

Information Sheet # 53
Dual Fuel Natural Gas & LPG Generator Systems

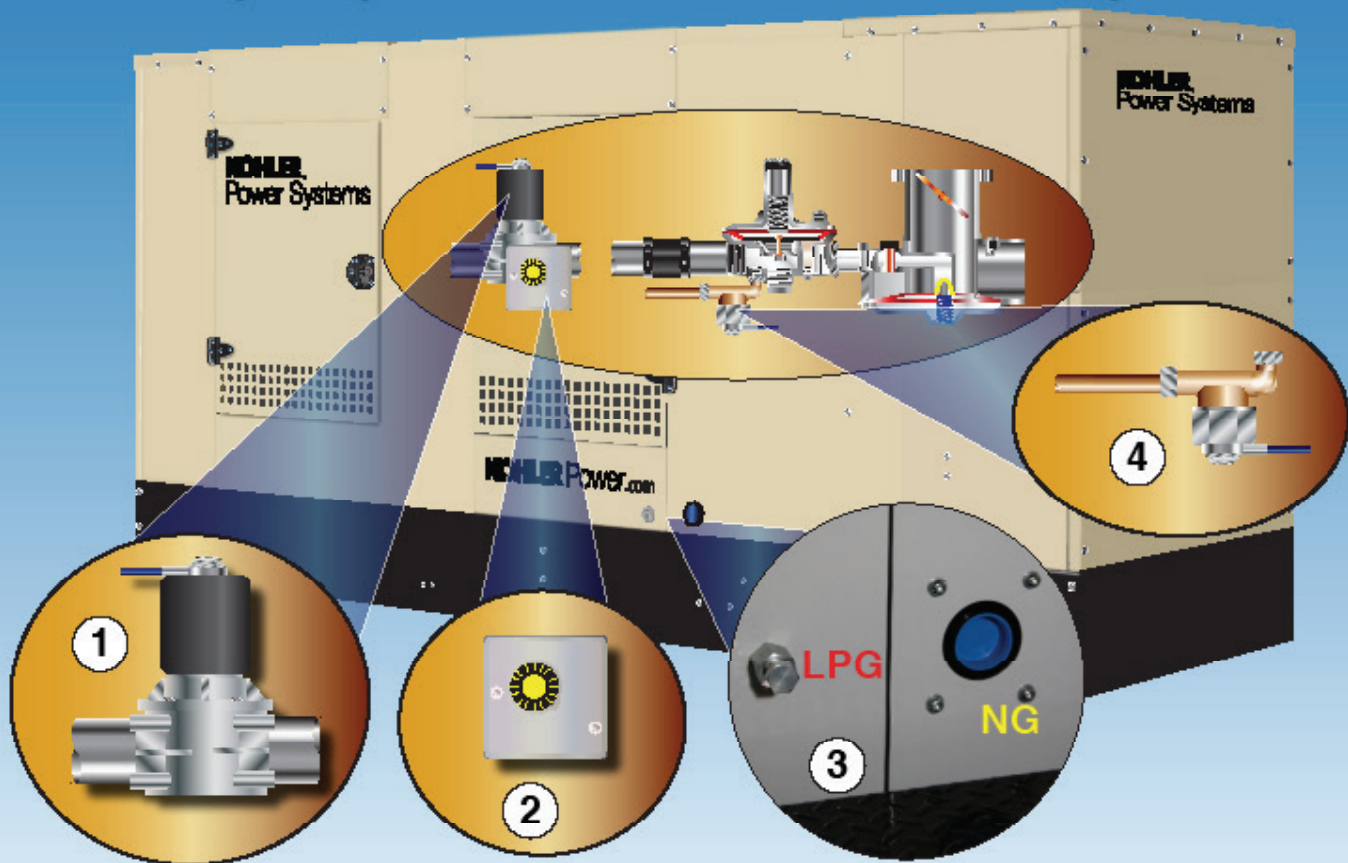
*Your Reliable Guide for
Generator Maintenance*

1.0 Introduction:

Frequently standby and prime power generator systems are powered by gaseous fueled spark ignition engines. The most commonly used gaseous fuels are natural gas (NG) and liquid petroleum gas (LPG). Usually the generator system will be configured to run on single fuel source, however, there is the option to select a dual fuel source. A dual fuel system refers to a systems ability to switch between one fuel source and another. At any given time, the generator will be running on just one of the fuel sources, therefore, dual fuel is not the same as bi-fuel system when the system runs on a controlled mixture of two different fuel types, such as a gas diesel mixture.

