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IN PERSPECTIVE

AMLO's Budget and the Future of Mexican Fuel Oil Production

The inauguration of Mexican President Andres Manuel Lopez Obrador, known as AMLO, on December 1 has major implications for state-owned Pemex. This edition's In Perspective looks at AMLO's planned reforms, particularly those pertaining to the national refining sector, while analyzing the effect such reforms will have on the country's domestic fuel oil portfolio.

Trouble at Pemex

The deteriorating state of Pemex under AMLO's predecessor, Enrique Pena Nieto, has been well publicized. When Pena Nieto first took office in 2012, the country's oil and gas production had been deteriorating for roughly a decade. Already aging infrastructure deteriorated quickly as the government misappropriated funds to maintain existing projects. Poor management and the constant reshuffling of employees also led to systemic dysfunction that resulted in a decline in production numbers.

In response, Pena Nieto instituted a series of energy reforms in 2013 that deregulated the sector and allowed private companies to access the country's hydrocarbon reserves. According to Pena Nieto, these reforms would see Mexican crude production return to 3 million bpd. But the recovery of the sector never materialized, and crude production fell from 2.5 million bpd when Pena Nieto first took office in 2012 to 1.8 million bpd in 2018. Aging oil fields with dwindling hydrocarbon reserves, and a lack of investments in all stages of the refining process, are said to have contributed to the production downfall.

The Mexican refining sector is in a state of disrepair, with many of the country's refineries operating well below their nameplate capacity. Crude processing across Pemex's six refineries stood at 611,900 bpd in 2018, down drastically from the 1.2 million bpd processed in 2012. This means refineries are operating at about 38 percent of their aggregate nameplate capacity of 1.62 million barrels per day. Declining processing capacity is evident across all of Pemex's refineries, though it is most apparent at the 190,000 bpd Madero and the 185,000 bpd Minatitlan refineries. The Minatitlan refinery saw crude runs drop 85 percent since 2012, while the Madero refinery was shuttered for most of 2H 2018. An overhaul of the entire refining system is necessary to address much needed maintenance, though these critical projects have largely been ignored in recent years.

As Mexican refining capacity has declined, so too has Mexican product yields. Gasoline production declined 50 percent from 418,000 bpd in 2012 to 207,000 bpd in 2018. Likewise, diesel production plummeted 61 percent from 299,000 bpd in 2012 to 117,000 bpd last year.

With demand remaining healthy, Mexico has been forced to turn to the international market for its supply of light products. Between 2015 and 2018, gasoline imports increased 56 percent from 326,000 bpd to 510,000 bpd. Middle distillate imports have also soared from 162,000 bpd in 2015 to 278,000 bpd in 2018.

A Man with a Plan

Enter AMLO, who made the revival of Pemex a key pillar of his campaign. AMLO has several goals that, if achieved, he claims will reverse the misfortunes of Pemex. On the production side, AMLO hopes to expand production capacity to 2.4 million bpd by 2024 (production was 1.8 million bpd last year). The AMLO administration insists this will be accomplished by accessing mature oil reserves that Pemex had previously thought depleted and by launching new production projects in shallow waters.

But it is on the refining side where AMLO's intentions have made the most buzz. AMLO's 2019 budget approved by Congress includes a number of plans to renovate and restore the country's existing refineries, while even providing money for the construction of a new refinery. Below is an outline of how the budget was allocated.

Cadereyta Refinery Maintenance, 2019-2022

The maintenance will involve the rehabilitation of refining units. The government also allocated money towards revitalizing tank storage and auxiliary services. Budgeted amount estimated in 2019: \$102 million.

Dos Bocas Refinery Construction

The budget devoted money to both develop necessary studies to determine configuration for the new refinery construction and to develop the engineering, procurement and construction of processing plants. The new refinery will have a capacity of 340,000 bpd. Budgeted amount estimated in 2019: \$2.6 billion.

Madero Refinery Maintenance 2019-2023

Funding will be devoted to sustaining operating capacity by reinforcing the integrity of equipment, which will eliminate inefficiencies and increase production. Budgeted amount estimated in 2019: \$83 million.

Minatitlan Refinery Maintenance 2019-2023

Funding directed towards Minatitlan will sustain production capacity through the restoration of facility equipment, with the hopes of maintaining operational reliability and eliminate risk conditions, as well as achieving production goals. Budgeted amount estimated in 2019: \$90 million.

Salamanca Refinery Maintenance 2018-2022

The allocated money will go to restoring the process plants and systems of the refinery, in addition to improving operational units. The funds will also go towards the rehabilitation of storage tanks. An overarching goal of this project is to sustain operational reliability. Importantly, the allocated funds do not target a long-discussed coking project. Budgeted amount estimated in 2019: \$106 million.

Salina Cruz Refinery Maintenance 2018-2022

The funding will sustain operating capacity by reinforcing equipment, which will eliminate inefficiencies and risk conditions, while increasing production. Budgeted amount estimated in 2019: \$54 million.

Tula Refinery Maintenance 2019-2023

Money will go towards maintenance of equipment, security improvements, environmental protection and replacement of machines. Funds will also be devoted to sustaining operating conditions and production capacity, while eliminating risk conditions and providing reliability. Budgeted amount estimated in 2019: \$110 million.

On Fuel Oil

Fuel oil production decreased year-on-year in 2018 from 217,000 bpd in 2017 to 185,000 bpd. Two refineries - the Cadereyta and Salina Cruz refineries - both saw increased fuel oil production last year to the tune of 8 percent and 29 percent, respectively. The big increase in production at Salina Cruz was largely due to the bounce back from a particular damaging 2017, when flooding and a subsequent fire at the facility temporarily knocked out fuel oil production.

Despite increased output from Salina Cruz, it was not enough to boost overall Mexican fuel oil production. Production at the Tula refinery dropped 23 percent from the 70,200 bpd produced in 2017 to the 54,000 bpd produced last year. Production at Minatitlan declined 56 percent to 11,900 bpd, while production at Salamanca dropped 13 percent to 37,000 bpd. But the largest decline came from the Madero refinery. After 2017 yielded an unusually strong 16,300 bpd of fuel oil output, production dropped 67 percent to 5,400 bpd in 2018.

The future of fuel oil production in the short term will largely depend on how effective AMLO's reforms are at returning the supply chain to full capacity. The declining trend in Mexican fuel oil production has proceeded uninterrupted since 2010.

The decline is largely attributed to the deteriorating state of Mexican refineries that has inhibited secondary units and decreased crude runs. Mexican refineries have also been slashing their runs of heavy crude oil in favor of light crudes. While refinery runs in Mexico have fallen 35 percent since 2016, the share of light crude processed in state-owned refineries has jumped from 57 percent in 2016 to 65 percent last year. Consumption of heavy crudes has at the same time fallen from 43 percent in 2016 to 35 percent in 2018. So, while refinery runs, and consequently fuel oil production, are down, there are also fewer barrels of high sulfur fuel oil-yielding heavy crude processed in the country's refineries.

Will the Refineries Come Back?

AMLO's plan to refurbish the country's six refineries is an ambitious one. The short timeline for the massive projects, combined with the sheer scope of work that needs to be done, presents an uphill battle for Mexican reform efforts. There are also questions surrounding how the Mexican government can afford the 22 percent increase in capital expenditures within its 2019 budget.

The track record for Pemex is not very positive when it comes to the efficiency of previously scheduled work, and maintenance at this point looks quite tedious considering the current state of Mexican refineries. AMLO and his administration will need to run a very tight ship in order to achieve the goals of improving the efficiency at Mexican refineries. However, the number of obstacles facing Pemex likely point to a scenario in which it will require more time to meet AMLO's expectations than the government has provided for the projects.

In addition, Mexico will also need to invest in new technologies at its refineries so that Mexican Mayan crude is fit for domestic processing. Mexico will either need to bring in these new technologies to refine heavy crudes, or increasingly process lighter crudes to mix with its own. As production of light crude has been on the decline due to, among other things, a lack of investment, the country would likely have to import more of it from the international market, probably from the US Gulf. AMLO has thus far seemed averse to importing more oil from the US and there are several light crude fields currently under development by Pemex. The goal is for those to achieve first oil by the end of the year, though it remains to be seen how much light crude this will make available for Pemex.

On the refinery in Dos Bocas, the plan in its timeline is extremely ambitious. Refineries of this size can be built in three years in other countries, and AMLO would like the refinery completed by 2023. The history of projects of this scope in Mexico makes this timeline seem unlikely.

Pemex, Fuel Oil Production and 2019 Budget Allocations per Refinery				
Refinery	Budgeted Amount 2019 (USD)	Fuel Oil Production 2016 (kbd)	Fuel Oil Production 2017 (kbd)	Fuel Oil Production 2018 (kbd)
Dos Bocas	\$2.6 billion	-	-	-
Cadereyta	\$102 million	13	13.6	14.7
Madero	\$83 million	9.7	16.3	5.4
Minatitlan	\$90 million	7.5	26.1	11.9
Salamanca	\$106 million	45.7	42	36.7
Salina Cruz	\$54 million	87.3	48.5	62.4
Tula	\$110 million	64.9	70.2	54



UK Refineries and IMO 2020

UK refineries are in good shape ahead of the looming sulfur spec change, which is set to cripple crack spreads on fuel oil and send middle distillate profits soaring. While synonymous with plant closures and weak income statements, the UK's harsh operating and regulatory environment has put the sector through the ultimate stress test and, barring substantive capital investments, not much can be done to improve performance.

High product specifications and stringent environmental standards will not change, regardless of whether or not the United Kingdom exits the European Union. The regional shipping markets are already operating with a sulfur limit of 0.1 percent, below the 0.5 percent global limit dictated by MARPOL Annex VI, and overall demand for fuel oil in the UK has been under attack for decades.

In terms of domestic market dynamics, the IMO mandate changes very little for the UK refineries focused on road transport fuels. Like all players, however, they are vulnerable to price fluctuations in feedstock and refined products markets.

The UK has six refineries in operation with a combined crude oil processing capacity of 1.23 million barrels per day. These are: Exxon Mobil's Fawley Refinery (265,000 bpd), P66's Humber Refinery (240,00 bpd), Valero's Pembroke Refinery (220,000 bpd), Essar Oil's Stanlow Refinery (210,000 bpd), Petrolneos' Grangemouth Refinery (205,000 bpd) and Total's Lindsey Refinery (100,000 bpd).

The UK refining sector faces significant challenges and is plagued by overcapacity and plant closures. More than 300,000 bpd of throughput capacity has been lost since 2008 with three outright plant closures, and unit shutdowns from Total and Essar. This, combined with system upgrades, has improved the overall health of the sector.

According to the UK Petroleum Industry Association, UK refineries are extremely efficient and achieve some of the lowest pre-tax prices on diesel and gasoline in Europe. This helps sustain throughput levels at close to 90 percent capacity.

