



INNOVATIVE PROPOSALS TO REDUCE URBAN POLLUTION HANDLING eco-friendly vehicles(urban busses fleet,trucks,cars)

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Substantial and innovative
Proposals aimed towards *pollution reduction* in urban

areas, through implementation of eco-friendly vehicles (urban busses fleets, trucks, cars) and eco-compatible fuels (natural gas-biogas, biomethane, mix hydrogen-cng)

Introduction

- During the 58th UITP World Congress and Mobility-City Transport Exhibition, which was held last June 2009 conjointly with the Bus Committee, an interesting pitch presentation was given titled "Quality Time in Bus".
- The pitch duly pointed out the type of quality a Public Transportation Company must offer to guarantee customer satisfaction, but it also underlined the absolute necessity that buses reduce the amount of hazardous emissions and particulate as well as reduce the quantity of CO₂ released into the air keeping in mind that the public transportation users are also pedestrians who live the cities.

Trends

Additional projects like **starbus**, to promote sustainable energy solutions for bus fleets, an initiative funded by the **European Union**, (Intelligent Energy Europe Program) is targeting to fight pollution of urban areas.



Also the recent conference in Milan-Italy (5-6-7 **Mobility tech ott.09**) stressed the necessity of developing bus with near zero emissions.

Interesting bus, already in movement, microturbine fueled with CNG + electric motor.

Trends

The late seminary, placed in Cairo from 11th to 13th October
- *BUS&BUS Egypt with BUS&BUS Business-Verona-Italy, organized by Italian Trade Commission I.C.E.*
-enhanced the necessity to promote the use of green fuels for buses, lorries, cars in order to reduce the pollution level in towns such as Cairo (20 millions inhabitants).

On the road to Copenhagen

Ten years to save the planet

Delegations of 192 countries join together in Copenhagen in December 2009: during two weeks of meetings they define new global agreements on planet pollution reduction, focusing on CO₂ emissions decreasing.

Even if we are just little parts in this huge world, each of us should cooperate for harmful emissions reduction.

Target



The project funded by its promoters:

International Consortium of 4 Companies (Raufoss Fuel Systems, Ragasco, Metatron, Cavagna Group) originates on a simple consideration: all citizens have the right to live, work and travel in unpolluted cities.

Promoters of GreenerCities

The following companies have started the initiative:

- Cavagna-safety Valves for Cylinders
- Metatron-pressure regulators and injection systems
- Raufoss Fuel Systems- hight pressure cylinders and storage
- Ragasco-cylinders



