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Desalination—A Tide Eye to mix tremendous world cultures in forecasting future

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ABSTRACT

The paper introduces "A Tide Eye" which is the title of a recently published novel by one of the authors mentioned above. The story describes aspects of an R&D project on desalination in Japan and the works of several people who participated in the project, including the author. Then, it extends to review tremendous aspects in respective culture to applying achievements of science and technology, and forecasts the future of the world. The paper goes on to examine the role that cultural diversity plays in various applications of scientific advancement and how this in turn shapes the future.

Keywords: Desalination; R&D Project; Civilization; Culture; Tide Eye

1. Introduction

Initially, the paper narrates a novel entitled "A Tide Eye" which has recently been written by an author [1]. The story is collaborated with Japanese state of arts in desalination activities and extends to discuss tremendous world culture to accept science and technology (Fig. 1).

2. Formation of A Tide Eye in Japan

One of the authors, Shigeki Toyama (pen name: Issac Yoyogi) recently published a novel entitled "A Tide Eye—Dramas in R&D of Fresh Water from the Sea" (1) which describes various phases in Japanese R&D projects on desalination. The content is composed of the following four Sections, including eight Dramas.

〈*Section* 1 There was still A Tide Eye around the defeated nation〉

(Drama 1) Yoyogi-Hatsudai in December 1945.

In August 1945, Japan was defeated in World War II and the National Chemical Laboratory (NCL) stood in the ruins of Yoyogi-Hatsudai, Tokyo, and looked for a new task for the defeated nation. Then, NCL found A Tide Eye around the defeated land which might provide infinite resources.

In those days, Seiichi Tomisaka graduated from Tokyo Imperial University, where he studied magnetite from sea water. He then decided to work at NCL

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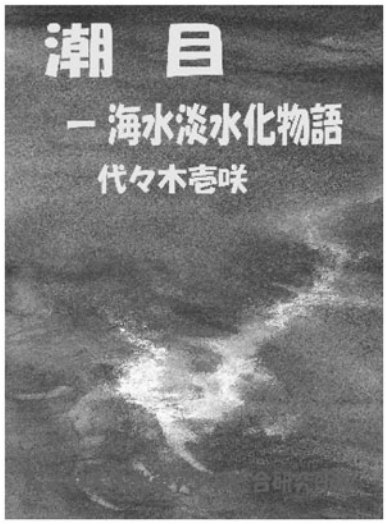

Fig. 1. The cover of book "A Tide Eye".

(Drama 2) Plant Tests in Sakata.

The NCL project to utilize sea water was launched in 1950 and test plants were constructed at a corner of a soda factory in Sakata. Masayuki Yanagisawa participated in the last stage of the project. He studied mechanical engineering at Nagoya University and was interested in control and systems engineering.

(Drama 3) Achievements and Evaluation of the R&D Project.

The project was accomplished its task but it was evaluated harshly. The established process could not be applied, since other methods demonstrated better results.

〈*Section* 2 Fountain headspring and rushing stream of science and technology〉

After the project, Tomisaka was dispatched to Washington as a science attaché from 1958 for five years and Yanagisawa was abroad to Minnesota as an oversea researcher in 1960 for one year.

(Drama 4) Science Attaché in Washington.

During his five-year stay in Washington, Tomisaka worked as a diplomat other than chemist. In those days, he had a lot of opportunities to observe the American way of R&D and others. Outstanding American projects were the space development of NASA and the utilization of nuclear science for peace.

In 1961, UJNR (US-Japan Conference on Natural Resources) was established to enhance communication between US and Japan. "Desalination" was selected to be a panel for the specialists, and Tomisaka was appointed to be the head of panel specialists for the Japanese side.

(Drama 5) Oversea Researcher in Minnesota.

Yanagisawa had studied at the University of Minnesota and spent almost all of his time in front of a computer which was a precious opportunity. He stayed only one year, but encountered a lot of valuable experiences. Roommates there brought a fountain spring of European science such as from Goettingen (Mecca of Fluid dynamics), Glasgow (Cage of thermo dynamics), and Paris (Drill Hale for Mathematician). Yanagisawa saw a rushing stream of science and technology formed by the confluence of that European headspring to realize American dreams to disclose desires.