However, the UK refining infrastructure is somewhat antiquated and plants were designed to produce gasoline, creating a mismatch within the UK fuels market. Driven by government policies, domestic fuel demand is levered towards middle distillates, making the UK a net importer of jet fuel and diesel, and a net exporter of gasoline and fuel oil.

January to October 2018 supply demand balances show the UK is long naphtha (26,000 bpd), gasoline (95,000 bpd) and heavy fuel oil, including bunker fuel, (32,000 bpd). It is short LPG (27,000 bpd), kerosene (180,000 bpd), diesel and gasoil (268,000 bpd), and other products (24,000 bpd).

Many of the six remaining refineries have an inherently high gasoline yield. JODI data put the system-wide gasoline yield at 30 percent, but some plants may be skewed towards a 50 percent yield, which creates a serious challenge for profitability. The UK is a net exporter of gasoline and the demand growth outlook in the domestic market is flat, which puts pressure on refining margins for light products. Operators are taking measures to tackle the issue by increasing export capacity and expanding their retail footprint.

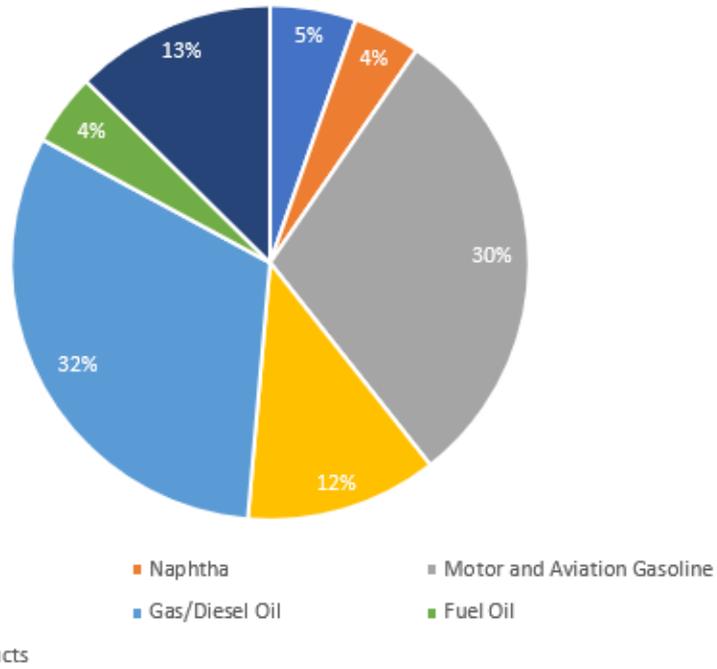
The money is in middle distillates and UK refiners are achieving healthy price premiums on jet fuel and diesel. The industry achieved a combined kerosene, diesel and gasoil yield of 44 percent in 2018, which is as much as they can possibly achieve without significant capital investments. But the money is not forthcoming as UK refining remains a pariah in the capital markets. Royal Dutch Shell announced the permanent closure of the Shell Higher Olefins Plant (SHOP) and Alcohols units in Northwest England following a fire in December. The supermajor says it was uneconomical to rebuild the plant, a view which is largely indicative of UK heavy industries.

At the bottom of the barrel, fuel oil yields average 4 percent across the UK system, but this varies plant by plant. P66 runs the UK's only coking unit at its Humber Refinery in Northeast England, allowing it to upgrade heavy, high sulfur feedstock. Essar Oil has also made substantial adjustments to its refinery to lower fuel oil yields, but other plants may produce as much as 12 percent fuel oil.

Older plants with high gasoline and fuel oil yields could face strained margins come January 1, when the IMO rules go into effect. Refineries will find themselves dependent on rising distillate crack spreads to offset weak fuel oil cracks. With little to no flexibility in output, they are vulnerable to price swings in the refined products markets.

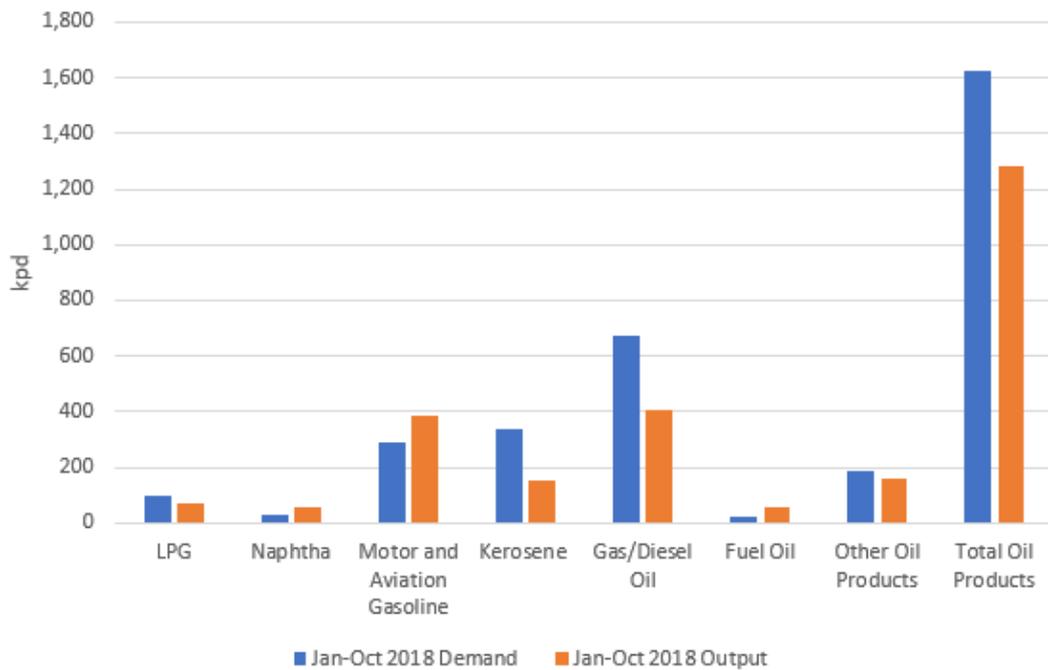
The IMO ruling will squeeze UK refining margins from both sides. The plants were designed to run light-sweet crude from the UK continental shelf in the North Sea, which narrows feedstock options. As the market nears the sulfur cap deadline, crude oil traders will begin pricing in the low sulfur premium, thus raising the cost for light-sweet crudes that are a staple feedstock for UK plants.

United Kingdom, Refinery Yields Jan-Oct 2018



Source: JODI

United Kingdom, Product Balances



Source: JODI



IN THE MARKETS

Consort Bunkers of Singapore to Keep Stable Bunker Supply Volumes

Consort Bunkers has become one of the top bunker suppliers in Singapore with its stable supply volume over the past couple of years. The Maritime and Port Authority of Singapore updates its list of top bunker suppliers by volume every year and Consort Bunkers ranked number 12 in 2017 and number 11 last year. Singapore ended last year with 51 licensed bunker suppliers operating in its port and total bunker sales of 49.8 million metric tons, compared with 55 suppliers and 50.7 million mt in 2017. The monthly delivery volume for Consort Bunkers is about 170,000 mt, consisting of 65 percent high sulfur 500 cSt and 35 percent high sulfur 380 cSt.

The company's business model minimizes fluctuation in its delivery volumes. In addition to its own bunker sales, Consort Bunkers also offers spot and time-chartered barging services to major oil companies and trading houses. About half of its delivered volumes are self-bunker sales. Consort Bunkers owns five barges with sizes ranging 3,700-8,338 mt, with high pump rates and three lines of segregation.

While focusing on 3.5%S RMK 500 and RMG 380 grades, Consort Bunkers sometimes also supplies 0.1%S marine gasoil (MGO). The company is considering supplying some

0.1%S MGO from April. Last year, Consort Bunkers supplied 5,000 mt per month of 0.1%S MGO for only three months in response to customer requests. The sales did not make much economic sense at the time and were discontinued as the quantity demanded was too small for the size of the company's barges.

As the bunker market marches towards 2020, Consort Bunkers will start to supply 0.5 percent low sulfur bunker fuel, but it will not be available any earlier than October. A clear direction about the global IMO 2020 bunker market is likely to appear three months before the 0.5 percent sulfur cap takes effect. Demand for complaint fuel before October will therefore be limited. Consort Bunkers expects to not have any issues finding required 0.5%S bunker cargoes in Singapore when the time comes and that its current fleet of barges is adequate for the market change.

With headquarters in Singapore, Consort Bunkers was established in 1988. Presently, it also operates bunkering services in UAE (Fujairah, Khor Fakkan and Jebel Ali) and China (Zhoushan and Ningbo). The company adopted the Mass Flow Meter system since 2014, three years before MFM became mandatory in Singapore for marine fuel oil.

Singapore, Largest Bunker Suppliers in 2018	
1	Ocean Bunkering Services
2	Petrochina International
3	Sentek Maring & Trading
4	Equatorial Marine Fuel Management Services
5	Shell Eastern Trading
6	Total Marine Fuels
7	ExxonMobil Asia Pacific
8	Toyota Tsusho Petroleum
9	Maersk Oil Trading Singapore
10	BP Singapore

Japan's Kansai Electric Cuts Back Fossil Fuel Burns as Nuclear Power Returns

In the past two years, Kansai Electric Power Company (KEPCO) of Japan reintroduced most of its active nuclear power capacity after the long suspensions that followed the earthquake/tsunami and the Fukushima accident in March 2011. As a result, KEPCO's fossil fuel consumption, especially fuel oil and crude oil burns, has dropped considerably.

Currently, KEPCO has three nuclear power stations, Ohi (2,360 MW), Takahama (3,392 MW) and Mihama (826 MW). Four units at two of KEPCO's nuclear plants with a total of 4,100 MW generation capacity have returned to operation. Takahama Units 3 and 4 (870 MW each) restarted in 2017, and Ohi Units 3 and 4 (1,180 MW each) restarted last year.

Nuclear power generation accounted for about 44 percent of KEPCO's total power generation prior to March 2011, but fell to zero after September 2013. Following the restart of these four units, the share of KEPCO's nuclear power generation jumped to 14 percent in fiscal year 2017, which ended March 31, 2018, and will double in FY2018.

At the same time, the share of KEPCO's fossil fuel power generation dropped from 86 percent in FY2016 to 72 percent in FY2017 and is expected to be around 58 percent in FY2018. In FY2017, KEPCO's fuel oil and crude oil burns declined 41 percent and 72 percent to 1.1 million barrels and 2.4 million bbls, respectively. LNG consumption also decreased by 15 percent, while coal consumption slightly increased. (See the accompanying table for KEPCO's fossil fuel consumption.) In FY2018, while fuel oil and crude oil consumption has already hit bottom, KEPCO's LNG and coal consumption are expected to continue declining.

