Biogas as a Vehicle Fuel

Presented by: T L Fletcher, BSc
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The times are changing in our quest to reduce CO$_2$ emissions

**HARDSTAFF** are the most prominent producer and long term participants in the natural gas vehicle market, after identifying natural gas as a viable and cost effective alternative fuel for light and heavy commercial vehicles.

**HARDSTAFF** pioneered the development of natural gas vehicles in the UK, and have since gained international recognition in the field.
The move to Natural Gas is not solely driven by reduced operating costs:

- **The economic and environmental climate is the greatest motivating factor**
  - Image of a methane molecule (CH4)

- **Escalating fuel costs and possible disruption in supply of imports from politically unstable countries accelerated the demand for alternative fuelled vehicles**
  - Image of a methane molecule (CH4)

- **Government initiatives**
  - Image of a methane molecule (CH4)
Advantages

- Emission Standards
- Reduced Dependency On Oil
- Corporate Image
- EU Compliance
- Cost Savings
- CO₂ Savings
HARDSTAFF are in a unique position:

**Current production includes:**
- DAF 55, 65, 75, 85 Series
- Volvo 12 litre
- Mercedes Benz AXOR

**Current developments in progress include:**
- Mercedes Benz ACTROS
- DAF LF45
- Refuse Collection Vehicles Euro 3 to 5
- Other models at Euro 4 and 5, including automatic gearboxes
<table>
<thead>
<tr>
<th>Substitution Rate</th>
<th>CO2 reduction%</th>
<th>Saving per vehicle per Year (Kg)</th>
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</thead>
<tbody>
<tr>
<td>50%</td>
<td>13.75%</td>
<td>16315</td>
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<tr>
<td>55%</td>
<td>15.08%</td>
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<td>60%</td>
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<td>19.17%</td>
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<td>85%</td>
<td>23.33%</td>
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<td>90%</td>
<td>24.67%</td>
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</table>

**Long Haul Vehicle:** based on 75,000 miles per year and 7.5 mpg

**Note:** 1 litre of diesel emits 2.61Kg CO2
In our experience substitution of diesel by natural gas is typically 70% - 85%.

Substitution Levels are equal with either CNG or LNG storage.

Dual Fuel components are ECE R110 certified and in alignment with ISO standards.
- CO₂ savings of 20%
- 35% to 65% reduction in NOx
- Hardstaff Exhaust System will meet Euro IV and Euro V emissions
- 98% reduction in CO
- 3 dB reduction in noise levels using Hardstaff exhaust technology
Storage

LNG Tank
Cryogenic, 160°C, 100 psi

CNG Tank
High pressure ambient temperature 3600 psi
The umbilical design allows the vehicle to fully jack knife and contains safety break away units for operational safety.

 Allows a 6x2 tractor configurations to use CNG as fuel source or as an alternative or addition to LNG.

 Range of combined tractor unit and trailer is 620 miles (1,000 kms) approx. dependent on substitution ratio.
Biomethane

Natural Gas technologies are fully compatible with Biomethane

Fuel source can be CNG from Anaerobic Digester or LNG from Landfill

UK will be first in Europe to create landfill gas (upgraded to LNG for use in vehicles)

Methane from Landfill is cleaner than pipeline gas and has a very high energy content

Transported economically in liquefied state – well established legislation and standards

Ideal for dual-fuel use!
Biomethane

Biomethane is widely used as a vehicle fuel - worldwide

Contributes towards meeting Renewable Transport Fuel Obligations

100% renewable fuel source fully compatible with current mainstream production engines

Creates opportunities to supply own fuel
Infrastructure

In 2003 The Hardstaff Group formed Portal Gas Services as a service provider for Natural Gas Stations and Compressed and Liquefied Natural Gas for use as a vehicular fuel. These stations can be built and sited relatively quickly and the semi-transportable design specification prevent the asset becoming stranded offering real flexibility.

Liquefied & Compressed Natural Gas Station

These stations can be built and sited relatively quickly and the semi-transportable design specification prevent the asset becoming stranded offering real flexibility.
Gas storage facility capable of storing 12-tons of LNG, designed to support outbased fleet operations.
Product Support

- Hardstaff are well placed to serve both a nationwide and global marketplace with a wide range of interactive services that provide its customers with a ONE STOP SHOP (complete package)

- Full backing & support from manufacturer
- Repair & maintenance contracts
- Technical help line
- Driver Training provisions
- Actual performance against Diesel
- Range capabilities maximised with LNG and CNG
- Extremely low additional maintenance costs
Hardstaff warrant all dual fuel components and offer a comprehensive warranty package.

Manufacturer warranty unaffected.

Warranty procedure will be carried out through existing authorised dealer network.
ESTIMATED PAYBACK TIME

- Cost of Natural Gas against diesel
- Fuel economy
- Grant incentives
- Value of CO₂ credits
- Exemption from congestion charging
Natural Gas safety in the UK is well formulated and managed

Driver training, education and transfer of knowledge essential

Installation staff must be IGE trained

Company must be Quality Registered and working towards ECE R115

**Hardstaff offer training in all disciplines for management, drivers and vehicle technicians**
OIGI® Dual Fuel technologies can be adapted to any fully electronically controlled fuel injection system, including:

- Euro 2, 3, 4 and 5 light and heavy duty vehicles
- Refuse Collection Vehicles (RCV)
- Buses and Coaches
- OIGI® technologies can also be adapted to passenger vehicles
Parallel Paths Process and Integrated Strategies
(collaboration behaviour removing barriers to optimal performance)
Why Hardstaff?

Turn-key concept incorporating:

- LCNG Station
- Hardstaff OIGI® Dual Fuel Technologies
- Fuel Supply (Biogas option)
- After Sales Support
- Warranty
- Health & Safety
- Training Programme
As the leading authorities in this field, let us help you
Biogas as a Vehicle Fuel