JPRS L/9758

28 May 1981

Japan Report

(FOUO 33/81)

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APPROVED FOR RELEASE: 2007/02/09: CIA-RDP82-00850R000400010054-7

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ECONOMIC

U.S. FIRMS TURN TO BUYING NEW EQUIPMENT FROM JAPAN

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19, No 953, 5 May 81 pp 1, 4

[Article by Hideo Tamura, NIHON KEIZAI SHIMBUN correspondent]

[Text]

In an attempt to reconstruct their ailing business, American electric, auto and oil companies have started to purchase goods, factory equipment and manufacturing technology newly developed in Japan, generating unexpected demand.

In the field of electric machinery, Westinghouse Electric Corp. has started talks with Mitsubishi Electric Corp. on a possible joint venture to construct a highly productive plant for heavy electric machinery equipped with Japanese technology somewhere in the United States. The new plant will be designed and operated under Mitsubishi's production management method, just like a Mitsubishi plant in Japan. Westinghouse will shoulder most of costs for constructing the plant, and Mitsubishi will offer its technical know-how on production management.

Westinghouse is planning to make the new plant a "model" to trigger its campaign to revolutionalize assembly lines, following the "kamban" method ("just-in-time" formula) developed by Toyota Motor Co. to increase productivity. In introducing Japan's superior production management know-how, Westinghouse is trying in particular to expand its integrated circuit department, which is trailing behind Japanese counterparts, and its defense department is expected to flourish under President Ronald Reagan's "strong America" defense buildup programs.

On the other hand, General Electric Co. has recently concluded an agreement on overall technical cooperation with Toshiba Corp. and Hitachi, Ltd. and made inquiries to both Japanese firms concerning possible cooperation in selling their products in third countries. Sources said GE would like to take over agents' work in selling Japanese heavy electric machinery in Latin America where they have better and stronger sales networks.

Sources attributed the reason for GE's inquiries to their judgement that the company might not be able to meet foreign demands once U.S. domestic demands are activated as a result of its reconstruction drive. Japanese makers also believe that it will be easier to export their products if they hold hands with GE in Latin America where President Reagan is attempting to upgrade its image and prestige.

Meanwhile, General Motors Corp. and Ford Motor Co. are planning to procure most of their factory equipment from Japanese makers. GM now has 150 industrial robots and would like to have 13,000 by 1990. Thus, Kawasaki Heavy Industries, Ltd., Japan's leading robot maker, has started to supply GM with newly-developed welding robots through its agent in the U.S., Unimation Inc. Sources said new investments of $76 billion will be needed to reconstruct America's ailing auto industry from 1980.

In the field of machine tools, new orders are pouring into Japanese makers from the U.S. Mitsubishi Heavy Industries, Ltd. has recently received orders from GM and Ford to make high-speed machine tools. Nachi-Fujikoshi Corp. received inquiries from Ford concerning a ¥20 billion contract for machine tool lines for autos. Hitachi Shipbuilding & Engineering Co. has just received an order from GM to construct two large presses.

In addition, GM has recently started to buy heavy volumes of high-quality, high-technology Japanese goods. GM used to

buy American goods, but changed their mind recently. The Japanese bearing industry will supply GM with 1 million bearings monthly in a long-term contract.

Moreover, one Japanese maker of auto accessories has received inquiries from GM concerning the purchase of large volumes of high-quality liquid crystal indicators, but the maker is wondering whether to accept GM's inquiries because the indicators are supplied to its affiliated automakers.

On the other hand, in the wake of President Reagan's order to decontrol oil prices, the U.S. majors, including Exxon Corp., Mobil Corp., and Standard Oil Co. of California, have started to expand their investment in oil development. As a result, sources said there will be an increasing demand for oil well pipes in the future. Sources estimated U.S. demand for oil well pipes will total 4-to-4.5 million tons annually in the next several years, but the supply in the U.S. is limited only to 3.5 million tons. Confronted with possible shortage of seamless pipes, the majors have recently concluded an agreement with Nippon Kokan K.K. to supply 2,000-to-2,500 tons of pipes annually. Sources also said Nippon Steel Corp., Sumitomo Metal Industries Ltd. and Kawasaki Steel Corp. are also concluding long-term agreements to supply pipes.

CSO: 4120/225

SCIENCE AND TECHNOLOGY

UPDATE ON JAPAN'S NUCLEAR POWER GENERATION PROGRAMS

Fuel Rod Safety

Tokyo NIKKAN KOGYO SHIMBUN in Japanese 22 Jan 81 p 5

[Text] Japan Atomic Energy Research Institute [JAERI] (director, Tsuneo Fujinami) has decided to engage in international joint research on the safety of high burnup fuel rods of over 30,000 megawatt/day/ton as a part of a study to improve the operation efficiency of the light water reactor, such as its load follow-up operation. It has already participated in the "Bechtel Project" sponsored by Bechtel Pacific Northwest Institute of the United States last November; in 1981, it will also participate in the "Superlamp Project" sponsored by Studsvik Energiteknik A.B. of Sweden.

The development of high performance fuel rods and securing of their safety data are indispensalbe elements in improving the comprehensive operation efficiency of nuclear power generation, as in extending the replacement cycle of fuels and in load follow-up operations, both of which the [Japanese] electric power industry expects to realize by the mid 1980's. Inasmuch as MITI is promoting the development of a reactor which will make output adjustment operation possible within its Third Improvement Standardization Plan beginning in fiscal 1981, the JAERI's joint international research is drawing much attention.

Accompanying the expansion in sharing nuclear power generation, and in order to provide efficient operation of electric power sources in the future, the output adjustment of nuclear units during the night has become a big problem. In addition, in order to increase the operation efficiency of nuclear generation, the lengthening of the fuel replacement cycle has also surfaced as one of the issues of the nuclear energy industry. This, however, is impossible with the design of the present fuel rods; it is necessary first to conduct tests on the behavior of fission products (FP) emerging from fuel pellets at high buring stages and on the reciprocal action of fuel and coating pipes; i.e., secure data from the standpoint of safety.

It is for this reason, that JAERI participated in the Bechtel Project and will participate in the Superlamp Project, both of which deal with high burnup fuel rods. All of this comes in addition to safety proving tests of normal burnup fuel rods (Halden, Demolamp, Interlamp, and Overlamp Projects) in which JAERI had been engaged as a part of its joint international research projects. JAERI plans to establish its own safety data on high burnup fuel rods by combining the data obtained by this joint international research and by irradiation tests in the Japanese material testing reactor (JMTR).

Bechtel Project: This project studies the discharge of FP gas at the time of high burnup of uranium dioxide sintered pellet fuels and the reciprocal action of high burnup fuel and zircaloy coated pipe. Already the U.S. group (Department of Energy, Electric Power Research Institute, Babcock and Wilcox Co., Nuclear Energy Regulatory Commission, General Electric, Combustion Engineering and Westinghouse) and European group (Babcock-Brown Boveri Reaktorbau GmbH, Great Britain Nuclear Energy Public Corp., Argentine Nuclear Power Commission, Kraftwerk Union AG, FRAMATOME S.A.) have begun the project since January 1980; the Japanese group (JAERI and Central Research Institute of Electric Power Industry, etc.) began its project in November 1980.

Since the partial maximum burnup level of actual fuel has, at the final stage of burning, reached as high as 50,000 megawatt/day/ton (collectively, an average of 28,000 megawatt/day/ton), the Japanese group is particularly interested in obtaining data on FP gas discharge in the fuel rods and on the behavior of the rods themselves.

The Bechtel Project will continue for 8 years/sic/ from 1980 to 1986; it will study fuel rods which have been irradiated up to 20,000-50,000 megawatt/day/ton in commercial reactors, and rods which have been irradiated up to a maximum 60,000 megawatt/day/ton. For the time being, Japan plans to participate in the first 4-year plan.

Superlamp Project: This project gathers the data for safety inspection, such as damage threshhold values of high burnup fuel rods. Countries participating in the project are Japan, Sweden, the United States, Italy, Norway, Denmark, Finland, and West Germany: the project will terminate at the end of December 1982.

The project, using the R-2 reactor of Studsvik Energiteknik A.B., will conduct "output rapid climbing tests" of fuel testing materials for pressure water reactors (PWR) and boiling water reactors (BWR) which have been irradiated in commercial reactors. The research will be on the interaction (PCI) of fuel pellets and coated pipes, and on damage threshhold values of fuel rods over 30,000-40,000 megawatt/day/ton for PWR and those over 30,000 megawatt/day/ton for BWR.

Advanced Boiling Water Reactor

Tokyo NIKKAN KOGYO SHIMBUN in Japanese 22 Jan 81 p 5

[Text] According to informed sources revealed on the 22nd, six electric power companies using boiling water reactors (BWR), such as Tokyo, Chubu, and Chugoku [electric power companies], have reached a basic agreement on joint development of a nuclear reactor (ABWR), an improved version made possible by the U.S. General Electric, Hitachi, Ltd., and Tokyo Shibaura Electric; an agreement will be signed next month.

The ABWR will be a radically improved version of the conventional BWR; it will be developed for the purposes of increasing its safety and for greatly raising the operation rates; its is, in other words, the "ultimate in BWR." Research and development will start as of next fiscal year and its actual utilization is expected in 3-5 years after conducting proving tests for installation of the re-cycling pump within the housing container; it is expected that Tokyo Electric Power Company and others will employ it in their newly built nuclear power plants. The Ministry of International Trade and Industry, on the other hand, has decided to adopt a policy

of wholeheartedly supporting this ABWR as development of a Japanese-made light water reactor, and the result of the development of the reactor is expected to greatly contribute to the "doing without oil" [policy].

The Policy Is for Tokyo Electric and Others to Use [the Reactor]

The six electric power companies, namely, Tokyo, Chūbu, Chūgoku, Hokuriku, Tōhoku, and Nippon Electric Power Company, all of which have been using BWR, will participate in the joint development of ABWR with G.E. In 1978, on G.E.'s proposal to improve the BWR, an advanced engineering team (AET) was formed, and general designing and research were conducted over the past 2 years. AET was a joint international development organization for nuclear reactors formed by the world's five BWR makers--G.E., Hitachi Ltd, Tokyo Shibaura, ASEA-ATOM (Sweden), and Ansaldo Mecchanico-Nucleare (AMN); in addition, Tokyo Electric Power Copmany participated as a user.

As of this year the research of the AET will enter a second stage (phase II) where proving tests will be conducted in preparation for commercialization; it is at this stage that the six Japanese electric power companies such as Tokyo Electric Power Company, all using BWR, will be participating.

The signing of the development agreement will take place next month between the six companies, G.E., Hitachi Ltd, and Tokyo Shibaura Electric.

The nuclear reactor to be developed at this stage will be one which will take advantage of the results of the research conducted by AET and will be called ABWR, signifying its improvements. ABWR is designed to radically enhance its safety and greatly improve its operation rates; it is an ultimate in BWR. Research and development will start as of next fiscal year; however, technologically, proving tests will be conducted for 1) installing the re-cycling pump in the housing container; 2) the possibility of load follow-up operations; and 3) structuring work that will facilitate periodic inspections. The reactor is expected to go into operation within the next 3 to 5 years.

In addition, it has already been determined that this ABWR will obtain a complete support of the Japanese Government as a part of technological development of the third improvement standardization [plan] which MITI will start as a 5-year plan as of next fiscal year. This means that MITI regards ABWR as an important successor to the present BWR and that it will actively guide the development of the reactor.

As far as nuclear energy is concerned it has been promoted as an "ace" in [research for] alternate energy sources for oil; however, due to anxiety over safety, its development has not been proceeding as planned. Since ABWR brings about radical improvement in terms of safety and operation rates, its early utilization is hoped for.

Nuclear Fusion Research Programs

Tokyo NIKKAN KOGYO SHIMBUN in Japanese 23 Jan 81 p 2

[Text] As of the 22nd, the Long-term Strategy Review Sub-committee (chaired by Shigeru Mori, director of the Japan Atomic Energy Research Institute) of the Japan Atomic Energy Commission's Nuclear Fusion Council has decided on a long-term strategy

for the development of a nuclear fusion reactor. At the core of the strategy is the completion of the latter half of the decade 1985-1995, of a research reactor of the 300,000 kilowatt heat output class that will realize self-ignition criterion. The reactor will succeed the critical plasma testing system (JT-60) now being built on the Tokamak model, the latter being the major force in the development of nuclear fusion reactors. By the end of February, a report will be compiled and approval obtained at the Nuclear Fusion Council. Also, the Japan Atomic Energy Commission will insert the results (of the Council) in the Long-term Atomic Energy Research Development Utilization Plan (Long-term Plan) scheduled to be completed (revised) this fall.

According to informed sources, the long-term strategy for the development of nuclear fusion reactors will center on the Tokamak model, but R & D will be advanced for its alternates such as the stellalato and mirror machine (both utilizing the magnetic field lock-in method) and the inertia lock-in method which uses laser. In particular, regarding the Tokamak type, the original long-term strategy compiled in April 1978 by the Nuclear Fusion Council had called for construction of a 100,000-300,000 kilowatt heat output core engineering testing system as a successor to the JT-60; however, the new strategy will eliminate this step and, by early 1985, move directly into construction of the research reactor capable of self-ignition; the reactor will be completed by the latter half of the decade 1985-1995.

