

FOR OFFICIAL USE ONLY

JPRS L/9653

10 April 1981

# Japan Report

(FOUO 22/81)



FOREIGN BROADCAST INFORMATION SERVICE

FOR OFFICIAL USE ONLY

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [ ] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

COPYRIGHT LAWS AND REGULATIONS GOVERNING OWNERSHIP OF MATERIALS REPRODUCED HEREIN REQUIRE THAT DISSEMINATION OF THIS PUBLICATION BE RESTRICTED FOR OFFICIAL USE ONLY.

FOR OFFICIAL USE ONLY

JPRS L/9653

10 April 1981

JAPAN REPORT

(FOUO 22/81)

CONTENTS

ECONOMIC

Indonesia Agrees To Double LNG Export to Japan  
(JAPAN ECONOMIC JOURNAL, 17 Mar 81)..... 1

Japanese, French Plant Firms Will Cooperate in International  
Tenders  
(JAPAN ECONOMIC JOURNAL, 17 Mar 81)..... 2

SCIENCE AND TECHNOLOGY

Five Major Steelmakers Will Boost Plant, Equipment Investments for  
1981  
(JAPAN ECONOMIC JOURNAL, 17 Mar 81)..... 3

Solar Energy Research Wins Wide Support  
(Kiyoomi Takiyu; BUSINESS JAPAN, Mar 81)..... 4

Ways To Overcome Problems in Plant Export Discussed  
(Various sources, various dates)..... 7

Current Drive, by Shohei Kurihara  
Export Insurance System  
Negotiations With Europe  
Survey of Overseas Activities

Mitsui Firms Probe Commercial Feasibility of Coal-Methanol Mix  
(JAPAN ECONOMIC JOURNAL, 17 Mar 81)..... 24

Ethylene Producers Expand Naphtha, LPG Storages  
(JAPAN ECONOMIC JOURNAL, 17 Mar 81)..... 25

Toray Will Double Carbon Fiber Production to 100 Tons a Month  
(JAPAN ECONOMIC JOURNAL, 17 Mar 81)..... 26

Russian Seeks Collaboration in Coal Liquefaction Program  
(Hiroshi Egashira; JAPAN ECONOMIC JOURNAL, 17 Mar 81)..... 27

- a -

[III - ASIA - 111 FOUO]

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

Alleviation of International Data Communication Control (TECHNOCRAT, Jan 81).....	28
New-Type Private Data Communication Network (TECHNOCRAT, Jan 81).....	29
A Single Syllable Input Voice Recognition Device (TECHNOCRAT, Jan 81).....	31
Software Development by Graphics (TECHNOCRAT, Jan 81).....	32
An Interferometric Supersonic Microscope (TECHNOCRAT, Jan 81).....	34
Joint Research Project on High-Molecular Materials (TECHNOCRAT, Jan 81).....	35
Heat Dissipating Silicon Rubber (TECHNOCRAT, Jan 81).....	36
Injection Molding Measurement Monitor (TECHNOCRAT, Jan 81).....	37
Energy Saving Injection Molding Machine (TECHNOCRAT, Jan 81).....	38
Microcomputer Controlled Injection Molding Machine (TECHNOCRAT, Jan 81).....	39
Measurement of Stratospheric Materials (TECHNOCRAT, Jan 81).....	40
Solar Seawater Desalination Plant (TECHNOCRAT, Jan 81).....	41
Companies To Compete for Bids in Constructing Oil, Gas Production Facilities (TECHNOCRAT, Jan 81).....	42
Development of Technology for Synthesis of Silicon Semiconductor Membrane (TECHNOCRAT, Jan 81).....	43
New Dry-Etching Method Narrows LSI Line Width to 0.5 Microns (JAPAN ECONOMIC JOURNAL, 17 Mar 81).....	44
Green Cross Is Ready for Three Types of Interferon (JAPAN ECONOMIC JOURNAL, 17 Mar 81).....	45
Automatic Reticle Mask Defect Inspection System (TECHNOCRAT, Jan 81).....	46

- b -

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

Method Developed for Manufacturing Powdered Amorphous Silicon (TECHNOCRAT, Jan 81).....	47
Digital Dew-Point Meter Developed (TECHNOCRAT, Jan 81).....	48
Lithium Cell Totally Solidified (TECHNOCRAT, Jan 81).....	49
Magnetic-Field Microwave Plasma Etching System (TECHNOCRAT, Jan 81).....	50
New Filter Technology for Removal of Super-Fine Dust (TECHNOCRAT, Jan 81).....	51
VLSI's Heading for Mass Production (TECHNOCRAT, Jan 81).....	52
VAD Optical Fiber Manufacturing Technique (TECHNOCRAT, Jan 81).....	55
Research Accelerated on Optical Measurement Control System (TECHNOCRAT, Jan 81).....	60
Sub-Pico-Second Pulse Laser Described (TECHNOCRAT, Jan 81).....	62
New Type of Catalyst for Redox Cell (TECHNOCRAT, Jan 81).....	65
Heat Storage Medium for Waste Heat Energy in Rivers, Seas, Air (TECHNOCRAT, Jan 81).....	66
High-Performance LP Gas Detector Incorporating Newly Developed Special Sensor (TECHNOCRAT, Jan 81).....	68
Two-Cycle Engine Based on Active Thermal Atmosphere Combustion Process (TECHNOCRAT, Jan 81).....	69
Super-Low Temperature Fatigue Tester (TECHNOCRAT, Jan 81).....	70
Fuel-Saving, High-Efficiency Propulsion System for Large Ships (TECHNOCRAT, Jan 81).....	71
Direct-Couple Type High-Economy Generation System Using Waste Heat (TECHNOCRAT, Jan 81).....	72
Catamaran Stern Type Energy-Saving Ships (TECHNOCRAT, Jan 81).....	73

- c -

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

Method of Storing, Dispensing Coal Using Concrete Silos (TECHNOCRAT, Jan 81).....	74
New 70 Percent Efficiency Wave Resonance Generation System (WRC) Described (TECHNOCRAT, Jan 81).....	75
Earthquake Detection System Described (TECHNOCRAT, Jan 81).....	76
Ministry of Agriculture, Forestry, Fisheries To Develop Biotechnology (TECHNOCRAT, Jan 81).....	77
Briefs	
Practical Amorphous Cell Development	78
International Cooperation for Coal Liquefaction	78
Largest Solar Power Plant	79
Gas Absorption-Type Heat Pump	79
Ultra-Small Proximity Switch	79
Pump Heats Water	79
Technical Cooperation With China	80
Sintered WBM Tools	80
New Drills	80
New NC Equipment Maker	80
Tools Operated by Human Voice	81
New Electro-Discharge Machine Maker	81
Ultra-Precision Mirror	81
Machining Center for Mass Production	81
High Speed Hobbing Machine	82
Verticle Machining Center	82
Automobile Air Clutch Developed	82
Lightweight Commuter Train Coach	82
Auto-Leveler	83
Positive-Type Electron Beam Resist	83
Voltage Direct Photo-Ignition Thyristor	83
Photo-Sensitive Organic System	83
Terminal Which Directly Calls Demos	84
Optical Fiber Fluxmeter	84
High-Speed Press Facsimile	84
Postal On-Line Maintenance	85
Glass-Made Optical Fiber Connector	85
Fujitsu M-170F Computer	85
NEC Model 55 Office Computer	85
Software Maintenance Technology	86
Decentralized Data Processing Minicomputer	86
Fujitsu General Purpose Computer	86
Large-Scale Decentralized Processor	86
LSI Tester Family	87
High-Sensitivity Sensitive Material	87
Nylon 66 With Incombustibility	87
Automatic Injection Molding System	87
Marine Differential-Temperature Power Generation	88
LP Gas Automatic Control Valve	88

- d -

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

ECONOMIC

INDONESIA AGREES TO DOUBLE LNG EXPORT TO JAPAN

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19, No 946, 17 Mar 81 p 4

[Text]

Electric utilities and city gas companies have agreed with Pertamina, the Indonesian state oil corporation, to nearly double their total imports of liquefied natural gas.

Prior to the agreements, Indonesia was scheduled to supply about 7.5 million tons of LNG a year. Under the latest agreements, 3 million tons a year will be supplied to Tokyo and Tohoku Electric Power Companies. Another 3 million tons will be delivered to Chubu and Kansai Electric Power Companies, and Osaka and Toho Gas Companies.

The extra 6 million tons, priced at \$5 about per million British thermal units, will be supplied over a 20-year period, starting 1983.

The agreements will pave the way for negotiations between Pertamina and the Export-im-

port Bank of Japan on the latter's financing assist for LNG development projects.

Pertamina originally asked for \$6 per million BTU on the grounds of skyrocketed crude oil prices and linking its LNG price to petroleum. Users here insisted on \$5 payment, pointing out that LNG transportation costs are higher than carrying crude oil. The price compromise was made, due partly to the 1983 target for supply starts.

The utilities agreed to expand their purchases of Indonesian

LNG as a part of their efforts to reduce reliance on petroleum. Currently, Japan imports a total of 15 million tons of LNG annually from, among others, Indonesia, Brunei, Abu Dhabi and Alaska.

The Japanese long-term plan, worked out in April, 1979, calls for expanding the import volume to 45 million a year by 1990. The new contracts with Pertamina will raise the Indonesian share to 20 per cent in the import gain planned by the industry and Japanese Government.

COPYRIGHT: 1981, the Nihon Keizai Shimbun, Inc.

CSO: 4120

FOR OFFICIAL USE ONLY

ECONOMIC

JAPANESE, FRENCH PLANT FIRMS WILL COOPERATE IN INTERNATIONAL TENDERS

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19, No 946, 17 Mar 81 p 6

[Text]

Plant builders of Japan and France have agreed on going hand in hand in joining international tenders to better outrace rivals from other countries.

This revolutionary cooperation setup between the industries of the two countries was arranged by the Japan Machinery Exporters' Association with its French counterparts, Groupement des Ensembliers Industriels Francais and Association Francaise des Societes D'etudes et de Conseils Exportatrices.

A JMEA spokesman said that the association sent an industrywide mission to Paris in early March to confer with Creusot Loire Entreprises and other French plant builders on mutual collaboration in worldwide biddings. The mission members, led by Toshiba Corp. Consultant Katsuzo Nagai, comprised officials of JGC Corp., Chiyoda Engineering & Construction Co. and six other companies.

Salient points agreed on at the Paris meeting were:

—French plant builders will

extend full cooperation to their Japanese counterparts in winning tenders in Africa and East Europe. In return, the latter will help the French industry advance into Southeast Asian markets.

—Specifically, they will form consortiums thereby sharing risks involved in international construction jobs. Japanese enterprises will buy French equipment as much as possible in exporting their plants to Africa so that they can contribute to boosting French trade.

—They will take advantage of the merits in each country's

export finance systems and also call on the governments of both countries to create a joint export insurance system.

Japanese and French plant builders, far from working together in international tenders, so far have staged fierce competition in winning contracts from the Soviet Union, East Europe and African nations.

For example, a Japanese-U.S. team, composed of Nippon Steel Corp. and Armco, Inc. suffered a crushing defeat in the Russian electrical sheet plant tender last year, losing to Creusot Loire.

COPYRIGHT: 1981, the Nihon Keizai Shimbun, Inc.

CSO: 4120



FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

FIVE MAJOR STEELMAKERS WILL BOOST PLANT, EQUIPMENT INVESTMENTS FOR 1981

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19, No 946, 17 Mar 81 p 4

[Text]

Plant and equipment investments by five major Japanese steelmakers in fiscal 1981 are expected to reach ¥680.8 billion (on a construction basis), a sharp 36.2 per cent gain over the provisional figure for the preceding fiscal year, it was learned last week.

Nippon Steel Corp. plans to boost its plant and equipment investments for fiscal 1981 to around ¥200 billion from the provisional ¥165 billion for fiscal 1980.

Among the major plants and equipment it plans to start building during fiscal 1981 are a small diameter steel pipe mill at the Yawata works, a cold strip mill at the Hirohata works and a continuous casting equipment each at the Kimitsu and Muroran works.

From the peak of ¥325 billion in fiscal 1975, Nippon Steel has reduced its plant and equipment investments to ¥160 billion in fiscal 1978, ¥170 billion in fiscal 1979 and around ¥165 billion in fiscal 1980.

Nippon Kokan K.K. intends to increase its investments in fiscal 1981 to around ¥104.6 billion, sharply up from the provisional ¥65.5 billion for

fiscal 1980.

Investments will be centered on the expansion of seamless pipe production capacity and energy conservation.

Sumitomo Metal Industries, Ltd. envisages boosting investments in fiscal 1981 by 33.7 per cent over fiscal 1980 to around ¥131 billion.

Kawasaki Steel Corp. plans to increase investments by a staggering 72.7 per cent to around ¥125.2 billion in fiscal 1981. Investments will be earmarked mainly for the expansion of the seamless pipe mill at the Chita works and the expansion of the electrolytic galvanizing line at the Chiba works.

Kobe Steel, Ltd. also will boost its investments in fiscal 1981 by 11.1 per cent over fiscal 1980 to around ¥110 billion.

These major steelmakers have moved to boost their capital spendings in an attempt to expand their seamless pipe production and continuous casting capacities and beef up production of such high value-added steel products as surface-treated steel sheets and high tensile steel sheets for automobiles.

COPYRIGHT: 1981, the Nihon Keizai Shimbun, Inc.

CSO: 4120

FOR OFFICIAL USE ONLY

## FOR OFFICIAL USE ONLY

## SCIENCE AND TECHNOLOGY

## SOLAR ENERGY RESEARCH WINS WIDE SUPPORT

Tokyo BUSINESS JAPAN in English Vol 26, No 3, Mar 81 pp 69-73

[Article by Kiyoomi Takiyu, managing director, Solar System Promotion Society]

[Text]

THE energy crisis is one of the most serious problems the world faces today. To Japan, which depends almost entirely on imported oil as its energy source, energy is a crucial national problem. Efforts have been made by the Japanese government and private industries to tackle this problem in three major areas ever since the first "oil shock" in 1973 through securing sources of oil imports, energy saving and finding alternate sources of energy. Among them, development of energy sources other than oil is considered the most important in the long-range viewpoint. Solar energy, which provides a pollution-free, limitless source of energy if effectively utilized, could contribute greatly to solving the energy problems of mankind.

Among many countries of the world, Japan has been active in exploiting solar energy over the years. In Japan, sun-heated water by either natural circulation of warmed water through pipes or warmed water stored in tanks has been in practical use since before the energy crisis. The first oil shock attracted the attention of the people as they realized the need for the development of a more effective use of solar energy. Concordantly, the Industrial Technology Agency of the Ministry of International Trade and Industry launched the "Sunshine Program" under which many technical studies were initiated to manufacture equipment and devices for hot water supply and air-conditioning of buildings.

The first successful step in developing equipment for practical utilization of solar energy during the years immediately following the launching of the government program called for combined efforts among the private sector in collaboration with the government to move forward to the ultimate goal of replacing oil with solar energy. For the purpose of developing technology, promoting marketing and the economic viability of solar systems, and obtaining public support to encourage increased demands, the Solar System Promotion Society was established in May 1978.

## What Is a Solar System?

A solar system is a system which collects heat from the sun, converts energy to heat water or air, and stores heated water or air in tanks, utilizing the stored energy when required for hot water supply or air-conditioning. When the temperature of the stored water or heat is low due to lack of sunshine, an auxiliary heater will automatically bring the tank to the required temperature.

For productive collection of solar energy, forced circulation of water (or air) is constantly maintained between the collector and the tank. Operation of the circulation pump and the auxiliary heater is automatically controlled. An electric heater, hot water boiler or heat pump is used as the auxiliary heater. For cooling, an absorption refrigerator or a Rankine cycle engine refrigerator is added to the system.

The system is normally used as a

heater system or a hot water and heater/cooler system. The solar system is different from the conventional solar water warmer. It comes under different government jurisdiction and the Solar System Promotion Society does not handle the conventional solar water warmer.

## The Market Condition

It is estimated that a total of 2.5 million solar water heaters are currently installed in Japan. Solar systems, on the other hand, are still in their infancy. Lack of public understanding and still-expensive installation costs are the major marketing problems.

The situation, however, is gradually changing. The general public is becoming increasingly aware of the need for energy conservation. The rising price of kerosene and increases in utility rates are drawing the attention of consumers to solar energy. Growing numbers of houses, offices, schools, hospitals, homes for the aged, and public facilities such as athletic halls and government buildings are installing solar systems.

Solar systems are also beginning to be installed at industrial facilities involved with farming, fishery, livestock and manufacturing. As seen in Table 1, the total number of solar systems installed throughout Japan as of July 1980, was 1,573. The statistics cover all members of the Solar System Promotion Society which comprise manufacturers and thus can be regarded as reflecting the total market size. It is

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

Table 1. Solar System in Use in Japan

	End June 1978	End June 1979	End Dec. 1979	End June 1980
Houses	1,442	2,365	4,146	14,174
Apartments	12	25	30	50
Businesses	132	274	443	899
Industrial plants	25	21	29	50
Total	1,611	2,685	4,648	15,173

Statistics cover systems manufactured by members of the Solar System Promotion Society.

Table 2. Accumulated Number of Solar System by Function

(As of the end of June 1980)

	Hot water supply	Hot water heater	Hot water/heater/cooler	Others	Total
Houses	13,674	448	48	4	14,174
Apartments	45	1	4	9	50
Businesses	715	53	115	16	899
Industrial plants	24	4	3	19	50
Total	14,458	506	170	39	15,173

Statistics cover systems manufactured by members of the Solar System Promotion Society.

significant to note that the figure represents a sixfold increase from 2,685 of June 1979. The rapid increase is expected to continue because the official measures to promote the solar system started in April 1980.

About 90% of the solar systems currently in use are installed in private houses, but use at business establishments and industrial plants is expected to grow in the near future because of today's critical energy situation.

Over 90% of the systems now in use are for hot water supply. This is mainly because of the low cost of installation, but more and more solar systems are expected to be used for air-conditioning as well because of its safety and pollution-free nature, an important advantage for households with children and older people, while costs of oil, electricity and gas are continuously rising.

Increasing the Use of Solar Systems

In its "Long-Range Forecast of Energy Demand and Supply," the Japanese government declared that it will aim at lowering the dependency on imported oil to 50% of the total energy requirements by 1990. This

policy calls for installation of solar systems at 7.8 million houses, one-fourth of the total houses in Japan, in addition to increased utilization in the business and industry sectors. It is estimated that 5.2 million kiloliters of oil will be saved.

This cannot be achieved without concerted efforts between the government and private industry in promoting solar systems. The governmental measures which began during fiscal 1980 were expanded in 1981 to include the following:

**Technical development:** 1) Grants to develop industrial solar systems (fixed heat process and cascading heat process system) - Budget, ¥216 million, and 2) Grants for hot water supply/air-conditioning system (study of assessment system and development of equipment and materials) - Budget, ¥290 million.

**Establishment of a basic promotional structure:** 1) Promotion of quality improvement of solar systems (establishment of a solar system quality improvement committee) - Budget ¥3 million, 2) Grants for acceptance

study as the basis of promotional activities - Budget ¥19 million, and 3) Establishment of a performance assessment organization (by a non-profit organization for technical assessment facility and conducting testings) - Budget ¥402 million.

**Promotional activities:** 1) A subsidy to promote the installation of solar systems at public facilities (continuing from the first year, government subsidies are given to finance 50% of the installation costs of solar systems by local government agencies and non-profit corporations engaged in educational, cultural, welfare, medical care, environmental protection, sports and recreation, public communication and transportation activities) - Budget, ¥3,600 million.

2) A subsidy to the Solar System Promotion Society's public financing program (continuing from the first year, the following government subsidy is provided to the Society for low interest loans) - Budget, ¥1,797 million, with the total amount of loans (per year) set at ¥11,000 million. Loan conditions for houses are set at 5.5% per year interest and 5-year repayment with a maximum of ¥2 million, and on businesses, 6.5% per year interest and a 10-year repayment, maximum ¥100 million. Loans will be available for systems approved by the society, and contractors should be registered with the society.

3) A subsidy for promotional activities (establishment of four permanent exhibition facilities and operational costs) - Budget, ¥47 million.

4) Tax reduction (7% income tax reduction, or 30% special depreciation, 25% reduction on taxable real asset value).

These government measures will become effective only when the industry makes its own efforts to promote the use of solar systems in Japan. The Solar System Promotion Society, as the central body, will combine efforts of member firms during the coming fiscal year in expanding the loan program, standardization of equipment, improvement of installation technology, quality control, establishment of economic viability assessment, exhibitions and seminars, publication of technical manuals, and publicity activities. Working programs are now under study.

FOR OFFICIAL USE ONLY

I am proud to state that Japanese solar system technology and equipment enjoy world recognition for quality and performance. Many developing countries without self-supporting energy sources are showing interest in importing technology and equipment such as solar collectors from Japan. Energy is not a problem for one country alone; it is a global problem. Japan, as one of the industrialized nations of the world, should extend every possible assistance to developing nations in their efforts to seek alternate energy sources.

The Solar System Promotion Society requests governmental support in providing such assistance to developing countries which will lead to increased technology and product exports from Japan.

