

DEGA **MIX**

Diesel and Gas Mixture



-ELPIGAZ
AUTOMOTIVE

- ✓ LPG for diesel engines
- ✓ LPG for excavator
- ✓ LPG for aggregates
- ✓ LPG for buses
- ✓ LPG for lorries
- ✓ LPG for combine-harvester
- ✓ LPG for stationary engines



DEGA^{MIX}

Diesel and Gas Mixture

Positive Vapour Injection for Diesel Powered Vehicles

DEGA^{mix} (Diesel and Gas mixture) is LPG system for vehicles with diesel engines, that means engines with self-ignition. In other words, we present you DUAL FUEL system which allows the vehicle to operate simultaneously on diesel and injecting via the air induction LPG fuel. The DUAL FUEL feeding solution was used by Rudolf Diesel - inventor of diesel engine with self-ignition in order to optimize engine's overall performance.

DEGA^{mix} system has few significant benefits:

Advantages of using LPG

- Allows saving your money thanks to replacing expensive diesel fuel with much cheaper LPG
- Increases engine's power typically by 20% or more in some cases

Longer engine life

- More complete combustion of diesel reduces carbon deposits. Less carbon deposits means reduced oil contamination. This increases oil and engine life.

Cleaner burning and reduced emissions

- Decreases the emission of pollutants into the atmosphere
- More complete combustion

Reduced maintenance

- Fewer oil changes less sludge
- Less carbon deposits inside crankcase

Improved combustion characteristics

- Results in a cooler engine more torque, and smoother running engine

Less driver fatigue

- Clients report quicker point to point times.

DEGA^{mix} system application:

DEGA^{mix} can be used in a wide range of high-compression engines, starting with the non charged (non turbo) engines through turbo engines up to Common Rail. The system can be installed in:

- Vehicles (passenger cars, delivery trucks, heavy-loaded trucks, buses)
- Construction machinery
- Agriculture machinery and tractors
- Stationery engines (generators and pumps).

In DUAL FUEL system LPG is being added to the engine running on diesel fuel. Application of DEGA^{mix} allows decreasing diesel fuel consumption from 20 up to 30% by dosing 20-30% of LPG instead, which is significantly cheaper.

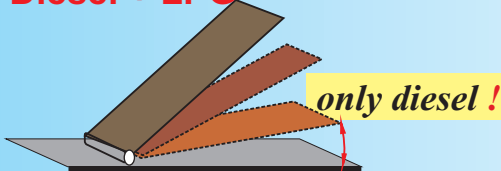
DEGA^{mix} system holds all required approvals and certifications allowing installing it in many types of vehicles: passenger cars (M1), delivery trucks (N1) and lorries (N2 and N3) and also for buses (M2 and M3).

How does the DEGA^{mix} system operate?

LPG when injected into the diesel engine enhances the combustion by stabilizing or evening out the combustion of this normally violent explosion that occurs in the combustion chamber. By evening out and slowing down the effect of it provides a more even burn resulting in more power, more torque, fewer emissions, less engine wear and the system pays for itself with increased fuel mileage.

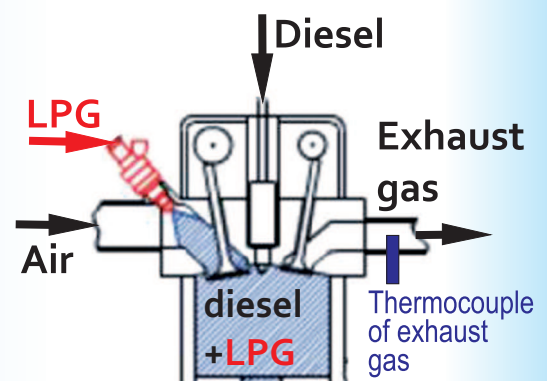
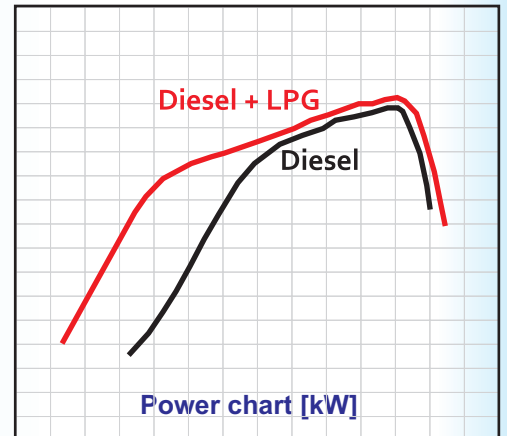
DEGA^{mix} system does not add LPG while operating at idle, while engine braking and at higher engine revs.

