,494	2,092,894	9,589	14,396	23,985	5,153,752
(A)/(B) (%)	84.9	93.8	102.2	94.0	83.2	93.7	122.3	102.2	98.2	97.1	97.5	97.3

Automobile Production (Four-wheeled cars)

Years	Passenger cars				Trucks				Buses			Grand Total
	Ordinary cars	Small four-wheelers	Light four-wheelers	Total	Ordinary cars	Small four-wheelers	Light four-wheelers	Total	Large models	Small models	Total	
Jan.–Dec., 1980 (A)	403,338	6,438,847	195,923	7,038,108	885,198	2,113,311	914,679	3,913,188	16,470	75,118	91,588	11,042,884
Jan.–Dec., 1979 (B)	412,556	5,588,115	175,100	6,175,771	770,756	1,892,696	733,762	3,397,214	15,550	47,011	62,561	9,635,546
(A)/(B) (%)	97.8	115.2	111.9	114.0	114.8	111.7	124.7	115.2	105.9	159.8	146.4	114.6

Automobile Exports (Four-wheeled cars)

Years	Passenger cars			Trucks				Buses			Grand Total	Amount (in $1,000)
	Ordinary cars Small four-wheelers	Light four-wheelers	Total	Ordinary cars	Small four-wheelers	Light four-wheelers	Total	Large models	Small models	Total		
Jan.–Dec., 1980 (A)	3,926,036	21,124	3,947,160	332,257	1,548,251	73,177	1,953,685	7,616	58,500	66,116	5,966,961	24,867,634
Jan.–Dec., 1979 (B)	3,090,300	11,690	3,101,990	275,897	1,107,420	40,613	1,423,930	6,083	30,778	36,861	4,562,781	18,336,585
(A)/(B) (%)	127.0	180.7	127.2	120.4	139.8	180.2	137.2	125.2	190.1	179.4	130.8	135.6

ket for Japanese cars accounting for about 40% of the total car exports from Japan, the situation does not warrant optimism because there are a number of factors causing anxiety: (1) As the yen's exchange value against the dollar has tended to rise since the latter half of 1980, prices of Japanese cars became higher and their price competitiveness weakened. (2) The Big Three American automakers began to branch out into the small car market. GM with its J-car line, FF 1800cc-2000cc, in addition to X2800 cars; Ford with its Erica models, FF 2300cc and 1600cc, in addition to Escort FF 1600cc; and Chrysler with its K cars, FF 2200cc and 2600cc. (3) Since the beginning of 1981, the Japanese automobile industry has watched carefully the developments of U.S. government policy represented by a task force led by Secretary of Transportation Drew Lewis to aid the American automobile industry, and the outcome of 11 bills presented in the U.S. Congress to control imports of Japanese cars. Recently, the matter was settled politically, as the Japanese government agreed to have its automakers limit shipments to the United States voluntarily for three years till 1983 contrary to the wish of the Japanese auto industry. According to this program, shipments of Japanese passenger cars to the United States in 1981 will total 1,680,000, down 7% from the 1,820,000 in 1980.

The situation in the European market which accounts for 20.6% of Japanese car exports is also grave. While demand for automobiles in general dipped because of the recession since the beginning of 1980, in the free market such as West Germany Benelux, the share of Japanese cars increased, eating into sales of French and Italian cars. This provoked even louder criticism against Japan.

Deficits in the EC countries' balance of payments with Japan have grown year after year. In 1980, exports from Japan to EC totaled $16,000 million, an increase of 31.3% over the year before, while imports from EC to Japan remained at $7,800 million, up only 3.3% from the previous year. Thus Japan's excess of exports swelled to $8,800 million.

The EC Foreign Ministers Council decided on February 17, 1981, to introduce a surveillance system to watch imports of passenger cars, color television sets, color TV picture tubes and some machine tools. The EC commission explained that the purpose of this system is not to limit trade but to obtain statistical data on the import of these items promptly. However, some people voiced their fear that there is a possibility of this system leading to protectionism.

In EC countries there are loud cries for some measures to settle the automobile problem similar to the political arrangement between Japan and the United States. Rupture of the negotiations between JAMA and CCMC which took place in Paris on May 15 and 16, 1981, demonstrates these views.

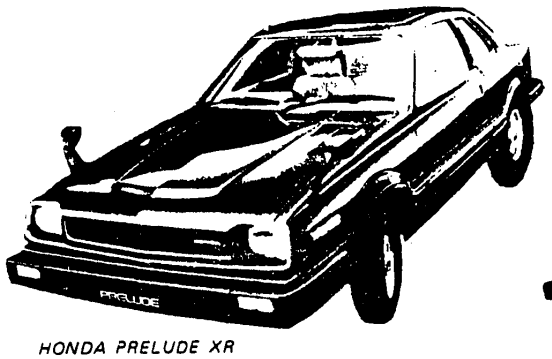
With the two major markets for Japanese cars being influenced by such factors, it will be difficult to increase exports to these areas. It is considered desirable for the Japanese to export automobiles to these areas with moderation.

The situation in other overseas markets is as follows: In the Middle East, it is expected that exports to Saudi Arabia, a large market, will slow, and shipments to Iraq will decrease a little because of the Iran-Iraq dispute. In Southeast Aisa business conditions on the whole are turning for the better, and exports to this area are expected to increase. Major countries of Latin America are expected to relax trade restrictions. Exports to Africa on the whole will level off or increase slightly. In Oceania, there is a growing tendency to switch over to smaller cars, and demand for Japanese cars will increase.

Exports to the world market as a whole, therefore, are expected to level off or increase slightly.

Worldwide Demand for Automobiles

According to the forecasts by Bradycast and Eurofinance, the total demand for automobiles throughout the world will increase from 42 million units in 1979 to 50 million in 1985 and 60 million in 1990. The annual growth rate will be 3% in the next 10 years as compared with 4% for the past 10 years. By regional groups, the annual average growth rate in the next 10 years in the industrialized countries such as the U.S., West Germany and Japan will be 1.4%, and in other regions including the U.S.S.R. and East European countries, 7.2%. It is essential for the Japanese automobile industry in the future to seek cooperation with other countries in the markets of industrialized nations of the West as well as to make efforts to secure markets in other regions. As of 1979, Japanese cars accounted for a 12.9% share of the industrialized countries' market and a 30.3% share of the developing nations' market.



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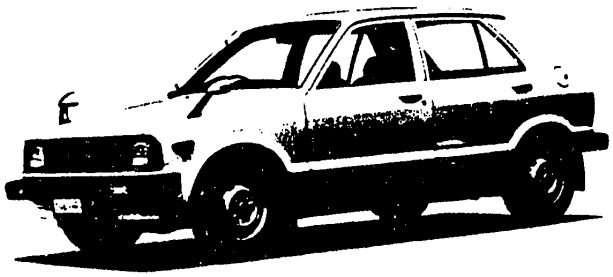

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Automobile Exports in the Last Year (Four-wheeled cars, by region)

Destination	Passenger cars			Trucks				Buses			Grand Total (A)	Component ratio (%)
	Ordinary cars Small four-wheelers	Light four-wheelers	Total	Ordinary cars	Small four-wheelers	Light four-wheelers	Total	Large models	Small models	Total		
Southeast Asia	231,648	1,896	233,544	65,657	242,057	29,943	337,657	5,583	4,332	9,915	581,116	9.7
Middle East	241,319	133	241,452	66,608	221,637	1,766	290,011	729	10,763	11,492	542,955	9.1
Africa	84,907	133	85,040	36,790	163,063	1,934	201,787	620	34,882	35,502	322,329	5.4
Europe	1,001,502	6,030	1,007,532	21,049	187,130	9,959	218,138	28	1,256	1,284	1,226,954	20.6
North America	1,977,466	1	1,977,467	78,093	536,928	87	615,108	2	0	2	2,592,577	43.4
Latin America	199,192	12,806	211,998	36,251	103,544	25,912	165,707	421	4,105	4,526	382,231	6.4
Oceania	189,736	125	189,861	26,569	93,653	3,564	123,786	233	2,985	3,218	316,865	5.3
Others (International Organization etc.)	266	0	266	1,240	239	12	1,491	0	177	177	1,934	0.1
Total	3,926,036	21,124	3,947,160	332,257	1,548,251	73,177	1,953,685	7,616	58,500	66,116	5,966,961	100.0

Automobile Ownership

Years	Four-wheeled cars				Three-wheelers	Motorcycles		
	Passenger cars	Trucks	Buses	Total		125 cc and under	126 cc and over	Total
End Nov., 1980 (A)	23,541,795	13,906,762	230,266	37,678,823	17,952	*11,727,000	1,000,706	12,727,706
End Nov., 1979 (B)	22,523,986	13,286,077	229,266	36,039,329	25,347	*10,749,000	875,091	11,624,091
(A)/(B) (%)	104.5	104.7	100.4	104.5	70.8	109.1	114.4	109.5

Note: 1. Trucks include special motor vehicles and large special motor vehicles. Three-wheelers include special motor vehicles.
2. Figures marked with * are estimates

In the past, there was a tacit division of work among car producing countries in such a way that large cars were mainly produced by the United States, efficient high-speed cars by European countries and fuel-efficient cars by Japan. In the future, however, the fundamental requirement for car design will be improvement in fuel efficiency, and the main emphasis throughout the world will be production of small cars.

The American Big Three are expected to make an enormous investment of $78,000 million in developing small cars by 1985. Multinational corporations such as GM and Ford are carrying forward a so-called "world car" concept. That is, to produce cars and parts designed at the headquarters in a country where cost is the lowest and which, considering its technological level, is most suitable for the production. How to compete with the cars produced in this way will be a problem for the Japanese automobile industry. GM plans to invest $40,000 million during the early part of the 1980s, of which $8,000 million will be spent abroad. Moreover, this corporation is said to be constructing new and well-equipped factories, two in Michigan, one in the suburbs of St. Louis, Missouri, and in other states among them Oklahoma, Texas, Louisiana, Kentucky and California. Outside the country, it has already begun to construct a large assembly plant and related facilities in Spain, and a factory to build engines and transmission gears in Austria. It also plans to make additional investments in several other countires.

It is expected that by 1985 the FF design (front-engine front-drive) will be adopted in 95% of the cars to be produced. Such cars are lighter, save more fuel, and afford greater passenger

space. In May 1981, the J car (FF, 30 mpg) was put on sale. The T car (front-engine, rear-drive in 1982, FF from 1984 onward), and the S car (FF, 50 mps, in 1984) are expected to follow.

In Europe, to cope with the Big Three, automakers have begun to make large investments. In France, Renault invested $7,500 million, and in Italy, Fiat invested $6,500 million. Besides, BL in Great Britain, and Benz, VW and BMW in West Germany are also said to be constructing new facilities or enlarging existing ones.

It is mainly to cope with the advance of Japanese cars that the European automakers are expanding their facilities.

Equipment investment by Japanese automakers in the three years from 1980 is estimated at $23,000 million, 80% of which will be spent on development of new models, replacement of equipment to switch over to FF cars, and other purposes related to plant rationalization.

In any event, large equipment investment mainly on small cars will continue to the middle of the 1980s in major automobile producing countries of the world, and fierce competition is expected to arise.

International Competitiveness of Japanese Cars

As U.S. automakers are expected to be fully equipped with new and advanced facilities for production of small cars by 1985, and as they are also beginning to adopt the QC circle method for quality control, their equipment efficiency and productivity will be improved in time. In adition, the Reagan administration reportedly will tackle the problem of correcting the wage level of automobile workers which is said to be higher by 50% or 60% than the average wage level of U.S. workers. Gradually, problems will be rectified.

Putting all these together, we may suppose that the price competitiveness of U.S. cars will equal that of Japanese cars in a few years' time.

Not only production costs but also foreign exchange rates greatly affect price competitiveness. Therefore, it is necessary to watch carefully rate fluctuation figures. Automakers which, like GM, operate internationally, producing cars at low cost in various parts of the world, will see the result very soon.

In the field of small-car production, manufacturing techniques of Japanese industry are preeminent, and the ability to develop technology has overtaken that of European and American industries. In exhaust emission control devices Japanese technology takes a good lead, although the environmental demands of one country differ from those of another.

In fuel efficiency, Japanese passenger cars on the average already match the EPA Standard for 1985, 27.5 mpg or 11.5 km/l. Japanese cars are, therefore, in an advantageous position in fuel efficiency. However, the mileage of the J car which GM started selling in 1981 is 30 mpg (12.6 km/l), and that of the S car which is expected to appear on the market in 1984 will be 50 mpg (21 km/l). Japanese manufacturers cannot slacken their efforts.

Mileage Test
by the U.S. Environmental
Protection Agency (EPA)
'81 model cars

Japanese 8.5km/l	16.6 km/l
U.S. 6.4 km/l	12.7 km/l
European 6.8 km/l	11.9 km/l

As far as steel is concerned, the Japanese industry has an advantage, for Japanese-made steel is of very high quality. In the future, however, it will be necessary to make cars still lighter as a way of improving fuel efficiency. Special steel, nonferrous metals such as aluminum and synthetic resins will be required as materials. Therefore, how to develop new materials in cooperation with related industries has become a matter of urgent necessity.

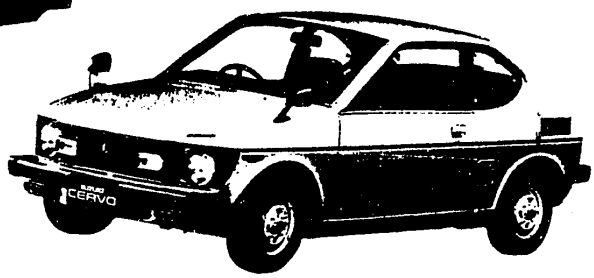
As far as competitiveness in the supply of parts is concerned, the products of Japanese automobile parts manufacturers are excellent in respect to quality, prices and delivery. Moreover, there is a mutually cooperative relationship between parts manufacturers and assembly companies. For example, parts makers develop new products at the request of assembly plants. Such relationships are unheard of in foreign countries. Thus, Japanese automakers are in a decisively advantageous position compared to their counterparts in Europe and America which have to develop and manufacture parts independently.

Prospects for internationalization must also be considered. There is a cry for opening markets to the world, and for promoting actively the internationalization of the automobile industry during the 1980s.

Generally, automobile producing countries import foreign cars in fairly large quantities, and international exchanges in their automobile markets are quite active. The dependence of various countries on foreign cars is roughly 25% for the U.S., 45.5% for the U.K., 22% for France, 22% for West Germany, and 35% for Italy. The share of foreign cars in the Japanese market is a little under 1%, with annual sales totaling 45,000 units. Japan is loudly censured for its restricted import of foreign cars due to non-tariff barriers. The fact is, however, the Japanese market is now open. This should be publicized more widely. As domestic demand is expected to grow to some extent, it will be necessary to open the increased portion of demand to foreign cars. It will be possible to open the market up to at least 5% of the total sales. That would improve Japan's position in other countries' markets. We hope the Japanese government will take adequate measures such as simplification of import certification procedures and that importers and foreign manufacturers will be more active in developing the Japanese market.

As regards internationalization of the automobile industry the Japanese are fairly advanced in international

ISUZU GEMINI GOLD DIESEL SEDAN

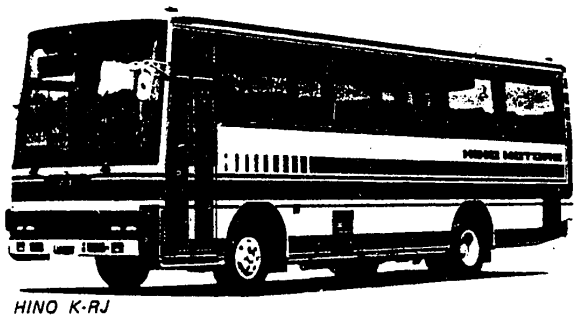


SUZUKI CERVO

operations through investment abroad to expand sales, and committing production of parts and assembly to developing countries. However, in trade relations with industrialized nations, if the Japanese successfully extend the market resorting only to market mechanism, while most of the industrialized countries are suffering from a high degree of unemployment and deficits in international balance of payments, trade friction will become greater.

It is said that now is the time for the Japanese automakers to wrestle with the problem of internationalization actively in such ways as local procurement of parts, production of Japanese cars in foreign countries and tie-ups with local manufacturers in parallel with exports of finished cars.

A question is raised as to whether the Japanese automakers can produce cars of the same quality abroad as in Japan. However, differences in quality of labor can be coped with by automation of major processes. The question is rather in local procurement of parts, in respect to quality, prices and delivery dates of the products. It will be considered desirable that related Japanese parts manufacturers also advance into foreign countries together with assembly companies.



HINO K-RJ

The Japanese automobile industry has already begun international operations. (1) Honda Motor Company is constructing a factory in Ohio to produce 12,000 small passenger cars annually, and has contracted with BL (U.K.) to grant license for manufacture of its small passenger cars. (2) Nissan Motor Company is constructing a factory for small trucks in Tennessee and has announced its intention to produce small passenger cars in the U.K. This company also has tied up with VW (West Germany), and as a part of this tie-up, is examining possibilities of cooperation with VW in the latter's production in Japan as a variation of increasing the number of imported cars. Nissan also is considering joint production with Alfa-Romeo (Italy). (3) Toyota Motor Company is examining joint production with Ford in the United States.

In this way, Japanese automakers have disclosed their global strategy, and their policy for international cooperation is attracting attention.

Uncertainties Influence Future

The 1980s will be an age of uncertainty in various respects including the oil problems. At this point of time, the Japanese automobile industry can be said to stand in an internationally advantageous position. However, GM and Ford, although they suffer from deficits at present because of the delay in switching over to small cars, are supposed to start mass production of high-performance small cars soon. If the Japanese industry should be off its guard, the premier position it has won will be snatched back in no time.

Therefore, it is required of the Japanese industry to make efforts to develop cars of high quality and performance that can stand up well to foreign competitors, while working for harmony with other countries.

Continuing into the 1980s, much will be expected of the Japanese automobile industry from the viewpoint of national economy. Heavy responsibility hangs over the people engaged in the automobile industry. It is our earnest wish that the Japanese automobile industry will grow at a steady pace. □

CSO: 4120/65

SCIENCE AND TECHNOLOGY

AUTO INDUSTRY ADAPTATION TO INTERNATIONAL REQUIREMENTS

Tokyo BUSINESS JAPAN in English Vol 26 No 10, Oct 81 pp 72-77

[Article by Yoshihiro Ohkawara, Business Manager, Japan Auto Parts Industry Association]

[Text]

JAPAN'S auto industry was preoccupied in the first half of 1981 with finding a remedy for various complications arising from the Japanese-American auto problem.

The Japanese-American auto problem emerged in the spring of 1980, when the American auto industry sought Japan's cooperation to bolster the American automakers ailing under recession. Japanese auto industry promised cooperation and took various steps.

This problem covers numerous aspects. But essentially it demands the establishment of Japanese automakers on the American soil (for the production of cars and auto parts) as well as expanded imports of American-made auto parts by Japan.

Japan cooperated in the following ways: The automakers dispatched an auto parts buying mission to the U.S., while the auto parts industry dispatched a mission to America to study the possibilities for parts production there.

Furthermore, Japan abolished the import duty on foreign cars and auto parts. Imported cars are placed in a more favorable position than domestic cars as regards anti-pollution requirements. Everything has thus been liberalized as far as imports are concerned. Nevertheless, a speedy improvement of the situation is not in sight in spite of all these efforts.

The United States, on the other hand, has succeeded in restricting the import of Japanese-made passenger cars to 1,860,000 units in 1981 with the "voluntary" cooperation of Japanese automakers (with the possibility that the import restrictions may be extended for several years if necessary). America's import tariff for cabless trucks has been raised from 4% to 25%. All these steps can seriously affect Japan's auto industry.

These decisions were made in May 1981. They have a complicated background involving the Japanese government and the auto industry. At any rate, they pose a menacing problem to the auto and the auto parts industries in Japan. It was the most significant event for them in the first half of 1981.

In spite of these adverse factors, the output of passenger cars in the January-June period of 1981 stood at 3,550,000 units, up 2.2% over the same period a year before. Trucks, with 2,030,000 units, rose 4.3%. Buses with 60,000 units rose 40%. The combined output of all automobiles, 5,640,000 units, rose 3.3% over the same period in 1980.

Exports of passenger cars with 2,130,000 units rose 7.9%. Trucks with 1,020,000 rose 9.7% and buses with 48,000 rose 70%. Combined exports of all cars in the first half of 1981 rose 9.1% over the same period a year before. However, the domestic market stagnated.

Japanese cars have already acquired a stable international reputation because of their excellent performance, economy (few incidences of mechanical troubles and outstanding fuel performance) and construction. Future efforts should be directed at local production in importing countries and the export of technological expertise rather than exports of finished cars and parts.

There were numerous indications showing this trend in the first half of 1981. The recent Ford-Isuzu-Suzuki tie-up is a typical example. This may be termed an international division of technology. Apparently the time has come for the auto industry to develop new models with the joint cooperation of industrially advanced countries, as is already practiced in aircraft production.

Table 1. Output of Auto Parts (Machine Statistics)

(Unit: ¥100 million)

	1979	1980	1981	81/80
November	1457	1717	1907	111%
December	1394	1654	1875	113%
Total	2851	3371	3782	112%
January	1287	1555	1755	113%
February	1312	1678	1760	105%
March	1414	1781	1861	105%
April	1432	1814	1957	108%
May	1461	1797	1846	103%
Total	6906	8625	9179	106%

Table 2. Exports of Auto Parts by Month

(Unit: $1 million)

	1980	1981	81/80
November	259	340	131%
December	287	417	145%
Total	546	757	139%
January	204	292	143%
February	277	380	137%
March	278	388	140%
April	272	392	144%
March	298	364	122%
Total	1,329	1,816	137%

Table 3. Exports of Auto Parts by Region

(Unit: $1 million) (Nov.–Dec. 1979, Nov.–Dec. 1980, Jan.–May 1980, Jan.–May 1981)

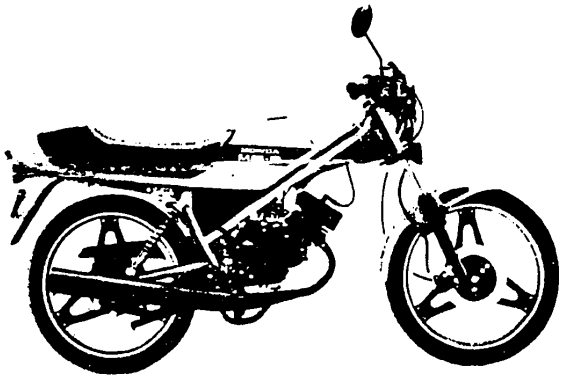
	Nov.–Dec. 1979	Nov.–Dec. 1980	Jan.–May 1980	Jan.–May 1981	Share	81/80
North America	149	195	356	433	23.8%	122%
Western Europe	63	82	148	214	11.8%	145%
East Asia	62	62	131	176	9.7%	134%
Southeast Asia	86	124	210	294	16.2%	140%
Middle & Near East	54	77	153	167	9.2%	109%
Africa	48	99	131	220	12.1%	168%
Central America	30	37	61	98	5.4%	161%
South America	15	25	37	63	3.5%	170%
Oceania	32	41	73	101	5.5%	138%
Communist Bloc	8	15	29	51	2.8%	176%
Total	547	757	1,329	1,817	100%	137%

Table 4. Output of Four-Wheeled Vehicles by Type (Jan.–June 1981)

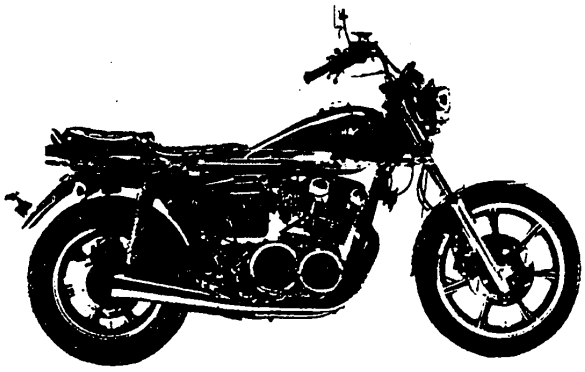
	Passenger cars	Trucks	Buses	Total
Ordinary cars	214,991	457,867	8,874	681,732
Small cars	3,237,244	1,032,588	51,963	4,321,795
Light cars	100,159	538,938		639,097
Total	3,552,394	2,029,393	60,837	5,642,624
Compared to same period of 1980	102.2%	104.3%	140.5%	103.3%

Table 5. Exports of Four-Wheeled Vehicles by Type (Jan.–June 1981)

Type	Units exported	Share	Growth rate (over same period of 1980)
Passenger cars	2,127,909	66.6%	107.9
Trucks	1,019,166	31.9%	109.7
Buses	48,748	1.5%	170.5
Total	3,195,823	100%	109.1



HONDA MB-5



YAMAHA XS750 Special

Table 6. Exports of Four-Wheeled Vehicles by Region
(Jan.–June 1981)

Region	Units exported	Share (%)
Southeast Asia	321,892	10.1
Middle & Near East	226,159	7.1
Europe	687,632	21.5
North America	1,305,665	40.9
Central America	74,781	2.3
South America	144,725	4.5
Africa	244,494	7.7
Oceania	185,801	5.8
Others	4,674	0.1
Total	3,195,823	100.0

Table 7. Exports of Two-Wheelers (Jan.–June 1981)

Type	Units exported	Share (%)	Growth rate (over same period of 1980)
Below 50 cc	279,777	12.3	104.4%
51~125 cc	1,142,773	50.1	129.7
126~250 cc	243,300	10.7	103.6
Above 250 cc	614,289	26.9	126.0
Total	2,280,139	100%	120.7

Car Production

The output of 4-wheeled vehicles in the January - June period of 1981 stood at 5,640,000 units or 5,900,000 if 260,000 knockdown sets are included.

