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Japan Report

(FOUO 36/81)

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POLITICAL AND SOCIOLOGICAL

SUZUKI'S TOUR OF EUROPE VIEWED AS FAR FROM EASY

Tokyo THE DAILY YOMIURI in English 26 May 81 p 1

[Article by Philip H. Trezise, contributor editor]

[Text]

For anyone aspiring to become the prime minister of Japan, I would propose a careful examination of the present prime minister's program for the first half of 1981.

Mr Suzuki has the honor and the burden of being the head of the government of the currently most successful of the advanced industrial countries. At home he has the usual problems of a political leader with a big parliamentary majority, which are to reconcile differences within his party and to keep the country on a steady course. When he goes abroad, however, he is bound to be expected to be carrying presents with him.

When the prime minister took his lengthy tour of Southeast Asia in January, it was naturally supposed that he would bring promises of Japanese economic assistance to the ASEAN nations. He then made the traditional spring visit to Washington, to be told politely by President Reagan and his senior associates that the US wishes Japan to do more for defense. On a side trip to Ottawa he learned with no surprise that Canada hopes to have restrictions placed on Japan's automobile exports, paralleling the understanding between Tokyo and Washington.

In June, prior to the seven-country summit that will take place in Canada in July, Mr Suzuki most dutifully pay a 10-day call on Western Europe. There he will see heads of government of the European Community countries and the leadership of the community in Brussels. The conversations during this visit undoubtedly will be the most difficult, for the Europeans can be expected to be very demanding about their longstanding complaints over trade with Japan. Indeed, if the London Economist is right, relations between Japan and Europe are at the "lowest point in years."

Growing Complaints

Reviewing my files, I find a 1975 press release on the subject of the community's bilateral trade deficit with Japan (it was estimated to be $2.2 billion). The deficit has grown in every subsequent year, and so have the complaints. In 1979, as is well remembered, a senior bureaucrat of the EC Commission wrote irritably that the Japanese people are "workaholics" living in "what Westerners would regard as little more than rabbit hutches."

Last November the community's Council of ministers issued a formal declaration strongly critical of Japan's policies and trade practices. At the end of February the council met again and proposed that imports of certain products from Japan be placed under "surveillance." It also suggested that the "question of trade with Japan" should be raised at the Ottawa summit, this being a transparent threat to make Mr Suzuki the object of pressure from the other six summiteers. And now that Japan's automobile exports to the US are to be restrained, it can hardly be the case that the Euro-

peans will not ask for like treatment.

Some of the rhetoric from the community is rather odd. The continuing emphasis on the bilateral imbalance with Japan passes over without comment other bilateral accounts of the community. In 1979, for example, UN statistics show Japan to have had a $5 billion surplus with the community, while the community's surplus with Switzerland (population 6.4 million) was $7 billion and with Austria (population 7.3 million) $4.8 billion. The US regularly runs a very large bilateral surplus with the community—in 1980, nearly $18 billion—without attracting hostile attention from the Council of Ministers.

To focus on the bilateral accounts is a pernicious notion anyway, as the US-Japanese wisemen properly observed in their report. If bilateral balancing ever becomes the objective, precious little will be left of world trade.

In other respects, too, Japan has grounds for taking exception. After 20 years, neither the community's common commercial policy nor its GATT commitments are fully operative in respect of Japan. The United Kingdom, France, and Benelux have bilateral safeguard clauses left over from past trade agreements with Japan. Italy retains a right not to accord community treatment to items liberalized with regard to Japan. Most of the community countries maintain residual quantitative restrictions against Japan, some of them on a discriminatory basis.

Resistance Strong

Even when Japanese firms propose to manufacture their products in Europe, they sometimes encounter resistance, as Hitachi discovered in the United Kingdom and Nissan in Italy. French displeasure over a projected Nissan plant in Wales is sure to be ignored, however, and it is hard to believe that opposition to Japanese direct investment can be sustained for very long anywhere in the community.

No small part of the problem between Japan and Europe is simply lack of knowledge about one another. Relations have been distant for three decades now, as both have put primary stress on their ties with the US. Barriers to understanding are slowly being broken down, partly through official contacts, partly through private groups like the Trilateral Commission. But the US still finds itself in the middle between allies who are not very certain about one another.

Then too the European economies are going through an especially trying period. All four of the big countries—Germany, France, the United Kingdom, and Italy—are in recession and only France seems likely to avoid having minus GNP growth for the full year of 1981. The bellwether economy, Germany, is expected to have a $16 billion external deficit this year, after a $15.3 billion deficit in 1980, and the French 1981 deficit may be nearly $10 billion. While Japan cannot properly be called the source of Europe's difficulties, it is at least understandable that sentiment against imports would be rising in a time of high unemployment and gloomy economic prospects.

Nevertheless, Japan and the community have shared interests, in their security alliances with the US and in their mutual stake in a reasonably open, growing world economy. As the excellent community representative in Tokyo, Mr Fielding, has said, without cooperation between Japan and Western Europe there can be no long term prosperity or security for either or for the Free World.

The European Commission, the secretariat of the community, has proposed in effect that there should be a general bilateral negotiation in order to arrive at a common community trade policy toward Japan. Whether the member states can be brought together on this approach is uncertain. If they can be, Japan should examine it sympathetically.

Separate Obstacles

As matters stand, the danger is that the member countries will separately impose large additional obstacles to trade with Japan and set off a surge of protectionism. It is true that Japan would be negotiating to obtain commercial treatment from the community to which it is already entitled under the rules of the GATT. Still, if a bargain could be struck under which European national restrictions could be traded off for reductions in particular Japanese trade barriers, the outcome could be a profitable one for both sides. It could also be a long step forward for free trade, which these days desperately needs help.

It is evident that Mr Suzuki's European visit will not be an easy one. His hosts are certain to ask him for actions that at a minimum will be costly and embarrassing at home. But if he is able to explore the possibilities for an eventual effort to put Japan-community relations on a more even and sensible basis it may be that his travels and labors will not have been in vain.

CSO: 4120/238

SCIENCE AND TECHNOLOGY

ELECTRONICS EXECUTIVES ON PROSPECTS FOR NEXT DECADE

Hitachi President Yoshiyama

Tokyo NIKKEI ELECTRONICS in Japanese No 262, 13 Apr 81 p 245

[Interview with Hirokichi Yoshiyama, president of Hitachi Ltd: "Time to Develop Original Technology Independently"]

[Text] [Question] What kind of growth will take place in the electronics industry from now on?

[Answer] Since the entire Japanese economy is in a period of slow growth, it is hard to expect a very large figure for overall growth. Electronics will not grow as fast as in the past, but it will probably be higher than average for the next 10 years.

[Question] How much will your company's sales grow?

[Answer] The electronics area will grow by a double digit annual rate. The area of energy will probably show a high rate of growth as the results of previous development emerge. However, we also have areas like home electrical products and industrial equipment where we cannot expect a great deal of growth. On the average, I believe it will be impossible for the company to grow by double digit rates from now on. In the future, certain areas will become more prominent.

[Question] What will be the size of your work force?

[Answer] I believe the total number of people will not change much, but the places where they work will change. The number working in factories will probably decrease and the number involved with software and systems technology will increase. Since software-related jobs will increase in number, the number of employees in our affiliated companies will expand.

[Question] Will productivity continue to increase?

[Answer] I believe there is still plenty of room for improvement. There is an especially great deal of room for improvement in software productivity.

[Question] What will be your major products?

[Answer] Instead of saying what our major products will be, I would rather say that the development of integrated circuit technology is the basis of everything. Everything else is made up of them. Of course, software is important, but computers, microcomputers, or other hardware made with combinations of IC's only work well if the foundation is strong.

[Question] How much will research and development expenses increase?