This is because heat-adding, stability control, and impurity technologies for plasma have advanced beyond the 1978 expectations; also because it has been judged that information on the previously planned core engineering testing could be obtained from [1] the results of research and development of the revised JFT-2 system (to begin operation in 1983) which, parallel with the construction and operation of the JT-60, expected to be completed in 1984, will conduct non-circular plasma testings, [2] from research and development of super conducting coils; and [3] from international cooperation with countries possessing systems similar but larger than the JT-60, viz., the United States with its TFTR, Europe with JET, and Russia with T15.

Because of this, the development of the Tokamak type nuclear fusion reactor will go directly from JT-60 to the testing reactor; thereafter, the plan is to build a prototype of the 1 million kilowatt heat output class with electric output of 300,000-400,000 kilowatts, and finally to build a proving reactor of the 3 million kilowatt heat output class with electric output of 1 million kilowatts. The first reactor is expected to go into operation by 2010.

Furthermore, research and development will aim at the eliminating the conventional pulse operation type. Since it was found that plasma flow can be maintained by feeding high frequency waves to the plasma, that is, since it is possible to maintain continuous operation, testing of a large-type [reactor] with continuous operation will continue using the JFT2 revised system.

Committee on Nuclear Plant Robots

Tokyo NIKKAN KOGYO SHIMBUN in Japanese 30 Jan 81 p 9

[Text] Japan Industrial Robot Industry Association (chairman, Tsuneo Ando) has established a "Committee on the Development of Nuclear Plant Robots" (committee chairman, Prof Yoji Umetani, Tokyo Institute of Technology) to conduct research on automation of inspection and maintenance work in nuclear power plants. The first meeting will be held on the 30th.

The committee will conduct research on replacing workers with robots in order to cope with the problem of radioactive contamination by the former during regular inspections. More concretely, the research will aim at development of five robot systems, namely, "assembly," "transportation," "inspection and measurement," "cleaning," and "disassembly." In order to accomplish them, R & D will emphasize the development of 1) smaller and light weight robots, 2) multi-jointed arms, and 3) walking robots. This means that the development of robots for nuclear power plants will go into full-swing, supported by the nation as a whole and by the robot industry.

Once a year, nuclear plants are inspected rigorously, but the problems lie in [the danger of] radioactive contamination by the workers and the length of inspection periods. In the case of Tokyo Electric Power Company, the contamination level has been set at maximum of 3 rems per year (the maximum level worldwide is usually 5 rems). It is therefore, expected that demand for mechanization of inspection and maintenance work will further increase as the number of nuclear power plants increases in the future. For this reason, among the nuclear power plant makers, there are those who have developed ISI (inspection during period of actual operation) robots and actually adopted automatic fuel exchangers.

The reason for the establishment at this time of the committee on the development of nuclear plant robots within the [robot] industry association is to support the promotion of the government's nuclear power policy. Last November MITI established a committee to conduct "investigation and research on the future visions of nuclear power generation technology" (chairman, Prof Keiichi Oshima, Tokyo University). The committee's purpose is to clarify "problematic points in design concepts" and to create "future visions of light water reactors" in order to improve safety and reliability measures of light water reactors. Five central themes are involved in the creation of the vision: 1) improvement in performance, 2) facilitating dismantling of reactors, 3) improvement in quality control, 4) lowering contamination levels, an 5) substantial increase in plant safety. Of these, the robot industry association will cooperate in 4), the "lowering of contamination levels" by utilizing industrial robots.

Editorial on Nuclear Plant Site Selection

Tokyo NIKKAN KOGYO SHIMBUN in Japanese 30 Jan 81 p 2

[Text] At the cabinet meeting held at the end of last November the Japanese Government decided on "oil alternative energy supply targets," based on the Oil Alternative Energy Law. To achieve these targets, however, the major premise will be the promotion of the utilization of principal energy sources, i.e., nuclear power and coal. In reality, however, the utilization of nuclear power and coal is facing some difficulties--the former with respect to plant sites, the latter with disposal of ash. Both plans are making slow progress, so that already it is commonly viewed that the targets will be difficult to achieve. Of the two, the major obstacle is the difficulty in locating plant sites, and in order to ensure safe [procurement of] energy, it is necessary to supplement the [procurement] system by reviewing it from all angles. One of the reviews should involve considerable reduction in the government permit procedure period. Since this can be solved only through government efforts, we look forward to its earliest possible realization.

The alternative energy supply target hopes to replace 350 million kiloliters of oil with alternative energy sources by fiscal 1990; this would reduce dependency on oil to 50 percent. Needless to say, the major alternative energy sources are coal and nuclear power; they must supply, respectively, the equivalent of 123 million and 75.9 million kiloliters of oil. The difficulty with coal can be solved soon, since its supply base--China and Australia--has been established, leaving only the problems of expanding infra-structures, such as the overseas ports and disposal of ashes.

On the other hand, the prospect for nuclear power plant sites is extremely gloomy and the plant lead time defies common sense. The lead time for unit No 1 at respective power plants, compiled by The Federation of Electric Power Companies, is 186 months, or about 15 years, at Fukushima No 2 [plant], Kashiwazaki Kariu, and Kawauchi--all under construction--while at 10 existing locations it was on average only 97 months, i.e., about 8 years (from the application for survey, through the Power Development Council, construction, and finally to full operation). There is fear that this rapid increase in lead time may get worse in the future. On top of this, only three prefectures have newly established nuclear power plants in the past 10 years; this tells how difficult the establishment of new plant sites is in comparison with the expansion of [existing facilities].

When lead time increases in this manner, naturally the supply target cannot be achieved. The reason for this lies above all in anti-nuclear movements, but complex nature of paper work involved is also responsible. [Concerning the latter,] it is obvious how much of an obstacle it faces when we see that 33 laws and 66 permits are involved in the construction of a nuclear plant. When municipal levels are included, the procedures required would double; progress, therefore is extremely slow. Consequently, it is naturally the government's duty, for example, to promote simplification and unification [of procedures] by increasing the number of personnel in charge of environmental and safety investigations and by conducting these investigations simultaneously.

Measurement Apparatus Development

Tokyo NIKKAN KOGYO SHIMBUN in Japanese 31 Jan 81 p 1

[Text] For the purposes of reducing radioactive contamination of inspection workers at nuclear power plants and shortening inspection and maintenance time that are expected to increased in the future, MITI will start a 5-year plan from 1981 to develop a series of technology to reduce the level of contamination; the plan will emphasize the development of six automatic inspection apparati such as the automatic deep damage detector for welded portions of curved pipes and the automatic fuel inspection apparatus. The plan is called "Subsidized Project for Proving Tests of Automatic Inspection and Other Apparati for Power Generating Nuclear Reactors." According to MITI, the project will take 5 years with a total cost of about 4 billion yen, two-thirds of which is expected to be subsidized; 338 million yen has been appropriated for the first year. Informally MITI has selected Power Generating Thermal Engine Association (chairman, Toshio Yoshioka), as the recipient of the subsidy. After the formal budget approval the Association will go ahead with the development project, combining efforts of nuclear equipment and robot makers under its Nuclear Inspection Power Center.

The development of the six apparati will begin with the "automatic damage detector." A nuclear power plant, being a "jungle of pipes," has numerous places where pipes are curved and welded. The apparatus will automatically detect damages in welded

areas of primary curved pipes by using supersonic waves; the pipes range in size from major pipes of several cm in diameter to branch pipes of little more than 20 cm in diameter. R & D will also involve detection of damages by moving [the apparatus] coiled around the pipes and processing of data. Since damage detection of welded curved pipes constitutes about half of the entire inspection operation, the effect of automization will be great. As for the "control rod drive (CRD) automatic disassembly and inspection apparatus," proving tests will be made to determine its remote control system that would reduce radioactive contamination during CRP disassembly, cleaning, and inspection. The "automatic fuel inspection apparatus" examines and cleans current and spent fuel rods by remote control, that is, without removing the rods from the water in the reactor. This work was formerly done by removing the rods one by one; the new apparatus is an underwater camera similar to the gastrocamera. In addition development and proving tests of three kinds of automatic cleaning systems will be conducted--the "automatic cleaning apparatus," "primary crud (radioactive corrosives) removal apparatus," and "coolant radioactive gas removal apparatus."

The nuclear equipment and robot industries have already accumulated a certain degree of basic technologies, but the purpose of the 5-year plan is to complete automatic equipment capable of meeting inspection and maintenance work on actual nuclear power plants, by urging materialization of these apparati by instituting a new policy.

Fusion Research at Osaka University

Tokyo NIHON KEIZAI SHIMBUN in Japanese 2 Feb 81 p 14

[Text] An ambitious laser nuclear fusion plan, the best in Japan naturally and of top quality worldwide, is steadily progressing. This is the "diamond" project of the Laser Nuclear Fusion Research Center of Osaka University (director, Prof Chiyobei Yamanaka). Since 1972 with an investiment of 10.59 billion yen, the center has been developing two series of laser, the strongest in Japan; the glass laser, called "gekko" ["intense light"] and the carbon dioxide laser called "rekko" ["raging light"]; the center is located on the Senri Hill next to the old Expo site. A design for the future nuclear fusion power reactor, "Senri No 1," (electric output, 426,000 kilowatts) has also been completed.

The target for the 1st period (1980-84) of the Diamond Project is the completion of gekko XII (output 20 kilojules, 40 trillion watts). The center has already completed its element module, requiring only further reinforcement. The target for the 2nd period (1985-89) is the completion of a laser system with five-fold increase in output, or 100 kilojules. A system of this class should allow for laser nuclear fusion testing under the "break-even" (critical) condition, a condition which extracts output energy equal to input by irradiating deuterium fuel pellets of less than 5 mm in diameter with single wave length laser beams that are a million times brighter than the sun, and by raising the temperature [of the pellets] to super high 100 million degrees C and [thus] igniting the nuclear fusion reaction.

The critical state of the 2nd period, in terms of Tokamak nuclear fusion system, is equivalent to that of "JT-60" belonging to the Japan Atomic Energy Research Institute. The target for the 3rd period is a laser system of output 1 megajule and 200 trillion watts; this is a demonstration nuclear fusion reactor equivalent to Tokamak type "INTOR." The 4th period will see the completion of an actual nuclear fusion power generating reactor. Its concept design, "Senri No 1," has already been compiled by a committee composed of manufacturers and electric power companies.

Senri No 1 has heat output of 1.24 million kilowatts and electric output of 496,000 kilowatts. After deducting [electric] consumption by the institute, equal to 70,000 kilowatts, net output will be 426,000 kilowatts and heat efficiency rate, 34.3 percent. The core of the reactor is in the shape of a stainless globe 10 meters in diameter. From eight directions eight intense laser beams with total output of 1-5 megajules meet at the center of the core and irradiate. From above fuel pellets coated with a mixture of deuterium and tritium are shot to the center; the temperature is raised to 100 million C°, causing nuclear fusion to take place at 1 second intervals.

The problem is how to extract the nuclear fusion energy produced at extremely high termperature of 100 million C°. Seventy percent [of the energy] is neutron and 30 percent, x-ray, Senri No 1 uses three types of coolants--1) liquid lithium, 2) liquid natrium, and 3) water--to extract nuclear fusion energy in heat form; the heat produces steam 540 C° and 200 atmospheric pressure, which then turns the turbine. The liquid lithium coolant is 70 cm thick and circulates the reactor body; it protects the walls of the reactor by simultaneously removing the heat and absorbing the radiation.

In comparison with the Tokamak type, the laser nuclear fusion is structurally far simpler: 1) lower degree of vacuum is admissable, 2) magnetic field is unnecessary (large electro magnetic such as superconduction coils are unnecessary), 3) no problem with plasma lock-in hours (fuel pellets are used from the beginning). In laser fusion, however, "It is indispensable to increase the output of light source laser, make the processing of fuel pellets more precise, improve on the guidance light of laser beams and on the supply mechanism of pellets, etc." (director Yamanaka)

The glass laser "Sheba" (1978) of Lawrence Livermore Research Institute of the United States has an output of 10 kilojules. "Nova" which is expected to be completed in 1984 has an output of 300 kilojules. [For both cases,] Japanese (Hoya Glass) glass is used. Although the Japanese technology is high, Osaka University Center has [only] 30 employees, 90 if outside help and students are included. Funds of 6-10 billion yen for the 1st period are needed, 100 billion yen for the 2nd period. The budget for the fiscal 1981, however, is still on the 20 billion yen level. Therefore in comparison with the 28 billion yen for the JT-60, it is small by one less digit.

Osaka University Center has been successful in producing nuclear fusion reaction neutrons by using giant lasers of the present Gekko IV (2 kilojules, 4 trillion watts) and Rekko III (10 kilojules, 1 trillion watts) to irradiate the pellets and compressing them two hundred-fold.

Toden's Cleaning Technology

Tokyo NIHON KEIZAI SHIMBUN in Japanese 2 Feb 81 p 1

[Text] Tokyo Electric Power Co Ltd [Toden] has now technologically acquired a firm footing on a "system cleaning" which will decrease the level of radioactivity in the entire power generation system of a nuclear power plant. Not only for the purpose of nuclear generation but also for the purpose of eliminating contamination of workers, the technological development of system cleaning has been an urgent issue. The company will compile a final report on the cleaning method and its cost by this summer. Concerning its implementation, however, since there is no previous case of system cleaning anywhere in the world, specific period of enforcement and target power generation units remain undecided.

