

# IMO 2020 – Short-term implications for the oil market

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## Executive summary

- The IMO 2020 regulation mandate ships to emit less sulphur dioxide by only using fuel oil with less than 0.5% sulphur content (vs 3.5% currently).
- This regulation has been postponed for a number of years, but 2020 is now a set date for the regulation implementation. The main uncertainty is around the level of compliance from shippers.
- Adaptation of ships (scrubbers or LNG propulsion) is unlikely to make up more than 30% of substitution away from high sulphur fuel oil.
- Even with conservative assumptions there will still be wide-reaching impacts on distillate/kerosene refining margins. Shippers will be most impacted but so will those reliant on distillate products (diesel, kerosene, heavy and light gas oil).
- The crude market is likely to see demand tailwinds from HSFO (high sulphur fuel oil) used in power generation, with medium weight low sulphur crudes as the clear winners and sour or super light crudes potentially losing out from the new regulation.
- Regionally, crude from North/West Africa, Brazil and parts of the North Sea are best suited to producing IMO 2020 compliant fuel oil, and will consequently go to premium versus sour crudes.
- Most global production growth is coming from Russia, Middle East OPEC or North America. By and large, the type of crude from these regions is generally not low sulphur (<0.5%).
- Globally, refiners have been slow to change and are taking a "wait and see" attitude. Some refiners have already invested and are complex enough to produce the cleaner product slate.
- Combined with high utilisation rates and light crude loading versus historical levels, distillate markets could tighten considerably post 2020.
- Additional capital expenditure (capex) will be required to increase desulphurisation/cracking capacity.
- In the long run the market wide crude differentials will soften, and distillate margins will normalise, but this could take longer than expected and have dramatic impacts for energy markets and industrial activity in the meantime.

## Background

### What is IMO 2020?

The International Maritime Organisation (a branch of the UN) has stated that as of the 1<sup>st</sup> of January all ships must reduce their sulphur emissions from 3.5% thresholds to 0.5%. The regulation has already been passed and any attempt to change the regulation would potentially take another 22 months (i.e. the regulation will go through on the stated date). The aim of this regulation is to reduce the emission of sulphur dioxide (which results in acid rain and environmental damage).

***To give a sense of how pressing this is, on an annual basis, one large container ship emits more sulphur dioxide than 50 million diesel cars over a year (there are over 65,000 ships in operation globally).***

### What is the impact on maritime consumption and fuel substitution?

The bunker fuel market currently accounts for around 5.5 million barrels per day (mb/day) of global consumption, with 4mb/day accounted for by ferries, cruise/container ships, LNG/LPG carriers, dry bulk transport and oil tankers; amounting to around 70,000 ships.

These ships consume over 50% of the total global fuel oil demand. Fuel oil is a long hydrocarbon fraction obtained during petroleum distillation, and has traditionally been the bottom of the barrel, high sulphur by-product formed along with gasoline and distillate (diesel) by refiners.

IMO 2020 will mean ships can no longer simply burn untreated high sulphur fuel oil (HSFO). This leaves three options available to shippers:

- i. Install scrubbers (exhaust gas cleaner systems that extract the sulphur as the HSFO is burned).
- ii. Switch fuel intake to low sulphur fuel oil (which is equivalent to distillate).
- iii. Switch to liquid natural gas (LNG) propulsion systems.

Despite being well flagged, the shippers have been relatively slow moving in adapting for three main reasons. The first is because the industry has been in a structural downturn, and consequently capital has been constrained. The second is that players are dis-incentivised to be early movers on installing scrubbers or converting to LNG, given the capex requirement and uncertainty around enforcement of the regulation. Thirdly the state of the HSFO and LNG markets over the next two years is an additional uncertainty, both in terms of availability at ports and price. Ultimately, shippers do not want to limit their trade routes and port refilling options and will therefore act as late as possible.

The IMO has until recently been ambiguous around enforcement of the 2020 legislation and this has contributed to the slow progress of shippers. However, they have now made it clear that ships will be regularly checked going in and out of ports and ships not installed with scrubbers will not be allowed to carry HSFO, to stop fuel switching out at sea.

Given that scrubbers take 6-9 months to install, coupled with the limited number of ports capable of installing them, there is likely to be long installation lead times even if shippers start to demand them now. From an industry supply perspective, the best possible outcome is around 1,200 are installed before the 2020 deadline (out of the +60,000 needed at this point in time).

**Put simply, this implies that the most likely outcome of the implementation of IMO 2020 is a significant increase in demand for low sulphur distillates and a surplus of high sulphur fuel oil.**

To illustrate this increase in demand in simple terms the basic assumptions/numbers are highlighted below:

- We conservatively assume the low end of current global bunker fuel usage (HSFO) of around 5.0mb/day (the current estimated range is 5.0-6.0mb/day).
- We optimistically expect that 0.5mb/day of HSFO will be substituted through conversion to LNG propulsion.
- We optimistically expect that 0.5mb/day of the existing HSFO demand will remain as some ships will install scrubbers to reduce emissions.
- We also conservatively expect that 1.5mb/day of HSFO demand continues, due to less disciplined operators not complying with the new regulation (through bribes or fuel switching out to sea).