[Answer] Research and development expenses for 1980 slightly exceeded 100 billion yen. This is about 5.8 percent of sales. We would like to increase this percentage a bit, but I doubt that the amount of research and development will reach 10 percent of sales in the next 10 years. GM and IMB both have about the same ratio as Hitachi right now, but there is a difference in the actual amount spent. Since IBM is only involved in electronics, its actual expenditures in that area are much higher than ours. We are investing the most money in the area of electronics also, but it is impossible to be on top in everything. We must selectively develop the items that can move to the front and, with them as a basis, carry on equal technological exchange with the United States and Europe. I believe this is the path we should take.

[Question] What areas will be emphasized in future research and development?

[Answer] One goal is to take a position of leadership in developing integrated circuit technology. Also, development related to energy measures is important for carrying out the responsibility of the country, and not just that of the company. Also necessary is the development of new materials as a conprehensive foundation for everything else. There are many important areas here just related to electronics. Another very big job is development for increased productivity in software.

[Question] Do you believe that original development is possible?

[Answer] We must carry out original research and development. This is Japan's assignment from here on out. There are suddenly more and more people coming to Japan to learn about production technology, but we are still behind in original technology. It is time for Japan to employ money and people for independent development of creativity. I believe the reason we have not had original results thus far is that over a long period of time we have gotten into a bad habit of following others in technology to avoid risk.

[Question] What do you think about government aid for development?

[Answer] A great deal of money is required for energy development so we would like government assistance in that area. Rather large expenditures will also be required for electronics. Up to now we have received some forms of assistance, but we would like to see it increased. The Keidanren has put out figures on the government share of development expenses in the United States and Japan, and it is still small in Japan when compared with the United States. The government seems to be in the mood for expanding assistance, so I think things are moving in the right direction.

[Question] Will Japan continue to be internationally competitive?

[Answer] At present, I believe there are a number of reasons why Japanese products are known for reliability and quality. One possible reason is the unity of management and labor, the company labor unions, and the lifetime employment system. This environment cannot be easily duplicated in the United States and Europe. In this respect, I believe Japan will continue to be strong. However, if we just rest on our laurels, they will catch up with us. Japan is behind in many respects, but if we do not slack off and continue to work hard, I believe we can keep growing during the next 10 years.

Nihon Electric President Sekimoto

Tokyo NIKKEI ELECTRONICS in Japanese No 262, 13 Apr 81 p 246

[Interview with Tadahiro Sekimoto, president of Nihon Electric Company: "It Is Premature To Say That Japan Does Not Have Original Technology"]

[Text] [Question] What will be the scale of production in the electronics industry?

[Answer] The Japan Electronics Industry Development Association has estimated that it will be double the present amount in 10 years. However, electronics will enter into another field and the VLSI will move into practical application between 1985 and 1990. The electronics industry may undergo a qualitative change but not in a negative direction. Therefore, I think that the scale of growth will be a little more than double the present amount.

[Question] What will the amount of exports be?

[Answer] They probably will not increase 4.5 times as they did in the last 10 years. The amount of exports already exceeds 4 trillion yen, so the base is very high, and also it will be necessary to expand local production. I think the increase will be about 1.3 to 1.5 times the present level.

[Question] How much will your sales grow?

[Answer] Sales have increased about 3.5 times in the last 10 years at the rate of 13.5 percent a year. In the next 10 years, we would like an annual growth of 10 percent plus alpha, and we would like the alpha to be at least 5 percent. I believe there is a potential for growth in our operations.

[Question] What will be the size of your work force?

[Answer] Including regional factories, it has grown to about 1.1 times its size 10 years ago, from 40,000 to 45,000 employees. In the next 10 years, I believe it will increase even more. The productivity of hardware production will continue to increase from now on, but software jobs will expand. In 10 years, I believe the number of employees will be 1.3 times that at present, or about 55,000.

[Question] Will software productivity improve?

[Answer] Of course, we intend to increase productivity. We are going to establish a software production technology laboratory and work hard at it. We will strive to make products subject to software engineering. However, at present there is a great difference between individuals in software production efficiency. If we compare software to Mt Fuji, we find differences in quality at the peak, in the middle, and at the foot of the mountain. The software at the peak can only be produced by superior people. Software at the foot of the mountain may be produced automatically by machine. So, depending on the item, there will be a great difference in the increase of software productivity.

[Question] What about future investment in plant and equipment?

[Answer] The largest area for future investment will continue to be the production of electronic devices. Another area of investment growth will be reduction of labor through office automation.

[Question] What will be your major products?

[Answer] There will be little change from the present in general categories. Communications equipment, computers, and electronic products for the home (new NEC household electrical products and computers, which are expected to be brought into the home soon) and the electronic devices on which these products are based will be our major products. C and C (computers and communications) are the fusion of these products. Balancing the composition of sales is our basic policy.

[Question] How much will you spend on research and development?

[Answer] At present, we are spending about 6 percent of sales. The actual amount spent will continue to grow, but this ratio probably will not change much. Industry cannot put a great deal of money into research and development. The government should put out more money for work close to basic research. I believe we should make the research expenditures necessary to utilize government research plus alpha.

[Question] What areas will you emphasize in research and development?

[Answer] New materials, new devices, digital technology including signal processing, sensory technology, and optoelectronics. Last year we reorganized our central research laboratory and set up four laboratories. In organization as well, emphasis was placed on the fields publicly announced.

[Question] Will more original research come out of Japan?

[Answer] I think it is premature to say that original research results are not forthcoming from Japan. Of course, heretofore, according to a study of the National Science Foundation in the United States, of the technical innovations which have been important breakthroughs, 65 have come from the United States, 25 from Britain, 4 from France, 3 from West Germany, and 2 from Japan. However, in the last 5 or 6 years, Japan has been catching up with the United States in certain limited fields. Whether we can move ahead or not will be an issue for the next decade. Therefore, the methods of research and types of investment will be different from

now on. A declaration that something has been "done" is very important information. If Japan does original research, we must announce that we have "done" it before anyone else. In addition, a lot of moeny will be required.

[Question] What is your view on government assistance?

[Answer] Looking at the Science and Technology White Paper, we see that the government share of research and development expenses is far too low in Japan as compared to the United States and other countries. In 1977, the government share of these expenses in Japan was 27.4 percent, compared to 50.5 percent in the United States and about 50 percent for Britain, France, and West Germany. If we are aiming at establishing this country on the basis of technology, the government should put out at least 50 percent of these expenses without delay even though it may be difficult.

Fujitsu President Kobayashi

Tokyo NIKKEI ELECTRONICS in Japanese No 262, 13 Apr 81 p 247

[Interview with Taiyu Kobayashi, president of Fujitsu: "We Can Improve Software Productivity"]

[Question] How much growth will there be in the electronics industry during the next 10 years?

[Answer] We could not forecast 10 years ago what would be happening today, and we cannot really predict the next 10 years. However, there will probably be as much growth as indicated in the figures put out by the Japan Electronics Industry Development Association.

[Question] What about the size of your company's sales and work force?

[Answer] Since there is a market, if appropriate stimulus is given to industry, sales will increase. I believe that sales will triple or quadruple in the next 10 years. The number of our employees will grow to four times the present figure.

[Question] Will productivity continue to increase?

[Answer] In the last 5 years, we have doubled sales without increasing the number of employees. I believe that we will keep this momentum. Important areas for the future will be office automation and rationalization of software and IC design.

[Question] Will you increase software productivity?

[Answer] Yes, we definitely can. We are getting our tools sharpened and concentrating all our efforts on this, so I am sure we can do it. We have become much more inventive in producing software and we have stopped using "human wave" tactics for everything, so I believe that productivity will go up.

[Question] What about future plant and equipment investment?

