HEINZMANN solutions for reducing fuel costs and emissions

Dual fuel extension kit for common rail-based diesel engines

Sharply increasing fuel costs and increasingly strict emission limits are encouraging diesel engine manufacturers and operators of existing diesel-driven systems to seek new solutions. Help for both problems is promised by conversion of diesel engines to natural gas. HEINZMANN offers modular conversion kits for this.

Reduction of operating costs thanks to dual fuel conversion

Depending on the price of gas which in many countries is far lower than the price of diesel, this measure can enable a significant reduction in operating costs. Natural gas is also available practically everywhere now. Thanks to the combustion behaviour of natural gas and its combustion properties, the exhaust gas quality with respect to soot, CO₂, NOₓ, HC und SOₓ can be kept within current and future anticipated limits with no subsequent treatment. The conversion costs will pay for themselves in many cases after just a short time.

So-called dual fuel operation furthermore offers the option of running engines equipped with or converted to the gas system bivalently. Should the gas supply run out, unrestricted diesel operation can take over therefore ensuring continued availability.

Gas-powered engines are located in many applications including stationary systems, vehicles and increasingly in locomotives and ships. They use gas storage technologies such as high compression (Compressed Natural Gas, CNG) or gas liquefaction (Liquefied Natural Gas, LNG). These application areas are also ideal for dual fuel operation.

Dual fuel expansion becoming more significant in marine sector

The marine sector will be of particular significance in future. The biggest influence on this will be the impending worldwide introduction of so-called ECAs, Emission Controlled Areas, in coastal regions. The prohibition of heavy fuel oil will necessarily increase operating costs. Since this will apply to existing engines also, the shipping industry needs to take corresponding action. Gas power is favoured here because, unlike in high seas, the distances travelled are shorter and tank capacities need not be so large.

Disadvantages of conventional injection in dual fuel operation

Dual fuel operation is characterised in that the incoming gas and air mixture is not ignited by a spark but by a small quantity of injected diesel fuel. The aim is to keep this so-called ignition oil quantity as low as possible to achieve a favourable consumption and emission performance. In simple systems, the ignition oil quantity is reduced to just the injection quantity of the existing diesel injection system. This method however has narrow limits. The reason this is a typical injection misbalancing of conventional injection systems at small injection quantities. Therefore, in such systems the
Ignition oil quantity has to be set quite high to ensure ignition for all cylinders. The diesel portion is typically 10…30 % of the overall fuel consumption which correspondingly limits the savings potential in terms of operating costs and emissions. A further disadvantage is that the injection timing and therefore the ignition timing cannot be changed for gas operation. It is therefore impossible to optimise the efficiency or emissions.

**HEINZMANN offers modular solution kits for precision dual fuel conversion**

An ideal solution is the conversion of the diesel injection system to a common rail system in conjunction with dual fuel conversion or to fit a dual fuel system in an engine with an existing common rail system. HEINZMANN offers modular solution kits for this which can be precisely tailored to the respective applications. The open architecture allows the addition of new functions at any time, e.g. lambda control, exhaust gas recirculation or exhaust gas treatment.

**Reduction of ignition oil quantity by balancing the diesel injection quantity and use of knock control**

By balancing the diesel injection quantities throughout the entire operating range of the engine, engines can be run with minimum ignition oil proportions of as little as 1 %. If multipoint gas injection is chosen for the gas end system, full individual cylinder control can be implemented for control of the diesel and gas side. In conjunction with a knock control module which monitors the individual cylinders, optimum combustion management can be achieved for each cylinder. Free parameterisation of the diesel injection timing ensures the best possible combustion process for diesel and for gas operation under all operating conditions. Together with cylinder-specific exhaust temperature management and misfire detection, the overall system offers extensive engine monitoring and provides reliable protection.

**Optimum fuel/air ratio thanks to boost pressure control**

The optimum fuel/air ratio can be adjusted with additional boost pressure control via a wastegate or a compressor bypass valve in order to improve the exhaust emission quality for any operation point. NOx emissions in particular can be further reduced in this way. This also has a favourable influence on knock behaviour and maximum performance in gas-operating mode.

**Reduction of nitrogen oxide emission due to exhaust recycling system**

In addition, retrofitting an exhaust gas recirculation system can also significantly reduce nitrogen oxide emissions. This will even enable compliance with the TIer 4 limits which specify a further reduction of NOx. Expensive exhaust after-treatment systems are not necessarily required.

**Dual fuel solutions to meet future emission regulations**

The HEINZMANN system can be upgraded at any time, making it highly future proof. Depending on the expansion level, coverage of currently applicable emission directives is guaranteed. Connection to a primary system controller or application-specific function units, e.g. for generators or locomotives, can easily be realised by using standard bus interfaces.

**HEINZMANN engine management expertise**

HEINZMANN has years of experience in engine management in both the diesel and gas engine sectors. We have been carrying out dual fuel conversions successfully for 20 years for the most diverse of applications.
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Practically all our components are developed and produced in-house. Together with our comprehensive system expertise, this enables us to supply single-sourced application-appropriate solutions for equipping new engines as well as for the conversion of existing engines.

Company Profile

The HEINZMANN Group is one of the leading system suppliers worldwide for engine and turbine management solutions, specialising in all relevant technologies.

- Complete common rail systems
- Electronic fuel injection systems
- Mechanical and electronic speed governing systems
- Air fuel ratio controllers for gas fuelled engines
- Dual fuel system solutions
- Generator management
- Digital and analogue controls
- Mechanical and hydraulic actuators

The product portfolio is completed by engine emission management, safety systems for combustion engines, communication software and a variety of accessories. Our system solutions optimise the management of diesel, gas and dual fuel engines and gas, steam and hydro turbines.

HEINZMANN has the appropriate control and system solution for any application involving marine drives, locomotive control systems, construction and agricultural vehicles or gensets.

HEINZMANN was founded in 1897 and has been growing ever since. At the end of 2005, HEINZMANN acquired REGULATEURS EUROPA, which supplies electro-hydraulic actuators and diesel engine governors of highest quality. DATA PROCESS, a specialist in monitoring and control systems for marine applications, became part of the Group in 2011.

Contact:

Martina Denhard-Aisenpreis

Heinzmann GmbH & Co. KG
Am Haselbach 1
D-79677 Schönau/Germany
Phone: +49 7673 8208 - 0
Fax: +49 7673 8208 - 188
Email: info@heinzmann.de

www.heinzmann.com