

FOR OFFICIAL USE ONLY

JPRS L/10662

16 July 1982

Japan Report

(FOUO 42/82)

U. S. - JAPAN VLSI WAR

FBIS FOREIGN BROADCAST INFORMATION SERVICE

FOR OFFICIAL USE ONLY

NOTE

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

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

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

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

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

FOR OFFICIAL USE ONLY

JPRS L/10662

16 July 1982

JAPAN REPORT

(FOUO 42/82)

U. S. - JAPAN VLSI WAR

CONTENTS

Japan's Strength in 64 K RAM, Anxiety Discussed
(SHUKAN ASAHI, 1 Mar 82)..... 1

VLSI War Expected To Become More Fierce
(Tatsu Seko; TOSHI TECHO, Mar 82)..... 9

NEC President Sekimoto Interviewed on VLSI War
(NIKKEI BUSINESS, 22 Mar 82)..... 13

Background of VLSI War With United States Reviewed
(Kato, Nonaka; NIKKEI SANGYO SHIMBUN, 15-20, 22, 26,
27, 29 Mar 82)..... 19

Japanese-U.S. Semiconductor Competition, Cooperation
(DENPA SHIMBUN, 29 Mar 82)..... 50

NEC Vice President Ouchi Interviewed on Semiconductor Issue
(SANKEI, 30 Mar, 1, 2, 5 Apr 82)..... 90

Confronting U.S.-Japanese Semiconductor Industries Analyzed
(Eiichi Hasegawa; NIHON KOGYO SHIMBUN, 16,17,22,24 Mar,
7 Apr 82)..... 100

- a -

[III - ASIA - 111 FOUO]

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

JAPAN'S STRENGTH IN 64 K RAM, ANXIETY DISCUSSED

Tokyo SHUKAN ASAHI in Japanese 1 Mar 82 pp 76-80

[Text] "The American semiconductor industry has been lauded as the stronghold of technological innovation and industrial genius, but now it is facing the Japanese forces, and it is experiencing its first setback and is staggering in its struggle for survival," according to an article in the American economic magazine FORTUNE entitled "Semiconductor Chips--Routine Japanese Victory" (24 December 1981 issue). The article further says: Japan has captured 70 percent of the world's market in 64 kilobit RAM (Random access memory) and has won an overwhelming victory. With this victory, Japan has probably won supremacy over the RAM market for the rest of the century."

The 64 kilobit RAM--an item only a few millimeters square made from sand (silicon)--has entwined the major semiconductor makers of Japan and the United States in a decisive conflict, and in the background is the situation that this memory will be the strategic product which will herald the attainment of the VLSI (very large scale integrated circuitry) age.

VLSI usually refers to a single chip within which more than 100,000 elements are integrated, and this degree of integration is at least an order of magnitude greater than the 10,000 or so elements to be found in the LSI (large scale integrated circuit) of the past. In the usual RAM, called the dynamic type, each bit (a bit is a unit of memory capacity) is comprised of a transistor and condenser, and a 64 kilobit (a kilobit is 1,024 bits) together with its accessory circuits represents an integration of 150,000 elements. It is in this sense that VLSI is called an entry product.

The reason the domestic and foreign semiconductor makers are waging such a desperate market battle over the 64 kilobit RAM is because of the almost unlimited development potential of its market. As was pointed out in the aforementioned FORTUNE magazine, last year's sales (1981) still amounted to only about \$100 million more or less, which was less than 1 percent of the output of the world's semiconductor industry.

On the other hand, this market is expected to increase to \$2 billion by 1985, and its fraction of the semiconductor market overall is expected to come up to about 10 percent. Assuming that these figures are realized, this will be a record for sales of any single semiconductor product, and "the fact that it will be the best selling chip in the 25-year history of the semiconductor industry" (FORTUNE magazine) is almost a foregone conclusion.

- 1 -

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

The semiconductor makers in Japan, the United States, and Europe which have eyed this "treasure mountain" and have entered the field include roughly 15 companies. The principal participants are Motorola, Texas Instruments (TI), Intel, and Mostec of the United States, Hitachi Limited, Fujitsu, Nippon Electric, Oki Electric Industry, and Toshiba Corporation of Japan, and the Siemens Company of West Germany from the European sector; however most of these companies still have not gone all out to exploit this item.

As a result, there is fierce competition between makers where the 64 kilobit RAM market is concerned, and it was inevitable that a Japanese-American clash would occur.

The Japanese semiconductor industry had already had a confrontation with the American side in the matter of the 16 kilobit memory, which was the predecessor to the 64 kilobit RAM, and Japan had waged a "successful battle" by capturing a 40-percent share of the market. What is taking place now is said to be the ensuing battle over VLSI.

Now, the Japanese makers on the first round of this present confrontation were able to do even better than with the 16 kilobit item, and they came very close to achieving an "overwhelming victory" according to the results at hand.

Japanese Forces Emphasize Investment in the 64 Kilobit Battleline

The reader is referred to the accompanying table. This table, compiled by the Dataquest Company, an American survey company, shows the 64 kilobit RAM output by different makers. It can be seen that since the start of mass production in 1979, the Japanese makers have consistently led the field.

The American share of the output for the third quarter of 1981 (3,495,500 units) was 33 percent and the Japanese share 67 percent; Hitachi ranked first and Fujitsu ranked third, indicative of the Japanese strength. The United States still has double Japan's output where the overall semiconductor industry is concerned, and one can readily see how the Japanese makers have gone all out in this leading technology product.

"Certainly the Japanese forces are strong." This was the frank statement of President G. Moore of the American Intel Company when he visited Japan late last year. The Intel Company is one of the well-known companies of Silicon Valley (the leading semiconductor industrial belt in the world which stretches along the southwest shore of San Francisco Bay) which since its inception in 1968 has become a microcomputer giant and "memory king." On the other hand, its 1981 sales suffered a setback to about \$800 million from the preceding year's \$850 million because of the recession. Where the memory business is concerned, it does not come in the top five category, showing its lack of strength in this area, and a "pullout statement" has often been made. "The term 'pullout' is not appropriate," said President Moore emphatically. "Intel is putting all its strength into EPROM (special memory with readout which can be changed electrically), which is another promising market in the memory area, and that may be the reason for such rumors to be floating about. If we look back, we see that when the world's influential semiconductor makers

FOR OFFICIAL USE ONLY

rushed into the 16 kilobit RAM market in 1977, Intel remained the only company which supplied both EPROM and 16 kilobit RAM. Since that time, in order to fulfill our responsibilities to our users, we have shifted our production system to EPROM. We like to think that the objective situation is the same right now."

But when we pointed out that despite all that has been said, the American share of the 64 kilobit RAM market is small, Moore answered: "The Japanese makers, after producing their first 64 kilobit RAM, put all their investment into this area, and this is the margin by which the Japanese makers are leading the American makers." He added the following, as though it were an afterthought: "To be sure, we don't expect this situation to continue indefinitely. The American makers are gradually building up their mass production systems, and they should be able to recover some of the share gradually."

The American makers seem to be planning a recovery policy to regain their ground in one sweep. On the other hand, the present situation is such that, putting President Moore's thoughts aside, the lack of corresponding successes and pullout behavior stand out.

The American semiconductor industrial leaders which had been wielding their strength as leaders in this field, including companies such as National Semiconductor, Fairchild, Advanced Microdevices (AMD), Mostec, and Intel, which comprise a series of technology-oriented firms, have done very little up to now regarding mass production efforts in the area of memory. There are many reasons, and these reasons differ with the various companies, but it seems that they have not established mass production technology and have been delayed in investment in facilities because of the lack of funds.

While that may be so, the AMD Company which is one of the influential businesses in the Valley declared at a top business meeting last fall that it would get out of the 64 kilobit RAM market. President J. Sanders, loudly lamenting the situation, said: "The onslaught of the Japanese makers has left us no room to enter," as he threw in the towel.

American Makers "In Bondage"

Among these makers, the ones which have assured themselves a fixed share of the market are the second-ranking semiconductor maker, Motorola, and the top maker, TI. On the other hand, last year TI revealed plans to switch its Austin, Texas plant, which was just completed last year, from mass production of 64 kilobit RAM to 16 bit microprocessors. The main supply plant for 64 kilobit RAM which TI has at present is its Miho plant (Miho-mura, Ibaraki-ken) in Japan.

According to FORTUNE magazine, such moves on the part of American makers represent none other than "complacency with one's business." When one delves into the factors responsible for such a situation, it may be said that the "strength" of Japan's semiconductor industry emerges as a major factor.

Take, for example, the difference in fund acquiring capability. As the semiconductor industry aspires toward development to the VLSI age, the specter of

FOR OFFICIAL USE ONLY

the high cost of new facilities looms, and the price tag of 10 billion yen for a new plant is not surprising. This is an area where the Japanese makers have greater capability because they are also involved in heavy electrical equipment, computers, and household electrical appliances and they are, for the most part, giant industries.

On the other hand, the American makers (particularly the Silicon Valley makers) are mostly of the venture business scale and of the medium- or small-business level, so funds to expand the business or renovate their facilities do not come readily. This is why there are many cases in which a business puts itself into bondage to domestic conglomerates or to European industries; however, such businesses do not fully understand the semiconductor business and the timing of their investments is frequently badly misplaced.

There is also a wide difference in production technological strength. One such example is where many of the American makers resorted to narrowing the pattern width and decreasing the chip dimensions in order to maximize the number of chips to be made from a single wafer (thin circular plate of silicon), but this practice resulted in a lower yield (rate of acceptable products turned out). Lower yield leads to higher cost and detracts from competitive strength, and this was the adverse situation they found themselves in.

In contrast, the Japanese makers place assurance of yield as a primary premise, and they allow a large margin in their circuit designs. This does not make the size of the chip any smaller but eases the pressure on the production process, and the net result has been increased productivity. "In the midst of the Japanese-American semiconductor friction, the American side claimed that larger chips do not make possible lower cost and it accused the Japanese of 'dumping,' but the actual situation is just the reverse," said Vice President Jungi Ouchi of Nippon Electric. Former President L. Sabin of the Mostec Company said: "The Japanese makers, in setting out on mass production of the 64 kilobit product, considered it sufficient to expand and improve the technology used in the production of the 16 kilobit product, and that turned out to be the proper course."

The Japanese superiority also stands out on the quality front. At the "Semiconductor Seminar" held in Washington in March 1980, section chief R. Anderson of Hewlett Packard, which is one of the larger users in the United States, stated: "The Japanese memory (16 kilobit RAM) has a reject rate upon receipt and a damage rate in the field which are roughly 10 times superior to the comparable rates for American products" (the so-called Anderson bomb). He later came out with the statement that "We now find this difference cut down to a 3:1 ratio," indicative of the improved quality of the American products. On the other hand, this gap has not seen much improvement with the entry into the 64 kilobit age, and "there is still a 2:1 difference," according to FORTUNE magazine.

Industry related parties in Japan made the following statement with regard to the reason Japan is surpassing the United States in the matter of quality.

"While there is no denying the fact that quality control is rigorously practiced in the Japanese plants, there is also the synergistic effect of the

FOR OFFICIAL USE ONLY

industry and knowledge level of the workers who man these plants, so quality is built into the products they make" (Vice President Ouchi of Nippon Electric).

"When the 'finishing precision' approaches 1 micron (1/1,000 of a millimeter), there is a battle with dust particles, and the focus of the operation is to render them dustfree and unmanned. This is an area where Japanese plants have done well in the matter of automation and the use of clean rooms, and this has also improved productivity" (Kazuo Kanehara, head of the Semiconductor Department, Hitachi).

Japan's strength comes from the advanced state of its lifetime employment system and its reassessment of the group principle, but FORTUNE magazine especially pointed out "Japan's organizational strength" for evaluation, and this is a point worth noting.

The magazine stated: "Where 64 kilobit class chips are concerned, establishment of long-term plans, continuous teamwork, and great improvement in control on the production front have become necessary, and 'the situation in the U.S. companies' where technologists and design people are continually shifting between different companies, which in the past was considered essential to the 'crossbreeding effect,' has now become a tremendous burden."

Price Will Be 1/20 Within 2 Years

In a situation in which the "treasure mountain" in the form of the 64 kilobit RAM is well in hand, while the American makers are in a state of stagnation and the Japanese makers have achieved a resounding victory, the top makers of Japan are not relaxing their guard.

One of the reasons here is that while the Japanese have been able to lead the Americans, there is the need to win out in the production battle with the other domestic makers.

Among these companies the top struggle is between the two semiconductor companies: number one, Nippon Electric, and number two, Hitachi. Hitachi plans to "use its superiority in the memory market to overtake Nippon Electric" (Semiconductor Department head Kanehara) as its strategy; it came out with plans to increase production to 700,000 units per month by the end of last year and to 1 million units by the end of March.

Then, Nippon Electric, which had been producing only 300,000 units as late as last October, suddenly announced plans for greatly increased production, which left Hitachi uneasy. This plan called for a monthly increase of 150,000 units to a system capable of producing 1.05 million units by the end of March. Where Nippon Electric was concerned, "there was a sudden increase in demand, and we had to change our policy" (Vice President Ouchi), but Hitachi considered that "to tack on an extra 50,000 units by a later announcement is not acting responsibly" (Hitachi top executives).

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

In addition to these two companies, Fujitsu laid plans for 600,000 units, Mitsubishi and Oki for 500,000 units each, and Toshiba for 300,000 units by their production systems, and these companies plan to maintain their world-wide rankings.

Another reason the top makers cannot rest easy is the price battle, which has sunk into the depths. Where a unit price of \$100 was the prevailing level about the beginning of 1980, when this item appeared on the market, it had dropped to \$30 by the end of that year and further to \$15 by the end of April 1981, to \$10 by the end of September, and still further to \$6 by the end of the year. In other words, the price of this item dropped to about 1/20 of the initial price in the course of a scant 2 years. This trend is underscored by the following statement from one of the top personnel of a large maker: "The price is moving like a nightmare even before the product itself."

The 256 Kilobit RAM Will Be the Strategic Battle

Even before the 256 kilobit RAM market has become firm, plans for the production of the 256 kilobit RAM with four times the capacity have taken shape, and this is again source of anxiety. The capacity of semiconductor memory quadrupled in 2 years over the 1970 decade to come to the 64 kilobit level. As the VLSI age was entered, this rate of development was blunted, but even then a doubling every 2 years is expected.

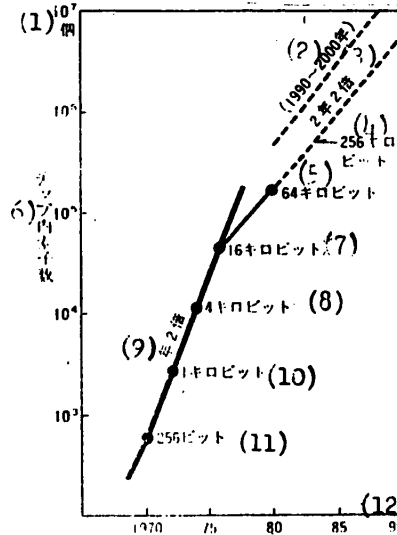
If we accept these figures, then the 256 kilobit age should be upon us in 1984, but in this world of "first in, sure victory," the theory is that if one can be just a year ahead of the others, he can win out. This is why makers such as Hitachi, Nippon Electric, and Toshiba set out early in the game to establish their production systems and hope to enter the production phase sometime between the latter half of this year and the start of next year. There is a consensus in the industry that "the 256 kilobit market will determine the fate of the VLSI conflict," and the moves by the various companies from here on will bear watching.

In the midst of such a situation, the sentiment of other countries against a "strong Japan" may become even more severe. There are strong feelings within the industry that "Japan acquired a 40-percent share of the 16 kilobit RAM market and created trade friction. It has acquired a 70-percent share of the 64 kilobit RAM market, and if it should make a single error, there may be an instant recurrence.

At the present time, the SIA (American semiconductor industrial group) is urging the government to establish import regulations, while the government is said to be studying regulations to be applied to items of national security.

The dire premonitions experienced by those in Japan's semiconductor industry on reading the FORTUNE article have already proved to be true.

FOR OFFICIAL USE ONLY



Changes in Degree of LSI Integration

- Key:
- (1) 10^7 units
 - (2) 1990-2000
 - (3) Double in 2 years
 - (4) 256 kilobit
 - (5) 64 kilobit
 - (6) Number of elements in chip
 - (7) 16 kilobit
 - (8) 4 kilobit
 - (9) Double each year
 - (10) 1 kilobit
 - (11) 256 bit
 - (12) Year

Output of 64 Kilobit Dynamic RAM

	1979	1980	1981		
			First quarter	Second quarter	Third quarter
Hitachi Limited	S	105	200	700	1,100
Motorola	10	150	125	350	725
Fujitsu	24	130	110	360	550
Texas Instruments	2	24	35	130	370
Mitsubishi Electric	S	17	36	70	320
Nippon Electric	0	5	50	100	250
Oki Electrical Industry	0	S	5	30	100
Mostec	0	0	S	10	40
Toshiba Corporation	0	7	10	20	20
Intel	0	3	5	10	20

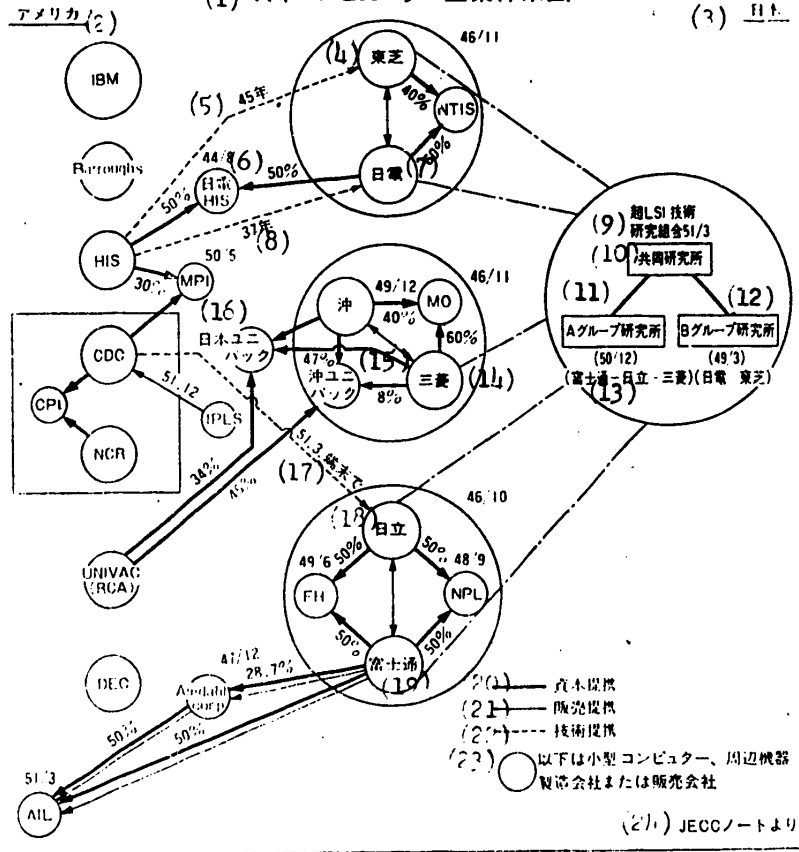
(Source) Dataquest survey S is sample output (Unit: 1,000)

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

Because of the Fierce Competition,
Each Maker Seems To Be Adopting Some Form of "Insurance"

(1) 日米コンピューター企業体系図



- Key:
- | | |
|---|---|
| (1) United States-Japan Computer Industrial System Chart | (14) Mitsubishi |
| (2) United States | (15) Oki-Univac |
| (3) Japan | (16) Japan Univac |
| (4) Toshiba | (17) To end of March 1976 |
| (5) 1970 | (18) Hitachi |
| (6) Nippon Electric HIS | (19) Fujitsu |
| (7) Nippon Electric | (20) Capital agreement |
| (8) 1962 | (21) Sales agreement |
| (9) VLSI Technology Research Group March 1976 | (22) Technology agreement |
| (10) Joint research laboratory | (23) Includes small computers, peripheral equipment, production companies, or sales companies |
| (11) A Group Laboratory | (24) From JECC Notes |
| (12) B Group Laboratory | |
| (13) (Fujitsu-Hitachi-Mitsubishi) (Nippon Electric-Toshiba) | |

COPYRIGHT: Asahi Shimbunsha 1982
9923
CSO: 8129/1084-A

FOR OFFICIAL USE ONLY

VLSI WAR EXPECTED TO BECOME MORE FIERCE

Tokyo TOSHI TECHO in Japanese Mar 82 pp 34-36

[Article by analyst Tatsu Seko]

[Text] The semiconductor industry joined the ranks of 1-trillion yen industries in 1981. When compared with the production total of 540 billion yen in 1978, this represents a sharp growth of almost double in the course of 3 years. With the accelerating trend of the industrial world in adopting the electronics revolution, growth is expected to continue at the rate of 20 percent or better each year, and the semiconductor is tabbed as the top growth item for the eighties.

Furthermore, the semiconductor technology as represented by VLSI (very large scale integrated circuit) is the backbone of the electronics industry, and its strategic importance is increasing by the year. This is why the various companies in this industry are fighting to out produce each other and are putting forth every effort for technological development and investment in facilities as they prepare for all-out war.

This VLSI war is taking place with great vigor everywhere, and a report on this situation is presented here.

The Semiconductor Industry Is a "First In, Sure Victory" Situation

The IC (integrated circuit) invented by Kilbey of the United States in 1958 possessed only a few elements in its degree of integration. Next, Fairchild of the United States developed the planar technology by which a number of elements were formed on a silicon base plate; this was the event which triggered development of double the degree of integration each year, and it was not long before a degree of integration of more than 100,000 elements on a chip a few millimeters square was developed, and the age of VLSI was entered.

The item which opened the curtains for the entry of the VLSI age was the 64 kilobit RAM (write in and read out memory). The degree of integration of a 64 kilobit RAM is roughly 150,000. At present, the previous generation 16 kilobit RAM is still the mainstream of domestic and foreign memory markets, but recently there have been moves by the large American computer makers to install 64 kilobit RAM, while there is a trend in Japan to exploit the wave

FOR OFFICIAL USE ONLY

of interest in OA (office automation) to put these units into personal computers, as a result of which the market has been expanding sharply. The belief is growing that the 64 kilobit RAM will take over the main role in the memory market by the latter half of this year.

The semiconductor industry since its inception has followed the basic business "first in, sure victory" concept. One of the reasons Japan's IC industry was far behind that of the United States up through the first half of the 1970's was, if one looks very closely, the fact that it came in late and was the loser. For a while, the royalties the Japanese semiconductor makers paid to American industries for the basic patent on the IC of Kilbey, the planar patent, the selective diffusion patent, and other patents amounted to more than 10 percent of the sales volume. This sum alone made the price of the American product cheaper, and there was a large import volume while domestic technology had difficulty in developing.

But the establishment of MOS (metal oxide membrane semiconductor) technology and desk calculators became the starting point for the rapid expansion of the private industrial market, and the gap between Japan and the United States was reduced at a sharp pitch. The present situation is that Japan has surpassed the United States in some areas, but the agony of coming late into the field is one every semiconductor maker has experienced.

Even the mass production war presently developing within the country on the 64 kilobit RAM shows this line of thinking on the part of all the companies as they try to grab prior advantage. If one is late in entering the field, he will find all the large users completely sewed up, and he will be in the very bad situation of being unable to finance the next round of investment in facilities if there should be an easing in the market situation.

Let us look back at the intensity of the increased production battle. Hitachi Limited was the first to set up a system to produce 1 million 64 kilobit RAM's per month. This was achieved on 26 October 1981. When this news hit the headlines, it was not more than a week before Nippon Electric, which was the tip in the industry, succeeded in producing 1 million units per month, on 2 November of the same year. Then as the year closed and the new year was ushered in, Fujitsu also disclosed that it was producing 1 million units per month, and these three companies were each producing 1 million units per month as of the end of March.

At the same time, Mitsubishi Electric and Oki Electric were stimulated by the actions of the aforementioned three companies and modified their initial plans to produce 300,000 units by the end of March to aim at production of 500,000 units per month. Since then, Mitsubishi has decided to increase its production also to the 1 million units per month level by October of this year, but every company keeps its plans for increased production under cover, and the end of this mass production battle certainly is not in sight.

This mass production battle is not limited to the memory area. There is also increased production conflict in the micon area, which seems to be expanding with a limitless field of application. When a micon is coupled to a sensor

FOR OFFICIAL USE ONLY

(detection element), the combination can greatly promote the conversion to electronics of household electrical appliances, automobiles, robots, various types of medical equipment, and the communications and information areas. This is an area in which Matsushita Electronic Industrial, Tokyo Sanyo Electric, and Sharp, which are semiconductor makers for household electrical systems, are expected to play leading roles.

Other electronic items which are also basking in the limelight are CCD (charge coupled element), sound synthesis LSI, and semiconductor lasers, on which the different companies are placing their strength as future strategic products.

In this manner, the battlelines for the VLSI age are spreading laterally through product diversification.

Companies which shifted from production only for their own use to production for external sales such as Leco, Suwa Seikosha, Nippon Gakki Company, and Nippon Denso, which had been dealing in items other than electrical equipment, have found opportunities to become intermediaries in IC production and have seized the chance for spectacular development in a leading industry, and the VLSI age has taken on the atmosphere of rivalry between local barons.

Will a 1 Megabit Make Its Appearance in 1985?

Part of the fate of being in a first in, sure victory industry is to be enmeshed in a fierce technological innovation wave. The race to improve the degree of integration is such a situation. Even while mass production of the 64 kilobit RAM was being put into practice, the semiconductor industry was already engaged in laboratory testing of the next generation 256 kilobit item and making plans to come out with commercial production. Hitachi Limited, if it can put everything together, plans to make sample shipments this fall and shift into real production next spring, while Toshiba Corporation, which was delayed in its entry into the 64 kilobit RAM field, is making plans not to fall behind in the 256 kilobit race and is planning to produce this item next year. At the same time, Nippon Electric has invested 27 billion yen in the construction of a new VLSI production plant at its Sagamigahara site which is expected to start operation in 1983, and the other companies in this industry are all planning quick entry into production of the 256 kilobit RAM.

"While continually engaging in this fierce competition, is it safe? When do the semiconductor makers hope to recoup their investments?" It is not surprising for such statements to come from the heads of other businesses.

It is definite that the Japanese forces have prevailed and the American makers have been bested where the 64 kilobit RAM is concerned. The share (percent of the market) which the Japanese makers have captured for this particular item is about 70 percent. This situation is verified by the fact that many American semiconductor makers have suspended production of 64 kilobit RAM or cut down on the production and thereby backed away from confrontation with the Japanese makers. Only two companies, Motorola and Texas Instruments, are left in the field. It is pushing the point to judge future trends based on just the 64 kilobit RAM situation, but it seems definite that the American makers are facing some difficulties in getting into the 256 kilobit RAM race.

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

In the matter of degree of integration, Japan's semiconductor makers have already begun laboratory research on the 1 megabit RAM. The 256 kilobit RAM represents a degree of integration of roughly 600,000 elements. Simple calculation shows that a 1 megabit RAM will have a degree of integration close to 2 million elements. It is possible that this product will appear by 1985 at the earliest, and some of the American makers are already voicing sentiments of "giving up."

In another direction, the legal period of amortization for semiconductor production facilities is 5 years, reflecting the fierceness of technological innovations. On the other hand, nobody waits that long. This is manifested by the situation that "the semiconductor area must recover its investment completely in 3 years and produce a profit," which is a view shared by top business management. This viewpoint further spurs the increased production conflict aimed at large-scale profit. Once one becomes enmeshed in the backbone technology of electronification, one cannot relax or backtrack.

In addition, research and development and investment in facilities for VLSI eat up gigantic sums of money. According to some test calculations by a well-known semiconductor consultant in the United States, the cost of constructing a VLSI level plant will increase from \$23 million in 1980 to roughly double, or about \$50 million in 1985. Already semiconductor industry top maker Nippon Electric spends more than 10 percent of its total sales on plant investment, and the other companies are assigning the major part of their investments to the semiconductor area.

In order to survive in this VLSI war, high technological development strength and a strong sales force are required, in addition to abundant fiscal strength. The fact that all of these companies have put considerable effort into the acquisition of funds attests to the situation that this is an important sector in the overall battle.

Improvement in the degree of integration other than in the memory area, the mass production conflict, and the diversification of products to respond to the rapid electronification in the industrial world present a vast number of problems which the semiconductor maker must resolve. The food for new industries and the real conflict in IC is just beginning.

