

# MESD Webinar 2020: Reducing GHG Emissions for Singapore Harbour Craft

## Panel Discussion Q&A

- 1. Where will the expected MeOH supplies come from if methanol is used as the possible fuel source for maritime fuel in Singapore?**

Currently all major producers of bio and renewable methanol are located in North Europe and North America. However, fossil methanol (from natural gas) can be supplied worldwide.

- 2. Which are the fuel(s) that can meet IMO2050 targets and which are the fuel(s) that have the most potential and are feasible after taking the 7 crucial factors into consideration?**

Please refer to MESD Report "[Alternative Fuels for International Shipping](#)".

- 3. How about Fuel Cell for harbour craft?**

Fuel cell is projected as the future energy option for harbour craft. There are still barriers to overcome: cell capacity, cost, and the availability of suitable fuels.

- 4. Are there emissions regulations and tests administered for harbour craft? Meaning pollutants such as NO<sub>x</sub>, SO<sub>x</sub>, PM 2.5, etc? Or are there plans to implement regulations on this? For example, NO<sub>x</sub> contributes to global warming.**

The regulation will be studied. However, at the moment, the focus is to get the technology ready and all stakeholders on board. The limit for SO<sub>x</sub> emission has been set to be less than <0.1 %. NO<sub>x</sub> and PM<sub>2.5</sub> not yet regulated. NO<sub>x</sub> (NO & NO<sub>2</sub>) has no direct greenhouse effect, while N<sub>2</sub>O does.

- 5. Regarding the battery powered fleet of vehicles, what are the power requirements at MW scale? Are they charged manually or automatically?**

You could refer to the case studies in the [report](#) for power requirements.

For power requirements in MW, it is likely, due to safety, the vessels will be charged semi-auto or automatically.

- 6. For biodiesel, have scalability and 'fighting' with other industry been taken into account?**

Yes. The main competition for Biodiesel (FAME) is with land transportation.

- 7. Is zero shipboard emission the right approach when you are generating power in Singapore with fossil fuel? Considering that the electric propulsion losses are much higher compared to mechanical system, is it shifting emission from ship to shore?**

We consider the life cycle assessment of the GHG emission instead of tank to wake only. We agree that electrical propulsion shifts emission from ship to shore. However, the carbon footprint of the grid is generally lower, thus this shift is still meaningful.

- 8. Fast ferries and Marine Coast Guard vessels are high fuel consumers. Is there a plan to conduct a study on these vessels?**

Yes, they are included in our analysis of SP craft.

- 9. All the future green and blue alternate fuels Methanol, Ammonia, Synthetic Methane are tapping on the same green H2 produced by Solar/Wind. Based on the cost of production, which fuel is the most cost efficient to produce from Green H2?**

The production of green methanol and synthetic methane requires CO<sub>2</sub>. Considering the future source of CO<sub>2</sub> from direct air capture, we are of the opinion that ammonia would be the most cost efficient to produce. This is because nitrogen which is needed for ammonia production is more readily available in the air. In all instances, the source of the green H<sub>2</sub> is the same.

- 10. During the electrification of HC study and alternative fuels study, was the impact of cost studied in adoption of these solutions?**

The impact of cost is not studied in these reports. However, we noted the higher cost of alternative solutions, and there would be impact on the HC owners.

- 11. Given Singapore's investment into floating solar and existing work done for Autonomous Vessels, how do these 2 concepts gel in with harbour craft electrification (non-passenger carrying)?**

Floating solar was created to maximise the dead space on Singapore surface water. Autonomous vessels were developed to increase the safety and reduce the dependence on manpower. The convergence of two technologies could open up the opportunity for harbour craft electrification. Capability build-up of the technology would benefit the industry as well.

- 12. Can you elaborate more on MPA's Green Berths concept and what technology/solutions are being looked at present?**

The Green Berths initiative is to use green materials to build the berths in Jurong Port.

- 13. In this current challenging time, would cost continue to impact HC owners' decision to adopt a more sustainable fuel? Do HC owners expect their clients to fully appreciate the cost of implementing clean fuels?**

Many multinational companies have set sustainability targets (typically carbon emissions) over the next 30 years. In order to meet their targets their entire supply chain must likewise be aligned in the long run. In the short run, companies will find the most cost effective way to meet their sustainability targets and if reducing their carbon footprint through transitioning sustainable fuels or electrification can meet both criteria then it will be the way to go. It just means that we have to make sure that the solutions that are being developed needs to be commercially viable as well.

**14. Can renewable energy technology be applied on existing ship?**

Yes, but depends on the operating profile and power requirements of the vessels. Well-known demonstrations include wind and solar related technical measures,

**15. Is the GHG reduction by diesel-electric system based on real data or makers' claim? By preliminary calculation, it increases emission.**

The GHG reduction by diesel-electric is based on various literature sources. The benefit of diesel-electric propulsion is very much dependent on the vessels' power requirement.

**16. The Ports of Antwerp, Rotterdam and Copenhagen are making firm commitments to bunker a range of fuels for both large and smaller craft. Europe seems to be leading in alternative fuel policies, technology and production. And methanol is one of the front runners. Is Singapore tapping the expertise there to accelerate its plans?**

At SIBCON 2020, MPA signed the Memorandum of Cooperation (MoC) with Ports of Antwerp and Japan on Future Fuels Port Network. It needs cooperation between different ports to enable the transiting to a new fuel and it has to form a supply chain to develop a new fuel. It is important to learn from other ports on the experience and expertise.

**17. Some Singapore flagged vessels operating in Indonesia have reported fuel quality problems since the Indonesian government mandated biodiesel (20-30% biofuel content). Has this issue arisen in the biodiesel testing done thus far in Singapore?**

We are aware of such practice when it comes to biodiesel (FAME) blending. It is a less concern for B7 and less. For B20 and above, potential issues will arise if the user is not prepared. This is part of our ongoing study.

**18. Since Singapore HC have been using conventional system for decades, compared between hybrid and full electric HC, is there any information that indicates which is more feasible for Singapore HC?**

For short term, hybrid is more feasible for harbour craft with space to accommodate additional machinery. The choice of hybrid or full-electric also depends on the operating profiles of the HC. In our study, we suggest an in-depth understanding of the operating profile of each vessel type, before determining the alternate feasibility.

**19. Have you considered e-MGO for harbour craft? [e-MGO can be referred to the mid-distillates from pathways including Methanol-to-Synthetic Fuel or Power-to-Fischer Tropsch Fuels]**

We have not included e-MGO in our study. This may be explored in future study.

**20. Will SG be developing her own regulations and standards for HC electrification?**

Part of the recent grant call on Electrification of harbour craft, mentioned about looking into the interoperability of charging stations and existing standards. New business mode could be

explored too. In terms of regulation of HC, the baseline of the current HC operation performance which MESD is currently measuring would be very important.

**21. In term of decarbonising, would NH3 be a more feasible fuel than methanol since NH3 has no CO2 emission from tank to wake?**

From tank to wake perspective, ammonia is carbon free. To make it a truly zero-emission fuel, there is a need to address the CO2 emission during the production stage.