Heavy Duty Gas Engines integrated into Vehicles

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Project partners:
1 - AVL - AVL List GmbH - AT
2 - BWR - Borgwarner Ludwigsburg GmbH - DE
3 - BOSCH - Robert Bosch GmbH - DE
4 - DAI - Daimler AG - DE
5 - DINEX - Dinex Ecocat OY - DK
6 - FPT - FPT Industrial S.p.A. - IT
7 - IDIADA - Idiada Automotive Technology S.A.- ES
8 - IVECO - Iveco Espana SL - ES
9 - MAN - MAN Truck & Bus AG - DE
10 - POLIMI - Politecnico di Milano - IT
11 - RCD - Ricardo UK Limited - UK
12 - SAG - SAG Motion GmbH - AT
13 - TNO - Nederlands organisatie voor toegepast natuurwetenschappelijk onderzoek - NL
14 - TUG - Technische Universiteat Graz - AT
15 - UEF - ITA-Suomen Ylipisto (University of Eastern Finland) - FI
16 - UASE - Hochschule Esslingen - DE
17 - UNR - Uniresearch BV - NL
18 - VOLVO - Volvo Technology AB - SE
19 - VIF - Virtual Vehicle Research Center - AT

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Executive summary

SAG delivers tank system prototypes to the project partners MAN (Tank system with low pressure pump) and Iveco (Tank system with medium pressure pump).

Both tank systems consist of the following components:

(1) Base tank: Double walled stainless steel tank with Vacuum Multi-Layer Insulation and a specially designed pump socket to provide the possibility to mount a cryogenic pump
(2) Cryogenic Pump: Cryogenic Pump including drive and Control system
(3) Plumbing: Heat Exchanger, valves, couplings and piping to ensure sufficient fluid flow and preparation acc. To the engine specifications. All components are directly mounted on the tank system

The tank system with low pressure pump is using a Cryogenic Piston pump driven by a linear electric drive. The complete system including the electrical control unit was developed specifically for the HDGAS requirements. The pump is designed to realize a differential pressure of 12 bar with a mass flow of 75kg/h.

The tank system with medium pressure pump is using a cryogenic piston pump driven by a hydraulic piston. The design of the LNG pump including the hydraulic drive was developed specifically for the HDGAS requirements. The pump is designed to realize a differential pressure of 65bars with a mass flow of 100kg/h.

Both systems were tested on the SAG pump test bench, where the functionality of the pump systems could be confirmed. These tests were done with liquid nitrogen.

The systems are designed in a way to meet the requirements of ECE R110, however they do not have the certificate due to the need of using non certificated components in the plumbing system and for the pumps. To ensure that an ECE certification could be achieved for the tank system, SAG performed a drop test and a bonfire test according to the ECE R110 guidelines. Furthermore there was done a shake test with measured vibration signals to ensure that the life length strength of the tank system is sufficient.

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