

Episode 2

Leap Forward by Germanium Transistor

The first semiconductor product I worked on was germanium transistor. Because it is not made anywhere now, it is something that you can only see in museums. However, the germanium transistor played a very important leading role in the history of Japanese semiconductor industry and opened up the way to the semiconductor power country.

In 1959, I entered Hitachi right after I graduated from the University of Tokyo. This year was the year of the marriage of His Imperial Highness (currently the Emperor), and it was also the year when TV became more popular. At that time, Hitachi was filled with the spirit for promoting domestic technology, instead of depending on the foreign technology, which was the ideal of the founder Namihei Odaira, and Hitachi was as vigorous as being called a “wild warrior Hitachi”.

A group education for two months was held after the entry to the company in April. The place was the facility of Hitachi, in Hitachi City, Ibaraki Prefecture, where the company originally started. The executives of the company alternately stood on the podium, and there was a wide range of education including not only the history of Hitachi, the present situation, and the “Hitachi Spirit”, but also the world situation, culture and technology.

At the end of group education there was an “assignment announcement”. We had submitted up to the third aspiration in advance, but the assignment did not necessarily go along with it, so this was a moment of sad and pleasure for each of us. Fortunately, in my case, assignment to the semiconductor division was decided as desired.

Hitachi’s semiconductor factory had started its operation in the previous year (July 1958), but in order to acquire public approval for the construction as soon as possible, the words of “factory” could not be used, and it was called “Transistor Laboratories”. It was actually “transistor factory” of course, and it was changed to “Musashi Works” after a while, so that the name stood for the body.

In this year, there were 7 new college graduates who were assigned to the semiconductor division. All senior employees were transferred from other business divisions within Hitachi, and it so happened that 7 of us became “the first-generation employees” of Hitachi semiconductors.

The graduating school and the assigned work place of each of us was (in alphabetical order): Aoyama (Kyoto Univ., Design Section), Ebisawa (Tokyo University of Education, Material Sec.), Odaira (Waseda Univ., Manufacturing Management Sec.), Sakamoto (Osaka Univ., Production Engineering Sec.), Suzuki (Tohoku University, Design Sec.), Tanaka (Fukushima University, Accounting Sec.), and Makimoto (The University of Tokyo, Production Sec.). Having joined the company in the same year, we had intimate group relationships, and we were called “Seven Samurais” (see photo below). We still hold a kind of alumni meeting, or “Group of ’59” every year, of which naming is derived from joining the company in 1959.



Photo 2.1 New college graduates at Hitachi's Semiconductor Division in 1959
(The author at right in the front row)

My first job was “product engineering of germanium transistors”. Simply speaking, it was management and improvement of “yield” that fluctuated day by day. At that time, the structure of transistor was a thin piece of germanium of about 1 mm square, which functioned as a base, and an emitter and a collector were formed by burned-indium dots at the both sides. The most delicate work was required under the microscope, attaching lead wires to the emitter and the collector. In this work, skillful girls with strong eyesight who were out of junior high schools played big roles. They came to be called “Transistor Girls” from some time later.

Although it gets a little on the side story, you may recall a movie of “City with Cupola (Nikkatsu Film Company)” which was screened in 1962. Actually, a part of the location of this movie was held at our Musashi Works.

A cupola is a blast furnace that melts iron to make castings. A heroine's father who has worked here for many years loses his job due to restructuring. The eldest daughter played by Sayuri Yoshinaga as the heroine gives up studying in the regular high school, decides to go to a night school, and at that time she chooses a state-of-the-art transistor factory as the daytime workplace. Sayuri Yoshinaga, now a well-known top-notch actress, was awarded the leading actress award for the Blue Ribbon Award by this movie, and is said to have solidified her foothold to the top class actress.

However, “Transistor Girls” were the main force in production line until the first half of the 1970's, and after that the ratio of girl workers decreased year after year. According to “30 Year History of Hitachi Semiconductor”, the female ratio at the time when I entered the company in 1959 was 85% and 15% for men, but in 1975 it was reversed to 35% for women and 65% for men. And in 1985,

15% of women and 85% of men; the ratio of men and women became just the opposite of 1959, and the semiconductor factory changed into a male workplace.

In the background of such changes, there was a progress in automation along with product conversion; from germanium transistors to silicon transistors, and to ICs. The manual work of young girl workers was replaced by automated machinery. But during the launching phase of the Japanese semiconductor industry, “Transistor Girls” played vital roles as “golden eggs”. These young girl work forces were not only in semiconductor manufacturing, but also driving forces to produce high-tech products at the time such as radios and televisions. And even temporarily, Japan surpassed the leading US in transistor production, and became the top of the world.

Kotaro Tani’s “Genealogy of the Semiconductor Industry” states as follows.

“From the summer of 1956, transistor radios began to sell explosively among the young generation. Sony’s transistor production in this year was 300 thousand pieces per month, and in the following year it was 800 thousand pieces, more than double of the number of the previous year. In 1959, Japan produced 86 million transistors and became the world’s largest producer.”

Semiconductor applied products such as radios which were produced in large quantities greatly contributed to the improvement of the image of Japan as a whole, and renewed the meaning of “Made in Japan”.

Let me introduce two episodes in this regard.

In 1962, the then Prime Minister Hayato Ikeda visited France for the first time after the war and met with President De Gaulle. It was a transistor radio that was chosen as a souvenir to the President on this occasion. This was a state-of-the-art product representing Japan at the time.

Prime Minister Ikeda spoke eagerly about this new transistor. For that enthusiasm, President De Gaulle half ridiculed him as “transistor salesman”. The semiconductor was exactly the symbol of Japanese high technology and the “star of hope” at the time.

Next, let me introduce a passage that Wakako Hironaka, a translator of “Japan as Number One: Lessons for America” (by Ezra F. Vogel) published in 1979, wrote in a translator’s afterword of the same book:

“I recall 20 years ago (note: around 1960) when I came to the US, I felt that the Americans were somehow making a fool of Japanese. -an omission of a middle part- It was still very soon after I left Japan, and I felt painfully that Americans, who were disappointed with the goods which were so-so in the appearance but cheap and poor in quality, regarded the Japanese as the cheap people who could only make cheap things.

However, thanks to the transistors, the Americans’ views on Japan sharply changed. A French leader sneered the Japanese as a “transistor salesman”, but the attitude of the Americans toward Japan, especially that of the general public, was a pure surprise and respect.”

As can be seen from these sentences, consumer electronic equipment such as semiconductor based radios and televisions have transformed the image for Japan abroad. It was the transistor that created an opportunity to change the image of “Made in Japan” which once meant “cheap and poor in quality”, to mean “high quality and high performance”.

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