

## **CYCLIC CARBON DIOXIDE STIMULATION** **("Huff-and-Puff")** **(A well-stimulation method)**

Cyclic CO<sub>2</sub> stimulation is a single-well operation that is developing as a method of rapidly producing oil. It is similar in operation to the conventional cyclic or "huff-and-puff" steam injection process. CO<sub>2</sub> is injected into a well drilled into an oil reservoir, the well is shut-in for a time providing for a "soak period," then is opened, allowing the oil and fluids to be produced.

In this process the production of additional oil is accomplished by some or all of the following mechanisms:

1. CO<sub>2</sub> dissolves in the oil, reducing its viscosity and allowing the oil to flow more easily toward a production well.
2. Increased oil-phase saturation due to CO<sub>2</sub> dissolving in the oil and causing it to swell.
1. Solution-gas drive achieved by the evolution of

CO<sub>2</sub> and natural gas from the oil phase at the lower pressures occurring during production.

4. Hydrocarbon extraction by the supercritical CO<sub>2</sub> gas. This process is also applicable to viscous (heavy) oil reservoirs that have a high oil saturation and temperatures or pressures that preclude miscibility between oil and CO<sub>2</sub>. The most important operating parameters are volume of CO<sub>2</sub> injected per cycle, number of cycles, and degree of back pressure during production.

This process can be repeated several times, but efficiency decreases with the number of cycles. Cyclic CO<sub>2</sub> stimulation can be useful in recovering heavy oil in cases where thermal methods are not feasible.

# CYCLIC CARBON DIOXIDE STIMULATION

Carbon dioxide is introduced into an oil reservoir during injection. The injection well is then shut in for a “soak period” during which the carbon dioxide swells the oil and reduces its viscosity. The well is then opened and the carbon dioxide provides a solution gas drive, allowing the oil and fluids resulting from the soak period to be produced. This process is repeated.

*Schematic portrays one well during the 3 phases of this process. Flow pattern is stylized for clarity.*