COPYRIGHT: 1981 The Nihon Kogyo Shimbun

CSO: 4120

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

WAYS TO OVERCOME PROBLEMS IN PLANT EXPORT DISCUSSED

Current Drive

Tokyo NIKKEI SANGYO SHIMBUN in Japanese 19 Dec 80 pp 13-18

[Article by Shohei Kurihara, chief of Machinery and Information Industry Bureau, Ministry of International Trade and Industry]

[Text] Significance of Plant Export

Japan's officially approved plant export (except transport machinery) adds up to some 10 billion dollars annually, and it comprises about 10 percent of total exports. In Japan, the importance of a drive for the advanced development and higher added values of the export structure has been stressed in the light of the advanced stage and higher added values of the industrial structure, and plant export deserves attention as a model example. Especially in recent years, the importance of plant export has increased due to changes in the international environment and other circumstances as follows:

1. As seen in the semi-industrialized countries of Southeast Asia, the desire for industrialization among developing nations is strong, and plant export has great significance as a form of economic cooperation which could help those countries by boosting their income and transferring technology.
2. The export of cars, television sets and other products has resulted in trade frictions and the future trend is a source of concern. Consequently, it is hoped that future exports will be free of trade frictions and will meet the needs of the recipient countries.
3. Not only do plants have a major ripple and job-producing effect on the domestic economy, but their rate of added values and technology intensiveness is also high. They are therefore effective in enhancing the level of Japan's industrial structure.

Recent Trends

Japan's plant export showed a marked growth until fiscal 1976. The average annual growth rate during FY66-76 was about 38 percent (officially approved exports), while

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

the period FY71-76 showed a remarkable rise of about 44 percent. In addition to the large increases in plant demand in both advanced and developing countries, Japan's favorable conditions, such as its high technological capability and the stabilization of the yen at a low rate, are considered to have contributed to its competitiveness.

However, the growth rate after FY77 declined rapidly and hovered around 4 percent during FY77-78. Seen from a yen base, the strong rise in the yen rate brought a drastic decrease in FY77 and FY78, but a slight recovery was seen during FY77-79. [sic] Also, in FY79, there were signs of a return to high growth, with exports worth 11.8 billion dollars (53 percent higher than the previous year). However, it included about 3.5 billion dollars worth of exports to China, which were virtually nonexistent before. Since further exports to China cannot be expected in the near future except for spot shipments, it could be said that the basically stagnant condition remained unchanged.

A number of reasons could be given for the recent sluggish condition, for which the main reasons are as follows:

1. Following the initial oil shock and as a result of the sluggish economies in the advanced nations, plant export demand dipped sharply, especially in the European Community countries. As a result, primary plant-exporting countries like West Germany and France, which had previously viewed the advanced nations as their principal markets, began to seek sales outlets in the developing countries of Asia, Africa and the Middle East. This resulted in headlong competition with Japan, which had been marketing plants to the developing countries in Asia and the Middle East.

2. On the other hand, with the boosts in oil prices by the Middle East oil-producing countries, the developing nations began to experience an industrialization and land development boom, beginning in 1974, which was accompanied by large purchases of plants. Around 1977-78, prospects for rapid industrialization were generally on track and plant demand ended its first stage.

Also, because of the deterioration in the international balance of payments caused by the rise in oil prices, cumulative foreign debts in many of the non-oil-producing countries increased rapidly, and there were many cases of industrialization plans being deferred or suspended. Plant-exporting countries also became concerned about risks in some countries and narrowed their markets.

3. In addition, the sharp rise of the yen is viewed as a decisive and unfavorable factor for Japan. Plant export is usually backed by long-term credit, but foreign exchange risks prove to be a major obstacle in any business negotiation.

Since FY80, exports to target countries have been disrupted, partially as the result of economic sanctions against the Soviet Union in connection with the Afghan problem, and also because of the Iran-Iraq war. Also, such plant-exporting countries as West Germany and France have granted mixed loans--a combination of conventional financing and ODA-based soft loans--to promote plant export, and they have also provided private-base terms which are free from OECD voluntary restraints. Such cases where orders are sought under favorable finance terms

FOR OFFICIAL USE ONLY

have become frequent, and attention is focused on new problems for Japan where business negotiations fail because of less favorable finance terms.

Future Tasks

Although plant export is desired and there are great expectations for the future, the present situation is stagnant and the outlook is not very optimistic.

Although we are in a severe environment, international consortiums are being formed with Western countries, and Japan's share of plant exports is gradually increasing through its efforts to open up opportunities for new orders and to capitalize on its technological capability. However, there is a growing vigilance among the Western nations against Japan's advance, and it faces the difficult task of pushing the plant-export drive while avoiding international frictions.

For the time being, Japan is considering the following promotional policies:

1. A more flexible implementation of its export insurance system.
2. A more flexible application of ODA-based loans (to compete with the mixed loan system of Western nations).
3. A more flexible application of OECD voluntary restraints.
4. Formulate a system to organize international consortiums (e.g. signing of a joint insurance agreement).

Drastic Export Increase Centering on Oil-Producing Nations

Plant export business begins through negotiations with the overseas users. When agreement is reached on contract negotiations, a series of preparatory steps are taken in agreement with the user country--such as surveying for onsite construction, procurement of machinery and materials from third countries, assignment of overseas builders and securing of workers in the site country. Of course, equipment and machinery are shipped from Japan also. When these steps are completed, onsite construction finally begins. In addition to Japanese personnel, manpower from the site country and from third-country nations in Europe and America participate and work closely together in the construction. Touching episodes of international exchange often occur. When the construction is safely completed, the plant is transferred to the custody of the user country through a process of operational guidance. It requires 3 to 5 years from agreement on contract to completion of construction. An important industrial facility which will play a large role in the user country's industrial capability is thus built by Japanese hands. This is why plant export is treated as a "welcome" export which contributes to the industrial progress of the user country.

If we look at the progress of Japan's plant export shown in the MITI's statistics on approved exports, the total barely exceeded 300 million dollars in the mid-1960's. However, in FY71 it topped 1 billion dollars, and exports subsequently continued to expand rapidly, centering on the Middle East oil-producing countries where revenue from crude prices zoomed upward during the oil crisis. In FY76 it reached the 8-billion-dollar level and the export industry secured a position only

## FOR OFFICIAL USE ONLY

next to the automobile, steel and home appliance industries. The average annual growth rate during the 11 years from FY66 to FY76 was about 38 percent. During the 6 years from FY71 to FY76, it was about 44 percent, which indicates the speedy growth. (Note: The plant exports in the MITI's statistics on approved exports were heavy machinery plants worth more than 500,000 dollars per plant, with a deferred payment proviso of one year or longer.)

The reasons for the remarkable growth of Japan's plant export in the mid-1960's were: on the supply side, stronger international competitiveness, and on the demand side, a widening global market.

Regarding the increase in international competitiveness, one could point on the technical side to the speed with which Japan's plant makers caught up with the markers of Europe and America. The buildup of engineering technology required for plant construction was made possible by aggressive investment in domestic facilities. Also, the superior quality of plant equipment and machinery, punctuality of delivery, and the trust enjoyed among users played an important part. Furthermore, in the case of Japan's plant export, we cannot overlook the fact that the role of Japan's top-level trading companies is fully utilized--from information-gathering to fund procurement.

Meanwhile, a widening global demand proved to be of considerable help. According to the OECD's statistics on plant-related machinery, the average annual growth rate in global demand for plant-related machinery was about 21 percent during the pre-oil shock years from 1970 to 1973, and about 19 percent during the post-oil shock years from 1973 to 1976. Despite the worldwide recession due to the oil shock, the reason global demand for plant-related machinery did not drop perceptibly was because of the active OPEC markets in the Middle East and Africa. In contrast to the marked slowdown in markets in Europe and America following the oil shock, the demand in the Middle Eastern and African markets grew at a rate of some 34 percent during the post-oil shock years 1973-76 and greatly surpassed the world market as a whole.

#### Export Abetted by Expanding Global Demand

Which contributes more to expansion of Japan's plant export--increased competitiveness internationally, or the growth in global demand? According to the "analysis of Japan's international competitiveness concerning plant export" conducted by the Japan Machinery Export Association, contributing factors supporting the expansion of plant export during the 4 years from 1973 to 1976 were: "growth of global demand," 70.9 percent; "increasing global competition," 8.2 percent; "changes in types of plant machinery," 6.7 percent. "Growth of global demand" is indicated as probably the strongest factor supporting the increase in Japan's plant export.

As we have seen so far, Japan's plant export achieved remarkable progress by about 1976, but the growth rate since 1977 has slowed sharply and is now stagnant. That is, after recording 8.01 billion dollars in FY76, it rose to 8.61 billion dollars in FY77 and 8.73 billion dollars in FY78, thus remaining at the 8-billion-dollar level for 3 years. In FY79, it finally broke the barrier and rose to 11.78 billion dollars. However, since this included about 2.7 billion dollars worth of plants destined for China and held over from the previous fiscal year, the export volume

FOR OFFICIAL USE ONLY



FOR OFFICIAL USE ONLY

for FY78 was actually about 11.4 billion dollars and for FY79 about 9.1 billion dollars. In other words, there was a drop of some 27 percent in FY79, compared to the previous year.

Political Changes Cause Slowdown This Year

What are the causes of the drastic change in the plant export growth, with FY77 as a watershed? First, the impact of the sharp rise of the yen. The yen value rose at a rapid pitch in early 1977 and continued to do so until the end of 1978. In 1976, a dollar was equal to about 300 yen, but the yen reached a high in the fall of 1978, a rate of 1 dollar to less than 180 yen.

It could be generally stated that a high yen value causes export price competitiveness to weaken, and its impact is especially true in the case of plant export. In other words, since the settlement of payments for plant export is spread over an extended period, the exporter would fear a rise in foreign exchange risks if the yen tended to become stronger, and he would hesitate to conclude the contract. It may be said that this tendency increased as the yen grew rapidly stronger from 1977 to 1978.

Furthermore, the sluggish world demand for plants has accelerated the stagnation of exports. As we have already seen, the rise or fall of Japan's plant depends largely on the trend in global demand. When the world demand drops, a lag in exports is inescapable.

The impression since 1977 has been that the world's markets which had attracted Japan's plant export have disappeared one after another. First was the Algerian market. Plant export related to the natural gas development project in the Sahara Desert planned by SONATRACH (National Company for the Transport and Marketing of Hydrocarbons) saw a boom 4 or 5 years ago, but trade talks dwindled following political changes in the local government in late 1978 (no subsequent development). Also, because of the Iranian revolution in February last year, Iran-bound exports stopped completely. In addition, a reevaluation trend set in with regard to the industrialization plans which had so swiftly gained momentum in the Middle Eastern countries. This resulted in a narrowing of plant demand.

Also, talks on exports for China, which suddenly loomed as a "prize" market the year before last, culminated in some 2.7 industrialization plans in FY79 resulted in a sharp reversal. With the buildup of the Chinese economy entering an adjustment period, the increasingly pessimistic outlook precludes hope for recovery for some time to come. Furthermore, relations with the Soviet Union deteriorated after the Soviet invasion of Afghanistan the year before last, and Japan-Soviet trade talks were frozen when Japan stopped export credits to the USSR in cooperation with U.S. sanctions against the Soviet Union.

Meanwhile, the closing of the Iraqi market following the outbreak of the Iran-Iraq war in late September was probably the decisive factor threatening the future of Japan's plant export. According to a survey by the Japan Plant Association, the contracted plant exports to Iraq in FY79 totalled about 350 billion yen. This was an increase of nearly 15 percent compared with the previous year and had the signs of an "Iraqi fever." In that year large-scale trade talks had been planned for five cement plants (totaling 200 billion yen), an oil refinery (worth 150 billion yen) and crude oil processing facilities (worth 60 billion yen). The

FOR OFFICIAL USE ONLY

plans were expected to revitalize Japan's plant export, which had been declining for several years.

New Contract Formula To Avoid Risks

The international environment surrounding Japan's plant export is severe. Consequently, the government and industry are desperately working on measures to ride out the difficult times.

Plant-export companies are forming international consortiums with enterprises in Europe and America as a strategy to secure markets. The aim is to avoid, as much as possible, head-on collisions between the Japanese side and the European-American side concerning international plant trade talks, and to join hands in "international cooperation" to share trade opportunities.

Amid the stagnant global demand, the rise in export risks looms as another obstacle for plant-producing enterprises which are seeking expansion of exports. Since plant export requires plant construction abroad over a period of many years and since collection of payment is spread over years, the plant exporter is vulnerable to political dangers such as upheavals, wars and internal strife, or to such economic dangers as unfavorable balance of payments in the importing country. Increase of such risks results in curtailing exports.

Examples of recent political risks were the freeze on plant trade talks between the Soviet Union prompted by the U.S. sanctions against the USSR as a result of the Soviet invasion of Afghanistan, and the halt in exports to Iraq resulting from the Iran-Iraq war. Also, cumulative debts in non-oil-producing countries and East European countries are recognized as economic risks. With countries like Turkey unable to repay foreign debts, there is a spreading fear globally that plant payments might be halted or postponed.

Also, the onrush of worldwide inflation is seen as a major risk factor. The reason is that, during the time between contractual agreement and actual delivery, plant materials procured from around the world would skyrocket in price and goals would become difficult to meet. As a measure for avoiding such risks, a contract formula called "cost-plus-fee formula," which leaves the payment for equipment and machinery costs to the customer, is being adopted among Japanese companies.

Three Types of Supplier's Credit

The two principal forms of financial assistance offered by Japan are export credit by the Japan Export-Import Bank and yen loans provided by the government. The Export-Import Bank financing is divided into three types: supplier's credit, bank loans and buyer's credit.

The supplier's credit is offered to the exporter in the form of settlement of payment (export credit), which the Export-Import Bank purchases on long-term deferred payment of contracts between the Japanese exporter and the importer in the foreign country. In such cases, the foreign exchange bank group also participates in the Export-Import Bank financing. The share ratio is 70 percent by the Export-Import Bank and 30 percent by the foreign exchange bank group. The majority of Japan's plant export is based on supplier's credit, and the Export-Import Bank loans for export financing totalled 324.4 billion yen (approved loans) during FY79.

## FOR OFFICIAL USE ONLY

Bank loans are provided by the Export-Import Bank to government-affiliated banks in the importing country for plant payments. The government-affiliated bank lends the money to the importer to pay the Japanese exporter. Also, buyer's credit is provided the importer by the Export-Import Bank and is received by the Japanese exporter. Bank loans are frequently provided to such communist bloc countries as the USSR, East Germany and China, and to Latin American countries like Mexico and Brazil. They now constitute the principal type of Export-Import Bank loans, together with supplier's credit. Buyer's credit has been provided to Algeria's SONATRACH.

## Government Loans to Non-Oil-Producing Countries

In the case of supplier's credit, the settlement of payment for plant export is deferred. However, in the case of bank loans and buyer's credit, ready cash payment is the rule, which avoids risks on the part of the exporter from future foreign exchange fluctuations. Consequently, providing bank loans results in facilitating agreement on export contracts and in enhancing competitiveness during plant purchase negotiations.

Government loans can also be expected to increase. Government loans are provided to the government of the importing country as plant import loans, and the exporter receives payment directly from the Japanese Government. The loan transaction is handled by the Overseas Economic Cooperation Fund for the government. Compared to Export-Import Bank loans, interest rates are lower and the terms usually longer--about 20 years. When exporting to a country which has difficulty in importing plants, such government loans are indispensable. When global demand decreases and exporters are forced to explore new markets, such loans are said to be quite effective. Consequently, there is a strong voice in the Japanese plant industry for expansion of government loans, and the government has clarified its policy at home and abroad to actively grant loans to non-oil-producing countries with foreign exchange problems, as a form of economic cooperation.

## Much Expected of Mixed Credit

Such government assistance is not unique to Japan. The governments of the advanced countries in Europe and America also actively support plant export. Especially conspicuous are the aggressive efforts of West Germany and France, and their new financing called "mixed credit" is a threat to Japanese exporters. Mixed credit is a form of deferred payment financing by exporters tied to extremely low-interest, long-term government loans. The conditions for the grant of export loans are a deciding factor in the bid for orders in international negotiations, and when fierce competition begins among exporters from various countries over low-interest and long-term financing, countries like France reportedly provide lateral assistance to its own exporters by promising government loans to the prospective importer country and thus offering to lighten the burden of the borrowing importer.

There have been cases where the Japanese side lost out in plant talks in the face of mixed credit offered by European exporters, such as bids for communications equipment for Egypt and electric generating equipment for Honduras. As a result, Japanese makers are strongly demanding that their government also offer mixed credit.

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

Joint Insurance Agreement With European Countries

Another form of government assistance which cannot be ignored is expanded export insurance. As a step in promoting international consortiums among plant exporters, the Japanese Government is firming up a policy decision to conclude an agreement in Belgium with various European countries on "joint insurance." There is also a strong demand among plant makers for the establishment of "pre-loading insurance."

The present scope of export insurance is to provide collateral for the risks which occur abroad after plant equipment and machinery are loaded on board and leave Japanese wharves. But there is a demand to broaden the scope to include risks in the pre-loading stage. Because of the Iran-Iraq war, Iraq-bound equipment and machinery could not be loaded, which increased the need for such insurance. The role of insurance supporting the desire of plant makers to export will probably increase in importance in the future.

Orders to LNG Tankers

With the worldwide boom in oil excavation as a backdrop, the construction of ocean rigs is also booming. As a result, there has been a sharp increase in orders for Japanese shipbuilding and heavy machinery, as well as for added construction of plant facilities and new construction of specialized plants to produce large ocean structures.

Especially noteworthy are the numerous projects for large-scale use of natural gas in order to economize on use of oil. In Indonesia, in addition to the LNG plant in Batak, Kalimantan, the Nikki Chemical and Bechtel companies are competing for bids to explore for natural gas and to build an NGL (natural gasoline) separation plant in Arun, North Sumatra. There are also LNG, LPG and NGL projects planned in the USSR, Australia, Nigeria, Qatar and Thailand. However, with LNG and LPG glutting the global market and second thoughts being entertained in Japan regarding purchases at spot prices, a reappraisal of LNG trade is underway.

Due to the activity in LNG trade, there have been increasing cases of orders received by Japanese shipbuilders for LNG tankers. Recently, Mitsubishi Heavy Industries and Kawasaki Heavy Industries received orders for one LNG tanker each to transport Arun LNG. It is also highly probable that, in the second round of orders, Mitsubishi Heavy Industries and Mitsui Shipbuilding will each receive an order for a tanker.

Coal gasification and coal liquefaction projects have also been started. Regarding gasification projects, Hitachi Ltd received an order for seven coal gasification furnaces from the American Natural Resources as the first U.S. commercial project. As for liquefaction projects, the Mitsui Coal Liquefaction Co of the Mitsui group initiated a pilot plant in Omuta City, Fukuoka, to conduct coal liquefaction tests using Victoria (Australia) brown coal. In addition, the company has begun to study the possibility of a joint venture with Australian enterprises to construct a commercial 6,000-ton daily capacity plant there. The Mitsui Coal Liquefaction Co (MCL) is participating in a joint Japan-U.S.-West Germany SRC-II project. The MCL's technical development branch is participating in the EDS plan which is centered on the Exxon Co (United States) and is aiming for the start of operations of a 250-ton plant in 1981 or 1982. The Japan Brown Coal Liquefaction Co signed

FOR OFFICIAL USE ONLY

a joint development agreement with the Province of Victoria (Australia) and obtained guarantees for brown coal supplies needed for liquefaction. Such concerns as the Mitsubishi group, Sumitomo group and a direct hydroliquefaction group, centering on Mitsui Shipbuilding, are also pushing their respective coal liquefaction plans.

Petrochemical projects are also likely to be actively pushed next year. As for the Saudi Arabia project being pushed by the Mitsubishi group, the Chiyoda Chemical Engineering and Construction Co has been consigned to conduct surveys for its commercialization, and technicians from Saudi Arabia will arrive in Japan next spring to receive training. There are other petrochemical plans in Saudi Arabia, and discussions are underway to combine them with the Mitsubishi project. If this materializes, a supersize project with an annual production capacity of 500,000 tons of ethylene will become highly feasible.

There is also activity between Japan, the United States and Canada to build a petrochemical complex on the west coast of Canada. The Mitsubishi Chemical Industries, Mitsubishi Petrochemical, Asahi Glass, Mitsubishi Corporation, Occidental Petroleum (United States) and Dome Petroleum (Canada) would build an ethylene center with an annual production capacity of 300,000 tons and a target operational date in 1985. Japan's chemical industry has recently been concentrating its efforts on overseas production with plant sites near material resources, and it also has plans for chemical complexes in Alaska and Australia.

Series of Steel Refineries Projected

The second-stage construction of the Baoshan steel refinery in China has been postponed, but there are many refinery projects in the works globally. In addition to the 500-600 billion yen projects in Mexico, Venezuela and Libya, plans are underway for the construction of new refineries in Malaysia, Thailand, Iraq, Algeria, Saudi Arabia and Colombia.

In the Middle East, there are many sea water desalinization projects, as usual. In Kuwait and the United Arab Emirates, there are projects for which one new bid and one rebid have been submitted respectively, and one project in the UAE and three projects in Saudi Arabia for which surveys are underway to put production on a commercial basis.

Among the projects interrupted by the Iran-Iraq war, active steps are being taken to reopen talks and construction on Iraq-related projects. In Iraq, the Chiyoda Chemical Engineering and Construction on Iraq-related projects. In Iraq, the Chiyoda Chemical Engineering and Construction, Toyo Engineering Corp, Mitsubishi Heavy Industries, Kawasaki Heavy Industries and Niigata Engineering have started preparations or supplemental negotiations to reopen construction work on oil refineries, LPG plants, fertilizer plants and cement plants. General construction companies, which are going ahead with construction of new towns and harbor facilities, are working to secure transport routes and studying the reentry of key personnel. Talks on large projects totalling 200-300 billion yen are also likely to be reopened at the request of the Iraqi Government.

Japanese interests had been experiencing successive failures in talks concerning exports to the USSR, due to sanctions against the Soviet Union for its Afghan

FOR OFFICIAL USE ONLY

invasion, but there are active moves on Japan's part to improve trade with the USSR. Japan has decided to provide the USSR with bank loans through the Japan Export-Import Bank to build the Siberian natural gas pipeline. It will be the first step in the thaw in anti-Soviet sanctions, and the pipeline talks are seen as a big step forward. The pipeline will connect Siberia and Europe at a total cost of over 10 billion dollars, and the Soviet Union has offered a deal amounting to some 3 billion dollars.

