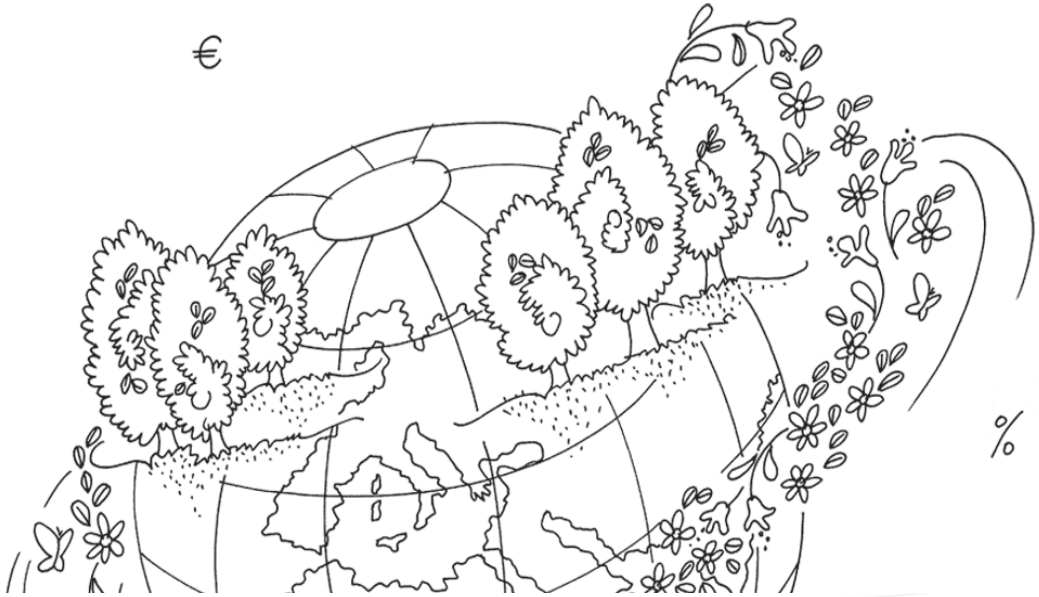
LANDIRENZO®



# Clean Cities Transportation

March 30-31, 2011

Workshop for Almaty

## LANDI RENZO GROUP

## Solution for transportation energy

Gert-Jan Rap

Revision 5
23-03-2011

# *Agenda*

- **Landi Renzo Introduction**
- **OEM Projects**
- **R&D Highlights**
- **Gas Systems Trends**
- **Typical CNG System**
- **New Technologies**

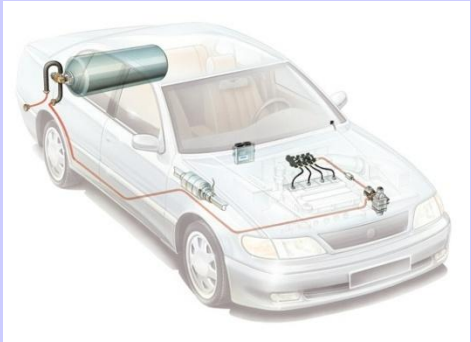
# History of the Group

| | |
|---|---|
| **1954** | Renzo Landi, father of the current owner, founds "Officine Meccaniche Renzo Landi", producing systems for conversion of vehicles to run on gas |
| **1960s** | Sells products directly to *installers* and establishes a sales network in Italy |
| **1963–64** | International expansion as products are exported to Europe and Asia, and subsequently to South America |
| **1965** | Begins to outsource manufacturing, but *retains R&D activities and assembly* |
| **1968** | Introduction of Renzomatic, a pressure reducer for LPG conversion. First product in the market to electronically control the "idle speed" condition |
| **1978** | Corporate reorganisation as Landi Renzo S.r.L, which controls the company's subsidiaries, is formed |
| **1980s** | Further evolution of business model as company uses distributors to deal with end-market installers |
| | Introduction of TN1, the first pressure reducer operated electronically |
| **1990s** | Acquired 70% of *Eurogas Holding BV* in 1995, a Dutch company operating in the same sector. Then in 1999 it formed a Polish subsidiary, Landi Renzo *Polska* |
| | Acquisition of *MED S.p.*A., a specialist in gas valves and car alarm systems to improve electronic capabilities |
| **2001** | After receiving **ISO 9001** certification (1996), the Company was the first in the industry to obtain **ISO/TS 16949** certification for automotive high quality standards |
| | Production facility opened in *Brazil* |
| | Subsidiary opened in *China* |
| **2003** | Subsidiary opened in *Pakistan* (includes production facility) |
| **2005** | Subsidiary opened in *Iran* |
| **2007** | *Stock Exchange quotation* |
| **2008** | ***Lovato Acquisition*** |
| **2009** | Subsidiary opened in *Romania* |
| **2010** | Subsidiary opened in *India* and *USA,* |
| | ***Acquisition of AEB*** |

# Highligts

- **World leader** in **CNG** and **LPG** fuel systems for Cars – LCV - Buses
- Presence in more than **50 countries**
- **14** Subsidiaries
- Two main business channels: **Aftermarket & OEM**
- **1040** Employees
- **Stock exchange** Quotation (2007)
- Landi Renzo focussed on **R&D** and **Distribution**

## Complete System



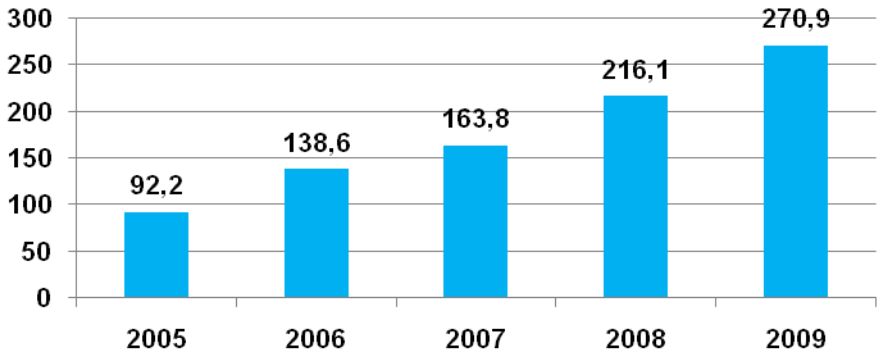
## Components

**CNG Reducers**

**Electronic Control Unit**

**LPG Reducers**

**LPG / CNG Injectors**



# Geographical footprint

Product presence
Distribution
Assembly, testing, and packaging

Italy

Italy, Lovato

Netherlands

Poland

China

Romania

Venezuela

LANDI RENZO USA

Pakistan

Brazil

BAYTECH
CORPORATION

Italy (MED)

