



LPG MARINE FUEL



Water is source of life



Water is the source of life, a symbol of growth, regeneration and refinement. Its eternal cycle enriches the water with all the goodness from the soil and the sky. It brings freshness, saves the thirsty, feeds the hungry and washes away the evil.

The majority of our planet is covered in water, the colorless fluid forming the hydrosphere. Water is a very simple chemical substance, and yet the most important constituent of every organism, being a key element in the majority of biochemical reactions.

Without water, there would be no life. Every living being needs water for its existence, since air and water are the most important reasons for the existence of life on Earth anyway.



The Problem



Common story from happy sailors...

Arriving in the mooring field, we get right in the fuel dock. We'd used 75 liters of water and only 19 liters of diesel! I was really surprised it was so little diesel. Even around the fueling dock, the water was a gorgeous, translucent blue. After fueling we stood on the dock and looked in the water, seeing straight to the bottom in 4 meters of water. There were dozens of little fish swimming all around.

Picture and text from an internet blog

Every time this quite very common "happy sailor" leaves the fuel dock, the water remain much less "gorgeous, translucent blue" and some dozens of "little swimming fish" will not survive!

Effects of marine engines pollution



Emissions and utilization of marine engines contribute to a number of very serious water and air pollution problems. Such pollution lead to adverse health and welfare effects associated with ozone, particulate matter (PM), NO_x, volatile organic compounds (VOC), including toxic compounds, and carbon monoxide (CO). Gasoline and diesel fuels in the water are harmful to humans and in many cases fatal to aquatic life.

Floating fuels and oils are also particularly noxious because they reduce light penetration and the exchange of oxygen at the water's surface. The floating oil contaminates and pollutes the microlayer, thus, has the potential to poison much of the aquatic food web.

A single liter of diesel or gasoline released onto the water can cover 10,000 sq/m of water surface area

Underwater exhaust gases are a problem



Marine engines emissions:

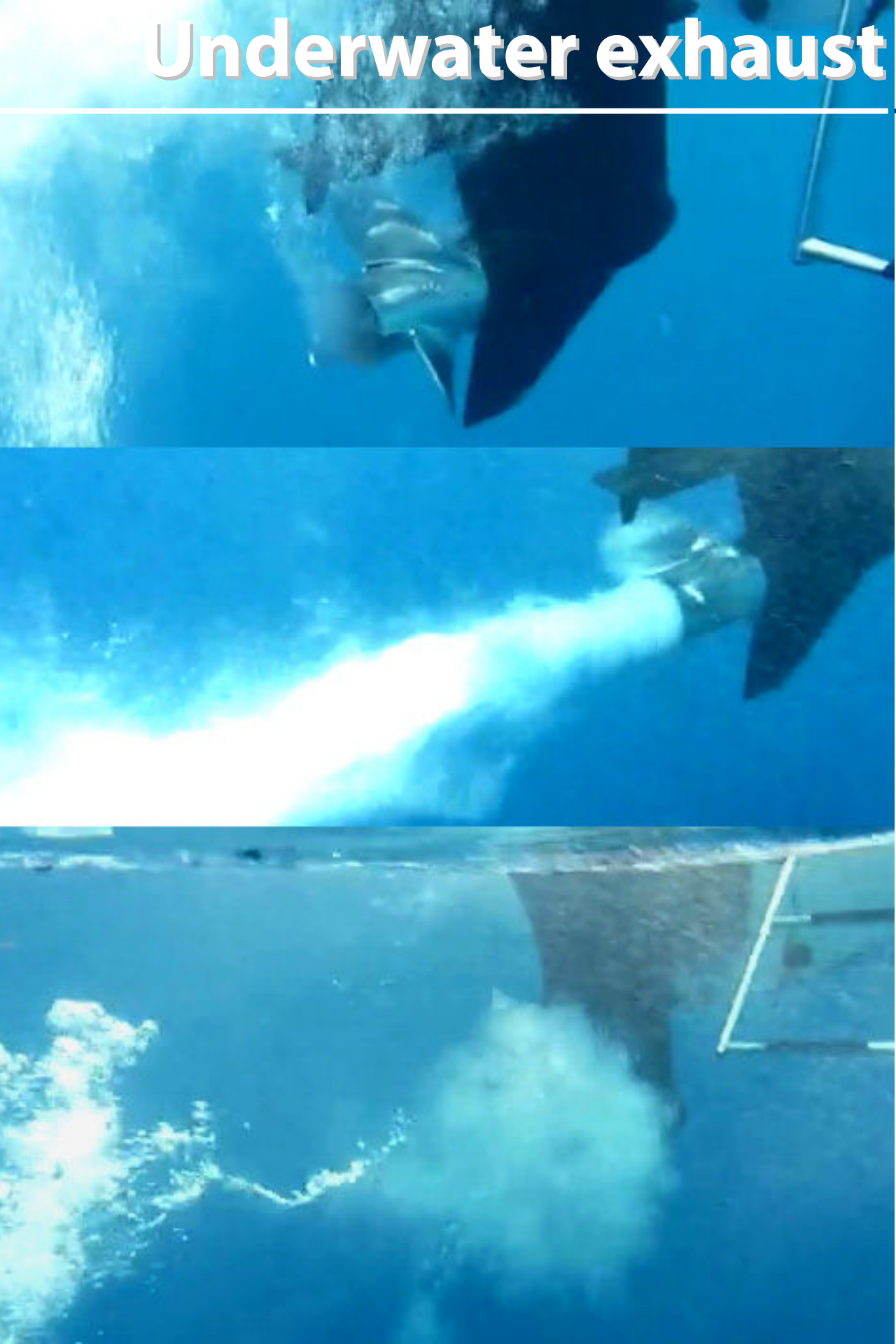
Gasoline engines

Emissions from gasoline combustion contain zinc, cadmium, iron, six fundamental hydrocarbons, eleven basic polycyclic hydrocarbons, cyanides, benzene and MTBE, ammonia, nitrous oxides, hydrogen sulphide, sulphur dioxide, ten individual aldehydes and ketones, phenols, amines, nitrosamines and myriads variants.

Diesel engines

The problem with diesel fuel is primarily its emission of sulphates due to its sulphur content, as well as emission of particulates, aldehydes, polycyclic aromatics, unburned hydrocarbons and a high degree of nitrogen oxides.

These compounds are associated with smog and its many serious negative effects on the human health and the environment.



Hydrocarbon and oil pollution entering North America's waters every year from recreational boating is estimated to be more than 15 times the amount of a supertanker spill, up to one billion of liters!



recreational boats
exhaust gases
bilges fluids
fuel spills

supertanker per year



October 9th, 2013

EU Parliament approved the Directive for the reduction of the engines emissions of Recreational Boats till to 14 meters of length:

- 20% of NO_x***
- 20% of hydrocarbons***
- 34% of Particulate Matters***

Approximately 6 millions of motor boats, sailing boats, jet skis and other recreational crafts navigate the European shores, lakes and rivers. The recreational marine activities across Europe involve some 37,000 companies and directly employs today around 272,000 workers.

- 
- A photograph of a white motorboat with a dark stripe, sailing on a blue sea under a blue sky with white clouds. The boat is seen from a side-on perspective, moving towards the left.
- Less 20% NO_x**
 - Less 20% NMHC**
 - Less 34% PM 2,5**

...the solution?



LPG as marine fuel!

greener cleaner cheaper

LPG is the ideal fuel for clean waters




- **9% NO_x** vs. Gasoline
- **99% NO_x** vs. Diesel
- **50% PM_{10}** vs. Gasoline
- **98% PM_{10}** vs. Diesel
- **30% CO_2** vs. Gasoline
- **19% CO_2** vs. Diesel

Springs, rivers, lakes and seas thank also LPG for the total absence of:

lead, benzene, formaldehyde, polycyclic aromatic hydrocarbons, MTBE, ethanol, methanol and acetaldehyde

vice versa present in gasoline and diesel engines exhausts.

A photograph of a family on a boat. A man in blue shorts sits on the left, a woman in a pink bikini leans over the side with a child, and another child is diving into the water. The water is clear and blue, and the sky is bright with some clouds.

LPG as fuel don't pollute in any way the water

LPG is the ideal fuel for vehicles



PROPANE
EXCEPTIONAL ENERGY®



LPG, likewise known as propane gas, can be today also called “Natural Gas”, because more than 2/3 is obtained from separation from natural gas. **LPG as is a naturally occurring by-product of natural gas extraction (70%) and crude oil refining (30%), therefore we either use it or it is wasted.**

Unlike gasoline, diesel, methanol and ethanol LPG is non-toxic and is not harmful to soil and water and the placement of LPG tanks either above or below the ground are not regulated by the Environmental Authorities.

This environmentally friendly fuel is daily used by millions of people around the world to make their lives much more comfortable and is a choice that can be made today, because it is a ready and abundant available source of energy. LPG is extremely versatile and portable: it can be transported using sea, rail or road transport and is available in even the remotest of areas.

LPG - Liquid Petroleum Gas - is a gaseous hydrocarbon that can be easily stored under moderate pressure as a high energy density liquid, expands to approximately 270 times its liquid volume when it is reverted to vapor and burn very, very cleanly as a dry gas.

These characteristics makes the LPG not only an ideal fuel for many applications such as water and space heating, cooking, but due to the very clean combustion, the high Octane ratio and the easiness to be transported in liquid form, makes LPG also an ideal fuel for any kind of vehicles.

Auto LPG or Autogas is the LPG used for vehicle purposes. LPG has major advantages over many other fuels when it comes to taking care of the environment and for reducing the environment impact of vehicles. **LPG not only has lower net greenhouse gas equivalent emissions than gasoline, diesel and CNG (Compressed Natural Gas), but also surpasses a great number of highly promoted bio-fuels.**

LPG has zero toxicity and zero contamination



- ▶ LPG don't damage freshwater or saltwater ecosystems, underwater plants or marine life.
- ▶ LPG if spilled on the ground is not harmful to soil and don't damage vegetables or cause harm to drinking water supplies.
- ▶ LPG vapor is not considered air pollution.
- ▶ LPG is not considered a greenhouse gas.
- ▶ LPG vapor is not harmful if accidentally inhaled by animals or people.
- ▶ LPG will cause bodily harm only if liquid LPG comes in contact with skin.
- ▶ LPG never ages if it remains in the tank.

LPG is so environmentally friendly and harmless in the unused state which is commonly used as a propellant for the spray we use daily on our body!

Unthinkable to do the same thing with other fuels such as gasoline, diesel, ethanol or methanol!

LPG is non-toxic, non-caustic and will not create any environmental hazard if released as a liquid or vapor into water or soil. If spilled in large quantity, the only environmental damage that may occur is the freezing of the organism or plant life in the immediate area. There are no long term effects following a LPG spill even if in large quantities.

