
2020 Refining Armageddon!

Throughput rates and margins plunge with demand.

Morningstar Commodities Research

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Data Sources for This Publication

U.S. Energy Information Administration
CME Group

Struggling

The coronavirus epidemic is providing U.S. motorists with the lowest gasoline prices seen in a generation, but stay-at-home orders are preventing them taking advantage. Instead, demand for gasoline has tanked 30% since mid-March, and despite lower refinery production, finished mogas inventories continue to swell. Meanwhile, diesel demand has remained relatively robust. Refiners are struggling with lower throughputs and margins as well as operational constraints brought by swelling product inventories. This note illustrates how changing fundamentals are negatively affecting refining.

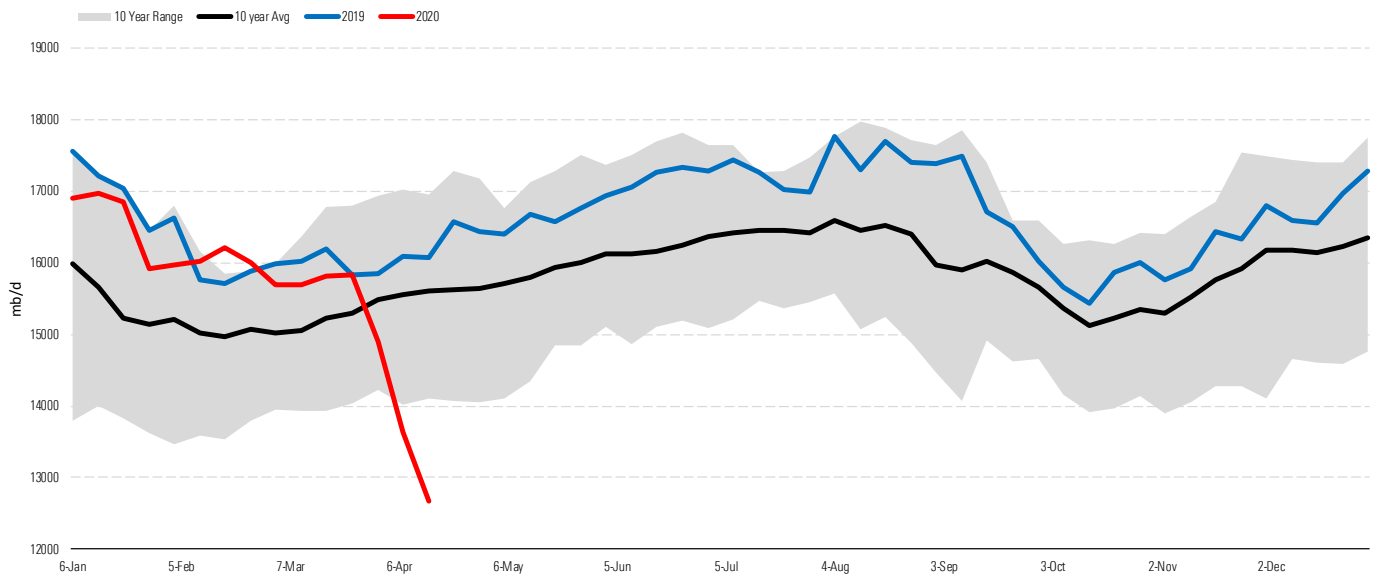
In March, we described how an early 2020 boost to gasoline prices and refining margins was ended abruptly by a combination of the coronavirus crisis decimating demand and a surge in crude supply following a Saudi-Russian dispute over output cuts (see [Early 2020 Refining Boost Hit by Demand Destruction](#)). Since then, the international lockdown has wreaked further havoc on the oil market. Demand for U.S. crude has plummeted in the past three weeks and now threatens to shut in production, as we described last week (see [Changing Permian Drivers in Wake of Price Collapse](#)). The OPEC+ agreement reached on April 12 to curtail 9.7 million barrels/day of production in May and June has so far had little positive impact on crude prices, with U.S. benchmark West Texas Intermediate delivered at Cushing, Oklahoma, pricing under \$19/barrel last week. For refiners that would normally expect to benefit from cheap crude, the biggest challenge turns out to be keeping their plants running in the face of slumping demand.

