



8th Central European Congress on Food

Food Science for Well-being  
23-26 May 2016, Kyiv, Ukraine



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- **Food Technologies**

ENERGY SYSTEMS FOR FOOD CHAIN

- **Energy Efficiency**
- **Machine Building for Food Chain**
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### **EFFICIENCY EVALUATION OF GEOTHERMAL HEAT PUMP SYSTEM ON LOW GWP REFRIGERANTS**

The increasing demand of energy sources for urban, household and industrial facilities requires strategies development for seeking new energy sources. A lot of attention is devoted to alternative energy sources and one of the most attracting among them is energy production form geothermal sources. Ground source heat pumps are a highly efficient renewable energy technology, which uses the earth, groundwater or surface water as a heat source when operating in heating mode or as a heat sink when operating in a cooling mode. A lot of attention is drawn to heat pumps in recent years because of its potential to reduce primary energy consumption and thus reduce emissions of the greenhouse gases (GHGs). Heat pump unit provides a high degree of productivity with moderate electric power consumption in comparison with conventional heating and hot water production systems. In this paper a theoretical performance study of a vapor compression heat pump system with various natural and synthetic refrigerants (HFCs) is presented. Operation mode of the heat pump unit was chosen according to European Standard EN14511-2:2007 and EN255-2.

When evaluating the efficiency of heat pump (HP) systems, the most commonly used measure is the energy efficiency (first-law efficiency). For heat pump systems it is presented by a coefficient of performance (COP). Nevertheless, for specifying the possibilities for thermodynamic improvement, in many cases energy analysis is not enough and exergy analysis is required. This study presents an exergy assessment of a ground-source (or geothermal) heat pump (GSHP) system. This system was installed in Odessa, Ukraine. The exergy destructions in each of the components of the overall system are determined. Exergy efficiencies of the system components are determined to assess their performances and to explicate the potential energy saving for further improvement.

**KEY WORDS:** *ground-source heat pump, exergy analysis, energy efficiency, performance assessment*