Design and Analysis of Electric Power Production Unit for Low Enthalpy Geothermal Reservoir Applications

Authors : Ildar Akhmadullin, Mayank Tyagi

Abstract : The subject of this paper is the design analysis of a single well power production unit from low enthalpy geothermal resources. A complexity of the project is defined by a low temperature heat source that usually makes such projects economically disadvantageous using the conventional binary power plant approach. A proposed new compact design is numerically analyzed. This paper describes a thermodynamic analysis, a working fluid choice, downhole heat exchanger (DHE) and turbine calculation results. The unit is able to produce 321 kW of electric power from a low enthalpy underground heat source utilizing n-Pentane as a working fluid. A geo-pressured reservoir located in Vermilion Parish, Louisiana, USA is selected as a prototype for the field application. With a brine temperature of 126°C, the optimal length of DHE is determined as 304.8 m (1000ft). All units (pipes, turbine, and pumps) are chosen from commercially available parts to bring this project closer to the industry requirements. Numerical calculations are based on petroleum industry standards. The project is sponsored by the Department of Energy of the US.

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