Iran

India

LANDIRENZO
INDIA

AEB
TECHNOLOGIES

# Lovato Company Profile: Overview

- LPG & CNG systems & Components
- Active worldwide
- Since October 2008 Lovato is part of the LANDI RENZO GROUP

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# Landi Renzo OEM Business Model

LANDIRENZO
L'alternativa in movimento

1 **Turnkey projects ready to run**

2 **Industrial approach**

3 **High quality solutions offered to competitive price**

4 **After-sales**

# OEM Alternative Fuel Vehicle Partnerships

| | Developed Markets | Emerging Markets |
|---|---|---|
| Cars | FIAT GROUP, GM, TOYOTA, PSA PEUGEOT CITROËN, RENAULT, VW Group, NISSAN, Mercedes-Benz, OPEL, CHEVROLET, DAIHATSU | MARUTI SUZUKI, INDUS, SAIC, SUZUKI, VW Group, NISSAN, TATA, RENAULT, ADAM Daring to Innovate, SAIPA, NEXUS, Brilliance China Automotive Holdings Limited, IRAN KHODRO INDUSTRIAL GROUP |
| LCVs | irisbus, TOYOTA | CHRYSLER, Mahindra & Mahindra, Ashok Leyland |

# Focus on main project

| | Italy | Europe | Asia | South America |
|---|---|---|---|---|
| **Fiat** | LPG | | | |
| **Renault** | LPG | | CNG | CNG |
| **Dacia** | LPG | | CNG | |
| **GM (Opel)** | LPG | LPG / CNG | CNG | |
| **VW - Seat - Skoda** | LPG | | | |
| **Nissan** | LPG | | | |
| **Toyota** | LPG | | CNG | CNG |
| **Dahiatsu** | LPG | | | CNG |
| **Suzuky** | LPG | | CNG | |
| **PSA - CITROEN** | LPG / CNG | | | |
| **CHRYSLER** | | | | CNG |
| **BMW** | LPG | | | |
| **Daimler** | CNG | | | |

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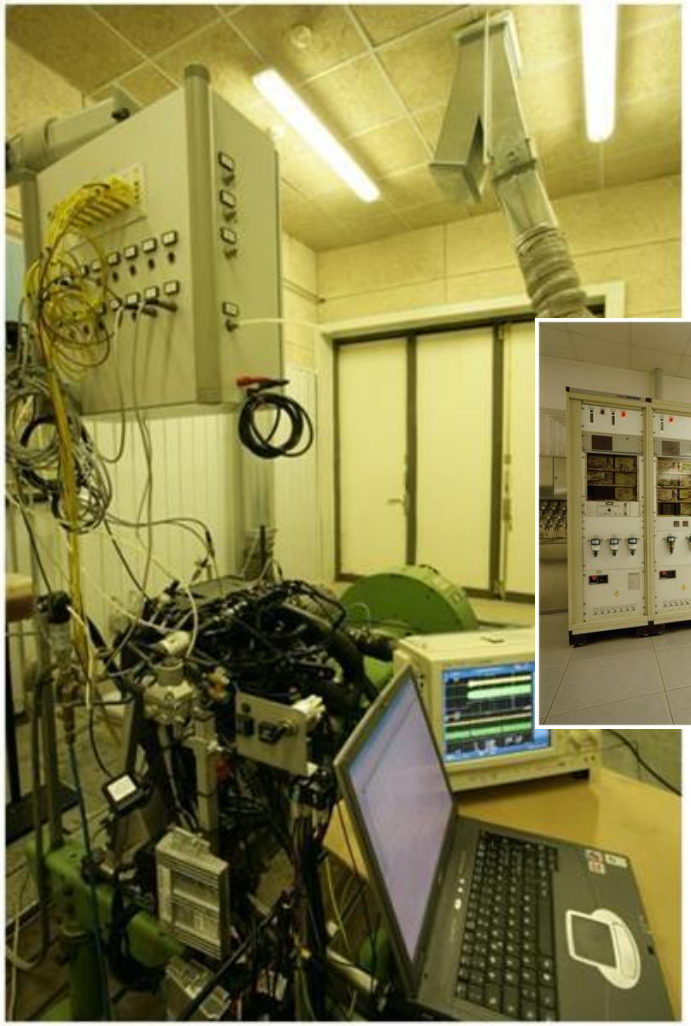
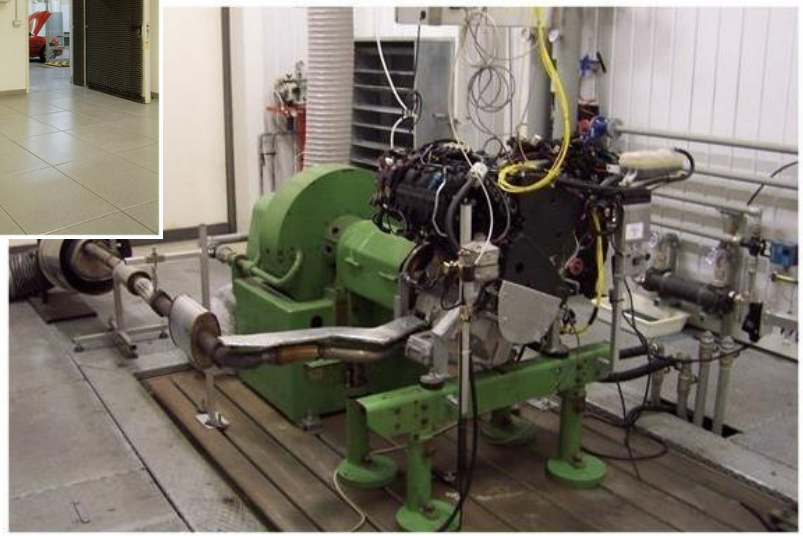
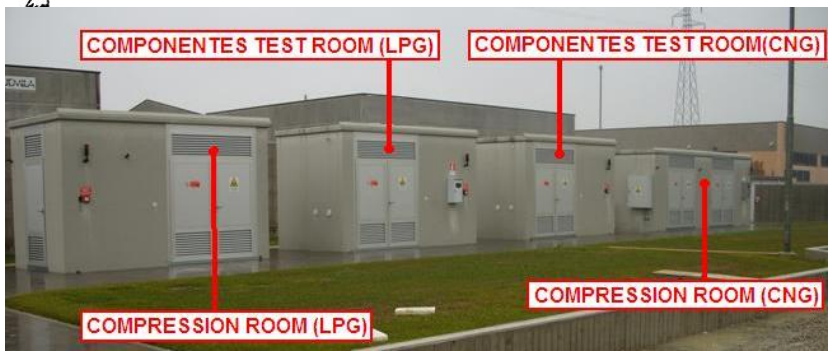
# Emissions & Performance LABS

