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Activities of the Core

Nov. 1, 2023	The 5th Geoseminar (organized by HU-ACE)
Nov. 22, 2023	The 110th Biomass Evening Seminar (co-organized by HU-ACE).
Nov. 24, 2023	The 85th HU-ACE Steering Committee Meeting
Nov. 25, 2023	The 6th Higashihiroshima-Ene/Eco Seminar (co-organized by HU-ACE)
Nov. 29, 2023	Our center received the Dean's Special Award of the Graduate School of Advanced Science and Engineering
Nov. 30, 2023-Feb. 8,2024	Lectures on Advanced Energy Plant.

Introduction of the Hiroshima University Biomass Premium Evening Seminar.

We would like to introduce the Hiroshima University Biomass Premium Evening Seminar, which is co-organized by HU-ACE. This seminar, which began in March 2021, is characterized by the fact that it is possible to give lectures and participate online four times a year (once every three months) even from far away, without the burden of traveling, due to the online meeting environment prepared in response to COVID-19. In addition, the purpose of the event is to contribute to the development of biomass by having leading experts in various fields related to biomass give lectures. The next lecture, the 12th in the series, will be given on Tuesday, December 19 by Dr. Seiichi Taguchi, a specially appointed professor at the Graduate School of Science, Technology and Innovation, Kobe University, who is an authority on bioplastic production research and will discuss in the lecture one of the biodegradable plastics that has been attracting attention in recent years. We welcome anyone sho is interested to join the seminar (please note that it will only be conducted in Japanese). The details can be found on the following webpage (http://i-aeu.sakura.ne.jp/231219premium/).

Moderator: Matsumura, the head of HU-ACE

The 11th lecture：Takuyuki Yoshioka
「The past and future of forestry mechanization in Japan」

Related Events

The 8th International Symposium on Fuels and Energy (ISFE2024) is scheduled on July 1-2, 2024.
Details will be announced later.

We have constructed a roadmap for the development of energy utilization technologies leading up to 2050 and an integration scenario called the “Hiroshima Scenario”. Please feel free to share your thoughts with us.
https://hu-ace.hiroshima-u.ac.jp/wp/wp-content/uploads/2022/10/220921-brochure.pdf

Research consultation and joint research are welcome.

Issued by Advanced Core for Energetics, Hiroshima University
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Research Topics

No. 46

Utilization of local heat sources “reservoir water” for heat pump systems

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Research fields: Architectural environment, Building equipment

Keywords: Energy conservation, Renewable heat, Heat pumps

Abstract

Background

Heat pumps are well known as an energy-saving technology for air conditioning, in which the efficiency is strongly influenced by the heat source temperature. Thermal energy in the ground or water is a possible heat source for heat pumps, whereas air is the most common at present, although the ground and water have much larger heat capacities than the air does. In particular, continuous use of the ground source leads to excess changes in the heat source temperature in some cases, which causes decline of the energy efficiency. On the other hand, water has a potential to improve the thermal diffusion owing to its natural convection. We therefore focus on the reservoir water around the *Setouchi* region, in which stable water levels are maintained for agriculture throughout a year (Fig.1).

Fig.1 A reservoir around Hiroshima University

Methods

We found that a reservoir 5 m deep near the campus had natural water temperatures of 15ºC at the bottom during summer, which were much lower than those in a GSHP system (Fig.2). This indicates that the reservoir source is a promising heat source for cooling, and suitable in cooling-dominant applications such as server rooms, different from the ground source used both for cooling and heating. We investigated a physical model based on the entrainment law to predict the influence of heat release into reservoirs in a previous study[1].

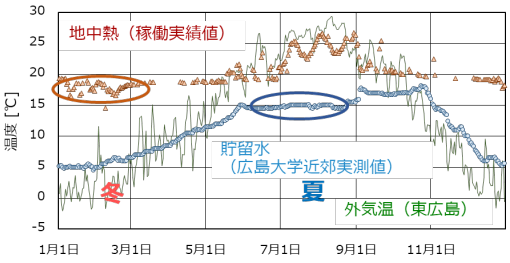

Fig.2 Annual temperature variations of reservoir water under natural condition and heat source water to GSHP

Results

Although the entrainment law was originally developed to represent seasonal changes in vertical water temperatures in a natural environment, we demonstrated the applicability of it to the evaluation of reservoir source heat pump systems through laboratory experiments (Fig.3). The use of the entrainment law may enable the simplified prediction of annual system performance without use of turbulent models such as CFD methods. In future works, we plan to apply this model to system simulation for heat pump systems.

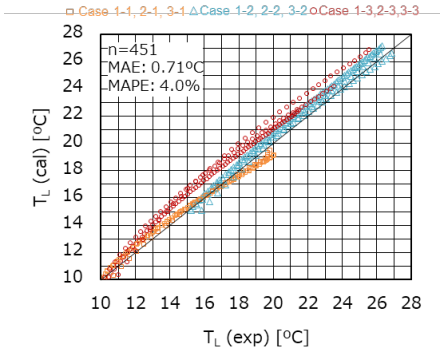

Fig.3 Validation of water temperatures predicted by entrainment law[1]

References

1) S. Kindaichi, K. Takehara, D. Nishina, Applied Thermal Engineering 185 (2021) 116428.