In 1976 Tokyo Electric Power established a cleaning committee by appointing the director of the Nuclear Power Management Dept. as its committee chairman. The company also invited as members experts from Tokyo Shibaura Electric, Ebara Infilco Co Ltd (headquarters, Tokyo; president, Ichiro Yoshihara, capital, 540 million yen), and Central Research Institute of Electric Power Industry; they have been engaged in research on system cleaning ever since.

The contents of the research are, 1) estimate on the contamination level of target units, 2) cleaning method and selection of cleaning agents, 3) waste liquid and waste material disposal method, 4) estimate of cost and the number of days required for cleaning, and 5) predictions on cleaning effectiveness. As target units, the committee has selected Fukushima First Nuclear Generation Model No 1 (output 460,000 kilowatts) whose contamination level by radioactive material is comparatively high and Model No 3 (output 784,000 kilwatts) whose contamination level is relatively low.

Studies up to now show that the most effective cleaning method is by means of chemical agents; both the "Candicon method and what is commonly referred to as the "Driesden method" are prominent candidates.

The Candicon method was developed by Canadian Nuclear Power Public Corp to clean heavy water reactors; it uses relatively weak chemicals to remove "radioactive grime" accumulated on distribution pipes, and collects it by means of a filter and ion exchange resin. Since the chemical used is weak, a coefficient of cleaning (value obtained from dividing the level of contamination before cleaning by the level after cleaning) is 10, which is relatively low; the amount of waste material produced, however, is small.

The Driesden method uses a relatively strong chemical agent called "NS1" developed by Dow Chemical of the United States for the purpose of cleaning Driesden Nuclear Power Generator Model No 1; it removes "grime" by disolving it in the chemical. The coefficiency of cleaning is expected to be about 100, but since the chemical itself becomes radioactive, the amount of waste material increases.

The final report will recommend a multiple cleaning method and the cost is expected to reach several hundred million to serveral billion yen. Although Toden states that, "when the report is compiled, our technological preparation on system cleaning is done," (Nuclear Energy Management Dept.) it would seem that further high level management analysis is necessary before the system can be applied.

Nuclear Plant Robot Industry

Tokyo NIKKEI SANGYO SHIMBUN in Japanese 3 Feb 81 p 8

[Text] Industrial robot manufacturers have begun to make a move toward the development of nuclear plant robots. It would be a system in which intelligent robots will perform the work of maintenance, inspection, repair, and disassembly of nuclear power reactors; it will be a result of full utilization of rapidly advancing microcomputer technology. Research and development will start with the goal of realizing unmanned operation of nuclear power plants in the future. Recently, the Japan Industrial Robot Industry Association (chairman, Hikoo Ando) gathered 14 manufacturers from various

industries such as robot technology, nuclear reactor, engineering, and electric power plant, and established the "Nuclear Plant Robot Development Committee." The committee will develop new robots. The Ministry of International Trade and Industry, which has already instituted a national project for nuclear power generation support system development, intends to actively support such a movement in the robot industry.

Aims at Unmanned Operation

Comprehensive electric and heavy machinery manufacturers including Hitachi Ltd, Tokyo Shibaura Electric, Mitsubishi Heavy Industries, Ishikawajima-Harima Heavy Industries, Kobe Steel Ltd, Daido Steel Co Ltd, and Meidensha Electric Mfg Co Ltd are committee participants. In addition, Japan Atomic Power Company and Tokyo Electric Power Company, MITI, universities, and research institutes will participate.

The committee held its first meeting on January 30. Later it will define the problems in the development of robots and determine the enterprise which will be responsible for development of separate themes.

There are five targets for R & D: assembly robots, transporting robots, inspecting and measuring robots, cleaning robots, and disassembly robots. Each robot will be equipped with microcomputers so as to perform numerous operations. The research issues common to all robots are, miniaturization, light weight, development of multi-joint arms and walking mechanism, sensor systems such as vision and touch, remote control technology, and development of software. These developments will enable robots to open and close valves inside the reactor, and repair breakdowns. Because of this, operation rates of nuclear power plants will improve and electric cost will decrease. Also, radioactive contamination of workers will decrease. Furthermore, since the number of nuclear power plants that must be disassembled will increase in the future, robots capable of such operation will be developed.

Thus far, work within a nuclear reactor was done in the main by either stopping the reactor and workers entering it in turn to perform a desired operation, or by remote control manipulators.

In the United States, during the Three Mile Island mishap, a robot called "Herman" played an important role in collecting contaminated sample water from the primary coolant. It is reported however that Herman did not enter the reactor proper; therefore, even in the United States, the development of a robot which can perform emergency work inside a reactor is only beginning.

In Japan, since the end of last year, MITI has initiated the development of a nuclear power generation support system. Included among the projects are the development of a mid-air inspection robot, surface inspection robot, and inspection manipulator; the three robots will be developed by Hitachi, Tokyo Shibaura Electric, and Mitsubishi Heavy Industries, respectively. In addition, since the present establishment of the committee means that major robot manufacturers and related industries have joined hands in active development of robots, the intensity of research in unmanned operation of nuclear power plants is expected to rise sharply.

Multi-Purpose High-Temperature Gas Reactor

Tokyo NIKKEI SANGYO SHIMBUN in Japanese 4 Feb 81 p 16

[Text] Since this year, Japan Atomic Energy Research Institute [JAERI], which has been promoting a development plan for a multi-purpose high-temperature gas reactor, has begun a detailed design study of a 50,000 kilowatt heat output research reactor. As for next year, the Institute has decided to make further design studies. Since the nuclear power steel project of MITI's Agency of Industrial Science and Technology, which had originally aimed at utilization of heat from nuclear reactor into manufacturing of steel, will terminate by the end of the present fiscal year, the outlook on the development of multi-purpose high-temperature gas reactor is not promising. However, since JAERI considers "the utilization of nuclear reactor other than for power generation, a thing of the future," it intends to engage actively in R & D of a research reactor.

The multi-purpose high-temperature gas reactor supplies heat produced in the core of a nuclear reactor not only for power generation but also for production of steel and chemicals, for energy manufacturing, and for local heating and air-conditioning. The JAERI is particularly interested in the possibility of extracting 1,000 C° heat from the reactor; if this is realized the following become a possibility: direct steel manufacturing using reduction gas, gasification and liquifaction of coal, resolution of naphtha, manufacturing of ethylene, manufacturing of hydrogen by thermochemical analysis of water, and direct cycle power generation with high heat efficiency using helium gas turbine.

Because of this, since 1969 JAERI has been engaged in R & D of major multi-purpose high-temperature gas reactor technologies involving fuel, materials, and high-temperature equipment; since 1978 it has been constructing a large structure equipment proving test loop (HENDEL) at the Tokai Research Institute in Tokaimura, Ibaragi prefecture; the purpose of the loop is to establish the large structure equipment technology that would be used in the construction of the gas reactor. Based on the results obtained from above, it has begun a detailed design of a research reactor as of this fiscal year.

According to the designs thus far drafted by JAERI, the research reactor has an energy output of 50,000 kilowatts. Its major features are the use of low condensed uranium as fuel, helium gas coolant, and the use of grain-sized fuel in a graphite moderated reactor.

These fuel pellets are called "coated fuel particles" that are less than 1 mm in diameter. Its core, consisting of uranium dioxide or uranium carbide, is coated with three or four thin layers of special carbon and silicon. This coating protects the uranium and at the same time prevents leakage of fission product (FP).

The fuel is made of coated fuel particles solidified by burning them with graphite; JAERI is considering a system whereby the core would be composed of multi-layer hexagonal graphite blocks arranged horizontally and vertically; each block is filled with short cylindrical fuel cells.

Because carbon and silicon coatings resist and conduct heat equally well, they are capable of withstanding temperatures of over 1,000 C°; the high heat produced inside the core can be taken outside the reactor by chemically stable helium gas.

Concerning the research ractor, in fiscal 1979 JAERI ordered a comprehensive system design (concept design) from major nuclear equipment manufacturers headed by Fuji Electric Co Ltd; the design was completed last year. The present detailed design will detail the structural design of each equipment as well as the overall operation and safety plans of the entire plant. JAERI intends to conduct critical experiments as early as 1988.

"Nuclear Fusion Federation Lecture Series" to Be Held

Beginning on the 4th, the 2nd Nuclear Fusion Federation Lecture Series, wherein Japan's latest findings on nuclear fusion research are presented, will be held for 3 days at Tsukuba Research Center of the Agency of Industrial Technology and Science, located in Tsukuba, Ibaragi prefecture.

The lecture series is sponsored by Nuclear Fusion Group, which is made up of nuclear fusion researchers in Japan, by Applied Physics Society, Electric Society, Japan Metal Society, Japan Nuclear Society, and Japan Physics Society. The last lecture was held in January 1978 at Tsukuba Annex of the National Education Hall in Tsukuba. During the 3-day period, five special lectures, four panel discussion and 253 general research presentations ("poster" presentation) are planned and the participants are expected to number about 550.

The emphasis in R & D of nuclear fusion is now moving from plasma physics to engineering research aimed at actual application. Reflecting such a trend, the present lecture series will emphasize the role of nuclear fusion development in resolving energy problem, nuclear fusion reactor designs, the problem of tritium as fuel, and other problems surrounding the realization of nuclear fusion reactor.

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CSO: 4105/115

SCIENCE AND TECHNOLOGY

JAPANESE TO START NEGOTIATIONS WITH SOVIETS ON LARGE DIAMETER PIPE

Tokyo NIKKEI SANGYO SHIMBUN in Japanese 22 Apr 81 p 3

[Article: "Business Negotiations With Soviets on Large Diameter Steel Pipe; Independent of the Yamburg Project; Will Soon Send Negotiating Team to Begin Regular Commercial Negotiation"]

[Text] Four steel pipe producers, including Nippon Steel Corporation, have decided to proceed with business negotiations with the Soviets to export large diameter steel pipe to the Soviet Union without explicitly tying the exports to the Yamburg gas pipeline project. They will dispatch a working level negotiating team to Moscow as early as the 27th. West Germany considered that it would take a long time to complete a business deal related to the Yamburg Project because of U.S. interference. Thus, the Germans made a 550,000 ton steel pipe deal with the Soviets which was not explicitly tied to the project. In view of this fact, the Japanese have also hastily decided to begin negotiations with the Soviets to conclude a similar agreement.

West European steel producers were convinced that it would take a long time to complete the deal on the Yamburg pipeline project, which is to supply natural gas from Western Siberia to West Europe. One of the reasons is that the United States believes this project will create a national security problem and therefore is applying pressure on West Europe. Another reason is that negotiations on the financing are having rough going. Thus, Mannesmann Co. of West Germany out of desperation proposed to the Soviets that "we would like to conclude a regular commercial deal without explicitly tying it to the natural gas pipeline deal." The Soviets and West Germans reached an agreement on the condition that the West Germans will make shipments of the goods in the latter half of this year.

The Yamburg deal may drag on till the end of this year. If Japan must wait for it to be concluded, Japanese steel pipe exports to the Soviet Union will cease after July 1981 when the FY80 export contract with the Soviet Union expires. Therefore, the Japanese have decided to go ahead with regular commercial negotiations as the Germans did to continue exports of steel pipe to the Soviet Union through the latter half of this year. Nippon Steel Corp and three other steel pipe producers had discussions with the Soviets at the end of March, and reached a general agreement that "Japan will export to the Soviet Union 3.5 million tons of large diameter steel pipe over the next 4 years." The four steel pipe producers expect to have sales of 500,000 tons this year. Even if the Japanese proceed with the negotiations in a regular commercial manner, however, the deal still requires a loan from the

Export-Import Bank of Japan. Thus, the four steel pipe producers are talking to the bank while negotiating with the Soviets. It is doubtful, however, that the loan amount will be decided by the 27th. Therefore, the chances are small that the amount of steel pipe to be exported and the price will be agreed on within this negotiating session.

CSO: 4105/159

SCIENCE AND TECHNOLOGY

PROS, CONS OF PARTICIPATION IN SOVIET YAMBURG PROJECT

Tokyo NIHON KEIZAI SHIMBUN in Japanese 25 Apr 81 p 5

[Article: "Yamburg Project Is a Litmas Test for the Evaluation of the Soviet Union"]

[Text] Some say, "It is dangerous not to give bait to a hungry bear." Others say, "While you think that you are feeding him, you yourself may be dragged into his cage without knowing it." These opinions are quietly but heatedly being exchanged among the Western developed countries at present. The "bear" means the Soviet Union, and the "bait" is a loan which European countries are to give to the Soviet Union in exchange for the supply of natural gas buried in large volume in Yamburg in Western Siberia. The "Yamburg issue" has become a litmus test to measure the Western countries attitude toward the Soviet Union.

