CARBON DIOXIDE FLOODING

Carbon dioxide (CO_2) can sometimes be used to enhance the displacement of oil from a reservoir. Carbon dioxide occurs naturally in some reservoirs, either with natural gas or as a nearly pure compound. It can also be obtained as a by-product from chemical and fertilizer plants, or it can be manufactured or separated from power plant stack gas.

When pressure in a candidate reservoir has been depleted through primary production and possibly waterflooding, it must be restored before CO_2 injection can begin. To do this, normally water is pumped into the reservoir through injection wells until pressure reaches a desired level, then CO_2 is introduced into the reservoir through these same injection wells.

Even though CO_2 is not miscible with oil on first contact, when it is forced into a reservoir a miscible front is generated by a gradual transfer of smaller, lighter hydrocarbon molecules from the oil to the CO_2. This miscible front is in essence a bank of enriched gas that consists of CO_2 and light hydrocarbons. Under favorable conditions of pressure and temperature, this front will be soluble with the oil, making it easier to move toward production wells.

This initial CO_2 slug is typically followed by alternate water and CO_2 injection - the water serving to improve sweep efficiency and to minimize the amount of CO_2 required for the flood.

Production will be from an oil bank that forms ahead of the miscible front. As reservoir fluids are produced through production wells, the CO_2 reverts to a gaseous state and provides a "gas lift" similar to that of original reservoir natural gas pressure. On the surface, the CO_2 can be separated from the produced fluids and may be reinjected, helping to reduce the amount of new CO_2 required for the project; thus, the CO_2 can be recycled.

This procedure may be repeated until oil production drops below a profitable level.

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This method is a miscible displacement process applicable to many reservoirs. A CO_2 slug followed by alternate water and CO_2 injections (WAG) is usually the most feasible method.

Viscosity of oil is reduced providing more efficient miscible displacement.