Oil & Gas Equipment Performance and Maintenance Analysis

PROJECT INTRODUCTION  
This project focuses on the analysis of oil and gas equipment performance and maintenance data to optimize operational efficiency and reduce downtime. By leveraging key metrics such as rotary torque, pump speed, oil viscosity, and wellhead pressure, the analysis provides insights into factors that impact penetration rates, equipment performance, and potential risks. The goal of the project is to identify patterns and trends that can assist in maintenance planning, risk management, and improving overall equipment reliability in the oil and gas industry.

QUESTIONS TO ANSWER IN THIS PROJECT

**Equipment Performance Questions**

1. **What is the average drilling performance, and how can it be improved?**
   * Analyze Penetration Rate to evaluate drilling efficiency.
2. **How do drilling parameters (RPM, WOB, Torque) impact penetration rates?**
   * Investigate correlations to optimize drilling conditions.
3. **What is the efficiency of production equipment based on GOR and Water Cut?**
   * Assess production quality and operational effectiveness.
4. **How does the flow rate influence wellhead pressure?**
   * Analyze the relationship to optimize extraction processes.

**Maintenance Schedule Questions**

1. **When should preventive maintenance be scheduled based on condition monitoring data?**
   * Use Bearing Temperatures to predict maintenance needs.
2. **What are the common causes of downtime, and how can they be minimized?**
   * Analyze Downtime Events to identify root causes for reduction strategies.
3. **What indicators reflect the health of equipment from condition monitoring data?**
   * Evaluate Oil Quality to assess equipment performance.
4. **Are there early warning signs of equipment failure from monitoring data?**
   * Utilize Gas Detection Levels to identify potential failures.

MY FINDINGS  
From the project on Oil & Gas Equipment Performance and Maintenance Analysis, here are some key findings in regards to the final dashboard:

1. **High Rotary Torque Reduces Penetration Rate**: The first graph indicates that as rotary torque (in lb-ft) increases, the penetration rate (in ft/hr) tends to decrease, implying that higher torque might hinder drilling efficiency.
2. **High Pump Speeds Increase Penetration Rate**: The second graph shows that increasing pump speed (in strokes/min) leads to an increase in penetration rates. This suggests that efficient pump speed management can improve drilling rates.
3. **Weight on Bit Influences Penetration**: The third graph demonstrates that a higher weight on the bit (in tonnes) slightly increases penetration rates. However, this effect seems marginal as there is variability in the data.
4. **Oil Viscosity and Downtime**: The graph on oil viscosity (cSt) and downtime duration (minutes) indicates that increased oil viscosity may be correlated with higher downtime, as seen from the fluctuations in downtime duration when viscosity spikes.
5. **Bearing Temperature and Oil Viscosity**: There's a comparison between oil viscosity and bearing temperature (in °F), but there is no clear trend, suggesting that other factors might influence bearing temperature more than oil viscosity does.
6. **Wellhead Pressure and Flow Rate**: A comparison between wellhead pressure (psi) and flow rate (barrels/day) shows that while the flow rate fluctuates throughout the year, it generally follows a stable trend. The wellhead pressure appears more variable over the months.
7. **Gas Concentration and PRV Events**: This graph indicates that higher gas concentration (ppm) might be associated with an increase in PRV events (pressure relief valve activations). Managing gas concentrations could be crucial for safety and reducing PRV incidents.
8. **Gas Concentration vs. BOP Status**: The area graph tracks gas concentration alongside the blowout preventer (BOP) status, indicating periods of active vs. inactive states. Peaks in gas concentration appear to coincide with periods when the BOP is inactive, highlighting potential risks in those periods.

CONCLUSIONOverall, the dashboard suggests the importance of monitoring equipment performance metrics like penetration rate, rotary torque, pump speed, and gas concentration to optimize drilling operations and prevent potential risks in the oil and gas industry.