Refinery Response

Refineries can't take advantage of tumbling crude prices in this environment because the lack of demand restricts their throughput. They are reducing runs and struggling to manage operations while finished product storage tanks threaten to fill up. Refineries operate around the clock and need a constant supply of crude and other feedstock inputs to keep running, but they are equally reliant on demand drawing down their finished product inventory. At normal run rates of 80%-100% of operating capacity, they optimize blending and production processes to meet seasonal and price signals of market needs. Larger sophisticated refineries have different units that produce more gasoline or distillate based on crude slate and unit capacity. But when throughput is cut dramatically, downstream units may not have enough feedstock to run, backing up refinery operations. As a result, although refiners can reduce throughput in the face of demand destruction, they can only cut throughput by 40%-50% before they face operating constraints.

Exhibit 1 shows the extent of recent damage to refinery operations. Together with exhibits 2-7, this seasonal chart is based on weekly Energy Information Administration estimates, in this case of refinery crude inputs. For all these charts, we used data from 2010 to 2019 to calculate a 10-year average (black line) and a 10-year range (gray shaded area) and show the weekly data for 2019 (blue line) and 2020 through April 10 (red line). The plummeting red line in Exhibit 1 reflects refinery crude throughput 19% below the 10-year average and 10% below the 10-year range for the week ended April 10.

Exhibit 1 U.S. Weekly Crude Inputs to Refineries



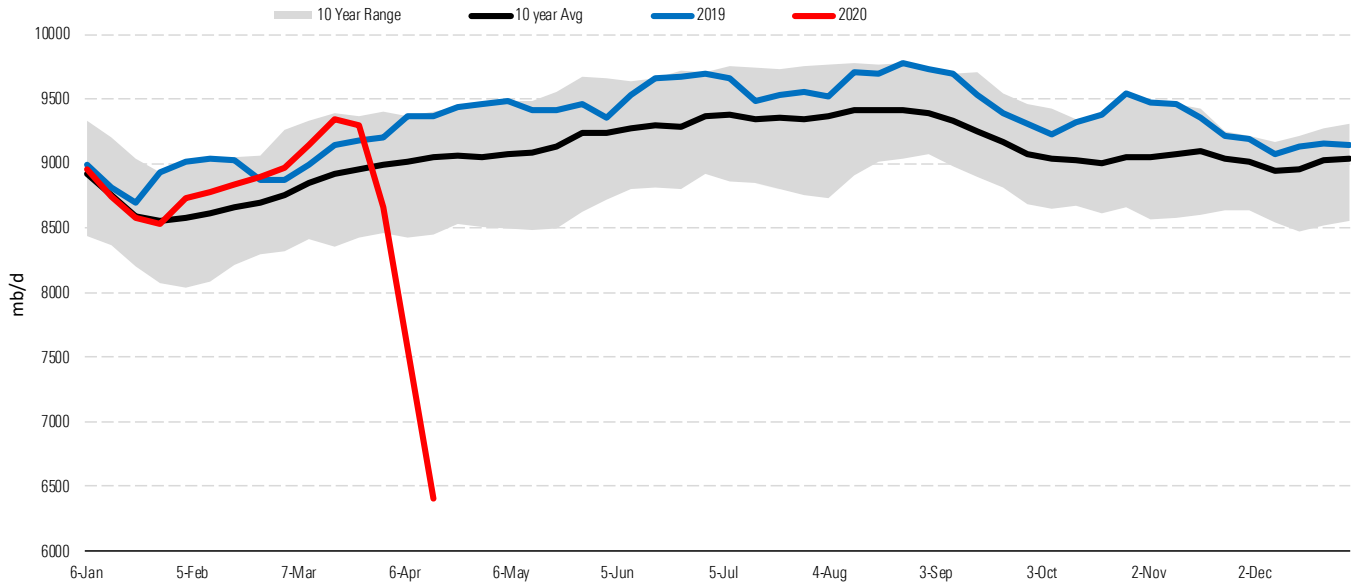
Source: EIA, Morningstar.

The challenge for refiners during the coronavirus crisis is compounded by variation in demand for finished products. While lockdowns have decimated consumer demand for gasoline, continued commercial truck and rail freight operations have only partially affected distillate demand to make diesel fuel. Exhibits 2-6 illustrate the contrast between gasoline and diesel that complicates refiners' operating equation.

