Behind the Barrels: U.S. Crude Oil Imports Unveiled Through SQL

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Abstract

The data set will be used to analyze factors of the United States obtaining crude oil over the years and compare imported crude oil versus domestic crude oil. I will be using MySQL to answer the objectives, Excel to prepare the dataset, and Tableau if needed to better represent the results.

Variables

The dataset provides information about the year, month, country of origin, location of oil import, the name of the oil company, the type of oil, and volume imported in the thousands of barrels.

- Year
    - Range 2009 to 2024

- Month
    - Range from month 1 to 12

- Origin_Type_Name
    - Country of Origin

- Destination_Name
    - Location of oil import

- Destination_Type_Name
    - Refinery
    - Refinery state
    - Refinery PADD
    - Port
    - Port State
    - Port PADD
    - United States

- Grade_Name
    - Light Sour
    - Light Sweet
    - Heavy Sweet
    - Heavy Sour
    - Medium

- Quantity
    - Range from 1 - 141016

Objectives

- Identify the top 5 countries from which the United States imported crude oil the most in terms of total volume over the entire period from 2009 to 2024. Include the total volume of crude oil imported from each country in the result.

- Analyze the monthly trends in crude oil imports over the entire period from 2009 to 2024. Calculate the average volume of crude oil imported per month and identify any significant fluctuations or seasonal patterns in import volumes.

- Calculate the year-over-year growth rate in crude oil imports for each year from 2010 to 2024. Determine which years experienced the highest and lowest growth rates in import volumes and provide the percentage change.

- Investigate the distribution of crude oil imports across different U.S. ports of entry. Determine the top 3 ports of entry in terms of total volume imported and the average volume of crude oil imported per shipment for each port.

- Determine the market share of the top 5 oil companies in the United States based on the total volume of crude oil imports they handled over the entire period from 2009 to 2024. Include the percentage of total imports for each oil company.

- Classify the types of crude oil imported into the United States based on their properties (e.g., sweet, sour, light, heavy). Calculate the total volume of each type of crude oil imported and determine the percentage distribution of each type.

- Investigate if there is any seasonal variation in crude oil import volumes based on the type of crude oil. Calculate the average volume of each type of crude oil imported for each month of the year and identify any significant peaks or troughs.

- Assess the dependency of the United States on crude oil imports by comparing the ratio of imported crude oil volume to domestic crude oil production. Calculate this ratio for each year from 2009 to 2023 and determine if there are any trends indicating increasing or decreasing import dependency.

Analysis

Identify the top 5 countries from which the United States imported crude oil the most in terms of total volume over the entire period from 2009 to 2024. Include the total volume of crude oil imported from each country in the result.

Origin_Name	Origin_Type_Name	Total_Volume
Canada	Country	119406217
Saudi Arabia	Country	33678442
Mexico	Country	29971333
Venezuela	Country	22031954
Iraq	Country	13751493

Analyze the monthly trends in crude oil imports over the entire period from 2009 to 2024. Calculate the average volume of crude oil imported per month and identify any significant fluctuations or seasonal patterns in import volumes.

Checking every month we can see a spike with the highest being January. We have an average volume of 2516.5074 from 2009 to 2024.

Month	Avg_Vol
1	2516.5074
2	2287.1603
3	2486.6964
4	2402.5817
5	2454.5420
6	2390.5895
7	2430.2978
8	2454.0275
9	2387.3407
10	2379.2376
11	2409.0930
12	2494.7619

Calculate the year-over-year growth rate in crude oil imports for each year from 2010 to 2024. Determine which years experienced the highest and lowest growth rates in import volumes and provide the percentage change.

The highest growth rate will be 6.91 percent for the year 2016 and the lowest growth rate will be -91.28 percent in 2024.