In view of the major risks involved in plant export to countries in the Middle East, a second look at the Southeast Asian markets is also being taken in Europe and America. Japan had hitherto shown strength in Southeast Asia, but the trend toward appraisal is bound to increase competition. Among the major items in the region are the Saglin [phonetic] hydroelectric generating plant in Indonesia, which may cost 50 billion yen, and the fertilizer plant in Malaysia, which is expected to cost 57 billion yen. Some 20 groups, including those of Japan, France, West Germany and South Korea, are bidding for the Saglin hydroelectric generating plant. Recently, Toyo Engineering received an order for a 70 billion yen fertilizer plant in Indonesia.

Engineering Capability Highly Evaluated

The most popular form of contracts for Japan's plant export has been the "full turnkey contract," which includes a lump order ranging from production surveys to plant completion. There have been few which opted for the cost-plus-fee contract, which adds engineering fees to the accrued costs. This is because, in the case of developing nations, a complete set of conditions is necessary for plant operations to the point where operations can be started with one turn of the key. However, from the standpoint of technical capability, and extremely high degree of engineering capability and management ability is demanded of the side receiving the order under a cost-plus-fee contract. Therefore, if the conditions are not met, the cost-plus-fee contract usually is not chosen.

Nonetheless, the oil refinery built in Saudi Arabia by Chiyoda Chemical Engineering and Construction and the order for an oil refinery in Kuwait recently received by Nikki Chemical were under the cost-plus-fee type of contract. Toyo Engineering and Nikki Chemical have received orders, for engineering only, for a methanol plant in Trinidad-Tobago and an aluminum plant in Brazil, respectively. These examples indicate that the engineering capability and management ability of Japan's engineering firms have come to be highly evaluated on an international level.

In Japan, consulting, which includes surveys for commercial production, drafting master plans and checking estimates from the standpoint of the ordering side, is still inferior to the Western nations. However, consulting orders received by Japanese consulting firms have increased, and such firms as Nippon Koei and Pacific Consultants International are showing impressive results.

TAS Contracts Increasing

Concerning recent plant export, the importance of not only prices and performance of hardware but also technology transfer to the developing countries importing plants are stressed, and personnel training and operational guidance have been given increasing importance as contract terms.

FOR OFFICIAL USE ONLY

As an example of operational guidance currently in practice, the TAS (technical assistance service) contract for the Shikuda [phonetic] petrochemical plant signed by Toyo Engineering Corp with the Algerian hydrocarbon company, and handled by the affiliated Cosmo International Company, is striking. Instructors are assigned one-on-one for 450 of the 1,420 employees from the plant manager to process operators, under "double post training," and class education is also conducted concurrently.

The training was started in March 1978. By the end of November, 279 employees were on their own after completing technology transfer, and a like number of instructors returned to Japan. The rest are continuing their training. Each instructor consults with the hydrocarbon company to determine how long his assigned student should continue training, but it is expected to be some time before all trainees will be able to stand on their own. All employees are required to receive basic education in class before beginning work, and the [IPEDIX] Company of France and the [Comerinto] Company of Italy have been assigned to offer educational guidance. In other words, an international consortium has been formed for operational guidance.

Plant employees are being solicited by other companies, and, with some trainees quitting due to a sense of insecurity after their instructors leave, operational guidance has not always lived up to expectations. However, not a few cases have surpassed expectations. For example, at the steel works in Qatar built by Kobe Steel Co, 120 Japanese instructors were sent at the beginning of operations in April 1978. Today, 80 are training leaders in management and operations. The reason for the decrease to 80 Japanese is because of the training completed, and today the plant is functioning at 130 percent of production capacity. At this rate, it is believed, the plant will continue to improve its efficiency after the total transfer of operations to the Qatar side.

In the case of steel plants, also, there are increasing examples of large-scale operational guidance. The double post training conducted by Nippon Steel Corp at China's Baoshan steel complex is said to involve some 1,000 trainees, and the steel works in Algiers is also said to be on a similar scale.

#### Guidance Also in Maintenance Techniques

The developing countries are seeking technology transfer at every phase, and there are increasing cases of technology transfer beginning with the construction phase. An example is the Kaduna oil refinery in Nigeria, which was completed this past October by Chiyoda Chemical Engineering and Construction.

It is a large project totalling 180 billion yen and some 1,000 Nigerians, including not only miscellaneous workers but also welders, plumbers and assemblers, were assigned to its construction, which required high degree of skill. The skilled workers were trained in onsite training classes by a Japanese staff, and those who attained a certain level of skill were successively assigned to construction work.

Meanwhile, the training of technicians and operators was conducted in Japan under a separate technician training contract. Parallel with the plant construction,

FOR OFFICIAL USE ONLY

75 Nigerians came to Japan to learn operational and maintenance techniques while working in Japanese refineries. Today, the plant (in Nigeria) is run almost entirely by the 75 Nigerians who were trained in Japan, and it is considered a model for the industrialization of Nigeria.

Share of Risks and Funds

There are two types of international joint ventures for plant export. One is formed between the enterprises of the exporting country and the site country ordering the project. The other is between nonsite countries which team up together. For example, in Brazil, which had adopted the policy of boosting the domestic production rate in order to raise national capital, the type of joint venture with enterprises of the site country is more often adopted. However, in this case the site country obliged to form consortiums from a policy standpoint, although there is inherently no need to form joint ventures at all. It is quite different in nature from that of enterprises in Europe and America, which join hands for projects in the Middle East to compete with other consortiums. Therefore, a consortium generally means a joint venture between enterprises in nonsite countries.

International consortiums began to increase in Japan after the initial oil shock. According to a report by the international consortium survey committee formed by the Japan Machinery Export Association, under commission by the MITI, Japanese companies formed 78 international consortiums for 71 projects during the 4 years from 1976 to 1979. Their partners were varied, including West Germany (26), the United States (15), Britain (13), France (10), Denmark (7), Austria (3), Switzerland (2), South Korea (2), and 1 consortium each with Italy, Spain, Czechoslovakia, Poland and Lebanon. This year, 13 consortiums have been formed for 12 projects, and orders for 9 projects have been received.

The reason for the increase in international consortiums is because the projects are more massive, more complicated and the terms are longer. Among Japan's plant exports, there was only one costing more than 100 million dollars in 1973, but as many as 27 last year, which by themselves constituted about half of the total worth of approved plant exports. Consequently, a single enterprise by itself could no longer bear the list cost or provide the financing and supply capability to cover the projects.

If merely large scale and increased complexity were involved, joint ventures among Japanese companies could cope independently with the challenges in many respects, and in reality the number of Japanese consortiums has sharply increased. However, in order to meet the fierce competition and cope with higher yen values, there is a limit to the capability of purely Japanese joint ventures. For example, regarding onsite construction capability, teaming up with foreign companies is the key to stronger competitiveness in order to cover the lag in internationalization among Japanese engineering and construction companies. Also, in certain regions it is often more advantageous to team up with engineering and licensing concerns in Europe and America, which have wider vested interests and achievements. International consortiums are also more effective as a means of avoiding competition with European and American companies.

The decline in price competitiveness due to the higher yen value was also greatly instrumental in promoting international consortiums. As a means of coping with



## FOR OFFICIAL USE ONLY

the higher yen, overseas procurement came into active use, but overseas procurement requires a high level of knowhow in trade negotiations, specifications, control over delivery and construction pace, and transport. Consequently, it is often more advantageous to form international consortiums, rather than for Japanese companies to go it alone, and to consign the activities en bloc to foreign companies. There are some cases where consortiums are formed with European and American companies in order to facilitate dollar-based contracts and dollar financing.

There are thus various merits to international consortiums. However, regardless of the merits, unless the Japanese companies themselves possessed adequate capabilities and achievement records, international consortiums with the advanced engineering countries of Europe and America would not be feasible. In this respect, Japanese engineering industries have in the past dozen or more years rapidly acquired international competitiveness in both hardware and software, and have also posted broad achievements. Consequently, there are many indications that European and American enterprises have also increased their competitiveness by joining Japanese companies.

#### Major Role by General Trading Houses

During 1976-79, Japanese companies formed 78 international consortiums. Among these, 59 are partnerships with European enterprises and only 15 with American enterprises. The reason is said to be the prevailing opinion in America that they could get along without consortiums. However, during the past 1 or 2 years, international consortiums between Japan and the United States have been increasing. This indicates that the American engineering firms with their overwhelmingly superior achievements and sales volume have been forced to make a forward looking reappraisal of the real capability of Japan's engineering industry.

The role of the general trading house in the international consortiums formed by Japanese companies is substantial. The general trading house has a manifold function and capability, such as the initiation of projects, providing assistance in finding partners, procuring and applying funds, executing contracts and conducting public relations between partners and customers, conducting sales campaigns, etc. It has been very effective in forming domestic consortiums and is proving equally effective as the consortiums become internationalized. The role of the general trading house increases as the projects become more complex and varied, and its importance vis-a-vis plant export is expected to continue growing.

COPYRIGHT: Nihon Keizai Shimbunsha 1980

#### Export Insurance System

Tokyo NIHON KEIZAI SHIMBUN in Japanese 7 Jan 81 p 5

[Text] The Ministry of International Trade and Industry (MITI) has decided to broaden its export insurance system to cope with the increase in plant export in-through the development and import of foreign resources and consortiums with European and American enterprises. It includes (1) new insurance to guarantee obligations of parent companies vis-a-vis joint ventures in cases where trading houses establish joint ventures or subsidiary companies for the development and

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

import of oil and coal; and (2) extension of insurance to cover plant export orders received jointly with foreign companies and where the share of orders received by the Japanese side is less than 50 percent. Additionally, the coverage rate (damage covered by insurance) will be raised from the present 90 percent to 95 percent. With the disrupted construction of the Iran-Japan petrochemical (IJPC) project due to the Iran-Iraq war as a turning point, the direction of export insurance has become an issue, and the MITI intends through these steps to support joint plant export with European and American enterprises in order to eradicate friction in resources development and trade occurring from such unstable international conditions, and to establish "danger-resistant export insurance."

Seek Guarantees for Obligations in Joint Ventures

The MITI plans to convene its export insurance council (Keizo Tamachi, chairman) in January, at which agreement is expected on measures for expansion of insurance and a hike in rates. Subsequently, the MITI will submit a bill to the current Diet session to revise the export insurance law and begin a new system sometime in FY81.

The reason for the expansion and boost in expert insurance is the increasing development and import of resources and plant export not anticipated under the existing system. For example, in the case of the IJPC project, the approximately 110 billion yen in investments or loans by Mitsui & Co to the IJPC could be covered by overseas investment insurance--which is one form of export insurance--provided the project is halted under agreement with its partner, the NPC (Iranian National Petrochemical Corporation). However, the guarantee of debts by Mitsui & Co regarding sums borrowed by the IJPC from the Euromarket will not be covered.

The proposed revision is aimed at eliminating such risks through inclusive coverage. First, it is aimed at including the debt guarantees related to resources development by Japanese companies under overseas investment insurance. When not only the IJPC but also Japanese companies develop and import oil, coal and natural gas, they usually establish a 100-percent capitalized subsidiary in the site country or set up a joint venture with site country capital. Although investment and loans toward such ventures have hitherto been covered under overseas investment insurance, the new proposal is aimed at including coverage of debt guarantees by the parent companies toward loans borrowed by subsidiaries and joint ventures.

If it materializes, the new system would facilitate guarantees by the parent companies vis-a-vis loans borrowed by joint ventures and subsidiaries participating in the projects. The aim is to promote the development and import of substitute fuels through such measures. We shall inquire further into coverage of other kinds of resources development besides coal and oil.

Regarding expansion of plant export insurance, ordinary export insurance will cover plant orders received by consortiums wherein the share of orders on the Japanese side is less than 50 percent. The present system embraces only "domestic enterprises" and excludes ventures wherein the share of orders on the Japanese side is under 50 percent. Plant makers have therefore been reluctant to participate in plant export centering on foreign companies.

## FOR OFFICIAL USE ONLY

However, the MITI feels that "in order to remove trade friction with the European Community, there is greater need to increase plant export through joint ventures with the European countries" (a high MITI official), and it has decided to create conditions from the insurance side which are conducive to forming joint ventures. Thus, even if their share of orders declines further, the Japanese companies would be able to receive insurance coverage proportionate to the orders, in cases where such factors as wars pose difficulty in collecting payments from customers, and they could "form joint ventures with the countries of Europe and America with peace of mind" (a certain plant maker).

Also, supplemental coverage for the most widely used ordinary export insurance will be raised from the present 90 percent to 95 percent and, in cases where contracts are nullified, the compensation rate for damages incurred by Japanese companies will be increased. In implementing the revision, the MITI contemplates a hike in insurance premiums.

(Note: Export insurance. This insurance guarantees compensation by the government in cases where an exporter is unable to collect payment in the country of import because of war, bankruptcy, etc. There are presently nine kinds of insurance, including ordinary export insurance, foreign exchange fluctuation insurance, overseas investment insurance, etc. The exporter pays premiums to the government export insurance special account in proportion to the debt and, when it is unable to collect the debt, the special account pays damages at a set rate. In most cases, insurance damages are paid in the developing countries which suffer from unstable political conditions and unfavorable foreign currency reserves.)

COPYRIGHT: Nihon Keizai Shimbunsha 1981

## Negotiations With Europe

Tokyo NIKKAN KOGYO SHIMBUN in Japanese 15 Jan 81 p 13

[Text] The Japan Machinery Export Association (Ichiro Terao, director) will send a mission on international plant exchange to Europe in late February. Principal companies engaged in plant export such as Chiyoda Chemical Engineering and Construction, Nikki Chemical, Toyo Engineering Corp, Nippon Steel, Kobe Steel, Ishikawajima-Harima Heavy Industries, Toshiba, Hitachi, Kawasaki Heavy Industries and Nippon Electric have already decided to participate in the mission. Also, such trading houses as Mitsubishi Corp, Mitsui & Co and C. Itoh & Co are expected to join the mission through their local overseas branches, and indications are that it will be an unprecedentedly large-scale mission on international plant exchange. Consequently, it is expected that specific matters will be taken up as themes and discussed in considerable detail with the organizations and enterprises of four European countries, including Belgium and the Netherlands, which are seeking a policy of joint cooperation between Japan and Europe on plant export, and that goals with substantial merit will be established concerning international exchanges.

In order to expand Japan's plant export, the Japan Machinery Export Association considers it indispensable to seek export cooperation with European countries in third country markets, and it considers that such cooperation is related to avoidance of trade friction with Europe. Consequently, it has aggressively promoted exchange projects with the machinery industry groups of European countries, centering on the Japan-Europe international plant exchange commission (Katsuzo Nagai, chairman and Toshiba consultant).

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

In addition to sponsoring periodic consultative meetings with the Belgian Machinery and Metal Industry Union (FABRIMETAL) and the Dutch Machinery and Electrical Industry Association (FME), the commission has reached basic agreement with industrial groups in Britain and France on periodic consultations.

The Japan Machinery Export Association is thus planning to have the mission visit Belgium, the Netherlands, Britain and France to discuss industrial cooperation between Japan and Europe with the various organizations in those countries. At the third periodic meeting with FABRIMETAL, with which two consultative meetings have already been held, discussion on individual matters is expected. Also, it will be the second meeting with the FME and, besides plant export cooperation in third countries, general talks will be held on investment and technical cooperation in the Netherlands.

It will be the initial periodic talk with the British Machinery Industry Managers Federation (EEF). In France, talks will be held to set up periodic discussions with the Plant Industrial Group (GEIF) and the engineering enterprises organization ABETEX.

Japan's prominent enterprises in the plant export field are thus participating in full force in the upcoming mission. Mitsubishi Heavy Industries is also said to be studying the possibility of joining. The mission to Europe will be unprecedented in its scope, and major results are anticipated from the visit.

The chairman of the Japan-Europe international plant exchange commission has been appointed as leader of the mission, which will depart 23 February and disband 6 March in Paris.

COPYRIGHT: Nikkan Kogyo Shimbunsha 1981

Survey of Overseas Activities

Tokyo MAINICHI SHIMBUN in Japanese 11 Jan 81 p 7

[Text] Japanese enterprises have made increasingly aggressive advances into overseas markets each year in order to counter import constrictions and to secure low-cost labor. However, the reality of such activities is not always made clear. Consequently, beginning in FY81, the MITI has decided to kick off a "fundamental survey of overseas projects and activities," which may be viewed as an elucidation of "Japan-type multinationals." The content of the survey will be detailed to include the production volumes of individual items and their distribution routes. The MITI's policy is to resolve the friction resulting from the advance into overseas markets by Japanese capital on the basis of survey results, and to pave the way for an international system of division of labor, including the restructuring of industries.

The MITI has conducted a survey of "trends of overseas projects by Japanese enterprises" annually since 1970, concerning the overseas activities of Japanese companies. However, since the survey items were simplified, it could not provide sufficient data in explanation of such company activities based on actual conditions. For example, the "textiles" produced abroad by Japanese companies totaled 749.3 billion yen in sales (1978 survey), but the sales volumes of individual items were not determined.

FOR OFFICIAL USE ONLY

A conspicuous "bomerang effect" was seen in the textile field, where Japanese capital was invested overseas and the goods produced overseas were shipped back to Japan, resulting in a negative impact on the domestic textile industry. It has not been made clear what kind of goods, in what countries and in what quantities, were produced by Japanese capital to make reverse entry into Japan, nor were adequate countermeasures taken.

Therefore, the survey will add areas of study, probing much deeper into the internal workings of the companies, including such specific categories as overseas production volumes by country and item, the procurement routes of raw materials and parts, the sales routes of finished products, etc. The MITI takes the view that the real conditions of overseas activities by Japanese companies could be better understood by studying the conditions of capital investment, procurement of raw materials and parts, production, sales and profits. When the survey results and damage to the domestic industry from the boomerang effect become clear, it intends to set up definite guidelines on overseas activities.

Once Every 3 Years Beginning Next Year

The object of the survey will include some 4,000 large, medium and small enterprises, and will be conducted once every 3 years, beginning in fiscal 1981. It will be limited to those enterprises with at least 25 percent capital investment in foreign corporations, or those with less than 25 percent investment but which are sending corporate executives to the foreign companies or maintaining technical cooperation with them. Finance and insurance companies are exempted from the survey.

Partial results of the survey will be made public during FY81 and complete results will be announced during FY82.

COPYRIGHT: Mainichi Shimbunsha 1981

5884  
CSO: 4105

FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

MITSUMI FIRMS PROBE COMMERCIAL FEASIBILITY OF COAL-METHANOL MIX

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19, No 946, 17 Mar 81 p 9

[Text]

Mitsui Group companies interested in coal-methanol mixture fuel will send a fact-finding mission to North America in mid-March in an attempt to probe into the mixture's commercialization possibilities.

The group, including Mitsui Mining Co., Mitsui Toatsu Chemicals, Inc. and Mitsui & Co., believes that the transportation problems with Western U.S. and Canadian coals can be solved by importing coals in the form of mixture.

The group is slated to conduct coal-methanol fuel's experimental production, transport, storage and combustion with a pilot plant with daily capacity of 1.2 tons at the Tochigi works of Mitsui Miike Machinery Co. in fiscal 1981. In or after 1982, the group hopes it

can be promote experiments by building a plant with daily capacity of 50 tons or so.

The new form of energy features obtaining methanol by gasifying coal before blending the alcohol with coal at a ratio of 4:6 (Electric Power Development Co. is interested in coal-oil mixture for the same purpose of solving coal transportation problems.)

North America is seen as an ideal site for coal-methanol fuel. The collieries in the west are located more than 1,000 kilometers from the Pacific coast, raising transportation costs per ton \$6-10 above the Australian coals. To solve the problem, some advocate that the Western coals be carried in slurry form. But this method's disadvantage includes requirement of large water volume.

COPYRIGHT: 1981, the Nihon Keizai Shimbun, Inc.

CSO: 4120

FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

ETHYLENE PRODUCERS EXPAND NAPHTHA, LPG STORAGE

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19, No 946, 17 Mar 81 p 9

[Text]

Ethylene producers are expanding their naphtha and liquefied petroleum gas storage capacity in an attempt to purchase these feedstocks at low prices. The tank construction projects are aimed at reducing variable costs, including feedstocks, which account for 80-90 per cent of total ethylene production costs.

Showa Denko K.K. leads the industry's tank storage plans. The company is expanding its storage capacity to 240,000 kiloliters by July, when 100,000-kiloliter capacity will be completed. SDK's investment in existing tanks and a berth at Oita helped it increase its recurring profits by ¥ 400 million in the year

ended December, 1980. Other ethylene makers were forced to report reduced profits.

Mitsubishi Petrochemical Co. is following SDK by planning increased storage capacity at both Kashima and Yokkaichi, as are Sumitomo Chemical Co. and Shin-Daikyo Petrochemical Co.

It costs roughly ¥2 billion to build a 40,000-kiloliter tank. The ethylene industry plans to expand its storage capacity by about 410,000 kiloliters. The roughly ¥20 billion investment reflects the petrochemical industry's realization that ethylene competitiveness depends partly on obtaining and stocking low-price feedstocks.

COPYRIGHT: 1981, the Nihon Keizai Shimbun, Inc.

CSO: 4120

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

TORAY WILL DOUBLE CARBON FIBER PRODUCTION TO 100 TONS A MONTH

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19, No 946, 17 Mar 81 p 9

[Text]

Toray Industries, Inc. will start expansion of its carbon fiber capacity in May to more than double it to 100 tons a month by in 1982. The company's monthly capacity is rated at 35 tons, making it the world's largest producer of the specialty "fiber."

The Toray capacity expansion features construction of a new line rate at 50 tons a month and boosting the existing plant's capacity by 15 tons for 50 tons a month. The construction project is aimed at meeting the demand, which the maker anticipates will drastically go up in the next few years.