Gasoline Demand

As of April 10, gasoline demand (red line in Exhibit 2) is down 31% since mid-March—literally dropping off the chart to levels 29% below the 10-year average (black line) and 24% below the bottom of the 10-year range (gray shading).

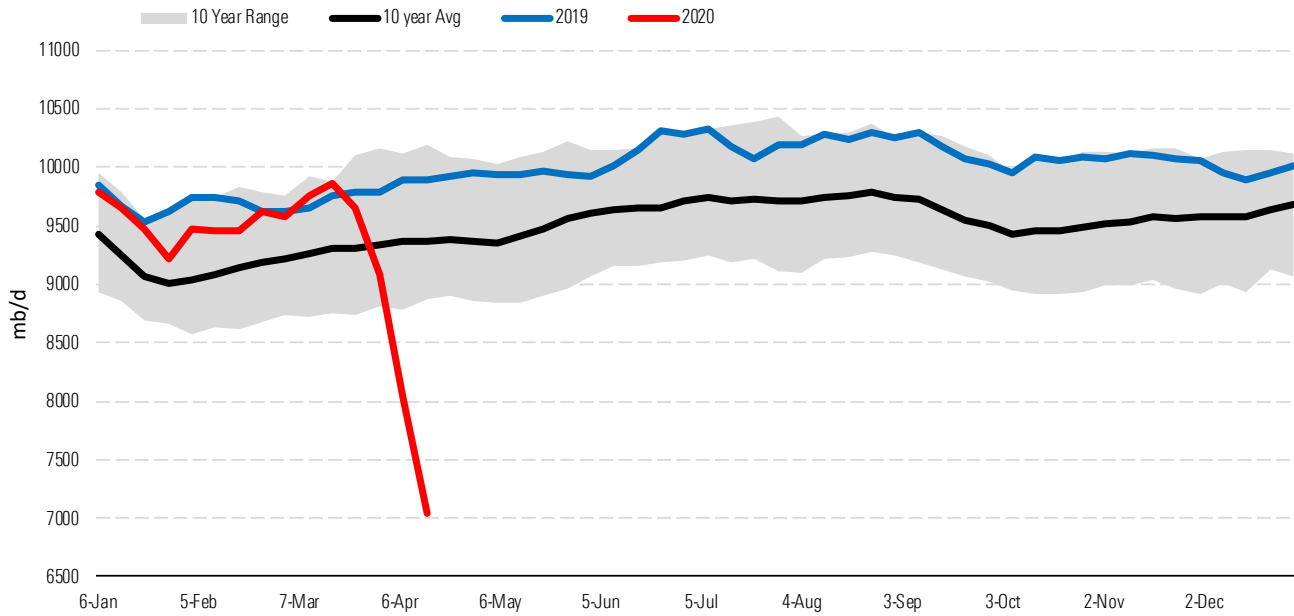
Exhibit 2 Seasonal U.S. Gasoline Demand (Four-Week Average)



Source: EIA, Morningstar.

In response to plummeting demand, refiners and blenders have reduced net gasoline production (red line in Exhibit 3) to levels 25% below the 10-year average and 21% below the 10-year range.