The Yamburg Project is to lay out 5,000 km-long pipelines from Yamburg in Western Siberia to eight European countries, West Germany, France, Holland, Italy, Belgium, Austria, Sweden and Switzerland, and to supply to these countries 40 billion m^3 of natural gas per year over the next 20 years. This is the biggest business deal ever to be made between the East and West. The Soviets are proceeding with Western banks to obtain a 4.7 billion dollar loan over the next 10 years, and are inquiring about the purchase of large diameter steel pipe and equipment parts from the Japanese.

Centering on this Yamburg Project, opinions generally fall into two categories:

The cautious opinion: If this project is completed, Soviet supplies would constitute 20 percent of natural gas imported by the West European countries. In West Germany, the ratio of Soviet gas to the total natural gas consumption would be the largest among the West European countries, and would reach 30 percent by 1990. The NATO countries which are supposed to stand up against the Soviet Union would inevitably and heavily depend upon Soviet energy supplies.

If they help the Soviet Union in its economic development, it would eventually result in helping the Soviets expand their military forces. The Soviets are expansionists who try to increase their power whenever possible, and thus, they must be contained.

The positive opinion: Soviet economy has already been depressed, and the Soviets will soon have a difficulty in supplying necessary energy to the Communist community. If the Eastern bloc is forced into a severe shortage of foreign currency, there is a danger that it would eventually use its military forces to invade oil producing

countries, including Middle Eastern countries and African countries. If Western countries establish economic cooperation with the Soviet Union, avoiding the total dependency on the Soviet Union, the Soviets probably would not start a political adventure that would sacrifice their economic gain.

The United States under the Reagan Administration is the strongest advocate of the cautious opinion. The United States has conveyed its concern to those Western leaders who visited Washington this spring, and it intends to discuss this issue with Chancellor Schmidt of West Germany who is visiting the United States this May. Because Japan is not a direct recipient of Soviet natural gas, the United States is not demanding self-discipline from Japan as explicitly as from European countries. According to the U.S. Department of State sources, however, the U.S. Administration will discuss with Prime Minister Suzuki when he visits Washington, Japanese perceptions of Soviet policy.

There are differences of opinions among West European nations depending upon the characteristics of administrations and leaders, but roughly speaking, those countries that are located geographically distant from the borders of the Eastern countries tend to have a cautious opinion, and West Germany which shares its national border with East Germany has the most positive opinion. France has also participated in the Yamburg Project, but it is considered that France intends to minimize its scale of participation in response to the U.S. request.

Similarly, those countries which heavily depend on foreign energy sources tend to have a positive opinion. Even at the energy specialist conference recently held in Brussels under NATO sponsorship, the majority of European countries held a positive opinion that "the Yamburg Project is mutually beneficial both for the East and the West."

What is confusing to the Japanese and Europeans is the fact that the superpower United States that can influence the Soviet Union most strongly is located furthest from the Soviet Union and also has considerably higher energy self-sufficiency. Therefore, European countries are dissatisfied with the U.S. interference, saying that "the United States is only concerned with increasing its authority over the Soviet Union, and does not try to understand that both national security and economic benefit can be attained by this deal." On the other hand, there are opinions in the United States that "European countries are engrossed over the immediate economic gain and are approaching communism." Whatever the conclusion may be, it may take a long time for these discussions to come to a conclusion.

CSO: 4105/161

SCIENCE AND TECHNOLOGY

SHAKY SOVIET YAMBURG PIPELINE PROJECT

Tokyo NIKKEI SANGYO SHIMBUN in Japanese 19 Mar 81 p 3

[Interview with Yutaka Saito, executive director of Nippon Steel Corporation, by Sasaki, reporter of the newspaper]

[Text] The U.S. has warned West European countries that national security problems are involved in the Soviet plan to construct pipelines to supply natural gas from Yamburg in Siberia to West European countries. This issue has stirred up stormy reactions in the Western world. In Japan, the Export-Import Bank of Japan is studying a proposed loan of 3 billion dollars to the Soviet Union. On the 23d, Deputy Director Komarov of the Foreign Exchange Bureau of the Soviet Foreign Trade Ministry will visit Japan. The Japanese iron and steel and machinery industries are greatly concerned about the situations in Europe and the U.S., but are still interested in the Yamburg business deal, and are enthusiastically collecting information. Executive Director Yutaka Saito of Nippon Steel Corp stated that "West Germany and France have reached a fundamental agreement with the Soviet Union on a loan, but they have not signed the agreement." He also speculated that "the United States probably cannot succeed in checking West Europe."

[Question] The U.S. Government insists that a national security problem would be created if West European countries depend on Soviet energy supplies. Can the United States stop the European countries?

[Answer] I just met the West Germans on the 16th, and they told me that Yamburg natural gas will constitute no more than 2.5 percent of all the energy consumption in West Germany. The U.S. Government, however, seems to be worried that by this natural gas supply deal, the Western world's economic sanctions against the Soviet Union will be ineffective, and therefore, the Western world will not be able to confront the Soviet Union. Despite the U.S. objection, Western European countries are proceeding with negotiations with the Soviet Union. In view of this fact, it is probably difficult for the United States to stop the West European countries.

West Germany appears to be thinking that the United States will not try to oppose them too strongly because West Germany will depend on the Soviet Union for only 2.5 percent of its energy. The Germans appear to think that the United States can be persuaded based on this fact.

[Question] There is a report that West Germany and France have already signed a loan agreement. Is it true?

[Answer] At this stage, they have just agreed on a general financial arrangement, but have not signed it yet. The condition of the financing is an interest rate of 7.75 percent per annum unredeemable for 5 years, but it does not appear definite yet. Total credits from the European countries will be about 12 billion dollars. The reason why they cannot sign it is because they have not agreed on the sales price of the natural gas. They have not decided if they should cancel the difference between the loan interest rate and the open market interest rate by discounting the gas price, or if they should include the difference in the sales price of the steel pipe which they will sell to the Soviets. Business negotiations on individual goods have not yet started.

[Question] It is reported that the loan from the Export-Import Bank of Japan to the Soviet Union is 3 billion collars. According to a report, Deputy Director Komarov of Foreign Exchange Bureau of the Soviet Foreign Trade Ministry will visit Japan and talk with the bank officials. I wonder if they can get into concrete negotiations?

[Answer] The Soviets have inquired about a 3 billion dollar loan, but they have not told us what or what volume they wanted to buy. They just want a 3 billion dollar loan for the Yamburg Project, but the Export-Import Bank of Japan is not considering such a loan. Deputy Director Komarov will probably talk about the loan with the bank people. However, they cannot talk about a concrete financial arrangement until West European countries settle their arrangement first.

[Question] How much chance is there for the iron and steel industry to export steel products to Yamburg?

[Answer] There is no concrete proposal from the Soviets. Japan has had a record of exporting 750,000 tons of large diameter steel pipe to the Soviet Union annually during the past 4 years. We have informed the Soviets that we have a supply capability of 1 million tons per year.

The Yamburg Project is to produce 64 million m^3 of natural gas annually and is to supply West European countries including West Germany with 58 billion m^3 per year. The Soviets plan to pay for the construction expenses and steel pipe costs from the natural gas sales. Therefore, this business deal is totally centered around West European countries, and Japan's role is just to supply what West Euorpe cannot supply. Because the Soviets have set priority on the Yamburg Project, all business negotiations on steel product exports have been suspended. Japan very much wants to export to the Soviet Union, but such are the characteristics of the project.

Japan cannot move ahead until Western Europe and the Soviet Union have come to a settlement. The United States cannot say no to Japan after Western Europe has decided on it. Western Europe is the deciding factor.

Sophisticated Strategy for a Large-Scale Business Deal

Executive Director Saito served as president of Nippon Steel Corporation in the United States, and is familiar with the U.S. situation. The United States is asking West European countries to reconsider their participation in the Yamburg Project. Executive Director Saito states that "the East and West exchange is becoming more active. We cannot fight a war any more. If we have trouble, the whole world will be unhappy." Thus, Saito stresses the fact that the West and East are mutually interdependent economically and regards the U.S. position as unreasonable.

The Yamburg Project will construct 5,000 km long pipelines to contain a pressure of 75 atmospheres, and will require a sum of about 30 billion dollars (6.3 trillion yen) to complete. Aside from the U.S. concern that the Western camp will be weakened politically, this project also will have a great influence on the world economy. For West European countries which are suffering from depression, this large-scale business deal is like a rainfall eagerly awaited. Executive Director Saito's view is that it will be difficult for the United States to stop Western Europe, and this view sounds reasonable in view of the current West's situation. Japan expects a business deal of about 3 million tons of steel pipe, which amounts to 3 billion dollars, because West European countries cannot supply all that the Soviets want. Thus, Executive Director Saito's opinion that "We will just wait for the West European settlement. Until then, we will wait calmly and quietly" can be said to be a sophisticated strategy.

CSO: 4105/156

SCIENCE AND TECHNOLOGY

YAMBURG PROJECT NEGOTIATIONS TO BEGIN AT END OF APRIL

Tokyo NIHON KOGYO SHIMBUN in Japanese 17 Apr 81 p 1

[Article: "A 500,000-ton Deal This Year; Large Diameter Pipe for Yamburg in the Soviet Union; Business Negotiations Start at the end of This Month"]

[Text] According to disclosures by concerned parties on the 16th, business negotiations for the sale of large diameter steel pipe for the Yamburg Project in the Soviet Union is expected to begin at the end of this month. Japanese trade executives will visit the Soviet Union, and an executive of the Soviet Iron and Steel Export and Import Corporation is expected to visit Japan at the end of this month. Business negotiations will be held independently of negotiations on the Yamburg Project and will be in the form of a regular commercial deal that is usually negotiated each year. The volume of the deal is speculated to amount to 500,000 tons this year beginning in July.

The Yamburg Project deal was proposed by the Soviets last July on the condition that the Export-Import Bank of Japan provide a 3 billion dollar loan.

The main items in the deal include large diameter steel pipe and gas booster turbine stations, which are to be the heart of the Yamburg Project. The Japanese Government, however, has shown reluctance about the deal because it was so large in scale and anti-Soviet economic sanctions were continuing. Thus, the deal has been deadlocked.

The Soviets were pressuring the Japanese for a time saying that if the Japanese will not conclude the Yamburg Project deal they will stop importing large diameter steel pipe which is negotiated in the form of a regular commercial deal each year.

West Germany concluded a deal with the Soviet Union independently of the Yamburg Project deal to export large diameter steel pipe, however. Thus, the Japanese iron and steel industry decided to move ahead with a business deal with the Soviets arranged in a similar manner.

Parties concerned speculate that if they proceed with this deal separately from the Yamburg deal they can export 500,000 tons of steel pipe this year beginning in July.

CSO: 4105/158

SCIENCE AND TECHNOLOGY

SOVIET YAMBURG PIPELINE PROJECT TO BE DISCUSSED IN TOKYO SOON

Tokyo NIHON KEIZAI SHIMBUN in Japanese 22 May 81 p 3

[Article: "Soviets May Make Concrete Proposals; Yamburg Pipelines; Tokyo Negotiations Beginning on the 24th"]

[Text] This week in Tokyo, Japan and the Soviet Union will hold their first full-scale discussion on the Soviet project for laying out 5,000 km long natural gas pipelines to connect Western Europe and Western Siberia (the Yamburg Project). The Soviet Union will dispatch Deputy Director Komarov of the Foreign Exchange Bureau of the Soviet Foreign Trade Ministry, and Director General Afanasyev of the Soviet Iron and Steel Export and Import Corporation. They will hold talks with the Export-Import Bank of Japan and the iron and steel industry, respectively, beginning on the 24th.

The Soviets consider the 12 billion dollar [sic] Yamburg Project to be the core project in their current 5 year plan (1981-1985). The Soviets want to finalize their negotiations with the Japanese at the earliest opportunity because they want to plan for the future, and therefore, the Sovietsare expected to make very concrete proposals and explanations about the amount to be financed, the interest rate and the conditions for the import of large diameter steel pipeline.

Initially, Undersecretary Ivanov (in charge of finance) of the Foreign Trade Ministry was scheduled to visit Japan for the negotiations. The Reagan Administration of the United States recently asked the Western countries for "a discreet attitude" toward the Yamburg Project; however, this project has become politically sensitive. The Soviets did not want to irritate the United States and Japan excessively, and therefore, they decided to send Deputy Director Komalov to Japan.

The Soviets criticized the United States on the 19th in the Communist Party organ PRAVDA, "The United States is increasing its pressure on Western Europe and Japan in order to restrict and complicate the loan agreement for the energy development project in Siberia." It can be said that this is a manifestation of the Soviet concern about the fact that the Yamburg Project has become a political problem between Japan, the U.S. and Western Europe, and the realization that this project is going to be delayed. Observers in Moscow speculate that the Soviets wish to have a credit line for a total amount of 3 billion dollars at an annual interest rate of 7.5 percent. Deputy Director Komarov reportedly told Japanese trading houses that "the interest on West Germany's loan of 10 billion DM to the Soviet Union was decided to be 7.5 percent." It is said that he showed his intention to ask for a similar deal from the Japanese. With regard to the amount of loan, some speculate that the Soviets may demand more than the 3 billion dollars which was initially expected.