Currently, KEPCO owns and operates four oil-burning power plants in Japan: Kainan (2,100 MW), Gobo (1,800 MW), Aioi (1,125 MW) and Ako (1,200 MW). Those thermal power plants mainly use low sulfur crude oil with a sulfur content no higher than 0.1 percent. Fuel oil, which is also 0.1%S max, is used as a combustion aid or sometimes instead of crude.

About 90 percent of KEPCO's low sulfur crude was sourced from Indonesia, with the rest coming mostly from Chad. Fuel oil is supplied by domestic oil companies and trading houses, such as JXTG Nippon, Cosmo and Idemitsu.

In Japan, the costs associated with crude oil and fuel oil power generation are three to four times higher than the cost of nuclear generation, which is the cheapest source of power followed by coal and LNG. In order to reduce fuel costs, KEPCO converted Unit 1 and Unit 3 (375 MW each) of the Aioi thermal power plant from oil-fired to dual-fuel fired, burning both oil and LNG, in 2016. KEPCO has also suspended several oil-fired units, including three units totaling 1,500 MW at the Kainan plant in 2017 and one unit of 375 MW at Aioi plant in 2018. Reflecting the reduction in power generation costs after the return of nuclear power plants, KEPCO lowered its electricity price by 4.29 percent in 2017 and 5.36 percent in 2018.

Including KEPCO's four units, Japan now only has nine out of 37 nuclear power units running, not counting retired units. Osaka-based KEPCO is one of 10 regional power utility companies in Japan, servicing the Shiga, Kyoto, Hyogo, Osaka and Wakayama prefectures, as well as portions of the Mie, Gifu and Fukui prefectures. Shares of KEPCO are listed on the Tokyo Stock Exchange.

Kansai Electric, Fossil Fuel Consumption				
	Fuel Oil	Crude Oil	LNG	Coal
	<i>(Barrels)</i>		<i>(Tons)</i>	
FY2010	1,230,374	7,309,118	5,349,521	3,915,900
FY2011	1,348,123	26,976,841	7,335,916	3,965,502
FY2012	1,195,817	33,840,320	8,142,888	4,423,959
FY2013	1,888,591	38,053,613	8,459,666	4,074,482
FY2014	2,186,976	26,688,363	9,407,089	4,262,804
FY2015	1,335,933	21,197,514	8,888,827	4,108,185
FY2016	1,876,181	8,548,236	9,337,224	4,433,789
FY2017	1,103,480	2,361,694	7,945,765	4,511,578

Note: Japan's fiscal year runs from April 1 to March 31.

Korea East-West Power to Burn Less Fuel Oil after Switching to LSFO

After switching from high sulfur fuel oil (HSFO) to more expensive low sulfur fuel oil (LSFO) in the second half of last year, Korea East-West Power Company (EWP) is expected to run its sole fuel oil-fired Ulsan plant less often this year. In the second half of last year, EWP changed the burning fuel for the 1,200 MW Ulsan plant from 2.5%S max HSFO to 0.3%S max LSFO, anticipating South Korea's emission standards would soon becoming stricter. In 2018, EWP consumed 477,972 metric tons of fuel oil, consisting of 364,232 mt of HSFO and 113,740 mt of LSFO.

EWP's higher fuel oil consumption last year was in response to the reduction in nuclear power generation in South Korea. EWP expects to use as little as 67,352 mt of LSFO in 2019. (See the accompanying table for EWP's fuel oil consumption.)

The Ulsan plant, which accounts for 10.7 percent of EWP's total generation capacity, has three 400 MW steam units with flue gas desulfurization (FGD) equipment. Reaching

the end of their life cycle, the three units are scheduled for decommissioning in 2021. In addition to its resid-burning steam units, the Ulsan plant has 2,072 MW of combined-cycle capacity fired by LNG.

EWP generally buys fuel oil on a spot delivered basis, with pricing indexed to MOPS HSFO 180 cSt. The main sources of the material are Singapore and Malaysia. The fuel oil is delivered by tankers to the port of Ulsan, which has restrictions of LOA of 250 meters, draft of 14.4 meters and dead-weight maximum of 50,000 mt. (The accompanying table shows EWP's 0.3%S max fuel oil specification.)

In January, EWP bought two opportunistic cargoes of 0.3%S

max LSFO for a total of 70,000 mt. A 30,000 mt cargo was purchased from Hanwha at an unusual discount of around \$8/mt, and a 40,000 mt cargo was purchased from GS Global at a low premium of \$35/mt. LSFO premiums generally range between \$50-70/mt, and even up to \$100/mt. EWP is not planning to issue tenders for LSFO supply in February, but possibly will buy one or two cargoes in March.

One of the six subsidiaries of Korea Electric Power Corporation (KEPCO), EWP owns five power plants, including Ulsan, with a total capacity of 11,183 MW, which meets approximately 9.8 percent of South Korea's electricity needs.

Korea East-West Power, Low Sulfur Fuel Oil Specification		
Property	Limit	Test Method
Sulfur Content (wt %)	Max. 0.3	ASTM D-4294
API Gravity (at 60°F)	Min. 15.0	ASTM D-1298
Pour Point (°C)	Max. 45.0	ASTM D-97
Flash Point (PMCC °C)	Min. 70	ASTM D-93
Viscosity (cSt at 50°C)	Max. 540.0	ASTM D-445
Water & Sediment (vol %)	Max. 0.50	ASTM D-1796
Calorific Value (kcal/kg)	Min. 10,440	ASTM D-240

Korea East-West Power, Fuel Oil Consumption	
Year	Fuel Oil Consumption (mt)
2010	649,432
2011	601,751
2012	967,220
2013	1,160,718
2014	513,639
2015	654,695
2016	1,179,555
2017	362,389
2018	477,972
2019E	67,351
E=Estimated.	

HSFO Coming to Play in the Asphalt Market in 2020

IMO 2020 will have a major impact on the global bunker and fuel oil markets, and is also expected to be one of the most influential events in the asphalt market. The IMO regulation adjusts the sulfur limit in marine bunker fuel from 3.5 percent to 0.5 percent starting in January, but provides little guidance or detail about where the excess high sulfur fuel oil (HSFO) will go after it is pushed out of the bunker market. Allen Smith, the co-founder of Pennsylvania-based Asphalt & Sourcing Alliance (ASA), stated that among many potential pathways to deal with this excess, the global asphalt market may absorb up to 25 million tons of HSFO, thereby increasing global asphalt supply by nearly 20 percent and causing asphalt prices to drop after January 2020.

The current global bunker market is about 250 million tons per year, of which HSFO accounts for nearly 80 percent, according to industry estimates. Some analysts project that when the IMO 2020 sulfur cap comes into force in 2020, except for a small volume used in ships with scrubbers or in the case of noncompliance, an estimated 100 million-150 million tons of high sulfur residual bunker fuel may be displaced from the global marine fuel pool and need to find new applications. The global processing capacity of all existing refineries, meanwhile, will be insufficient to handle all the displaced HSFO, so some of it will be forced into new pathways. For instance, as the price of HSFO drops to a certain level, some power plants may be incentivized to use it as burning fuel, displacing coal. At the same time, a portion of the excess HSFO will be processed into asphalt, potentially causing a reduction of asphalt prices, which move in tandem with HSFO prices. This could perhaps stimulate asphalt demand for road paving and roofing.

IHS Markit estimates there will be about 12 million tons per year of displaced HSFO that will end up in the asphalt market, with power generators taking up a similar amount. Smith believes the volume and disposition of these two pathways could potentially be interchangeable. If the price of asphalt is more attractive than the savings from using HSFO in power generation, some of the surplus HSFO will be placed into additional asphalt production. Asphalt is the heavy black sludge remaining after distilling a barrel of crude oil. On average, HSFO carries about 70 percent of asphalt content. Displaced HSFO from the bunker market can add 20 million tons per year of new asphalt production to the existing 100 million ton global asphalt market.

Beyond 2020, the position of HSFO in the global bunker market may also influence asphalt demand. HSFO prices are expected to start their decline in the fourth quarter as prices of LSFO and diesel increase. At the same time, asphalt prices will start to fall, while demand and production increase. This trend will deepen into 2020 and may continue until HSFO bunker demands start to recover around 2023-2025. By then, there will be enough refining capability built up to destroy heavy bottoms and enough scrubbers installed on ships to be able to burn HSFO in compliance with the new sulfur regulation.

Over 90 percent of global residual processing capacity and asphalt capacity are in North America, Asia and Europe. The North American refineries not only have the most asphalt production capacity, but also the most coking capacity to destroy asphalt or excess HSFO. These refiners will be able to respond quickly to market changes in the coming years. Having invested heavily in the past few years, most of the North American refineries now have expanded crude oil choices and the capability to deal with excess heavy fuel oil with optimal operational control. Until the rest of the world adapts to the market change, the transition in 2020 may lead to more opportunities for North American asphalt producers. Balancing asphalt demand, they will be encouraged to run discounted asphalt-rich heavy crude and bring in the very inexpensive HSFO as coker feed. Much of this will come from the Mediterranean and other places where refineries are less complex and produce too much HSFO.

According to ASA's Smith, there are about 50 of the 129 North American refineries producing and selling asphalt. In response to stronger market demand over the last few years, North American asphalt production has been gradually increasing, currently totaling 24 million tons per year. Though a small amount is used for roofing and other applications, about 80 percent of US asphalt is used for paving. The US Department of Transportation has become more focused on road quality issues. If asphalt prices fall as expected after 2020, state DOTs may increase their budgets for paving or keep their budgets the same while increasing miles paved. There are more questions than answers at this point. However, it is worth watching how the IMO 2020 will bring changes and opportunities in the asphalt industry.



Japan's Chubu Electric to Further Reduce Crude/Fuel Oil Power Generation

Backed by LNG power generation, Chubu Electric Power Company of Japan has gradually decommissioned its oil-fired power plants, leaving only one plant in operation. The latest decommissioning was of two crude oil/fuel oil-fired units that combined for a total 875 MW at the Owase-Mita plant in December 2018. Previously, Chubu retired a 500 MW unit at the Atsumi plant in December 2017 and three units totaling 1,125 MW at the Taketoyo plant in March 2016. Now Chubu only burns crude oil and fuel oil at two of the units at the Atsumi plant for a total generating capacity of 1,400 MW.