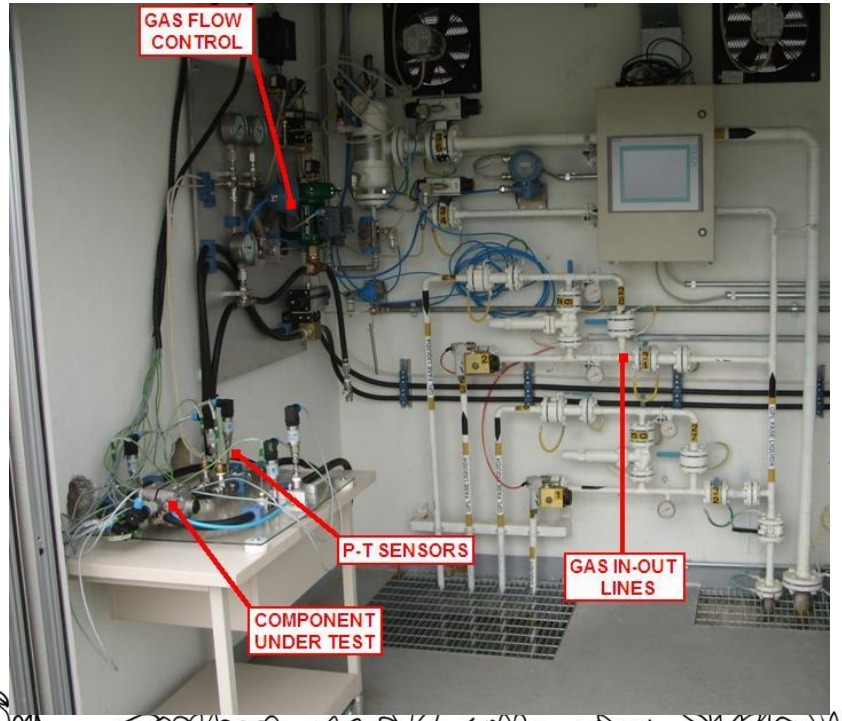




**Top level Testing facilities at three sites in Italy**

# Components Testing Facilities with real-gas




## CNG / LPG COMPONENTS TEST BENCH

**Advanced Testing Facilities:**

- Components tested with real gas
- Different gas blends and gas conditioning

## H2 COMPONENTS TEST BENCH:

- Available in new technical centre

# New R&D Center

- 4 Dynamic Engine test cell
- 2 Climatic/Emission Roller Benches
- 1 Chassys Dynomometer
- Mechanical Proto Lab
- Electronic Lab

# Injectors Assembly Line

**Highly automated production lines**

# *Agenda*

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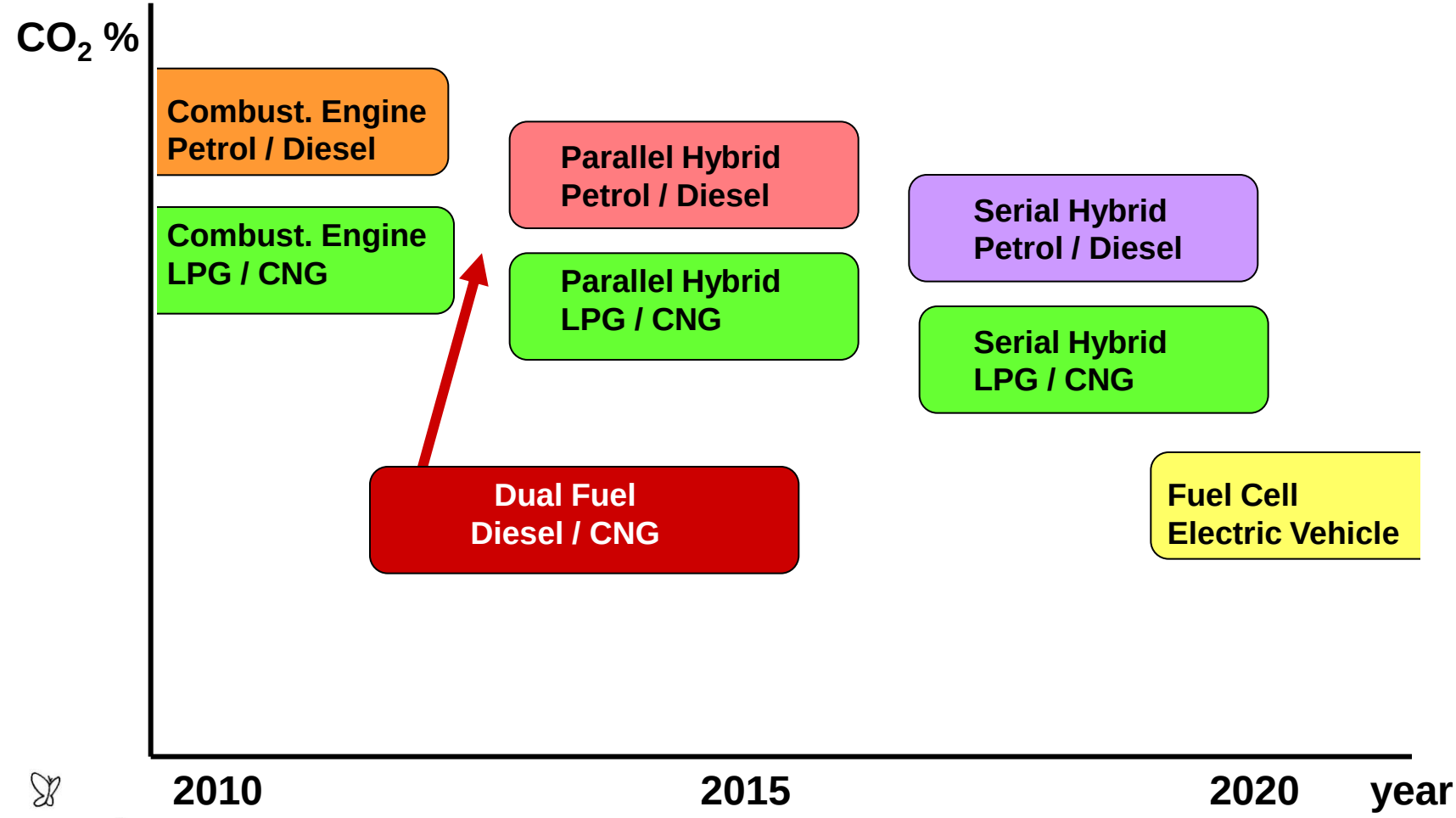
# Trends in Powertrains / Fuels