COPYRIGHT: Asahi Shimbunsha 1982

9923

CSO: 8129/1084-B

FOR OFFICIAL USE ONLY

NEC PRESIDENT SEKIMOTO INTERVIEWED ON VLSI WAR

Tokyo NIKKEI BUSINESS in Japanese 22 Mar 82 pp 26-28

[Interview with Tadahiro Sekimoto, president of Nippon Electric Company, by Ryoki Sugita of NIKKEI BUSINESS; date and place not specified]

[Text] "Japan, which had been the student, is now threatening to take over the professional seats of the leading countries of the Western world." This is the factor responsible for the emotional reaction of the Western countries, according to President Tadahiro Sekimoto of Nippon Electric, which is in the forefront of this high-level technological friction. He further said that there will be "self-propelled technology" from here on, as he put the spurs to development of independent technology and proclaimed that "We would like to get rid of the criticism that we just join the bandwagon of technology." "A researcher must himself hammer out his standards and make his challenges," he said in expounding his offensive technological business theory.

There Is a Belief That the U.S. Government Is Inciting the Industry in the Second Semiconductor Conflict

Question: It seems that it is your thesis that Nippon Electric, which has developed the so-called "C and C" technology which ties together computers and communication, is in a very enviable position to cater to society's needs from here on. You actually are directing an aggressive business, but is it not also the situation that because you represent the main force of a high-level technology, you are continually exposed at the front lines of the Japanese-American business friction? I would like to ask you, first of all, just how you regard the present commercial friction, going back to the experience of the initial "Japanese-American semiconductor war" and thereafter.

Answer: Focusing on semiconductors, at the time the first semiconductor war occurred in 1977, the U.S. Government made the following statement, despite the efforts on the part of industry: "From the standpoint of free trade, it behooves you to build up your competitive strength." On the other hand, when this second semiconductor war emerged, I received the impression that it is the government which may be inciting the industry. This is a feature which is completely different from the first.

- 13 -

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

The fact that the safety assurance problem has been included in the discussions is also a new point. Despite these tough times, the United States is putting up money for the defense of the free countries, but it says that Japan's defense load is too small and that this situation needs to be resolved. I once said that this was a problem of jealousy. To be sure, this trade friction is not simply one of economic fundamentals; this is the view I have taken and it is gradually becoming more enhanced.

As trade friction develops over a wide front, as is occurring today, it is no longer a problem for a single industry or a single business. It must be handled as a problem of all industry or a national problem, and if we limit ourselves to IC (integrated circuits) to argue over the situation on a narrow front, the solution will not be forthcoming in my opinion.

The Reason U.S. Products Do Not Sell in Japan Is the Lack of Sales Know-how

Question: Even if one might say that the U.S. Government is not inciting the industrial world, it is true that the government approves the hard stand the industrial world is taking against Japan. Up through last year, the attitude within the Reagan administration was: We should learn from Japan. This situation has now changed. Can we say that this was the result of a careful study of Japanese business, from which it was discovered that it could not be readily duplicated?

Answer: President Reagan has not departed from his stand on the free trade principle, but he has been saying that there must be a better balance in trade and the red ink on the American ledger needs to be reduced so that the administration can breathe easier. Let us look at a problem which is separate from the introduction of Japanese business practices and that is the subject of QC (quality control); there are efforts on the part of American industry to increase this program. The Americans have only started their efforts, and it has not reached the stage where voices are being raised to the effect that they cannot compete with Japanese business. First of all, there is no beaten dog aspect in their makeup.

They are wondering why, in spite of their high-level technology, they cannot sell to Japan? Could it not be the nonduty barriers? Certainly, there is wonderful technology in the United States. If we were asked to duplicate the technology that enabled the United States to launch the Saturn exploration observation ship Voyager, we would be unable to do so.

Now, just the possession of high-level technology does not allow one to engage in business. Besides good technology and a good product, sales knowledge or, in other words, sales know-how must be at hand or good business is not possible. The reason the share of American products on the Japanese market is low is not just one of superior or inferior technology but the great lack of sales know-how. It is 20 years since Nippon Electric established its NEC-America in 1963, but we were active in the United States even before then. It is through the selling experience we accumulated that we have come to today's position.

FOR OFFICIAL USE ONLY

That is why even when the Japanese market is opened up exactly the way the Americans want, there will be no avalanche in sales of American products. This is an area in which there is "misunderstanding" either intentional or in good faith.

The Problem Is "Engulfing Friction"; It Will be Structurally Unfavorable to Electronic Products

Question: Electronics related activities involve high-level technology products, and a competitor is necessarily subjected to extreme nervous strain. When Japan is pressing along a technological front, if a misunderstanding is left untended, could the situation be amplified emotionally and eventually wind up a major problem?

Answer: The present commercial friction is not a "forcing friction" but an "engulfing friction." In another direction, even though we do not use force, the other side is buying Japanese products at a good clip and is, in fact, engulfing our products. Since the need for electronics is on a single path to expansion, the goods that we handle will probably continue to be swallowed up. That is why it may be said that this friction will not become a structural affair. I believe that friction is an adjunct to human society. On the other hand, I do not believe that unnecessary anxieties should be left untended to start unwanted friction.

The problem Japan presently faces with IC is the 64 kilobit RAM, which is the gateway to VLSI, and the fact that we have acquired 70-80 percent of the share in the American market. On the other hand, if we compare the situation to a marathon, we are still only 100 to 200 meters from the start, and the Japanese industries, which have been embroiled in their own domestic competition, came out of the starting gate as though in a dash. It is not because Japan is so technologically superior that it is ahead at the present time.

Looking at the 1981 IC trade with the United States, the excess of exports over imports is only on the order of 700 million yen. The exports also include some products which American companies produce in their Japanese subsidiary plants. This is why the problem which is being regarded with such anxiety is something which the Americans should understand if explained properly.

This is why this company has set up a subsidiary plant for production in the United States: to jump into the rival community, become part of it and maintain a conversant stance. On the other hand, as was mentioned before, this is a problem between countries, and there is a limit to such measures.

Japan Which Had Been the Student Is Now the Instructor, and This Must Be a Source of Irritation to the Western Countries

Question: When we look at the true source of American irritation, the fact that Japan had been getting a free ride on the technology train may be a factor. According to foreign comments, Japan is lacking in creative ability and depends on foreign efficiency application end. What do you, the international

FOR OFFICIAL USE ONLY

satellite communications company, think about the research and development system of both Japan and the United States and how do you react to such criticism?

Answer: The statement that Japan is relatively lacking in innovative work possibly was true in the past. Even in the electronics area, our efforts to date have been concentrated on catching up with and overtaking the United States.

We can now say that while we have not overtaken the United States, we have risen to a level that rivals the United States. To say that we had a free ride till then is somewhat ludicrous, but if the Americans believe "we have been copied a lot," this is something we cannot deny.

In the past, the Western countries were the professors and we were students. The students are now in the assistant professor class who occasionally write papers and threaten to take over the professional rank. This situation has led the other side to have mixed feelings and to think that it would not have been teaching if it had known this was to be the result. I think that from here on, Japanese research and development should pursue the creative and more intensively so we can say that we are not just freeloading by the time the 21st century rolls around.

Shouldn't We Study a Matrix Organization Which Exploits Individual Creative Ability?

Question: If we keep the Comsat experience in mind, what are the areas of American knowledge which we should emulate in setting up our future research and development system?

Answer: Vertical and horizontal control matrix type work promotion is under study in the United States, and it is now thought that creative work is not possible without such a setup. The usual organization consists of a vertical functional organization split according to different specialties and a horizontal type project organization in which the necessary specialists from the necessary functional organizations are assembled. An example of a large-scale project organization is the Apollo project organization in which work is performed very efficiently under a single head. On the other hand, if the capabilities of the man heading a special area are wanting, the whole system will suffer.

If there are an abundance of researchers above a fixed level, the project organization will be good, but the actual situation is that such a situation is seldom realized. This is where the matrix organization concept emerges.

In the COMSAT project, I placed the various researchers under different functional organizations into a number of projects, and a total force of 20-30 people were engaged in parallel participation in five projects. In this system, I did not assign only a single manager per project, but I also assigned an "alternate." The head of project section A handled not only his project but also served as deputy manager for the sections in which his

FOR OFFICIAL USE ONLY

people were involved. It became possible to make an individual evaluation of every researcher in this manner. The matrix organization is also a system which improves the capability for exploiting the individual's creative ability.

Question: That is to say, when a party working in the organization participates in research and development, the ability to correctly evaluate a given party is one of the keys in drawing out his creative talent?

Answer: In a leading area where individual brain power is relied on to come up with ideas, unless individual evaluation is given greater weight, it will probably be difficult to draw forth creative ideas.

Question: In the area of technological development there is usually the question of whether the need (demand) intent or the seed (seed) intent should prevail. What do you think the future direction will be?

Answer: We are engaged in research and development as a business, and unless the final product we come out with is accepted by society, our work will be meaningless. That is why it is very important to know just what is needed in the market, and this is where the statement "Listen to the market with regard to new technology" applies.

And that is not all. I also use the term "technology runs by itself." That is to say, this is the "seed" approach, and this is something which comes closer to a pure research effort of a scientific nature. On the other hand, a general type of research and development can give rise to something entirely new for which there seems to be no application. At the same time, research can take place completely independent of market trends, and the research can run by itself, as the words imply. This is where one creates a market for the creation.

If we are to pursue creativity, then we tend to go toward the seed concept, and just how many seeds we come up with in the future to contribute to international society is going to be a major subject.

Jump at Chances; Uncertainty Is To Be Expected, Anticipate Takeover

Question: What are the researchers doing at the present time?

Answer: A researcher must himself keep a rein on himself. That is to say, he must establish a goal, set up his own timetable, and conduct his work independently. Whether one goes at this work with full force marks the dividing line of a good researcher.

While not limited to researchers, mankind has nodes at frequent intervals just as a bamboo rod. This is chance, and one does not know which direction to proceed with this node as the boundary. The greater the chance, the larger is this node, and the more difficult the future is to see. The situation when I was asked to join COMSAT was such a case, and I was full of uneasiness. What had once been a straight path in the past was now being criss-crossed by intersecting paths.

FOR OFFICIAL USE ONLY

A chance is something like that, and one jumps at it. Uneasiness is to be expected. It is the ability to suppress this anxiety and seize the opportunity that is desirable.

Question: I am asking for a very positive opinion, but please define the future dream for technology.

Answer: Information will be treated not only by conversation but by sight and exchange of data, in other words, by creating a C and C system. Not only electronics but other compound technologies such as biotechnology will be exploited to develop C and C, giant "artificial servants." The hands and feet will extend to the ends of the earth, and the brains will be vested in the computer. On the other hand, it will eventually be man who operates this system in the "artificial servant" that will be developed, and this is the dream by which I hope we can contribute to society's well-being.

[Interviewer] These are the impressions from Mr Sekimoto, who gives you 10 answers to each question you ask. He is a man whose mind works very fast, and he presented himself as a polemicist of the top class where research and development was concerned. In addition, he was well versed in theory of life. The statement "suppress the anxiety and seize the opportunity" has deep meaning. It is only when one throws his whole effort into his assigned work, whether technological or administrative, that new paths are opened to mankind; this seems to be his iron rule for salaried people. Combustible man-- this is not for the business but eventually for himself.

Tadahiro Sekimoto

He was born 14 November 1926 in Kobe, and is now 55 years old. He graduated from the Faculty of Science of Tokyo University as a physics major in 1948 and went to work for Nippon Electric. He was engaged in research and development at the Central Laboratory until May 1969. During the interval between August 1965 and August 1967 he went to the international satellite communications company COMSAT in the United States, where he directed research on the PCM satellite communications system as research department head. In November 1974 he was elevated to a director, in June 1977 to executive managing director, and in June 1978 to senior executive managing director where he was in charge of domestic sales. He replaced former President Tadao Tanaka (presently director and consultant) as president in June 1980.

COPYRIGHT: Nikkei-McGraw-Hill, Inc 1982

9923
CSO: 8129/1084-C

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

BACKGROUND OF VLSI WAR WITH UNITED STATES REVIEWED

Tokyo NIKKEI SANGYO SHIMBUN in Japanese 15-20, 22, 26, 27, 29 Mar 82

[Article by reporter Kato]

[15 Mar 82 p 5]

[Text] The Japanese-American semiconductor friction has been reignited. The American side has its sights on setting up anti-Japanese regulations to squeeze down on VLSI (very large scale integrated circuits). The most advanced Japanese semiconductors and technological development system have become objects of criticism. The Japanese and Americans are about to engage in a life or death struggle. The factors responsible for this Japanese-American semiconductor friction and the Japanese response are sought in this article.

SIA Is Lighting the Fires

1 February 1982. The top executives of SIA (American Semiconductor Industry Association), which is made up of 14 leading semiconductor makers of the United States, secretly made a visit to Deputy Representative MacDonald of the Office of the USTR (United States Trade Representative). The SIA disclosed to the USTR the situation with regard to the 64 kilobit RAM (random write in and read out memory), which is the top batter in the VLSI lineup, in which roughly a 70 percent share (fraction of market) of the American market for this item has been captured by the Japanese, and stated that "If this situation remains unchanged, the American market will be taken over by the Japanese," as it strongly urged "government aid to improve" the situation. This is the beacon signalling the rekindling of Japanese-American semiconductor friction.

This was the opener initiating anti-Japanese criticism spearheaded by American semiconductor makers and accompanied by high government officials and mass communication media. There are still accusations on the part of American industries of Japanese dumping and cries for investigation, and many fires are being started all around which may not be extinguishable even with large fire trucks.

The concerned people in Japan were shocked by this recurrence of friction. Vice President Jungi Ouchi of Nippon Electric, who serves as spokesman for the

FOR OFFICIAL USE ONLY

Japanese semiconductor industry, made the following unhappy statement: "We have done nothing wrong."

The Japanese cannot be faulted for the dilemma. This is because the IC (integrated circuit) duty problem, which had been a thorny issue since the first semiconductor friction starting in 1977, had just been resolved. This issue came to the forefront during the Japanese-American summit meeting in May last year between Prime Minister Suzuki and President Reagan, and there was joint agreement to lower the duties. The United States lowered its duty to 4.2 percent starting in January of this year (it was formerly 5.6 percent), while Japan lowered its duty to 4.2 percent (formerly 10.1 percent) in April of this year, and although there was some discrepancy in time, the final rates became the same.

The trends in IC exports to the American market, which are carefully monitored each month by responsible people on the Japanese side, were "good" throughout last year. The cumulative exports for the January-December trade registered a decrease of 1.7 percent from the previous year, to 71.2 billion yen, while imports increased by 1.3 percent, to 70.5 billion yen, and the net balance was a plus 700 million yen (compared to 2.8 billion yen for 1980).

Compared to the 1970's, when Japan's balance of trade was consistently negative, there is a change in the situation, but the balance of trade where Japanese IC is concerned is at equilibrium. "The Americans have nothing to pick on even where export-import balance is concerned" is the Japanese comment. Exports to the United States have leveled out at about 30 percent of total exports, and concentrated exports to the United States such as those of automobiles are not seen in the IC area.

At the same time, mutual exchange is advancing between the large semiconductor makers of the two countries, and not only sales centers but also production plants are being started on both sides. The disclosure of VLSI related patents was settled 4 years ago, and closed licenses are popular between the Japanese and American makers. It is not strange to hear statements such as "The semiconductor makers of these two countries are in a mutually supplementary relationship" (Japanese Electronic Machine Industrial Association).

64 K RAM Is Initial Point of Conflict

Even regarding the 64 kilobit RAM, which has become the main focal point in this friction and in which Japan has captured a 70 percent share of the American market, the Japanese say: "The fight over the 64 kilobit RAM has just begun. Compared to a marathon, only the first 200-300 meters have been run so far. It is not yet time to be arguing about one's share of the market, and there is no telling what will happen to the Japanese share once the mass production system of the American makers gets rolling" (according to Managing Director Toshio Takai of Japan Electronic Machine Industrial Association).

On the other hand, the actual situation is that such statements on the part of the Japanese are essentially unheeded. Semiconductors are associated with different backgrounds and factors compared to the fibers, steel, and automobiles which were the friction-creating items of the past, and the outstanding

FOR OFFICIAL USE ONLY

feature of this present situation is that the anti-Japanese regulations came into the picture so quickly.

The industries which created friction previously were all well-established industries. There is an altogether different picture where semiconductors are concerned. At the time of the first friction in 1977, Japan's export of IC to the United States was only 1.3 billion yen. The Japanese production was only 208.5 billion yen. In 1981 Japanese exports to the United States exceeded 70 billion yen while production exceeded 1 trillion yen (including all semiconductors), and the real growth started here. It has been predicted that the developments in electronics innovation will create a market in the 1990's which will be four-five times that of the present.

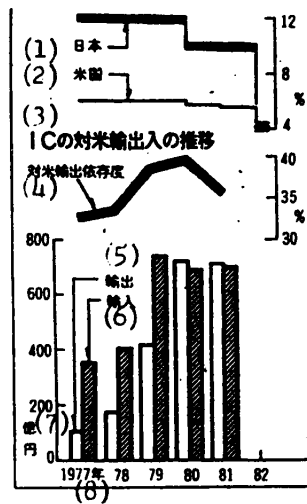
This is why the first friction was compared to "an adult picking on an elementary or middle school child" (industry top executive). It may be said that Japan has taken the lead over the United States where the 64 kilobit RAM--the present sore point--is concerned, but many of the areas such as microns and logic (logic circuits) are areas of American superiority which are in no danger.

Control Leading Industries

There is no doubt that the reason the American side is presently trying to curb Japan is because semiconductors have strategic value. In Japan, semiconductors are used in all types of household electrical equipment, various private industrial items, NC (numerical control) machinery, medical equipment, automobiles, and robots, and the field of application is broadening each year. Semiconductors are taking the role of a heart to promote the development of new products and differentiation of products. In the United States, there is great awareness of the semiconductor's role in improving performance in the areas of space, aircraft, computers, and communications-type leading technology.

There are also strong feelings that if the present situation is allowed to remain unchecked, there will be successive erosions of the American side. This is why the Americans are waging a fierce war, even throwing in some emotional overtones.

FOR OFFICIAL USE ONLY



Japanese-American IC Duties

Key:

- | | |
|--|---------------------|
| (1) Japan | (5) Exports |
| (2) United States | (6) Import |
| (3) Trend in IC Exports-Imports with the United States | (7) 100 million yen |
| (4) American export dependence | (8) Year |

[16 Mar 82 p 5]

[Article by reporter Kato]

[Text] The top micon maker, Intel of the United States, released its annual statement for 1981 at the end of January this year, just before the Japanese-American semiconductor friction recurrence emerged. The company reported a decrease in sales of 7.7 percent below the previous year's 788.7 million, and net profits of 27.4 million yen, which also was a 7.17 percent decrease.

Intel is the company which was the first in the world to develop the micon, in 1971. Riding on the micon boom which followed, it increased its sales by an astonishing rate of 95 percent per year over the 5-year period 1971-76, essentially doubling its sales each year. This annual increase in sales was blunted to 39 percent per year for the 5 years 1976-80, but it had already come to be known as a success story in the annals not only of the American semiconductor industry but the entire industry as well.

I never thought that Intel would experience so much business instability and drop toward the red; said the head of a certain large Japanese semiconductor maker.

FOR OFFICIAL USE ONLY

The SIA (American Semiconductor Industry Association), which is the stronghold of this anti-Japan regulation movement, is a group which was formed in March 1977 with five companies--Intel, Fairchild, National Semiconductor (NS), Motorola, and Advanced Micro Devices (AMD)--as the nucleus. Even today cadres of these companies man the main posts of SIA.

Is NS Falling Into the Red?

The financial reports announced by the various companies following Intel's disclosure were also on the dark side. In addition to Motorola, which suffered a 6.0-percent decrease in profits in 1981 compared to the previous year, AMD (9 months statement) showed a 70.3-percent decrease from the same period last year, and NS (28-week statement) reported a decrease of 95.7 percent and barely preserved its black ink status. It is being said that NS will not be able to avoid falling into the red in its 34th half-year period. Fairchild was acquired by the Schlumberger Company of France in 1979, and no company statement was forthcoming, although it is estimated that it had suffered a considerable loss in profits.

In the United States, a businessman's capabilities are severely questioned on the basis of a single year's performance. Recently, Mostec, a large maker in the memory (memory element) area, held an emergency board of directors meeting in February, at which time the business capabilities of President C. Vin Prossro were questioned and he was replaced. In 1977 this company was able to grab a 38.3-percent share of the market (fraction of market sales) in 16 kilobit RAM (successive write in and read out memory), which is the generation preceding the 64 kilobit RAM, and was way ahead of second-place Intel with 28.2 percent and Nippon Electric with 15.6 percent and was even called the "memory king" in the United States.

The principal factors responsible for the large decrease in profits of the American semiconductor makers in the United States were the high interest rates, which resulted in a depressed situation and poor market conditions, so they picked a scapegoat (sacrificial lamb) and stepped up their anti-Japanese attack, which is manifested in the present recurrence of friction it seems.

20 Percent of Sales to Research

With the entry into the VLSI (very large scale integrated circuit) age, there have been sharp increases in research and development costs and investments in facilities, and this has proved to be another source of irritation on the part of American semiconductor makers. The standard construction costs for a VLSI mass production plant are said to be about 15 billion yen, which represents a large increase over the IC (integrated circuit) and LSI age plants which were in the 5-10 billion yen range. The new mega (1 million) bit VLSI plant which Toshiba Corporation is soon going to start constructing is expected to cost 20 billion yen just for the research and development building.

In addition, research and development costs to upgrade capabilities and develop the next-generation products are usually allotted the vast sum of 10-20 percent of total sales. In Japan, during the past few years many industries

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

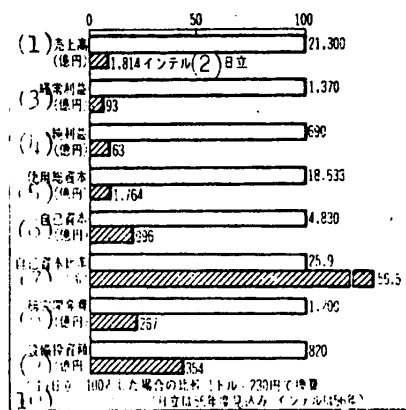
other than electronics industries have entered the electronics field, hoping that they have not been left too far behind, and have also joined in the IC contest, but at the present time, these entries have been limited to the top members of the respective industry, such as the pioneer in the audio industry and automobile parts maker Nippon Denso, the watchmaking industry's Seiko group, and the pharmaceutical industry's Nippon Yakki. These companies are entering this field because they can afford the vast investment required.

Japanese Companies Can Handle Large Loads

In this respect, there is a wide gulf between the American semiconductor makers, which are large in number but represent small specialty businesses, and the Japanese semiconductor makers, which are large integrated electrical makers, possess a large internal market within their own company and can assume risks (danger) much greater than the American companies.

Assigning a value of 100 to the total sales of Hitachi, Intel's sales come up to only 8.5, while the investments in facilities between the two companies are in 43:2 ratio and the research and development costs in 22:3 ratio (these figures for Hitachi are the estimated values for 1981; Intel's figures are those reported for 1981). This situation reflects the desperate efforts not to fall behind in the VLSI race. In the midst of this VLSI age entry, the foreign and domestic semiconductor industries are seeing demand for capital increasing, and the construction of facilities is becoming a large industry.

The realization that because of differences in the scale of business and the industrial structure the open water between Japan and the United States is widening is thought to be the factor that is spurring this recurrence of friction.



Comparison of Principal Business Scales Between Hitachi and Intel

Key:

- (1) Total sales (100 million yen)
- (2) Intel Hitachi
- (3) Gross profit (100 million yen)
- (4) Net profit (100 million yen)
- (5) Capital invested (100 million yen)
- (6) Own capital (100 million yen)
- (7) Fraction supplied by own capital (percent)
- (8) Research and development costs (100 million yen)
- (9) Investment in facilities (100 million yen)
- (10) (Note) Comparison made with Hitachi assigned a value of 100.
\$1 = 230 yen. (1980 estimates for Hitachi, 1981 reported for Intel)

FOR OFFICIAL USE ONLY

1981 Performance of Major American Semiconductor Makers
(Unit: 1 million dollars, percent. Δ: minus)

<u>Name of company</u>	<u>Total Sales</u>	<u>Growth Over Previous Year</u>	<u>Net profit</u>	<u>Increase Over Previous Year</u>
Texas Instruments	4,206.0(4,074.7)	3.2	108.5(212.2)	Δ48.9
Motorola	3,335.9(3,086.4)	8.1	175.0(186.1)	Δ 6.0
Intel	788.7(854.6)	Δ7.7	27.4(96.7)	Δ71.7
Analog Devices	156.2(135.7)	15.1	4.6(9.3)	Δ50.5
American Micro Systems	140.7(129.4)	8.7	7.9(4.3)	83.7
Advanced Micro Devices	206.4(229.1)	Δ9.9	5.8(19.5)	Δ70.3
National Semiconductor	580.5(593.0)	Δ2.1	1.3(30.2)	Δ95.7
Perkin Elmer	251.0(252.1)	Δ0.4	14.2(16.4)	Δ13.4

Note: The values in () are previous year's (same period) values. This period is 9 months for Advanced Micro Devices, 28 weeks for National Semiconductor, and 3 months for Perkin Elmer. All other companies are on an annual basis. Perkin Elmer is a maker of facilities to produce semiconductors.

[17 Mar 82 p 5]

[Article by reporter Nonaka]

[Text] "The challenge from Japan regarding the silicon chip" has been the wedge to rekindle the Japanese-American semiconductor war and even to escalate it as the VLSI era is entered (FORTUNE magazine of 23 March 1981). On the other hand, the greatest challenge to the semiconductor makers of Silicon Valley over the past several years has come from the majors (international oil capital) and the giant conglomerate industries. These companies have highly evaluated the future potential of IC and LSI makers with high-level technological strength and are using their abundant capital to launch a buying attack.

Seen as Forward Looking Moves

As shown in the accompanying table, the rate of purchase of American semiconductor companies increased sharply as the seventies was entered. Among the industries interested in buying are Exxon and Schlumberger of France, which is a major figure in oil exploration, and General Electric (GE) and Phillips which are integrated electric equipment makers of the United States and Europe. General Electric has the special distinction of having retreated from the semiconductor business 8 years ago, but it has ideas of making a comeback and is said to be thinking of acquiring a leading company, Intersil.

This type of industry acquisition differs from what takes place in Japan. It is only because the semiconductor, which is the prime force behind the electronics revolution, assures a future as a growth industry that giant industries rush in to try to buy them, while, on the other hand, the semiconductor makers are eyeing the assurance of capital which they seek by all-out

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

participation in such deals. The valley people look on this series of buying dramas as forward looking moves reflecting a dynamism which should be welcomed.

A symbolic example of the allure semiconductor makers have to the giant industries is the case of the takeover last December of American Micro Systems (AMI) by the Gould Company, which is a large electronics, electrical machines, and battery maker in the United States. Gould first displayed its interest in the semiconductor industry in 1979 when it attempted to buy Fairchild and Mostec but failed in its haste, but on the theory of "third time is the charm" it acquired operating rights to AMI.

Aim for Industries With Technological Strength

It is only natural that takeovers are limited to those industries with technological strength. Ever since it became clear in January that the top maker of microns, Intel, had its worst year last year, the talk among Wall Street stock analysts has concerned "who will take over Intel." The same story may also be applied to the third-ranking American company, National Semiconductor (NS), which also seems to be having difficulty with figures running in the red.

It may be said that the American semiconductor industries are in the midst of readjustment and change from an age of ease. As the VLSI age is about to be entered, the question of where the vast capital will come from has emerged, and these trends have suddenly accelerated.

"Among the 36 companies which started operation before 1966, there are only 7 companies which can stand on their own in a completely independent manner" (Survey Department of the Japan Choki Shinyo Bank).

Just as the American semiconductor makers were faced with this structural change situation, the Japanese semiconductor makers grabbed the lead in production of the first-generation VLSI product, the 64 kilobit RAM (random write in and read out memory), and rushed into the American market. These Japanese companies included Nippon Electric, Hitachi Limited, and Fujitsu as well as many which were active in production of the 16 kilobit RAM which preceded the VLSI and latecomers to the 16 kilobit RAM field such as Mitsubishi Electric and Oki Electric.

The American companies which were able to attempt to counter this onslaught were limited to the large, independent maker Texas Instruments (this company actually produced its goods at its plant in Japan) and Motorola, while a company such as Mostec which had come under the wings of another giant industry was in the midst of revising its VLSI strategy and could not counter. At the onset of the 64 kilobit RAM war, it was only natural that "the Japanese forces took over a 70-percent share (fraction of the market) of the American market."

Aim for End of the 1980 Decade

On the other hand, the VLSI war is "not limited to the 64 kilobit RAM but concerns a long-term technology that will go into the 1 megabit class and extend to the end of the 1980 decade" (President G.R. Moore of Intel).

