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Q1 2016: U.S. REFINING MARGINS CONTINUE TO FALL

Special Topic: Ethanol's Growing Consumer Subsidy

Houston, June 1, 2016

Compared to last quarter of 2015, Baker & O'Brien, Inc.'s 16Q1 release to PRISM¹ subscribers reflects a significant decline in average U.S. refining margins. As the table below shows, the average refining margin in all PADDs (with the exception of PADD 3) was below the prior quarter. The downward pressure on margins was due primarily to weaker distillate prices, high refinery run rates, product inventory builds, and unseasonably warm weather.

Comparing 16Q1 results to 15Q1, refining margins were substantially lower for all PADDs, with the greatest declines in PADDs 2 and 4. Over the last year, improved pipeline logistics have severely curtailed the crude oil cost advantage enjoyed by inland refiners — especially those processing Bakken crude oil — as the WTI vs. Bakken price differential narrowed significantly from a year ago.

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

	<u>16Q1 vs. 15Q4</u>	<u>16Q1 vs. 15Q1</u>
PADD 1	-2.73	-6.25
PADD 2	-5.54	-9.87
PADD 3	0.97	-1.41
PADD 4	-6.88	-6.98
PADD 5	-3.46	-6.40
U.S. Overall	-1.64	-4.60

The U.S. Gulf Coast (USGC) LLS 321 crack spread was down \$1.15/Bbl. compared to the previous quarter. However, this downward trend was even more apparent in the Chicago market, where the WTI 321 crack spread was over \$5/Bbl. below the prior quarter. These declines reflected primarily weak distillate

Key Refining Margin Metrics, \$/Bbl.

	2016	2016	2015	2015	2014
	<u>March</u>	<u>Q1</u>	<u>Q4</u>	<u>Annual</u>	<u>Annual</u>
WTI	37.82	33.33	42.10	48.68	93.10
LLS	40.11	35.19	43.56	52.33	96.74
Brent	38.49	33.92	43.68	52.40	98.91
LLS – Maya	10.64	9.10	9.21	8.27	11.01
USGC LLS 321*	9.80	8.95	10.10	14.70	12.12
USGC LLS 6321**	5.14	4.95	6.08	10.15	8.05
Chicago WTI 321***	14.42	10.08	15.21	21.06	19.05

*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

margins, as gasoline margins continued to be comparatively strong. As a result, to the extent possible, most refiners are maximizing gasoline production over distillate. According to the latest data from the U.S. Federal Highway Administration, vehicle miles traveled have increased 21 months in a row beginning in May

2014 through February 2016. The resulting strong gasoline demand has resulted in much firmer gasoline prices relative to distillate.

¹ PRISM™ 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.

Compared to the prior quarter, the 16Q1 LLS/Maya crude oil price differential declined only slightly (\$0.11/Bbl.). As a result, USGC coking refiners enjoyed relatively firm margins compared to the last quarter of 2015.

Special Topic: Ethanol's Growing Consumer Subsidy

On May 19, 2016, the Environmental Protection Agency (EPA) announced its proposed renewable fuel obligations for 2017 for refiners and importers of gasoline and diesel fuel. The table below shows the 2017 proposed Renewable Fuel Standard (RFS) compliance requirements, which on an overall basis are 4% higher than 2016. In order to achieve compliance, a refiner or importer must fulfill its renewable volume obligation (RVO), which is calculated as a percentage of the total gallons of gasoline and diesel fuel produced or imported by the company

RIN Type	RIN Code	2016 Rule		2017 Proposed		
		National Volume	Required RVO	National Volume	Required RVO	RVO
		Bgals. ¹	Percent	Bgals.	Percent	Percent Increase
Cellulosic Biofuel	D3	0.230	0.128	0.312	0.173	35.2%
Biodiesel	D4	1.900	1.590	2.000	1.670	5.0%
Other Advanced Biofuel	D5	1.480	0.292	1.688	0.377	29.1%
Corn Ethanol	D6	14.500	8.090	14.800	8.220	1.6%
Total Volumes		18.110		18.800		

Note 1: billions of gallons

during the calendar year. An obligated party must either blend the appropriate renewable volumes, or purchase the appropriate renewable identification numbers (RINs), for each of the four renewable fuel categories based on the RVO percentages shown in the table.

Under the RFS, the EPA is compelled to keep increasing the required renewable fuel volumes—despite the fact that the U.S. gasoline pool is currently at the maximum allowable E10 ethanol

Based on EPA Final Rule for 2016 For 1 BGY of Gasoline + Diesel Produced (~65,000 B/D)			
RIN Type	RIN-Gallons Required	RIN Cost	Total RIN Cost
		(YTD 5/25) (\$/RIN-Gal.)	
Cellulosic Biofuel	1,280,000	1.607	\$ 2,057,568
Biodiesel	15,900,000	0.780	\$ 12,402,175
Advanced Biofuel	2,920,000	0.761	\$ 2,220,788
Corn Ethanol	80,900,000	0.720	\$ 58,279,389
Estimated 2016 RFS Compliance Cost			\$ 74,959,921
			\$ 0.075 per gallon of gasoline or diesel

content of 10% (the so-called “blend wall”). The overall ethanol content of the pool could be increased by expanded use of E15 or E85, but neither fuel has received any significant consumer acceptance. This lack of acceptance has caused a steady increase in both RIN values and RFS compliance costs. For 2015, RFS compliance costs averaged 5.5 cents per gallon of gasoline or diesel fuel produced or imported. Using year-to-date prices through May 25, 2016, and based on an

RVO of one billion gallons per year (about 65, 000 Bbls./day) of gasoline or diesel fuel produced, the compliance cost is up to 7.5 cents per gallon, as shown in the table.

Based on the proposed 2017 RVO percentages, compliance costs are expected to increase to 7.8 cents per gallon, using the year-to-date prices.

The RFS compliance cost is a cost to consumers, as it is passed along at the wholesale level. In its proposed rules, the EPA cites multiple studies which conclude that RFS compliance costs are fully passed through at the wholesale level. This supports EPA’s position that the RFS does not negatively impact small refiners and merchant refiners who have limited or no capability to

blend renewable fuels into their produced or imported gasoline or diesel fuel, and must purchase RINs to meet their obligations. However, there is no question that the RFS severely affects the competitive balance within the industry as it creates large profits for renewable fuel blenders, and large costs for non-blenders. Some refiners must pay hundreds of millions of dollars in RFS compliance costs each year. Although the RFS compliance costs are a zero sum game for the industry, consumers ultimately foot the bill through higher fuel prices. Few consumers realize that they are paying, on average, approximately 7.5 cents per gallon more at the pump to subsidize renewable fuel producers — and these costs will keep increasing as the pressure to meet the RFS requirements continues.

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 focuses primarily on the downstream industry and 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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