

REFINERY INDUSTRY IN FOCUS

Baker & O'Brien, Inc.

www.bakerobrien.com

Q2 2020

Q2 2020: U.S. Refining Margins Driven Downward by Coronavirus Impact

Special Topic: U.S. Refiners Singing the Coronavirus Blues in Q2 2020—A Retrospective Review

Houston, August 7, 2020

Baker & O'Brien, Inc.'s second quarter 2020 (20Q2) *PRISM*[™] update showed a steep decline in U.S. refining cash margins reflecting the impact of reduced petroleum consumption since the COVID-19 outbreak. The largest drops were in PADDs 2, 4, and 5. Given the lockdowns through most of the U.S. during the second quarter, the decline was expected. With reduced refinery utilization, refinery fixed costs were distributed over fewer barrels. Reduced demand drove down product prices, and some refiners struggled to cover their operating costs. With the easing of the lockdown restrictions and product demand increasing, refinery margins may have bottomed out for now.

Consistent with the *PRISM* cash margins, both the USGC 321 crack spread and Midwest Chicago crack spread saw steep declines. The second quarter LLS – Maya price differential decreased by almost \$1.50/Bbl. despite the IMO 2020 sulfur specifications for marine fuel oil taking effect at the beginning of 2020. Any impacts from IMO 2020 were overshadowed by the severe global reduction in petroleum product demand.

PRISM Cash Margins vs. Previous Periods (\$/Bbl.)

| | <u>20Q2 vs. 20Q1</u> | <u>20Q2 vs. 19Q2</u> |
|---------------------|----------------------|----------------------|
| PADD 1 | -7.00 | -8.28 |
| PADD 2 | -10.64 | -16.55 |
| PADD 3 | -7.27 | -8.54 |
| PADD 4 | -9.68 | -16.81 |
| PADD 5 | -12.17 | -15.30 |
| U.S. Overall | -8.94 | -11.66 |

Key Refining Margin Metrics, \$/Bbl.

| | <u>2020</u> | <u>2020</u> | <u>2020</u> | <u>2019</u> | <u>2018</u> |
|--------------------|-------------|--------------|-------------|---------------|---------------|
| | <u>June</u> | <u>Q2</u> | <u>Q1</u> | <u>Annual</u> | <u>Annual</u> |
| WTI | 38.29 | 27.80 | 45.86 | 57.02 | 64.92 |
| LLS | 39.47 | 30.07 | 48.16 | 62.67 | 69.96 |
| Brent | 40.06 | 28.69 | 50.14 | 64.29 | 71.06 |
| LLS – Maya | 3.88 | 5.66 | 7.11 | 4.67 | 7.49 |
| USGC LLS 321* | 6.54 | 5.88 | 9.22 | 10.82 | 11.29 |
| USGC LLS 6321** | 4.73 | 4.56 | 6.64 | 7.91 | 8.27 |
| Chicago WTI 321*** | 10.49 | 7.96 | 9.20 | 17.54 | 17.40 |

