SPE Workshop: Managed Pressure Drilling (MPD) and Underbalanced Drilling (UBD)

8 – 9 JULY 2025 | KUALA LUMPUR, MALAYSIA

Effect of Ballooning and Supercharged Drilling Fluid Pressurization on Bottomhole Pressure

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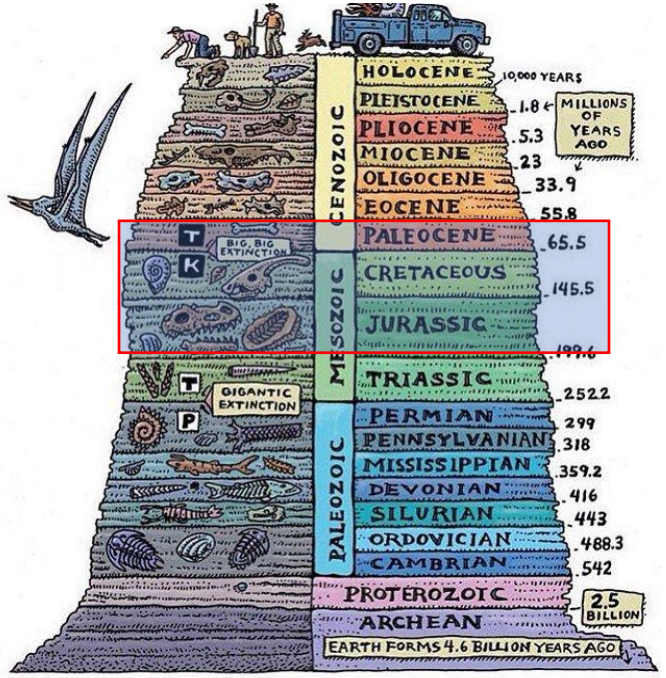
Objective

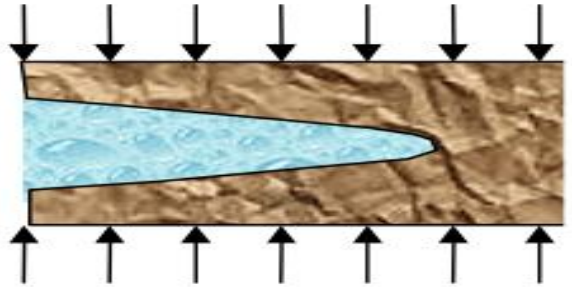
This presentation examines four distinct cases of drilling in shale and carbonate formations (Paleocene, Cretaceous and Jurassic), focusing on the challenges and solutions related to the loss and pressurization of drilling fluids

- Case 1, exploratory well
- Case 2, exploratory bounding well
- Case 3, exploratory well
- Case 4, development well

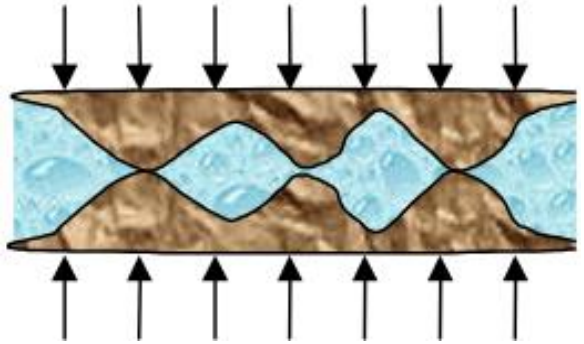


Introduction

Ballooning is a phenomenon that occurs when formations take drilling mud.



Supercharging is a phenomenon that occurs when the pressure on the face of the formation increases due to the leakage of the drilling fluid*.



*This concept is known in wireline and logging while drilling; in this case, it is used to explain fluid pressurization in the formation.

