REDUCING COST AND ENVIRONMENTAL IMPACT OF GEOTHERMAL POWER THROUGH MODELING OF CHEMICAL PROCESSES IN THE RESERVOIR

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Key Words:
Geothermal reservoir, chemical processes, numerical modeling, geochemical modeling

ABSTRACT

Geothermal power generation and mineral extraction from geothermal brines are affected by chemical processes within the reservoir. Until recently, numerical simulation technology for geothermal systems could not handle most chemical processes, except for tracking total salinity, one or two non- condensable gases, and non-reactive tracers. The Lawrence Berkeley National Laboratory (LBNL) has developed an enhanced version of their geothermal reservoir simulation software TOUGH2, developed with funding from the U.S. Department of Energy. This highly innovative software (TOUGHREACT) includes comprehensive chemical interactions between liquid, gaseous and solid phases that are coupled to the modeling of solute transport and subsurface multiphase fluid and heat flow.

GeothermEx, Inc., in collaboration with LBNL, is verifying the applicability of the TOUGHREACT software to a set of practical chemical problems encountered in typical geothermal fields in California. These example problems, drawn from published industry experience, include: (i) recovery of minerals from geothermal brines, (ii) effect of injecting silica-supersaturated brine in wells, (iii) effect of injecting acidic brine originating from various fluid handling processes; (iv) minimizing gas production through optimized water injection, and (v) modeling of chemically-reactive tracers. All five problems are important to the geothermal industry in California; their solution can help reduce the cost and environmental impact of geothermal power.

To date, our evaluation has confirmed the ability of TOUGHREACT to handle the first four of the above- mentioned problems; the last problem is now under consideration. This study has pointed out the need for improvements in some features of TOUGHREACT to make it more useful for practical application..

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