* LLS deemed conversion to 67% conventional 87R gasoline and 33% ULSD

** LLS deemed conversion to 50% conventional 87R gasoline, 33% ULSD and 17% Fuel Oil

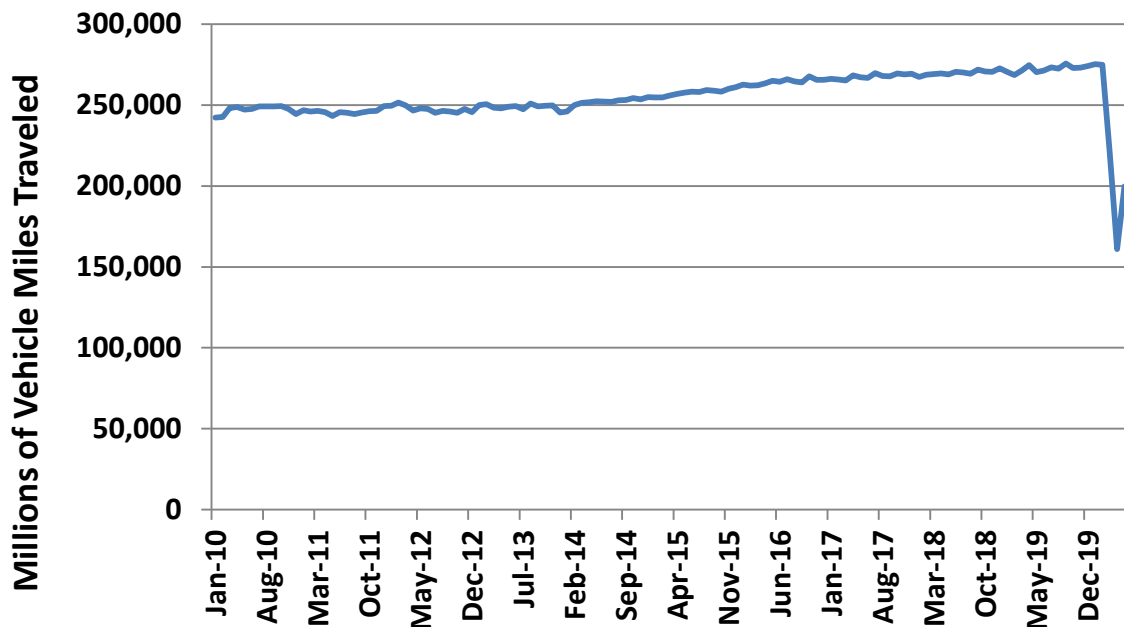
*** WTI deemed conversion to 33% conventional 87R gasoline, 33% RBOB and 33% ULSD

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The devastating impact of the COVID-19 crisis will live long in everyone's memory. For U.S. oil refiners, the severe drop in demand in the second quarter led to one of the least profitable quarters in recent history.

To better understand what led to the severe decline in refining margins, let us first take a look at gasoline demand. With the country going into "lockdown," vehicle miles traveled (VMT) plummeted by an almost unimaginable 41% from February through April 2020 (**Figure 1**). VMT rebounded modestly in May as lockdown restrictions eased, and the U.S. tentatively re-opened but still remain well below the historical average.