[Answer] Very sophisticated equipment is needed for production of both semiconductors and computers from the design stage through manufacturing and testing. Also, the depreciation must be limited to a short period. The game moves fast with dramatic changes. We are mentally prepared to keep expanding at the same pace. Whether we can actually do this or not is the main problem facing management.

[Question] What will be your major products in the future?

[Answer] Future electronics products all depend on IC's. There are very sophisticated IC's and some which are not especially so. Fujitsu will concentrate its strength on high-technology products such as computers and digital communications equipment, especially electronic switching systems. The basic orientation will remain the same. Because of the nature of our sales network, we are not particularly skilled at selling large volumes of products which are not so sophisticated. However, comparing the situation to Mt Fuji, I believe that the areas at the foot of the mountain will make great progress in the next 10 years and we should not ignore these areas. In particular, the society of the future will connect the peak and the foot of the mountain with a network of communication lines. This will require a high level of software technology, and it is our job to produce it. What bothers me is that if we do not develop an approach which will obtain a little more profit from software, we will end up with more work and less profit.

[Question] Will software become profitable in the future?

[Answer] If a strong social need developes, money will be spent on it. But things will be difficult until that happens. I believe our most difficult period is right now.

[Question] How much will research and development spending increase?

[Answer] Ten years ago, research and development expenses were 5.5 billion yen, 4.6 percent of sales. In 1979, they were 30.5 billion yen, or 6 percent of sales. We would like to continue expanding these expenditures, with the condition that dividends be kept stable. Since our main strength will be high-technology products, we cannot be stingy with research and development or it will end up like the octopus who ate his own legs. Simply piling up money is not the same thing as maintaining internal reserves. We want to increase internal reserves in the form of research and development spending.

[Question] What research and development areas do you intend to emphasize?

[Answer] We are coming up against a wall with LSI's based on silicon. We will emphasize new elements and new materials such as gallium arsenide, Josephson's element, and other new elements.

[Question] What do you think about government assistance?

[Answer] We were able to have rapid growth from the end of the war until recently because of the great stimulus of government assistance. The amount of money was

not great, but directions were set for research and development in our society through the assistance obtained. Furthermore, other companies in the same field are turned in the same direction and develop through competition. This is why the effect has been rather large for the amount of money involved. I believe that this is an excellent system that is unique to Japan.

[Question] Will original research emerge from Japan?

[Answer] Only irresponsible critics say that it will not. The things that are now known as original research were desperately sought out by the United States during World War II with government money. In Japan, even if the concepts were there, they were not properly developed. Therefore, I think that the present method of administering assistance in Japan is very good. This year also, a forward-looking budget was set up for the next generation of basic technology. If things continue in this way for the next 10 or 20 years, we will no longer have a situation in which original ideas do not develop in Japan.

[Question] Can high reliability be maintained?

[Answer] Middle level personnel who have been out of college for about 10 years think that machines are highly reliable. They do not know the difficulties of working with unreliable machines. Because of this, I am rather apprehensive about maintaining high reliability over the next 10 or 20 years.

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SCIENCE AND TECHNOLOGY

ELECTRONICS INDUSTRY EXECUTIVES ON FUTURE PROSPECTS

Toshiba President Saba

Tokyo NIKKEI ELECTRONICS in Japanese No 262, 13 Apr 81 p 248

[Interview with Shoichi Saba, president of Toshiba Corporation: "Office Work Efficiency To Be Promoted"

[Text] [Question] What will be the scale of production in the electronics industry?

[Answer] Between the electrical and the electronic industries, the electronics industry will probably show the greater growth. If we consider the emergence of new products and the expansion of practical applications, production in the electronics industry is expected to more than double in the next 10 years.

[Question] How about export growth?

[Answer] Since there are problems such as trade friction with the advanced countries, growth will not be unlimited. In the next 10 years, exports should reach 1.4 to 1.5 times the present amount. By providing new technology, materials, and parts, we will try to find new markets without friction. Depending on how well this goes, there is a possibility for further growth.

[Question] How large will your sales be?

[Answer] We would like sales to grow by at least 10 percent annually. Under generally stable growth conditions, it will be difficult to achieve this. But if we make an effort in the area of electronics, I believe it is possible. Of course, heavy electrical equipment is our main business. Growth here is not likely to be spectacular, but the demand for energy will continue to grow and the heavy electrical equipment business will expand steadily. However, the leading growth areas will be electronics and related fields (office automation [OA] equipment, electronic equipment for medical use, etc.).

[Question] What will be the size of your work force?

[Answer] We would like to keep the total number of employees about the same. However, the composition of the work force will change greatly. Direct workers will

be reduced in number and there will be an increase in people who use their minds such as software engineers, systems engineers, and design engineers. New employees will be hired systematically without regard to changes in the economy.

[Question] What are the prospects for improving productivity?

[Answer] There is no limit to improving productivity. There will probably be a slowing down in the improvement of hardware productivity, but it will continue. From now on, there will be an increase in the productivity of software and indirec operations. Toshiba has been conducting a campaign called EPOC (engineering efficiency and productivity of coming age) to increase the productivity of technical operations, and we are now starting a campaign called POWER (program for office work efficiency revolution). This program aims at improving the efficiency of office work (clerical work and indirect operations). We expect great results in this area.

[Question] What are the prospects for improving clerical productivity?

[Answer] Technical productivity increased a great deal with the introduction of computer-aided design. The clerical area also, for example, the preparation of documents, will be greatly simplified in the future. Actually, however, we are not only thinking of OA. What would happen if the production engineers from the factory looked at the flow of clerical work? Production engineering methods which have been effective in the factory may be applicable to the flow of clerical work. This is the main focus of the POWER campaign. If necessary, machines will be used.

[Question] What areas will you emphasize in plant and equipment investment?

[Answer] The electronics area alone (semiconductors, electron tubes, parts, and industrial electronics apparatus) presently commands 50 percent of the total plant and equipment investment.

[Question] What will be your main products?

[Answer] The two "E's," electronics and energy, will be our main strength. The former includes semiconductors and electron tubes which will form the basis for office automation, electronic medical equipment, and consumer electronic equipment, especially video. The latter is nuclear energy. Therefore, Toshiba will not change greatly in character in the next 10 years. Electronics will probably emerge as the top area in sales composition in that period.

[Question] What areas will you emphasize in research and development spending?

[Answer] The two "E's" I have mentioned, and materials. There is a wide variety of materials including all types of ultimate materials, amorphous materials, and ceramics. Materials development will be undertaken with affiliated companies.

[Question] Will original development emerge in Japan?

[Answer] Japan has already left the era of importing and imitating technology. However, there is still a lack of attention to basic fields of research necessary

for doing something original. Basic research and very dangerous research cannot be done by industry alone. Research which requires a long period of time before results emerge or involves risk makes it necessary to increase the government budget and create the proper environment. If this is not done, we will not be able to get original results. I do not believe that the Japanese are unintelligent.

[Question] Can we maintain international competitiveness?

[Answer] One could say that Japan is in danger of traveling the same road as Britain and the United States. However, we have these examples in front of us and I believe we can get by without taking the same path.

Matsushita Electric President Yamashita

Tokyo NIKKEI ELECTRONICS in Japanese No 262, 13 Apr 81 p 249

[Interview with Toshihiko Yamashita, president of Matsushita Electrical Industries: "Information-Related Products To Be Major Products of Future"]

[Text] [Question] Do you think that the electronics industry will grow at the same pace in the next 10 years as in the last 10 years?

[Answer] I believe that it will grow. Electronics has penetrated into many fields in such forms as the microcomputer, and I believe this trend will continue. Through this process, the electronics industry will expand.

[Question] Will there be a change in the growth pattern in which exports take the lead?