Nevertheless, this still leaves the need for refiners to supply an additional 2.5mb/day of increased LSFO/middle distillate demand from shippers in 2020.

The base global demand for distillate is around 30mb/day, therefore a 2.5mb/day increase in demand from IMO in 2020 amounts to around an 8% increase in demand over a short period of time.

## A bit more detail around the HSFO substitution assumptions

### Liquefied natural gas conversion

Our 0.5mb/day of HSFO fuel switching could prove too optimistic. In the first few years post the 2020 implementation, we do not forecast a significant amount of LNG switching (10%) because of the limits on the number of ports fitted with LNG refuelling (there are 800 marine bunkers versus only 55 LNG ports).

However, LNG conversion/adoption is more bullish longer-term given: improving port availability, (the 25 biggest ports globally will have LNG refuelling by 2021), and separate IMO regulation targeting a 50% carbon dioxide emission reduction by 2050 (versus 2008 levels). LNG could consequently be an area of increased substitution, but this is more likely to play out on a 5-20 year horizon.

### Scrubber installation

If shippers order a scrubber now the current lead time (waiting period plus installation) is around 6-9 months. Installation is quite quick (2-4 months, requiring incremental investment of about \$3-5 million). However, installation requires a dry dock and a limited number are suitable or available (around 428 of varying sizes)<sup>1</sup>. Currently around 500 ships are fitted with bulk carriers and tankers accounting for over 50% of scrubbers installed or on order. Our base case assumes 3000 ships are fitted by 2020, which implies a 0.5mb/day will continue to use HSFO in compliance with IMO.

### Non-compliance to IMO 2020

We measure compliance as a percentage of bunker fuel consumption globally (rather than percentage of compliant ships). This is an important distinction given 25% of the total ship fleet consumes 85% of marine fuel. We have assumed 30% non-compliance of IMO 2020.

This may prove to be on the high side given:

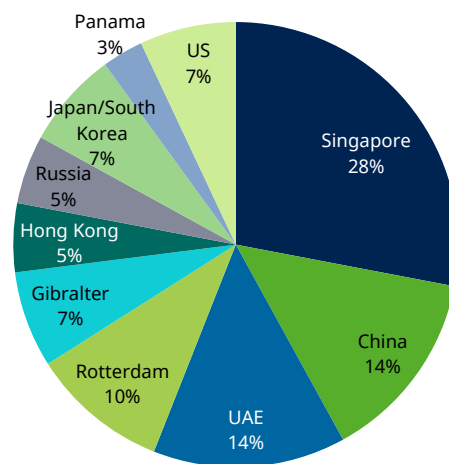
- The high concentration of bunker fuel demand from a small number of ships.
- The high concentration of bunker fuel supply from a small number of countries.
- Country support for the regulation: North American, Eurozone and China as end markets account for around 90% (by tonnage) of the world sea borne trade. None of these are likely to oppose the IMO 2020 regulation. Likewise there is backing from almost all the countries supplying bunker fuel (shown in chart I) with UAE as the only major supplier that is not a signatory of the environmental air pollution convention (MARPOL).
- Support from large public companies, both ship insurers and shipping companies (Maersk, Hapag-Lloyd, J Laritzen and others have formed the “Trident Alliance” with the aim of aiding enforcement of the IMO 2020 regulation).

**However, it should be noted that opinions on compliance varies considerably e.g. Bob Dudley (CEO of BP) believes compliance will be below 50% given the difficulty of enforcing the regulation globally.**

## How does this impact crude oil demand and product demand?

When assessing the supply and demand dynamics of the global oil market, the implicit assumption usually made is that each barrel of crude can be used at a 1:1 ratio to create the various oil based products demanded. However, in a period where distillate demand grows disproportionately faster than both gasoline and fuel oil demand, this assumption is called into question.

Chart I - % of global bunker supply concentration



Source: IEA, Schroders.

<sup>1</sup><https://www.trusteddocks.com/catalog/region/western-europe>

Typically the maximum distillate cut for each barrel of medium API crude is approximately 50%. This means around two barrels of crude is required to produce one barrel of distillate. Therefore our forecast of 8% growth in distillate demand over the next 18 months could result in higher crude oil demand of around 5.0mb/day (i.e. 2.5mb/day x 2 = 5.0mb/day), and surplus fuel oil production as an inevitable by-product, which can be used for power generation.

***It is worth noting that distillate inventories are already well below the five year average levels and given current refining set up it is hard to see how inventories do not draw further as we approach 2020.***

Putting this distillate demand lift in context of the global crude demand balances, it is very clear to us that 2020 will prove to be an unusual and potentially very strong demand year.

Below is a summary of the oil market balances for both 2019 and 2020. It is important to note that many sell side IMO research reports estimate that oil demand could be lifted by as much as 1.8mb/day over and above normal growth rates of 1.2-1.6mb/day every year.