As regards small four-wheeled passenger cars, the outputs by Toyota (–1.2%) and Nissan (–6.6%) failed to attain last year's level by a slight margin. Toyo Kogyo (+21.5%), Isuzu (+23.3%) and Suzuki (+59.7%) registered considerable gains in output, but their contributions to the overall output was slight since these latter companies produce only small number of passenger cars.

One prominent fact was that the output of light four-wheeled passenger cars grew 11.2% whereas ordinary passenger cars (+0.4%) and small four-wheeled passenger cars (+2.1%) recorded only a modest growth. Popularity of very small cars is ascribed to their economical fuel consumption. Steep growth of their output is expected in Japan where gasoline prices are hiked at frequent intervals.

The output of two-wheelers (motorcycles) has recorded a steady growth, with an increase of 18.7% over the same period of a year before. Smaller models below 50-cc engine displacement and bigger models above 250-cc registered particularly steep growth.

This phenomenon is characteristic of Japan. Motorbikes below 50-cc engine displacement have become popular among housewives to use for shopping instead of bicycles. Big motorbikes of 500 - 750 cc class are spreading like wildfire among young leisure-seekers. We can see at a glance on any Japanese street that big motorcycles are growing more and more deluxe every day.

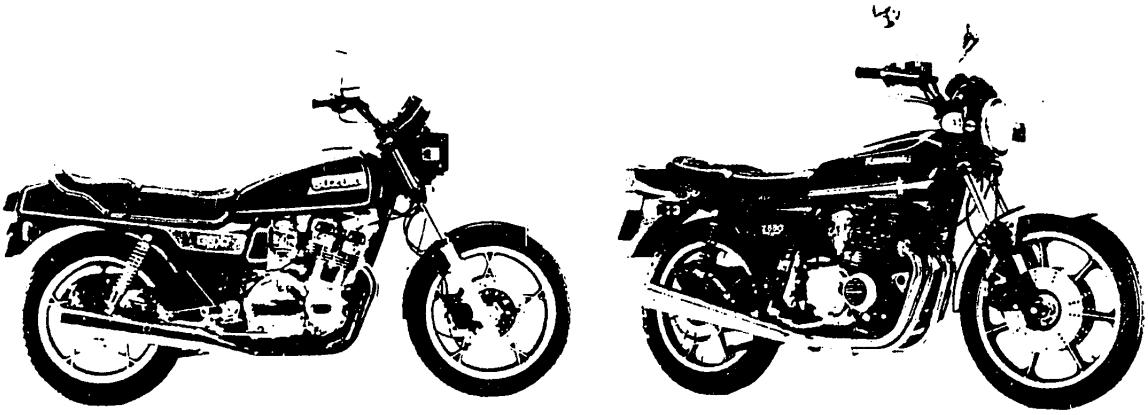
Auto Parts

The demand for cost reduction for auto parts is growing steadily in view of the harsher export climate and probable tapering off of consumption in the domestic auto industry. Japan's auto parts industry can anticipate neither peace nor rest with the introduction of electronic technology and the intensifying competition for the development of electronics-applied products.

Fortunately the overall output value of auto parts has not diminished owing to the increase of highclass products and the development of new parts. However, the environment surrounding the auto parts industry in Japan is growing harsher every year with soaring costs of raw materials and labor costs.

As mentioned at the outset, Japanese automakers are eyeing overseas production and many foreign auto firms are interested in local production in Japan. Japan's auto parts industry must seek ways to supply its products to Japanese plants abroad and must also think of its assessement by overseas automakers. These problems have caused considerable strains in the industry. At the same time, the auto parts industry must continue its research and development of parts as well as production techniques.

Output and exports of auto parts are shown in the attached tables. Since the statistics compiled by the Japan Auto Parts Industry Association are expected to be delayed owing to technical problems, we have adopted the Machine Statistics of the Ministry of International Trade & Industry (Table 1) and the Customs Clearance Statistics of the Ministry of Finance (Table 2 and 3). Tables in the previous article, which contained data up to November 1980, have been up-dated to May 1981.



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SCIENCE AND TECHNOLOGY

NEW TECHNOLOGIES, CREATION OF NEW DEMAND SECTORS

Tokyo DIAMOND'S INDUSTRIA in English Nov 81 pp 14-21

[Article by Yoshio Yamashita, Director General, Okasan Economic Research Institute

[Text]

Many economic and political pressures such as international trade conflicts, increasing government deficits, continuous inflationary pressure, and energy problems (which now seem to have eased somewhat) will continue to plague Japan in the 1980s. Faced with this rather difficult situation, Japan will rely on the development of new technologies to maintain its present level of prosperity.

The following table shows the results of a survey conducted by the Japan Industrial Machinery Association which questioned leaders of Japanese management on their main priorities in this decade. The results of this survey showed that management's top concerns are the development of new technologies and the creation of new demand sectors. Among the foreseeable developments in new technologies and emerging demand sectors, we are most interested in the areas of electronics and biotechnology.

Promising Products

I. Electronics Related Products
(1) Processing Automation
Industrial robots
CAD systems
FMS (Flexible manufacturing systems)
EDM (Electric discharge machines)
LASER machines
(2) Office Automation
Office computers
Personal computers
Word processors
Facsimiles
PPC (Plain paper copiers)
OCR (Optical card readers)
Voice recognition systems
LASER - beam printers
POS (Point of sales systems)
Car telephones
(3) Home Electronics
VTR (Video tape recorders)
VTR cameras
VTR tape
Videodiscs
PCM (Pulse code modulators)
Electronic games
Large screen TV
Automatic translating machines
(4) Medical Electronics
Surgical LASER equipment
CT (Computer tomography)

(5) Security/Environment
Total security systems
New transportation systems
(6) Semiconductors
VLSIs (Very large scale integrated circuits)
Optical semiconductors

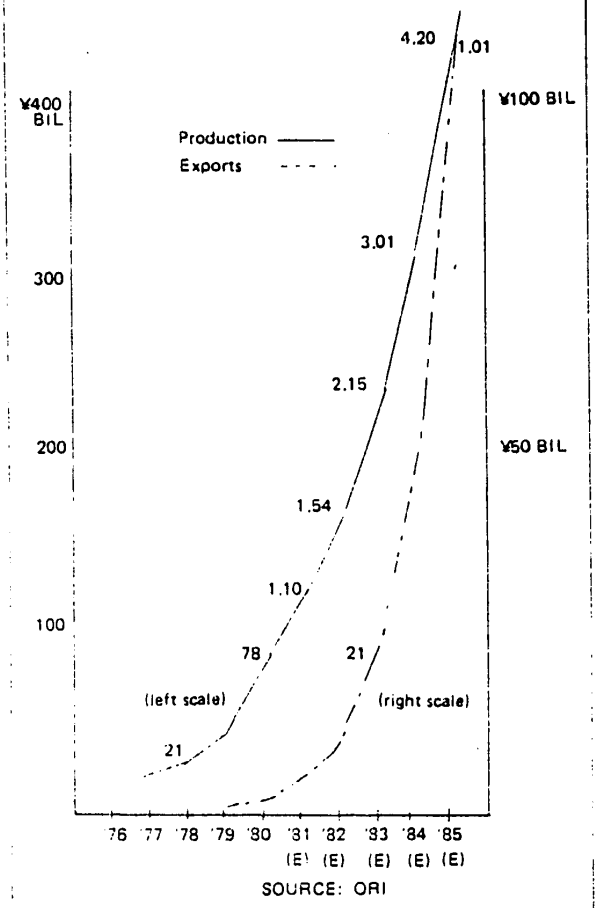
II. Biotechnology
(1) Drugs
Third generation antibiotics
Anti-cancer drugs
Anti-liver-disorder drugs
Immunization systems related medicines
Interferon
(2) Genetic Engineering
(3) Enzymes
Fixed enzymes
Single cell proteins

I. Electronics

(1) Processing Automation

Industrial Robots

Production and Exports of Robot



SOURCE: ORI

Industrial Robot Makers Grouped by Nation

Country	Number of Companies
Japan	70
U.S.	26
Canada	1
West Germany	33
Switzerland	1
England	18
Italy	11
France	8
Sweden	5
Finland	3
Holland	2
Norway	2
Denmark	1
Austria	1

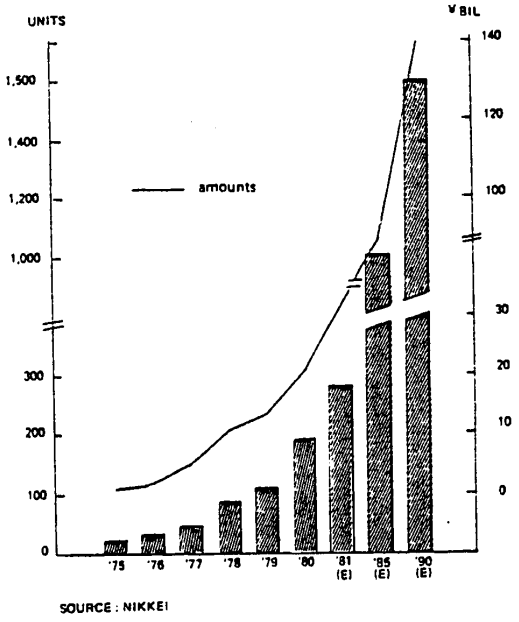
(NOTE) Excepting makers of manual manipulators and fixed sequence robots.

SOURCE: ORI

CAD System (Computer Aided Design System)

CAD Systems are being adopted more and more in manufacturing factories for their labor saving and automated design functions. The CAD market is now ¥30 billion in Japan and is expected to grow to ¥100 billion in a few years. CAD Systems produce extremely accurate designs at a high speed and are rapidly becoming essential equipment for the accurate design of complex VLSIs, aircraft, ships and automobiles.

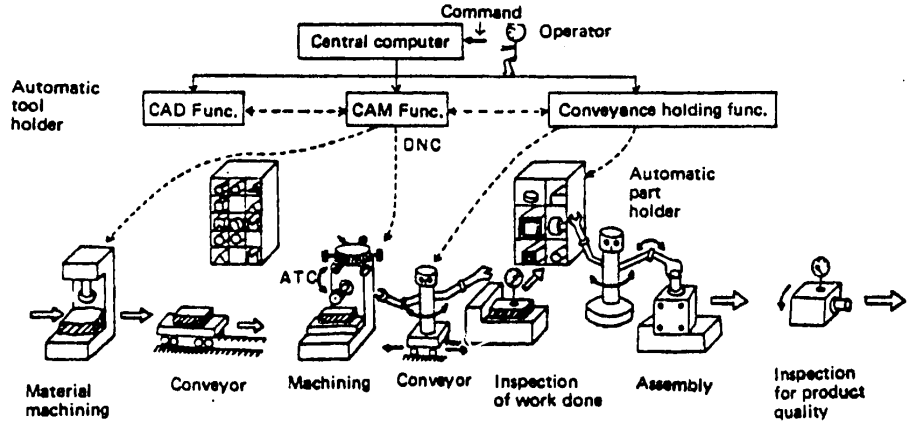
Forecast for CAD Production



SOURCE : NIKKEI

FMS (Flexible Manufacturing Systems)

Illustration of Unmanned FMS



The FMS, which eliminates the need for manpower in production, has recently become quite a popular topic in Japan. The FMS is made up of a computer controlling the robots (or automatic work conveyance equipment), the NC machine tools, and a various number of MCs. Robots and automatic conveyance machines deliver the work to-be-done to the MC machines which in turn make the products; these machines are controlled by computer tape which has already been punched with digital information.

One outstanding feature of the FMS is its flexibility; one production line can be used to make many kinds of products simultaneously in small lots, with higher productivity achieved by eliminating the need for human labor. It has often been true that mass production made diversity impossible, but with the FMS this is no longer the case.

(2) Office Automation

Personal Computers

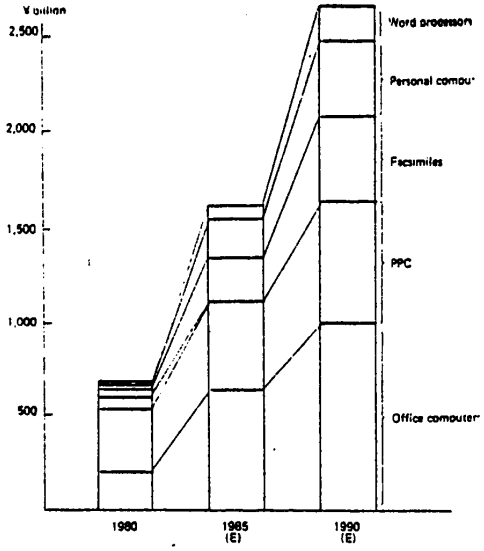
Of the five major office automation products, personal computers and word processors are expected to lead the growth of office automation products in the first half of the 1980s. Personal computer production should grow at an annual rate of 50% in the first half of the 1980s. Even though these computers are labeled "personal computers," 80% of personal computers are estimated to be used for business purposes. Personal computers are defined in the following ways:

(a) Having multi-purpose uses, such as office and science use.
(b) Furnished with microprocessors, keyboards and CRT terminals.
(c) Prices ranging from ¥100,000 to ¥1,000,000.

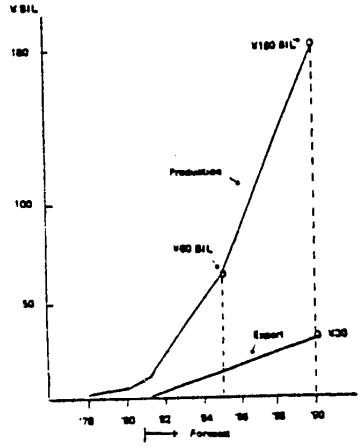
Word Processors

Word processor production is expected to grow 64% annually in the first half of the 1980s. Japanese character word processors in particular should show strong growth.

Forecast for OA Production



Word Processor Production & Export



Major Word Processors

Maker	Name of system	Price
		(in thousands yen)
Ricoh	RIPORT-420	2,700
NEC	BUNGO	2,980
Fujitsu	OASYS 100J	1,590
Yokogawa	WORDIX	2,350
Mitsubishi	M-8510	2,530
Matsushita	JD-1000	3,100
Toshiba	JW-5	2,600
Oki	Letter Mate 80	1,850
Sharp	WD-3000	2,950

Major Personal Computers

Maker	Name of system	Capacity
N E C	PC-8000	16 KB, MAX 64 KB
FUJITSU	FUJITSU MICRO 8	64 KB
HITACHI	BASIC MASTER LEVEL 3	32 KB MAX 60 KB
OKI	IF-800 MODEL 20	48 KB
SHARP	MZ-80 B	64 KB

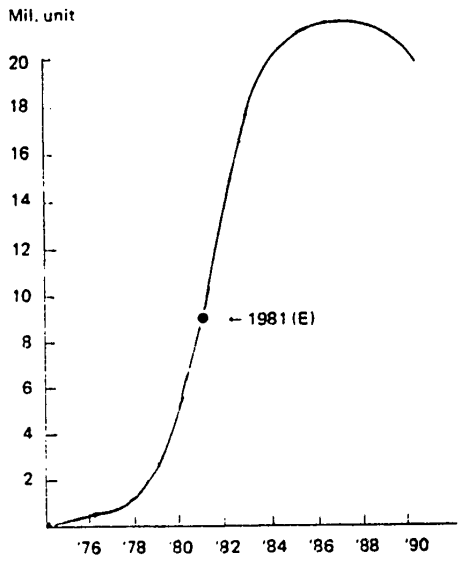
(3) Home Electronics

VTR/VTR Camera/VTR Tape

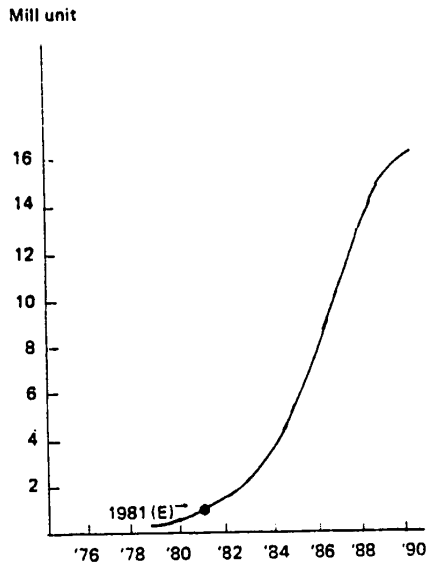
These three graphs represent rough approximations of VTR, VTR camera, and VTR tape production growth.

While VTR production in 1981 is estimated to attain a level nearly 2/5 of its peak production, camera and tape production fosecasts for 1981 represent only a small fraction of estimated future peak levels.

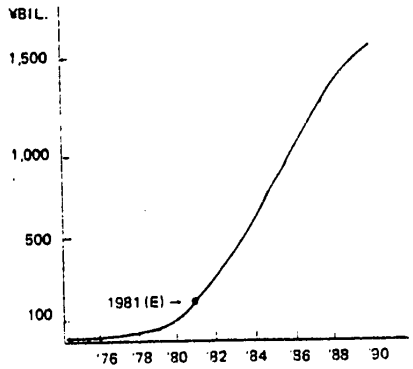
Forecast for VTR Production



Forecast for VTR Camera Production



Forecast for VTR Tape Production



Videodiscs

PCM (Pulse Code Modulation, same as DAD or Digital Audio Disc)

Advantages of PCM

1. Super high-fidelity sound quality is achieved through accurately converting sound waves into digitals in the PCM System (the system can distinguish 16,384 different levels of sound).
2. Due to mass production, discs are low priced.
3. Small, light discs can be produced (a disc of 12 cm in diameter records over a 60 minute period).
4. The PCM System will have features such as repeat performance and programmed preferred order selection.
5. Discs can be easily preserved and maintained.
6. The system will later be adapted for car stereo and audio headphone use.

There are three different systems just as there are three videodisc systems. PCM system sales will be seen starting 1982. The PCM market potential is estimated to be about ¥600 billion (including discs, replacement players, and amplifier markets).

Comparison of the Three Systems

	Philips/MCA Optical Laser	VHD Grooveless Capacitance	RCA Grooved Capacitance
Rounds per minute	1,800	900	450
Replayed minutes	30x2 / 60x2	60x2	60x2
Lifetime of stylus	--*	more than 2,000 hours	300 - 500 hrs
Lifetime of disc	Practically limitless	unknown	500 times
Features			
Frame stop	o	o	x
Slow motion	o	o	x
Quick motion	o	o	x
Random frame access	o	o	x

Note; (*) Philips/MCA optical laser system uses a laser instead of a stylus. The He-Ne laser lasts about 5,000 hours, and the semiconductor about 50,000 hours.

II. Biotechnology

(1) Drugs

Third Generation Cephalosporin Antibiotics

Third generation antibiotics are scheduled to be marketed from next year, following the marketing of second generation antibiotics already in progress. Of the six third generation antibiotics scheduled to be marketed, five were developed exclusively by Japanese makers. Only one foreign company, Hoechest (with Roussell), rivals Japan in this segment of the market.

Anti-cancer Drugs

Succeeding surgical treatment methods, radiation therapy, and chemical treatments through anti-cancer drugs, a new form of preventative treatment through immunization is now taking up the challenge to defeat cancer, supported by the full efforts of modern science. Production of anti-cancer drugs last year on a cash basis reached ¥107.3 billion, 10.8 times larger than production totals of just five years ago.

Such dramatic growth can be explained by strong potential demands, and the marketing commencement of a series of these drugs within recent years. However the total share of all prescription drug production held by such anti-cancer drugs is still extremely low at 3.1% (cash basis). It is predicted that this year the number one cause of death, excluding deaths from cerebral thrombrosis, will be cancer. We can expect that demand for anti-cancer drugs will gradually increase as techniques for early diagnosis of cancer improve.

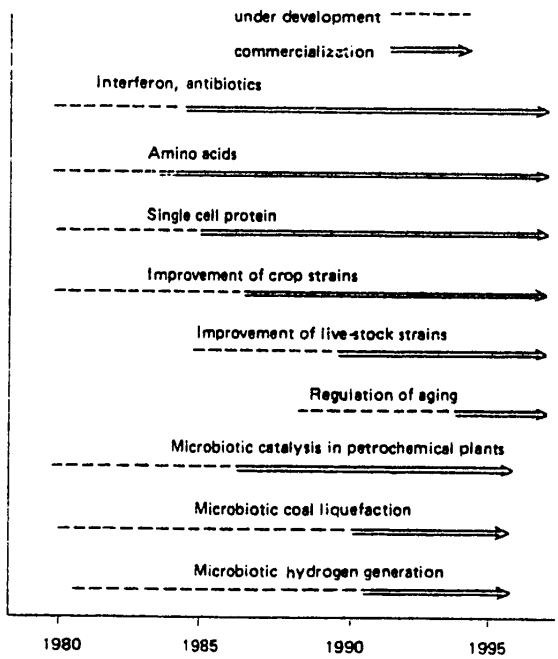
(2) Genetic Engineering

Genetic engineering has entered center stage as a new technology currently in the process of creating totally new industries. It is expected to have applications in such various fields as the food, chemical, pharmaceutical, and energy industries. The total market size for genetic engineering products is estimated at ¥5 trillion.

