Oil Terminals in Transition as Net Zero approaches

Campaigns, initiatives and much lobbying and political debate continues to gather pace regarding energy transition, decarbonisation and reductions in greenhouse emissions. This is here to stay and oil storage terminals have to actively consider their future strategy as the decline in fossil fuels accelerates in the coming years.

Governments have set and are setting increasingly stringent targets for the reduction in greenhouse emissions and have made some industry changing statements. For example, the UK Government has stated that no new gasoline / diesel only cars can be produced after 2030. Many car manufacturers have already stated that electrification is the future; Jaguar Land Rover, Volvo Cars and others have announced that they will only produce electric vehicles from 2025 for JLR and others on dates in the near future. This will have a dramatic effect on oil terminals whose main, perhaps sole purpose, is to receive, store and redeliver ground fuels to filling stations. For example, some terminals in the South East of England are distributing as much as 10,000 tonnes each day of gasoline and diesel; electrification of cars and vans will lead to very significant reductions in the demand for these fuels and therefore for the tanks they are stored in at oil terminals.

Then there is shipping, which is considered to be a major polluter. Eighty per cent of global cargo is carried by ships, the majority of which are running on fossil fuels stored at oil terminals around the world and if shipping was to be considered a 'Country' it would be the world's sixth largest emitter. As a method of transportation though, ships emit less than 5% of the CO2 than a truck does, on a tonne-km basis. Alternative low carbon fuels seems to be attracting considerable interest in the shipping community. For example, Maersk, one the world's largest shipping companies, along with a consortium including DFDS, Copenhagen Airports, the airline SAS, Logistics Company DSV Panalpina, and Orsted, is throwing its considerable weight behind methanol. E-methanol would still emit CO_2 on a tank-to-wake basis, although it avoids sulphur and particulate matter. Crucially, it is liquid at room temperature, no more toxic than diesel and easier to store and handle than ammonia or hydrogen. Manufactured by combining wind energy and energy from carbon capture (CCS) from shoreside fossil-fuel powerplants, it would allow Maersk to run its vessels in a carbon-neutral – if not carbon-free – way, exceeding IMO targets. ''Our ambition to have a carbon-neutral fleet by 2050 was a 'moon-shot' when we announced it in 2018," said Søren Skou, CEO, A.P. Moller-Maersk, in February. "Today we see it as a challenging yet achievable target"

Ammonia, meanwhile, need only be cooled to -30^{o}C, making it more practical than hydrogen or LNG in terms of storage. Wärtsilä is developing engines for operating on ammonia, as well as a possible retrofit package for existing engines which would allow them to burn it.

Other fuels, e.g. hydrogen, LNG and bioLNG are all actively being considered and used increasingly as an alternative to conventional fossil fuels. For example P&O's new cruise liner, the Iona is using LNG as its main fuel and other ships in the P&O fleet have been modified to run on a range of fuels including LNG.

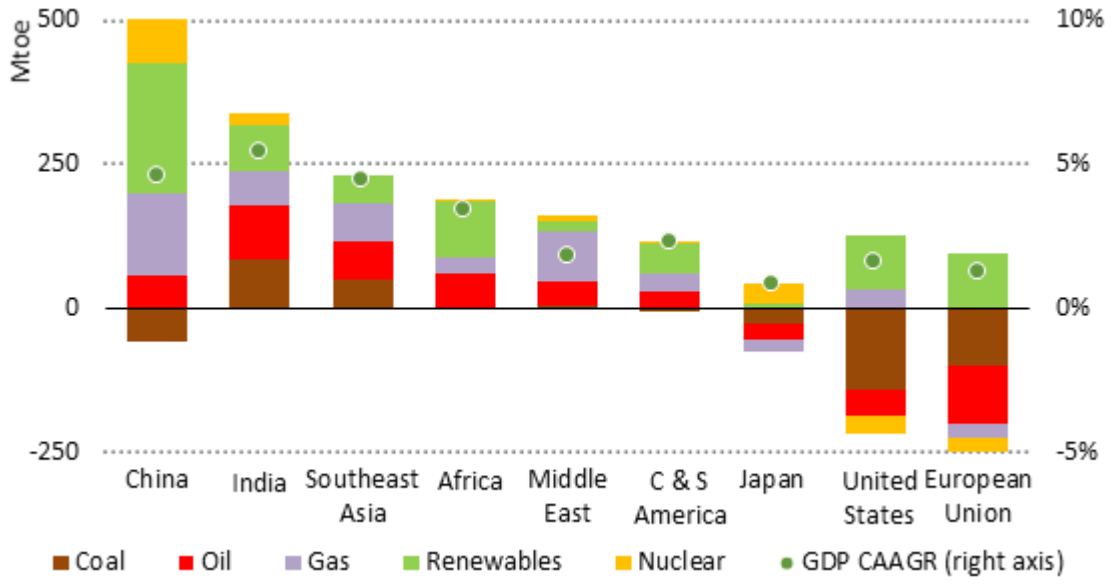
Another product gaining popularity as a transition/replacement fuel is the low emission alternative to diesel, HVO or hydrotreated vegetable oil. This is already being widely used in trucks and in marine diesel engines and can reduce greenhouse emissions by as much as 90%. This is an example of a breakthrough product in the search for clean renewable fuels. It is produced by hydrotreatment of

