

# NS Ene-pile Ground Thermal Energy System

## 1. Introduction

At the Kyoto Protocol (COP3), Japan promised to reduce CO<sub>2</sub> emissions and other greenhouse gases. Nevertheless, public energy consumption life is still increasing. In particular some drastic measures must be taken urgently to save energy in office buildings.

Under such conditions, more attention is being paid to the Ground Source Heat Pump (GSHP) system as an energy saving measures. However, this system is not yet widespread because of the high cost of installation of ground heat exchangers. One possible solution to this problem is utilizing building foundation piles as the ground heat exchanger.

The NS Ene-Pile Ground Thermal Energy System utilizes the NS Eco-Piles, which are one kind of foundation piles with the rotating press-in method, as a ground heat exchanger. Here the “NS Ene-Pile” is used for the whole thermal energy utilization with the NS Eco-Piles.

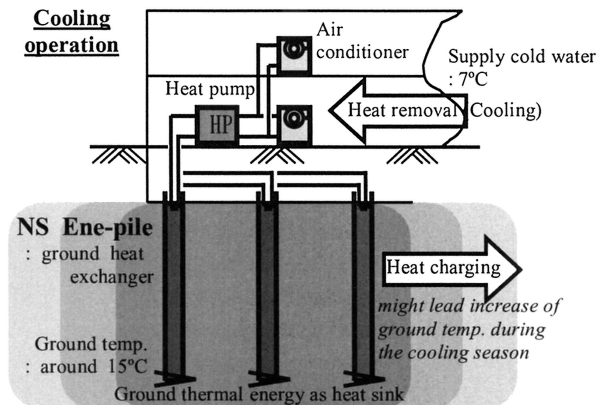
## 2. Conventional GSHP System

The GSHP is an efficient system because it uses ground thermal energy which is stable throughout the year as a heat source. This system also features high energy efficiency and low running costs, and is effective in reducing CO<sub>2</sub> emissions. Since underground temperatures are almost invariable throughout the year, the system can be used anywhere in the country, including cold regions. In addition, the ground heat exchanger is generally prepared by inserting a U-type resin tube at a depth of 50 to 100 m, to utilize the groundwater heat indirectly. Therefore, it is possible to use this system even in the areas where the utilization of groundwater is regulated. Furthermore, unlike air source heat pumps, this system does not emit waste heat into the open air. Therefore, it does not propagate the heat island phenomenon.

In spite of these favorable features, the use of the ground heat exchangers is not popular because of the economical concerns. The initial investment of such ground heat exchangers is high. This is due, in part, to the high cost of boring operations in Japan since it has unique geological features.

## 3. NS Ene-Pile Ground Thermal Energy System

By utilizing the hollow section of the NS Eco-Pile, it is possible to dramatically reduce the initial investment cost of such ground heat exchangers. It is also possible to install, at comparatively low cost, the NS Eco-Piles for only as heat exchangers. Furthermore, since the NS Ene-Pile permits ground excavation and building of an underground structure as a single process, it can be used to create an underground space in a short time and at a reasonable cost. These will eliminate the major factors in the conventional method that have prevented the spread of the GSHP systems. It is also possible to utilize ground thermal energy more effectively, by applying the NS Ene-Pile to the underground heat storage tank.



Note: Bore holes have been known as a typical ground heat exchanger so far, in which resinous U-tubes are put.

Fig. 1 A schematic diagram of the NS Ene-pile Ground Thermal Energy system

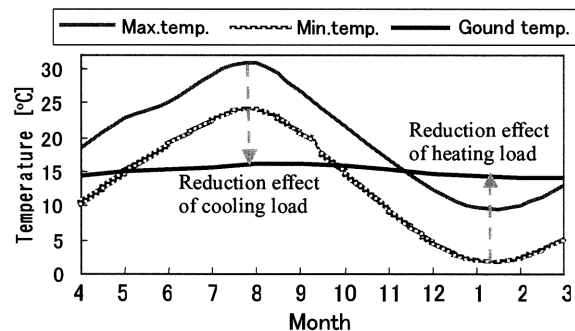


Fig. 2 Variations of outdoor air temperatures and ground temperature

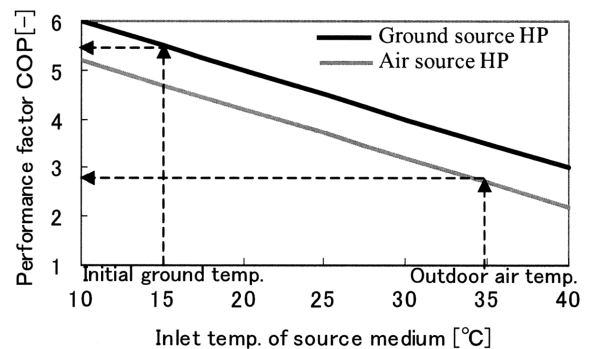


Fig. 3 Performance curves for cooling operation

( For further information, contact Building Construction Division )