Year	Total_Vol	Pre_Tol_Vol	Growth_Rate	Final_Growth_Rate
2016	80446408	75247452	6.9091	6.91%
2021	62620782	60324572	3.8064	3.81%
2023	65943430	64215886	2.6902	2.69%
2022	64215886	62620782	2.5472	2.55%
2017	81483304	80446408	1.2889	1.29%
2015	75247452	75049128	0.2643	0.26%
2018	79381288	81483304	-2.5797	-2.58%
2011	93872828	97581904	-3.8010	-3.80%
2014	75049128	78700272	-4.6393	-4.64%
2012	86378796	93872828	-7.9832	-7.98%
2013	78700272	86378796	-8.8894	-8.89%
2019	69253016	79381288	-12.7590	-12.76%
2020	60324572	69253016	-12.8925	-12.89%
2024	5751256	65943430	-91.2785	-91.28%
2010	97581904	NULL	NULL	NULL

Year	Growth_Rate
2016	6.9091

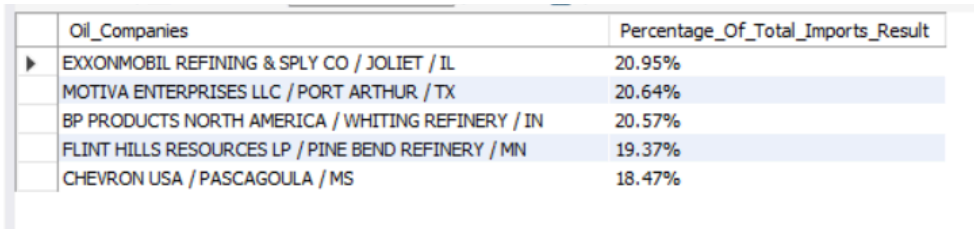
Year	Growth_Rate
2024	-91.2785

Investigate the distribution of crude oil imports across different U.S. ports of entry. Determine the top 3 ports of entry in terms of total volume imported and the average volume of crude oil imported per shipment for each port.

The highest port of entry is the refinery PADD with an average of 4891.8483.

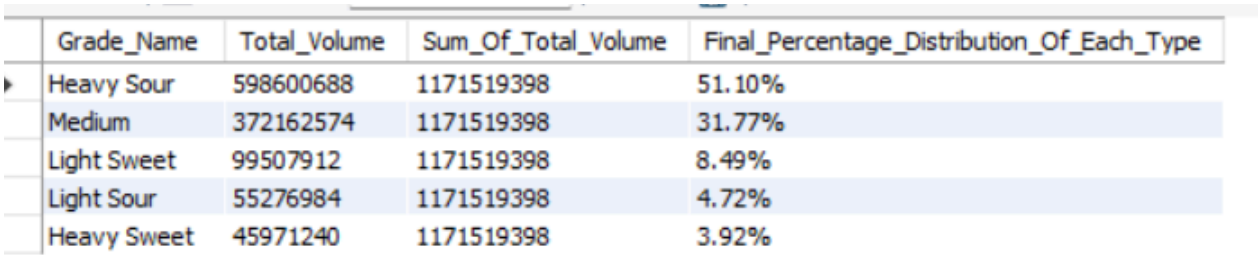
Port_of_Entry	Total_Imported_Volume	Average_Imported_Volume_Per_Shipment
Refinery	167359914	1099.5113
Refinery State	167359914	2258.9951
Refinery PADD	167359914	4891.8483

Determine the market share of the top 5 oil companies in the United States based on the total volume of crude oil imports they handled over the entire period from 2009 to 2024. Include the percentage of total imports for each oil company.



Oil_Companies	Percentage_Of_Total_Imports_Result
EXXONMOBIL REFINING & SPLY CO / JOLIET / IL	20.95%
MOTIVA ENTERPRISES LLC / PORT ARTHUR / TX	20.64%
BP PRODUCTS NORTH AMERICA / WHITING REFINERY / IN	20.57%
FLINT HILLS RESOURCES LP / PINE BEND REFINERY / MN	19.37%
CHEVRON USA / PASCAGOULA / MS	18.47%

