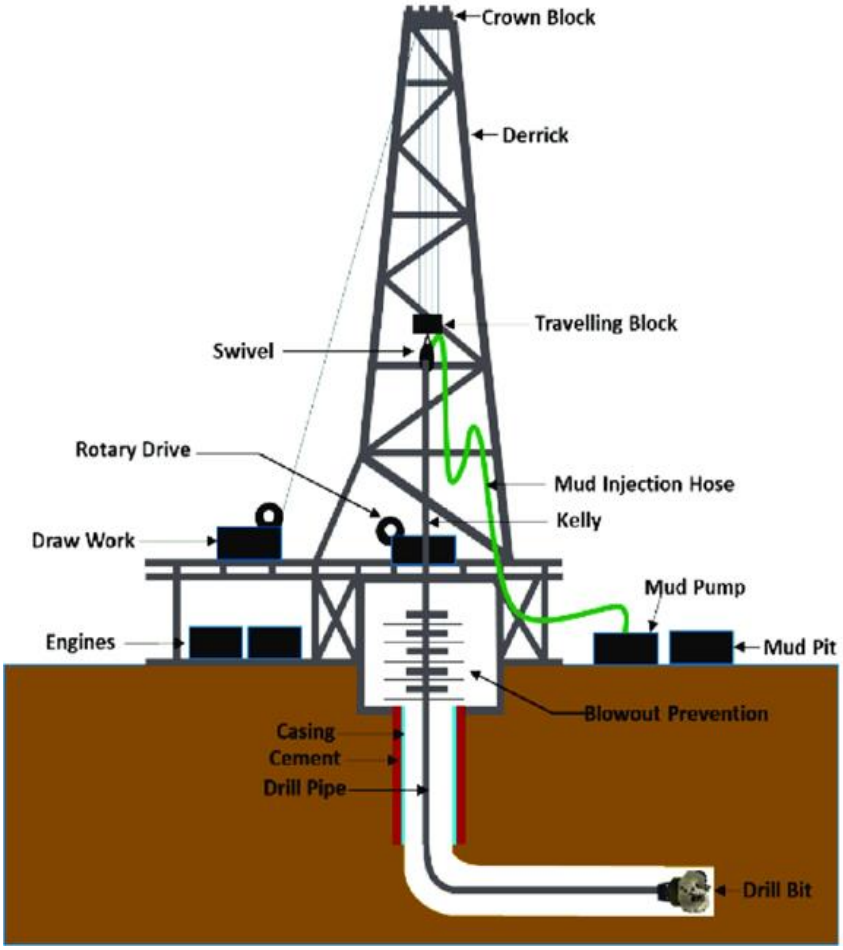
CASE STUDY

Drilling Data Analysis Using Power BI Dashboard



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1.Overview:

This project showcases the analysis of drilling data using Power BI. The goal is to visualize operational performance, track inefficiencies, and provide actionable insights to decision-makers. The dashboard focuses on optimizing drilling efficiency, reducing costs, and minimizing Non-Productive Time (NPT). Below is a comprehensive breakdown of the dataset, purpose, strategy, and visualizations.

2.Dataset Overview:

The drilling data consists of daily operational metrics that offer a detailed overview of the drilling process. The key data points include:

- **Well ID:** A unique identifier for each well.
- **Mud Volume (L):** Volume of mud used in liters.
- **Rig ID:** Unique identifier for the rig.
- **Drilling Depth (m):** Depth achieved per day.
- **Bit Type:** Type of drill bit used.
- **Mud Type:** Type of drilling mud (e.g., water-based, oil-based).
- **Rate of Penetration (ROP):** Speed of drilling in meters per hour.
- **Downtime (hours):** Hours lost due to issues.
- **Incidents:** Description of any operational incidents.
- **Cost (USD):** Cost incurred during drilling.
- **Contractor:** Contractor managing the operation (e.g., Baker Hughes, Schlumberger).

3.Purpose and Goals:

The primary purpose of the dashboard is:

• Track the daily operational performance of the drilling process.

• Identify any inefficiencies or issues that may affect the drilling operation.

• Enable decision-makers to act based on real-time data insights.

Goals:

• **Optimize Drilling Efficiency:** Key metrics like ROP, bit type, and mud type help ensure performance optimization.
• **Monitor Costs**: Track drilling costs over time, enabling cost comparison across wells and rigs.
• **Minimize NPT**: Identify and reduce non-productive time to improve operational efficiency.

4.Key Questions:

1. Which well has the highest ROP, and what are the contributing factors?
2. What are the downtime trends for each rig and well?
3. How much drilling depth was achieved across different rigs daily?