The only damage and potential danger exists is the fire, if the vapor is ignited following a spill. And even then, there are no long term effects of ignited LPG that can be damaging to the environment.

LPG is a very great modern fuel!



natural **cheaper** **SAFE** *environmental* available *easy*

Also LPG is a “Natural Gas”

LPG can be today also called “Natural Gas”, because more than 2/3 is obtained from separation from natural gas.

LPG has great production surplus

World’s increased extraction of Natural Gas ensures an LPG surplus production ranging from 15 to 27 million tonnes per year that can support a substantial growth in demand beyond the 2030.

LPG greatly reduces the fuel costs

Production surplus and absence of supply tensions warrant long terms lower prices, making the LPG an highly affordable fuel, cheaper than gasoline and diesel. A further saving for LPG vehicle operators, especially in fleets, is that pilferage is much more difficult than with gasoline or diesel fuels. Investing in an LPG vehicle once, ensure to cut the fuel bills forever.

LPG has high energy content

So it can take a vehicle much farther of any of the other alternative fuels.

LPG warrant great efficiency

Since LPG has a higher octane than gasoline, LPG engines can use higher compression ratios, resulting in more power and better fuel efficiency.

LPG increase the engine life

Reduction in maintenance costs and increase of engine life are some of the reasons for LPG’s popularity with professional users like taxi and bus fleets, utility vehicles, fork-lifts, etc.

LPG has an easy handling

LPG is easily liquefied and stored in moderate pressure tanks. These properties make the fuel easily transported on any kind of vehicle and refuelling a LPG vehicle is simple and cheap.

LPG Autogas is already a great reality

In Europe LPG-Autogas has more than 36,000 filling stations to fuel more than 7 million of vehicles. In Turkey are around 8,000 LPG filling stations and 4 million of vehicles. Autogas is today the most accepted alternative fuel with more than 18 million vehicles worldwide.

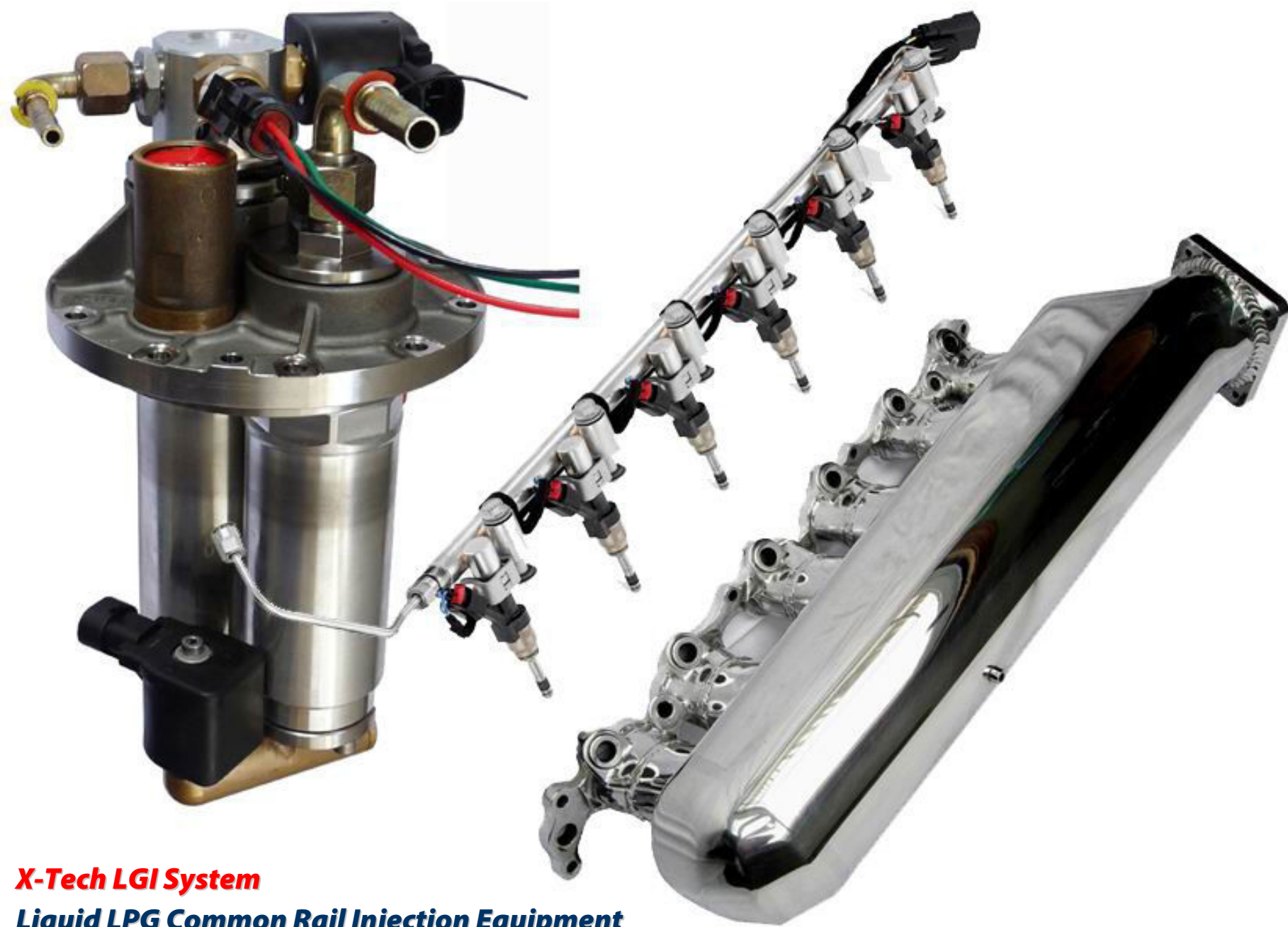


***TECHNOLOGIES TO MAKE LPG AS
IDEAL FUEL FOR MARINE ENGINES***

LGI System makes LPG ideal fuel for marine



We are pleased to introduce you our LGI System, an innovative hi-tech Liquid LPG Common Rail Injection System that lets use LPG in efficient, easy and safe way as fuel for pleasure and working boats.



X-Tech LGI System
Liquid LPG Common Rail Injection Equipment



The **IMMISS** Technology Innovation



IMMISS, the 1st MEMS* as Liquid LPG Injection System for Engines

Integrated

Multifunction

Multipurpose

Injection

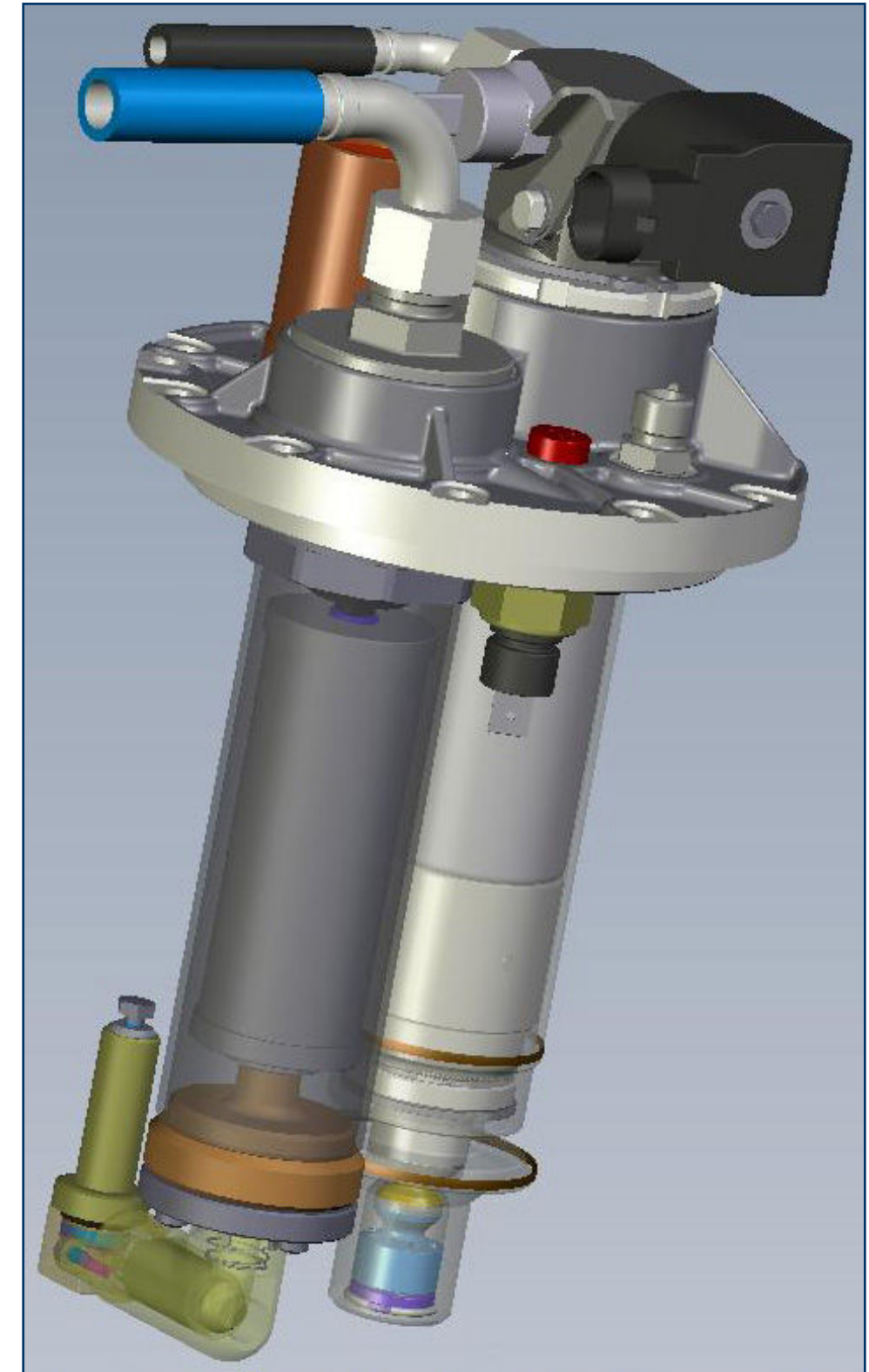
System for

Sealed and pressurized fuels

Combining micro-mechanical and electronics design, **IMMISS** solution, core of the LGI System, ensures very important targets:

- increase of efficiency and reduction of emissions;
- easy implementation with new generation of engines;
- great reliability also with dirty gases;
- easy to install, to use and to maintain system;
- simple and cheap to manufacture;
- ready as DME Fuel System for turbines and fuel-cells.