Case 1, exploratory well

Section 8 ½”

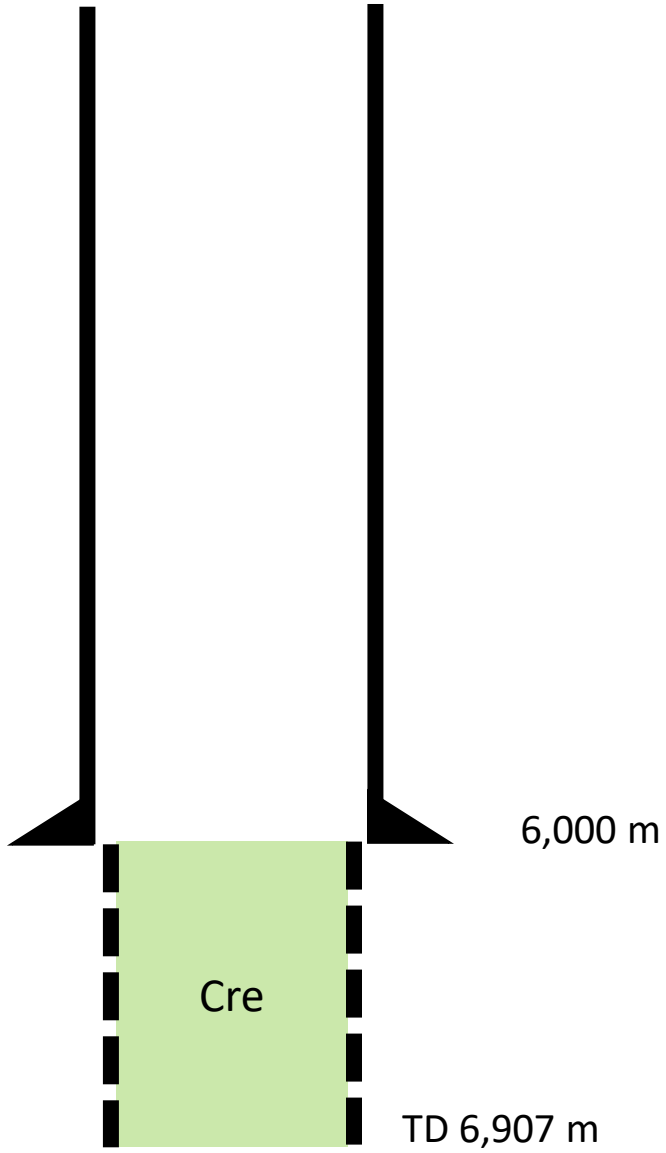
Shoe: 6,000 m (TVD)

Drill 907 m

Carbonate rock (Cretaceous).

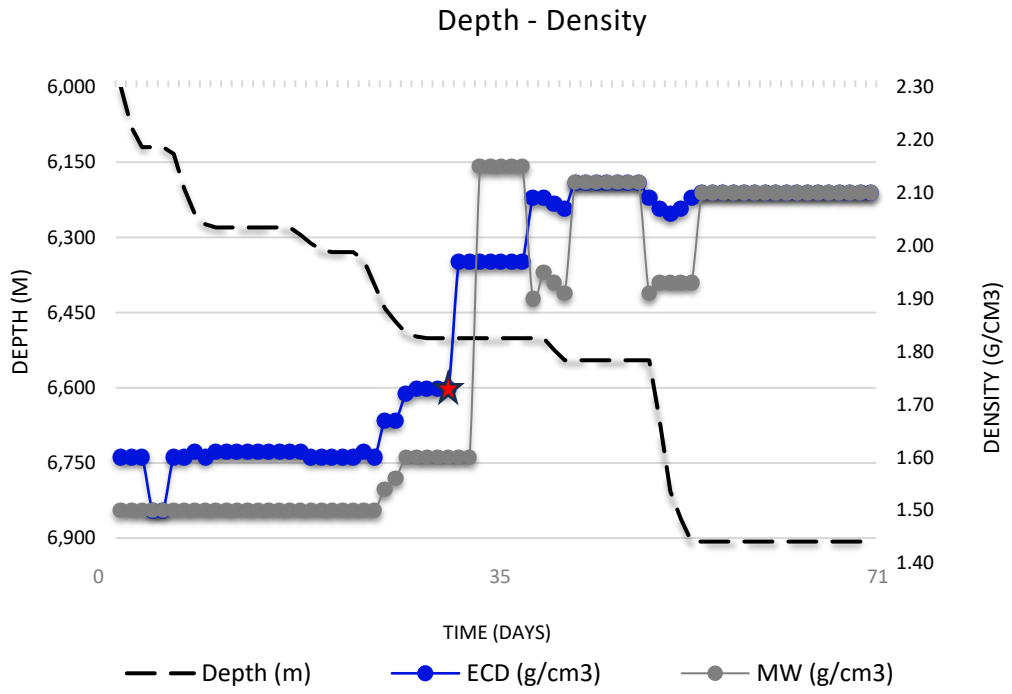
Drilling was through MPD equipment.

