



Product **Technical Statements**

Introduction to GHP™

GHP™ is a Transitional Technology upgrading existing / in-use engines into hydrogen-hybrid engines operating on 2 fuels of petrol or diesel and hydrogen jointly. GHP™ is not an alternative fuel!

Up to 30% of fossil fuel is replaced with hydrogen, abating 2.7 kg of carbon for every liter of fossil fuel no longer burned during an engine's combustion process.

GHP™ is the lead into fuel cell technologies within a nation.

The Technology

The GHP™ technology operates via a stoichiometrically calculated addition of hydrogen gas into the air / fuel mix of an engine.

The stoichiometric formula calculates the volume of hydrogen to be injected into an engine, and it's the ip trade secret of GHP™.

The Engine Upgrade Process

No design change and no functional change required to an engine.

Hydrogen is an already present substance within fossil fuel, so an engine's sensors recognize and accept the addition of hydrogen gas into the combustion process.

Hydrogen gas comfortably replaces petrol or diesel as hydrogen is a combustible fuel of higher calorific value than petrol or diesel. Hydrogen in a gaseous state is valued at 120 megajoules, petrol 42.4 megajoules and diesel 34.95 megajoules.

GHP™ is designed to reduce and replace up to 30% of petrol or diesel fuel consumption with hydrogen gas.



GHP™ **Product Safety**

Hydrogen Fuel Enhancement and Hydrogen-Hybrid Engines

The addition of hydrogen gas into the air / fuel mix of an internal combustion engine is not an innovation.

Hydrogen fuel enhancement and hydrogen-hybrid engines have been tried and tested in science since the 1960s by international universities and reported upon favorably by NASA. GHP™ is the refinement and commercialization of a known and proven science.

Hydrogen Gas

Hydrogen in a gaseous state is an inert gas. Hydrogen gas can only be explosive when mixed with oxygen in a fully contained environment at the ratio of 1 part hydrogen to 4 parts oxygen. hydrogen gas used with the GHP™ product is 99.995% pure.

Hydrogen gas is 3 times lighter than helium gas and innately rises into the atmosphere upon release from its storage cylinder – unlike other fuels that pool low. Hydrogen gas if involved in a fire burns upwards in a candle effect – unlike other fuels that spread wide.

Hydrogen gas is non-toxic if exposed to human inhalation – hydrogen is a natural substance within air.

Gas Cylinders

Hydrogen gas cylinders are manufactured internally of 5mm thick mild steel and capable of enduring direct impact in an incident and/or accident – unlike aluminum alloy metals used in the manufacture of storage cylinders used with LPG and CNG fuels.

Mild steel is capable of withholding hydrogen molecules. Hydrogen gas cylinders are manufactured to accept expansion of stored gas up to 5 times the fill pressure of 200 bar.

Hydrogen gas cylinders are capable of being stored outdoors, up to 65 degrees Celsius direct heat is tolerable. Hydrogen gas cylinders are designed and manufactured with an automatic relief valve permitting an instant dump of stored gas should the cylinder pressure become unstable.



Hydrogen gas cylinders are color-coded to indicate gas type to the emergency services in an incident and/or accident occurrence. Hydrogen gas cylinder valves are left-hand thread avoiding misconnection errors.

Hydrogen gas cylinders are manufactured to ISO EN 12205 – 2001 / TPED 99 / 36 CE standards compliance.

Cylinders sized to store 8,800 litres or 8.8 cubic meters - typical usage = power generators

- 1410 mm Height
- 229 mm Outer Diameter
- 53 KG Full
- 49 KG Empty

Cylinders sized to store 4,400 litres or 4.4 cubic meters – typical usage = buses / trucks

- 910 mm Height
- 200 mm Outer Diameter
- 30 KG Full
- 28 KG Empty

Hydrogen Gas Cylinder Valves

Hydrogen gas cylinder valves are type specific per country. Valves are manufactured from brass as brass compound safely withholds tiny and lightweight hydrogen molecules.

Hydrogen Hosing

Hosing transferring gas from a gas storage cylinder into an engine's combustion process is of high-pressure capacity accepting up to 5 times is transfer pressure of 200 bar.

High-pressure hosing is manufactured of Kevlar – same materials used in bullet-proof vests ensuring durability in industrial environments. High-pressure hosing is manufactured to BS EN ISO 14113:1997 standards compliance.

Pressure Reducing Regulator

The pressure reducing regulator lowering the transfer pressure from a stored 200 bar down to 10 bar for injection into an engine's combustion process is a 2-stage regulator.



Use of a 2-stage regulator ensures consistency of gas flow as a cylinder fill depletes. 2-stage pressure reducing regulators are manufactured to ISO 2503 standards compliance.

Flame Arrestor

The flame arrestor set into the hydrogen gas flow process is a one-way valve eliminating any risk of spark and/or flame flowback to the hydrogen gas storage cylinder.

Flame arrestors in use in the GHP™ product are BAM (German) manufactured, tested, and certified to BAM / ZBA / 007 / 03 standards compliance.

Shutoff Solenoid

In the GHP™ product a shutoff solenoid is used as a safety measure to close the flow of hydrogen into an engine when the operator ceases use of an engine.

Shutoff solenoids operate as fully open or fully closed via an associated on / off switch. the shutoff solenoids used in the GHP™ product are fuel quality valves and compatible with hydrogen gas. Shutoff solenoids are manufactured to ISO / CE 400325 – 142 standards compliance.

Hydrogen Injectors

In the GHP™ product hydrogen injection is specialized. The injection system is manufactured from brass as brass compound safely withholds tiny and lightweight hydrogen molecules.

Hydrogen-Hybrid Management

As there is no design change and no functionality change to an engine if the hydrogen gas runs out an engine will continue operating on its standard fuel system of petrol or diesel.

Product Installations

The GHP™ product requires skilled installation. motor mechanics and diesel engine mechanics are contracted product installers and members of the GHP™ product installer network following completion of hydrogen technology training with the GHP™ IP owners.

Product installations are conducted in compliance with published standards for the GHP™ product.