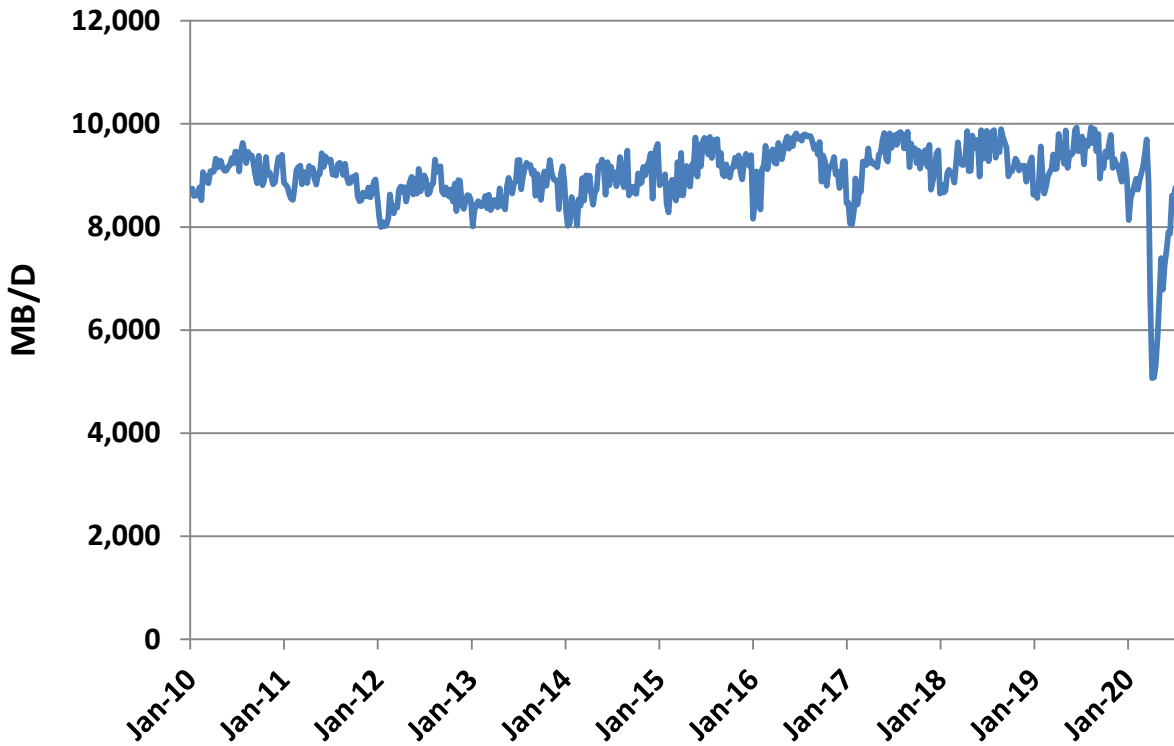
Figure 1
U.S. Vehicle Miles Traveled



Source: U.S. Department of Transportation, Federal Highway Administration, May 2020 Highway Statistics

As a result, 27% less gasoline product was supplied during the second quarter of 2020 compared to the second quarter of 2019 (Figure 2).

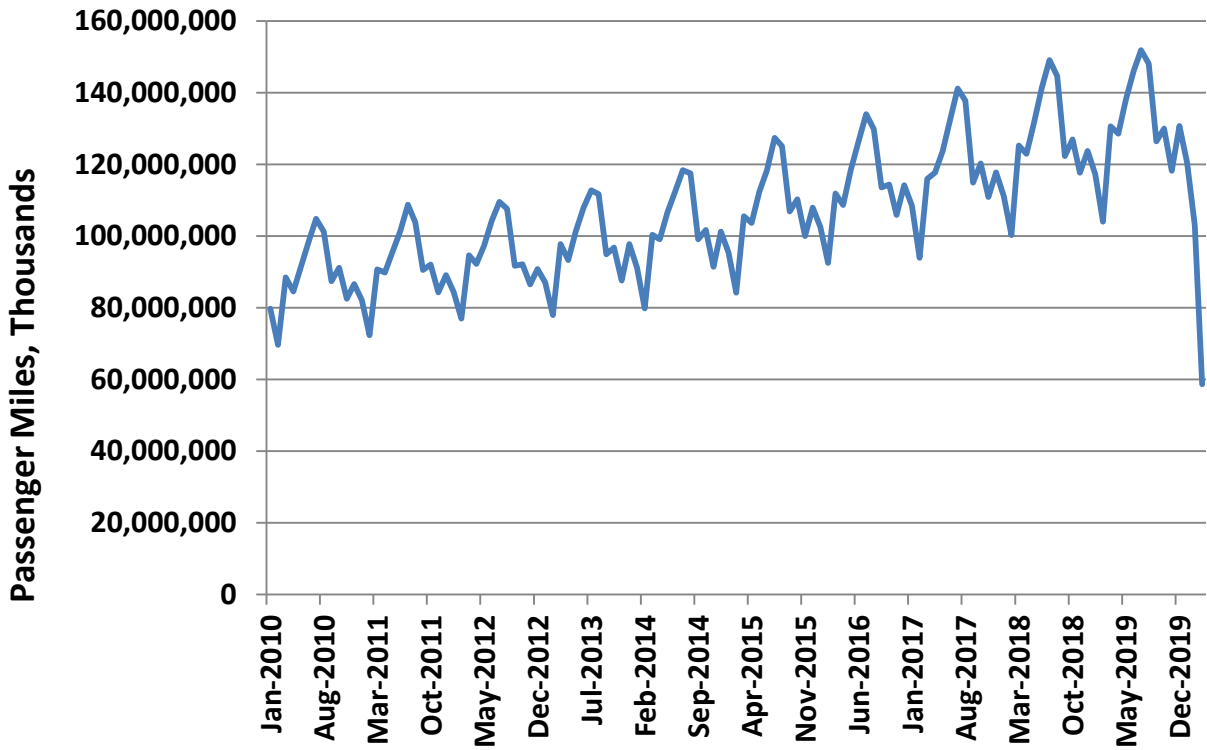
Figure 2
U.S. Total Finished Gasoline Supplied