Major Anti-cancer Drugs

Stage	Name of Company	Name of Drug	Marketing	Monthly Market Size
Marketing	Sankyo Chugai	Kurestin Picibanil		¥3,500 MIL 1,500
Awaiting Health Insurance Approval	Yamanouchi	Yamaful	1981	
Awaiting Government Approval	Ajinomoto & Yamanouchi	Lentinan	1982	
Clinical Testing	Nippon Kayaku Tanabe Chugai & Ajinomoto Green Cross	Bestatin TA-077 CAM Spadicomycin	1983 1984 1985 1984	
Animal Testing	Sankyo Kureha Chemical Takeda Takara Ajinomoto	FU-U-G K-247 O-ALPL B-1, 3-D Gevukan MAC7	1985 or later 1985 or later 1985 or later 1985 or later 1985 or later	

Commercialization of Developments in Each Field



History of Cephalosporium Development

Generation	Drug Name	Maker	Country	Licensee
First	CET	Eli-Lilly	U. S. A.	
	CER	Eli-Lilly	U. S. A.	
	Cephamejin	Fujisawa	Japan	
	CEX	Eli-Lilly	U. S. A.	
	CEG	Eli-Lilly	U. S. A.	
Second	Cephamandole	Eli-Lilly	U. S. A.	
	Panspolin	Takeda	Japan	
	Takeshrin	Takeda	Japan	
	Cephmetazon	Sankyo	Japan	
	Cepharoll	Eli-Lilly	U. S. A.	
	CGP 9000	Chiba-Geigy	Switzerland	
	Cekuroshin	Granson	England	
	Cephadrokisil	Bristol	U. S. A.	
Third	Cefoperazin	Toyama	Japan	Pfizer
	Sefotacs	Hoechst & Roussell	W. Germany	Chugai
	Epocelin	Fujisawa	Japan	Smithkline
	Ceperatan	Yamanouchi	Japan	ICI
	Bestcoal	Takeda	Japan	Abott
	Shiomarin	Shionogi	Japan	Eli-Lilly

* Some drug names have been phonetically rendered.

Applications

Pharmaceuticals:
- Interferon
- Insulin
- Growth hormones
- Antibiotics
- Anti-cancer drugs
- Amino acids
- Enzymes, diagnostic drugs

Food Industry:
- Single cell protein (SCP)
- Amono acids, ligin
- Soy bean paste, soy sauce, seasonings
- Various types of *sake*, alcohol
- Sugar, Isomeriged sugar

Medical Field:
- Regulation of aging
- Treatment of previously difficult-to-treat diseases
- Artificial organs
- Elucidation of antizen-antibody reactions

Agriculture:
- Agricultural crops which need no fertilizers
- Highly photosynthetic plants
- Microorganisms
- Breeding of high yield crops
- Compound crops
- Improvement of live-stock

Industry, Energy:
- Microbiotic decomposition of industrial waste
- Gasoline additives
- Microbiotic liquefaction of coal
- Using microorganisms as petrochemical catalysts
- Microorganisms that generate hydrogen production

CSO: 4120/67

SCIENCE AND TECHNOLOGY

MITI TO WORK OUT LONG-RANGE GUIDELINES ON TECHNOLOGY DEVELOPMENT

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 978, 27 Oct 81 p 16

[Text] Long-range guidelines for industrial technology development in the next two decades will be worked out by the middle of 1982 by the Ministry of International Trade and Industry.

According to MITI, the proposed planning calls for exhaustive efforts by both government and industry to make Japan independent through development of its own technology and to ward off international technological friction through intensive efforts at cooperation. Plans will be drafted on the basis of a recommendation filed by a committee of veteran Japanese business and academic thinkers.

The recommendation, coming as a research report entitled "For the Sake of New Research and Developments," was presented early October to Seiichi Ishizaka, Director-General of MITI's Agency of Industrial Science and Technology, by his special advisory body, Long-Term Industrial Technology Planning Committee, after four years of study. Chaired by Yujiro Hayashi, vice board chairman of the private Institute of Future Technology, Tokyo, the 22-member committeee included various scholars, notably Prof. Emeritus Keiichi Oshima at the Engineering Faculty, University of Tokyo.

MITI explained that the long-range vision is to be specifically aimed at three targets representing vital economic needs —1) Greater contributions, through technology development, to the world community of nations; 2) Overcoming restrictions in the availability of natural resource products for Japan as a resources-poor nation; 3) Building "closer approaches of technology to humans" and "overcoming limitations in raw material and energy supplies," to attain the Government aim of building up "both vitality and ease" in Japan's social climate.

Three main themes have been screened out by the committee from no less than 365 listed as potential. The trio are: 1) Micro technology; 2) Information technology; 3) Composite technology.

The micro technology will be diverse. But policy attention is to be concentrated on those representing basic technology.For instance, those pursuing extreme miniaturization and density will be considered most important, as seen in the current VLSI (very large-scale integration) semiconductor development studies, application of natural biological functions to different chemical processes, as witnessed in modern genetical engineering.

Information technology will be identified with computerization as "two sides of the same coin."

Specifically, the aim is to develop a really sophisticated "artificial brain" performing close-to-human thinking and decision-making functions with capacity to substitute for the five senses of man. In transmitting information, new means of sending simultaneously a far greater volume of information than existing means such as through full introduction of the fiber optics and laser-utilizing methods now shaping up in Japan are to be developed. Possibilites of discovering a new area of information technology are to be sought in the modern general engineering, especially recombinations of DNA (deoxyribonucleic acid).

The composite technology will be chiefly represented by the progress of the modern mechanical electronics for greater automation of industrial factories.

Building Japan's own independent technology will be emphasized because a large part of the fundamentals of Japan's current technological developments had been imported from the U.S. and other advanced Western nations.

CSO: 4120/63

SCIENCE AND TECHNOLOGY

TWO FIRMS PRODUCE GRAPHITE WITH NEW METHOD

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 978, 27 Oct 81 p 16

[Text]

Toyo Carbon Co. of Tokyo and Inoue Japax Research Inc. of Yokohama have jointly developed artificial graphite for making heat-resistant tools and other industrial items. The new graphite may represent new technology to change the physical property of graphite.

According to Toyo Carbon, its new joint product with Inoue Japax Research was developed primarily to remove long-standing technological problems for semiconductor makers in improving their common low production yield when producing, under high temperatures of 500 to 1,000 degrees C., airtight glass-encapsuled parts of lead wires of transistors, diodes and other semiconductors. The trouble has been a wide difference in heat expansion rate between cobalt alloy or other metals used to place the lead wire and a graphite jig to guide and emplace the lead wire.

Graphite, because of its outstanding resistance to high temperatures, is widely used for various industrial purposes, especially making jigs to guide, stabilize, or emplace something.

The disparity between graphite's thermal expansion co-efficient of only two- to five-millionths per each one degree C. of temperature rise and metal fixtures' equivalent of twice to five times as high has frequently caused errors of the graphite jigs. The result is production of poor encapsuled lead wire devices.

The two companies have developed their own method of producing artificial graphite changeable in heat expansion co-efficient from anywhere between five- and 20-millionths per one degree C., enough for commercial production of such semiconductor parts.

Toyo Carbon in charge of production and sales of the new kind of graphite envisions wide applicability of the new product beyond such semiconductor manufacture, such as making continuous casting dice-producing and other metallurgical jigs, new types of nuclear power plant partitions and aerospace machine materials.

CSO: 4120/63

SCIENCE AND TECHNOLOGY

TOYO KOGYO PRODUCES NEW ROTARY ENGINE

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 978, 27 Oct 81 p 7

[Text] Toyo Kogyo Co., which made the rotary engine practical and produced the "Mazda" car series, recently announced development of a new rotary engine which is about 30 per cent higher in fuel efficiency than most such engines it has produced.

The Hiroshima-based automaker also said it will market, starting at the end of November, two new subcompacts of its Luce (export name: Mazda 929) and Cosmo series. These will be equipped with its new engine, "RE 6PI"

The new engine, as the company's President Yoshiki Yamasaki put it, is "the quintessence of all our rotary engine development and production efforts in the past two decades" and represents the climax of the company's development of the first generation of practical automobile rotary engines under a basic West German technological license.

According to the company, its new engine features a new structural concept called a "6-port induction," meaning the use of six "ports" (gasoline-air mixture suction mouths) compared with four for conventional engines of the kind. The two additional ports are supplementary inlets.

On top of this, the new engine is controlled in frequency of revolutions during idling and the density of its gas emissions by an 8-bit, one-chip microcomputer produced by Mitsubishi Electric Corp.

The new engine, in the case of application to a 5-speed car and in terms of Japan's officially-set 10-mode car running engine operations to measure the fuel efficiencies or emission volumes, has averaged 10 kilometers per liter of gasoline in running distance, compared with 7.8 kms for its best predecessor. It was the first two-digit fuel efficiency figure to be attained by the company's rotary engine cars, and about equal to 9.8 to 10 kms attained by the best 2,000 c.c., six-cylinder, 5-speed reciprocating engine cars.

In the next three to four years, the company envisions another 30 per cent rise in its rotary engine fuel efficiency.

CSO: 4120/63

SCIENCE AND TECHNOLOGY

'LIGHT' PRODUCING DEVICE MADE BY GOVERNMENT LABORATORY

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 978, 27 Oct 81 p 16

[Text]

An experimental plant to produce very strong, stabilized light, promising many important applications, was completed recently at the Electrotechnical Laboratory in Tsukuba City, northeast of Tokyo, by the Ministry of International Trade & Industry's Agency of Industrial Science and Technology.

Named "Tsukuba" after the academic-research community of Japan, the ¥1.1-billion linear accelerator (synchrotron) worked well in its official trial run. It generated various kinds of light when operated at its full electron-speeding-up capacity of 500 million electron volts, making electrons fly at a speed close to that of light.

The accelerated electrons were kept flying about in an "electron storage ring," a roughly circular structure of slender piping which is close to a total vacuum inside. The whole ring measures about 10 meters in diameter. Lights of all wavelengths from visible to X-ray types are shot out by the revolving electrons as "synchrotron radiation" from different apertures in the storage ring, where electromagnets deflect the flying electrons. The synchrotron was initially equipped with three such light outlet windows.

The laboratory believes the new facility will be useful in developing new industrial technology. Such lights may provide the standard for measuring different beams and radioactivity and identification of the characters of new electronic materials. It is also planned to utilize the strong X-rays available from the facility for development of a very large-scale integration (VLSI) semiconductor-circuit precision pattern printing technology ("lithography") and creation of pi-mesons for cancer treatment.

CSO: 4120/63

SCIENCE AND TECHNOLOGY

NEC WILL MASS PRODUCE 256-KILOBIT RAM CHIPS

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 978, 27 Oct 81 p 1

[Article by Takahide Nonaka]

[Text]

Nippon Electric Co., the nation's largest semiconductor maker, will mass produce 256-kilobit random access memory chips, possibly in 1983.

It will become the world's first commercial producer of 256K RAM chips as no company in the world has yet established their mass production technique. The 256K denotes the number of memory cells in each tiny chip, theoretically 256,000. The memory capacity is four times as large as the preceding 64K.

NEC revealed last week that it will build a plant for manufacture of very large-scale integrated circuits (VLSIs) at a cost of ¥27 billion in Sagamihara, Kanagawa Pref., near Tokyo, and install highly sophisticated facilities and equipment to mass produce 256K as well as 64K RAM chips. Construction will start late this month.

The two-year project calls for building a three-storied plant having a total floor space of 19,800 square meters. The project will comprise two phases. In the first phase involving plant and equipment investments of ¥15 billion, NEC will complete production lines for 64Ks by September, 1982. Installation of 256K production lines will be carried out in the second phase. Mass production of 256Ks thus will be initiated sometime during fiscal 1983 (April, 1983-March, 1984).

The new VLSI manufacturing plant will use 5-inch silicon wafers to produce such superchips. The monthly wafer input volume during fiscal 1983 is planned at 60,000 units, meaning that the plant will be capable of producing 1 million VLSI chips a month in terms of 64Ks. It will be one of the world's largest VLSI manufacturing plant.

Moreover, NEC will become the world's largest maker of VLSIs when the Sagamihara plant is put into a full operation.

World sales of 64K RAM chips are estimated to reach $1.8 billion. Such huge demand in the near future has led NEC to decide on the new highly sophisticated VLSI plant at this moment. Demand for more integrated memory chips is strong from makers hoping to build smaller, more powerful and more reliable computers, calculators and other electronic devices.

Technically, production of 256Ks requires high precision techniques to shrink the electronic lanes (or the distances between individual components on the chip) to 1.5 microns, compared to 3 microns for 64Ks.

NEC's aggressive move is expected to have a delicate impact on its rivals.

CSO: 4120/63

SCIENCE AND TECHNOLOGY

SHIP MACHINERY PRODUCTS REGISTER REGULAR GROWTH

Tokyo BUSINESS JAPAN in English Vol 26 No 10, Oct 81 pp 79, 83, 85, 87, 89

[Article by Takumi Mogi, Chief, Ship Machinery Section, Ship Bureau, Ministry of Transport]

[Text]

BECAUSE of the international shipping recession following the oil crisis in the fall of 1973, the Japanese shipbuilding industry entered a period of slump and shipbuilding volume dropped sharply from the 1975 peak. However, from around 1979, because of the restrictions on tankers by IMCO, aged ships were scrapped and ships to replace them were built. As a result, bulk carriers were ordered in anticipation of greater demand for transporting steam coal due to a sharp rise in the crude oil price, and, in addition, ships were built to beat the anticipated ship price hike. As a result, in 1980, the volume of launched steel ships in Japan recovered to 7,280,000 g/t (ships of 100 g/t and over). This is only 40% of the 1975 peak but an increase of 69% compared to the previous year.

The volume of orders for new ships received in 1980 continued the favorable trend of 1979 and contracts were concluded for about 10,000,000 g/t. Today, Japan has a backlog of orders equivalent to roughly two years' operations.

Among various materials needed for ship construction, machinery, such as engines and auxiliary engines, various fittings and other ship machinery industry products, reached ¥921,300 million in 1980, excluding primary products, such as steel, non-ferrous metals, lumber and electric wires. This comes to 93% of the all-time high.

The quarterly production of the Japanese ship machinery industry continued a minus growth for seven quarters from the peak third quarter of 1977, when there was a big demand for cargo ships, to the second quarter of 1979. Some corporations even went bankrupt. However, from the third quarter of 1979 when the volume of ship orders received began to recover, production also turned upward. It continued growing on a quarterly basis until the first quarter of 1981. In 1980, in particular, because of the sharp rise in the price of ship fuel, there was a boom in the conversion of main engines from turbine engines of high fuel consumption rate to diesel engines of high thermal efficiency rate. The demand for machinery expanded in order to meet requirements set by IMCO. Also, the export of diesel engines and various machinery increased, mainly to the burgeoning shipbuilding nations. As a result of these factors, the business recovery of the ship machinery industry exceeded that of the shipbuilding industry.

Among the wide variety of ship machinery industry products, I shall take up in this article the production of major items.

Diesel Engines

The combined production of main and auxiliary engines in 1980 reached 10,210,000 hp, up 15% compared to the previous year. Production of large engines of 10,000 hp and over, in particular, continued booming, supported by export and engine-conversion demand together with activated new-construction demand. The annual production of 2,790,000 hp was 160% greater than year ago. The 1,120,000 hp of the third quarter was on the same level as the all-time high in 1975. Production of diesel engines of medium size from 1,000 hp to less than 10,000 hp totaled 2,900,000 hp. However, it dropped 4% from a year ago, lowest of all ship machinery industry products, reflecting the stagnant business of coastal ships and fishing boats. Small size diesel engines of less than 1,000 hp were in a situation similar to that of medium-sized diesel engines. Although exports grew, the production of 3,490,000 hp was only a slight

Table 1. Ship Machinery Industry Production

Unit: ¥100 million

Type		Year	1978	1979 (A)	1980 (B)	B/A %
Engines	Steam engines	Turbine engines	50	45	72	160
		Boilers	86	83	107	129
		Total	136	128	179	140
	Internal combustion engines	Diesel engines	2,182	1,817	2,321	128
		Outboard motors	291	290	355	122
		Total	2,473	2,107	2,676	127
Auxiliary machinery			1,484	1,252	1,633	130
Fittings			3,892	3,462	4,725	136
Grand Total			7,985	6,950	9,213	133

2% increase from a year ago.

Turbine Engines

Turbine engine production, which had shown a typical pattern of following the trend of large tanker construction, dropped sharply in 1976 and since then has remained almost on the same level in terms of horsepower. However, production has been increasing in terms of units because of greater demand for auxiliary engines for tankers, whose quantitative demand was substantial though the sizes of tankers became smaller. Moreover, the adoption of energy-saving systems increased the demand for auxiliary turbines as an exhaust gas turbojet electric power generation system to be mounted on large diesel ships. In 1980, 373 turbine engines or 430,000 hp were produced.

Boilers

With the decrease in the construction volume of turbine ships, boiler construction, which had dropped temporarily, recently has tended to grow. However, with respect to main boilers, orders were received for only two units in 1980. This explains the fact that although 1980 production reached 791 units worth ¥10,700 million, including 495 auxiliary boilers worth ¥7,400 million and 294 exhaust gas boilers worth ¥3,200 million, the total 1980 production of boilers was only 28% of the 1975 peak.

Engine Room Auxiliary Machinery and Deck Machinery

Engine room auxiliary machinery production amounted to ¥107,200 million in 1980, up 127% compared to the previous year. Of this, the production of pumps worth ¥14,700 million, air machinery worth ¥6,300 million, separators worth ¥2,600 million, heat exchangers worth ¥12,200 million and electric machinery worth ¥34,200 million increased 30% to 90% compared to the previous year. However, the production of refrigerators and related machinery dropped 5%, reflecting the slump in fishing boat construction.

With the recovery of the construction volume of cargo ships, deck machinery production has recovered at long last from the decreasing trend since 1977. In 1980, with deck cranes worth ¥16,300 million as the biggest component, production amounted to ¥56,100 million, up 38% compared to the previous year.

Navigational Instruments

Production of radar, gyro-compasses and loran amounted to ¥79,800 million altogether, up 40% compared to the previous year. Of this, ¥24,200 million were exported, which corresponds to 30% of the production.

Table 2. Export of Ship Machinery Industry Products

Unit: ¥100 million

Region \ Year	1978	1979 (A)	1980 (B)	B/A %
Asia, Oceania	543	543	701	129
North America	423	415	665	160
Central & South America	151	153	177	116
Europe	316	326	520	160
Others	111	122	215	176
Total	1,544	1,559	2,278	146

Fittings

Fittings production amounted to ¥220,900 million, up 41% compared to the previous year. As in the case of navigational instruments noted above, production of all fittings items increased. In particular, marine container production was the most outstanding of all. With demand abating worldwide since the beginning of 1979, export value dropped and production also had leveled-off. However, in 1980, production recovered to ¥93,800 million which is almost equal to the 1978 peak. Container exports hit an all-time high of ¥58,000 million.

Ship Machinery Products Exports

With the worldwide recovery trend of the shipbuilding business, Japan exported in 1980 ship machinery industry products worth ¥227,800 million, up 46% compared to the previous year. As a result, the export ratio to production of Japan's ship machinery industry has grown to 25%.

Among items whose export value was high, marine containers were the biggest, accounting for 25.5% of all ship machinery exports, or ¥58,000 million, up more than 35% compared to the previous year, centering on North America. Next were diesel engines whose exports grew substantially for new-construction use by South Korea, Taiwan, European shipbuilding nations and the United States. They amounted to ¥56,800 million, up 68.4% compared to the previous year, and accounted for 24.9% of exports. Third were outboard motors which rode on the spreading wave of marine leisure sports worldwide and of motor-driving of motorless boats. They amounted to ¥33,500 million, up 33.4% compared to the previous year, and accounted for 14.7% of exports. Fourth were navigational instruments, such as radar, loran and radios, whose production belong to the electronics field in which technological innovation has made great progress recently. Exports amounted to ¥24,000 million, up 35% compared to the previous year, centering on North America and European nations. Fifth were parts and accessories for diesel engines, which include component parts of large diesel engines exported to South Korea or Taiwan, and large parts most conspicuous of which are crankshafts. They totaled ¥17,800 million, up 51.5% compared to the previous year, and accounted for 7.8% of exports. Altogether, these five items accounted for 83.5% of total ship machinery exports, or ¥190,100 million. Among other items whose export value had been low, oil cleaning machines and valves increased substantially from a year ago. The items whose export value dropped were turbine engines, and accessories, and heat exchangers.

These ship machinery industry products were exported to 145 nations, even to non-shipping and non-shipbuilding nations. Characteristics by region are outlined as follows:

Asia – This region is located near Japan and has been a stable export destination for many years. The amount of exports to Asia in 1980 was ¥65,100 million, up 30% compared to the previous year. Next to North America, this region takes a high 28.6% of Japan's ship machinery exports. There are 18 export destinations most conspicuous of which are burgeoning shipbuilding nations such as South Korea with ¥20,500 million and Taiwan with ¥12,800 million. Of the export items diesel engines, the leading item, account for 44.9% of the total or ¥29,200 million. Other items cover a wide range, such as diesel engine parts and accessories, valves, navigational instruments, outboard motors, deck machinery and electric machinery.

North America – This region which includes the United States and Canada was the biggest export destination of all, taking ¥66,500 million, up 60% compared to the previous year. The United States is also Japan's biggest export partner. Containers accounted for an overwhelming 69.3% of all exports, or ¥46,100 million. Other items include navigational instruments, ¥7,900 million, outboard motors, ¥3,500 million and diesel engines, ¥2,700 million.

Europe – Having a number of shipbuilding nations, this region was also one of Japan's major export market amounting to ¥52,000 million, up 59.9% compared to the previous year. Of export destinations, major shipbuilding nations ranked high, such as the United Kingdom with ¥9,400 million, Denmark with ¥9,100 million, Norway with ¥6,300 million, West Germany with ¥5,700 million, Holland with ¥4,200 million, France with ¥4,000 million and Sweden with ¥2,800 million. Other destinations included 13 nations, among them Spain. Of the export items, the major ones are diesel engines ¥15,200 million, outboard motors ¥10,700 million, navigational instruments ¥7,000 million and diesel engine parts ¥5,600 million. These four items accounted for 74% of the total for this region.

Other regions – The three regions – North America, Asia and Europe – account for 80.6% of the total export value. Other regions importing Japanese ship machinery include Central and South America with ¥17,700 million, Africa with ¥6,500 million, Oceania with ¥5,100 million, the communist bloc with ¥5,500 million and Middle & Near East with ¥3,900 million.

Ship Machinery Industry Imports

In 1980, ship machinery industry products worth ¥44,200 million were imported, up 20.1% compared to the previous year. This increase reflects the fact that shipowners are designating the components when they order ships. The production in Japan of export ships using designated components has increased from a year ago.

The biggest of all import items was deck machinery with ¥6,600 million (a component ratio of 15%), followed by pumps with ¥5,100 million (11.6%) and navigational instruments with ¥4,800 million (10.8%). Items which showed a sharp drop from a year ago were fittings for cargo han-

Table 3. Import of Ship Machinery Industry Products

Region \ Year	1978	1979 (A)	1980 (B)	B/A %
North America	101	209	179	86
Europe	218	127	232	183
Others	54	32	31	97
Total	373	368	442	120

dling and mooring equipment (down 54.2%) and internal combustion engines (down 30.5%). Those which showed a substantial increase were pumps (up 43.8%), navigational instruments (up 35.2%) and paints (up 252.1%).

The United States supplied 40.4% of all Japanese imports of ship machinery with ¥17,900 million, centering on deck machinery and internal combustion engines. But, compared to the previous year, the total dropped 14.4% because of the decrease in fittings and electric appliances. Imports from Norway amounted to ¥6,300 million or 14.2% of the total. Of this, a major item was cargo oil pumps with ¥4,000 million. Norway is followed by West Germany with ¥4,400 million, Sweden with ¥3,800 million, the United Kingdom with ¥3,700 million and Denmark with ¥2,500 million.

