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Q4 2018: U.S. Refining Margins Remain Robust

Special Topic: Can Mexico's Refining System Be Revived?

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Baker & O'Brien, Inc.'s 18Q4 *PRISM*¹ update showed overall improvement in U.S. refining cash margins compared to the prior quarter and fourth quarter 2017. With the exception of PADD 3, all PADDs showed increases versus the third quarter, with the biggest increases coming in PADDs 2 and 4. Much of the quarterly decline in PADD 3 margins can be attributed to a decline in the discount between imported heavy sour crude oil and light sweet crude oil. Compared to a year ago, refining margins improved in all PADDs, with refineries in PADDs 2 and 4 seeing the biggest improvements. Several refineries in PADDs 2 and 4 benefitted from deep discounts in logistically constrained Canadian crude during the quarter. EIA data indicated a modest 1.8% decrease in gasoline and diesel consumption compared to the prior quarter and a 0.2% increase compared to 17Q4.

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

	<u>18Q4 vs. 18Q3</u>	<u>18Q4 vs. 17Q4</u>
PADD 1	1.57	4.15
PADD 2	8.28	10.68
PADD 3	-2.30	1.63
PADD 4	10.23	18.67
PADD 5	2.90	8.22
U.S. Overall	1.56	5.44

Key Refining Margin Metrics, \$/Bbl.

	<u>2018</u>	<u>2018</u>	<u>2018</u>	<u>2018</u>	<u>2017</u>
	<u>Dec.</u>	<u>Q4</u>	<u>Q3</u>	<u>Annual</u>	<u>Annual</u>
WTI	49.51	59.10	68.84	64.92	50.87
LLS	56.00	66.56	73.29	69.96	54.11
Brent	57.38	67.79	73.75	71.06	54.26
LLS – Maya	3.25	2.52	8.54	7.49	7.01
USGC LLS 321*	5.82	7.74	12.94	11.29	13.34
USGC LLS 6321**	5.09	6.49	9.55	8.27	9.86
Chicago WTI 321***	10.21	15.05	20.45	17.40	17.71

* 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

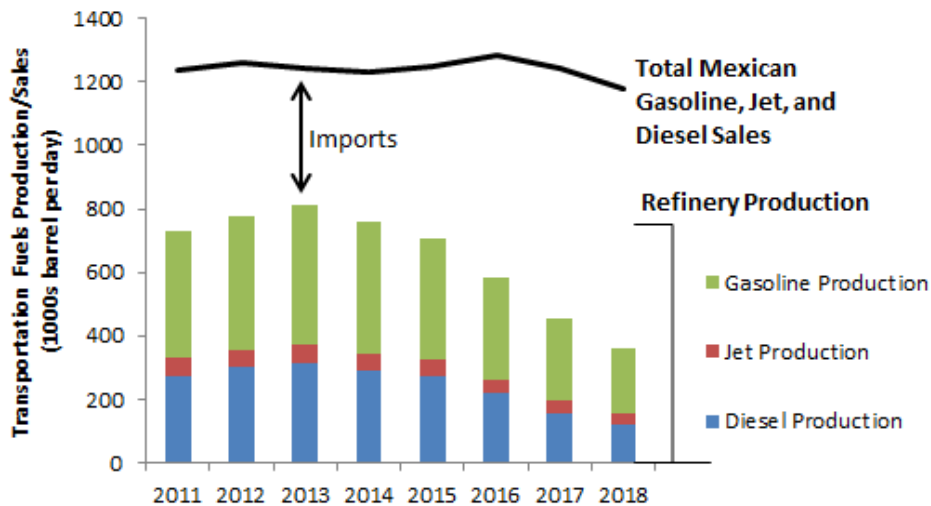
*** WTI deemed conversion to 33% conventional 87R gasoline, 33% RBOB and 33% ULSD

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.

Special Topic: Can Mexico's Refining System Be Revived?

Most U.S. refiners appear to be in good health - setting production records and targeting Latin America export markets. However, across the southern U.S. border, the Mexican refining sector is in dire need of rejuvenation. In January 2019, the Secretaria de Energia (SENER), the Mexican equivalent of the U.S. Energy Information Administration, reported that the Petróleos Mexicanos (PEMEX) controlled refining complex limped into the new year at a meager 31% monthly utilization, with domestically refined products supplying less than 30% of the domestic transport fuel demand. This follows several years of successive declines in throughput. It begs the question: is the Mexican refining sector in long-term terminal decline, or can it be revived?

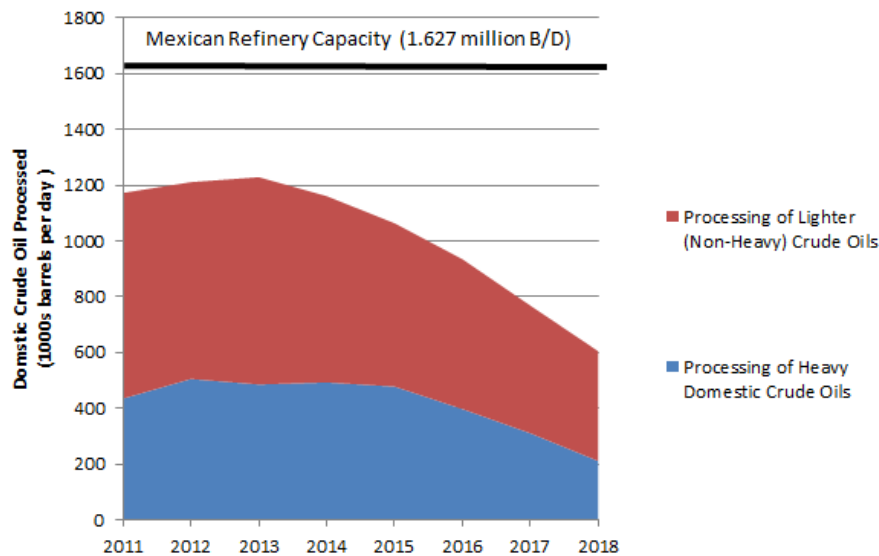
Mexican Refinery Transport Production and Total Domestic Sales



Source: SENER.

