WP7: On-engine aftertreatment systems

Objectives

- Integration of SCR (Selective Catalytic Reduction) with the 4-stroke diesel engine and combining it with particulate emission (PM) abatement technology would enable to achieve more than 80% NOx emission reduction and 25% reduction in PM. Also a combination of integrated SCR and EGR (Exhaust Gas Recirculation) is to be developed. Feasible solutions of combining the above mentioned technologies having as a target the near zero emission engine are also studied.

- Integrating oxidation catalyst technology into gas engines will enable compact solutions to further reduce THC emissions. The objective is a catalytic system working with the engine and optimization of the engine performance. Also the knowledge on deactivation & regeneration strategies for integrated catalyst solutions and methane formation and location in the engine exhaust system should increase. Target is a greenhouse gas emission decrease up to 15% and fuel savings up to 5%.

WP Leader: Jukka Leinonen

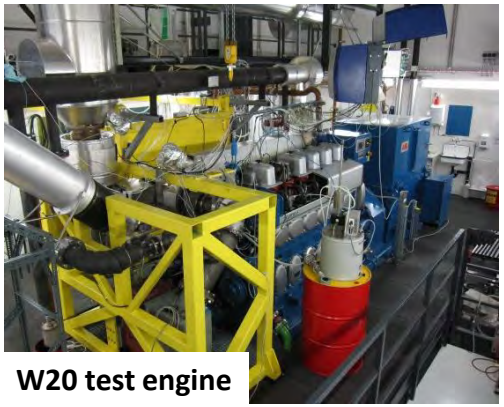
Partners: WÄRTSILÄ, VTT, Vaasan yliopisto UNIVERSITY OF VAASA, PAUL SCHERRER INSTITUT PSI

Subprojects

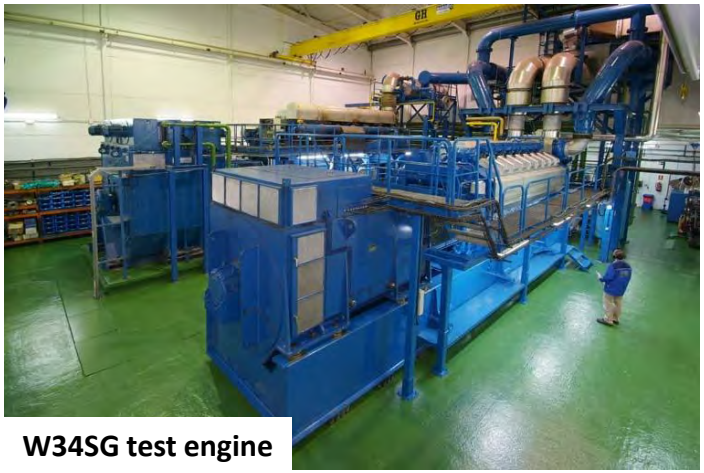
- 7.1 Combined on-engine aftertreatment solutions for 4-stroke diesel engines
- 7.2 SCR reduction agent injection solutions
- 7.3 Integration of methane and ethane abatement technology with gas engines
- 7.4 Emission measurement systems for integrated after treatment technologies

Progress update

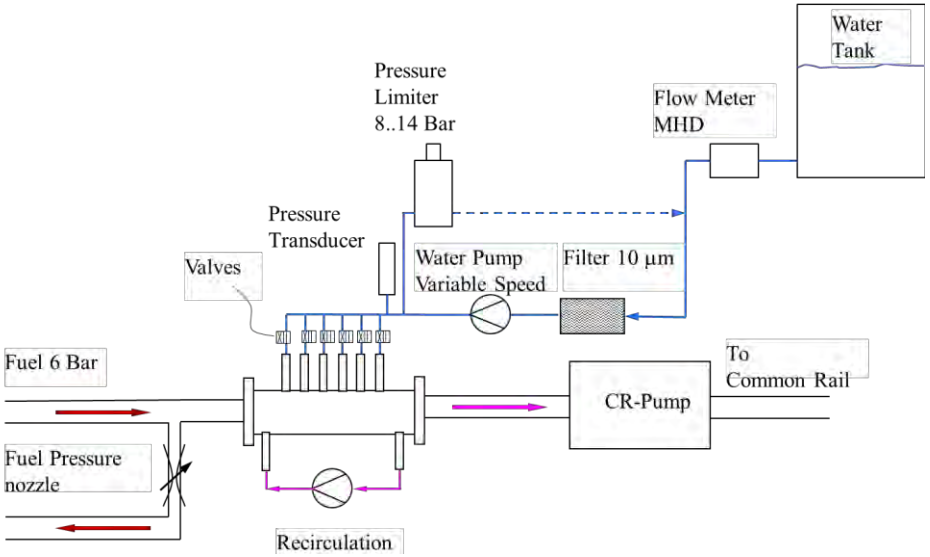
- PSI, Activities are ongoing as planned. Installation for W20 tests are ongoing and planned tests will be done on schedule
- WFI, Planning of activities are ongoing with partners. PM measurement test preparations are on schedule.
- WSP, Planning of activities for Feasibility and demonstration of integrated methane abatement with gas engines are ongoing with partners.
- UV, Activities are ongoing as planned. Literature reviews regarding SCR integration with engine, PM abatement and PM filters are started.
- VTT, Planning development and testing of emission measurement systems are ongoing with partners.