CSO: 4105/157

SCIENCE AND TECHNOLOGY

NEW MATERIALS REVOLUTIONIZING INDUSTRY

Tokyo NIKKEI BUSINESS in Japanese 26 Jan 81 pp 188-192

[Text] Maximum Processing, Multiple Functions, and Complex Compounding; the Limits of Material Change Are Expanding; Designs Conform to Users' Tastes

Let us first exercise our minds: imagine flowers in bloom in a meadow. What would you do with them?

Ordinarily, your response would be, "put them in a vase." There are, of course, other answers. If one were to dry them, one could preserve them for a long time as dried flowers. A person with a hearty appetite might want to boil them and eat them. Perhaps a dryer might want to grind them for dyes; a beekeeper might consider extracting nectar. The same flower can be dried, boiled, ground, or the purity of certain of its parts raised; a number of different uses can therefore open up.

Recently, the phrase, "material revolution" has gained wide currency. Being a revolution, its impact should have reached every nook and cranny of the industries, but somehow it has not come across too clearly. Let me, therefore, in conjunction with our mental exercise above, try to explain the degree of impact of this material revolution.

The uniqueness of the present material revolution is said to consist of three factors: "maximum processing," "multiple functions," and "complex compounding." These require further explanation. "Maximum processing" refers to the fact that conditions and technologies for processing various materials, such as extremes in pressure and temperature or microminiaturization, in general have become extremely sharpened. This means that the scope within which changes can be imposed on materials has greatly expanded, exactly as in improving the techniques for drying and grinding the flowers.

As a result, it has now become possible to attribute various nondecorative functions--such as dyes, food, etc--to the flower, about which heretofore it had been considered "sufficient merely to grow strong and last long." Not very romantic, but this is what is meant by "multiple functions," the second characteristic of the material revolution.

The third factor, "complex compounding," refers to the process, for example, of encasing a flower in plastic to make an accessory or extracting the scent and dissolving it in oil to make perfume. It means that by linking one material with another, products can be freely designed and distributed that conform to the tastes of the users.

How then do these changes in materials affect every nook and cranny of the industries? The answer is simple. No matter how sharp the techniques for grinding flowers and extracting scents become, they are like the miser's gold buried in the ground if there are no dyers and perfume makers. In other words, in the present material revolution, what is significant is not only the technology of the makers of new materials, but also the creative ideas of a countless number of users who take advantage of this technology. That is to say, the time has come when a person who has never thought of flowers as raw materials can, by some chance conception, develop a revolutionary product. Let me give one example.

Carbon Fiber Six Times as Strong as Steel Is a Hit

Carbon fiber is one of the new materials in the textile industry. It is an industrial fiber as light as aluminum and six times as strong as steel of similar weight. The world's largest carbon fiber manufacturer is Toray Industries (monthly production, 35 tons); it developed and began marketing the fiber about 10 years ago. At that time the price was high, and despite the fact that it was a high-performance material, demand was minimal. There was, however, one company that showed extreme interest in the product, the Olympic Fishing Tackle. The fiber was used, of course, for fishing rods. The two companies began joint research and succeeded in merchandising the rods. The carbon rod has become such a hit that now whenever one speaks of fishing rods, the reference is principally to the carbon products, as it is in golf clubs and tennis rackets.

The linkage between a fiber company, a tackle maker, and a sporting goods maker is something that was previously unheard of. In the future, there is a strong possibility that the application of carbon fiber, in combination with metals and plastics, will expand to include tanks, ships, airplanes, and automobile bodies. Toray has already entered into joint research with a car manufacturer and others.

From this, it can be seen that industries, though previously unrelated, must become aware of each other if they want to grasp "business opportunities." This is the first noticeable feature of the new materials.

New Materials Plus New Usage; Large-Scale Market Formed Overnight; Dentures To Overtake Automobile Industry

Now to show how large a market can be formed when a new material is linked with a new usage, it goes as follows:

--If Japan were to use copper wire to popularize the use of TV telephones, this alone would require the import of huge volumes of copper, equal to 60 percent of the world's usable supply of copper. For all practical purposes this is

impossible; but it can be done easily if optical communication (optical fiber) using glass fiber instead of copper wire is used. One forecast predicts that the market for optical communication would reach some 400-500 billion yen by 1985.

--Dentures today are made of ceramics. A set of dentures costs 500,000 yen. If, in accordance with the predicted increase in the population of the aged, there is one person above the age of 65 in each household in Japan by the 21st century, then it is possible that as long as the price of dentures remains the same, the market for it will surpass that of automobile. The cost will naturally come down with advances in technology; but either way it is unmistakable that the dentures market will become a large one.

--In 1979, Japan imported industrial diamonds worth 16 billion yen, or 19.26 million karats. This included synthetic diamonds worth 10 billion yen. In the future, with advances in super high pressure technology, new materials that are hard and superior in electrical insulation and thermoelectric conductivity will create a number of markets similar to those now handling synthetic diamonds.

There are other reasons why new materials are attracting attention. Among these, we cannot forget the fact that these materials are closely connected with bringing together the top brains.

Director Akira Sekimoto of the planning division of Japan Synthetic Rubber says: "Our pressure conduction rubber is used in calculator and word processor switches. Our cost breakdown is as follows: raw materials and other fluctuating expenses, 20-30 percent; facilities and other real fixed assets, 15-20 percent; personnel expenses, 50-65 percent. In comparison, the petrochemical industry shows fluctuating expenses of 60-70 percent; facilities, 25-35 percent; and personnel expenses, 10 percent. Thus you can see how much emphasis we place on knowledge.

Close Links to Movement in Concentration of Brains

Pressure conduction rubber is a rubber sheet which, when pressure is applied, conducts electricity along the pressurized points, which undergo extreme changes in resistance. This rubber sheet usually serves as an insulator, but when a certain point on it is pressed with a stick or something similar, that point alone will conduct electricity. This makes it most suitable for switches in thin hand-held calculators. Products such as this require large research and development expenses, but not much in terms of petroleum and other raw material expenses. Since, naturally, one cannot simply sell the product and do nothing about it afterward, a new material becomes a product only after various problems such as where and how it must be used are thoroughly examined with the users, that is, only after supplying "soft service." In other words, the question of how to pioneer new usage becomes the biggest and the only factor in producing profits.

For example, let us consider the censors which Chichibu Cement is developing as part of its new ventures. The censor, about the size of a small bean, uses special ceramics. By taking advantage of the characteristic that the flow of electricity varies when steam enters between the particles, the censor is used

in temperature control. In the early years, the censor was built into microwave ovens to adjust oven temperatures. But because it could function in high temperatures and other extreme conditions, its application was expanded. It is now creating new markets in such functions as factory thermometers and automobile engine controls. Moreover, in the case of censors and the like, investment for a manufacturing facility would require one less zero than the 400 billion yen that would be needed to build a cement plant; that is, slightly more than what would be needed to build a testing facility would be sufficient.

"Now, there are a little less than 150 researchers, but of these a little more than 30 are involved in the development of ceramics. As long as there are people, there will be personnel expenses. It therefore doesn't make any sense not to devise a way to use the technology we have now and fight it out with our brains." (Giichi Sido, director, planning development department, Central Research Center, Chichibu Cement)

With advances in technology, switches, censors, and other new functions are being added to ordinary materials. As a result, new areas of application are opening up, and simultaneously, with the concentration of brains, are improving the characteristic "sale volume" of material makers. In other words, this is the impact brought about by new materials; but in fact we have only stated the preliminary stages of the impact. The greatest point of the material revolution lies in the fact that users without any deep specialized knowledge of the materials can use them easily.

Rebirth for Medium and Small Industries; Increased Opportunity To Discover New Applications Even Though Technology and Capital Are Lacking

"In the optical fiber or super LSI, tremendous investment is needed to develop new materials. But the user can conduct research with comparatively small facilities. For example, if a user says he wants a certain material with a particular quality for a particular purpose, a material maker can respond to it. Therefore we can say that opportunities for even medium and small industries and amateur researchers to discover creative applications have increased." (Tsuneo Nakahara, director, R & D division, Sumitomo Electric Industries)

This is precisely the case when printed plywoods replace ordinary boards; a layman with no knowledge of how to operate a plane can now repair his own walls. If medium and small industries, poor in technology and capital, place orders with material makers, specifying what they desire in terms of application and performance, they can easily incorporate new results into their businesses. For this reason, as we have seen, there are increasing cases in which research is moving ahead through joint research of material makers and users looking for new areas of application.

Among the new materials being developed by TDK Electronics is something called the rare-earth cobalt magnet. This is a small, high-energy magnet, whose application is rapidly increasing in such areas as communications controls, audio equipment, and rotors. At the merchandising stage, most of these products emerge on the basis of joint research with the users. The magnet is also used in Sony's

popular "Walkman" head phones, but the material for this was developed by TDK, in accordance with Sony's desire to develop the "Walkman" 4 or 5 years ago. Among its future types of usage, the magnet is being considered for NC Machine Tool's servomotor and for computer terminals. TDK believes there is ample room for medium and small industries to incorporate it into their products.

Attention Must Be Directed to Materials That May Not Be Totally Related

Recently, "business ventures" are again gaining in popularity in the United States, especially in areas of medical equipment and nuclear energy. We can say that this movement is also a good example, illustrating the fact that with the appearance of new materials, medium and small industries are being rejuvenated.

Of course, in order for these new materials to penetrate all areas of industry, there is one precondition which we cannot forget. That is the problem of information-gathering ability regarding new materials. For example, a deadline for a paper to be read at an international conference on optical fiber is set at 6 months prior to the conference, whereas ordinarily deadlines of this kind are set at a year in advance. This is because technology advances too quickly, so that unless a presentation is held right up to the time of the conference, it will be outdated. Naturally, in order to pursue such rapid movements in material, an appropriate way must be devised to collect information. We have asked several experts to indicate some points developers of new materials and their users should be aware of:

1. It takes 5 years to develop a new material, expand its usage and realize profits. Success depends on whether, during these years, one has the patience to endure losses, continue to improve the material, and convince the user.

2. The essential quality of a material is progressing from that which is durable to that which possesses the functions of the human mind and the five senses. Attention must be given to materials of the latter type, even if they are only remotely related to one's business.

3. The usefulness of a new material is determined by whether or not the newly gathered information can be connected immediately to one's business. Thus, it is important to establish a route that directly conveys the information from the purchase and sales departments to the technology department. The conventional systematic approach where existing technology is merely strengthened and accumulated no longer works here.

It is said that since the Apollo project, technology has become miniature-oriented and stagnant. But, on the other hand, it is also true that such miniature-oriented technology has become sharpened and is continually producing materials that are easy to use. If one is attentive to the movements of new materials and applies them thoroughly, there will be no such thing as stagnant technology. In fact, can we not say that we have entered an age of technological revolution the likes of which we have never seen. (Hisao Saida)

An Interview With Noboru Makino, Vice President, Mitsubishi Comprehensive Research Center

"Revolution From Capital Concentration to Brain Concentration"

Recently, new materials such as performance polymers, new ceramics, minute materials, etc, have successively become topics of conversation. We can call this a second boom, the first occurring around 1940 with the appearance of nylon, polyester, and super hard alloys.

The characteristics of the recent new materials, however, are that their markets are not large and that, in the area of manufacturing, the emphasis is from concentration of capital to concentration of brains. Large facilities and land or large volumes of energy required by conventional material industries are no longer needed. In their place, software which bridges two types of hardware--the material which is created and the machinery which utilizes it--has become important.

The key lies in how well a producer of materials can take advantage of a user's capability, and vice versa. In other words, a kind of amateurism which takes an interest in a wide range of technology is needed.

Japan's technological standard regarding materials has always been high. This is shown by the fact that there are many revolutionary discoveries in the area of metals. But when we compare ourselves to the United States, which is similarly strong in materials, Japan, which does not have a military demand or the space shuttle, tends to fall behind in the most advanced basic technologies. Thus, we more or less have to maintain our superiority in the application of new materials and in manufacturing technology. Since more and more American industries now tend to drop development projects in favor of making quick profits, if Japanese industries can go ahead with development, enduring losses for about 5 years, they can easily become the foremost in the world in their respective fields.

Figure 1.

