Название публикации:

Ground Source Heat Supply in Moscow Oblast: Temperature Potential and Sustainable Depth of Heat Wells

Авторы:

Vasil'ev, G.P.a, Gornov, V.F.a, Dmitriev, A.N.b, Kolesova, M.V.a, Yurchenko, V.A.a

a. OAO INSOLAR-INVEST, Moscow, Russian Federation
b. Plekhanov Russian University of Economics, Moscow, Russian Federation

Сведения об издании:

Thermal Engineering
Volume 65, Issue 1, 1 January 2018, Pages 72-78

Аннотация:

The paper is devoted to a problem of increasing the efficiency of low-potential geothermal heat in heat pump systems of residential buildings the Moscow oblast of Russia, including Moscow. Estimates of a natural geothermal potential in the Moscow oblast (based on climatological data for the period from 1982 to 2011) are presented and a "Typical climatic year of natural soil temperature variations for the geoclimatic conditions of the Moscow oblast, including the city of Moscow" is proposed. Numerical simulation of the influence of geothermal energy potential and the depth of heat wells on the efficiency of ground source heat pump systems for the heat supply of residential buildings is carried out. Analysis of the numerical simulation showed that the operation of a heat pump system in a house heating mode under the geoclimatic conditions of the Moscow oblast leads to a temperature drop of the heat-exchange medium circulating through heat wells to 5–6°C by the end of the first 10 years of operation, and the process stabilizes by the 15th year of operation, and further changes in the heat-exchange medium temperature do not any longer significantly affect the temperature of the heat-exchange medium in the heat well. In this case, the exact dependence of the heat-exchange medium temperature drop on the depth is not revealed. Data on the economically expedient heat well depth for the conditions of the Moscow oblast ensuring a net present value for the whole residential building life cycle are presented. It is found that the heat well depth of 60 m can be considered as an endpoint for the Moscow oblast, and a further heat well deepening is economically impractical.

Ключевые слова:

geoclimatic conditions, ground source heat pump supply system, heat well, net present value, soil temperature, thermal efficiency, typical climatic year, Buildings, Drops, Geothermal energy, Heat exchangers, Heat pump systems, Heating, Housing, Life cycle, Numerical models, Pumps, Temperature, geoclimatic conditions, Net present value, Soil temperature, Supply, Geothermal heat pumps