Challenges: Water and gas influx and fluid loss
Events: Supercharging effect (hypothesis)
Solution: Increased control density, Supercharging not accepted

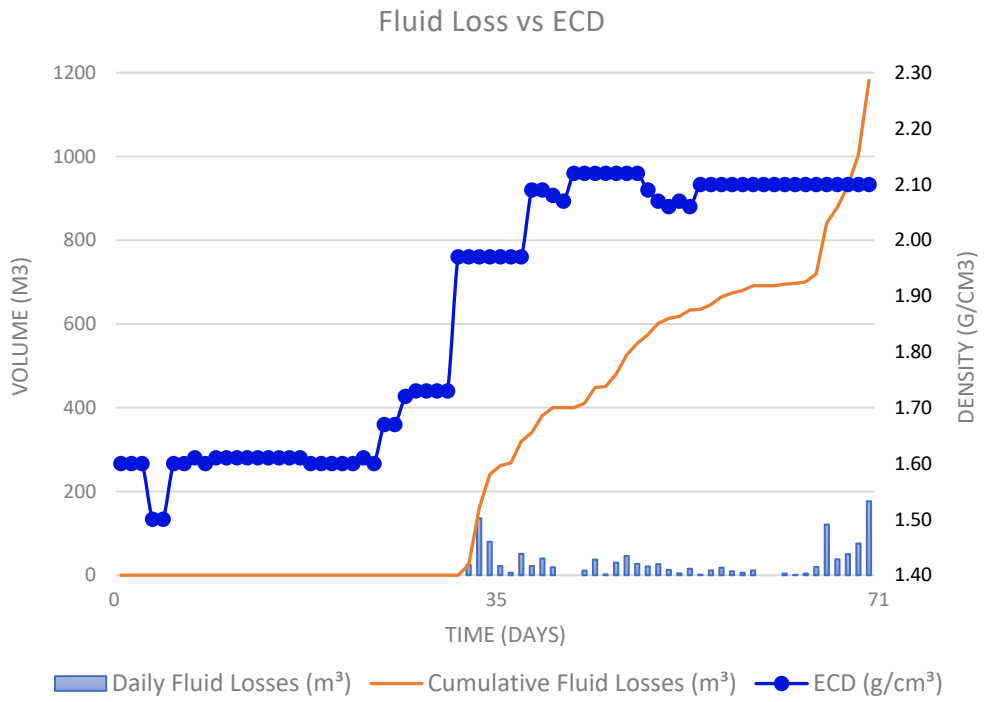


Case 1, exploratory well

- Drilling Operations



- Drilling fluid losses



★ Bullheading

Case 2, exploratory Bounding well

Section 5 7/8”

Shoe: 5,000 m (TVD)

Drill 250 m

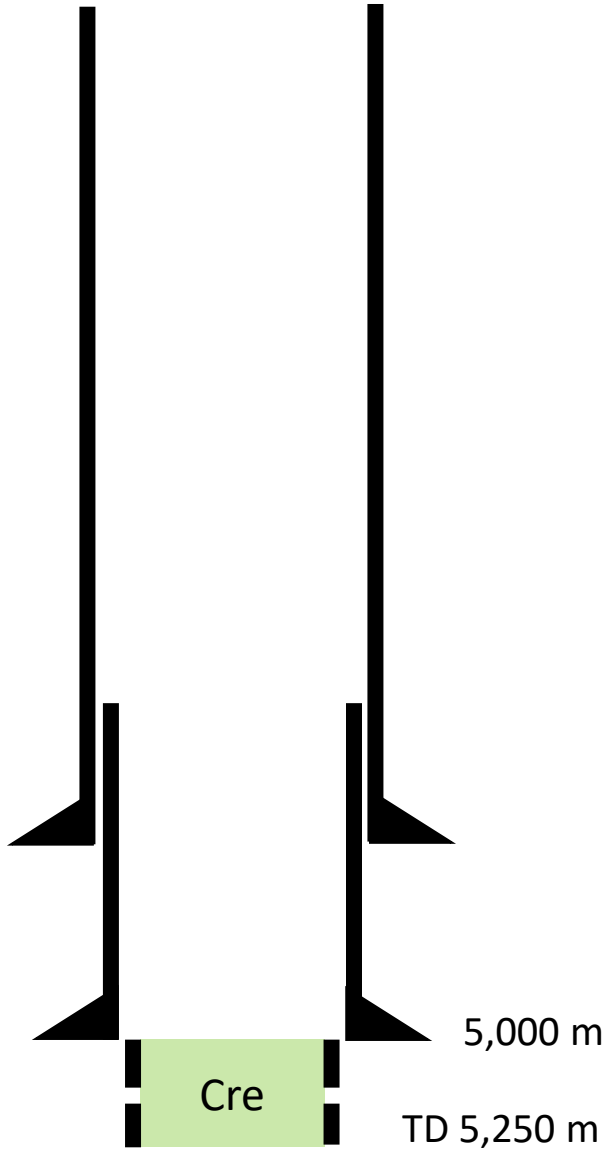
Carbonate rock (Cretaceous).

