Methanol Institute Viewpoint – Gregory Dolan, CEO

"Methanol Takes on LNG for Future Marine Fuels"

On January 1st, a sea change occurred as ships entering within 200 miles of US, Canadian, Caribbean and northern European waters began to face a 0.1% fuel-sulfur limit. National and regional environmental agencies in these areas had established Emission Control Areas (ECAs) under pollution rules adopted by the International Maritime Organization (IMO), an agency of the United Nations. For shipowners, they can comply by shifting to low-sulfur marine gasoil (MGO) or marine diesel oil (MDO), but can expect a 50% increase in fuel costs. They can also install on-board emissions-scrubbing equipment and continue to use heavy fuel oil (HFO), but these technologies are complicated, costly, and unproven. Complicating the situation even further, new vessels build after January 1, 2016 will also have to meet stringent nitrogen oxide emission regulations if they want to enter or operate in the North American ECA. Simply taking the sulfur out of fuel oil will not allow shippers to comply with these NOx emissions.

For the existing fleet of some 100,000 commercial vessels plying the world's oceans, and the 2,000 new keels laid each year, the option of adding dual-fuel capability for diesel-LNG (liquefied natural gas) or diesel-methanol is increasingly seen as the smart course. While there are already some 50-60 ships using LNG as a bunker fuel, interest in the use of methanol fuel is quickly gaining speed.

First, let's look at the global efforts to demonstrate methanol as a marine engine fuel:

● From 2010 to 2014, two European programs – EffShip ("Efficient Shipping with Low Emissions") and SPIRETH ("Alcohol (Spirits) and Ethers as Marine Fuel) – identified methanol as an alternative fuel that could reduce emissions and improve the environmental performance of marine transport. The technology development work from these programs contributed to the IMO's draft IGF code (International Code of Safety for Ships using Gases or Low-Flashpoint Fuels) which governs the safe handling of LNG and methanol fuels on-board ships.

● In December 2013, Methanex Corporation, the world's largest methanol producer and distributor, announced an agreement with Mitsui OSK Lines (MOL) to build seven new 50,000 dead weight ton ships with MAN Diesel & Turbo's ME-LGI flex fuel engines running on methanol, fuel oil, marine diesel oil, or gas oil. The ships are being built for delivery next year by Japan's Minaminippon Shipbuilding Co., and South Korea's Hyundai Mipo Dockyards Ltd. The ships have been chartered by Canada's Waterfront Shipping Company, a subsidiary of Methanex.

● In January 2015, Lloyd's Register announced plans to design a whole new generation of cruise ships and ro-pax ferries powered by methanol ushering in a low-emission, fuel-efficient revolution in today's marine fleet. Partnering in the project are German shipyard Meyer Werft, German shipbuilder Flensburger-Schiffbau-Gesellschaft, and German methanol distributor HELM AG. Funded by the German government, designs for the new methanol ships will be developed over the next three years.

● On March 27th, the Swedish ferry operator Stena Line, will relaunch the *Stena Germanica* featuring the world's first dual-fuel methanol propulsion system. The 240-meter long, 1,500 passenger ro-pax ferry features four Wärtsilä engines, with one of the engines converted to methanol operation while in dry dock in Poland's Remontowa shipyard in January. Once the owner is satisfied, the other three engines will be converted one by one while the vessel is in service. Running on methanol, SOx emissions are expected to be cut by 99%, NOx by 60%, particulates by 95%, and CO2 by 25%. Funding of €11.2 million for the work was provided under the European Union's Trans-European Transport Networks (TEN-T) program.

The effort by Wärtsilä is particularly significant, as they are converting existing engines by adding a new fuel rail and injector system, while changing nothing inside the ship's engine. The ship operator simply presses a button on the bridge, and the fuel delivery system switches over from diesel to methanol operation in seconds. Existing ballast tanks on the Stena ferry are being used to store methanol fuel, with the addition of nitrogen blanketing to inert the methanol. The cost of conversion is estimated to be €300 per kilowatt of engine capacity, and these costs are comparable to adding a scrubber system. The addition of LNG dual-fuel capability is expected to be more than €1,000/kilowatt, with the need to install special storage facilities for the cryogenic fuel expected to be expensive and potentially impinging cargo or passenger space.

Methanol's cost advantage over LNG is not limited to the ship. Methanol is one of the most widely shipped chemical commodities in the world, with current global methanol demand of around 65 million metric tons per year. Much of this methanol supply is shipped from one continent to another, with the world's major shipping hubs handling hundreds of thousands of tons of methanol each year, and smaller ports handing thousands of tons. Since methanol can be stored in mild steel tanks and is already present at just about every chemical port/terminal, it would be very simple to make the infrastructure adjustments to offer methanol as a bunker fuel. By comparison, LNG projects will be much more capital intensive, complicated, and challenging from a safety perspective. LNG also has a tendency to allow methane to boil off, creating a potential carbon footprint concern. As a bonus, methanol is readily biodegradable and soluble in water, making it an environmentally friendly alternative to oil-based fuels.

On the supply side, global methanol production capacity exceeds 100 million tons, which provides an overhang of 20-40 million tons to meet marine fuel demand. While most methanol is made from the steam reformation of natural gas, methanol can be produced from a wide range of feedstocks, including coal, biomass, and even CO2. Methanol is a unique molecule that offers wide pathways to renewability that simply are not open to LNG.

As the lifecycle economics of using methanol compared with other emission compliance options becomes more evident, we will see the tide rising on the use of methanol as a marine engine fuel.