Yanagisawa became acquainted with Muhammad Salah, an Egyptian scientist holding a ph D from Glasgow, as a roommate in the University of Minnesota and Shoko Kikuta who was a Japanese student, the daughter of the Shinto priest of Atsuta Shrine.

〈*Section* 3 Rushing stream floods into ocean and forms A Tide Eye〉

(Drama 6) Rapid Growth and the Golden 1960s of the Ministry of International Trade and Industries.

The US-Japan Security Treaty was negotiated at a time of political turbulence by the Kishi cabinet in 1960. The next prime minister, Ikeda campaigned using the catch phrase "Doubling Income" which was supported by the rapid economic growth. When he visited America, newspapers referred to him as a transistor radio salesman. The report stated that the principle of transistors had been established in the US and that Japan imitated the technology without any fundamental research.

JF Kennedy took the US Presidency in January 1961 after Eisenhower. His catch phrase in the election campaign was "(1960s golden) Golden Sixties," but this was similar to the mood in Japan. The gross national product of Japan, GNP grew 4.5-fold in the 1960s and the annual growth rate was 16% on average. It was attributed to hard work, Americanized consumption attitudes, the strong savings rate, active capital investment, high one level of education, and so on. Besides, it cannot be overlooked that a role of the Ministry of International Trade and Industry (MITI) in the government during this time.

The rapid growth of Japan created a great market for developed western countries. It was presumed that if western products were imported, they might destroy fragile Japanese industries. However, MITI had prepared the greenhouse to protect fragile Japanese industries. This was against the value of free-market capitalism. The term "Notorious MITI" was born in developed countries. Another term was "mimic monkey ignorant of science." Under these circumstances, Yanagisawa Masayuki came back to NCL.

(Drama 7) Accomplishments of National Projects in cooperation with the Government, Universities, and Industry.

There were various diplomatic missions between the two countries such as the US-Japan Security Treaty and Japan-US fiber negotiations. In those days, the Japan-US trade economy joint committee was organized to interexchange specialists at the government level for the benefit of the two countries, and various Japan-US scientific committees were started from 1961. Tomisaka Seiichi managed the panel "Desalination" since he was the science attaché in Washington. He changed the panel name to "Fresh Water from the Sea and the By-products" and appointed Yanagisawa to be the secretary. On the American side, Dr Giram, the director of OSW (Office of Saline Water) was nominated to be the representative, and both experts participated. The panel held a meeting alternately every year in Japan and the United States to exchange information. Hence, NCL was able to be the center of Japan.

The large-scale engineering research and development project managed by the MITI was started from 1966, and seawater conversion was selected to be one of the projects.

The project comprised of five subjects. The followings were their themes and nominated companies in parenthesis.

- Design production and test of the high-speed long-pipe type multistage flash evaporator (SASAKURA ENGINEERING CO., LTD).
- Prevention for scale formation (Hitachi, Ltd).
- A heat transfer pipe loop test (MITSUBISHI HEAVY INDUSTRIES, LTD, CHIYODA CORPORATION and JGC CORPORATION).
- Concrete multistage flash evaporator (KAJIMA CORPORATION).
- Byproduct from the brine (ASAHI GLASS CO., LTD).

It was decided to conduct fundamental researches in NCL to backup contracted subjects by companies. Followings were their themes.

- Studies on decrease the non-equilibrium temperature in flash evaporation.
- Elucidation of the flash vaporization mechanism.
- Studies on mechanism of condensing heat transfer.
- Studies on corrosion of the heat transfer tube at the environmental condition.
- Studies on protecting scale formation.
- Durability test of concrete in hot sea water brine.
- Refinement of byproduct.

Their FERT diagram is shown in Fig. 2.