E.U. Patent N. 08807149.3
Japan Patent N. 2010-526387
China Patent N. 200880117188
S. Korea Patent N. 10-2010-7009268
Other International Patents Pending



*MEMS: Micro Electro Mechanical System

Liquid LPG “Port” injection technology



**More Power & Torque than gasoline,
less emissions and with WTW* efficiency like Diesel**



**LPG
Enthalpy**

**WTW - Well-To-Wheels*

Higher efficiency for "NATURAL" reasons



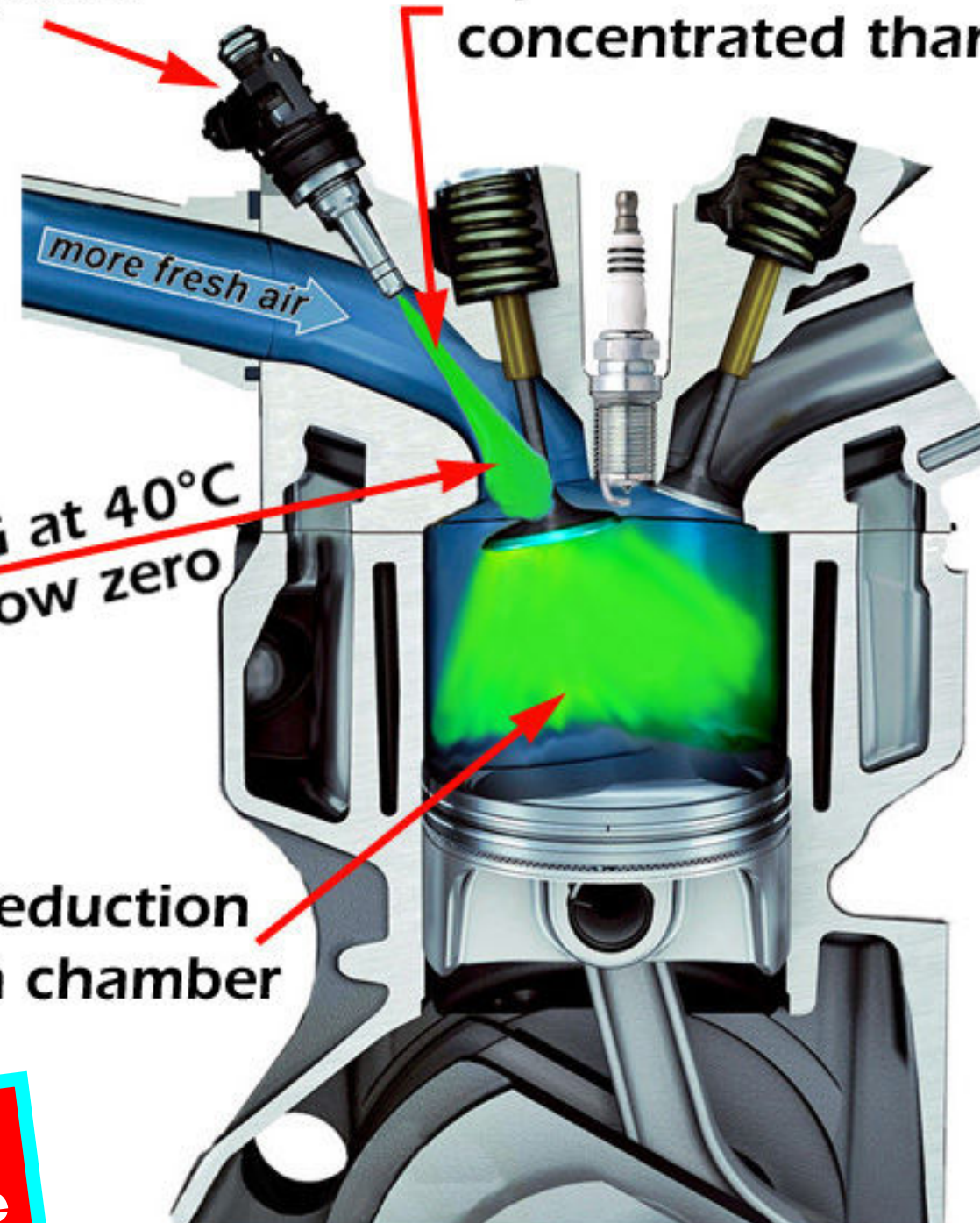
liquid LPG injector

liquid LPG >250 times more concentrated than vaporized



LPG at 40°C below zero

temperature reduction in combustion chamber



LOWER TEMPERATURES

MORE POWER

MORE TORQUE

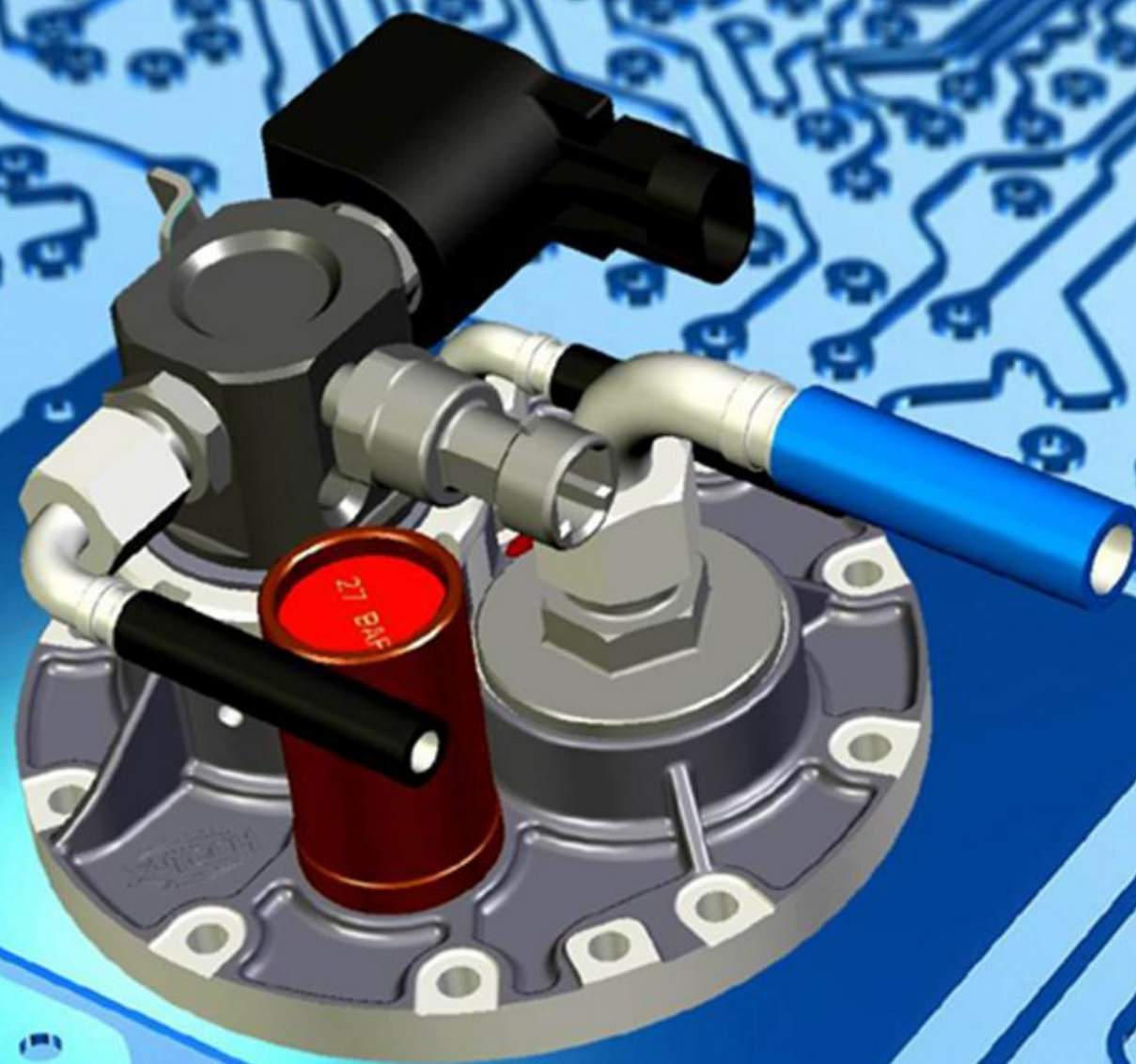
LESS FUEL

LESS EMISSIONS

HIGHER EFFICIENCY

**LPG Autogas:
104 - 110 Octane**

IMMISS



 **DIGITAL
NATIVE**

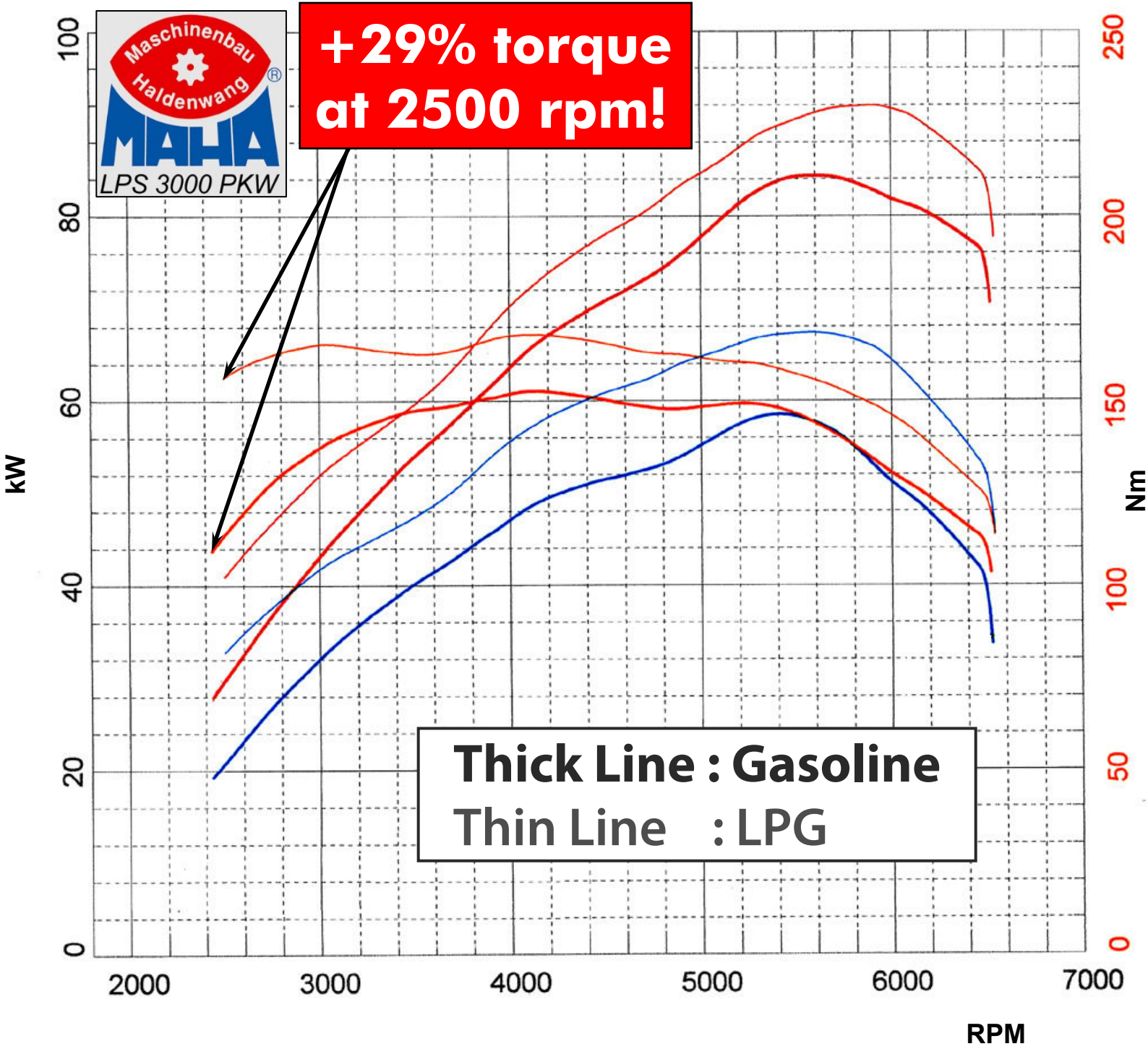
digital control of
brushless LPG pump

digital control of
80% tank filling

in-tank control of
temperature and
pressure of LPG

in-tank monitoring
of LPG composition
and contamination

IMMISS: much more power and torque!