Diesel + LPG



The system is pre-programmed to shut down automatically if the exhaust temperature exceeds its pre-set temperature setting for a minimum of 30 seconds. There is also a pre-set on engine coolant if the temperature drops below the pre-set parameter, and return to normal diesel operation if pre-sets are breached.

Such solution guarantees complete safety of the engine and allows running as MONO FUEL system. The **DEGA^{mix}** programming ensures safe and reliable operation of the diesel engine.



Benefits of using DUAL FUEL system

DEGA^{mix} system is perfect for trucks, agricultural machinery, agricultural tractors, power generators and other machines powered by diesel engines. Thanks to this innovative solution many benefits are available:

ECONOMY

- Decrease of operation expenses (thanks to replacing expensive diesel fuel with much cheaper LPG)
- Increase of mileage between next refueling
- Extended oil change intervals

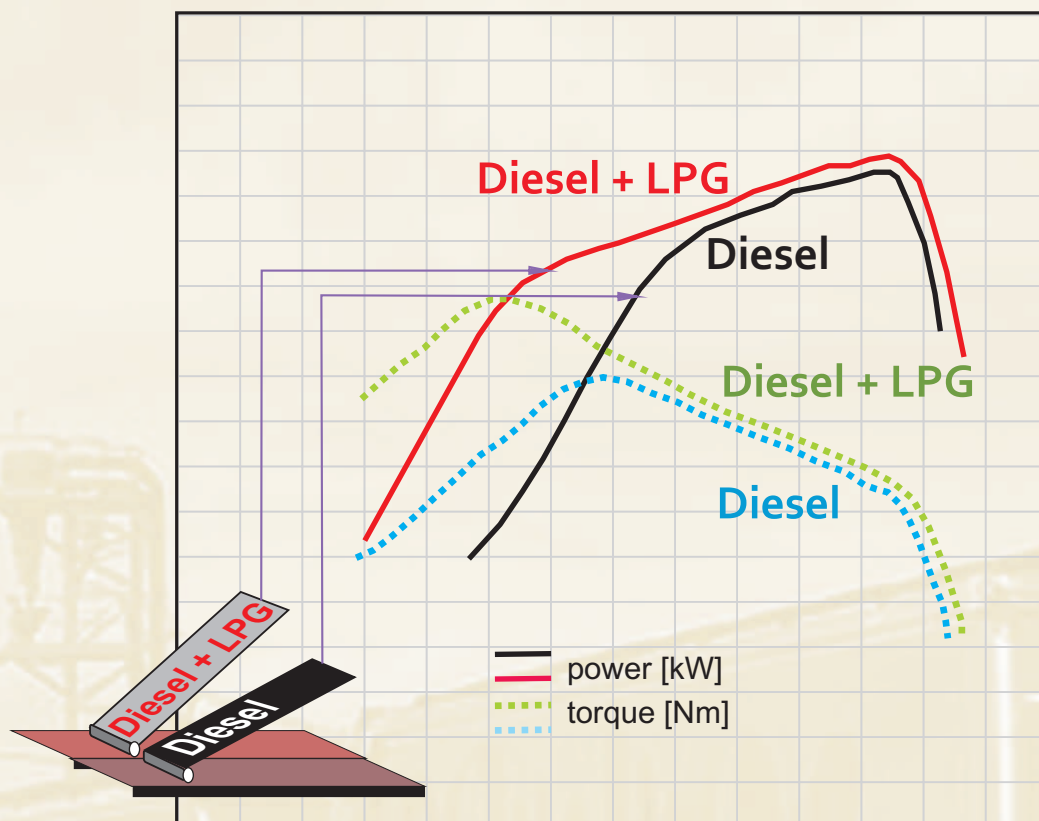
OPERATION

- Increase of the driving dynamics (torque and power increase)
- Mechanics - lower pressure in particular components of car fuel systems
- Diversification of energy carriers

ECOLOGY

- Lower emission of pollutants into the atmosphere thanks to better diesel combustion and lower emission of CO₂
- Using ecological fuels (LPG)

The highest efficiency of **DEGA^{mix}** system is reached with loaded engines, that is for automobiles covering long distances and transporting large cargos and also for other machinery operating with a large load (tractors, aggregates).



