

A Feasibility Study of the Potential Benefits of Low-Rate Water Injection in Superheat Steam Production Wells

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ABSTRACT

This Paper investigates the technical feasibility of improving the productivity of superheated steam production wells by low-rate water injection downhole. A combined numerical simulation model of the reservoir and wellbore was developed to analyze the physical and thermodynamic processes associated with such downhole injection. The model consisted of a geometrically-increasing radial grid with 12 horizontal layers, the vertical stack of the central grid blocks representing the wellbore. The model was calibrated against the temperature and pressure profiles from two flowing wells. The modeling of low-rate downhole injection (through a tubing) so far indicates that up to a third of a MW of additional power can be easily gained by injection at 7,500 ft. Of this additional steam, about half results from de-superheating of steam and the remaining from extraction of heat from the formation surrounding the wellbore. In addition to increasing the power capacity, downhole injection improves neutralization or acidic steam (if caustic soda is added to the injection water), scrubbing of chloride and dilution of the non-condensable gases in the produced steam.

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