Test of Euro III Opel Omega 2.0I-16V Gasoline, License Plate BH485SZ with 137,250 km, equipped with LGI System Mark III since 77,000 km.

Power and Torque Gasoline		
Correct Power*	84,3 kW	114,6 HP
Engine Power	83,1 kW	113,0 HP
Power on wheels	57,4 kW	78,0 HP
Lost Power	25,7 kW	35,0 HP
Max power at	5625 g/m	174,5 km/h
Torque	152,6 Nm	
Max Torque at	4145 g/m	128,7 km/h
Max RPM reached	6525 g/m	202,6 km/h

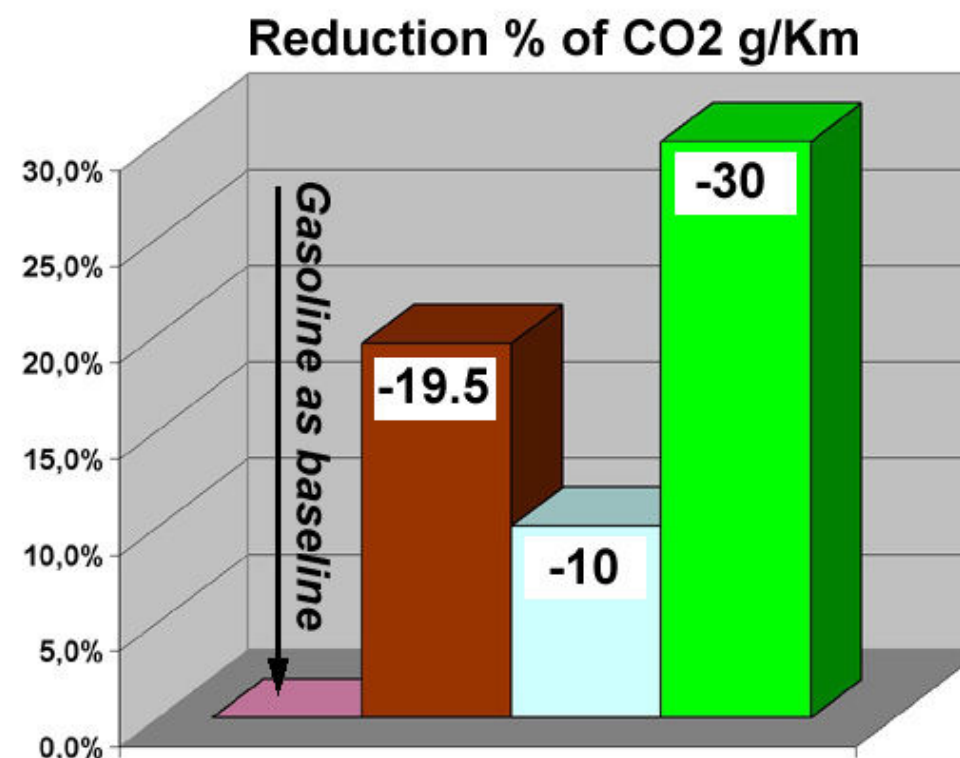
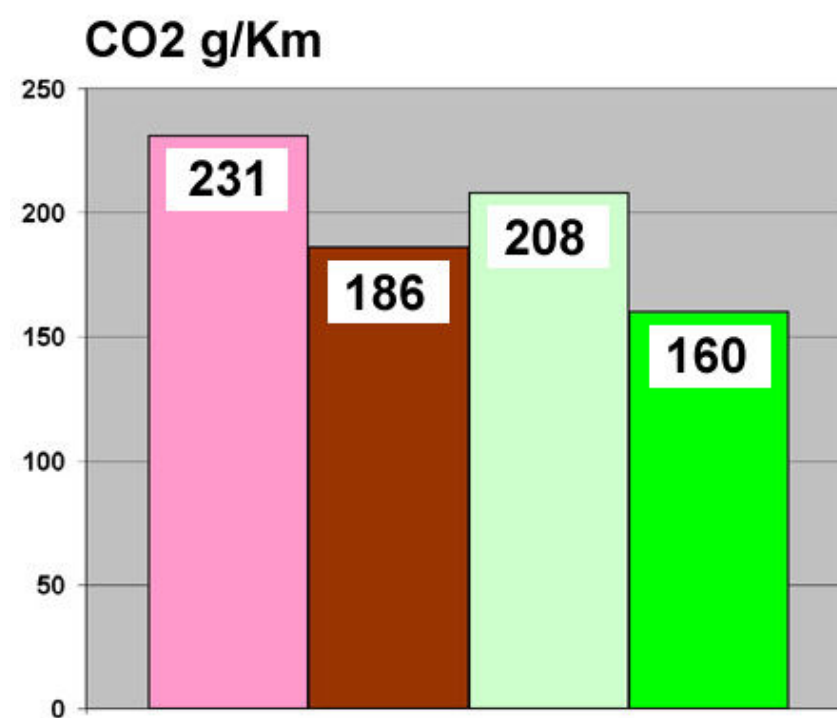
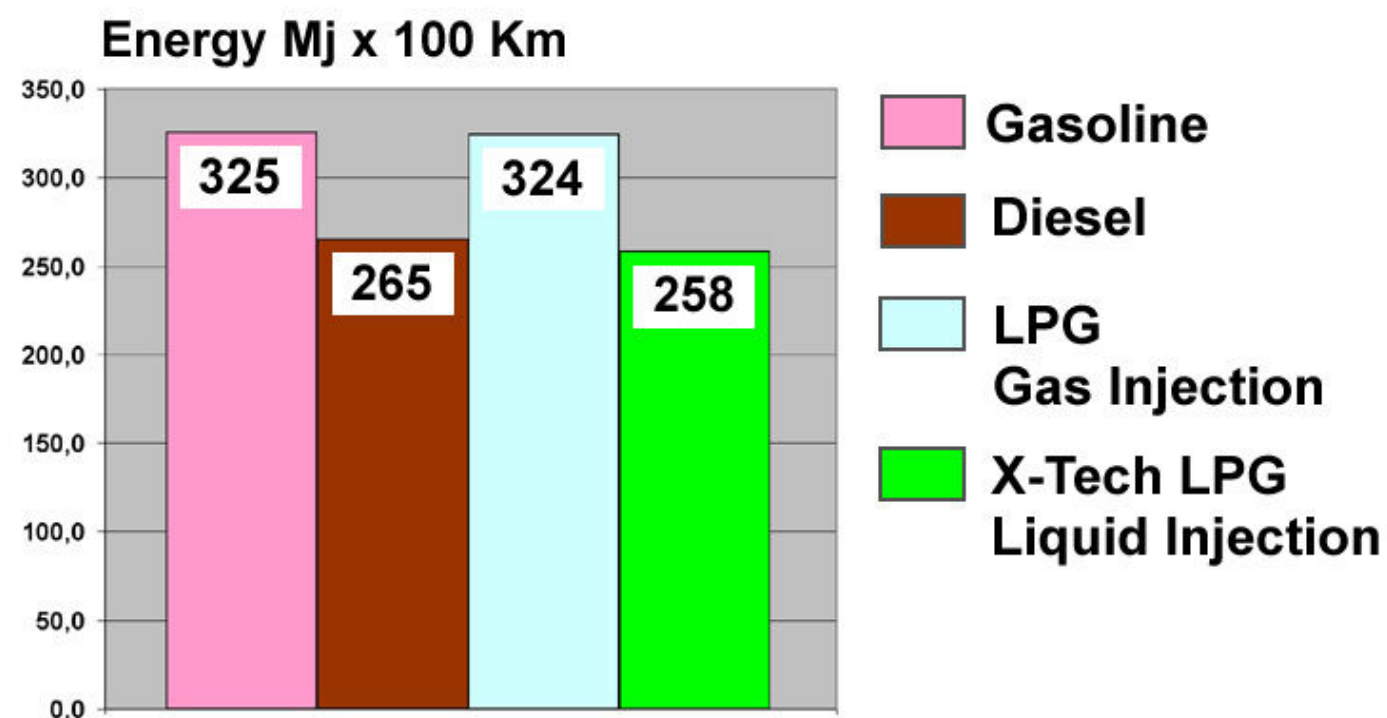
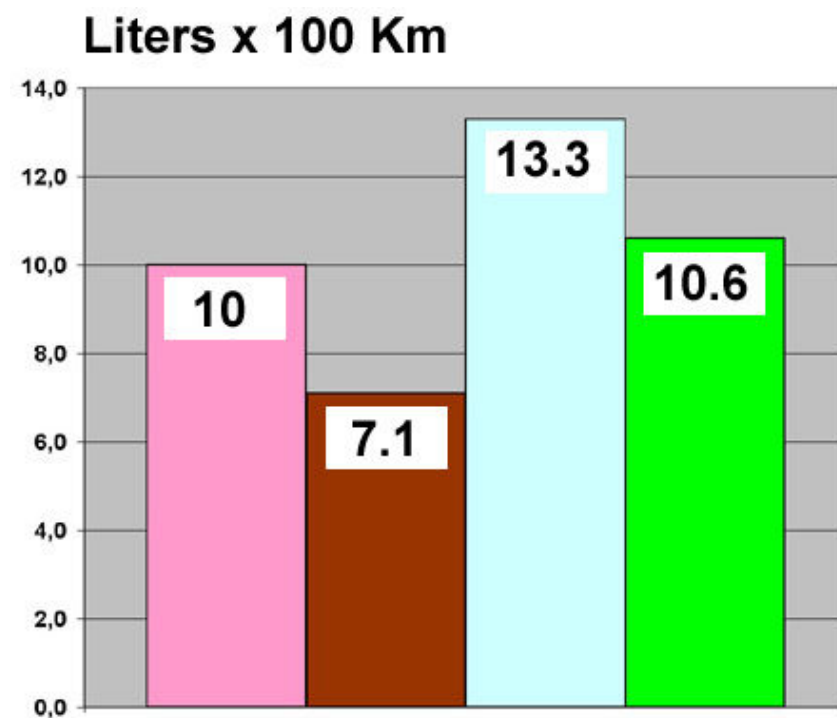
Power and Torque LPG		
Correct Power*	91,9 kW	125,0 HP
Engine Power	90,4 kW	122,9 HP
Power on wheels	65,7 kW	89,3 HP
Lost Power	24,8 kW	33,7 HP
Max power at	5915 g/m	183,6 km/h
Torque	167,8 Nm	
Max Torque at	4115 g/m	127,6 km/h
Max RPM reached	6540 g/m	203,1 km/h