It is hoped that this explanation of the trends in Japan of ship machinery industry products in 1980 will serve as a helpful reference for those involved in the Ship Asia and Euro Port Marine Exposition. ◘

CSO: 4120/65

SCIENCE AND TECHNOLOGY

FUTURE OF SEAMLESS STEEL PIPE MAKER SUMITOMO METAL EXAMINED

Tokyo SHUKAN ORU TOSHI in Japanese 6 Aug 81 pp 52-57

[Text] It is said that the steel industry is entering an age of contest over quality from an age of a contest over volume. Sumitomo, which had enjoyed life as the top maker in the seamless pipe production area as well as benefitting from the boom, has been digging its spurs toward a higher class alignment in looking toward the post-boom era. For Sumitomo, which presently derives its greatest profit from oil well pipe, to be preparing for an anticipated stage of over-production of seamless pipe 2 years in the future seems to be a somewhat premature handling of an emergency.

While there is a fierce contest developing to attain a higher class, on the other hand, there is also some opposition to shortening of processes following the change to continuous casting and to improvement of dependence on existence of a loan, which in the past was considered the destined way of handling frontline skirmishes involving cost cutting in a wide area. It is not overstating the case to say that the steel industry has plunged into an era which resembles the plant expansion conflicts of the past.

Where Sumitomo is concerned, its superiority in the area of seamless pipe should prove to be a great weapon in waging battle in this new period of conflict. In this sense, Sumitomo's development during the next 1-2 years bears watching.

Applauding Seamless Boom

The magnitude of the significance of the oil pipe boom is shown to the maximum by Sumitomo's present profit structure.

Sumitomo very recently made a large upward revision of its profit plan for the mid-September period. It reported sales volume of 690-700 billion yen, up from 640 billion yen; ordinary profits, which showed a decline of 10 percent in the previous period to 40 billion yen, increased 10 percent to 45 billion yen, indicating a turn for the better.

The reasoning here is that should the yen rate, which had been expected to drop below 210, remain at an average of over 220 in an assured manner, the price of OCTG (oil country tubular goods--general designation of steel pipe), of which seamless pipe makes up the main portion, would be raised upward 20 percent or

more compared to the end of the previous period, while at the same time the upward rise in bunker oil would become relatively smaller, so that the pressure on cost would be less, and this factor entered into the picture.

Counter to the great improvement in OCTG figures due to a lower yen rate and increase in price, profits from other operations such as steel plate, formed steel, and wire as well as steel pipe other than OCTG are being pushed. "OCTG is providing 90 percent of our profit" (Keinosuke Tamaki, head of Accounting Department), and the contribution of OCTG to the profit picture is extremely high.

Looking at the present order picture, it is expected that this bright picture in seamless pipe will continue through the latter half of this year. In another direction, the unsettled domestic market is undergoing a recovery which may be somewhat late, but storage facilities are slowly increasing, and at least some improvement is taking place. As a result, the ordinary profit through this period will be 95 billion yen at least, and this can rise up to the 100-billion-yen plateau if the yen rate should remain at 230. If the seamless boom continues through next year, "the domestic picture will improve somewhat (vice president Ryutaro Uesaka), and if that happens, it will be certain that the improved profit base adjustment will be maintained.

How long will this boom in oil well pipe which brings high profit continue for Sumitomo?

Behind this boom in oil well pipe is, first of all, President Reagan's abolishing of the oil price control system, as a result of which oil development in the United States was reactivated. Where the number of active drilling rigs in the United States had dropped to a minimum of 1,600, very recently this number exceeded 4,000 rigs, and the net result has been that America's dependence on imported oil decreased from what was at one time 50 percent to 38 percent.

At the same time, the increase in crude oil prices raised the level of minimum drilling cost, and very deep wells or low-quality shallow wells which in the past could not even be considered became drilling targets. As the well depth became greater, the demand for pipe per well increased, while abandoned shallow wells began to be reworked in large numbers, resulting in a spectacular increase in the number of wells.

The result of all this has been that American demand for oil well pipe jumped from the former 2.5 million tons/year to about 4 million tons/year expected for this year. The Lone Star State predicts that this total will be 7.8 million tons in 1985.

Besides the United States, the Soviet Union is importing slightly under 400,000 tons of oil well pipe and Europe is importing about 200,000 tons, while oil-producing countries such as Mexico, Venezuela, and Saudi Arabia are talking about increasing their orders, so there is an active demand for oil well pipe. As oil drilling efforts increase, the need for large-diameter pipe to transport oil will also increase.

Japan supplies roughly 70 percent of the export market for the oil well pipes that is in great demand throughout the world. Sumitomo accounts for about 40 percent of Japan's production, or about 10 million tons. Its export volume is greater than that of the combined efforts of Germany, France, and Italy. It is said that in Europe seamless pipe is used where Japan uses welded pipe, and any seamless pipe left over for export is somewhat scarce. The actual picture is that Sumitomo, which at present is the world's largest oil well pipe industry, will be in an enviable position for a while.

Being in a position to benefit most from this seamless boom is a good opportunity for a large steelmaker to improve its debt dependence structure.

In order to reinforce its competitive strength through modernization of its facilities, this company has increased its investment in facilities, which had been limited to 50-60 percent of the amortization fund at about 60-70 billion yen, to 100 billion yen. The expenditure this year will be 136 billion yen on a construction base and 107 billion yen on a disbursement base. On the other hand, by the change in the amortization to a fixed-rate method, the amortization cost will increase by roughly 13 billion yen (10.43 billion yen the previous period), while profits will maintain this year's increased profit base adjustment, and "there will be roughly a 40 billion yen surplus" (Uesaka). The interest-due obligations, which had decreased to 1.0108 trillion yen at the end of the previous period, will most certainly drop below the trillion level this period.

At the same time, the stock is approaching the 300-yen level, and the possibility exists that they will issue convertible bonds. There already were two issues last year, for 50 million dollars and 100 million Swiss francs, but these conversions achieved roughly 70 percent of their goals, and preparations are under way for a domestic package offering this fall which will be based on the dollar and Swiss franc to float a 60 billion yen bond issuance. Because this conversion has swelled the amount of ready capital, there is greal likelihood that there will be 3 to 5 percent voluntary reduction during the course of the year.

The stock is presently hovering around 300 yen and is not moving, but if it should rise to over 350 yen, large-scale public subscription would become feasible.

Desperately Defending Pipe Top Position

Sumitomo Metals has been using its superiority in the seamless pipe area as the lever to promote active improvement in its own structure.

On the other hand, other companies are not looking at these high profits in seamless pipe without any thoughts of their own.

Nippon Steel, Kawasaki Steel, and Nippon Kohan, which are already in seamless pipe construction, are making plans to increase their production, while welded pipe makers such as Maruichi Steel Tube and Kubota Ltd have opened and are expanding their oil well pipe areas. In addition, U.S. Steel has started to expand its production with capital advances from the oil majors, and there are other expansion plans in the offing in the Western countries.

On the other hand, the design and construction of seamless pipe plants requires 1 and 1/2 to 2 years at the minimum, and it will be 1983 at the earliest when the increased production on the part of the Japanese companies will appear. The production from the Western sphere will be even later, and will come along 1985-86.

It does not seem possible that 2 years hence, when the production of these four companies including Sumitomo Metals will come up to more than 40 percent, there will be an oversupply in seamless pipe. The demand for oil well pipe will increase with the rise in price of oil along with the need to drill even deeper wells. On the other hand, anyone can see that if the increase in demand should be blunted while the supply increases greatly, the present high profits could no longer be maintained.

The situation is that at the time of the first boom, Sumitomo Metals was experiencing a high yield while other companies were struggling, but then it suffered bitterly in the period of decreased demand that followed. With this in mind, this company is making every effort to capitalize on the present boom.

Looking at this present boom, "it should continue for 1-2 years" (Uesaka). In the interim up to 1983, when the results of plant expansions are expected to appear, an increase in the ratio of electrically formed pipe in the total oil well pipe area should continue the shift to high-profit OCTG. Seamless pipe, in particular, is expected to increase its weight among high class pipe, and following this with electrically formed pipe should give the company the high add-on value provided by seamless pipe, the improved degree of operability of electrically formed pipe, and increased volume of production of OCTG overall.

In another direction, the aim of the new mill presently under construction at Kainan, which is expected to come into production by the end of 1982, is not simply to expand the production capacity. Production of smaller bore pipe is planned for this new mill, and by varying the product mix between the products of this new mill, the other mill at Kainan, and the first mill at Wakayama, improved productivity is envisioned along with a well-rounded product array.

In the technological development front, the greatest emphasis is being directed at the development of high class pipe.

Sumitomo Metals had been producing boiler tubes for the navy since before the war, and the technology it had developed was the basis for its entry into the production of oil well pipe at the end of the war along about 1950. It was able to obtain API (American Petroleum Institute) approval upon entering the American market after a very trying period, and it initiated mass export of oil well pipe in 1951. This is the background to the number one producer of boiler tubes for electric power use and energy related piping (oil well pipe, oil transport pipe).

It made its start in the area of boiler tubes, which are high class pipe, and significantly, it started at an early stage to conform to API specifications,

while the technology for post processes such as heat treatment and thread cutting was being taken up.

Spur To High Class Alignment

At the present time, the SM series pipe, which greatly surpasses API specifications on high-temperature corrosion-resistance and high tensile strength, and the VM joint (Sumitomo Metals is the only company in Japan making this product), which is a special air-tight joint which was developed jointly with the French Barorec Company, are indicators of the high-class route for pipe which this company hopes to take. Demand for either product is not very large as yet, but these are intended for use under very harsh conditions, and this route may be classed as one of the answers to just what to do when the boom fades.

While defending its position as the top maker in the area of pipe, this company is also planning to "exploit oversupply in the pipe area and is looking toward production of high class steel plate" (Uesaka), and this again is a major problem.

At the present time, the largest market for steel plate is thin plate for automobile production, but recently the reduction in weight concept for energy conservation has become the overriding factor in the automobile industry. The development of lighter and stronger high tensile strength steel plate has become a desperate contest. In the midst of this race Sumitomo Metals came out with what is called "the dream steel plate": it is soft during fabrication but on being painted and baked it turns into a tough metal, the so-called high-formability bake-hardening cold rolled steel plate, which this company was the first to introduce to the industry. Its array of products ranging from a tensile strength of 35 kilos to 100 kilos puts this company right alongside Nipon Steel.

This material is particularly good when both ends are difficult to work, and "we are working at the frontiers of quality" (Morio Takahashi, member of Second Technology Development Department). The high add-on value is evident when one sees that the share of high tensile strength steel for automobile use is 1.5 times greater than the share of crude steel.

This company at an early stage also produced steel plate electroplated with a high corrosion-resistant alloy for use as rust-resistant plate at sites difficult to paint.

There is also a development battle brewing in the area of various types of precoated steel plate for use in various household electrical appliances, and it may be said that development of surface-treated steel plate and high tensile strength steel plate, which in a broad sense represents a users' coalition of household appliances and automobiles, has become the subject of maximum attention. The fact that the accumulation of heat treatment technology and alloy steel technology is being exploited makes this situation similar to that of pipe.

Where thick plates are concerned, this company shares the market with Nippon Steel in 9 Ni thick plate which can be used down to -165°, in addition to which

this company is tops regarding high tensile strength thick steel plate for raised water power plant use. At the same time, the SHT steel plate, which can be used down to -60° and which is produced by a process requiring no hardening and tempering processes, making possible a large reduction in cost, is being highly evaluated for applications such as LPG tanks and line pipe. This steel plate is also used as the work material for electrically seamed pipe and is thereby also contributing to the development of high class electrically seam-welded pipe.

In addition, coal liquefaction (COM), carbon fiber as a byproduct activity of coke gas, and hydrogen production are being treated as independent areas of development. Where engineering is considered, the risks are too large concerning hard areas such as plants, as a result of which they are regarded rather passively, while greater attention will be directed mainly at soft areas such as technological cooperation, according to present policy. On this front, this company was asked last year for technological guidance in the area of continuous casting and seamless technology from three plants--U.S. Steel, Bethlehem Steel, and J and L Steel. This is evidence of the high international evaluation of Sumitomo Metals' technological strength.

Activities of Other Companies

Nippon Kokan, which ranks second in the area of seamless pipe, has the capacity for a monthly production of 100,000 tons. It is presently investing 90 billion yen in order to increase its facilities for producing medium-diameter seamless pipe. This new plant is expected to be completed in September 1983, and monthly production will be increased by 50,000 tons. This company has a long history where pipe is concerned, and its drill pipe for oil well use is evaluated particularly highly throughout the world. Where drill pipe is concerned, it is presently absolutely top domestically.

Nippon Steel is tops in overall pipe production. It ranks third in the area of seamless pipe and rubs shoulders with Kawasaki Steel in this respect. It established a Steel Pipe Industry Department this year and plans to promote the production of seamless pipe. It is presently aiming for monthly production of 100,000 tons and has started expansion at its Yawata steel plant. It plans to increase capacity of small-diameter seamless pipe to 50,000 tons and medium-diameter pipe to 47,000 tons by March 1983. The total cost will be 80 billion yen.

Where the above three companies are expanding their rolling facilities for seamless pipe, Kawasaki Steel will be able to increase production simply by working on the post treatment process of the refining line. The monthly capacity of its Chita plant is 110,000 tons, but the refining line is the bottleneck, so that the actual monthly production is 42,000 tons. It is investing 37 billion yen to make primary and secondary expansions which are presently under way, and it hopes to produce 69,000 tons by March 1982. The third-stage expansion may soon get under way. The ultimate goal is to realize the 110,000-ton capacity of the rolling facility.

About the latter half of 1983, when the expansions of these companies are expected to be completed, the monthly production is expected to undergo a large increase,

from the present 300,000 tons/month to 500,000 tons/month, and there are some who fear a stage of oversupply. Nevertheless, each company is reinforcing its production of high class products for which all indications are for sharply increased demand, and the belief is that rather than destroying the demand balance, Japan's seamless pipe will take a firm seat in the area of high class products in the world market.

Interview with President Norifumi Kumagai: Future of the Steel Industry and Sumitomo Metals' Strategy

Kumagai: When seen from a worldwide viewpoint, steel is not on a declining trend where volume is concerned. There is the area represented by aluminum and chemical materials, but new applications are appearing. Even though we do not expect periods of very high growth, the volume will still increase.

On the other hand, production on the part of developing countries is increasing, and Japan will not be able to expand its production of ordinary steel above its present level. We have no choice but to forgo aiming at volume, but instead must set our sights on producing high quality material.

[Question] Please give some specific examples of higher quality.

Kumagai: One such item is the alloy steel area in which other materials are added to iron to form new materials. Some examples are the development of pipe which is resistant to the corrosive action of gases of high sulfur content and development of light and highly corrosion-resistant steel plate. Another is the assembly of steel pieces for applications in areas where steel could not be used before. For example, supplying steel which is easy to use and fabricate for structures such as the Honshika Bridge. We are somewhat behind where the latter type product is concerned, but the former is a profitable one for us. Particularly in the area of pipe, I consider that we are a step ahead.

[Question] Do you think the Japanese steel industry has surpassed that of the United States?

Kumagai: The American industries had other profitable products so that they neglected steel. That is why their facilities became delapidated and the production rate suffered. On the other hand, they are now engaged in an all-out effort toward the rebirth of steel, and their will to do so has been rekindled. They have a technological development strength that should not be belittled.

[Question] Even where facilities are concerned, Japan must not be caught napping; otherwise it will surely be bested once again by the United States.

Kumagai: That is so. Technology is advancing, and Japan's present facilities will be out of date in another 5-10 years. Should modernization of the American plants take place in the meantime, there is adequate cause for the possibility of a reversal which will see the United States leading us once again. The problem is whether Japan will plan to revitalize its plants in the interim.

[Question] Speaking of physical constitution, is there a problem in fiscal constitution?

Kumagai: To achieve modernization on borrowed money is beset with the interest problem. There is a need to raise the profit level and assure longer internal residence time of funds as well as to consider means of fund raising other than borrowing. While exploiting the value of time is the best, it is difficult because there is the premise that a high profit system that sustains high stock price is a necessary condition. We will use convertible bond issuance for the time being.

[Question] Will the high profit from pipe at present make for a good opportunity to reinforce the physical structure?

Kumagai: The fate will be determined within the next 2 years. We will develop a pipe which will be second to none and we also plan to improve the quality of our plate. We may fall behind in the volume of plate, but we will never fall behind in quality.

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SCIENCE AND TECHNOLOGY

MACHINERY BUILDERS TEAM UP WITH EUROPEAN, U.S. FIRMS

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 979, 3 Nov 81 p 6

[Text]

Japan's major machinery producers are showing rising zeal in teaming up with U.S. and European enterprises in developing "high technology" products, such as oil drilling rigs, nuclear power generators, medical equipment, and aircraft engines.

By pushing international division-of-labor in the high technology field, Japanese machinery builders aim at lessening investment risks and costs, attaining early revulsion of capital, and also mitigating trade friction with Western countries.

Also behind these global links are the facts: — Development objects now have become so complicated and sophisticated that the world's project promoters must share their respective wisdom for achieving final targets; and the rapid progress of Japanese technology development has been widely recognized in the international marketplace.

Three machinery builders — Kawasaki Heavy Industries, Ltd., Hitachi Shipbuilding & Engineering Co. and Nippon Kokan K.K. — have tied up with American engineering enterprises to devise offshore oil drilling rigs.

Mitsubishi HI also has agreed with Westinghouse Electric Corp. of the U.S. to jointly develop nuclear power reactors. Their link has changed into an equal partnership from the previous licensee-licensor relationship.

Kawasaki HI and West Germany's Messerschmitt-Bolkow-Blohm are now working together to mass produce medium-sized, twin-engined helicopters in the spring of next year. "Costs have proved far less than in case of a single company doing that job," said a Kawasaki HI official.

The two companies have already won 150 orders (90 for delivery to the U.S.) including optional contracts. They envision selling 1,000 units over the next decade.

Sumitomo Heavy Industries, Ltd. and France's CGR-MeV received the first order for their clinical cyclotron last spring.

These international projects are being carried out not only between the companies of two different countries but among the enterprises of three nations or more.

Examples of these tripolar projects are seen in the schemes to develop an aircraft engine and a passenger plane.

International Machinery Development Projects

Project	Japanese promoter	Foreign partner	State of Progress
Helicopter (8 to 12 seats)	Kawasaki Heavy Industries	Messerschmitt-Bolkow-Blohm (W. Germany)	Mass production is scheduled for next spring
Medium and low temperature power generation (using fluorenol 85)	Mitsui Engineering & Shipbuilding	Thermo Electron (U.S.)	No. 1 unit was completed in October
Jet engine (for 150-seater passenger plane)	Ishikawajima-Harima Heavy Industries, Mitsubishi Heavy Industries, and Kawasaki Heavy Industries	Rolls-Royce (Britain). Pratt & Whitney (U.S.) and General Electric (U.S.) hope to join	Japanese core firm was formed in October
Jet passenger plane (150 seats)	Mitsubishi HI, Kawasaki HI and Fuji Heavy Industries	Boeing (U.S.), McDonnell Douglas (U.S.)-Fokker (Holland), or Airbus Industrie (France, Britain, W. Germany and Spain)	Partners will be selected in November
Clinical cyclotron	Sumitomo Heavy Industries	CGR-MeV (France)	First order was received last spring
Oil drilling rig	Hitachi Shipbuilding & Engineering	Friede & Goldman (U.S.)	First order was received in October
Oil drilling rig	Nippon Kokan K.K.	Global Marine Development (U.S.)	Development is under way
Oil drilling rig	Kawasaki HI	Zapata (U.S.)	Tie-up contract was signed in September
Light water reactor and advanced fast breeder	Mitsubishi HI	Westinghouse Electric (U.S.)	Tie-up contract was signed in September
Direct steelmaking reduction process (using high sulphur crude oil residue)	Sumitomo HI	C-E Lummus (U.S.)	After successful demonstration tests, developers have started efforts to win orders
Know-how on analysis of waving inside LNG carrier's tank	Nippon Kokan	McDonnell Douglas	Britain's Shell may join this project

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SCIENCE AND TECHNOLOGY

TOYO KOGYO, NEC COOPERATE IN DEVISING ELECTRONIC CAR ENGINE

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 979, 3 Nov 81 p 6

[Text] Toyo Kogyo Co. has teamed up with Nippon Electric Co., Japan's largest semiconductor maker, to develop electronic engine control systems and other electronic automotive parts.

Three other major automakers here earlier teamed up with semiconductor and auto parts makers to develop car electronics: Toyota Motor Co. with Nippondenso Co. (auto parts maker) and Toshiba Corp; Nissan Motor Co. with Hitachi, Ltd., and Mitsubishi Motors Corp. with Mitsubishi Electric Corp. These three automakers already have marketed the so-called electronic cars.

Toyo Kogyo and NEC plan to jointly develop an electronic engine control system, probably using 8-bit microprocessors. While its specifics have not been disclosed, the system will be capable of controlling fuel injection on a concentrated basis so as to obtain the optimum fuel cost, output power and exhaust gas volume per each revolution of engine according to the data on the status of engine and accelerator detected by a sensor.

Shinko Trading Co. (NEC's affiliate), the mediator of the Toyo Kogyo-NEC partnership, is supplying electronic parts to Toyo Kogyo. It has so far achieved notable results in exploring the car electronics market. It, for example, has helped NEC become the No. 2 microprocessor and IC supplier to Nissan Motor after Hitachi.

Electronic car makers usually purchase microprocessors, the core of their electronic engine control systems, from a single semiconductor maker in order to maintain the secrecy of their engines. But they buy ICs from more than one maker to insure stable supply.

CSO: 4120/63

SCIENCE AND TECHNOLOGY

TRANSPARENT, HIGH HEAT FINE CERAMIC DEVELOPED

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 979, 3 Nov 81 p 13

[Text] A fine ceramic, resistant to extremely high temperatures of 1,300 degrees Centigrade and rapid temperature changes and yet transparent, has been developed by the National Institute for Research in Inorganic Materials of the Government's Science and Technology Agency.

The new material, believed to be without precedent, and expected to be widely applicable to such things as observation windows of high temperature furnace, has been developed by special processing of the ceramic material, sialon. Sialon, which is a scientific term, stands for silicon, aluminum, oxygen and nitrogen. It is made by sintering, either under a special pressure or under normal atmosphere pressure, powders of aluminum nitride, which in turn is produced by blending silicon nitride and alumina.

The institute located at Sakura Village, Niihari County, Ibaraki Prefecture, said there are two types of sialon, Alph and Beta. Type Beta has been tried successfully for making the transparent ceramic through various new processes, including reducing the impurities in the raw materials and controlling the sintering temperature and pressure.

The contents of iron, magnesium and other impurities, usually coming in 2 to 3 per cent, have been cut down to 0.5 per cent or less. The sintering temperature has been raised to 1,600 or 1,750 degrees C. under unusually strong pressure of 100 kilograms per square centimeter. The pressurization has been continued simultaneously with heating for a long time, between one and five hours, for various results.

The best specimen that obtained, about 0.6 milllimeters thick, though still quite dark in color, has proved to be transparent enough to permit reading ordinary printed letters through it when placed in direct contact with them.

According to the institute's chief researcher, Satoru Mitomo, the reduction of impurities and adaptation of the processing heat and pressure seem to have lessened light permeation-interfering particles in sialon. The specimen, however, still lets through only 5 per cent of the visible lights of 0.4 to 0.6 micron in wavelength and 40 per cent of the infrared rays. But he expected the transparency to be sharply boosted through a better sintering method.

CSO: 4120/63

SCIENCE AND TECHNOLOGY

NTT CLAIMS TO BE TURNING OUT WORLD'S MOST INTEGRATED LOGIC ELEMENT

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 979, 3 Nov 81 p 8

[Text] Nippon Telegraph & Telephone Public Corp. (NTT) announced last week development of what it says is the world's most integrated logic element.