Source: Department of Energy, Energy Information Administration (EIA) Weekly Product Supplied

This impact on petroleum product consumption has not been limited to fewer commuters driving but also fewer passengers flying; airline passenger miles dropped over 55% compared to the same period a year ago (Figure 3).

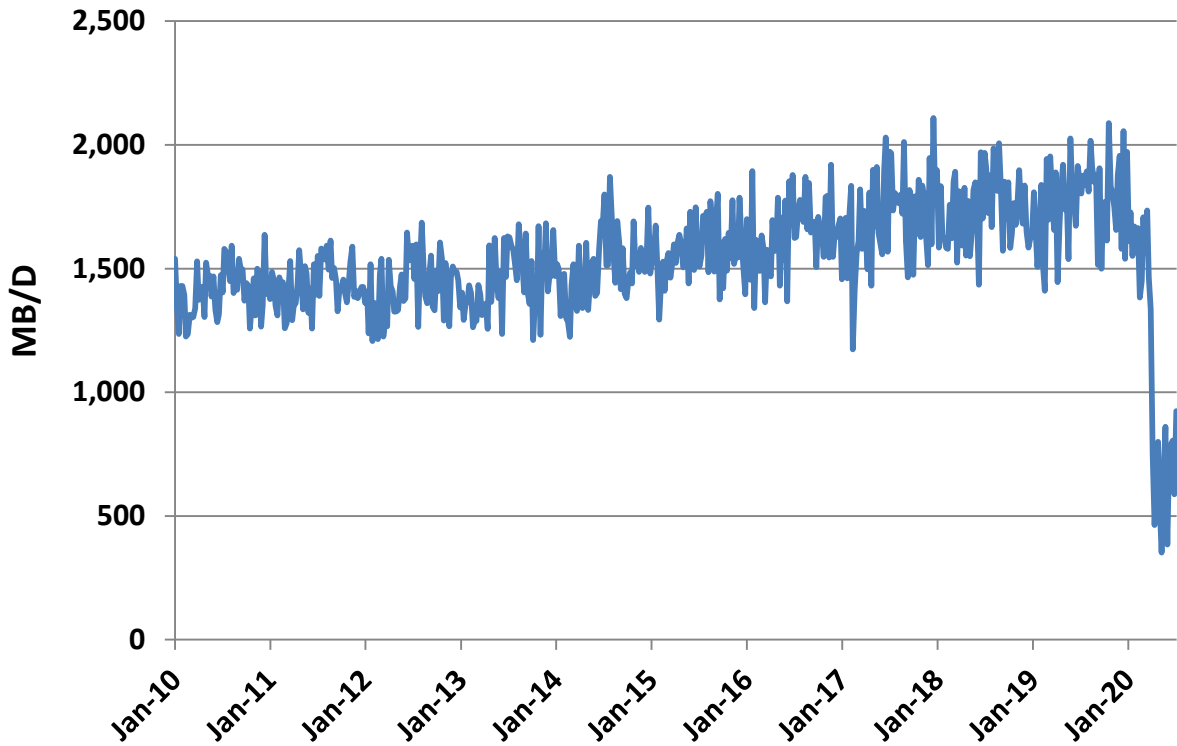
Figure 3
Airline Passenger Miles



Source: U.S. Department of Transportation, Bureau of Transportation Statistics, T-100 Market Data

This has resulted in a significant decrease in the volume of jet fuel supplied to airports. Refinery jet fuel supply dropped 64% year-over-year (YOY) during the second quarter (Figure 4). However, unlike gasoline, the rebound has been limited.

