Cutting-edge Innovation by Japanese Firms **Case Study 1**

DNA of Open Innovation: Yokogawa Electric Corp.

By Masahito TAKAGI

Introduction

Founded in 1915, Yokogawa Electric Corp. is a manufacturer of electrical equipment centering on controllers and measuring instruments. In 2010, the company celebrates the 95th anniversary of its founding. Given its long history, it would be safe to say Yokogawa is one of Japan's sustainably developing corporations. In a nutshell, over the last century innovation has been handed down to respond to changes in the business environment. Based on our company's history, part of open innovation is introduced below.*(Charts 1&2)*

Innovation in Measuring Instruments

Two years after its founding, Yokogawa put electric meters on sale in 1917, becoming a pioneer in producing and selling them in Japan. Described hereafter from the viewpoint of technological innovation is the company's development in this area, taking power meters as the example.

Initially, power meters were intended for the fundamental frequencies of 50/60 Hz. The subsequent appearance of inverters for lighting equipment necessitated high-precision measurement of electric power as high as dozens of kHz. Conventional needle-type power meters were unable to meet that demand. In a technical breakthrough in 1967, we developed a new system in which multiplicative computations of voltage and current signals were done with analog electronic circuits for their conversion into digital signals.

Years later, demand grew for measuring harmonics of the 500th order or more (25kHz or more) and minute electric power for energy-saving use. To meet this demand, we developed a system in 1995 to calculate electric power through the digital processing of digitized voltage and current signals. This enabled us to satisfy newly created needs for gauging the efficiency of inverters and motors required for developing such products as high-profile electric and hybrid vehicles. The development of electronic circuits for those measurement needs led us to foray into the LSI tester market in 1984 and then into the high-frequency measuring instrument sector on a full scale in 1988.

Innovation in Controllers & Automation

In 1933 and thereafter, Yokogawa continued the development of aircraft instruments and flow, temperature and pressure controllers. About 15 years later in 1948, in-house discussion went on to set the future direction for industrial instruments amid increasing projections that chemical and other processing industries should grow remarkably in the years ahead. We concluded that we should strive to develop new competitive systems by ourselves rather than modeling on the products of our US peers. Based on this, we turned attention to electric instruments. At that time in Japan, electric instruments were seen as difficult or even impossible to develop, although such instruments work speedily and precisely. But we developed an electric industrial recorder in 1950 for the first time in Japan, making us the target of industry attention.

Further, an executive of our company, who visited the United States for three months from December 1950 until February the following year, reported upon returning home that industrial instruments were rapidly changing from mechanical to electric types. The report firmly convinced us that the first development of electric instruments in Japan was in line with a global trend. This gave us strong self-confidence that served as the driving force of our further technological advancement, resulting in the widespread automation of Japanese industry.

CHART 1

Corporate History

1915	Tamisuke Yokogawa, doctor of architectural engineering, establishes electric meter research institute in Shibuya, Tokyo, with Ichiro Yokogawa & Shin Aoki
1917	Produces & sells electric meters for the first time in Japan
1920	Incorporated as Yokogawa Electric Works Ltd.
1933	Starts research & manufacture of aircraft instruments & flow/temperature/pressure controllers
1948	Makes public offering of company stock
1950	Develops Japan's first electronic recorder
1955	Signs technical assistance agreement for industrial instruments with Foxboro, United States
1957	Establishes Yokogawa Electric Works, Inc. as North American sales office
1974	Establishes Yokogawa Electric Singapore Pte. Ltd. to run Singapore plant Establishes Yokogawa Electric (Europe) B.V. as European sales office
1975	Releases CENTUM, the world's first distributed process control system
1983	Forms Yokogawa Hokushin Electric Corp. through merger with Hokushin Electric Works, Ltd.
1984	Releases Model 3520 Analog LSI Test System, entering IC tester field
1986	Establishes Xiyi Yokogawa Co., Ltd. in Xian, China, jointly with Xian Instrument Factory Company name changed to Yokogawa Electric Corporation to further establish corporate identity
1988	Enters high-frequency measuring instrument business
1990	Establishes Yokogawa Middle East E.C. in Bahrain
1996	Releases Confocal Scanner, entering biotechnology business
1997	Announces Enterprise Technology Solutions business concept
2000	Announces new VISION-21 & ACTION-21 corporate strategy Releases magnetoencephalographic system
2001	Releases the world's first 40Gbps optical communication module, entering next-generation optical fiber communication field
2002	Acquires 100% of Ando Electric stock
2004	Develops 40Gbps optical packet switch, entering optical communication business Fully integrates Ando Electric's business
2005	Establishes Yokogawa Electric International Pte. Ltd. in Singapore to oversee global industrial automation business
2006	Second Milestone of VISION-21 & ACTION-21 corporate strategy announced