cavagna group
Advanced Solutions for Gas Control

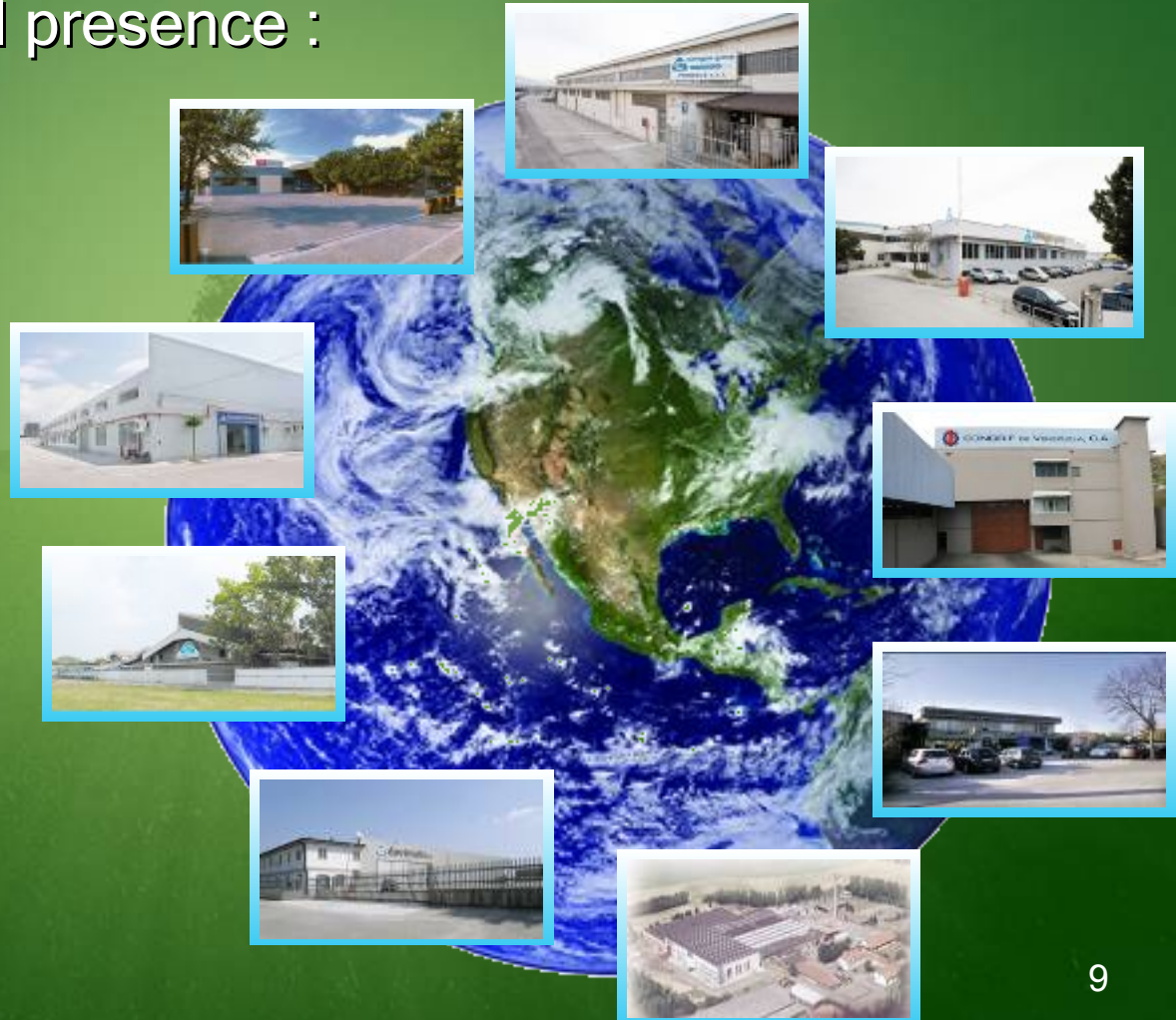
Partners



GREENERCITIES

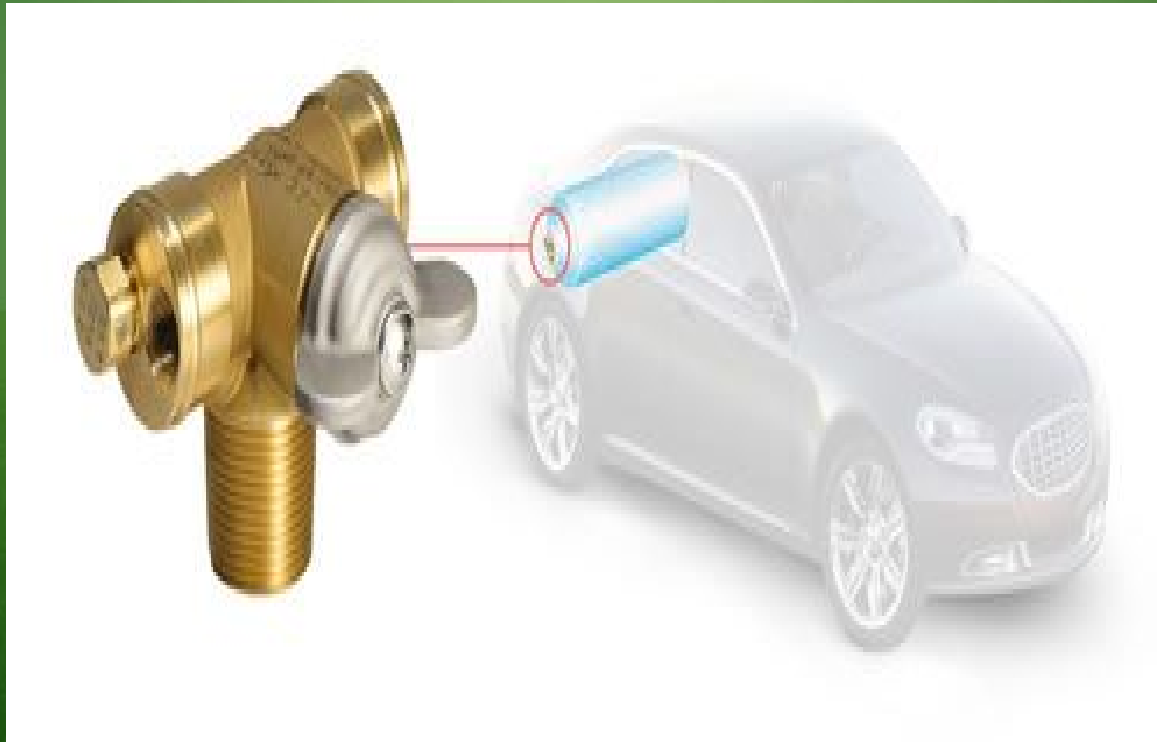
cavagna group - global presence :