FOR OFFICIAL USE ONLY

Those American semiconductor makers which have been able to fend off takeover efforts and which have assured capital certainly can be making such long-range plans and engage in active investment in facilities. Looking at the trends among semiconductor makers which have been taken over or have entered into capital participation plans and the large independent makers with regard to the scale of investment in facilities, it is evident that the investments by those companies which came under the aegis of giant industries increased tremendously, although they still fall below those of the giant industrial systems where absolute sums are concerned. Among these companies, Mostec, which was acquired in 1979 by the conglomerate United Technologies (UT) which came to the fore as a primary air and space industry, doubled its investment in facilities in 1980 to \$850 million.

There is an overriding feeling that these reorganizations within the American semiconductor industry will be mostly completed within this year. The only companies left for takeover are Intel and NS. The American strategy for the entire 1980's decade will soon start revving up its engines. Should the Japanese challenge escalate too much, the anti-Japanese criticism will not only echo through the valley but will also incite the big businesses under which these valley companies now operate.

Investment in Semiconductors (Unit: \$1 million)

<u>Large independent makers</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>
Texas Instruments	115	190	190
Intel	85	82	125
Motorola	72	159	200
National Semiconductor	49	70	90
Makers tied in to external capital	23	58	70
Fairchild	40	50	80
Signetics	22	42	65
Mostec	19	42	85

Note: Compiled with data from Morgan Stanley Electric Rater Dataquest Company

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

American Semiconductor Makers Which Have Been Taken Over

<u>Year</u>	<u>Industry Taken Over</u>	<u>Investing Foreign Industry</u>	<u>Fraction of Capital Invested (%)</u>	<u>Investment (\$1,000)</u>
1969	Monolithic Memory	Northern Telecom (Canada)	12.4	289
1971	Micropower	Daini Seikosha (Japan)	77.0	3,385
1975	Signetics	North American Phillips (Holland)	100.0	43,850
	Zylog	Exxon (United States)	50.0	---
1976	MOS Technology	Commodore International (Bahamas)	100.0	10,000
1977	Frontech	Commodore International (Bahamas)	100.0	10,866
	Intersil	Northern Telecom (Canada)	24.0	3,500
	Interdesign	Ferrante (Great Britain)	100.0	14,230
	American Microsystems	Bosch (West Germany)	25.0	16,200
	Litronics	Siemens (West Germany)	80.0	16,200
	Advanced Microdevices	Siemens (West Germany)	20.0	26,723
	Solid State Scientific	Siemens (West Germany)	25.0	4,500
	Siliconics	VDO (West Germany)	24.0	6,100
1978	Electronic Allies	Lucas (Great Britain)	100.0	8,905
	Spectronics	Nippon Electric (Japan)	100.0	3,000
	Synatech	Honeywell (United States)	100.0	24,000
1979	Mostec	Honeywell (United States)	100.0	349,000
	Microwave Semiconductors	United Technologies (United States)	100.0	25,000
	Fairchild	Siemens (West Germany)	100.0	397,000
	Unitrod	Schlumberger (France)	100.0	10,000
1980	Marmon Integrated Circuits	Schlumberger (France)	100.0	2,700
1981	Intersil	Toshiba Corporation (Japan)	100.0	235,000
	American Micro Systems	GE (United States)	100.0	218,000
		Gould (United States)	100.0	

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

[18 Mar 82 p 5]

[Article by reporter Nonaka]

[Text] Every time friction in leading technological areas such as semiconductors surfaces between the United States and Japan, the name of the computer giant IBM comes forth in line with the instigator. During the open-door problem involving the Japan Telegraph and Telephone Public Corporation 3 years ago, IBM, which was aiming at taking over Japan's communications market, appeared prominently. At that time, IBM stressed its "main role as shadow," but it is a fact that the presence of IBM served as a bluff (threat) in the Japanese-American negotiations. The result of the public corporation situation was that IBM and the corporation entered into a closed license agreement (mutual exchange of patents agreement), and the merit of an open-door situation was clearly demonstrated.

Agreement in Recognizing Anti-Japanese Strategy

The rapidly accelerating introduction to the American market since the beginning of the year of the Japan-produced 64 kilobit RAM (random write in and read out memory) has become a new hotspot in Japanese-American trade friction. The SIA, (American Semiconductor Industry Association) with deep ties to the government in Washington, has escalated its anti-Japanese criticism. On the other hand, the event that shook the concerned Japanese parties was the appearance of the name IBM on the stage since the start of the "Japanese-American semiconductor war."

It was said that IBM was talking to the Silicon Valley American semiconductor makers in order to enter into joint production to counter the Japanese. This news appeared in the 21 February edition of the San Francisco EXAMINER. This was just preceding the visit of Mr Ezaki, chairman of the Special Investigating Committee on International Economic Measures and a Liberal Democratic Party member, to the United States to discuss trade problems.

A secret meeting was held on 20 February at Oakland in Florida. Those present besides IBM were the fourth-ranking National Semiconductor and eighth-ranking Advanced Micro Devices (AMD), and these companies were represented by vice presidential level people. Although Hewlett-Packard and Intel also had been invited, they were have said to have declined. The names of those participating are not accurately known, but a consensus was reached to the effect that "in order to counter the Japanese makers, which possess such vast financial strength working under the subsidy of their government, American industry must unite as one and enter joint production type cooperative efforts."

Formal Participation in SIA

Talk that IBM would eventually be coming to the forefront of this Japanese-American semiconductor war was heard continuously during the past year. IBM, which is the world's largest semiconductor maker, had joined the SIA, which is the foremost critic of Japan, as the 44th regular member in December 1980.

FOR OFFICIAL USE ONLY

The SIA was organized in March 1977, spearheaded by five large makers of the valley including Intel and Mostec. The semiconductor makers, which were becoming increasingly aware of the Japanese menace, gradually were taken into the SIA fold, and on 4 April 1977 when then Prime Minister Fukuda, on a visit to the United States, met with President Sanders of AMD serving as a representative of the American industry, Sanders asked for the lowering of Japanese duties and relief from the government-backed sales to the United States. This was the starting skirmish of the Japanese-American semiconductor war.

The entry of IBM, which in the past had been loath to join any specific trade organization and now had become a flag waver, into the SIA was a shock to Japanese industry. With this new member, the SIA secured its position as the sole representative of the American semiconductor industry. The only maker which is not a member is possibly Texas Instruments, which has production plants in Japan. The SIA activities suddenly intensified. Well-informed sources say that ever since fellow state resident Reagan became President of the United States, lobbying by the SIA in Washington has intensified to the extent that it has been said: "There are many empty seats at board meetings in the valley."

Various speculations have come forth with regard to the conference on joint production between IBM and the valley semiconductor makers. IBM adopted a policy of outside purchase of the 64 kilobit RAM, which is the focal point of the present Japanese-American semiconductor war, and the Japanese side has taken over a 70 percent market share (fraction of the market) of this product, so that IBM's source of supply may be endangered. If it acts in concert with the SIA to fight against importation of the 64 kilobit RAM from Japan, it can deal a blow to rival American computer makers such as Honeywell. This is the rationale given for engaging in these high-level tactics.

In any event, it is a fact that IBM has contributed to this reemerging semiconductor problem, and the SIA has begun to flaunt the threat of this powerful new "aid." Where IBM is concerned, "the computer problem follows the semiconductor"; IBM is probably planning to exploit the large administrative force it displayed during the public corporation problem once again.

"It is said that the research and development budget for 1981 was more than \$1.6 billion, of which the greater part was semiconductor related," and for this company which is also a "giant" in the semiconductor area to be pushed to center stage shows the threat the Americans feel regarding the latent capability of the Japanese makers.

FOR OFFICIAL USE ONLY

Production and Development Related System for IBM Semiconductors
(Survey by the American ICE Company, 1981 Data)

	Research and Development Department	Proto- type Labora- tory	Test Plant	Produc- tion Plant
Basic Laboratory	Yorktown Heights (New York)	0		
General System Department	Rochester (Minnesota)	0		
General Technology Department ¹	Hopewell Junction (New York)		0	0
General Technology Department ²	Essex Junction (Vermont)	0	0	0
System Development Department	San Jose (California)	0		
Data Product Department	Tucson (Arizona)		0	0
General System Department	Austin (Texas)		0	0
Federal System Department ³	Manassas (Virginia)	0	0	0
Overseas	Sindelfingen (West Germany)		0	0
"	Cobelennes (France)		0	0
"	Boebringen (West Germany)	0	0	0
"	Zurich (Switzerland)	0		
"	Noshu, Shiga-ken (Japan)		0	0

- Notes: 1. East Fischtul Plant
2. Barrington Plant
3. Military System Development Plant

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

[19 Mar 82 p 5]

[Article by reporter Kato]

[Text] Although it is not apparent on the surface, the U.S. Department of Defense is said to be strongly stressing an anti-Japanese regulatory stance. The rise to the fore of Japanese semiconductors, and particularly VLSI (very large scale integrated circuit) products such as the 64 kilobit RAM (random write in and read out memory), has brought forth the statement that "This production has risen to a level that will overpower American domestic industry, and this will make difficult any effective countermeasures in the event of war" (WALL STREET JOURNAL of 5 February).

VLSI has become an instrument of national security and a strategic military item in the United States. The COCOM (anti-communist country export regulatory committee) product list includes military goods, nuclear power related equipment, and high precision tool machinery, together with single crystal silicon wafers, semiconductor diodes, IC (integrated circuitry), and many other semiconductor and related industrial products.

Large Subsidies for VHSIC

The history of semiconductors from transistors to VLSI is said to run on the same track as that of American military technology. The military's VHSIC (very high speed integrated circuitry) plan started in 1979 is an important example in which military technology and VLSI development are combined into a single development.

This plan has already gone past the preparatory research stage and is now on the performance demonstration stage (1981-1984). This is a project in which six large companies--Honeywell, Hughes Aircraft, IBM, Texas Instruments (TI), TRW, and Westinghouse--are acting as prime contractors for the Department of Defense and are working with their own cooperative makers with vast subsidies from the army, navy and air force to further development of the next-generation VLSI.

The developmental objectives include a microcomputer with the capability of performing 12 billion multiplications and additions per second and an element with a circuit line width of 0.5 micron (1 micron = 1/1,000 millimeter) (a 64 kilobit RAM has a circuit line width of 3 microns) which are "super-super LSI" with performance several stages above the 64 kilobit RAM or the 16 bit micon.

At the same time, these products must be able to operate normally under very harsh conditions such as exposure to high-level ionizing radiation and temperature extremes of -55°C to +125°C.

The Defense Department hopes to apply this "super-super LSI" development to set up a battlefield information system or in radar in fighter planes to assure itself military superiority. The U.S. Government plans to provide \$200 million in subsidies to promote the VHSIC plan, and this sum is expected to grow considerably.

FOR OFFICIAL USE ONLY

U.S. Government in Anti-Japanese Regulatory Stance

Preceding these events, although limited to only a single product, the Japanese forces overwhelmed the American forces in the initial conflict over the 64 kilobit RAM, and the Defense Department is seen to have increased anxieties over future national security. The U.S. Government, which had played a pacifying role with regard to the complaints of the SIA (American semiconductor industrial association) during the previous friction, made a complete turn-around this time to take the lead in the anti-Japanese movement.

Secretary Baldrige of the Commerce Department said: "We cannot ignore (the Japanese onslaught)"; the move by one sector of the top-level executive arm of the government to evoke the provisions of the 1962 commerce expansion law on "national security items," Article 232, to clamp down on Japanese-made semiconductors is none other than a manifestation that the direction taken in the VLSI war was having great influence on the development of military technology.

The military is waving the flag for a "strong America," while President Reagan has made balance in military might with the Soviets one of his "sacred areas." The retaliation against anyone who trespasses on these "sacred areas is severe." Immediately after the rekindling of friction, the Department of Commerce directed a statement to the six large makers "to promote development and production of 256 kilobit RAM and the 1 megabit RAM and to be prudent with statements that incite the country"--an unusual request. This, too, eventually boils down to a violation of sacred areas and calls for a special alert against uncalled for counterreactions.

The American semiconductor industry aside, in the midst of the uncertainties of the private and industrial areas, there is continued growth in the military, space, and air spheres. According to a survey made by the American large semiconductor company ICE, the market scale for IC in 1981 for military, space, and air increased 23 percent over the previous year, to more than \$600 million. Individual companies involved include Texas Instruments, National Semiconductor, and Signetics, which are supplies at the \$70 million level.

In Japan, the Defense Agency recently issued contracts to large semiconductor makers for research and development on a CCD (charge coupled device) with infrared detection capability for missiles and tanks to be used as enemy search units; this country has recently become very aware of the ties between defense and LSI. On the other hand, the main strength of the Japanese semiconductor industry has been in the private and industrial areas, and there is little likelihood of any change in this situation in the near future.

Cost Difference Between Military and Private Sectors

The production cost of ordinary IC in the United States is said to be \$2 per unit in the private area and \$40 in the military area--a wide difference. The government takes care of the cost end where the military is concerned, and there is no reluctance to allow high-level leading technology development. This is an appealing market for the semiconductor maker. On the other hand,

FOR OFFICIAL USE ONLY

U.S. Department of Defense VHIC Plan: Performance Demonstration Stage (Phase 1, 1981-84)

<u>Principal Contractor</u>	<u>Cooperating Maker</u>	<u>Subsidy (\$1 million)</u>	<u>Branch of Armed Forces</u>	<u>Basic Development Path</u>
Honeywell	3M	19.9	U.S. Air Force	Electric-photo signal processor
Hughes	Union Carbide	27.4	U.S. Army	Battlefield information distribution system
IBM	Northrup	19.9	U.S. Navy	Ultrasonic signal processor
TI	--	22.7	U.S. Army	Missile processor and sensor
TRW	Motorola	34.4	U.S. Navy	Electronic battle signal processor
Westinghouse	Sperry Univac GCA			
	National Semiconductor	33.8	U.S. Air Force	Fighter radar processor
	Control Data			
	Boeing			
	Harris Semiconductor			
	Mellon Institute			

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

too much dependence on the military results in loss of cost control, as well as the fact that development of other market areas and of new products suffers. The clash between the private industry-oriented Japanese forces and the military-oriented American forces is now about to commence.

[20 Mar 82 p 5]

[Article by reporter Kato]

[Text] A party to announce the formation of the "High-Speed Calculation System for Scientific and Technological Research Use" was held at the Hotel Okura in Minato-ku in Tokyo on 12 March. The party was attended by President Takunao Yamamoto of Fujitsu, who will serve as chairman of the board of directors, as well as by executives of semiconductor and computer companies along with top government figures, and talk was directed at developing production for the 21st century.

Director Seiichi Ishizaka of the MITI's Agency of Industrial Science and Technology made a speech which was prefaced by the statement that "Recently we have had the opportunity to read more articles written by foreign correspondents," followed by "When the Americans hear of this party, concerned people in the United States will become even more excited."

Director Ishizaka was right. "The advancement of large sums of money by the Japanese Government to subsidize VLSI (very large scale integrated circuit) development is outrageous" is the criticism which has flared up anew on the American side.

Large Makers Take Divided Charge of Element Development

The objective of this group is the establishment of a practical technology for a super computer to perform work such as aerodynamic computations associated with aircraft and treatment of graphic information transmitted by satellite which cannot be undertaken by the present generation computers. One phase of this project is the development of new high-speed logic (logic element) and memory (memory) to replace the silicon used at present; this effort is being broken down into different categories, of which the large makers of the industry will take charge of development, including: 1) Josephson coupling element, 2) HEMT (high degree of electron mobility transfer) transistor, and 3) gallium arsenide electric field effect transistor.

On 12 February, about a month before the organization of this group, a party commemorating the formation of the "New Capability Element Research and Development Association" formed in conjunction with the establishment of the basic technological research and development system of the next-generation industry by MITI was held at the same site. This association also announced targets for development to be used in the next-generation VLSI: 1) super lattice elements, 2) three-dimensional circuit elements, and 3) environment resistant elements. At this party, former Prime Minister Takio Tanaka of the Liberal Democratic Party wore a necktie pin adorned with an IC (integrated circuit) which had been presented by Mr Suzuki 10 years before when he had visited a certain semiconductor plant, and he encouraged the industrial leaders gathered around to "dig in."

- 35 -

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

Both of these organizations are slated to receive more than 200 billion yen in subsidies from the government over the next 10 years. The contributions of the constituent members, which are private companies, are expected to top the government subsidy level. It is easy to see why the American side, which fell behind in its initial skirmish on VLSI, is keeping a very wary eye on the research and development system for the next-generation VLSI on the part of the Japanese.

There Are Also Large Subsidies in the United States

On the other hand, it cannot be said that the American criticisms are completely on target. There is the VHSIC (very high speed integrated circuit) which is being promoted mainly by the Department of Defense, in addition to subsidies granted by NASA (National Air and Space Administration), the NSF (National Science Foundation), and the Department of Energy to promote VLSI research and development. It may be said that the Americans and Japanese are roughly on an equal footing where research and development systems and government subsidies are concerned.

In fact, the Japanese subsidies have provisions for some form of return through profit payments after a fixed period, which is very close to a no-interest loan; the Japanese companies have to operate under more severe conditions compared to the one-way handout of the U.S. Government subsidy plan.

Certainly, the Japanese Government has played a major role in the development of Japan's semiconductor industry. The "Kiden Law" enacted in 1971 (special law on management of certain electronic industries and electrical machine industries) clearly spells out the plan to raise the level of the semiconductor industry (Article 3) and even states that the government will serve to assure funds and make loans (Article 5). One factor responsible for the growth of the Japanese semiconductor industry to the 1-trillion-yen level in 1981 is the government and the skillful manner in which the Ministry of Industry and International Trade guided the development.

In other words, the criticism the American side levels against the Japanese VLSI research and development system may be a rehashing of the "criticism of Japan Inc." in somewhat modified form. Recently, the influential American economic magazine FORTUNE compiled a survey of Japanese and American business leaders' opinions. One of the questions asked was: "Of the two countries, the United States and Japan, which gives its businesses greater capacity where regulations and administrative actions are concerned?" and 76 percent of the 491 American business heads who replied cited Japan.

SIA Looks for Favorable Plan

As a result, there is considerable feeling that the true aim of the recent SIA (American Semiconductor Industry Association) criticism of Japan is to make Japan the scapegoat and thus extract very favorable treatment from the U.S. Government. The fact that it even criticizes the adversary country's research and development plan on the next-generation VLSI indicates that should it change its stance, this will result in internal government interference.

FOR OFFICIAL USE ONLY

Be that as it may, it is evident from the fact that the U.S. Department of Defense has been drawn into the picture that this present friction has gone beyond the private sector and industry level to come to the national security level where the electronics revolution and VLSI development are involved. Thus, we can expect some emotional outbursts as this friction develops from industry versus industry to the stage of government versus government.

Research and Development Organization for Next Generation VLSI

	<u>Research Theme</u>	<u>Private Contractor</u>
New Capability Element Research and Development Association	1. Super lattice element	Fujitsu, Sumitomo Electric Industries, Hitachi, Nippon Electric, Oki, Sharp, Toshiba, Mitsubishi Electric, Matsushita, Sanyo Electric
	2. Three-dimensional circuit element	
	3. Environment resistant reinforced element	
High-Speed Computing System for Scientific and Technological Research Use (new element research section only)	1. Josephson element	Fujitsu, Hitachi, Nippon Electric Fujitsu, Oki (Logic) Hitachi, Mitsubishi Electric (Memory) Nippon Electric, Toshiba.
	2. HEMT	
	3. Gallium arsenide electric field effect transistor	

[22 Mar 82 p 5]

[Article by reporter Nonaka]

[Text] On 16 February, the seventh ranking semiconductor maker in the world, the American Fairchild Company, disclosed its plan to move into Japan. President Robert Skarko of Fairchild Japan, which is this company's Japan-based corporation, who was interviewed by this reporter at the Keidanren Hall in Ote-machi, Tokyo, announced: "We will invest about 21 billion yen in the construction of an integrated IC plant at the Isahaya industrial park in Isahaya City, Nagasaki Prefecture, which we hope to complete by 1985."

Aim at Opening Market in China

Fairchild merged with Tokyo Denka Kagaku Kogyo (TDK) in 1971 and has a history of making plans to enter the Japanese market while retrenching. Despite such a background, it now plans to start a lavish production program at its Isahaya plant, but when the reporter asked "What will be the production scale?" and "What sales volume will you be striving for?", President Skarko avoided any definite answers. "We will initiate operations next August for assembly of the logic IC and linear IC which are in such high demand in Japan" was all that he would offer.

It is said that the key to this closemouthed stance is China. Schlumberger of France, which took over Fairchild in 1979, held a directors meeting which acted

FOR OFFICIAL USE ONLY

upon the plans to enter Japan and at the same time reportedly made the decision to route the production of its Isahaya plant to China. Schlumberger, which is known worldwide as an oil explorer, previously put forward a plan to participate in the technological end of oil field exploration in China and has long had its eye on the Chinese market. The reason behind the decision to locate its semiconductor production site in Japan at Isahaya is said to be the proximity of this city to the Nagasaki airport, which is one terminal of regular China-Japan air service which will facilitate any approach to the Chinese market.

This is the first effort by any American semiconductor maker to initiate a trade strategy aimed at China, and one can understand why Fairchild is unwilling to reveal the production plans for its Isahaya plant.

The world's largest semiconductor maker, the U.S. Texas Instruments (TI), has started production of 64 kilobit RAM at its Miho plant in Ibaraki Prefecture and has assigned this plant to be its VLSI supply base.

The design center which will be the site for circuit design and development which the top micon company, Intel of the United States, constructed at the Tsukuba Research and Academic City in Ibaraki has been completed. This company will set out to develop new products here destined for the world market.

The top radio communications maker and second semiconductor maker in the United States, Motorola, merged its three subsidiary plants in Japan for which it advanced all the capital and established Japan Motorola, and it plans to set up a VLSI mass production plant in the Kyushu area.

Exploit Superior Brainpower

These are all events which have taken place during the past year. The various American makers are stepping up their activities in Japan and have made their Japanese companies large pillars in their worldwide strategy. "Japan is the second largest market next to the United States and it has great growth potential" (President Condon E. Moore of Intel) is typical of the expectations of Americans, and they intend to exploit to the maximum degree the concentration of brainpower and the highly productive labor force.

On 17 March, TI gave the recession (business stagnation) as the reason for releasing about 3 percent of its work force, 1,700 workers, indefinitely (no definite rehiring date, temporary discharge from work). These layoffs were to take place at the Houston and Dallas plants and to involve workers in semiconductor plants. This is a good reflection of the status of the American semiconductor industry, which is suffering from the longlasting recession, while TI's Japanese company is putting fancy ads in newspapers and magazines to the effect that "Join J. Kilbey (the technologist who developed the first IC in the world in 1958) in his second effort to push the micron limit" as it goes all-out for manpower.

Following Fairchild and its decision to locate a production site in Japan, Intel, which completed its design center to give it a foothold in this business, and AMD laid plans to build plants in Japan in 1983; the activities of

FOR OFFICIAL USE ONLY

American companies have become quite noticeable. Leading American maker Analog Devices, eyeing development in Japan for semiconductor type products such as the AD converter (semiconductor which converts analog information into digital information) used in VTR and audio, completed a technical center at Tsukui in Kanagawa Prefecture and will soon start actual production. In this way, the number of companies locating plants in Japan is increasing.

Japanese Side Strengthening Its Plants

On the other side of the picture, leading Japanese makers such as Nippon Electric, Hitachi Limited, Toshiba Corporation, and Fujitsu all are producing IC at their plants located in the United States, and some rapid moves are being made to locate second plants. Nippon Electric is investing roughly 20 billion yen to build a VLSI production plant in Roseville City in California, where it plans to produce 3 million units of VLSI products including the 64 kilobit RAM; this will be its second plant.

That is to say, the business strategy of the Japanese and American semiconductor makers has shifted from semiconductor trade to emphasis on locating plants on the other country's home ground. Electronic Industrial Association of Japan (president, Sadakuzu Shindo, president of Mitsubishi Electric) which has been keeping close watch being concerned about the rekindling of the Japanese-American semiconductor war refuted that "capital investment and technology exchange have already been actively conducted in the form of mutual extensions, and the semiconductor industries of both countries are in mutually supplementary relationships' based on the above stated background.

This era of mutual extension on the part of Japanese and American makers actually involves the siting of plants on the home soil of the adversary. Compared to the situation in which all four of Japan's top makers are "in step" locating in the American market, the advance of the American companies into Japanese territory is only just beginning. As can be seen by Fairchild's move to construct a plant for production aimed at China, the strategies of the American makers may involve some very clever ideas. The Japanese companies, which know only too well the "threat of the United States when it gets down to brass tacks," are increasing their guard against the moves of the American makers, which threaten to jump in and reach deep down into the pockets of the Japanese market and establish VLSI production strongholds.

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

Mutual Extensions of Japanese and American Semiconductor Makers
 (* Indicates Planned Construction)

	<u>Name of Company</u>	<u>Plant Site</u>
(Japanese side)		
Nippon Electric	NEC Semiconductor America	Mountain View, California Roseville, California
Hitachi Limited	Hitachi Semiconductor America	Dallas, Texas
Toshiba Corporation	Toshiba Semiconductor USA	Sunnyvale, California
Fujitsu	Fujitsu Microelectronics	San Diego, California
(American side)		
Texas Instruments	Japan Texas Instruments	Hinode-machi, Oita-ken; Kamogaya-shi, Saitama-ken
Motorola	Japan Motorola	Shiokawa-machi, Fukushima-ken (joint with Kaizu Toko)
Fairchild	Fairchild Japan	Isahaya-shi, Nagasaki-ken
Analog Devices	Analog Devices of Japan	Shiroyama-machi, Tsukui-gun, Kanagawa-ken
Intel	Intel Japan	Tsukuba Research and Academic City, Ibaraki-ken

[26 Mar 82 p 5]

[Article by reporter Nonaka]

[Text] It was when the deputy USTR (United States Trade Representative), MacDonald, visited Japan to attend a Japanese-American trade subcommittee meeting and American demands to open up the Japanese market were increasing day by day that "Japanese challenge in the leading technology area of semiconductors" (Secretary Baldrige of the Department of Commerce) had become the top focal point in the Japanese-American friction.

Hitachi With Fine Act

Hitachi stepped forward to play the role of temporarily pacifying this "concentrated firepower" (industrial leaders) of anti-Japanese criticism with regard to semiconductors. Hitachi on 2 March had announced a technological agreement with the large American electronic equipment maker Hewlett-Packard (HP) in the field of 64 kilobit RAM for VLSI (very large scale integrated circuit). Just when the SIA (American Semiconductor Industry Association) was screaming for import regulations on Japanese-made 64 kilobit RAM, Hitachi demonstrated a stunt blowing away the rumor that Hitachi is lacking in political sensitivity.

FOR OFFICIAL USE ONLY

The Ministry of International Trade and Industry, which has the role of being a leader for the development of the Japanese semiconductor industry, praised this effort highly. The Hitachi statement coincided unexpectedly with a press meeting following a cabinet meeting and the minister of international trade and industry made the following statement:

"There has been an active interchange of capital and technology in the past regarding semiconductors between the United States and Japan. The HP and Hitachi agreement is one of good examples that show the fact that Japan recognizes the importance of cooperative relationship and the need to exist even in the foremost technological field of the 64 K RAM.

This agreement stipulated that Hitachi would provide HP with N channel MOS (metal oxide film semiconductor) process technology to produce 3-micron-width (a micron is 1/1000 of a millimeter) circuits for the 64 kilobit RAM and the mask-producing technology which HP hopes to use to mass-produce 64 kilobit RAM for use in minicomputers and measurement equipment. This is the first case in which a member of the Japanese semiconductor industry has entered into a cooperative agreement with a foreign company on the 64 kilobit RAM.

The Japanese makers succeeded in capturing 70 percent of the market share (fraction of the market) for 64 kilobit RAM. Hitachi is the top maker and has garnered 50 percent of the share, so it has been subjected to fierce criticism from the American side, and it probably considered that it had the responsibility of taking the lead to avoid this friction from the standpoint of "the nation's interest" (Hitachi top figure).

It is known that HP had previously given a high evaluation of Japanese-made semiconductors based on their exceptionally low reject rate. When computer makers and similar companies purchase semiconductor products, they try to diffuse the risk by making product purchase contracts with two or more companies. On the other hand, this present agreement between these two companies relates to the provision of production technology, and even though HP had favored Japan, the shock was nevertheless great.

Unexpected Reaction by American Side

However, the reaction of the American semiconductor makers of Silicon Valley was not what Hitachi (or the ministry of International Trade and Industry) had expected. Well-informed sources had reported that: "They in the valley who have been worried that the Japanese are rapidly gaining upon them feel that our self respect has been trampled." As proof of this statement, the sources state that the U.S. semiconductor industry suddenly started to move toward a dumping suit for the principal instigator).