[Answer] I think the composition will change. It would be difficult to continue with the same pattern. Local production will increase. If the country receiving the exports can do the same work, we cannot force our products on them, even if they are high in quality and inexpensive. However, there are some products, such as the VTR, of which we export 80 percent of our production volume and almost no trouble occurs. This is because trading partners do not have the same industry. It will be necessary to send out more such products from now on.

[Question] How much will sales increase in the next 10 years?

[Answer] Whether the pace will be the same or not, it is possible that we will have just as much growth as in the last 10 years. Products presently having an annual trade volume of 2 trillion yen will not all go bad in the future. Although some say that television is no longer a strong product, it is still a necessity of life and there is a replacement demand. Also, it is possible that we will have thin television sets which can be hung on a wall or miniature sets the size of a wrist watch. Therefore, the products we have now are not at all bad, and they will get better.

Also, there are new fields. In our domain, products relating to alternative energy sources such as solar energy will advance considerably in the 1980's. Also, there are many products we do not have now but which are expected to come on the market

soon, during the eighties, such as optical technology products, video discs, the CAPTAIN (printed character and graphic information system), and two-way cable television. Therefore, the products for the eighties will be much better than those of the seventies. There was little specificity or concreteness in the seventies. Now we have many things which may not be completely new technology but can be clearly put into product form. Because of this, we are bound to be successful in the next 10 years.

[Question] What are your thoughts on productivity improvement and the size of your work force?

[Answer] We must forever be improving productivity. However, even when we carry out rationalization of the factory and reduce personnel, there are still jobs which must be done by human beings. Therefore, the number of employees will increase. If we consolidate our present force, it may be all right for electronics but not for the country as a whole. We must think about places for new people to work.

[Question] What will your main products be?

[Answer] Information-related products. Not just items like the SBC (small business computer). Such things as two-way television will appear, and the transfer of information will probably undergo considerable change.

[Question] In that case, will there be a change in the image of Matsushita Electric as a manufacturer of home electrical products?

[Answer] More than that, I think that the distinction between home products and industrial products will gradually disappear. Microcomputers are now being used in home electrical products, and it is getting harder to make the distinctions of the past.

[Question] What fields will you emphasize in research and development?

[Answer] We have all kinds of work to do in new fields in the eighties. If we put our hand to everything, we cannot expect good results, so we will choose those areas that fit the nature of our company and our skills. These are the areas of information and energy. In both cases, we must start with materials (new ceramics, amorphous materials, semiconductors, etc.).

[Question] What percentage of sales will you spend for research and development?

[Answer] At present, the percentage is 4 percent, but we have no intention of sticking to 4 percent.

[Question] What do you think about government assistance?

[Answer] There is a difference in the intensity of cost consciousness involved with government money and private money. With the money of industry, everything is linked to cost. So no matter how important the research is, the money will not be used beyond certain limits.

[Question] Can international competitiveness be maintained for the next 10 years?

[Answer] I think it can. The high quality of Japanese products comes from the trust between labor and management, the motivation of employees for work, and company loyalty. For example, the United States has the knowledge to produce the VTR. Its management and technical personnel are excellent. However, only Japan can produce it as a product with stable quality and low cost. I am sure that this is because of the loyalty of workers to their companies. The idea that the individual's situation improves when the company makes progress just cannot be understood in other countries. In Matsushita's overseas plants, we have a very difficult time for the first 3 years until the employees can understand this. Another reason is that the Japanese electronics industry is working chiefly to produce products for private use rather than for the military or a space program. With military products, economy is not a concern and the users are specialists. With private products, we do not know who will be using them and, more important, there are very severe cost restraints.

Oki Electric President Miyake

Tokyo NIKKEI ELECTRONICS in Japanese No 262, 13 Apr 81 p 250

[Interview with Masao Miyake, president of Oki Electric Industry Company: "Large Government Projects Necessary"]

[Text] [Question] What do you think the pace of growth will be in the next 10 years as compared to the last 10 years in the electronics industry?

[Answer] The composition of the electronics industry will change. It will spread out to broader areas, so greater growth can be expected. However, in the fields where progress can be expected, for example, office automation, the number of new manufacturers will increase. In these areas, at least 50 percent of the growth will be carried out by other companies than the present electronics manufacturers.

[Question] Will the pattern of expanding mainly through exports change?

[Answer] A large research and development investment will continue to be necessary for IC's, which are basic to all electronics advances. It is impossible to recover even this development investment in the Japanese market alone. We must seek outside markets as well, but it will become more difficult to sell only those products which are the result of mental work. We must consider export of other things besides physical products such as local production and provision of know-how overseas.

[Question] How much will sales grow?

[Answer] We would like to maintain an annual rate of growth of at least 15 percent. When we consider plant and equipment investment and pay raises, I think it will be difficult to do this in a sound way.

[Question] What will be the size of your work force?

[Answer] Rather than holding down the number of employees, we are shifting the content of jobs from direct factory work to intellectual jobs such as design and development. Automation is not used only to mass produce products cheaply. We must rely on machines to obtain the necessary quality. Therefore, it is not linked with changing the number of people.

[Question] Can productivity be further improved?

[Answer] I would not say that it can or that it must. Rather, our work inevitably leads to improvement. When we calculate the direct labor time expended in the factory for a certain amount of sales, we find that it drops by 20 percent each year. This is not due to rationalization but to changes in product content and technological progress.

[Question] How much will you spend on plant and equipment?

[Answer] Over the long term, we will have to continue making a considerable amount of plant and equipment investment. However, our company is presently making investments to make up for the lag in the past. So 1980 and 1981 are the peak years for this irregular situation.

[Question] What will your main products be?

[Answer] There are four main areas. One is communications equipment, which has been important in the past. Another important area is small computers along with terminals and other peripherals. Also, there are consumer appliances and equipment. In this area, we must make items for the ordinary household, but what we are aiming at is the field known as OA [office automation], given a broad definition. The other important area is IC's which are the basis of all the rest.

[Question] What areas will grow in the next 10 years?

[Answer] Out of these four important areas, including IC's, the area which will grow the least is communications equipment. Communications equipment is Oki Electric's basic product and the motive power for our technological progress. However, its share of sales will go down. In its place, IC's and OA will probably become more important.

[Question] How much will you spend on research and development?

[Answer] Right now it is about 5 percent of sales, and we would like to keep it up to 5 percent.

[Question] What areas will you emphasize in research and development?

[Answer] The four areas I have mentioned will be the central areas. We will concentrate especially on terminal equipment, including dispersed data processors. We will take the attitude that this must not be neglected.

[Question] What do you think about government assistance?

[Answer] I believe that the government should take the position of promoting very large development projects rather than small ones. What is most important is for the effects spreading out from the results of this research to raise the overall level of technology.

[Question] Will Japanese products remain internationally competitive?

[Answer] I do not say this just because I'm an old engineer, but I think that America's underlying power is awesome. The United States has come up with such things as the "Monday car" but its good products are good. Japanese products are clustered around an average value. That is, the standard variation is small, and we may be giving somewhat excessive praise to this. It is often said that Japan has produced little good basic work. Therefore, there is some concern over how long we can continue.

[Question] What would it take to produce good basic work?

[Answer] I believe that large projects could provide the stimulus. At Bell Laboratories in the United States, five or six approaches are determined at the preliminary discussion stage for achieving one purpose. Halfway through the project, these are narrowed down to three, and, finally, to one approach. Therefore, a number of offshoot results are obtained in the intermediate stages. In Japan, we settle on one plan for the start and so we get few secondary results. This is an important difference.

[Question] Can Japan do original research?

[Answer] If we are allowed to, I believe we can. Until recently, we have not been given the opportunity. Industry cannot touch anything that does not link up with business within 3 or 4 years.