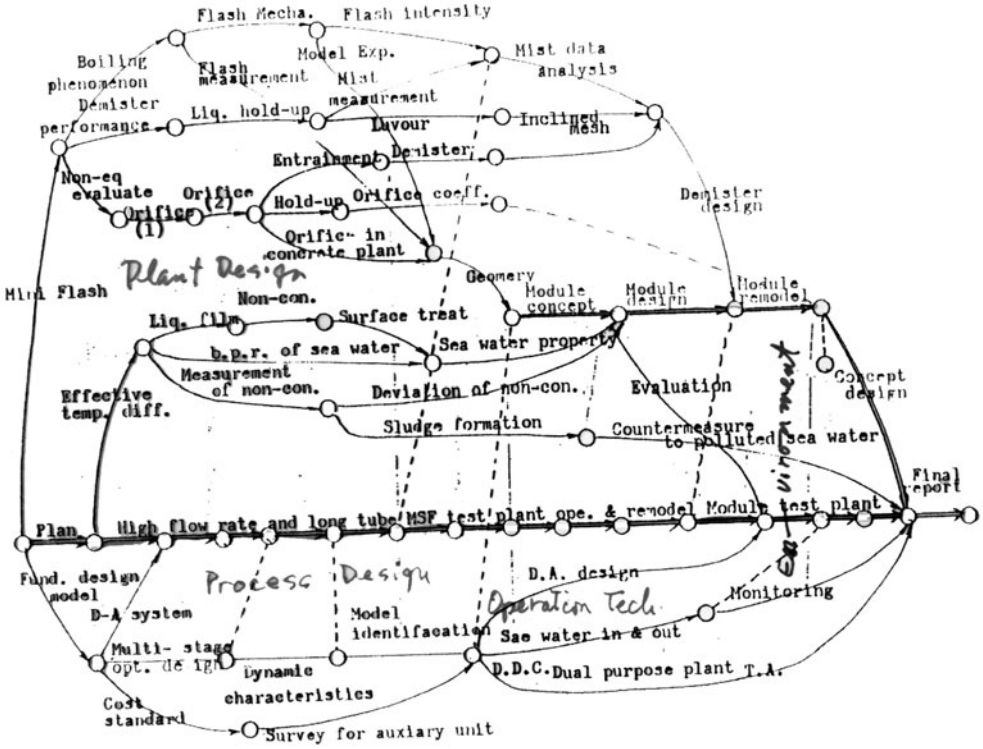

Fig. 2. PERT diagram of the national project on desalination in cooperation with the Government, University, and Industry.

〈*Section* 4 Water demand in desert brings tide eyes of culture〉

(Drama 8) Hit and out of national targets for 10 years.

Industrial structure to support mass production and mass consumption in the golden age of MITI was shifted to a knowledge-intensive type in 1970s. The oil crisis took place in those days. Crude oil of one barrel of 2–4 dollars rose with 10–12 dollars inward in an instant. It casts a long shadow on seawater water conversion cost. Thus, the reverse osmotic membrane method caught up with the evaporation method. Large evaporations were usually so designed to combine with a big nuclear plant to be able to supply low-temperature steam exhaust from turbine as the energy source. However, presumed power plant was actually decided to construct in Fukushima far from Tokyo which was too far to bring water.

(Drama 9) A Tide Eye around respective cultures and science.

A solar heat seawater conversion system proposed by Yanagisawa Hasahiko was noticed by the UAE and he was invited there by the Ministry of Power and Water. Then, he visited Abu Dhabi, where he met a couple who were acquainted when Yanagisawa had studied in the United States. It was a surprise for Yanagisawa that they had been married. Hassan Salah was an Egyptian Islamite and Kikuta Shoko was the daughter of the Shinto Shrine priest. Regardless of Yamagisawa's surprise, Shoko told him.

"I recall you said that a fountain spring of science was born in Europe and it converted to the Rushing stream of technology in the United States."

Yanagisawa was delighted that Shoko had remembered such a thing and said.

"The rushing flows are now in the ocean and forms A Tide Eye. Japan has operated the tide in Pacific and extended to Asia and the here the Middle East."

Shoko replied.

> Some people say Islamite are contradictory to democracy but I can not agree. When prophet Muhammad propagated in Arab, he preached the doctrine of Islam coincided with the essence of democracy. Some Christian people think their culture is always superior to others, but it attributed to their misunderstanding obstinacy and ignorance of Islam. We should notice that there is no standard democracy in this world. For example, the democracy of America is formed on the Christian sense of values, and the democracy born in Egypt is based on a way of thinking and the culture of the Islam. I and Sarah, my husband, let the two sense of values coexist and spend it recognizing it well. Even "Duality existentialism" can explain even "Cosmic dual and Five natural elements combination theory" in the same way.