At Toray's Ehime works, located at Matsuyama City, the new plant is scheduled to be completed in about a year. Simultaneously, the 35-ton-a-month plant's capacity will be steadily raised to 45-50 tons a month. By mid-1982, Toray expects to possess the world's largest (100 tons a month) level.

The company anticipates that the demand will go up

fast, starting in 1985. In the past year or so, major chemical concerns demonstrated their interest in entry into and expansion of carbon fiber business in both the U.S. and West Europe. Given this situation, Toray wants to maintain its No. 1 slot in the carbon fiber industry.

The product is made by baking special grades of acrylic fibers. Its unique qualities, including light weight comparable to aluminum and better strength than steel, led to applications for leisure goods. In the U.S., aircraft makers are interested in carbon fiber consumption, while automobile and space equipment makers will likely adopt the material, too.

Besides being No. 1 in capacity, Toray's technical expertise was demonstrated when its process was licensed to Union Carbide Corp. (Similarly, Toho Rayon Co. will make its know-how available to Celanese Corp., another U.S. maker.)

COPYRIGHT: 1981, the Nihon Keizai Shimbun, Inc.

CSO: 4120



FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

RUSSIA SEEKS COLLABORATION IN COAL LIQUEFACTION PROGRAM

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19, No 946, 17 Mar 81 p 3

[Article by Hiroshi Egashira]

[Text]

MOSCOW — The Soviet Union intends to call upon Japan to cooperate in its coal liquefaction project during its 11th five-year economic development plan (1981-85), it was learned last week.

Baibakov, chairman of the Soviet Gosplan (national planning committee) sounded out Ryoichi Kawai, chairman of the Lumber Committee, a sub-committee of the Japan-USSR Business Cooperation Committee, who visited Moscow last week to sign a basic agreement on the Russo-Japanese forestry resources development project, on Japan's interest in the joint coal liquefaction project.

Should Japan's cooperation

in the project materialize, cooperation with the Soviet energy projects would develop from production of the conventional energy sources, such as petroleum and natural gas, to development of alternate energy sources.

According to Kawai, Baibakov refrained from referring to any detail of the coal liquefaction project save to disclose only its inclusion in the current five-year economic plan when he met with Kawai.

But this was the first time that the Soviet Union had disclosed its intention to carry out a coal liquefaction project with a free nation.

The Soviet Union is said to have already built pilot coal liquefaction plants and to now be studying the feasibility of its coal liquefaction technology.

COPYRIGHT: 1981, the Nihon Keizai Shimbun, Inc.

CSO: 4120

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

ALLEVIATION OF INTERNATIONAL DATA COMMUNICATION CONTROL

Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 72

[Text]

The KDD has decided to alleviate control on use of the leased circuit for international data communication, which it is accused of doing by the American information processing industry.

Presently the KDD permits connection of only one computer installed abroad when an information processing industry of a foreign country tries to supply its service to a Japanese user. This is due to the fear that the information may be exchanged as not being processed between the terminals connected to the two computers at the both ends if two or more computers are permitted to be connected. Particularly, strict restrictions were posed because it is almost impossible to investigate in detail the use status of many computers installed in a foreign land and check for violations.

On those restrictions, however, the American users have expressed a strong feeling of dissatisfaction. Corresponding to those demands, the KDD has decided to permit the connecting of multiple computers installed in a foreign land. This decision enables the business world in the U.S. to expand and diversify their services in Japan. Behind the KDD decision, there exists consideration to try to evade the issue of the international data communication restrictions from becoming a source of friction between Japan and America, like the NTT open-door problem.

COPYRIGHT: 1981 Fuji Marketing Research Co., Ltd.

CSO: 4120

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

NEW-TYPE PRIVATE DATA COMMUNICATION NETWORK

Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 73

[Text]

*The private decentralized processing on-line system, at present in general use, employs in many cases, the discrete distribution system in which each unit is connected separately. The shortcomings are however that the number of distributions increases and the distribution passes are complexed, bringing about high construction expenses and difficult and operation maintenance.*

*NEC has announced for such a situation, an optical private communication network, "N6770 Data Link" which enables high-speed data transmission among units by loop connecting a number of computers or terminals in an office or a factory by the optical fiber cables. This system consists of multiple loop interface units (LIU), optical fiber cables which connect among the LIU's and one maintenance/monitor unit for each LIU computer or terminal being connected.*

*The LIU is also provided with functions of a packet exchange, which enables sending data to all units connected to the data link by specifying the addresses of the communicating destination for each packet from a certain computer.*

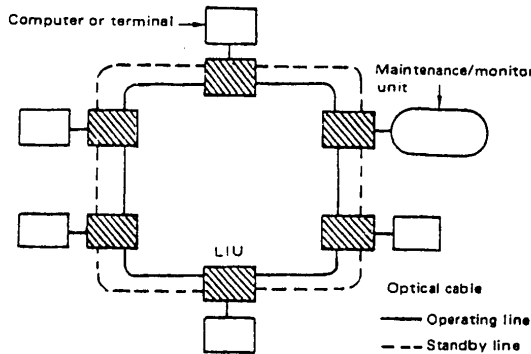


Fig. 1. N6770 Data Link

FOR OFFICIAL USE ONLY

**FOR OFFICIAL USE ONLY**

*As optical fiber cables are used for the communication line, the system enjoys such properties as wide transmission band, low transmission loss, and ability not to suffer from electromagnetic interference. The length of a cable between one LIU and another can be up to 2km and the total length cables up to 150km. This system can connect up to 126 units, computers or terminals, in one loop and also transmit 32 megabits of data per second.*

**COPYRIGHT: 1981 Fuji Marketing Research Co., Ltd.**

CSO: 4120

**FOR OFFICIAL USE ONLY**

FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

A SINGLE SYLLABLE INPUT VOICE RECOGNITION DEVICE

Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 74

[Text]

NEC has been successful in the production of a voice recognition device by single syllable input. In respect to voice recognition, the production of a device that recognizes two words as one word has begun. However, single syllable input is made by uttering each syllable such as A or B and the uttering time is shorter than for a word. Therefore, single syllable input must be precise and a higher processing for recognition is required.

To overcome this problem, NEC has used their unique recognition method based on the Dynamic Programming Marking System for recognition of a single syllable and a word. The device produced in this way has the following characteristics. 1) A single syllable can be recognized in 0.25 to 0.3 second by dedicated hardware in a multiprocessor environment. 2) High-speed data input is possible. 3) The device can be connected to a CRT display.

This device can recognize 68 different single syllables, 10 numerals, and about 500 words.

COPYRIGHT: 1981 Fuji Marketing Research Co., Ltd.

CSO: 4120

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

SOFTWARE DEVELOPMENT BY GRAPHICS

Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 74

[Text]

Fujitsu has developed a software-oriented graphics display technique to develop software using two-dimensional drawings.

This basic idea is intended to develop a program by making the computer directly read the flowchart used for program development. Various commands or conditions are written into frames (boxes). These boxes are connected together by lines along the logical flow. There are five ways to connect lines as shown in the figure. They are: Simple, IF, CASE, DO, and DO UNTIL boxes.

To input a program written by boxes and lines to the computer, you will punch the data about where a line to a box originates, what a command in a box is, and where a line goes to and then input it. NEC provides software called a transformer to rewrite a graphics program into a normal program for conversion to the language used by the computer.

The program using graphics requires a paper area three times wider than conventional programs in a text format, but the volume of documents can be greatly reduced owing to the lack of need for flowcharts from the viewpoint of the entire process of program development. This approach is a trial to open the way for the automation of software development.

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

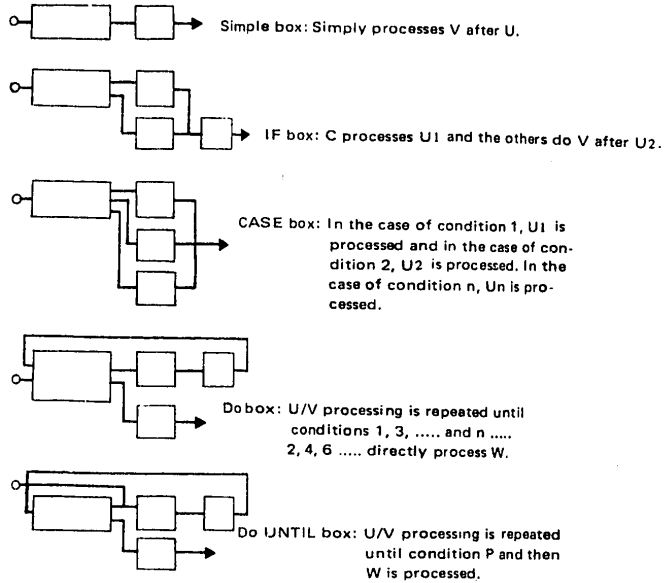


Fig. 1. Basic Patterns of Graphic Program Display

COPYRIGHT: 1981 Fuji Marketing Research Co., Ltd.

CSO: 4120

FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

AN INTERFEROMETRIC SUPERSONIC MICROSCOPE

Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 77

[Text]

*Hitachi has developed a new type of interferometric supersonic microscope that operates at 1GHz. This interferometric microscope has a resolution of less than 0.3 microns in depth, which enables detection of minor changes in the internal structure of semiconductor devices, living organisms, and metals. Commercial production of the microscope is expected soon.*

*The supersonic microscope uses supersonic waves that can propagate into optically opaque substances. A supersonic wave is generated by vibrating a piezo-electric thin film excited by high frequency pulses. The wave is converged through an acoustic lens having a spherical surface, is irradiated onto the sample, and then the reflected waves from the sample are again focused by the spherical lens and converted into electrical signals.*

*Supersonic microscopes presently available have frequencies limited to 200MHz due to the difficulty of manufacturing the acoustic lens, and have a resolution of 5 microns azimuthally and 10 microns in depth. The new product, however, has a resolution of 1 micron azimuthally and 0.3 microns in depth.*

COPYRIGHT: 1981 Fuji Marketing Research Co., Ltd.

CSO: 4120

FOR OFFICIAL USE ONLY



FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

JOINT RESEARCH PROJECT ON HIGH-MOLECULAR MATERIALS

Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 80

[Text]

Five major synthetic-fiber and chemical makers, including Toray Industries Inc. and Mitsubishi Chemical Industries Ltd. have started a "council for high-functionality high-molecular materials" in order to promote joint research and development of high-molecular materials producing functionality films (such as inverse osmosis membranes) and new engineering plastics (high-functional resin).

The council is intended to be an organ for carrying out the "next-generation industry basis technology research and development scheme" which the Ministry of International Trade Industry intends to start next fiscal year. It is a successor to the "Biotechnology Council" organized by Mitsubishi Chemical Industries and Asahi Chemical Industry Co. The five companies which have joined the council are making plans to promote for the time being 5 lines of research on high-molecular materials in the pioneer fields which are in research and development phases, such as "reactive high-molecular materials". The five

study themes include the following: 1) "high-efficiency separation film materials" to be used for functional films; 2) "high-molecular conductive materials" to be used for electronic parts; 3) super-hard plastics and "high-crystal high-molecular materials" with high heat resistance; 4) "reactive high-molecular materials" intended to cause reaction with the aid of catalysts.

COPYRIGHT: 1981 Fuji Marketing Research Co., Ltd.

CSO: 4120

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

HEAT DISSIPATING SILICON RUBBER

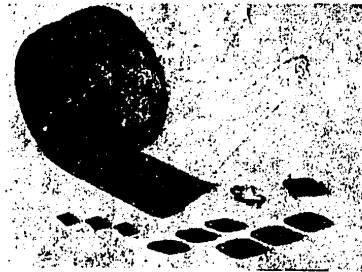
Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 81

[Text]

*The Shinetsu Chemical Industry Co. has recently developed 3 types of heat dissipating silicon rubber with thermal conductivity and thermal resistance increased and has started marketing them as materials for heat dissipating insulation to makers of electronic equipment and parts. In heat dissipating insulation material industries, Fujikura Kasei and Fuji High Polymer have already marketed similar types. So, it seems that the companies concerned will compete vehemently on pricing.*

*The new silicon rubber has the following features: 1) It has high thermal conductivity and is able to convey 5-9 times more heat than ordinary rubber and plastics. Thus, it is able to protect transistors from thermal destruction. 2) It has sufficient rubber resiliency not to damage parts of heated equipment and flanges and elements of equipment.*

*Its applications are as insulating and heat dissipating material for semiconductor elements in particular, power transistors for television sets, stereo sets transceivers and computers and heat dissipating materials and vibration damping materials for heated electrons and electric parts for electronic jars and panel heaters.*



Heat Dissipating Silicon Rubber (TD  
(TC-New Series)

COPYRIGHT: 1981 Fuji Marketing Research Co., Ltd.

CSO: 4120

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

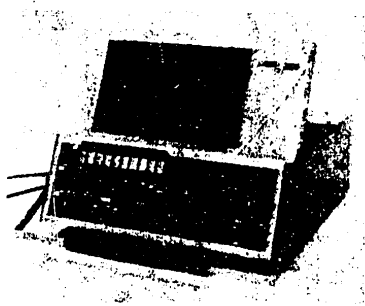
SCIENCE AND TECHNOLOGY

INJECTION MOLDING MEASUREMENT MONITOR

Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 81

[Text]

*Nippon Regulator Co. has recently developed an injection molding measurement monitor which acquires correct data on the molding conditions of injection molding machines and conditions of resin in molds and has exhibited it at Japan Plas '80 recently held in Osaka. The system is equipped with a microprocessor and is able to analog display variations in measurements by using 10 bar graphs, design easy-to read values by using a digital display and print out the data by using a printer. It is attracting attention as an instrument which enables injection molding products to be produced efficiently under optimal conditions.*



Injection Molding Measurement  
Monitor

COPYRIGHT: 1981 Fuji Marketing Research Co., Ltd.

CSO: 4120

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

ENERGY SAVING INJECTION MOLDING MACHINE

Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 81

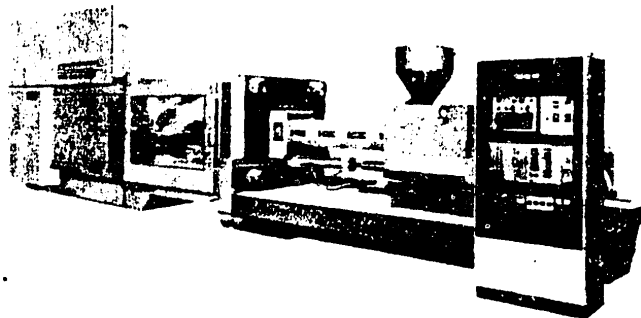
[Text]

*Mitsubishi Heavy Industries has lately announced that it has developed a high-performance injection molding machine which is able to save energy by more than 30%. The new molding machine attracted attention when it was exhibited at Japan Plas '80 which was held in Osaka in November.*

*After the cost of electric power was raised overall, the molding machine industry turned to developing energy saving molding machines. Consequently, a number of medium-sized makers have lately disclosed new energy saving types, and the developments of these companies are attracting attention.*

*In light of this, the new energy saving molding machine lately developed by Mitsubishi Heavy Industries is significant and is being much talked about.*

*The company explains that it aimed at improvements laying emphasis on three points: energy saving, high operativity and ease of operation. In respect to energy saving, an effective linkage system for pump motors has been incorporated, heater capacity has been reduced by 30% and a multi-step discharge shifter has been adopted.*



Injection Molding Machine "650 MF-110"

COPYRIGHT: 1981 Fuji Marketing Research Co., Ltd.

CSO: 4120

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

MICROCOMPUTER CONTROLLED INJECTION MOLDING MACHINE

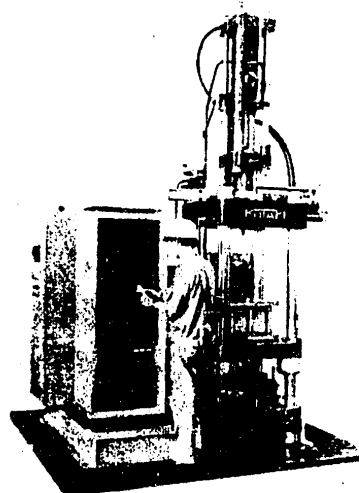
Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 81

[Text]

*Jointly with Kotaki, Iwatani Sangyo Co. has recently developed an upright rubber injection molding machine equipped with a micro-computer and has exhibited it at Japan Plas '80.*

*There is growing demand for rubber injection molding machines primarily in the automobile industry. The microcomputer-equipped injection machine is intended to meet this demand and increase sales while augmenting the exploitation of new markets.*

*The molding machine has the following features. It has few parts which depend on molds and materials, requires no special skill to operate and enables the user to achieve stable quality and higher accuracy because conditions for molding can be set and controlled easily. It involves low material losses, saves resources and energy, provides high cost-performance ratio and increases productivity.*



Microcomputer Controlled Injection Molding Machine

COPYRIGHT: 1981 Fuji Marketing Research Co., Ltd.

CSO: 4120

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

MEASUREMENT OF STRATOSPHERIC MATERIALS

Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 86

[Text]

The Meteorological Laboratory is conducting a test for measuring the amount of micro-ingredients which are estimated as accountable materials for destroying ozone, such as Freon gas, by flying in the stratosphere, on an airplane with measuring instruments aboard. As compared with the conventional method, by which the upper atmosphere is collected by airplanes or balloons and is analyzed on the ground, it has an advantage that precise measurement can be made in a short time. It has been confirmed that the first observation test conducted last winter presented practically almost no problems. A full-scale observation has been made since last October, and this method is scheduled to be used in international cooperative observations of the stratospheric atmosphere, which will start in 1982.

The measuring instrument to be used is called an infrared interference spectroscope. Infrared rays in sunlight falling on the measuring instrument are divided in two directions crossing at right angles by a beam splitter and are reflected by mirrors respectively. The two reflected rays are introduced into a detector at the same time. In this instance, the movement of one mirror at a constant speed puts the two reflected rays introduced into the detector out of phase. An interference fringe resulting there is detected. Infrared absorption system is calculated from the interference fringe to examine what kinds of substances exist in the air.

COPYRIGHT: 1981 Fuji Marketing Research Co., Ltd.

CSO: 4120

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

SOLAR SEAWATER DESALINATION PLANT

Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 88

[Text]

The Agency of Industrial Science and Technology of MITI has decided to develop and make practical an electrical dialysis seawater desalination test plant using solar cells, as part of its Sunshine Project.

Techniques available for the desalination of seawater include the multistep flash system, which separates water by boiling and evaporation, and the inverse osmosis system which separates water by using inverse osmosis membranes. These systems, however, have the drawback of high energy costs, such as for oil and electric power. The technique developed by the Institute is known as the electrical dialysis system, which makes use of solar energy only.

This electrical dialysis utilizes electrophoresis. The mechanical system involved consists of anion exchange membranes which pass anions only, and cation exchange membranes which pass cations only, both alternately arranged, with a pair of electrodes provided on both sides of the membranes. Applying a

voltage between the electrodes causes anions and cations to be drawn to the cathodes and anodes respectively, resulting in the production of nonchlorine compartments and condensed-chlorine compartments in an alternate pattern. The liquid in the nonchlorine compartments is fresh water.

The electric dialysis system requires the temperature of the liquid to be raised to 70-80°C, to increase the utilization efficiency of the current. The energy required for this can be covered by making use of solar cells and solar collector panels.

The key point in the development of a seawater desalination plant using the above technology, is the development of weather-proof solar cell panels, high-responsivity batteries and inexpensive high-performance ion exchange membranes. In 1982 the Agency intends to start the construction of a model plant, with a desalination capacity of 25t per day, by making full use of the technology developed under the Sunshine Project.

COPYRIGHT: 1981 Fuji Marketing Research Co., Ltd.

CSO: 4120

FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

COMPANIES TO COMPETE FOR BIDS IN CONSTRUCTING OIL, GAS PRODUCTION FACILITIES

Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 88

[Text]

In the manufacture and installation of large underwater structures such as platforms used to produce oil and natural gas from undersea oil fields, European and American companies such as McDermot (U.S.), Brown & Roots (U.S.), ETPM (France) and Saipen (Spain) are far in the lead. Japanese companies are still behind the European and American companies, competitively, although shipbuilding companies and steelmakers such as Nippon Steel Corporation and Nippon Steel Corporation and Nippon Kokan have received orders for platforms.

Under these circumstances, Nippon Kokan and Nippon Steel Corporation have decided to enter into direct competition with the European and American companies by forming an alliance to jointly acquire orders for the manufacture and construction of production facilities for undersea oil and natural gas exploration and development in areas surrounding the Japan islands. This alliance will be advantageous to them both, in that work shops and assembly yards can be jointly used in the effort to win international tenders.

For the time being both companies will jointly apply for international tenders for production facilities in gas fields off Tokiwa in Fukushima Prefecture. They also intend to work together when necessary in the future, for tenders concerning sites off Sakhalin, the Japan-Korea continental shelves and Pohai Bay.

COPYRIGHT: 1981 Fuji Marketing Research Co., Ltd.

CSO: 4120

FOR OFFICIAL USE ONLY



FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

DEVELOPMENT OF TECHNOLOGY FOR SYNTHESIS OF SILICON SEMICONDUCTOR MEMBRANE

Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 76

[Text]

Professor Keitarou Yoshihara of the Molecule Science Research Institute of the Ministry of Education, Prof. Mitsugu Hanabusa of Toyohashi Technology Science College, and Lecturer, Akira Namiki have together developed a new manufacturing technology for a silicon semiconductor membran employing a chemical reaction using a laser beam. By this new manufacturing technology, infrared rays with  $16\mu$  wave length of a laser beam are momentarily exposed to the silicon (the material of semiconductor) and Silangas (which is hydrogen compound) like a strobe flash, to activate them for a chemical reaction. In the above way, the silicon membran is manufactured onto a base of glass or similar material without heating.