This Information Sheet discusses the operation of a dual fuel system, where it may be employed, output considerations, and any application considerations when putting in place this type of system. (Continued over)

Key Components of Dual Fuel Gas Generator System



Key to Components on a Dual Gas Generator Shown Above

Item	Description	Item	Description
1	Natural gas lock-off valve	3	Dual LPG and NG inlet to generator system
2	Pressure sensor switch	4	Liquid petroleum gas lock-off valve

To fulfill our commitment to be the leading supplier in the power generation industry, the Loftin Equipment and Bay City Electric Works teams ensure they are always up-to-date with the current power industry standards as well as industry trends. As a service, our **Information Sheets** are circulated on a regular basis to existing and potential power customers to maintain their awareness of changes and developments in standards, codes and technology within the power industry.

2.0 When a Dual Fuel System is Used:

Having more than one fuel sources is an added benefit when:

- **Primary fuel is subject to interruption** - Natural gas is usually delivered to the generator from the gas utility's supply network. The gas could be cut-off due to failure of the delivery system.
- **LPG mobile sets** - Most mobile gas sets equipped with LPG cylinders can be switched to run on NG when available.
- **Rental Sets** - Renters can be offered the option of LPG or NG.
- **Local codes** - Dual fuel on mobile sets may be necessary when another gas source cannot be used.
- **Using LPG as a back-up fuel** - When primary fuel is NG, LPG is a back-up in stationary and mobile applications.
- **Protecting from Drops in NG Pressure** - When the operator detects NG pressure has dropped below nine inches of water column the unit can be switched to run on LPG. Some systems accomplish the switch automatically.

3.0 Sizing of Dual Fuel Generator System and Differences Between LPG and Natural Gas:

LPG (propane) and natural gas (methane) are different chemicals with methane represented chemically as CH₄ and propane as C₃H₈. LPG has a higher energy content than NG with 93MJ/m³ versus 38.7MJ/m³ for NG.

Actual power ratings vary from manufacturer to manufacturer, but as a guide, one major manufacturer gives a LPG prime rating with a 125°C rise generator as 100kW, whereas it's prime rating running on NG is given as 90kW. It is important for the operator to note when switching from LPG to NG fuel, the generator is not supplying a load greater than the engine can deliver when running on NG.

4.0 Dual Fuel System Key Components:

While most of the engine ignition systems and generator controls remain the same across NG and LPG operation, there are the following additional components configured to make an unit dual fuel operational. Components referenced below are detailed in "Front Page Diagram".

- **Two inlet connections** - NG and LPG connections differ in size and connection. Both types are clearly marked.
- **NG input lock-off valve** - This valve is always closed when the unit is running on LPG.
- **LPG input lock-off valve** - This valve is always closed when the unit is running on NG.
- **Minimum pressure sensor** - When the unit detects NG has fallen below nine inches of water column the NG lock-off valve closes and the LPG valve opens. Conversely the opposite occurs when the pressure increases above nine inches of water column.
- **Engine control mapping** - The Electronic Control Module (ECM) that controls the gas engine's closed loop ignition system remaps itself to run on NG or LPG. When the unit is running on NG, the ECM will have all the sensor input and output controls in-line with the burn of NG and vice-versa when the unit is running on LPG.

5.0 Dual Fuel Auto-Switching Operation:

Most gaseous generator sets configured to run either on NG or LPG are designed and configured to switch fuels automatically having sensed certain pre-set inputs. Automatic switching from one gaseous fuel to the other will involve the key components defined above, and adhere to the following sequence of operation:

1. **Standard NG fueling** - The generator, while running on NG, will have the LPG input lock-off valve in the closed position, and the NG input lock-off valve in the open position with NG delivered at a greater pressure than nine inches of a column of water.
2. **Fall in NG gas pressure** - When the minimum pressure sensor senses the NG input pressure has fallen below nine inches of water column it initiates a series of system changes:
 - The sensor singles the ECM to re-map the ignition controls to run on the LPG settings
 - The NG input lock-off valve is put into the off position cutting off the flow of NG
 - Simultaneously the LPG input lock-off valve will open to allow the flow of LPG
3. **Return to standard NG fuel mode** - When the minimum pressure sensor senses the NG input pressure has risen above nine inches of water column the LPG lock-off valve closes, the NG lock-off valve opens, and the ECM re-maps to run on NG.

6.0 Dual Fuel Manual Switching Operation:

Should the operator wish to switch from LPG to NG manually this can be accomplished by switching one of the lock-off valves to the closed position, and then the other valve to the open position. The sensor will single which gas valve is in the open position, and the ECM will map the ignition controls to the appropriate gas input.

Even when fuels are switched manually, should the pressure sensor detect the NG pressure is below nine inches of water column the unit will not start if the NG lock-off valve will not open.

7.0 Adjustment of Pressure Sensor:

The pressure sensor is set by the manufacturer, any adjustment should only be made by a technician certified to work on the unit. During a planned maintenance visit the technician will check the pressure is set to the manufacturer's specification, and adjust accordingly.



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