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Goal: Identifying best places to drill wells based on geologic properties

Problem Statement

- What is the expected cumulative production for a well given its properties?
- If values of porosity, permeability, depth are given, can you predict the best location on the map for a new well?
- What are the main drivers of production?

Definitions

Not all rocks are created equal, some hold the key to production success. Understanding the following terms will help you uncover sweet spots:

- Porosity: The percentage of void spaces in the rock that can store fluids like oil and gas. Higher porosity means more storage capacity

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- Permeability : The ability of fluids to flow through the rock. High permeability means oil can move faster and more easily to the wellbore.
- Facies: The type and characteristics of rock layers. Different facies influence whether the rock is a good reservoir or a barrier to production.
- Pressure drives the movement of oil and gas, and as you produce, pressures drop. Wells with significant pressure drawdown often produce more but may decline faster.

By tying together geological properties (like porosity and facies), pressure trends, and production data, you will determine: Where is the best place to drill a well, and why?

Objective

In this exercise, you will integrate geological, production, and spatial data to identify:

- Where is the best place to drill a well?
- What geological and operational factors drive production performance?
- Do we care only about oil production or should we look at gas as well?

The Data

You will work with:

1. Petrophysical Data: Depth, porosity, permeability, dominant facies.
2. Cumulative Production & Locations: Oil production, pressures
3. Well Locations: 3D spatial data including bottom hole x, y locations and well depth.

Core Questions to Solve

1. Geological Sweet Spots
    a. Which facies, porosity, and permeability values dominate high-performing wells?
    b. What kind of oil trap is this? Is it stratigraphic or structural?
    c. Why do some wells produce more gas?

2. Spatial Sweet Spots
    a. Where on the field map are the most productive wells located?
    b. Can you identify clusters of sweet spots based on cumulative production and pressure trends?
    c. Is the top of the structure always the best place to drill a new well?

3. Pressure & Production Dynamics
    a. How does pressure drawdown relate to production performance?
    b. What patterns do you observe in production and pressure rates over time?

Deliverables

1. Identify the Best Place to Drill
    a. Combine insights from geology, production, and spatial mapping.
    b. Present a clear recommendation: Where would you drill the next well, and why?

2. Key Production Drivers
    a. What factors geological or operational most influence production performance for both oil and gas?
    b. How does drawdown (pressure differential) impact oil production?
    c. What could be the reasons why some wells do not produce oil?

3. Facies Insights
    a. Why is it important in oil and gas to characterize a reservoir and understand rock types?
    b. How do facies relate to porosity and permeability?