

REFINING INDUSTRY IN FOCUS

Baker & O'Brien, Inc.

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Q4 2020

Q4 2020: U.S. Refining Margins Remain Depressed

Houston, March 12, 2021

Baker & O'Brien, Inc.'s Q4 2020 *PRISM*[™] update showed that U.S. refining margins remain depressed with little to no improvement through the end of 2020. Average U.S. oil refining cash margins were well below seasonal norms and close to breakeven as the COVID-19 lockdowns and travel restrictions continued to suppress demand for petroleum products.

Demand for gasoline, jet fuel, and diesel fuel remains well below 2019 levels. Measures enacted in response to the growth in COVID-19 case levels during Q4 2020 led to a decline in gasoline demand of almost 5% compared to the prior quarter. One bright spot was that the combined demand for jet fuel and diesel fuel improved during the quarter by 10% but remains well below 2019 levels.

When comparing the Q4 2020 oil refinery cash margins to the same quarter a year ago, the double-digit declines highlight the continued impact of the COVID-19 pandemic on refiner profitability. Our analysis shows no appreciable improvement in margins for Q4 2020 over Q3 2020.

As illustrated by Key Refining Margin Metrics, most indicators remained

depressed versus 2019. Although crude prices were higher at the end of 2020, USGC crack spreads were little changed from the prior quarter while Midwest crack spreads declined 20%. The LLS - Maya light-heavy spread increased slightly in Q4 2020, which benefited USGC coking refineries. However, the light-heavy spread in late 2020 remained well below the averages for 2020 and 2019. The impact of COVID-19 on U.S. demand for petroleum products has been so great during 2020 that the substantial increase in the light-heavy spread expected from implementation of the IMO 2020 bunker fuel sulfur specification has yet to materialize.

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

	Q4 2020 vs. Q3 2020	Q4 2020 vs. Q4 2019
PADD 1	0.66	-9.86
PADD 2	-0.54	-12.06
PADD 3	0.21	-10.21
PADD 4	-0.27	-16.54
PADD 5	0.20	-10.42
U.S. Overall	0.02	-10.86

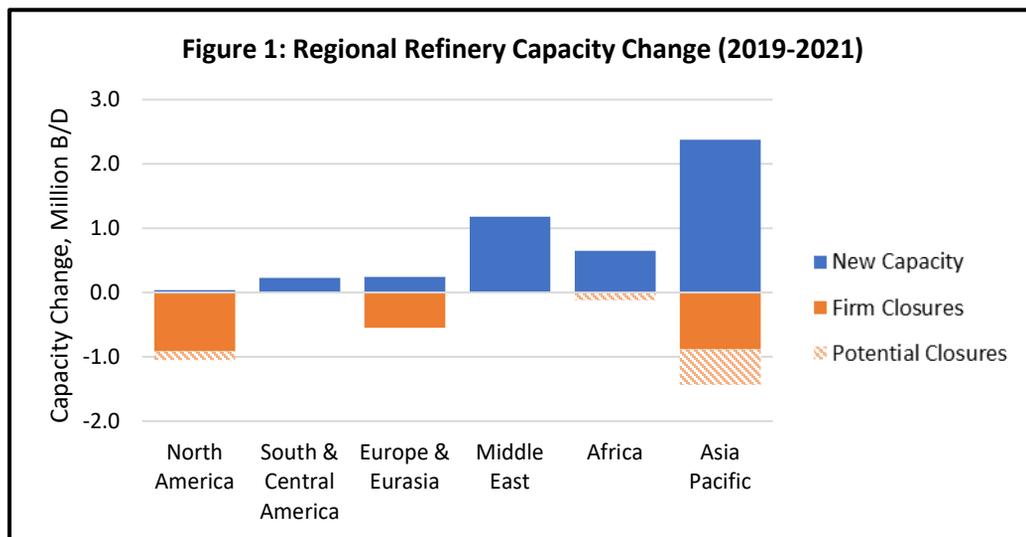
Key Refining Margin Metrics, \$/Bbl.

	Dec 2020	Q4 2020	Q3 2020	2020	2019
WTI	47.04	42.56	40.91	39.30	57.02
LLS	48.93	44.06	42.47	41.20	62.67
Brent	49.85	44.09	43.02	41.50	64.29
LLS - Maya	3.33	3.50	3.27	4.88	4.67
USGC LLS 321	7.05	6.61	6.66	7.09	10.82
USGC LLS 6321	6.23	5.82	5.21	5.45	7.91
Chicago WTI 321	6.93	7.23	9.14	8.38	17.54

Special Topic: Global Oil Refining Capacity Set to Expand in 2021 Despite Announced Closures

It has been over a year since the first reports of COVID-19 began to emerge. In that time, significant parts of the world economy came to a near standstill, accompanied by an unprecedented decline in demand for oil products. Faced with plummeting global demand and low or negative operating margins, some refiners temporarily or permanently shut down crude capacity in order to balance supplies. But oil refining is a capital-intensive industry with long investment cycles, so the ultimate impact of the pandemic on the longer-term views of refinery operators remains to be seen.

