

# WP8: Engine Integrated SCR and combined DPF and SCR

## Objectives

### Engine Integrated SCR

- Investigation of High Pressure SCR process; injection, mixing, decomposition and flow distribution with the aim of making the SCR components compact while still maintaining the same high performance as best available technology today
- Designing of engine integrated High Pressure SCR with system with unaffected engine footprint and only slightly affected gallery arrangement around the engine
- Testing of compact High Pressure SCR component performance on 4T50ME-X test engine

### Combined DPF and SCR

- 80% PM reduction with after-treatment system (based on IMO Tier II engine out emissions)
- 80 % NOx reduction with after-treatment system to reach IMO Tier III limits
- Reduce the necessary installation space for after-treatment system SCR on DPF within IMO Tier III (SCR only) system
- Adaption and integration of the after-treatment system (SCR on DPF) on a marine Diesel engine



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## Partners

- LUH: Leibniz University Hannover (Hannover)
- DTU: Technical University of Denmark (Copenhagen)
- MDT: MAN Diesel & Turbo

## Roles

- LUH: Test rig for investigation of urea injection and decomposition
- DTU: Investigations of SCR mixing and flow distribution.  
Development of mechanism for  $\text{NH}_3$  measurements.
- MDT-CPH: Compact mixer, Integrated SCR design and  $\text{NH}_3$ -slip investigation.
- MDT-Aug: Catalyst coating and filter test bed. Selection & design of SCR on DPF prototype. Modelling of urea injection and decomposition.

# WP8.1: Engine Integrated SCR for diesel engines

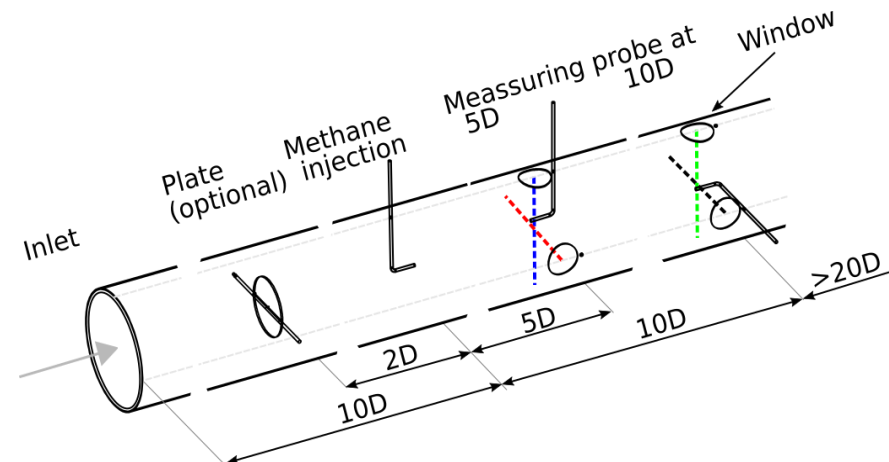
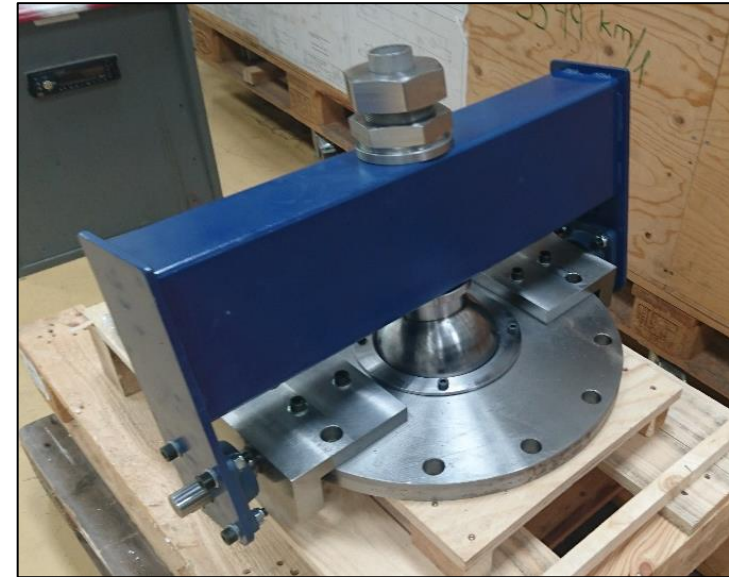
## Measurement equipment for mixing and flow distribution

### Progress update

- Traverse mechanism is ready for testing
- Flow experiments done with/without mixer plate, CFD calculation.