As noted before in the report, we have taken a more conservative approach with regard to demand, as we do not expect the shipping industry to be 100% compliant and more importantly we expect any spike in distillate prices will slow the conversion rate (i.e. the demand lift will be spread over a longer period).

Our underlying assumptions are simple:

- 2020 – Non IMO related demand growth is just 1.0mb/day – strong USD and higher oil prices having a direct impact.
- 2020 – IMO related (additional distillate demand) is 1.0mb/day. A relatively conservative assumption.
- 2020 – Non OPEC ex-NA supply grows by 0.3mb/day (which equates to 1.8mb/day of new project supply due to a 4% base decline rate).
- 2020 – Non OPEC North American supply grows by 1.2mb/day. This assumes no pipeline constraints (which will be a limiting growth factor in 2019).
- 2020 – Call on OPEC production will be 33.0mb/day. This compares to their current production rate of 31.8mb/day and assumes that effective spare capacity is below 1.0mb/day. This assumes no decreases in Iranian, Venezuelan, Libyan or Angolan production.

### **A summary of the oil market balances for 2019 and 2020 estimates (mb/day)**

Schroders IM	2019 mmbd	y-o-y Δ	Schroders IM	2020 mmbd	y-o-y Δ
<b>Global demand</b>	<b>100.4</b>	<b>1.1</b>	<b>Global demand</b>	<b>102.4</b>	<b>2.0</b>
OECD demand	47.4	0.0	OECD demand	48.4	1.0
Non-OECD demand	53.0	1.1	Non-OECD demand	54.0	1.0
<b>Non-OPEC supply</b>	<b>60.9</b>	<b>0.7</b>	<b>Non-OPEC supply</b>	<b>62.3</b>	<b>1.5</b>
Non-OPEC ex-NA	36.7	-0.5	Non-OPEC ex-NA	37.0	0.3
North America	24.1	1.2	North America	25.3	1.2
OPEC NGL	7.1	0.0	OPEC NGL	7.1	0.0
<b>Non-OPEC + NGL</b>	<b>68.0</b>	<b>0.7</b>	<b>Non-OPEC + NGL</b>	<b>69.4</b>	<b>1.5</b>
Est. 2019 OPEC production	32.5	0.4	Est. 2019 OPEC production	33.0	0.5
<b>Market balance</b>		<b>0.0</b>	<b>Market balance</b>		<b>0.0</b>

Source: Schroders.

Going forward we expect the excess HSFO to be an unwanted by-product, and price to weaken substantially. However, this does not mean it will become a wasted product, as refiners have already confirmed that it will likely incentivise HSFO being used as a fuel for power generation, competing with coal in emerging markets (HSFO emits less CO2 than coal).

It is important to highlight that HSFO contains around 50% more energy per unit than coal. With current coal prices of \$50/tonne, this implies that HSFO prices would need to decline to around \$100/tonne to be competitive with coal fired power stations; this requires a significant fall from spot and two year forward prices (\$400/tonne and \$250/tonne respectively).

***“HSFO surplus will be taken on by either refineries capable of cracking it, or emerging market economies to burn for power generation as an alternative to coal, the Saudis are already approaching European refiners to discuss exchanging their crude with HSFO by-products” - Greg Garland (CEO Phillips 66)***

### **How does this change the refining environment?**

The impacts and market adjustments that will be required to adapt to a post IMO regulation world are threefold:

- i. Divergent pricing of crudes based on their sulphur content.
- ii. Divergent pricing of crudes based on distillate cut available (a function of API).
- iii. Increased investment by refiners to allow more desulphurisation.

Background and definitions of oil grades:

Crude type	Weight (API)
Light	>31.0
Medium	22.3-31.1
Heavy	<22.3
Extra heavy	<10

Sour crude has sulphur content greater than 0.5%.

Source: Schroders.

Crude type	Weight (API)	Sulphur content (% wt)
WTI	39.6	0.24
Brent	38.3	0.4
OPEC basket	32.7	1.77 (wide variety within average)

### Crude sulphur content:

It is believed that less than 20% of crude volumes globally can, without blending, be used to create IMO compliant fuel oil (LSFO), although Galp's head of downstream thought this figure could be as low as 5%! Well suited areas include Brazil pre-salt, North Sea, West African crudes, and many areas of US onshore shale (more detail is given in upstream section). This means that each refiner will need to develop a blend that can economically produce LSFO (with resilience to widening of sweet/sour price differentials). However, most refiners will still have to produce HSFO as a bottom of the barrel by-product. One issue is that different impurities (asphaltenes) in crudes can interact and precipitate, resulting in sludge formation down the line, which can clog ship engines.

Another issue is that refiners are not comparing notes on blending; this means post IMO 2020 there may be increased reliance on a few hubs (causing the price to rise beyond where it is economic). Another implication is that two compliant LSFOs from different refiners may become uncompliant when mixed in marine bunkers. This will require fuel segregation (expensive in terms of infrastructure), or cross-compatibility testing (takes time and money and could cause tanker delays).

