

# NUMERICAL SIMULATION OF AIR-EARTH HEAT EXCHANGER WITH ROUND CROSS SECTION

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## **Aim**

Recently a lot of research on using heat potential of solid mass for heating and cooling buildings has been carried out. The necessity of research in this field is conditioned by the continuous growth of power consumption by society. One of the solution options for this problem is air-earth heat exchanger. The aim of this work is numerical simulation of U-shaped air-earth heat exchanger with round cross section and calculation validation with the help of experimental data.

## **Results of work**

In this work Ansys Fluent software was used for air flow investigation through P-shape pipe with round cross section placed inside of soil mass. Thermophysical model is based on assumption that soil mass properties used in calculation are isotropic and homogeneous, the temperature of soil mass depends on its depth, according to climate conditions. Calculation was based on set of equations of momentum conservation, energy, kinetic energy and dissipation rate, which characterizes heat exchange and aerodynamic process in air-earth heat exchanger.

Calculation was validated with the help of full scale experimental facility for investigation of thermophysical processes in the usage of geothermal ventilation systems, created at the Institute of engineering thermophysics NAS of Ukraine.

## **Summary**

Theoretical calculation and experimental research have shown that:

1. Although geothermal ventilation system alone does not maintain indoor thermal comfort it still reduces energy demands for air heating in ventilation in winter as well as its cooling in summer;
2. The daily average outdoor air temperature variations do not greatly influence air temperature at the outlet of air-earth heat exchanger.