The Government Also Seriously Began To Get Involved in Development of New Materials (Development Expenses for New Materials Newly Budgeted for FY 81)

- Agency for Industrial Science and Technology

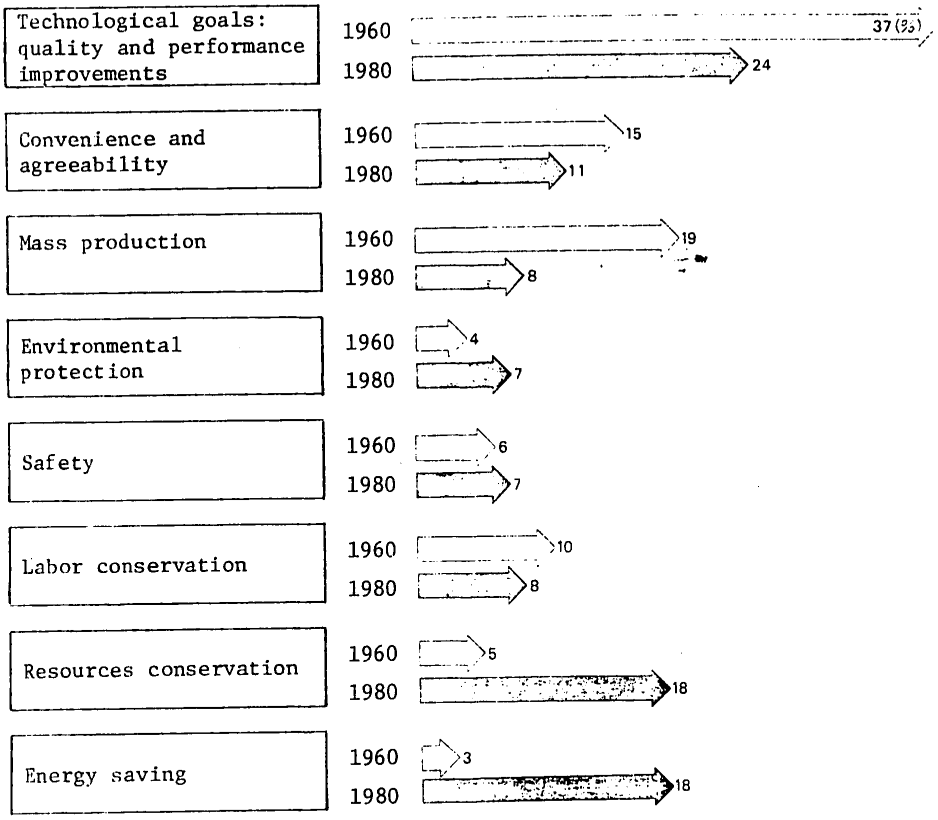
Theme	"Basic industrial technology research & development system for the next generation"
Budget	2.714 billion yen
Summary	New Materials: (fine ceramics, functional polymers, etc) Biotechnology (utilization of genetic engineering) New functional elements (three-dimensional elements, etc)

- Science and Technology Agency

Theme	"Promotion and utilization of creative sciences and technology"
Budget	About 500 million yen (a part of adjustment expenses for promotion of science and technology=3.35 billion yen)
Summary	Micro-particles (materials for catalyst and electric conduction) Complete crystal elements (static induction elements,etc) Special structural substances (amorphous, strata-type compounds, etc) Fine polymers (high added value particles)

Figure 2.

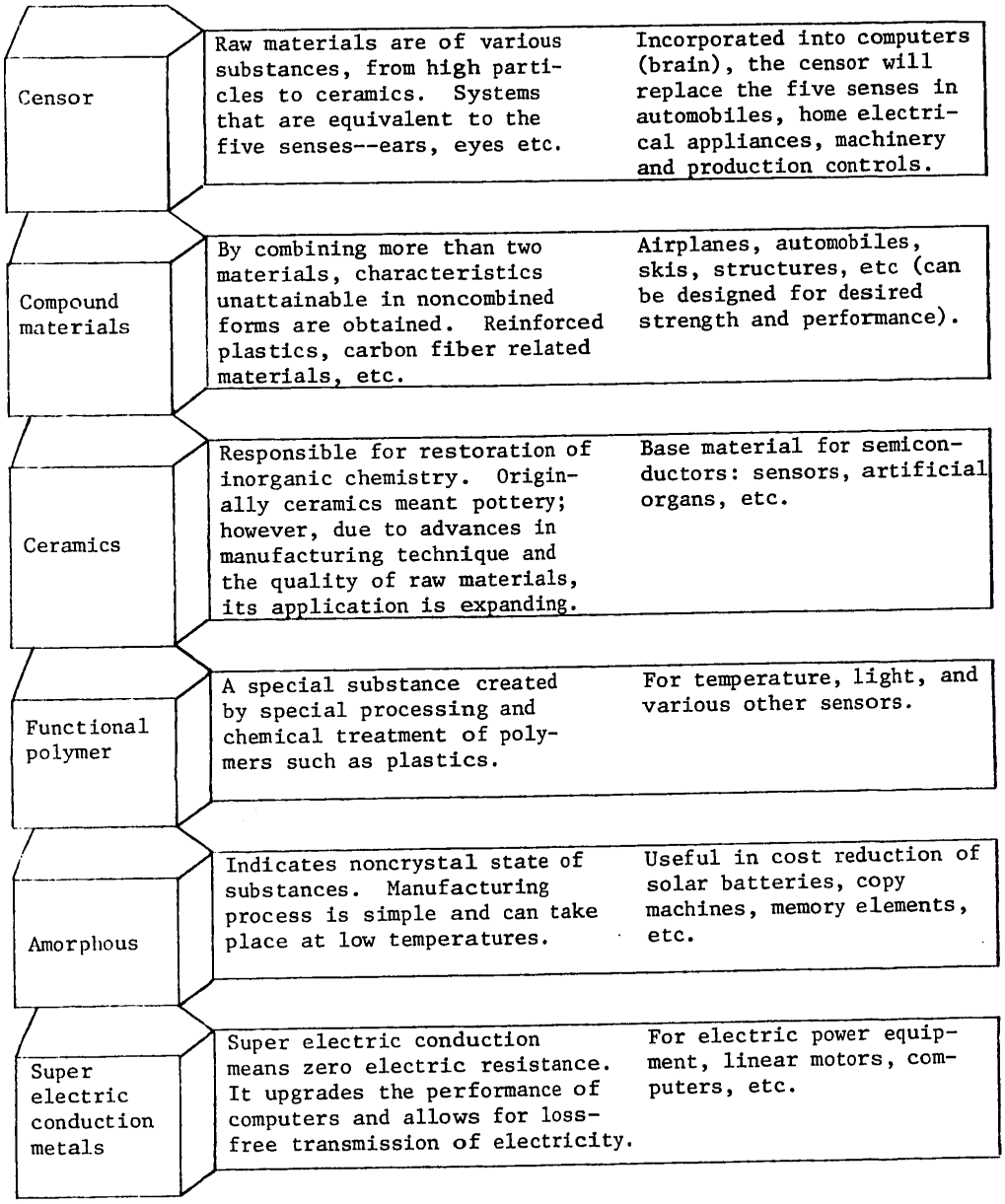
The goals of technology have diversified since the 1980's. There is ample room to expect a great deal from new materials with such multiple functions.



Note: "A Survey on Research Activities of Private Enterprises (1979)" compiled by Science and Technology Agency

Figure 3.

Major New Materials, Functional Substances, and Their Applications



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CSO: 4105/119

SCIENCE AND TECHNOLOGY

MAGNETIC BUBBLE MEMORY USED FOR DATA-BASE MACHINE

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 947, 24 Mar 81 p 13

[Text]

Japan's Electrotechnical Laboratory at the Research and Academic City of Tsukuba, has been successful in developing magnetic bubble memory type of data-base machine to assist the computer, cutting down access time (the time required for calling the computer into action) to 1/10th of earlier magnetic disc machines, it was recently learned.

According to the laboratory, of the Ministry of International Trade and Industry's Agency of Industrial Science and Technology, its data-base machine consists of nine principal units — one unit representing an interface section for overall and input and output control and eight other memory facility units. "Data-base" means basic data including identification of varieties of information, the volume of information, filing structure arrangement, and memory facilities. "Interface" means a theoretical junction between devices for information signal transmissions.

Connected with a single common pass (passage of electronic pulse signals bearing information), the nine units will work sequentially. The eight units, each having a 1-megabyte memory capacity, make up a total of 8 megabytes of memorizing capacity. A total of 256 bubble memory chips, each of 256-kilobit memory capacity, is used. Each of the eight units has a working speed of 1.25 megabytes a second. Processing information simultaneously, they are capable of handling 10 megabytes of information a second altogether.

The whole device features an average access time of only 2.3 milliseconds, no more than about 1/10th of a megnetic disc equivalent developed and marketed last autumn by a joint American-West German-Japanese commercial computer software enterprise group called "The Software AG Group." That magnetic disc device, tradenamed "ADABAS Data-base Machine" had drawn wide attention as the first of its kind in the world. But that device still has to extract data from its discs, put the data into its main memory section, and then call up the computer.

The new device can instantly call up the computer. Today's rapidly spreading use of computers in the world has given rise a corresponding growing demand for larger and more capable types of such data-base machines to supplement computers. Simple computer-handling software could hardly meet the demand. Some kind of hardware exclusively to handle an assembly of data for operating the computer thus has been called for.

CSO: 4120/224

SCIENCE AND TECHNOLOGY

IHI MAKES NICKEL ALLOY TO RESIST 1,000° C HEAT

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 947, 24 Mar 81 p 13

[Text]

A new precision casting method to produce super-heat resistant alloys for making the blades of innovational gas turbine engines has been developed in practicality by Ishikawajima-Harima Heavy Industries Co. (IHI) of Tokyo.

The company also said it has experimentally developed for the Society of Japanese Aerospace Companies a new monocrystal nickel-based alloy with the new casting method. The new alloy could be double as efficient as that produced by its original method.

According to the company, two similar methods of alloy casting and producing single-crystal alloy gas turbine blades had been earlier developed by United Technologies Corp. of the U.S., and the patent rights the corporation holds will be valid until 1984 and 1987, respectively. Washington has been strongly controlling international licensings of the two methods.

Thus, such a casting method in Japan has been developed by Komatsu-Howmet, Ltd., a joint Japan-U.S. enterprise of Osaka. IHI has followed up with two new methods.

IHI says its Directional Solidification (DS) Process essentially lets the cast alloy cool down in a single direction from the bottom of the mold. A column-shaped product that results is thus very strong in vertical stress. Even the conventional chiefly nickel alloy produced by the method, in terms of application to making gas turbine blades, has proved to withstand a maximum heat of 980 degrees C. (1,796 degrees F.), 10 degrees C. higher than the best equivalent method so far developed, twice as long in creep life (the length of time a sample piece of the alloy can keep tolerating a given pressure of weight), and 10 times as long in thermal fatigue life (the length of time such piece can keep resisting cyclical temperature changes).

The new nickel-based alloy, though still in the experimental stage, promises much better performances of 1,000 or higher degrees C. (1,832 degrees F. or more), four times as long in creep life, and 20 times as long in thermal fatigue life.

The DC Process casting mold made of some ceramic material has a water-cooled copper bottom, and only a single-crystal particle is allowed to grow through a limitation channel or window between the bottom plate and a blade-shaped structure above.

A gas turbine blade now under development with the new alloy will have many inside airflow holes formed by special tubes put into the mold.

The company plans to apply such a blade to a new high-efficiency gas turbine as well as a hybrid gas-steam turbine to be developed under governmental sponsorship.

CSO: 4120/224

SCIENCE AND TECHNOLOGY

GOVERNMENT LAB DEVELOPS NOVEL INNOVATIVE VOICE SYNTHESIZER

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 947, 24 Mar 81 p 13

[Text]

The Musashino Electrical Communication Laboratory of Nippon Telegraph and Telephone Public Corp. has developed a new kind of voice-synthesizer that produces spoken messages of better quality than earlier ones, it was recently learned.

According to the laboratory, its "Line Spectrum Pair" (LSP) process of synthesizing human voices has also been found fit for "voluntary vocabulary message at any volume by a simple command suggesting the message. That means the new wonder machine delivers a speech or gives a long message by picking up and combining words just like the human brain does, in contrast to recorders which just repeat what is spoken. Only the most sophisticated computer can do such a job in the area of information and information analysis.

Now applied to different practical purposes in Japan, including "speaking" watches and clocks, "ushering" speakers in elevator cages, and vending machines, the voice synthesizing technology is essentially a method to keep in an electronic brain center, in the form of electronic signals, spoken messages and put them out according to circumstances. An electronic circuit corresponding to the human vocal passage (the whole structure of the throat, mouth and nose) processes the electronic pulse signals representing the message into a simulation of the human speech.

Back in 1969, the laboratory had developed its own "partial autocorrelation" (Parcor) formula of a voice synthesizing method corresponding to the natural speaking process of changing the sounds from the vocal chords to the lips. Although it has been widely adopted for industrial application in Japan, the laboratory has found it limited in electronic signal concentration to somewhere between 4,800 and 9,600 bits a second. Greater concentration caused unnatural distortion and disruption of sounds.

Representing the desired answer to the problem, the LSP process model, almost as short as a pen, produces a simulated voice message by remembering, besides the fed-in vocabulary, all changes in the characteristics of the vocal passage. Such characteristics are received from the frequencies of resonance between the open and the closed state of the windpipe, comparing the vocal passage to a sound-producing tube of some wind instrument.

The new process requires only about 80 per cent of the necessary volume of information to remember in the preceding Parcor process to produce the same amount of sounds, with an advantage of better sound quality, and even only about 60 per cent in case an additional process of "interpolation of parameter" is applied. It requires only 2,400 bits a second of memorized information to do better the similar job done by the Parcor process with 4,000 bits a second. With 4,000 bits a second, it can "speak" 70 per cent longer.

CSO: 4120/224

SCIENCE AND TECHNOLOGY

SOLAR CELL CALCULATORS PROVING BRISK SALES ITEM

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 947, 24 Mar 81 p 9

[Text] Electronic calculators powered by solar batteries are selling briskly, luring companies into the business.

Matsushita Communication Industrial Co. entered the market last week in an attempt to boost its share in Japan's calculator market from the present merely 5 per cent or less.