The reduction in oil power generation capacity will lead to further declines in Chubu's crude oil and fuel oil consumption. Chubu's electricity production has been relying heavily on thermal power plants since its 3,617 MW Hamaoka nuclear power plant was suspended after the Fukushima Daiichi nuclear disaster in March 2011. However, unlike the ever-present increase in LNG and coal consumption, Chubu's surge in crude oil and fuel oil burns were just a temporary solution for a couple of years. In fiscal year 2017, which ended on March 31, 2018, Chubu consumed 1.6 million barrels of crude oil, 75,000 barrels of fuel oil, 12 million tons of coal and 11 million tons of LNG, compared to 6.9 million barrels of crude oil, 164,000 barrels of fuel oil, 14 million tons of LNG and 10 million tons of coal in FY2012. (See the accompanying table for Chubu's fossil fuel consumption.)

The fluctuation of Chubu's crude oil and fuel oil consumption in the past three years is due to stock management. Chubu's oil-fired thermal plants burn low sulfur crude oil and a relatively small amount of low sulfur fuel oil. The sulfur content of crude and fuel oil in each plant may be slightly different, but is generally limited to less than 0.2%. Crude and fuel oil are delivered to Chubu's power plants by barge. Expecting to procure its crude oil and fuel oil through JERA, a joint venture between Chubu and Tokyo Electric Power (TEPCO), Chubu started to use crude and fuel oil in its stocks in FY2015. Chubu used up most of its fuel oil stocks in FY2015 and did not purchase any crude oil in FY2016 and FY2017.

JERA was established in April 2015 to cover Chubu and TEPCO's entire supply chain from upstream fuel business and fuel procurement to thermal power generation. Following a further agreement between Chubu and TEPCO, both companies will integrate their fuel acceptance, storage, gas transmission and existing thermal power generation businesses into JERA on April 1 in a spinoff of the joint venture.

Nagoya-based Chubu has an aggregated power generation capacity of 35 GW, providing services in five prefectures in the central region of the Honshu island of Japan. Shares in Chubu are traded on the Tokyo, Osaka and Nagoya stock exchanges.

Chubu Electric Power, Consumption of Fossil Fuels				
	Crude Oil	Fuel Oil	LNG	Coal
	(1,000 barrels)		(1,000 tons)	
FY2008	4,730	126	10,027	9,664
FY2009	1,862	220	10,090	9,409
FY2010	3,227	264	10,511	11,203
FY2011	9,240	233	13,101	9,760
FY2012	6,913	164	13,913	10,279
FY2013	3,428	31	13,760	10,566
FY2014	591	94	13,501	10,508
FY2015	359	396	12,499	10,282
FY2016	579	75	12,775	10,688
FY2017	1,623	75	12,071	11,058

Note: Fiscal year begins on April 1 and ends on March 31.

Dominican Partners Diverge in FO Contract Awards

After years of awarding in conjunction, two Dominican power producers - EGE Haina and Consorcio Energetico Punta Cana-Macao (CEPM) - have awarded separate annual fuel oil supply contracts. CEPM has awarded a contract to local Dominican producer Refidomsa for the supply of 90,000 barrels, while EGE Haina has contracted BP to supply some 3.3 million barrels of 2.2%S max fuel oil. Both contracts will cover calendar year 2019 and are tied in reference to USGC HSFO. Last year, the companies both awarded a contract to Novum Energy for the supply of 3.75 million barrels; 3.3 million barrels to EGE and 450,000 barrels to CEPM. Novum had held the contract for three years in a row. (See the accompanying table for the company's import specification.)

CEPM chose to award a contract to local Refidomsa in part due to its expectation that it will consume drastically less fuel oil in 2019, and as such, it would not need to go to the international market for its supply. The company will consume less fuel oil on the startup of its new natural gas-powered 51MW power station in Bavaro. The new power station will provide approximately 20 MW of base power generation. Operations at the new power station began this year. Equipment, procurement and construction (EPC) were supplied by Wärtsilä.

CEPM historically had imported between 35,000-40,000 barrels of 2.2%S fuel oil per month. Deliveries were made to San Pedro de Macoris, located on the southern coast of the country and 75 km east of Santo Domingo.

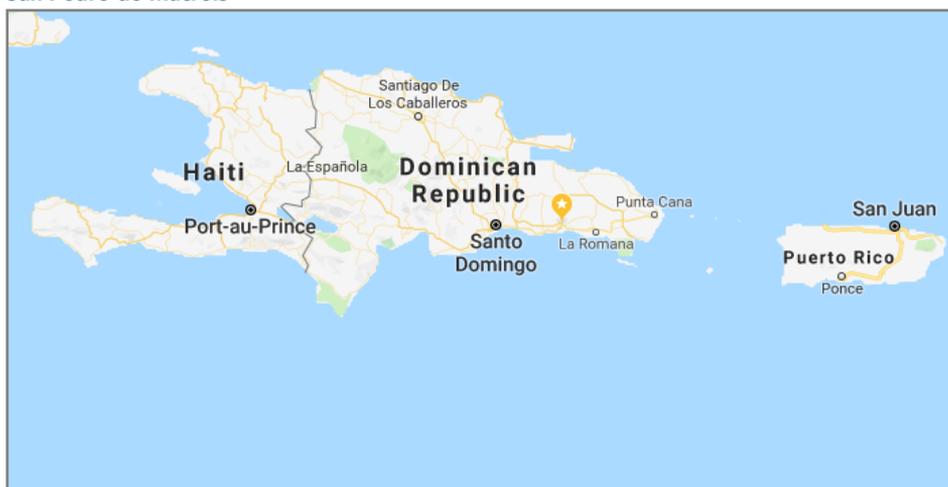
The terminal's shipping restrictions are: 22.8 ft draft, 600 ft LOA and a 110 ft beam. CEPM operates several resid-burning power plants in the Dominican Republic. Its largest is the 70 MW Bavaro power station, which is powered by six 18V32DF diesel Wärtsilä engines. Other resid-fired plants include the 14 MW Bayahibe power station, the 8 MW Punta Cana plant, the 7 MW Barcelo station and the 5.5 MW Puerta Plata River power plant. The company also maintains an 8.25 MW wind farm at Quilvio Cabrera and is currently developing a 7 MW solar complex in Bavaro.

CEPM is a privately-held utility that owns generation and distribution and serves the Dominican market.

EGE Haina receives fuel oil cargoes in 40,000-58,000 barrel batches and burns both 2.2%S fuel oil and 3%S fuel oil. The 2.2%S fuel oil is burned at the 225 MW Quisqueya II power station, the 5.1MW Pedernales plant and the 153 MW Sultana del Este power barge. The 225 MW Quisqueya II plant runs on 12 Wärtsilä 18V50 DF engines of 17.2 MW each, whereas the Sultana del Este power barge operates on nine Wärtsilä 18V46 engines of 16.5 MW each. EGE Haina burns 3%S fuel oil at its 293 MW Haina plant and its 33MW San Pedro de Macoris power station. In addition, EGE Haina has a 54 MW coal plant located in Barahona, as well as two wind farms with an aggregate capacity of 127 MW.

EGE Haina is 50 percent owned by private investors. The rest is held by the government of the Dominican Republic (49.9 percent) and the state's Dominican Corporation of State Electricity Companies (0.1 percent). Incorporated in 1999, EGE Haina is the largest operator of generation assets in the Dominican Republic.

San Pedro de Macoris



EGE Haina and CEPM, Fuel Oil Specification			
Parameter	Min	Max	Test Method
Kinematic Viscosity at 50°C, cst	275	380	ASTM D445
API at 60°F	11.5	-	ASTM D4052
Density at 15°C, g/ml	-	0.989	ASTM D4052
Micro Carbon Residue, % wt	-	16	ASTM D4530
Sulfur Content, % wt	-	2.2	ASTM D4294
Nitrogen Content, % wt	-	0.4	ASTM D445
Vanadium, ppm	-	190	ASTM D5683A
Sodium, ppm	-	47	ASTM D5683B
Ash, % wt	-	0.07	ASTM D482
Water, % v	-	0.5	ASTM D95
Asphaltenes, % wt	-	12	ASTM D6560
Aluminum, ppm	-	30	ASTM D5184
Silicon, ppm	-	30	ASTM D5184
Potassium, ppm	-	10	ASTM D5184
Calcium, ppm	-	28	ASTM D5184
Zinc, ppm	-	10	ASTM D5184
Phosphorus, ppm	-	10	ASTM D5184
Lead, ppm	-	10	ASTM D5184
Copper, ppm	-	10	ASTM D5184
Magnesium, ppm	-	10	ASTM D5184
Flash Point, PMCC °C	70	-	ASTM D93
Pour Point, °C	-	30	ASTM D97
CCAI	810	860	For Conversion
Total Sediment Potential, % wt	-	0.07	ASTM D4870A
Sediment by Hot Filtration, % mass	-	0.07	ASTM D4870
Compatibility	-	1	ASTM D4740
Lower Heat Value, Mj/kg	40.1	-	ASTM D4868

A Look at Heavy Sweet Crude Flows

Heavy-sweet crude will be in high demand from refiners looking to circumvent the post-IMO 2020 landscape.

In a sense, heavy-sweet crude is the holy grail of IMO 2020. These crudes have high yields of diesel and low sulfur fuel oil, both of which will find large refining margins in a max 0.5%S world.

While refiners would ideally like to get their hands on these heavy-sweet crudes, there is simply not enough supply to satiate global appetites. According to our data, heavy-sweet only made up 1.3 percent of global crude loadings last year, down slightly from the 1.5 percent of total loadings in 2017.

The largest source of heavy-sweet crude exported in 2018 was West Africa, which saw exports decrease 3.3 percent from 363,000 bpd in 2017 to 351,000 bpd last year. Most West African heavy-sweet crude was directed towards East Asia, particularly China. Of the 112,000 bpd exported from West Africa and directed towards East Asia in 2018, 95 percent was delivered to China. The remaining volume is either still in transit or was delivered to Hong Kong or South Korea.

China has been at the forefront of locking up heavy-sweet crude under long-term contracts, ensuring a healthy flow of West African heavy-sweet crude to Chinese refineries.

The most prominent heavy-sweet crude emerging from West Africa is Dalia crude of Angola. Dalia made up 34 percent of all heavy-sweet crude exports in 2018, when exports totaled 169,000 bpd. Roughly 45 percent (77,000 bpd) of Dalia exports are directed towards China, with 43,000 bpd imported into CNOOC's Huizhou refinery. Other large takers include Spain (33,000 bpd), India (19,000 bpd) and the United States (17,000 bpd).

