Liquid Metal Heat Exchanger for Geologic Deposits

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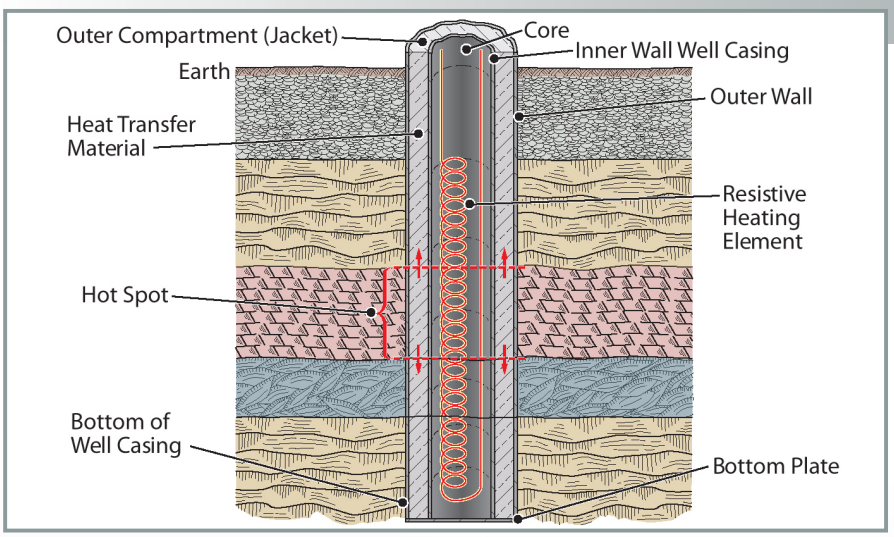

Technology Summary

Researchers at ORNL developed a down-well heating apparatus that efficiently heats subterranean geological deposits, such as oil shale, to extract hydrocarbons for energy needs. The apparatus provides more efficient heat transfer than existing technologies for hydrocarbon extraction. It also holds promise for in situ remediation of contaminated soils and geological formations by thermal decomposition.

The apparatus allows the liquid metal to distribute heat evenly throughout the oil shale. This reduces or eliminates entirely the problems that alternative technologies have with localized hot spots. The invention is inserted down a well into the subterranean ground where hydrocarbons are expected. The heater raises the temperature of the heat transfer metal to a temperature within the preselected temperature range. The metal transfers heat to the deposit in the earth, driving the hydrocarbons towards another well for extraction.

The heat transfer metal operates in both a passive and an active circulation mode. The metal is configured to have a melting point temperature lower than the operating temperature range of the heater, and a boiling point higher than the operating temperature range.

Advantages

- Eliminates or reduces hot spots by providing more even heat distribution
- Reduces costs associated with in situ heat extraction of oil shale by reducing heating element maintenance
- Tin, a low cost, nontoxic, stable metal, could be well-suited for this application

Potential Applications

- In situ heating of oil shale and tar and oil sands, for hydrocarbon extraction from geological formations
- In situ remediation of contaminated soils and geological formations by thermal decomposition
- Applications requiring high heat fluxes, single-phase (liquid) heat exchange, natural circulation heat transfer, and/or system compactness

Patent

Robert C. Devault and David J. Wesolowski, *Liquid Metal Heat Exchanger for Efficient Heating of Soils and Geologic Formations,* U.S. Patent 7,665,524, issued February 23, 1020.

Inventors

Robert C. Devault[1] and David J. Wesolowski[2]
[1]Energy and Transportation Science Division
[2]Chemical Sciences Division
Oak Ridge National Laboratory

Licensing Contact

David L. Sims
Technology Commercialization Manager, Building, Computational, and Transportation Sciences
UT-Battelle, LLC
Oak Ridge National Laboratory
Office Phone: 865. 241.3808
E-mail: simsdl@ornl.gov

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