# *Agenda*

- **Landi Renzo Introduction**
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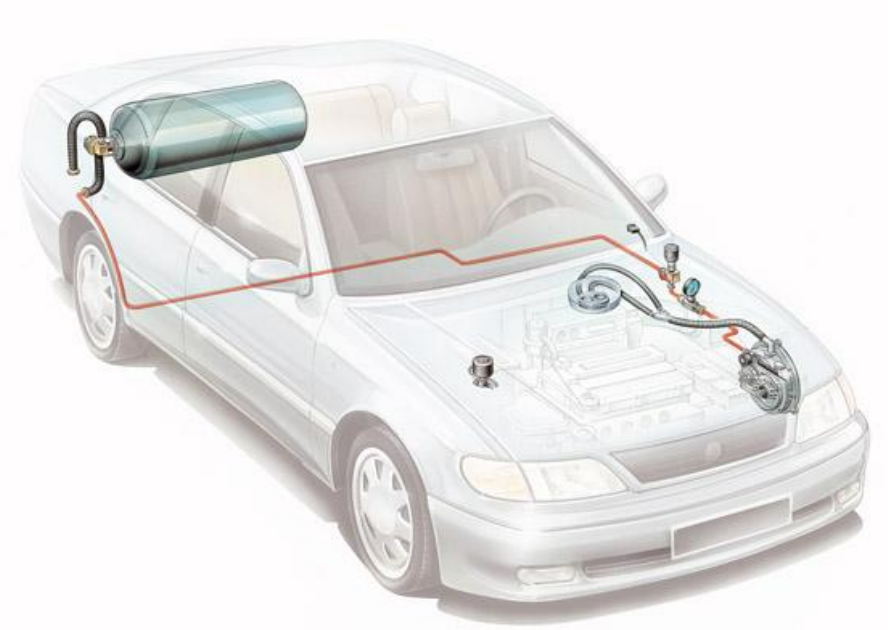
# *Landi Systems Overview*

- **Landi designs and produces "ready to go" CNG systems covering :**
  - ✓ **OEM and aftermarket installation.**
  - ✓ **Any type of alternative fuel from LPG to CNG and CNG-Hydrogen mixture.**

- **CNG system is installed "additionally to" existing petrol system.**

- **Focus :**
  - **optimised installation process**
  - **engine endurance**
  - **vehicle performance**
  - **exhaust emissions**



# Обзор систем КПГ

- **Системы КПГ состоят, преимущетсвенно, из следующих компонентов:**

- ✓ **Горловина бака**
- ✓ **Резервуар КПГ (1 или более)**
- ✓ **Система труб**
- ✓ **Редуктор давления**
- ✓ **Распределитель с ручным / электромагнитным управлением**
- ✓ **Воздушно-топливный смеситель или инжекторы**
- ✓ **ЭКУ (электронное контрольное устройство)**
- ✓ **Переключатель**

