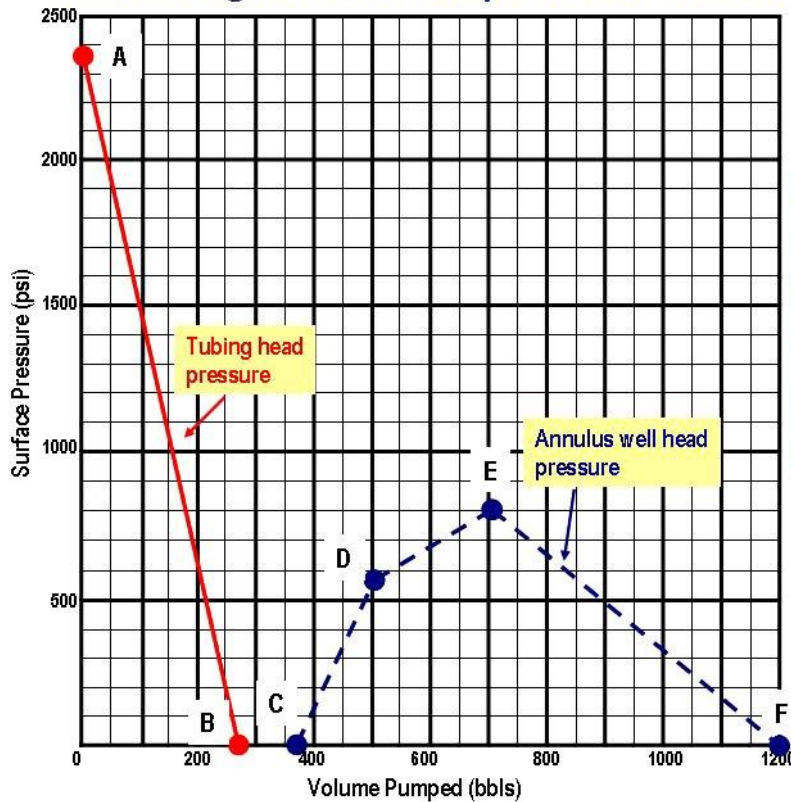


EXERCISE WELL KILL OPERATIONS 5

Reverse Circulation #1 [Static Condition]

All fluid is lighter than the completion brine in annulus



More Information:-

- Point A, pressure = 2,367 psi
- Point B, barrels pumped = 273 bbls
- Point C, barrels pumped = 389 bbls
- Point D, pressure = 571 psi
- Point D, barrels pumped = 500 bbls
- Point E, pressure = 800 psi
- Point E, barrels pumped = 700 bbls



Referring to the reverse circulation graph and the information above, answer the following five (5) questions

1. What is the total volume of the well?

Answer _____ bbls

2. What is the tubing pressure at the start of the pumping operation?

Answer _____ psi

3. What is an approximately tubing pressure after pumping 200 barrels of lighter fluid into annulus?

Answer _____ psi

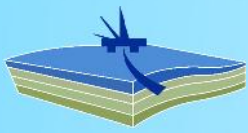
4. What is the annulus well head pressure after pumping 200 barrels of lighter fluid into into annulus?

Answer _____ psi

5. At what point on the graph does the new lighter fluid completely fill in the annulus and the original completion brine completely fill in the tubing?