The silicon membran which has a wide application area including for Amorfis solar batteries has been so far manufactured by a chemical reaction through ionization of a gas material. However, in the case of employing the ionization method, it is difficult to control impurities and to maintain the thinness of the membran. Therefore, when manufacturing membran transistor for digital plane T.V., it is possible to manufacture such only under conditions of an ultra high vacuum of  $10^{-12}$  HG. On the contrary, this manufacturing technology

employing a chemical reaction using a laser beam has good points as mentioned below:

- (1) Manufacturing process is simple.
- (2) It is quite easy to control impurities because only a material gas actuates the  $\text{CO}_2$  gas laser.
- (3) It is easy to accurately maintain thinness of the membran under non vacuum conditions by adjusting the gas pressure, intensity of the laser beam and the number of the beam's pulses.
- (4) The laser beam is more efficient because  $\text{CO}_2$  gas absorbes more than 90 percent of the beam.

In the experiment, Prof. Yoshihara employed a  $\text{CO}_2$  gas laser (light source with 100kW power as peak, a time scan of 0.2 micro second and an average power of 0.2W) so that he could manufacture the membran of 0.6 micro in thickness by using a laser beam under the condition of 1/8HG gas a hundred times and 1.4 micro under 1/4HG gas.

We have little experience of employing laser beams in the area of forming chemical compounds. However, this application will extend possibilities for the other chemical compounds and seems to come to the fore as a new method for forming chemical compounds.

COPYRIGHT: 1981 Fuji Marketing Research Co., Ltd.

CSO: 4120

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

## NEW DRY-ETCHING METHOD NARROWS LSI LINE WIDTH TO 0.5 MICRONS

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19, No 946, 17 Mar 81 p 13

[Text]

A Japanese company has developed a dry-etching method of mass-producing large-scale integrated (LSI) electronic circuits in sub-micron line width down to 0.5 microns.

The production yield is almost always 100 per cent, the developer said. The Kawasaki company believes its process to be the world's first that is practical.

According to Tokyo Ohka Kogyo Co., the 0.5-micron line width attained by its new process is one-third as small as the 1.5 microns which conventional Japanese commercial methods produce. The company's achievement was aided by the Faculty of Pharmacy of Chiba University, a national school in Chiba, near Tokyo as well as by various semiconductor makers in the Kawasaki area. The laboratory and the university faculty have experimentally attained 0.25 microns in line width by the new method.

The company's new method, essentially identified as a "plasma etching" process, had been originally developed for electronic data processing jobs in 1973 with the cooperation of the same university faculty. The company has sought about 20 "design" patents in Japan and key Western countries on

that original process. ("Plasma", in this case, represents very hot, electrically-charged atomic separation of oxygen. "Etching" is transposing the electronic circuit pattern on little silicon chips by photography. The finer the circuit lines in width, the larger the volume of information that can be packed into each chip circuitry as a basic computer element.)

As the company explained its "Submicron Plasma Dry Etching Process," a silicon wafer is coated with an oxidizing chemical film. The wafer is further coated with some photosensitive artificial resin — a photoresist. These treatments may be the same as the conventional methods, but the resin used in the new process loses its photosensitivity when heated.

After the original circuit pattern is photographically transposed on the wafer surface through light exposure, the wafer is heated and hardened by a hot-air dryer. Then, the printed circuitry is photographically developed inside an oxygen plasma-filled chamber.

The completely dry process comes in sharp contrast to the conventional, wet methods, which required dissolving in a strongly acid solution all intervals between each two lines.

That developing treatment temporarily causes the printed lines to swell to double the original size, though they shrink back to the original size later. But the swelling limited commercial production of line width to around 1.5 microns. Besides, all bends of the lines tended to curve and lose that much precision. Production yield dipped considerably below 100 per cent.

The new method is free from all such troubles. On top of that, it is highly automated. Average production time is about the same as for the best conventional process — one wafer per one or two minutes compared with the conventional method's 10 wafers at a time in 30 minutes. The new method is much less costly because it needs no developing and assisting chemicals.

COPYRIGHT: 1981, the Nihon Keizai Shimbun, Inc.

CSO: 4120

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

GREEN CROSS IS READY FOR THREE TYPES OF INTERFERON

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19, No 946, 17 Mar 81 p 9

[Text]

Starting April, The Green Cross Corp. will be capable of supplying all three types of interferon (alpha, beta and gamma) for clinical trials coordinated by the Ministry of Health & Welfare. The last two types will be imported by the Osaka firm from the U.S., including Collaborative Research Inc. of Waltham, Massachusetts.

In all, Green Cross will supply 6.5 billion units a month, including the 4.5 billion units of the alpha type the company will produce by extraction from white cells of human blood (2.0 billion units) and lymphoblast

culture (2.5 billion).

The company will become the first Japanese source of all the three types of interferon, a protein believed to effectively block multiplication of viruses. The potential wonder drug, estimated to be effective against viral diseases, is classified into three types under an international agreement made a year ago.

The imports are intended to fill Green Cross's short-term need. The Massachusetts company signed a pact, under which it will provide Green Cross with production know-

how for production of the gamma type as early as May. Specifically, CRI is scheduled to supply mutated strains of yeast, developed by genetic engineering.

The Japanese firm will try to commercialize the CRI know-how four or five years from now.

Toray Industries, Inc. and Mochida Pharmaceutical Co. are trying to develop fibroblast technique. Sumitomo Chemical Co. is pursuing the lymphoblast technique, while Takeda Chemical Industries, Ltd. is working on leukocyte know-how.

COPYRIGHT: 1981, the Nihon Keizai Shimbun, Inc.

CSO: 4120

FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

AUTOMATIC RETICLE MASK DEFECT INSPECTION SYSTEM

Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 70

[Text]

Nippon Kogaku Kogyo Co. has experimentally made an "automatic reticle mask defect inspection system" that inspects at high resolution for microscopic defects in patterns on reticle masks that are used in manufacturing semiconductor ICs. Techniques developed by the Musashino Electro-Communications Laboratory of the Nippon Telegraph and Telephone Corporation were used in developing the system.

In the system, a picture of a circuit board is converted into electric signals and compared against the original drawing of the board that has been recorded on magnetic tape. Any defects are detected automatically.

The system has the following features:

- 1) It compares the pattern on the reticle or the mask against the design data. This permits detection of defects caused by erroneous operation of the drafting machine.
- 2) It can also detect defects on a master mask that has been directly drawn by an electron beam exposure system.

The minimum defect size detectable is  $2\mu\text{m}$  for reticles and  $1\mu\text{m}$  for masks. Inspection time is 15 minutes for a  $100\text{mm}\times 100\text{mm}$  reticle area and 15 minutes for a  $10\text{mm}\times 10\text{mm}$  mask area. The maximum size of samples for inspection is 6 inches for both reticles and masks.

The system is priced at less than ¥100 million.

COPYRIGHT: 1981 Fuji Marketing Research Co., Ltd.

CSO: 4120

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

METHOD DEVELOPED FOR MANUFACTURING POWDERED AMORPHOUS SILICON

Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 70

[Text]

Fuji Photo Film Co. has developed a method for manufacturing powdered amorphous silicon that has high photo-electric performance, and at the same time found that high-performance, photosensitive systems can be produced for electronic copying machines and optical sensors.

Amorphous-silicon powder is made by the conventional method of dissolving gaseous silane in a glow discharge. Variations in manufacturing conditions, such as pressure, flow rate, and temperature of the gas and the power of the high-frequency current applied enables hydrogen-doped powder with a particle diameter of about  $0.1\mu\text{m}$  (that can be increased up to  $10\text{--}20\mu\text{m}$  by coagulation) to be obtained for a specific resistance between  $10^4\text{--}10^{14}\Omega\text{cm}$ . By mixing this powder with high-molecular organic materials, large-area flexible photoreceptors can be manufactured.

One possible application is as a photosensitive plate for electronic copying machines. The new photoreceptor can reproduce half tones that are not available with selenium photosensitive plates. By combining a suitable toner, reproduction similar to photography is possible.

The powdered amorphous silicon has a spectral sensitivity near that of the human eye. Therefore, it could be used as an optical sensor in place of the human eye and thus, is expected to find several application in reception elements, illumination photometers, and light meters for cameras.

COPYRIGHT: 1981 Fuji Marketing Research Co., Ltd.

CSO: 4120

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

DIGITAL DEW-POINT METER DEVELOPED

Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 76

[Text]

Yokogawa Electric Works, Ltd. has developed a digital dew-point meter which uses a quartz oscillator as the detection element and provides the high accuracy of  $\pm 0.3^{\circ}\text{C}$  and high resolving power of  $0.1^{\circ}\text{C}$ .

The meter is designed to allow a gas under measurement to come in contact with a quartz oscillator, cools it with an incorporated electronic cooler and measures the temperature of the gas or the dew point at the time when the surfaces of the quartz oscillator has condensation. This is effected by using a high-accuracy platinum temperature measuring resistor.

While it has a maximum temperature measurement range of  $-50^{\circ}\text{C}$  to  $+40^{\circ}\text{C}$ , the dew-point meter has the following features: 1) Because of being a cooled type, it does not require any reference gas to calibration. 2) While indicating the correct dew-point when condensation eases off into equilibrium, it automatically detects and displays this equilibrium. 3) Dew-points and frost-points are automatically discriminated and frost-points are converted into dew-points for display, and 4) as a standard system, it is equipped with an analog output unit to permit long-period continuous recording in operation in combination with a recorder. The meter is priced at ¥1.3 million.

COPYRIGHT: 1981 Fuji Marketing Research Co., Ltd.

CSO: 4120

FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

LITHIUM CELL TOTALLY SOLIDIFIED

Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 71

[Text]

*Hitachi Ltd. and Hitachi Maxel have succeeded in synthesizing a high-lithium ion conductive solid electrolyte for totally solid cells. This permits manufacture of ultra-thin (less than 0.1mm) high-performance cells that have high energy density and long shelf life without any electrolyte leakage.*

*The solid electrolyte is a compound of a lithium, nitride-lithium, iodide-lithium, hydroxide system ( $Li_3N-LiI-LiOH$ ). The current output characteristics of the totally solid cell exceed those of solid electrolytes made of a lithium iodide-alumina system ( $Li_3I-Al_2O_3$ ) by a factor of 100.*

*To prove the feasibility of a totally solid, ultra-thin cell using the new material, the Hitachi Central Laboratory and Hitachi Maxel manufactured a prototype using a thin lithium nitride-lithium iodide-lithium hydroxide film encased in an ultra-thin cell 0.7mm thick and 20mm in diameter. The cell output a maximum current of 5mA and exhibited performance characteristics 100 times higher than conventional solid lithium cells. When the cell is used with a constant current of 2 $\mu$ A, which can drive a liquid-crystal display type watch, the cell will output a stable voltage for more than 1,000 hours.*

*Characteristics of the New Electrolyte*

- 1) Crystal Structure: simple cubic lattice similar to  $\alpha$ -AgI*
- 2) Ion Conductivity:  $1.1 \times 10^{-1}$  S(Siemens)/cm =  $1.1 \times 10^{-3} \Omega^{-1}$ (mho)cm [at 25°C]*
- 3) Dissolution Voltage: approx. 2V*
- 4) Electronic Transference Number: below  $10^{-5}$*

COPYRIGHT: 1981 Fuji Marketing Research Co., Ltd.

CSO: 4120

FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

MAGNETIC-FIELD MICROWAVE PLASMA ETCHING SYSTEM

Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 71

[Text]

The Central Laboratory of Hitachi Ltd. has developed a magnetic-field microwave plasma etching system for ultra-LSI production. The system uses a magnetic-field microwave plasma generator that not only enables high-accuracy microscopic (0.5 $\mu$ m) processing but also enables resist for electron beams vulnerable to heat to be used because of the lower amount of heat generated during the process.

The newly developed system makes atoms ionize quicker by applying a resonance from a microwave electrical field caused by a magnetron and circular movement of electrons caused by a magnet to plasma generation. This permits stable generation of ions of the required density under a gas pressure 100-1000 times less than that of conventional etching systems. Thus, the new system achieves high-accuracy processing by reducing neutral and highly reactive atoms and molecule radicals that adversely affect etching.

The system etches lines 0.5 $\mu$ m wide (min. 0.2 $\mu$ m) and has a processing time of 30 minutes for 9-sheet batch processing (in multicrystal silicon processing with 3-4 in wafers) with a tolerance of  $\pm$ 5%. The system can etch a variety of materials by varying the level of vacuum and the intensity of the magnetic field. It also has an etching and monitor that announces the end of etching.

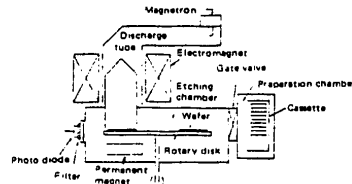


Fig. 1. Micro-Plasma Etching System

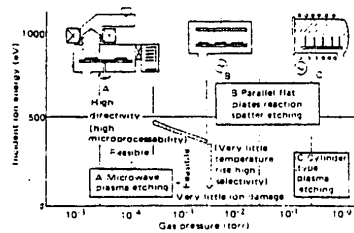


Fig. 2. Dry Etching Systems Compared

COPYRIGHT: 1981 Fuji Marketing Research Co., Ltd.

CSO: 4120

FOR OFFICIAL USE ONLY



FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

NEW FILTER TECHNOLOGY FOR REMOVAL OF SUPER-FINE DUST

Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 71

[Text]

*Japan Air-Tec Co. has developed new filter technology for removing super-fine dust floating in the air with a particle diameter of 0.1 $\mu$ m. This development adopts static filter principles. Only a single cycle of processing in the atmosphere is able to remove super-fine dust by more than 99.97%.*

*The technology newly developed can be characterized by the use of an HEPA filter which has high-performance filter functions made by folding a paper-like glass fiber filter as an induction filter in an accordion fashion. Its principles, though not yet fully explained, may be this. The use of the HEPA filter, consisting of a wide-area inductive material folded in an accordion manner increases the possibility of dust coming into contact with the inductive material, causing dust, though consisting of very fine particles and having small charge, to be readily drawn-in electrically.*

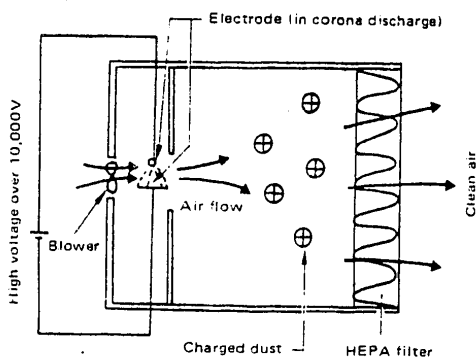


Fig. 1. Super-Fine Dust Removal

COPYRIGHT: 1981 Fuji Marketing Research Co., Ltd.

CSO: 4120

FOR OFFICIAL USE ONLY

## FOR OFFICIAL USE ONLY

## SCIENCE AND TECHNOLOGY

## VLSI'S HEADING FOR MASS PRODUCTION

Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 pp 44-45

[Text]

Large scale production of 64k RAM's, called the VLSI element of the first generation, is being eagerly promoted in Japan. A 64kRAM has 4 times higher integration than conventional 16kRAM's and consequently requires greatly different manufacturing processes than previously, and in turn, putting conventional manufacturing systems out of use. It is recognized that it takes an investment of around ¥10 billion to construct a single production line and thus, at present, the semiconductor industry is becoming completely an equipment industry. Under these circumstances, 6 Japanese makers and 3 foreign-financed makers are competing in constructing plants for production.

Table 1. 64kRAM Production Plants in Japan

Company	Development plant	Mass production plant
Nippon Electric Co.	Sagamihara establishment (Sagamihara, Kanagawa pref.)	Nippon Electric, Kyushu (Kumamoto, Kumamoto pref.)
Hitachi Ltd.		Musashi plant (Kodaira, Tokyo)
Fujitsu Ltd.	Kawasaki plant (Kawasaki, Kanagawa pref.)	Aizu plant (Aizuwakamatsu, Fukushima pref.)
Toshiba Corp.	Transistor plant (Kawasaki, Kanagawa pref.)	Oita plant (Oita, Oita pref.)
Mitsubishi Electric	Nita-Itami works (Itami, Hyogo pref.)	Kumamoto plant No.2 (Nishigoshi, Kumamoto pref.)
Oki Electric	Hachioji plant (Hachioji, Tokyo)	Oki Electric, (Kiyotake, Miyazaki pref.)
Japan Texas Instruments	Hatogaya plant (Hatogaya, Saitama pref.)	Miura plant (Miura, Ibaragi pref.)
Japan IBM		Yasu plant (Yasu, Shiga pref.)
Motorola Semi-conductors Japan		Aizu Toko (Shiokawa, Fukushima pref.)

FOR OFFICIAL USE ONLY

## FOR OFFICIAL USE ONLY

Starting ahead of others for 64kRAM production, Fujitsu is investing totally ¥27 billion in equipment for semiconductor production by adding ¥5 billion in the latter half of 1980. This increment is a first step to build up its Iwate Plant (Kanagasaki, Iwate Pref.) for large scale production of VLSI elements, such as 64k RAM's, following similar efforts at its Aizu Plant.

NEC is aiming at mass production of 64kRAM's at a rate of 100,000 units per month from next spring. The building of the diffusion line No.6 of its Kyushu Plant, in which the company has invested totally ¥10 billion in 1979 and 1980, has recently been completed and at present equipment is being brought in. A test run is scheduled at the end of 1980.

Technically confident for some time of 64k RAM's, Hitachi transferred the bipolar IC production line of its Musashi Plant to its Takasaki Plant in the summer of 1980 and then equipped the Musashi Plant with a 64kRAM mass production line consisting of the latest systems.

Toshiba has recently started construction of Clean Room No.4 at its Oita Plant. The company has decided to make an additional investment of about ¥2 billion in this plant in 1980, and a further large investment in 1981. Clean Room No.4 is scheduled to start operation in the latter half of 1981 for pretreatment processes for 64kRAM's.

Aiming to join the top group for 64kRAM production, Mitsubishi Electric Co. is at present starting production of 64kRAM's at a rate of 30,000 units per month at its Kitami Works. The company intends to complete a 100,000 unit per month production system by putting Ward C of its Kumamoto Plant No.2 into operation in the spring of 1981. It also intends to invest ¥5 billion in the Kumamoto Plant No.2 in 1980.

Oki Electric Industry Co. is making a total commitment to ultra-LSI production and is building a new plant in its 13,000m<sup>2</sup> premises in Kiyotake, Miyazaki Pref. The company intends to complete the building in January 1981 and start operation in the summer of 1981. It will invest totally ¥3 billion in this plant in 1980 and in 1981.

Not only Japanese makers but also foreign-financed makers are disclosing their plans for constructing 64kRAM mass production plants. Texas Instruments, the world's largest semiconductor maker, is constructing a plant in Miura, Ibaragi Pref., intending to complete it this December. The plant is scheduled to start 64kRAM production in the first quarter of 1981.

Japan IBM has already announced its 3-year plan for LSI production at its Yasu Plant in Shiga Pref. and is starting to bring equipment in Motorola, the second largest semiconductor maker, who have acquired 50% of Aizu-Toko stocks, it seems, will start 64kRAM mass production at Aizu-Toko in two years time.

A 64kRAM has a minimum circuit line width of 3 $\mu$  and thus requires more difficult techniques for microscopic

FOR OFFICIAL USE ONLY

processing than LSI with a line width of  $5\mu$ . This necessitates expensive equipment in all processes, including drafting systems using electron beams instead of light in mask production, exposure systems of projection or reduction scale projection types instead of contact types in circuit transcription, dry photography etching systems using gases instead of liquid chemicals and ion injection systems instead of diffusion furnaces, each unit of such equipment costing several hundred million yen.

Despite this, domestic and foreign makers are competing in investing in equipment for 64kRAM. This is just because 64k RAM is expected to create such huge markets, amounting to \$1.8 billion (or ¥360 billion) world-wide in 5 years to come.

Another important point is that a line width of  $3\mu$  to be made available for LSI's instead of the present  $5\mu$  will possibly enable LSI production to be doubled by using the same materials and processes as used at present.

A simple calculation shows that more than 300 5mm square LSI elements can be made on a 4-in (or 10.16cm) diameter silicon wafer. This number of 300 can be increased to nearly 900 if the LSI element is 3mm square instead of 5mm square. By completely mastering technology for 64kRAM mass production, a company has the possibility of monopolizing the market by reducing the prices of all LSI products to a third, ahead of other companies. It is here that the secret of companies being so devoted to 64kRAM mass production lies.

COPYRIGHT: 1981 Fuji Marketing Research Co., Ltd.

CSO: 4120

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

VAD OPTICAL FIBER MANUFACTURING TECHNIQUE

Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 pp 50-52

[Text]

In the near future it is planned to adopt the use of optical fiber communications, by which communications are made by passing optical signals through hair-like fine glass filaments. The system is to be applied to public telecommunications in Japan, and NTT (Nippon Telephone and Telegraph) has announced that it has developed optical fibers of a super-high-purity quartz.

Manufacture of optical fibers begins with making round glass bars as basic stock. This basic stock has a cross section similar to that of optical fibers and which consists of a clad in the periphery and a core in the center, which has a slightly higher refractive index than the clad. Drawing out a filament from the basic stock which is heated over 2000°C produces an optical fiber about 125 $\mu$ m in outer diameter (core: 50 $\mu$ m). In the world, a number of methods for manufacturing basic stock have been invented or proposed. Among them, VAD (vapor-phase axial deposition) is a unique method developed by NTT.

The VAD method uses liquid silicon tetrachloride as the principal raw material. Germanium tetrachloride is added to this in small quantities to provide the refractive index to the core about 1% higher than the clad. The liquid raw material is evaporated and delivered into an oxygen-hydrogen burner. This causes the raw material to be synthesized in the flame into fine glass grains (0.05--0.1 $\mu$ m in diameter). These grains are blown onto the tip of a mother quartz bar where they deposit and grow to be a bar about 5-7cm in diameter, of porous basic stock looking like "chalk".

