

## **Reserve Growth in Oil Pools and Fields of Alberta, Canada**

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Reserve growth is recognized as a major component of additions to reserves in most oil provinces around the world, particularly in mature provinces. It takes place as a result of new discovery of pools/reservoirs and their extensions within existing fields, improved knowledge of reservoirs over time leading to a change in estimates of original oil-in-place, and improvement in recovery factor through application of enhanced oil recovery methods, horizontal/multilateral drilling, and 4D seismic.

A reserve growth study was conducted for oil pools of Alberta, Canada with the following objectives: (1) evaluate historical oil reserve data in order to assess the potential of reserve growth, (2) develop reserve growth models/ functions to help forecast hydrocarbon volumes, (3) study reserve growth sensitivity to various parameters (for example, pool size, porosity, and oil gravity), and (4) compare reserve growth in oil pools and fields of Alberta with those from other large petroleum provinces around the world.

The reported known recoverable oil exclusive of Athabasca oil sands in Alberta increased from 4.5 billion barrels of oil (BBO) in 1960 to 17 BBO in 2005. Some of the pools that were included in the existing database were excluded from the present study for lack of adequate data. Therefore, the known recoverable oil increased from 4.2 to 13.9 BBO over the period from 1960 through 2005, with new discoveries contributing 3.7 BBO and reserve growth 6 BBO. This reserve growth took place mostly in pools with more than 125,000 barrels of known recoverable oil. Pools with light oil accounted for most of the total known oil volume, therefore reflecting the overall pool growth. The smaller pools, in contrast, shrank in their total recoverable volumes over the years. Although pools with heavy oil (gravity less than 20°API) make up only a small share (3.8 percent) of the total recoverable oil, they showed a 23-fold growth compared to about 3.5-fold growth in pools with medium oil and 2.2-fold growth in pools with light oil over a 50-yr period. Pools with high porosity reservoirs (greater than 30 percent porosity) grew more than pools with lower porosity reservoirs because of permeability differences between the two types.

Reserve growth models for Alberta oil fields show almost twice as much growth than those of oil pools, possibly because there may be more than one pool in a field with different discovery years. Based on the models, the growth in oil volume in Alberta pools over the next 5-yr period (2006-2010) is expected to be about 500 million barrels of oil.

Over a 25-yr period, the cumulative reserve growth in the Alberta oil pools has been only 2-fold compared to a 4- to- 5-fold increase in other petroleum producing areas such as Saskatchewan Province, Volga-Ural Basin, U.S. onshore fields, and U.S. Gulf of Mexico. However, the growth at the field level compares well with that in U.S. oil fields because in other petroleum provinces the growth is reported at field levels rather than at pool levels, the latter basically being the equivalent of individual reservoirs.