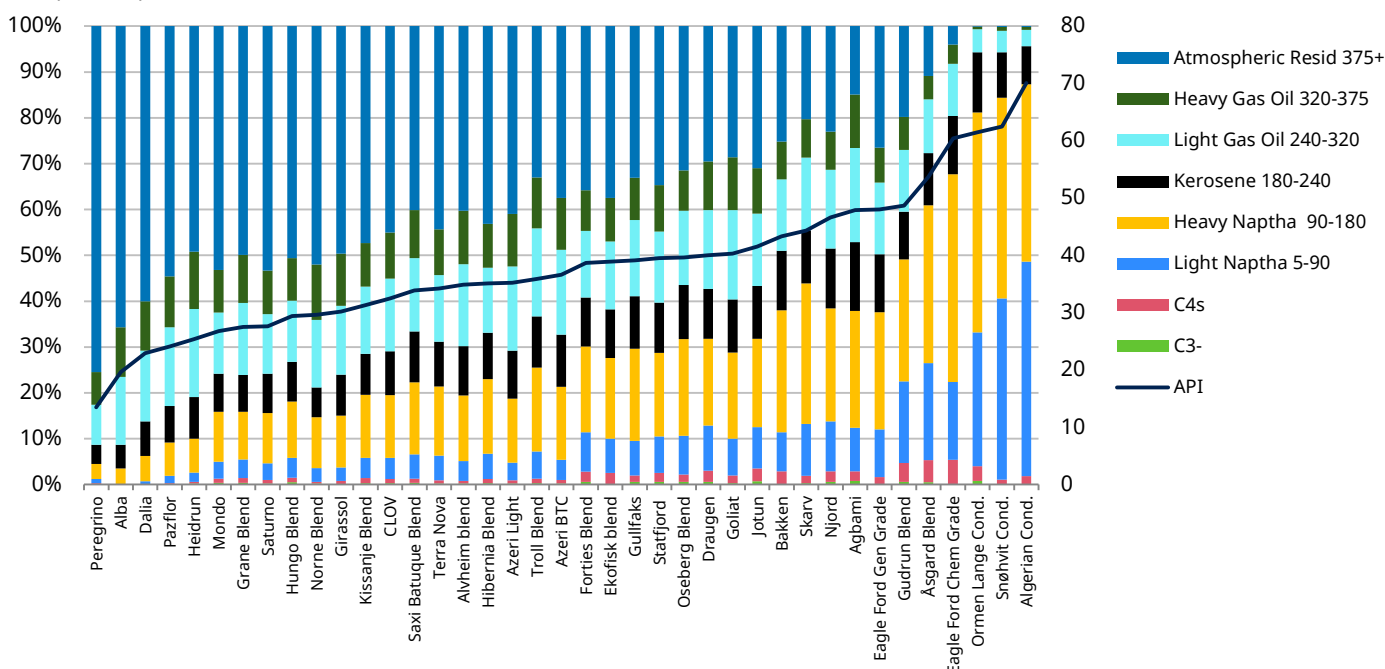
### Heaviness of crude and distillate yield:

There is a large disparity in what refiners are built to take in terms of American Petroleum Index (API), and what distillate/product yield can be achieved from the same refiner slate.

Chart II below shows the API versus product yield relationship. Detail on this relationship is given in the next section, but what is clear is that light gas oil (LGO), heavy gas oil (HGO) and resid yield declines rapidly from light crudes with API >40, LGO and cracked HGO or resid is required for diesel and LSFO production.

### Chart II – Refining yield vs API relationship between crude hubs

Yields (% of vol)



Source: Equinor Company Data; Schroders.

## Regional refining

### United States

Ironically the US refineries have been upgraded in the last 15 years to take heavier crude. When they made the investment decision, their domestic light production was declining and they thought they would need a higher import requirement of medium and heavy grades. This has changed with the US shale boom but US refiners still need to import Canadian heavy, Mayan or Venezuelan crude to blend with lighter shale grades. These imported crudes are mainly high sulphur (sour). This will mean the distillate produced using them will not be IMO compliant without additional desulphurisation capacity.

***"We are already fairly maxed out in the amount of light crude we are taking into our refineries, we could flex it a few percent maximum. We have secured imports from Canada as a source of heavy crude to replace Venezuelan sources; we have not received a shipment from PDVSA since October 2017"*** - Greg Garland (CEO Phillips 66)

The theoretical options available to US refiners are simple: to invest in desulphurisation equipment, adapt refineries to take lighter crudes, or increase utilisation further to boost overall distillate (and other product) output.

In reality utilisation rates in the US area already at around 95%; which is the maximum a refinery can practically operate at to account for maintenance periods and outages. In addition, US refiners are maxed out on US onshore light crude. Any increase in throughput would also likely erode gasoline margins as the market becomes oversupplied.