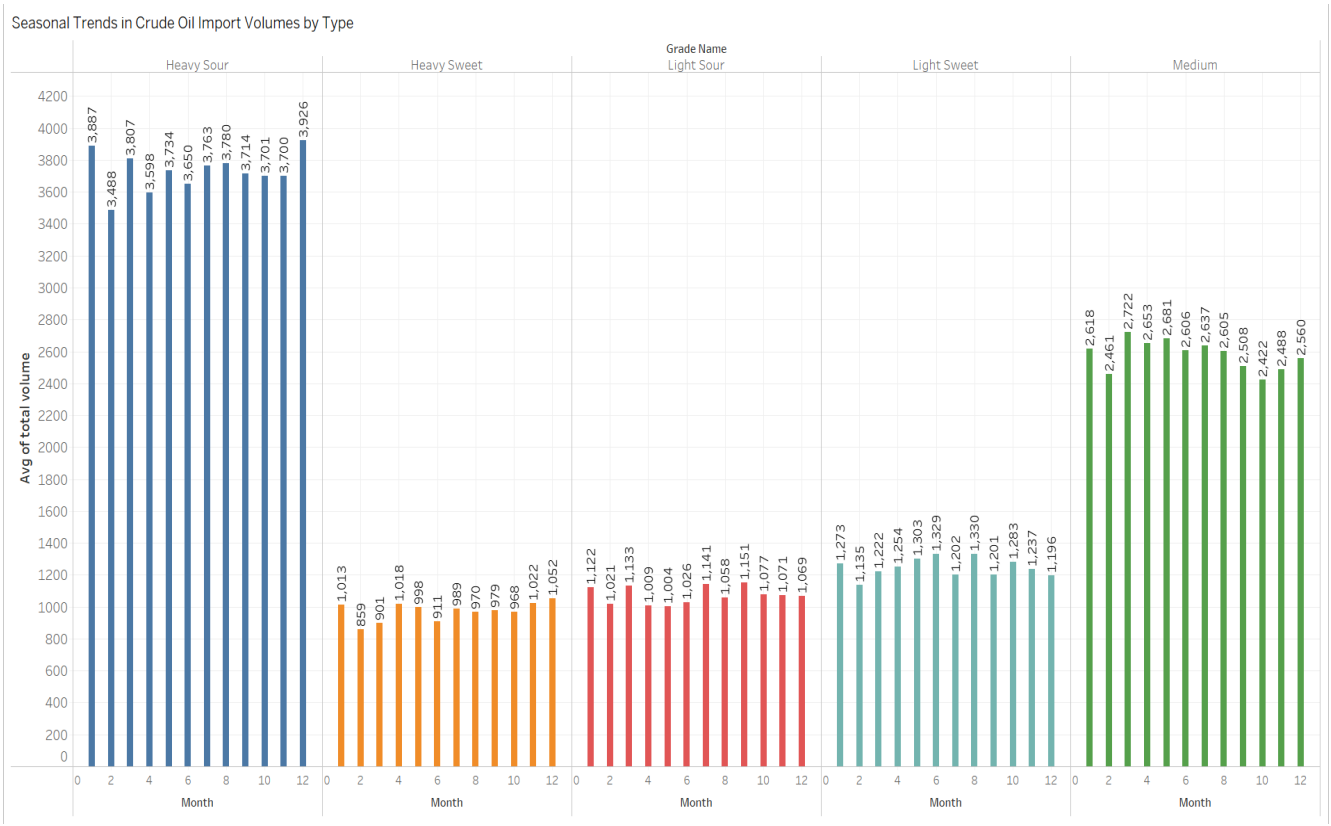
Classify the types of crude oil imported into the United States based on their properties (e.g., sweet, sour, light, heavy). Calculate the total volume of each type of crude oil imported and determine the percentage distribution of each type.



Grade_Name	Total_Volume	Sum_Of_Total_Volume	Final_Percentage_Distribution_Of_Each_Type
Heavy Sour	598600688	1171519398	51.10%
Medium	372162574	1171519398	31.77%
Light Sweet	99507912	1171519398	8.49%
Light Sour	55276984	1171519398	4.72%
Heavy Sweet	45971240	1171519398	3.92%

Investigate if there is any seasonal variation in crude oil import volumes based on the type of crude oil. Calculate the average volume of each type of crude oil imported for each month of the year and identify any significant peaks or troughs.

As I can see there aren't any seasonal variations in crude oil.



Month	Grade_Name	Avg_Total_Volume
1	Heavy Sour	3887.3460
1	Heavy Sweet	1012.9652
1	Light Sour	1121.9529
1	Light Sweet	1272.5353
1	Medium	2618.0311
2	Heavy Sour	3487.7107
2	Heavy Sweet	858.9915
2	Light Sour	1020.5605
2	Light Sweet	1135.1014
2	Medium	2460.8027
3	Heavy Sour	3807.4515
3	Heavy Sweet	901.3450
3	Light Sour	1133.4015
3	Light Sweet	1221.8962
3	Medium	2722.0342
4	Heavy Sour	3598.0210
4	Heavy Sweet	1018.0651
4	Light Sour	1009.0938
4	Light Sweet	1253.6177
4	Medium	2652.9935
5	Heavy Sour	3733.5843
5	Heavy Sweet	997.9200
5	Light Sour	1004.0109
5	Light Sweet	1303.2500
5	Medium	2681.2912

