Natural Gas Conversions for Drilling Rigs & Frac Spreads
## BACKGROUND

<table>
<thead>
<tr>
<th>HISTORY</th>
<th>SERVICE AREA</th>
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<tr>
<td>• In business since 1936</td>
<td>• San Antonio</td>
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<td>• Traditional Fuel Systems, C-Stores, Bulk Plants</td>
<td>• Dallas/Ft. Worth</td>
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<td>• Design/Build, Engineering, Construction, Installation and Repair/Maintenance Services</td>
<td>• Midland/Odessa</td>
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<td>• Lubbock</td>
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<td>• Albuquerque</td>
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# Alternative Fuels Services

**INDUSTRIAL**
- Drill Rig Conversions
- Frac Fleet Conversions
- GenSet Conversions
- Aggregate Plants
- Mining Conversions

**FLEETS/RETAIL**
- CNG Facilities
- LNG Facilities
- LCNG Facilities
- Bio Diesel Systems
- DEF Systems
Alternative Fuels Projects

- Private Fleet CNG Facility – Encinal, Texas (2013)
  - Phase I CNG Complete in 3rd Qtr 2013
  - Phase II CNG Planned for 3rd Qtr 2014
  - Phase III LNG Planned for 2015
  - Completion in March
- Private LCNG Retail Facility – Seguin, Texas (2014)
  - Finalizing Funding
- Private LCNG Retail Facility – San Antonio, Texas (2015)
- Drilling Rig Conversions – (2 Complete 2013 with 4 more in 2014)
  - (1) Well-Head Gas Conversion & (1) LNG Conversion
- Frac Spread Conversion – (2104)
  - Test Program scheduled for Eagleford
- Asphalt Plant Conversions – (5 in 2014 & 2015)
  - Converting from Diesel to LNG
Dual Fuel Systems for Oil & Gas Drilling/Fracking Engines
What is Dual Fuel?

• Dual Fuel is a “co-firing” of diesel fuel and natural gas
• Conversion Gas Trains are designed for use on conventional, heavy duty diesel engines
• Conversion Gas Trains can be installed in the shop as well as in the field
• Natural Gas typically substitutes up to 60% of the diesel fuel required to maintain a given speed and load
System Overview and Description

• Dual Fuel Conversions are a retrofit technology
• Requires no major changes or modifications to the engine
• Engine can still be operated on 100% Diesel
• Designed to allow for switching of fuel modes during full or part load conditions
• Utilizes a fumigation gas delivery method
Characteristics of a Dual Fuel System

- Maintains diesel like performance and efficiency
- Compression ignition
- Low gas supply pressure
- Sophisticated engine protection system
- Auto switching of fuel modes
- Non-Intrusive, simple installation
- Easy to operate
Fuel Gasses Compatible with Dual Fuel System

- Pipeline Natural Gas
- Well-Head Gas
- Liquid Natural Gas
- Compressed Natural Gas
- Bio-Gas (Landfill, Wastewater)
- Coal-Bed Gas
GAS SUPPLY SOLUTIONS FOR RIGS & FRAC SPREADS
• CNG Tube Trailer
  – Approx. 155 MCF
  – Approx. 1200 DEG

• LNG Transport Trailer
  – Approx. 830-900 Mcf
  – Approx. 6300 – 7000 DEG

• LNG Regasification Queen
  – Approx. 12,000 Mcf

• LNG Vaporization Trailer
  – Used for Frac Spreads due to high continuous demand
LNG Vaporization Skid

- Water Pump
- LNG Vaporizer
- Heat Exchanger
- Cool Water Return
- Vapor NG to Frac Engine
- NG Fueled Water Heater
- Heater Fuel Gas
- Warm Water
- LNG Supply
- Heated Water
Benefits to the User

• Reduced energy cost
  • Fuel flexibility
  • Rapid Payback
• Reduce environmental impact
  • Simple to install
  • Reduced exhaust emissions
Dual Fuel Emissions

Dual Fuel Systems will typically reduce production of:

• Nitrogen Oxides
• Sulfur Oxides
• Reactive Hydrocarbons
• Carbon Dioxide
• Carbon Monoxide*
• Particulates
• Visible Emissions

*with installation of oxidation catalyst
Dual Fuel Cost Analysis Components

- Cost of diesel fuel per gallon
- Cost of natural gas per thousand cubic feet
- Average Load
- Hours of Usage
- Costs to “clean” Well Head Gas
- Costs to transport CNG/LNG
PARTNERS

– LNG Merchants
  • Developer and Supplier of LNG

– LNG Energy Resources
  • Transportation of CNG and LNG
  • Providing Conversions as part of their Fuel Program

– L&S Cryogenics
  • Design, Engineering & Fabrication of Cryogenic Equipment
  • UPS Shipping Corridor – Salt Lake to Los Angeles
Any Questions?