European Association for the Development of Renewable Energies, Environment and Power Quality

International Conference on Renewable Energies and Power Quality (ICREPQ'09)

Valencia (Spain), 15th to 17th April, 2009

Hydrogeothermal Cascade Heat Pump – Economic and Ecologic Appropriacy

D. Goričanec[1], A. Saljnikov[2,], D. Antonijevic[3], J. Krope[1] and M. Komatina[2]

[1]University of Maribor – Faculty of Chemistry and Chemical Technology,
Smetanova 17, Maribor 2000 (Slovenia)
Phone:+38631817073, e-mail: darko.goricanec@uni-mb.sl

[2]University of Belgrade - Faculty of Mechanical Engineering,
Kraljice Marije 16, Belgrade 11120 (Serbia)
Phone:+381638849189, e-mail: asaljnikov@mas.bg.ac.yu

[3]Singidunum University – Faculty of Applied Ecology,
Bul. Mihaila Pupina 12a, Belgrade 11070 (Serbia)
Phone:+381637270654, e-mail: dantonijevic@sezampro.yu

Abstract. The article considers economy of exploiting heat from low-temperature geothermal sources for high-temperature heating of buildings using a heat pump. For the exploitation of low-temperature geothermal sources, a two stage heat pump with a heat transmitter was planned. The pump consists of two single stage heat pumps which use different refrigerants at each stage. At stage one, the calculation of the heat pump is conducted with refrigerant
R407c; at stage two of the heat pump, the refrigerant R600a is used. The main operational characteristics of a two stage heat pump are presented in the form of diagrams. For the exploitation of heat from geothermal water with a temperature of 45°C, a profitability evaluation of the investment in the heat pump was carried out, using the method of the net present value. In the research, also the coefficient of profitability and the period of time in which the investment is going to return itself were established.

Key words

Geothermal energy, heat pump, coefficient of performance, refrigerant, economy

References

[1] Ibrahim Dincer, *Refrigeration Systems and applications*, John Wiley & Sons, 2003
[2] Stoecker, W. F., *Industrial refrigeration handbook*, Updated ed. of: Industrial refrigeration. McGraw-Hill Cos, 1998,
[3] Hirrschberg H. G., Handbuch Verfahrenstechnik und Anlagenbau, Springer Verlag, 1999
[4] www.viessman.de
[5] Vasic V., Krope J., Goricanec D., Annalysis of energy flows in an absorption chiller. *Stroj. vestn.*, 2000, vol. 46, iss. 8, pp. 517-524
[6] Torhac E., Crepinsek L., Krope J., Goricanec D., Saljnikov A., Stipic R., Kozic Dj.: Profitability evaluation of the heating system using borehole heat exchanger and heat pump. *IASME Trans.*, 2005, vol. 2, iss. 8, pp 1381-1388.
[7] Kozic D.., Krope J., Goricanec D. Optimization of Large Heta Pumps in Long Distance Transit Heat Transportation. *Int. J. of Power and Energy Systems*, Vol. 14. No.1,1994.
[8] Kurtz, Ruth, *Handbook of engineering economics*, Guide for engineers, techn. scientists, managers, McGraw-Hill, 1984