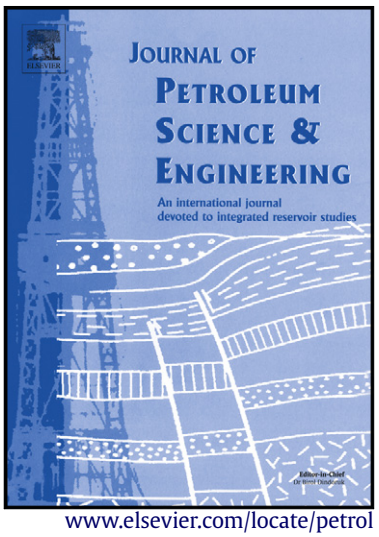

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T.D. Humphries, R.D. Haynes

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Joint optimization of well placement and control for nonconventional well types

T. D. Humphries[a,*], R. D. Haynes[b]

[a]*Department of Mathematics, Oregon State University, Corvallis, OR, USA*
[b]*Department of Mathematics and Statistics, Memorial University of Newfoundland, St. John's, NL, Canada*

Abstract

Optimal well placement and optimal well control are two important areas of study in oilfield development. Although the two problems differ in several respects, both are important considerations in optimizing total oilfield production, and so recent work in the field has considered the problem of addressing both problems jointly. Two general approaches to addressing the joint problem are a simultaneous approach, where all parameters are optimized at the same time, or a sequential approach, where a distinction between placement and control parameters is maintained by separating the optimization problem into two (or more) stages, some of which consider only a subset of the total number of variables. This latter approach divides the problem into smaller ones which are easier to solve, but may not explore search space as fully as a simultaneous approach.

In this paper we combine a stochastic global algorithm (Particle Swarm Optimization) and a local search (Mesh Adaptive Direct Search) to compare several simultaneous and sequential approaches to the joint placement and control problem. In particular, we study how increasing the complexity of well models (requiring more variables to describe the well's location and path) affects the respective performances of the two approaches. The results of several experiments with synthetic reservoir models suggest that the sequential approaches are better able to deal with increasingly complex well parameterizations than the simultaneous approaches.

*Corresponding author. +1-541-737-5165
Email addresses: humphrit@science.oregonstate.edu (T. D. Humphries), rhaynes@mun.ca (R. D. Haynes)