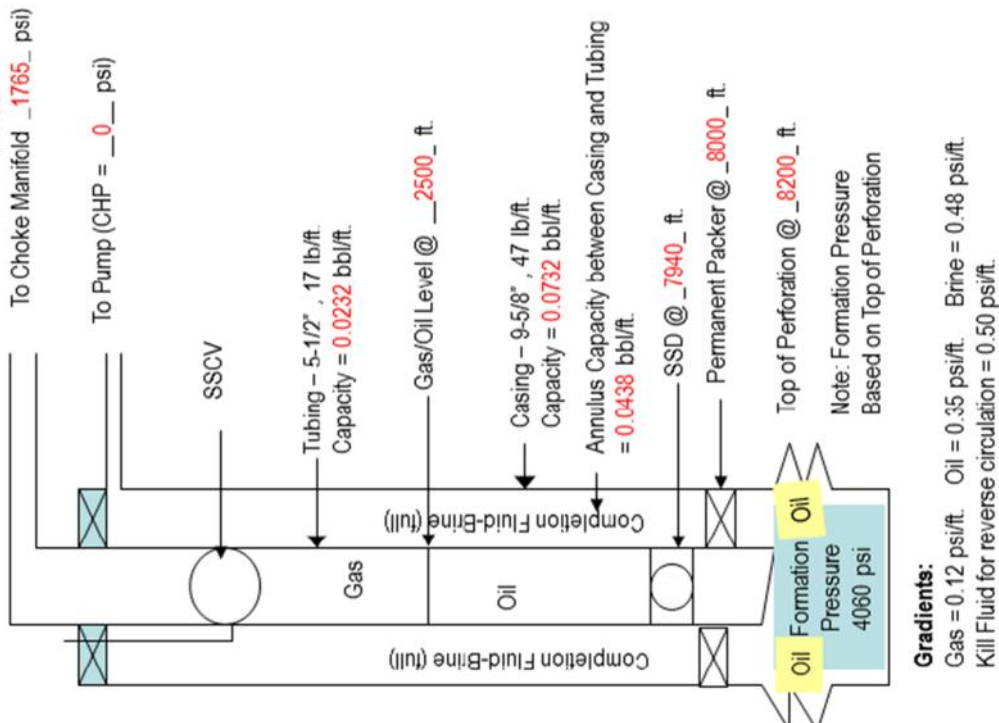
Answer _____ [Point]





Reverse Circulation #2

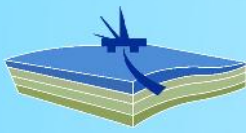
COMPLETION DIAGRAM -1



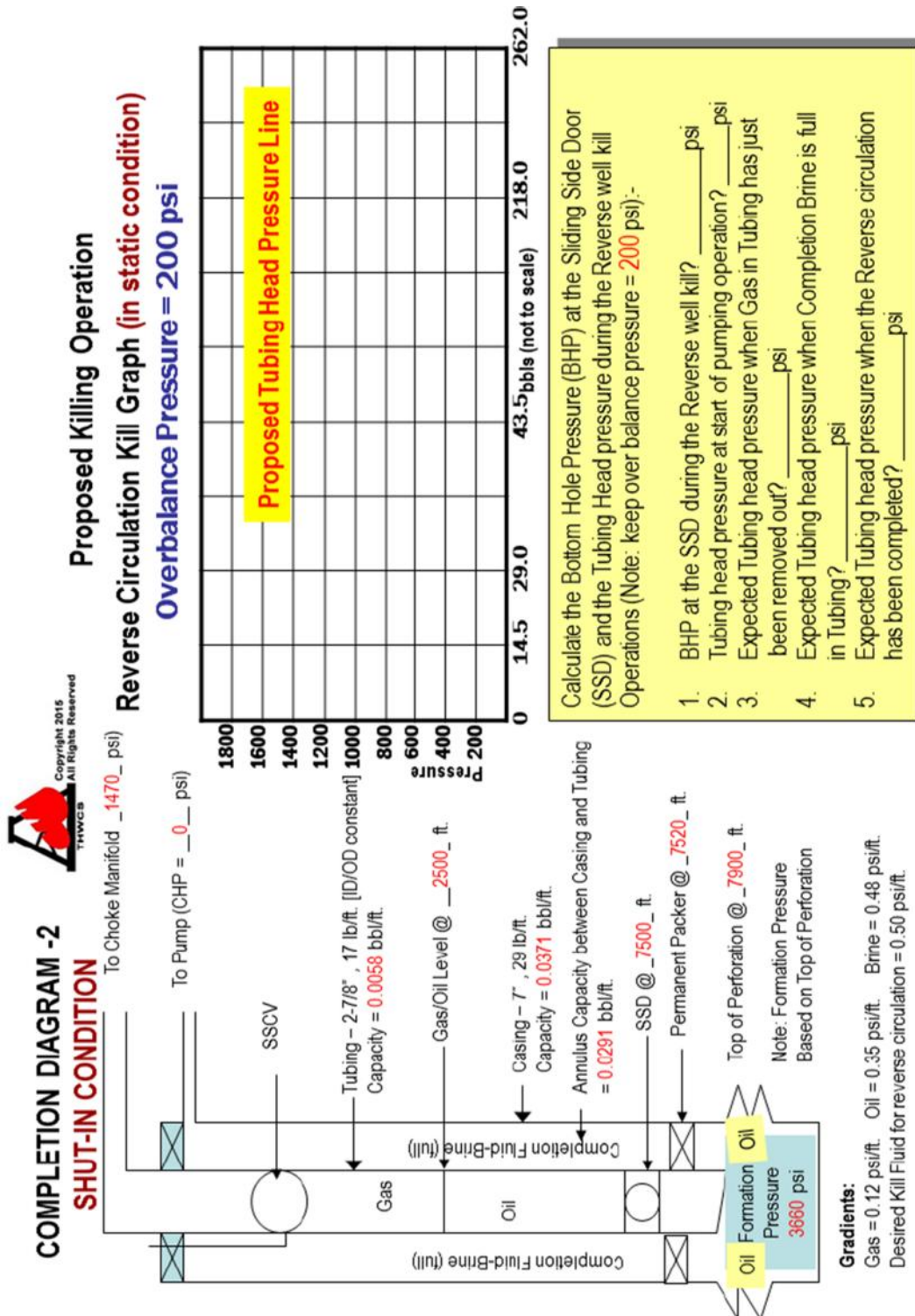
From Completion Diagram, Calculate and Answer the following questions:

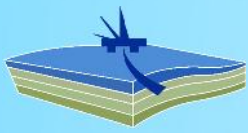
All questions related to **REVERSE** Circulation (in static condition)

1. What is the volume in Annulus? _____ bbls
2. What is the volume of Gas in Tubing? _____ bbls
3. What is the volume of Oil in Tubing from Gas contact until SSD? _____ bbls
4. How many barrels of kill fluid to be pumped in annulus when the Gas has been completely displaced out of the tubing? _____ bbls
5. How many barrels to pump and Kill fluid starts entering the tubing? _____ bbls
6. When tubing has just been completely filled with Brine, calculate the pressure at the SSD in static condition. The **THP** at that time was **158** psi. _____ psi



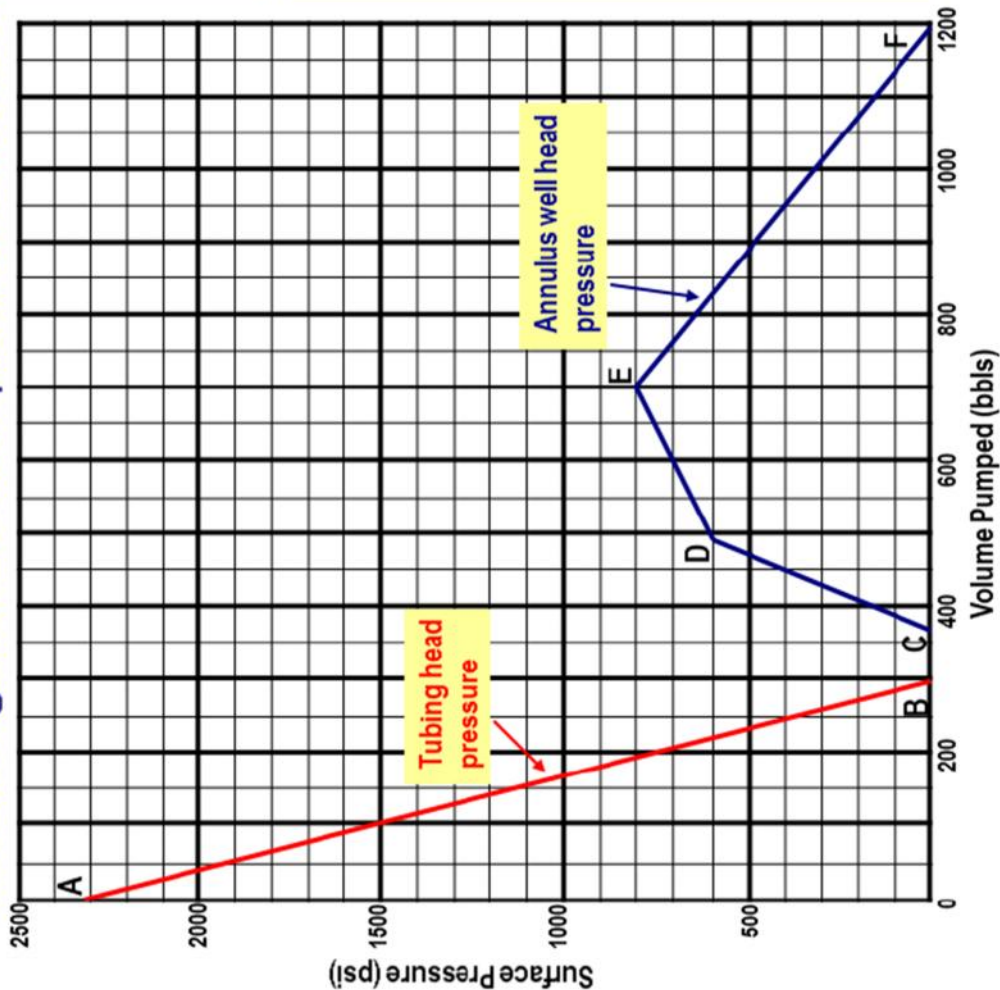
Reverse Circulation #3





Reverse Circulation #4

**Reverse Circulation Kill Graph (in static condition)
Kill Fluid is lighter than the Completion Brine in Annulus**

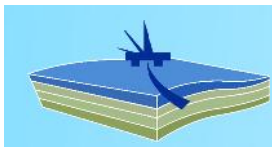


Kill Graph for Reverse Circulation For initiative Production.

- Tubing & Annulus capacity are constant