## Europe

The European refiners are in a slightly better position than their American peers. Due to consumer trends in diesel demand, which were well defined until 2015, refineries are already more geared towards producing distillate. However, this distillate output has high sulphur content, and is not suitable for IMO 2020 regulations. This is because a large portion of the heavy crude slate comes from Russia (Urals). Coastal refiners are advantaged because they can source more of their crude from North/West Africa, which tends to be less sour. Alternatively, they can take US light and sweet crude to blend with the heavier sour crudes from Russia. Galp, Repsol and Saras all have European refineries that are well placed and set to benefit from IMO 2020.

European refiners also have more scope to increase utilisation, because current utilisation rates are lower at around 83%.

However, storage and transportation constraints could limit utilisation rates in Europe. The refining process inherently produces HSFO, and ships currently account for over 50% of HSFO use. With IMO 2020 resulting in ships switching to low sulphur distillate, demand could fall sharply resulting in rapid builds in inventories. This could quickly fill the storage available.

***“We have invested in our refineries, but many European refiners will not have sufficient desulphurisation or cracking capacity, and are dependent on sour crudes from Russia and the Middle East. We expect our refining margin to improve as a result of IMO 2020, given our expectation of sour crude discounts.” – Dario Scaffardi (CEO Saras)***

Coal/petcoke prices should act as a price floor for fuel oil prices, as HSFO can be burnt for power generation, and this will likely be taken up by emerging markets in need of cheap energy. HSFO also emits less CO2 than coal and the sulphur can be captured by scrubbers installed at the power plant level. This is economically more efficient than fitting individual ships with scrubbers.

However, considering tanker ships without scrubbers will not be allowed to transport HSFO there could be transportation bottlenecks and it is conceivable that the glut of HSFO from European refiners could end up limiting output if it cannot be removed and transport costs become very high (offsetting benefit from distillate margins). Avoiding this scenario will require refiner adaptation to break down the HSFO into lighter products.

## Asia/Middle East

Refining utilisation rates in Asia are similar to those in Europe. However, the majority are located in the Middle East, where significant new desulphurisation capacity is required to be IMO compliant post 2020. Likewise, Chinese tea-pot refineries do not have the complexity to increase production of IMO compliant distillate.

## Refinery adaptation/investment

There are four main types of technology that can be used to try to supply the market in a post IMO 2020 world, and stop hub differentials from blowing out, or diesel prices rising too aggressively. These are bottom of the barrel conversion, adaptation to lighter crudes, desulphurisation and resid hydrocrackers (which allow more distillate cut by adding heavier elements).

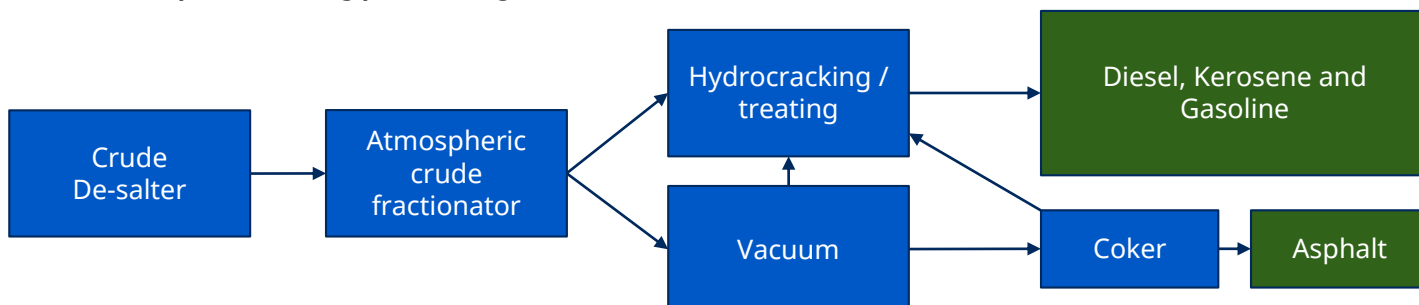
Broadly speaking these either involve altering the API crude slate refiners are capable of taking, therefore allowing a higher middle distillate yield from light (e.g. shale) crudes, or alternatively processing crudes to remove the sulphur.

Refiners with desulphurisation capacity will use the best yielding (middle/heavy weight) and cheapest crudes, regardless of sulphur content. Consequently we expect differential between sweet and sour hubs to go to a significant discount, but think it is unlikely to go beyond an \$8 differential, because medium/heavy grades will be demanded for its high product yield by refiners able to remove the sulphur.

Only a small percentage of the global refining complex has desulphurisation equipment installed, and to do so is expensive. For an average refiner (of around 0.2mb/day capacity) installation of desulphurisation equipment (resid hydrocracker) would cost around \$1 billion. Investing in additional cracking units (to allow a greater distillate yield, is also fairly expensive, a Coker costs \$600-\$800 million).

## The refining process and potential areas of adaptation:

Chart III – Simplified refining process diagram



Source: Schroders.



## How does this impact upstream energy markets?

There is mixed opinion on whether IMO 2020 implications will be greater for crude producers or refiners in the global oil markets.

