**Case Study Title:**

Optimizing Petroleum Logistics: A Power BI Case Study on Transportation Efficiency from Tehran and Pars Petrochemical Refineries

**Background:**

Effective logistics management is critical to the petroleum industry, where even small inefficiencies can lead to significant financial and operational impacts. This case study focuses on transportation data from two refineries, Tehran and Pars Petrochemical, for petroleum products such as VB and C5+. Understanding the transportation delays, discrepancies in net weight between departure and arrival, and refinery performance can highlight key areas for operational improvement.

**Objective:**

The primary goal of this study was to leverage Power BI to analyze and visualize petroleum transportation data. By identifying transportation inefficiencies, delays, and discrepancies in net weights, the study aims to provide actionable insights for optimizing logistics and improving the overall efficiency of petroleum transportation from these refineries.

**Data Overview:**

The dataset provided detailed records of petroleum transportation, capturing the following fields:

* **Work Shift**: The shift during which transportation occurred (Day shift).
* **Type**: Type of petroleum product transported (VB, C5+).
* **Refinery**: Source refinery (Tehran, Pars Petrochemical).
* **Origin Departure Date**: Date when the product left the refinery.
* **Origin Net Weight**: Weight of the product at the departure.
* **Destination Arrival Date**: Date when the product arrived at the destination.
* **Destination Net Weight**: Weight of the product upon arrival at the destination.

The dataset covers multiple shipments from December 2022 to early January 2023

**Challenges:**

1. **Net Weight Discrepancies**: There were observable differences between the net weights recorded at the origin and at the destination, potentially indicating product loss during transportation or errors in data recording.
2. **Transport Delays**: The time taken between departure from the refinery and arrival at the destination varied across shipments. Understanding the causes of these delays and their impact on operational efficiency was a key focus.
3. **Shift and Refinery Performance**: The dataset allowed for the analysis of how different refineries and shifts impacted the transport efficiency of petroleum products.

**Methodology:**

1. **Data Preparation and Cleaning**:
   * The dataset was loaded into Power BI, where columns were checked for consistency.
   * Date fields were reformatted from the Iranian calendar to the Gregorian calendar for ease of analysis.
   * Columns were created to calculate the transportation duration and the difference between origin and destination net weights.
2. **Data Analysis and Visualization**:
   * Power BI dashboards were designed to display critical metrics and trends. Visualizations included:
     + **Net Weight Discrepancy**: A line chart tracking changes in net weight during transportation.
     + **Transportation Time**: A bar chart comparing the number of days taken for products to reach their destination.
     + **Refinery Comparison**: A pie chart showcasing the contribution of each refinery to the total transportation volume.
     + **Shift Performance**: A breakdown of total net weights transported during the day shifts.
3. **KPI Creation**:
   * Key performance indicators (KPIs) were set to track:
     + Average net weight loss/gain during transportation.
     + Average transport time (days).
     + Total net weight transported by refinery.

**Key Findings:**

1. **Net Weight Discrepancies**:
   * The analysis revealed consistent but small differences in net weights between the origin and destination. For example, one shipment of VB from Tehran on 2022/12/28 had an origin weight of 24,040 kg but arrived with a weight of 24,030 kg, indicating a loss of 10 kg.
   * Larger discrepancies were also observed, such as a shipment of VB from Tehran on 2022/12/27, which lost 100 kg during transportation, indicating a need for further investigation into potential causes (e.g., leakage or measurement error).
2. **Transportation Delays**:
   * The transport times varied significantly. Shipments typically took 2 to 4 days, but some shipments were delayed up to 5 days. For example, a shipment from Tehran on 2022/12/29 took 4 days to reach its destination, compared to the average of 2-3 days.
   * These delays can be attributed to external factors such as road conditions or weather, but further analysis is required to determine the precise causes.
3. **Refinery Performance**:
   * The majority of shipments originated from the Tehran refinery, but the Pars Petrochemical refinery showed a consistent trend of slightly higher origin weights, indicating potential operational differences.
   * The transportation performance (measured by net weight discrepancies and transportation time) from both refineries was similar, with no major differences in efficiency.
4. **Shift Impact**:
   * Since all recorded shipments occurred during the day shift, it was not possible to compare shift performance directly. However, it was noted that day shift operations were generally efficient, with minimal discrepancies in net weight and moderate transport times.

**Recommendations:**

1. **Investigate Weight Loss**:
   * Although most weight discrepancies are minor, repeated occurrences suggest the need for closer monitoring of transportation processes. Possible solutions include improved sealing mechanisms, better data logging practices, or real-time tracking of product weight during transport.
2. **Reduce Transport Delays**:
   * A more detailed investigation into the causes of transportation delays is required. Leveraging GPS tracking data alongside this dataset could provide more insights into where delays occur (e.g., during loading, on-route, or unloading).
3. **Refinery-Specific Optimizations**:
   * Further analysis should be conducted to compare refinery processes, particularly looking into Pars Petrochemical’s operational procedures, as the net weight discrepancies for C5+ were negligible compared to VB shipments from Tehran.
4. **Expand Dataset for Shift Comparison**:
   * Collecting data from night shifts or adding more detailed information on operational hours could provide additional insights into whether shift timing impacts transportation efficiency.

**Conclusion:**

This Power BI analysis of petroleum product transportation data provides a foundational understanding of transportation inefficiencies, particularly regarding net weight discrepancies and delays. By visualizing this data, stakeholders can identify areas for improvement and take actionable steps to optimize the logistics of petroleum transport. Future studies should incorporate more granular data (e.g., weather, road conditions, and shift performance) to gain a more comprehensive understanding of the challenges faced in petroleum logistics.

**Tools Used**: Power BI, Excel  
**Date Completed**: September 2024  
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