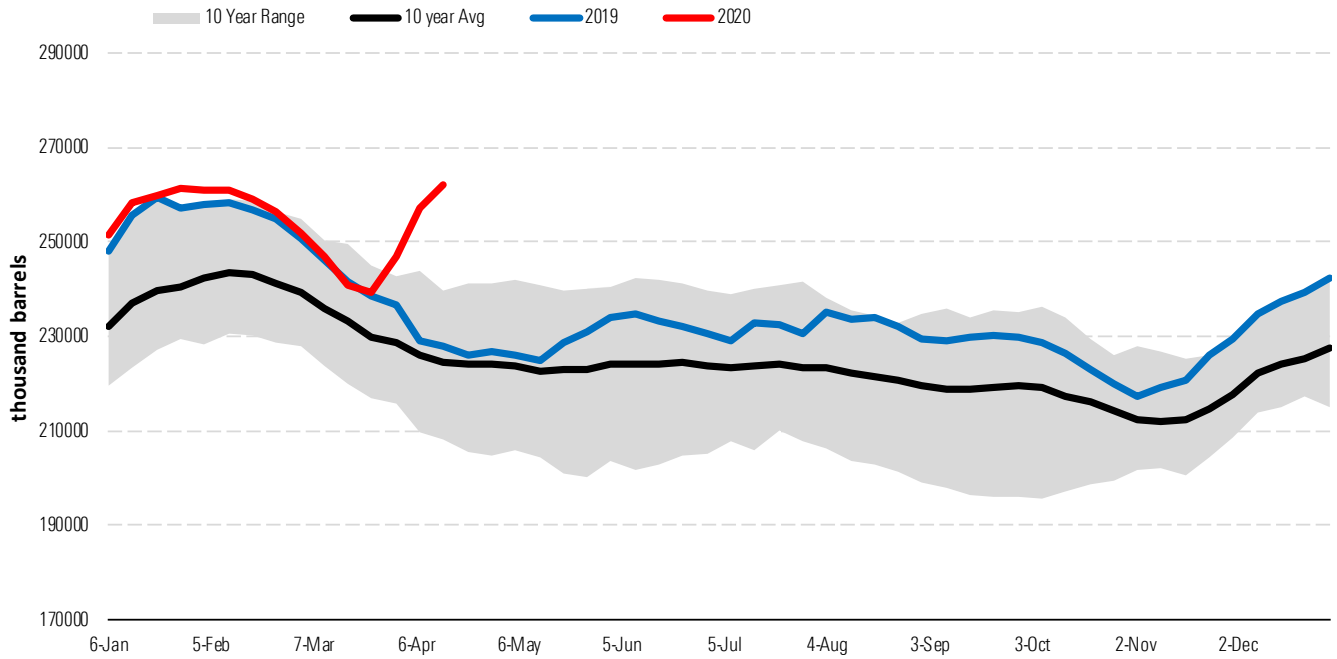
Exhibit 3 U.S. Refinery and Net Blender Gasoline Production (Four-Week Average)



Source: EIA, Morningstar.

Despite reduced refinery output, tepid demand has caused inventories to rise to unprecedented levels for this time of year (Exhibit 4). Gasoline stocks as of April 10 were 17% higher than the 10-year average and 9% above the 10-year range.

Exhibit 4 Weekly U.S. Gasoline Inventories



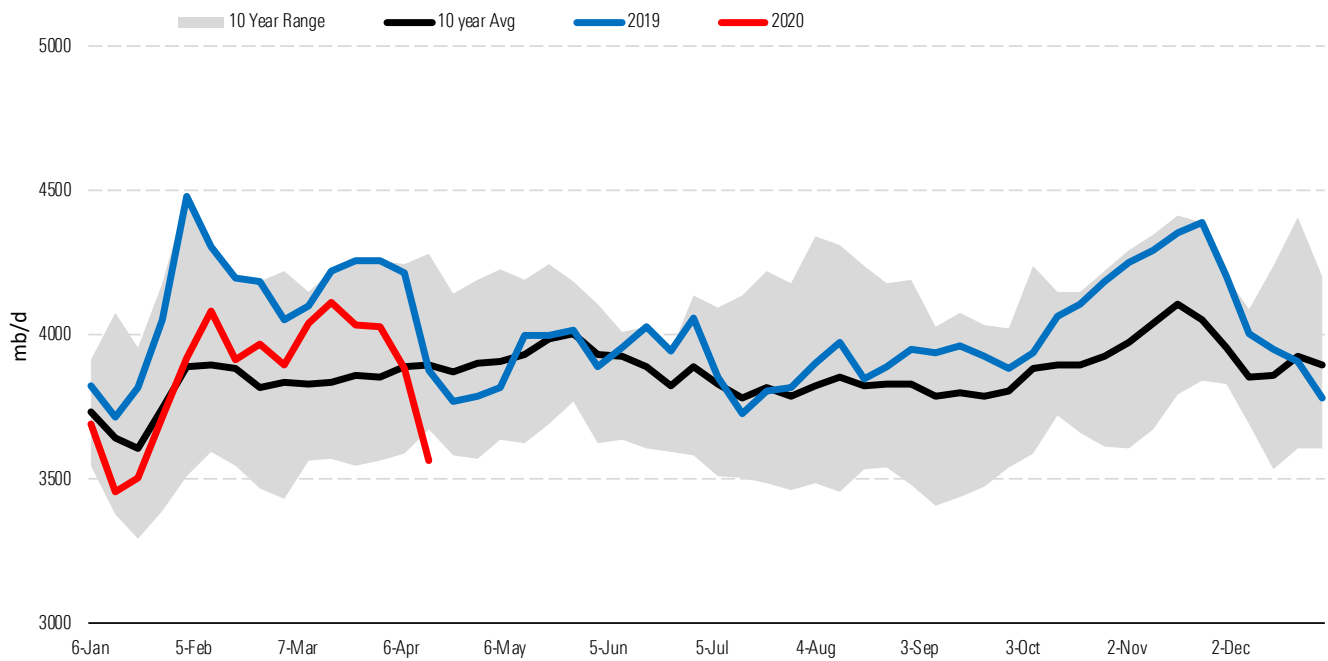
Source: EIA, Morningstar.