Drilling was through MPD equipment.

Challenges: Gas influx, fluid loss and high surface pressure

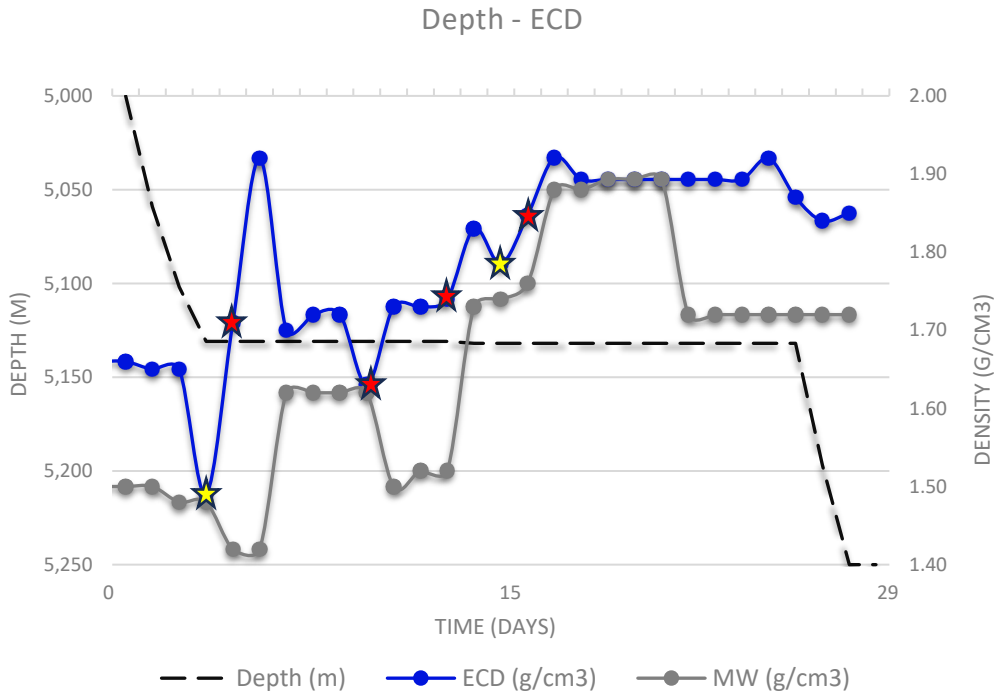
Events: Supercharging effect (hypothesis)