Hitachi and HP are champions of leading technology and this agreement between the two drew attention to the situation that the cooperative efforts between industries in the semiconductor area was accelerating on an international scale. There is particularly fast formation of the second-source (secondary supplier) family among leading semiconductor makers of Japan, the United States, and Europe in securing the microcomputer which is the promoter of the electronics revolution.

FOR OFFICIAL USE ONLY

This family interrelationship network links Intel with Nippon Electric and Fujitsu and also Motorola with Hitachi, so that companies which are fiercely fighting each other in the semiconductor friction are holding hands. On 2 March when Hitachi announced its agreement with HP, it had people present in New York at the announcement of the 32 bit micon by Motorola, and they stated there that Hitachi will develop a peripheral equipment business as a second-source maker for Motorola.

To be sure, cooperative agreements between American industries are also popular. Among these, the agreement between Advanced Micro Devices (AMD) and Intel which is slated to continue for more than 10 years was a source of great surprise to others in the industry. This involves AMD becoming the second source for the 16 bit micon "8086" developed by Intel, which is why the contract was signed; the scope of the agreement includes semiconductor devices which will be developed in the future.

In addition, three companies--RCA, semiconductor maker Signetics of the United States, and Phillips of Holland--have entered into joint development of CMOS (complementary metal oxide film semiconductor) structured logic IC (integrated circuit for logic circuit use), while Intel and General Electric are planning to enter into a technological agreement on production of new semiconductors. It is a busy situation at present.

As the situation of "bitter enemies in the same boat" was about to appear among the giant makers as the VLSI age was being entered, Hitachi, which had previously been active in cross license agreements (technological exchange), hoped to exploit this approach to dissipate the friction. This is a situation in which national boundaries were crossed over, and a Japanese maker took the initiative to participate in agreements. Toshiba Corporation had beat out the sparks of this friction before they got to Europe, and it announced technological cooperation with the Italian semiconductor maker SGS-ATES.

While trade friction including semiconductors was spreading, there was a tendency for the castigation fight to escalate between Japan and the United States and even Europe, but there is a good probability that there will be agreement between giant industries on the basis of a single technology, multiple technology, or joint management in order to assure a future.

FOR OFFICIAL USE ONLY

16 Micon Family Relationship Diagram

<u>Product Type and Development Maker</u>	<u>Second Source</u>
V8086 Intel, United States	Nippon Electric Fujitsu Mitsubishi Electric AMD, United States Harris, United States Siemens, West Germany Matora Harris, France
V68000 Motorola, United States	Hitachi Limited Mostec, United States Rockwell, United States Signetics, United States Thomson CSF, France Phillips, Holland
VZ8000 Zylog, United States	Sharp SGS-ATES, Italy
VTMS9900 Texas Instruments, United States	AMI, United States ITT, West Germany

[27 Mar 82 p 5]

[Article by reporter Kato]

[Text] At about the time of the rekindling of the Japanese-American semiconductor friction in the middle of February, the 1982 ISSCC (International Solid State Circuit Conference) was opened in San Francisco in the United States.

The ISSCC provides the platform to which leading specialists from the semiconductor makers and research organs come to disclose their latest leading technology and new products; a 32 bit micon was announced last year which drew great interest from people concerned both in the United States and abroad.

To Be Developed by 1985 Period

On the other hand, there was no single item at this year's ISSCC which drew such interest. In its place special-use LSI (large scale integrated circuit), with the customers needs the primary consideration, and design techniques for VLSI were prominent in their number. The specialty of the Japanese semiconductor makers, the low power consumption CMOS (complementary metal oxide film semiconductor) product, was the main attraction at this conference. It may be said that this conference was one which featured improvement of present technology and discussed possible extensions.

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

Director Makoto Kikuike of Sony's Central Laboratory said: "The world's semiconductor industry has (setting aside product growth but considering the technological aspects) reached a stage of maturity." Mr Kikuike is one of the pathfinders of Japan's semiconductor industry. "The news of the invention of the transistor was one such event, and up till the present time, one never knew what new semiconductor developments would be forthcoming"; this has been an age when this stimulating situation continued. But now, basic technology and material development and discovery have virtually been completed.

The Kilbey patent, which involves placing a number of transistor and resistance type elements on a single chip (small piece) of silicon base plate, and the Planar patent by which a thin membrane is utilized to form many elements on a silicon base plate type basic technology came to the fore before 1975, while the eighties are expected to be taken over by MOS (metal oxide film semiconductor), semiconductor laser, and optical fiber type main line products of the present electronic revolution. The basic research and development stage for the one chip micon and CCD (charged coupled device) were essentially complete by the sixties. The Josephson element, which is in the spotlight as the most promising element of the next generation VLSI, already had its basic theory developed about 1962.

Emphasis on Improving Production Technology

Certainly, semiconductor industrial technological development is continuing at a rapid tempo at present, and the race to produce a higher degree of integration or reduce computer computation time is taking place with no respite in sight. On the other hand, these are only extensions of existing technology; the developmental objectives are already fixed to a certain degree. "Development is such that the end result can be foreseen, and it is not true technological innovation" (Mr Kikuike) is the type of statement one hears.

Certainly there still remains the possibility of some epochmaking technological revolution rivaling that of the transistor and IC, but the activities in the semiconductor field, which is now entering the stage of maturity, are now being shifted to application technology, cost reduction, and higher reliability. The technological agreement between Hitachi Limited and Hewlett-Packard and the recent wave of technological agreements between giant American industries are all part of this same trend.

Japan is weak in developing creative technology but is superior in applied and production technology--the present resurgence in friction between these two countries probably incorporates some of the American irritation caused by this Japanese trait.

Very recently, two companies, Toshiba Corporation and Hitachi Limited, announced a new element separation technology which allows circuit design of 1 micron (1/1000 of a millimeter) and submicron (less than 1 micron) width. Nippon Electric is presently constructing a new plant which can handle 5-inch-diameter silicon wafers (present 4 inch) in order to improve yield. Fujitsu has developed gate arrays with a gate number (volume of information by logic circuit elements) of 10,000, placing this in the top class in the world as a

FOR OFFICIAL USE ONLY

representative product of its semicustom (partially special order) LSI stock, while SONY has developed a new method for manufacturing high class silicon single crystals called the "MCZ (crystal drawing utilizing strong magnetic field) method." In this manner, developments in application and production technology are actively continuing in Japan.

What Is the Friction?

These abundant application and production technology efforts are being achieved by the large Japanese semiconductor makers, most of whom are entering into closed license (technological exchange) agreements with large American makers, thereby mutually canceling technological cost payments. The payments made by this country's semiconductor makers in technological fees amounted to about 10 percent of the total sales up to the latter part of the sixties, about the time mass production of IC was becoming a reality. "We paid high tuition" (head of industry) was the type of comment made. On the other hand, the timelimit of 15 years has expired for basic patents such as the Kilbey and Planar patents, and there has been a large decrease in such payments, so that top companies such as Nippon Electric now only pay out about 1 percent for such rights.

In this period of maturity where development and discovery of creative technology are dying down, high reliability and low cost are taking over. The Japanese export of memory to the United States had its start with the 4 kilobit RAM (random write in and read out memory) in 1975, followed by the 16 kilobit RAM that captured 40 percent of the market share (fraction of the market) and still later by the 64 kilobit RAM which took over a 70-percent market share, all of which were the result of superior mass production technology and quality quality. Assuming there will be no new development similar to the one chip micon, which utterly devastated Japan, Japanese-American semiconductor friction may only now be starting.

Main Technological Innovations in Semiconductors

<u>Year</u>	
1948	Junction transistor
1950	Single crystal drawing method
1951	Electric field effect transistor
1954	Vapor phase diffusion method
1959	Kilbey patent (IC)
"	Planar patent
1960	MOS transistor
1962	Semiconductor laser oscillation
"	Josephson element theory
1965	Optical fiber
1968	MOS-IC
1970	CCD
1971	Micon
1974	Electron beam exposure system

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

[29 Mar 82 p 5]

[Reporters roundtable]

[Text] The conflict between Japan and America over the standardbearer VLSI (very large scale integrated circuit) of the electronics revolution is expected to intensify and will certainly not abate. This series has discussed the background of this Japanese-American semiconductor friction along with the responses to the various attempts at resolution, and has described the status of past Japanese-American struggles over VLSI. This final article consists of a roundtable discussion among desk people and the various reporters.

Complexity of Background Is Problem

Desk: The semiconductor is one of the items of great concern to the U.S. Government, which is actively trying to open up the Japanese market. After being excluded from the Versailles summit, the Japanese-American friction seems to have the potential of turning around.

A: Hardly anybody even in the industry expected that the U.S. Government would step to the forefront in the semiconductor problem. There are some who say: "This is the result of President Reagan being from California, where Silicon Valley is located." Such being the case, there are other products of great concern to the U.S. Government such as oranges and beef, which are also produced in California. President Hiroji Kobayashi of Nippon Electric said: "This present friction is not one which will be resolved by semiconductors alone" as he alluded to the complexity of the background of this present controversy.

B: The elevation to the forefront of the opening of the Japanese market to semiconductors by the U.S. Government has been met head on by the Ministry of International Trade and Industry. The duties have dropped to the same level, mutual advances in construction in the other's country and technological agreements have multiplied, so there should be no cause for complaint. Even regarding the issue of participation by American industries in Japan, at the government-industry research and development organ meetings we have no recollection of the American members being barred from participation. As Under Secretary Fujiwara of the Ministry of International Trade and Industry said at the outset of this recurrence of friction: "The semiconductor war is a war without a battlefield," as he pointed to the difficulty in attaining a solution.

A: Even at that, the Ministry of International Trade and Industry has considerable concern with regard to the United States. The statement to the heads of the large semiconductor makers "Do not make any statements that will incite the United States" is an extreme example of this stance. At the same time, ever since the recurrence in friction, all the companies have had to keep their mouths shut with regard to plans for future increase in production of 64 kilobit RAM (random write in and read out memory). It is now almost impossible to discuss any plans on next-generation VLSI development. If the U.S. Government is out to suppress leading technology in Japan, there is no telling what unreasonable demands will be forthcoming.

- 46 -

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

Dispel the Dumping Problem

Desk: There was a time when dumping of Japanese semiconductors seemed to be emerging as a problem. What is the situation today?

B: There is no clearcut picture as yet, but the SIA (American Semiconductor Industry Association) did ask the Department of Commerce to investigate dumping, and it is said that one company, Motorola, is pushing this request. The U.S. Government does not appear likely to act on this request without definite proof and seems to be simply making some checks.

A: There is one industrial leader who said: "If there is to be a check on dumping, let them do it right." The dumping problem has been a bitter experience for many of these companies because they experienced the same problem which required 12 years to resolve in the matter of color TV. They seem to be saying: "There is absolutely no dumping." There have been some companies which since the recurrence of this friction have issued strict orders not to be stuck with trifling incidents when dealing with American sales bases.

B: It is said that all of the Japanese makers with plants in the United States are consistently making a profit, while the American companies are feeling the effects of the recession, and the dumping problem is not one which any of the companies seems to be deeply concerned about. An official of one company with small export volume said: "If we should go to any excesses to expand our exports, we will be under severe peer pressure."

Desk: It seems that the formal announcement by Fairchild, which is number 7 among the world's semiconductor makers, that it will locate a plant in Japan came directly after this friction flared up again.

B: Setting aside this recurrence in friction, there is considerable desire on the part of American semiconductor makers to locate in Japan. The success of Texas Instruments (TI), which advanced to Japan in 1968, seems to be serving as a stimulus. The profit statements of Japan TI have trended toward higher levels over the past years to the 4-billion-yen level, and last year the profit statement was also good. The reason TI is able to supply a large volume of 64 kilobit RAM to the American market along with the Japanese makers is because its plant in Japan (Miho in Ibaraki-ken) is well equipped for mass production.

A: The head of a certain foreign financed firm said that there is no other customer like a Japanese user who sets such severe standards on quality and delivery time. These practices, on the other hand, have contributed to the improved reliability of Japanese products. The feedback effect of production technology acquired in Japan is not something that can be taken lightly.

B: TI, which early in the game established an internationally diversified industrial system, has been at odds with the SIA on this semiconductor friction problem from fairly early in the game. At the time of the previous friction, President Shefford said: "Criticism of Japanese semiconductors is off base. Rather than complain, you should be working toward expanding exports." Last year President Busey said at the stockholders general meeting:

FOR OFFICIAL USE ONLY

"We will not knock our competitors at this meeting. We will bring our fight to the market." This is why there even has been a statement from among the American makers that "anti-Japanese criticism is most vehement from the medium- and small-business located in the valley. The real source of this criticism is the American medium- and small-business problem.

A: This is why the changes taking place on the American scene, such as take-overs by large industries and cooperative agreements between giant industries, may serve to ease this friction somewhat.

Do Not Trip in the Moves to the United States

Desk: "What about the advances of Japanese makers in locating plants in the United States?"

A: It is said that very recently a certain Japanese maker was approached by an American firm to ask if it could make use of an idle production line. The labor situation and improved service to customers are still strong incentives to locate plants in the United States. This can also be an excellent means to further Japanese-American exchange and equalize opportunities.

B: It is not as simple as that. The problem in the United States at present is not whether a semiconductor is made in Japan but whether it is made by Japan. There is probably some emotional factor that a VLSI upon which Japanese breath has spread itself is not good. This is not a problem to be solved simply by locating plants in the United States.

Desk: If that is the case, it would be difficult even to set up a counterplan.

A: President Kobayashi of Nippon Electric said: "The Americans detest ambiguous responses most of all," but it is possible that Japan may develop its own technology that is so creative that even the Americans will have to show respect and thus put an end to this friction. Very recently, Japan's semiconductor technology has closed up considerably on the United States and has even been able to surpass the Americans in some products, although it still lags considerably behind in basic research and future technology creative strength.

B: Adults and children do not engage in fights. In this sense the semiconductor conflict signifies that the Japanese have come rather close to the Americans. When we look at the situation in the United States, where the major oil companies and integrated electrical makers are getting into the semiconductor field, future Japanese-American semiconductor production will become adult versus adult confrontations. Both sides have strong parental (government) support, but there is a good chance for this friction to take on other forms.

FOR OFFICIAL USE ONLY

History of Japanese-American Semiconductor Friction

1977 March	SIA is formed
April	SIA leaders confer with visiting Prime Minister Fukuda on IC problems
1978 March	SIA members call for boycott of Japanese products
	Ministry of International Trade and Industry established VLSI patent disclosures
December	General survey by ITC on IC initiated
1979 November	Semiconductor white paper submitted by ITC on Japan-made semiconductors
	SIA submits complaint to USTR
1980 January	USTR announced the SIA complaint is without foundation
1981 March	SIA proposes industrial promotion plan to government
May	Prime Minister Suzuki announces plan to lower duties on IC at meeting of heads of Japan and the United States
September	Japanese and U.S. Governments formally announce lowering of IC duties
December	Share of Japan-made 64 K RAM on the American market hits 70 percent
1982 February	SIA proposes anti-Japanese regulations to USTR, Secretary of Commerce Baldrige makes severe anti-Japanese criticism

COPYRIGHT: Nihon Keizai Shimbunsha 1982

9923
CSO: 8125/1084-D

FOR OFFICIAL USE ONLY

JAPANESE-U.S. SEMICONDUCTOR COMPETITION, COOPERATION

Tokyo DENPA SHIMBUN in Japanese 29 Mar 82 pp 17-32

[Text] Japanese-American Semiconductor Friction, First Establish Facts

The semiconductor trade problem has again been stirred up since the beginning of this year. The American criticism of the Japanese is almost as intense as though it were breathing fire.

The bone of contention this time is that the Japanese have captured a 70-percent share of the American market in 64 K RAM, and if this situation continues, the United States will be ousted from the top rank in the matter of leading products.

The Japanese contend that the 64 K RAM is a product whose market is only now developing and that crying about the share of the market at this time is premature.

Because the Japanese reply seems to make sense, the Americans have come out with a complaint of dumping and special management in the interest of national security--which are problems which the Japanese have difficulty comprehending.

On the other hand, the Japanese industry is fearful that this incident could become an administrative problem that could twist the problem between the industries of the two countries into something more serious. Healthy competition is the driving force behind development, but the Americans claim unfair practices and say the Japanese are driving for a one-sided advantage.

Many unfair practices have been pointed out by the Americans, but the freedom of trade and financing adopted by the Japanese Government plus the lowering of tariffs have wiped out any unfair relationships, and the Japanese consider that they can go no further in trying to appease American business.

These unreasonable demands and criticisms are not completely beyond comprehension. It is not entirely clear that the Japanese-produced 64 K RAM have actually captured 70 percent of the American market, but assuming it is true, this is only an initial trend in the market.

FOR OFFICIAL USE ONLY

Even assuming that the market is just on the threshold of growth, why did the American side allow the 64 K RAM market to be taken over by the Japanese. This is something for considerable consideration.

In order to assure themselves a stable supply of important parts, computer makers order their parts from three or four semiconductor makers at a time, and the common practice in the United States is to use a domestic maker as the first choice in this matter.

In the situation that the American semiconductor makers are delayed in their ability to supply 64 K RAM, important uses are shunted aside where introduction is involved, and the market has difficulty expanding. It is not that only the Japanese can supply this product but that the Americans take the initiative and work toward market growth—that is the desire of the Japanese.

It is the industry's view that the present trend of events was completely unexpected, although there were signs 2-3 years before. There are a number of versions, but what is clear at present is that the Americans were somewhat delayed where the 64 K RAM is concerned. They were found wanting in the structural design, process, materials, manufacturing equipment and various other areas.

The Japanese side was able to come up with silicon material with planar quality of 2 microns deviation, masks which can respond in 12 minutes to 3 micron finishing, resists with very high purity, easily sectionable dry etching and optimum structural design compatible with mass production.

Japan-made 64 K RAM are finding ready sales overseas, and the necessary materials and equipment are increasing. It might be better to state that they are keeping up.

Two or three years ago the large computer makers and semiconductor makers of the United States with sufficient insight into evaluating technology had already become aware of the superiority of Japan-made 64 K RAM and reportedly were formulating some type of countermeasure.

This series of events and the moves on the part of leading American industries such as Texas Instruments, Motorola, Fairchild, and IBM to reinforce their semiconductor production in Japan are not completely unrelated.

In certain areas Japan has superior ability to improvise and it possesses technological development strength such as large volume supply through mass production. When one looks at the successive development of new technology and superior materials which even American industry purchases in large volume, there are some aspects of this anti-Japanese criticism which seem beyond reason.

The semiconductor market is more and more going toward "mass production" and "large volume utilization," and Japan is fast becoming "a country well suited to semiconductor production." It is hoped that this situation can be comprehended.

FOR OFFICIAL USE ONLY

Greatly Reinforce Onsite Production To Avoid Trade Friction

It is anticipated that Japan's semiconductor production will exceed the previous year's production by some 20 percent, indicating a large rate of growth. The entire semiconductor industry recorded 1-trillion-yen business last year, and the industry expects this sum to reach 1.3 trillion yen this year.

Among the products which are expected to attain great growth are the micro-processor and memory, while new products such as gate arrays and voice synthesis LSI are expected to expand very rapidly this year.

The economic situation around the world makes predictions difficult, but limiting ourselves to this particular area, considerable growth can be expected as the result of automation, greater conservation of power, conservation of resources, and conservation of energy demand of society overall.

Criticism of Japan Intensifies

Although this is a very favorable area, the trade friction as represented by the American criticism of the Japanese 64 K RAM is a major problem. The semiconductor market in the Western world is in a state of recession, and the criticism of Japanese industry, which is maintaining a good rate of growth despite this situation, is increasing.

The recovery of the overseas market is awaited, and there are signs that this might be on the way. It seems that the situation in the United States and Europe is that semiconductor sales, which fit right in with automation and conservation of power movements, are casting aside the effects of the recession and are beginning to expand.

Half Onsite Production, Half Export

This trade friction is not limited to semiconductors, but Japan's semiconductor companies are reinforcing their plans for production in the other countries' home ground in an effort to avoid this friction. According to the plans of these companies, their overseas production is expected to increase over the next 2-3 years. In the system that is being established, a large portion of the semiconductors for the Western markets will be provided by products made in the respective countries, with the remainder coming from Japan.

Location of American Plants in Japan Is Also Active

The situation is so favorable that the Japanese semiconductor market has grown to the point that it has now attained the 1-billion-yen level. Last year's production is estimated at 950 billion yen, while the 1-trillion-yen mark is expected to be broken this year, reaching as high as 1.1 trillion yen.

Because of this large market, there is activity among the American semiconductor makers to enter the Japanese market. The movement in the semiconductor industry is taking place as though national boundaries do not exist, which is one of the features of this industry.

FOR OFFICIAL USE ONLY

The reason this market is expanding in this manner is the regularly increasing growth in portable calculators, watches, television sets, stereo, VTR, computers, and communications equipment. Portable calculators, watches, and small game sets are VLSI application products which are Japanese in origin and are used throughout the world.

Sustain Growth of the Electronics Industry

The advances in LSI are sustaining the development of the entire electronics industry, and despite the somewhat depressed state of the overall economy, semiconductors are pulling the development of the semiconductor industry along, and their role is becoming more important.

"Diagnosis" of the 1982 Semiconductor Market

According to data of the Ministry of International Trade and Industry, Japan's semiconductor (semiconductor elements and IC) production last year attained the 1-trillion-yen level for the first time. The growth rate was 23.5 percent-- a high rate of growth. All of the companies are anticipating growth this year between 15 and 25 percent. Although the market is experiencing very harsh conditions, growth products and growing markets are acquiring strength, and this is giving rise to large growth. This article will deal with "1982 Semiconductor Market Prospects" and present a compilation of the expected developments. According to Ministry of International Trade and Industry statistics, last year's production total (unless otherwise stated, these statistics will be the source of information, while import and export data will be taken from the Ministry of the Treasury overall was 1,067,309,000,000 yen, or just barely over the trillion level. Of this total, sales of semiconductor elements such as transistors and diodes increased 28.8 percent over the previous year to 378.5 billion yen, while those of IC increased 20.8 percent to 688,754,000,000 yen. These results show that the rate of growth in IC production was slightly below that of "semiconductor elements" last year, the first such instance since the IC industry became established in Japan and contrary to the initial predictions of the industry. Several hundred semiconductor elements are used in a VTR set, and the great growth in VTR was responsible for this increase in semiconductor element production, while the decrease in demand for memory resulted in the relatively inactive IC market.

30 Percent Reduction From Peak

The reduction in production of audio equipment which surfaced in early autumn last year greatly affected Japan's semiconductor company sales records. Limiting ourselves to audio equipment, the present sales are about 30 percent below the peak period; this is a serious problem even in the semiconductor business world which is blessed with a comparatively wide application field.

This recession in audio equipment sales has continued since last fall; due to this factor, the semiconductor makers in preparing their statements as of the end of March are allowing for a 5 to 10 percent reduction in sales from the originally estimated values. Furthermore, the calendar year statistics will reflect the full effects of the recession and show even greater effects.

FOR OFFICIAL USE ONLY

VTR, which was instrumental in greatly improving semiconductor demand last year, has been undergoing regular growth this year as well, and although there are wide differences between set makers, the demand is continuing to expand laterally in an orderly manner.

Thus, the overall private sector picture is one of recession, and the dependence of the various semiconductor makers on this market is very large, so various countermeasures are being developed. The problem is just when recovery will come; the prevailing opinion is that the situation is at its worst now and that there will eventually be a return to increased demand. This recovery may come as soon as July, according to many observers. In any event, the audio picture is expected to recover during the latter half of the year.

At the same time, the various semiconductor makers are hoping that the set makers will become active in new product development in order to ride out this recession and thereby increase orders for semiconductors. It is said that when there is a recession, new semiconductor applications become very active, and this situation seems to be emerging at the present time.

When the question concerns what type of semiconductor product is in demand, the greatest demand seems to be for miniaturized and lightweight sets. In addition, great expansion in the area of application is expected, such as introduction of new technology to the signal treatment system of linear IC to cut down noise. Demand for micons and optical devices for automation and power conservation of sets seems to be increasing.

Demand for Continued Development

In the same private area, apart from the production trend of VTR, it is said that demand for development of new IC and LSI is becoming active. For example, it is said that 1,000 elements or more of bipolar LSI may be introduced in the signal processor of the central section, and CMOS microprocessors and logic circuits introduced in the peripheral section control system.

Supplement the Private Situation Suffering From Recession

Thus, the various semiconductor makers are introducing new equipment in hopes of expanding sales in order to bolster the recession-plagued audio area and the dull VTR market.

On the other hand, demand for semiconductors used in computers and OA equipment is increasing favorably this year; all the companies regard this area as a promising market to supplement the other semiconductor areas where the overall market picture is concerned. To this end, the semiconductor companies are placing emphasis this year on intensified development of the OA equipment market; the market in semiconductors for OA equipment use is expected to be the top battleground this year.

According to some test calculations by a one semiconductor maker, semiconductors for OA equipment use will increase on the average 25 percent per year up to 1990, and the sales will expand from almost 100 billion yen this year to 170 billion yen in 1990. The market makeup this year is 34 percent memory,

FOR OFFICIAL USE ONLY

22 percent micon, 22 percent bipolar digital, 11 percent MOS digital, and the remainder individual semiconductors.

Many Experienced Industries

As is evident from these test calculations, memory and micon products account for more than half the OA equipment use semiconductors, and the remainder are for peripheral circuit use such as for interfacing. The feature of this market is that the companies involved include many more experienced members compared to those of VTR, while the life of the products is between half a year to a full year--extremely short. There are about 20 companies just in pancon. It is said that there are more than 30 companies in word processors, including the OEM makers.

It is to be expected that the race to sell semiconductors for OA use will intensify just as the OA equipment market is being bitterly contested, and the product development strength and sales strength of the various semiconductor makers will be sorely tested. On the product front, high-speed operating microprocessors and memory products along with short delivery time gate array stand out, and the general view is that technology and particularly soft support capability will be in the limelight on the sales front.

Foreign Funded Systems Entry

There was essentially no foreign funded maker present in last year's semiconductor market's prime battlefield, the VTR, but this outside influence will be seen in the OA area, and competition in this area is expected to pick up.

To the Japanese makers, which led the world in the matter of VTR, the OA equipment represents a new market for the future. The interchangeability of software for microprocessors for pancon use is becoming an important item, and the market development plans seem to be completely different from those of VTR.

Growth Companies Are Micon and Memory

What are the products which are expected to show great growth in this year's semiconductor market? The following is a compilation of the views of various semiconductor companies.

The top product is considered to be the micon. This involves a large market (presently estimated at 10 million units LSI per month); the monetary value is expected to increase a minimum of 30 percent this year. It is expected that the general-use 8/16 bit used in pancon will have to grow at least 50 percent.

Memory is another product that should be ranked with the micon as a promising product. Even though the price war in 64 K RAM is an item of concern, this year's production is expected to hit the 100-million mark, or roughly five times last year's production of slightly under 20 million units. Mask ROM,

FOR OFFICIAL USE ONLY

EPRAM, and static RAM are expected to be great contributors to the profit picture, and there is good possibility that various ROM for Kanji use will be the star of the memory area.

The market for gate array and voice synthesis LSI is small at present, but these are promising products whose applications are expected to increase this year. Both tend toward custom-made products and thus are not sold immediately, so the market is expected to expand gradually, and its movement is being closely watched.

In addition to IC and LSI products, there are digital interface products used in micon periphery, linear products, and small-package standard digital IC which are expected to see good growth.

In another area, since last year the so-called discrete semiconductor element has shown an increasing rate of use in the form of small package flat back products. Other products are switching type devices for power source use, power devices for automation and power conservation applications, and optical devices, and all of these are expected to experience good growth.

Semiconductor Market Viewed Through Statistics

The various semiconductor companies have various views on just how Japan's semiconductor industry will grow this year, and here we will use some statistics to make a simple analysis of the situation.

50 Billion Reduction in Audio

First, we will look at one of the areas that is relatively depressed and see what effect it will have on the semiconductor demand. The area which was depressed this spring was audio equipment (including automobile use radio/stereo); production is down 1.3 percent from its onetime peak. There has been growth in some areas of microcassettes and headphone type stereo, but assuming that this present situation will continue for the rest of the year and with semiconductors and IC used by the audio equipment industry accounting for nearly 20 percent of the total production and being a large market, it can be expected that there will be a reduction of roughly 50 billion yen in sales.

At the same time, the market in color TV has been stagnant, production has not increased, and only lateral movement is expected this year. We will assume here that demand for consumer-use electronic goods other than audio equipment will decrease by 10 billion yen.

