

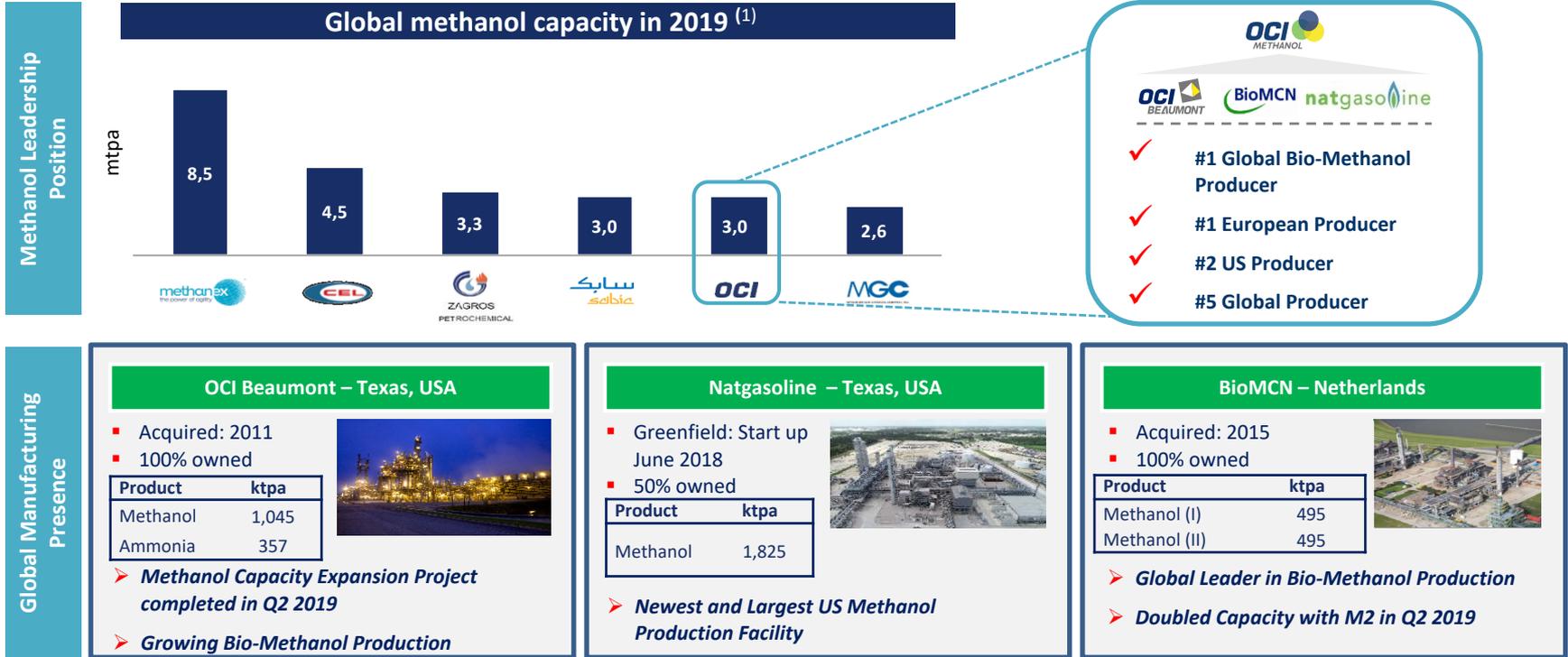


# **Bio-Methanol as a Building Block for the Chemical and Biofuel Industries**

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# OCI N.V. – A Methanol Industry Leader With A Global Asset Base



Source: Company information  
 1) All capacities adjusted for equity interest

# Bio-Methanol / Bio-MTBE

## Production Process



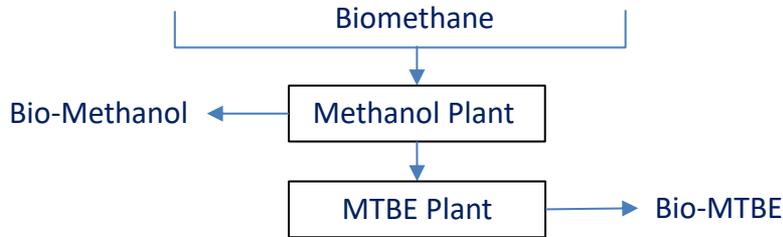
### Anaerobic Digester

Feedstocks include food waste, animal manure, sewage sludge, industrial organic waste



