

A Basic Concept for Installing Cooling and Heating System Using Seawater Thermal Energy from the West Coast of Korea

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Abstract : As carbon dioxide emissions increase due to rapid industrialization and reckless development, abnormal climates such as floods and droughts are occurring. In order to respond to such climate change, the use of existing fossil fuels is reduced, and the proportion of eco-friendly renewable energy is gradually increasing. Korea is an energy resource-poor country that depends on imports for 93% of its total energy. As the global energy supply chain instability experienced due to the Russia-Ukraine crisis increases, countries around the world are resetting energy policies to minimize energy dependence and strengthen security. Seawater thermal energy is a renewable energy that replaces the existing air heat energy. It uses the characteristic of having a higher specific heat than air to cool and heat main spaces of buildings to increase heat transfer efficiency and minimize power consumption to generate electricity using fossil fuels, and Carbon dioxide emissions can be minimized. In addition, the effect on the marine environment is very small by using only the temperature characteristics of seawater in a limited way. K-water carried out a demonstration project of supplying cooling and heating energy to spaces such as the central control room and presentation room in the management building by acquiring the heat source of seawater circulated through the power plant's waterway by using the characteristics of the tidal power plant. Compared to the East Sea and the South Sea, the main system was designed in consideration of the large tidal difference, small temperature difference, and low-temperature characteristics, and its performance was verified through operation during the demonstration period. In addition, facility improvements were made for major deficiencies to strengthen monitoring functions, provide user convenience, and improve facility soundness. To spread these achievements, the basic concept was to expand the seawater heating and cooling system with a scale of 200 USRT at the Tidal Culture Center. With the operational experience of the demonstration system, it will be possible to establish an optimal seawater heat cooling and heating system suitable for the characteristics of the west coast ocean. Through this, it is possible to reduce operating costs by KRW 33,31 million per year compared to air heat, and through industry-university-research joint research, it is possible to localize major equipment and materials and develop key element technologies to revitalize the seawater heat business and to advance into overseas markets. The government's efforts are needed to expand the seawater heating and cooling system. Seawater thermal energy utilizes only the thermal energy of infinite seawater. Seawater thermal energy has less impact on the environment than river water thermal energy, except for environmental pollution factors such as bottom dredging, excavation, and sand or stone extraction. Therefore, it is necessary to increase the sense of speed in project promotion by innovatively simplifying unnecessary licensing/permission procedures. In addition, support should be provided to secure business feasibility by dramatically exempting the usage fee of public waters to actively encourage development in the private sector.

Keywords : seawater thermal energy, marine energy, tidal power plant, energy consumption

Conference Title : ICOTECA 2023 : International Conference on Ocean Thermal Energy Conversion Applications

Conference Location : Bali, Indonesia

Conference Dates : January 09-10, 2023