Diesel Demand

Diesel demand hasn't been affected like gasoline during the pandemic. That's because most U.S. freight transportation, including rail and trucks, uses diesel and these sectors have remained active. Construction has also remained largely active during the crisis. While demand for jet kerosene has plummeted due to air travel restrictions, that fuel is produced from the same middle distillate pool as diesel, allowing refiners to reduce jet production and increase diesel to some degree.

Exhibit 5 shows distillate demand has fallen 13% since mid-March but is still only just outside the 10-year average.

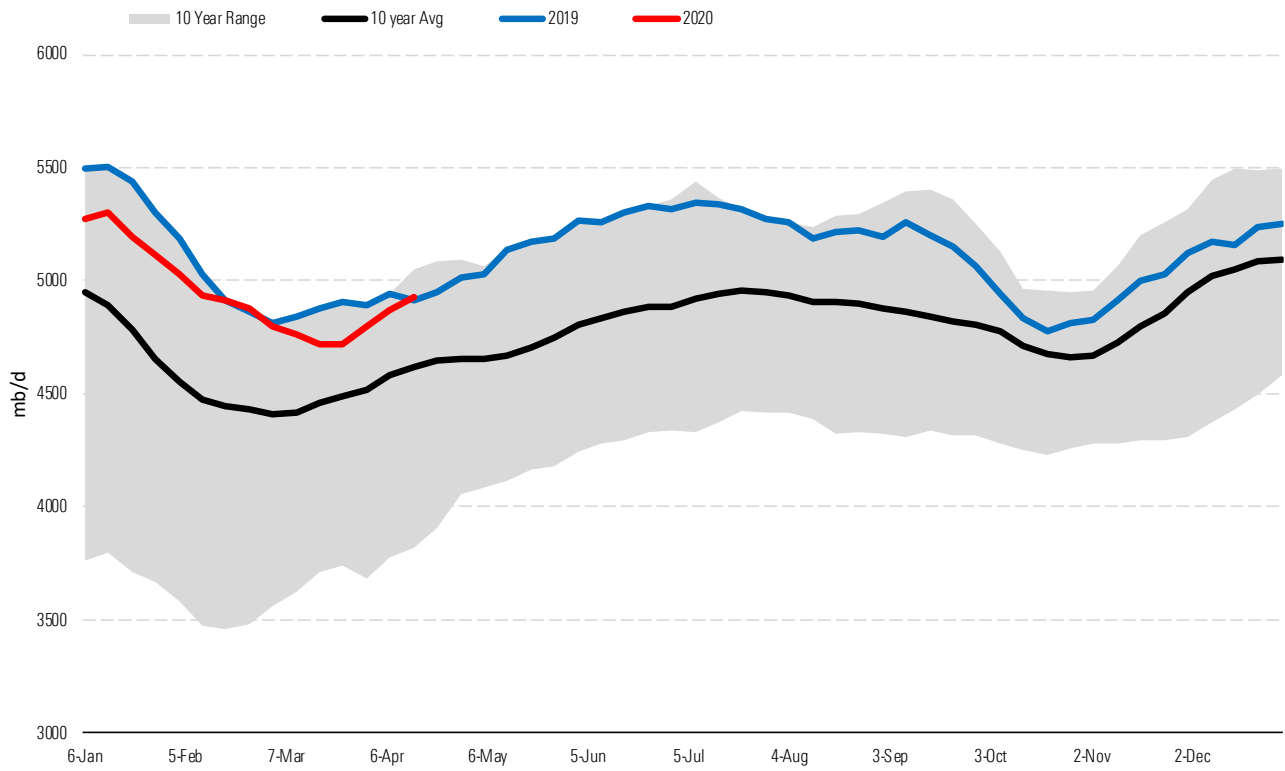
Exhibit 5 U.S. Weekly Distillate Demand



Source: EIA, Morningstar.

