

From Underwater Imaging Toward Satellite Communication

Interviewer: Takamasu Kanji

VARIOUS methods for finding fish have been handed down across generations of fishermen around the world. They are able to pursue fish by knowing the seasonal migration routes, watching seabirds circling over the ocean, checking under driftwood, and looking for color changes on the surface of the water. All of these are indications for finding shoals of fish in the sea, and all throughout history fishermen have ultimately relied on their intuition when fishing.

In the water, where radio waves do not penetrate, a sound wave can travel five times faster than it does in the atmosphere. By emitting ultrasound waves inaudible to the human ear from the fishing boat, a fish finder is able to determine the position and size of fish shoals from the sound waves that bounce back. It was this technology that revolutionized traditional fishing. In 1948, 28-year-old Furuno Kiyotaka, the owner of a small marine electrical contracting business in a small port far from the industrial centers of Japan, developed this amazing new technology. This was the start of the global Furuno brand for marine electronics.

Furuno is recognized by the National Marine Electronics Association with product awards in several categories each year. In 2004, the company received awards in 10 of 26 categories. We talked with Furuno Kiyoyuki, the younger brother of the founder Kiyotaka, and the fifth president of the company.

Furuno developed the world's first fish finder, which has been recognized as an amazing accomplishment. How was this revolutionary invention achieved?

Furuno: The Furuno household was a large family of 10 children. In order to help support the family, my oldest brother Kiyotaka dropped out of junior high school and obtained a license as a radio repairman, before establishing the predecessor of Furuno Electric in 1938. He ran the electrical contracting business for fishing vessels and small ships in Nagasaki with my second oldest brother, Kiyokata. After World War II, he happened to find a submarine detector among some scrap from the former Japanese Navy, which he had purchased to use as repair parts.

An experienced fisherman once told Kiyotaka that when bubbles rise to the sea surface, it means there is fish down below. He got the idea that maybe he could find fish using ultrasound from the submarine detector.

Even the naval submarine detector was not good enough to detect a 2,000-ton class submarine. A vast majority of researchers at the time felt that ultrasound could easily pass right through the fish and the echo would not come back



to the detector. Kiyotaka was advised to his face that he should give up his research. However, with such an inquiring mind and full of enthusiasm, he persuaded a ship owner to help him continue the experiments despite a series of failures. By installing the ultrasound transceiver in a hole on the hull bottom, in order to reduce the noise created by the ship, he finally succeeded with the practical application in 1948. His zeal

for invention was based on the idea that if he could find a way to look into the ocean, it would certainly help the fishing industry and eliminate the risk of ships returning to port empty.

Initially, the device recorded the presence of fish with black ink on special paper rolls, but today the same information is shown using color images on LCD panels. Through the use of fish finders, fishermen can now accurately identify the type and size of fish through the images produced by the device in their favorite fishing grounds. An enormous amount of ecological data of fish in the sea has also been accumulated, thanks to this technology.

How precisely can fish finders detect fish?

Furuno: We can display even a small fish, if it is near the ship. Fish shoals can be detected within a radius of several kilometers.

I'll give you one example of detection accuracy in the sea using ultrasound. In a project to find the sunken battleship Yamato in 1985, we captured a clear 3D image of the Yamato's hull at a depth of 340m using our specially developed ultrasound detection device.

I have heard that diagnostic echo-

Photo : Furuno Electric Co., Ltd.

devices for scanning the human body were based on ideas taken from fish finder systems. In addition, our company produces an ultrasound bone densitometer. Ultrasound technology has a wide variety of applications since it can see things that are invisible to the naked eye without causing any harm to the human body.

What kind of equipment do fishing boats have today?

Furuno: In addition to the fish finder, which can locate fish directly below the ship, scanning sonar can search with a 360-degree field of vision. The tidal flows vary according to depth, and a current indicator is installed to measure the speed and direction to help fishermen deploy the net at the right time. Radar is also used to find flocks of birds in the air. Finding fish from the movement of seabirds is a traditional technique that fishermen have used since ancient times. Since radar enables us to detect bird flocks far out of human sight, it is particularly effective for catching fish in the oceans. Today's large-scale fishing vessels are equipped with a total of 20 types of devices, including GPS and telecommunication equipment. These devices were all developed by our company.

Furuno has literally revolutionized the fishing industry. However, wouldn't you say that the increased efficiency brought about by the fish finder and other technology has helped exhaust this natural resource?