5.Strategy for Effective Data Presentation:

To convey the insights effectively, the following strategies were employed:

- Highlighting Key Metrics
- Color-Coded Alerts
- Filter and Drill-Down Options
- Engaging Visuals

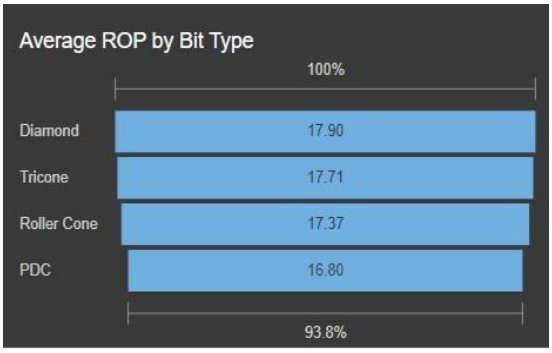
6.Key Performance Indicators (KPIs):

1. Average Rate of Penetration (ROP): Measure of the drilling speed.
2. Total Downtime: Cumulative hours of downtime.
3. Total Incidents: Number of incidents during operations.
4. Total Cost by Quarter: Tracks financial efficiency over time.

7.Results – Power BI Dashboard Visualizations:

1. Average ROP by Bit Type:

This chart compares the average Rate of Penetration (ROP) across different bit types. Different drill bits are suited to different geological formations, and their performance can vary significantly. Monitoring ROP by bit type helps in selecting the most efficient bit for the specific geological conditions, thereby optimizing drilling performance and reducing costs associated with slower penetration.

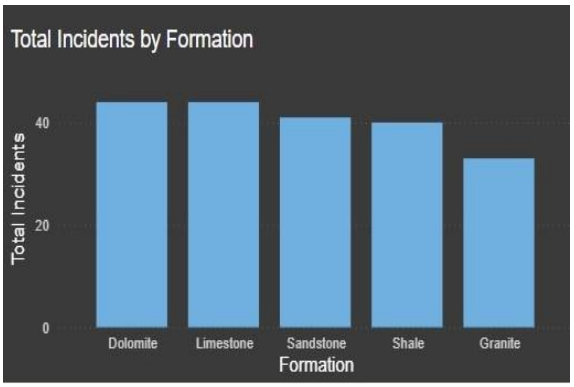


2. Downtime Trends:

Downtime represents periods when drilling operations were paused, possibly due to equipment failure, maintenance, or other issues. Reducing downtime is key to improving efficiency and lowering costs, as downtime can significantly affect project timelines and financial outcomes. This metric helps teams analyze and minimize non-productive time (NPT) and plan better for preventive maintenance or equipment upgrades.

3. Total Incidents by Formation:

Different geological formations can present different challenges during drilling. This bar chart categorizes incidents by formation type, helping managers understand which formations are more prone to causing operational difficulties or accidents. With this data, strategies can be developed to improve drilling techniques in problematic formations, and safety protocols can be adjusted to minimize risks in high-incident areas.

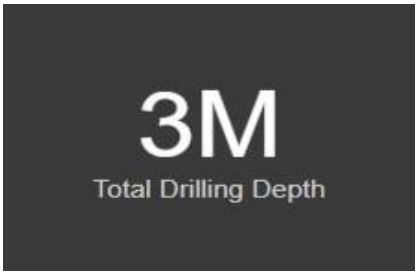


4. Total Incidents:

This metric helps the team monitor safety and compliance. Each incident represents a risk to personnel or equipment, and tracking the number of incidents helps identify recurring issues, formations prone to incidents, or operational areas that need improvement. This data is vital for enhancing safety measures and reducing operational hazards.

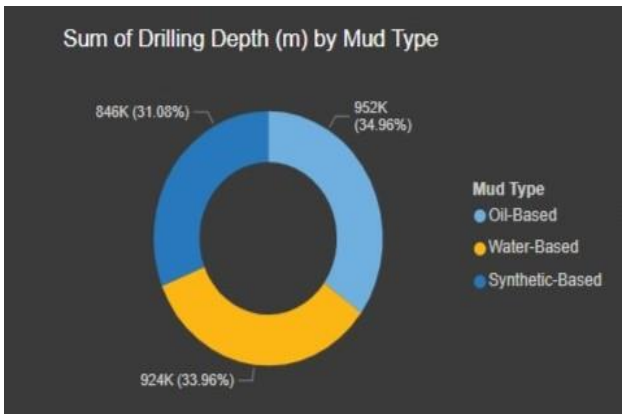
8. Total Drilling Depth:

This metric reflects the overall progress of the drilling operations across all wells. Tracking the cumulative drilling depth helps managers assess whether the project is progressing on schedule and within operational goals. It also offers insight into how efficiently the teams are reaching target depths.



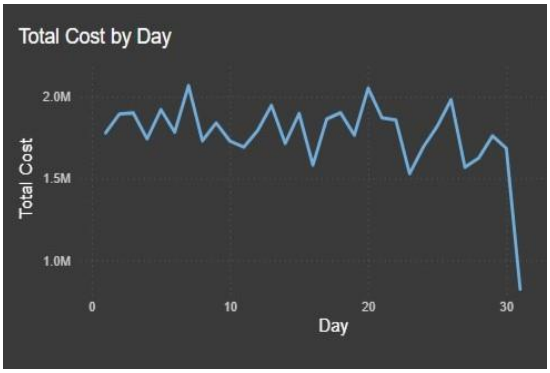
5. Sum of Drilling Depth by Mud Type:

This visualization breaks down the total drilled depth by the type of mud used. Mud types are essential in drilling as they help lubricate the drill bit, stabilize the borehole, and carry the cuttings to the surface. By analyzing the contribution of each mud type, management can determine which type works best in certain conditions or formations. This information assists in making cost-effective decisions regarding mud usage in future operations.