In addition, household-use micon-equipped products are increasing, and even assuming consumption has leveled off, the related semiconductor demand is expected to remain firm.

Thus, market demand is expected to decrease by 50 billion yen in the audio equipment area, while television is expected to decrease 10 billion yen. The demand for pocket calculators, watches, cameras, and musical instruments is of some concern, but the fraction of the market accounted for by these products

FOR OFFICIAL USE ONLY

is relatively small, while, on the other hand, growth in games is large, so that no great change is expected in this area.

OA To Increase 30 Percent

On the other hand, the extent of growth in the areas where growth is expected is the item of concern. The product which all the companies are looking at is OA equipment, and a large growth rate of 30 percent is predicted for this area. When it is considered that OA accounts for 5-6.5 percent of the country's semiconductor production, a 30-percent increase is equivalent to a little more than 10 billion yen. The computer and its peripheral and terminal equipment are also expected to grow by 30 percent, and this will be accompanied by a 25-percent increase in IC and a little less than 3 percent in semiconductors, which spells out a 25-billion-yen expansion in sales this year.

Firm growth is also expected in other semiconductor using products, such as measurement equipment and communication equipment. The rate of use by automobiles is said to be only 2-3 percent of the total, but this is an area which has the potential of increasing with the greater electronification of automobiles.

Totaling the increases and decreases in semiconductor demand for the different product areas, the minus quantity attributable to audio equipment type private-use products of 60 billion yen compares to the 35 to 40 billion yen increase by OA and computer related areas, to show an overall decline of 20 to 25 billion yen.

New Demand for VTR Use

At this rate, the semiconductor market in Japan would be in a minus situation, but this picture may be greatly affected by the trend in production of household-use VTR.

The VTR-use semiconductor demand last year, including that for cameras, was more than two times and close to three times the preceding year's total, at about 120 billion yen, and the associated increase in IC was 13.4 percent of the total domestic consumption, while the increase in semiconductors was 16.7 percent.

Even assuming this year's VTR production will not match last year's sharp growth and will probably become more stabilized, the trend to IC use has intensified, which necessarily means that there will be new demand for semiconductors on the order of several tens of billions of yen.

Looking at the overall picture, it cannot be denied that this is a harsh environment, and the efforts of the companies to develop new applications will be reflected in their records. New developments can be classified into short-, medium- and long-term developments, but the increase in sales in this area comes from general-use products rather than custom-made products, and the differences in sales strength and new market development will create the differences in company records.

FOR OFFICIAL USE ONLY

Stern Look at Exports

On the export front, the economic situation in the Western countries remains in a state of stagnation, and a stern view of this situation is the prevailing attitude of the various companies. Exports of semiconductor elements last year increased 15.8 percent over the preceding year to 72.17 billion yen, while IC showed an increase of 8.9 percent to 199,639,000,000 yen. The IC exports, which for the past several years had been doubling annually, were thus blunted, and this was attributable to the recession in the memory market and the recession in the Western countries.

While sales of LSI for calculator and watch use to Southeast Asia have bottomed out, the memory products destined for the United States and Europe have been joined anew by the 64 K RAM, so substantial growth may be expected.

On the other hand, anti-Japanese criticism has been escalating in the Western countries, as a result of which the domestic semiconductor makers are taking a discreet attitude toward 64 K RAM. The total production of 64 K RAM throughout the world last year was 100 million, which is expected to increase sharply to 600 million this year; the market scale is expected to increase from less than 20 billion yen last year to just under 70 billion yen this year, displaying its promising nature. The Japanese semiconductor makers, while reinforcing exports to the Western countries, are also increasing their production in foreign countries in an effort to avoid friction.

Import Semiconductors Also on Trial

Imports overall totaled 155.6 billion yen, an increase of 9.7 percent; the small rate of increase has continued for the past 2 years. This breaks down to an increase of 27.5 percent for semiconductors to 37,253,000,000 yen, and an increase of 4.9 percent for IC and total value of 142.53 billion yen. The reason this growth in semiconductor elements was greater than in IC, just as with domestic production, is the reverse export from the Southeast Asian plants of the domestic makers and the new activity on the part of Korean makers.

The domestic market is less active this year than last, and imported semiconductors are expected to face rough going overall.

Despite this situation, technologically advanced products such as microprocessors, memory, and linear IC are expected to show large increases, and the desperate struggle in the export picture is expected to intensify greatly.

FOR OFFICIAL USE ONLY

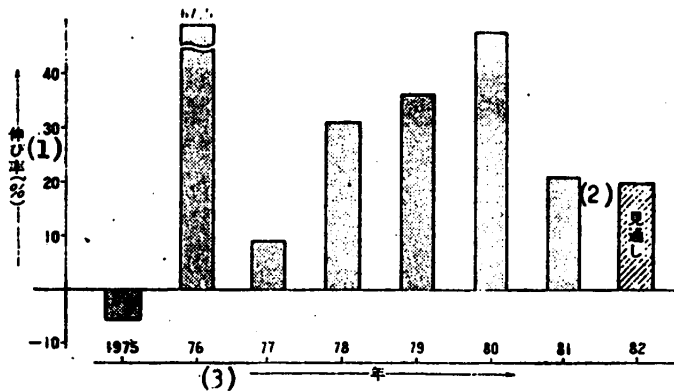


Figure 1. Trends in Japan's IC Production Over Preceding Year (Records from 1974 through 1981; 1982 data are estimates of the Japan Electronic Machine Association)

Key: (1) Growth rate (percent) (2) Estimated (3) Year

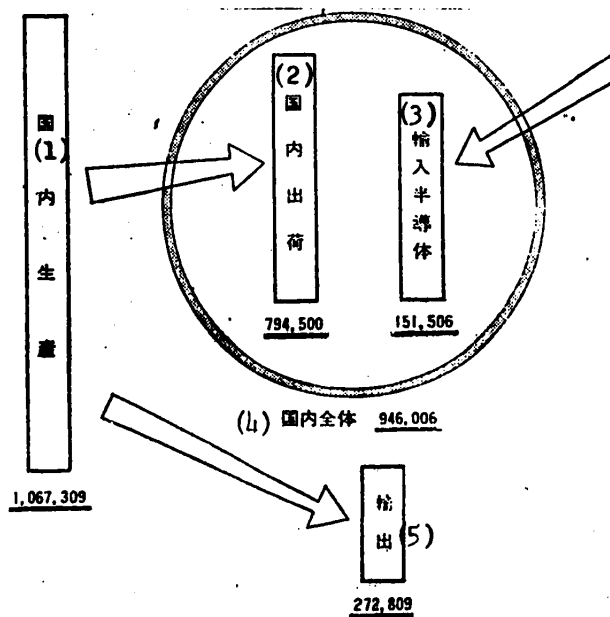


Figure 2. Classification of Production, Shipments for 1981 (Unit: 1 Million Yen)

Key: (1) Domestic production (4) Domestic total
 (2) Domestic shipments (5) Exports
 (3) Semiconductor imports

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

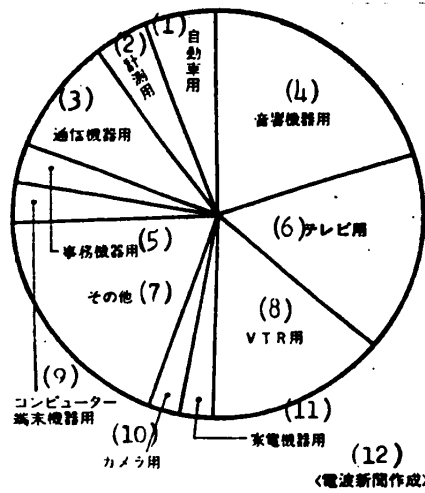


Figure 3. Domestic Semiconductor Element Use Classification for 1981

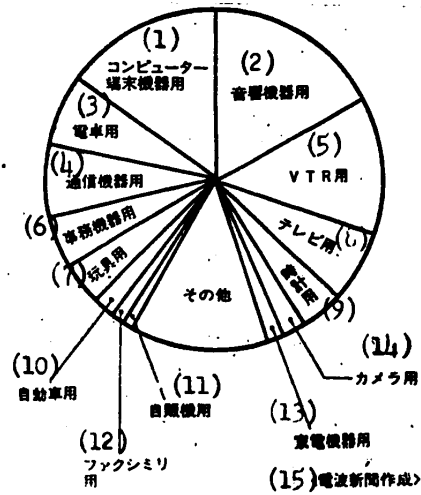


Figure 4. Domestic IC Use Classification for 1981

- Key:
- (1) Automobile use
 - (2) Measurement use
 - (3) Communication equipment use
 - (4) Audio equipment use
 - (5) Office equipment use
 - (6) Television use
 - (7) Others
 - (8) VTR use
 - (9) Computer terminal equipment use
 - (10) Camera use
 - (11) Household electric equipment use
 - (12) Compiled by DEMPA SHIMBUN

- Key:
- (1) Computer terminal equipment use
 - (2) Audio equipment use
 - (3) Portable calculator use
 - (4) Communication equipment use
 - (5) VTR use
 - (6) Office equipment use
 - (7) Toy use
 - (8) TV use
 - (9) Watch use
 - (10) Automobile use
 - (11) Vending machine use
 - (12) Facsimile use
 - (13) Household electric equipment use
 - (14) Camera use
 - (15) Compiled by DEMPA SHIMBUN

FOR OFFICIAL USE ONLY

Recession Is a Good Opportunity

"A recession is a good opportunity" is a term often used in the semiconductor field. New product development becomes more active the more serious the state of the world economy, and semiconductors are the tickets to development.

This is not a recession year, but talk of the type presented above has been making the rounds among concerned people in the industry.

Micon Is Representative Example

The term "the deeper the recession, the better the opportunity" was aptly demonstrated by the performance of the micon during the dark days of the oil crisis in 1973. Up till that time, about the only micon use was in electronic registers, but the oil crisis was the dividing point when the micon began to be used in various types of equipment. It was about this time that the micon kit made its appearance, and the micon in a box developed in the United States, which was the predecessor of the pancon, also appeared about this time.

While this situation may have been the result of a chance overlapping in timing, the micon kit and the micon in a box rolled up unexpectedly good sales at that time. The economy was in a highly stagnant state, and if everyone had been occupied with his daily duties, these products might not have found such ready sales, according to those in the semiconductor industry.

Fling Aside Reverse Boundary

Looking still further back into history, to the days when semiconductor work involved a very difficult environment with a strong so-called reverse boundary, it was only by cutting through this reverse boundary that the buds of development were able to grow. The IC developed for the military came into general use in the United States about the latter half of the 1950's and into the 1960's, along with the end of the first stage of Apollo and the end of the Vietnam war, and the micon entered into the race for lower cost portable calculators and other sideproducts which weathered this crisis.

Judged by past trends, the semiconductor may be said to be in almost a blessed state regarding the way it has developed. Japanese production has passed the 1-trillion-yen mark and has reached a state in which it can remain unaffected by small economic instabilities.

Expect 18 Percent Growth This Year

Even though everyone says things are bad this year, according to the data put out by the Japan Electron Machine Industrial Association last year, 18.1 percent growth is expected this year, to a sales total of 1.26 trillion yen.

A growth rate of 18 percent in the face of a declining GNP is, objectively speaking, a high rate of growth, but this is an industry which has maintained an average 25 percent rate of growth through 1979, 1980, and 1981, and the statement the greater the recession, the better the business, seems to apply.

FOR OFFICIAL USE ONLY

Why are the leaders of the semiconductor industry using such terms? While it may be true that investments in the semiconductor area require vast sums which must be amortized in order to continue this development, the potential for much greater growth in this area also seems to be a factor. This is evident when one sees that not only the development end of LSI is under fire but the sales end as well.

The practice on the sales front of holding honeycomb structured target fulfillment conferences and pep rallies which include the agencies is one which all the semiconductor makers have adopted since last fall.

Aim at OA

The aim here is to attack a market such as that of OA equipment which seems destined for great growth, but the companies are not forgetting that robots, tool machines, and amusement equipment are areas where utilization of semiconductors is expected to increase. Where sales of LSI are concerned, there are plans looking 2-3 years ahead to enter the home automation market; homeowners and home builders will be the targets of this move, and the respective market battles are developing.

Savings on New Market Development

When one analyzes the situation of better opportunity the more depressed the situation, one finds that a period when there is not too much activity such as the present is a good time to develop new markets. This is the time in which the markets one has in mind but usually does not have the time to develop can be attacked, as seen in many examples to date.

The semiconductor industry often has been described as "an area of fierce competition of a varied nature," in that the main market is constantly a scene of fierce conflicts centered on the large makers. The markets for portable calculators, watches, VTR, television, and automobiles are said to be areas where one cannot relax for a moment. It seems certain that the OA equipment market will be where maximum confrontation will take place, but even when the market scale is small, the development of new markets is what will determine the future standings of the various makers.

How To Avoid Overseas Friction

"Won't this fierce competition be settled one way or the other?" is a statement often made in regard to the intensity of the rival efforts of the Japanese semiconductor makers. It is said that if one can survive in the domestic semiconductor war, he will have no trouble in the world market.

The reason the competition is so fierce is that the Japanese semiconductor makers are all headed in the same direction, and the products also are in exactly the same area.

Taking the 64 K RAM as example, there are six large makers in Japan--Hitachi Limited, Fujitsu, Nippon Electric, Mitsubishi Electric, Oki Electric, and

FOR OFFICIAL USE ONLY

Sharp. Five companies--Motorola, Texas Instruments, Mostec, Fairchild, and Intel--are the corresponding American makers.

As has often been said in the past, American companies are quick to retreat, while such behavior on the part of Japanese companies is essentially nil. The Japanese companies are still for the most part producing old-type memory even though the price has dropped. This is one of their services to their users, although it has been said that the situation in Japan is one of too highly competitive a nature.

There seems to be no countermeasures or solution to this situation. Every maker has the attitude that this competition will not go away as long as semi-conductors are undergoing development. If things continue in the present way, then the Japanese will eventually be supplying more than half of the world's need for semiconductors just as in other electronic parts (such as Braun tubes, resistors, condensers, and coils). This will be the result of the fierce domestic competition and the reward for each company's efforts, but this is not a situation which may be appreciated by foreign countries.

It may be said that the industry hopes that further escalation in domestic competition can be arrested and useless mistakes in production can be avoided.

American Criticism of Japanese 64 K RAM

Events Since February

Ever since February of this year, criticism by the Americans of the export of 64 K RAM by Japan has erupted in a tirade. The Japanese are on the alert for future moves.

The critical attack by the Americans on Japanese IC exports surfaced in 1977, and the problem has smoldered since then. On the other hand, since February of this year, in addition to the complaints of the industrial group which was directly carrying on this fight (the SIA = American Semiconductor Industry Organization) and part of the American semiconductor makers, the U.S. Government (in particular, the Department of Commerce) and members of Congress, have joined the ranks of the criticizers, and there is deepening feeling that the American side hopes to make this an administrative issue.

The principal events in regard to the American moves are listed below:

1 February: SIA representatives met with deputy trade representative MacDonald in Washington and asked for government intervention to cope with the Japanese export of 64 K RAM. The New York TIMES carried the following article.

"Japan Controls 70 Percent

"Only 3 years ago, the United States was leading in the production of chips. However, this situation no longer exists. Japanese makers such as Hitachi, Toshiba, Fujitsu, and Nippon Electric have invested huge sums in production facilities, which, together with government-financed research and development, short-term amortization, and domestic market protection, enabled these

FOR OFFICIAL USE ONLY

companies to challenge California's Silicon Valley, and this has brought concern to the administration in Washington.

"The United States has shifted from a chip exporting country to a purely importing country. The Japanese already control 70 percent of the American market in 64 K RAM. This was only 40 percent in 1979.

"What concerns the U.S. Government is not just protecting the American market. What is of greater concern is the anxiety that the Japanese will usurp leadership in the leading high technology semiconductor area. A certain high-ranking government official said: 'The country which controls chips over the next 10 years will be in a position (advantageous) similar to that of an oil-exporting country today.'

"The present problem is the claim by some American industry members that the Japanese in their efforts to foster their competitive edge are resorting to 'dumping.' The Japanese claim that their profits from this American trade are small and that dumping is out of the question. Nevertheless, the American semiconductor industry is drafting a formal dumping charge against the Japanese makers."

Bring Forth Safety Assurances

An AD-DJ-KYODO NEWS AGENCY report carried in this paper on the 6th said that high American officials were investigating the possibility of invoking the provisions of the American trade law empowering the President to limit imports which were threatening national security and thereby protect against the Japanese control of the 64 K RAM market.

At the joint congressional hearings on trade problems held on the 10th, Commerce Secretary Baldrige said: "The Japanese semiconductor industry, with government research and development subsidies in the form of nonduty barriers, has accelerated exports to the United States."

Japan Follows With Its Counterargument

On the 12th, directly after a cabinet meeting, the Ministry of International Trade and Industry announced to reporters that top officials of the government were trying to pacify the protectionist movement demonstrated by the series of anti-Japan criticisms.

On the 18th, President Hirokichi Yoshiyama of Hitachi Limited in speaking to a Chubu financial seminar at Inyuama-shi in Aichi-ken touched on the 64 K RAM friction problem and said: "They (the Americans) may have their points, but the information industry must take into account demand, and the actual situation is that there is a balance in figures, and certainly no imbalance. The 64 K RAM is the leading technology for LSI in which Japanese technology is leading at present, but this is simply a manifestation of the technological development level of the industry. It is not fair to claim trade imbalance based on a single product," rebutting the American attack.

FOR OFFICIAL USE ONLY

The FNS news item appearing in this paper on the 20th introduced the subject of trends in the American 64 K RAM market, and said that the increasing capacity of computers has lengthened the lead time (acquisition period) of 64 K RAM, while the price dropped from the \$13 per unit to \$6-\$7 in a year's time.

On the 20th, the joint economic committee of parliament issued a report entitled "Semiconductor Industry Trade and Development" (part of the contents were given in this paper from the 22d through the 25th).

On the 25th, the Japan Electronic Machine Industrial Association gave to the Keidanren reporters club the Japanese industry's interpretation (appended) of the anti-Japanese criticism on the part of the American semiconductor industry in which it claims that the Americans are misguided and there is actually no problem.

Propose Mutual Principle Plan

A news item dated the 25th in this paper reported that Sam Gibbons, who is chairman of the Congressional Trade Subcommittee, proposed a mutual principle plan aimed at the high technology area which will enable a limitation on products such as the 64 K RAM.

Secret Conference for Anti-Japan Resistance

The 1 March edition of the WALL STREET JOURNAL reported that some 50 executives of the principal semiconductor and computer makers of the United States excluding IBM met at Oakland, Florida in a secret conference with high government officials including the secretary of defense in order to draft a plan of resistance against the Japanese makers and to study a plan to establish a new joint activity for promoting basic research and development.

On the 2d, Hitachi Limited announced that it had entered into basic agreement with Hewlett-Packard Company, the sixth-ranking American electronic equipment maker, on supplying the company with 64 K RAM technology. The Ministry of International Trade and Industry came forth with the comment that it evaluated very highly this agreement as an important step toward promoting joint existence and activities between Japanese and American semiconductor industries.

This paper reported on the 3d that American trade groups such as the SIA had contacted House members and concerned people that they would support a mutual principle plan which would limit imports of 64 K RAM from Japan and seek to open the Japanese market.

On the 5th, this paper carried a KYODO NEWS SERVICE item reporting that the U.S. Government was making an unofficial survey of the effects of Japanese IC on American industry.

This paper carried an account on the 6th relating the rebuttal by Vice President Jungi Ouchi of Nippon Electric to the semiconductor friction and specifically to the American criticism, claiming the American statements were off base.

FOR OFFICIAL USE ONLY

On the 8th, this paper reported that a complaint had been made to the Department of Commerce by the SIA, headed by Motorola, calling for an unofficial study of the price of Japan-made 64 K RAM to verify charges of dumping.

On the 9th, this paper carried an FNS report to the effect that Executive Vice President John R. Welty of Motorola spoke at a SEMI (American Semiconductor Equipment and Material Association) meeting and claimed that the low selling price of 64 K RAM was raising havoc with VLSI research and development funds and that protective legislation was necessary.

On the 10th, an article in this paper discussed the subject of government assistance to leading technology industries such as the computer industry, and said that government assistance in the United States was one order of magnitude greater than in Japan.

An item in this paper on the 16th reported a followup to the account of the 8th on price survey and said that an unofficial survey was being made by the Department of Commerce.

Problem of Anti-Japanese Criticism Regarding Semiconductors

View of the Japan Electronic Industry Association

We heard recently that a section of the U.S. Government (particularly the Department of Commerce) has taken a very critical stance toward the Japanese semiconductor industry and the Japanese Government's handling of semiconductor affairs, and the Japan Electronic Industry Association presents its views on this problem below.

Status of Japanese-American Trade in Semiconductors

The trade in semiconductors between Japan and the United States and the investment activities in the respective countries are shown in an appended table, in which it can be seen that there has been activity in the area of mutual entry into each other's country. This movement is the response to the expansion in the market accompanying developments in semiconductor technology, in which the supply industries are seeking to locate themselves in the world's two largest consumer countries in this area, the United States and Japan. This is a movement which we applaud as exemplifying the basic concepts of free trade.

FOR OFFICIAL USE ONLY

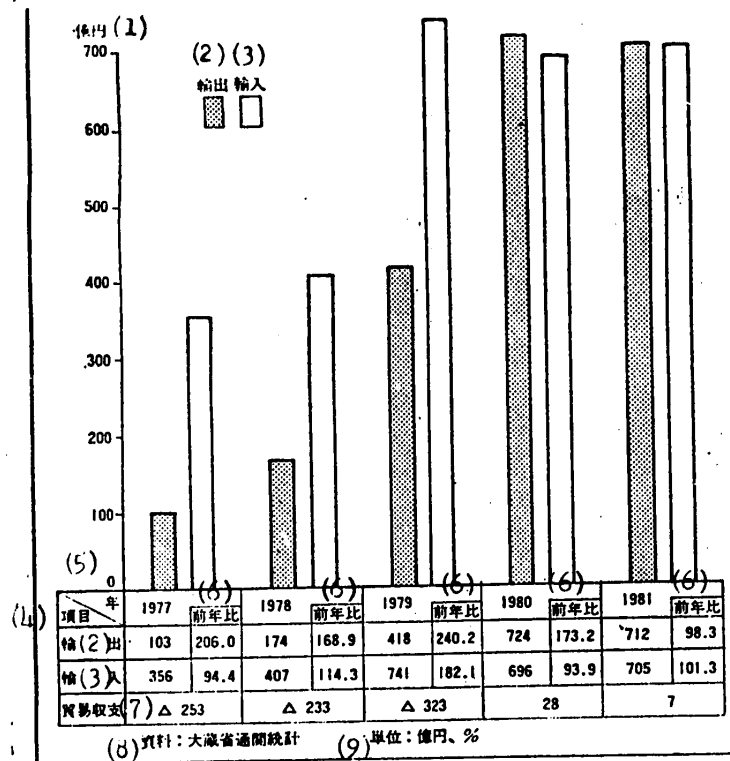


Figure 5. IC Export-Import Trends to the United States

- Key:
- (1) 100 million yen
 - (2) Exports
 - (3) Imports
 - (4) Item
 - (5) Year
 - (6) Ratio over previous year
 - (7) Trade balance
 - (8) Source: Ministry of Treasury Statistics
 - (9) Unit: 100 million yen, percent

On the Argument That the Japanese Market Is Closed

Recently a faction in the United States has reopened the issue of Japan having placed restrictions on semiconductor exports and investments, claiming that while Japan is allowed free access to the United States market, a free approach to the Japanese market is closed. This is an issue we have repeatedly denied; as mentioned above, the present Japanese-American trade situation is one of an open market, and we wish to reiterate this position once more.

1. Complete Freedom in Finance and Trade

Both the financial and trade aspects of Japan's semiconductor market were made free in 1974, and this market is completely open to foreign capital.

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

2. Duties Are on the Same Level Between the Two Countries

In the MTN (Tokyo round) agreement in 1979, both Japan and the United States agreed to lower their duties in steps by 1987 (the duties in 1978 were 6 percent for the United States and 12 percent for Japan), but last year there was an urgent request from the United States to lower these rates as quickly as possible, and Japan agreed to this request from the standpoint of maintaining and expanding the free trade system. The Americans lowered their rate effective 1 January 1982 while the Japanese set 1 April as the starting date, and both countries lowered their rates to 4.2 percent (the EC has the very high rate of 17 percent).

3. There Are No Non-Tariff Barriers

There are accusations and slanders citing cartels and buy Japanese policies as non-tariff barriers, but such accusations are completely without foundation. Japanese semiconductor users are for the most part private businesses, and they order what they need freely, paying particular attention to quality, price, delivery time, and after service.

64 K RAM

This is a new LSI memory for computer use for which demand is expected to increase in the next few years; a fierce fight is being conducted between the Japanese and Americans for this market, but this is just the initial stage for this market. Japan's share of the market grew rapidly (the Ministry of International Trade and Industry claims 80 percent, but definite proof is not at hand), and because this is a product from the leading technological area, semiconductors, the Americans sense a possible national security risk. On the other hand, this product is presently in short supply in the United States, and the completion of more American facilities is anxiously awaited. Some on the American side claim that the Japanese are dumping and using pirate-type price strategies to increase their share and are being criticized as a result, but absolutely no such incidents are taking place.

On the So-Called National Security Items

In order to rescue the American industry from this increased share of the American market captured by the Japanese, the U.S. Government activated Article 232 of the 1962 trade expansion law relative to national security items and is said to be considering limiting imports.

On the other hand, the following situation needs to be considered. The American and Japanese international trade in semiconductors is in a mutually supplementary relationship. In addition, the United States has overwhelming superiority in areas such as microprocessors and bipolar digitals, and to single out one area of this diverse semiconductor product array in which the Japanese share has increased and attack it on the basis of national security seems to be stretching a point. Japanese products are highly evaluated for use by American computer makers and other users and are contributing to American industry (including defense).

FOR OFFICIAL USE ONLY

At the same time, elaborating further on the national security viewpoint, Japan depends on the United States for a large portion of the weapons it needs. Also, in a broad extension of the term security, Japan depends on the United States for a large portion of its food.

Conclusion: Free Competition Is the Source of the Semiconductor Industry's Development

The semiconductor has served as the foundation of electronic industry growth through unceasing development of new technology and the offering of new products made possible by new technology and is playing a major role in making possible an abundant life for the people and for a good economic society. These technological advances in semiconductors are only possible through competition in the area of the technology itself.

Semiconductor technology and industry are expected to expand greatly from here on; this is an area which has the potential of having a great impact on all industries and economies and of achieving great growth. If an attempt is now made to artificially suppress this competitive situation, there seems to be no question but that the development trend will be hurt.

Great Expectations of Micon (Remarks by Director Tomihiro Matsumura, Nippon Electric)

The plans for the new fiscal year have not been made final and the figures are not yet firm. We expect the semiconductor market to undergo some rough times during the first half. The following is an account of what might be expected.

In Japan, the decline in consumer goods has gradually come to affect demand for semiconductors. This decline in consumer goods activity is also affecting our activities, and we cannot hope to see any growth in sales during the first half of this year. We hope to see some increased activity both in the private and industrial areas in the latter half of the year.

On the other hand, the overseas market, if compared to the weather, can be described by saying that the United States is unfortunately cloudy with occasional rain and, to be honest, there seems to be no way out of this situation. On the other hand, the off-year elections are coming up, and it can be anticipated that the government will come out with a number of vigorous recession-defeating proposals, which are expected to come in the latter half of the year.

The situation in Europe is even worse than in the United States; it is awaiting American recovery. Thus, we cannot hope for much in the way of semiconductor exports. There was a time in the past when exports increased by 50 percent, but now we are beginning to sense that this growth will be on the same level as that in our domestic trade.

The first problem is trade friction. Where some of the American users had been buying about 10 percent of their memory in Japanese products and only three or four Japanese companies were the suppliers, the American users are now in the mood to buy these from one or two American companies.

FOR OFFICIAL USE ONLY

This change in the attitude of the user is probably a factor which needs to be given considerable weight in the solution of this trade problem.

There is no such situation in the semiconductor trade with Europe, and there is no problem.

Thus, while there are some very sticky factors, still the semiconductor industry overall is expected to grow an average of 15 to 20 percent per year in the 1980's. It may be prudent to consider the present period as one of haziness and readjustment following growth.

Our company is in such a situation, but we hope to develop new products and invest in facilities and not fall behind other companies. The largest market we will tackle this year will be the domestic industrial market, and we have placed great hopes on the micon. The position of this company is at the upper level even on a worldwide basis, and going by numbers alone, we consider we have surpassed Texas Instruments. The monthly production of LSI for micon use is expected to reach 6 million by March of this year, and all of our plants are in full production. We refer to this as 110 percent operation; our Kyushu Nippon Electric and Yamagata Nippon Electric are working two shifts per day, while the Sagamigahara plant is working three shifts.