In the domestic market, there already are three suppliers of solar battery-powered calculators — Sharp Corp., Sanyo Electric Co. and Towa San Kiden Corp. These three companies introduced their models last autumn in succession. Unexpectedly high demand now prompts them to boost production.

Sharp, which until recently had been producing two kinds of "solar calculators" at a monthly rate of 50,000 units each, has trebled their production volume to a total of 300,000 units monthly. The Osaka consumer electronics maker hopes to boost output further.

Sanyo is now producing 55,000-60,000 units monthly by operating production facilities at full. In order to meet the shortage of solar batteries, the company has started construction of a solar battery manufacturing plant capable of producing cells mountable on 1 million units of calculators a month. Sanyo now receives many inquiries from other calculator makers for a supply of solar batteries.

Matsushita entered the market with a monthly output of 30,000 units. It relies on Matsushita Battery Industrial Co. for supply of solar batteries.

These solar calculators sell for ¥4,500-4,700, slightly higher than ordinary models.

Demand for solar calculators is strong both in industrialized nations and developing countries. Consumers in advanced nations are energy-conscious and feel prices of silver-oxide batteries to power ordinary calculators expensive. In developing countries, where the supply of ordinary batteries is short, solar cell-powered calculators are very convenient.

CSO: 4120/224

SCIENCE AND TECHNOLOGY

RESIDUAL CRACKING WILL GET PRIORITY IN MITI'S POLICY

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19, No 953, 5 May 81 p 6

[Text]

The Ministry of International Trade & Industry will place priority on residual oil cracking in its petroleum policy for the 1980s. The MITI strategy will be implemented, starting in fiscal 1982, following the plan's approval by the General Energy Council this May.

The Ministry's plan was formulated in view of the worldwide trend toward light crude oil tightness and increased supply of heavy petroleum. Despite this anticipated development, the domestic consumption pattern will be marked by increasing demand for light product oils, such as kerosene and diesel fuel.

To cope with the shifts, MITI will help the petroleum refining industry to venture into residual oil cracking through joint investment arrangements. The Ministry also plans to offer subsidies to encourage the industry to crack more residual oil.

Residual oil cracking is expensive, requiring ¥20-30 billion per plant capable of processing 200,000 barrels of residual oil daily. To reduce the risks, MITI will help create an environment to encourage cracking systems. That is, it will ease the administrative guidance presently designed to keep product prices low. The new guidance will be designed so that petroleum refiners can raise prices for "middle cuts," such as kerosene and diesel fuel, reflecting the market trend more faithfully.

In addition, MITI will help refiners with no hopes for oil business growth to venture into new energy fields, including coal liquefaction and oil shale processing. This policy will be applied to oil companies, regardless of their nationality.

CSO: 4120/225

SCIENCE AND TECHNOLOGY

NTT CHOOSES EQUIPMENT FOR 'OPEN' TENDER

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 947, 24 Mar 81 p 9

[Text]

Nippon Telegraph & Telephone Public Corp. (NTT) has chosen 11 telecommunication equipment items, including data communication input and output terminal sets, facsimile transmission facilities, and private branch exchanges (PBX), for the first round of its open procurements in fiscal 1981.

According to NTT, it will shortly start inviting applications for its preliminary screenings of qualifications of all prospective bidders, commencing such screenings early during coming April.

It will be the second time the corporation will make such purchases on free international as well as domestic competitive tender basis in the wake of the initial round of such procurements announced last January in line with the agreement between Japan and the U.S.

The 11 items listed for the first procurement round in fiscal 1981 are equipment to be used at telephone line terminals. So far, domestically-made items, either produced by the corporation itself or by the few local makers officially given type certifications by the corporation, have been in use.

Last January's announced procurement round to apply to this January-March or final quarter of Japan's fiscal 1980, in the total value of nine such items involved, attained ¥18.5 billion (in terms of the preceding fiscal 1979 official pricing terms).

The new round of procurements, to be shortly announced, in the total value of 11 such items, will come to about ¥9 billion or only half as much (in the same terms).

However, as NTT has explained, the last January round was exceptionally large in value because of involvement of expensive steel pipings or tubings besides measuring and checking devices and magnetic tapes.

In contrast, the new round, involving only communication apparatus to be attached to the end of telephone lines, will actually be more significant for having direct bearings on the Japan-U.S. inter-governmental agreement.

According to NTT, the initial internationally open procurement round announced last January had come to the deadline for its acceptance of qualification applications as of the end of last February. As the result, 36 companies have been officially selected as eligible bidders, including 15 "new faces" hitherto never meeting the NTT procurements. Nine out of the 15 new participants were foreign corporations and a predominant eight of the foreign participants are to sell magnetic tapes (JEJ-Mar. 10).

That first round of screenings had been criticized by Japanese traders representing would-be foreign telecommunication apparatus supplies for having been unreasonably meticulous in demanding information concerning the applicants' conditions, even including "business secrets." Such procedural rigidity or complexity had been thought problematical even by some NTT insiders.

Whether because of such backgrounds or not, NTT's new round of qualification screenings will feature simplification of such procedural requirements as well as accompaniment of an English-language explanatory pamphlet.

CSO: 4120/224

SCIENCE AND TECHNOLOGY

CUSTOMERS WILL BE ABLE TO USE 'INFONET'

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 947, 24 Mar 81 p 9

[Text]

The INFONET international computer time-sharing service network operated by Computer Sciences Corp. of the U.S. will become available for Japanese customers next summer as Mitsui Knowledge Industry Co. of Tokyo last week concluded business arrangement with CSC.

It will be the fourth TSS network accessible from Japan, following MARK III of Information Services International Dentsu Limited (a joint venture between General Electric Co. of Fairfield, Conn. and Dentsu Inc.), TYMCOM of Kokusai Tymshare Limited (a joint venture between Tymshare, Inc. of Cupertino, Calif. and Marubeni Corp.) and CALL 370 of CDC Japan, Ltd. (a wholly-owned subsidiary of Control Data Corp. of Minneapolis, Minn.).

The CSC-MKI partnership is expected to intensify competition within the TSS network industry which do not necessarily fare well.

INFONET is a remote computing service (RCS) featuring use of large-scale computers installed in the U.S. which process information or provide necessary information through international telecommunications circuits.

In the first stage, MKI will use CSC's host computers in the U.S. by connecting Japan and the U.S. with leased circuits. When yearly revenues exceed ¥500-600 million, the Tokyo company will install a large-scale computer in Japan to better serve Japanese customers.

It will take at least five years before it goes into the second stage, MHI president Takeshi Kodosaki said.

CSO: 4120/224

SCIENCE AND TECHNOLOGY

ROLLS-ROYCE SUGGESTS JOINT JET ENGINE DEVELOPMENT

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 947, 24 Mar 81 p 8

[Text]

Britain's Rolls-Royce Ltd. has sounded out the aircraft industry here on the possibility of jointly developing a jet engine for a 150-seat plane at an early date. The British offer, though unofficial, is a call for the existing U.K.-Japan engine development agreement to be modified.

Rolls-Royce and three Japanese enterprises last April set up a joint venture company, Rolls-Royce and Japanese Aero Engines Ltd., on an equal footing to produce a 9-ton propulsion engine for a 130-seat plane. Japanese participants are Ishikawajima-Harima Heavy Industries Co., Kawasaki Heavy Industries, Ltd. and Mitsubishi Heavy Industries, Ltd.

Under the accord, the British and Japanese team is due to complete the No. 1 test engine in January, 1982. The venture company, at its board of directors meeting last fall, decided to try to sell the first of its new engines (brandnamed RJ500) to Boeing Co. of the U.S. for the latter's 130-seat B737-300 now under development.

An engine for a 150-seater needs to be fitted with a propulsion of 11 to 12 tons, depending on its cruising capacity, compared with the 9-ton propulsion engine for a 130-seater now

being developed by the U.K.-Japan venture company.

Rolls-Royce does not appear to be asking for an immediate start to develop the 150-seater engine. But its new overtures can be justified, considering that world demand trends could change in favor of 150-seat planes in the latter half of the 1980s.

The three Japanese firms feel they must carefully respond to the new British bid. They reason that development costs may swell over the 140 billion yen now equally shared by the Britons and the Japanese, should the proposed engine be preferred to the present engine. They also say they cannot easily change their capital raising program because half the capital requirements to be met by the Japanese side are to be furnished by the government as a subsidy.

The Japanese industry thus will have to study how the new British offer should be modified for incorporation in the existing development plan.

CSO: 4120/224

SCIENCE AND TECHNOLOGY

MACHINE TOOL BUILDERS BOOM SLOWS

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 947, 24 Mar 81 p 7

[Text]

Machine tool builders have come to a lull in production and sales at last after basking in an unprecedented, four-year long boom triggered by the worldwide moves of industrial sectors to save energy and streamline operations amid the first and second oil crunches.

An ominous shadow, though obscure yet, is looming large over both domestic and overseas markets. Crawling uneasiness stems from an oversupply of numerical control device-equipped machines that account for half the industry's total production.

The Japan Machine Tool Builders' Association, which usually compiles an annual demand outlook in March, is at a loss on how to do so this year. An association spokesman says, "We may be unable to size up the industry's production projections this year." Its 107 member builders are split in their views on demand outlooks, with half the members expecting orders in 1981 to rise over a year ago and the remaining half forecasting in the opposite direction.

After picking up rapidly in 1977, machine tool orders last year surpassed the ¥500 billion level, rising 42 per cent over a year ago to ¥621.5 billion. Production in 1980, in value terms, reached ¥683 billion, up 41 per cent.

The industry chorused, "We will emerge as a ¥1 trillion industry sooner or later."

The situation this year is betraying the industry's expectation.

Pessimists say that production of NC device-equipped lathes peaked out last year with 12,000 units (or ¥152.5 billion), up 46 per cent from 1979. While pinpointing a slowdown in domestic shipments to small and medium enterprises, they noted that sales of NC lathes on the American market have been on the decline partly because of oversupplies of both Japan- and U.S.-built machines.

Friction with European builders is proving another factor unfavorable for the Japanese industry. In fact, the European Community has set the January-March quarter as a period to keep close watch on the inflow of Japanese machine tools into their markets.

CSO: 4120/224

SCIENCE AND TECHNOLOGY

HITACHI MAKES SUPER CABLE WITH ALUMINUM COVERING

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19, No 953, 5 May 81 p 16

[Text]

Hitachi Cable, Ltd. of Tokyo recently disclosed its success in developing an aluminum-covered type of superconductivity power cable to answer long-standing technological problems of how to produce a cable that maintains the temperature and lightens the weight of the superconductivity electromagnet vital for many energy development purposes.

According to the company, which is affiliated with Hitachi, Ltd. of Tokyo, Japan's top multi-business electric-electronic industry giant, such cables are usable for making the coil of the superconductivity electromagnet. Such a magnet is the heart of modern nuclear fusion experiment devices, of the prospective magnetohydrodynamic (MHD) electric power generators (to turn heat directly into electricity) as well as energy storage systems. These magnets are also used for the linear motors of modern levitation railway vehicles that float and run along their tracks at super speeds.

The superconductivity power cable, usually made of niob or some other highly conductive kind of material, develops its great electric conductivity when cooled down to an extremely low temperature by liquid helium or other coolants.

But such a cable must be covered with some stabilizing material, such as copper, to help its electric conductivity if the temperature should rise. The higher the temperature, the stronger the electric resistance of the cable. In such a case, the stabilizing covering shares the cable's function of passing electric current to offset the cable's loss of conductivity. Aluminum has been considered an ideal kind of stabilizer, but compounding it with the cable proper and other processing had been difficult.

CSO: 4120/225

SCIENCE AND TECHNOLOGY

GLASS MAKERS STRESS FLOAT TECHNIQUE

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19, No 953, 5 May 81 p 17

[Text]

Asahi Glass Co. has completed and started commercial runs of its fifth flat glass plant. The ¥15 billion plant's construction started at Kashima in 1974, a year after the oil crisis. The demand problem, caused by the crisis, forced Asahi to suspend the project until the spring of 1980, when it resumed construction.

Its monthly capacity is rated at an equivalent to 350,000 cases. One case equals 100 square fleet of flat glass of 2 millimeter thickness.

The plant incorporates the float technique developed by Pilkington Bros. of England. Melted glass is floated on metal so that glass can be produced highly efficiently. The single-furnace Kashima plant's completion raised to four furnaces the company's float process plants. The monthly capacity of Asahi's float process flat plants went up from 790,000 cases to 1,140,000 cases.

Upon the plant's completion, the firm suspended operation of a conventional plant in Osaka having a monthly capacity of 200,000 cases. Only one plant near Tokyo now produces sheet glass with the conventional process. Its output is limited to those thinner than 2 millimeters, however.

In the meantime, Nippon Sheet Glass Co. is scheduled to expand its float flat glass capacity at its Maizuru plant by June. Its present capacity based on the Pilkington technique totals 690,000 cases a month. Central Glass Co. runs two furnaces at a plant, with total capacity of 390,000 cases. Central's plan calls for attaining a 250,000-case monthly capacity by the end of 1982.