### Landfill Gas recovery plant

Feedstocks include municipal organic waste

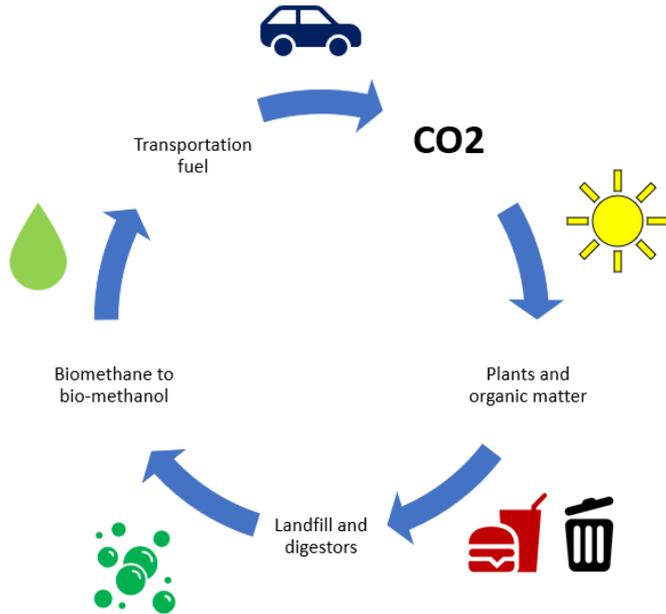


## Properties / Performance

- Methanol is a commodity chemical used to manufacture many consumer and industrial products and is used as a fuel source
- Using biomethane in the production process reduces the carbon intensity of the methanol produced
- Chemically, bio-methanol is identical to methanol
- Bio-methanol can be used as a feedstock to reduce the carbon intensity of other chemical products
- Bio-methanol produced from waste-based biomethane is a second generation, advanced and double-counting biofuel for petrol engines
- Bio-methanol has an energy density of 16 MJ/L as compared with ethanol at 21 MJ/L and petrol at 32 MJ/L
- Bio-MTBE has an energy density of 26 MJ/L as compared with ETBE at 27 MJ/L

# Bio-Methanol / Bio-MTBE

## Life Cycle Analysis



## OCI Bio-Methanol

- OCI produces bio-methanol at its production plants in the USA and the Netherlands principally from waste-based biomethane
- OCI works with several biomethane suppliers in the USA and EU including Shell, BP, EDF and Air Liquide
- All OCI bio-methanol for use in the chemical market is ISCC Plus certified and for use in the biofuel market is ISCC EU certified.** Audits of the entire supply chain are conducted by SGS, Dekra, and SCS Global.
- OCI bio-methanol for use in the biofuel market is produced with a 60% GHG savings versus fossil fuel, and we are pursuing opportunities to source biomethane from animal manure which would result in a negative carbon intensity product
- OCI produces a grade of bio-methanol with a higher GHG savings for the bio-MTBE market, and a lower GHG savings for the biodiesel market

# Growth Opportunities

## Petrol Fuel

- **Air quality is a growing concern** – following “dieselgate”, concerns about particulate matter, NOx and SOx pollution are driving new vehicle purchase decisions benefiting petrol vehicle sales. Ultra low emissions zones will be rolled out in cities across the EU perpetuating the “dirty” image of diesel vehicles.
- **Diesel car sales continue to decline** - diesel car sales in the UK dropped from 42% of new car sales in 2017, 32% in 2018 and 22% in 2019, while petrol car sales increased 53% of new car sales in 2017, 62% in 2018 and 65% in 2019.
- **EU RED II legislation aftermath** – first generation ethanol use is capped at 7% or less and cannot be the answer to decarbonize the petrol fleet. Fuel suppliers have few new biofuels to comply with the demands of RED II, other than bio-methanol and bio-MTBE. Potential for A20 fuel developed by Eni/FiatChrysler.

## ISCC Concerns

- **Mass balance is the most cost-effective chain of custody** – Physically mixing products with different sustainability characteristics but keeping them administratively separate is essential.
- **Biomethane cross boarder trade** – The mass balance system is an effective methodology to track biomethane trade across Member State borders.
- **<sup>14</sup>C measurement is not the answer** – the chain of custody system is the best way to prevent fraud and determine the bio-based content of fuel.
- **UCOME is often palm oil in disguise** – used palm oil must be segregated from the legitimate benefits of used cooking oil as a biodiesel feedstock

# Future Growth Opportunities

## Marine Shipping

- International marine shipping relies on heavy fuel oil (HFO) and annually consumes 300 mil tonnes
- New IMO regulations are driving change to reduce GHG emissions
- Although the cost of fuel remains the highest concern, technical, environmental and other aspects also affect fuel selection (biodiesel, LNG, etc.)
- Methanex has championed dual fuel engines designed to run on HFO at sea and methanol in regulated coastal areas
- Methanol reduces sulphur, nitrogen, particulate matter and carbon emissions when compared to conventional fuels
- **Methanol is cost competitive, globally available and easy to handle, transport, store and deliver**

## Biobased / Net Zero Products

- Governments, academics and social media are driving a fundamental change toward biobased products with sustainable production processes and net zero products which have no associated GHG emissions or have been offset.
- Methanol production results in carbon emissions. By utilizing biobased feedstocks, offset programs and theoretically carbon capture and storage, methanol can play an active role in the manufacture of biobased and net zero consumer and industrial products
- OCI is ready to deliver bio-methanol if the EU Green Deal proposes a mandate on biobased feedstock for industry

## Conclusion

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- **New advanced biofuels will emerge to challenge the status quo**
- **Bio-methanol and bio-MTBE are readily available liquid fuels to meet RED / RED II targets with an E5 petrol**
- **It is likely that diesel prices will rise due to higher biodiesel costs, while petrol prices will drop due to lower ethanol / bio-methanol costs**
- **Bio-methanol and bio-MTBE may be the best alternative for EU countries blending low levels or no ethanol in 2020**
- **E10 is not the only way forward. Alcohol fuels or GEM fuels may be the best option available to decarbonise the petrol fleet**
- **Marine fuel and biobased chemicals often future growth opportunities**