

Enhanced Production of Geothermal Heat through the Reaming of Underground Wells in the Production Zone

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Abstract: In order to extract heat from the high temperature rocks that lie relatively close to the surface in different parts of the world, wells must first be drilled down into those rocks. Once the wells are established then either natural fissures or artificially induced fractures are generated to create an underground network of channels in the hot rock. Either existing steam in the rock, or injected water is then pumped through this network as a way of extracting the heat, turning it into steam, and bringing it to the surface. At the surface the steam, depending on temperature, can be used to drive generators, and/or to provide district heating.

The rocks through which the wells must be drilled are generally igneous, and thus of a high strength, tough and very hot, and conventional methods of drilling are difficult and slow. The use of high-pressure fluid jets to drill the wells has been shown to be faster than conventional drilling, and since the jets cut away from the bit, there are not the wear problems that are associated with conventional drilling tools. Further the jets have the potential to be re-oriented in the production zone to ream out the well from a radius of 4.5 inches to some 36 inches. This increases the productivity of individual wells, and reduces the number that may need to be drilled.

Abrasive can also be introduced into the water-jet stream as it is pumped down the borehole, and it is also possible to create a cutting jet that can notch the walls of the borehole so that, under controlled pressurization, cracks can be grown out in preferred directions, and the process of heat extraction simplified.

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