

REFINERY INDUSTRY IN FOCUS

Baker & O'Brien, Inc.

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Q4 2019

Q4 2019: U.S. Refining Margins Rebound

Special Topic: European Refiners – More Marginal Than Ever?

Houston, February 12, 2020

Baker & O'Brien, Inc.'s 19Q4 *PRISM*¹ update showed an increase in U.S. refining cash margins compared to the prior quarter. All PADDs showed increases versus the third quarter, with the biggest increases coming in PADDs 4 and 5.

Gasoline prices were down almost 6% in the fourth quarter compared to the third quarter while crude prices remained relatively flat during this time period. Increases in diesel prices offset some of the losses seen in gasoline prices; however, the U.S. Gulf Coast (USGC) crack spread declined by 20%. Compared to a year ago, refining margins were lower in three of the five PADDs with the exceptions being PADDs 1 and 5.

The January EIA Short Term Energy Outlook (STEO) indicated a 3.1% decrease in U.S. gasoline consumption compared to the prior quarter, but most of this decrease is due to seasonal effects as gasoline demand is down by only 0.6% compared to 18Q4. Conversely, the EIA STEO reported U.S. distillate product demand on a quarterly basis increasing 1.1% over the prior quarter. Both the USGC 321 crack spread and Midwest Chicago crack spread declined from the prior quarter despite relatively stable crude oil prices between the quarters. The LLS – Maya price differential improved by over \$5/Bbl. in the fourth quarter in anticipation of IMO 2020 sulfur specifications becoming effective for marine heavy fuel oil at the beginning of 2020.

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

	<u>19Q4 vs. 19Q3</u>	<u>19Q4 vs. 18Q4</u>
PADD 1	1.96	2.14
PADD 2	1.13	-8.80
PADD 3	1.05	-0.85
PADD 4	5.10	-11.71
PADD 5	4.95	1.09
U.S. Overall	1.82	-2.39

Key Refining Margin Metrics, \$/Bbl.

	<u>2019</u>	<u>2019</u>	<u>2019</u>	<u>2019</u>	<u>2018</u>
	<u>Dec.</u>	<u>Q4</u>	<u>Q3</u>	<u>Annual</u>	<u>Annual</u>
WTI	59.79	56.95	56.46	57.02	64.92
LLS	63.52	60.76	60.67	62.67	69.96
Brent	67.02	63.18	62.00	64.29	71.06
LLS – Maya	7.72	7.56	2.22	4.67	7.49
USGC LLS 321*	8.17	10.97	13.66	10.82	11.29
USGC LLS 6321**	3.59	6.29	10.25	7.91	8.27
Chicago WTI 321***	10.17	13.66	18.86	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

¹ *PRISM*TM is Baker & O'Brien's refinery modeling and database system that includes operational and economic performance details for refineries in the U.S., Canada, Europe, and Asia.

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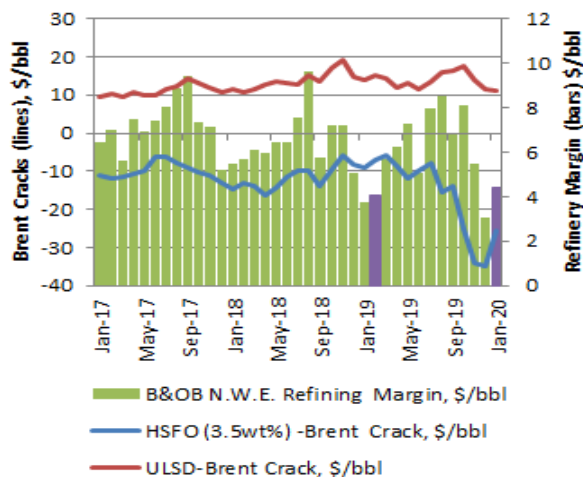
Seasoned oil refining commentators often observe that the death knell for many less complex European refineries has been ringing for the past 30 years. Indeed, coastal European refiners are often viewed by refining analysts as the weak-link globally and often underpin their refined pricing models as the marginal producers (which must cut rates first when margins deteriorate).

Since the wave of European closures after the 2008/2009 financial crisis abruptly terminated the now-distant “Golden Age” of refining, perhaps the real European refinery story has been one of on-going resilience: European refiners have continued to operate against a backdrop of ever-increasing competitive pressure from the Middle East, Eurasian, and North American oil product exporters targeting their mature product markets. Yet, longer-term existential threats on the horizon continue to grow – for example, the UK Government, which has already committed to legally binding target of net zero emissions by 2050, brought forward its proposed ban on internal combustion engine (ICE) vehicles by five years to 2035 in the lead up to hosting the 2020 UN Climate Change Conference later in the year. However, the cyclical nature of the industry means that many refiners are far more focused on the immediate future, and this year could be an ominous one for all European refiners.

