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Report on the 24th Annual Meeting

Research Presentation and Planning Committee Chair　Katsunori Shimizu

We are pleased to report that the 24th Annual Meeting of the Deep Ocean Water Applications Society for FY2020 was held on October 29, 2020 (Thursday).

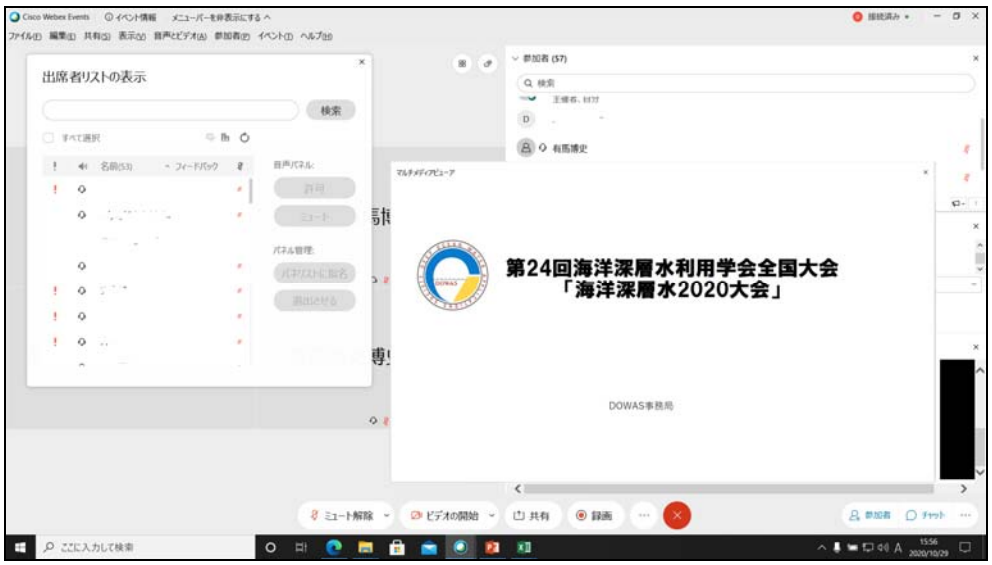
This year, unlike previous years, the event was held using a web conferencing system, which was the first attempt for this meeting with the aim of preventing the spread of the novel corona virus.

There was a total of 75 participants, with 65 members, 6 non-members, and 4 students joining. The number of participants from overseas was 1 from Taiwan and 1 from Malaysia.

Regarding the number of research presenters, 19 general research presentations and 1 poster presentation were submitted by the Utilization Promotion Committee for a total of 20 submissions. We were able to receive two presentations from Taiwan and one from South Korea due to the academic society exchange between Japan, Taiwan, and South Korea. Regarding the themes of presentations, in addition to the research results on the utilization of deep ocean water, there was also a report on the relationship and possibility of utilization of deep ocean water for society with the novel corona virus, so the range of research presentations was very wide. In addition, the presentation time was 15 minutes (conventional presentation time +2-3 minutes) and questions were handled by email afterward. I personally evaluate that overall, it went smoothly.

In holding the meeting online, we asked presenters to take on the challenge of recording. In addition, the new chairman recorded the opening remarks and the new vice-chairman recorded the closing remarks. The society secretariat (Saga University) was in charge of broadcasting on the web.　As the organizer, I would like to express my gratitude and thank you for including my remarks here.

＊Log in Page



＊Web Conferencing View

First Movements in Deep Ocean Water Resource Utilization in China

Kochi University/University of Tokyo, Professor Emeritus Masayuki Takahashi

It seems that interest in the use of deep ocean water resources is increasing in the People's Republic of China (China) as well. The first was related to Ocean Thermal Energy Conversion (OTEC), with the first OTEC-related patent application filed in 1987, and a considerable number of applications have been filed since 2002(Nippon Technical Trading Co. https://www.ngb.co.jp/ip_articles/detail/994.html). Also, on April 13, 2013, Lockheed Martin of the United States and Reignwood Group of Chinese investment companies announced a joint development plan for a 10,000kW offshore OTEC power generation facility offshore in territorial waters of China (off Hainan Island?) in the presence of John Kerry, then US Secretary of State in Beijing. Unfortunately, we haven't heard of further progress on this plan.

In 2017, the "China Deep Ocean Energy Conference 2017" was held in Kaiguchi City, the capital of Hainan Island, where an overview of world research and technological development on OTEC (by Zhong Petroleum and Petroleum Engineering) and the basic route of China's OTEC development (Zhonghai Oil Research Institute), OTEC Technology (National First Ocean Research Institute), Offshore OTEC Floating Body Design (Beijing High Density Deep Sea Technology Co.), etc. There were also several presentations on the utilization of deep ocean water including national research and private institutions that shows OTEC technological development is underway at multiple locations. In addition, the International Deep Ocean Water Subcommittee was established for the first time at this conference. See the DOWAS Newsletter (Volume 20, Issue 2, 2017) for more information. This subcommittee was organized by the State Oceanic Administration Tianjin Seawater Desalination Research Institute and Hainan Provincial Renewable Energy and Environmental Technology Research Institute. At the subcommittee, Professor Choi Susumu of Kunming Medical University in China presented the results of several years of research in the medical field using deep ocean water taken off the coast of Hainan Island. The two research Institutes that organized the subcommittee seem to have considered more active utilization by pumping deep sweater from off Hainan Island, which is deeper than 200m and in China's territorial waters. Unfortunately, the cost of laying an intake pipe was found to be prohibitive as the continental shelf drop off is nearly 100km from Hainan Island. Nevertheless, it is possible that research using deep ocean water taken offshore of Hainan is ongoing.