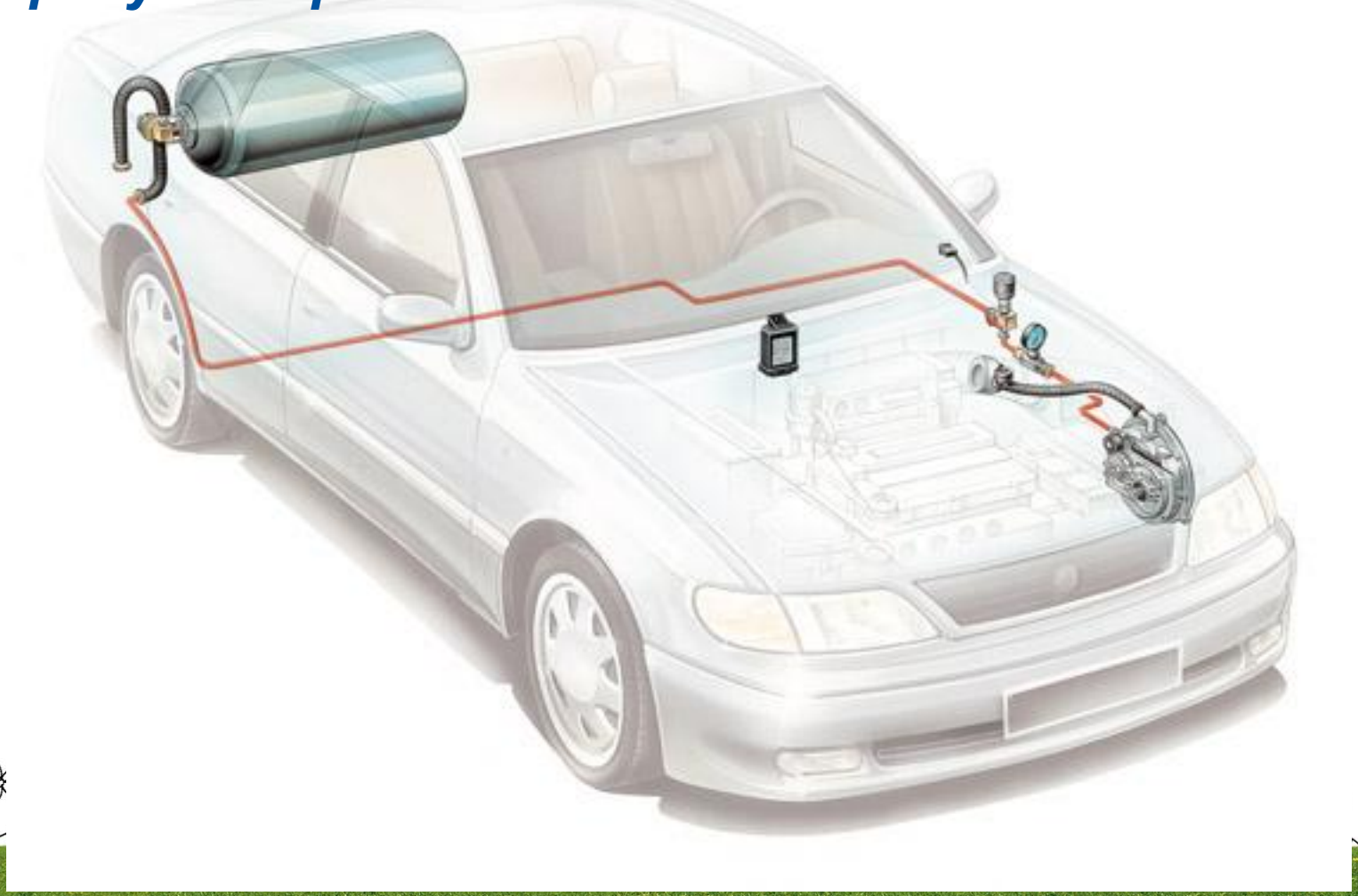
# Обзор систем КПГ

- **Пять поколений систем КПГ**

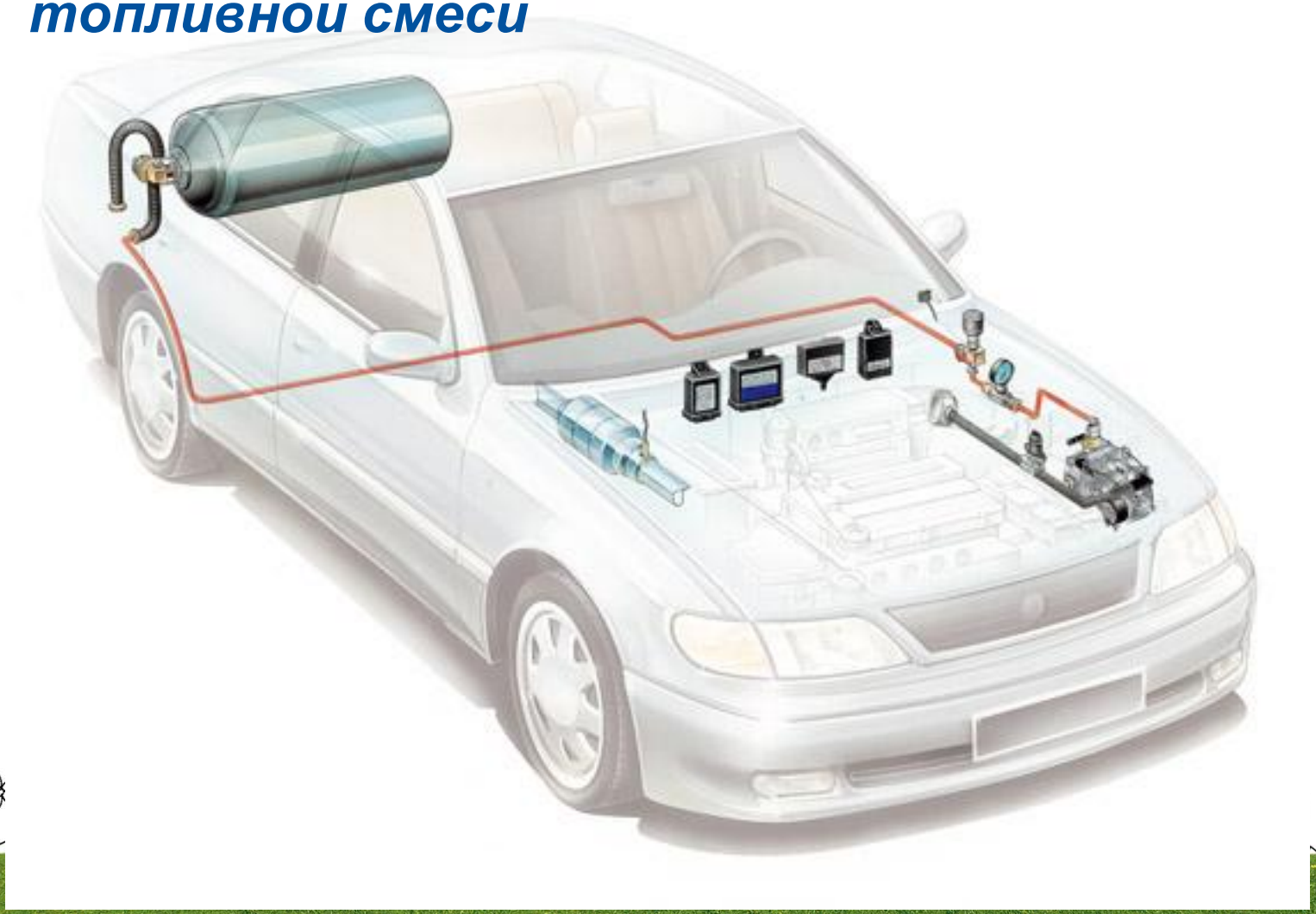
| | |
|---|---|
| • **1-е поколение** | **для карбюраторных автомобилей** |
| • **2-е поколение** | **для автомобилей Euro 1 и 2 с топливным инжектором** |
| • **3-е поколение** | **для автомобилей Euro 2 и 3 с топливным инжектором** |
| • **4-е поколение** | **для автомобилей Euro 3, 4 и 5 с топливными инжекторами** |
| • **5-е поколение** | **для автомобилей с прямой инжекцией** |

