BEAUTY

Bio-ethanol engine for advanced urban transport by light commercial & heavy-duty captive fleets

Motivation and Objectives

Motivation: Promotion of the use of bio-fuels by the development of dedicated solutions (engines, combustion technologies and fuels) based on the use of bio-ethanol for local fleets in the urban environment.

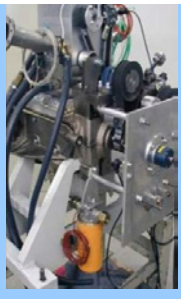
Objective of the project is to define, in a 2 years programme, engine solutions based on three different technology concepts meeting ambitious targets in terms of:

- Future emission limits (Euro 6),
- Fuel conversion efficiency (at least 10% higher than that of a contemporary Spark Ignition (SI) engine running on equivalent bio-ethanol blends),
- Cold startability down to -15°C of ambient temperature.

The solutions have been developed starting from existing powertrains and focusing on dedicated components and materials according to the given technological approach.

Project Plan, Milestones and Deliverables

TC stoichio HD
TW1



Surface Ignition Diesel
TW2

Controlled Auto Ignition
TW3

Technical Approach

The development of engine technologies has covered different combustion approaches:

- Stoichiometric TC SI engine for HD applications,
- Surface Ignition Diesel engine for LD applications,
- Controlled Auto-Ignition (CAI) TC SI engine for LD applications.

Due to the specific combustion systems, different fuel compositions have to be used not only in terms of gross bio-ethanol content, but also in terms of hydrocarbon composition, volatility, octane number, etc.

Experimental activities have been coupled to life cycle analysis that will consider the entire impact of both 1st and 2nd generation bio-ethanol chains including contributions from Direct Land Use Change (DLUC).

Achievements

WP0: Well to Tank analysis on 1st and 2nd generation bio-ethanol chains including assessment of different use of heat/energy recovery including DLUC contribution;
Well to Wheel simulation on NEDC and on "Real Life" testing conditions.

WP1: Development of a dedicated fuel injection system and cold start electrical device;
Prototype engine with compression ratio optimized for E100.

WP2: Development of the combustion chamber for Diesel/ethanol blend characterization.
Experimental activity on Single Cylinder engines to determine boundary condition for Diesel like combustion approach: possible use of Diesel blends containing up to 30% E85.

WP3: Development of the combustion code for Controlled Auto-Ignition process simulation.
Experimental activities on Single Cylinder engines to determine influence of fuel parameters on combustion stability, fuel efficiency and pollutant formation. Operation under full load conditions on the Multi Cylinder engine showed good potential for increasing engine efficiency with E85.

WP4: Influence of low ethanol blend on combustion and particulate number on Multi Cylinder SI engine.

Budget	6.15 M€	Funding	2.97 M€
Duration	24 + 4 month prolongation	Start	January 2009
DG	Research / SST	Contract n°	218512
Coordinator	Andrea Gerini, CRF	Contact	andrea.gerini@fptpowertrain.crf.it
Partners	CRF, Daimler, FEV, AVL, CNR-IM, RWTH, WUT, E4TECH, EMRE (US)		

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SEVENTH FRAMEWORK PROGRAMME