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SCIENCE AND TECHNOLOGY

POSSIBILITY OF LAUNCHING RECONNAISSANCE SATELLITES VIEWED

Tokyo BUSINESS JAPAN in English Vol 26 No 5, May 81 p 36

[Article by Yoshiteru Oka, Associate Editor of FUJI EVENING]

[Text] NASA's space shuttle Columbia landed safely on April 15 at Edwards Air Force Base in Southern California after a flawless test flight, opening an era of true space utilization.

According to the NASA program, the Space Transportation System, known more commonly as the "space shuttle," is expected to be launched some 500 times in the coming 15 years; 150 of these times are projected for military purposes. The missions expected for the space shuttle are many – carrying into earth orbit a variety of satellites for reconnaissance, surveillance, communications, etc. It will also take part in experiments of laser-applied anti-satellite facilities.

With Columbia's success, the U.S., bent on closing the gap in the arms race in space with the Soviet Union, now seems to have established a major lead in the development of space-borne strategic arms.

Japan has so far launched satellites for academic research projects, communications and meteorological surveys, but none for reconnaissance purposes. Needless to say, the capacity for collecting information from a reconnaissance satellite is immeasurable, and its development is a highly productive investment. As the late U.S. President L.B. Johnson noted back in 1967, "The U.S. reconnaissance satellites, should they be the sole product of the space effort valued at a total of $40,000 million to date, will be certain to bring in results worth 10 times as much as the amount invested."

The Japanese Constitution does not prohibit the country from developing and retaining reconnaissance satellites. It is only natural that the Defense Agency and Self-Defense Forces, frustrated with an extremely limited supply of strategic information collected by U.S. reconnaissance satellites, has shown more than a little interest in having their own satellite for this particular purpose.

When the U.S. LANDSAT was launched, the Self-Defense Forces made a serious study on the possibility of using an earth resources satellite in place of a reconnaissance satellite. As soon as NASA released photos taken by the earth resources satellite, they checked the photos, only to find that an earth resources satellite could never serve as a replacement. LANDSAT, running in an orbit as high as 900 km above the Earth, or four times higher than a reconnaissance satellite, offered photographs with 80 meters of resolving capacity at most. It was known that NASA's reconnaissance satellites usually provided photos with a resolving capacity as good as 30 centimeters.

But this has not made Japan give up on having its own reconnaissance facilities in outer space. One may recall the comments of the late Prime Minister Masayoshi Ohira at a meeting with U.S. newsmen prior to his visit to the U.S. in May 1979. He repeatedly emphasized a need for Japan to improve its reconnaissance capability, which apparently suggested a need for having its own reconnaissance satellite.

It is generally believed that Japan has ample technological capability to develop and build a reconnaissance satellite. Propelling the satellite into orbit is no problem, since the National Space Development Agency of Japan (NSDA) will shortly complete its M1 rocket development program. The M1 is capable of carrying 1.3-2.2 payload tons into orbit. This is more than enough to launch the usual type of reconnaissance satellite which weighs some 0.15 tons.

The some ¥10,000 million required for launching a satellite does not seem to pose too big a problem for the Japanese government as the Air Defense Force pays almost the same to procure an F15 fighter. One point to consider is the fact that a satellite for photographic reconnaissance has only a 2-week life. In order to conduct continuous all-year round reconnaissance, a total of 25 satellites will be needed, requiring the sum of ¥250,000 million for their launching, which the Japanese government will not find too large to provide.

Then, what has made Japan hesitate in deciding to possess a reconnaissance satellite?

First, NSDA's rocket boosters are permitted solely for "peaceful" uses. Inevitably views are divided on whether or not the use of the rocket for launching a reconnaissance satellite would be appropriate.

Next comes the problem of the launching site. Uchiura, Kagoshima Prefecture, has been used as Tokyo University's launching site for a scientific research rocket, while Tanegashima Island is used by NSDA. In either case, rocket launchings have been conducted only during the holiday seasons observed by the local fishery community, namely early in February and mid-August, in consideration of the possible effects of rocket launchings on fishing operations. If no ideal site can be found elsewhere in Japan, Iwojima Island, where there are no permanent residents, has been suggested. The idea does not seem practical however.

Another problem that requires a solution is the lack of capacity to handle the time-consuming work of organizing and compiling the huge quantity of information collected by a reconnaissance satellite.

Meanwhile, NSDA is scheduled to launch a maritime observation satellite in fiscal 1984 followed by a land observation satellite in 1987. The former is expected to provide a resolving capacity of its photos up to 50 meters, while the latter is expected to offer even better results. They could be developed into Japan's first reconnaissance satellites if future conditions warrant their use.

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SCIENCE AND TECHNOLOGY

PLANT EXPORTS MARKED BY STEEP DEMAND FLUCTUATIONS

Tokyo BUSINESS JAPAN in English Vol 26 No 5, May 81 pp 59, 61, 65, 69, 73

[Article by Kazumi Taki, Japan Consulting Institute]

[Text]

AS indicated in Table 1, Japan's exports of industrial plants amounted to only about $320 million in fiscal 1965, assuming only 3.8% of the nation's total exports valued at $8,300 million. The weight of industrial plants in the nation's total exports was very small. The trend of industrial plant exports, however, has shown a notable annual increase. Especially after the first oil crisis, exports have shown outstanding growth. While these exports exceeded the $1-billion level for the first time in fiscal 1971, they reached more than $5 billion in fiscal 1975 and totaled as much as $11,800 million in fiscal 1979. As the nation's total exports in fiscal 1979 were $107,000 million, the ratio of industrial plant exports assumed 11%, improving their position in the nation's trade. Now great expectations are placed on plant exports as one of the country's major export items.

Table 2 shows how Japan's exports of industrial plants have increased regionwise in five years since fiscal 1975. The most remarkable increase was registered in exports to the Communist bloc, by 394% in fiscal 1979 over fiscal 1975, which was followed by "other regions" with 323%, the Middle and Near East with 317% and Africa with 270%. Of the total exports to the Communist bloc in fiscal 1979, around $4,300 million, some $3,500 million was for China. The steep increase was due to the larger demand for exports to China. In China, as many as 120 projects to construct industrial plants were announced in 1978 as a major part of the country's 10-year development plan, which led to "a China boom" among Japanese industrial plant manufacturers. Contracts to export industrial plants to China were concluded one after another. Of these, exporting industrial plants to Baoshan steel mill amounted to as much as $1,500 million. Though large in growth rates, exports to North America and Europe have been small in value, not contributing much to the nation's total exports of industrial plants. A large increase was registered in exports to the Middle and Near East and Africa, reflecting Japan's exports of many large industrial plants to meet the increased demand for large-scale plants against the background of the voluminous inflow of oil dollars into the oil producing countries in these regions. Of Japan's total industrial plant exports in fiscal 1979, the number of those valued at more than $100 million each accounted for 17 with a total value of some $5,200 million. These large plants assumed 44% in the nation's total industrial plant exports for the fiscal year, and amounted to $11,800 million. As the total number of these plants was 743, this indicates how these large plants account for a large share of the statistics. Of these large industrial plants, 10 were exported to the Middle and Near East and Africa, including 3 for Saudi Arabia, 2 for Iraq, 1 for Kuwait, 1 for

Table 1. Japan's Industrial Plant Exports (1965 – 1979)

(Unit: $1,000)

Fiscal year	Number	Value	Growth rate over previous FY (%)
1965	71	320,873	
1966	90	326,944	1.9
1967	127	508,185	55.4
1968	129	491,070	- 3.4
1969	167	711,378	44.9
1970	213	965,396	35.7
1971	231	1,303,617	35.0
1972	257	1,490,785	14.4
1973	350	2,198,258	48.0
1974	415	3,858,324	75.5
1975	489	5,241,438	35.8
1976	680	8,005,535	52.7
1977	736	8,607,374	7.5
1978	753	8,729,174	1.4
1979	743	11,784,981	35.0

Yemen, 1 for Algeria, 1 for Tunisia and 1 for Nigeria.