*Correction as per DIN 70020 rules
Ambient temperature : 23,9 °C - Temperature of intaken air: 24,7 °C
Relative humidity: 49,7 % - Atmospheric pressure: 14,7 hPa

Meaningful reduction in CO₂ emissions



Fuel consumption and CO₂ emissions comparative road tests on Opel Omega 2.0l 16V gasoline vs. 2.2-DTI-16V Turbo Diesel - Euro III



Fuels Energy Content:

- Gasoline: 32.54 Mj/l
- Diesel: 37.2 Mj/l
- LPG: 24.38 Mj/l

“Key Factors” that make the difference



Survival capability



Extremely efficient filtering/separation from ferrous particulate contaminants

Easy maintenance



Very simple, fast and safe LPG pump extraction also with full LPG tank

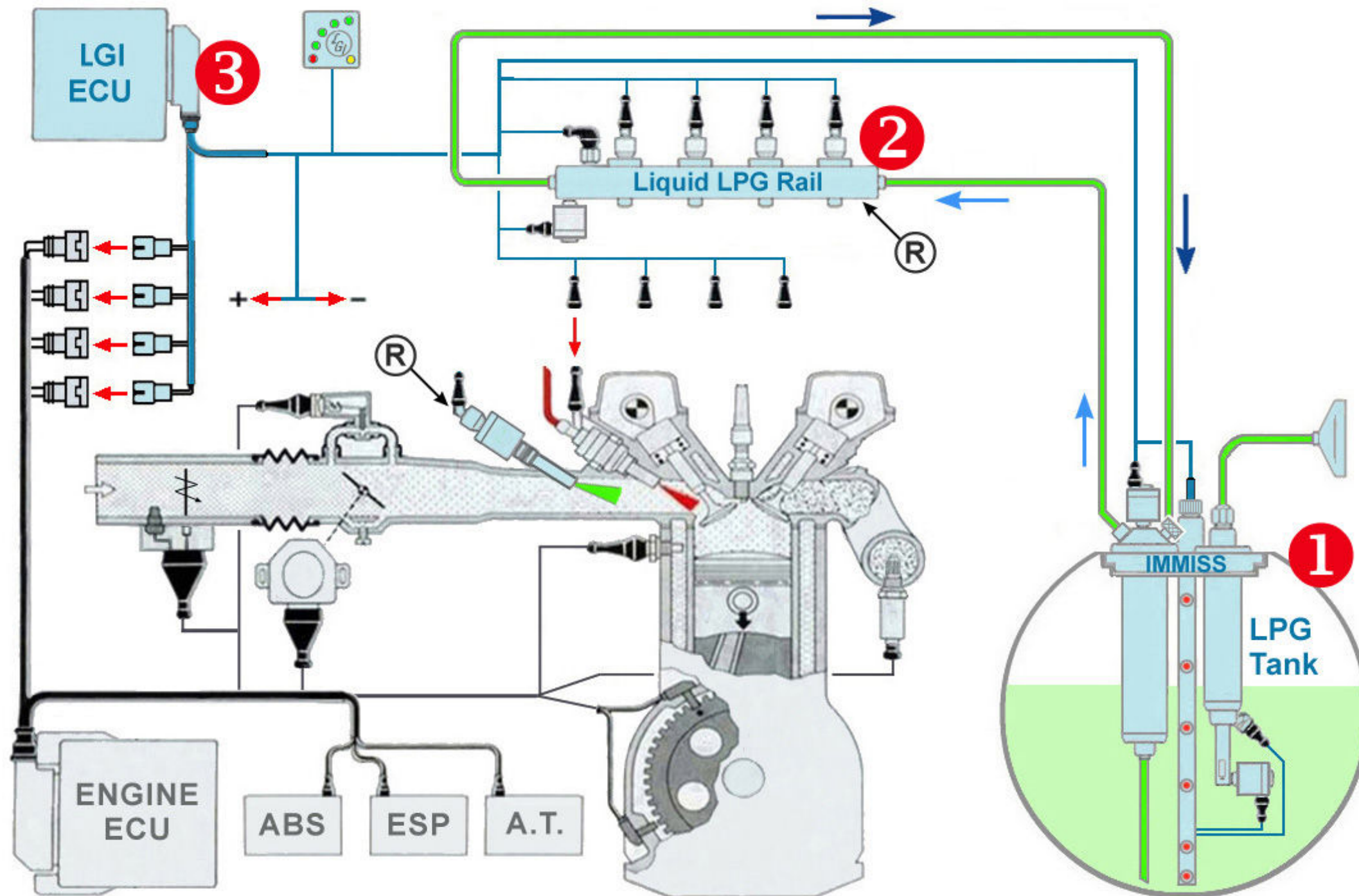
Safe, simple and fast maintenance

X·TECH
MARINE

To extract the LPG pump for cleaning the filter or making maintenance, also with full LPG tank, is a simple and safe operation that takes few minutes...



Only 3 main components



IMPORTANT!

The electronics that controls the tasks of the LGI System has a very simple interface and does not interfere in any way with the original ECU functions, indeed in a "Smart & Friendly" way maintains fully operational all the original engine management parameters.

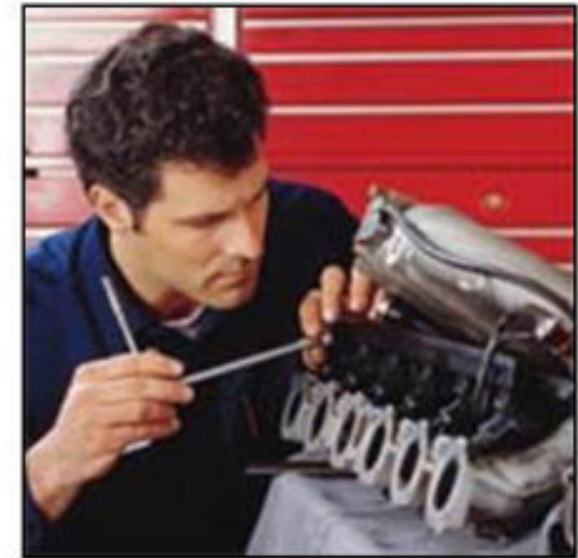
X-Tech LGI System is a complete solution



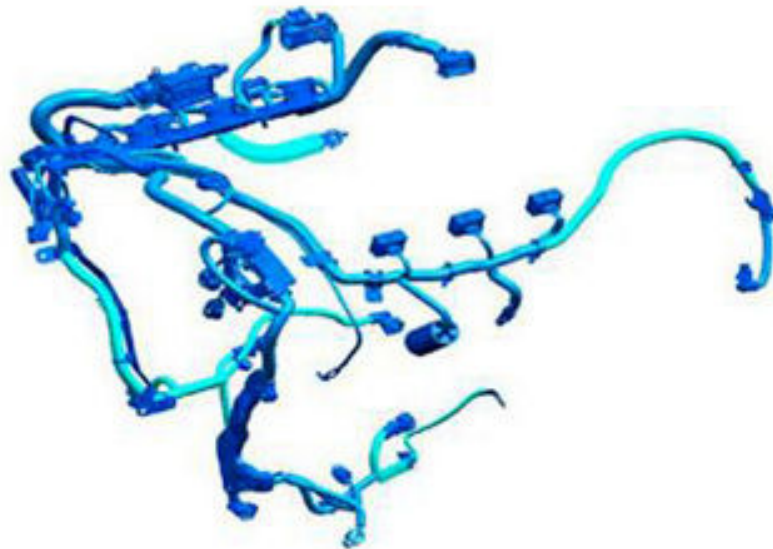
ECU



**IMMISS &
LPG Tank**



Training



Harness



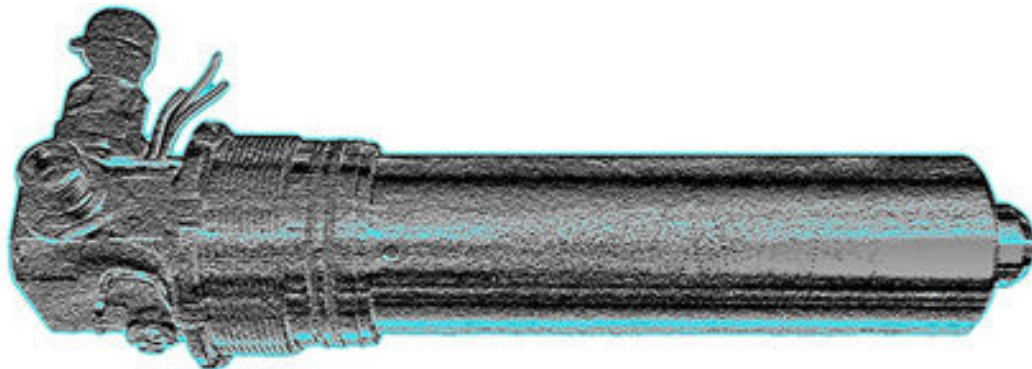
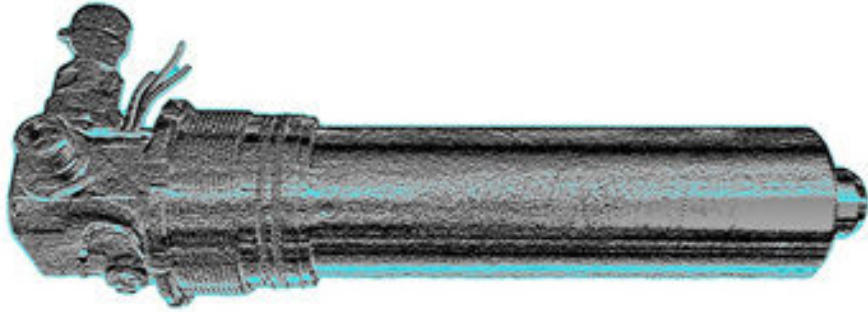
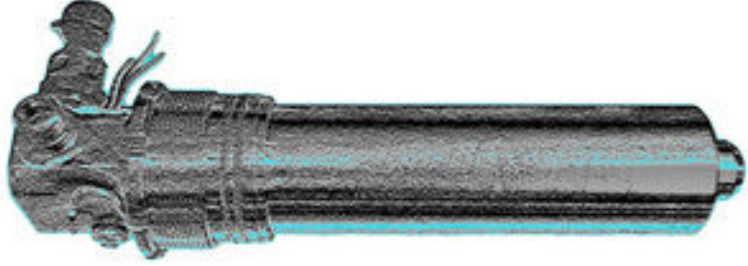
Liquid LPG Injectors + Rail