More recently, studies on utilization of deep ocean water have begun in Sanya City on the southern tip of Hainan Island. The reason I learned of this was an email from Professor Xiaolong, who belongs to the State Key laboratories for Ocean Engineering, Department of Ship Engineering, Shanghai Jiao Tong University in June 2019. Professor Xiao asked me to give a lecture on Deep Ocean Water at Shanghai Jiao Tong University, and I visited China from Monday, July 22nd to Friday, July 26th. I summarized the basics and application of deep ocean water in six lectures and prepared easy-to-understand lecture materials.

On the morning of the 23rd, the day after arriving in Shanghai, when I was guided to the meeting room of the State Key Laboratories for Ocean Engineering, there were about 20 professors, associate professors, assistant professors, researchers, and graduate students, including Professor Yanagiken. Then, I immediately started the lecture on deep ocean water that I had prepared. The slides are written in English and the lecture was in English. I finished 4 lectures in the morning and afternoon of the first day, 2 lectures in the morning of the next day, and

we talked about the whole of deep ocean water in the afternoon. As three new government officials from Sanya City participated in the overall story, the associate professor translated the content spoken in English into Chinese. According to what I heard, the construction of a new ocean industrial city is currently underway in Sanya City, and the use of deep ocean water resources is one of the targets with the Department of Ship Engineering of Shanghai Jiao Tong University in charge of overall planning.

About two months after the lecture, Professor Xiao sent another email and asked me to give a lecture and a site visit for people who are interested in deep seawater in Sanya City. From October 21st to 26th I went for about six days. The planned new industrial city site is 26.1km2 on the western outskirts of Sanya City, most of which has been vacant, and construction work on buildings has already begun near the sea (Figure 1). Also, near the sea on the east side of the planned site, a hands-on maritime museum will be completed and opened, and in the immediate vicinity you can hold lectures and conferences on the new city in a 9-story incubation building with offices and hotel.

The new ocean industrial city concept has been published as "Instructions on the Development and Liberalization of Hainan"(Central Committee 12 Document) at the time of the April 13, 2018 Sanya City visit as a national project aiming at economic development of Sanya region, enhancement as a free trade advanced area of Hainan Province, and a free trade port with the characteristics of China over the next 17 years from 2018 to 2035.

For this reason, Sanya City is proceeding with the secretariat's plan to establish new facilities. The plan stipulates the enhancement of a series of ocean industries such as fishing, aquaculture, shipbuilding, and ocean transportation with a view to business, and it seems the utilization of deep ocean water is also being considered. It seems that Universities in the new industrial city such as Shanghai Jiao Tong University (utilization of deep ocean water), Zhejiang University (development of new materials used in the ocean), Wuhan University of Technology (underwater optics), Ocean University of China (fishing, culture) will secure a campus in the district and proceed with research, and at the same time, promote student education for graduate students and commercialization in collaboration with companies. In Sanya city, there is a provincial Hainan South China Sea Institute of Tropical Ocean (HITO), where research on coral etc. is being promoted.

As mentioned earlier, the continental shelf drop off is about 100km off the coast of Sanya City, and beyond that there is a steep cliff from a depth of 200m. Therefore, there are three possible cases for the utilization of deep ocean water in Sanya City. (1) Install a deep seawater storage tank near the port to carry and store deep ocean water, (2) lay an intake pipe of appropriate thickness to pump deep ocean water to land, and (3) use deep ocean water offshore. In (1) and (2), the amount of deep ocean water is limited and the cold energy, which is one of the resources of deep ocean water cannot be used. Rather than choosing one of these cases, it seems better to devise the utilization of deep ocean water in the order of 1-3.

From December 16th-20th a total of 11 people, including Professor Yang and Professor Jianmin from Shanghai Jiao Tong University, 3 from Sanya city, and 4 from private companies visited Japan for a tour of industrial facilities, and we visited facilities in Kumejima and Muroto, and talked with local people.

In the near future, it is expected that deep ocean water resource utilization plan will be created in Sanya city, and we eagerly await that content.

Figure 1. A construction site for a new marine industrial city in the suburbs of Sanya City, Hainan Province. Taken from the 9th floor of the incubation building with sea on the left. University Campuses such as Shanghai Jiao Tong University are on the other side of the forest on the left. Construction work on shanghai Jiao Tong University is scheduled for 2020.