The porous base stock is heated, while growing, to a high temperature by an electric furnace placed about it to form a transparent round bar, the base stock for drawing optical fibers. From a bar of the base stock manufactured by this method, an optical fiber as long as 10-50km can be drawn.

As described above, the VAD method is a mass-production method for manufacturing optical fibers. In the beginning of its development, it was doubted if this method would be

FOR OFFICIAL USE ONLY

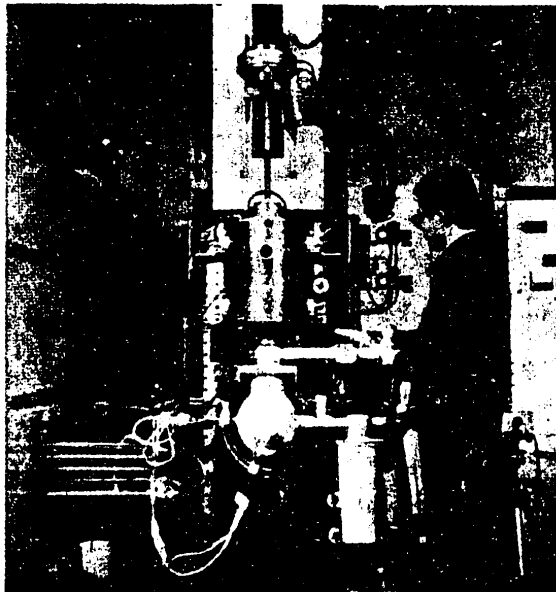


Photo 1. Test Manufacturing of Base Stock for Optical Fibers by VAD Method

Porous base stock which is allowed to grow in the flask-like white container seen in the center is gradually drawn up. Then, it is heated in the cylindrical electric furnace located above the first container to make the transparent glass bar base stock, which is continuously drawn out from the top of the electric furnace.

effective for producing low-loss optical fibers. As the VAD method synthesizes glass in an oxygen-hydrogen burner flame, this inevitably causes water to remain in the base stock in the form of hydroxyl ions.

If OH ions are contained in optical fibers, they cause strong optical absorption at the following wavelengths: 0.95, 1.24, 1.39 and 2.7 $\mu$ m. At the wavelength of 1.39 $\mu$ m in particular, a content of OH ions of only 0.3ppm will allow light to pass by only 1% per km, causing large attenuation (a loss of 20dB/km) by absorbing the remaining 99%.

After a series of tests, NTT has developed a technique of almost completely removing the OH ions from base stock. It consists of blowing a small quantity of a vaporized de-hydroxyl agent into the electric furnace during the process when making the transparent glass stock from the white porous base stock. Recently, this method has enabled the OH ions content to be reduced considerably. Conventionally, a process using no de-hydroxyl agent allowed about 30ppm of OH ions to remain. At

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

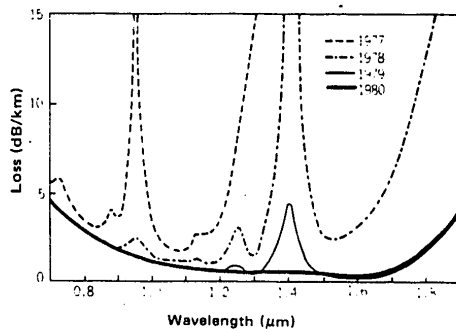


Fig. 1. Yearly Improvements in Low-Loss Characteristics of VAD Optical Fibers

A few years ago, very large attenuations due to OH ions were found at 0.95μm and 1.39μm. At present, good low-loss characteristics are found in a wide wavelength range.

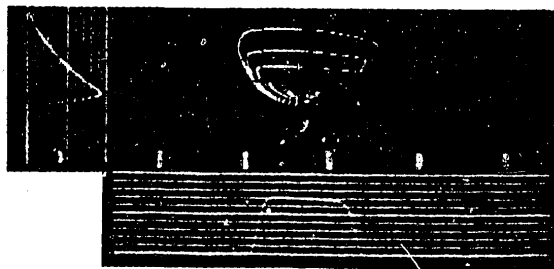


Photo 2. Temperature of Surfaces of Growing Porous Base Stock

Temperature of surfaces of the base stock tip are represented by isothermal lines (the center portion is hottest).

Curves seen on the left and at the bottom indicate the temperature of base stock surfaces in axial and radial directions respectively.

present, this level can be easily reduced to 1/1000. NTT has attained still lower levels below 1ppb (1/billion).

In the beginning, it was believed that optical fibers manufactured by the VAD method would not be applicable in wavelengths over 1.2μm. After it was made possible to remove OH ions, impurity-free quartz-glass optical fibers which showed characteristics close to ideal loss curves were obtained.

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

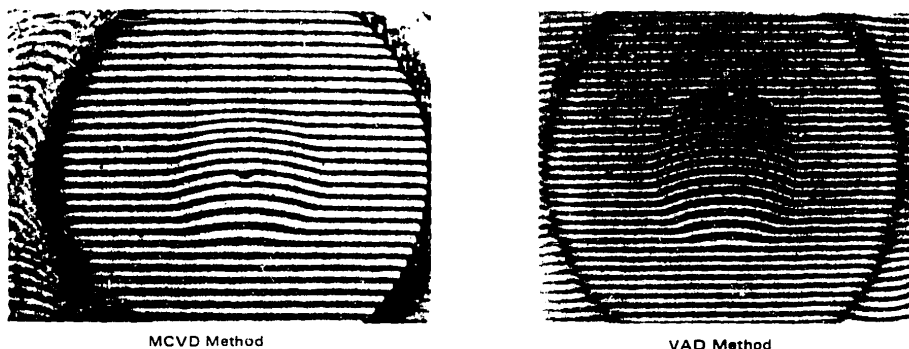


Photo 3. Microscopic Interference Photographs of Cross Sections of Optical Fibers

Interference fringes are curved in the portions which correspond to center cores. This is because of the difference in refractive factor between the core and the clad sections. For the MCVD method, a small dip of the refractive factor is seen in the center.

As OH ions were reduced, low-loss ranges were widened and at present, super-low-loss (below 1dB/km) ranges have been widened to 1.1-1.7 $\mu$ m.

The fact that low-loss ranges which are highly permeable to light were thus widened indicates good prospects for future multiple optical wavelength transmission which performs telecommunications by simultaneously transmitting light of different wavelengths through a single optical fiber.

In order to use optical fibers as a large-capacity transmission medium, it is important that not only light loss characteristics are improved but also the transmission bands. Losses are an index as to how far the brightness of light can be transmitted, while transmission bands are an index to how much information can be transmitted in a unit of time. Transmission bands are usually represented by frequency, and a higher frequency here indicates the possibility of larger-capacity transmission.

For large-capacity transmission through usual transmission lines, lines of a coaxial structure or a waveguide structure are used. For optical fibers, the pattern of distribution of refractive factors for the core section is an important factor of transmission band characteristics. In other words, the core section should be so designed that its center has a refractive factor about 1% higher than that of the clad section and that it has different refractive factors which are found increasingly smaller towards its periphery. Here, it is known that if gradual decreases in refractive factor in radial directions form a curve of the second order, the best transmission characteristics can be attained.

In the VAD method, the distribution of refractive factors for the core section is formed when porous base stock is synthesized. Refractive factors depend on the content of germanium oxide which is synthesized in a burner's flame. So, it will be a solution to contain the germanium in such a manner that its

FOR OFFICIAL USE ONLY



FOR OFFICIAL USE ONLY

concentration forms a curve of the second order in radial directions. But this is hard to realize. Thus, a number of tests were carried out to prove that the temperature of base stock surfaces during the synthesis of porous base stock has a great effect on the quantity of germanium contained in the base stock.

On the basis of these findings, conditions for synthesis were adjusted appropriately while monitoring the temperature of the surfaces of the porous base stock by using a 2-dimensional thermometer, which made use of infrared rays. A distribution of refractive factors in the desired form was thus obtained and with high accuracy.

Recent optical fibers made by the VAD method show 500–1500MHz·km<sup>0.9</sup> (max. 7000MHz·km<sup>0.9</sup>) in the 6dB band width.

COPYRIGHT: 1981 Fuji Marketing Research Co., Ltd.

CSO: 4120

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

RESEARCH ACCELERATED ON OPTICAL MEASUREMENT CONTROL SYSTEM

Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 pp 52-53

[Text]

The Agency of Industrial Science and Technology of the Ministry of International Trade and Industry has decided to establish next year, a research association of 10 or more makers, for the purpose of accelerating research and development on "optical measurement control systems", which the Agency has been pursuing as a major project since 1979.

In the belief that optical technology will trigger extensive technological innovations in some industries, particularly the electronics industry, MITI has already started an optical-industry technology promotion association as a non-government promotional organization. The new decision is based on the idea that it is advisable to rapidly accelerate the project in order to prepare for the optical age which is expected to flourish from the middle of the 1980's.

Steady efforts are being made to make practical optical technology as innovative technology to replace the functions of electrons with those of light. In Japan, the Nippon Telephone and Telegraph Corporation (NTT) is planning for optical communication systems as future systems to replace copper cable systems, and is investing much effort, research and determination in application programs. The Japan National Railways Corporation (JNR) and electric power companies are studying the adoption of optical communication systems for these future requirements.

Not only with applications in communications fields, optical technology is also expected to find a variety of applications in electronics and to induce fresh technological innovations in a number of industries.

The major project started last year aims to make practical a system for measuring, transmitting and controlling, by the use of light, picture data and process data such as for temperature, pressure, flow rate etc. satisfactorily, even under unfavorable conditions in industrial communities and large-scale plants.

In starting the project, the Agency commissioned research individually to 7 makers. Now, with some results obtained,

FOR OFFICIAL USE ONLY

the Agency has decided to accelerate research aiming at a target 6 years ahead by establishing a research association consisting mainly of makers.

In respect to budget, a big jump is scheduled from this year's nearly ¥0.9 billion to more than ¥2 billion next year, which indicates the Agency's determination to substantiate the project both quantitatively and qualitatively.

Also, some desire is for joint laboratories to be established under the association for promoting research. The Agency intends to review problems, including the above, in order to determine a full research system by the end of this year.

On the other hand, the Optical Industry Technology Promotion Association is beginning to run its operation. Its main objective of optical market promotion activities is expected to be fully carried out. Thus, both aspects are underway: promotion of pioneering research, and development of markets.



COPYRIGHT: 1981 Fuji Marketing Research Co., Ltd.

CSO: 4120

FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

SUB-PICO-SECOND PULSE LASER DESCRIBED

Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 pp 53-55

[Text]

The Electrotechnical Laboratory of the Agency of Industrial Science and Technology has succeeded in oscillating a sub-pico-second pulse laser with a pulse length of less than a pico second. This is called Synchronous Mode Synchronization and uses a liquid coloring element laser to ensure a pulse length of 0.41 pico second and an average pulse laser light output of 11mW.

The liquid coloring element laser can generate the shortest light pulse with the widest range of gain width up to  $10^{13}$ Hz. Its mode synchronization is conducted by vertical mode control in the laser resonator.

There are two methods of mode synchronization. One is Passive Mode Synchronization where no external control signal is added to the laser resonator; oversaturated absorbing color elements, that show the same characteristics with remarkably non-linear absorbing change against incoming light strength, are fed into the laser resonator. The other is Active Mode Synchronization, either by optical loss which incorporates a modulator inside the resonator using the same frequency of vertical mode margin, or by exciting light strength whose modulation cycle is tuned, by half-times of even numbers, to an elapsed time for the light to travel both ways inside the excited laser resonator. The latter one is called Synchronous Mode Synchronization. Mode modulation is conducted on a continuous wave (c.w.) with performance of the shortest pulse lines, in both Synchronous Mode Synchronization and Passive Mode Synchronization.

The laboratory has constructed an experimental apparatus where Rhodamine 6G is used as the coloring element (See Fig. 1).

In this apparatus, Glycol, which contains melted Rhodamine 6G as the coloring element, is circulated by a pump and is kept at 10°C. There is a narrow and long effusion exit in the circulation path where colored liquid comes out as a flat. On this ejected colored liquid, an Argo Ion laser is irradiated to oscillate laser light.

FOR OFFICIAL USE ONLY

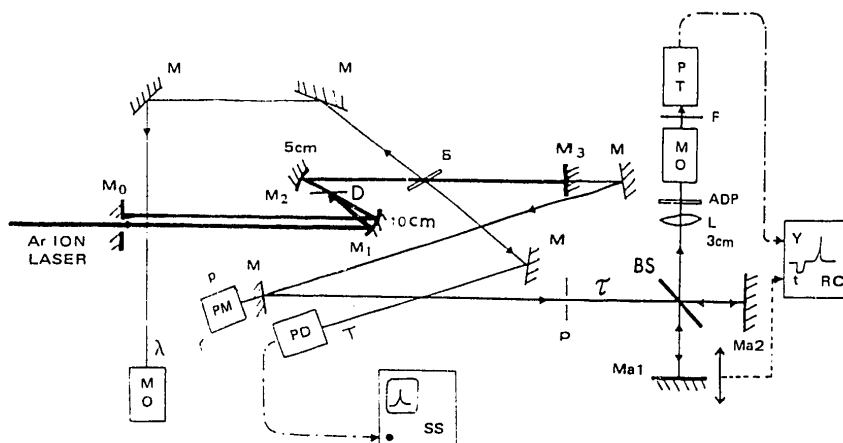


Fig. 1. General Configuration of the Experimental Apparatus

Part of the super-short pulse lines generated by the color element laser are received by a photodiode and are monitored on a sampling scope for measurement by generating a non-linear high frequency self-relative wave form.

The resulting color laser of CWR6G under Synchronous Mode Synchronization control was 0.41PS and had a pulse width of 11mW (as shown in Fig.2). The oscillated line generated at the output mirror had a center of 606nm and was 2.06nm wide, which is  $\Delta\lambda/\lambda = 0.69\%$ ; multiplication of line width indicated by frequency unit, and pulse width. Here the pulse suggests a proximity to transform-limited pulse.

While the present form of oscillation by Electrotechnical Laboratory still needs more work on laser stability, it is nonetheless likely to widen the possibility for uses in the fields of photochemical reaction and radiation reaction analysis, high-speed measuring with light, and information transmission technology.

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

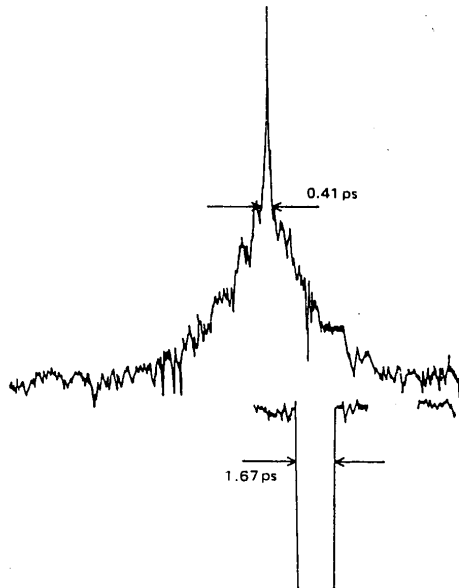


Fig. 2. Non-linear Self-Relative Wave Form When Resonator Wavelength is Shorter Than  $L_{SHMAX}$ .

COPYRIGHT: 1981 Fuji Marketing Research Co., Ltd.

CSO: 4120

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

NEW TYPE OF CATALYST FOR REDOX CELL

Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 57

[Text]

Redox cells have been gaining public attention as possible large capacity electric power storage systems. The Electrotechnical Laboratory of the Agency of Industrial Science and Technology has developed a copper and silver catalyst used on a carbon felt electrode which is one order of magnitude less expensive than the gold catalyst currently used.

Finding an efficient reaction material is one of the more important problems to be solved in redox cell development. In this area, ETL has found a redox pair consisting of phosphoric acid and pyrophosphoric chromium manganese. The electromotive force and energy density for this redox pair is better than that of the chromium ferrum pair.

One subprogram of the research and development program on electric power storage systems by new type cells focuses on a redox flow type secondary cell. The program belongs to the research and development program on large scale energy saving technology promoted by the Agency of Industrial Science and Technology, Ministry of International Trade and Industry. According to the plan, the laboratory will develop a 100W class cell during fiscal year 1980 and a 1kW class collective cell over fiscal years 1982 and 1983. Current activities to meet this goal include research and development of element technology, such as redox systems, electrodes, and electrolysis cells and system technology which integrates and optimizes the element technology.

Chromium has shown strong promise in laboratory level research of redox systems. However, drawbacks of chromium are its low standard electrode potential of -0.4V and 0.6V for chloride and orthophosphate, respectively and its relatively slow electrode reaction speed which is likely to cause hydrogen generation during charging. To overcome these difficulties, NASA developed an electrode with a catalyst. Gold is electrolytically deposited on a carbon felt electrode; then lead is electrolytically reduced on it.

The laboratory has tried copper and silver as catalysts in place of gold. An output of more than 20mV was obtained in experiments in which the amount of the catalysts were 1 to 10mg per cm<sup>2</sup>, however, the experiments show difficulty in replicating the results.

The reaction material of redox pairs is an ion solution in water that can change valence, such as iron ions and chromium ions. Charge and discharge of the cell is associated with the oxidation-reduction reaction of the ion solution brought in a flowing type electrolysis tub. Thus, a key issue in redox cell development is development of a reaction material with a life span of 5 to 10 years and with excellent efficiency. (Fig. 1).

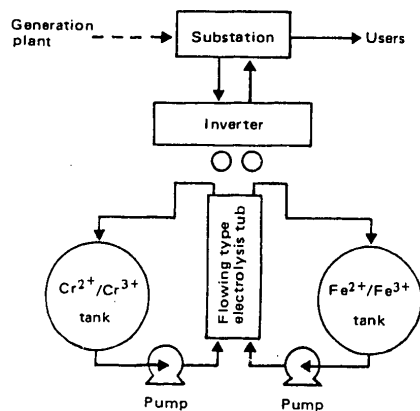


Fig. 1. Redox-flow Type Secondary Cell

COPYRIGHT: 1981 Fuji Marketing Research Co., Ltd.

CSO: 4120

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

HEAT STORAGE MEDIUM FOR WASTE HEAT ENERGY IN RIVERS, SEAS, AIR

Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 57

[Text]

*The Agency of Industrial Science and Technology has developed a new type heat storage medium that can efficiently recover and store heat energy discarded into rivers, seas, and air, such as the warm waste water from iron mills and power plants. The heat storage medium is a compound of sodium iodide and ammonia, called an ammine complex compound, and the chemical reaction of it is used to store heat energy. The advantage of this medium is that transportation by pipes is possible because it is a liquid.*

*The newly developed ammine complex compound is a fluid in which several ammonia molecules are combined with a single sodium iodide molecule. When resolved and part of the ammonia becomes a gas, it absorbs external heat. On the other hand, it releases heat when it combines with ammonia gas. The ammine complex compound can store waste heat as chemical energy and is easily transported and stored since it is a liquid. Therefore, waste heat can be easily recovered, stored, and transported by constructing a pipe line between the waste heat generation site and the consuming site. No heat is dissipated because the heat energy is converted into chemical energy. Thus, no heat insulation is required.*

*In basic experiments, waste heat with a temperature of 30°C was stored and recovered at a temperature of about 50°C. The agency predicts that practical use of this new type heat medium is possible. Because of the properties of the ammine complex compound, heat recovery and reutilization are possible for temperatures between -20°C and 200°C. (Fig. 2)*

FOR OFFICIAL USE ONLY



FOR OFFICIAL USE ONLY

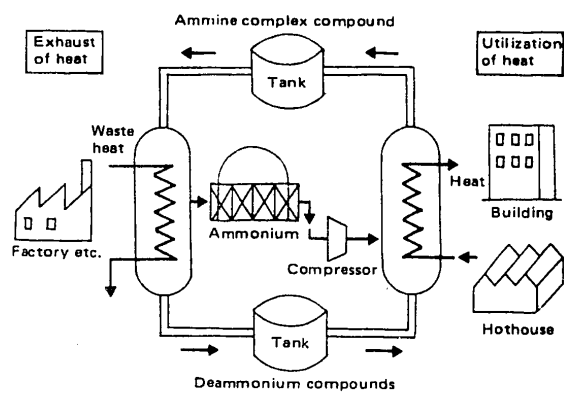


Fig. 2. Flowchart of Waste Heat Energy Recovery Using Heat Storage Medium

COPYRIGHT: 1981 Fuji Marketing Research Co., Ltd.

CS0: 4120

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

HIGH-PERFORMANCE LP GAS DETECTOR INCORPORATING NEWLY DEVELOPED SPECIAL SENSOR

Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 64

[Text]

Takei Seisakusho, in cooperation with the Toshiba Research Development Center and Clean Life Creator, has developed a gas leak detector that shows a high sensitivity and selectivity to propane gas leaks, and a stopper for gas cylinders.

To raise its performance, the currently developed gas detector has a built-in sensor implanted with a zinc oxide compound element with zinc oxide as the main component, plus additional chlorides, and a special circuit.

While the sensor shows a sharp reaction to isobutane, propane and ethane, its reactions to hydrogen, carbon monoxide, methane and smoke are slow. It shows an excellent selectivity to propane gas components.

The gas stopper is installed in the main gas valve section. Upon receiving electrical signals from a detector, the solenoid built in the gas stopper starts functioning and causes a metallic ball mounted atop a weight-like object to fall, closing the main valve of the gas cylinder.

COPYRIGHT: 1981 Fuji Marketing Research Co., Ltd.