- 9 production units
- 13 business units
- 1000 employees



CAVAGNA

- CAVAGNA Group



Location

METATRON
Advanced Engine Control
and Propulsion Systems



METATRON

- Robot



RAUFOSS-RAGASCO



What is being done?

Metropolis' like London and Milano have boldly introduces congestion charging policies for their City centers and many other cities throughout the world

are doing likewise.

Milano for example, with their recently introduced

Ecopass system, charges circulation fees according to the amount of polluting emissions discharged from the vehicle.



Are these the only solutions ?

Of course today's technologies and computer science can strongly contribute to the *global war* on pollution, but the freeholders of these technologies and of the necessary competences to implement them, have been operating individually, each pursuing their individual business interests.

We *strongly* need to focus on the primary pollution sources, beginning with those vehicle categories which are in circulation today. Public Administrations can smartly manage *public transportation fleets* and implement cleaner and eco-friendlier public transportation solutions.



Objectives



The primary objective of **GREENERCITIES** is to jointly fight pollution through **SYSTEM** & **SYNERGY**.

Strongly *stimulate & encourage* Public Administrations to make strong and concrete decisions by acting at once to obtain immediate results.

We cannot wait **for hydrogen to move our cities.....**

Objectives

The innovation **GREENERCITIES** proposes :

1. To test along with the cleaner fuels already used such as CNG and Biogas (which is obtained through the decomposition of organic material and today fuels over 1000 buses in Sweden alone) new mixtures of natural gas and hydrogen, which will allow a gradual but crucial detachment from our dependency on oil..
2. To test along with already circulating hybrid vehicles (Diesel /Electric, Gasoline/ Electric) other innovative hybrid vehicles(Microturbina withCNG/Electric).

Objectives



The **GREENERCITIES** project promoters want to bring awareness to the Public Transportation Sector that the use of such fuels like natural gas and biogas can significantly contribute to solve air quality related issues in urban and suburban areas.

| Vehicles | Test | CO ₂ | CO | HC | NOx | Particolato PT |
|-------------|----------|-----------------|--------|--------|--------|-------------------|
| | | g/km | g/km | g/km | g/km | g/km |
| Irisbus CNG | Adverage | 1256,84 | 0,7212 | 0,0831 | 3,5839 | 0,00925 |

Tests carried out February 25°, 2005 at the University of Graz (Austria) resulted as shown in chart above.

Safety



The **GREENERCITIES** project promoters have discovered that there is little or almost no knowledge regarding the

advantages of use of these cleaner fuels compared to the traditional gasoline or diesel fuels, and that in many cases unjustified “fears” hinder the implementation of these cleaner fuelling solutions.