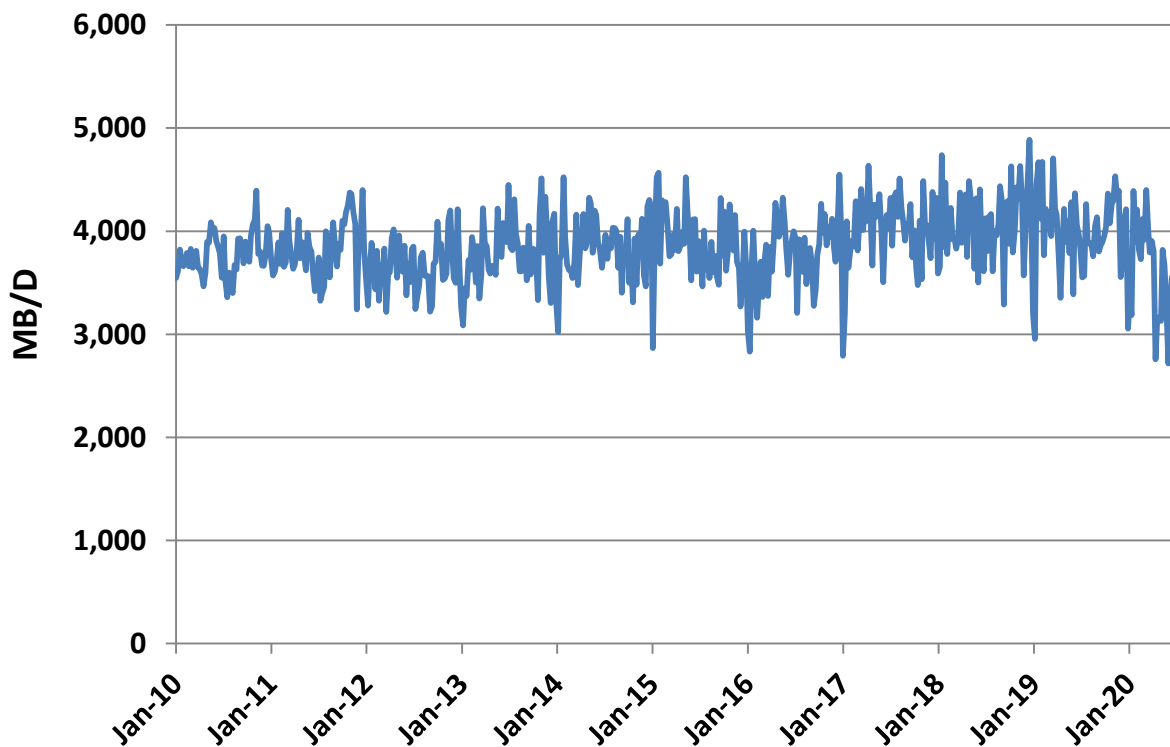
Figure 4
U.S. Total Jet Fuel Supplied



Source: EIA Weekly Product Supplied

While COVID-19 lockdowns and travel restrictions caused major declines in gasoline and jet fuel consumption, the impact on diesel demand was less severe (**Figure 5**). Though consumers stayed home, freight continued to move throughout the country to deliver goods to those consumers. U.S. diesel consumption declined 14% YOY in the second quarter. Consequently, refiners were challenged to substantially reduce gasoline and jet fuel production but limit diesel production reductions.