# Обзор систем КПГ;
# 1-е поколение – карбюраторные автомобили

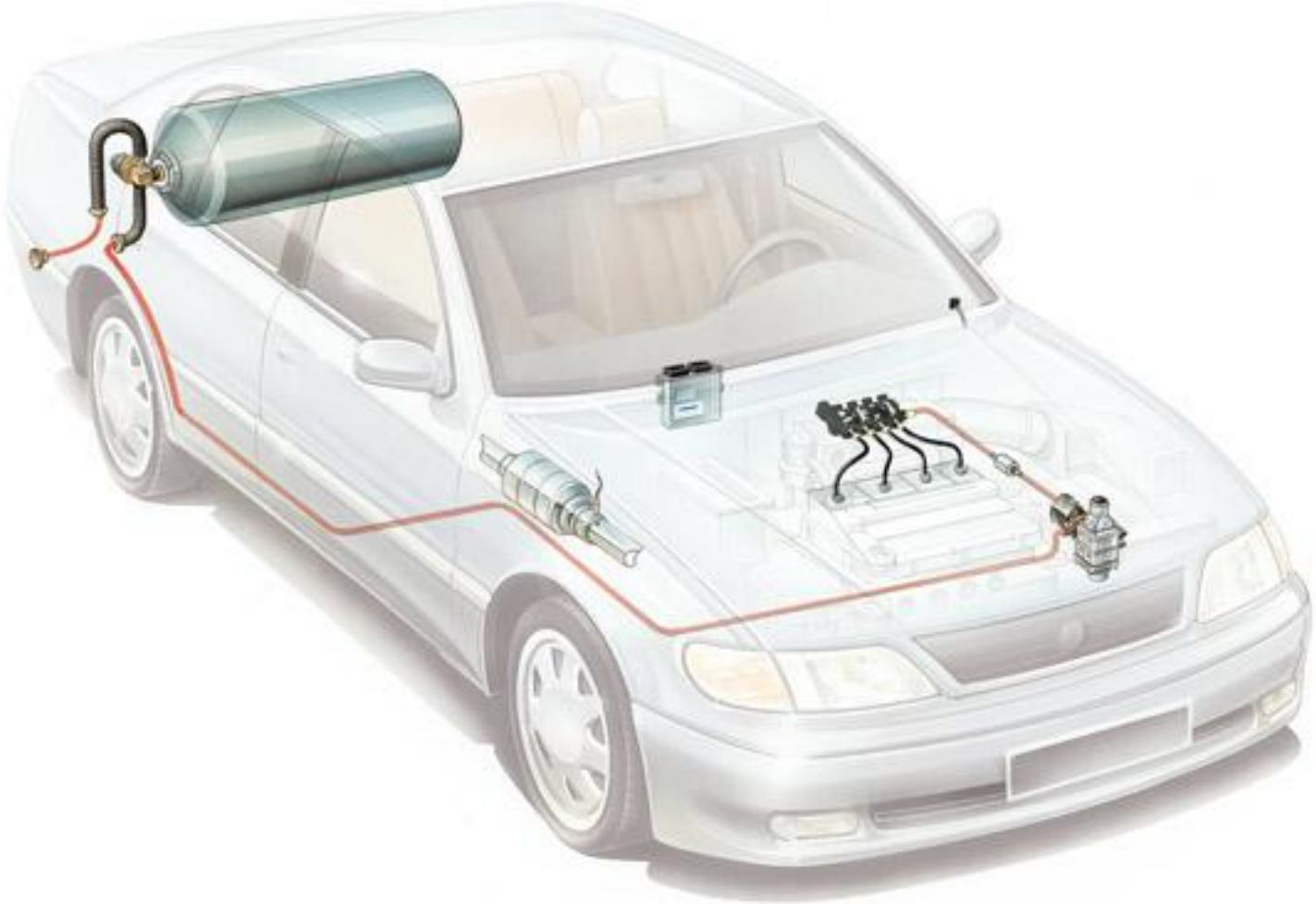
# Обзор систем КПГ;
# 1-е поколение – автомобили Euro 0 и 1 с топливной инжекцией без электронного регулятора состава топливной смеси



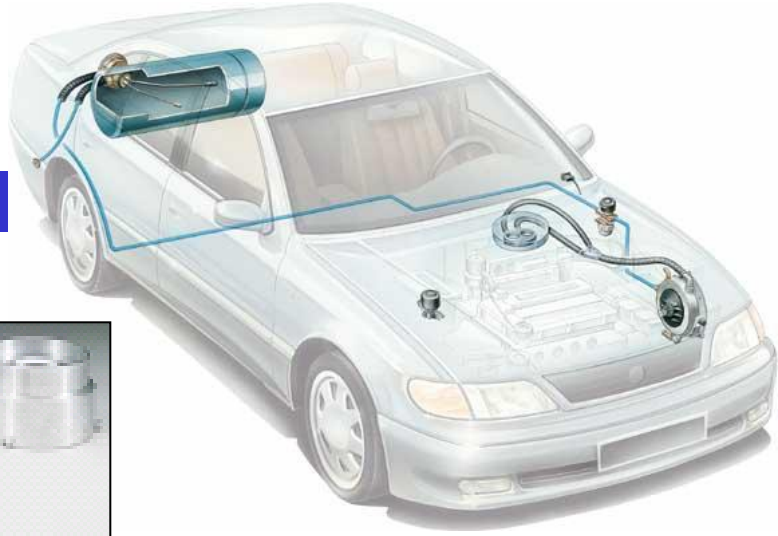
# Обзор систем КПГ;
# 2-е поколение – автомобили Euro 1 и 2 с электронным регулятором состава топливной смеси



# Обзор систем КПГ;
# 4-е поколение – автомобили Euro 3, 4 и 5 с непрерывной топливной инжекцией



# Системы КПГ на базе смесителей



## Карбюраторные автомобили

3-х ступенчатый регулятор КПГ

Смеситель КПГ – в зависимости от типа автомобиля

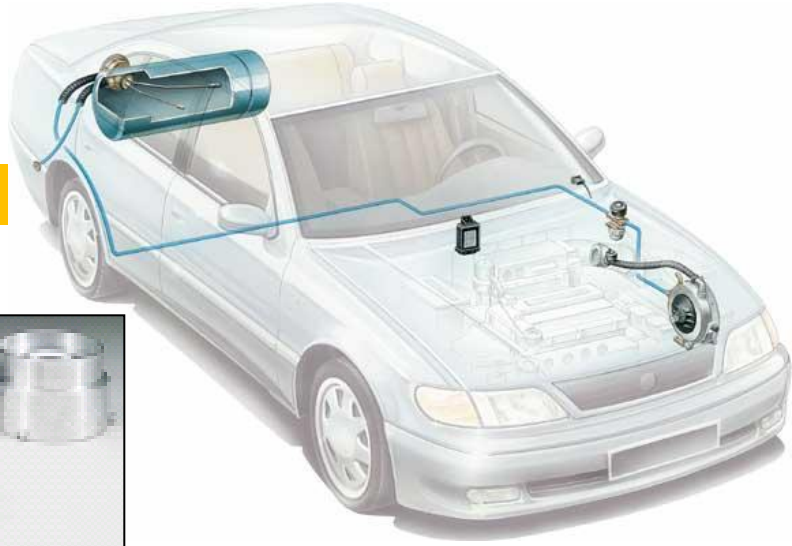
Приборная панель переключателя, вкл. Датчик уровня топлива

