

Characteristics of a Shallow Groundwater Aquifer in a Steamflood Oil Field

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A spatial variation in the temperature of a shallow groundwater aquifer has been observed in a steamflood oil field. The temperature of the groundwater from water supply wells that are in closer proximity to cyclic steam injectors are, on average, higher than water supply wells located farther from the steam injectors. It is likely that the increase in groundwater temperature is a result of conductive heat transfer from the steam injectors. This increase in temperature could potentially lessen the life of the pump and motor and/or potentially augment the degradation of the water quality.

Understanding the groundwater flow direction and the steamflood history of the field is critical to identifying potential water-supply well locations with temperature ranges more typically found in shallow groundwater aquifers. Ideally, water supply wells should be sited away from active steam injectors. However, more often than not, water-supply well locations are based more on facility proximity rather than subsurface conditions. Thus, techniques should be employed to minimize the effect of high water temperatures. These include, but are not limited to, shrouding the pump, setting the pump high enough in the water column to ensure that water is traveling past the motor, operating the pump from a variable speed drive, and utilization of water storage tanks.

With the amount of subsurface data and data collection tools that are available for understanding the characteristics of oilfield reservoirs, there is limited understanding about the characteristics of the shallow groundwater. The remote locations of many oil fields cause basic operations to rely heavily on the use of groundwater for various facilities. However, studies concerning the direction of groundwater flow, gradient, hydraulic conductivity, water chemistry, and other groundwater characteristics typically arise out of a need for water storage or because of environmental inquiries.