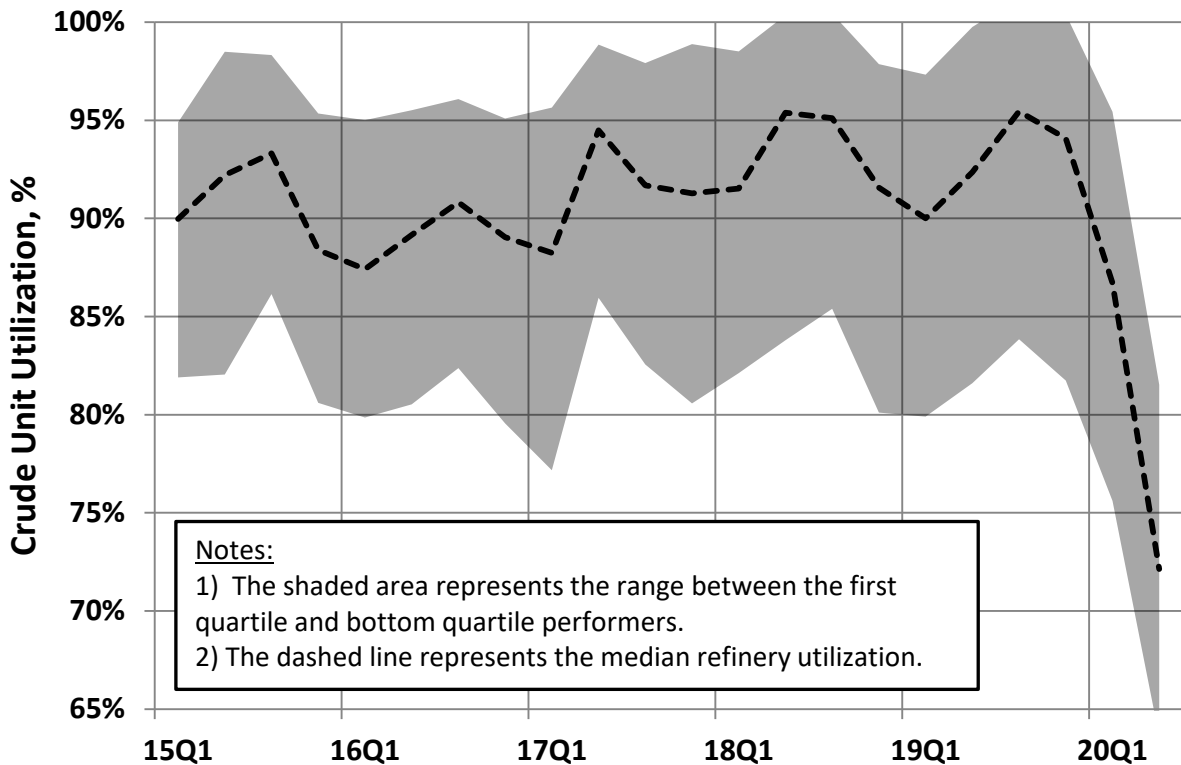
Figure 5
U.S. Total Diesel Supplied



Source: EIA Weekly Product Supplied

Reduced product consumption resulted in significantly lower refinery utilization. In some cases, refiners unable to cover their variable operating costs shut down. Average U.S. refinery utilization decreased to just over 70% during the second quarter of 2020, a 20% YOY decrease. The last time U.S. refiners experienced utilization rates less than 80% was in February 2010. One would have to go all the way back to the first quarter of 1985 to find U.S. refinery utilization rates this low. On a positive note, recent weekly refinery utilization rates have begun to improve, suggesting that the bottom may have been reached (Figure 6).