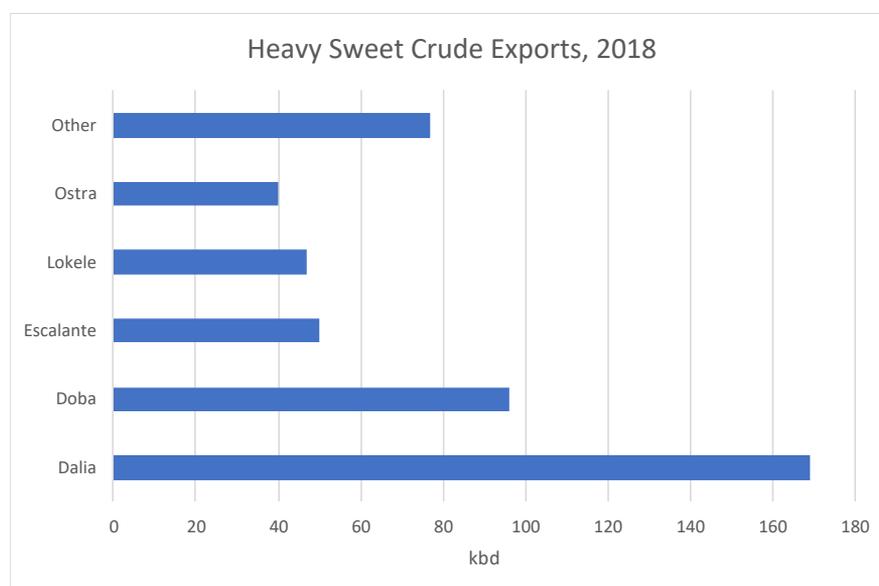
The West African heavy-sweet Doba crude is produced in Chad and piped to ExxonMobil's Kome-Kribi FSO offshore Cameroon. Exports from Cameroon stood at approximately 96,000 bpd in 2018, up from the 80,000 bpd exported in 2017. Historically, the United States has been the largest destination for Doba, though its share has been steadily declining in recent years. The United States took 68,000 bpd in 2015, but last year imports were only 17,000 bpd. More imports have been directed towards Asia in recent years.

Last year, South Asia took 22,000 bpd, up from 13,000 bpd in 2016. Some 11,000 bpd were delivered to China, while an additional 17,000 bpd were brought to lightering zones in Singapore, volume that is likely to have been brought to East Asia after lightering.

Latin America is the second-largest regional exporter of heavy-sweet crude following West Africa. Argentina keeps most of its heavy-sweet Escalante crude within its borders, though exports are likely to increase in the coming years. Argentinian exports of Escalante stood at 50,000 bpd in 2018, double 2017's level. All exports are loaded from YPF's Caleta Cordova SBM off the coast of the country's Chubut province. Most exports are delivered to either China or the United States. In 2018, the United States took 25,000 bpd, nearly 88 percent of which were delivered to PADD 5. BP took a majority of the US volume (15,000 bpd) via its Cherry Point refinery. Chinese imports of Escalante stood at 20,000 bpd last year. All deliveries to China were brought to the country's northern region, including to the ports of Qingdao and Yantai.

Exports of Brazilian heavy-sweet Ostra crude stood at 40,000 bpd in 2018, down from 50,000 bpd in 2017. All of Ostra exports are done from FPSOs, with most volume coming from Petrobras' Espirito Santo FPSO. Roughly 36 percent (14,000 bpd) of exports were directed to South Asia. Essar's Vadinar refinery received 9,400 bpd of Ostra crude last year, while Reliance's Jamnagar refiner took an additional 2,300 bpd. Outside of South Asia, the United States took approximately 13,000 bpd. Offtake destinations vary, but include Shell's Deer Park and Martinez refineries, as well as Valero's Port Arthur refinery.

Latin American and West African heavy-sweet crude make up approximately 88 percent (441,000 bpd) of global heavy-sweet supply. While more supply of heavy-sweet crude will come on line in the coming years, the supply will likely be incremental at best. Because there is a lack of supply, refiners will instead try to procure light-sweet crudes with minimal fuel oil yields. Lighter and sweeter crudes will be able to reduce fuel oil yields and produce greater quantities of higher-end light products.



GS Caltex of South Korea Pause HSFO Imports

In response to the recent change in fuel oil import economics, South Korean refiner GS Caltex is scaling back from its usual imports of high sulfur fuel oil (HSFO). Previously, the company imported one cargo of 80,000 mt of HSFO as bunker blending stock for the production of domestic bunker supply every one or two months. Fuel oil cracks have been strong as a result of tight supply in the region, and high premiums of HSFO have made important

economics negative for GS Caltex since January. As a result, the refiner has met all of its HSFO bunker requirements, which is about 200,000 mt per month, domestically at its 800,000 bpd Yeosu refinery on South Korea's southwest coast. It is unlikely GS Caltex will resume HSFO imports any time before June.

As with HSFO, GS Caltex has not imported any straight run

fuel oil (SRFO) this year. Depending on crude runs and crude margins, GS Caltex sometimes imports SRFO as feedstock for idle operating capacity to maximize utilization rate. Instead of specific quality requirements for SRFO import, GS Caltex makes decisions based on economics. Last year, GS Caltex bought 90,000 mt per month of SRFO from Abu Dhabi National Oil Company under a one-year term contract.

HSFO imports/exports for GS Caltex have swung a lot in the past two years. Until July 2017, on a monthly basis, the refiner had regularly imported one Aframax cargo of blending stock of HSFO with low density, high viscosity and sulfur content around 4 percent, mainly from Singapore. However, the closure of a heavy-oil upgrading unit at Yeosu refinery after a fire in August 2017 turned GS Caltex from a net HSFO importer to a net HSFO exporter. Before the unit resumed operations over a half year later, GS Caltex exported 200,000 mt per month of HSFO with sulfur content of 4.5 percent to Singapore and China bunker market for blending. Since then the volume of the refiner's HSFO exports has become quite small and irregular. With a cargo size of only 5,000-7,000 mt and a sulfur content around 3.3 percent, the HSFO is mainly sold to Japan for bunker blending.

In 2020, GS Caltex may need to import 0.5%S bunker fuel oil to meet its domestic demand. The Yeosu refinery can produce the low sulfur grade only if processing low sulfur crude oil, which is expected to be very expensive once IMO 2020 regulations come into effect. At this moment, whether the economics at the time will allow GS Caltex to change its crude oil slate for production of 0.5 percent LSFO is uncertain. Regardless, the refiner has a basic plan for managing its HSFO production after 2020. On one hand, the refiner will try to make long-term deals with some bunkering and shipping companies to supply HSFO to ships using scrubbers. On the other hand, GS Caltex will produce more bitumen (asphalt) to minimize HSFO outputs. After 2020, the company's bitumen production can be increased to 150,000 mt per month from the current 40,000 mt per month, and HSFO production will be about 100,000 mt per month. The required 0.5%S bunker fuel will be imported from international major oil companies, though the volume is currently unknown.

Established in 1967, Seoul-based GS Caltex is South Korea's second-largest oil refiner, having core businesses in petroleum, petrochemical, base oil and lubricants. In August 2018, the company's total crude processing capacity expanded from 790,000 bpd to 800,000 bpd. GS Caltex is a 50:50 joint venture between GS Group of South Korea and Chevron of the United States.

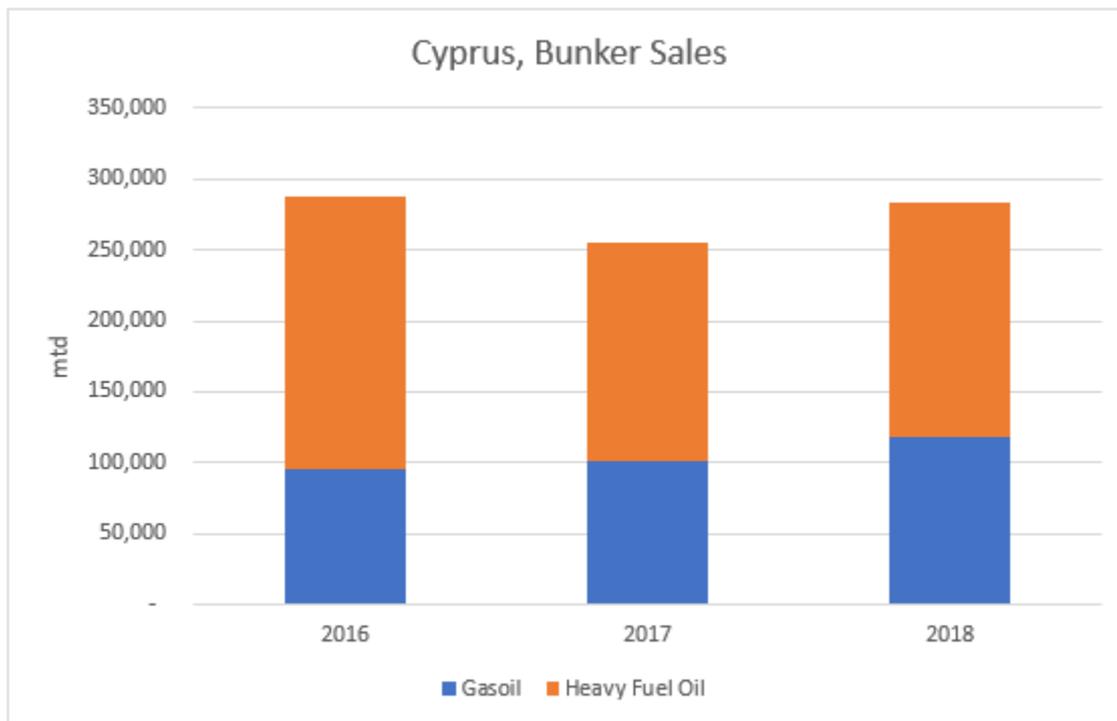
Cyprus Bunker Market Expands in 2018

The Cypriot bunker market expanded in 2018, as sales of both fuel oil and marine gasoil (MGO) surpassed their year-ago levels. Total bunker fuel sales off the coast of Cyprus were 283,434 metric tons last year, an 11 percent increase from 2017. Total sales in 2016 were 288,220 mt, up from the 244,000 tons of marine fuel sold in 2015.

The growth in the Cypriot bunker market was largely driven by a 16.3 percent jump in MGO sales. After increasing 6.8 percent in 2017 to 101,295 mt, sales again grew last year to 117,778 mt. Sales of bunker fuel oil also expanded last year. Heavy fuel oil bunker sales grew 7.5 percent from 2017 to 165,656 mt last year. However, sales are down 14 percent from the 193,333 mt sold in 2016. A further increase in the size and scope of the Cypriot heavy fuel oil bunker market is very unlikely in the years to come. As IMO 2020 comes into effect, sales of Cypriot +0.5%S bunker fuel oil can be expected to drop significantly. Depending on the global supply of IMO 2020-compliant bunker fuel oil after 2020, bunker suppliers may choose to focus on larger ports and leave smaller ports without an adequate levels of compliant fuel oil. If this holds true, Cyprus can be left without enough sub-0.5% fuel oil for its bunker market, as surrounding bunker markets are much larger and entertain more vessel traffic. Alternatively, Cypriot sales of IMO 2020-compliant marine gasoil are likely to keep increasing in the coming years.