- The Tubing consists of Gas and Oil (Gas above, Oil below)
- In Annulus filled with a heavy Brine
- Light fluid density is less than Brine density

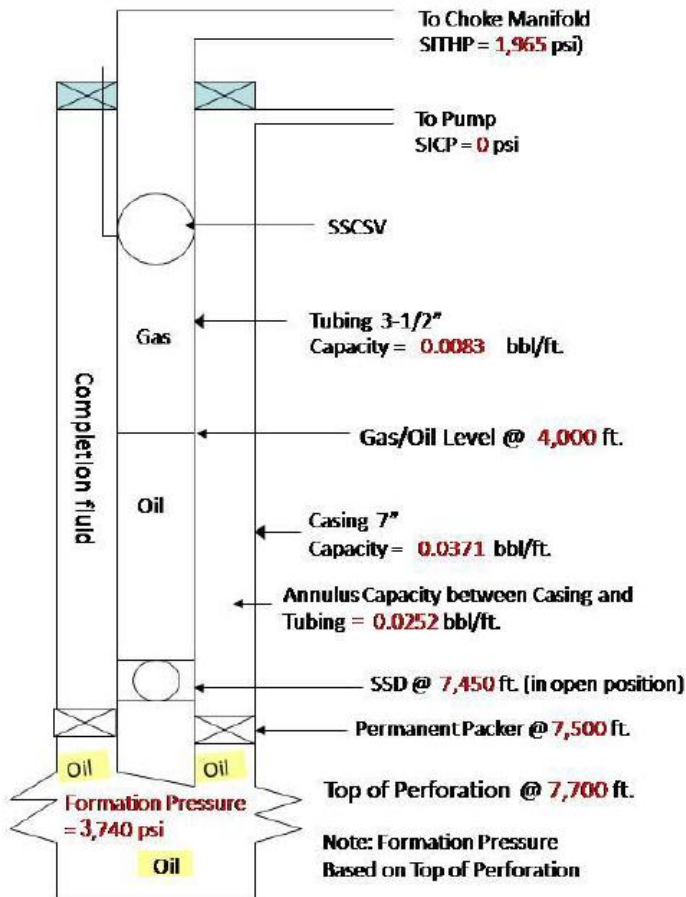
1. What is the total volume of this well for Reverse circulation?
2. What is the Tubing head pressure at the start of the pumping operation?
3. What is the Tubing head pressure after pumping 100 bbls of Kill fluid?
4. What is the Annulus well head pressure After pumping 200 bbls of Kill fluid?
5. At what point on the graph does the lighter Fluid completely fill the annulus and the Original completion fluid (Brine) completely fill the Tubing?





Reverse Circulation #5

COMPLETION DIAGRAM



Gradients:

Gas = 0.12 psi/ft. Oil = 0.35 psi/ft. Brine = 0.49 psi/ft.

Kill Fluid for reverse circulation = 0.52 psi/ft.

Over Balance Pressure apply during reverse circulation = 200 psi

STIHP = 1,965 psi

Tubing Capacity = 0.0083 bbl/ft

Casing Capacity = 0.0371 bbl/ft

Annular Capacity = 0.0252 bbl/ft

Gas/Oil Contact = 4,000 ft.