Furuno: I have to agree with you on this point partially. However, I think it is important to distinguish between efficient fishing and the problem with natural resources. In Japan, we have traditionally set seasons and limits for the catching of shrimps, crabs and shellfish in an effort to avoid depleting these marine resources. Today, it is increasingly important to carry out fishing while considering the management of

resources in all the oceans of the world. While stabilizing its operation by improving efficiency, the fishing industry and the government should cooperate to establish the rules and morals.

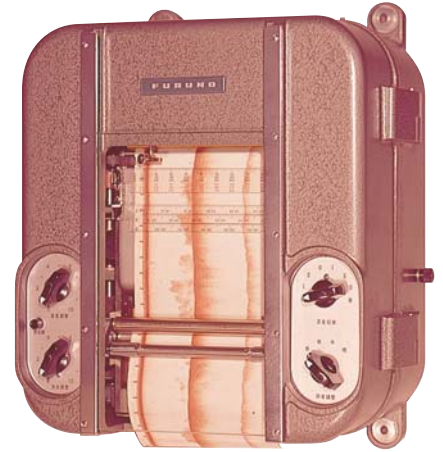
Your company has gone beyond the historical achievement of developing the fish finder. What is the driving force behind this continual development?

Furuno: In the words of our founder Kiyotaka, "My life was always about challenging commonly held notions." In other words, he was so hungry to develop all kinds of useful products for society by himself. He took on the challenge to develop new products, even when there were experts' objections from technical or business standpoints. The company has inherited his spirit.

Through the improvement of fish-finding capability and the development of powerful engines for fishing boats, the fishing grounds have been expanded widely toward the midst of oceans. The needs for reliable communication with land bases and accurate positioning of fishing boats have greatly increased. Responding to these demands, we developed radio communication and LORAN navigation systems for fishermen on their small boats.

The marine radar at the time was only for large commercial ships. It weighed 200kg with a huge antenna, which was out of reach for small fishing boats despite the proven usefulness of radar for safe navigation. Japanese radar makers at the time produced licensed versions for leading manufacturers in the United States and Europe.

After three years trial and error, we succeeded in launching a remarkably compact radar device in 1961. The first compact radar unit had a 18kg antenna, and was installed on a high-speed hydrofoil. Not only fishing boats but a number of pleasure boats began to adopt this type of radar as well. Today, you can see the blue Furuno logo on radar antenna at any marina in the world. Furuno is currently the world leader of marine



The first made fish finder

radar with a 40% market share and 30,000 Furuno radar units are sold annually.

Because it started as a manufacturer of devices for small fishing boats, Furuno has always been looking for ways to make its products lighter and more compact. I think this has helped us to expand our markets.

What other kinds of products do you make?

Furuno: One example is the core modules for GPS receivers. Although GPS devices have recently become popular as car navigation systems in Japan, we have been making marine GPS devices for quite a while. After developing position measuring devices such as the LORAN, the GPS was merely a new variation using a satellite instead of a land base as the electronic signal source. The scale of the car navigation market in Japan last year was said to be 3.1-3.2 million units, and one-fourth of them employed our core modules. We also manufacture instruments for helicopters, and automatic monitoring devices for the topographical changes caused by volcanic activities and landslides. GPS technology is also used to produce the 3D maps for cell phones.

We also make the handheld terminals that are used for logistics management by employing wireless communication

Photo : Furuno Electric Co., Ltd.



Radar antenna

technology in plants and warehouses. We sell several kinds of blood analyzers for the biochemical field, and we are now codeveloping a DNA Microarray analyzer in alliance with Combimatrix of the United States.

The current breakdown of Furuno's product sales are as follows: radar devices, navigation equipment, GPS and other marine devices account for 33%, telecommunication devices such as radio and satellite communication devices make up 9%, fish finders and other fishing instruments take up 12%, industrial equipment such as medical equipment and data management devices account for 27%, and parts make up 19% of our overall sales.

You have such a diverse lineup of products. What is your development policy?

Furuno: At our company 30% of the entire staff, or 400 people, work in the development section. As a part of my management, I have articulated the principle for the development fields.

We call these the SPC, or Sensing, Processing and Communication technologies. These fields make up our core technologies, and under the slogan of "measuring the unseen," I tell my staff to pursue their research freely.

At first glance it may seem like we are expanding our development field indiscriminately, but these are all products which are based on the SPC principle that I just mentioned.

How have you promoted your overseas expansion?