The nation's exports of industrial plants from April 1980 to January this year totaled $7,700 million, only 72.8% of some $10,600 million registered in the same period of the previous fiscal year. Regionwise, as shown in Table 3, exports to Southeast Asia increased by 129.6%; those to Central and South America, Africa, Oceania and other regions increased by 138.5%, 109.3%, 519.1% and 176.6% respectively; and those to the Middle and Near East and the Communist bloc sharply decreased to 49.4% and 33.9% respectively. In the regional ratios of Japan's industrial plant exports in fiscal 1979, the Middle and Near East assumed 30.5% and the Communist bloc 36.4%, for roughly two-thirds of the total. Their shares, however, declined to 21.6% and 16.4% respectively in the period between April 1980 and January 1981. As these fugures markedly declined, the nation's plant exports showed a sharp decrease in that period. The major reason for this in the case of Japan's exports to the Middle and Near East was that the conflict between Iran and Iraq dragged on. After the first oil crisis, Japan's industrial plant exports to Iran and Iraq markedly increased. Especially those to Iraq registered a sharp increase in large plants in connection with Japan's imports of crude oil from that country. Iraq thus became a large market for Japanese-made industrial plants. But the country's hostilities with Iran have dragged on, so projects to construct industrial plants in Iraq have been forced to be suspended temporarily until the situation is normalized. It has also become difficult for those concerned to promote new talks for contracts for industrial plant exports. These factors have led to a sharp decline in Japan's industrial plant exports to Iraq.

Japan's plant exports to Iran had assumed a large share before Ayatullah Khomeini's revolutionary regime assumed office, but the share decreased phenomenally as Japan applied economic sanctions to the country, a condition that developed after staff members at the U.S. Embassy in Tehran were taken as hostages. Ayatullah Khomeini's policy to restrict the modernization of his country has also affected Japan's industrial plant exports to that country.

Table 2. Regional Destination for Japan's Industrial Plant Exports

(Unit: $1,000)

Region	FY 1975		FY 1976		FY 1977		FY 1978		FY 1979		
	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value	Ratio over FY 1975
Southeast Asia	164	1,490,755	216	1,260,919	238	1,848,456	226	2,406,975	187	1,878,143	126.0
Middle & Near East	46	1,143,176	88	2,906,572	94	1,851,440	87	1,420,434	118	3,624,232	317.1
Central & South America	100	1,015,478	127	1,178,392	140	830,446	167	2,021,404	119	590,819	58.2
Africa	26	318,930	54	818,491	42	1,951,114	46	640,589	41	863,245	270.5
Oceania	11	34,583	12	64,307	13	122,140	13	329,382	12	48,289	139.6
Communist Bloc	91	1,095,775	104	1,450,005	137	1,511,136	146	1,695,086	170	4,317,708	394.0
Others	51	142,741	69	255,529	72	492,642	68	215,304	96	462,550	323.7
Total	489	5,241,438	680	8,005,555	736	8,607,374	753	8,729,174	743	11,784,981	224.8

As for the decline in exports to the Communist bloc, the Soviet Union and China slowdown has had the most serious effect. As Japan took a policy of economic sanctions against the Soviet Union after it invaded Afghanistan, Japan's industrial plant exports to that country have become almost nil. As for Japan's plant exports to China, a large increase was registered from the latter half of 1978 to 1979, and the total amount of such exports in fiscal 1979 reached as much as $3,500 million, leading to anticipation among many businessmen in Japan of bright prospects for trade with China. This excitement, however, did not last long. In 1980, the conventional policy of importing large-scale plants centered around those for petrochemicals was criticized within the Chinese government, and the move to restrict the import of industrial plants became pronounced. In recent months, the Chinese government has notified Japanese enterprises concerned that it would be necessary to either suspend the construction of large industrial plants in the fields of steel and petrochemicals or to cancel the previous contracts for importing such plants because China had to readjust its economy. This deeply shocked the Japanese enterprises concerned. The number of projects for which such notification was made totaled 15 valued at some $1,500 million. This is the main reason why Japan's export figures for industrial plants show such a sharp decline.

The regions to which Japan's industrial plant exports have shown a phenomenal increase in fiscal 1980 include Southeast Asia, Central and South America, Oceania and others. As far as Southeast Asia is concerned, the political situation of ASEAN countries in particular is comparatively stable and they are actively promoting industrial development. The demand for industrial plants is large and orders for large-scale plants valued at more than $100 million have increased. The number of plants valued at more than $100 million each for which Japan has received orders from ASEAN countries in fiscal 1980 amounts to five. When compared with the fact that the number of large-scale plants valued at more than $100 million each for which the Middle and Near East has placed orders with Japan in fiscal 1980 is only four, this indicates how actively ASEAN countries are promoting their industrialization. Exports of industrial plants to Central and South America have also increased, but this was due mainly to the sharp decrease in such exports in the previous fiscal year.

Though Japan's exports of industrial plants to Oceania showed an increase of as much as 519% in fiscal 1980, this was due to the fact that Japan's exports to that region had been very small and Japan received an order from Australia during the period for a large power generating plant valued at more than $100 million.

Japan's industrial plant exports during fiscal 1980 were first expected to reach $10 billion in the beginning of the fiscal year, but judging from the results achieved so far, it seems that it will be difficult to reach even $9 billion.

Though Japan's industrial plant exports are mostly destined for developing countries, in the case of non-oil producing developing countries, having been seriously affected by the sharp rise in crude oil prices, their international trade balance has worsened and their liabilities toward foreign countries have heavily accumulated, making it difficult for them to import industrial plants. This being the case, therefore, though they wish to import industrial plants, it is impossible for them to do so unless they receive economic assistance from advanced industrial countries. It has become necessary for Japan to promote such exports on the basis of economic cooperation. Even in the case of oil producing developing countries, as the war between Iran and Iraq has dragged on, instability is the mark of many governments and inflation has intensified. Now some of them are forced to cut back, postpone or suspend their industrialization programs. In view of this fact, their demand for Japanese-made industrial plants is most likely to be sluggish for the time being. If this decrease in demand is temporary, Japan will soon resume active exports, but if it is prolonged, competition among advanced industrial countries for receiving the few orders for

Table 3. Regional Destinations for Japan's Industrial Plant Exports in Fiscal 1980 (April 1980 – Jan. 1981)

Region	Number	Value ($1,000)	Growth rate over previous FY (%)
Southeast Asia	180	2,224,163	129.6
Middle & Near East	109	1,669,337	49.4
Central & South America	74	766,912	138.5
Africa	37	853,619	109.3
Oceania	25	250,644	519.1
Communist Bloc	101	1,264,272	33.9
Others (North America & Western Europe)	101	683,542	176.6
Total	627	7,712,489	72.8

industrial plants from developing countries will become intensified.

Needless to say, unless Japanese-made industrial plants are internationally competitive, it will become difficult for Japanese manufacturers to receive orders. As the quotation of the yen has tended to rise since the end of last year, Japanese-made industrial plants are likely to become less competitive internationally. It will only be possible for Japanese manufacturers to expand their industrial plant exports by concentrating their efforts on enhancing their international competitive strength, exploring promising overseas markets, and forming international consortia.