The logic VLSI (very large-scale integration) features 20,000 gates (logic circuits) integrated on a 12 millimeter-square chip. It can perform 32-bit high-speed operations, NTT said.

Such high integration has been attained by NTT's highly advanced CMOS (complementary metal-oxide-semiconductor) technology. The VLSI chip's minimum line width measures 2 microns, compared to 3.5 microns and 4 microns for similar 32-bit devices earlier developed by Bell Telephone Laboratories Inc. and Intel Corp., respectively.

Because of its CMOS structure, the new chip's power dissipation stands at as low as 750 milliwatts.

According to NTT, processors used in minicomputers can be replaced by a chip of the new logic VLSI.

NTT's achievement represents Japan's first successful attempt to develop more integrated processors, while integration of memory devices has been progressing smoothly as in the case of 64- and 256-kilobit dynamic random access memory (RAM) chips.

NTT plans to apply the logic VLSI to computers for the planned Information Network System (INS). The INS service, scheduled to start in fiscal 1983, is designed to offer a wide range of voice and non-voice services by integrating NTT's telecommunication and information processing capabilities. In such a system, processors capable of advanced functions and performance will play an important role and be required in great numbers.

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SCIENCE AND TECHNOLOGY

HITACHI TO BOOST OUTPUT OF 64K RAM CHIPS

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 979, 3 Nov 81 p 8

[Text]

Hitachi, Ltd. last week revealed a plan to boost production of 64-kilobit random access memory (RAM) chips to 1 million chips a month next April from the present 700,000 chips. Until September, it was producing 500,000 chips monthly.

Hitachi expects surging demand for such highly integrated memory chips mainly from computer builders and other information processing equipment makers.

With the bold plan, Hitachi will be the nation's largest producer of 64Ks, far outdistancing its rival semiconductor makers. Industrymen see that Hitachi has started a big "offensive" in the semiconductor field.

At present, 64Ks are being produced by about 25 companies in Japan, the U.S. and Europe. Japanese producers have been stepping up mass production volume since the middle of this year in anticipation of greater demand for more sophisticated memory units than the preceding 16K and 8K RAMs. However, it turned out that demand was not so strong as producers expected earlier. As a result, prices of 64Ks plunged to around ¥2,000 or less per chip from ¥20,000 only a year earlier.

Ironically, however, the remarkable price plunge has stimulated possible customers to purchase 64Ks instead of 16Ks.

Hitachi seems to have confidence in a strong 64K demand in the near future. Managing Director Yasuo Miyauchi said that 70 to 80 per cent of production would be shipped abroad. His remark indicates that Hitachi already has secured large-lot customers mainly in the U.S. Miyauchi also said that 64K quotations have almost hit the bottom. This judgement is another factor for Hitachi's aggressive 64K production policy.

64K RAM Production Plans in 2nd Half of Fiscal 1981

(In 1,000 chips per month)

Hitachi	1,000
Fujitsu	600
NEC	300
Toshiba	300
Mitsubishi	300
Oki	300

During the first half (April-September) of its 1981 business term, sales of Hitachi's semiconductor and IC division rose 22 per cent from a year earlier to ¥95 billion. The company expects such sales in all 1981 will reach ¥205 billion, up 24 per cent from the 1980's ¥165 billion. The estimated sales value will account for 9.6 per cent of Hitachi's total sales. The composition ratio, which stood at 8.5 per cent last year, thus will finally near the 10 per cent level.

Besides Hitachi, other Japanese semiconductor makers are now spurring 64K RAM production. Fujitsu Ltd. is the runner-up with the monthly output planned at 600,000 chips at the end of next March. Nippon Electric Co. (NEC), Toshiba Corp., Mitsubishi Electric Corp. and Oki Electric Industry Co. follows them with plans to produce 300,000 chips monthly each as of the same date.

Among them, NEC is trying to catch up with Hitachi and Fujitsu most aggressively. The nation's largest semiconductor maker recently started building a plant capable of producing both 64Ks and 256Ks (JEJ-Oct. 27 issue). Depending on the market trend, industrymen predict, NEC might concentrate on production of 64Ks. This indicates that Hitachi and NEC will compete fiercely in the 64K RAM field in the next several years to take the leadership in the market.

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SCIENCE AND TECHNOLOGY

NTT DEVISES SEMICONDUCTOR LASER OF 1.5 MICRON WAVE

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 979, 3 Nov 81 p 13

[Text]

A fiber optics communication semiconductor laser, capable of continuously sending out an infrared beam of 1.5 icrons in wavelength under normal room temperature (15 degrees C.) without refrigeration, has been developed by Nippon Telegraph and Telephone Public Corp.

The laser had been sought by fiber optics communication researchers of many advanced nations because a laser wave 1.5 microns long had been known as the most ideal type of light for transmitting through optical fiber lines with the least possible loss in signal strength. But no good laser that requires no refrigeration and continuously works at room temperature had been developed anywhere. So far, NTT, though spearheading the world's fiber optics communication technology, had been using a 0.8-micron beam laser for practical application and a 1.3-micron type for experimental purposes. The 1.5-micron beam laser, if well developed, could sharply reduce the number of midway boosters (relays) on a given long-distance optical fiber communication line.

Observers expected NTT's success to draw global attention because there has been an international suggestion to introduce a fiber optics type of undersea communications lines below the Pacific and the Atlantic between Japan and North America and between the U.S. and West Europe if a good 1.5-micron semiconductor laser is developed. NTT plans to start a field trial with the new laser in the next two years after ensuring its applicable service life of at least 10 years.

According to the announcement, specifically made by NTT's Musashino Telecommunication Laboratory developing the new laser, the new laser, known as a "Distributed-Feedback" type, features another decided advantage of being perfectly free from a common trouble of disruption in the signal wave form over a long distance of light transmission through an optical fiber communication line. In the past, even an equivalent wavelength laser's beam, when transitting a long line of such fiber, had become confused with other lights of nearby wave bands occurring around it and running along with it. This is because the new laser's semiconductor is made up of two different layers of four different chemicals, indium-phosphorous and indium-gallium-arsenic-phosphorous, with a unique wave-formed inner layer and only the inner layer matches the 1.5-micron wavelength.

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SCIENCE AND TECHNOLOGY

'DOUBLE-DECK' SEMICONDUCTOR PRODUCED

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 979, 3 Nov 81 p 13

[Text] Hitachi, Ltd. of Tokyo recently disclosed its success in producing, on a trial basis, a "double-decked" type of semiconductor. The company expressed its belief that it has gained a foothold in creating a multiple-tiered, three-dimensional electronic circuit unit.

All sorts of integrated transistor semiconductors, though immensely increasing in density of electronic circuitry up to the large-scale integration class and now very large-scale integration class, have been single-tier structures.

Since there is an inevitable limit to density on an one dimensional struture, multiplying the layers of such units could open immense room for increasing density. According to the electronics manufacturer, the idea of piling up each chip had posed great difficulty.

The company has broken through the bottleneck by covering a completed silicon chip with a thin insulating film, speading a silicon solution over the film, and then bombarding the silicon covering with a laser beam to create a single-crystal growth of silicon in the same size as the original chip. Little holes were made in the film so that the lower and the upper chips will be connected with slender silicon columns. The upper chip has proved to be just as neat and trim as the lower one in crystallization

The upper chip, when transistors were laid on it and tried out, proved to work just as well as the ordinary single-layer transistor-bearing chip.

CSO: 4120/63

SCIENCE AND TECHNOLOGY

ENVIRONMENT INDICATION SYSTEM FOR ROBOTS DEVELOPED

Tokyo TECHNOCRAT in English Vol 14 No 7, Jul 81 pp 49-52

[Text]

The control systems section of the Electrotechnical Laboratory, which has been engaged in study of intelligent robots, has successfully developed a system which indicates the work environment of a robot.

This system easily enables one to generate an environment model at a distance without entering the actual work environment of the robot. At this time, one does not have to handle such live numeric data, as of position or angle in most cases. Moreover it enables one, by a superimposed display, to generate the model on an interactive basis as always monitoring the actual environment, and the internal model. The environment model thus generated brings possibilities of generating motion locus of a robot's arm or of its visibility, by combination of graphic processing and a geometric model, for the purpose of helping the robot in its work, such as avoiding collisions with other objects in the environment, or of other applications. From this viewpoint, the laboratory will continue studies for more accurate modeling of more complex environments with less labor.

The outline of the work environment indication system just developed is given below. The environment indication system is made up mainly of a laser pointer and a superimposed display (Fig. 1). The laser pointer enables a laser beam spot to be focussed on a given point in the environment by operating an optical mirror scanner placed in front of the laser beam source, thus determining the position of the desired point. The superimposed display enables one to superimpose given information in line images or characters onto the actual environment displayed on the monitor screen. The monitor screen is divided into 640×480 graphic elements each corresponding to which storage is given. The contents stored are synchronized with a T.V. camera and readout sequentially to be superimposed on an imaging signal and displayed on the screen.

Configuration of the actual system is given in Fig. 2. Interfacing between hardware and the 3-dimensional position measurements is performed by a PDP 11/34 computer and model configuration, or by graphic processing by the host computer COSMO. The TV camera, the laser beam source, and the scanner, etc. for measuring and monitoring are allocated as shown in Photo 2. Photo 1 shows the operator's console peripherals.

Environment modeling is performed as follows: The operator applies the laser spot onto the characteristic point on the modeling subject by operating the laser pointer as seen on the display monitor on which the actual environment is displayed. The system detects the spot position as the lightest position by monitor imaging signals and performs a 3-dimensional position measurement for the spot based on a triangulation method from that position, and the direct angle. The required number of thus measured characteristic points and the provided commands permit the system to create a geometric model having the same position, posture, shape, and size as has the subject. The system is provided with basic cubic models (Fig.3) and commands which create each model. The operator now tries to divide the subject into the basic cubes according to such procedures to apply the basic cubes to the actual subject by laser pointing and commands, and then combines them to create a complicated-shaped subject model.

In the process of environment modeling, the system takes into consideration the direction and visual scope of the TV camera showing the actual environment, creates a line picture

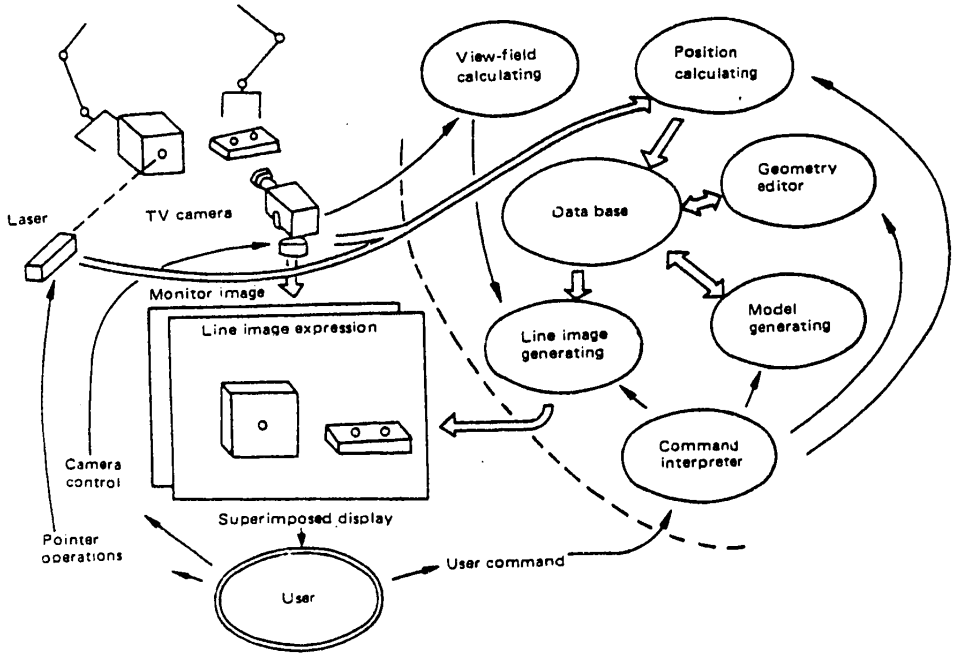


Fig. 1. System Components Diagram

of the subject model which must be received by the camera, based on the environment model created internally, and displays it on a superimposed display (Photos 3, 4), thus permitting the operator to grasp at a glance the status of the internally created model from the state of the line picture superimposed on the actual subject image. Error parts of the model due to errors in laser pointer measurements or the indication procedures can be corrected by performing geometric operations using a conversion program for the model until the line image is correctly superimposed with reference to the immediate display of the results, thus enabling the correct environment model to be made.

In the work environment, there exists such parts as those behind other subjects, or internal parts of hole all of which are invisible and cannot be measured by the laser pointer. As for such parts, the operator surmises the shape of the subject in the environment as he sees the monitor and gives the system the commands based on that surmise to indicate it to the system. Therefore even if there are some characteristic points that cannot be measured, the model can be created so far as the subject can be seen because the operator can give

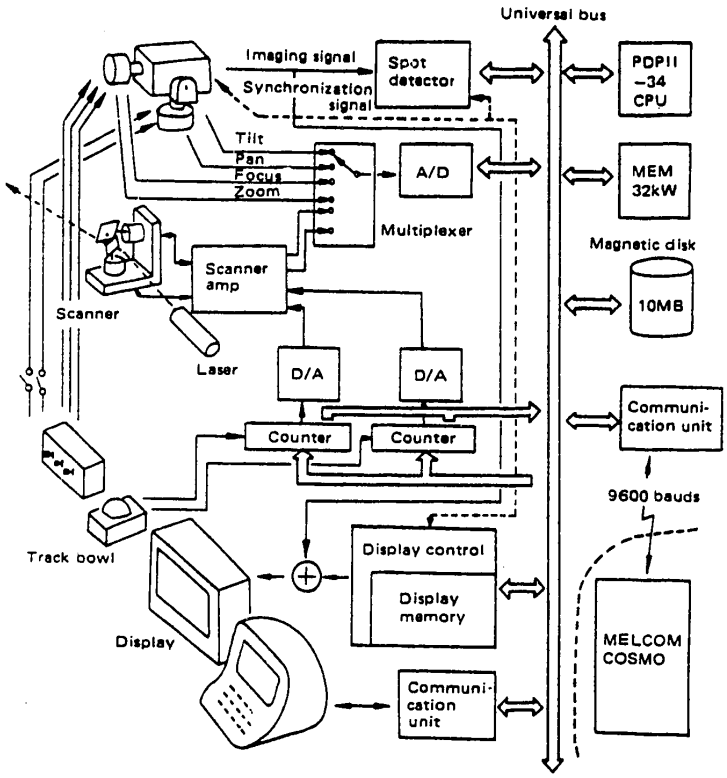


Fig. 2. Hardware Configuration

the system indications based on other characteristic points or models in the vicinity. The obtaining of 3-dimensional measurements for position by means of the laser pointer is also possible even if the spot cannot be detected automatically, by operating the cursor and indicating the spot position on the monitor screen as far as the laser spot can be applied and shown on it. So it can be said there are no limitations to modeling subjects. And one anc configurate not only a geometric environment model but also a work environment data base for the robot by indicating the use, material, and name of each model.

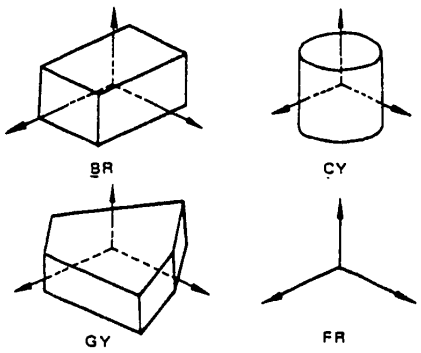


Fig. 3. Basic Cubes (some of them)

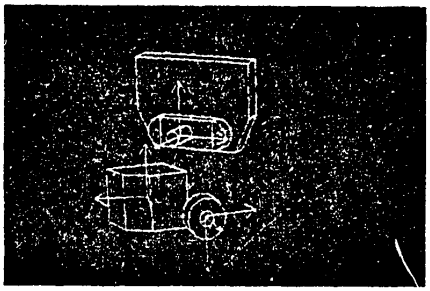


Photo 3. Environment Model Created in Computer

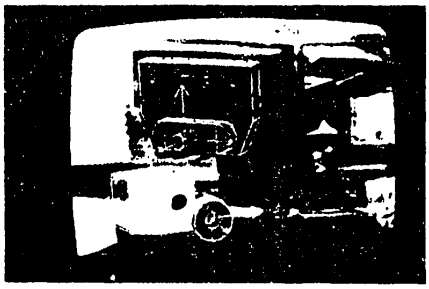


Photo 4. Superimposed Display of Actual Environment Monitor and Internal Model

CSO: 4120/64

SCIENCE AND TECHNOLOGY

SOPHISTICATED MACHINING CENTERS PRODUCTION DISCUSSED

Tokyo TECHNOCRAT in English Vol 14 No 7, Jul 81 pp 39-42

[Text]

Domestic production of machining centers (MC) in 1980 reached 5,231 units, surpassing for the first time the 5,000 mark. Japanese-made machining centers first appeared on the market in 1976 when 133 units were produced, so 1980's production shows a 40-fold increase in barely five years.

This rapid increase reflects the industry's investment efforts for rationalization of equipment and labor saving, and demands for numerically controlled (NC) machine tools including MC's are expected to increase considerably further.

Of the 107 machine tools makers, members of the Japanese Machine Tool Builders Association, those who at present manufacture MC's number 31. In addition, there are about eight MC makers who are not members of the JMTBA, so nationwide about 40 firms now manufacture machining centers. This means that in 1980, each of these 40 firms produced an average of 14 MC's a day. Machining centers are the fruits of the entire technology a machine tool maker accumulates over a long period, therefore it is very heartening that such highly sophisticated machines are produced on such a scale and by so many makers.

The balance sheets for the March accounting period for machine tool makers recently made public, without exception show greatly increased profits over the previous term. As to what has contributed to these increased profits cannot be explained by a sweeping generalization since these makers produce different mixes of machine tools, but one thing sure is that NC machine tools, especially NC lathes and MC's, have made significant contributions.

It used to be that, as an industry, manufacture of machine tools was very vulnerable to fluctuations in economy, with usually a boom year followed by three years of poor sales. Since the bottoming out the 1975 recession, the industry's

sales have been steadily increasing for the past 6 years, riding on the crest of a boom for NC machines and helped by increased exports that have offset a slacking domestic demand.

What contributed to the industry's strong showing until now, has been MC's and NC lathes, to begin with, and then transfer machines, automatic lathes and electrospark machining machines for the automobile industry. Demands for such machines may in the future encounter periods of slight or moderate adjustment, but as Takeo Okuma, president of Okuma Machinery Works, states, "The future is fantastic", so the prospects for machine tools seems very bright.

Even though the prospects for certain kinds of machine tools are bright, there are slight differences in tone of recent announcements. For example, President Koichiro Kitamura of Kitamura Machinery Co. is among those who take a bullish view, and says, "Domestic production of MC's this year will reach the 8,000 mark. When I say 8,000 units, I mean machining centers by their very character, as compound machining machines, will encroach on the demands for both drilling and milling machines that functionally compete with MC's". Sources close to JMTBA on the other hand, are more moderate, "At the best, output will show a 40% gain over last year to reach the 7,000 mark". This figure itself seems to indicate that the production of machining centers may have reached a peak when it is a fact that the domestic production of NC lathes last year was 12,036 units.

What really seems to be in the minds of MC makers is, "The battle this year will be fought centered on MC's". "The emphasis is being shifted from production of NC lathes to production of MC's", states Kinroku Degawa, president of Hitachi Seiki Co. Masatoshi Shimizu, president of Makino Milling Machine Co., says, "We manufactured 258 machining centers last year and this year's goal is 50% up". President Okuma of Okuma Machinery Works says, "Facilities and equipment in big companies are now obsolete, and we can expect a demand for large-scale replacement". "We are planning to greatly expand our MC department", says Masafumi Yamabe of Toshiba Machine Co. "We started shipping MC's from July, and we expect them to become the No.2 pillar after NC lathes", as stated by Mori Precision Machinery Works. Shin Nippon Koki Co. plans "to exploit the market at home and abroad on the strength of our achievements in delivering large-scale machines to the aircraft industry". Nakamura-Tome Precision Industry Co. displays its enthusiasm for MC's by saying, "We are going to newly enter the field by introducing onto the market new types of energy-saving machines".

There is now an opinion that if all these firms start increasing production at the same time, the balance between supply and demand will easily be disrupted. However, the consensus of the industry is summed up by President Kitamura of Kitamura Machinery Co. who in his attempt to explain the current situation facing the MC industry likened it to a "Sumo" match where all wrestlers are up in the ring for a

showdown. Some people fear increased competition for sales between MC makers on the domestic front so that they can recover any fall in exports caused by trade frictions with Europe.

Exports of machine tools in 1980 amounted to ¥269,577 million, which accounts for 39% of the total value of the year's production which stands at ¥683,048 million. Of this, exports of MC's totalled 2,920 units worth ¥61,451 million.

Of the 5,231 MC's manufactured in 1980, 55% were exported. That is, over a half of the total output was destined for export to foreign countries.

By export markets, exports to Europe numbered 1,209 units (1,004 units to EC countries), while exports to North America were 1,436 units.

The future tasks facing the machine tools industry are (1) prevention of any meaningless price war domestically, and (2) for exports, to gain recognition of made-in-Japan machine tools as being first class brand-name products.

Fortunately, the orders for machine tools for this year from the domestic users are expected to stay at the same high level as last year, worth some ¥620 billion. With backlogs reaching as much as a half of their annual production, all the machine tools makers are producing at full capacity. On the other hand, management is taking a very cautions attitude towards equipment investment for capacity expansion. This is best illustrated by the words of Umeo Oyama, president of Tsugami Co., who stated, "We will make investments for labor-saving and rationalization, but no equipment investment merely aimed for capacity increase. We have learned from our past bitter experiences". In this way, efforts of all firms are directed towards building up internal reserves and reducing interest payments by refunding previously borrowed money.

The corporate posture being as such, it seems that a situation has been created where the excessive competition that has accompanied every past recession will hardly materialize this time.

The problem rather will be how to avoid the misunderstandings of Europe and America with respect to makers' being unable to comply with their demands. Exports of MC's, along with NC lathes, are subject to cartel restrictions under the Import-Export Trade Act. Under this law, the Ministry of International Trade and Industry (MITI) can guide the machine tools industry to set the minimum prices for machining centers and NC lathes bound for export to North America and Europe. The objective of the law is to eliminate excessive competition and thus avoid confusion in export markets.

Despite such voluntary restraints by Japan, European countries, and also the U.S. to a lesser extent, are viewing the inroads of Japanese NC machine tools with increased alarm.

In February this year, the EC Commission placed cars and color TV's imported from Japan on the list for restricted imports from Japan. The contents of the decision were made

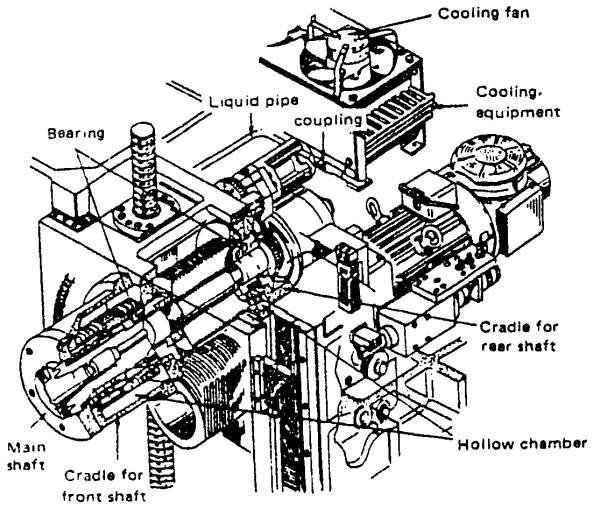


Fig. 1. Structural Drawing of the Main Shaft Incorporating Heat Pipe

public at a meeting recently held at the EC Commission between Japan and the EC. According to the EC, imports of machining centers from Japan in the January-March period of 1981 were up 68% over the same period a year ago, although imports of NC lathes did not register such a brisk increase. The figure however is held in doubt by the Japanese side. According to Japanese customs clearance statistics, the increase in Japanese exports in terms of units was 61% and in monetary value 51% for Japan vs. 88% for the EC, thus showing great differences in allegations between the two sides.

