

SAGD Well Optimization

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Abstract

Choosing the areal and vertical locations for SAGD well pairs and groups of well pairs is a vital decision for reservoir evaluation and planning. The locations of these wells fundamentally control hydrocarbon recovery performance, which is the steam-oil-ratio (SOR), the oil or bitumen production rate (O_{RATE}), and the ultimate economic recovery (R). Ideally, flow simulation would be performed for many possible alternative locations considering many alternative geostatistical realizations; however, this brute force approach is intractable given the computer effort required for flow simulation. Instead, we calibrate the flow response to quickly calculated static parameters and optimize them instead of the full flow simulation results.

A simulated annealing algorithm is developed and described for determining optimum aerial and stratigraphic SAGD well pair locations. The objective is to minimize SOR and maximize O_{RATE} and R subject to a number of reservoir-specific variables and constraints. There are three basic steps to the methodology: (1) model the relevant reservoir variables using geostatistics, (2) formulate the optimization problem and constraints, and (3) solve the optimization problem using simulated annealing. The methodology is implemented on a subset of data from the Athabasca Oilsands in Fort McMurray, Alberta, Canada.

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