Exhibit 6 shows that four-week average distillate production as of April 10 is level with last year and still at the high end of the 10-year range.

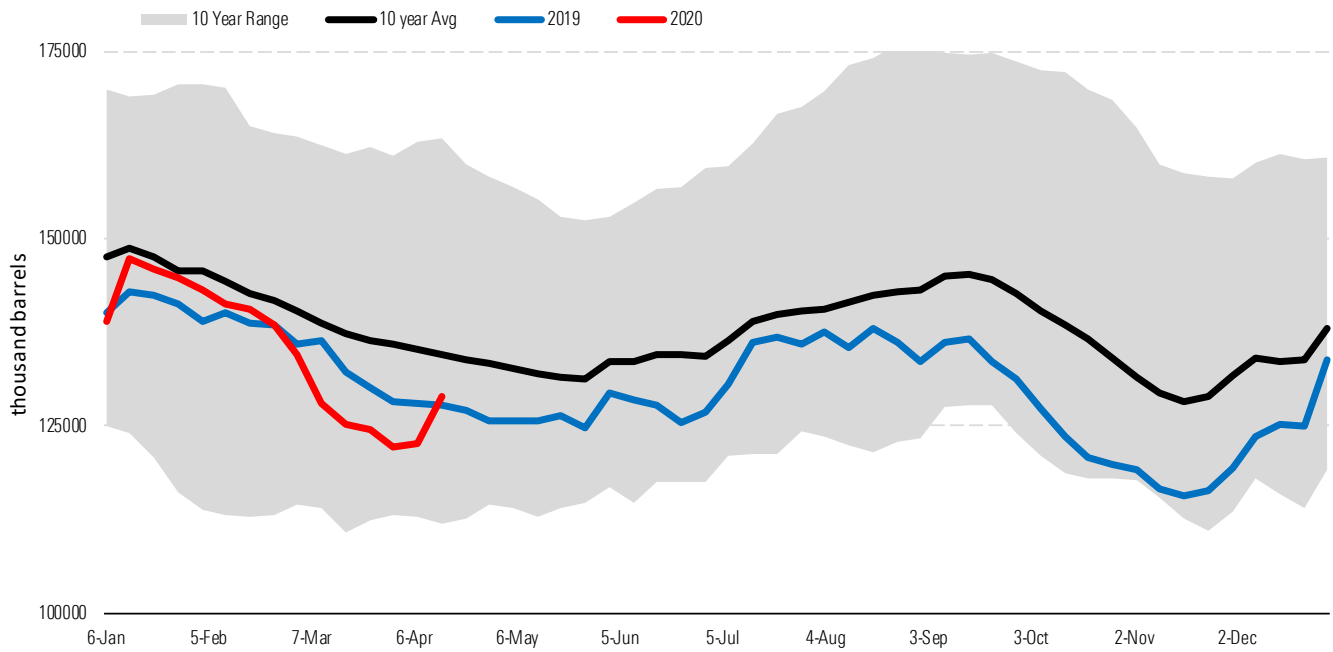
Exhibit 6 U.S. Weekly Distillate Production (Four-Week Average)



Source: EIA, Morningstar.

Exhibit 7 shows distillate stocks as of April 10 were still below the 10-year average and close to levels at this time last year.