3. Succession of achievements in the national project

Water Reuse Promotion Center (WRPC) was established to success achievements of the national project in 1978. The principal task is composed of following four items (2–4) [2,3].

(1) Seawater desalination.
(2) Wastewater treatment & reuse.
(3) Rationalization of water use.
(4) Overseas technical support & international exchange program.

Regarding seawater desalination, WRPC succeeded the management of Chigasaki test facilities where various test plants were operated for the national project by MITI until 1978.

Followings were their major items:

(1) Reverse osmosis.
    (a) Fundamental test (1974–1982).
    (b) Test plant 800 ton/day (1978–1985).
    (c) Counter measure to contaminated water.
(2) Freezing process.
    (a) Test plant 10 ton/day (1980–1984).
(3) Pervaporation (1985–1988).

In these days, desalination plant constructions and their locations were surveyed (24) [4]. Fig. 3 is one of the graphs, which indicates three tendencies.

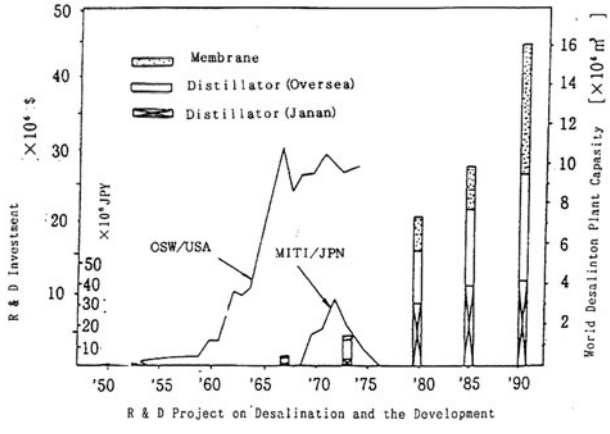

Fig. 3. R&D investment and world desalination plant capacity.

