

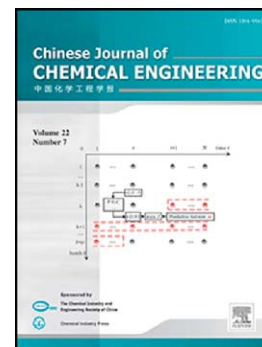
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Modeling and optimization for oil well production scheduling*

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Abstract In this paper, an oil well production scheduling problem for the light load oil well during petroleum field exploitation was studied. The oil well production scheduling was to determine the turn on/off status and oil flow rates of the wells in a given oil reservoir, subject to a number of constraints such as minimum up/down time limits and well grouping. The problem was formulated as a mixed integer nonlinear programming model that minimized the total production operating cost and start-up cost. Due to the NP-hardness of the problem, an improved particle swarm optimization (PSO) algorithm with a new velocity updating formula was developed to solve the problem approximately. Computational experiments on randomly generated instances were carried out to evaluate the performance of the model and the algorithm's effectiveness. Compared with the commercial solver CPLEX, the improved PSO can obtain high-quality schedules within a much shorter running time for all the instances.

Keywords Oil well production, Scheduling, Mixed integer nonlinear programming (MINLP), Improved particle swarm optimization

1 INTRODUCTION

Oil plays a major role in nowadays society because it covers the high demand for vehicle fuel and is widely used in industrial processing. In the middle and later periods of the oil field exploitation, oil reserves are finite and most oil fields will run in low-yielding and inefficient pumping. According to the statistics, there are about 80% light load oil wells among all the pumping oil wells. In the oil field exploitation, electricity consumption accounts for about 35% of the whole petroleum recovery cost.

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