Solution: Increased control density, Supercharging not accepted

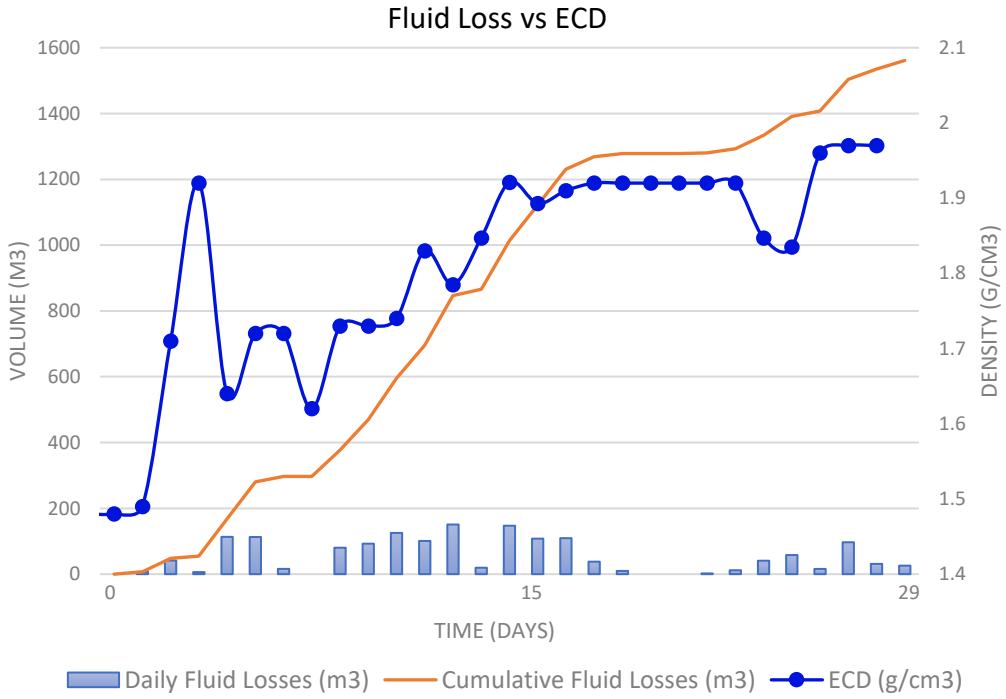


Case 2, exploratory Bounding well

- Drilling Operations



- Drilling fluid losses



☆ Well Control ★ Bullheading

Case 3, exploratory well

Section 8 ½”

Shoe 6,500 m (TVD)

Drill 551 m

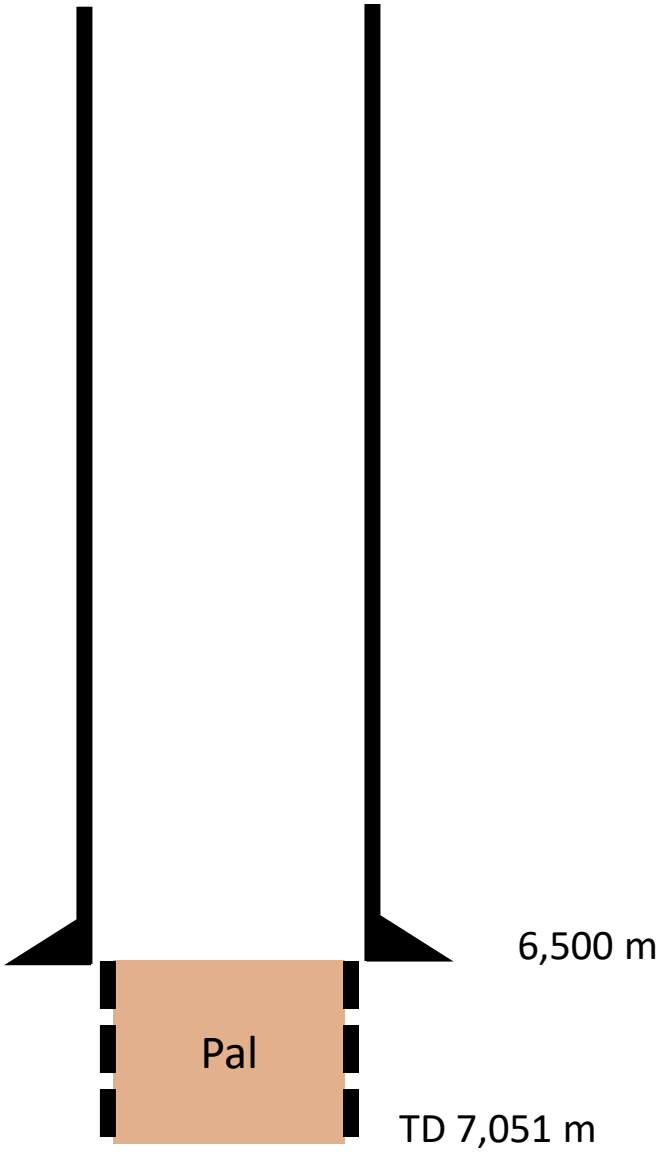
Shale rock (Paleocene)

The first 46 m was drilling conventionally and then through the MPD equipment.