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SCIENCE AND TECHNOLOGY

ELECTRONIC TECHNOLOGY AIDS OVERSEAS SALES OF ELECTRIC TOOLS

Tokyo BUSINESS JAPAN in English Vol 26 No 5, May 81 pp 75, 82

[Article by Yasuo Inoue, Staff Writer, THE NIHON KOGYO SHIMBUN]

[Text] JAPAN'S electric tool industry has been steadily expanding production. Since it achieved an output valued at ¥111,200 million in 1979, thus exceeding the ¥100-billion mark for the first time, the industry has continued to show a growth of more than 10% since then.

What has been supporting this remarkable growth is the export market. Exports of electric tools have increased year after year, and the ratio of exports to the industry's total output has reached nearly 40%. Though at first destinations were mainly Southeast Asian countries, they now include the United States and European countries, testifying to the fact that Japanese-made electric tools and the technology incorporated into them have attained worldwide acclaim.

One of the reasons the export of electric tools has increased is that the domestic demand has leveled off because of the sluggishness of private housing investments and the once-budding demand for tools by do-it-yourself enthusiasts that had assumed some 10% of the total domestic demand has been stagnant because personal spending was dull.

The major reason, however, has been that electric tool manufacturers have been actively exploring overseas markets. Their efforts are now showing good results.

The number of major manufacturers making only electric tools is nearly 50. Of these, wholly Japanese makers include two major ones — Makita Electric Works and Hitachi Koki, as well as such well-known ones as Mitsubishi Electric Corp., Shinko Electric, Shibaura Engineering Works, Kosoku Electric Machine, Nitto Koki, Kuken Kubota Industry, Matsushita Electric Tool, Ryobi, Mito Industry, Fuji Diamond Industry, Nippon Electric Precision Equipment, and others.

Foreign-capital affiliated companies include Japan Black and Decker, the Japanese corporation affiliated with Black and Decker of the U.S., the world's largest electric tool maker, and Robert Bosch Japan, Japan Drive-It, and others. Competition in technical development and sales among them is intense. As for exports, both Makita Electric Machinery Works and Hitachi Koki have been vigorously endeavoring to exploit overseas markets by establishing bases in foreign countries from many years ago. In a more recent example, Makita began local production in Vancouver, Canada, at the beginning of last year.

The fact that Japanese-made electric tools have earned worldwide recognition is not necessarily due to the active sales efforts of manufacturers. Their success in overseas markets can be largely ascribed to the fact that makers have been exerting efforts to develop new technology and products in order to adequately meet the ever-diversifying needs of customers who wish to have more advanced products. Without such strenuous efforts by makers, Japan's electric tools would never have been numbered among the world's best products.

The most noticeable technical development in recent years is that, as in

the case of various machines and equipment, electronic technology and ICs (integrated circuits) have been widely adopted in electric tools.

In the case of electric grinders, for instance, electronic control functions have been incorporated into such tools so as to automatically prevent rotation slowdowns. Among electric grinders, disc grinders, which have wider contact surfaces when grinding and polishing, have tended to be troubled by slowing of the rotation speed. With the above electronic control function built in, however, the working efficiency of disc grinders has improved to twice that of conventional models. Needless to say, the new functions have been materialized with ICs. Electronic technology has been adopted in electric saws as well. Some recent types of electric saws have become much more efficient as the cutting width of materials can be digitally controlled.

The second remarkable fact about newer electric tools is that cordless tools have appeared on the market. It is both inefficient and unpleasant for operators to have to work while dragging long electric cords. If tools have no cords, operators can carry them easily and work at places where no electric source is available. To make electric tools without cords has been one of the most important targets of development efforts.

The best key to this is to use batteries. Cordless tools are already available in smaller tools such as electric drills, screwdrivers, grinders, circular saws and others. The problem is the short life of batteries. Their weakness is that charging takes about 10 hours for only an hour of use. Recent batteries, however, have improved in performance and are more powerful than conventional ones. They are slowly but gradually approaching the ideal.

The third noteworthy fact about electric tools is the recent move toward devices that prevent the scattering of dust, and dust collectors to keep the working environment clean. If powdered dust is left uncollected, operators may often be physically affected.

Manufacturers of electric tools have been seriously tackling the problem of effectively collecting dust. Some of the recent circular saws, sanders, and grinders already feature dust-collecting devices. Regulations regarding dust have already been stipulated, and "Regulations for Preventing Diseases from Dust" was put into effect from October 1979. This fact is one of the reasons why electric tool manufacturers have been urged to concentrate on efforts to work out measures to prevent dust.

The fourth element in the recent development of new tools is how to make them smaller in size and lighter in weight. Voices of users calling for smaller and lighter tools, centered around drills for use in housing construction in particular, have become stronger.

When using impact drills, for instance, operators are forced many times to assume unnatural positions. When boring holes in ceilings or inserting bolts in over-head fittings, the tools operators use must be small and light. Tool makers, therefore, have been exerting efforts to develop products to adequately meet the needs of users by reducing less important parts and using lighter materials. In fact, recent products have become considerably lighter and easier to use as compared with previous models.

Some of the tool manufacturers plan to establish central laboratories to conduct basic research on electric tools and to develop new products to fill the needs of users. Competition among manufacturers is expected to become more intensified in the area of developing new technology and products.

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SCIENCE AND TECHNOLOGY

NEW TECHNOLOGY PROVIDES GREATER MEASURING MACHINE ACCURACY

Tokyo BUSINESS JAPAN in English Vol 26 No 5, May 81 pp 109, 114

[Article by Michio Kawada, Director, National Metrological Research Laboratory, Agency of Industrial Science and Technology, Ministry of International Trade and Industry]

[Text] RAPID progress of industrial technology and greater economic expansion have increased the need for measuring instruments in many fields. As a result, numerous innovations have been introduced and new measuring instruments meeting consumer's needs have come to be extensively produced.

Principal measuring instrument improvements achieved in recent years can be stated as follows:

Measuring efficiency is demanded first of all, since measurement is seriously affected by defective maintenance, controls or operation. The development efforts center on measuring instruments that can be handled with ease even by unskilled operators.

At the same time, the demand for higher reliability and precision has become stronger. This has led to the development of a large number of measuring instruments provided with devices for automatic compensation or automatic correction as well as non-automatic correcting devices, all of which demand trouble-free operations.

Particularly noteworthy are the practical applications of measuring instruments with built-in microcomputers or microprocessors that are capable of automatic compensation, and processing of measurement data. The development of measuring instruments capable of fast processing of data is being accelerated.

I should like to summarize the typical measuring instruments and their fields of application, touching on various types of measuring instruments, new technology and changing demands.

Measuring Lengths

Most familiar measuring instruments for length including micrometers and tool gauges are becoming increasingly digital. The latest products are provided with LC (liquid crystal) displays. Operating on built-in miniature batteries, these new measuring instruments can be carried anywhere. Zeroing of measuring value at any arbitrary position or holding of the display data are possible, making these devices extremely convenient at the actual work site.

A remarkable trend in recent length measurement devices is the emergence of measuring instruments suitable for multidimensional objects. It is no longer enough to measure the simple, unidimensional length of an object. Its complex shape must be grasped as well. In all-inclusive length measurements, measurement data is converted into electrical signals, digitalized and processed with a computer to provide the desired information.

One of the high-precision methods for the digitalization of length measurements makes use of laser interference. In addition, some measuring instruments utilize moiré fringes, optical encoders and electromagnetic magne-scales for enhancing precision.

Multidimensional measuring instruments that have already reached the stage of practical application include three-dimensional measuring devices for curves, curvatures, radii and center positions used for cams, gears and screws; roundness testers; surface

roughness testers; and automatic bore measuring devices.

For example, a three-dimensional measuring instrument has an automatic operation command tape with memories of measurement sequence, operation sequence, information on locating, processing method of design parameters and measurement data. The operator has only to set the object for measurement and the command tape. Three-dimensional measurements including the shape are accomplished automatically.