CSO: 4120

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

TWO-CYCLE ENGINE BASED ON ACTIVE THERMAL ATMOSPHERE COMBUSTION PROCESS

Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 64

[Text]

Kubota, Ltd. has announced the manufacture and sale of a 2-cycle engine based on an active thermal atmosphere combustion process, a technology obtained under license from the Japan Clean Engine Research Institute.

The active thermal atmosphere combustion process basic to the technology of the new engine takes advantage of the following principle. With an internal combustion engine, if a device is made to detain as much as possible of the high-temperature residual gas from the previous cycle trapped inside the cylinder, and the trapped gas is effectively utilized while simultaneously controlling the speed of the new gas mixed with air flowing into the cylinder, the fresh gas-air mixture is heated and dissolved by the residual gas, and is activated. The activated gas then combusts without the help of an electric spark.

Being a variation of the so-called lean gas-air

combustion method, the process has great merits compared with conventional gasoline engines, it can save fuel consumption by 20% under a partial load. The points of this process are the technologies pertaining to the state of residual gas and the method of mixing the residual gas with a new gas-air mixture and heat control, and it can be applied to internal combustion engines using various kinds of fuels including not only gas, gasoline and kerosene but also methanol, ethanol and others. The amount of emission of harmful substances such as CO, NOx by an engine using the process is small, 1/5 to 1/10 of a conventional internal combustion engine, and the process also emits less noise. Thus, it is advantageous from the standpoint of pollution prevention.

COPYRIGHT: 1981 Fuji Marketing Research Co., Ltd.

CS0: 4120

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

SUPER-LOW TEMPERATURE FATIGUE TESTER

Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 65

[Text]

*Kobe Steel, Ltd. has succeeded in the development of fatigue testing equipment using liquid helium that can test material for a long time at extremely low temperatures, and has delivered it to the National Research Institute for Metals, the Science and Technology Agency.*

*The equipment can attain, using liquid helium as the refrigerant, an extremely low temperature of  $-269^{\circ}\text{C}$ , and it can also be operated continuously for 2000 hours, the time span needed to collect data in a material fatigue test.*

*The equipment is composed of a fatigue tester, "re-condensation type helium refrigerator" (a freezer for returning helium vapor to a liquid form), "non-oil-lubricating helium compressor" (used to eliminate impurities in the helium gas that will log the circuit, however small amounts they may be, such as carbon dioxide, hydrogen), and "aluminum plate fin type heat exchanger" (for freezing high pressure and low pressure helium gases simultaneously and evenly). These components have been instrumental in making possible a long-term continuous freezing, a process that is required for elevating the precision of fatigue tests.*

*The equipment is expected to play a big role not only in the research and development of nuclear fusion reactors, drawing attention as the future source of energy, and the super-conducting rotary machine that is considered a future generator, but also in other fields such as estimating the operating-life of strut materials for the super-conducting magnet for use in the magnetic-float super-high speed train being developed by engineers of the Japanese National Railways.*



New Fatigue Testing Equipment

COPYRIGHT: 1981 Fuji Marketing Research Co., Ltd.

CSO: 4120

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

FUEL-SAVING, HIGH-EFFICIENCY PROPULSION SYSTEM FOR LARGE SHIPS

Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 68

[Text]

The Nagasaki Shipbuilding Yard of Mitsubishi Heavy Industries has recently developed a new propulsion system which increases propulsion efficiency and achieves significant fuel savings in large ships, such as tankers and bulk carriers.

Conventionally, in order to increase propulsion efficiency of large-width freighters and VLCC and ULCC of 200,000-400,000t classes, the shipbuilding industry has been promoting the use of Kort nozzle propulsion units in addition to the use of global bows and the development of effective ship designs. However, although the use of Kort nozzle propulsion units achieves a 3-4% increase in propulsion, it also introduces several complications, such as the necessity of advanced techniques in manufacture, reduced service life as a result of cavitation (metallic separation) at the point where the tips of the propellers come close to the casings, and the necessity of using special expensive alloys for the propulsion units.

Water circulation is generated in front of and behind the propellers, which can prevent further improvement in propulsion efficiency.

In order to prevent this circulation, the yard improved the Kort nozzle system by developing reaction fin, called a water circulation corrector, and installing it at a location in front of the propeller. This effectively prevents the generation of water circulation which produced losses in the rotational energy of the propellers, and instead converted it to propulsion energy, increasing propulsion efficiency by 5-6% above that of the Kort nozzle system. Furthermore, because the reaction fin can be independently installed on the stem in front of the propeller, it will not cause cavitation. Thus, the new system permits the use of cast steel, a material which is not only cheaper than that of the Kort nozzle system, but also has a longer service life. In addition to these advantages, features of the system include simple manufacturing technique and easy installation.

COPYRIGHT: 1981 Fuji Marketing Research Co., Ltd.

CSO: 4120

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

DIRECT-COUPLE TYPE HIGH-ECONOMY GENERATION SYSTEM USING WASTE HEAT

Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 69

[Text]

*In view of saving fuel in ships, Ishikawajima Harima Heavy Industries has recently developed a "direct-couple type high-economy power generation system" (SSG) which makes full use of main diesel engines, and has decided to mount it on an 30,700t tanker which will be completed in March, 1981.*

*SSG uses the method of mechanically coupling steam turbines and generators to main engines via speed changers. It proves very effective in applications in propulsion plants with relatively low-rated output, and in the output range of which no exhaust gas economizer turbo-generation system will work or in ships with long hours of about 70% load reduced-speed operation.*

*The 30,000t class tanker on which the new SSG will be mounted will have a diesel engine (15,000hp). Reportedly, the use of the SSG with this engine will reduce fuel consumption by about 5%, or annually 380t (in terms of heavy oil C) for normal output, or annually 650t (like wise) for 70% load navigation, compared with the use of independent turbo-generators. It is generally recognized that the use of SSG will reduce fuel consumption by about 30% compared with conventional methods of fuel consumption in ships.*

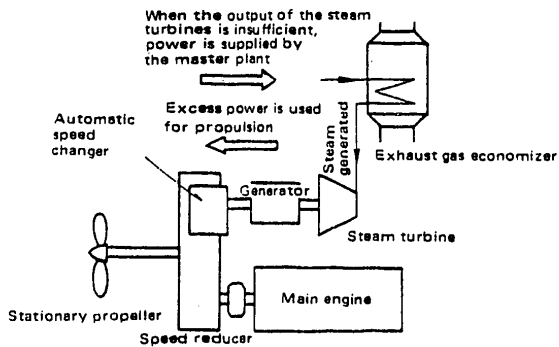


Fig. 1. Mechanism of SSG System for Medium-Speed Master Plant

COPYRIGHT: 1981 Fuji Marketing Research Co., Ltd.

CSO: 4120

FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

CATAMARAN STERN TYPE ENERGY-SAVING SHIPS

Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 69

[Text]

*Sanoyasu Dockyard Co. has developed a new energy saving design for ships incorporating twin sterns, two hulls and two engines, so as to increase loading space and to reduce stern configuration drag. The company has started intensive marketing activities of the design for standard vessels, ro-ro ships, ferries, bulk carriers and tankers in the 60,000 to 130,000 ton range.*

*Ro-ro ships and ferries with double sterns have achieved the same loading capacity as compared with conventional catamarans and 30 to 50% more than single hulls ships. Fuel consumption is improved by more than 10% over single hull vessels, while, conventional catamarans have a 15 to 20% higher fuel consumption than single hull vessels.*

*For bulk carriers and tankers, the fuel consumption is cut by more than half. The distance between the two sterns is considerably less than with ro-ro ships. This is to reduce friction drag due to increased wet area as little as possible, while the merits of the twin sterns are retained.*

*More concretely, for single hull and engine large bulk carriers and tankers of 60,000 tons, power is 15,200HP x 122rev/min, providing a speed of 15.5 knots and fuel consumption 45.1tons/day. For the newly developed catamaran-stern ships, cruising speed is 15.3 knots, power 11,640HP x 58rev/min and fuel consumption 37.3tons/day.*

COPYRIGHT: 1981 Fuji Marketing Research Co., Ltd.

CSO: 4120

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

METHOD OF STORING, DISPENSING COAL USING CONCRETE SILOS

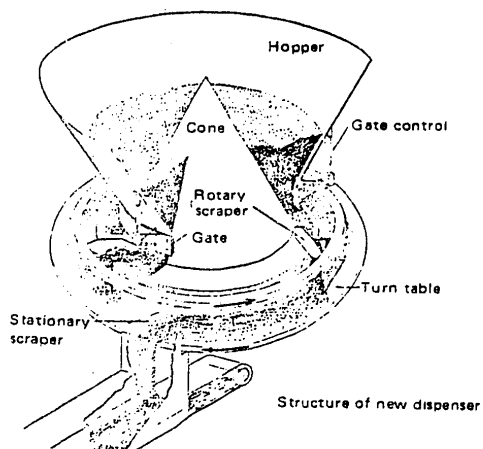
Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 69

[Text]

*Ohbuyashi-Gumi Ltd. and Hitachi Ltd., which have jointly been promoting research and development of a new method of storing and dispensing coal, have reached the conclusion that it is more advantageous to use concrete silos, and have recently started test runs using a test plant to determine the feasibility of its commercialization.*

*The key point of the test plant (test concrete silo) is a specially designed hopper, the lower half of which is bent upward like a peaked cup to prevent jamming. In dispensing coal, larger hoppers are more likely to prevent jamming. But such hoppers are likely to allow excessive coal to flow out. Thus, the use of a hopper with its lower half bent up inside will sufficiently narrow the outlet of the hopper to prevent coal from overflowing.*

*For dispensing coal, the following method is used. Coal dispensed from the hopper is first received on the turntable, which turns around the hopper with the aid of a scraper, and then delivered out to a belt conveyor through the outlet provided in another turntable located under the first turn table.*



COPYRIGHT: 1981 Fuji Marketing Research Co., Ltd.

CSO: 4120



FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

NEW 70 PERCENT EFFICIENCY WAVE RESONANCE GENERATION SYSTEM (WRC) DESCRIBED  
Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 89

[Text]

The Maritime Industry Study Group has announced the success of basic tests carried out on a new coastal wave force power generation system with an air energy-wave energy conversion efficiency of 50-70% (max. 90%).

The new system is known as a "WRC (wave resonance) system", and was proposed by the Taisei Construction Co., a member of the Group. Reportedly it is capable of power generation at wave heights as low as 1m. In appearance it looks like a concrete caisson, in that it is hollow and has water inlets in the submerged portion at the front with air vents on the top surface.

When coastal waves hit the upper front wall of the system, duplicated high wave-height waves are caused. The resulting amplitudinal perturbation causes the water surfaces in the free water compartments in the system to resonate, making the air, in the air compartments provided above, contract and expand. This initiates an air flow, which is allowed to enter the power generation systems, thus obtaining an electrical output.

The Study Group intends to continue its research, and in 1982, plans to construct a 30-50kW class output test plant at a cost of ¥230 million.

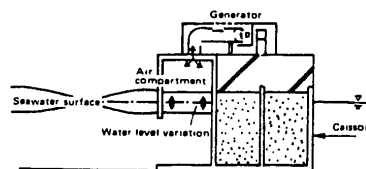


Fig. 1. Principles of Operation of "WRC System"

COPYRIGHT: 1981 Fuji Marketing Research Co., Ltd.

CSO: 4120

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

EARTHQUAKE DETECTION SYSTEM DESCRIBED

Tokyo TECHNOGRAT in English Vol 14, No 1, Jan 81 p 91

[Text]

*Mitsubishi Electric Corp. has developed and marketed a "P-wave sensor earthquake detection system" as an early warning system against earthquakes.*

*Earthquake waves include P waves and S waves. The former have a higher propagation speed (6-8km/sec) than the latter (3-4km/sec.), unless recorded at the source of the earthquake. Tremors due to P waves last for about 3-15 sec. This is called the preliminary tremor, which is not violent. Tremors violent enough to cause damage occur after the S waves arrive.*

*This newly developed system makes use of this relationship between P and S waves and is designed to minimize damage by giving an alarm. This warning is based on an estimation of the magnitude of the S waves, by detecting the P waves arriving before the S waves. P-wave sensors for elevators have already been put into practical use by several companies and the product has sufficient universality to be applicable to other equipment.*

*The new system has the following features: 1) It is able to detect and pick up P waves only from the continuous vibration of buildings, by using filter separation. 2) the user can easily check the operation through the switches provided. 3) It will continue to operate for more than 1 hour after a power failure has occurred.*

*Possible applications of the system are the starting of emergency generators used in underground towns, department stores and hospitals, refuge alarms used in warehouses, factories and schools, and interruption of computer operation.*

*The market price of the system in kit form is ¥465,000.*

COPYRIGHT: 1981 Fuji Marketing Research Co., Ltd.

CSO: 4120

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

SCIENCE AND TECHNOLOGY

MINISTRY OF AGRICULTURE, FORESTRY, FISHERIES TO DEVELOP BIOTECHNOLOGY

Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 92

[Text]

The Ministry of Agriculture, Forestry and Fisheries has decided to definitely begin, in the next fiscal year, technological developments in new fields, primarily biotechnology (technology using biological functions).

Biotechnology is a technology which makes industrial use of the functions contained in life-forms, including bio-reactor technology (which makes industrial use of biological reactions), large-quantity cell cultivation technology and cell fusion utilization technology. The technology is expected to embrace a wide range of applications. Altogether, five chemical companies, including Sumitomo Chemical and Asahi Chemical Industry, together with the Institute of Industrial Science and Technology of the Ministry of International Trade and Industry, have organized a "Biotechnology Discussion Group". The technology is thus attracting much attention as a technological field of the future.

Because it is a characteristic of the agricultural, forestal and fisheries industries to repeatedly reproduce biological resources by making use of natural energy, the Ministry of Agriculture, Forestry and Fisheries is most concerned with biotechnology. Also, because

it is obviously necessary to make an effort (1) to maintain and improve Japan's self-supply capacity of food and (2) to maintain and cultivate forestal resources and preserve the environment, the Ministry has decided to begin the technological development in new field, primarily at the Tsukuba Agricultural community Study Project.

In the next fiscal year, the Ministry intends to secure a budget of ¥300 million, which will be primarily invested in the following: (1) development of a technology for increasing agriculture forestry and fisheries productivity by applying cell engineering and genetic rearrangement; (2) development of a technology for converting reproducible unexploited and undeveloped biological resources into usable materials such as food, feed and energy; (3) efficient utilization of natural energy. At the same time, the Ministry aims to develop new food fields by promoting the following studies: (1) studies on food materials such as new protein made by using microbes; (2) development of new processed food produced by using bio-reactors; and (3) studies on new preservation techniques by using antagonistic microbes and enzymes.

COPYRIGHT: 1981 Fuji Marketing Research Co., Ltd.

CSO: 4120

FOR OFFICIAL USE ONLY

## FOR OFFICIAL USE ONLY

## SCIENCE AND TECHNOLOGY

## BRIEFS

PRACTICAL AMORPHOUS CELL DEVELOPMENT--The Agency of Industrial Science and Technology of the Ministry of International Trade and Industry has announced a long term development strategy for solar power generation technology. The program calls for: 1) developing practical amorphous solar cells within five years, 2) reducing solar cell cost by developing low cost silicon production technology, 3) establishing system technology, such as solar power generation plants with an output of 1,000kW, and 4) developing a large solar simulator. The development will be collectively carried out by nine private companies, including Mitsubishi Electric Co., under the New Energy Development Organization. The "Sunshine program" initiated solar cell development that uses crystalline semiconductors for ribbon type, thin film type, and compound type solar cells. Development of ribbon type and thin film type solar cells is now at the stage where mass production technology is available for commercial production of solar cells. [Text] [Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 56]

INTERNATIONAL COOPERATION FOR COAL LIQUEFACTION--An agreement has been reached on a coal liquefaction experiment using Canadian coal in Japan. The Canadian coal experiment is another international cooperative experiment involving Japan in the area of coal liquefaction technology development. Previous experiments have been conducted with the U.S.A., West Germany, Australia and China. Japan and West Germany have decided to participate in the construction and operation of Gulf's SRC-2 coal liquefaction pilot plant which has a capacity of 6,600 tons/month. Japanese participants include both private enterprises, such as Mitsui Coal Liquefaction Co., along with Government agencies. Mitsubishi Corp. is participating in Exxon's EDS method. Mitsui & Co. and Idemitsu Kosan Co. are cooperating with West Germany. These are just a few examples of Japan's promotion of joint coal liquefaction development programs with countries that produce coal and/or have been developing the technology. This year, Japan agreed with Australia to participate in lignite liquefaction in Victoria, Australia. The Japanese government with the Nissho Iwai Group will fund the construction of a pilot plant scheduled to be started by the end of next year. More recently, Japan has agreed to start a joint coal liquefaction experiment with China using Chinese coal. The agreement with Canada includes carrying out coal liquefaction experiments using sample coal supplied by Canada. These experiments will use the direct hydrogenation method, solvent extraction method, and solvolysis method, which have been under development in the coal liquefaction project of the Agency of Industrial Science and Technology. [Text] [Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 56]

FOR OFFICIAL USE ONLY

## FOR OFFICIAL USE ONLY

LARGEST SOLAR POWER PLANT--Shikoku Electric Power Co. has decided to construct the world's largest solar power plant with an output of 1,000kW. It will begin operation in 1985 and will be located in a coastal industrial zone of Saijo city, Ehime prefecture. The company has requested strong support from the New Energy General Development Organization. Crystal silicon solar cells will be used. The first milestone is to start operation of a 25kW plant within the next fiscal year. Construction and operation of the plant will accelerate the understanding of the total system, including connection with power lines, and will lead to large-scale applications in the early 1990's. According to the solar power plant program of Shikoku Electric Power Co., the study phase from fiscal 1980 to fiscal 1987 will look into: 1) AC/DC conversion equipment and its control equipment, and 2) battery storage equipment to stabilize power output. The total cost of the research project will be 4 to 5 billion yen. [Text [Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 56]

GAS ABSORPTION-TYPE HEAT PUMP--Osaka Gas Co. and Sanyo Electric Co. have developed a "gas absorption-type heat pump system." The heat pump system uses city gas and is the first of its kind in the city gas industries. Features of the heat pump system are: 1) uses 50% less energy than conventional boiler systems; 2) it can heat water to 60 to 90°C by recovering heat from waste water at a temperature of 20 to 40°C; 3) cold water can be extracted for process cooling and air-conditioning at the same time that hot water is being output; 4) water can be heated by using well water and low temperature water from solar heat system; and 5) the principle is the same as that of gas absorption freezers, therefore no qualifications are required for operation and full automatic operation is possible. Waste water at a temperature of 30 to 50°C is exhausted in the dyeing process of textiles, cleaning process of bottles, and as waste water of public baths. Since direct heat exchange with these sources is inefficient with present systems, these potential sources of energy for the new heat pump system are being wasted. [Text] [Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 56]

ULTRA-SMALL PROXIMITY SWITCH--Lead Electric Co. has recently developed an ultra-small proximity switch (micro-processor). This sensor measures only 3.8mm in diameter yet has an operating distance of 2mm, and can be used as a built-in detector in small-size automatons of robots that until now could not be fitted with proximity switches. Being a sealed type, the sensor can be built into metals and can also detect positions with high accuracy, making it suitable for precision processing. Having a capacity for close-contact detection, it can also be used for close-contact confirmation. The detection head alone costs 28,500 yen. [Text] [Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 64]

PUMP HEATS WATER--Osaka Gas Co., in conjunction with the Tokyo Sanyo Electric Co., has developed a gas absorption heat pump system that can turn low-temperature waste water into high-temperature water. With this system, high-temperature water (70 to 90°C) can be effectively obtained by recovering heat from low-temperature waste water (30 to 50°C) by using a gas absorption heat pump that uses city gas as a heat source. The system can reportedly save 40 to 50% in energy consumption compared with conventional heavy oil boilers, and can recover the installation costs in reduced annual fuel bills in two and a half years. [Text] [Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 64]

FOR OFFICIAL USE ONLY

## FOR OFFICIAL USE ONLY

TECHNICAL COOPERATION WITH CHINA--Hitachi Seiki Co. has signed a technical cooperation agreement with China for machine tools. In compliance with a request from the Chinese Machinery and Equipment Export Corporation, Hitachi Seiki Co. will contract with the corporation for the production of machine tools. To advance the modernization program of China, the Chinese domestic machine tools industry must be built up. In the first step in this direction, China contracted with Yamazaki Machinery Works for production of conventional lathes. Since November 1980, 200 units have been produced each month, and half of the production, 100 machines per month have been exported back to Japan. China plans to sign technical contracts for other types of machine tools in the near future. [Text] [Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 66]

SINTERED WBN TOOLS--Nippon Oils and Fats Co. has developed an industrial manufacturing technique for wolframinate-born nitride using super high pressure impact for the production of sintered WBN tools. Conventional cutting tools are easily damaged, especially their surfaces, when cutting newly developed materials that have higher hardness than conventional materials but poorer machinability. Diamond wheels and diamond tools prevent part of these problems for non-ferrous materials, but diamond tools can not be used on ferrous materials due to their affinity. To overcome these problems, cubic nitride tools have been developed. However, while these tools have higher hardness they are also more brittle. The WBN cutting tools developed by Nippon Yushi Co. not only have a higher hardness, they also have a higher toughness, and thus are expected to fill a wider range of applications. [Text] [Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 66]

NEW DRILLS--Hosoi Kosakusho Co. has succeeded in developing a sintered carbide drill bit that has two narrow straight chip exhaust grooves. Chips from the new drill bits are discharged out of straight grooves instead of conventional spiral grooves. Drilling speed with the new bit is ten times that of conventional bits and reaming is not needed. The bit's edges are made of two sintered n-type carbide tips, the cutting edge is a circular arc without chisel, consequently, the drills bits are not prone to cutting edge damage at low cutting speeds. The chips are cut by chip pockets between the cutting edge and the groove and are fed out the straight grooves, without coming in contact with the drilled surface. This gives the drilled surface a mirror finish with a roughness of 3-4  $\mu\text{m}$ . The manufacturing cost of the drill bits will be sharply less than that for conventional bits with spiral grooves, and the drill bit stiffness is also improved due to the narrow width grooves. [Text] [Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 66]