CSO: 4120/225

SCIENCE AND TECHNOLOGY

TORAY TO SET UP NEW CARBON FIBER FACTORY

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19, No 953, 5 May 81 p 17

[Text]

Toray Industries, Inc. plans to construct a carbon fiber plant with monthly capacity of 60 tons by June, next year and to raise the present plant's monthly capacity from 35 tons to 45 tons by December, 1981, both at its Ehime works.

The leading producer's capacity thus will go up to 105 tons a month at the end of 1982.

Toray President Yoshikazu Ito said the projects are intended to maintain "our position as the world's No. 1 in carbon fiber capacity and qualities."

The new ¥6 billion plant, by far the largest anywhere in the world, is designed to make carbon fibers from acrylic fibers at lower costs than existing facilities through energy conservation. Integrated production is planned, with the plant incorporating all the production steps from polymerization to "baking" of fibers. The initial operating rate will be about 70 per cent of the 105-ton monthly capacity after mid-1982.

Since its production start in 1971, Toray has expanded applications of its carbon fiber to include leisure goods (e.g., fishing rods and golf club shafts) and industrial products. In the U.S., Lear Avia Corp. is extensively using the Tokyo company's product in its eight-seater business aircraft (Lear Fan 2100 model). The Columbia space shuttle's interior included the Toray carbon fiber, too.

As exemplified by these facts, the company anticipates that carbon fibers will be used in larger quantities by aircraft and automobile industries.

There is a worldwide trend toward raising carbon fiber capacity. In Japan, Asahi Chemical Industry Co. and Nippon Carbon Co. tied up to start their carbon fiber project.

CSO: 4120/225

SCIENCE AND TECHNOLOGY

SONY DEVELOPS VIDEO SYSTEM CAPABLE OF SCANNING 1,125 LINES PER SECOND

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19, No 953, 5 May 81 p 9

[Text]

Sony Corp. last week announced development of a high-definition video system, featuring 1,125 scanning lines per second, compared to 525 for the NTSC system now used in Japan, the U.S. and some other countries.

The picture resolution of the HDVS prototype, shown at a press conference, is the same as the present 35 mm film, having a million picture elements, a Sony spokesman said.

Sony's achievement is based on Japan Broadcasting Corporation (NHK)'s technology. NHK has been proposing to make its 1,125 scanning line-format the world's unified standard. Sony has developed its own system by adding video recording, time base correction and other capabilities.

Because of its high resolution and color fidelity, possibility is strong that HDVS will greatly change the production and distribution method of motion pictures. Francis Coppola, a noted film director who attended the Tokyo press confab, hinted of his shooting a picture with use of the new technique, which he called "electronic cinematography."

Technically, Sony's HDVS features 1,125 scanning lines and 60 fields per second with a frequency band width of about 30 megahertz, which can contain five to six times more information than the present 525-line NTSC standard color TV system.

CSO: 4120/225

SCIENCE AND TECHNOLOGY

CTDC TO UNDERTAKE INTERNATIONAL PLANE PROJECT

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19, No 953, 5 May 81 p 8

[Text]

The Ministry of International Trade & Industry (MITI) recently decided on a tentative basis that Japan's prospective third-generation civilian transport plane development project to be realized in the form of a joint international project should be initially placed in the care of an existing association of various Japanese aircraft makers now engaged in an international project to develop Japan's second generation of such planes.

According to sources close to MITI, the decision has been reached against a complex background. Since 1978, the association, known as the Civil Transport Development Corporation (CTDC), has been successfully developing Japan's second generation of new civilian aircraft, referred to in Japan as the YX series, together with Boeing Co. of the U.S. and Aeritalia SpA of Italy. The YX series, a follow-up to the first generation, YS-11 series, developed by Japan itself, is also called the "Boeing 767 (and 777) series" because Boeing Co. has undertaken the principal burden of the project.

The next or third generation of such new planes, logically referred to as the YXX or New YX series, is also to be developed through international cooperation, as MITI has officially decided through a joint government-industry council study. Airbus Industrie, a joint enterprise of key West European countries, McDonnell Douglas Corp. of the U.S., and some other Western aircraft makers, as well as Boeing are listed as possible members of a new international project to develop the YXX series with Japanese interests.

If the YXX development project is realized internationally without Boeing's participation, it had been feared both inside and outside MITI that the Japanese makers' association, CTDC, would be undesirable as the promoter of the new project since it has been promoting the YX (Boeing 767 and 777) project with Boeing and Aeritalia, and all such projects are essentially commercial in character.

However, MITI has decided to let CTDC take charge of the new project on a provisional basis, at least during fiscal 1981, but ultimately on a lasting basis if possible, because it would be expensive and wasteful to create a new organization for the project. Such a new organization is to be created only if Boeing really is excluded. MITI has a fiscal 1981 subsidy of ¥353 million with which CTDC member companies will start a YXX preliminary designing job during May or soon after.

CSO: 4120/225

SCIENCE AND TECHNOLOGY

CONSTRUCTION MACHINERY BUILDERS CUT TIES WITH WESTERN PARTNERS

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19, No 953, 5 May 81 p 8

[Text]

Japan's construction machinery builders are becoming increasingly enthusiastic about cancelling license contracts with their Western partners and removing restrictions on exports based thereupon.

The builders feel they are fettered by the tie-up contracts with U.S. and European partners in efforts to expand their business. They complain they now cannot export some of their products depending on the conditions of the license contracts.

"We have grown up as one of the nation's key industries with our combined production value topping ¥1,200 billion. We no longer find that there is anything to learn from what Western licensers offer."

Komatsu, Ltd. and other construction machinery builders have set about cutting technological linkups with their Western counterparts in a bid to make a fresh start as an "independent industry."

The moves of the industry to abrogate partnership with Western enterprises shaped up in the year before last when the Fair Trade Commission advised Mitsubishi Heavy Industries, Ltd. to revise a joint venture contract with Caterpillar Tractor Co. of the U.S. FTC suspected that a joint venture contract restricting production models and/or export areas might run counter to the Anti-Monopoly Act.

MHI then followed FTC's guidance and persuaded its U.S. partner to annul the arrangement restricting production models.

Triggered by this contract modification, other construction machinery builders here began to seriously consider abolishing linkups with Western makers.

Last year, Komatsu discontinued its technological tie-up with America's Bucyrus-Erie Co. in almost an unilateral manner. The company also is now asking the U.S. partner to nullify a joint venture contract.

Ishikawajima-Harima Heavy Industries Co. followed suit in cancelling its comprehensive sales contract with Koehring Co., also of the U.S.

This year, Kobe Steel, Ltd. has abrogated its 26-year-long technological tie-up agreement with Harnischfeger Corp. of the U.S., excluding a contract on electrical excavators, by paying ¥4,400 million as a cancellation fee. The company has simultaneously taken over partial holdings in the U.S. enterprise.

The unanimous view of the Japanese builders is that technological tie-up arrangements with Western partners have now outlived their usefulness.

They are particularly anxious to smooth out restraints on exports under the existing tie-ups, now that domestic demand has come to a lull due partly to the slowdown in public works projects of the government and municipal offices.

Moves of Construction Machinery Builders to Cancel or Weaken Technological Tie-ups with Foreign Partners

Company	Partner	Latest moves
Komatsu, Ltd.	Bucyrus Erie Co. (U.S.)	Technological tie was cancelled in July, 1980. Cancellation of a joint venture firm is now under negotiation.
Mitsubishi Heavy Industries, Ltd.	Caterpillar Tractor Co. (U.S.)	Inequal clause was revised in March, 1981. Efforts to improve relations are now being made.
Kobe Steel, Ltd.	Harnischfeger Corp. (U.S.)	While cancelling technological tie, Kobe made a capital participation in Harnischfeger in March, 1981.
Ishikawajima Harima Heavy Industries Co.	Koehring Co. (U.S.)	Sales contract was cancelled in late 1980. IHI is now considering whether to cancel or continue technological tie.
Japan Steel Works, Ltd.	Orestein und Koppel (West Germany)	Technological tie will be cancelled at the end of 1982.
Yutani Heavy Industries, Ltd.	Poclain S.A. (France)	Accord was reached in February, 1981 to totally remove restraints on export areas.

CSO: 4120/225

SCIENCE AND TECHNOLOGY

MACHINERY PRODUCTION PREDICTED TO GROW STEADILY

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19, No 953, 5 May 81 p 8

[Text]

Japan's machinery builders will enjoy steady growth in both production and exports this fiscal year, but the advance rate will somewhat decelerate, the Japan Machinery Federation said in its recent outlook on the industry's business trends.

The federation predicted that machinery production and exports in fiscal 1981 will rise by 7 per cent and 8.2 per cent over a year earlier, respectively, compared with the 12.5 per cent and 26.2 per cent gains scored last fiscal year.

Cited in the outlook as the most promising are electrical machinery, such as video tape recorders, whose production and exports are expected to climb by 12.1 per cent and 13.8 per cent, respectively.

The federation forecast that the industry cannot look much to full recovery of domestic demand, indicating that builders will rush to push up exports.

Production and Exports by Machinery Builders in FY1980 and Outlook for FY1981

(In billion yen, yr to-yr change in parentheses)

	Estimated production value in fiscal 1980	Outlook for fiscal 1981
Total production	47,002.8 (112.5%)	50,296.2 (107.0%)
(Exports)	18,538.0 (126.2%)	20,053.5 (108.2%)
General machinery	11,807.5 (106.4%)	12,450.1 (105.4%)
Electrical machinery	13,247.3 (117.5%)	14,847.3 (112.1%)
Transport machinery	18,121.3 (112.4%)	18,866.2 (104.1%)
Precision machinery	1,486.9 (114.7%)	1,648.4 (110.9%)
Cast & foundry machines	2,011.4 (116.1%)	2,101.4 (104.5%)
Office machinery	326.7 (119.8%)	382.7 (117.3%)

CSO: 4120/225

SCIENCE AND TECHNOLOGY

JNOC PLANS OFFSHORE STOCKING OF CRUDE OIL WITH THREE COMPANIES

Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19, No 953, 5 May 81 p 6

[Text]

Japan National Oil Corp. is launching the world's first offshore crude oil stockpiling project on an island off Kita-Kyushu City in collaboration with three companies: Maruzen Oil Co., Kyushu Oil Co. and Yamashita-Shinnihon Steamship Co. The four partners will build a harbor and related crude oil accepting and loading facilities at Shirashima, an island eight kilometers from Kita-Kyushu, by March, 1986. There, eight tanker-like structures each capable of holding 700,000 kiloliters of oil will be floated to stockpile 5.6 million kiloliters. The total cost is estimated at ¥160-180 billion.

The four interests will start a consortium in May. Its capital of ¥10 billion will be largely (70 per cent) put up by JNOC. The remainder will be funded by Maruzen (six per cent), Kyushu Oil (Four per cent), Yamashita-Shinnihon (five per cent) and about 50 investors (15 per cent in all).

JNOC, which has been planning the project for nearly three years, recently signed basic agreements with four fishing cooperatives about monetary compensation for losing the "right to fish" in and near the uninhabited island.

The offshore project features the "tankers," which are larger than real existing tankers. To hold 700,000 kiloliters in their bunker, they will measure 397 meters in length and 82 meters in width. They will be 25 meters in height. A man-made harbor is planned to protect the big "tankers," with large concrete blocks used as the major harbor material. Upon completion, the stockpiling base will be leased to JNOC by the planned consortium, which is tentatively named Shirashima Offshore Oil Stockpiling.

JNOC intends to implement the whole plan carefully. Upon completion of the first "tankers," the government corporation will carry out experiments to confirm safety.

Shirashima will become the site of JNOC's fourth stockpiling project. JNOC already keeps a 7.2 million kiloliter stockpile by utilizing idle tankers in two spots, and plans to build two bases on land — Mutsu Ogawara in north Honshu and Tomakomai, Hokkaido.

CSO: 4120/225

SCIENCE AND TECHNOLOGY

BRIEFS

ROBOT DEVELOPED--The world's first simultaneous five-axle control featuring robot for arc welding has been commercially developed by Mitsubishi Electric Corp. of Tokyo, the company recently announced. The versatile robot works almost as delicately as human hands, minimizing the job preparation time. It represents MELCO's entry into Japan's highly-prominent industrial robot industry and will be marketed from August, for 9.7 million yen (the price of its machine proper alone). MELCO said 30 units a month would be produced. Compared with the best conventional equivalent, the new robot needs only about 1/4 the preparation time to put into full operation. Its built-in computerized numerical control device remembers and takes over all necessary welding conditions, including the electric current volume, voltage and working speed, that are humanly determined while watching the trial welding job. [Text] [Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 947, 24 Mar 81 p 8]

MEMORY CHIPS PRODUCTION--Mitsubishi Electric Corp. will begin mass production of 64-kilobit random access memory (RAM) chips in July at its No. 2 Kumamoto plant. The monthly production volume will be 100,000 chips at the initial stage, and will be raised to 200,000 chips toward the year-end. Mitsubishi is now installing 5 billion yen 64K RAM production facilities at the No. 2 Kumamoto plant on the Kyushu "silicon island." At present, Mitsubishi is test producing 64K RAMs at its Kita-Itami plant in Hyogo Pref. at a monthly rate of 10,000 to 30,000 units. [Text] [Tokyo JAPAN ECONOMIC JOURNAL in English Vol 19 No 947, 24 Mar 81 p 9]

CSO: 4120/224

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