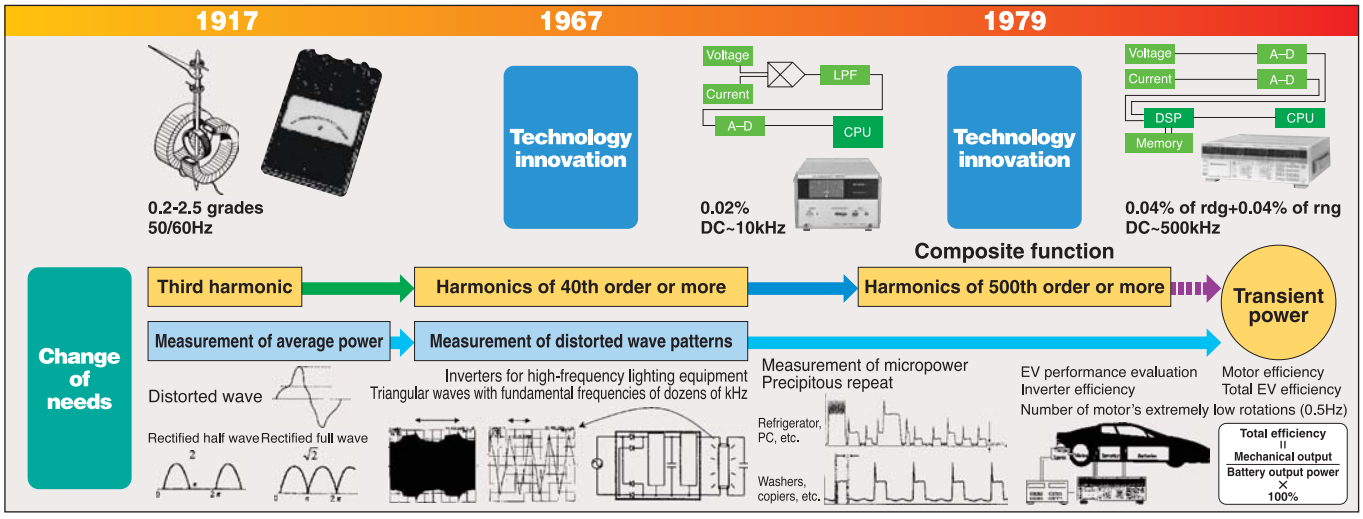
Source: http://www.yokogawa.com/

Technical Alliance

Despite the development of our electric industrial instruments, Yokogawa did not have much experience in the area of applications. To secure market share in Japan amid mounting competition, we judged it necessary to form technical partnerships with US companies, thereby taking in cutting-edge technologies.