CARS – TRUKS-VAN-BUSES

Passenger Cars



Delivery Van



Heavy-Duty trucks



City Buses



1997

2007

Fiat Group sales of NGVs (1997 – Oct. 2009):

1. > 350.000 passenger cars & LDVs with a European market share > 75 %
2. > 14.000 buses & garbage trucks with European market share > 50% (Italy, France, Spain, Greece)
3. > 2.000 engines for buses of no captive customers (Europe, China, Far East, Latin America)

MADRID- CNG



CNG Urban buses Irisbus



Irisbus Iveco EUROPOLIS CNG



Irisbus Iveco CITYCLASS CNG 12 m

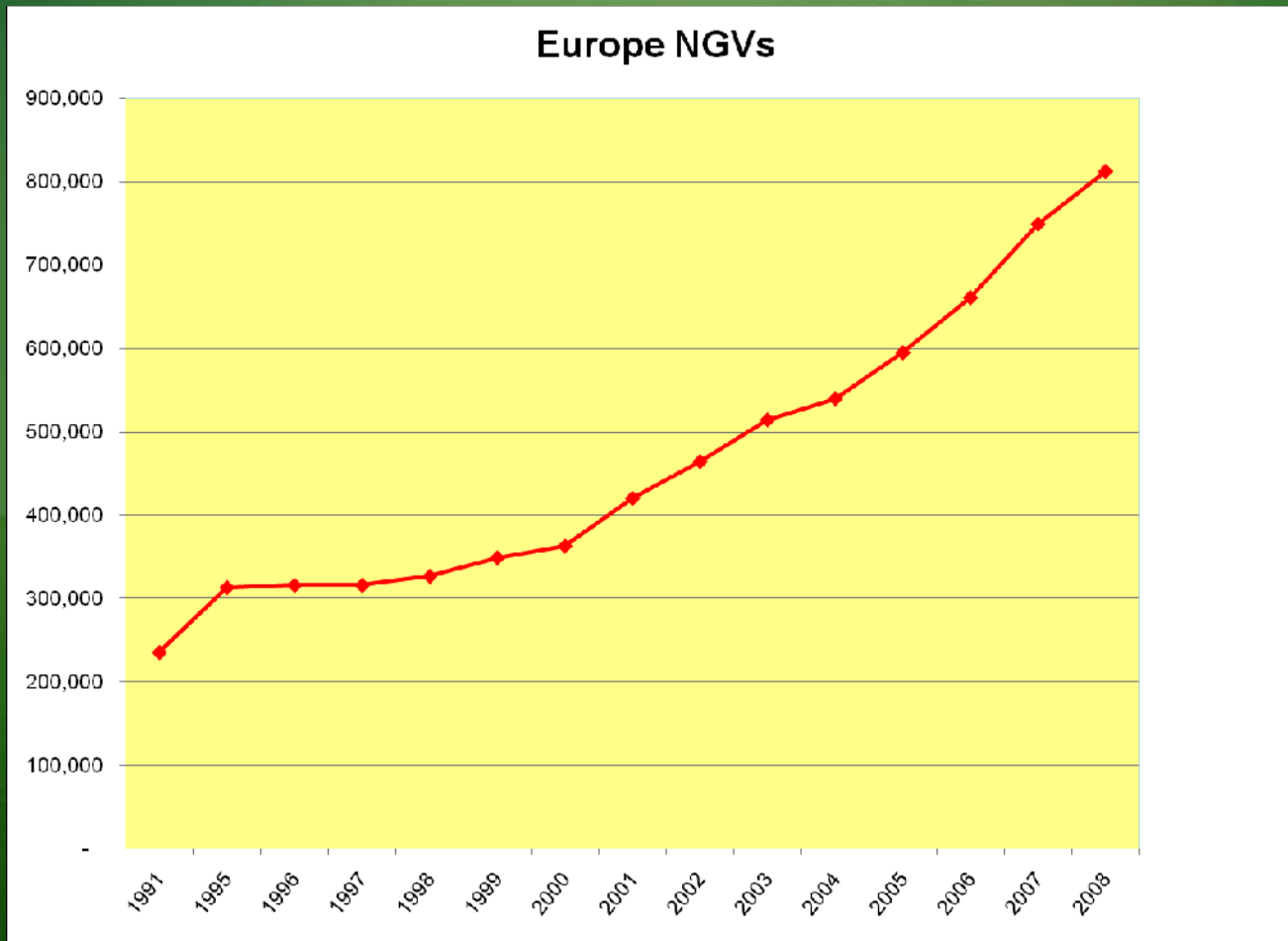


Irisbus Iveco CITYCLASS CNG 18 m



BEIJING Irisbus Iveco CITYCLASS CNG 18 BUS, IVECO TECTOR CNG engine

Western Europe. Market Growth



The steady Western European growth is driven by the cleaner emissions of NGVs

Countries

Main Countries using *Eco vehicles* for public transportation
 (2008)