Запорный клапан бензина

(1) Mixer based systems have a Lambda control unit if a catalyst is present

# Системы КПГ на основе смесителей

## Система на основе смесителя



**Смеситель КПГ – в зависимости от типа машины**

**3-х ступенчатый регулятор КПГ**

**ЭКУ – регулятор состава топливной смеси (РСТС)**
**РСТС Шаговый электродвигатель**
**Жгут проводов**
**Переключатель с датчиком уровня топлива**

(1) Mixer based systems have a Lambda control unit if a catalyst is present

# Системы КПГ на основе топливной инжекции

## Система многоточечной инжекци

2-х ступенчатый регулятор КПГ

Фильтр

Инжекторный рельс

ЭКУ

Приборная панель Переключателя с датчиком уровня топлива

# Обзор систем КПГ;
# Заправочные штуцеры КПГ

- **Существуют различные типы заправочных штуцеров**
  - ✓ **NGV-1 для пассажирский автомобилей и LCV's ISO 14469-1.4**
  - ✓ **NGV-2 Для грузовиков и автобусов**
  - ➢ **Итальянский профиль**
  - ➢ **Новозеландский стиль**

**NGV-1**

**NGV-2**

**источник : www.weh.com**

**source : EMER**

**Итальянский профиль Новозеландский стиль**

# Обзор систем КПГ: Хранение КПГ

- **Четыре типа цилиндров КПГ**
  - **КПГ -1 цельная сталь**
  - **КПГ -2 сталь+ цилиндрическая обмотка**
  - **КПГ -3 металлическая обшивка + комбинированная обмотка**
  - **КПГ -4 цельная комбинированная обмотка**

**источник : xperion**

# Обзор систем КПГ: Хранение КПГ

- ✓ **КПГ - 1** **0,90 - 1,15 кг/л** **Срок эксплуатации – 20 лет**
- ✓ **КПГ - 2** **0,65 - 0,85 кг/л** **Срок эксплуатации – 20 лет**
- ✓ **КПГ - 3** **0,30 - 0,50 кг/л** **Срок эксплуатации – 15 лет**
- ✓ **КПГ - 4** **0,25 - 0,55 кг/л** **Срок эксплуатации – 20 лет**

**Рабочее давление - 200 бар**

**источник : xperion**

# Обзор систем КПГ: Хранение КПГ

источник : Vitkovice

**КПГ-1**

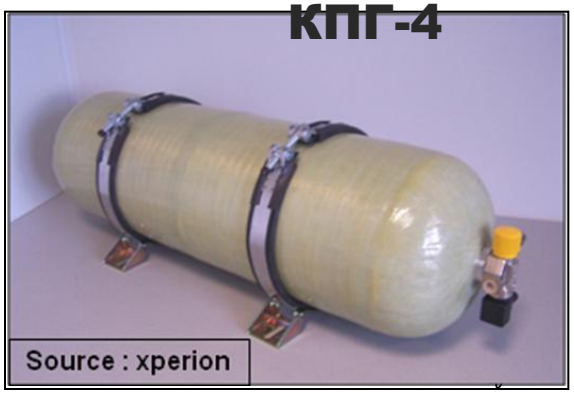
**КПГ-2**

источник : China OGPE

**КПГ-3**

Источник: Luxfur Cylinders

**КПГ-4**



# Обзор систем КПГ: Клапан цилиндра КПГ

- **Минимальные требования к оснащению клапана цилиндра:**
  - ✓ **Ручной клапан обслуживания**
  - ✓ **Автоматический клапан обслуживания**
  - ✓ **Клапан расхода топлива**
  - ✓ **Предохранитель**

  **Дополнительно**
  - ✓ **Встроенный контрольный клапан**
  - ✓ **Внутренний воздухоотвод**
  - ✓ **Разрывная мембрана**

**New MED CNG Valves**

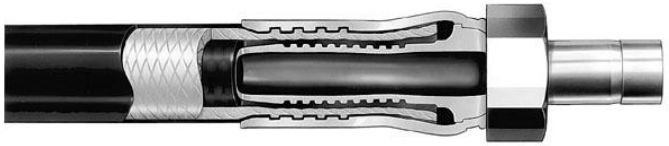
CNG TANK SOLENOID VALVE WITH BUILT-IN VENTING - TYPE MNG 10.5

CNG TANK SOLENOID VALVE TYPE MNG 10.7

CNG TANK MANUAL VALVE WITH BUILT-IN VENTING - TYPE MNG 10.6

источни : MED

# Обзор систем КПГ: Трубки и муфты



источник: Swagelok

- **Трубки**
  - ✓ **Нержавеющая сталь**
  - ✓ **Оцинкованная сталь**
  - ✓ **Использование меди НЕ допускается**
  - ✓ **Гибкие трубки ➔ R110**

- **Муфты**
  - ✓ **Двойное уплотнительное кольцо (нержав. сталь)**
  - ✓ **Двойной конус (сталь)**
  - ✓ **Врезные кольца НЕ допускаются**

источник : Swagelok

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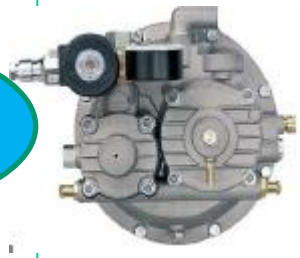
# *New Developments*

- **Product improvement**
  - ✓ **Further improve CNG reducers and injectors for new vehicle technology**
  - ✓ **Optimize ECU Software for new vehicle technology**
- **New CNG components**
  - ✓ **Electronic CNG regulator**
- **Dual-Fuel Technology**
- **Electric Drive**
- **Upgrading existing Public Transport Buses**