Figure 6
Historial Refinery Utilization

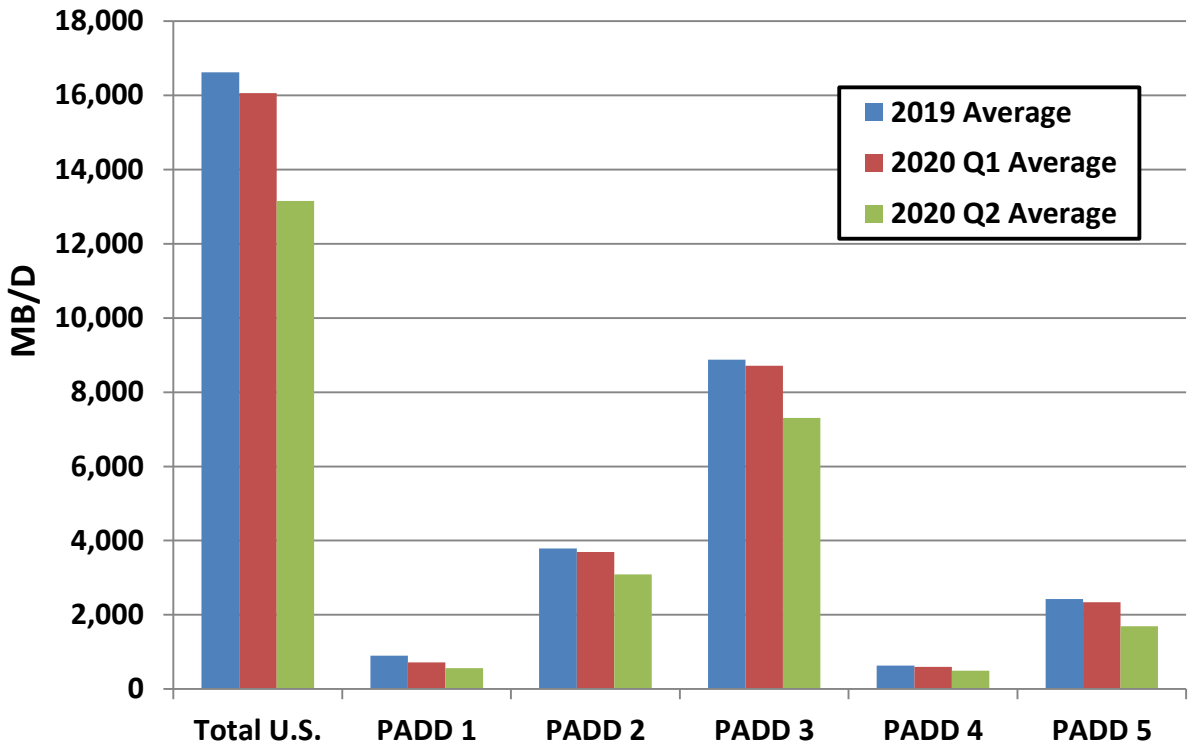


Notes:
 1) The shaded area represents the range between the first quartile and bottom quartile performers.
 2) The dashed line represents the median refinery utilization.

Source: Baker & O'Brien PRISM

Almost half of the reduction in crude oil inputs occurred in PADD 3 (Figure 7).