CHART 2

Technology innovation in power meters



Sources: Modified by author from "New Industry Creation Strategy" by Fumio Kodama & Kiminori Genba, 2000; "The Case Study on Technological Lock-in & Unlock in Power Measurement" by Masahito Takagi, Technology & Economy, pp. 10-13, Vol. 396, February 2000

In August 1953, two executives visited Foxboro Co., one of the Big Four US industrial instrument suppliers, and proposed a technical alliance. Two years later, in 1955, we signed a 10-year technical assistance agreement for industrial instruments with the Massachusetts company. Referring to why Foxboro selected Yokogawa as its business partner, President Lex Bristol later said Yokogawa, unlike other Japanese companies, clearly says "yes" or "no" on the spot. During the 10-year period, we absorbed techniques and application know-how as much as possible from Foxboro. Steady efforts we made helped improve our technologies and manufacturing methods significantly, going a long way to our growth later. "Had we not entered into either a technical partnership or the industrial instrument area, we would have got ourselves into a mess," said a former executive. "That's terrible, in hindsight."

The technical alliance later played a significant role in spurring the automation of Japanese industry as a whole. It not just helped automate the processing industry but also enabled corporations to manage their administrative organizations under comprehensive, well-planned programs with more flexibility and to streamline management. Automation may not be called innovative production technology in some aspects, but it can be regarded as innovation as a whole along with nuclear power generation and synthetic technologies. It would be safe to say Yokogawa thus contributed to innovation in Japan as a prime mover through the popularization of electric industrial instruments. This technology enabled us to release the world's first distributed process control system in 1975.

Joint Ventures

The establishment of two joint-venture companies can also be viewed as an example of open innovation that has contributed to our sustained development. Yokogawa-Hewlett-Packard Co. (YHP) (currently Hewlett-Packard Japan Ltd. and Agilent Technologies Japan Ltd.) and Yokogawa Medical Systems Ltd. (YMS) (currently GE Healthcare Japan Corp.) were set up in joint ventures with Hewlett-Packard Co. (HP) and General Electric Co. (GE), both of the United States, though ownerships of these businesses have now been transferred to HP and GE, respectively.

In 1961, a Yokogawa executive visited HP and proposed a technical linkup to introduce technologies for high-frequency measuring instruments. At that time, HP supplied its proprietary technologies only to its wholly owned subsidiaries, thus initially snarling negotiations. But our untiring efforts coupled with the help of a mediator resulted in the establishment of YHP in April 1963. It is difficult for Yokogawa alone to develop measuring instruments, an area where technological progress is rapid, deep and widespread. The joint partnership enabled YHP to obtain high-frequency instrument technologies both from Yokogawa and HP while Yokogawa focused on general measuring instruments, thus permitting efficient division of labor and cooperation.

In medical electronics, GE was looking for a Japanese partner to sell in Japan an X-ray CT system it commercialized in 1976. Meanwhile, Yokogawa was considering branching out into the medical equipment market in a bid to surmount the aftermath of the first oil crisis. Yokogawa was the 30th Japanese firm to offer partnership, but it speedily signed a sales agreement with GE in October of that year as the US electrical giant highly valued our technical development and servicing capabilities as well as the successful operation of YHP. The two partners maintained good working relationship. In the 1980s, sales competition intensified in Japan, prompting GE to propose a joint venture with Yokogawa. As a result, YMS was founded in April 1982.

Conclusion

The above is a brief sketch of some undertakings regarding open innovation focused on our corporate history. In Japan, the period a corporation can enjoy prosperity, or the life of a corporation, used to be said to be 30 years. When looking back at the history of our company that greets the 95th anniversary this year, I found open innovation to have greatly contributed to our sustained advancement. Even today, we are pushing forward a variety of alliances with universities, national research institutions and forward-thinking customers. With the life of a corporation said to have been shortened to less than 10 years nowadays, we need to respond quickly to changes in the business climate to ensure technical innovation. The handover of innovative DNA from one generation to another remains the key to sustainable development. JS

Note: The names of companies and products mentioned here are their registered trademarks.

Masahito Takagi is general manager, Corporate Liaison Office, and concurrently deputy general manager, Technical Strategy Department, Corporate Research & Development Headquarters, Yokogawa Electric Corp.