Exhibit 7 Weekly U.S. Distillate Stocks



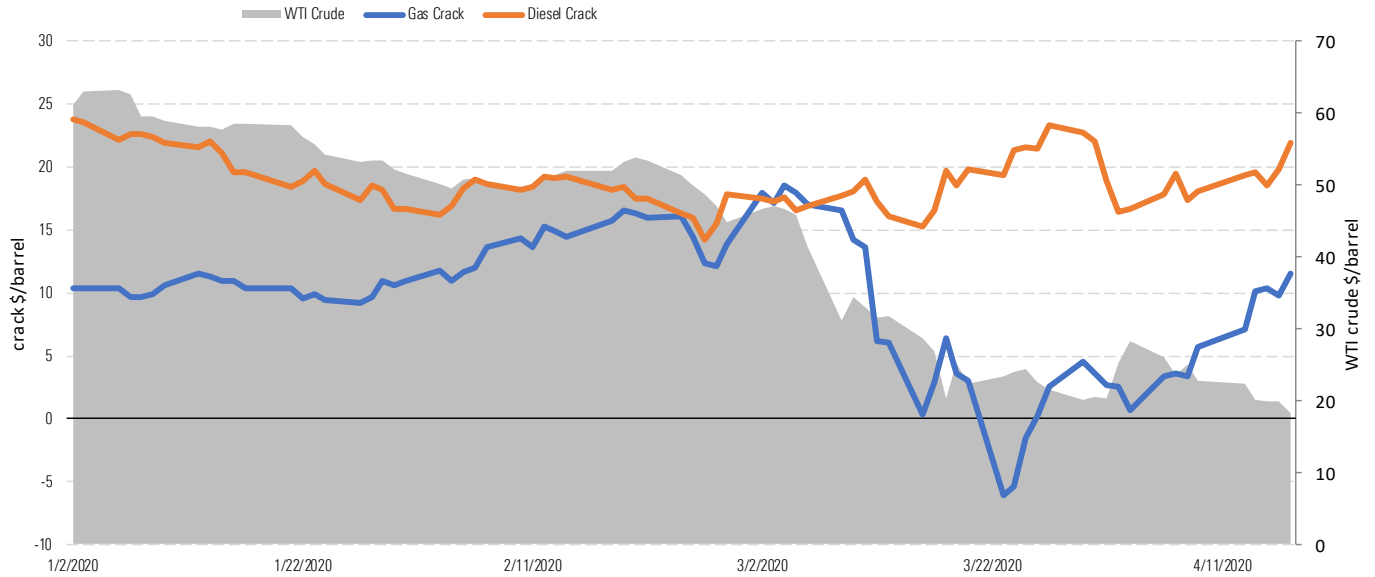
Source: EIA, Morningstar.

Refining Margins

Given the dramatic impact on gasoline demand and output but relative stability of diesel, refiners have had to make rapid adjustments to their throughput rates to deal with the overall drop in demand as well as to rebalance their input and operations to produce more diesel than gasoline. Exhibit 8 shows the U.S. benchmark refining crack spreads (product price minus crude price) for CME Nymex New York Harbor ultra-low-sulfur diesel (orange line, left axis) and CME Nymex New York Harbor gasoline (blue line, left axis) as well as underlying prices for CME Nymex WTI crude (grey shaded area, right axis).

The diesel crack remained strong in the past month, with prices not falling as fast as gasoline and staying stronger than crude. The gasoline crack followed the downward path of crude during March - falling into negative territory on March 23-26 but has recovered since to \$11.58/barrel on April 17 as crude prices fell to new lows last week. The gas crack is still below its year-to-date average of \$12.71/barrel before the March 6 price crash and only 75% of the 2019 average of \$15.41/barrel.

Exhibit 8 CME Nymex Gasoline and Diesel Cracks



Source: CME Group, Morningstar.

As a result, refineries producing a 50/50 gasoline and diesel yield (the 2-1-1 crack spread) are currently more profitable than refineries producing a more common 2:1 ratio of gasoline to diesel (the 3-2-1 crack spread). Since prices crashed on March 6, the CME Nymex 3-2-1 crack has averaged \$9.87/barrel, or \$2.29/barrel lower than the 2-1-1. The average 2-1-1 for 2019 was \$19.92/barrel, a \$1.50/barrel premium over the 3-2-1 equivalent. The more diesel refiners produce relative to gasoline, the higher their margins since the price crash in early March.

These charts dramatically illustrate changing conditions in the U.S. refining industry during the pandemic. The examples we use of CME Nymex crack spreads and EIA weekly summary statistics are by definition general and don't reflect widely varying circumstances across the country that are far worse in some regions, better in others. We'll provide more regional insight in upcoming analysis.

Until lockdowns end and life begins to return to normal, refiners will struggle to continue operating—trying to keep their plants running without filling up storage. Despite bargain-basement crude prices, they have to balance output to maximize diesel and minimize gasoline to protect margins. It seems likely that not all refiners, particularly small independents, will survive the upheaval. ■■

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