Because most refiners do not have the right refining infrastructure to produce more LSFO/distillate; many will need to change what goes into the refineries. This will create more demand for low sulphur (sweet) middle weight crudes, and proportionally less demand for high sulphur (sour) crudes.

With regards to producers, management we have spoken with think pricing differentials between sweet and sour, all other things being equal, could be between \$2-8/bl after IMO implementation, but in reality it is impossible to accurately predict, as \$25 differentials are not heard of in the short term (1-2 years). The table below highlights some of the best placed crudes globally, and the upstream companies associated.

***“IMO 2020 will be more of an upstream story, given the mixed impact it will have on different product margins. We are well placed as our refineries are already capable of producing 0% HSFO, and our crude production is medium API and sweet, and should therefore trade at a premium to sour grades. I think that premium could reach \$8-10 in some cases.” – Head of Downstream Galp.***

**Table I - Global crude hubs positively exposed to IMO 2020**

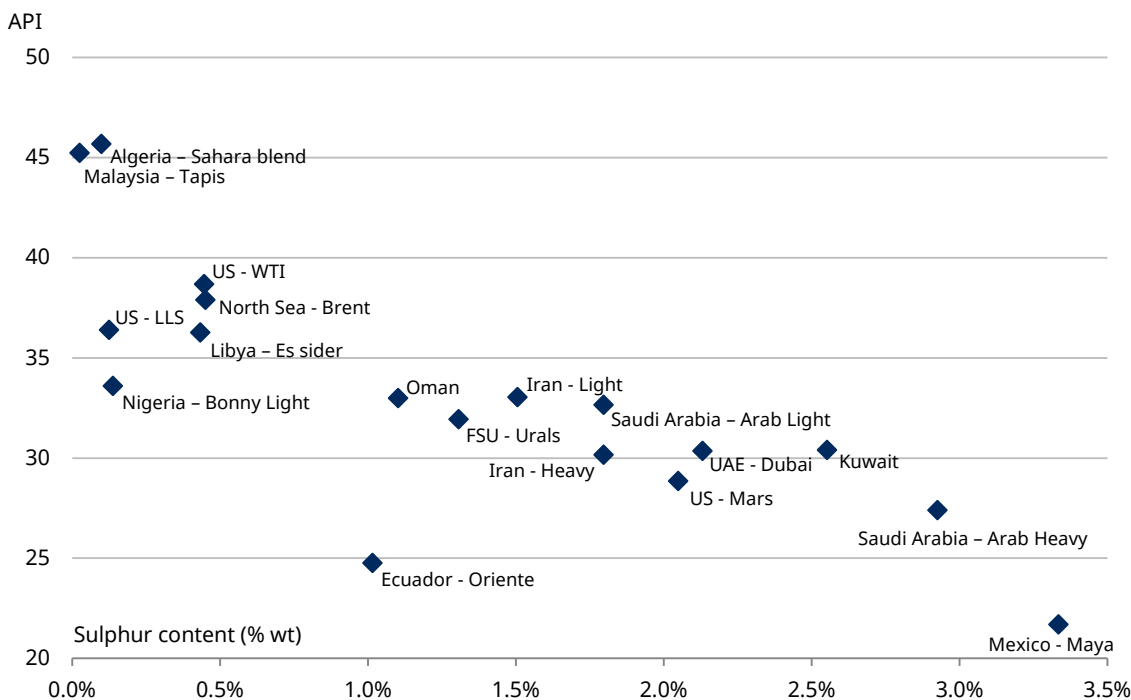
Country/Basin	API	Sulphur content (average)	Companies associated	Potential impact on prem. to Brent
UK North Sea	19-37	0.5%	PMO, ENQ, STL	
Norway (ex. Condensate)	18-40	0.3%	STL, AKERBP	+\$1-\$2
Libya	37-43	0.2% (ex two hubs)	COP, MRO, FP	
Ghana/Ivory Coast	23-39	0.3%	TLW	+\$2-\$3
Angola	19-32	0.4%	GALP	+\$2-\$3
Nigeria	26-47	0.1%		+\$2-\$3
Brazil (pre-salt Campos)	13-30	0.3%-0.67%	GALP	+\$2-\$5
Argentina	24-34	0.3%		
Colombia	24-44	0.5%	GTN, OXY	+\$1-\$2
Suriname/Guyana	Est. 30-40	0.3%	HES, XOM	+\$2-\$3
US (WTI)	40	0.2%	US Permian E&Ps	
Canadian Syncrude Sweet	32	0.1%	SU, MEG, CVE	+\$4-\$6
Western Canadian Select	34	0.5%	SU, MEG, CVE	+\$2-\$3
Indonesia	20-47	0.1%	XOM	
Russia (Urals)	31	1.4%	BP	-\$4-\$8

Source: Schroders.