| <i>country</i> | <i>n° buses</i> |
|----------------|-----------------|
| China | 45321 |
| Ukraine | 30500 |
| Korea | 16538 |
| Colombia | 13800 |
| India | 12000 |
| Usa | 11000 |
| Armenia | 9831 |
| Russia | 8000 |
| Iran | 6200 |
| Egypt | 5367 |
| Thailand | 4535 |
| Italy | 2334 |
| France | 2000 |



| <i>country</i> | <i>n° buses</i> |
|----------------|-----------------|
| Germany | 1444 |
| Japan | 1417 |
| Australia | 1263 |
| Spain | 845 |
| Sweden | 808 |
| Turkey | 492 |
| Greece | 416 |
| Poland | 350 |
| Portugal | 314 |
| Canada | 240 |
| Switzerland | 160 |
| Norway | 110 |

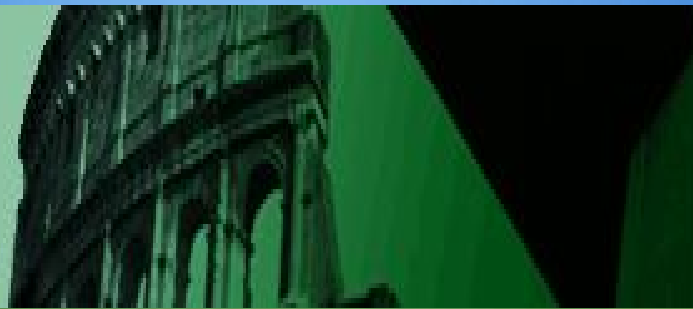
Objectives

GREENERCITIES recognizes and understands:

Vehicles powered by mixtures of CNG and hydrogen represent the first step towards future transportation based on hydrogen alone and viable much sooner than fuel cell.

HCNG, a mix between 10% and 40% hydrogen, can be a bridge to an hydrogen based economy.

- WHY NATURAL GAS / HYDROGEN BLENDS (HCNG) ?
 - ENVIRONMENTAL BENEFITS
 - MINIMUM IMPACT ON VEHICLE/POWERTRAIN
- TECHNOLOGY
- If HCNG contains 10 ÷ 40 % by volume of Hydrogen in Natural gas
- “HYTHANE” IS A TRADE MARK FOR A SPECIFIC COMPOSITION
- FOR A MORE GENERAL COMPOSITION IT SHOULD BE DESIRABLE A NEW DEFINITION : e.g. HYDROMETHAN



- With reference to methane hydrogen is characterized by :
 - higher H/C ratio
 - higher combustion velocity;
 - Less ignition energy;
- more complete combustion reactions;
 - less engine cyclic variation;
- increased speed of flame front in combustion chamber.

GENERAL REMARKS

- 1- Mixing Hydrogen in CNG is profitable from the environmental point of view as H/C ratio of the fuel increases (effect on CO₂, THC & CO) and combustion process is speed up (effect on thermodynamic efficiency);**
- 2 – The right balance between Hydrogen and CNG must be determined taking into account vehicle range and engine combustion parameters (emissions & efficiency);**
- 3 – Compared to pure Hydrogen, HCNG mixtures have no dramatic influence on vehicle range and engine performance potential;**
- 4 - Concerning safety aspect no major problems are expected;**
- 5- For mixtures with less than 40% vol. Hydrogen minor changes seem necessary to ensure full compatibility of the employed materials but more durability test are still needed;**
- 6 – Finally, the introduction of HCNG blends could play an important role in boosting the process of diffusion of the technologies and of the infrastructures needed for pure Hydrogen in a longer term approach, thus representing a really sustainable “bridge” solution.**