The servo motor moves the device along the X, Y and Z axes according to the command. The length of each coordinate axis is read with a linear encoder built in each axis. Such information as processed measurement quantities, the code for designating the drawing, comparison with reference values and the judgment of acceptance or rejection is all neatly typed out. These devices are applicable to the measurement of objects having complex shapes.

Measuring Techniques for Mass

Among mass measuring instruments, the diffusion of commercial scales utilizing load cells of electrical resistance type has become noteworthy. Their uses are expected to multiply in the future as they have numerous advantages over conventional commercial spring scales.

The load cell scale can be made very compact. It features an excellent weighing sensitivity and precision. Some new products have a weighing precision of better than 1/3,000 of its maximum range. These scales have built-in microcomputers that perform calculations based on measured data. For example, they calculate the net weight (weight minus tare), and digitally display the unit price, the final price and the weight in case of commercial scales.

There are also scales which automatically correct zero point and portable scales operating on built-in compact batteries and dispensing with power supply cables. Scales which can be directly linked with an office computer system and issue bills, invoices and write business documents such as itemized sales records have already entered the practical stage.

The development of labelling machines and digital counting scales exclusively operating on load cells is aslo noteworthy. Load cell scales with their quick response economize on the time needed for each weighing. Hence, they are extensively employed in supermarkets as labelling machines for weighing merchandise and labeiling it, indicating weight, price, date and other information.

Another application of the load cell is the counting model which counts the number of products with uniform size and weight, such as screws, parts of electric machines and printed matter. Some highly sensitive models have a precision of 1/5,000 - 1/10,000 to their maximum range. If the unit weight is known, the count of pieces in a lot can be obtained at one touch. Applications of load-cell equipment are expected to show increasing growth.

Temperature Measuring Techniques

Among the temperature measuring devices widely used in Japan at present are thermocouples, thermistors, electrical resistance thermometers and heat radiation thermometers. Research and development on temperature measurement based on heat radiation has been rapidly progressing in recent years. Dichroic thermometers and Si or Pbs radiation thermometers belong to this type.

Since these thermometers have such advantages as quick response and the capability to measure without contact, they are finding daily expanding applications. Models featuring outstanding reliability and performance are already being industrially manufactured.

On the other hand, the growing need for accurate and high-precision temperature control and the importance of maintaining the precision of thermometers have given rise to the introduction of systems for regular thermometer checking and the modernization of temperature correcting devices.

An increasing number of temperature measuring devices and thermo-

meter testers are being installed in test rooms of plants.

Pressure and Flow Measuring Techniques

The most widely used device for measuring pressure is the elastic pressure gauge incorporating a Bourbon tube, bellows and a diaphragm. Models with a precision of 1/1,000 of the maximum range have come to be manufactured. In some models detected pressures are converted into electric signals by means of a transducer provided on the elastic body and are displayed in digits.

Recently developed digital sphygnomanometers based on elasticity measure maximum and minimum (systolic and diastolic) blood pressures automatically.

Hydraulically operating air piston gauges are used as reference manometers or deadweight pressure gauges. They are employed as standard pressure gauges with a precision of 1/10,000.

Uses for flow meters range over household water meters, gas meters, gasoline meters and oil meters at gas stands to various large industrial flow meters for gases and liquids. Some flow meters for water flow control, operating on electromagnetic and ultrasonic principles, have diameters exceeding two meters.

Reliability and performance of household water meters and gas meters have been greatly improved through rigorous quality control during production. Some of the newer models are designed to convert meter readings into electrical signals and to transmit them to a central control station for collective telemetric reading.

Gasoline meters and oil meters of extremely high standards have come to be demanded following the oil crisis. Among the volume-type oil meters there are models achieving a precision of 1/1,000. Reliability is enhanced further, for example, by providing automatic compensating arrangement of temperature and pressure, or a high-performance air separator.

The technology of measuring gas flow under various conditions has made giant strides, as exemplified by the gas meter utilizing the Kármán vortex, the volume-type servo gas meter whose pressure gradient between the inlet and the outlet is made zero, and the nozzle Venturi Type gas meter with a gas jet of sonic speed. They are making possible the measurement of gas flow which was deemed as impracticable only a decade ago.

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SCIENCE AND TECHNOLOGY

SIMPLIFIED PROCESS TO SPEED USE OF HYDROGEN AS ENERGY SOURCE DISCUSSED

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[Text]

RESEARCH is progressing throughout the world on the use of hydrogen as an energy source superseding petroleum.

Now a new iron-titanium alloy, which can occlude hydrogen in ordinary temperatures, has been jointly perfected by Nippon Jukagaku Kogyo, a leading maker of iron alloys in Japan, and Ulvac Corp. (with the participation of Shinku Yakin, a subsidiary of Ulvac).

The alloy is mainly composed of iron (Fe) and titanium (Ti) in a ratio of 1 : 1, with the addition of small quantities of zirconium (Zr) and niobium (Nb) or zirconium and molybdenum (Mo). It can be activated by merely exposing it to hydrogen gas of 35 atmospheres for some hours at ordinary temperatures.

Both iron and titanium are abundantly available at low cost. Iron-titanium alloy was long regarded as a promising material for the occlusion of hydrogen, but the ordinary alloy features an extremely slow initial reaction with hydrogen. To activate the surface of the alloy, it is necessary to heat the alloy in a vacuum for several hours.

This activating pre-treatment is followed by keeping the alloy at 400°C under 65 atm. for long hours. The development of some method to enable more efficient activation was eagerly awäited, especially in large plants.

The recently developed alloy solves this problem completely. A high degree of safety is ensured because the alloy can be activated in ordinary temperatures and under relatively low pressure.

The maker intends to construct a plant with a monthly output of one ton and to start sample shipments shortly. If mass production gets under way, price per kg would come down to ¥4,000 - ¥5,000, which is competitive with foreign products which cost ¥7,000 - ¥10,000 per kg.

The bright future for hydrogen energy systems has served as the motive force for the joint project by Nippon Jukagaku Kogyo and Ulvac Corp. The large quantity of electric power required for the production of the hydrogen-occluding alloy is supplied from geothermal power generation. Nippon Jukagaku Kogyo offered its expertise on the melting of the alloy, while the Ulvac group supplied its know-how on vacuum metallurgy and plant engineering.

Joint research and development were started last September when it was felt that the perfection of a hydrogen-occluding alloy was entirely possible by the extensive pooling of the know-how of both enterprises.

Professor Tokio Ota of Yokohama State University, Faculty of Engineering, an authority in this branch of metallurgy, made a vital contribution towards the initiation of this development project.

The newly developed product may be applied to the development of air-conditioning systems using chemical reactions between hydrogen and metals, now being promoted by the Research Development Corporation of

Japan, and to another comprehensive research project researching wind power and heat energy being promoted by the Science & Technology Agency. In addition, the new alloy may be applied organically and with advantage to the removal of snow from roads and to regional energy supply for agricultural facilities.

In particular, the new technology has a direct bearing on the comprehensive research being conducted by the Science & Technology Agency for the utilization of wind power, which calls for the development of inexpensive and efficient hydrogen-occluding metals as a means for long-term stabilized storage of thermal energy converted from the kinetic energy of the wind.

This national research and development project is divided into two sectors: (1) designing and manufacture of large-size heat storage and releasing systems participated in by the National Space Development Agency of Japan (a part of the Science & Technology Agency), Kawasaki Heavy Industries, Tokai University, Shinku Yakin and Yokohama State University, and (2) mass production technology for hydrogen-occluding materials, participated in by the National Research Institute for Metals.

The five-year, ¥800-million development project has been in progress since 1980. One of the hydrogen-occluding alloys being studied is an iron-titanium alloy: Ti 1.22 – 9.5wt % $Fe_7Ti_{10}O_3$.

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END