OIL PRODUCTION

Enhanced Oil Recovery (EOR) is a term applied to methods used for recovering oil from a petroleum reservoir beyond that recoverable by primary and secondary methods. Primary recovery normally refers to production using the energy inherent in the reservoir from gas under pressure or a natural water drive. Secondary recovery usually refers to injection of water or waterflooding. Thus, Enhanced Oil Recovery is often synonymous with tertiary recovery. Improved Oil Recovery (IOR) and Advanced Oil Recovery (AOR) have similar meaning, except they also apply to primary and secondary methods, and sometimes EOR methods can be used earlier in the sequence. At or before the time these drawings were prepared, waterflooding was considered as Enhanced Oil Recovery, but now EOR is generally considered to follow waterflooding.

Four groups of methods - thermal recovery, gas miscible recovery, chemical flooding and microbial flooding - are included in this collection. Twelve EOR methods and two production technologies are described and illustrated in this collection. The thermal recovery methods are steamflooding, cyclic steam stimulation and in situ combustion. The gas miscible recovery methods are carbon dioxide flooding, cyclic carbon dioxide stimulation, nitrogen flooding and nitrogen-CO_2 flooding. The chemical flooding methods are polymer flooding (including polymer gels), micellar-polymer flooding, and alkaline flooding. Microbial EOR methods include microbial flooding and cyclic microbial recovery. The production technologies are improved drilling technology and hydraulic fracturing.

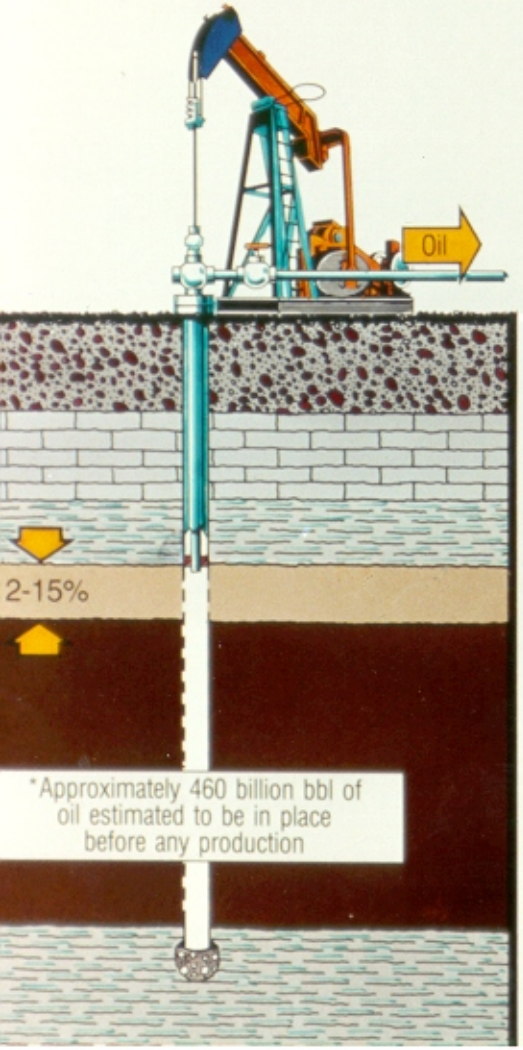
The OIL PRODUCTION illustration (with figures updated below) indicates the effect of EOR on production of the 568 billion barrels of oil that has been discovered in the United States. It is estimated that an additional 67 billion barrels of oil have not been discovered (total 635 billion barrels in the U.S.) The EOR target is 200 billion barrels of the 377 billion barrels of the remaining discovered resource that is producible with EOR. (Note that the illustration, drawn in the 1980's, shows a recovery range of 4-11% for EOR; the current figure, depending on the method used, ranges from 5-30%.)

OIL PRODUCTION

Improved technology through research is enhancing oil recovery.

