The Future of Powertrain Technology

Automotive News Europe – New Powertrain Technologies Conference
Amsterdam – March 27 – 28, 2007

Rinaldo Rinolfi
Executive Vice-President – FPT Powertrain Research & Technology
Drivers of the Engine Technology in the Next Decade (2010 – 2020)

- **Environmental Requirements**
  - Reduction of Diesel Particulate and NO\textsubscript{x} emissions down to the gasoline levels (“Fuel neutral emissions”).
  - Need for ultra-low emissions for urban vehicles in critical metropolitan areas.

- **Fuel consumption and CO\textsubscript{2} emissions reduction** under the pressure of both regulation (European CAFE) and market (fuel cost).

- **Performance and driveability improvement** (“fun-to-drive”)
  - Emphasis on increase of dynamic low-rpm Torque rather than high-rpm Power.
Diesel Engine Towards Fuel Neutral Emissions

Diesel Particulate Filter Becomes Standard

Under Floor DPF

Close Coupled DPF

- Pre-Cat
- Front Cat
- Catalysed DPF

- Turbine
- Front Cat
- Catalysed DPF
Diesel Engine Towards Fuel Neutral Emissions

Breakthrough Technologies for NO\textsubscript{x} Reduction

New Common Rail Technology for Modular Injection

Ultracooled & Clean EGR (Low Pressure EGR)

Electronic VVA for Transient EGR Control
The hybrid technology gives a consistent fuel consumption reduction in the urban missions, but with a very high add-on cost.

City delivery vans and buses are the most promising application for Diesel hybrid propulsion.
Spark Ignition Engine Strikes Back

Turbocharging for Fun-to-Drive

Electronic Valve Control for Fuel Economy

FIRE 1.4 Turbo

FIRE 1.4 Turbo Multiair
Radical Downsizing for Diesel-like CO$_2$ Levels

0.9 litre Twin-Cylinder Multiair Turbo Engine

- Power: 105 Hp
- Torque max: 155 Nm
- Fuel Economy: +20%
Ultra-Low Emission Propulsion for Urban Transportation

The Spark Ignition Natural Gas engine is the only realistic and industrially available solution in the medium term.

The progressive introduction of Natural Gas – Hydrogen mixtures on public transportation fleets is a natural bridge towards Hydrogen propulsion in the long term.
The Powertrain Technology Road Map

- **H₂-CNG TC - EVC**
- **CNG PFI TC - EVC**
- **CNG PFI EVC**
- **Gasoline PFI / GDI TC - EVC**
- **Gasoline PFI EVC**
- **Gasoline PFI**
- **CNG PFI**
- **Diesel HYBRID**
- **Diesel MODULAR INJECTION L.P. EGR + DPF (+EVC)**
- **Diesel MULTIJET + DPF**
- **Euro 6 Diesel**
- **Euro 5 Diesel**

- NOx Emission [g/km]
  - 0.020
  - 0.040
  - 0.060
- CO₂ Emission Reduction (%)
  - 0
  - 10
  - 20
  - 30
  - 40
  - 50
  - 60