22.The Study of Engineering Technology on Intake of Deep Ocean Water

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1. Introduction

The development of deep ocean water (DOW) industry in Taiwan has been about ten years. Currently in civilian sector there are three companies in Hwalian County. In particular, The Taiwan Deep Ocean Water Company belonging to The Taiwan Fertilizer Company is one of the more successful. In government aspect, The Ministry of Economic Affairs and The Agricultural Commissioner have respectively set up facilities in the southern and the northern bank of Chiben River in Taitung County, referring to as *Eastern Deep Ocean Water Innovation R&D Center (EDOWIC)* and *The Source Bank of Marine Life*. However, these two facilities were encountered water intaking failure problem, resulting in a serious delay on DOW industry.

In order to assist on resolving the problem, the author has held meetings or conferences each year since 2012, gathering experts from government, university, and companies, foreign or domestic, to discuss the issues. However, the progress on fixing the intake of DOW pipe has been slow, and the problem has remained till now. The purpose of this study is to look for the possible solutions or alternatives for the DOW supply for the two facilities established in Taitung County area.

2. The Cause of Failure of the DOW Pipe

About the cause of the failure of the DOW intake pipes, through *in-situ* surveys using various underwater instrument, incorporated with the data analysis on seabed properties, earthquake, and climate information, the results have indicated that the failure of the DOW pipe was due to the instability of the seabed, causing landslide or collapse of the seabed triggered by typhoon or earthquake, and in turn rendering coverage of the water pipe or intake mouth by the seabed sediments. It is therefore considered as an inevitable failure due to the natural disasters.

This argument of DOW pipe failure may not be accepted without doubt. Even if the cause is due to natural disasters, one still has to question if the failure factors were completely unsolvable by engineering technology. For example, it is questionable on whether the selection of the pipe route has been based on the in-depth analysis of the data obtained from the seabed survey. Furthermore, it was understood beforehand that the pipes were lied on the seabed nearby the Chiben River mouth, the question is whether this factor was considered to be coped with and then in response to the design factors, including the choice of the pipe materials, special maritime design, as well as project manage- ment, etc. These are questions worth of pondering and serious consideration.

3. Plausible Fixing Approach on DOW Pipe

Though the DOW pipes were fail to intake the water, the image of ROV survey was shown that the pipe remains operable in the upper part till 300 meters. Since sea water at this depth is still valuable in use, it is therefore worth of considering if one may develop plausible approach to fix the pipe.

As an example, the Dragon Prince Hydro Survey Enterprise Cooperation in Kaohsiung, Taiwan has designed an ROV with mechanical arms which are capable of drilling holes on the water pipe on site to make the water running. Although this is not a long-term solution, it provides a quick and inexpensive way to an urgent solution.

4. Alternatives for DOW Intake

To guarantee a stable water supply, one has to consider the alternatives for water intake to cope with the emergent situation. To support industrial development, one has to have a stable water supply. However, for research purpose, we may use alternatives in case of necessary. For example, the Ministry of Economic Affairs has considered to design a floating intake facility to supply DOW for research purpose in EDOWIC.

5. Reconstruction, Relocation of DOW Pipe

The Ministry of Economic Affairs is now under assessment on whether to reconstruct the DOW pipe at the original site (with new routes), or to relocate to some other places. But in any case, we should continue the development as soon as possible so that the delay may be reduced to minimum. If relocation is the choice, one should consider the land base that is capable of industrial development.

6. Concluding Remarks

In summary, the DOW industry has been deterred by the failure of water intake problem, causing a great damage on the local economic development. Both the government and civilian sectors should work together to find the solution. We believe that DOW industry offers a great opportunity in local prosperity in the eastern part of Taiwan, and all efforts should be invested to make it true.