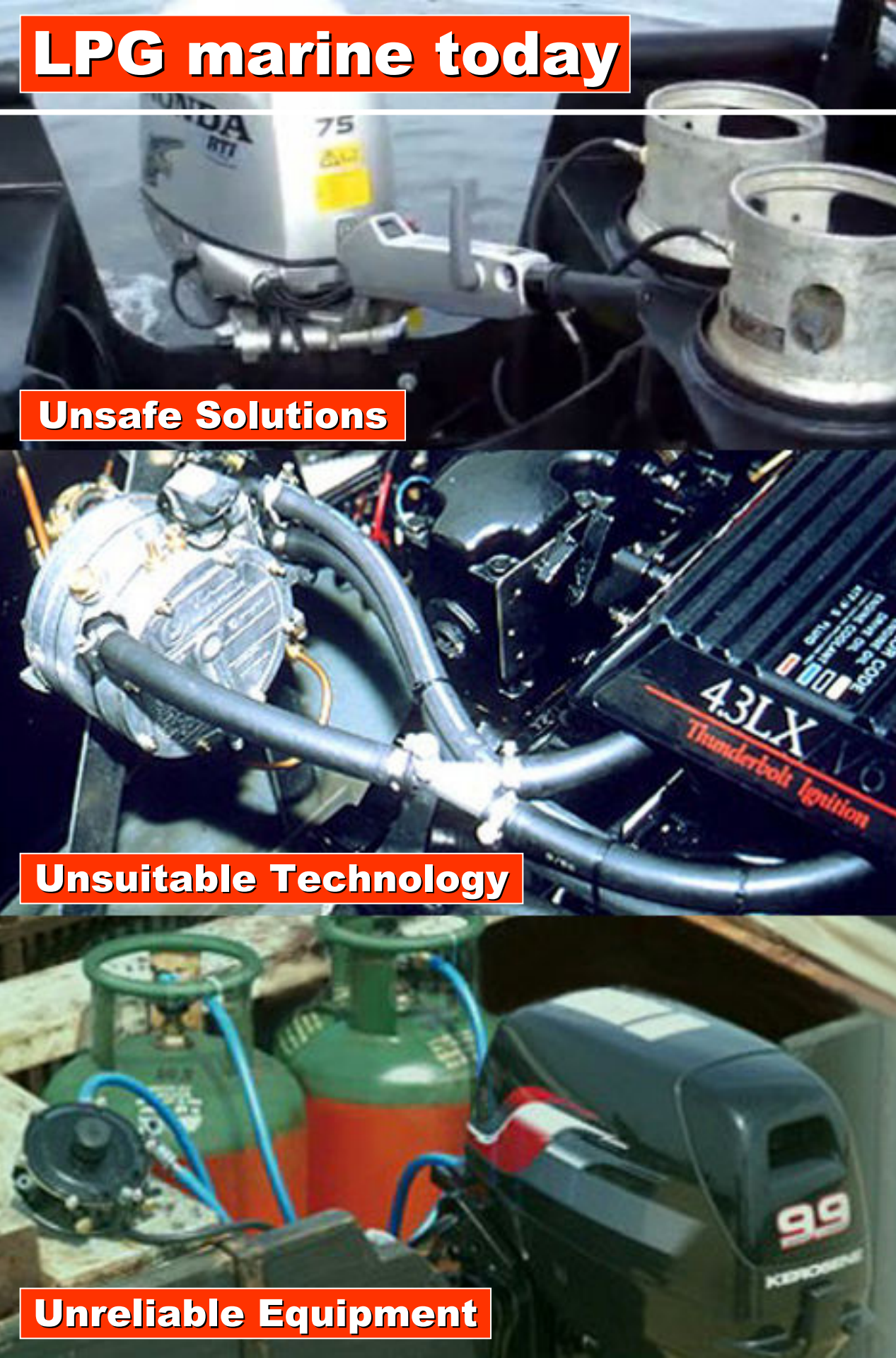


Hoses and pipes

IMMISS/LGI System is Easily Scalable...

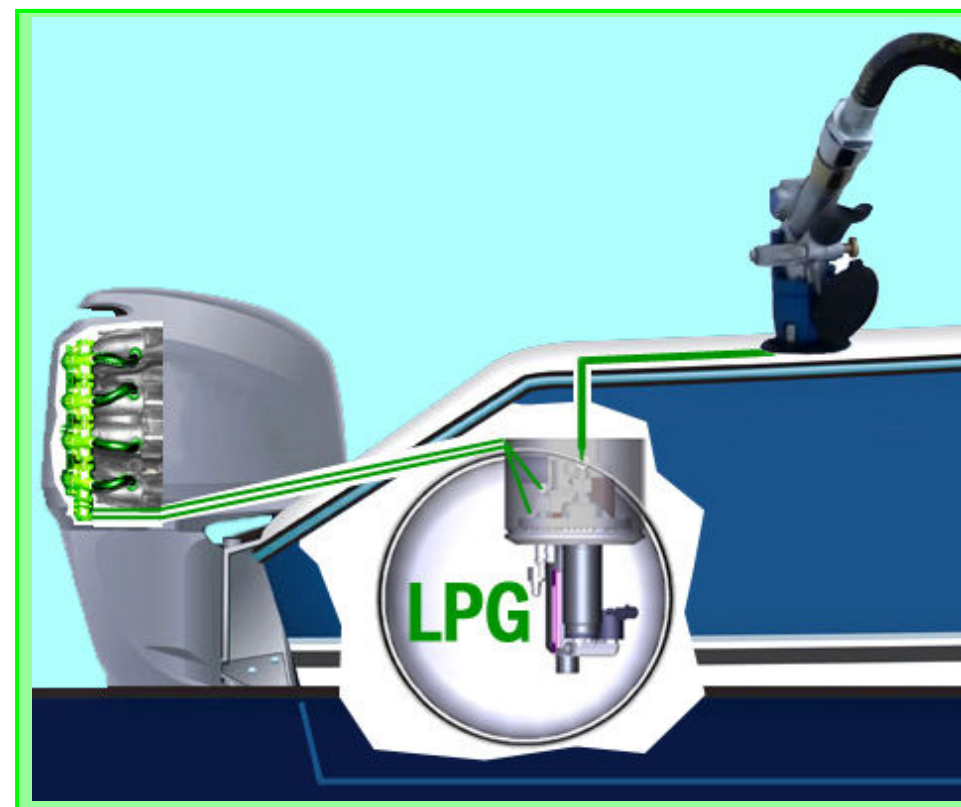
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LGI System

X·TECH
MARINE



Implementation of X-Tech LGI System need short engineering and few time for installation.



IMMISS design let to increase the safety

X·TECH
MARINE

IMMISS is a "solid state" device, with no parts scattered in the tank and his design lets safety solutions impossible with other systems