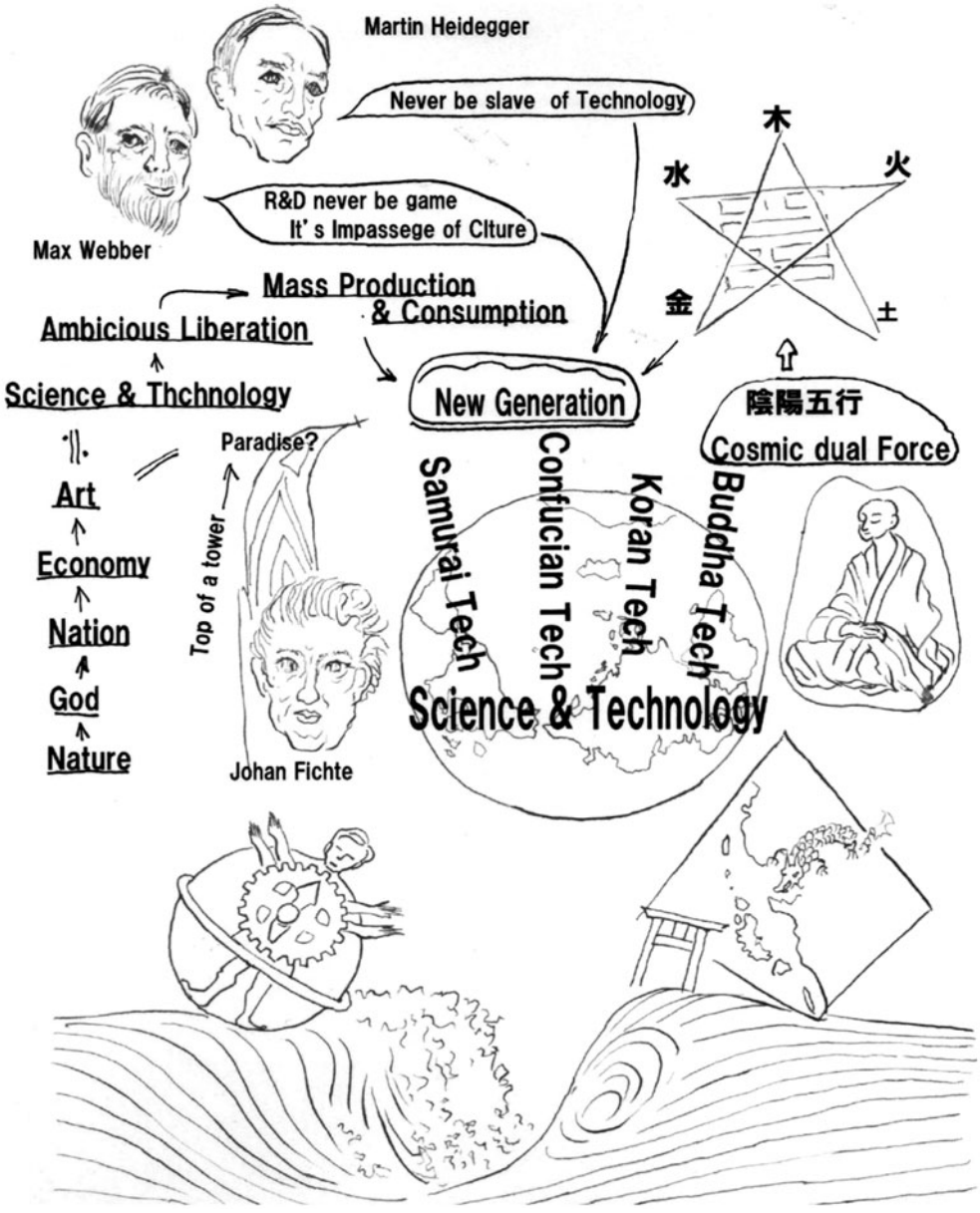

Fig. 4. Water is an element of human culture.

(1) Demand for seawater conversion had been created in the Gulf. It was corresponded to the ever demand along Tokyo Bay.
(2) It also became obvious that the achievement of National Project on desalination contributed on the big share in worldwide plant construction.
(3) Membrane process had been turned up as the next generation technology which may attribute the test of WRPC in Chigasaki.

4. Future trend of science & technology in harmonizing in tremendous cultures

Mind of science and technology would be originated in revolution of Christianity by the Renaissance in Europe. Subsequently, it became the world that politics influenced by liberation from God. Johan Fichte (1762–1814), German philosopher, gave a speech at the end of Prussia–Franco war ended. There, he defined

five stages in human history. Namely, they were controlled by nature, god, politics, economics, and art, and now we entered in the stage of politics and soon the age of economy would come. The final stage art would be postulated to be paradise for those people who pray under the high ceiling of a church as shown in left side of Fig. 4.

On the other hand, oriental people who pray in front of a wall without higher ceiling could not find a way straight forward to paradise but turn around way as shown in upper right of Fig. 4. Namely, they are cosmic dual force and five natural elements such as fire, water, wood, gold, and soil.

If history of human culture is accounted to be 5,000 years, that of scientific technology will be only 1/10 and now accounting tremendous culture in the world. Then, various technologies will be created such as Samurai, Confucius, Buddha, Koran etc., other than science & technology by Christian as shown in central part of Fig. 4.

How do these varieties of technologies get harmony with variety of culture? There will be various answers. If art, fifth final stage of Fichte, is substituted to science and technology, it will be able to discuss a paradise as the present status. "Science" is introduced in Section 2 of "A Tide Eye" that it would be fountain headsprings in Europe and grew up to rushing springs in America. Then, mass production has been widely spread and lifestyle of mass consumption pervaded.

The five stages of Fichte are presumed to be straight forward to paradise above a tall tower of church.

On the other hand, orient idea imagines nothing in front of a closed wall and results in conceiving a circle of cosmic dual force. Now, science and technology has spread all over the world and fused to respective culture and has been going to create Buddha technology, Koran technology, Confucian technology, Samurai Technology, and so on.

Recall here the word of Martin Heidegger (1889–1979) that never forgets that technology is just a method and never be slave of it. Max Webber (1864–1920) also warned that it would be the impasse of culture if technology R&D turns to just a game. Various culture draw respective paradise. For example, these technologies, such as saving, safety, durability, the global environment, and so on, would create the next new generation in connection with respective cultures.

5. Conclusion

"Desalination" is a technique to give us water. The water is the material which is indispensable for survival. Let us think about what science and technology for human being is. It becomes obvious that water technology is a principal element of human culture and a pioneer of the next generation.

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