Foreign Semiconductor Makers Enter the Electronics Industry

By Hayden Stewart

Foreign companies now occupy around 23% of Japan's semiconductor market. They expect to win an even higher percentage of sales in the near future.

Their success is the result of trade negotiations and hard work. Explains Glen Fukushima, formerly a member of the Office of the United States Trade Representative (USTR) and currently vice president of the American Chamber of Commerce in Japan (ACCJ), Japanese companies used to maintain relationships with one or more local suppliers and purchase their semiconductors somewhat exclusively from these makers.

Now the U.S.-Japan Semiconductor Trade Agreement is beginning to correct these relationships. Says Fukushima, who played a key role in negotiating the agreement, it forced Japanese companies to try foreign semiconductors, which they then liked.

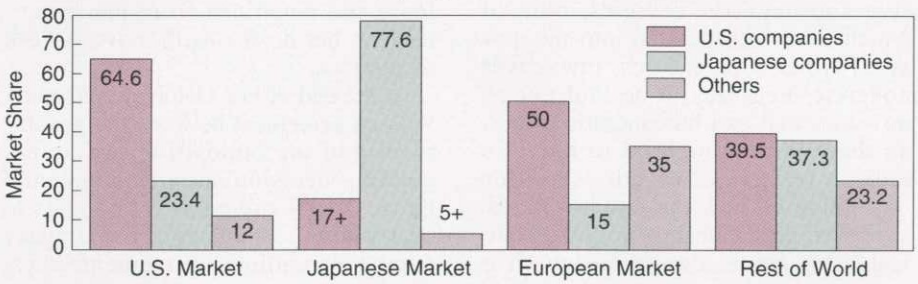
Foreign executives have also worked hard to win the confidence of Japanese customers who will now purchase foreign products that offer superior technology.

Japanese users are even welcoming foreigners into their "design-in" programs: a practice in which electronics and semiconductor makers work together on next-generation products from the early stages of development.

Foreign Market Share

Source: SIA.
Note: In the above figures, foreign semiconductors are defined as a product which a foreign company assembled. The Japanese government uses a different formula. Their method includes products that were assembled by a Japanese company but sold under a foreign brand, as well as semiconductors that are manufactured and used internally by a company that does not sell these products to other firms.

Global Market Share of American, Japanese and other Semiconductor Makers



Source: SIA, March 1995
Note: Foreign makers occupy less of the Japanese market than their competitiveness would suggest, but this gap is diminishing.

Competition and market access

According to the Semiconductor Industry Association (SIA), a California-based nucleus group for semiconductor makers with facilities in the U.S., American firms currently occupy 43% of the global semiconductor market, followed closely by Japanese makers (40%) and companies from the Asia/Pacific region and Europe (17%).

U.S.-based companies once dominated the semiconductor industry. They pioneered its early development from the late 1950s through the early 1970s, producing a variety of computer components such as the first single chip microprocessor in 1971.

Since that time, Japanese companies have become equally strong competitors. Instead of focusing on a wide range of products, however, Japanese companies invested heavily in plant and equipment for the production of low-cost/high-volume memory chips such as DRAMs.

By the 1980s, NEC, Fujitsu, Toshiba, and other Japanese companies were rapidly gaining market share. Product strength supported this growth: the companies were expanding the memory capacity of each DRAM by shrinking its individual circuits. They often achieved lower defect ratios than their American counterparts, too.

According to Roger Mathus, executive director of the U.S. Semiconductor Industry Association in Japan (SIAJ), Japanese firms also gained market share through dumping. Says he, "In the 1980s, Japanese companies resorted to this tactic as they had invested in capacity beyond the requirements of their market share."

In 1981, Japanese firms held 27.4% of the market and American firms held 57.2%. By 1988, the numbers were 51 and 36.5% respectively.

Among U.S. producers, only a few companies like Texas Instruments and Micron Technology remained committed to DRAM products while Intel and other producers withdrew. Instead of producing volume chips, these companies specialized in custom semiconductors for niche areas.

Successful specialization in growing

fields helped American producers to reverse their declining market share by the 1990s. Over 100 firms currently produce a wide range of semiconductors in the U.S., but only Motorola has re-entered the DRAM business.

Asia/Pacific and European companies are also emerging as formidable competitors. Three South Korean firms have successfully penetrated the memory chip market and a handful of European companies produce custom semiconductors and memory products.

Foreign companies have maintained a smaller percentage of the Japanese market than their global competitiveness would suggest. In the middle 1980s, U.S. producers occupied about 8% of the Japanese market, while European and Asia/Pacific makers accounted for a nominal amount.

