

MICROBIAL ENHANCED OIL RECOVERY

- MEOR is one of the EOR techniques where **bacteria and their by-products are utilized for oil mobilization** in a reservoir.
- **Tertiary production technology**, which uses microorganisms or their metabolites to enhance the recovery of residual oil
- In this method, **nutrients and suitable bacteria**, which can **grow under the anaerobic reservoir conditions**, are injected into the reservoir.
- The **microbial metabolic products** that include biosurfactants, biopolymers, acids, solvents, gases, and also enzymes **modify the properties of the oil and the interactions between oil, water, and the porous media**, which **increase the mobility of the oil** and consequently the recovery of oil especially from depleted and marginal

PRINCIPLE

MEOR is a process that increases oil recovery through inoculation of microorganisms in a reservoir, aiming that bacteria and their by-products cause some beneficial effects such as the formation of stable oil-water emulsions, mobilization of residual oil as a result of reduced interfacial tension, and diverting of injection fluids through upswept areas of the reservoir by clogging high permeable zones.

MECHANISMS

- **Reduction of oil/water interfacial tension and modification of porous media wettability by surfactant production and bacterial action.**
- **Selective plugging of porous media by microorganisms and their metabolites.**
- **Oil viscosity reduction caused by gas solution in the oil due to bacterial gas production or degradation of long-chain saturated**

METHODS

- MEOR methods can be divided into two main groups:
 1. **Ex-situ production** of the MEOR metabolites such as biosurfactants, biopolymers, and emulsifiers using exogenous or indigenous bacteria. In this case, microorganisms are grown using industrial fermenters or mobile plants and then injected into the oil formation as aqueous solutions.
 2. **In-situ production** of the MEOR metabolites. In this case, the formation of metabolites is the result of the microbiological activity that takes place directly in the reservoir. The MEOR metabolites are produced by indigenous bacteria or by exogenous bacteria that are injected into the

ADVANTAGES

- Increase of the productivity of the oil fields
- Increase in the total oil produced and more efficient operation of wells and oil fields
- Increase of the viscosity of the formation water due to the upsurge of biomass concentration and the microorganisms' metabolic products, such as soluble biopolymers, which reduces the mobility of the formation water within the formation rock
- The MEOR set up is less expensive, because the injected bacteria and nutrients are inexpensive
- Low energy input requirement for microbes to produce MEOR agents
- Reduced of the operations downtime