Challenges: Fluid loss and water influx

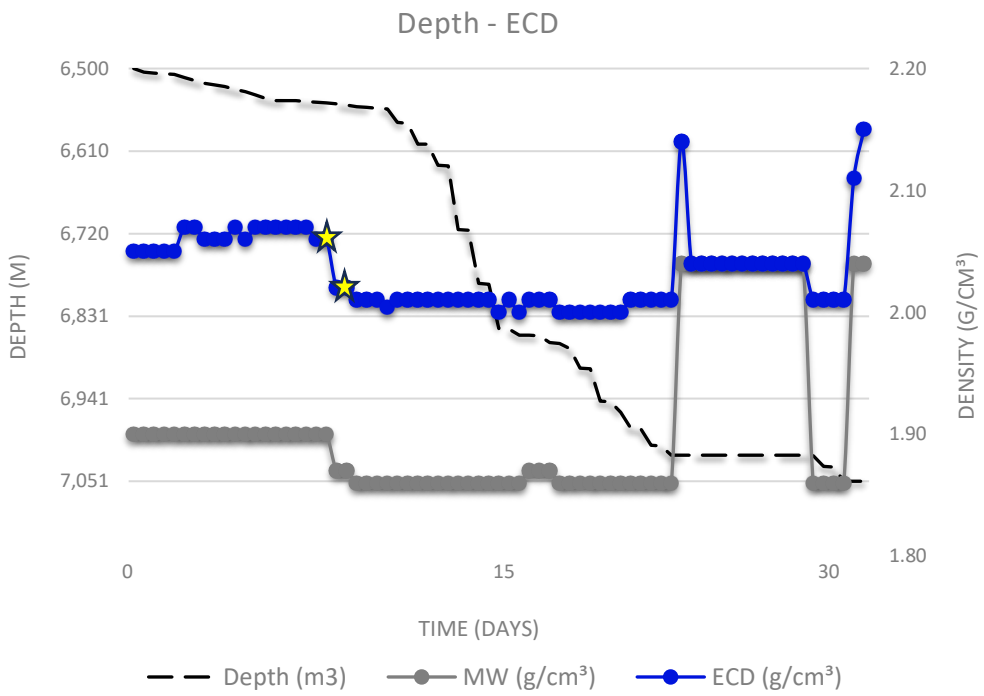
Events: Ballooning effect

Solution: Vent volume and reduce the ECD

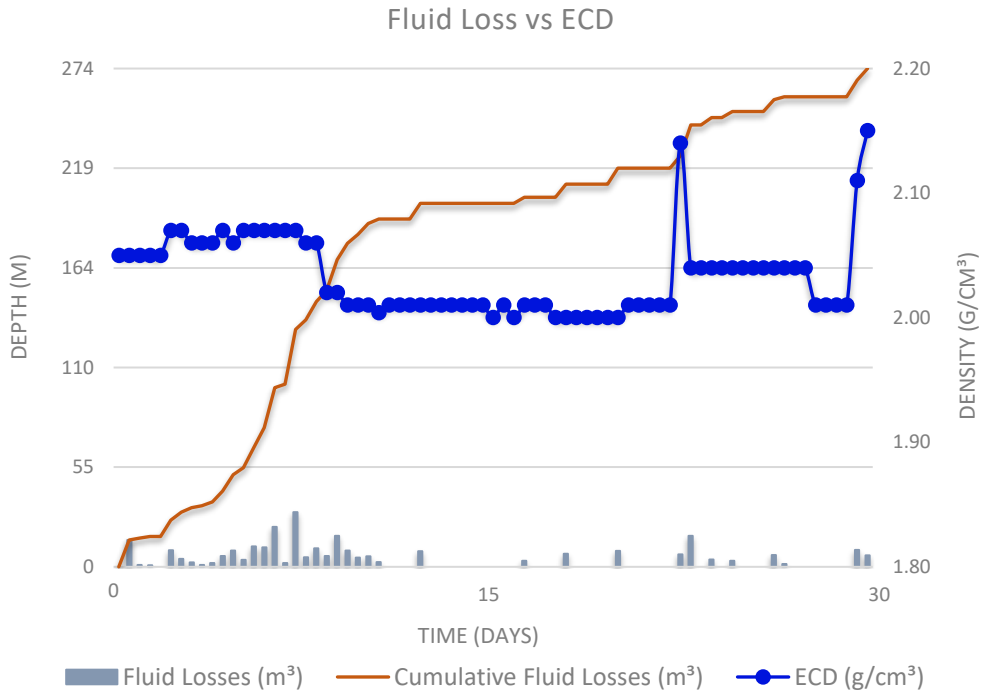


Case 3, exploratory well

- Drilling Operations



- Drilling fluid losses



☆ Well Control

Volume recovered during connection: 52 m³

Case 4, development well

Section 8 ½”