Quality differentials were partly responsible. But Fukushima insists that even competitive firms faced *monzen barai* (literally, they were turned away at the front gate). He gives a typical scenario: "A foreign company approaches a Japanese automaker. Before even looking at the salesman's price or technology, however, the Japanese company replies 'No thanks, we are buying from a particular maker who buys autos from us in turn'."

The U.S. government ultimately intervened and negotiated the U.S.-Japan Semiconductor Trade Agreement. It was signed in 1986 and renewed in 1991. The agreement calls on Japanese companies to stop dumping. It also asks the Japanese government to encourage the use of foreign semiconductors and describes a market share of 20% as reasonable.

The SIAJ's Mathus contends that "U.S.-based firms alone should achieve more than 20%;" this figure is merely a "threshold" for all foreign companies "which indicates the start of an open market."

The first semiconductor agreement was somewhat successful. It stopped overseas dumping by Japanese companies, but it failed to resolve the problem of market access in Japan. At the end of 1991, when the agreement was renewed, foreign semiconductor makers still accounted for less than 15% of the Japanese market.

After 1991, the U.S. government backed up the semiconductor agreement with special reviews and threats of economic sanctions when progress failed to materialize.

Such pressure led to "an environment for cooperation," says Fukushima. "It forced Japanese users to look at what foreigners offered." After they tried foreign chips, he adds, "Many users found the products competitive."

The SIAJ also sponsors working groups to unite foreign makers and domestic users like telecommunications equipment manufacturers.

NEC is Japan's largest semiconductor maker and a major producer of electronic products. More than 20% of the semiconductors in these latter goods are foreign.

Mark Pearce, a spokesman for NEC, confirms that foreign semiconductor makers are highly competitive. Their defect ratios were possibly higher years ago, he says, but now "there is a very good parity between chips made in Japan and elsewhere."

Pearce also acknowledges that in some areas "foreign companies are streets ahead of the Japanese." For instance, he says, "We must purchase microprocessors from Intel, because they are the best."

Foreigners achieved a market share of 22.4% over the four quarters of 1994, exceeding 20% for the first time. North American firms held around 17%, followed by Asia/Pacific companies with 4 to 5%, and Europeans ones with 1 to 2%.

Speaking in San Jose, California, SIA President Andrew A. Procassini, declared that "The credit for this achievement must be directed to a variety of sources including the two trade agreements, the dedicated effort of U.S. semiconductor manufacturers, the participation of Japanese consumers, and the monitoring and encouragement of the U.S. and Japanese governments."

From monzen barai to design-ins

Foreign companies are now relying less on politics than business acumen to fuel their growth. "The U.S.-Japan Semiconductor Trade Agreement helped us to capture 20% of the Japanese market," says Texas Instruments (TI) spokesman Obata Muneo. "Beyond this figure, it will be less important."

Foreign companies should exploit their superiority in designing advanced and high-value added chips. Says TI, Japanese users may still prefer to buy products from their traditional suppliers, but they will buy foreign products which are superior.

TI is the eighth largest semiconductor vendor in Japan and the most successful foreign one with a 3.8% market share. It offers a wide range of products, but specializes in unique areas like Digital Signal Processing (DSP), where it accounts for nearly 50% of the market.

Through numerous design-in programs, TI has used DSP and its other technologies to help Japanese companies make better products. In a usual case, TI and its customer can improve on current products in terms of speed, sound, visibility, and other factors. "Better quality semiconductors enable such differentiation," explains Obata, "They are the heart and brains of high value products."

A case in point: TI recently teamed up with Sony to improve the latter's digital audio system for aircraft. Conventional systems offer 16 music channels. But Sony's new system will facilitate 128, as well as sound tracks and other music with the quality of a CD player. The new system is based on TI's DSP TMS320C53 chip for audio data compression. It will debut on Boeing's upcoming B777 this spring.

Design-in programs also help semiconductor makers maintain their technological superiority. Explains Obata, "Through our partnerships, we have developed expertise in a wide range of electronic systems."

Developing such expertise and taking care of customers on a global level requires a significant amount of investment in each market. In Japan alone, TI maintains 5,400 employees, four semiconductor plants (including a joint venture with Kobe Steel), one R&D center, and five design centers.

The company's Tsukuba Research & Development Center cost ¥5.4 billion. It opened in 1991 and hosts a full spectrum of research and development programs.