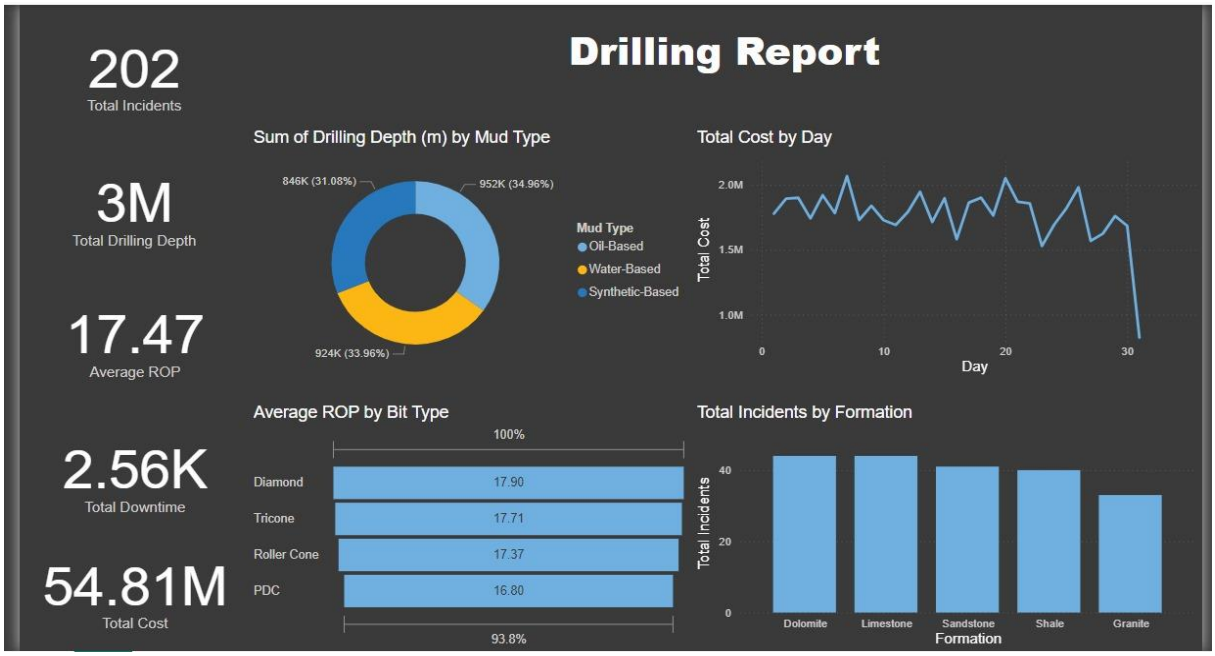
6. Total Cost & Total Cost by Quarter:

This total includes all expenses incurred throughout the drilling period, such as labor, materials, equipment, and other operational costs. Keeping track of this ensures that the project stays within budget and helps to identify opportunities for cost optimization. Managers can also compare costs to the drilling depth or efficiency metrics to ensure that spending aligns with project outputs.



Tracking costs on a quarterly basis helps identify seasonal trends, operational peaks, or inefficiencies that may impact budgeting. Fluctuations in quarterly expenses may highlight periods of higher activity, equipment upgrades, or unexpected downtimes. By analyzing these costs, decision-makers can adjust resource allocation and financial planning, ensuring that future quarters align more closely with the project's budget and performance goals.

8. Summary of the Drilling Report Power BI Dashboard:



The Drilling Report Power BI Dashboard offers a comprehensive overview of key performance, cost, and safety metrics related to drilling operations. The dashboard is designed to give decision-makers real-time insights into daily activities and long-term trends, enabling more informed, data-driven decisions.

- **Total Incidents** and **Total Downtime** highlight safety concerns and non-productive time, helping teams identify areas where operational risks can be mitigated.
- **Total Drilling Depth** and **Average Rate of Penetration (ROP)** provide a measure of operational efficiency, showing how quickly and effectively the drilling process is progressing.
- **The Sum of Drilling Depth by Mud Type** and **Average ROP by Bit Type** offer insights into the performance of different drilling equipment and materials, enabling optimization of resource use.
- **Total Cost by Day** and **Total Cost by Quarter** track the financial aspects of the operation, showing how costs evolve over time and helping managers stay within budget.
- The **Total Incidents by Formation** chart shows where incidents are more likely to occur based on geological formations, allowing teams to adjust safety protocols and drilling strategies accordingly.

8.Conclusion:

The data reveals key operational insights into the drilling process. A strong correlation exists between drilling depth and rate of penetration (ROP), which influences downtime and costs. Furthermore, mud types of impact incident rates, with water-based mud showing a higher risk.

Key Findings: Wells with lower ROP results in higher costs and downtime, indicating operational inefficiencies. Schlumberger has a dominant role but fluctuating cost structures, likely due to well conditions. Water-based mud tends to be associated with higher incident rates, suggesting a need for reviewing its usage in challenging formations.