Advantages of DEGA^{mix} system - OPERATION

- Increase of the torque and of engine's power

Engine's power with **DEGA^{mix}** system increases up to approx. 10-15% and torque up to even 30% - especially at the low torque speed, so where it's needed the most. The vehicle has doubtless better acceleration and driving is much more dynamic. The above mentioned results are confirmed by opinions of drivers and of research on chassis chamber and during test drives.

- Lower supply in car feeding systems (emulation)

Addition of LPG to diesel engine allows to decrease supply in particular components of diesel powered car's feeding system, while keeping the same pressure on the accelerator. That is conducive to extend life of the whole fuel injector system in the engine (Common Rail).

- Diversification of energy carriers

Recently it is more and more popular to use an alternative energy that allows every entrepreneur to obtain many benefits in a long term perspective.

Advantages of DEGA^{mix} system - ECONOMY

Fuel costs decrease

Using DEGA^{mix} system allows to save your money thanks to:

- replacing expensive diesel fuel with much cheaper LPG
- for vehicles up to 25% diesel can be replaced with LPG and even up to 30% for stationary engines,
- decreasing up to 5% of total diesel and LPG consumption in comparison to running on diesel only.

Formula given below presents savings received thanks to applying DEGA^{mix} system. Financial benefit is demonstrated as an equivalence of the amount of saved diesel at each 100 km distance, on the basis of current prices of both fuels, that is diesel and LPG.

$$\text{\$DF} = \text{DF}_m - (\text{DF}_d + \text{LPG}_d \times \text{CLPG}/\text{CDF})$$

DF_m = diesel consumption by mono fuel powered engine (only diesel)

DF_d = diesel consumption by dual fuel powered engine (diesel + LPG) - DEGA^{mix}

LPG_d = LPG consumption by dual fuel powered engine (diesel + LPG) - DEGA^{mix}

CLPG = LPG price (EUR/dm³)

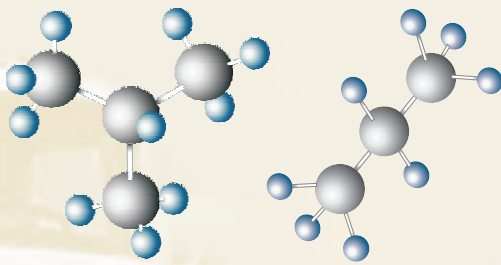
CDF = diesel price (EUR/ dm³)

\\$DF = Financial benefit demonstrated as a equivalence of the amount of saved diesel (dm³ /100 km), thanks to applying DEGA^{mix} system

Increase of the intervals between refueling

Thanks to using additional fuel the distance between next refueling is increased and also the engine's functioning is extended.

Advantages of DEGA^{mix} system - ECOLOGY



Lower exhaust gas emission

Thanks to using dual fuel system (diesel+LPG) for diesel engines emission of pollutants and soot into the atmosphere is significantly decreased comparing to diesel combustion. In no charged combustion chamber of diesel engine, not all of components are completely combusted which leads to pollutants origination such as:

- CO (Carbon monoxide)
- HC (Hydrocarbon)
- particulate solids

It means even during combustion process in the engine with direct fuel injection (without Common Rail system), only 75-80% of injected fuel undergoes physico-chemical changes and by-products in the form of pollutants are emitted into the atmosphere.



TGA model
consumption
[l/100km]

only diesel	
DF _m	42
DEGA ^{mix}	
DF _d	26
LPG _d	9
\\$DF	11,4
\\$EUR	13,03

Savings for MAN TGA with DEGA^{mix} system

- 13 030 EUR/ 100 000 km



469L model
consumption
[l/100km]

only diesel	
DF _m	28
DEGA ^{mix}	
DF _d	20
LPG _d	8
\\$DF	4,14
\\$EUR	4,89

Savings for MAN 469L bus with DEGA^{mix} system

- 4 890 EUR/ 100 000 km



380 model
consumption
[l/100km]

only diesel	
DF _m	35
DEGA ^{mix}	
DF _d	26
LPG _d	8
\\$DF	8
\\$EUR	6,67

Savings for SCANIA 380 with DEGA^{mix} system

- 6 670 EUR/ 100 000 km



T5 model
consumption
[l/100km]

only diesel	
DF _m	10
DEGA ^{mix}	
DF _d	6,5
LPG _d	2,6
\\$DF	2,06
\\$EUR	2,44

Savings for VW Transporter T5 with DEGA^{mix} system

- 2 440 EUR/ 100 000 km

* information obtained from DEGA^{mix} system users prepared basing on the fuel price level in Poland: diesel - 1,18 EUR/l, LPG - 0,65 EUR/l

