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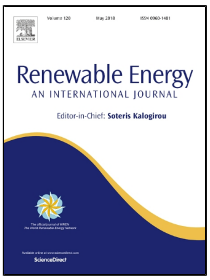

THE Wellbore Heat Exchangers: A Technical Review

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THE WELLBORE HEAT EXCHANGERS: A TECHNICAL REVIEW

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ABSTRACT

The available literature on the WellBore Heat eXchangers (WBHX) has been analyzed giving prominence to three aspects. First, the heat transfer through the geothermal reservoir and between the formation and the well has been analyzed. Then, the design of the WBHX and the modelling of the heat exchange has been reviewed. Lastly, the analysis of the performance of the WBHX in the production of thermal and/or electrical energy has been focused. Regarding the modelling of the heat transfer in the reservoir and between the wellbore and the formation, the sensitivity studies in literature highlight as key parameter the residence time of the fluid into the device. At fixed flow rate the residence time of the fluid in the WBHX is function of the well diameter. From analyzed papers, it raises the need of the insulation of the upward pipe in order to avoid heat losses. The range of produced thermal power is 0.15÷2.5 MW and of electrical power is 0.25÷364 MW. The WBHX is a promising technology if and only if is applied in the more convenient geothermal assets. The continuous study of the possible designing solutions and the improvements to enhance heat transfer is fundamental to allow this technology ready to market.

Keywords: wellbore heat exchanger, geothermal energy, deep borehole heat exchanger, heat transfer

NOMENCLATURE

A	cross-section of heat transfer
c_p	specific heat capacity
D	diameter
Ei(x)	exponential integral function
f	friction factor
gradT	temperature gradient
h	convective heat transfer coefficient
H	height
k	heat transfer coefficient
l	characteristic length
L	length
Nu	Nusselt number