Shoe 4,000 m (TVD)

Drill 865 m

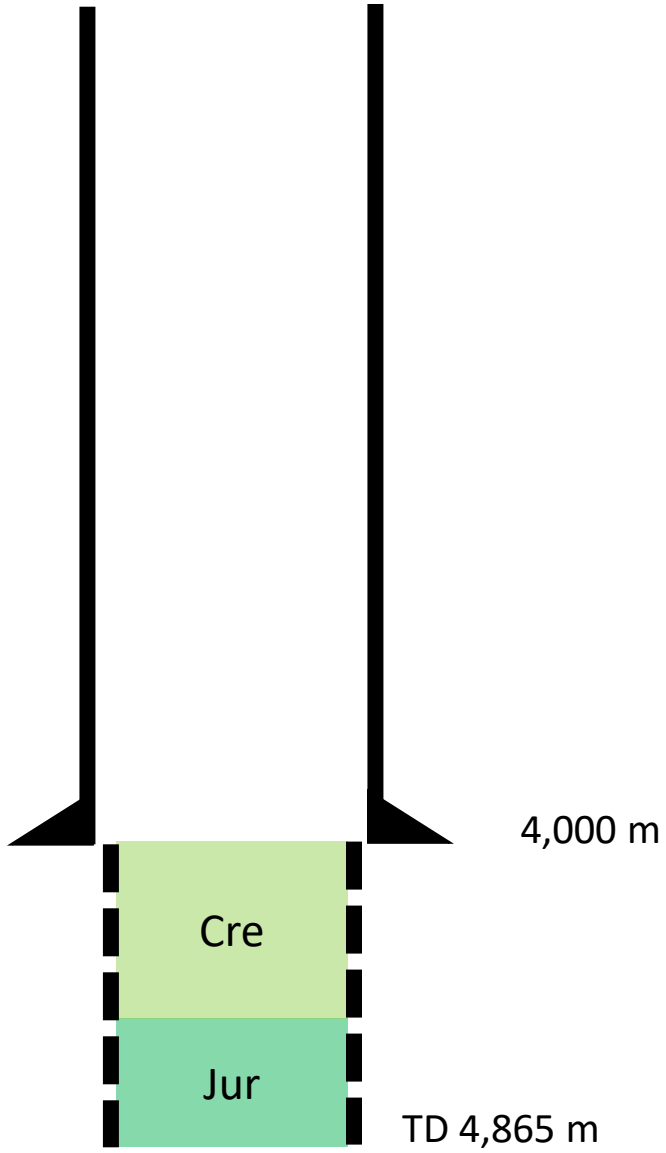
Carbonate rock (Cretaceous and Jurassic).