Motorola and LSI Logic also have manufacturing facilities in Japan, but for many American companies such investments may be too costly. Yet the SIAJ is optimistic. Says Mathus, "Nearly every month, a U.S.-based company announces a new facility or office in Japan." With such high enthusiasm, strong technologies, and the warming receptivity of Japanese users, the SIAJ believes that American firms can now hope for a share of the Japanese market which reflects their competitiveness around the world.

European companies have mixed feelings about efforts by the U.S. government to pry open Japan's semiconductor market.

The European Electronic Component Manufactures Association-Semiconductors Japan Office (EECA-SC/J) is a nucleus group for European makers in Japan. It is working with the SIAJ to increase the market share of its members.

But many European firms are still unhappy about U.S. government policies. Says Takizawa Yoshimichi, the U.S. government has been pressuring domestic users to purchase more foreign semiconductors, so "Japanese users have focused their attention on American makers." Takizawa is the general manager of Fuji Electronic Components (FEC), a joint venture between Fuji Electric of Japan and Siemens A.G. of Germany. The company imports and sells German-made chips.

FEC nonetheless stands to benefit from the growing receptivity of Japanese users to foreign companies in general.

According to Takizawa, his company has long designed semiconductors for Japanese users who either export their final product to Europe or assemble it there. Says he, "Over 20% of design-ins between FEC and local users are for goods that will be produced off-shore."

Now FEC expects to conduct more design-ins for local products, such as automobiles and telecommunications equipment. Says Takizawa, European companies are leaders in these areas and "FEC can derive Japanese solutions from strong European ones."

Siemens produces semiconductors for digital mobile communication like Global Special Mobile (GSM) and Digital Europe Cordless Telephone (DECT). Says Takizawa, "These products come from Europe but are becoming world standards." He continues, "FEC not only imports such European products, but can also create derivatives for domestic applications like the Personal Digital Cellular telephone (PDC) and the Personal Handy Phone (PHS)."

Takizawa is looking to the automobile industry for more Japanese customers as well. Says he, Siemens produces superior products for airbags, anti-theft systems, and other automotive applications. A case in point: If a car system fails during operation, Siemens' onboard diagnostics technology will store the information and inform the driver.

In fiscal 1994, FEC imported ¥4 billion worth of semiconductors. Within the next three to five years, it plans to increase that figure beyond ¥10 billion.

Amongst foreign semiconductor makers in the Japanese market, South Korean firms are expanding their market share the most rapidly. According to Dataquest, these companies recorded a year-on-year growth rate in excess of 100% in 1994.

Like their Japanese counterparts 20 years ago, South Korean companies are investing heavily in the development and production of DRAMs. Samsung, for one, is now the world's largest maker of these memory chips.

Samsung cannot provide official data, but estimates its Japanese market share at less than 3%. DRAMs account for about 80% of these sales.

The company is also pursuing design-in programs with Japanese companies like Sony and Sega, but would not elaborate on these programs.

Maker-to-maker alliances

Beyond cooperation with Japanese users, foreign semiconductor makers are even beginning to collaborate with Japanese semiconductor makers.

Again the motive is economic, not political. Although the global semiconductor market is enjoying double-digit growth rates and should reach US$160 billion by 2000, next-generation products are increasingly expensive to develop and produce. Many companies are looking for partners to share the risk.

Japanese companies are ideal partners in such cases. Executives acknowledge that they have excellent technologies and the capacity to either produce semiconductors in large volumes or conduct leading-edge research.

In many cases, the foreign company is a small, California-based firm without the capital or capacity to bring their technology into production.

Yet large foreign makers are also teaming up with Japanese companies. For instance, TI is working with Hitachi to build a DRAM manufacturing facility in Texas. And Samsung is cooperating with NEC to develop next-generation DRAMs.

Cooperation or conflict?

Budding international cooperation has not eliminated every problem. For instance, the U.S. and Japanese governments still maintain different formulas for counting the market share of foreign companies in Japan.

More importantly, foreign companies realize that Japanese users may still be loyal to their traditional suppliers. For this reason, foreign governments may resist terminating or not renewing the U.S.-Japan Semiconductor Trade Agreement. Says Fukushima, "Given that there is a proclivity in Japan to maintain long-term relations between users and suppliers, I assume that positive results are more likely to continue if the agreement is extended."

Despite such continuing troubles, everyone agrees that the direction of change is positive: Cooperation is slowly supplanting conflict, as foreign semiconductor makers become mainstream players in Japan's electronics industry.

Hayden Stewart, an American economist with a master's degree, is a freelance writer/researcher on business and economics.