Month	Grade_Name	Avg_Total_Volume
6	Heavy Sour	3650.1240
6	Heavy Sweet	910.6585
6	Light Sour	1026.0992
6	Light Sweet	1329.2122
6	Medium	2606.4413
7	Heavy Sour	3762.8146
7	Heavy Sweet	989.2608
7	Light Sour	1140.8839
7	Light Sweet	1202.3927
7	Medium	2637.1648
8	Heavy Sour	3779.9671
8	Heavy Sweet	969.5489
8	Light Sour	1057.6574
8	Light Sweet	1330.2107
8	Medium	2604.9696
9	Heavy Sour	3714.0360
9	Heavy Sweet	979.0317
9	Light Sour	1150.6861
9	Light Sweet	1201.0297
9	Medium	2507.7017
10	Heavy Sour	3700.9352
10	Heavy Sweet	967.9346
10	Light Sour	1077.1645
10	Light Sweet	1283.3311
10	Medium	2422.0104

Month	Grade_Name	Avg_Total_Volume
7	Light Sweet	1202.3927
7	Medium	2637.1648
8	Heavy Sour	3779.9671
8	Heavy Sweet	969.5489
8	Light Sour	1057.6574
8	Light Sweet	1330.2107
8	Medium	2604.9696
9	Heavy Sour	3714.0360
9	Heavy Sweet	979.0317
9	Light Sour	1150.6861
9	Light Sweet	1201.0297
9	Medium	2507.7017
10	Heavy Sour	3700.9352
10	Heavy Sweet	967.9346
10	Light Sour	1077.1645
10	Light Sweet	1283.3311
10	Medium	2422.0104
11	Heavy Sour	3699.5738
11	Heavy Sweet	1022.4119
11	Light Sour	1071.1902
11	Light Sweet	1236.6345
11	Medium	2487.6345
12	Heavy Sour	3926.2277
12	Heavy Sweet	1051.6300
12	Light Sour	1069.4022
12	Light Sweet	1195.5267
12	Medium	2559.5923

Assess the dependency of the United States on crude oil imports by comparing the ratio of imported crude oil volume to domestic crude oil production. Calculate this ratio for each year from 2009 to 2023 and determine if there are any trends indicating increasing or decreasing import dependency.

At the start of 2009, the import total volume was 95,269,076 and it was 65,943,430 in the year 2023. The United States increased its crude oil production in 2009 from 1,955,194 to 4,718,434 in 2023. The ratio from 2009 was 48 and 2023 was 13, a drop of 35.

In 2019 oil production in the United States was at its highest but assuming because of COVID-19, the production dropped and since then started to increase again in 2020.

In 2015 the total import volume was decreasing but in 2016 it went back up from 75,247,452 to 80,446,408. Since then the imported total volume slowly started to decrease seeing a focus on producing of crude oil in the Country.

Year	Imported_Total_Volume	Year	U_S_Field_Production_of_Crude_Oil_Thousand_Ba	Ratio
2009	95269076	2009	1955194	48.7261
2010	97581904	2010	2001805	48.7470
2011	93872828	2011	2071085	45.3254
2012	86378796	2012	2387700	36.1766
2013	78700272	2013	2735821	28.7666
2014	75049128	2014	3208643	23.3897
2015	75247452	2015	3445393	21.8400
2016	80446408	2016	3237795	24.8460
2017	81483304	2017	3415448	23.8573
2018	79381288	2018	3997180	19.8593
2019	69253016	2019	4493544	15.4117
2020	60324572	2020	4142504	14.5623
2021	62620782	2021	4112721	15.2261
2022	64215886	2022	4347377	14.7712
2023	65943430	2023	4718434	13.9757

Resources

Location of Data set: U.S. Crude Oil Imports (kaggle.com)
Location of the second dataset to answer the last question: Crude Oil Production (eia.gov)
Location of project: Jose E Garcia Montes De Oca | Data Analytics | Data portfolio (datascienceportfol.io)
Location of code, files, and project: Your Repositories (github.com)