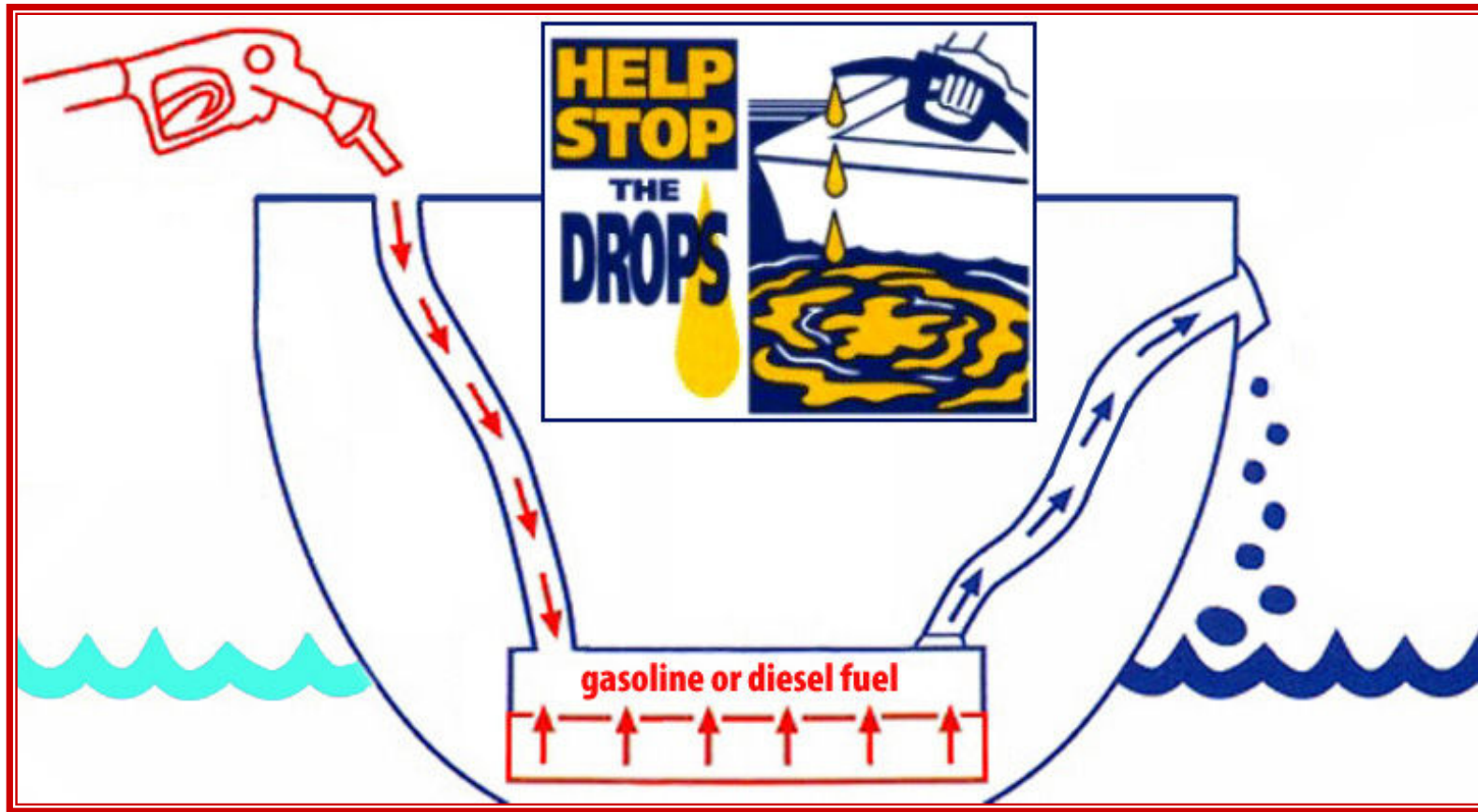


**ANTI-EXPLOSION
ANTI-SLOSHING
LPG TANK
INSIDE**



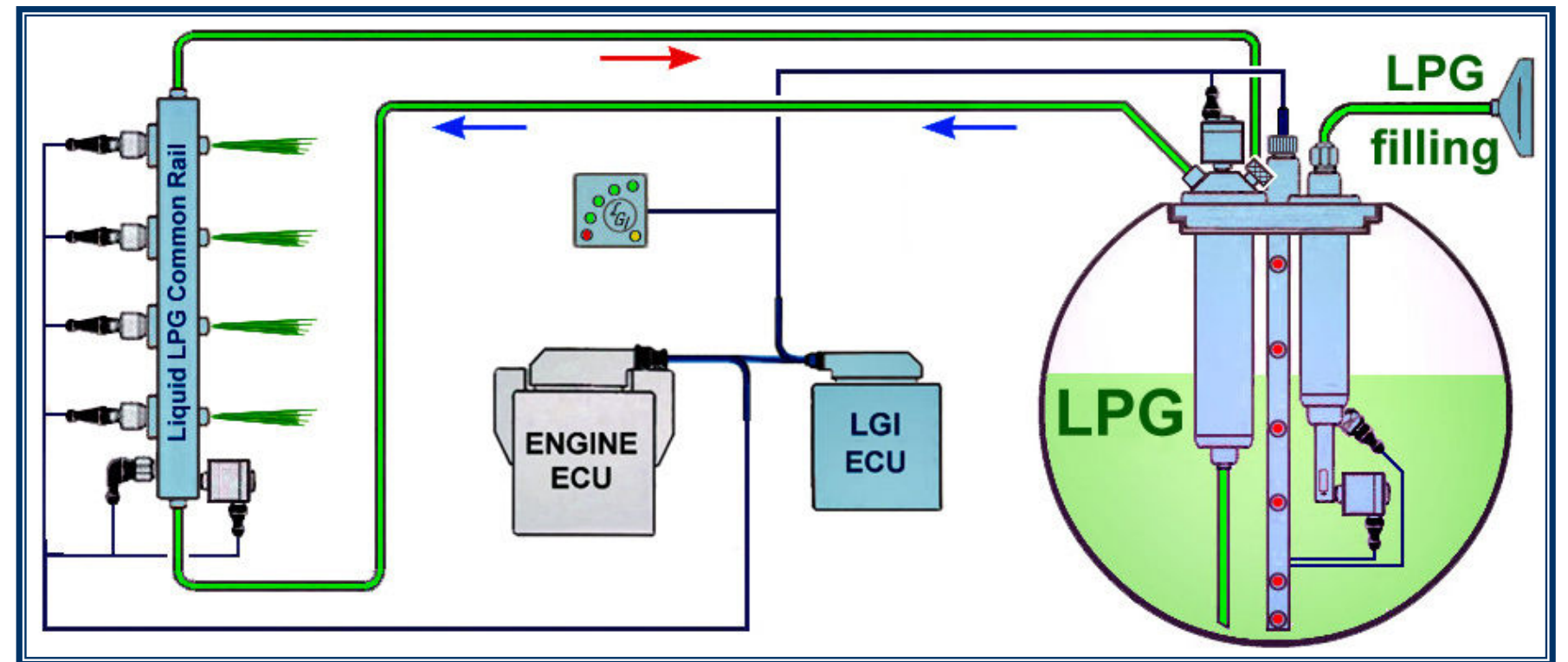
LPG filling is safe and environmentally friendly

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MARINE



For safety reasons gasoline and diesel fuel tanks on boats have an “open circuit”, that let the fuel spill in the water at every filling.

LPG fuel system has no way of leakage, because is a wholly closed circuit: here the LGI System fuel diagram.



LPG marine filling station is simple and cheap



A LPG filling station installed on pontoon for marine use, with tank and dispenser unit, costs few thousands € and can be easily and quickly positioned at any place at very limited costs.

Unlike gasoline, diesel, methanol and ethanol LPG is non-toxic and is not harmful to soil and water and the placement of LPG tanks are usually not regulated by the Environmental Authorities.

LPG filling station require very few electricity and, due the no-noisy, can be located everywhere.

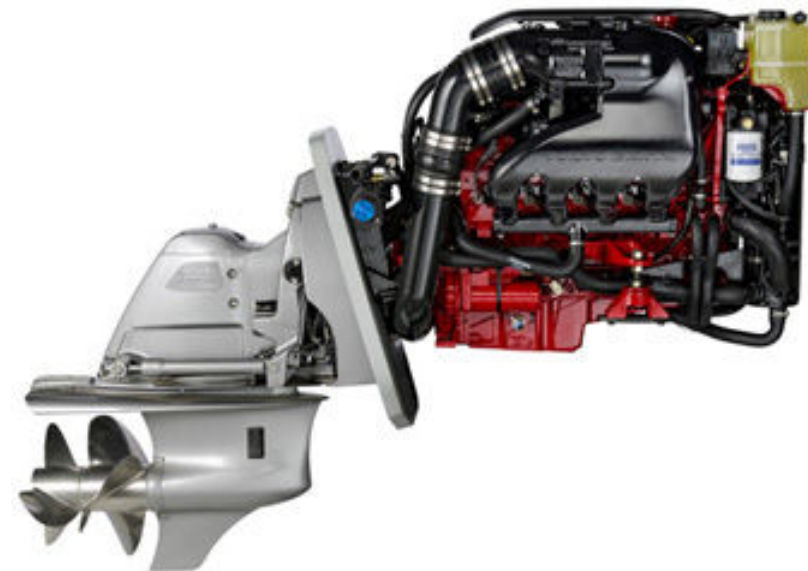
In England many seaport has LPG filling station and some others are located in Europe, one in Venice.

LGI System: the solution for hi-power engines



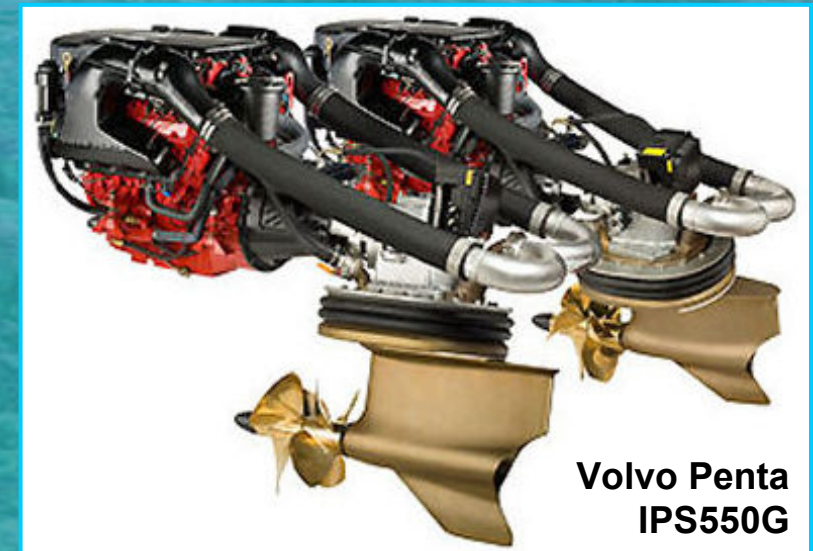
The powerful gasoline engines used by the most qualified manufacturers of stern-drive powertrains are ideal applications for the conversion on LPG with the LGI System.

In the same way is also the ideal solution for the last generation of 4 stroke outboard engines, thanks to the small dimensions of components and the friendly management system, designed to operate with the original electronics, granting efficiency and reliability levels before impossible.





X-Tech LGI System is the right technology to utilize LPG with the most technological state of the art marine propulsion systems today on the market.



Volvo Penta
IPS550G

LPG: the green fuel for the inland waterways



Tourisme fluvial

GPL



For the growing tourism that loves canals, rivers and lakes to enjoy slow journey we have the equipment in condition to let utilize the LPG as very clean and ideal fuel for propulsion, for cooking and heating, granting in the meantime total safety on board.

Logistic for refueling such boats can be easily realized in short time and at low cost, ensuring a new market for LPG during spring-summer time.



A skid mounted LPG filling station, with tank and fuel dispenser unit, cost few thousands Euro and can be easily and quickly placed anywhere.

LPG & LGI System for working boats



IMMISS / LGI System is designed for heavy-duty professional users such as taxi fleets, buses, trucks, industrial vehicles and for the marine sector of course.

Even in the most extreme conditions of use, is able to ensure a very high level of reliability, jointly to a simple maintenance, high efficiency and low operating costs.

In addition to the dramatic reduction of emissions, the other significant aspect to highlight is that using LPG on boats there is a significant reduction of operating costs, thanks to the lower cost of this fuel.

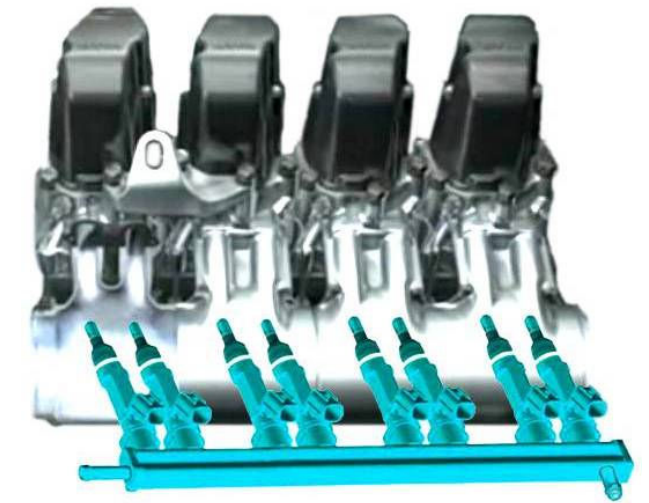
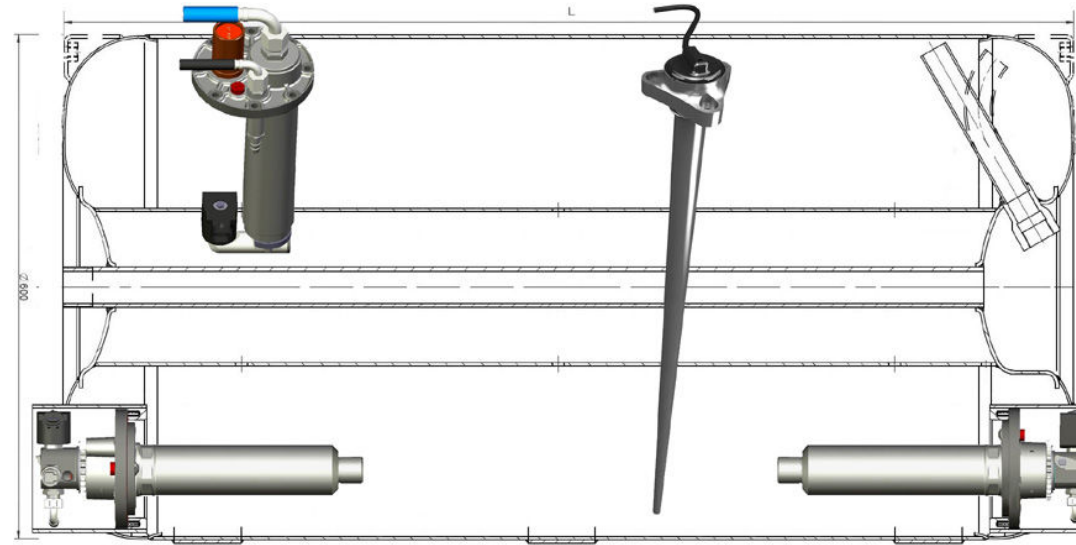
LPG & LGI System for shellfish culture and fish farming



