Ground source heat pump systems and the environmental risks

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In recent years, ground source heat pump (GSHP) systems have rapidly developed all over the world as a highly promising renewable energy technology for indoor cooling and heating. The GSHP systems are classified into two types. One is a closed type which indirectly exchanges heat with subsurface environment by circulating heat carrying-fluid inside an installed high-density polyethylene U-tube of 50 m-150 m. The other one is an open type which directly exchanges heat by pumping up groundwater. Both closed and open systems discharge heat into the subsurface environment in case of indoor cooling operation, most likely resulting in subsurface temperature increase in the vicinity of the GSHP systems. The increase in subsurface temperature can trigger changes in physical, chemical, and microbial processes in the subsurface environment. However, the effect of temperature increase on subsurface environment has not been clarified sufficiently.

Our on-going research has investigated the effect of sub-surface temperature increase on groundwater quality and the result has revealed that temperature increase of up to 7°C triggered an increase in concentration of groundwater chemical components such as boron and arsenic[1]. In this paper, the current research status especially the environmental risks of GSHP systems operation for achieving sustainable usage is reviewed.

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References

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