Gas in Tubing, gradient = 0.12 psi/ft

Oil in Tubing and in Casing,
Gradient = 0.35 psi/ft

Brine in Annulus as a completion
fluid, gradient = 0.49 psi/ft

Kill fluid, gradient = 0.52 psi/ft

SSD depth = 7,450 ft (TVD)

Packer Depth = 7,500 ft. (TVD)

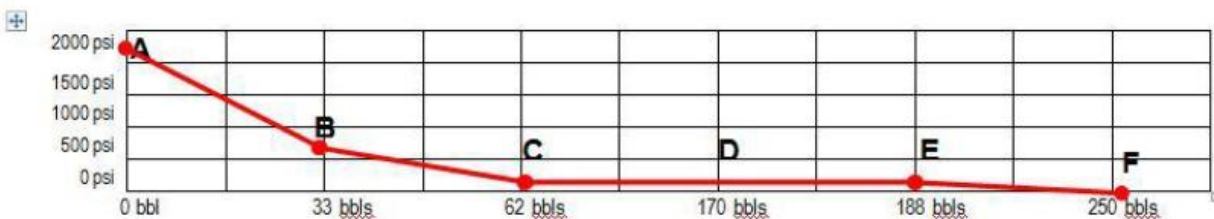
Top of Perforation = 7,700 ft. (TVD)

Formation pressure = 3,740 psi

Reference at Top of perforation

During reverse circulation;

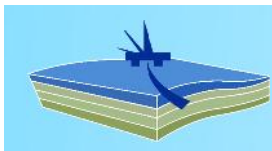
Over balance pressure = 200 psi



Pressure Schedule (tubing head pressure only)

Point A	Point B	Point C	Point D	Point E	Point F
2,165 psi	685 psi	200 psi	200 psi	200 psi	-22

Use this information, calculate and answer the following five (5) questions;



Reverse Circulation #5 - Questions

1. What is the bottom hole pressure (BHP) at the sliding side door (SSD) during reverse circulation well kill?

Answer: _____psi

2. After 62 barrels of kill fluid has been pumped, the tubing head pressure has stabilized at 200 psi (point C), the pressure remains unchanged until we have pumped 188 barrels (point E). What is the reason for stabilization at 200 psi?
 - a) The level of fluid in tubing has dropped to below surface
 - b) The gas coming out of the well, therefore, no longer expanding
 - c) The tubing remains filled with original completion brine and hydrostatic head remains unchanged
 - d) The oil is coming out the well and the choke opening remains unchanged

3. What is the total volume in annulus between well head and sliding sleeve (SSD)?

Answer: _____barrels

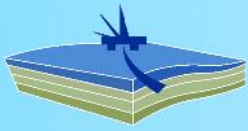
4. If the tubing head pressure between point [C] and point [E] is held constant at 150 psi, instead of 200 psi, will the well be under balance?

Answer: _____

5. At what point on the graph does the kill fluid partly filled in annulus while the gas has just been displaced out of the tubing string?

Answer: Point _____





EXERCISE COMPLETION OPERATIONS-5

Reverse Circulation #1

- | | |
|----|---------------|
| 1. | 1200 bbls |
| 2. | 2367 psi |
| 3. | 600 – 650 psi |
| 4. | 0 psi |
| 5. | Point E |

Reverse Circulation #2

- | | |
|----|------------|
| 1. | 347.8 bbls |
| 2. | 58 bbls |
| 3. | 126.2 bbls |
| 4. | 58 bbls |
| 5. | 347.7 bbls |
| 6. | 3969.2 psi |

Reverse Circulation #3

- | | |
|----|----------|
| 1. | 3720 psi |
| 2. | 1670 psi |
| 3. | 770 psi |
| 4. | 120 psi |
| 5. | 0 psi |

Reverse Circulation #4

- | | |
|----|-----------|
| 1. | 1200 bbls |
| 2. | ~2320 psi |
| 3. | 1500 psi |
| 4. | 0 psi |
| 5. | Point E |

Reverse Circulation #5

- | | |
|----|------------|
| 1. | 3852.5 psi |
| 2. | c |
| 3. | 188 bbls |
| 4. | No |
| 5. | Point B |