The micon is in a position of no problem, while memory is adaptable to many new applications, and is an area we want to reinforce. The mini-flat series is going well in the bipolar area; we cannot produce enough.

Telecom (electrical communication) use products have somehow registered good results in our overseas trade. These products are technologically advanced and are free from concern over trade friction. Monetarily, this is a 5-6 billion yen market, while microwave transistors and diodes have no American makers, so this is an area in which we expect considerable growth.

We will continue very active plant expansions again this year. The Sagamigahara plant will be our development center where we will concentrate our technologists and where 64 K RAM and bipolar CML (current mode logic) will undergo test mass production. Already plant A is under full operation, while construction of plant B, which will cost 5 billion yen, is almost complete and equipment will be installed starting next year. This plant is 50 meters wide and 110 meters long and is designed to work on 2 micron technology. We plan to invest a total of 27 billion yen in our Sagamigahara plant.

Overseas, our NEC Electronics USA is in full operation, and the results are exceeding the planned levels. Mask ROM production is proceeding exceedingly well, and following the assembly of 16 K RAM, 64 K RAM will be produced starting this April. We purchased a 72-acre tract outside San Francisco for our second plant, where construction is about 80 percent complete and where we hope to start operations this fall. At first this plant will just handle assembly, but the second building will house a wafer process as well, and we plan to end up with an integrated system.

FOR OFFICIAL USE ONLY

Sales of Gate Arrays To Hit 10 Billion Yen in 1985 (Remarks by Director Katashi Kawanishi, Business Department, Toshiba Corporation)

Despite this situation, we plan to engage in vigorous development. Our plans are based on an estimated 18 percent growth.

Looking at the individual areas, we do not expect much to happen in AV (audio video equipment) up through June or July. Now, what will be the prime mover which will pull us through this growth? The entire world is in a stagnant condition, some even call it depressed, but there will be moves to use semiconductors. This is why we do not believe that semiconductors will suffer.

Regarding the market, the trends will be toward OS and logic systems, and we are anticipating semiconductor needs for these areas. At the same time, this company has for some time been directing its strength to developing the automobile market, and semiconductor sales in this area account for 8 percent of the total. Since the worldwide average is 4 percent, this automobile use is expected to see large growth and contribute to our sales record.

Good growth in portable calculators using solar batteries is being experienced. It was said that watches were in a bad state, but as a result of the efforts put into exports, growth was attained to the extent that it could even make up for the decline in AV. Cameras and automobile-use products are registering good records. These LSI make good use of this company's CMOS technology, and they are in a state of good growth.

We are placing our greatest hope in micons. In the past, Toshiba was not as capable in this area, but now we have come abreast of the times. Our monthly production of LSI exceeds 1 million units, and we plan to increase this production monthly from here on. The micon has a wide field of application, from OA to toys, and the toy market in the United States is expanding.

The fraction of total sales belonging to CMOS micon is 40 percent, large for this company, and this may increase to 60 percent in the next period.

We anticipate that sales in gate arrays will total 10 billion yen in 1985; this will be achieved through sales of 3 billion, 6 billion and then 10 billion yen over successive years.

Another product on which we place high hopes is bipolar VLSI. This company announced its NSA (nitride self align) technology last year, and it has been highly evaluated. We anticipate an expansion in applications such as VTR in custom LSI and camera use. Our bipolar plant in northern Kyushu will start operation in September, and we hope to be in actual production of bipolar products by NSA technology during the last period of this year.

A number of things have been said about memory, but the VLSI line at our Oita plant will start actual operation, and we expect to plan for great development in this area. Already the NMOS and CMOS of the static RAM (SRAM) have been shifted from the transistor plant to Oita, and some leeway has been created so that we are planning large development in 64 kilobit DRAM during the last period. Where this company is concerned, SRAM accounted for 50

FOR OFFICIAL USE ONLY

percent of all memory, and this is 50 percent of all DRAM in the market in numbers and 25 percent in total money value, displaying a varied makeup.

We believe that we are the world's largest maker in the area of SRAM (in order to avoid misunderstanding) and we also have large interest in DRAM. In fact, there is actual demand for DRAM, and we hope to expand this area while paying attention to cost.

We plan to expand our monthly production of 64 K DRAM from 100,000 to over a million by the end of the year, and since this product will have to have higher performance and cost less than the competitors' products, it will come in a plastic package and will be capable of high-speed operation, according to our plan.

We are wondering when recovery in discrete (semiconductor) elements will come, since 40 percent of our business comes from AV directed products which are presently suffering about a 30 percent decline. We are awaiting AV recovery because of its large impact, but we are planning to reinforce the industrial-use end next period.

In addition, this company has a 45-percent share of the CMOS standard logic market in Japan. Our present target is 20 million per month, which we hope to attain by June if at all possible.

Toshiba Semiconductor American is mass producing 2 million memory units per month, of which a half is general-use memory and the remainder is custom memory. This company was considering emphasis on general-use memory, but the fierce price competition caused a shift in memory to custom memory and to mask ROM, making possible business operations in the black. We are placing importance on 16 K SRAM in the area of general-use memory and have intensified production control so that the mask ROM yield has been increased. We plan from here on to export half of our general-use memory from Japan to the United States, with the remainder coming from onsite production in the United States, as a way to avoid trade friction, as a result of which it is possible that we may be going into assembly of 64 K RAM.

On the foreign front, this company supplied the Italian SGA Ates Company with CMOS technology. Furthermore, the same company bought our CMOS memory and logic technology as well. Semiconductor sales are expected to increase 14 percent this period, to 170 billion yen. This is somewhat below the initially projected 180 billion yen; there was a 5-percent decrease in AV sales.

According to the directives of President Sanami, construction of a submicron VLSI research and development building with super clean rooms has been decided, and plans for a future of great expansion are in the offing.

To Produce Million 64 K RAM Per Month in Face of Expanding Demand (Remarks by Director Sutezo Hata, Hitachi Limited)

According to recent reports, the B/B ratio (semiconductor orders/sales ratio) in the United States was 1.06 in February. This ratio fell below one last June and remained there, and it finally made a turn for the better after 9 months.

FOR OFFICIAL USE ONLY

This B/B ratio is 1.02 in Europe, and although it is not certain whether recovery is on the way, still it is one indication that recovery may be on the way.

From our viewpoint, the overall situation is rather poor, and we are beset with problems such as the trade problem. The audio and television areas have not recovered very much. The private market is expected to undergo some critical times during the last period of this year. Some activity is expected during the latter half of this year; semiconductor demand for information industry, computer, OA, FA, and communication equipment is expected to pick up.

We believe that we should try something, but the trade friction is of some concern, and we cannot fully respond being just one company. Making a sober judgment of the situation, the market (which the Americans are criticizing) is open and duties have been lowered to 4.2 percent, so the market seems to be fair on all counts. We would like to see ourselves free of this situation (the trade problem), but this is something difficult to predict.

The March record in the semiconductor area went according to plan. In the past, demand for IC was only in small calculators and production varied accordingly, but recently the demand for IC is being met (by different applications) in one way or the other, and the overall picture is a favorable one.

We are planning for a large expansion this next fiscal year, but since we will be entering American soil and issue ADR, we are unable presently to offer any figures.

On the product end we expect great things from memory and micon, and we hope to put some effort into gate arrays. The demand for 64 K RAM has expanded considerably. Because every company has emphasized this product, the market has experienced considerable growth, and the drop in price might stop. This company will follow last year's plan and attain 1-million-unit production in April.

We had a request from Hewlett-Packard to provide it with 64 K RAM technology; HP has been a favored customer which has been patronizing our products and has great desire (to introduce technology), so we think this transaction will proceed in an orderly manner. HP is blessed with a number of specialists, and we expect to have their specialists come to our plant where professionals from both sides can get together and we can anticipate some good results.

On the production front, we have been studying the establishment of a new plant at the Chitose Industrial Park in Hokkaido, and the possibility is good. We are still conferring with the local people, but if the plans are realized, we hope to establish an assembly plant. In any event, this is something we will need in the future, and we definitely are making plans.

In the area of domestic production, bipolar is handled mainly at the Musashi plant and also at the Takasaki plant, while MOS is handled at the Kofu plant in the production system that has evolved, and we have some flexibility in our production capacity. The basic line of thinking of this company is to perform only the front end processes at these plants, and the back end processes including assembly at the many associated plants.

FOR OFFICIAL USE ONLY

Our American plant (Hitachi Semiconductor America) is presently constructing a new plant where test production of 64 K RAM is scheduled to start next month. The building is expected to be completed in the fall, and this site will serve to reinforce our production system. The plant in Europe (Hitachi Semiconductor Europe) is a specialty plant for memory in which the structure has flexibility and which eventually is expected to be the site for production of 64 K RAM. The investment in the semiconductor area for this period is expected to total 35 billion yen, which is a considerable increase over last year's 25 billion yen.

Advance Into Industrial Use in 1982 (Remarks by Vice President Fuzuo Fujimoto, Matsushita Electric Industrial Company)

The industrial environment from the latter half of 1981 until this spring has seen the former sharp expansion in video ease off, while audio has experienced a sharp decline in the unfavorable state of business that has taken place, but we believe that this situation will be improved by the latter half of this year. Semiconductors have made a large impact in the world, and we can expect even greater things this year. It may be said that the semiconductor industry has shifted from a basic industry to the area of leading industries. It has become more sophisticated, and it is an industry where many new products are created, so that last year there was no other industry that was watched more intently than the semiconductor industry.

When we consider those products which are made possible because of the power of semiconductors, we can list such products as the digital audio disk (DAD), the video solid state camera, the Captain system, and the individual telephone. How will it be possible for the market for DAD to appear? This will depend a great deal on new developments such as the semiconductor laser.

Matsushita Electric Industrial's semiconductor business showed an increase in sales in 1981 that was 14 percent over the previous year and totaled about 100 billion yen.

During 1982, we plan to take up semiconductors for industrial use in earnest, and together with our record as having been tops in private-use semiconductors, we will move toward a role as an integrated semiconductor maker. More specifically, we will expand sales in the digital area on a three-pillar base: not only microcomputers, but memory and logic as well. This year marks the 30th anniversary of the founding of this company, and efforts in new directions will be significant this year.

In the area of new products to be placed on the market, we will come out with general-use interchangeable products and will come forth with new products such as panaflat packaging by new resin mold technology, to enable thin miniature products, compound semiconductor technology, and VLSI technology.

In the memory area, the 64 kilobit static RAM will be followed by the dynamic RAM and the mask ROM where our strength will be directed. The large-capacity memory, which will be put on the market in the latter half of the year, will be mass-produced at the VLSI plant.

FOR OFFICIAL USE ONLY

We were producing industrial-use linear IC in the past, but in March we suddenly added 27 products such as the optical amplitude comparator and regulator, for a total of 55 products which we will produce at the rate of 3.8 million units per month.

Logic includes CMOS logic and LS-TTL, and we are building up a multiproduct mass production system. VLSI technology is used for custom products, and already products of 2-3 micron line width are coming off the production line. The general-use logic 4000 B line was built up to 40 products with a monthly production of 500,000 in 1981; this will be increased to 100 products and 2 million units per month in 1982, and to double that in 1983. In addition, 30 products will be given multifunctional, high-speed capability during 1982.

Production of 32 products covering the greater half of the market will be initiated in the LS-TTL area in February, and we are expecting monthly production of more than 2 million units. The production equipment of the high-speed series ALS-TTL is being put in readiness for initiation of operations, which is expected to be announced sometime this year.

There are 4 bit, 8 bit, and 16 bit microcomputers; the 4 bit is the top number in its class, while the 16 bit will be represented by the maximum speed MN 1613, for which mass production was initiated in 1981. The year 1982 will be the year for the micon; a 50-percent or more increase in sales and monthly production of 3.5 million units are anticipated. Future development products include the CPD solid state projection element and blue color LED.

In 1982, among the present mass production items, LED is expected to hit 350 million units per month and bipolar IC also 350 million units per month, while small signal transistors will be produced at the high level of 210 million units per month. In addition, MOS LSI including VLSI technology products is expected to rise to monthly production of more than 10 million units per month.

We are actively working toward development and mass production as described above, and we hope also to invest in facilities to enable this production.

In 1982, we intend to put up 26.5 billion yen in facilities investment, of which 22 billion is earmarked for three new plants for VLSI products production. These constructions are expected to be completed within this year.

Running Alone With Gate Arrays, Expanding IC Expected To Grow Still More
(Remarks by Director Sadao Inoue, Fujitsu)

Describing the semiconductor demand for this new year in a concise manner, it can be said that the worldwide picture is worse for the first period, and there are hopes that this situation may improve during the latter half. Of all the markets, that in Japan is in the best shape, indicating that it has not suffered as much as the others. Among this company's products, audio is not doing well while VTR production is undergoing readjustment, but they have been essentially unaffected by the recession. We do not depend very heavily on audio and VTR use products; the products we supply in the audio end are MET

FOR OFFICIAL USE ONLY

(mesh emitter transistor) and one chip micon in the VTR area, which are both high class products and will not be affected. Also, we do not handle very many portable calculators and watches, as a result of which we may be able to realize the anticipated sales this period. The sales of pancon are particularly good.

During this new year, IC is expected to grow by 20 percent worldwide, while the discrete product is expected to undergo lateral growth. This company is overwhelmingly involved with IC, and we are planning to continue this great growth during the new year. This growth must be at least an average 20 percent.

Looking at the movements in the world market, the situation in the United States is expected to remain bad this coming year, and while Europe has been sinking, the bottom apparently has been reached. The price of memory dropped, thereby putting pressure on sales. Even though recovery does not seem on the way in the United States, product shortages have been reported, indicating that all is not completely lost. This is why it is expected that reduction in prices will not be too prevalent in the United States during the latter half, and there are hopes that recovery is on the way. Although there is the problem of trade friction, Fujitsu will continue to reinforce its present production.

Among our products, gate array was one of which we were the sole producer, but the recent picture is that competition has entered this area. We plan to reinforce the development and CA system to assure ourselves an advantageous position. Increased production is necessary in the memory and micon areas, and we expect the market to expand considerably.

On the domestic front, we have decided on construction of new sites, first at Kaizu, then Iwate, and now Miyagi; this company's position is that there is a shortage in the absolute number of production units and we have to carry out active development.

When a leeway is created in the discrete line of an integrated semiconductor maker, other products can be produced, thereby enabling the supplementing of other products. In this company's case, IC is the main product, and there is need to expand our plants by a wide margin.

Semiconductor sales for the first half including electronic parts totaled 77.8 billion yen, and this is expected to increase to 100 billion yen this next period.

The evaluation of Fujitsu electronic devices has been firm both in Japan and abroad, and this trend has increased particularly overseas. The products we manufacture, such as micon, memory, and gate arrays, not only are expected to experience great growth, but even greater growth is expected in the future.

FOR OFFICIAL USE ONLY

Aim for 20 Percent Increase This Period (Remarks by Managing Director Kimio Sato, Mitsubishi Electric)

Audio equipment sales this period are expected to increase 20 percent from the depth to which they sank, but there seems to be no way to achieve the 25 percent that had been planned at the start of the year.

We believe that private-use sales will improve slightly this new year, but not as rapidly as last year; we are planning for a 20-percent increase.

Portable calculators seem to be making a sort of comeback, but no large recovery is expected. We do not believe that watches have recovered; both small calculators and watches are expected to remain in a depressed state as they were last year.

In contrast, office equipment and the OA market are in a favorable situation, and parts for use in robots are expected to increase greatly.

Looking at the market overall, the recession in audio will probably continue, but there seems a good likelihood that this new year will see demand for OA-related and robot-related energy-conserving phases of production emphasized, which is expected to greatly sustain semiconductor growth.

In the private sector, household-use VTR has been in a readjustment situation and should recover. We anticipate the appearance of a number of new products, by which this company plans to be active in responding to the demand.

Model changes are tending toward more compact design, and these are tied in to demands for related semiconductors.

The 64 K RAM is in a very good situation; we upped our production to 500,000 in March. We are planning to produce 1 million by early autumn of this year; we are in very good situation because of the reinforcement of our Kumamoto plant facilities.

Introduction of 64 K RAM to computers and pancon is actually going on; the present situation is that there is a lack of these semiconductors.

It is said the price competition is extremely fierce, but my belief is that there will be an end to this price cutting.

This is because: 1) there is large demand, and 2) there will be an accompanying price stabilization. I have always maintained that the price of the 64 K should be six times that of the 16 K, and there seems to be a move in that direction at the present time.

The 64 K RAM is also being exported; the present status is that American computer makers have been running evaluation tests, and the real exports will be from here on. Where this company is concerned, the export ratio of semiconductors is about 11 percent, which is low, but it is possible that a sudden sharp increase could occur.

FOR OFFICIAL USE ONLY

I have no comment to make at this time with regard to the joint company establishment with Westinghouse of the United States that was brought up last year.

This year's scale of investments has not yet been established, but it is certain that last year's total will be exceeded.

On the domestic front, we shifted production of discrete products to the north Itami plant and the Fukuoka plant, while assembly of mass-produced IC is being handled at the Kumamoto plant. In the area of new plants we hope to start operations next year at our new plant, for which a site was acquired at Nishijo in Aichi-ken.

We had initially planned for semiconductor sales of 80 billion for this first period, but 74 billion yen seems more likely. The total was 60 billion yen for the previous period; the discrepancy can be attributed to the 5-percent decline in audio sales.

We are planning for sales of 90 billion yen for the next period; the market situation is not necessarily good, but we are planning all-out development.

Reinforce Insumer, Quickly Attain 100 Billion Sales Per Year (Remarks by Managing Director Hiroshi Yoshie, Tokyo Sanyo Electric Co, Ltd)

Market movements are bad, and the audio situation is particularly bad.

There are some who believe that audio will begin a recovery starting about July, but it may be necessary to continue to tread water for some time. Because this company has been supplying Sanyo Electric in the past, the ties with consumer goods are strong; we are consumer oriented. We are particularly strong in signal treatment systems, and this is a reflection of the situation that our world is consumer oriented.

On the other hand, what was once called industrial has entered the consumer-use picture, and we have directed our strength to a total use area type business.

In order to make this change, it was necessary to divest ourselves of signal treatment systems; we are now promoting expansion of control and servo system devices. These devices are in demand for information equipment; one phase of this activity is the plan to market in May a thin membrane motor drive use IC. This will use a Darlington connector and diodes, and is expected to find application as the drive for floppy disks and solenoids.

As is evident from this example, what was once used in consumer goods is now being used in industrial applications; I have termed this type of demand "insumer" as a synthesis of industrial and consumer. We hope to use development of this area to balance the decline in the consumer area.

To be sure, we are in the stage of developing second-generation and even third-generation products, even in signal treatment systems, and we hope to complete them. For example, we hope to use LSI to make completely noise-free audio or introduce high integration of 1,300 elements for picture circuit use

FOR OFFICIAL USE ONLY

of VTR in the bipolar area and thereby reduce the number of parts; we hope to introduce these products in the fall.

We plan to initiate sales of one chip voice synthesis LSI using the Percole [phonetic] mode in August; this unit will incorporate ROM and will be capable of external connections. It is planned to increase memory products such as the 228 K mask ROM to this end.

This company places its greatest hopes on the micon market; this is a large market for LSI on the order of 10 million per month. We are producing both NMOS and CMOS and we hope to supply 4 million of the 10 million total, or 40 percent.

This is why we plan to reinforce micon; we plan to increase the breadth of the memory capacity of the micon and also put in CMOS.

Thus, this company has begun to shift its strength from consumer goods to industrial goods. We are aiming for sales of 100 billion yen in semiconductors in 1984; this will probably be accomplished through large expansion in the industrial area.

I would like to see the 10-billion-yen level attained earlier; the semiconductor area overall will grow greatly. It is said that the country's production last year totaled more than 1 trillion yen; this is expected to expand to 1.5 trillion yen in 3 years, so that a mere 10 billion yen seems trifling.

See 30 Percent Increase in FY-82, Establish Mass Production Technology
(Remarks by Director Kosaku Okano, Sharp)

There are a number of areas which are not clearly predictable when envisaging this year's semiconductor market. Electronic equipment is expanding on the basis of exports, but there is a need for downward revision. Audio is not doing well and one wonders at what point it will settle down, while no great growth can be expected in cameras. The growth rate in VTR has been blunted. Electronic products have shown a muted increase whenever a new product is introduced, but we can expect growth this year in DAD, video disk related items, and OA and FA-HA (factory automation and household automation) movements. Because of its broadness and the good development of the lower periphery, the semiconductor area is expected to grow at least 20 percent this year, regardless of the depth of the recession.

We at Sharp are anticipating an increase of 23 percent in semiconductor business over last year. Foreign sales will account for 60 percent and domestic sales 40 percent. The feature of FY-81 sales is the domestic market being the main force; the sharp increase in micon computers is outstanding. The pace for the entire industry has been a 160-percent increase in MOS micon, but Sharp's growth here has been 240 percent. The 4 bit one chip micon makes up the major part. The monthly production of micon as of March was 40,000-50,000 for the 4 bit product and 30,000-40,000 for the 8 bit micon. Demand in game-related products has increased to the stage that it has to be given serious consideration. There seems to be a trend toward increased demand for the 8 bit product.

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

In 1982, we are planning for a 130-percent increase in sales over the previous year.

IC is down in the area of integrated circuits, while LSI is growing; we are expecting growth slightly under 130 percent. While IC seems to be in low key, we will set out anew on a new hybrid IC. Potential uses for a super hybrid IC include television, audio, and micon.

Place on Market for Use of Micon

There are some items which are expected to grow, such as the 8 bit one chip micon in LSI, devices in the communication equipment area, and the 64 K RAM.

Applied semiconductor business includes light related devices and watch modules, counters, and day and hour display data packs.

Light is an area of long-proven record with items such as phototransistor, photointerrupter, photocoupler, and photothyristor; we are expecting a growth of close to 200 percent over the previous year.

Photo related products have been compiled monolithically under OPIC; we are planning further development of this commercialized series and a cut in price, seeking a 200 percent jump over last year. This is a product which together with the micon is indispensable in the mechanical electronics area, which has adequate demand, and we will regard this as our future strong point.

There are LED, EL, and semiconductor lasers in the display business; new plants at Nara and Koriyama will start production of EL during the latter half of 1982 and full-scale production will begin in 1983; we have to make good this sliding type production.

Four Items Will Be Theme

There are long and short wavelength semiconductor lasers under consideration, and Sharp is developing the short wavelength area. We will initiate mass production of 780 nanometer and 10 milliwatt products in April of this year. We will also mass-produce a 720 millimeter product, and we will attain commercialization through the VSIS structure.

The themes to be emphasized in 1982 will be four items: OPIC, hybrid IC, laser and EL.

Our investment in facilities was 14 billion yen in 1981, and there will be a slight increase to 14.4 billion yen in 1982. A companywide project, a semiconductor laboratory, will be completed in September at a cost of 12 billion yen, so the total increase in plant investment this year will be close to 190 percent.

The breakdown for 1982 investments includes 2.1 billion yen for EL related products and 7.3 billion yen for LSI related products.

FOR OFFICIAL USE ONLY

Investments in new areas include the industrialization of CCD. The CCD licensors have already shipped their samples, and research and development on plane sensors has been completed. What remains is the establishment of mass production technology and investment in facilities to industrialize the product; we hope to start mass production and sales in 1983.

Development of New Products as Well

We will also engage in development of new products such as bipolar IC, which is used in peripheral post treatment, in the commercialization of CCD.

In the LSI related area, we will renovate our VLSI facilities and introduce various fine working tools such as aligners and steppers.

Attention to Mask ROM, Aim at 50 Percent Increase Next Period in Electronic Devices (Remarks by Managing Director Yoshio Masuda, Oki Electric Industry Co, Ltd)

It is fairly difficult to predict what the overall semiconductor market will do in 1982. But if we look, for example, at the predicted American market in 1985 of 550 billion yen for dynamic RAM, 360 billion yen for static RAM, 260 billion yen for mask ROM, and 220 billion yen for EPROM, a quadrupling in the rate of growth each year can be anticipated.

We are paying great attention to this rate of growth; we don't expect to see much change in this basic trend.

This company is paying particular attention to mask ROM in the memory market. Games in which mask ROM are put up in cassette form are flourishing in the United States, and this trend may grow still more. To be sure, we are directing considerable strength at DRAM such as 64 K RAM, and in the area of mask ROM this company has an array of the 1 M bit jumbo chip with memory for Kanji and the general use 32 and 64 kilobit chip to be followed by the 128 kilobit chip, and we consider this is a fairly powerful area.

We do not have a department type organization such as the system used by the large makers but are concentrated according to specific areas, and this has helped to increase profitability.

We are considering dividing the company into thirds, with products with memory type general use items comprising one-third, customs items as one-third, and pseudo custom as the remaining one-third. Mask ROM will be handled as pseudo custom, and together with gate arrays will be expected to undergo great growth.

We hope to promote reinforcement of the general-use products this year. Last year, Miyazaki Oki Electric went into operation a month and a half ahead of schedule, but production of RAM and ROM on stream without mishap, and will be in full production this year.

The Miyazaki Oki Electric plant can mass produce 3 micron rule products, and because of the availability of space, more installations will be made to produce memory, micons, and gate arrays.

FOR OFFICIAL USE ONLY

On the overseas front, we have installed a design center at Oki Semiconductor (sales company) in the United States where we will start operations and expect to be in full swing by the end of 1982. The business office of this company was relocated in April to assure the design center adequate space; we hope to increase this center to about a 20-man operation using for the most part American technologists.

We hope to reinforce our master slice market development in the United States in this manner; we plan to make tapes for mask ROM there and make possible immediate mass production and activities as in Japan there.

We are studying production in the United States, but there are advantages and disadvantages, and method and site surveys are underway. In any event, this company has adopted a design center concept which differs from what other companies are doing in order to make close contact with the American market. Sales to the United States accounted for 10 percent of total sales in 1981 and they may increase to 25 percent in 1982.

The major products we export to the United States include custom and semi-custom products; in view of the trade friction and the situation that these products are not without competition from American products, we would like to pursue their export with vigor.

The sales of electronic devices this period comes up to 35 billion yen; we anticipate a 43-percent increase in total volume next period and a minimum of 30-percent increase in total sales.

The development of Miyazaki Oki Electric accounts for the major portion of our investment in facilities; since there is no need to build an entirely new plant from scratch this year, as was the case last year, plant investments will decrease by that amount, or about 10 billion yen.

These funds are intended mainly to reinforce production facilities.

New Moves Between Japan and the United States

The world's semiconductor industry seems to be on the threshold of change to a new era. The critical stance of the Americans against the Japanese semiconductor industry is one such move, but when this situation is reviewed from a broader viewpoint, the competitive and cooperative aspects of the world's two largest semiconductor producing countries, the United States and Japan, are even deeper.

Looking back at the events in the semiconductor industry over the past 2-3 years, the outstanding trend is the mutual entry of Japanese and American industries into each other's countries. Japan Texas Instruments had already been producing IC in Japan for over 10 years, while Motorola has been in production as a joint venture with Toko at the Kaizu plant, and now since the end of last year, IBM and Fairchild have started production of IC in Japan. At the same time, Intel and Advanced Micro Devices also have expressed their intentions to start production in Japan.

FOR OFFICIAL USE ONLY

On the other side of the picture, the Japanese have seen Nippon Electric, Hitachi Limited, Fujitsu, and Toshiba Corporation set up plants in the United States during the past 2-3 years. Even before then, Rome had entered into capital participation and technology introduction with the Exsa Company, while the watchmaking Seiko group aided in the establishment of the American CMOS and LSI maker Micropower Systems Company and holds stock in that company.

The objectives of these mutual entries are: 1) to produce within the export market, 2) to avoid the risk of being embroiled in the protective trade principle, and 3) to make use of technology and manpower in the country in which the plant is located. These moves are considered natural consequences for countries such as these two where semiconductor export-import is so active.

On the other hand, there is a strange difference between these two countries in that the United States is in a state of recession, while the Japanese are overcoming this recession and are maintaining good sales in the American market, which they sustain through these plants in America, while the Americans are trying to maintain what was once their superior position in the Japanese market and have located their plants there for this purpose.

What is interesting here is that both sides basically have displayed welcoming attitudes to these mutual entries, and the overriding logic seems to be that production under the same conditions is fair competition.

It may be prudent to consider that this mutual entry of plants followed by technology exchange and joint development of products is an indication that cooperation between the industries of these two countries has deepened. A well-known example of such cooperation is that between Hitachi Limited and Motorola Company in supplying microprocessor technology, and partially divided responsibility assignment or the technology exchange program between the Telegraph and Telephone Public Corporation and IBM.