Furuno: In 1950, Kiyotaka announced that he wanted to create a "worldwide Furuno." It was the year before the company became a joint-stock corporation, and the employees were astonished to hear this announcement at the humble company premises in Nagasaki. We actually started to export our products in 1953. Based on the principle of one distributor in each country, we signed contracts with reliable distributors, and adopted a policy of respecting the man-

agement that was carried out autonomously and independently by the overseas distributors. We continue this philosophy today, and even at the overseas subsidiaries in which we have capital invested, we entrust the top management to local people, and foster management that is suited to each individual market. Looking at the sales breakdown for each region, the Japanese market accounts for 47%, the Asian market 11%, and the European and North American markets 36%. However, sales in Asian countries have been increasing recently. Today, we have about 400 employees at 11 companies located in 10 countries, and in contrast

we have less than 20 staff stationed in seven countries.

In early 1990, the company faced its first management crisis, and you and the fourth president of the company, Kunitomo Shigeru, carried out large-scale restructuring.

Furuno: In 1990, Furuno had 1,900 employees and total sales of ¥50 billion, with overseas sales of ¥19 billion, or 38% of the total. But as of February 1993, the company recorded its first loss of ¥2.3 billion for the term.

The reason for the company going into the red was that, even though the structure of the product market had greatly changed, the enormous success of the past prevented us from quickly responding to the changes. In 1976, many countries established 200-mile economic zones in their coastal waters, which restricted the free operation of Japanese fishing boats. The development of refrigeration technology provided an additional blow, and imports of

fish to Japan increased. In Japanese coastal waters, there was a shift in focus from fish catching to cultivation and farming of species with market value. These changes had a serious impact on the Japanese fishing fleet. The price of fish fell, catches shrank, and investment in new fishing boat construction dropped off remarkably.

It was a very difficult decision, but in 1993 we called for the voluntary retirement of 10% of our employees, and began thorough cost reduction efforts in all areas of our operation. We repeated company-wide dialogues, including negotiations between the labor union and management.

We committed ourselves to carrying out the restructuring plan comprehensively and without compromise. While clarifying the cost management and responsibilities of each unit through the introduction of a division system, we proceeded to divide up the company centered on the sales departments at each location. Unfortunately, our head office building suffered damage in the Great Hanshin Earthquake in 1995. This was coupled with the hurdle of having to introduce a new accounting system based on international standards. Despite this difficult period, the company continued to hire new people for the development department and we maintained our own technology development lines. This is because independent development is the greatest asset that Furuno has to offer.

At the same time, we switched our management focus from the domestic fishing industry, which we had been dependent on, to overseas customers, and began to consider the domestic market as just another part of the world market. We decided to devote ourselves to the marine leisure market in Europe and the United States, where the Furuno brand is highly regarded. We actively undertook measures for the merchant marine market as well, by improving our lineup of satellite communication devices and bridge systems, the ECDIS and the Voyage Data Recorder.

Due in part to the company's division, the current number of regular employees is 1,376. Consolidated sales for FY 2004 were more than ¥75 billion, and we posted an ordinary profit of over ¥4.5 billion.

After the success of your restructuring, where do you go from here?

Furuno: Over the last five years we have been looking into what kind of a company Furuno would like to become by 2010. We call this "Furuno Visions" and "Furuno Values."

Quite some time ago, our founder Kiyotaka came up with the slogan, "Sell and enjoy, buy and enjoy." This means that through the development and selling of products, each and every employee is contributing to society, and pursuing personal satisfaction at the same time. By providing things that are really useful, customers will purchase our products. The fish finder was not developed a customer's request. Instead, it was a new product developed in anticipation of the latent public demand. Furuno was not simply selling a device, but the use of the device, or "software," was being sold proactively. We must continue to demonstrate this kind of approach in the future.

Since the company's founding, we have continued to value the Furuno brand name as a key management resource. We have maintained our independent management without joining a huge corporate group, and have refused countless offers for OEM production of our products. Of course we are actively involved in alliances with companies that possess the technology that we lack, but we want to maintain our independence, which is based on our proprietary technology development. This also means that we take responsibility for our brand. By follow-

Photo : Furuno Electric Co., Ltd.



Radar plotter

ing this approach, I think, we are able to take advantage of our brand when entering new business areas.

In the area of specific strategy, what are your goals?

Furuno: In the area of marine electronics, one of our goals is to expand our share of the merchant marine and pleasure boat markets. There are 17 million pleasure boats in the United States, while in Japan the number is still around a half million. Leisure activities on lakes and rivers are expected to become popular, and I think we will need to develop new products to better suit these freshwater environments.

Just recently, I spent a large sum to buy a 45ft cruiser. I want the development teams to use it and develop equipment that is suitable for leisure boating purposes. Unless we can manufacture products that make customers happy, there is no reason for the Furuno brand to exist. The company will only be around as long as it provides value to society, so our development and manufacturing teams need to focus on this goal. **J.S.**

Takamasu Kanji is an editor and biographer. He is also a senior advisor to the foreign editor of the New York Times.