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Maritime Innovations in Green Technologies

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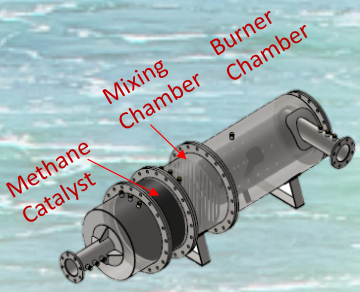
Nr. 4 Methane Catalyst for LNG Engines

Background:

Liquefied natural gas (LNG) is seen as a future-oriented fuel for ships.
By using LNG as fuel, emissions such as sulphur, particles and nitrogen oxides can be significantly reduced. During the combustion process in the gas engine, it can however happen that methane - the main component of LNG - escapes unburned. This is so called methane slip. Not only usable energy is lost, but methane also has a very strong greenhouse gas effect in the atmosphere. Emissions of unburned methane must therefore be prevented as far as possible in the LNG ship propulsion systems in the interests of climate protection. Advantages with regard to the environmental impact resulting from the use of LNG compared to conventional fuels can thus be reduced or even cancelled out by incomplete combustion of methane in the gas engines.

Content:

The objective of developing marine engine systems that release little or no methane in the exhaust gas is achieved through the use of catalytic converters. These catalysts have the task of converting the remaining methane in the exhaust gas into carbon dioxide and water. The catalyst must provide suitable conditions (e.g. temperatures, pressures, etc.) for the complete process of these chemical reactions. Based on experiences with soot filter systems for diesel engines, which are already working successfully with the „thermal regeneration" technology, the process for catalytic converters for methane oxidation should also be initiated by adding heat using the fuel available for the engine. Three catalysts have been studied in a catalytic converter installed behind an 200 kW industrial lean-burn gas engine. Light-off curves and degeneration behaviour of the catalysts have been studied under real exhaust gas conditions and compositions.



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Co-partner: FME POWERED BY DUTCH TECHNOLOGY

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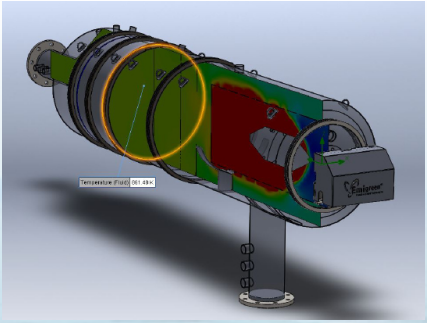
Results:

A prototype (Methane Catalyst) was built with the following specifications*:

- High activity in temperature range of the engine exhaust gasses between 300-450°C
- Under lean conditions containing high concentrations >6 vol.% of H_2O and ppm level SO_2 the catalysts showed remarkable resistance
- Complete oxidation of methane was measured at temperatures from 420°C
- The catalytic activity after 20 hours on stream could be regenerated for a large part with rich air-fuel ratios and elevated temperatures



- Sound attenuation of >30dBa was achieved. The catalyst can thus be installed in place of the conventional exhaust silencer

*all details with reservation

Advantages:

- **No methane slip by using LNG as fuel for lean-burn engines**
- **Improvement of the environmental balance**

The methane catalyst could be a future-oriented solution for methane slip and thus make the further use of LNG as alternative fuel in shipping even more attractive.

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