W20 test engine



W34SG test engine



Scheme of fuel emulsion system

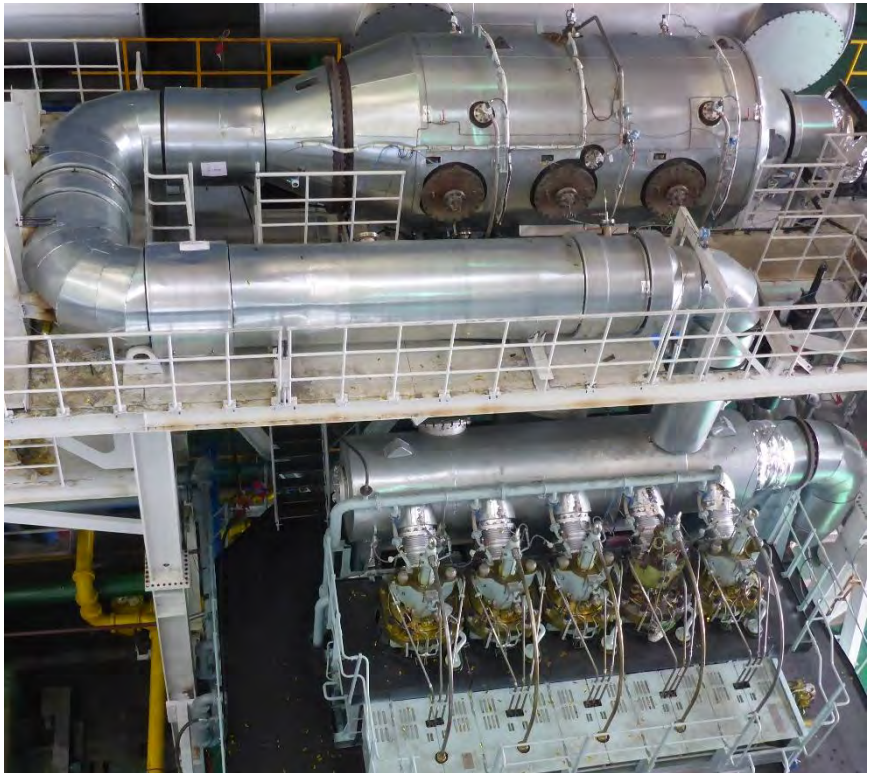
Deliverables and Plan for future work

- Literature review regarding SCR engine integration and particulate abatement.
- Emission measurement systems to support integrated after-treatment technologies
- Experimental assessment of integration of methane abatement technology into gas engine structure
- Experimental assessment of SCR reduction agent injection systems with sensors for feedback control

Objectives

WP deputy: Daniel Peitz

Development of key technology for integration of the currently separated SCR aftertreatment into existing 2-stroke engine structure, which enables widespread installation of SCR systems on all ship types and additionally increase overall NOx removal efficiency above 80%, reduce overall hydrocarbon emissions (HCs) by 50% or more, reduce PM emissions and lead to potential fuel savings of up to 5%.



WinGD pre-turbocharger SCR system

Subproject

7.5 Robust catalysts for pre-turbo SCR

Partners: WinGD Winterthur Gas & Diesel, dinex ECOCAT Fresh Ideas - Cleaner Future, Johnson Matthey, Paul Scherrer Institut PSI

Progress update

- WinGD, Activities are ongoing as planned. Measurements of vibrations on engines in the field and test cycle definition.
- Dinex Ecocat, Activities are ongoing as planned. Prototype catalyst supports currently manufactured, vibration testing in November.
- Johnson Matthey, Activities are ongoing as planned. Catalysts in production, testing will be done in December.
- PSI, Planning of activities are ongoing. Measurement of catalyst activity and deactivation.

Prototype metallic support for SCR catalyst

Vibration test setup for extruded SCR catalyst

Measurement of vibrations on engines in the field

Deliverables and Plan for future work

- Production of SCR catalyst, vibration testing according to supplied test cycle.
- Production of SCR catalysts in canning, vibration testing according to supplied test cycle.
- Laboratory testing of catalyst performance and catalyst deactivation assessment.
- Vibration testing of prototype SCR catalysts on engines operating in the field.