NEW NC EQUIPMENT MAKER--Sony Magnescale Co. has entered the NC equipment field. The new product is called "Magnescale CNC System" and consists of a command unit (LM35), a control unit, and a cassette printer. The positioning function of the magnescale gives the new system high positioning accuracy without using a ball screw. Consequently, the system is being marketed for new and used NC machine tools. Either two or three controllable axes can be set. [Text] [Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 66]

## FOR OFFICIAL USE ONLY

TOOLS OPERATED BY HUMAN VOICE--Hitachi Seiko Ltd. has developed the MBN-700 machining center that uses a human voice control input system. Human voice control input systems have been used in unmanned transfer systems and industrial robots, but this is the first application of its kind in the machine tools field. The main feature of the system is the ease with which data can be changed as compared to conventional tape input system machines. The input system was developed by Hitachi Ltd. and the machining center has been placed in operation at the Mito plant of Hitachi Ltd. Nippon Electric Co. is also studying a human voice input system for machine tools. [Text] [Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 66]

NEW ELECTRO-DISCHARGE MACHINE MAKER--Hitachi Seiko Ltd. has entered the wire cut electro-discharge machine field. The company has developed the H-CUT 304 wire cut electro-discharge machine for fine and precision machining. Fujitsu Fanuc, Mitsubishi Electric Co., JAPAX., Amada Co., Seibu Electric Mfg., and Makino Milling Machine Co. are the other companies in this field in Japan. Hitachi Seiko Ltd. contracted with Aje Co. (Swiss) for a die sinking electro-discharge machine in 1973 when it began manufacturing this type of machine. This new machine, however was completely designed and developed by Hitachi Seiko. The machine uses a double circuit system: one circuit consists of capacitor and transistor pulse circuits for high speed machining, and the other is an all-transistor circuit for fine machining. The NC equipment used is the Fujitsu Fanuc F200C, and the automatic programming equipment is the P-Model 1D produced by Hitachi Seiko. [Text] [Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 66]

ULTRA-PRECISION MIRROR--Toshiba Machine Co. has developed a metal mirror machining machine that uses super precision spherical air bearings. The machine was developed to meet the super precision specifications for electrical equipment and parts. The company has contracted with Toshiba Corp. for air bearings, and has developed a super precision spindle to achieve submicron accuracy. The machine is a diamond milling machine used for metal mirror finishing using diamond cutting only. The mirrors are used in high output laser oscillators and must have a flawless surface finish and perfect flatness to satisfy the optical requirements. Consequently, stiffness, vibration, thermal displacement, and machine accuracy were all taken into consideration in the design of the machine. [Text] [Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 66]

MACHINING CENTER FOR MASS PRODUCTION--[Photo caption] The photograph shows a YPC-30 machining center for mass production of small parts. The machine is designed for precision mass production of small parts for automobiles, hydraulic equipment, cameras, and aircraft. When a preload-conveyer with 8 stations (option) is used, the machine can operate unmanned. By adjusting the offset on an index table, the machine can be rigged for a transfer line. Main specifications: Table area, 300 x 300mm; Travel, 350(X) x 250(Y) x 300(Z)mm; Spindle speeds, 60-6,000 rpm; Spindle motor, 5.5kW (30 min), 3.7kW (cont.); Number of tools in ATC, 15; NC equipment, Fanuc system 6. [Text] [Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 67]

FOR OFFICIAL USE ONLY

## FOR OFFICIAL USE ONLY

HIGH SPEED HOBBING MACHINE--[Photo caption] The photograph shows the GH250P high speed hobbing machine. The machine has a 40% higher production rate than conventional machines: the required machine cycle time is 30 seconds for an automobile manual transmission gear. Main specifications: Max. workpiece diameter, 250 mm; Max. hob dimensions, 130 x 600 mm; Cutting feed, axial 10-300 mm/min, radial 10-200 mm/min; Motor, 11kW. [Text] [Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 67]

VERTICAL MACHINING CENTER--[Photo caption] The photograph shows the MCV-80D vertical machining center from Howa Kogyo Co. The machine has two spindles and a temperature control for the spindle oil. Main specifications: Table area, 900 x 360 mm; Travel, 400(X) x 360(Y) x 500(Z) mm; Distance between spindles, 360 mm; Spindle speeds, 70-2,500 rpm; Number of tools in ATC, 25 x 2. [Text] [Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 67]

AUTOMOBILE AIR CLUTCH DEVELOPED--Ohgane Seisakujo has developed an air clutch for automobiles, the first of its kind in the world. Conventional clutch disks gradually lose spring pressure after wearing down 3-4 mm, allowing the clutch to slip. As a result, clutches in city buses, for example, must be replaced at less than yearly intervals. The new air clutch has the following features:  
 1) it is on the average 3 times more durable than conventional clutches.  
 2) Because of uniform pressing load, it exhibits reduced judder (jolting starting due to uneven pressing).  
 3) It reduces troubles such as insufficient clutch disengagement.  
 4) Its spring is bent by centrifugal force during high-speed running, preventing losses of power transmission. In contrast to conventional clutches which transmit power by pressing the pressure plate onto the clutch disk with the aid of a spring, the air clutch presses the pressure plate by using compressed air for air brakes as used in large trucks, instead of springs. It mainly consists of a compressor, a tank, a pressure control valve and an inching valve for suction and exhaustion. The pressure plate has a doughnut shape, and is made of a special material which withstands temperatures above 300°C. [Text] [Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 68]

LIGHTWEIGHT COMMUTER TRAIN COACH--Kawasaki Heavy Industries has manufactured a test model of a light-weight commuter, which has a semi-monocque structure, consisting of an aluminum frame integrated with an aluminum exterior. The coach weighs about 28t in contrast to the approximately 40t weight of a conventional complete steel-body coach, achieving an approximately 10% reduction in power consumption. The aluminum body of the test model is made from extruded sections consisting of a frame (longitudinal members) and exterior plates, integrated together, made of a special aluminum alloy composed of aluminum, silicon, titanium, etc., and hollow extruded sections having a truss structure for floors. This has reduced the weight of the body to 4.3t, slightly more than one-half of the weight of a conventional steel body (about 8t). In addition large FRP parts are extensively used for interiors, achieving a significant reduction in the number of manhours and thus also in cost, in addition to the integrated structure. [Text] [Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 68]

FOR OFFICIAL USE ONLY



## FOR OFFICIAL USE ONLY

AUTO-LEVELER--Atsugi Automobile Parts Co. has recently developed and begun producing, for the first time in Japan, an auto-leveler (automobile height control system). The auto-leveler is a system designed to keep the vehicle height at a constant level regardless of varying passengers and cargo loads. It is intended to increase passenger comfort and vehicle performance and safety. The system consists of vehicle height sensors (which sense variations in vehicle height), a control unit, a reservoir tank, shock absorbers, an air compressor, an air dryer, stabilizers and monitor lights. Signals from the vehicle height sensors are received by the control unit, which opens or closes the valve on the reservoir tank to adjust pressure in the air chamber in order to keep the vehicle height constant. Auto-levelers are fitted in such vehicle models as Cadillac of General Motors. Compared with such conventional types, the new auto-leveler has the following advantages: 1) It has a reservoir tank to improve responsiveness. 2) It has greater endurance. [Text] [Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 68]

POSITIVE-TYPE ELECTRON BEAM RESIST--Toray Industries, Inc. has developed a positive-type, electron-beam resist for ultra-LSIs called "Toray EBR" that is made of a special chloroethyl methacrylate resin. The Toray EBR developed by the company is of two types: Toray EBR-1 and Toray EBR-9. Toray EBR-1 is a copolymer composed mainly of 2·2·2-trichloroethyl methacrylate, while Toray EBR-9 is a polymer composed mainly of 2·2·2-trifluoroethyl chloroacrylate. They have the following features: 1) Compared with conventional PMMA (polymethyl methacrylate), they have greater sensitivity. 2) Toray EBR-1 and Toray EBR-9 exhibit a pattern accuracy of 1  $\mu\text{m}$  (or experimentally 0.5  $\mu\text{m}$ ) and 0.5  $\mu\text{m}$  (or experimentally 0.2  $\mu\text{m}$ ), respectively. [Text] [Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 70]

VOLTAGE DIRECT PHOTO-IGNITION THYRISTOR--Hitachi Ltd. has recently succeeded in trial manufacture of a direct photo-ignition thyristor with a stopping voltage of 6,000V and a current capacity of 1,500A. The thyristor has been developed for DC converters and can be used in high-voltage power supplies for nuclear fusion reactors and power supplies for high-speed railway vehicles. The company intends to mass produce it as a 5,000V element. In conventional direct photo-ignition systems, light-emitting diodes are used as the light source for ignition. Unfortunately, the light output by LED is weak, and accordingly, thyristor sensitivity has had to be increased resulting in poor stopping characteristics and difficulty in producing elements having satisfactory characteristics. The company has developed the world's largest direct-photo-ignition thyristor by optimizing thyristor joints that can withstand high voltage. It has also developed the processing techniques for large-diameter high-withstand voltage PN junctions and high-sensitivity light receiver structures that are unlikely to ignite erroneously. [Text] [Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 70]

PHOTO-SENSITIVE ORGANIC SYSTEM--Hitachi Ltd. has developed a photo-conductive organic material that is very sensitive to light. The material is made by combining high-photo-conductive, high-molecular anthracene developed by the Hitachi Laboratory with a long-wavelength-absorptive, organic pigment. One of the most promising applications of this material is in photo-sensitive materials for semiconductor laser beam printers and copying machines. The new photo-sensitive

FOR OFFICIAL USE ONLY

system has a double-layer structure consisting of a charge generation layer that absorbs light to generate a charge and a charge transfer layer that moves the generated charge. Both of these are made of high-molecular anthracene and an organic pigment. The organic material can be used in the optical wavelength range of 450nm to 800nm, the wavelength for semiconductor lasers. At present, no other organic materials show a peak sensitivity (about 780nm) in the wavelength range needed for semiconductor lasers. [Text] [Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 70]

TERMINAL WHICH DIRECTLY CALLS DEMOS--Horiba, Ltd. has developed terminal equipment called "Kyoto Science and Technology Computing System," which can directly call, by means of a minicomputer, the super-computer that is used in the DEMOS (Data Communication Service of the NTT). This system consists of a MELCOM 70 (128-K bytes) as the main frame, a basic storage unit, a storage unit, a communications control unit, a fixed-disk unit, and a serial I/O unit. This system will make computations free of the errors that have occurred when executing complex scientific computations by the NTT data communication service, because this system stores the necessary data in the units and then calls the NTT super-computer by the minicomputer. Therefore, the software development speed may be increased five-fold and its cost reduced to one third as compared with the traditional computing systems. [Text] [Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 72]

OPTICAL FIBER FLUXMETER--The Central Laboratory of Hitachi has developed an optical fiber which can measure the magnetic field intensity even under a high potential of 500,000 volts or more. This product employs totally new principles which apply the Faraday effect: as compared with the traditional fluxmeter in which a metal search coil is used and with which measurements of flux were rather difficult to make on highvoltage equipment. This new product measures the field intensity in such a way that LASER light is put inside through optical fiber and the search coil of the detector unit and the magnetic membrane part are inserted into high-voltage equipment, then the magnetic field intensity is detected by the Faraday effect. Next, the photodiode converts the light into electric output and displays it in digital representation. This product uses a noninductive, high-insulation optical fiber so that you can insert the fiber in a narrow space. Moreover it can measure field intensities of ten gaussses or more with high accuracy without causing abnormal field confusion and insulation destruction. Hitachi Works Ltd. is planning to put it on the market as soon as possible. [Text] [Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 72]

HIGH-SPEED PRESS FACSIMILE--Matsushita Denso Kiki Co. started selling the press facsimile "LD-503" which can transmit one newspaper page of information in 40 seconds. It is maintenance free, and the lifetime is five times that of the one in which the laser is used, because of the LED being employed in it. Also it has a high reliability due to its microcomputer control. Use of it may be meritorious even to the user who deals with a small quantity of daily communications due to its ability to be used in the DDX network as well as in the common leased circuit. [Text] [Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 72]

## FOR OFFICIAL USE ONLY

POSTAL ON-LINE MAINTENANCE--Seven companies including Toshiba Corp. and Oki Electric Industry Co. have established in operation "Japan On-Line Adjustment", a maintenance company for postal savings on-line equipment. This new company will be affiliated with "Japan Accounting Equipment Service", the conventional company for maintenance and management of off-line equipment. The postal savings on-line maintenance company makes up the largest-scale maintenance network in Japan, executing maintenance for terminals in 22,000 post offices all over Japan. It is expected to exert considerable influence on the future computerization of the private financial agency which is its rival. [Text] [Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 72]

GLASS-MADE OPTICAL FIBER CONNECTOR--NTT (Nippon Telephone and Telegraph) has developed a method of using a groove formed on the periphery of two glass rods fused together in parallel to act as an axis adjusting guide, which forms an important part of an optical fiber connector. They also confirm that the method of connection is stable against the change in temperature with little loss. In this method of making an axis adjusting guide, two large glass rods are brought into strong contact with each other in parallel, are heated, and then undergo drawing (about 1 millimeter in diameter), at that time a part of the circular part of the adjacent rods are fused together. Wire drawing techniques employed enables mass production of high-precision guides. When connecting optical fibers, the groove (10 mm long) between the two rods is used as a guide to push the fiber surfaces to each other from the both directions and fix them. This method has given a 0.05dB average connection loss (in the case of single-core connection) and 0.02dB loss fluctuation over temperature change of -20 to +60 degrees centigrade. [Text] [Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 73]

FUJITSU M-170F COMPUTER--Fujitsu has announced that they have developed and will start to market the FACOM M-170F as their top-of-the-line model of the FACOM M-series F models of medium-scale computers. This new model contains a Remote Station Adapter (RSA) feature that uses fiber optic cable that enables the user to transmit large amounts of information to remote locations (3 km) at high speed. The total system can be designed to achieve a centrally controlled, distributed data processing system. In addition, the newly developed enhanced COBOL enables the user to greatly improve the productivity of his EDP department. This machine competes against the IBM 434-II (E-series model) that was recently announced by IBM in the United States, and its processing speed is 1.2 to 1.4 times faster than the IBM machine. [Text] [Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 74]

NEC MODEL 55 OFFICE COMPUTER--NEC has announced the NEAC system 150 model 55 as their top-of-the-line office computer. The main features are as follows: 1) Main memory capacity of 1M bytes, and the arithmetic processing speed is double that of the present 150II, which is equal to a general purpose mini-computer. 2) A high-speed fixed-disk drive and up to three line printers with a printing speed of 530 lines per minute can be connected to the system, and a large-scale multiwork system can easily be configured. 3) About 8,200 Kanji characters are available. 4) The system can be connected to the new NTT data network or systems provided by other suppliers. [Text] [Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 74]

FOR OFFICIAL USE ONLY

## FOR OFFICIAL USE ONLY

SOFTWARE MAINTENANCE TECHNOLOGY--MITI has officially decided that they will start a Software Maintenance Technology Development plan as a successive project after the Software Production Technology Development plan ends in 1981. This project will continue as a five-year plan. In its first year, it will overlap the current Software Production Technology Development plan. The new project is intended to develop a Software Maintenance Support System which is mainly focused on the development of 1) software tools to support software maintenance, 2) a maintenance information data base control system, 3) workstations dedicated for maintenance, and 4) establishment of Japanese documentation techniques. Kyodo System Development Co., a company jointly invested in by the software industries, is responsible for the development of the new project in continuation of the current project. Since the funds for this project will amount to approx. 6 billion yen, MITI is now doing their best to acquire the budget. [Text] [Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 74]

DECENTRALIZED DATA PROCESSING MINICOMPUTER--Hitachi has announced sales of a decentralized data processing super mini-computer "HITAC E-800," in two types, models 5 and 7. Both have the same storage capacity of up to two megabytes, with model 7 however, being designed for high speed processing in which a 16-k byte buffer storage is employed. Centralized data processing by means of HNA (Hitachi Network Architecture) has three types of node; the cluster node which control the terminal as the node computer function, the host node which executes processing as a subhost computer, and the communication control node. The model 7 costs about 19.2 million yen and the model 5 about 11.2 million yen. [Text] [Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 75]

FUJITSU GENERAL PURPOSE COMPUTER--Fujitsu Co. has announced introduction of their FACOM M-17F as their competitor model against IBM's 4341, the top model of IBM's series. The hardware of the new model enables adoption of a 64 K-bit LSI as main storage and it also has a multiprocessor configuration improving processing capacity and economic efficiency. The storage capacity is 4-12 megabytes for a single processor and 8-16 megabytes for a multiprocessor configuration. There is also a remote station adaptor which uses optical communication technology and provides for user-prepared programs in Japanese flowchart, thus automating and saving operations. It enjoys characteristics of being capable of using HYPER COBOL, which provides as much as 5 times program productivity over conventional COBOL. [Text] [Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 75]

LARGE-SCALE DECENTRALIZED PROCESSOR--Fujitsu Co. has put on sale FACOM 4920 and FACOM 4940 large-scale decentralized processors for use in centralized management or decentralized processes. The features are such as those given below. 1) Being compatible with the host computer FACOM M series, its system developments such as programming, control, or on-line environment definition can be done collectively on the side of the host. Also, the host management of programs or data at the decentralization point enables standardization of the whole system and centralized management on the side of the host. 2) Under the control of the newly developed decentralized processing system "OVIS," this processor can give as host-linked functions such as those that follow: (1) Batch data transmission function for transfer of files or programs, (2) RJE work station function, (3) Data stream compatibility which directly uses host software. [Text] [Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 75]

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

LSI TESTER FAMILY--Takeda Riken Industry Co. has developed two new LSI tester systems, the T310/43 and the T320/43, which operate at 10 and 20 MHz respectively, and thus has completed the line up of LSI memory testers for 10, 20, 40, and 100 MHz. [Text] [Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 77]

HIGH-SENSITIVITY SENSITIVE MATERIAL--Studies on sensitive materials for photography instead of silver chloride are being promoted in various circles. The Research Institute for Polymers and Textiles of the Agency of Industrial Science and Technology is achieving good results widely exceeding the sensitivity of conventional high-molecular sensitive materials, by using electron-giving and electron-sucking polyvinyl cinnamate. The Institute has already achieved very prominent results in its research into sensitive resin, including practical developments of a photo-resistant, having 1  $\mu$ m-level practical resolving power for microscopic processing and a sensitive nylon printing board. Recently, it has developed a non-photosoluble poval and this method of fixing this resin without losing the activity of enzymes and private enterprises has resulted in trial marketing for its commercialization. [Text] [Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 80]

NYLON 66 WITH INCOMBUSTIBILITY--In the field of high-molecular materials, provision of incombustibility is currently a big problem. Asst. Prof. Shinsaku Shiraishi at the Institute of Industrial Science of the University of Tokyo has synthesized "modified nylon 66," a self-deflaming nylon system which extinguishes a few sec. after it is taken away from flames. The new nylon has been made by modifying part of hexamethylene diamine, as the material of nylon 66, into phosphorus-containing diamine to create a new nylon system which contains phosphorus in its polymer structure. Properties of the new nylon are under study. So far, Shiraishi has observed that the new system has good potentiality for making a practical material because (1) its polymer has sufficient viscosity to provide colorless transparent film and (2) its molecular structure is a "hard" one, suggesting the possibility of providing high strength. Subsequent to the above studies, Shiraishi is also carrying out studies to increase the content of phosphorus, and the outcome is much anticipated. [Text] [Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 80]

AUTOMATIC INJECTION MOLDING SYSTEM--Nissei Plastic Industries has recently developed an automatic plastics injection molding system which has all processes from change of materials to selection of molding conditions. Intending to commercialize it in a few years after tests by users, the company demonstrated it at the 8th Plastic and Rubber Fair (Japan Plas '80). The system consists of a molding conditions memory, a fully automatic mold exchanger and a monitoring unit. Some makers have developed individual units. Nissei Plastics Industries is the first to develop a comprehensive system. The molding conditions memory is designed to have a controller developed by the company automatically control such factors as temperature, pressure and speed of injection and measurements. [Text] [Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 80]

FOR OFFICIAL USE ONLY

MARINE DIFFERENTIAL-TEMPERATURE POWER GENERATION--The Agency of Industrial Science and Technology is planning to construct a 1,000kW pilot plant for differential-temperature marine power generation in 1985, and a 45,000kW commercial plant before 1990. In line with these trends, Tobishima Construction has decided to start developing the techniques needed for this type of generation, by organizing a study team for that purpose. The company will begin primarily with (1) development of a platform for differential-temperature power generation, (2) development of cool-water intake pipes and (3) development of a platform anchoring (securing) system. [Text] [Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 88]

LP GAS AUTOMATIC CONTROL VALVE--Nichidoku Kogyo has developed and started marketing an automatic control valve for high-pressure LP gas. The company had been developing and marketing low-pressure quake-activated valves and more recently recognized that use of a high-pressure quake-activated valve would be more effective in preventing accidents caused by earthquakes. The automatic quake-activated high-pressure LP gas valve is designed to be fitted directly to the valve of a propane gas cylinder. When an earthquake exceeds a certain magnitude, it automatically stops the flow of gas. The valve has the following features: 1) The case which houses the quake sensor elements is completely separated from the gas flow. This is to prevent the sensor elements from contacting any high-viscosity fluids including butadiene polymers found in propane gas. 2) If the piping or gas fixtures on the downstream side form leaks when gas pressure downstream is exceeded by that upstream, the main valve will automatically lock in the closed position. [Text] [Tokyo TECHNOCRAT in English Vol 14, No 1, Jan 81 p 90]

CSO: 4120

END

FOR OFFICIAL USE ONLY