Chart V below shows global crude markers sulphur content (% of mass) plotted against the weight (API). Three things are apparent from the chart below:

- Less than half of international hubs have sulphur content of <0.5% (i.e. can be used without blending to produce IMO compliant products).
- Generally heavier crudes have higher sulphur contents and vice versa.
- Distillate (diesel) take is higher with heavier (lower API) crudes, this means medium/heavy, low sulphur hubs will be the winners.

**Chart V – Global crude hubs by API and sulphur content**



Source: Schroders; Company reports (BP & Equinor).

Chart V above mirrors what we have heard from company management, namely that the North Sea, areas of South America, West Africa and North Africa offer the best crude grades for refiners to adapt to IMO 2020. However, there is a wide range of crude markers in the Middle East and South America with Brazil pre-salt and Colombian crude having medium API and low sulphur compared with Venezuela. Likewise Iranian crude markers tend to be higher sulphur than those of Saudi Arabia. North America also has a wide range in API of crudes, with Canadian and offshore GoM being typically heavier, and US onshore shales on the lighter end of the spectrum. East Asian crude also screens well, and tends to be light with low sulphur content (reflected by the Tapis hub). However, given this accounts for a small portion of global production it will not move the crude markets.

### Impact on US onshore shale oil production

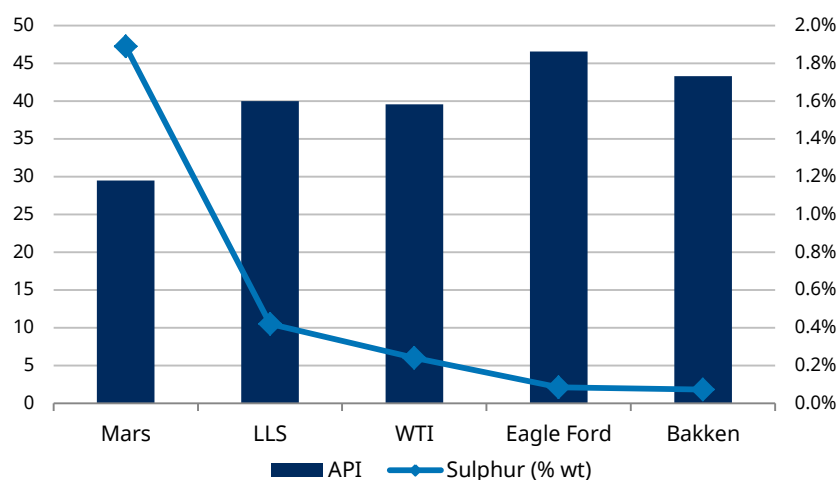
Crude sulphur content varies considerably across the US, as shown in Chart VI. However, except for the Mars hub, all are light crude (API >40). The recent growth in North American shale oil production has resulted in US refineries already using lighter refining slates compared to five years ago. This gives US refiners less scope to produce more distillate without taking heavier crudes.

In contrast European and Asian refineries will need to increase light and sweet crude intake. This will likely increase exports from the US, which have already grown substantially over the last three years.

However, we highlight that similarly to the incremental production growth from the Middle East, most of the US onshore production is light crude.

Globally refiners will still need more medium and heavy crude barrels, as production growth of heavier crudes is limited.

Chart VI - US crude grades by region



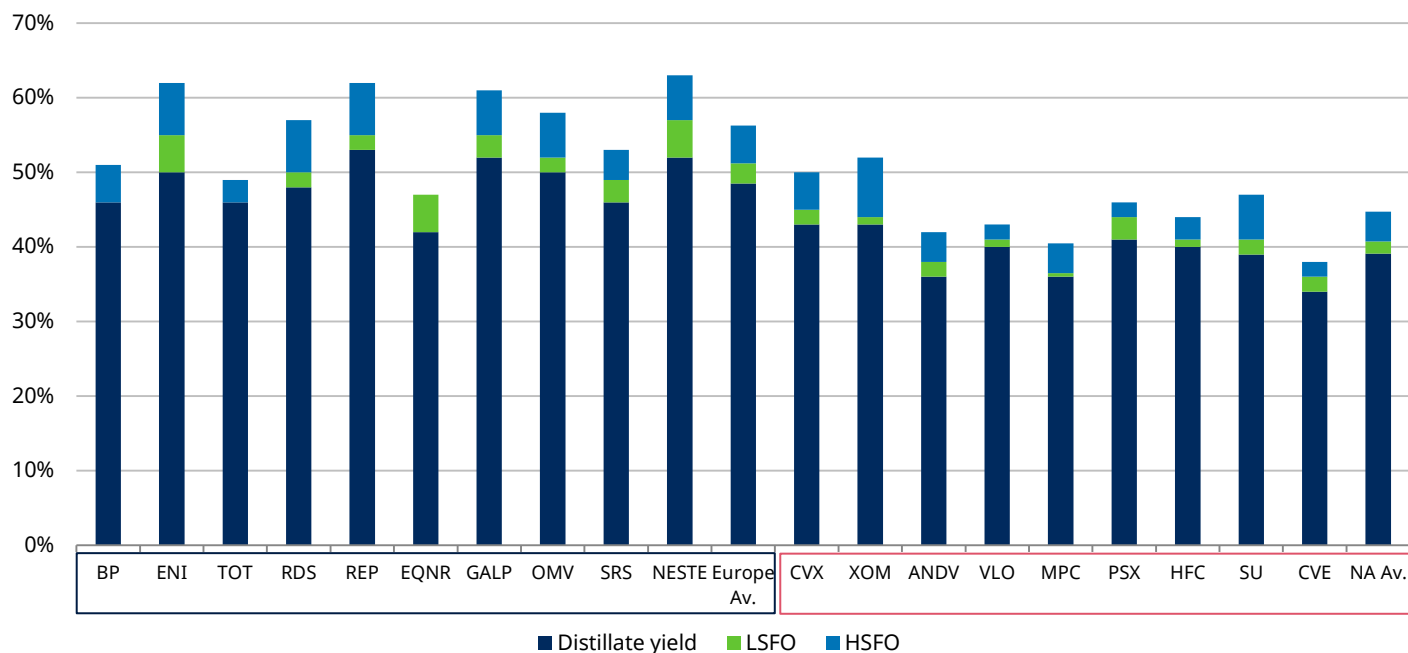
Source: Schrodgers; Equinor.