### Future tasks

- Test on 4T50ME-X engine
- Flow expansion experiments and compare with CFD



# WP8.1: Engine Integrated SCR for diesel engines

## NH<sub>3</sub>-slip investigation, compact SCR mixer, Integrated SCR design

### Progress update

- NH<sub>3</sub> slip measurements performed. Control strategy updated and implemented
- Urea Injection study on-going
- Mini SCR commissioned, first test performed
- Integrated SCR design specified

### Future tasks

- Urea mixing/evaporator study (mini SCR)
- Design integrated SCR for 4T50ME-X

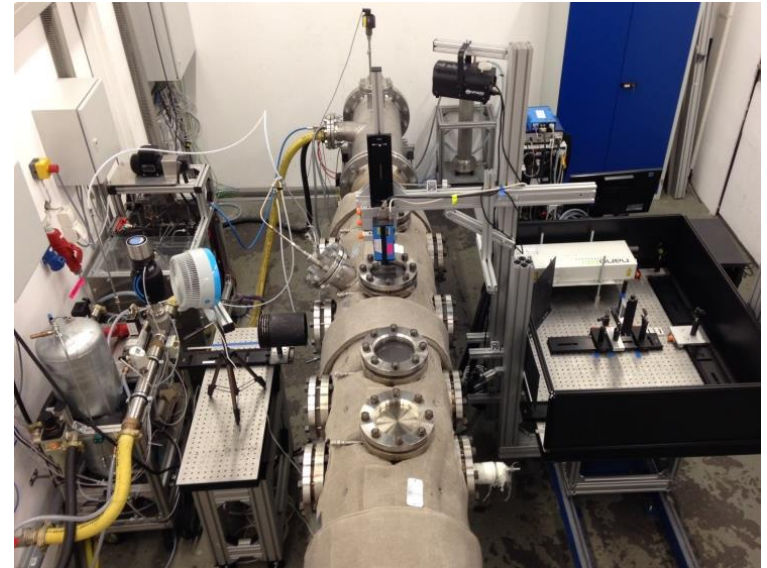


Mini SCR

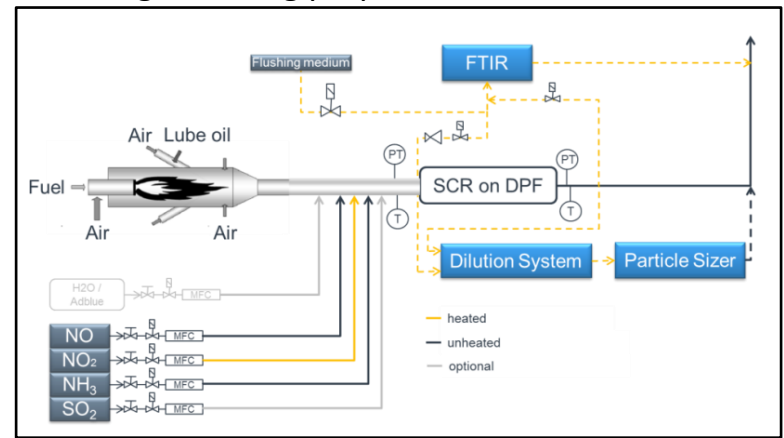
## WP8.2: Combined SCR and DPF

### Main results achieved during 1<sup>st</sup> period of the project

- Set-up of hot gas test rig completed and successfully tested (M44)
- Parameter study for validation of urea decomposition for different pressure and temperature conditions completed (M45)
- Design and procurement of synthetic gas test bed including particulate matter generation and characterisation
- Specification and procurement SCR coated Diesel particulate filters
- Investigation of SCR coated DPF samples by a pre-defined characterization test program



Hot gas test rig prepared for measurements

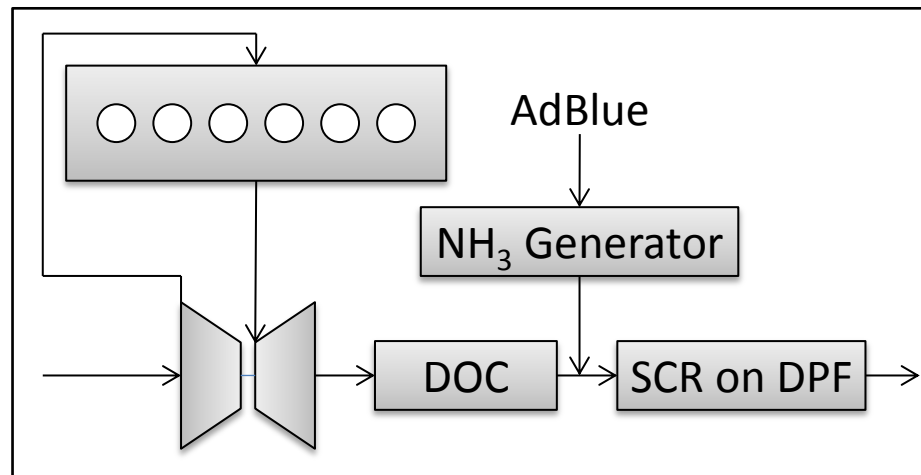


Synthetic gas test bed for filter testing

## WP8.2: Combined SCR and DPF

### Future Work

- Studying influence of mixing elements on urea decomposition
- Design and study of alternative and improved set-ups
- Build-up of synthetic gas test bed
- Ongoing characterisation and investigation of SCR on DPF samples
- Particulate measurement data base
- Pre-tests of EAT system components on engine test bed



High speed engine with SCR on DPF after-treatment system