Report on 2019 Visit to Deep Ocean Water Utilization Companies and Facilities in Taiwan

Tokyo University of Marine Science and Technology Chiaki Imada

On November 29, 2019, I provided a keynote speech entitled "Isolation and Characterization of Useful Microorganisms from Marine Environment and Application to the Industry- Treasure Hunting from Deep-seawater (DSW)"at National Taiwan Ocean University in Keelung City, Taiwan. The details of this society were reported in the previous issue by Kyoko Washiashi, a member of this society, so I will omit it here. On November 30th, the day after the end of the conference, we moved to Hualien City, Taiwan with Dr. Masayuki Takahashi under the guidance of Dr. Ping-Yi Huang of the Stone & Resource Industry R&D Center. There we visited facilities related to deep ocean water and companies promoting industrial use, so I would like to report here.

First, we visited the deep ocean water intake facility at Hualien Factory. This is a deep ocean water intake facility operated by Taiwan Yes, a subsidiary of Taiwan Fertilizer Co., Ltd. Taiwan Fertilizer Co., Ltd. was established as a state-owned enterprise in 1946 and was privatized in 1999 and now sells fertilizers and chemical products. This water intake facility was completed in 2007 by Maeda Corporation of Japan and others. There is a pump pit for seawater intake, a management building, land piping equipment, etc. In the factory on the land part of the facility and on the sea part, high-density polyethylene pipes (HDPE pipes) are laid under the sea for three types of purposes form the shoreline of the coastline. The three types are: deep ocean water intake (depth about 400m), surface water intake (depth 20m) and a spare pipe (50m depth).

＊HDPE Pipe: A commemorative pipe autographed by the people of Maeda Corporation who laid it at that time.

Next, we visited D Park (Deep Ocean Water Industry Park) operated by Taiwan Yes. D park is developing a multi-use model of deep ocean water. There is a seaweed and shrimp farm, and an entertainment park with bottled water including functional deep ocean water, cosmetics, shops selling supplements and salt, a park, footbaths, and restaurants.

＊Shop Entrance (left photo) and various products using deep ocean water in the shop (right photo)

The above-mentioned farm is about 8 hectares and is a natural flow-type system that introduces energy-saving smart agricultural IoT jointly developed with Chunghwa Telecom Co. the largest telecommunications carrier in Taiwan (*Refer to the simple model photo). In addition, a solar panel for solar power generation is installed above the aquaculture tank, which is used in the farm for lighting and heating.

＊A model of natural flow multi-stage system (left photo) and a farm with a power generation panel (right photo)

After that, we visited an oyster farm that utilizes deep ocean water and tasted *Ostrea edulis*. They are developing virus-reduced oyster products by immersing them in deep ocean water for a period of time.

＊A type of itahogaki. The body is brown and the tase is strong (left photo) and Professor Takahashi tasting it (right photo).

Next, I visited the Kuang Long Museum of Kuang Long Enterprise Co. Ltd. This museum also has abundant exhibits with attractions that allow general visitors to enjoy learning about deep ocean water and develop products such as bottled drinking water, concentrates, alcoholic beverages, supplements, and cosmetics from deep ocean water. In addition, there is also a restaurant and on the day of the event, I met a group of Japanese junior high school students who were visiting the Museum on a school trip from a remote island in Okinawa Prefecture Japan. After that, we visited Higashi Junsui Resources Production Engineering Co. Ltd. A subsidiary

of Happiness Cement Co. Ltd. Happiness Cement Co. Ltd. was established in 1974 and has been manufacturing and selling cement, ash powder, limestone and sandstone. From 2005 to 2006, a construction company under its umbrella laid a deep ocean water intake pipe using HDPE pipes. The water intake depth is about 700m. Here they manufacture sorghum liquor using deep ocean water and we toured the storage facility. I'd like to be able to recommend trying it with its 58% alcohol content as the fragrance is good, the concept is unique and its very attractive, though I wasn't able to drink it. I had the impression of ongoing deep ocean water product development.

What impressed me when I visited D Park and the Kuang Long Museum was that it was an entertainment facility where even ordinary customers could learn about deep ocean water and actually touch it. Also, I was very surprised and learned a lot from the fact that private companies that are not public or state-owned are planning, constructing, and operating large-scale facilities and actively working on the utilization of deep ocean water.

Taiwan has sought and promoted cooperation and alliances with the world-leading Japanese industry to foster the deep ocean water industry. In addition, the Taiwanese government and the private sector are jointly considering the expansion of business by exporting to China and utilizing Japanese know-how in research and development and product development to grow a new industry to support the Taiwanese economy. However, the difficulty of a water intake facility continues and where it cannot be repaired and achieve stable supply of water. Currently only facilities operated by Taiwan Fertilizer are able to take in water, so the price of raw water remains high and research and product development cannot be promoted as expected.

In the future, I sincerely hope that such water intake trouble will be improved, and that such a strong driving force of the private sector, research, and academic world will cooperate to develop the utilization of deep ocean water in Taiwan.