### How does this impact the refiners?

Refiners with high distillate and low sulphur fuel oil yields will benefit most from the expected margin growth in these products, driven by shippers switching fuel intake to comply with the new IMO 2020 regulation. Inversely, those with high gasoline and HSFO yields will be negatively impacted by lower margins in these products as HSFO demand falls, and gasoline supply (as a by-product) increases with higher refinery utilisation. Chart VII below shows the current distillate and fuel oil yields of different refiners. There is a clear divergence in yields between European and North American refiners, with Europe set up to produce more distillate (averaging 49% of crude throughput), and the US to produce more gasoline and less distillate (averaging 39% distillate yields). At a company level the stand out beneficiaries are Repsol, ENI, Galp, Saras and Neste. Asian refineries are also well set up to produce distillate, (average of 48% distillate yields), contrasting with companies like Gazprom and Petrobras with low distillate yields (33% and 37% respectively).

It should be noted that some refiners (e.g. Galp) have some flexibility over how much HSFO/LSFO they produce, so the yield numbers below may change to reflect product margins. However distillate yield numbers are unlikely to change meaningfully without a change in each company's refining complex.

Chart VII - Europe and North America distillate and fuel oil yields (as % of crude throughput) by refiner



Source: Wood Mackenzie.



## What is the likely time horizon of market reaction?

- The crude markets are not yet moving on IMO fears, refiners like to maintain flexibility rather than lock in contracts. Therefore they will take advantage of short-term price differentials until Feb-June 2019, when refiner slates will start to shift to produce more LSFO.
- Refiners are already experimenting with different blends to ensure they can produce IMO 2020 compliant fuel oil.
- Marine bunkers need to be drained and washed prior to 1 Jan 2020; therefore refiners will need to be ready and producing by middle 2019.
- For the first time ever shippers are contacting refiners about specific fuel requirements. This may shorten the time over which the regulation may start to impact physical markets.
- The general view from refiners is that the market will start reacting in terms of crude differentials/product margins from March-August 2019.

## Conclusions and macro impacts:

The main conclusions from this report are:

- Crude oil demand will be artificially high in 2020, before reverting back to normalised growth rates in 2021/22.
- Low sulphur fuel oil and diesel prices will increase as a result of higher demand from ships.
- Refiners supply of distillate is inelastic given crude availability is skewed to light crude; they are already operating near maximum utilisation rates, and a lack of adaptive capex in recent years.
- Sweet medium grade crude prices (e.g. from Brazil pre-salt) are likely to increase in the next two years, which will benefit the price per barrel realised by producers with the right crude.
- Producers supplying the wrong crude (i.e. extra light and sour crude) will be negatively impacted in terms of their realisations.
- US shale oil producers should benefit somewhat, as European and Asian refiners demand more of their crude.
- Higher diesel (and distillate prices) will negatively impact shipping costs and be inflationary globally.
- Given the global nature of the regulation, costs are likely to be largely passed on to the consumer. Fuel costs also make up approximately 70-80% of total transport costs.<sup>3</sup>
- Therefore higher fuel costs will greatly impact total shipping costs, and have knock-on effects for globally traded goods.
- Estimates for the cost vary (Wood Mackenzie suggests a 50% increase, EnSys estimate between 11-23%<sup>4</sup>).
- Perishable goods (like agricultural produce) will negatively impact more than other commodities, as shippers can moderate the speed to economise on fuel use in the latter case.
- Likewise geographical proximity will become more of a competitive advantage.

<sup>3</sup>S&P Global Platts

<sup>4</sup>[www.ensysenergy.com/downloads/supplemental-marine-fuels-availability-study-2/](http://www.ensysenergy.com/downloads/supplemental-marine-fuels-availability-study-2/)

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