Both Japan and the EC are trying to determine how this divergence in the two sides' values has come about, but MITI is of the opinion that an increase of 60% or so in machine tools exports will pose no problem. On the part of Japanese makers, they would be well served if they have the wisdom of giving second thoughts to the good and bad of one-sidely imposing Japanese-style trade practices in opening up markets in countries having different trade practices, languages and culture.

European countries, in particular, are keenly aware that they are lagging behind in the development of NC equipment, and they are anxiously desiring introduction of technology for NC equipment and NC machine tools from Japanese companies. Emphasizing the importance of international technical exchange and goodwill, President Okuma of Okuma Machinery Works states, "In the past, Japanese companies raised their technical levels by introducing machine tools

from the advanced countries in Europe and America. Now, it is the time we should return favors".

While almost all NC machine tools retain many of the mechanical features of their base machines, i.e. conventional machine tools, only machining centers have succeeded in achieving a metamorphosis as machines where the most is made of the characteristics of numerical control.

About 30 years after the first NC machine tools came to be used, and then a further 15 years after that, the machining center was born out of a concept that is quite a departure from the mere numerical control of conventional machines. The MC seeks to incorporate the functions of NC as main elements while retaining machining and ATC as subordinate elements for control.

Once a workpiece is loaded, the machine performs work on all planes in all machining operations. In early stages of the development of MC's, a machining center was understood to mean a machine that performs machining operations on all planes except the plane by which the workpiece is attached to the machine. Emphasis then was placed on the development of automatic tool change (ATC). The placing of emphasis also is related to problems of patent. The number of tools stored in an ATC has steadily increased from ten or so at the initial stage to currently when most ATC's store several times this number. Machines having a drum structure have also been developed one being YMS of Yamazaki Machinery Works, that can easily hold several hundred tools.

There are machines developed that by changing the tool head, they can use large-size tools, as well as machines designed to use tools with numerous cutters.

As for controls of the mechanical system, simultaneous control of three to five axes has become the norm, and with reaching this level and combined with the previously mentioned ATC function, MC's have attained all the functions expected of them when first conceived several years ago. In subsequent years, computer numerical control (CNC) of machining centers has made rapid strides supported by advances in minicomputer and microcomputer technology. MC's have registered significant improvement and expansion in terms of software, such as MDI with built-in CRT to begin with, and to include tape editing functions, computation and accuracy-compensating functions, etc.

Thus, in terms of function, MC's as machines may be viewed as having already progressed well past the initial stages of development. Hereafter, development trends are likely to head MC's into an age where corrections or compensations of functions are attempted by incorporating new developments in detectors and sensors.

Much hope is placed on MC's in future use, not as single units but as line machines.

One of the great weakeneses of the MC has been its development as a general-purpose machine with special emphasis placed on ATC. As with most other NC machine tools, an MC can have only one cutter engaged in a machining operation at any time and that it has not been compatible with automatic work change and transfer mechanisms.

If an MC "rationaliy" can be thrown into a production line represented by a transfer line that is very strong on these points, the features of the two systems will be brought into full play, raising the system flexibility and resulting in a rational distribution of ATC and AWC. The net result is the creation of a machining system of high productivity that can perform simultaneously numerous machining operations by using numerous tools.

Again, there are many items whose productivity and accuracy can be raised much higher by machining them in two to three processes, employing separate machines rather than by machining them with a single MC which overly consolidates the process. Hence the idea of employing a number of machining centers simultaneously has come to be accepted.

For this purpose, however, conventional MC's are built with too much emphasis on their multi-use features so that they can be used over a wide range of applications, and this very emphasis is reflected adversely in some ways and with poor performance in terms of economics.

Consequently, development of MC's which are not just general purpose or for exclusive use, but have functions that are highly capable of coping with variations in use as the situation and purpose demand is sought.

As for machining accuracy, no particularly high values were demanded of MC's, partly because they were originally developed for machining of parts produced in small quantities and that were complex in shape. For a long time, a tolerance of ±10 to 12.5μm (0.0005 inch which is up to ten times or so the error of positioning with a jig boring machine was accepted.

Among the reasons for this are the following: That a machining center is a kind of automated machine tool and thus basically machining accuracy is lower than a manually-operated machine requiring attendance of an operator at all times by the order of one digit; that the emphasis in the development of machining centers was placed in the increase in the operating rate beginning with reduced downtime and manpower reduction; and the development of equipment for inspecting machining accuracy of complex shapes of parts machined.

However, at present downtime is not so much of a problem, and owing to the ease with which machining accuracy of parts having complex configurations has come to be tested through the widespread use of three-dimensional measuring instruments, foundations for increased precision in machining by machining centers have been laid.

On the other hand, as for rotational accuracy of the main shaft that is the decisive factor in raising precision, the accuracy of even a main shaft mounted on ball bearing supports can be maintained below 1.0μm and the accuracy of the main shaft mounted on a fluid bearing support can be easily maintained below 0.1μm.

As for thermal displacement which is considered to be the principal cause of lowered accuracy and coming from mechanical structure, not only analytical and rational designing methods have come to be used widely but also the method as shown in Fig.1 in which by using a mechanical structure

directly as a part of a heat pipe, a thermal equivalency is obtained while the generated heat is discharged, has come to be put to practical use. With incorporation of such measures, the stability of machining accuracy has been further raised.

Moreover, MC's built for use, not as general-purpose machines but as machines used in production lines of limited scope and purpose, will be required to have much higher levels of the stability of accuracy, and this requirement will work to further raise the accuracy of machining centers.

Finally, automatic measuring instruments for measuring work, of the present level of technical sophistication incorporated in machining centers will lose their main functions once the stability of mechanical accuracy increases to the levels of 3 to 5μm. Some of these instruments will become unnecessary because post process measurement will satisfy the requirements for controlling machining accuracy, and some will develop as more sophisticated compound machines provided with the functions of machining and inspection by using the mechanical structure of the MC itself as a 3-dimensional measuring instrument and by incorporating the process of machining – inspection – correctional machining – inspection.

MC's are meeting a turning point in development, and the direction is away from their use as a single unit machining center towards their use as machines for use in production lines, as is represented by FMS. With it, machining accuracy is expected to increase from the current levels of $\pm 10\mu$m to ± 5 down to $\pm 3\mu$m, and with it, the kinds of automatic measurements required will see great changes.

CSO: 4120/64

SCIENCE AND TECHNOLOGY

OUTPUT OF 500MeV ELECTRON LINAC REPORTED

Tokyo TECHNOCRAT in English Vol 14 No 7, Jul 81 pp 31-37

[Text]

Introduction

High energy and large output of an electron linear accelerator (referred as to an electron linac) enables us, a wide variety of research and development programmes, such as for medical treatment for cancer by pions, material study by synchroton radiation, or super LSI technology. With its own design and purely domestic technology, the Electrotechnical Laboratory (ETL), starting from April, 1980, completed building an energy-saving type 500MeV electron linac in six months introducing a multipurpose, highly efficient system.

Permission, based on the Radioisotope Law, for use was granted by the Science and Technology Agency on December 22, 1980 and successful beam acceleration was achieved the same day. Performance was almost that expected to be obtained later in January, 1981.

The electron linac is larger than the 300MeV at Tohoku University and is as shown in Fig.1, and its maximum electron energy, electron beam power, and duty cycle are all the highest in Japan at present. The output is one of the highest in the world. The total length of the accelerator is about 80m and it is installed in an accelerator room about 100m long 6m underground.

1. Characteristics of the ETL 500MeV Linac

(1) For the accelerating sections, the backbone of the acceleration, three kinds of accelerating sections specially designed for low cost production, in total twenty, are arranged in line in order to prevent scattering and losses caused by rolling of the

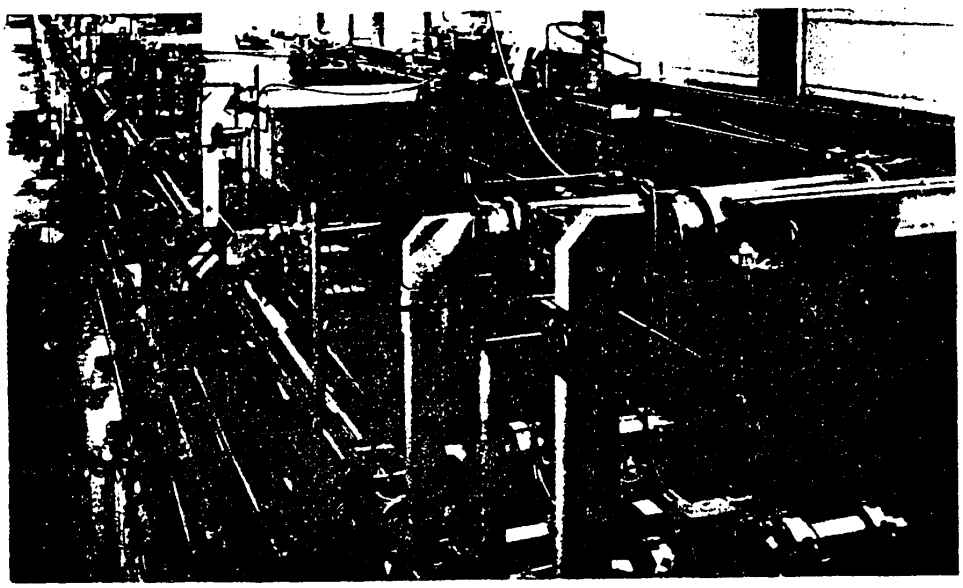


Photo 1. Total View of Accelerating Sections of 500MeV Electron Linac

electron beam, and to minimize electron beam loss in the sections. This is the ETL system.

(2) For the pulse klystron, the center for supplying microwave power to the accelerating sections, a highly efficient klystron with operation efficiency of 48 to 54%, highest efficiency in the world, was developed to enable an electron beam of large power to be accelerated with a 70% power capacity of the conventional type.

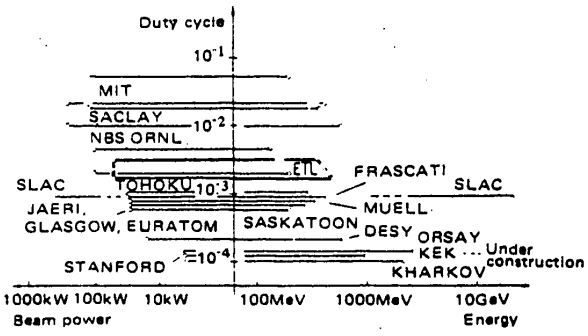
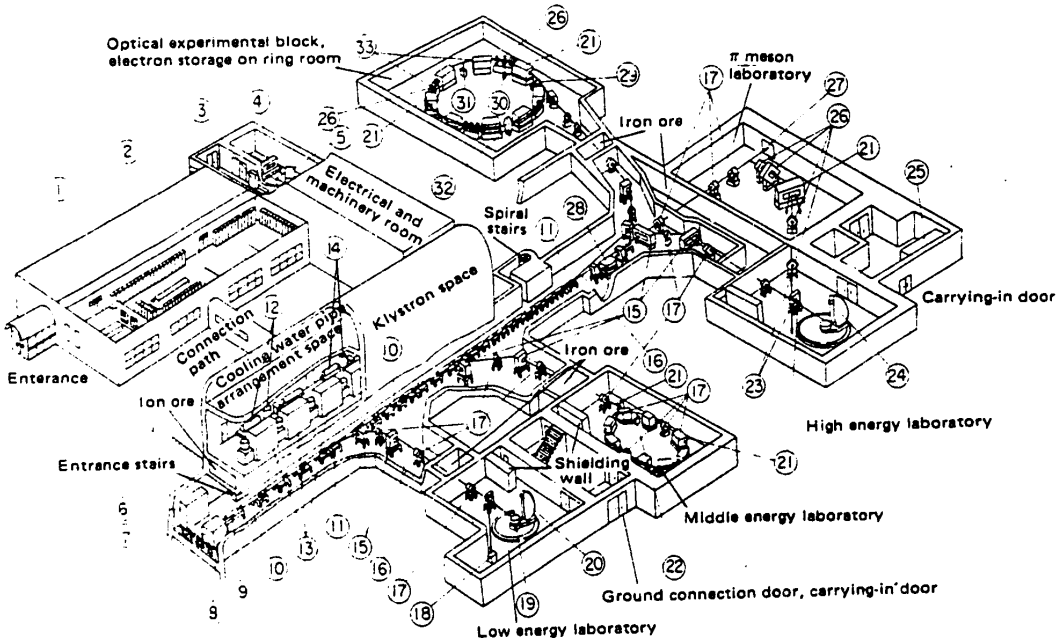


Fig. 1. Performance of Electron Linac's of More Than 100MeV in the World and ETL Linac

(3) The beam output is drawn from the way of accelerator itself to the low and middle energy laboratories, and from the top of the accelerator to the pion laboratory, the high energy laboratory and the electron storage ring room. Particularly, as simultaneous beam sharing to the four laboratories is enabled by pulse deflection using three pulsed-coils, one accelerator can do the work corresponding to four units and the electron beams can be used for a number of purposes and with high efficiency.

The above are some major characteristics and these are new innovations of ETL or results of its research and development over many years. Their extensive effects can be greatly expected. For the accelerating sections, for example, the ETL system that has sets of linearly tapered iris type accelerating section, is introduced in the injector at the Photon Factory which is being constructed by the National Laboratory for High Energy Physics (KEK) and for the pulse klystrons currently used in the world, most of them have an efficiency in the order of only 30%. Higher efficiency up to 50% or more is an urgent requirement for study from the standpoint of energy-saving and increased economy. The development of a higher performance klystron has been carried out since 1974 in cooperation with Tsohiba who took the initiative for the



(1) Management room (2) Measurement control room (3) Betatron control panel (4) Pair spectrometer (5) Betatron (6) Electron gun pulser (7) Electron gun (8) Ion pump (9) Buncher (10) Accelerating section, lens, and ion pump cooling pipe arrangement (11) Pulse deflection coil (12) Accelerating section cooling device (13) Klystron pulsar (14) Klystron cooling device (15) Analysis electromagnet (16) Vacuum duct and cooling pipe arrangement (17) Quddrupole electromagnet and ion pump (18) RI irradiation equipment (19) Scattering chamber and ion pump (19) Compton spectrometer (21) Deflection electromagnet (22) Ion pump (23) μ meson duct (24) Heavy ion spectrometer (25) Electromagnet power (26) Quadrupole electromagnet (27) Beam catcher (28) ECS electromagnet (29) Turbo molecular pump (30) Spatter ion pump (31) Ti getter pump (32) RF accelerating cavity (33) SOR observation duct

Fig. 2. A Bird's-eye View of ETL Linac Facilities

assignment and played a big role in its success. The electron linac is the product of integration of high microwave power precision processing, and super-high vacuum technologies and systems engineering. The recent progress of large power klystrons has enhanced the economy and safety of an electron lineac, leading to extensive use of linacs in many fields such as for scientific, industrial, and medical technlogies. According to this tendency, an electron linac of larger output has been required. Hence, when ETL decided to move to Tsukuba Research and Educational City in 1971, it planned the construction of a large scale electron linac and started to work on its basic design. The characteristics of the ETL linac described previously, are those that were designed and planned for construction during the period of 1973 to 1974.

2. Main Building and Related Facilities

Currently, the main building, where the large output high energy accelerator is installed and its related facilities are normally on a large scale and are more expensive than the accelerator itself, but ETL produced their own basic design taking into consideration economy together with safety, flexibility, and function.

As shown in Fig.2, the 500MeV electron linac and its related experimental facilities are installed in the linac and optical experimental blocks which are constructed semi-underground. The linac experimental block contains rooms for management,

measurement control, the klystron, low, middle, and high energy laboratories, and a pion laboratory in addition to the accelerator room (a complete underground room) which is about 100m long and 6m underground. The electron storage ring room (in the optical experimental block as shown at the upper center of Fig.2) will have its 600MeV electron storage

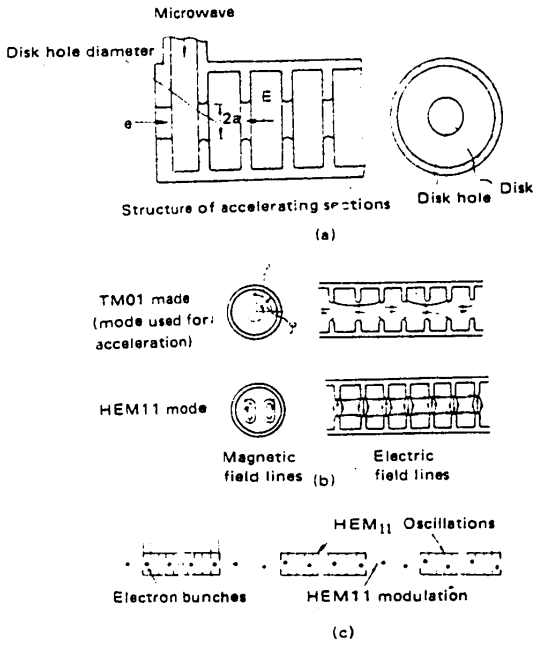


Fig. 3. Structure of Accelerating Section

ring installed in March, 1981. The electron beam is designed to be accelerated from 300 through to 500MeV by the electron linac, and then bent to the left by pulse deflection at the top of the accelerator room and made incident to the electron storage ring through a vacuum duct.

3. Characteristics of Building Design

(1) For the purpose of energy-saving, the power and the machinery rooms are adjacent to the central part of the room for the klystrons which consume large amounts of power, and the 1200kW AC generator is installed so as to cut pulse noise from the klystron pulsers and at the same time to provide a stable power source for the klystrons.

(2) As shielding material for ionizing radiation, inexpensive iron ore has been used to provide sufficient shielding and safety in lieu of expensive heavy concrete. About a ¥200 million saving could be made.

(3) The side walls of the accelerator room and laboratories are made double with blocks to prevent condensation forming.

(4) Air-conditioning of the accelerator room is of a closed circulation type except for in emergencies. The 100m long accelerator room functions as a feed air duct and the area below the floor of the room as the return duct. Air returning from the accelerator room is first cleaned with water and then passes through a filter for removal of moisture by chilled water, and finally fed back to the accelerator room.

(5) If any water leakage should take place in the accelerator room or laboratory, it is temporarily accumulated in a reservoir for further processing.

(6) Cooling water for the accelerator and experimental equipment is in a closed circulation type system. Temperature control for the accelerating sections is kept at 40±0.1°C and even if thinned-out operation of the electron beam from the low or middle energy section is run by pulse deflection, each accelerating section of the low, middle, and high energy sections can have controlled temperature at 40±0.1°C according to its respective duty cycle.

(7) Elevators and cranes are properly positioned for easy access to the accelerator room 6m underground and the laboratories at the time of delivery, installation, and adjustment of heavy machinery, and to improve flexibility and safety of the personnel engaged in experiments. The use of these elevators and cranes is one of the reasons why such large experimental equipment could be constructed in an incredibly short period of only six months by a small number of people and without any accidents.

(8) The doors of the accelerator room and each laboratory are equipped with a door and key interlock feature. Unless each door is closed and locked by key, beam acceleration is impossible. The control console includes a door open/close and lock display panel so that the operator can monitor these conditions. In addition, CCTV is specially installed in the accelerator room for constant monitoring.

4. Electron Linac

As shown in Fig.3, the accelerating section that accelerates the electrons is configured with pure copper disks each with a hole, and which are fitted in a pure copper tube having an inside diameter of about 8cm. The disks are spaced at intervals of 3.5cm (one-third the wavelength of 2856MHz microwave).

These holed disks work to adjust the phase speed of microwaves to light velocity, or to create a strong electric field (TM01 made) in an axial direction required for electron acceleration.

Electron injection to the accelerating section is made by an injector consisting of an electron gun, an electron power supply, an electron pulse modulator, an inflector, a prebuncher, and a buncher. The speed of the electrons injected at about 100keV by the electron gun, is at 55% light velocity and it is accelerated to about 1MeV at the exit of the buncher where it reaches 94% light velocity. The incident electrons to the accelerating section with this speed are accelerated in a strong electric field axially travelling with light velocity, but the

electron speed is only close to light velocity, 99.5% at 5MeV or 99.9999% at 500MeV and only the electron mass is increasing by relativistic effect.

The electrons are accelerated in a strong electric field on the axis of the holed disks, and the electric field range as shown in (b) of Fig.3 indicates the alternate direction of the field along the axis. Some of the electrons that are injected to the accelerating section are accelerated if they are at a certain phase, but others are deaccelerated. Thus, it is necessary that injection can be made at a suitable phase for acceleration at the stage of the injector. If the injected electrons at about 100keV from the gun passes through the cavity gap of the prebuncher, the electrons that pass early, centering around a certain phase are deaccelerated and ones that pass later are accelerated by periodically changing the electric field at 2856MHz. When the distance of about 30cm to the buncher is run, the electron flow becomes a discontinuous range and turns to the flow of electron bunches that are gathered in a phase interval of about 60° – electron bunches that continue of intervals of 105mm. In addition, an individual electron bunch becomes a part of a bunch within 4° (corresponding to slightly above 1mm in length) at the exit of the buncher with about 46cm in length (travelling wave type – Vp/c=0.75 to 1, $2\pi/3$ mode, constant impedence type). These electron bunches reach the highest energy through acceleration of the largest electric field by adjusting the microwave phase of each accelerating section.

While an electron is being accelerated in an accelerating section, it generates backward microwaves (mainly harmonic components having about 1.5 times the microwave input frequency) and the lateral electric field in the HEM11 mode takes place, which is shown in (b) of Fig.3. This lateral oscillation is further amplified by multistage acceleration by a number of accelerating sections and reduces the electron beam striking the holed disks in the accelerating section. ETL has developed the following structure and arrangement for the accelerating sections in order to restrain the Beam Blow-Up (BBU) effect.

(1) To make the operating distance between the HEM11 mode in the accelerating section and the electron beam as short as possible in order to prevent rolling force to electrons.

(2) To place Q electromagnet (quadrupole electromagnet) for focusing among the accelerating sections for restraint of rolling.