A wildcard at play is the establishment of a long-rumored Mediterranean emission control area (ECA) that would further decrease the permissible sulfur level present in fuels consumed in the region. If a regional ECA encompassed a directive that set lawful sulfur levels at 0.1%S - the sulfur limit currently employed in the coasts surrounding the United States, the North Sea and the Baltic Sea -, Cypriot bunker providers would likely see increased demand for marine gasoil sales. Demand for a zone in the Mediterranean first surfaced around 2005. According to a study conducted by the French National Institute for Industrial Environment and Risks, SOx emissions would drop by 606,000 tons to 150,000 tons in the Mediterranean by 2020 with a 0.5%S cap, compared to the use of 3.5%S HSFO in 2015. Emissions fell a further 118,000 tons under the ECAMED 2020 reference case, using 0.1%S bunkers. There would also be a 76 percent fall in NOx from the 2020 reference case to the ECAMED case, while particulate emissions would be 30 percent lower.

Cyprus bunker suppliers include Ajax Offshore Bunkering Service, Island Petroleum, Monjasa and BMS United Bunkers. Since the closure of the Larnaca refinery in 2004, Cyprus relies on imports for all of its marine bunker fuel needs. Imports of fuel oil into Cyprus last year stood at 4,130 mtd, while imports of gasoil stood at 2,950 mtd.



Falling MFO Sales Stymie Singaporean Bunker Market

The Singaporean bunker market contracted in 2018 for the first time in half a decade.

After sales surpassed 50 million metric tons for the first time in 2017, aggregate bunker sales retreated 1.6 percent to 49.8 million mt last year.

The contracting bunker market stemmed from declining sales of high sulfur marine fuel oil (MFO). While sales of MFO 180 cst and MFO 500 cst expanded by 13.36 percent and 5.63 percent, respectively, in 2018, sales of MFO 380 cst dropped 5.53 percent from 2017 levels to 35.72 million mt. Given the larger share MFO 380 cst holds in the Singapore bunker market relative to MFO 180 and MFO 500, total MFO sales fell 3.1 percent on the year. (The accompanying table shows a breakdown of MFO sales by year and grade.)

Several factors contributed to the reduced sales of bunker fuel oil seen in Singapore last year. The global economic slowdown reduced global trade and decreased demand for marine fuel. Last summer's bunker contamination crisis also reduced confidence in Singaporean MFO sales, likely driving shipowners to alternative fuels and ports. Bunker prices were also high in 2018 relative to previous years, which likely dissuaded MFO bunker buying. Ships calling on Singapore for bunkering declined 3.1 percent to 39,471 vessels in 2018.

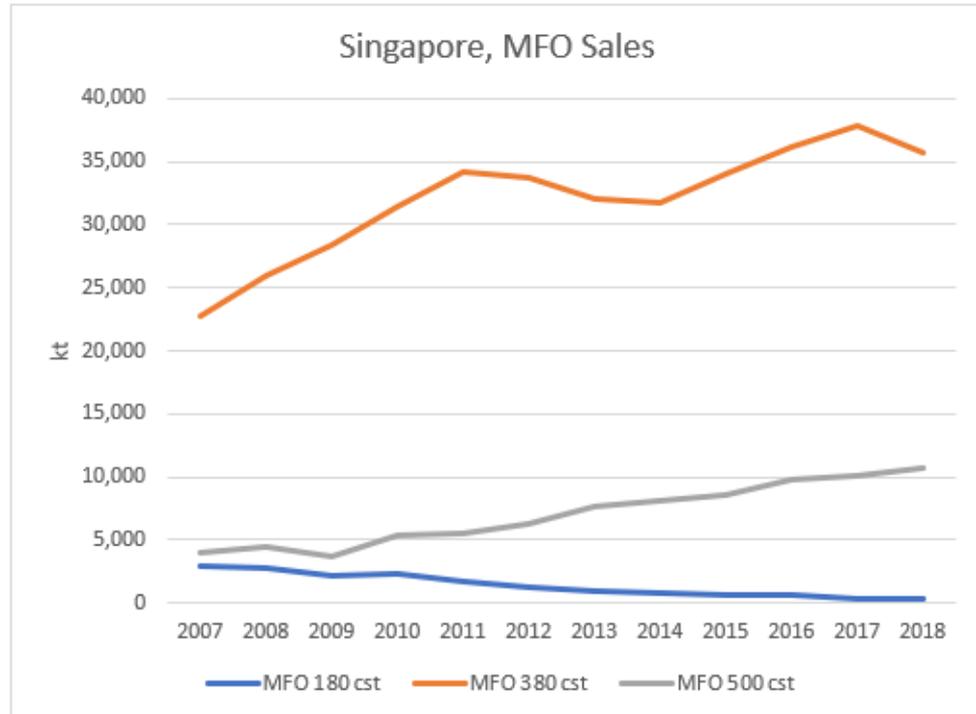
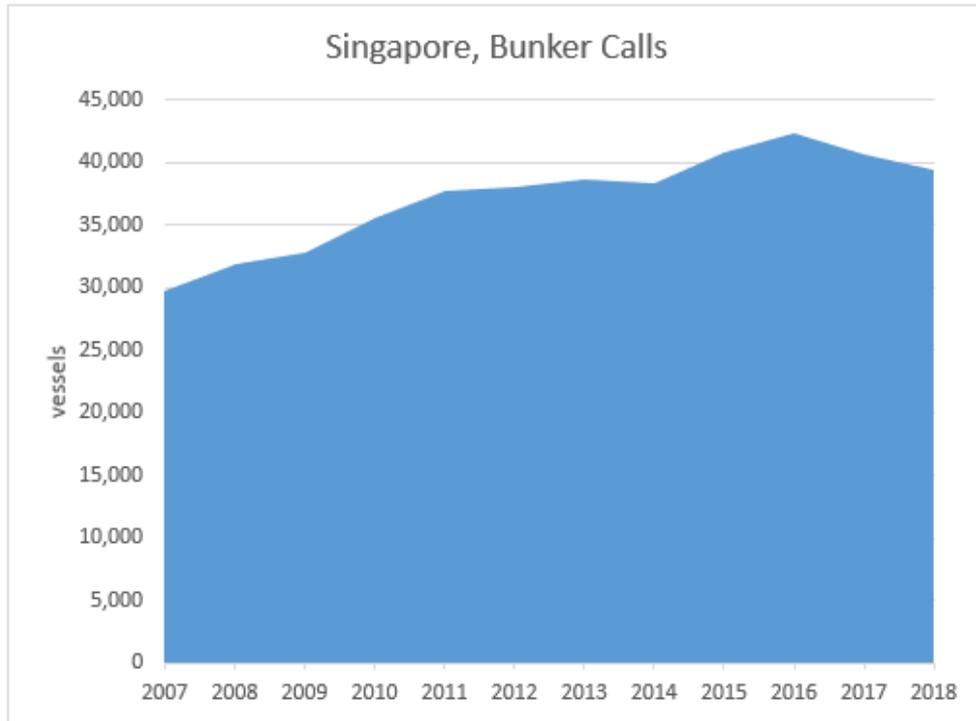
With the IMO's sulfur cap now less than a year away, sales of MFO are unlikely to ever again reach the 48 million mt per year sold in 2017. Even healthy scrubber adoption in the coming years will only support a portion of peak sales of MFO. Much of course depends on the economics of fuel purchasing, but even an industry-wide shift to scrubbing technology over the course of the next decade will only work to support future prices for high sulfur fuel oil (HSFO). Combined with the global drop in HSFO production, it is possible that MFO sales reached their peak in 2017.

While the world's largest bunker market will continue to expand in the coming years, that expansion will be built on the back of compliant low sulfur fuels. Enter the IMO 2020 compliant fuels, which experienced robust growth in 2018. Sales of low sulfur marine gasoil (LSMGO) expanded 19.8 percent in 2018.

Low sulfur fuel oil (LSFO) sales also grew last year. Sales of LSFO 180 cst expanded 540.3 percent last year to 256,600 mt, while sales of LSFO 500 cst increased 967.14 percent to 23,500 mt. Sales of LSFO 380 cst, by contrast, contracted 50 percent to 51,900 mt. Buying interest for MGO and LSFO is only expected to increase in 2019 and beyond as the global fleet transitions to low sulfur marine fuels.

Bunker fuel in Singapore is supplied by a host of major providers. The largest of these providers last year were Ocean Bunkering Services (OBS), PetroChina and Sentek Marine & Trading.

ClipperData has Singapore's fuel oil imports at 167,800 mtd in 2018, down from 214,750 mtd in 2017. The leading suppliers of fuel oil to Singapore last year were the Arab Gulf (43,600 mtd), Northwest Europe (24,580 mtd) and Southern Europe (23,560 mtd).



NB Power Burning Less Fuel Oil on the Back of Low Purchased Power Prices

Canadian utility NB Power in New Brunswick has seen lower-than-expected demand for fuel oil power generation since last winter due to low prices for purchased power in the region. The cold temperature and the spike of natural gas prices last winter boosted NB Power's fuel oil burns in fiscal year of 2017 (from April 1, 2017 to March 31, 2018) by 50 percent, to 750,000 barrels. The competitiveness of purchased power to fuel oil is expected to push the utility's fuel oil burns lower, to 500,000 barrels, in FY2018. NB Power's fuel oil consumption in FY2019 is projected to be 650,000 barrels.

NB Power only burns fuel oil at its 972 MW Coleson Cove plant, located about 20 kilometers from Saint John. The fuel oil is purchased from Irving Oil under a 10-year contract expiring in 2020 and delivered from Irving's 300,000 bpd St. John refinery to NB Power through the Lorneville pipeline. The fuel oil has a minimum API of 6, a maximum SSF viscosity of 350 and sulfur content of less than 3 percent with an average of 2.75 percent per quarter. NB Power has about 1 million barrels of No. 6 oil storage at the Coleson Cove site. (See the accompanying table for NB Power's fuel oil specification.)

NB Power's petroleum coke burn in FY2018 will likely total 30,000 short tons, the same quantity consumed in the past years. The company began co-firing petcoke with heavy fuel oil in its 350 MW Unit #3 at the Coleson Cove station in March 2008. NB Power also uses petcoke at its 467 MW Belledune plant. The coal-petcoke mix at Belledune is made up of 24 percent to 28 percent petcoke.

NB Power sources petroleum coke from the US Gulf Coast and Chicago area on a one-cargo-per-year basis. The petcoke is 6%S high sulfur green coke with hardgrove grindability index above 40. The cargoes are delivered in lots of 30,000 short tons and are normally fixed for fall delivery. (The accompanying table shows NB Power's fuel oil and petcoke consumption.)

