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USE OF ENGINE FUELS WITH ONAN ELECTRIC PLANTS

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This bulletin contains general information on the use of various fuels for ONAN generating plants. It is not intended to derate any type of fuel but rather compares them and explains their characteristics and practical applications.

Onan electric generating plants operate on gasoline, gas, or diesel oil. These fuels have individual characteristics which should be considered when selecting a plant. Several factors may influence the choice of one type of fuel over another and are as follows:

1. Initial cost of plant.
2. Cost of operation.
3. Availability of fuels.
4. Plant application (mobile or stationary).
5. Power requirement.

Gasoline:

Gasoline is readily available in all areas of the country. For this reason, plant service and maintenance can be obtained with minimum delay.

Most gasolines contain some lead additives (tetraethyl lead) which accumulate in combustion chambers. Since engines for generating plants operate at constant speeds, it is difficult to "blow-out" these deposits through the exhaust ports as is possible with an automobile engine operating at varying speeds. Therefore, engines operating on gasoline may require more frequent servicing and maintenance than those using other fuels.

Gasoline engine plants are generally used when light weight, portable plants are needed. However, they can also be used for primary or standby electrical power. Plants which are permanently mounted in vehicles can use any of the three types of fuels – gasoline, gas, or diesel.

General Information About Gas Fuel Use:

Gaseous fuels can be classified into two groups - bottled (Liquified Petroleum Gas - LPG) and piped (natural or manufactured). The piped gases (from an oil well) are natural, manufactured, or a combination of both. Bottled gases are a product of refining the crude oil and are supplied under pressure in tanks. Commercially, they are Butane, Propane, or a combination of the two.

Gas is a desirable fuel for most internal combustion engines. It is clean burning and has a high octane rating which makes higher compression possible without detonation. The low carbon content greatly reduces carbon build-up and results in fewer hot spots and more efficient operation. Thus, these important characteristics of gaseous fuels call out distinct advantages as follows:

1. Minimum carbon build-up.
2. Less combustion chamber heat - less valve burning.
3. Cleaner oil - less sludge - less oil consumption.
4. Better lubrication - no wash down of cylinder walls.
5. Longer engine life.
6. Remains "fresh" in storage - has no gumming characteristics.

Gas - Natural and Manufactured:

Natural gas, piped directly from the well in the field, has a BTU content of about 1100 BTU* whereas manufactured gas runs as low as 450 BTU. A combination will range somewhere between the two figures, probably about 850 BTU as an average. These figures are per cubic foot. To get nearly the same output from the gas engine generating plant in comparison to a gasoline engine plant, it is necessary to use the 1100 BTU gas. Otherwise, the output of the plant must be derated 15 to 20% for 850 BTU gas and 40 to 50% for 450 BTU gas.

If the plant is rated higher than the capacity needed, the lower BTU gas is satisfactory. But, if the lower BTU gas is used and more capacity is required, it may be necessary to select the next larger size. For example, if 3300 watts are needed, a 3500 watt plant would do if 1100 BTU gas was being used. But with 850 BTU gas, a 5000 watt plant would be required.

In addition to strainers and electric solenoids being required, the size of the pipe supplying the gas must be large enough to allow the required number of cubic feet of gas to be fed to the engine. Pipe size is very important as otherwise the engine will be starved for fuel and the output of the plant will be reduced.

* One BTU (British Thermal Unit) represents the quantity of heat required to raise the temperature one pound of water $1^{o}F$. at or near its point of maximum density.

Gas - Bottled:

This is the newest of the fuels. Commonly known as Liquified Petroleum Gas (LPG), it consists basically of Propane, Butane or a combination of both. The actual composition will depend on the local climatic conditions where the gas is being used. The BTU content will also vary, being higher for Butane than for Propane with the average being about 3200 BTU. With this high a BTU content, the plant will deliver its full rated output.

This fuel, LPG, is actually a liquid under pressure of an average of 70 or more pounds per square inch depending on temperature. When released from this pressure, LPG easily volatilizes under normal temperatures depending on the actual content of the gas.

Since LPG is supplied as a liquid, it is furnished in tanks or bottles depending on the quantity needed. This means that the plant can be permanently installed or mounted on a vehicle with its own bottle of fuel. Additional regulators are needed to reduce the high storage pressures and in some cases due to low ambient temperatures or the large amount of gas needed for the large plants, a heat exchanger may be required.

For detailed information concerning the use of gaseous fuels with ONAN products, consult Technical Bulletin No. T-015.

Diesel Oil:

Diesel oil is one of the products resulting from the processing of the crude oil. It is lower in cost per gallon and has a higher BTU content — 138,500 compared to gasoline which has a BTU content of 115,000. These factors are the principal advantages of diesel fuel. Also, with the common acceptance of diesel fuel for much of the mechanical equipment in use today — trains, busses, tractors, trucks and engines of all types — it has become almost as universally available as gasoline. In some countries, it is in larger supply than gasoline.

Like the gasoline and gas engines, a diesel engine is also of the internal combustion type. But while the other two use an electric spark to ignite the fuel, the diesel engine uses the heat of compressed air to ignite its fuel. To obtain that heat, the pressures are very high compared to those in a gas or gasoline engine and that is why all of the diesel engine parts must be much heavier and sturdier in construction. Engineering advances in materials and fuel injection systems now make this type of engine practical for many sizes of Onan generating plants.

Because of its very nature and design, the diesel engine uses less fuel than either the gas or gasoline engines. Also it requires considerably less servicing and has about twice the life of a gasoline engine. Of the three types, the diesel is the highest in initial cost. It will not start as easily over the wide range of ambient temperatures as the other two. Installation costs are about the same and under some conditions may be less than for the gasoline plant. Servicing must be done by a trained diesel mechanic.

Propane - Small qty's
1445 BTU/¢
- Large qty's
3723 BTU/¢ (25¢/gal)
N.G. heat rate 15.5¢/100 cf:
6774 BTU/¢
gasoline @ 23.5¢/gal:
4900 BTU/¢