INCREASING THE SUPPLY OF CLEANER SHIPPING FUEL

Commitments to cut climate-altering pollution is stimulating new regulations, such as IMO 2020, and reshaping marine fuel markets. Four main refining technologies can help adapt refinery output products to take advantage of these new greener fuel demands. However, adding or modifying process units not only requires substantial capital expenditure, but also increases refinery complexity and invites its own unique set of risks especially during the construction and commissioning process.

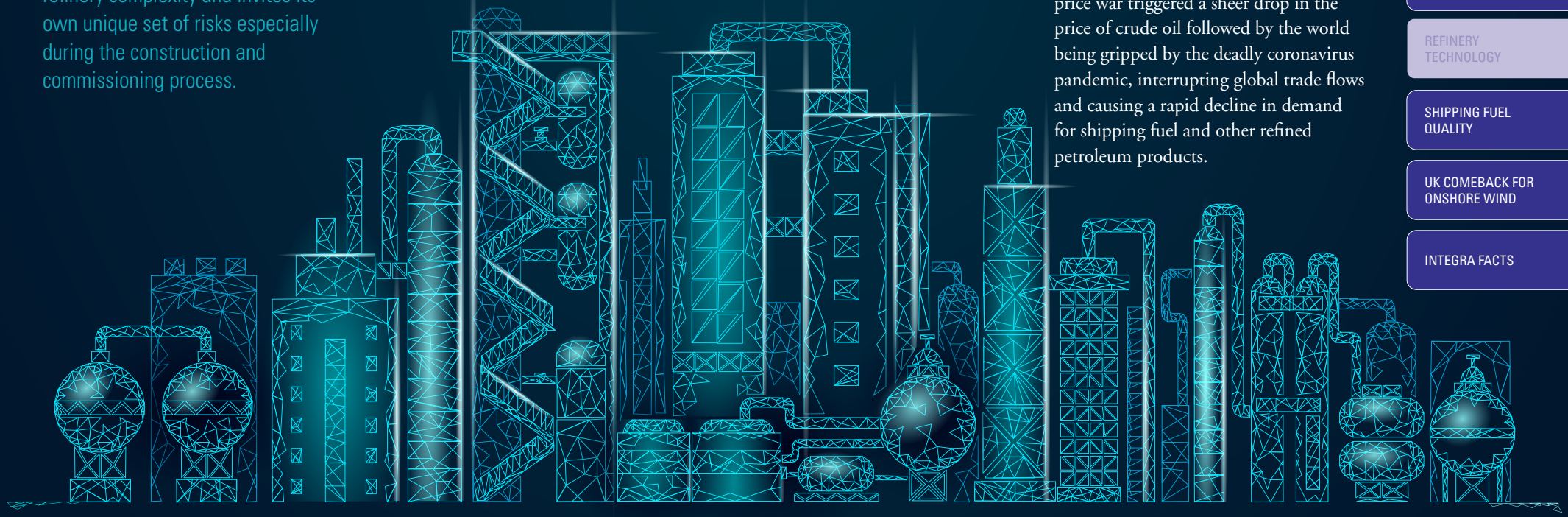
Throughout 2019 the global shipping and refining sectors were awash with speculation about how IMO 2020 would affect fuel markets when it came into force. In normal times, the shipping industry is estimated to consume about four million barrels per day of marine bunker fuels, with IMO 2020 potentially impacting 50,000 merchant vessels globally.

The new IMO 2020 regulations limit global bunker fuel to 0.5% sulphur content unless vessels have scrubbers installed to clean the emissions from usage of less-clean fuels, with prohibitions commencing 1 March 2020.

Ben Davis, Loss Adjuster for Integra Technical Services based in Singapore and a chemical engineer explains "The regulations mean that those shipowners affected have to carefully select their strategy. Do they install open or closed loop scrubbers; switch to alternative fuels (for example LNG); or use low sulphur fuels? Much of the "bottom of the barrel" heavy fuel oils typically used in shipping are no longer compliant, so refineries need to adapt their processes to meet the increased demand for compliant fuels such as distillates and Very Low Sulphur Fuel Oil (VLSFO)".

Market interrupted

No sooner had the new rules kicked in when market actors had to urgently confront two simultaneous black swan events. The Russia–Saudi Arabia oil price war triggered a sheer drop in the price of crude oil followed by the world being gripped by the deadly coronavirus pandemic, interrupting global trade flows and causing a rapid decline in demand for shipping fuel and other refined petroleum products.



Before these events, there were huge order lists for scrubbers to be retro-fitted to vessels. According to a McKinsey report published in November 2019, the scrubber payback period ranges from one to three years for a large vessel based on a light-heavy fuel oil price differential of between US$15 and US$23 per barrel. However, the spread between the cost of VLSFO and non-compliant High Sulphur fuel (HSFO) collapsed in early 2020 and many of the scheduled retrofits were impacted as shipyards closed due to COVID-19, resulting in many Shipowners abandoning plans to install scrubbers and instead moving to usage of VLSFO.