Fredericton-based NB Power has total generating capacity of 3,513 MW spread across 13 generating stations. These utilities include the Coleson Cove plant, the 467 MW coal-fired Belledune plant, the 660 MW Point Lepreau nuclear plant, seven hydro plants with total capacity of 889 MW and three combustion turbines, which combine for 525 MW. NB Power also has 294 MW of wind capacity and 441 MW of other capacity provided by third parties through power purchase agreements. The company can also purchase electricity from Quebec and New England if needed.

NB Power, wholly-owned by the provincial government of New Brunswick, is the largest electric utility in Atlantic Canada and handles generation, transmission and distribution of electricity in New Brunswick. The company operates in a winter-peaking province with big swings in energy usage between summer and winter. While an average summer day might see an NB Power peak system load of 1,500 MW, a very cold winter day might see a usage peak near 3,000 MW.

NB Power, Fuel Oil Specification		
Property	Limit	ASTM
API Gravity at 60°F	6 min	D287
Viscosity (SSF at 122 °F)	350 max	D445 & D2161
Flash Point, Pensky Martens (°F)	150 min	D93
Pour Point (°F)	70 max	D97
Gross Heat of Combustion (BTUs per barrel)	6,300,000 min	D240 & D70
Sulfur (% wt)	3.0 max	D4294
Sulfur (% wt)	2.75 max*	D4294
Ash (% wt)	0.15 max	D482
B.S. & W. (% vol)	1.00 max	D1796
Water + Sediment (% vol)	1.00 max	D95
Water by distillation (% vol)	1.00 max	D473
Sediment by extraction (% wt)	0.25 max	D473
Vanadium (ppm)	300 max	D5863
Sodium (ppm)	50 max	D5863
*Average per calendar quarter.		

NB Power, Fuel Oil and Petcoke Consumption		
Year	Fuel Oil (Thousand Barrels)	Petroleum Coke (Thousand Short Tons)
FY2010	1,300	30
FY2011	550	25
FY2012	675	15
FY2013	1,000	17
FY2014	900	30
FY2015	1,100	30
FY2016	500	30
FY2017	750	30
FY2018E	500	30
FY2019P	650	30
Note: Fiscal year runs from April 1 to March 31.		
E=Estimated, P=Projected.		

Innospec Expects More Customers to Use Its Additives Ahead of IMO 2020

Specialty chemicals company Innospec Inc. is expecting more customers to start using its additives for tank cleaning in the second or third quarter before IMO 2020 comes into force on January 1. Properly cleaning storage tanks and pipeline systems that are allocated to IMO 2020 compliant fuel is essential for refiners, bunker suppliers and shipowners who choose to use low sulfur fuel to comply with the upcoming regulation. Sediments and asphaltene sludge in tanks and pipes from previous high sulfur bunker fuel will contaminate new compliant fuel and render it noncompliant.

Innospec is seeing more customers engaged in discussions about the use of additives for tank cleaning versus the traditional method of manual cleaning. Currently, over 30 international companies are using Innospec's additives, the Octamar™ series, for tank cleaning. Many of them have used the additives for many years for general purposes. Some companies just started using Octamar™ products, particularly the Octamar™ BT-25, a few months or weeks ago for getting ready for IMO 2020, and are now in different stages of the process.

Octamar™ BT-25 contains an asphaltene dispersant stabilizer that can diffuse sludge gradually into the fuel during a clean-up period. The additives are used in storage tanks in service for three-five bunker cycles prior to switching to a new fuel. Kevin Cote, Innospec's Marine Technical Sales Manager, reports that three-five bunker cycles are necessary for eliminating potential contamination in storage tanks and fuel handling systems, including pipes. After a tank cleaning process is completed, there should be very little or no sludge to dispose.

Compared to the traditional method of manual cleaning,

using additives involves less work and is safer for crew and contractors. Manual cleaning requires detailed planning for dock space and hiring of cleaning specialists, as well as vessel schedule for any extended out-of-use period. When cleaning storage tanks manually, the crew has to enter enclosed spaces and are exposed to hazardous materials. Furthermore, the collected sludge has to be properly disposed of after cleaning.

Using additives in tank cleaning is also cost-effective - at least 50 percent cheaper than manual cleaning. For example, when Octamar™ BT-25 is used to clean a 500 cubic meter heavy fuel oil storage tank through three bunkers with a normal dosage rate of 1 liter per 20 metric tons, one liter of additive is required for each 30 mt of fuel oil in the first bunker, 20 mt in the second bunker and 10 mt in the third bunker. Excluding disposal costs, the cleaning cost in these three cycles is approximately \$2,300 per tank. If the same tank is cleaned manually, the cost will be around \$6,000 in China and \$9,000 in Singapore.

Octamar™ BT-25 is used not only for tank cleaning, but also for sludge mitigation, fuel stability and improved compatibility of different bunker stems. Products in Innospec's Octamar™ series are also used by shipping companies during the transition to a 0.1 percent sulfur limit in a number of Emission Control Areas around the world.

Headquartered in Englewood, Colorado, Innospec manufactures and supplies a wide range of specialty chemicals, serving industries and markets, including oilfield and fuels, refineries, power stations and performance chemicals. The company is also the world's largest supplier of heavy fuel oil additives, marine fuel additives and marine diesel treatments.

BY THE NUMBERS

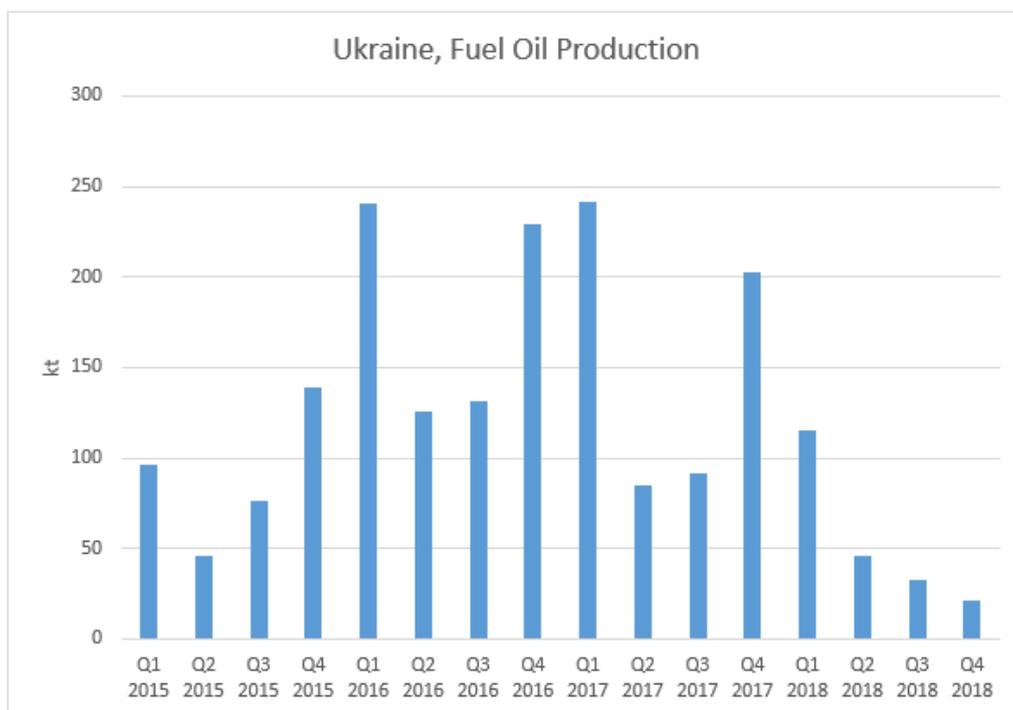
A Look at Ukrainian Energy Consumption

Ukrainian consumption of fuel oil for power generation dropped last year as demand for cheaper natural gas increased in market share. Fuel oil consumption stood at 214,000 metric tons last year, down nearly 66 percent from the 621,000 mt consumed in 2017. This comes despite reports in March that Ukraine had switched its power plants over to fuel oil after Russian energy company Gazprom declined to resume natural gas supplies into the country. Though fuel oil consumption did peak in March at 50,000 mt compared to the annual average of 18,000 mt per month, the volume was still below the 52,000 mt monthly average from 2017.

Fuel oil consumption has been declining in recent years on greater consumption of natural gas. Natural gas consumption increased in 2018 to 33.44 billion cubic meters from the 32.11 billion m³ consumed annually the year before. Consumption peaked in January at 4.8 million m³, and was at its lowest in June at 1.18 million m³.

Coal consumption stayed relatively constant at 45 million tons in 2018, compared to the 45.31 million tons consumed in 2017. Compared to 2016, consumption is down 16 percent from the 53.4 million tons consumed that year.

As Ukraine continues to develop its domestic natural gas resources, and power demand continues to increase, natural gas will increasingly push fuel oil out of the power generation mix. Ukraine has reserves of about 900 billion cubic meters of natural gas. Domestic production has been severely hampered by underinvestment in the recent past -- of the estimated 150 drilling rigs in Ukraine, 75 percent are obsolete. But investment is expected to pick up strongly in the coming years. The United States Department of Commerce predicts Ukrainian natural gas production will increase from 20 billion m³ in 2016 to 26 billion m³ by 2020.



IN CONFERENCE

MARPOL VI Effects on Refining and Production

This edition's In Conference is based on an October presentation entitled "MARPOL VI Effects on Refining and Production." The presentation was given by Edward Arnold, a senior consultant at Argus, at the company's 2018 Fuel Oil Summit in Miami.

IMO 2020 is among the greatest regulatory challenges that the global bunker and refining complexes has ever faced. While the official start date for the new sulfur cap is January 1, adjustments will occur before the deadline.

A look at global bunker demand shows demand for residual fuel oil has been steadily rising in recent years. At the same time, world fuel oil demand is going down as less resid is used in power generation and in industry. Argus believes demand for residual fuel oil in bunkering will continue to increase right up until 2020. A combination of high and low sulfur fuel oil demand is expected to increase through 2025 from 2020 levels.

Just shy of 4 million bpd of high sulfur fuel oil (HSFO) bunker demand is expected to be used in the closing months of 2019. Argus projects scrubbers and noncompliance to consume approximately 1.4 million bpd of HSFO after 2020. Approximately 2.5 million bpd of HSFO will need to be replaced by compliant marine fuels.

On average, the sulfur content of marine fuel oil will need to drop from the current 2.8 percent to 0.5 percent. Refiners will accordingly need to produce or secure blendstocks to create low sulfur bunker fuel. Low sulfur diesel fuel can be used directly as a marine fuel, but it can also be used as a blendstock to bring down the sulfur content of HSFO. If you take 2.5%S HSFO and try to bring it to 0.5%S with low sulfur diesel, your blending ratio will be approximately 6-to-1. Other products can be used, though most present their own dilemmas for refiners. A refiner can use hydrotreated vacuum gas oil (VGO) to bring down the sulfur content of fuel oil, but this may take away from gasoline production, which in turn could increase gasoline prices. Using low sulfur vacuum residue (VTB) takes away VTB from the production of anode grade petroleum coke, which in turn could increase the price of coke. Because blendstocks will need to be used to bring down the sulfur content of HSFO, there will be significant upward price pressure on both blendstocks and finished petroleum products.

