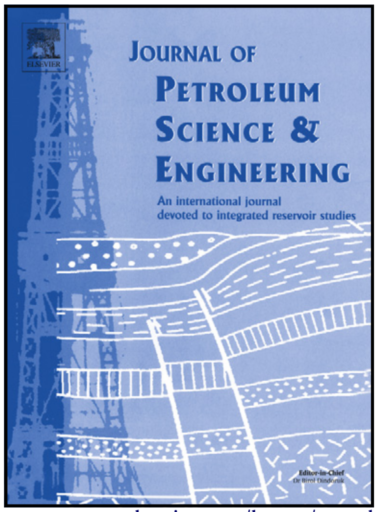


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# The Optimization of Continuous Gas Lift Process Using an Integrated Compositional Model

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## Abstract

Artificial gas lift is frequently used to boost the production rate of mature oil fields. The ultimate aim is to design and operate a gas lift system that can maximize the economic return of the well over a long period. This may require adjustment of the gas injection rate, tubing diameter and separator pressure at some specific intervals. In this study, an integrated mathematical model was developed in order to track the spatial and temporal variation of components in the process. The model was coupled to a combination of genetic algorithm and Marquardt optimization method in order to determine the process parameters that optimize the long-term economic return of an oil field. The results show that the maximum net present value is achieved when the production lifetime is divided into a suitable number of consecutive operation intervals with different tubing diameter, lift gas injection rates and separator pressures and an optimum value for tubing diameter.

**Keywords:** Continuous Gas-lift Process; Two-phase Flow; Compositional Modeling; Genetic Algorithm; Marquardt method; Optimization



## 1. Introduction

The pressure in many mature petroleum reservoirs is insufficient to sustain the weight of the fluid in the wellbore of a production well and overcome the frictional forces against its movement. The continuous gas lift process is widely used to improve production from oil fields that cannot produce under natural pressure. In this process, high-pressure natural gas is injected into the wellbore to lighten the column of fluid and allow the reservoir pressure to force the fluid to the surface (Takacs, 2005). Achieving the highest long-term field production