There is some evidence of optimism in the major investments in new refining capacity that continue to come onstream even while oil refineries are closing in certain parts of the world. As shown in **Figure 1**, most refinery closures have occurred or are planned in developed economies, including North America, Europe, Australia, Japan, and Singapore. Meanwhile, new capacity has been added or is under construction in the Middle East and in the developing economies of Africa and Asia-Pacific. The outlook for growing domestic demand in developing economies is providing strong incentives to add refining capacity in both domestic refineries and export refineries.



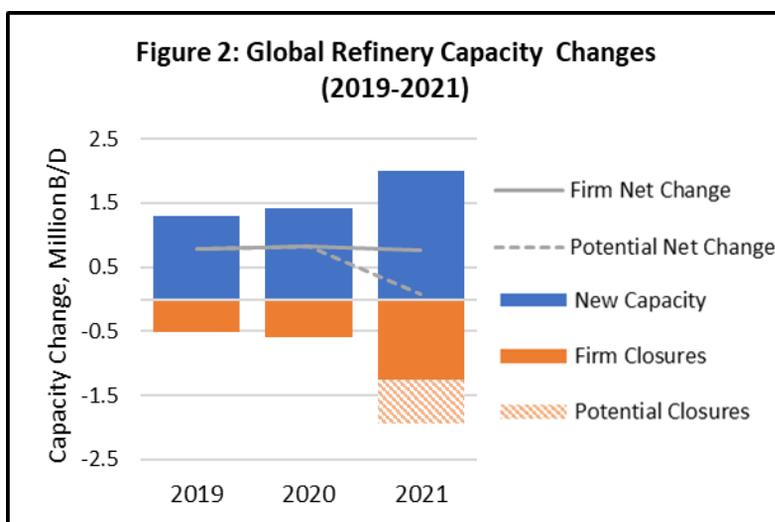
Looking first at the announced closures, we expect to have lost between 2.2 and 3.1 million B/D of global crude capacity from 2019 through 2021. Of these closures, approximately 1.0 million B/D are North American refineries. We discussed the outlook for [North American refinery closures in an article last fall](#).

In Europe, six refineries have closed or are at risk of rationalization, which may result in the loss of approximately 0.5 million B/D of crude capacity through 2021. Owners plan to convert the Neste Naantali (Finland), Gunvor Antwerp (Belgium), and Galp Matosinhos

Portugal) refineries into terminals. Petroineos is rationalizing a portion of capacity at its Grangemouth (Scotland) refinery. ENI Livorno (Italy) and Total Grandpuits (France) refineries will close but may re-emerge in 2024 as low-carbon fuels producers.

In the Asia Pacific region, eight refineries have announced closures or are at risk of rationalization through 2021. Closures of three refineries have been confirmed, including Eneos Osaka (Japan), BP Kwinana (Australia), and ExxonMobil Altona (Australia). Shell has announced that it will cut processing capacity by 50% at its Pulau Bukom facility in Singapore. The Viva Geelong (Australia) refinery accepted a federal government interim financial aid package to continue operations until at least mid-2021; however, its long-term future remains under review, and the refinery may close permanently. The Petron Bataan (Philippines) refinery announced a suspension of operations, and it is possible that it will resume operations for strategic supply reasons. Refining NZ Marsden Point (New Zealand) has proposed to convert the refinery to a terminal, which would require the agreement of tolling customers. Finally, Ampol Lytton (Australia) announced that it is considering its strategic options for the refinery but has not announced its closure.

Despite a wave of rationalization of crude capacity through the end of this year, capacity additions are likely to exceed closures in 2021 (**Figure 2**). If all of the potential capacity closures occur, this capacity will be replaced by new capacity (as shown by the gray dashed line), and there will be no net change in global refining capacity. It is more likely that some refineries currently under strategic review will continue to operate and some that have closed may be restarted, in which case, new construction is expected to add about 0.75 million B/D of net global crude capacity through 2021, in-line with the trend for recent years (as shown by the solid gray line).



Since construction projects are not immune to the pandemic, some of the 1.6 million B/D of new crude capacity that is scheduled to come onstream during 2021 may be delayed. For example, the Dangote Oil Refinery in Nigeria is the largest oil refinery project currently under construction. The project previously announced that startup would be delayed to the first half of 2021 due to COVID-19, but further delays could be announced. Other large projects scheduled to come onstream in 2021 include the Limetree Bay refinery (U.S. Virgin Islands, which was originally scheduled to be onstream in 2020), Saudi Aramco's Jazan refinery (Saudi Arabia), and Kuwait Petroleum's Al-Zour refinery.

Pressures to rationalize oil refining capacity in developed economies appear to be relentless, as governments take steps to incentivize the use of electric vehicles and renewable fuels. However, the developing economies are still working to mobilize their populations and will depend upon more economical petroleum-based motor fuels to support these efforts. In Valero's Q4 2020 earnings call, CEO Joe Gorder noted:

"...I think if you look forward to developing countries, their focus is a whole lot less on climate change and EVs than it is in feeding their people and providing safe and affordable housing for them... [the] internal combustion engine is far from being extinct."

Growth in refining capacity may pause in 2021 due to permanent and temporary COVID 19-induced refinery capacity rationalization. While the pandemic may flatten the curve in the global demand for fossil fuels, it is also likely to mark a shift in the center of gravity for oil refining to the developing world as the developed economies continue the transition to a low carbon fuels regime.

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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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