There are near-endless pricing scenarios for marine fuels after the sulfur cap goes into effect. Much will depend on supply and demand in 2020, both of which remain indiscernible at this point. Argus has accordingly developed several pricing scenarios. In one pricing scenario which the pricing agency gives a 15 percent chance of occurring, the spread between Fuel Oil No.6 3% USGC FOB and ULSD 62 FOB USGC Waterborne goes up to almost \$70. This will disrupt markets and profits, especially for simple refineries.

There are a lot of unknowns for IMO 2020, but there are also many certainties. High-conversion refiners are set to benefit, as their margins increase and their feedstock (heavy-sour crude) becomes a lot cheaper. Low-conversion refiners, including several in Europe, will see margins shrink as they drown in unwanted HSFO. Sweet-sour spreads are set to widen to create tremendous incentives for high-conversion refiners to fill (and perhaps add) capacity. Refiners will increasingly turn to cokers to process HSFO, as they have been doing for the past few years. Building a coker is a significant financial and timely endeavor, and an anticipated high spread will incentivize coker adoption. Total distillate demand will increase, both for marine fuel and for use in bunker blending. Gasoline will get more expensive, as will anode grade coke. Finally, HSFO will increasingly head to power stations and cokers. HSFO may even drop low enough to become competitive with coal.

A wild card with the IMO is the United States, specifically President Trump. As gasoline and consumer prices get more expensive as a result of the sulfur cap, Argus believes there is a significant chance the president pulls the US out of MARPOL. This is unlikely to have a large impact on the bunker market as the world's largest bunker centers are outside the US, though the move will certainly have an impact.

On the production side, producers of sweet crudes will likely come out as the winners of HSFO, especially if those crudes have a high distillate cut. Brazil will also benefit as a producer of low-sulfur medium and heavy crude. Producers of heavy crudes, including Maya, and Canadian bitumen producers will face financial hardships. Bitumen is already under high stress, and that problem is likely to continue.



IN THE DATA

Tanker Costs, Dirty Spot Trades													
To	From	End-Nov 2018				End-Dec 2018				End-Jan 2019			
		Panamax (55 kt)	Aframax (80kt)	Suezmax (130 kt)	VLCC (270 kt)	Panamax (55 kt)	Aframax (80kt)	Suezmax (130 kt)	VLCC (270 kt)	Panamax (55 kt)	Aframax (80kt)	Suezmax (130 kt)	VLCC (270 kt)
US Gulf	UK/Continent	22.91	--	--	--	27.73	--	--	--	23.64	--	--	--
Singapore	Mideast Gulf	--	18	--	--	--	15.94	--	--	--	13.13	--	--
	Mediterranean*	--	40	31.54	--	--	38.75	30	--	--	35.63	23.85	--
	UK/Continent	--	--	30	22.22	--	--	31.54	18.89	--	--	23.08	17.59
	Caribbean	--	30	34.62	29.07	--	40	36.92	20.37	--	40	28.85	20.74

Source: True North Chartering.
*Cost of these voyages includes Suez Canal tolls.

WORLD BUNKER FUEL PRICES (Dollars per Metric Ton)						
	Jan-18	Nov-18	Dec-18	Jan-19	Absolute Chg.	% Chg.
IFO-380						
Western Hemisphere						
New York (W)	393.15	460.83	391.18	401.59	10.41	2.7%
Houston (W)	366.36	403.64	352.50	368.63	16.13	4.6%
Los Angeles (W)	389.77	462.39	410.15	395.11	-15.04	-3.7%
Panama (W)	374.74	437.55	373.36	379.67	6.31	1.7%
Europe						
Rotterdam (D)	367.48	406.64	344.33	352.50	8.17	2.4%
Gibraltar (D)	385.78	452.98	381.32	381.89	0.57	0.1%
Piraeus (W)	387.65	430.48	364.03	373.45	9.42	2.6%
East of Suez						
Fujairah (D)	384.78	458.05	376.53	377.33	13.30	3.7%
Singapore (D)	391.33	471.74	381.13	399.84	23.31	6.2%
Hong Kong (D)	396.80	468.20	393.29	390.32	9.19	2.4%
Shanghai (W)	415.04	490.61	418.97	409.45	-9.52	-2.3%
Busan (D)	421.76	487.19	415.92	418.45	2.53	0.6%
MGO						
Western Hemisphere						
New York (W)	651.41	670.83	589.87	593.18	3.31	0.6%
Houston (W)	617.98	646.48	558.44	569.25	10.81	1.9%
Los Angeles (W)	608.86	678.75	590.74	597.05	6.31	1.1%
Europe						
Rotterdam (D)	592.02	596.02	514.42	524.27	9.85	1.9%
Gibraltar (D)	642.87	675.50	589.63	591.64	2.01	0.3%
East of Suez						
Fujairah (D)	636.52	799.09	772.50	757.17	-15.33	-2.0%
Singapore (D)	593.00	623.62	533.93	553.20	19.27	3.6%

Source: World Fuel Services.
D=Delivered. W= ex-Wharf.
Notes: Prices are means of the range

DPP Fixture Reports, Feb 2019						
Region	Vessel	Size	Cargo	Voyage	Rate	Charterer
Americas	ASTERION	35	DPP	MISS RIVER/BERMUDA	LS 615 K	SHELL
	KEROS	50	DPP	CARIBS/USG-OPTS	WS 157.5	ST SHIPPING
	NAVE CETUS	50	DPP	CARIBS/USG-OPTS	WS 157.5	ST SHIPPING
	ASTERION	35	DPP	SAINT JOHN/USAC	WS 260 (2018)	FREEPOINT
	NAVIG8 TBN	80	DPP	BRAZIL/SPORE-OPTS	RNR	PETROBRAS
	CONQUEST	50	DPP	ECMEX/USG	WS 180	CNR
	HELLESPONT PROTECTOR	50	DPP	ECMEX/USG	WS 187.5	CNR
	SKOPELOS	50	DPP	MISS RIVER/ECCA	WS 200	MERCURIA
	BERGITTA	70	DPP	AMUAY/USG-OPTS	WS 165	UNIPEC
	GULFSTREAM	50	DPP	USG/UKC-MED	WS 138.5	LEVANTINE
	NESTOS	50	DPP	ECMEX/USG-OPTS	WS 230	CNR
	PANAMAX INTL TBN	50	DPP	WMEX/USWC	WS 165	CNR
	ICE POINT	44	DPP	QUEBECA/USAC-OPTS	WS 200	FREEPOINT
	SINGLE	35	DPP	QUEBEC/USAC-OPTS	RNR	FREEPOINT
MARVEL	35	DPP	SAINT JOHN/USAC	WS 215	RESOURCE MARINE	
UK/Cont/Baltic	MINERVA TBN	100	FO	BYSOTSK/USG	WS 110	LITASCO
	DELTA TBN	100	FO	UST LUGA/UKC	WS 97.5 (2019)	CLEARLAKE
	EA JEWEL	100	FO	VENTSPILS/UKC	WS 87.5 (2019)	CLEARLAKE
	NEW SUCCESS	270	FO	ROTTERDAM/SPORE	RNR	PETROINEOS
	DELTA HARMONY	130	VGO	ENSTED/USG	WS 75 (2019)	EXXOM
	DELTA TBN	100	FO	VYSTOSK/UKC	WS 90	LITASCO
	EXPLORER	135	FO	UST LUGA/SPORE	RNR	NEWTON
	FOLEGANDROS	130	FO	BALTIC/SPORE	RNR	CORAL
	SEA HOPE	80	FO	ROTTERDAM/SPORE	LS 2.15M	CLEARLAKE
	XIN LIAN YANG	270	FO	ROTTERDAM/SPORE	LS 4.75M	PETROINEOS
	DONAT	130	FO	BALTIC/SPORE	RNR	CLEARLAKE
DIMITRIS P	130	FO	ROTTERDAM/SPORE	LS 2.9M	BP	
Med/Black Sea	ARIES SUN	80	FO	ALIGA/USG-SPAIN	WS 85-RNR	UML
	COROSSOL	80	FO	TAMAN/USG	WS 90	VITOL
	KAZAN	80	FO	TAMAN/EAST	RNR	ALVARI
	RADIANT SEA	55	DPP	SKIKDA/USG	WS 120	CHEVRON
	LA MER	130	FO	TAMAN/SPORE	KS 2.45M	CORAL
	COROSSOL	80	FO	TAMAN/USG	WS 90	VITOL
AG/Red Sea	SOLOMON SEA	80	FO	RUWAIS/YOSU	WS 145	GSC
	AFRA OAK EX D/D	80	FO	VADINAR/SPORE-FUJA	WS 150-LS 475K	MERCURIA
	CALIDA	80	FO	JUBAIL/FUJA	RNR	SHELL
	OCEAN QUEEN	80	FO	RUWAIS/EAST	RNR	CNR
	SAPPORO PRINCESS	80	FO	RUWAIS/EAST	WS 125 (2019)	SHELL
	ALIDA	80	FO	JUBAIL/FUJA	LS 500K	SHELL
	SPERCHIOS	80	FO	RUWAIS/USG	RNR	CHEVRON
	ATHENS VOYAGER	80	FO	FUJA/ROTTERDAM	LS 1.25M	VITOL
	OLYMPIC SKY	80	FO	STS KAZ/SPORE	WS 152.5 (2018)	ONEX
	ORACLE	80	FO	AG/RSEA	LS 840K	ATC
	SILVER SUN	80	FO	AG/RSEA	LS 800K	ATC
	LADY M	80	FO	FUJA-EAST	WS 124	CNR
	TORM INGEBORG	80	FO	BAHRAIN/EAST	WS 120	CLEARLAKE
	BLUE RIVER	80	FO	YANBU/EAST	WS 130	BP
OCEAN TAIPAN	80	FO	BAHRAIN/FUJAIRAH	RNR	SHELL	
VERMILLION ENERGY	80	FO	RUWAIS/EAST	WS 102.5	SHELL	

Far East	PETROPAVLOVSK	80	FO	ULSAN/SPORE	RNR	MITSUBI
	STAVANGER FALCON EX D/D	80	FO	SPORE/ULSAN	RNR	SK ENERGY
	PACIFIC BRIDGE O/O	100	FO	SPORE/NCHINA	WS 107.5	CHIMBUSCO
	AMBELOS	80	FO	THAI/SPORE	LS 360K	CHEVRON

Source: Southport Maritime

