# Calculating Hydrocarbon Volumes in a Reservoir

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## 1. Aim/Overview of the practical:

Calculating hydrocarbon volumes in a reservoir.

## 2. Task to be done:

To calculate the volume of oil or gas in the reservoir.

## 3. Apparatus:

- Reservoir data
- Code editor or IDE

## 4. Algorithm/Flowchart:

**NA**

**5. Theme/Interests definition:**

**Oil originally in place (**OOIP**):** refers to the total oil content of an oil reservoir.

**Gas originally in place (**GOIP**):** is the total gas content of an oil reservoir.

**Stock tank oil originally in place (**STOOIP**):** refers to the oil in place before the commencement of production.

**6. Steps for experiment/practical:**

- Develop a script, with relevant inputs, for designing the relevant formulation.
- Execute the program and display in the console.

**7. Observations/Discussions:**

- **For the Oil reservoir**

| **Parameter** | **Value (units)** |
|---|---|
| Area of the zone (A) | 2000 acres |
| Thickness (h) | 150 ft |
| Porosity ($\phi$) | 15 % |
| Water Saturation (Sw) | 30 % |
| Oil formation volume factor (Bo) | 1.65 |

- **For the Gas reservoir**

| **Parameter** | **Value (units)** |
|---|---|
| Area of the zone (A) | 2000 acres |
| Thickness (h) | 150 ft |
| Porosity (ϕ) | 15 % |
| Water Saturation (Sw) | 30 % |
| Gas formation volume factor (Bg) | 0.0035 |

**8. Percentage error (**if any or applicable**):**
**NA**

**9. Calculations/ Chemical Reactions / Theorems /Formulas used etc:**

- **For the oil reservoir**

$$\mathbf{OIP} = \mathbf{7758}\,\boldsymbol{Ah\phi}\,(\mathbf{1}-\boldsymbol{Sw}) = 7758 \times 2000 \times 150 \times 0.15 \times (1-0.30) = \mathbf{244377000}$$

$$\mathbf{STOOIP} = \mathbf{OIP}\,/\,\mathbf{Bo} = 244377000/\,1.65\; = \mathbf{1481072.727273}$$

- **For the gas reservoir**

$$\mathbf{GIP} = \mathbf{43560}\,\boldsymbol{Ah\phi}\,(\mathbf{1}-\boldsymbol{Sw}) = 43560 \times 2000 \times 150 \times 0.15 \times (1-0.30) = 1372000000$$

$$\mathbf{STGOIP} = \mathbf{GIP}\,/\,\mathbf{Bg}\; = 1372000000/0.0035 = \mathbf{392040000000}$$

**10. Result/Output/Writing Summary:**

| | **Oil Reservoir** | **Gas Reservoir** |
|---|---|---|
| **OOIP (**bbl**)** | 244377000 | - |
| **GOIP (**cu ft**)** | - | 1372140000 |
| **STOOIP (**bbl**)** | 1481072.727273 | - |
| **STGOIP (**cu ft**)** | - | 392040000000 |

**11. Graphs (**If Any**):**

**NA**

**12. Learning outcomes (**What I have learned**):**

- Recoverable reserves are a fraction of the OOIP or GOIP and are dependent on the efficiency of the reservoir drive mechanism.
- OOIP and GOIP are based on a geological model that geometrically describes the volume of hydrocarbons in the reservoir.
- Due to gas evolving from the oil as pressure and temperature are decreased, oil at the surface occupies less space than it does in the subsurface.
- Because of expansion, gas occupies more space at the surface than it does in the subsurface.