SAFETY



- 1) in case of leakage into atmosphere a demixing of the fuel occurs and the hydrogen fraction diffuses into air with its own properties: in closed room the flammability interval of pure hydrogen has to be considered;
- 2) a mixture leakage can be identified through the odour from the natural gas fraction (pure hydrogen is completely odourless);
- 3) the minimum value of the ignition energy is increased, thus allowing more safety to the mixture distribution operations; in case of leakage the same considerations as in item 1) have to be done;
- 4) the combustion flame is optically detected.

MILANO TODAY-GASOLINE...

DIESEL FUEL



TOMORROW...H2



GREENERCITIES



Objectives

The project wants to highlight that the real overall costs with the use of cleaner fuels is economically viable compared to the overall costs of traditional fuels (which to reduce the toxic emissions require the installation of costly CRT and SCR filters).



The GREENERCITIES project will continue with the organization of a dedicated highly qualified team, including :

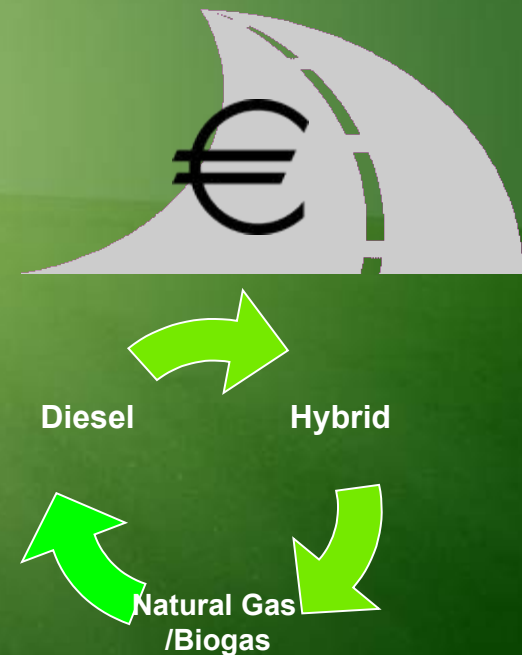
- World leading Companies operating in the cleaner fuels business sector (CNG e Biogas).
- National and International Public Transportation Companies which are using on a daily basis as well as experimenting eco-friendly vehicles.
- Public and private research organizations.
- Major European Universities.

Showcase

During the event, the **GREENERCITIES** booth will be outfitted with the latest CNG and BIOGAS vehicle technology as well as all other refueling components, thus to illustrate the complete technological chain. This will allow the Public Transportation Operators to perceive and touch with hand the technological safety levels that have been achieved, and prove the factual implementation of these systems.

In the **GREENERCITIES** booth the participating speakers will provide detailed information and promote solutions related to every aspect of the technology and its components. In detail they will pitch:

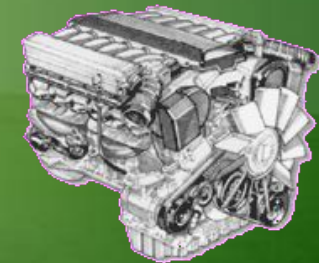
- The real costs vehicle per Km
- Operational comparisons based on experience between the different fuelling solutions;
(Diesel/Hybrid/Natural Gas/Biogas)



- The efficiency of natural gas related system in relation to the global CO₂ balance and the reduction of pollution.



- Motor management and emission breakdown systems



- Safety and Norms





- Natural Gas and Biogas supply



- Filling Stations..(Lombardy Italy -

The regions administration committed to funding both filling stations and CNG vehicles (August 16th 2004)



In conclusion.....

The promoters intend to reach the aforesaid objectives, as well as the testing of the new fuel composition by the end of 2010.

The **GREENERCITIES** website www.greenercities.eu is online and available to transportation operators

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NGV
2010
ROMA

"Creating a Revolution
in Transport"

June 8-10, 2010 | Rome, Italy



GREENERCITIES

Thanks for your kind attention