CHAPTER 1
INTRODUCTION

The combination of multilateral wells and intelligent completion has become one of the most compelling issues in the petroleum industry because it offers many advantages to improve production performance. Studies on both topics have increased rapidly over the past few years.

Multilateral wells are configured with more than one lateral branch radiating from a central borehole, increasing reservoir draining efficiency due to greater surface exposure than a vertical well. Multilateral configurations are also useful in multi-layered or complex reservoirs. A single wellbore can be drilled with many lateral branches; then, reservoir fluid can be produced in commingling with only one conduit from subsurface.

Intelligent Completion System (ICS) is a new completion application in which downhole equipment is controlled from the surface via data transmission lines, draining reservoir fluid from each branch independently. This reduces the water produced due to water coning and water cresting by automatic shutting of high water cut zones.

Combining these two technologies offers further opportunities. Downhole water reinjection can decrease water problems at the surface (a great advantage for environmentally sensitive areas). Also, water and gas injection can be used for water flooding or reservoir pressurization. Nevertheless, both technologies are generally considered expensive and extravagant. Their successful application depends on reservoir properties. Therefore, an optimization study should be investigated thoroughly before drilling and completing the well with these new technologies.

The objectives of this study are

- To investigate advantages provided by multilateral wells and intelligent completions using numerical simulation

- To define some guidelines for the new completion technology in order to optimize oil production

The thesis deals with reservoir simulations of synthetic heterogeneous reservoirs in oil-bearing and strong water drive environment. The study is extended from two previous studies and their results were used comparatively. Some parts of the reservoir model, fluid model, and production strategy were then used in this study. Traditional horizontal well and multilateral well geometries (called bilateral well and fishbone) were investigated. The intelligent completion studies were applied to each case to obtain optimal results. Probabilistic results provided by multilateral wells combined with intelligent completion are then discussed. Vertical permeability which is an important parameter in water invasion in multilateral wells was also studied.