

Enhancement Production and Development of Hot Dry Rock System by Using Supercritical CO₂ as Working Fluid Instead of Water to Advance Indonesia's Geothermal Energy

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Abstract : Hot Dry Rock (HDR) is one of geothermal energy which is abundant in many provinces in Indonesia. Heat exploitation from HDR would need a method which injects fluid to subsurface to crack the rock and sweep the heat. Water is commonly used as the working fluid but known to be less effective in some ways. The new research found out that Supercritical CO₂ (SCCO₂) can be used to replace water as the working fluid. By studying heat transfer efficiency, pumping power, and characteristics of the returning fluid, we might decide how effective SCCO₂ to replace water as working fluid. The method used to study those parameters quantitatively could be obtained from pre-existing researches which observe the returning fluids from the same reservoir with same pumping power. The result shows that SCCO₂ works better than water. For cold and hot SCCO₂ has lower density difference than water, this results in higher buoyancy in the system that allows the fluid to circulate with lower pumping power. Besides, lower viscosity of SCCO₂ impacts in higher flow rate in circulation. The interaction between SCCO₂ and minerals in reservoir could induce dehydration of the minerals and enhancement of rock porosity and permeability. While the dissolution and transportation of minerals by SCCO₂ are unlikely to occur because of the nature of SCCO₂ as poor solvent, and this will reduce the mineral scaling in the system. Under those conditions, using SCCO₂ as working fluid for HDR extraction would give great advantages to advance geothermal energy in Indonesia.

Keywords : geothermal, supercritical CO₂, injection fluid, hot dry rock

Conference Title : ICEERET 2017 : International Conference on Energy Efficiency and Renewable Energy Technologies

Conference Location : Tokyo, Japan

Conference Dates : November 13-14, 2017