Of significant consequence is the International Maritime Organization (IMO) tightening of the sulfur specification for marine bunker fuels from 3.5 wt.% to 0.5 wt.% on January 1, 2020. To assess the impact of these new fuel specifications, we used our *PRISM* models to compare the refining margin for some of Europe’s largest coastal refineries for January 2020 (post-IMO 2020) and January 2019 (pre-IMO 2020).

Historically, rather than make significant investments in residue upgrading technology (such as delayed cokers), many coastal European oil refineries opted to continue to produce high sulfur fuel oil for sale to the marine bunker market. Figure 1 shows that with the imminent introduction of IMO 2020, the value of this product plummeted sharply (blue line). Whereas complex refineries were able to take advantage of widening sweet/sour spreads in the second half of 2019, simpler refineries were more exposed.

Figure 1: Coastal European Refineries Monthly Key Indicators¹

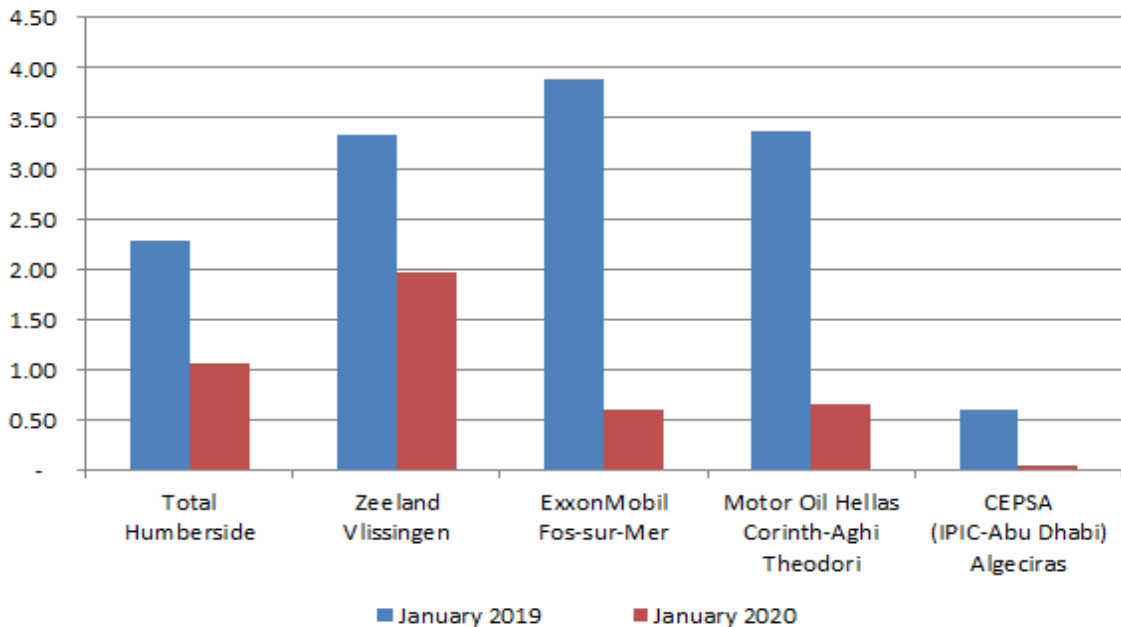


Note 1: The Baker & O'Brien Northwest European (NWE) refining margin is based on fluid catalytic cracker (FCC)-visbreaker refinery configuration processing Urals crude.

Furthermore, most refining market commentators predicted that IMO 2020 would usher in a new era of strong diesel (gasoil) cracks, but Figure 1 shows diesel cracks began to weaken (red line) even before the current Coronavirus outbreak. Yet despite these two unconstructive effects, a benchmark margin for a simple fuels Northwest European refinery processing (sour) Urals crude was still slightly better in January 2020 than the same time last year. While product pricing may have moved against them, European refineries are currently benefiting from unusually low regional natural gas prices, which translate into approximately 50% lower utility bills compared to January 2019.

A *PRISM* analysis for a sample of coastal European refineries with limited residue upgrading capability processing a range of crude oils shows that a simple refinery margin benchmark, however, does not tell the full story (Figure 2). Not all refineries benefit equally from the reduction in the natural gas price. Additionally, the current price weaknesses in the petrochemicals supply chain are also weighing on European refinery margins.

Figure 2: *PRISM* Cash Margins² for a Sample of Coastal European Refineries



The introduction of IMO 2020 is a significant step-change that has made the market environment for less complex coastal European refiners even more challenging, but generally markets adjust and rebalance. As our comparison in Figure 2 shows, bunker fuel oil effects are only one of many parameters that contribute to refinery margins. Like their shipping clients, European refiners are surely adapting to navigate these new “waters.” Later this year, we will have further insight on the IMO 2020 ripples on oil refining.

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 used in consulting assignments for Baker & O'Brien clients.

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