

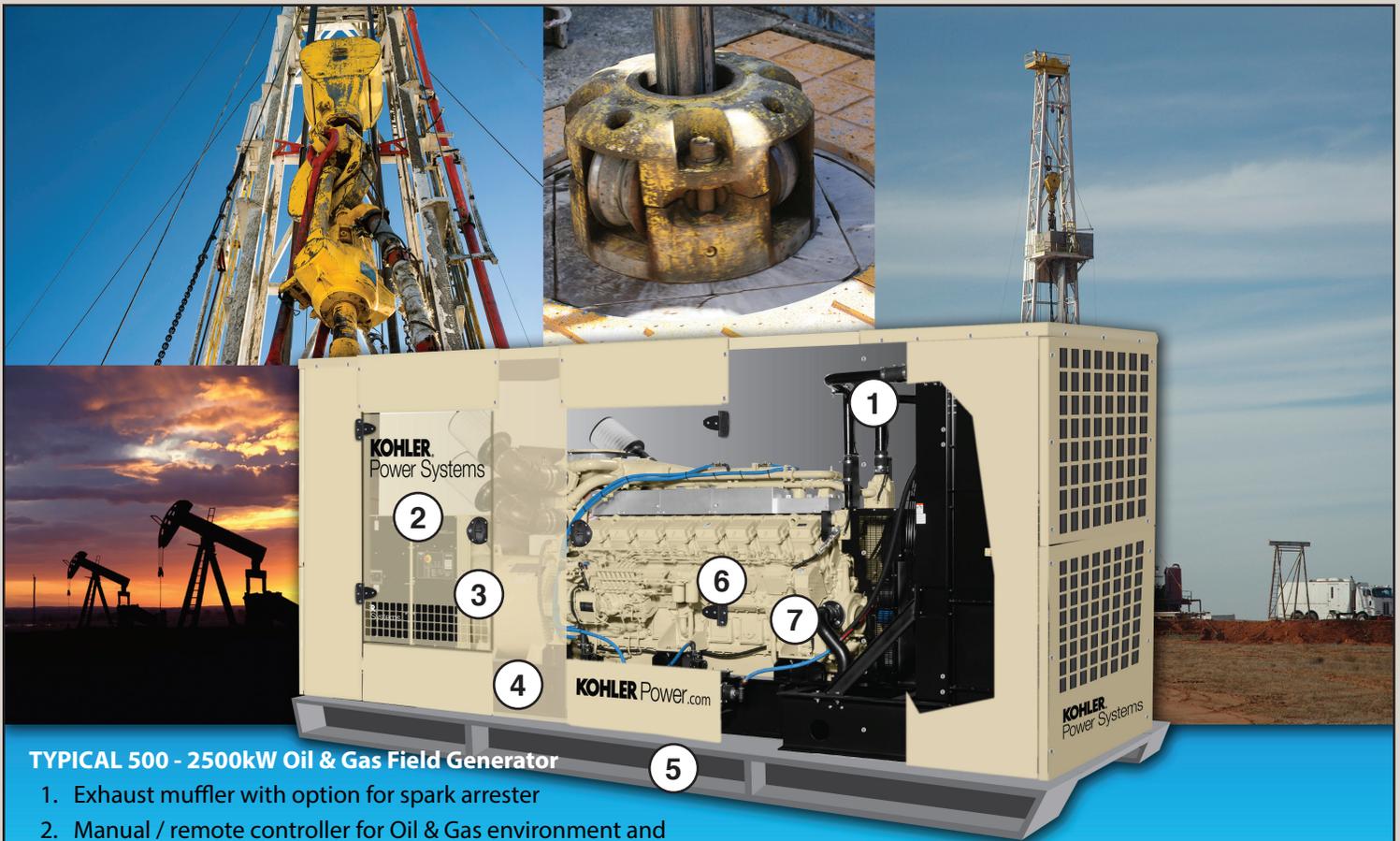
Information Sheet # 74
Generators in Oil and Gas Applications

*Your Reliable Guide for
Generator Maintenance*

1.0 Introduction:

There are a number of important factors that should always be considered when specifying generators for the oil and gas industry. Due to the harsh environment of most Oil & Gas drilling and production operations, there is a strong preference for heavy-duty generator systems to withstand the rigors of the environment.