Figure 7
Crude Oil Inputs by PADD

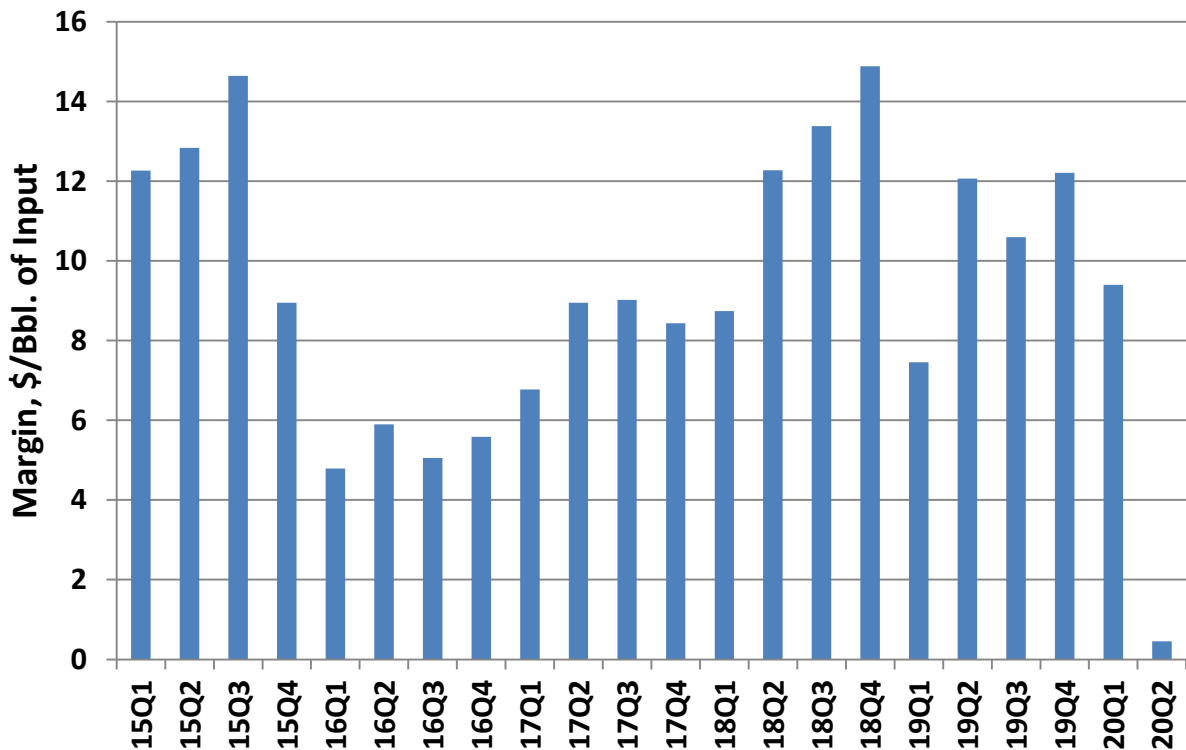


Source: EIA Weekly Refinery Inputs

Historical *PRISM* refining margins (Figure 8) show how painful the cumulative effects have been. From 2015 through 2019, refiners generated refining cash margins in the range of \$5/Bbl. to \$15/Bbl. Baker & O'Brien estimates that the U.S. weighted average refinery cash margin fell to just below \$0.50/Bbl. in the second quarter of 2020. This is an order of magnitude lower than the lowest margin seen in recent years. In fact, a review of EIA historical refining margins indicates that one would have to go all the way back to 2002 to find refining margins this low.

While recent signs indicate product demand is recovering, the questions remain: 1) how long it will take to return to 2019 levels; and 2) what the lasting impact of the COVID-19 pandemic will be on the U.S. refining sector.

Figure 8
***PRISM* U.S. Refining Margins**



Source: Baker & O'Brien *PRISM*

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About Baker & O'Brien

Baker & O'Brien is an independent professional consulting firm specializing in technology, economics, and management practice for the international oil, gas, chemical, and related industries. With offices in Dallas, Houston, and London, the firm assists clients with strategic studies, mergers and acquisitions, and technology evaluations. The firm also provides expert services to support insurance claims, investigate operating incidents, and support a wide range of commercial and construction disputes in the energy industry.

About *PRISM*

Baker & O'Brien's *PRISM* software is used to perform detailed analysis of individual refineries and the refining value chain from crude oil load port to products truck rack. The system combines a large historical database with a robust refinery simulator to provide analytical support to competitive assessments, strategic planning, crude oil valuation, and delivered cost of supply. The *PRISM* database currently includes operational and economic performance details for all refineries in the U.S. and Canada, most refineries in Europe, and over 50 refineries in the Asia Pacific region. The *PRISM* system is available for license and is used in consulting assignments for Baker & O'Brien clients.

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Baker & O'Brien, Inc. is an independent, professional consulting firm specializing in technology, economics, and management practice for the international oil, gas, chemical, and related industries.

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