**Geothermal Energy – An Imperishable Source Of Energy an All Aspects of Life**

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 ***Highlights***

* This paper presents information on how geothermal energy is trapped, transported and also about the recent methods applied for geothermal systems.
* Production of geothermal energy as an alternative source of fuel is possible.
* Selection of materials used for the transportation of geothermal energy.
* Geothermal energy in mining developments.
1. **Introduction**

Renewable energy is energy that is collected from renewable sources, which are naturally replenished on a human time scale, such as sunlight, wind, tides, waves and geothermal heat. Geothermal energy is thermal energy generated and stored in the earth. The geothermal energy of the earth’s crust originates from the original formation of the planet and from radioactive decay of materials. The heat present inside the earth’s crust can never be perishable and it is simply power. It is present from the shallow ground to deep down beneath the surface of the earth to the extremely hot molten rock called magma. The process of heat production from the earth’s core is similar to that of petroleum production which involves drilling, and complete wells and produce fluids from wells present in the marked formations beneath the surface. The ultimate goal in the extraction of geothermal energy is the heat and not the fluid as in case of petroleum production. The energy required for the total world population is 2.2 terra watts and the energy produced from geothermal source is 44 terra watts which is more than sufficient for the world population. By trapping some parts of this source, we can reduce the usage of non-renewable sources which will deplete on further use. There is a lot of risk involved in the production of heat from the geothermal mines due to its high temperature and also requires high initial cost for the setting up of the plant. Trapping of hot steam from the earth’s crust is the basic instinct during the usage of geothermal energy. For the process of trapping of steam, selection of materials is very essential. Materials that are heat resistant and which have high melting points can be used as the temperature of steam coming from the earth’s crust is nearly 13000C for the transport of the energy. The first major hydrothermal developments were located in areas with high tectonic activity marked by volcanoes, geysers, hot springs and large hot water reservoirs. These resources are relatively shallow and often flow to the surface naturally.

1. **Methods**

Today, engineers and geophysicist are bringing techniques for enhanced geothermal systems (EGS) to high temperature dry reservoirs at a depth of 3-10 kms. At these depths, the rock is hot enough to convert water to superheated steam. The hot dry rock system recovers the earth’s heat from hot but dry regions through the closed loop circulation of pressurized fluid. This fluid, injected form the surface under high pressure, open spree existing joints in the basement rock, creating a man-made reservoir. The fluid injected into the reservoir absorbs thermal energy from the high temperature rock surface and then serves as the conveyor for transporting the heat to the surface for practical use.

There are 3 types of power plants for the extraction of geothermal power.

* Dry steam power plants are the most basic style of geothermal power plants. Steam piped from a hydro thermal reservoir directly enters turbine to generate electricity. As the steam cools and condenses, the water is gathered and injected back into the reservoir.
* Flash steam plants use hot water that is below the boiling point while at reservoir pressure but that flashes to steam at lower surface pressure.
* Binary power plants use a closed system to exploit even cooler reservoirs whose water temperatures are less than 1500C. Water flows or is pumped to the surface and enters a heat exchanger where it brings a second fluid, to its boiling point, which must be below that of water. This fluid maybe circulated and this powers electricity generating turbines.

Geothermal energy can be extracted without burning of fossil fuel such as coal, gas or oil. Geothermal fields produce only about 1/6th of carbon dioxide that a relatively clean natural gas-fueled power plant produces. Though geothermal energy involves many risks, they can be transported through pipelines which are made up of heat resistant materials as the natural gas transportation is done in the recent times. Carbon nanotubes can be used for transportation of geothermal energy for its applications in many aspects. They are very economical and can withstand high temperatures up to 3400K. The multi walled carbon nanotubes do not burn at all, an intriguing property of carbon nanotube is their ability to harbor heat. Mining and geothermal production also share a dependence to the concepts of accessibility and extractability. Mineral deposits must have sufficient economic value to be mined at a profit. In geothermal production, it is the fluid’s heat content, accessibility and extractability that determines whether a geothermal resource is economically valuable and warrants production.

**3. Results and discussion**

The geothermal energy trapped and transported using the above methods can be used in the production of electricity, as a fuel, as an alternative for fossil fuels. The low temperature geothermal energy can be used for fishing, household purposes. Balneotherapy is the treatment of diseases by spa which requires hot springs and geysers produced from a geothermal power plant is pumped over a lava bed rich in Sulphur and silica content. These elements react with the hot water from the power plant and imbibe healing properties. Geothermal energy also shows high efficiency of about 86-95% which is very high compared to other renewable energy sources and whose supply is continuous and reliable.

**4. Conclusion**

Geothermal energy is an alternative and a considerable energy source in the present era as we are becoming deficit of non-renewable energy sources. Due to the use of geothermal energy, emission of greenhouse gases can also be minimized which in turn could reduce global warming.

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