For the structure of the accelerating sections, some five kinds of linearly tapered iris type accelerating sections, A,B, C,D, and E, as shown in Fig.4, were developed for use at the designing stage taking into consideration the above conditions and possibility of low cost production. A common holed disk or copper tube can be used for those accelerating sections and the

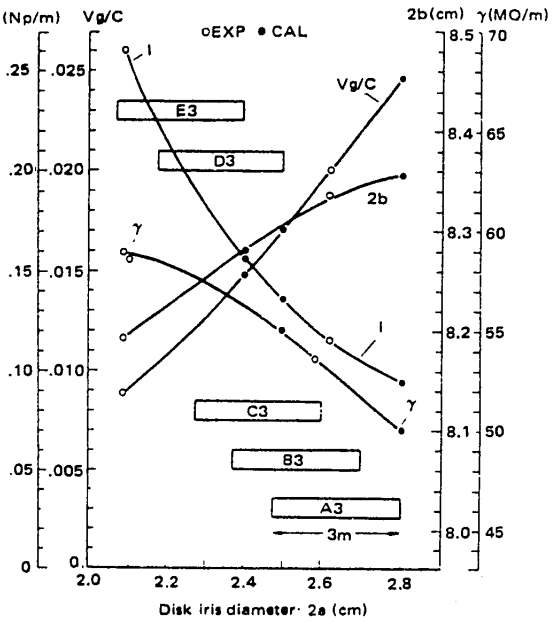


Fig. 4. Characteristics of Linearly Tapered Iris Type Accelerating Sections

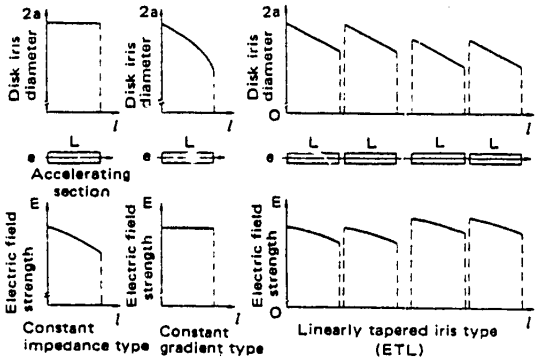


Fig. 5. Characteristics of the Structure and Arrangement of the ETL Accelerating Sections

iris diameter (2a) changes at a constant gradient according to the direction of microwave propagation. Some sets are of a combined arrangement in line, which is characteristic of the ETL acceleratior. Fig.5 shows the characteristics of the structure and arrangement of the ETL accelerating sections.

Conventional accelerators are either of the constant impedance type or Stanford type, and many of them use a system that arranges some parts of the same type.

The arrangement of the accelerating sections were finally made as shown in Fig.6. That is, four C2 types for the low energy section, four C3 types fo the middle energy section, and six C3 and six D3 type for the high energy section. Since the Q electromagnets and the steering coils of the electron beam were arranged alternately among the accelerating sections, the Q electromagents were placed every two sections, but the result of beam acceleration was very good so that beam loss was hardly found on the way of acceleration. The leakage dose rate from the accelerating sections was also very low.

The electron linac has proved an accelerator of excellent efficiency in energy use, but it has still room to be improved. An example is to increase microwave production efficiency of the pulse klystron. ETL has been progressing with higher efficiency of the klystron in cooperation with Toshiba since 1974.

The M4628 klystron with a 35% efficiency in the 7MW class was used for the ETL 25MeV linac that was manufactured in 1963. At that time, the M4628 had the largest output as a domestic product in Japan and its performance was of excellence. However, as the M4628 was a 4-cavity type, its efficiency was 35% and low, and then improvements to an energy-saving low maintenance type was started in 1974. The four-cavity type was improved to a five-cavity type and the cavity interval was adjusted, but the interval between input and output cavities and the perveance of the electron gun remained unchanged. The existing klystron socket could be used. Performance of this improved version klystron M4628A was as expected. Its efficiency was 49% and had an output of about 10MW. After 1977, the E3776L and the E3776 of a 2-output window type were manufactured as a trial for a model klystron for the 500MeV linac aiming at more than 20MW output and 50% efficiency. As a result, a 50 to 54% efficiency was obtained. The E3776L is the largest in efficiency as a pulse klystron in the world, but its total length is 173cm. Therefore, about 20cm was shortened for ease in handling and the electron gun was improved for longer life. This development has produced the E3776 that is used here. Photo 2 shows the pulse klystron with the highest efficiency in the world (upper right), its pulse transformer (lower right), and a pulse modulator (the big housing to the left). The klystron is a 2-output window type and has RF power of more than 25MW furnished to the accelerating sections installed in the accelerator room located 6m underground through the waveguide tube from the two output windows. As shown in Fig.6, microwaves are supplied to the injector and eight accelerating sections in the low and middle energy sections from four klystrons, K1 through K4, and to twelve accelerating sections in the high energy section from three klystrons, K5 through K7. K8 is scheduled to be used for the Energy Compressing System (ECS) with the 10MW klystron. There is a large power phase shifter on the way of the waveguide tube to each accelerating section so that the accelerating electric field phase of the accelerating section can be adjusted.

Photo 2. The Pulse Klystron with the Highest Efficiency in the World

The reflection power from an accelerating section or a waveguide tube is monitored by the USWR meter that is installed near the klystron so as to cut off klystron high voltage against a signal over a set value. The inside of an accelerating section and a klystron is kept at a high vacuum, but SF_6 with $2kg/cm^2$ as insulation gas is filled in a microwave dummy mounted on the top of a waveguide tube and accelerating section. There are seven 25MW klystron sets and two 10MW klystron sets arranged in the klystron room (Photo 3). The right front in Photo 2 shows the microwave driver and then the klystron sets in succession backwards. Total length of the klystron room is about 65m. From the front on the left side, air-conditioning for the accelerator room and the klystron room and cooling equipment for the accelerating sections, klystrons, and beam transport are arranged.

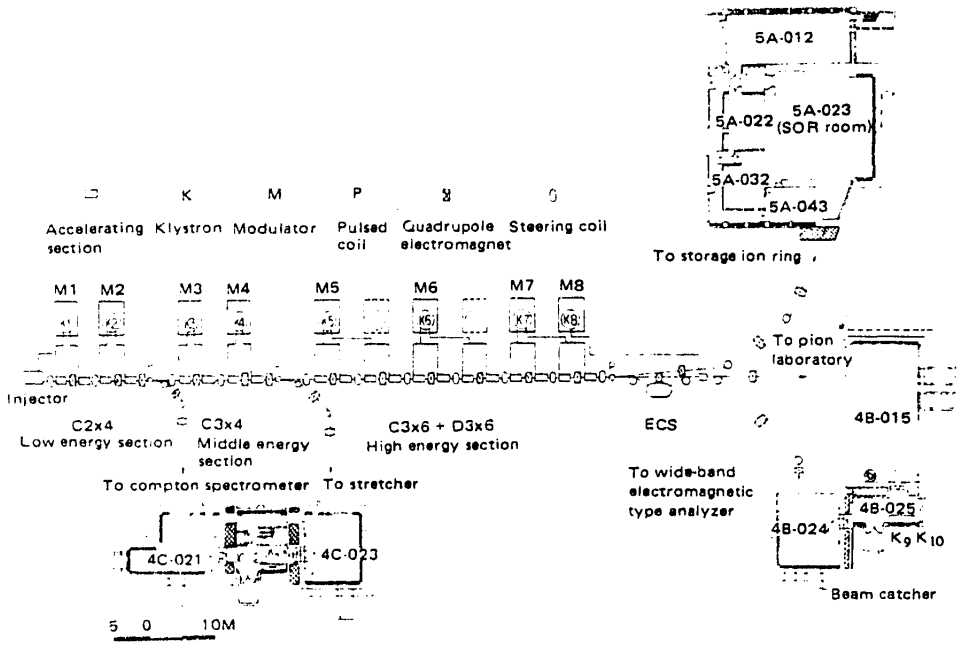


Fig. 6. Configuration of the ETL Linac and Beam Sharing to Each Laboratory by the Beam Transport System

Vaccum for the accelerating sections is very good and it is $5x10^{-7}$ to $1x10^{-6}$ Pa. During the initial practice operation to put microwaves in the accelerating sections, 5MW could be input three hours after operation started. There was no vacuum trouble at the time of beam injection and good results of injection equal to acceleration could be recognized. For this, result, the following reasons can be picked up:

- Out gas itself is very little because the accelerating sections made by Mitsubishi Electric Co., are processed at a high temperature during their fabrication.
- The period that the accelerating sections were aired was very short because axial adjustment was made smoothly at installation time.
- Efforts were made to clean the ceiling of the accelerator room, cranes, rails, fluorescent lamps, wiring trays, walls, and floors.

Table 1. Major Parameters of the 500MeV Linac

Total length	77m		
Accelerating section type	2π 3 mode, 2856 MHz at 40±0.1°C Linearly tapered iris type		
	C2 type	C3 type	D3 type
Number of accelerating sections	4	10	6
Length of each accelerating section	2.3	2.93	2.93
Shunt impedance (M/m)	54.1	54.5	55.6
Voltage attenuation constant (N/m)	0.140	0.148	0.170
Input peak RF power (MW)	12	12 (6)	6
Cooling water flow rate (1/min)	50	50	50
Cooling water temperature (°C)	37.2–40		
Beam pulse width	5 ns – 4μs		
Pulse repetition rate	less than 600 pps		
Number of klystrons	8 (1 is for ECS)		
Maximum peak RF power	25MW		
Average RF power	25kW		
Maximum duty cycle	0.0025 at 10MW		
Efficiency	more than 50%		
Total unloaded beam energy	520 MeV at 0 A		
Total loaded beam energy	467 MeV at 0.1 A		
Middle energy section			
Loaded beam energy	208 MeV at 0.1 A		
Low energy section			
Loaded beam energy	93 MeV at 0.1 A		
Construction period	March to September, 1980		
First beam acceleration	December 22, 1980		

Photo 3. Klystrons and Their Pulsars Arranged in the Klystron Room

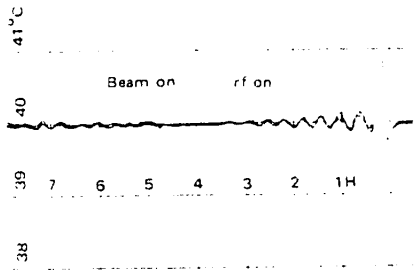


Fig. 7. Temperature Control of Accelerating Sections

- Pumping was started with the ion pump in mid-May and baking of accelerating sections was done many times (~80°C).
- Practice operation could be performed by putting microwaves into the accelerating sections in August.
- These agings had been done over a long period until December 22, 1980, the permission date for use.

The resonant cavity size of an accelerating section must be kept constant and a higher resonant Q value (≈13000) to obtain a higher accelerating electric field in the accelerating section that is kept in a high vacuum. Fig.7 shows the variation of the temperature of the accelerating sections from the operating time of the temperature control system for to a stable condition and the change of their temperature at the time of microwave consumption and beam acceleration. The temperature can rise to 40±0.2°C which enables beam acceleration for only fifteen minutes after operation starts and then three hours later it becomes 40±0.05°C at the stable condition. The temperature increases up to around 40°C for only fifteen minutes because warm water at 60°C is used as the heat source of the heat exchanger, and stability is very good. When microwave power was about two-thrids of designed value at rf on and beam on, the beam was about 350MeV and 40mA (average current 4μA). Slight but sharp changes in their temperature can be seen according as the rf power consumption and the beam acceleration, although it is fully controlled within 40±0.1°C.

A water bath made of acrylic plate 20cm wide, 20cm high, and 100cm long was placed near the beam window on the top of the accelerator in order to observe electron energy and accelerated beam currents. Photo 4 shows a picture of the image that was taken of Cerenkov radiations with ITV when about 350MeV and 40mA (average current 4μA) electrons were injected into the water bath (as the speed of a 350MeV electron is much faster than light velocity in water, Cerenkov radiations are emitted). Cerenkov radiations are spread over 80cm in length and in effect, a part of the electrons generated the 1m long water bath and color the acrylic plate of the bath. Photo 5 shows that about 300MeV electron beam penetrating 25 samples for activation analysis and an Al supporting board, and emitting Cerenkov raidations in water were observed with the same ITV.

Photo 4. Cerenkov Radiations by 350MeV Electrons Injected into the Water Bath

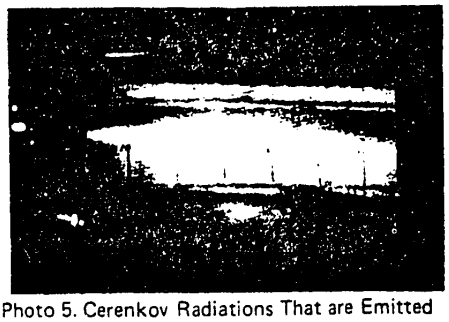


Photo 5. Cerenkov Radiations That are Emitted in Water by 300MeV Electrons Penetrating 25 Samples for Activation Analysis and an Al Support Board

Beam acceleration of about 350MeV and 60mA was successful by about one month of practice operation and it was confirmed that performance was obtained nearly as designed. Thus indicates that 500MeV can be fully obtained and that very stable beam acceleration will be made possible by the linearly tapered iris type accelerating sections of the ETL system. ETL plans to complete the five experimental facilities, such as a pion high energy, electron storage ring, and two other rooms. It will also be in a hurry to make electron injection to the electron storage ring and to supply beams to each laboratory.
(By courtesy of the Electrotechnical Laboratory)

CSO: 4120/64

SCIENCE AND TECHNOLOGY

TWO MITSUBISHI GROUP FIRMS BUY INTO HYUNDAI MOTOR

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 980, 10 Nov 81 p 6

[Text]

Mitsubishi Motors Corp. will provide its South Korean technological licensee, Hyundai Motor Co., with additional car production know-how under an agreement recently reached between the two companies.

MMC and trader Mitsubishi Corp. of the same group will also invest about 10 per cent in the Korean automaker in six to 12 months. Hyndai's capital, in yen terms, now stands at about ¥16 billion.

These tie-up bolstering steps are expected to help Hyundai Motor compete with its domestic rival Saehan Motor Co. in the small car war in Korea.

Hyundai Motor now turns out 140,000 subcompact cars annually, such as Pony and Cortina. It is licensed by MMC to produce the Saturn engine.

The Korean automaker plans to build a plant adjacent to its Ulsan factory to produce 300,000 cars a year. Partial start-up is scheduled for 1985.

In producing front-wheel drive cars at the new plant, Hyundai Motor will learn skills from MMC on related engines, transaxles and chassis parts as well as on exhaust gas control. The Korean company will also be given advice on about how to build the new plant.

It will be the first case of capital participation by a Japanese automaker in a South Korean automaker.

Hyundai Motor will thus become capable of producing 440,000-450,000 cars annually.

The stepped-up link with Mitsubishi Motors is considered one of the best ways for Hyundai Motor to survive the mounting car sales race with Saehan Motor.

The South Korean Government, under its auto industry regrouping policy, has reorganized passenger car makers into two companies — Hyundai Motor and Saehan Motor.

Saehan Motor, now producing Gemini, Rekord and other cars under affiliation with General Motors of the U.S., Opel of West Germany and Isuzu Motors of Japan, is due to start selling GM's S car, now under development.

CSO: 4120/63

SCIENCE AND TECHNOLOGY

TEC, FOUR OTHERS TO PARTICIPATE IN LIBYAN PLANT TENDER

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 980, 10 Nov 81 p 6

[Text] Toyo Engineering Corp and four other Japanese enterprises will form a consortium in joining an international fertilizer plant tender scheduled to open in Libya early next year.

The Libyan Government will invite tenders in mid-January, 1982 to construct a big fertilizer complex, comprising ammonia, urea and phosphoric acid plants, worth some 80 billion yen.

TEC and the four--Chiyoda Chemical Engineering & Construction Co., Kobe Steel, Itd., Marubeni Corp. and Mitsui & Co.--have started preparations to participate in the Libyan tender.

By going hand in hand, the quintet aims at dispersing "country risks" which are liable to be incurred in deals and/or projects in developing countries.

They also judge that joint participation by plural enterprises in a worldwide bidding will work more favorable for them than in case of a single firm's participation to receive export insurance from the Japanese Government, even if everything goes wrong for political or other reasons.

Sources said that TEC, representing the Japanese team, will offer to undertake the construction of a urea plant, with Chiyoda and Kobe taking charge of ammonia and phosphoric acid facilities, respectively.

CSO: 4120/63

SCIENCE AND TECHNOLOGY

ATOMIC-POWER PLANT BUILDING SLOWS FROM OBJECTIONS, CONSUMPTION TREND

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 980, 10 Nov 81 p 5

[Text]

The Government and electric companies are being forced to slow the pace of nuclear power plant construction because of public resistance to atomic energy projects and the slow growth of power consumption following last April's rate hikes.

As a result, the Agency of Natural Resources & Energy, Ministry of International Trade & Industry, is expected to slash the planned expansion of nuclear capacity by next March. By then, ANRE should have revised the long-term outlook on demand for electric power. The cut will be substantial. Until now, the Government has maintained a goal of 51-53 million kilowatts for nuclear power generating capacity by 1990.

The Government saw nuclear energy as the most important alternative in its plan to diversify power sources (coal, liquefied natural gas, liquefied petroleum gas, to cite a few examples).

As a result, nuclear power (15.51 million kilowatts) accounted for 12 per cent of the country's total electricity generating capacity at the end of fiscal 1980. ANRE's hearings led to an estimate that nuclear capacity would rise to 27.88 million kilowatts (or 15.8 per cent of the total capacity) by 1985 and 50.92 million kilowatts (21.7 per cent) by 1990.

However, the tempo is likely to slow down primarily because of continued public opposition. Japan Atomic Power Co.'s attempted coverup of its Tsuruga plant problems is likely to cause the Government's Electric Power Source Coordination Council to approve three projects with planned capacity totaling 5 million kilowatts.

The three projects are an 825,000-kilowatt plant of Tohoku Electric Power Co. at Maki and two 1.18-million-kilowatt plants of Kyushu Electric Power Co. at Genkai.

In addition, the cost of generating nuclear power is lower than for other types but the difference is narrowing. ANRE's latest estimate is that the cost gap has narrowed by about ¥1 a kilowatt hour, with nuclear generating rated at ¥11-12 a kilowatt hour compared to ¥19-20 a kilowatt hour for an oil-fired plant.

The demand for electricity shows no signs of test increases after the substantial rate hikes in April, 1980. Government and utility officials estimate that "structural changes are taking place" in the demand pattern — a belief that prompted them to revise the long-term demand estimate. The approximately 50 per cent electricity rate hike caused consumption to go down in the summer peak time by about 20 per cent.

CSO: 4120/63

SCIENCE AND TECHNOLOGY

MACHINE TOOL MAKERS TO SEND MISSION TO U.S. NEXT SPRING

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 980, 10 Nov 81 p 6

[Text] Japan's machine tool industry will send a mission to the U.S. next spring to prevent another trade friction from arising between the two countries.

Masanobu Hisano, chairman of the Japan Machine Tool Builders' Association, pointed out that exports of Japan-made tools to the U.S. have been faring well in contrast to the sustained loss of indigenous producers in their domestic ground. (See table.)

Hisano, also president of Toshiba Machine Co., said it is up to the industry to confer with top officials of the National Machine Tool Builders' Association of the U.S. on how to deal with what is happening at present.

The JMTBA head apparently fears that bitter outcries against the heavy inflow of Japanese tools may come out at the Chicago Show, an international machine tool exhibition, scheduled for next autumn.

The countrywide mission, led by Hisano, will be composed of top executives of major machine tool builders, including Hamai & Co., Hitachi Seiki Co., Shoun Machine Tool Co., and Toyoda Machine Works, Ltd.

Japan's machine tool exports to the U.S. in the January-June period of this year totaled ¥62,800 million, up 23 per cent from the same 1980 term. Exports in August swelled by 95 per cent to ¥14,900 million

Trend of Orders for Machine Tools in the United States

(In $1,000; yr-to-yr change in %)

	Orders	Annual change
1975	915,900	−55
1976	1,662,150	+81
1977	2,202,050	+32
1978	3,375,450	+53
1979	4,495,100	+33
1980	3,884,750	−14
1981 Jan.	206,550	−46
Feb.	212,800	−47
Mar.	287,250	−24
Apr.	228,550	−35
May	179,000	−52
June	253,650	−39
July	136,850	−49
Aug.	166,800	+ 2

Source: National Machine Tool Builders' Association

after climbing by 27 per cent to ¥13,200 million in July.

The first confrontation between Japanese and American machine tool builders surfaced in 1977. Japan's exports to the U.S. in the year rose by 56 per cent over a year earlier to 26,600 million yen, outrunning those of West Germany.

CSO: 4120/63

SCIENCE AND TECHNOLOGY

INVESTMENTS IN NEW ANTIBIOTIC DRUG FACILITIES

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 980, 10 Nov 81 p 12

[Text] Investment by pharmaceutical companies has grown active for the first time in several years. The current round of investment boom features expansion of plants and laboratories mainly for commercializing their biotechnology know-how as well as internationalization.

Shionogi & Co. and Fujisawa Pharmaceutical Co., in particular, have aggressive investment projects. In Iwate Prefecture, Shionogi is scheduled to invest ¥10 billion for construction of a third generation antibiotic plant. Its completion is slated for the summer of 1983. The company acquired 20-hectare land at the Kanegasaki industrial zone in 1976, where a pilot plant was completed in August last year.

Fujisawa is completing its third generation antibiotic plant at Takaoka, Toyama Prefecture, by the end of this year. The firm is investing ¥6.3 billion, the largest amount it is spending for a single drug.

The new product is intended for further corporate growth, which has been primarily made possible by antibiotic development and production.

Elsewhere, Tanabe Seiyaku Co. plans to complete construction at Onoda, Yamaguchi Prefecture, by the fall of 1982. The facilities are the first large plant designed exclusively for its Herbesser heart drug. The plant will triple Tanabe's Herbesser capacity to 12 tons a month so that it can meet the increasing demand from overseas markets.

Fuso Pharmaceutical Industry Co. plans to complete a plant in Okayama by the fall of 1982 so that it can maintain its share of dialyzer liquid market.

Takeda Chemical Industries, Ltd. is constructing a laboratory inside its central research institute for interferon development by genetic engineering in partnership with Hoffmann La Roche.

Sumitomo Chemical Co. has completed its interferon development lab at its Osaka works. It tied up with Wellcome Foundation for interferon development.

CSO: 4120/63

SCIENCE AND TECHNOLOGY

FAST DEVELOPMENT OF 'FINE BUILDINGS' DISCUSSED

Tokyo DIAMOND'S INDUSTRIA in English Nov 81 pp 25-26

[Text] Japan's big general constructors are now placing emphasis on the construction of "fine buildings." Production plants for ICs (integrated circuits) and LSIs (large scale integration circuits) are being built one after another. The manufacture of these semiconductors requires an extremely clean room free from vibrations and with a constant temperature and humidity. The requirements are so rigid that high technology is needed to design and build the plant facilities. General constructors call production plants of this kind "fine buildings."

In the United States, the air purity of the clean room is measured by the number of particles larger than 0.5 microns contained in one cubic foot of air. The manufacture of 4K bit ICs is said to require the air purity of 100 and that of 64K bit LSIs needs 40. The place that can meet the requirements is called a clean room. Takasago Thermal Engineering Co., which holds the top share in this field, says that in Japan many firms are trying to reduce the size of particles to measure cleanliness up to 0.1 microns instead of 0.5 microns and that the maximum permissible vibrations are also measured by the unit of microns, and the standard for LSIs is set at 0.3~0.5 microns. Building a workshop that can meet the rigid specifications affects the designing and construction work of the entire building that will house the clean room.

While investments in building construction have been stagnant in both public and private sectors, those in building IC and LSI production facilities are increasing at a rapid pace. Rapid advances in IC and LSI technology are intensifying competi-

tion among manufacturers. Fine buildings are being constructed under secret contracts between the owner and the constructor, and, therefore, it is difficult to know details of the buildings and who has built a given plant. However, the number of fine buildings has doubled annually during the past three years. The fast growth is quite understandable from the fact that VTRs and quartz watches are spreading at spectacular rates and that the adoption of microcomputers for cars is also becoming popular.