Drilling was through MPD equipment

Challenges: Gas influx, fluid loss and high surface pressure

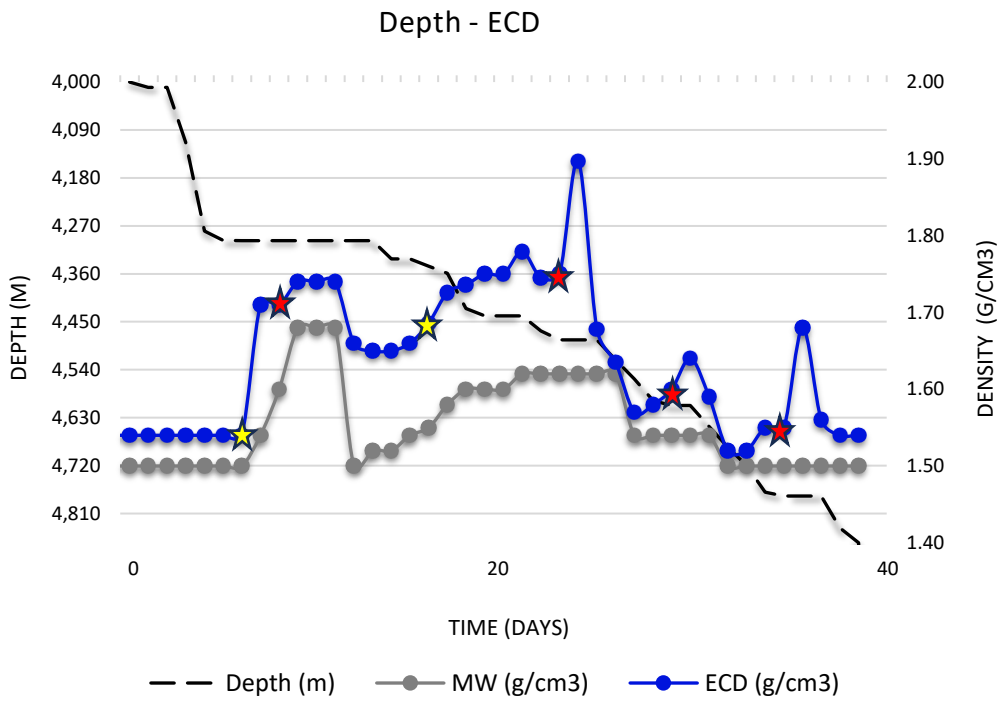
Events: Supercharging effect

Solution: Vent volume, reduce SBP and the ECD



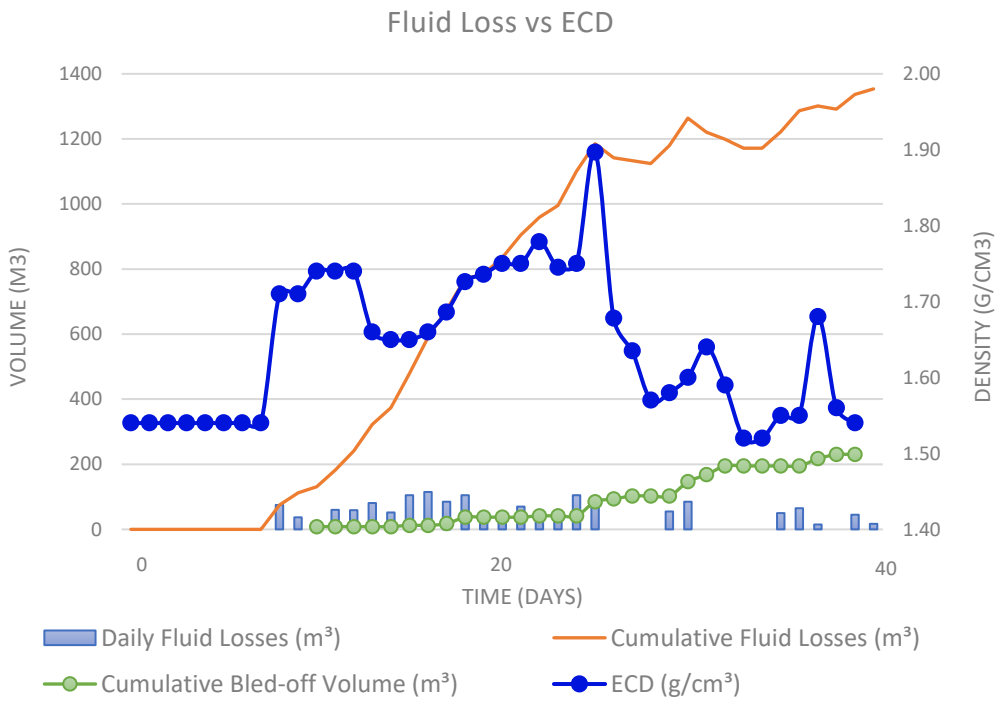
Case 4, development well

- Drilling Operations



☆ Well Control ★ Bullheading

- Drilling fluid losses



Volume recovered in drilling: 230 m³

Conclusions

- Importance of identifying the phenomenon
  - This phenomenon is not well known, making it difficult to identify and confirm.
- Reduction of well control times
  - By adjusting the ECD, well control can be carried out more efficiently (A well control can take up to 20 days, case 2).
- Decrease in surface pressures
  - While venting volume, the surface pressure decreases.
- Efficient drilling and use of MPD equipment
  - ECD adjustments can still be made during drilling.
- Cost optimization
  - Time reduction, material reduction (e.g., case 4, recover 230 m^3 of fluid, reduces costs due to material usage and mobilization).
- Environmental impact
  - Time reduction directly impacts our carbon footprint and material reduction (e.g., 230 m^3 of fluid is equivalent to 431 tons of CO_2 equivalent).

Thank you

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