Components of **DEGA^{mix}** system

DEGA^{mix} system for diesel engines consists of two main groups of components:

I - Components installed in the engine's chamber - "front kit" or "motor kit"

II - Tank with equipment

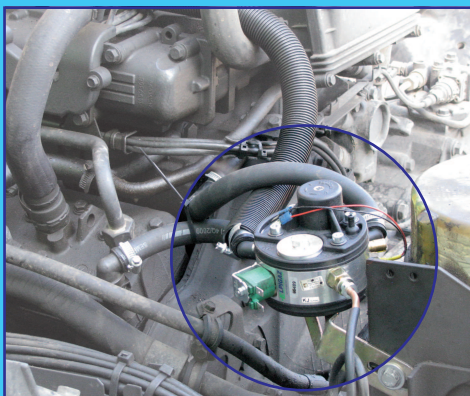
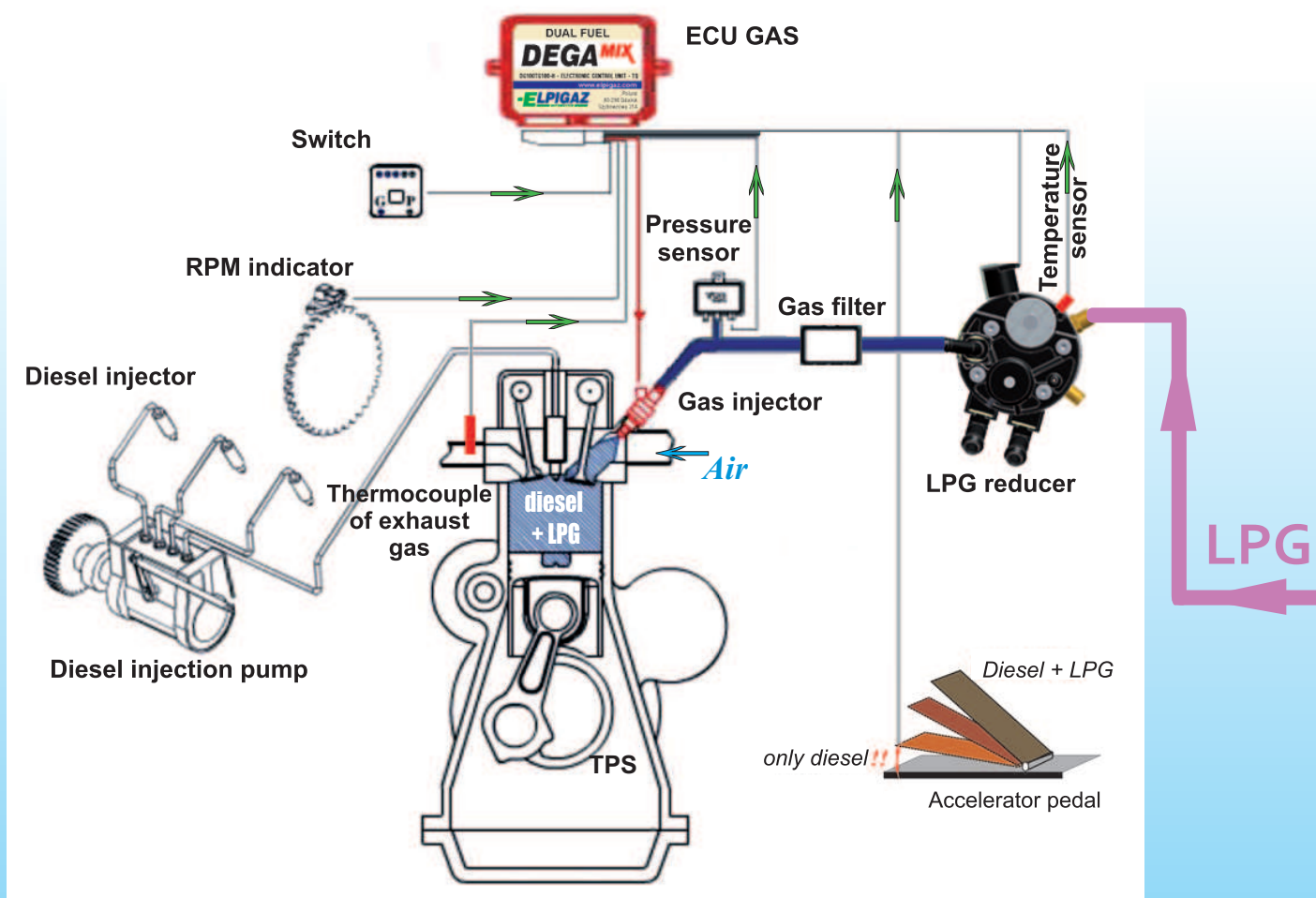
I-Components installed in the engine's chamber - "front kit" or "motor kit"