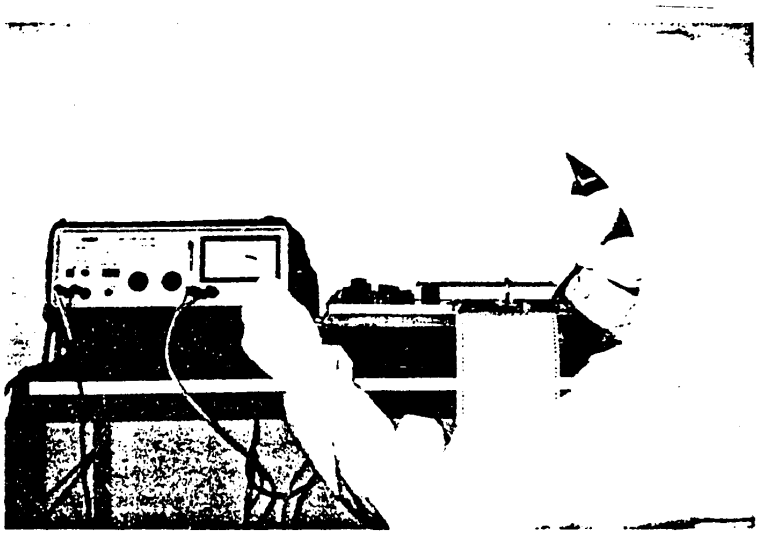
In constructing a fine building, the manufacturer would assign the job to a closely related constructor with a view to keeping the secrets. But competition is fierce in taking orders from those who will build their first fine buildings. The top constructors in this field are Takenaka Komuten Co. and Ohbayashi Gumi, Ltd., followed by Kajima Corp., Taisei Corp. and Shimizu Construction Co., which are all big construction firms.

Takenaka Komuten has received more than 50 orders for building semiconductor production plants since 1969. Takenaka is one of the few Japanese construction firms which started business with shrine construction. In principle, Takenaka takes an order on a full-turn-key basis from designing to execution of construction work. Since it has a civil engineering subsidiary, more than 90% of its contracts are for building construction. Therefore, its main area of business lies in the private sector and only a few in the public sector. Its designing division is staffed by more than 1,200 people: it is an ideal company to undertake the designing of fine buildings. Accordingly, the firm has outstanding business records in fine buildings.

Takenaka Komuten is paying special attention to vibration prevention and resistance measures in designing and constructing fine buildings. The firm participates in the planning of a fine building from the very beginning when the manufacturer selects candidate sites for the plant, so as to study roads, factories in the surrounding area, the ground and other conditions that would have strong effects on the prevention of vibration. Furthermore, a check list is prepared to ascertain that equipment to be installed on the workshop will meet anti-vibration requirements, and then the maximum permissible vibration at the workshop is set. This will be followed by a building-foundation-piles-soil analysis, a dynamic analysis for the machine base and a dynamic analysis for the floor based on the finite element method. After all these processes come the designing of the plant.

Since the dust prevention facility was often a source of vibration in the past, the dust prevention and anti-vibration problems are studied simultaneously in the designing process. The highly energy-consuming IC plant needs an energy recycling plan to use waste heat produced by the facilities. Thus, construction of a fine building requires the designing team to resolve far more complicated and difficult problems than ordinary buildings do. To be sure, the builder needs comprehensive technological capability.

Today, genetic engineering is entering a practical stage, and the construction of bio-clean rooms is on the rise. They are also fine buildings. Takenaka Komuten is now undertaking jobs to construct new types of fine buildings, since it has experience in building many experimental animal facilities.



Vibration measurement in a clean room (Takenaka Komuten).

CSO: 4120/67

SCIENCE AND TECHNOLOGY

JDB REPORTS PRODUCTION FACILITIES AGING

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 981, 17 Nov 81 p 3

[Text]

Production facilities in Japan swiftly are becoming superannuated, and there is danger of the nation's international competitiveness declining in the near future.

This is according to the Japan Development Bank on the basis of its latest survey.

JDB says that the adverse effects of sluggish plant and equipment investment after the first oil crunch have begun to surface, and the average age of manufacturing equipment (years of use) has grown to be 8.23 years, or 1.5 years higher than seven years ago.

In contrast, it notes that manufacturing facilities in the U.S. lately have begun to show signs of becoming younger after earlier being about three years older than those in Japan. As a result, it says that age gap between those in Japan and the U.S. has narrowed to around one year.

JDB thus feels it is urgent for Japanese enterprises swiftly to update their manufacturing equipment.

Private plant and equipment investment in Japan began recovering from fiscal 1978. Prospects are also that capital expenditure in the manufacturing sector in fiscal 1981 will show a 12.7 per cent yearly increase.

It notes in particular that the share of investment for renovations in total capital outlay recently has climbed to around 50 per cent, compared to around 20 per cent prior to 1973. The survey says that despite this, superannuation has progressed as an "after-effect" of the sluggishness in plant and equipment investment after the first oil crisis.

In the period for about three years after the first oil crunch, there was an increase in enterprises refraining from making investment in new equipment or for renovations, and the interval for renovations which previously has been nine to 10 years increased to 12 to 13 years in 1979.

Amid such a situation, new facilities which successively were set up in the period of high growth began reaching the renovation time and the average age of equipment sharply began increasing.

In particular, the age of equipment of the manufacturing sector which carried out drastic managerial "weight reductions" after the first oil crisis rose by an additional 0.11 year in 1980 over that of the previous year, meaning that the superannuation trend continued for seven successive years from 1973.

In 1980, the age of equipment in the basic materials industry became slightly less than nine years. Since the non-manufacturing industry, such as power firms, continued to invest at a high level, the average age of equipment on an all-industries base in 1980 reached 7.84 years, or continued to maintain the seven-year level.

Compared to this, plant and equipment investment in the U.S., the Japan Development Bank survey reveals, did not fluctuate as greatly as in Japan with regard to before and after the first oil crunch. As a result, the average age of its plant and equipment in the latest 10 years has been steady at around 10 years. In fact, the age of its manufacturing equipment in 1979 became "younger," or 9.6 years.

JDB anticipates that the speed in renovating equipment in the U.S. further will increase owing to such encouragements to capital expenditures as the U.S. Government's 10 per cent investment tax credit.

The bank thus feels that unless Japan steps up investment in renovating its manufacturing equipment, the gap between it and the U.S. in this area further is going to diminish.

CSO: 4120/66

SCIENCE AND TECHNOLOGY

ARMS EXPORTS TO U.S MAY BE PERMITTED

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 981, 17 Nov 81 pp 1, 19

[Text]

The Japanese Government last week worked out a new basic concept, which, while it still needs formal approval, actually will allow Japan to export arms to the U.S. in what constitutes a revision of its past ban on arms exports.

The new concept — "Basic thinking on exporting arms to the U.S." — was worked out among the Foreign Ministry, Defense Agency and the International Trade & Industry Ministry.

Its salient points are:

—Exports of arms to the U.S. are possible under Article 3 of the Japan-U.S. Security Treaty, pertaining to mutual cooperation and assistance.

—"Arms exports concerned with security" are outside the scope of the Government's so-called "Three Principles" on arms exports and its "Unified Policy" pertaining to arms export.

—Specifically, arms exports to the U.S. are feasible by reaching a governmental agreement under the Japan-U.S. Mutual Defense Assistance Agreement and following this up with export approval in accordance with the Export Trade Control Ordinance.

In July, this year, when Director-General of the Defense Agency Joji Omura went to Washington, the U.S. proposed Japan offering military technology to it with regard to bolstering Japan's defense.

The Japanese Government thereafter had been studying this and the arms export issue.

In 1967, the Government, in taking into account the principle of peace underlined in the nation's Constitution, adopted "three principles" on arms exports.

They were: 1) prohibiting them to Communist nations; 2) prohibiting them to nations designated in a United Nations' resolution, 3) prohibiting them to belligerents in an international dispute or those likely to become involved.

Thereafter, in February, 1976, the then Miki Government drew up a unified policy that "arms" exports to places other than those set in the "Three Principles" also should be considered with utmost caution in respecting the spirit of the peace Constitution.

However, the latest concept takes a slightly revised interpretation of such past thinking on arms export.

It says that "Japan, as a country aspiring for peace, should, in the future, continue to uphold the Three Principles and the Unified Policy."

But it goes on to say that as for arms exports, including supply of military technology, to the U.S., they should be allowed from the standpoint that the Japan-U.S. Security Treaty should get priority over the Three Principles and Unified Policy.

As to the reasons for such a view, the new basic concept says that the Three Principles-Unified Policy constitutes a policy measure as to arms exports but has no legal binding effect.

In contrast, it says that Article 3 of the security pact pertaining to mutual assistance is an international agreement with full legal effect.

CSO: 4120/66

SCIENCE AND TECHNOLOGY

MITSUBISHI HI TO TAKE OVER NIHON AEROPLANE MANUFACTURING

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 981, 17 Nov 81 p 7

[Text]

Nihon Aeroplane Manufacturing Co. (NAMC) of Tokyo, a government-industry enterprise developing and selling Japan's first civilian aircraft, the medium-range turboprop YS-11 series, is expected to be taken over in 1983 by Mitsubishi Heavy Industries, Ltd. NAMC will continue to maintain the YS-11 series, which have been widely sold at home and abroad.

According to informed sources, the Government, during its coming year-end Cabinet meeting, is scheduled to officially decide that the majority government-owned NAMC be dissolved by March, 1983 (the end of fiscal 1982) and NAMC's remaining business functions be taken over by some private industrial enterprise. Of NAMC's present paid-up capital of ¥7.8 billion, the Government has put up ¥4.2 billion.

The Government is thus doing away with a long-standing problem of NAMC's snowballing account deficits, which came to ¥7.3 billion at the end of last March and is expected to push up to ¥20 billion in ten years despite NAMC's success in developing the YS-11 series.

NAMC produced 180 YS-11 series planes between August, 1962 and August, 1973, but has had to suspend mass production due to a lack of commercial experience and other reasons. The twin Rolls-Royce engine-equipped turboprop aircraft have proved very popular everywhere.

However, NAMC's continued maintenance services, including spare part supplies, repairs and other technological services, are expected to be needed for another 10 years for the 160 planes still in active service in Japan and overseas.

MHI has basically agreed to take over such duties of NAMC, although on the condition that NAMC's heavy debts be somewhat cleared before its takeover.

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SCIENCE AND TECHNOLOGY

U.S. APPROVES MHI BUSINESS PLANE

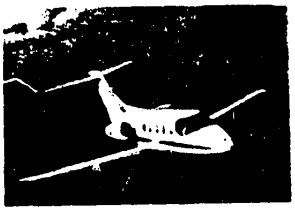
Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 981, 17 Nov 81 p 7

[Text]

The "MU-300" series of business jet aircraft, developed by Mitsubishi Heavy Industries, Ltd. of Tokyo, has been granted a type certificate by the U.S. Federal Aviation Administration (FAA), the company said.

The certificate is necessary for marketing the planes in the U.S. It means that MHI has become the first Japanese aircraft maker to be qualified to enter the American market for such jet aircraft.

According to MHI, its MU-300 series, developed since November, 1976, are high-efficiency planes seating 9 to 11, including two pilots driven by a pair of JT15D-4 jet engines of Pratt & Whitney Aircraft of Canada Ltd. The company is sure the MU-300s are competitive enough with American equivalent, including the Citation II of Cessna Aircraft Co. because they are about 10 per cent more fuel-efficient and



yet about 13 per cent faster in maximum speed than the Citation II. The MU-300's winning of the U.S. certificate had been delayed due to recent tightening of FAA's screening rules.

The company has already booked advance orders, chiefly American, for 120 units of the MU-300. It plans to start mass-producing and delivering the planes next January — through Mitsubishi Aircraft International Inc., its American subsidiary.

The plane, named Diamond 1, will be sold at $2.25 million, with the addition of inflation escalator.

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SCIENCE AND TECHNOLOGY

INDUSTRIAL MACHINE ORDERS SURGE

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 981, 17 Nov 81 p 7

[Text]

Industrial machinery orders in the first half of this fiscal year moved moderately higher than a year earlier, propped by active orders from abroad.

The Japan Society of Industrial Machinery Manufacturers announced that orders in the April-September period of this year rose by 6.3 per cent over the same 1980 term to ¥2,779,578 million.

Semi-annual orders broke down into ¥1,684,300 million worth of domestic orders, down 0.1 per cent, and ¥1,095,262 million worth of overseas orders, up 17.9 per cent.

The biggest year-to-year gain of 80.3 per cent was scored in orders for boilers and prime movers with a combined ¥483,266 million. The factors behind it were the increased capital investments by domestic electric utilities and the activated construction of power stations abroad.

Among other better selling items were transport machinery with ¥190,614 million, up 36.4 per cent, tanks with ¥82,185 million, up 25.4 per cent, and pumps with ¥116,699 million, up 10.2 per cent.

Losses were recorded by metals processing machines with ¥147,069 million, down 35.0 per cent, chemical machinery with ¥935,817 million, down 7.7 per cent, and plastics processing machines with ¥39,941 million, down 3.2 per cent.

Viewing sector-by-sector orders at home, orders from manufacturing industries fell by 8.7 per cent to ¥534,212 million, affected by operation cutbacks of the paper-pulp, ceramics and automaking branches.

Orders from government offices and regional public agencies dropped by 5.5 per cent to ¥277,847 million, while those from non-manufacturing sectors increased by 9.5 per cent to ¥724,660 million following the stepped-up capital outlays of electric utilities.

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SCIENCE AND TECHNOLOGY

FUJITSU PRODUCES HIGH PRECISION ASSEMBLY ROBOT

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 981, 17 Nov 81 p 16

[Text]

An assembly factory robot believed to have the world's highest level in working precision and credited with a "visual" capacity to recognize and sort numerous small apparatus parts and assembled complex products in any limited volume has been developed by Fujitsu Limited.

The leading Japanese computer, semiconductor and communications equipment producer said its robot could match two parts of a mechanical product in position (that is, spotting) with an error margin of no more than 6/10,000th of a millimeter even at the worst.

The robot proper has a visual observation camera of solid-state electronic semiconductor type and a built-in 16-bit microcomputer not just to differentiate and recognize parts and components to process by shape and form but to make its own decisions on how to handle them, and measure and check its own postures and arm positions for fitness.

The microcomputer, performing parallel processing of all information at a great speed, does such differentiation while keeping the robot working. The robot thus works without a pause, just like a skilled worker.

Applied to assembling parts of integrated circuit products of different shapes, the robot has already proved its worth by automatically arranging them by shape for proper processes.

The robot proper is quite a compact structure, measuring

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POLYDIACETYL PRODUCED IN CRYSTAL FORM

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 981, 17 Nov 81 p 16

[Text]

A new highly-polymerized chemical compound, a potentially valuable material to make heat and humidity sensors and a substitute for semiconductor and solar cell silicon, has been developed by the Research Institute for Polymers and Textiles, Agency of Industrial Science and Technology, Ministry of International Trade & Industry.

According to the institute of Yatabe Town, Ibaraki Prefecture, it has made a crystallized form of polydiacetyl, featuring a high degree of electric conductivity.

The new chemical compound also has proved highly sensitive to changes in temperature and humidity, showing its reactions in changes in its electric conductivity.

Polydiacetyl has been produced from diacetyl (biacetyl), also a chemical compound made up of two hydrocarbons of the acetylene series, a common material for synthetic resins and other chemical products. When strongly heated or hit by light or a gamma ray, diacetyl evolves into polyacetyl, a polymerized (complexly molecules-combined) crystal, with a chemical structure built up by chains of regularly-arranged scores to hundreds of its chemical molecules (carbon and hydrogen).

But this crystal is an electrically insulating material hardly passing electric current.

However, considering the highly regular lineups of carbon molecules in its chemical structure, addition of some impurity (doping) to replace the hydrogen molecules in it had been widely envisioned to make an electrically conductive version of it. But it had been difficult to do such doping because of the crystal's very strong chemical buildup.

Representing a breakthrough, the institute's own method of polymerizing diacetyl comes in two types:

Type A to pour diacetyl into a vessel filled with a gas of some impurity material and then heat up or irradiate with a gamma ray the mixed gas to obtain the wanted crystal.

Type B to put diacetyl into an organic solution of the impurity material, gain a crystalline sediment, and then thermally or radiologically process the sediment just like Type A. Iodine has been used as the impurity. Type B with a gamma irradiation has proved best, though diacetyl may not be the only elligible basic material.

A plate of crystallized polydiacetyl with a metallic sheen obtained has proved to have an electric conductivity (in ohmage or electric resistance) just wanted for making semiconductors. It has also been found so stable as to remain unchanged even after three or four months of direct exposure to the atmosphere.

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SCIENCE AND TECHNOLOGY

NEW CIRCUIT ELEMENT GIVES HOPE FOR OPTICAL COMPUTER

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 981, 17 Nov 81 p 16

[Text]

The Research Institute of Electrical Communication of Tohoku University, a Japanese national university in Sendai, northeastern Japan, has developed a new computer circuit element that may make possible development of an optical computer surpassing conventional electronic computers.

According to the institute, the new circuit device receiving, processing and emitting light signals, has been developed by Prof. Fumio Inaba and his team. It is named "Integrated Optical Bistable Laser Diode" and is an innovational version of the "optical bistable device," a basic element of the prospective optical computer known to all researchers.

Development of such a computer working at the speed of light — 300,000 kilometers a second — is now important computer research target, both in Japan and in other advanced countries. But such an element, though widely anticipated, had proved to be extremely difficult to integrate on a tiny substrate.

The diode just developed is a special circuit element capable of assuming and maintaining two kind of stable condition when any one light signal is put into it.

The two conditions are utilized just like the binary (0 and 1 numeral) signals put into conventional electronic computer circuitry to make the device memorize, calculate or otherwise process all different figures presenting information. It feeds back its stored-up memory information also in the form of light signals.

Prof. Inaba's team has implanted either a semiconductor laser or a light emitting diode and a light-detecting photodiode in face-to-face positions on a tiny wafer chip and electrically connected those components to produce the wanted circuitry.

After confirming the basic functions of its product as an optical memory element and an optical switch element, the team has successfully applied it, on a trial basis, to a light differential amplifier, a pulse wave light rectifier, a light pulse-wave height comparer, and an optical signal oscillator. The light emitting diode type has proved slower in working speed than the semiconductor laser type. Still at the laboratory refining stage, the new element is yet to attain its expected performance target. But it has promised an immediately attainable working speed of one-billionth of a second. Prof. Inaba has visualized its first applicability to making miniaturized boosters (relay devices) of a fiber optics communication line, and eventually wide usability for development of the optical computer and other optical information processing novelties.

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SCIENCE AND TECHNOLOGY

PHOTOSENSITIVE RESIN REACTS TO LASER RAY

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 981, 17 Nov 81 p 16

[Text]

A photosensitive artificial resin capable of reacting to visible lights longer in wavelength than ultraviolet ray and accepting laser beams to softness to a water-defying hardness to make possible wide utilization of laser beams for scanning-etching direct printing plate production has been developed by a Japanese governmental research institute.

The Research Institute for Polymers and Textiles of the Agency of Industrial Science and Technology noted that there have been various attempts both in Japan and abroad to produce artificial resins reacting to visible lights and to make such resins to accept laser beams.

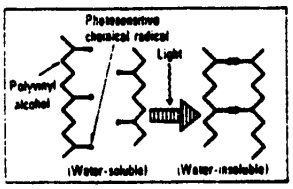
But the new type has proved several to 10 times as sensitive as a few similar new products hitherto created to react to visible lights for image or printing plate-producing purposes. Even, when compared with the best conventional resins of the kind reacting to the ultraviolet rays, the new product is no inferior in photosensitivity, it said.

Its new achievement, the institute said, is to answer Japan's long-standing technological problem to popularize the direct printing plate production method by laser beam scanning and immediately guiding the scanned image-bearing beams onto a printing plate.

Though decidedly economical through its saving of much labor and materials, such a method had been difficult for general adoption due to the scarcity of good materials on the printing plate side to accept laser beams or other longer wave lights than the ultraviolet rays.

According to the institute, almost all such photosensitive resins had reacted to only ultraviolet rays of 400 nanometers or less in wavelength that are invisible to the naked eye.

But the new kind of resin has proved to react to blue to yellow visible lights of about 420 to 560 nanometers in wavelength. It has thus easily accepted laser beams up to the maximum tolerable wavelength for it. The institute attained complete success with an argonne type of laser devise emitting lights of 488 nanometers.



The secret of the success lies in the development of a special kind of photosensitive resin made up of a combination of polyvinyl alcohol (tradenamed Poval) and an oxy-styryl-quinolinic acid working as a photosensitive chemical radical.

Specifically, two zigzag columns of Poval with protruding hair-like pieces of that chemical radical facing each other make up the resin. When light hits the resin, each two opposing hair-like protrusions join up to form a bridge, thus turning the essentially water-soluble softness of Poval into a hardness to defy water.

This character has been made the most of developing the new resin as a good material to cover a printing plate with it and expose only the wanted surface portions of it to light. Other parts may be washed clean of the material with water. Greater sensitivity to light is now being sought by improving upon the chemical radical.

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SCIENCE AND TECHNOLOGY

BRIEFS

YAMAZAKI MACHINERY UNMANNED FACTORY--Yamazaki Machinery Works Ltd announced last Monday that the company had begun to operate an almost fully automated plant in Aichi Prefecture. The plant, called a flexible manufacturing factory, can do processing jobs with 12 workers, compared with the previous 250 workers required at a conventional plant of the same capacity. President Teruyuki Yamazaki of the Aichi Prefecture-based machine tool builder said, "The new FM factory ranks the highest level in the world as an unmanned factory." The FM factory is equipped with 18 machining systems (composed of machining centers and peripheral equipment), two unattended feeding machines (carrying work pieces for machines processing) and one drum crane robot. All of these systems are controlled by six microprocessors. It operates completely automatically during eight midnight hours. While planning to preview the FM factory as a model, Yamazaki hopes to get orders for similar plants of the same capabilities from outside to sell at 3,500-4,000 million yen per unit. [Text] [Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 979, 3 Nov 81 p 6]

MITSUBISHI ELECTRIC SOLAR CELL--Mitsubishi Electric Corp. has developed a gallium arsenide solar cell having a light-to-electricity conversion rate of 18 per cent at 1 volt of electric pressure. The photovoltaic efficiency rate is almost double the highest level so far attained by conventional silicon solar cells. Mitsubishi has been developing GaAs solar cells at its LSI Development Laboratory at Itami, Hyogo Pref. for three years. It hopes to apply the newly developed batteries to Japan's furure artificial satellites. According to Mitsubishi, gallium arsenide has been under study in many countries as a potential substitute for silicon to make semiconductors and solar cells. Gallium arsenide has various advantages, including quicker electron passage, but it still poses problems, including less strength than silicon, requiring a thicker structure for application. [Text] [Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 979, 3 Nov 81 p 8]

TURBO-CHARGER TECHNOLOGY EXPORT--Mitsubishi Heavy Industries, Ltd, announced last Wednesday that the company had concluded a 10-year contract with Britain's Napier Turbocharger Ltd. to provide a technological license to produce turbo-chargers for ship diesel engines. The arrangement will be applicable to the products already commercialized and to be developed hereafter, an MHI spokesman said. This is the first case of Japanese ship engine turbo-charger know-how being exported abroad, the spokesman said. [Text] [Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 980, 10 Nov 81 p 6]

SILICON ABSORPTION--Mitsubishi Metal Corp. will take over the sales division of Japan Silicon Corp., a major maker of silicon wafers for semiconductors affiliated with it, on November 1. This arrangement seems to be a step toward Mitsubishi Metal's absorption of all of Japan Silicon in the near future. Japan's Silicon's sales have been growing at an annual rate of 20 per cent of late, supported by fast-rising semiconductor production. Its sales are expected to reach around 15 billion yen in the current fiscal year. Mitsubishi Metal has decided to absorb Japan Silicon as part of its policy of expanding its electronic parts business. [Text] [Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 978, 27 Oct 81 p 6]

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