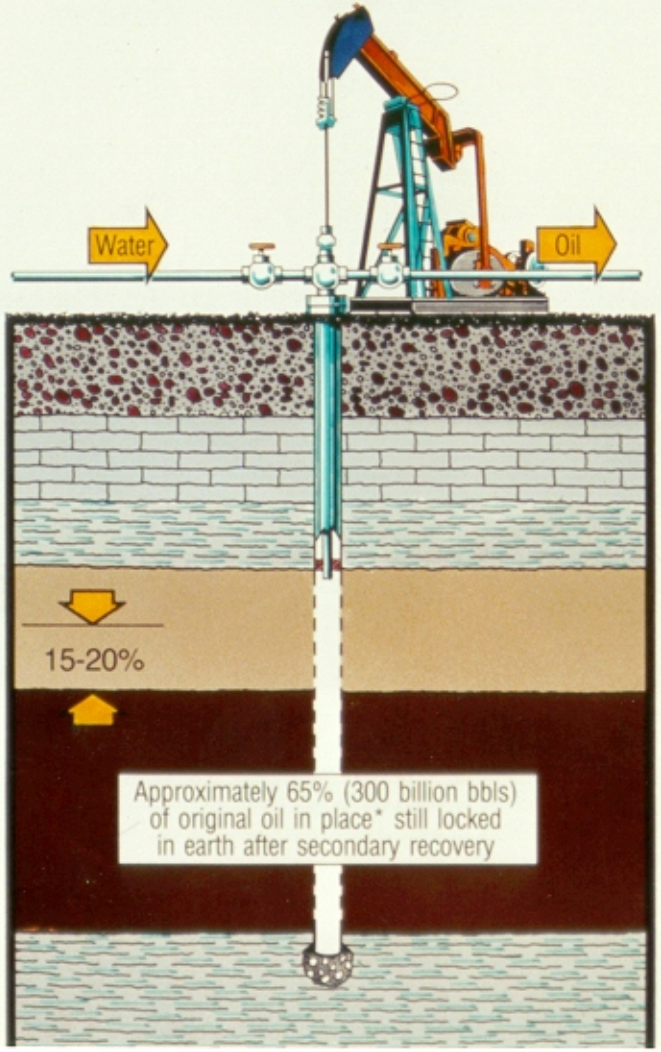
PRIMARY RECOVERY

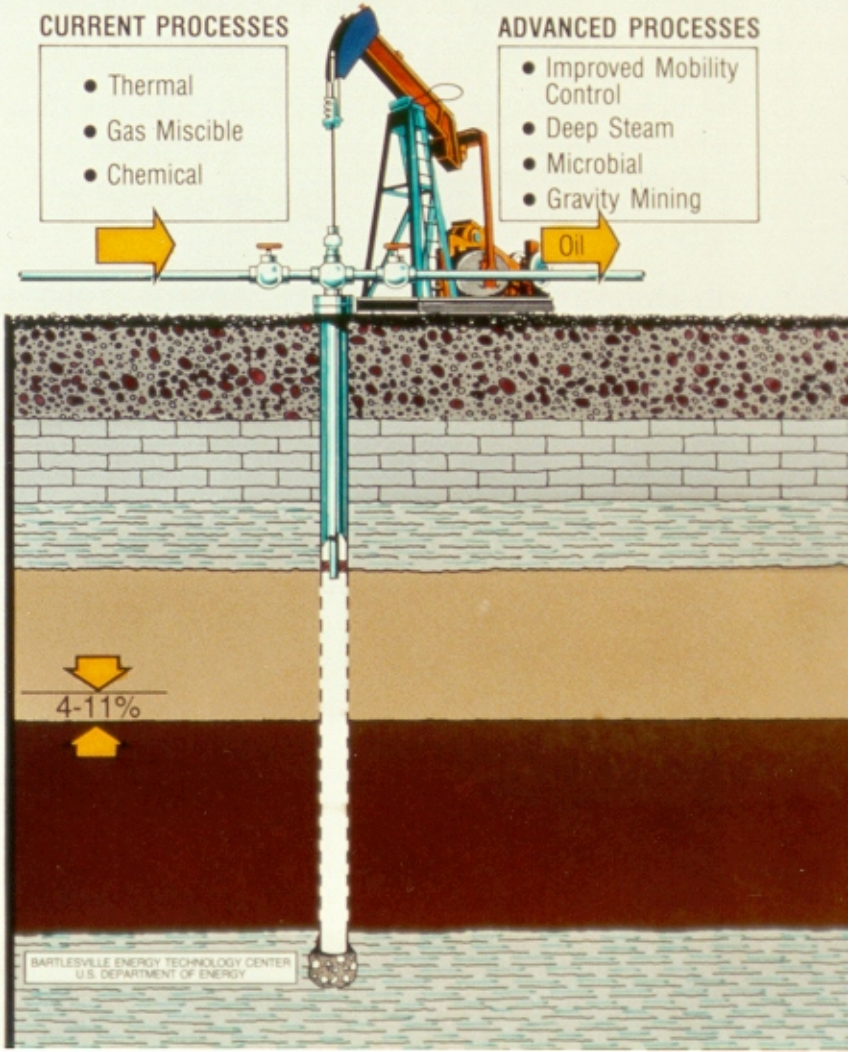
Produces 12-15% of the original oil-in-place*



SECONDARY RECOVERY

Another 15-20% of the original oil-in-place* may be produced by waterflooding



ENHANCED OIL RECOVERY (EOR)

An additional 4-11% of the original oil-in-place* may be produced using current and advanced technology