Configuration of **DEGA^{mix}** system depends on engine's horse power and includes following elements¹⁾:

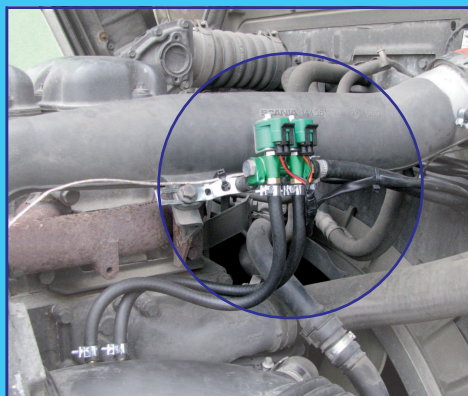
- **DEGA^{mix}** Control Unit (ECU GAS) with switch with full gas level indication
- Gas pressure sensor
- Gas filter
- Thermocouple of exhaust gas (for **DEGA^{mix}** system with exhaust gas thermocouple)
- FIORE FORTE - LPG reducer for gas injection system and temperature sensor
- Set of VERDE gas injectors (1 or 2-section)²⁾
- Set of harness and montage accessories

¹⁾ Two versions of **DEGA^{mix}** system with different types of power supply are available: 12 V and 24 V (24 V power supply type requires applying the pressure converter)

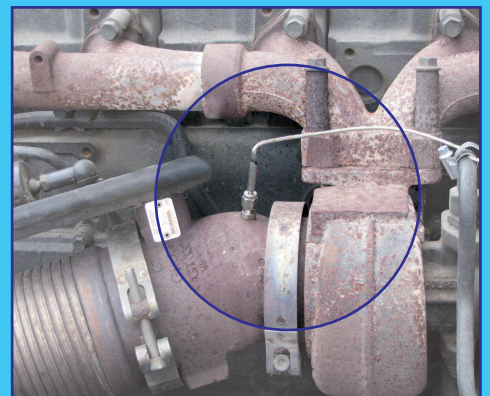
²⁾ Depending on engine's horse power (up to 300 HP - with 1-section injector, and +300 HP 2-section injector)



Fiole Forte reducer



Set of Verde injectors



Thermocouple of exhaust gas

II - LPG tanks with equipment for **DEGA^{mix}** system

Wide offer of LPG tanks suitable for **DEGA^{mix}** system contains the following POLMOCON tanks:

- Unique Large Capacity tanks (LC) - vertical and horizontal, with diameter D 565-720 mm and length from 350 mm even up to 1400 mm. For those parameters are available capacities from 74 up to 545 l. Such tanks are designed mainly for large vehicles, such as trucks, where LC tanks allow longer distances between LPG refill.
- Cylindrical tanks with different sizes and diameters
- MoreMo and HIT toroidal tanks – with the shape of the spare wheel, designed for many types of vehicles
- MoreMo standing toroidal tanks – STAND type, which allows optimal usage of available space in the trunk.

Choice of specific size and type of the tank depends on proportion of LPG and diesel feeding. With **DEGA^{mix}** system you should be able to refuel both fuels simultaneously or refuel less frequent LPG than diesel.

Tank is also selected taking into consideration the space available for it. In most installations the tank is fitted on the vehicle's frame, behind the driver's cab or in the spare wheel chamber.



“Large Capacity” tank



Filling point



Standing tank “STAND”



-ELPIGAZ
AUTOMOTIVE

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