Complaint Against 64 K RAM Export, American Industry Aims To Obtain Government Protection

On the competitive front, the problem which the Americans are stressing is the export of 64 K RAM by Japanese industry to the United States. The issues over which the Americans are distressed are given in detail in another section and will not be repeated here. What has not changed since the start of this problem is that the Americans are always in distressed state compared to the Japanese, and they want government aid for some measures to combat the recession and protect the industry.

The Japanese industry claims: "We are being made the scapegoats (sacrificial offering)" (Vice President Ouchi, Nippon Electric) and "They are aiming for subsidies" (Director Kaenbara of the Semiconductor Department, Hitachi Limited).

It is a commonplace practice of the Americans to moan over the Japanese industry in order to evoke some sort of government response, as mentioned before. One result of such actions has been the American industry receiving contracts from the Department of Defense for the VHSIC plan (development of LSI technology with 100 times the capability of the 1978 technology, with a development

FOR OFFICIAL USE ONLY

period from 1980 to 1986 funded at \$225 million) taken from the Japanese VLSI project.

The disparaging attacks culminating in this 64 K RAM attack seem to be aimed at: 1) limiting imports of 64 K RAM, the price of which has dropped too low, thereby enabling American industry to recover its competitive edge; 2) developing markets for American IC and lowering Europe's 17-percent duty; and 3) obtaining some sort of government encouragement and subsidy.

Japanese Production With Preeminent Yield

On the other hand, as evidenced by mutual entry activities, the world's semiconductor industry is heading in a new direction and is now in a large innovative period. Although there is no definite proof, it is said that 3 years ago a certain American large computer maker analyzed the Japanese made 64 K RAM and decided that the Japanese overall mass production technology was superior to the American technology based on both design technology and process technology.

The report entitled "Semiconductor Trade and Development," issued by a joint congressional committee on 18 February, stated without elaboration that Japanese 64 K RAM production technology is associated with greater yield, and this is something that is common knowledge among those in Japan's industry.

The reason for this superior yield is not limited to production technology alone: design methods and the solution of production problems are important factors which enable the Japanese to top the Americans. The Japanese not only solved practically all of the problems necessary to increase the yield of 64 K RAM but also removed any obstacle which could possibly be a detriment.

Put simply, it is a sort of blind type development activity, but both the transistor and IC in the initial stages of development in the 1950's and 1960's were products of the discovery of new principles which occurred rather naturally, and in the case of a leading technology such as the 64 K RAM such activities are very important.

The Americans are putting forth similar efforts, but it has been pointed out that there is a vast difference in degree from the Japanese. It is not clear just what this difference is, but as has often been said, Japanese products combine completeness of both product and production to the extent that they are items of superior quality, while the Americans are content to stop at some adequate level.

This is something which one can quickly understand when one looks at LSI for a small calculator or watch which Japan supplies to the world as top class items. These LSI are produced by a rather complex CMOS process; "Initially the yield was only 30 or 40 percent, but at present it is over 90 percent, and there are hardly any rejects" (department head Kawanishi of the Semiconductor Department, Toshiba Corporation).

If this situation did not exist, an LSI chip for watch use would increase in cost from 40 yen to 60 yen, while that for a calculator would not be able to cost only 100 yen, nor would the price remain stable for many years.

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

Yoshizaki, the former assistant chief of the International Trade Bureau (now International Trade Policy Bureau) of the Ministry of International Trade and Industry, who later entered the service of Japan Texas Instruments and at present is president of that company, said: "Japan holds the dominant position in the world with regard to IC. IC production is similar to the production of rice crackers in that the Japanese have the ability to put paintings on the individual rice grains. IC is perfectly suited to Japan."

President Yoshizaki made the following statement on recent movements: "What I predicted has come to pass. The situation in the United States is that the people serving different companies undergo a complete change every few years, whereas in Japan the same people keep on working and piling up experience. It is clear that a plant where the personnel does not change is stronger," as he came forth with a new viewpoint.

Japan Texas Instruments is reinforcing increased production of 64 K RAM at its Miho plant in Ibaraki Prefecture, just as its president said, and is exporting a portion of its wafer product to its assembly plants in Southeast Asia, where they are assembled into complete parts for export to the United States in the international strategy the company has developed.

As of the middle of March, this company was supplying plastic packaged 64 K RAM to domestic makers in Japan, running alongside the Japanese forces which were behind in the plastic area but are not undergoing development to a superior position; users' evaluation has been favorable.

Even though it erred by falling behind, Japan IBM will enter into mass production of IC next year at its Noshu plant in Shiga Prefecture, according to an announcement by the company. It is believed that this company also plans to exploit the superior Japanese attributes.

Back in 1973 or 1974, when importing IC into Japan was far from free, spot imports of IC from West Germany increased suddenly, drawing the attention of the concerned bureau. It was ascertained that this importation was from the IBM West German semiconductor plant, but now the reverse situation may be on the way.

The Not To Be Despised American Latent Strength, the Unrivaled High Technology

When we consider these events, it becomes evident that mass production of general-use IC and LSI is well suited to Japan. On the other hand, high-level microprocessors and innovative devices are where the Americans hold the center stage.

That being the case, a pattern in which general-use devices would be mass-produced in Japan while high-class products would be produced in the United States should take over, but the United States, which is the leader in the world market, will not stand for such a system, and this is what is bringing distress to the Japanese.

On the other hand, like it or not, the trend for Japan, which is superior in mass production of general-use devices, to continue that way is being enhanced still more.

FOR OFFICIAL USE ONLY

As a sidelight to this discussion, it has been noted here that "At the last ISSCC (International Solid State Circuit Conference) the technologists who were assembled drafted a report that the United States is many stages above Japan in advanced products and that this difference is increasing, and I believe that this is something we should note very carefully" (Director Hata of Hitachi).

Semiconductor Companies Reinforcing Sales Strength

The semiconductor companies are putting strength into their sales force because of the expanding applications for semiconductors and the growing market scale. The competition for a share of the domestic market is intensifying, as a result of which each company's activities in the sales area are becoming more and more hectic.

Establish Fully Funded Sales Companies To Respond To Intensifying Battle for Share

A recent development that has attracted attention is the establishment by Hitachi Limited of its "Hitachi Electronic Parts Sales Company," to which the company subscribed 100 percent. This new company, which went into action on 1 April with capital of 80 million yen, will operate initially with a force of 30 people and will conduct yearly business of 7 billion yen.

To Direct Lineage Sales Company

What is of interest here is that heretofore sales agencies were the mainstream for sales in semiconductors, and Hitachi is trying to convert this into a direct lineage sales company system.

Director Sutezo Hata of this company said: "We considered reinforcing sales in a number of ways, and this new company is one of these approaches." At the same time, "With certain users we hope to have direct dealings (with Hitachi) and there are some instances when the use of an agency where the name Hitachi does not come out directly may be possible and a diversified sales system is preferable," he said.

In the area of semiconductor sales system for the domestic semiconductor market, Nippon Electric is rated to have the top system in its agency (this company calls it special contract stores) network. The four large special contract agencies--Yosan (September 1982 period sales of 88.8 billion yen), Mitsunobu Denki (sales for same period of 62 billion yen), Shinko Shoji (October period sales of 50 billion yen), and Sajima Denki (46.7 billion yen)--are not only active in sales but carry on vigorous new market development; their technological strength and service strength are evaluated very highly.

Both Hitachi and Toshiba recognize the Nippon Electric strength in sales of electronic devices, but realize they cannot duplicate such a system, so both companies are looking into other new sales systems.

FOR OFFICIAL USE ONLY

Extremely Busy

The semiconductor industry department and electron tube industry department (Braun tube is main line) at Hitachi are under the control of the electron industry headquarters which conducts sales; the electronic parts business headquarters within the main headquarters is in direct charge of sales, and agencies are also used. The electronic parts business headquarters has a total of 250 employees in the Tokyo district and sells semiconductors as well as Braun tubes, from which it is evident that this is a very busy organization. In contrast, the sales department of Nippon Electric, which handles sale of electronic devices, totals 800 people--a sales staff at least double that of any other.

Director Katashi Kawanishi of Toshiba's semiconductor industry department states: "Semiconductor sales at this company are through direct sales and agency sales under the semiconductor industry department; we are increasing the number of people in the applied technology area apart from the business department to engage not in pure business but to reinforce technological services."

Two Types of Transactions

Tokyo Sanyo Electric, which plans for a 100-billion-yen business in semiconductors in 1984, is reinforcing its development of the industrial-use market and hopes to achieve great growth; it plans to reinforce its agency sales as one phase of this project. Managing Director Hiroshi Yoshie of this company said: "There are two types of users, those who purchase through the medium of agencies and those who prefer making direct purchases," as he indicated that sales were not simply resolved. The present direction of this company is to depend as much as possible on the agency line for sales of semiconductors for industrial use and reinforce the direct sales setup to develop two lines in its efforts to spur sales.

Whether to go through direct sales or through agency sales seems to be the prerogative controlled mainly by the wishes of the user. For example, industries outside of the regular semiconductor area such as toys, watches, machines, and tool machines seem to have more who prefer direct purchases from the semiconductor maker, while, on the other hand, many of the computer, communications equipment, and office equipment type electronic equipment industries prefer purchases through agencies.

Establish Special Subsidiary Company

"We can even use a cat's help" is an expression indicative of how busy the present state of the various semiconductor companies is. Admittedly this is a growth industry, but IC, LSI development, related software, and then application software type related industries are growing so rapidly that the situation cannot be adequately digested in the situation in which each company finds itself.

This is the background which prompted semiconductor companies to set up subsidiary companies 1 or 2 years ago to specialize in software or system design.

FOR OFFICIAL USE ONLY

Table of Subsidiary Soft/Design Companies of the Semiconductor Makers

Name of Company	NEC IC Micon System	Hitachi Microcomputer Engineering
Date established...	23 May 1980	7 June 1980
Capital.....	50 million yen	50 million yen
Owner.....	Fully owned by NEC	Fully owned by Hitachi
Name of president.....	Kiyoshi Uchimaru	Genichi Kamoshita
Business.....	<ul style="list-style-type: none"> ●System design for micro-computers ●Applications design ●LSI circuit design ●LSI circuit pattern design 	<ul style="list-style-type: none"> ●Hard and soft design for micro-computers ●Design of microcomputer application products ●Development design for semiconductor IC and LSI ●Soft development for LSI design and technological calculations ●Special survey of electronics
Manpower.....	300 employees	900 employees (as of March 1982)
Annual business.....	2 billion yen (planned)	4.8 billion yen (FY-81)
Location.....	1933-19 Shimonumabe, Nakahara-ku, Kawasaki-shi	1479 Kami Mizumoto-cho, Kodaira-shi, Tokyo-to

Name of Company	Toshiba Micon Engineering	Fujitsu Micro Systems
Date established...	1 April 1981	20 April 1981
Capital.....	50 million yen	50 million yen
Owner.....	Fully owned by Toshiba	Fully owned by Fujitsu
Name of president.....	Hiromu Yamamoto	Hiroyuki Nakano
Business.....	<ul style="list-style-type: none"> ●Basic and applied soft development for microcomputers ●Design business in IC/LSI ●Development of test programs and CAD programs 	<ul style="list-style-type: none"> ●Basics related to semiconductor products (mainly microcomputers) and their application product development ●Sales of soft and application soft ●Design and sales of semiconductor products and microcomputer application products ●Development, orders, and sales of software related to semiconductor production facilities
Manpower.....	250 men (as of 1 April 82)	110 men
Annual business.....	1.8 billion yen planned FY 82	--
Location.....	1 Toshiba-machi, Komukai, Saiwai-ku, Kawasaki-shi	1015 Kami Kodanaka, Nakahara-ku, Kawasaki-shi

FOR OFFICIAL USE ONLY

"Nippon Electric IC and Micon System," "Hitachi Microcomputer Engineering," "Toshiba Micon Engineering," and "Fujitsu Micon Systems" are four such companies already in operation; their general makeup is given in another section.

Adopt Flexible System

As may be deduced from their names, these new companies have strong ties with an engineering image. The functions of these four companies are very similar in nature, which in the main are: 1) LSI circuit pattern design, 2) hard and soft design for micon, 3) applied software development for LSI and micon, and 4) CAD/test program development. These companies have flexible systems which enable them to accept orders and make sales.

Each semiconductor company points out that these subsidiary companies have been brought up to possess great competitive strength, and their role is increasing as support forces.

As can be seen from their business activity makeup, these companies are expected to go into gate array development, which has great possibility of developing into a specialty area.

Sharp Increase in Each Company's Manpower

Of special interest is the sudden increase in each company's manpower. Nippon Electric IC Micon System started out with 200 employees; and its annual business of 700 million yen grew to a 2-billion-yen scale requiring 300 employees. Hitachi Microcomputer Engineering started off with an even larger staff of 700 people with annual business of 3.5 billion yen, which increased a year later to a staff of 900 people and business of 4.8 billion yen.

Toshiba Micon Engineering is planning to increase the number of its employees by 100 this April. All four companies are planning even greater increases from here on, and they seem likely to become powerful support forces to their parent companies in the areas of micon and LSI.

What worries these new companies is that despite the sharp increases in business volume, there is great difficulty in acquiring the necessary manpower. Restricting ourselves to events of this year, the new graduates in the area of electronics and mathematics related areas are being fought for by the electronics industry, and it is even more difficult to hire people in the soft development areas. Despite this situation, the parent companies are shifting various activities such as LSI, micon, soft, applied soft, and system design to these subsidiary companies and are anticipating satisfactory performance.

Expect Active Reinforcement

According to a certain semiconductor maker, assuming that the company overall was able to land 500-600 new graduates, the number allotted to the semiconductor department would be much fewer than the number requested. Since it is impossible to increase the number of graduates hired to resolve this lack, the engineering company has to revert to great reinforcement of its activities.

COPYRIGHT: Denpa Shimbunsha 1982

9923
CSO: 8129/1084-E

- 89 -

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

NEC VICE PRESIDENT OUCHI INTERVIEWED ON SEMICONDUCTOR ISSUE

Tokyo SANKEI in Japanese 30 Mar, 1, 2, 5 Apr 82

[Interview with Atsuyoshi Ouchi, vice president of Nippon Electric Company, by editorial staff member Hiroyuki Kanbara]

[30 Mar 82 p 10]

[Text] Japan's economic friction with the United States and Europe is shifting from television and automobiles to semiconductors. When the situation is such that the semiconductor trade does not favor the Japanese, why is the United States unilaterally attacking the Japanese? At the same time, how far will Japan's semiconductor technology advance and how will our country's industry and daily life be altered by these changes? We asked Vice President Atsuyoshi Ouchi of Nippon Electric, who is the acknowledged head of the semiconductor industry for his views.

Technology Innovation Advancing at Super Speed

[Question] The semiconductor makers at present are engaged in hot competition in putting up facilities. Can you say something about this situation?

Ouchi: Take our company, for example. We invested 38 billion yen in plant facilities during FY-81. The total sales of all of Nippon Electric is about 1 trillion yen. Of this total, semiconductor sales account for close to one-fourth, about 220 billion yen.

The total investment in facilities for the same year was 85 billion yen. Of this total, the investments under my jurisdiction totaled over 40 billion yen. The semiconductor area alone accounted for 38 billion yen, so our investment in facilities was close to half the total. This should give a good idea of how much investment is required.

Furthermore, the legal period of amortization of these facilities is 5 years, whereas it is 7 years for the usual type facility. We have been able to make this period specially short for the IC (integrated circuit) industry. The actual situation is that the period does not even reach 5 years. I tell my subordinates: "Once we install our facilities, we must be able to recover the investment in 2 years." We should be able to replace it in an average of 3 years, at least; otherwise we will be standing still in a respondent manner

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

using a slow speed and old machinery. This is how fast technological innovations are developing.

[Question] I guess the investment speed will see no abatement.

Ouchi: That is so. If we preview the 1980's decade, on the average IC-related investments will increase about 20 percent per year (monetary base). The expansion in transistors will not be as great. On the other hand, IC is the area of greatest attention, and MOS type IC such as for microcomputer use is expected to increase about 30 percent per year.

Furthermore, the value of the machinery depreciates 36 percent per year. The number of capabilities which the world's semiconductor industry gives to society is doubling each year.

If this situation were applied to automobiles, the highways of the world would be jammed with automobiles, making movement impossible and creating a serious social problem. However, we do not concern ourselves with such a possibility because of the small scale. That is why I believe that the semiconductor industry will expand at least until the end of this century.

Americans Faced With Structural Disadvantage

[Question] Is that magnitude of growth possible? With an expanding market, why should competition between makers be so fierce?

Ouchi: It is because this is an industry in which the learning curve (learning curve) and scale merit (mass production effect) are influential factors. No matter what is said, this is a narrow industry, and everything does not follow logic. If we conduct our business strictly on the basis of the experience we have accumulated, our basic value will depreciate. In addition, technological innovation will continue for the rest of the century, and a vast army of research and development personnel will be required. In order to recover the cost of such operations, small volume IC production not only will make impossible a reduction in cost but will cause us to lose out in the marketplace.

This is why the world is in an oligopolistic trend. I will apply this to the Japanese-American semiconductor friction. The small and medium makers of America's Silicon Valley (semiconductor industrial belt on the southwest shore of San Francisco Bay, where a number of leading semiconductor makers are located) are, generally speaking, in a state of structural disadvantage. Since no one comes to the rescue in such a situation, they pick on Japan as being the villain, and the idea of attacking Japan becomes a popular trend.

Need for Vast Investment

[Question] Is there not a minus side to the concept of learning curve and scale merit?

FOR OFFICIAL USE ONLY

Ouchi: There is. Although this is an industry with a rosy future, everybody is striving "to be bigger than everybody else," and the semiconductor makers throughout the world are locked in a terrific contest.

There is no doubt that a large scale results in lower basic price. If the lowest price possible becomes the market price, the other industries will be operating in the red, and this is why there is a race to achieve the top rank in the world. The rosy situation and the simultaneous fierce competition are two of the characteristic features of the semiconductor industry.

[Question] I guess a vast investment is required in order to win out in this contest?

Ouchi: Research and development and investment in facilities cost a good deal. Up to a few years ago, about 5 billion yen was thought necessary in order to expand sales by 10 billion yen. However, the facilities are becoming more high priced, and at present about 7 billion yen investment is required to expand sales by 10 billion yen. It can be expected that it won't be long before 10 billion yen investment in facilities will be required to increase sales by 10 billion yen.

[Biographical Note] Atsuyoshi Ouchi graduated from the Department of Electrical Engineering, Faculty of Engineering, University of Tokyo, on 17 September 1942. He entered service in Nippon Electric immediately after graduation and in March 1962 received a doctoral degree on a dissertation entitled "Research on Application of Negative Impedance Converter" in the area of a new electronic circuit theory. In November 1966 he became director of the Integrated Circuit Design Headquarters, where he faced the challenge of IC development. Since then he has served as head of the Department of Integrated Circuit Industry. He became a managing director in 1973, executive managing director in 1977, senior executive managing director in 1978, and vice president in June 1980. He is respected as Japan's leading man in semiconductors and is acclaimed even in foreign circles. He is presently vice president of the Electronic Communication Society and is active in the Keidanren Industrial Policy Research Committee. He is the author of the text "Introduction to Micon" (Kosaido Shuppan); from Tokyo-to, age 60.

[1 Apr 82 p 10]

[Text] Unreasonable Anti-Japanese Attitude

[Question] We now shift to the Japanese-American problem. First of all, what is the present situation in the Japanese-American semiconductor friction?

Ouchi: When then Prime Minister Fukuda stopped in California on a visit to the United States in 1977, the Silicon Valley representatives confronted him with "The Japanese IC makers are attacking with IC (integrated circuits), and this must cease. We ask the prime minister to come up with some countermeasures," and this was the start of this present friction.

In the steel, automobile, and television friction which preceded this present situation, it was the overwhelming Japanese exports which caused resentment on

FOR OFFICIAL USE ONLY

the part of the Americans. On the other hand, the amount of IC entering Japan from the American side at that time was greater than what was being exported to the United States. This excess in imports continued, and it was only for a short period near the start of last year that exports temporarily topped imports; there is good balance at the present time.

Furthermore, the products Japan exports to the United States include a high portion of MOS type LSI. This is a special area for Japan which was developed in connection with portable calculators. The U.S. military and NASA (National Aeronautics and Space Administration) advanced funds for study of the bipolar type, which is presently being shipped to Japan. Thus, there is a good overall balance in IC, and both sides are experiencing increased volume. This is a very ideal situation.

This, however, is the Japanese reasoning. If we listen to what the Americans have to say, they claim IC is the "oil for industry" and they believe it will play a major role in all areas in the future. Japan succeeds in anything it strives for. It will be too late if they let the situation develop to the stage that steel, automobiles and television attained, so now is the time to come out with rhetoric and hold back the impending flood, is one of the reasons. We would like to see something done about the structural inadequacy of Silicon Valley, but this is not something public opinion would approve if the aid were free, so the rationale seems to be that aid has been requested because the Japanese have launched an attack.

[Question] Such being the case, would not a counter argument that the export-import situation is in balance put them in a troubled position?

Ouchi: They will come forth with "You are bombarding us with a very great concentration of MOS, and that will not do" type retort. Now, it may be the result of high unemployment in the United States, but they are in a position that even if they were operating at full force, they would be unable to meet the demand at this time. This is why the criticism of concentrated exports does not hold water.

American Occupied Europe

[Question] Such being the case, is it the result of poor Japanese public relations that is causing misunderstanding?

Ouchi: Yes. Furthermore, the Japanese contribution to American imports of IC is a few percent; more than 80 percent is imported from plants the Americans set up in Southeast Asian countries. That is why, if the unemployment in the United States is truly the problem, rather than raise a din about Japanese exports, they could squeeze their Southeast Asian plants a little to alleviate unemployment in the United States.

Nevertheless, let's consider what it will be like if our exports to the United States keep increasing in the future. For example, there are the following type of statements coming from the Department of Defense: IC and LSI are important from a military viewpoint as well. As long as the IC and LSI of the United States are several steps above those from Japan and Europe, the military order of the West can be maintained. If now the technology of

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

Japan or Europe were to become superior to that of the United States, this would be a serious military problem. If this type of attitude is adopted, there is nothing we can do.

[Question] Let us now turn our eyes toward Europe.

Ouchi: Europe is already occupied by the United States, and what Japan does is of slight concern. Although it is said that the European people all use IC made in the EC, the truly European makers such as Phillips and Siemens produce only a slight amount, and it is the large American makers located in Europe such as Texas Instruments, Fairchild, and Motorola which are reaping the profits on the products, which are then carried back to their country. Because such a history has been recorded, rather than hate the Japanese, the Europeans have the feeling that they would somehow like to reverse the situation once more with regard to the Americans and Japanese.

Putting Plants in the Other Country Is the Key

[Question] Isn't there some specific move that can be made to fight this situation?

Ouchi: Yes. Nippon Electric has an IC plant in Ireland and one under construction in Scotland, and we are being greeted with open arms. Nippon Electric is making a top-class technology transfer to Europe. The engineers we will hire at our plant in Scotland are all graduates of Scottish universities. To be sure, we will dispatch some engineers from Japan in order to transfer the Japanese technology. When this is done and the engineers from both sides work together, the true worth of the engineering graduates of the Scottish universities will assert itself. This technology, which cannot be purchased even with billions of yen, will become commonplace by next year; technology transfer is not possible.

[Question] Is that so?

Ouchi: That is why the European plants will be manned by European technologists, as the plants purchased in the United States are completely manned by Americans, from the manager down to the lowest level technician. Of the total of over 400 workers, only a handful are Japanese. We bring these American technologists to our plant in Kyushu where they study quality control and other subjects before they return to the United States so that they can bring the level up before it goes awry.

[Question] Could you by being so overly generous risk losing these people to rival companies along with the technology and cause a dilution of advantage?

Ouchi: If that happens, so what? People who have studied in Japanese QC circles are proselytized with promises of increased salaries. Even if they are acquired by other companies, the technological innovations which I mentioned before are so fierce so that we will not be losing that much, while, on the other hand, why should we stop them from making this advance? There is no point in trying to protect today's technology. Rather than trying to keep the technology to ourselves, would it not be better to locate plants in

FOR OFFICIAL USE ONLY

the United States, hire American technologists and laborers, and thereby prevent trade friction from arising? Even if they leave, only 10 or 20 percent at most will leave; it is not a case of everybody leaving.

[2 Apr 82 p 8]

[Text] The Greater Part of Electric Equipment Is Semiconductors

[Question] Do you think that as the speed of semiconductor development picks up, some immeasurable effects on the industrial structure will arise?

Ouchi: Yes. Already considerable effect is seen in the area of the electrical machine industry which produces semiconductors. That is to say, the parts which had been used in these machines in the past are now being replaced by LSI (large integrated circuit). As this change takes place, the greater part of the added value to the electrical machinery in the area of hardware will be nearly all IC and semiconductors; the remaining added value will come from the software. Dr Jonas of Stanford Research Institute in the United States jokes that the total number of software technologists required in the world in the year 2025 will outnumber the total population of the world, as he describes the increasing density of software efforts.

[Question] That is incredible.

Ouchi: On the other hand, one large influence IC possesses is that it permeates various areas which are in no way related to electrical equipment. One such example which is a hit is the microcomputer. This product will most likely be responsible for greater electrification of automobiles. Up to a few years ago, machines were the sole domain of mechanical engineering, while electrical engineering was limited to the motors used to operate the machines, but today the situation is such that a machine which is not electronic will not sell. This is the situation with cameras. The same applies to reproducing equipment. Watches have become completely electrified. Furthermore, the prices are ridiculously low. This is because the price goes lower as more electronic parts are introduced. The stock page in newspapers today requires electric equipment, chemical equipment, and machines to be printed; this will all become electrical within a few years.

[Question] Such being the case, would not the party making the earlier introduction win out?

Ouchi: That is so.

Increasing Number of Parts With Conversion to IC

[Question] Would there again be a fierce fight for front position?

Ouchi: Yes. The Japanese tend to do something just to be doing something. In essence, they dash around madly without seeking a goal. The Europeans are of an opposite mold, and that is why they fell behind. Among the Europeans, mechanical engineering was very advanced in Germany, and electronics was not

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

able to simply break in because of the main position occupied by machines. This was compounded by labor belonging to different unions.

[Question] Were not both capital and labor conservative in Europe?

Ouchi: Truly conservative. It is only now that the United Kingdom, West Germany, and France have all started giving subsidies for VLSI. I believe they were considerably delayed.

[Question] As the degree of integration in semiconductors becomes higher, doesn't the need for the hard area become unnecessary in the area of electrical equipment.

Ouchi: Such is not the case. The electrical equipment industry is in a good position. Along about 1965, when IC first made its appearance, resistance makers and IC makers were in a turmoil. They worried that they were slated for extinction.

On the other hand, the end result has been exactly the opposite. That part taken over by IC has been surpassed by that part which increased because of IC. As machines and knitting machines successively introduced IC, the print base became marketable. This is where condensers and resistors find application. This is how these products expanded along with IC.

[Question] To be able to do all this, didn't it require considerable reaction, including investment in facilities?

Ouchi: Yes. I believe that even in the future, the peripheral parts industry will develop along with IC, although it may not be as large as the IC rate of growth that was mentioned earlier in this discussion.

[Question] What will be the effect on the people's living standard? Can we expect it to be a very comfortable existence?

Ouchi: So-called office automation, factory automation for plants, and replacement of labor by robots will become more popular, and it will be IC technology and software technology that will support the base periphery. This is why it is possible even today to combine a household telephone, television, and radio, which at present are separate, into a single system. On the other hand, such a set would cost 10 million yen, which is beyond the means of the ordinary household. However, if IC drops to 1/100 of its value based on capability, what is today only a dream will be available tomorrow at a price that one can afford.

[Question] If something that now costs 10 million yen were to become available for 10,000 yen, the product would go like wildfire.

Ouchi: What will drop in price to 1/100 of the present cost will be the chip section, while the price of the iron which is used to make the case will not drop very much, so my statement was very symbolic in nature. Please don't think that the price will fall to 1/100 level in the course of 10 years.

FOR OFFICIAL USE ONLY

Electronic Computer Home Not Far Away

[Question] Let us take, for example, the large computer made by Nippon Electric, the ACOS1000. How compact do you think it will be in 10 years?

Ouchi: That is something I cannot tell you off-hand. That is because we do not know today how small the core section, the memory, will become. On the other hand, the typewriter has a keyboard which must be large enough so an operator can punch the necessary keys, while the peripheral equipment must be easy to use and is becoming more elaborate, so there does not seem to be room for much miniaturization. The main section will become smaller. As the unit is made smaller, there will be no limit to how small people will want to see them reduced, and it becomes necessary to compensate using only the capacity of memory actually required.