According to Ben, "This means that as global trade flows return, refineries will start to consider their marketing mix and we could see new investments in technologies to help them adapt the output products to take advantage of new market demands and potentially higher profit margins."

Four main refining technologies

There are four main technologies that can enable refineries to produce VLSFO or to convert "bottom of the barrel" heavy hydrocarbons to produce lighter compliant fuels for the marine industry:

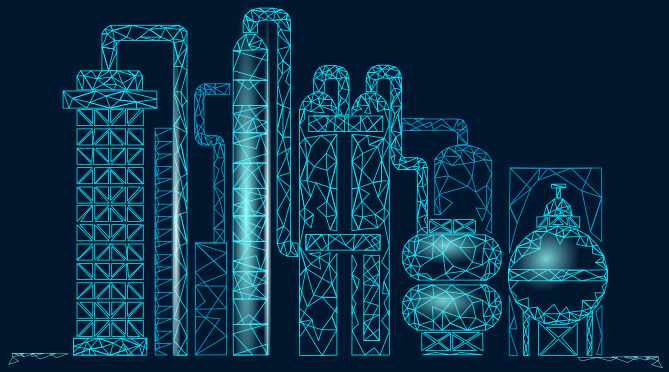
1. Delayed coking units
2. Resid hydrocrackers
3. Desulphurisation (including vacuum residue desulphurisation and hydrotreating)
4. Adaption of refinery process to lighter crudes (and switching crude slates to prioritise low-sulphur feedstocks)

Delayed coking is a semi-batch process that converts "bottom of the barrel" vacuum residue into light hydrocarbons and petroleum coke. Quite simply, vacuum residue is heated in the furnace and fed into a coker drum where it thermally cracks, producing light hydrocarbons that are extracted from the drums and coke that deposits on the drum walls (later cut out using water jets).

Resid hydrocrackers involve vacuum residue and hydrogen being mixed at high temperature and pressure and then being introduced into a number of reactor vessels containing a hydrotreating catalyst. The mixed feed is contacted with catalyst inside the reactor vessels, this enables the conversion of the stream into lighter hydrocarbons and the removal of impurities, such as sulphur hydrogen and some aromatic compounds.

Distinctive risks – but well understood

Ben suggests "These technologies come with a number of distinctive risks but, having been in existence for many years, are well understood both in the refining and insurance sectors."



DISTINCTIVE OPERATIONAL RISKS

Delayed Coking Unit	Resid Hydrocracker
The semi-batch nature of the coking process results in high thermal cyclic stress on the coke drums that can lead to cracks, deformation, etc. This is the most common form of failure.	Due to the high operating temperature and pressures paired with a viscous feed, typical equipment failures are the loss of feed pump or compressor.
Decreasing cycle time increases the throughput of the coke drum, however, can lead to greater stresses and higher risk of failure.	The exothermic nature of the hydrocracking reaction can result in 'temperature run-away' that can, in extreme cases, melt through the reactor walls.
During 'cool down' of the coke drum, an ex-cessive rate of water injection can result in 'drum bulging'.	Due to the presence of hydrogen, leaks in process units often results in devastating fires. This can give rise to extremely large property damage and business interruption claims.
A certain amount of coke builds up in the furnace tubes over time that requires periodic cleaning. Failure to properly maintain the furnace can result in the tubes completely clogging up, formation of hotspots and furnace tube ruptures or cracks.	

Policy conditions relating to testing, commissioning and handover

The very nature of this type of capital expenditure is that it involves building on an existing site and alongside operational facilities. This invites a multitude of different construction risks, for example when moving equipment within operational refineries, but these pale into insignificance when considered alongside testing and commissioning when hydrocarbons are introduced to newly constructed equipment and when the new plant gets integrated into the existing facility.

Typically, with construction costs for these types of investment costing hundreds of millions of dollars, specialist Construction All Risk (CAR) policies are necessary to cover the construction project. These cover Property Damage and Delay in Start-Up (DSU) claims during the construction period, with the asset transferring to the insured's operational policy once the construction is complete. "It's this handover phase where owners and contractors need to take care to follow insurance policy conditions" suggests Alistair Lamb, Managing Director – Asia, Integra Technical Services.

The operational policy will normally incorporate a testing and commissioning clause which includes gateway criteria to allow newly constructed pant to be admitted onto the operational cover, such as:

- Mechanically complete;
- Testing and commissioning process complete;
- Performance tested to 100% of design criteria for entire plant for 72 hours;
- Official acceptance by the insured (formal handover documents signed);

Alistair goes on to explain that "The newly constructed asset must meet all criteria and then should be presented to operational underwriters so they can consider the additional asset risk and charge any additional premium due to the increased overall insured value."

Issues can arise when a proper testing, commissioning and handover process is not followed or proper presentation of the risk is not made. To reduce some of the risk, some insureds are choosing construction policies which include early operations coverage to provide a bridge between the construction and operational policies.

MEET THE AUTHORS

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