

## WP 7 On-engine aftertreatment systems



- Integration of SCR (Selective Catalytic Reduction) with the existing strong Miller cycle 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 methane and ethane abatement technology into lean burn 4-stroke gas engines will enable compact solutions to reduce methane and ethane slip. 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%.
- Development of key technology for integration of the currently separated SCR after treatment into existing 2stroke 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%.





## **EXPECTED OUTCOME**

- Literature review regarding SCR engine integration and particulate abatement.
- Emission measurement systems for SO3, NH3 and PM emissions to support integrated after-treatment technologies
- Experimental assessment of integration of methane abatement technology into gas engine structure
- Concept about catalyst aging from in-field monitoring and laboratory experiments
- Experimental assessment of SCR reduction agent injection systems with sensors for feedback control
- Experimental assessment of selected combined on-engine emission reduction system for strong Miller cycle 4-stroke diesel engines with tests on rig/engine
- Pressure Limiter 8..14 Bar MHD Pressure Transducer Valves Fuel 6 Bar Fuel Pressure Nation Fuel Pressure Recirculation



Scheme of fuel emulsion system

**Emulsion mixer** 

Robust SCR catalysts for 2-stroke Diesel engines

## **PROGRESS AND PLANS**

	GANT	CHART: W	/P 7 On-eng	ine	aft	ert	rea	tm	ent	sy	ste	ms																			
SUB-PROJECT TITLE ACTIVITIES	ACTIVITIES			1ST YEAR										2ND YEAR								3RD YEAR									
				1	2 3	4	5	6	7 8	9	10 1	11 1:	1	2	3 4	5	6	7	8 9	9 1(	0 11	12	1 2	2 3	4	5 (	5 7	8	9 10	11	1
		Partner	PM	1	2 3	4	5	6	78	9	10 1	1 12	13	14 1	5 16	6 17	18	19 2	20 2	1 2	2 23	24	25 2	6 27	28	29 3	0 31	32	33 34	35	3
7.1 combined on-engine Intertreatment solutions for 4- stroke diesel engines	7.1.1 Literature review regarding SCR integration with engine.	VAASAY	6																												
	7.1.2 Literature review regarding particulate abatement including particulate filters.	VAASAY	6																												
	7.1.3 Feasibility and demonstration of particulate filters with tests on test rig/engine.	VAASAY	8																									Π		$\square$	
	7.1.4 Feasibility and demonstration of NOx and particulate reduction with tests on test engine.	PSI	12																												
	7.1.5 Feasibility and demonstration of selected optimum set-up for the combined on-engine aftertreatment solution with tests on test ria/engine.	WFI	16																												
7.2 SCR reduction agent injection solutions	7.2.1 Reduction agent injection in SCR: Modeling of spray, evaporation and reforming to gaseous NH3.	WFI	10										Π															Π		Π	
	7.2.2 Development of control strategies, dosing system for reducing agent and sensors for feedback control.	WFI	11																												
	7.2.3 Feasibility and demonstration of new reduction agent injection systems.	VAASAY	7																												
7.3 Integration of methane abatement technology with gas engines	7.3.1 Feasibility and demonstration of methane catalyst elements.	VAASAY	8																												
	7.3.2 Design for integrated methane abatement technology for gas engine structure.	WFI	15																												
	7.3.3 Feasibility and demonstration with tests on test engine.	WES	45																												
7.4 Emission measurement systems	7 4 1 NH3 measurements	VIT	12															T		T			T								Ĩ





Water

Vibration test setup for SCR catalysts







Metallic supported and extruded SCR catalyst

## WP PARTICIPANTS

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