# CNG Regulator road map

**Injection Engines**

**Carburetor Engines**



TN1

TN1STEP

NG2

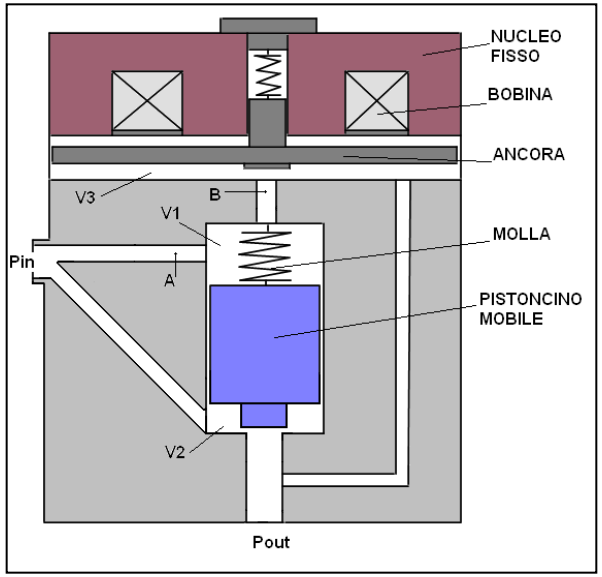
NG1

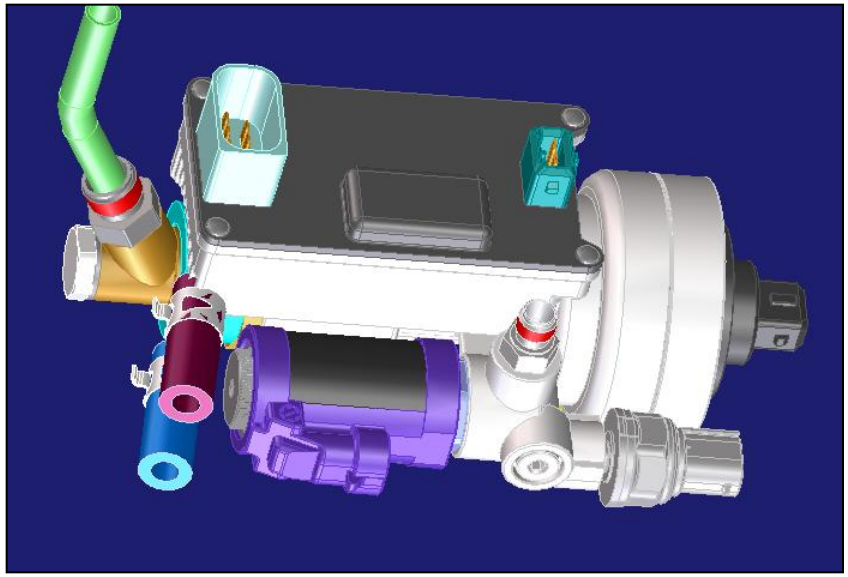
Electronic Pressure Reducer CNG and H2

CN04 compact

1965 1970 1975 1980 1985 1990 1995 2000 2005 2010 2015

# Electronic Pressure Reducer CNG



# *Dual Fuel Conversion System*

**The Dual-Fuel conversion kit is very similar to standard Bi-Fuel CNG retrofit conversion kit**

**Switch and Level Indicator**

**CNG Injectors**

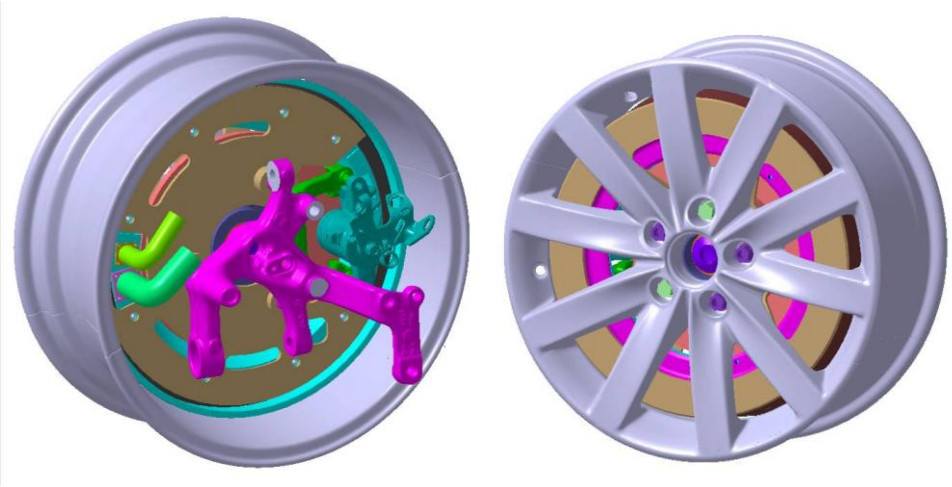
**Filter**

**Pressure regulator**

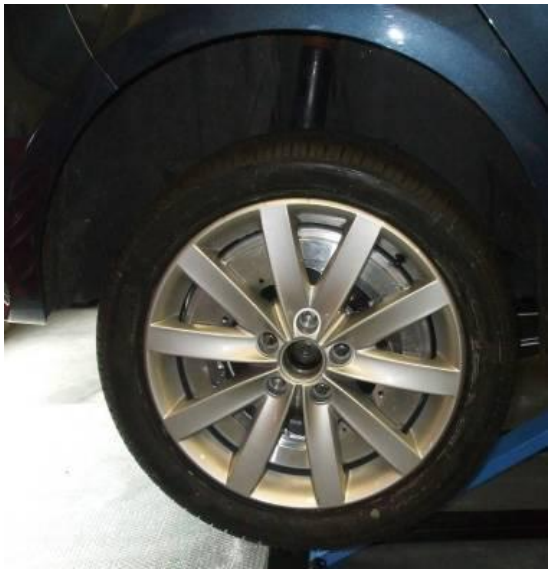
# Dual Fuel - Laboratory Vehicle

# *Hybrid: Motor-in-Wheels*

**Landi Renzo has developed a proprietary solution for integration of electrical motor in a standard vehicle wheel**
**- Improvement of vehicle dynamic**
**- No impact on vehicle braking system**



**Integration design for motor in wheel**



**Motor-In-Wheel installed**

# PROPOSAL OF A COMPLETE LINE OF PRODUCTS FOR BUS UPGRADING

# The Business Idea

**Trasformation of old pollutant engines into an ecological updated engines offering a recycling opportunity for old parts.**

**Dual fuel**: Diesel & CNG

**Mono fuel**: complete conversion to CNG

**Hybrid**: electrical powered whith a CNG combustion engine

- ➔ Reduction of $CO_2$ (& operating costs)
- ➔ Reduction of PM's (to almost zero in case of CNG monofuel)
- ➔ Extension of the life of the bus

# Thank You
# for your attention !


*Visit us at :* *www.Landi.it*

*Mr. Aldo Pertile* *apertile@landi.it*
*Mr. Giovanni Maccini* *gmaccini@landi.it*