As evidenced, the utilization of LPG as fuel for marine engines eliminates from the fishing food chain particulate matter (PM), benzene and MTBE, polycyclic aromatic hydrocarbons, cyanides, ammonia, nitrous oxides, hydrogen sulphide, sulphur dioxide, aldehydes and ketones, phenols, amines, nitrosamines and unburned hydrocarbons. It's a huge plus! For the environment, for the quality of fish products, and then for health.

LGI System: the solution for heavy-duty

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MARINE



The LGI System can be realized for engines with high power and very high fuel consumption, today till to around 500 hp. For higher powers - about 3,000 hp - exploiting on the peculiarity of the IMMISS design, is planned the development of a specific LGI System for such "Super Heavy-Duty" engines.

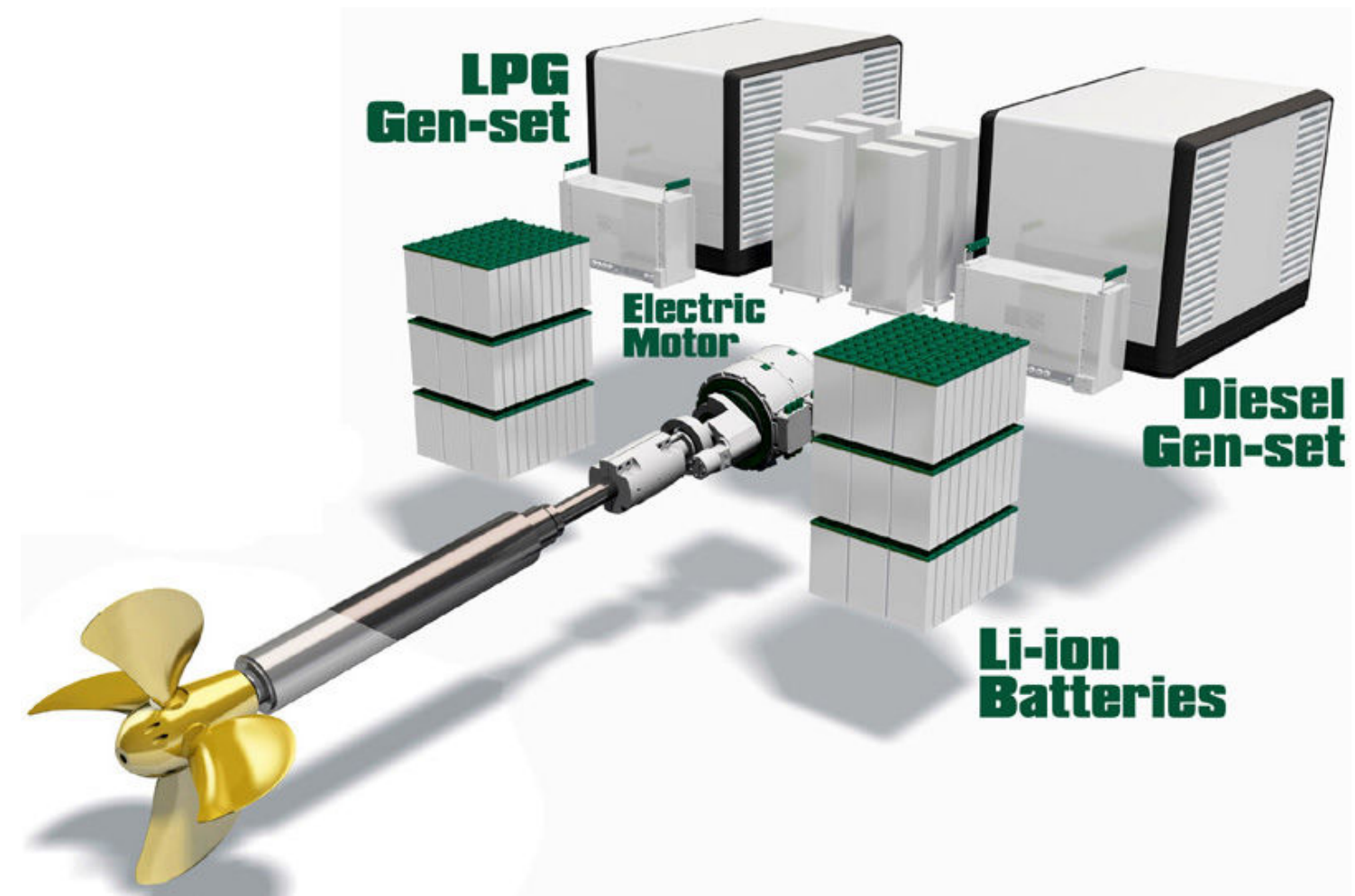
This system, called "Duplex", is equipped with two IMMISS injection pumps each LPG tank and feeds two injectors for each cylinder.



LGI System is the solution for new hybrid boats



The innovative hi-tech design of the LGI System makes easy the utilization of LPG as very clean and environmentally friendly fuel on the coming generation of boats equipped with hybrid-electric propulsion systems.



LPG greatly reduces the fuel costs



Today worldwide prices of LPG/Autogas for vehicles are far cheaper to conventional fuels like gasoline and diesel.

The adjunctive cost of the LPG LGI System for the boat engine can be paid in a short time due to the gap in the running cost of LPG, much cheaper than gasoline or diesel fuels.

Investing in an LPG boat once will ensure to cut down the fuel bills forever!



IMMISS Patents

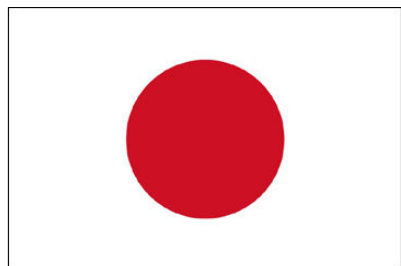
E.U. Patent N. 08807149.3
Covering E.U. 28 countries,
Switzerland and Turkey

Other International Patents Pending

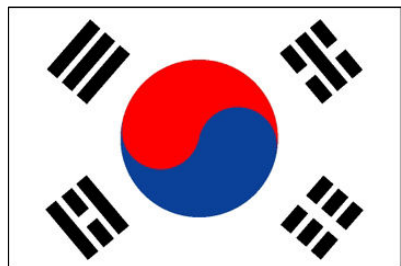
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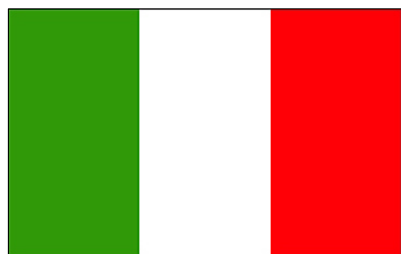
China Patent N. 200880117188



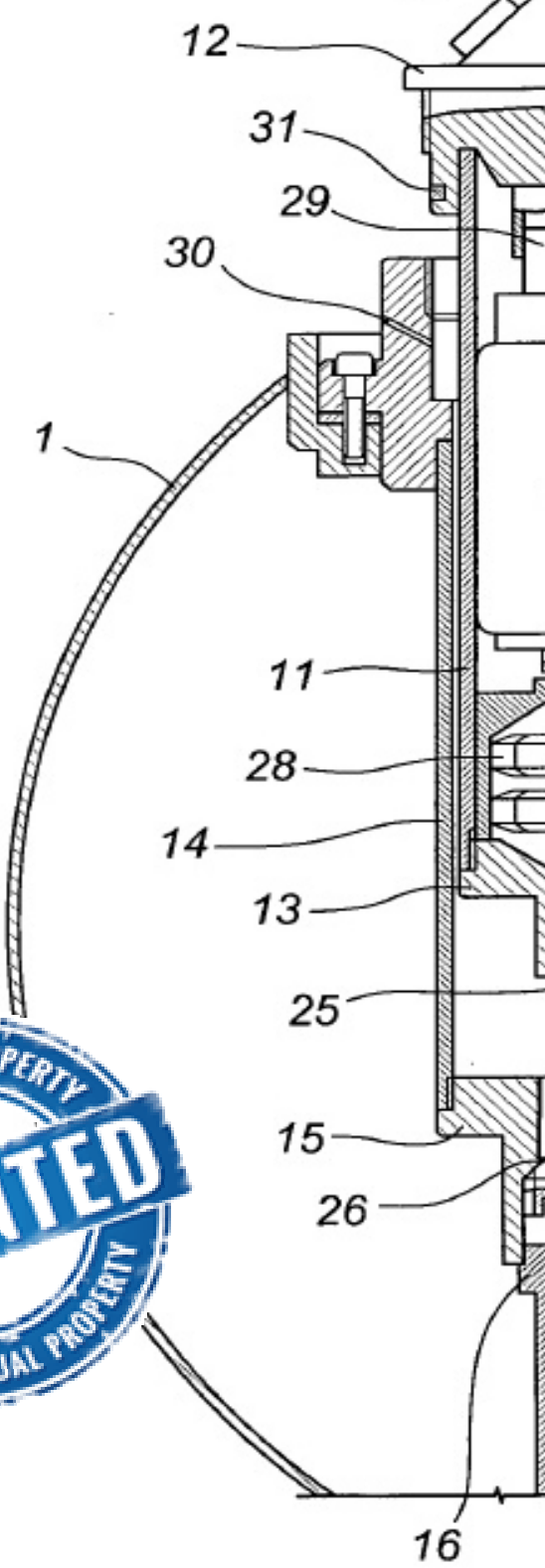
Japan Patent N. 2010-526387



Korea Patent N. 10-2010-7009268



Italian Patent N. 0001377627



LGI System & LPG

for enjoying an environmentally friendly & cheap boating!



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Member of WLPGA

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