[Question] This brings up another difficult problem.

Ouchi: Take for instance the personal computer costing 168,000 yen. This is a good price, and it is provided with the capabilities of a much larger computer. In the area of portable calculators, the first ones which were made in 1967 using our IC and Sharp's MOS type IC cost 600,000 yen. That calculator cannot hold a candle to today's model costing 3,000 yen (laughs).

This is why factories and households will be automated, and this will all be at a price that is affordable. On the other hand, the real problem is just what sort of products needs to be developed for household use.

[5 Apr 82 p 4]

[Text] Performance to Quadruple in 4 Years

[Question] How far do you think this technological competition in semiconductors will continue? It is said that memory capacity will go from the 64 kilobit RAM to the 256 kilobit RAM.

Ouchi: The degree of integration of LSI (large scale integrated circuit) is not only the result of how fine the physicist and chemist can make the integration. At the same time, the circuit itself must consume power of an order of magnitude less than what is now consumed, and an on-off circuit must be invented. In addition, dust damage will be an order of magnitude greater than what it is now, and a technology to enable even better clean rooms has to be developed. Furthermore, it may require a whole day just to examine a single chip into which more than a million elements are compressed. We will have to develop a technology that will enable the examination of the numerous elements crammed into these chips at fantastic speeds.

[Question] In other words, unless all these different areas are developed, the technology cannot advance very far?

Ouchi: That is right. This is why when you ask how far development will go, it is not an easy question to answer. What I can say is that this is the year when there definitely will be a takeover from 16 to 64 kilobit RAM in

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

the memory area. I have been saying for several years that this takeover will come about the middle of 1982. But because you people of the mass communications media have been flaunting 64 K RAM so insistently, the world thinks that the 64 kilobit RAM took over several years ago, when it was actually this year.

I suppose we will be going to the 256 kilobit product next. This will come in a few years. The 256 kilobit product has been produced in the laboratory, and test production has been attempted. This is the actual situation. Our company already had this product at hand 2 years ago. On the other hand, it is my belief that it will be about 1986 before it will become advantageous to use the 256 kilobit over the 64 kilobit. We have come through a stage in which there was a quadrupling in performance every 2 years, but the situation is closing down to a point when this quadrupling in capacity will require 4 years. This is 1982. Adding 4 years to 1982 gives you 1986. Then add another 4 years and it will be 1990, and that will be the time for the one megabit chip.

Conditions Becoming More Difficult

[Question] Then what do you think will happen?

Ouchi: At the present rate, I am not sure whether this development will continue at the present pace. This is because of the conditions I listed before. In any event, I believe that one is not wrong to assume that this age of IC and LSI using silicon will continue for the rest of this century.

On the other hand, there are some who will argue with this statement and say what about the gallium arsenide semiconductor. They will also ask about the Josephson effect (the effect in which cooling the electronic element to -273°C enables the operating speed of the element to approach the speed of light). Won't silicon be replaced by these other materials? However, both gallium arsenide and the Josephson element require cooling to very low temperatures. These will be indispensable in the high-speed computers of the future. Take, for example, this watch. This is adequate for my needs, and to introduce a Josephson element to make it more accurate is a meaningless improvement, so that although the Josephson effect and the gallium arsenide element will see their development, I still believe that at least 90 percent of the needs for the rest of this century will be provided by the present materials.

Awesome Latent Strength of the United States

[Question] What do you believe will come out of the Japanese-American competitive strengths? Can you say they are at the same level?

Ouchi: At present Japan is slightly in the lead in the matter of the 64 kilobit. On the other hand, we cannot look too optimistically into the future. This is something I do not really want to interpret or discuss, but there is a need for our research and development to take a considerable lead. That is to say, where the absolute number of researchers and developers is concerned, the United States, with double the population of Japan, should have twice the number we have in this area.

FOR OFFICIAL USE ONLY

[Question] Just how many are there at the present time?

Ouchi: I cannot give you the actual figures. On the other hand, their population is double ours. Looking at the number of colleges and universities, again they have double our number, and about 50 percent of the research and development funds are of a "boss stars and stripes" origin. The Americans criticize our subsidy system. The Americans certainly are not lacking in subsidies. They get it from the military and NASA, although it is described as being used for training purposes, but it all boils down to the same thing.

There is profit even if free, and a country with such a large population depends on the nation to provide 50 percent of the research and development costs. Japan is limited to the subsidies of the Ministry of International Trade and Industry, which accounts for 2-3 percent of our research and development costs. We have to scrape around to come up with the balance. This is the handicap we are faced with.

That is why the Americans wouldn't even dream of letting a Far East island country overtake it and come up to their level. This is another case of "Remember Pearl Harbor." Use leading technology to set back the Japanese. If the Department of Defense and NASA shell out the money and the universities work feverishly, they not only can overtake but surpass.

[Question] It has always been said that the Japanese lack creative ability.

Ouchi: I do not buy that theory. That is because in the 30 years since the end of the war, all the time of the Japanese technologists was taken up in the pursuit of the United States until very recently. That is why there is no time for a leisurely smoke or thinking up new creations. On the other hand, this situation has reversed itself dramatically during the past few years.

For example, there is the prestigious International Solid State Circuit Conference which is held in the United States in which only 90 papers from all over the world are presented each year. Up to a little over 10 years ago, there were at best one or two papers presented by the Japanese from among the 90 papers, and we were happy just to be represented. But last year the Japanese papers accounted for about one-third of the total. Such being the case, one can say that Japanese creativity blossomed forth suddenly over the course of 10 years. Thus, Japan has developed the margin to overtake the Americans in the matter of exploiting creative strength.

[Question] The technological development of semiconductors occurred in the 30 or so years since the war, and it is quite an accomplishment.

Ouchi: It is quite some record. Even at that we still have no time to relax. It may be an exhilarating experience for a young technologist. On the other hand, for one who handles the business end, he must always think about how to make things pay off, and this is somewhat of a pressure situation.

COPYRIGHT: Sangyo Keizai Shimbun 1982

9923

CSO: 8129/1084-F

- 99 -

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

CONFRONTING U.S.-JAPANESE SEMICONDUCTOR INDUSTRIES ANALYZED

Tokyo NIHON KOGYO SHIMBUN in Japanese 16, 17, 22, 24 Mar, 7 Apr 82

[Article by reporter Eiichi Hasegawa]

[16 Mar 82 p 8]

[Text] The recent report released by the U.S. Department of Commerce titled "1982 American Production Estimates" predicts that Japanese-made 64 kilobit DRAM will take up 80 percent of the share of the American market and sent out emergency warnings, while the Department of Defense used this situation to point out the danger to national security; the drive to limit Japanese exports to the United States is attracting attention. In this respect, the domestic semiconductor makers (Japan Electronic Machinery Association) have received no unsettled items in Japanese-American semiconductor trade," as it made public its interpretation of the situation and displayed its complete opposition to the American moves. "The anti-Japanese criticism is certainly a misunderstanding on their part" (Vice President Atsuyoshi Ouchi of Nippon Electric); the domestic semiconductor industry is searching for the true intentions of the Americans and is becoming more deeply confused. This is why a survey was made of the Japanese-American semiconductor trade situation and future through the statements of semiconductor industry leaders, including those from the United States.

Government Functions as Central Figure

At this time, anti-Japanese criticism is mounting on the American side with regard to the semiconductor trade. Unlike the past, when the SIA (Semiconductor Industry Association) was the principal instigator, government circles headed by the Department of Commerce have been spearheading the criticism which characterizes today's anti-Japanese movement. And the present situation is such that the Japanese are wondering just what the true intentions of this movement could be.

Semiconductors are "rice for industry" (Japan) or "prime oil for industry" (United States), as they view the situation. Unlike former objectives of trade friction such as color television or automobiles, the present situation is tied in heavily with the competitive strength of the entire industry; there have even been statements to the effect that "he who limits IC limits industry."

FOR OFFICIAL USE ONLY

Electronics is not only the backbone of the computer and private-use electronic equipment but all areas of industry including communications, automobiles, and industrial machinery as well as products of the future. In the United States, this industry since its inception has been considered to have deep ties with military technology, and there are many who voice their concern from the standpoint of national security.

There is presently in the United States a prestigious "VHSIC" (very high speed IC) plan, of which the pentagon (American overall military command) is sponsoring development, while in Japan a research and development project on new capability elements has been started, with the Ministry of International Trade and Industry calling the shots from the next-generation industrial base research and development system.

Reinforce Onsite Production

It was because of the loud anti-Japanese complaints from the Americans that the concerned Japanese parties decided it would be useless to treat these voices as purely the result of economic friction. If the Americans still dare to treat this situation as trade friction, "we cannot help but feel that we are being made the scapegoat within the framework of the entire Japanese-American trade" (Vice President Atsuyoshi Ouchi of Nippon Electric). This is because the problem areas in the Japanese-American trade friction which the Americans point out are "all misconceptions of the actual situation" (Ministry of International Trade and Industry) and "there is no problem item in the entire field of Japanese-American semiconductor trade" (Managing Director Toshio Takai of the Japan Electronic Machine Association).

Japan's semiconductor industry at present is hastening to reinforce its production on American ground while: 1) asking the Americans to get the true picture of the present Japanese-American semiconductor relationship, and 2) promoting public relations regarding the Japanese semiconductor industry by holding seminars where the industrial base is concerned. However, the seemingly unilateral, emphatic complaints of the Americans with regard to this semiconductor trade friction has the Japanese wondering what it is all about. They have become suspicious of the "true intentions" of the other's actions and agonize over the understanding as their confusion intensifies.

Reports From Both Houses of Congress

Let us now look into what is considered the most complete compilation of the present distress with the Japanese that is given in the joint congressional economic committee report titled "Report on the International Competition in the Semiconductor Industry." The following seven items are offered.

In order to protect its domestic industry in competition with American industry, the Japanese Government limits the access of imported goods to the Japanese market in the policy which has been in effect for several years. Even today, when formal restrictions have been removed, the ties which have been formed between the industries in this interim are so strong that any advance into Japan by American industry is difficult.

FOR OFFICIAL USE ONLY

Japan has placed emphasis on price reduction and quality of product rather than on development of new technology where the semiconductor industry is concerned, and there is the inherent risk that should this situation continue for long, the American semiconductor industry's research and development funds will be in jeopardy because of the low profit margin.

As long as Japan's semiconductor market remains closed, the worldwide competitive conditions will favor the Japanese. Japanese industry gives great preference to domestic products.

If Japan is to enter into the international market in the matter of electronics, it should open its domestic market to foreign makers and give resident status to those Americans who have a foothold in Japan.

There is need to view carefully the position in which American products find themselves in the Japanese market, as well as to review the export strategies the Japanese use with regard to the American market.

The ultimate condition for ending trade discrimination is the complete opening of the market for electronic products. To this end, there is need for the Japanese Government to grant foreign industries the same status as domestic industries in the matter of government purchases and to cease encouraging its people to buy domestic products.

Excluding those products manufactured by foreign industry in the United States which ultimately come under security regulations, these industries are granted the same privileges of participating in the fight for orders and in research and development plans. At the same time, American industries located in Japan should be granted the right to participate in Japan's research and development projects.

Fear Japan's Technology

The item of greatest concern in this state of distress is memory products, and in particular, the high share Japan holds in the 64 kilobit DRAM market. Japan, which held only 40 percent of the 16 kilobit DRAM market, acquired 70 percent of the market share in 64 kilobit DRAM during 1981, and this may even rise to 80 percent in 1982 (U.S. Department of Commerce 1982 U.S. trade estimates). It can be said that the effect of Japan's victory in the matter of the 64 kilobit DRAM, which is the gateway to VLSI, will have some very large effects on the future semiconductor industry.

[17 Mar 82 p 8]

[Text] Initiate Total Rebuttal

The Japanese side, which had been maintaining silence in the face of a series of anti-Japanese criticisms, addressed the reporters group in a meeting at the Keidanren Hall of the Japan Electronic Machinery Association (president, Sadakazu Shindo) in a torrent of rebuttal, releasing its pent-up feelings.

The following is the gist of these talks.

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

The Japanese-American IC trade is presently in a state of balance.

There is active mutual interchange in capital investments and technological exchange, and the semiconductor industries of both countries are in a mutually supplementary relationship.

In September last year, the two governments agreed to a final duty rate on semiconductors (4.2 percent), and the free trade principle was bolstered.

Even without waiting for the current supplementary data, it is evident that the Japanese-American semiconductor trade is in a state of balance. Japanese exports to the United States during 1981 totaled 72 billion yen (decrease of 1.7 percent from the previous year), while the imports for the same year totaled 75 billion yen (increase of 1.3 percent over previous year); the difference was so small that it could almost be disregarded.

This is why it is clear that the balance in trade is not the bone of contention for the Americans. The first semiconductor friction which arose in 1977 was the excessive import imbalance (25.3 billion yen). There is no sign of concern about the balance of trade in any of the present criticism.

Japan's Share Declined

The problem now is Japan's lead in the matter of leading technology as represented by the 64 kilobit DRAM, which is said to be the gateway to VLSI, and the insecurity over the possibility that Japan will be running alone in future semiconductor developments.

The Japanese forces which succeeded in acquiring 40 percent of the market in the 16 kilobit DRAM built up their market share in the 64 kilobit DRAM to 70 percent in 1981. This share is expected to go as high as 80 percent in 1982 (U.S. Department of Commerce forecast for 1982).

The Japanese, on the other hand, have a completely reversed view of the situation. Considering first of all, the establishment of the technological position of the 64 kilobit DRAM, its importance (among the leading technology products) is only "one of them" (Vice President Ouchi of Nippon Electric); they point out that the superiority of the American microprocessor systems remains unaffected.

Even with regard to the high share which is the basis for the strength of the Japanese forces, the Japanese say: "It is still in the stage of an expanding market, and it is premature to be arguing about one's share" (Managing Director Toshio Takai of the Japan Electronic Machinery Association).

This will be the year when American mass production will start out in earnest, and "Japan's share of the U.S. market may fall to 50 percent" (Managing Director Tomihiro Matsumura of Nippon Electric) has been predicted.

At this stage, the American plants of Japanese companies have started operation and 64 kilobit DRAM production on American soil is increasing, but even

FOR OFFICIAL USE ONLY

then "this is not considered a solution to the trade friction but just a continuation of the cost battle in the United States, which seems to be the main theme" (Vice President Ouchi of NEC).

Be that as it may, the share the two sides are battling over will not be known until the actual records are in, but this is a situation in which there must be some reason for the American argument.

Lowered Price Makes Entry Difficult

Excluding the large in-house makers such as IBM and WE, the large 64 kilobit DRAM makers in the United States are two companies, Texas Instruments and Motorola, and these two makers have production scales which surpass the Japanese makers.

On the other hand, the other makers such as Fairchild have only now begun sample shipments, and their opportunities in this business do not seem to be the greatest.

- It is to be noted that the continuing criticisms on the American side all focus on this point.

It is said that the sudden influx of Japanese products together with the supply of the large makers such as IBM and ATT (WE) being satisfied internally in the matter of 64 kilobit DRAM, the resulting pinching effect has caused many medium and small makers to retreat from the market. President Sanders of AMD (Advanced Micro Devices) said in an interview with the New York TIMES: "We (Americans) have been defeated in the 256 kilobit DRAM. The Japanese have won out in the mass production RAM market." This is the "retreat" related response that American industry is receiving.

In the background of this sense of danger on the American side is the market price of the 64 kilobit DRAM. This price dropped from the \$20-\$30 in 1980 to \$7-\$10 at the present time (refers to price per unit). With such a drop in price, it becomes very difficult for a latecomer to break in and make a profit.

The Americans claim that this sharp decline in price is caused by dumping practices on the part of the Japanese. Reportedly, the U.S. Government has initiated an unofficial survey to check out this dumping complaint. The Japanese have completely denied any such action, as is to be expected.

[22 Mar 82 p 6]

[Text] Exasperated Americans

"The Japanese IC makers already have had a bitter experience with color television. There is no reason for them to be engaged in dumping practices" (Vice President Atsuyoshi Ouchi of Nippon Electric), is representative of the opinions of the domestic semiconductor industrial heads as they deny the charges of dumping. The price of IC on the American market is set at the level on the domestic market, and should there be a sudden sharp drop in

FOR OFFICIAL USE ONLY

price at some local level, the price on the American market conversely could be higher than that in Japan.

Even in the matter of the suspicion of dumping informally cast on the 64 kilobit DRAM, "the price initiative on the market is held by American industry; the Japanese have no responsibility for muddling the price situation," (Mr Ouchi) laughs. It may be said that what is presently promoting the on-site production plans for semiconductors in the United States is the need to assure future price competition. Even assuming that the Japanese items are the price leaders for the American market, it is a fact that the price of IC is greatly influenced by the supply and demand balance, and the influencing power of the Japanese who hold such a large share of the market cannot be overlooked. This is the source of American exasperation.

The large volume export of 16 kilobit DRAM from Japan which created the initial Japanese-American semiconductor friction is said to have been caused by an inadequate supply on the American market. The basic pattern of the present friction over the 64 kilobit DRAM is following the same pattern. Now, the reason for the inadequate supply of American industry was, in the case of 16 kilobit DRAM, simply the delay in investment in facilities and miscalculation in predicting the expected demand. In contrast, the present situation seems to be the result of manufacturing technology and associated yield.

To be sure, TI, Motorola, IBM, and WE have mass-production capabilities equal to or greater than those of Japanese industries, and it is not fair to state flatly that the Japanese have the edge in mass-production facilities. On the other hand, it seems to be generally accepted that the Japanese do have an edge where mass-production technology is concerned.

Look at the "Ouchi Thesis"

There is a paper entitled "Comparing Japan's IC Technological Strength" by Vice President Atsuyoshi Ouchi of Nippon Electric which appeared in a 1980 issue of the ELECTRONIC COMMUNICATION SOCIETY JOURNAL. Although there has been considerable change in the situation since then, it is a good reference to make a technological level comparison. We will extract a few items on various technologies.

Product planning strength: The overall judgment gives American industry superiority. They are particularly superior in the area of industrial IC; almost all the IC products held up as standards throughout the world are of American design and marketed as such. On the other hand, the Japanese excel in the private-use area.

Device technology: Where device design technology is concerned, the Americans come forth with more proposals for new devices, and the Americans are slightly ahead in the matter of bipolar and MOS. Where manufacturing technology taking into consideration mass-production is concerned, the Americans are ahead in bipolar and the Japanese are slightly ahead in MOS. Overall, the Japanese are even.

FOR OFFICIAL USE ONLY

Assembly, testing technology: The Japanese lead in automation, the two sides are even in testing technology, and the Japanese lead in screening.

Quality control: The Japanese are superior. The Japanese are particularly superior in the matter of reliability design, process control, and quality control in the narrow sense.

IC production facilities: Excepting part of the assembly facilities, the Americans are superior.

In summary, there are more areas in which the Americans are superior and Japanese industry needs to improve itself at least one step.

It is now 3 years since that paper was written, and the pattern of American superiority in product development strength and Japanese superiority in mass-production strength has not changed, but it may be said that the respective differences have narrowed considerably. The difference in quality control over the 16 kilobit DRAM which previously had shocked American makers was cited by the most recent report of the HP (Hewlett-Packard) Company to give the Japanese the edge.

Could this be true? At least the Americans will say, "no." When President Kozo Imai of the Japanese corporation Analog Devices, which is a subsidiary of the American Analog Devices and which has just completed a technical center at Shiroyama-machi in Kanagawa Prefecture, appeared at the opening reception, he said: "We have finally developed a system whereby the regular products can be produced."

The presidents of other Japanese corporations of American semiconductor makers who were present said in subdued voices: "What Imai says is true." That is to say, only in Japan can these "regular products" or IC with standard performance be produced.

Difference in Experience Is the Spurring Factor

"It is evident once you give it some thought. Where the worker in a Japanese plant has a history as long as the plant itself, an American plant operates with workers who have only a year's experience."

The semiconductor industry is seeing increasing automation and becoming more and more a facilities industry; there is an aspect that whispers "semiconductor fishing theory and agricultural theory." The element that is the final determinant of the yield, which is a major factor affecting cost, is the "quality" of the worker or "morale." To be sure, American industry realized the importance of this element early in the game, and one finds many industries in the Valley which have adopted the Japanese industrial system.

On the other hand, the ones who have been talking about the "quality of the workers" are the so-called cum laude members represented by the managing directors of the Japanese corporations of the American industries, and this is an extreme example of the agony of the American semiconductor industry.

FOR OFFICIAL USE ONLY

[24 Mar 82 p 11]

[Text] If Only Quality Were Important

The focal point of the present Japanese-American semiconductor friction is directed at the degree of freedom of Japan's semiconductor market, which is strange in view of the essential balance in the semiconductor trade recently. The report of the joint congressional economic committee of 23 February on the international competition in semiconductors was devoted almost in its entirety to this subject.

One of the important items cited was the "buy Japanese" slogan which developed as the result of the strong ties between industries in the period when the Japanese were nurturing their semiconductor industries, while another important subject was the new technology projects such as, for example, the national projects which were closed to American industries located in Japan.

This report stated: "If the Japanese market were truly open, there would be need to demonstrate its openness," but the best testimonial for this situation probably comes from the American businesses located in Japan which carry on their daily businesses. Would it not be prudent to hear some of these businessmen lift their voices?

First, let us hear from R. Darby, head of the Intel Nonvolatile Memory Marketing Headquarters, who until recently resided in Japan as marketing manager for Intel Japan. He said: "A product which is good and priced right will sell no matter whether it is made in Japan or in America. Our 64 kilobit EPROM holds about 60-70 percent of the world market, and our share of the Japanese market is even higher."

Next, we hear from Ray Stator of Analog Devices Company. He came to Japan recently to attend the celebration of the completion of this company's plant in Japan, and made the following statement to the assembled reporters. "We sell 43 percent of our products to markets outside the United States. Japan is our largest market outside of the United States. Our share of the Japanese market is 39-43 percent."

Also present was the manager of a large American semiconductor company's Japan subsidiary, who will remain unnamed, who stated: "We have achieved satisfactory success. Good, low-priced products will sell not just because they are produced by American industry."

Same Conditions as Japanese Industry

Nearly all of the other American semiconductor related people shared the same understanding of the degree of openness of the Japanese market. Above all, the success of their business ventures is the best proof. Now comes the question of just how far these voices carry back to the heads of their parent semiconductor companies, their government, and the members of Congress.

Considering the participation of these Japan subsidiary companies in the new technology development project previously mentioned, some incredible differences come forth.

- 107 -

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

This report claims that these American companies should be allowed to participate in the VLSI development plan and the fifth-generation computer development plan, but a member of the Ministry of International Trade and Industry said: We recognize completely the resident status of American businesses located in Japan and their participation in these projects (Kazuyuki Wakasone, department head of the Electronic Machinery Department, Machine Information Industry Bureau).

"The reason there has been no participation by American companies up to now is because they showed no inclination to participate; there has been no restriction preventing their participation just because they were American businesses" (same source). The actual situation is that these companies are nearly all in the mass-production area and are outposts of their American companies; they do not have the organization to participate in research and development in the leading areas. On the other hand, if they express a desire to participate, they will be examined under the same conditions as Japanese industry and will be invited to participate if it can be shown they have the capability.

"We have had no instructions whatsoever from the United States with regard to semiconductor trade" (Wakasone), and assuming that there are no formal contacts under these conditions, it is difficult to believe that the report of the U.S. Congress should incorporate such a gross misunderstanding. How did such a misunderstanding come about? The Japanese claim that "this round of semiconductor friction is due to lack of understanding on the part of the Americans." On the other hand, there are many who believe that the Americans understand the situation but are trying to force their will on the Japanese.

Bold Unreasonable Proposition?

They add that "If the semiconductor industry is a strategic industry which America as a country cannot turn over, IC is to Japan a life or death situation," and "the structural inadequacies of Silicon Valley medium and small industries (this does not include all of the American semiconductor industry) resulting from the conversion of the IC industry to a facilities-oriented industry is trying to make Japan the scapegoat," indicating the severity of the rebuttal.

"If the interrelationship with military technology is the reason for the criticism of Japan, this is certainly no problem. There is no other course but to have faith in the good sense of the Department of Defense" is the all-is-lost attitude of the head of one large semiconductor company.

"If we take the present status of the Japanese semiconductor industry as a base, we cannot understand just what the United States is trying to do" seems to be the consensus of the concerned Japanese people.

[7 Apr 82 p 8]

[Text] American "Lack of Awareness"

The items which stand out in a check of the events of the Japanese-American trade friction to date are the extreme weakness in the factors

FOR OFFICIAL USE ONLY

FOR OFFICIAL USE ONLY

comprising the trade friction at the present time and simultaneously the considerable lack of awareness on the American side. On the other hand, what seems at first glance to be simply "lack of awareness" has characterized the situation since the first Japanese-American semiconductor friction in 1977.

What is seen in this background is the high evaluation of Japanese production technology and production efficiency, which had already earned a reputation in other industries, and the thought that the level of the American position in the matter of future semiconductor production will be lowered comparatively.

As claimed by the Japanese side, even today American superiority is unquestioned when the entire semiconductor industry is considered. On the other hand, as this industry made the transition from the technology innovation development stage on the strength of creative technology to a production technology development race which included rapidly developing targets and mass-production scale competition involving vast investments in facilities, not only production technology but industrial structure, labor situation, and business technology type knowhow became involved, which provided the Japanese forces with some advantageous positions.

Among the American semiconductor makers who are locating plants in Japan, there are many who state that one of the purposes of locating in Japan is "to absorb the active strength of the Japanese industry." President Ray Stator of the American Analog Devices Company, which recently constructed a technical center in Kanagawa Prefecture where IC production has been started, said: "To date we have incorporated a number of quality management methods such as QC circle activities which are indigenous to Japan. With the construction of plants in the United States, we expect that these innovations in the production area will spread from Japan to the United States."

This nuance is seen paradoxically in a dispersed manner in statements by domestic large semiconductor makers who deny Japanese superiority. "We should fear the American semiconductor industry," and "Production of 64 kilobit DRAM by American makers will rise sharply." "The decrease in the (Japanese) share of the market is something that cannot be avoided" shows the mood that prevails as Japanese industry awaits the rise in competitive status of the Americans.

Dangerous Underevaluation

The automobile industry, which is also agonizing over trade friction, has in the past (and even at the present time) been saying: "The United States is to be feared," emphasizing that the latent strength of the American automobile industry was being treated more than as an indulgence. To be sure, the giant American automobile industry at that time was in a healthy state, and the constant confrontation in the market with the American forces built up the Japanese automobile industry of today; it was not necessarily an exaggeration to say that it was partly a sensation of threat.

On the other hand, when one looks at the present situation of the American automobile industry, the excessive evaluation of the American automobile industry then and the self-underestimation were in error. There is a good possibility that the same thing could happen to the semiconductor industry. Self-underevaluation gives rise to "overstrong Japan."

FOR OFFICIAL USE ONLY

An overstrong Japan necessarily invites trade friction. This is a trend which has been experienced in a number of different industries. The automobile is one such example, as is iron and steel. Certainly, the real strength of Japan's semiconductor industry on a scale of 10, which is the rank of the United States, would put Japan at about 4 or less; this great strength of the United States is evident in everyone's eyes. Nevertheless, some facets resembling the automobile are seen. That is to say, likening the 64 kilobit DRAM to a compact automobile is not necessarily off target.

This is why a situation of an overstrong Japan will be sure to evoke trade friction, just as with the automobile. Even the semiconductor situation 10 years in the future predicted by Vice President Atsuyoshi Ouchi of Nippon Electric has as the premise "equalized technological development." Fortunately, there is a time margin for technological equalization, and the heads of the large makers are aware of this necessity along with the heads of Japan.

That is to say, this involves promotion of a desire to engage in mutual technology transfer. Japan's semiconductor industry historically has been engaged in putting forth every effort to absorb American technology, and this enthusiasm is still healthy today, as is seen in the family structure centered on American makers such as that of the micon. At least those American industries which put plants in Japan have the same enthusiasm as they engage in absorption of Japanese technology in the broadest sense.

Powerful Competitive Adversary

Hitachi Limited, Toshiba, and Oki Electric are in all-out technology granting, and top-level Nippon Electric has clearly indicated its plan to engage in indirect transfer of technology to the United States and Europe through location of its plants there.

All of these projects have just started so there are no results to evaluate as yet, but there is room for a great deal of future activity in this area. It may be that the United States will continue to be a powerful competitive adversary in the future, and the catastrophic development of semiconductor trade frictions may be something which cannot be avoided.

COPYRIGHT: Nihon Kogyo Shimbun Tokyo Honsha 1982

9923

CSO: 8129/1084-G

- END -

FOR OFFICIAL USE ONLY