Many U.S. refiners, particularly those with cokers, process Maya, the Mexican heavy crude oil. In contrast, the majority of Mexico's refineries are configured to primarily run lighter crude oil grades, such as Isthmus. Over the past five years, these lighter grades have experienced the lion's share of the overall decline in Mexican crude oil production, to the point where, in theory, Mexico should consider importing substantial light crude oil volumes to fill its refineries. Furthermore, financial constraints on PEMEX following the 2014 oil price collapse led to substantial reduction in refinery capital investment, suggesting reduced spending in key areas, such as refinery maintenance, infrastructure, and security. Notwithstanding recent refinery outages due to earthquakes and storms, the net result has been a dramatic reduction in the crude oil processed in Mexico's oil refineries, as illustrated by the figure below.

Domestic Crude Oil Grades Processed By Mexican Refineries



Sources: SENER and PEMEX.

Mexican refinery fortunes are intertwined with the success of PEMEX’s upstream business. Following the energy sector liberalization in 2013, it was anticipated foreign investment and access to improved technologies would initiate an improvement in crude oil production, but crude oil production continued its decline. Following the election of President Andrés Manuel López Obrador in December 2018, a new administration has taken office with a modified plan for the country’s energy industry – one that places a renewed emphasis on strengthening PEMEX internally rather than encouraging private investment.

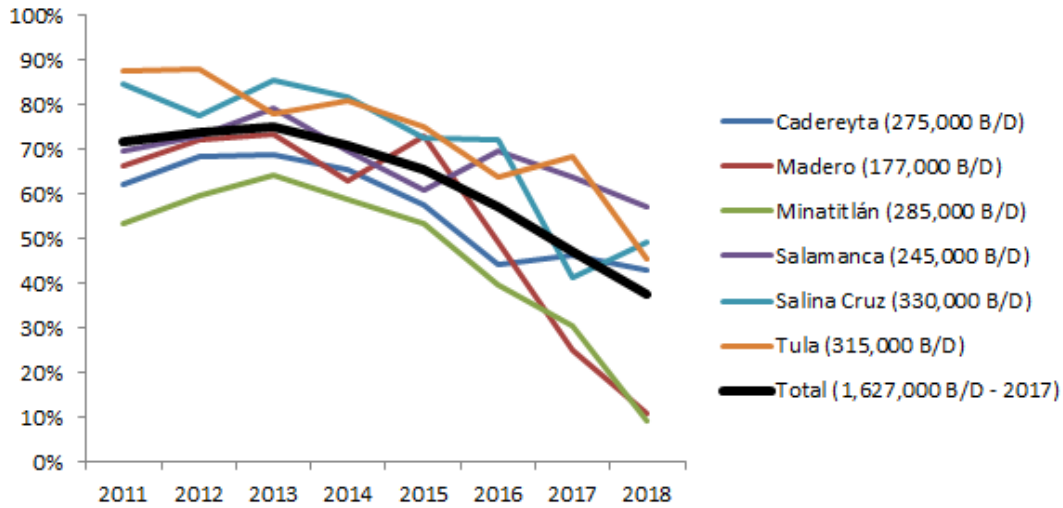
Soon after President Obrador took office, the government canceled or postponed multiple acreage auctions to potential outside investors. Then in late January 2019, the government formally suspended nascent U.S. light crude imports. In the downstream sector, to tackle refined product theft, several pipelines have recently been shut down and increased use of road transport is being used. In addition, to avoid further disrupting the resultant fragile fuel supply situation, it is anticipated that the government will continue to delay the introduction of clean diesel regulations, as not all of the PEMEX refineries are capable of meeting the ultra-low sulfur specifications.

With an improved refinery investment budget for 2019, PEMEX may be better positioned to follow through on the National Refinery Plan, introduced in December 2018, to rehabilitate its existing refineries. The plan also calls for the construction of a seventh 340,000 barrels per day (B/D) refinery in the Gulf of Mexico Port of Dos Bocas with the aid of federal government funds and recovered revenues from its crackdown on refined product theft. PEMEX forecasts that the estimated \$8 billion refinery will be on-stream within approximately three years. This appears optimistic. Recently completed and newly built grass root refineries have taken at least seven years to implement from the award of the front end engineering contract and have generally been prone to cost creep.

The new government would like to add up to 600,000 B/D of new refining capacity; however, the Mexican refinery system is not short of name plate capacity – the challenge has been filling it. Any long-term success for PEMEX’s investment plans depend on increasing refinery conversion capabilities to strengthen margins, produce more transport fuels, and process more heavy crude oil. The implementation of earmarked clean fuels investments and targeted investments to improve overall reliability is also important.

There is no “silver bullet.” The Mexican refining sector faces a myriad of complex challenges and a long road back to achieve its full potential. The U.S. refiners’ surging Mexican export business does not appear under any imminent threat. But rather than just supply product to address the symptoms, will outside firms be invited to treat the causes and assist PEMEX in reviving refinery performance?

Mexican Refinery Utilization Statistics



Sources: SENER, PEMEX, and Baker & O’Brien analysis.

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 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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