vegetable oils and/or animal fats, and the result is a premium quality fuel with a chemical structure almost identical to regular diesel and can therefore fully replace fossil diesel. It can also be used in conventional diesel engines with no modifications. The UK Government, seeking to be completely diesel free by 2030, could therefore meet this target by expanding the use of HVO, rather than purely relying upon electrification of cars. However, the availability of such fuels is limited in the context of global fuels demand.

So, the tank storage industry must adapt and invest for the future and seek out new storage contracts for the storage of emerging and alternative fuels and embrace innovation, adapting the terminals infrastructure to maximise flexibility. The terminal's management teams should ensure they are at the forefront of obtaining any required licenses, permissions and consents required for the storage of alternative fuels and equally ensure that employees are trained and competent and prepared for the handling of new and different products. Moving from the traditional oil storage terminal model, where there may be a limited number of different products and little in the way of product, to a multi-product, frequent product change terminal, requires a different strategy and operating plan. The terminal infrastructure also needs to be adapted to embrace the required flexibility to cope with multiple products, with simultaneous tank, rail, pipeline and truck operations. This typically means new capex investments in additional pipelines and pumps, along with automated control and monitoring systems so that individual tanks can be filled and emptied with a wider variety of liquid products. It is quite possible that energy transition may lead to a surplus of tanks and terminals, so 'survival of the fittest' will also likely be a major consideration to CEO's considering their strategic plan over the next decade and beyond.

What are the changes in demand that are likely to affect terminal capacity? The IEA forecast below puts this into perspective.

Changes in primary energy demand by fuel and region, 2019-2030



Source IEA

The biggest reduction in demand is likely to come from OECD countries and it will take longer for the lesser developed world to catch up.

The principal shift out of hydrocarbons will be towards electricity. The development of wind and solar is gathering pace and costs have been reduced dramatically from the earlier forecasts.

The key determinant of the speed of change will be the price placed on carbon emissions. A simplistic analogy is the price we pay for clearing our garbage should be reflected in the price of clearing the atmospheric garbage of carbon oxides. At present the price for emitting carbon is anywhere between $25 and $55 per tonne of carbon. This is too low to pay for the investment needed for carbon reduction unless a subsidy is paid to corporate investors.

Given that the electricity produced by wind and solar is intermittent, one of the major drives in R & D is how to store power effectively without creating massive demands on resources, such as mining for lithium and cobalt. The lithium-ion battery will perform a storage function in the near term but it is an unsustainable model long term.

A better method needs to be found and suggestions are currently working towards ammonia or hydrogen as a store of electricity. Both of these, if they prove effective could be outlets for storage installations.

The advantage that storage terminals have, be they coastal or inland, is that they are typically permitted to store toxic materials and it should be relatively easy to extend these permits to ammonia and other cooled liquids.

There are already in construction turbines based on stored liquid air. These plants can generate up to 50 MW of electricity and sustain it for a sufficient number of hours to act as 'batteries' for the grid. We foresee that these plants could be built on storage terminals in place of tanks so long as there is a relatively easy connection to the grid. The majority of terminals have grid connections.

Returning to the carbon price issue. We see this as the critical driver of all systems for decarbonising the atmosphere and we fervently hope that COP 26 comes up with a global pricing system that gives a financial incentive to all the above mitigating methods.

As we argue above, terminals need to get their planning process underway soon if they are to survive and we recommend that a net-zero-planning system be put in place to examine and explore the options so that funding can be gained from the major banks and financial institutions that currently are reluctant to finance anything that does not meet their ESG criteria.

Amongst the possible solutions we also list LPG, particularly in countries where cooking is done on charcoal (a tree destroying fuel).

The one outlet from hydrocarbons is almost certain to be the chemical industry. Chemical storage requires different handling criteria and these need to be explored.

As political changes occur it is going to take a regular monitoring of developments if terminals are not to be left behind.

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