This Information Sheet discusses the applications for generator sets used in the Oil & Gas Industry, and the specifications of generator systems used in Oil & Gas field drilling and production environments: *(Continued over)*



TYPICAL 500 - 2500kW Oil & Gas Field Generator

1. Exhaust muffer with option for spark arrester
2. Manual / remote controller for Oil & Gas environment and in some cases the ability to parallel several generators
3. 4-pole 1800 rpm single bearing, close coupled
4. Open or enclosed (options for winterization)
5. Rigid skid base for resting on any level firm surface
6. Diesel or gas engine with oil make-up system for prime power or continuous operation
7. Block heater

To fulfill our commitment to be the leading supplier in the power generation industry, the Loftin Equipment and Bay City Electric Works teams ensures 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 Location:

A majority of Oil & Gas field drilling and production operations are found in remote areas where little or no utility power is available. The generator is the primary power source in these applications and will be rated as a prime power unit to supply power 24/7. The prime power rating of a generator averages 10% lower than the standby power rating. Drilling operations are temporary and require generators to be mounted on extra heavy-duty skid type bases that keep the unit rigid when placed on an uneven surface.

3.0 Stable Electrical Load:

Electric powered drill rigs are replacing many mechanical rigs, and generators are replacing diesels that provide mechanical drive to the equipment. The generator used to power an electric rig has to be sized to manage large electric motors that power drawworks and mud pumps, the principal pieces of equipment on a drilling site.

The generator's alternator has to withstand voltage dips as large as 25% to 30% that an electric motor can cause when starting. In this type of application Permanent Magnet Generators (PMG) voltage regulators are used to better manage large voltage drops seen when the electric motors are engaged. PMG regulators are connected to the end of the alternator shaft and are independent of the excitation windings in the rotor of a brushless generator.

4.0 Controls:

The generator should be fitted with a control panel that allows manual and remote starting. The control room of a rig may be the source to initiate start and stop. The generator should have a suitably sized circuit breaker. The circuit breaker protects the cables leaving the breaker. A breaker should have a shunt trip to be operated by the controller to help shut down a generator for protection.

Annunciation panels are frequently used to transmit the status of the generator system. Remote indicators can alert the service provider of the generator condition, and are usually a requirement for unmanned production sites.

Some gas field sites that have multiple-pad drilling will require several generators to run in parallel operation, plus control panels suitable for paralleling two or more generators.

5.0 Prime Mover:

Until recently, the majority of applications for drilling and production operations was for oil and used diesel engines. Now, however, a high percentage of drilling and new production sites are for gas, which is driving much of a fracturing technique, or fracking, boom seen in North America. Large spark ignition, or SI, engines frequently are used to run using gas produced from the site.

Gaseous fueled engines must be equipped with the controls that are approved for operation in a gaseous environment.

Some states, such as North Dakota, are restricting the flaring of gas, which requires capturing and liquefying gas that would have been flared. In this case, SI powered generators can be operated on liquid petroleum.

6.0 Alternator:

Oil & Gas power applications in North America frequently specify generators in the range 500 to 2000 kW (the usual 60Hz generator speed in this range is 4-pole running at 1800 rpm). For the oil and gas applications there are other operating conditions that the alternator has to take into account:

- Alternator kW sized with a 0.7 PF (Power Factor) as opposed to the usual 0.8 PF
- Anti condensation heaters within the alternator winding to manage high humidity
- Windings within the alternator rated for a 80°C temperature rise operating in 40°C ambients

7.0 Accessories:

The operational environment and prime power application of the Oil & Gas market will frequently require the following optional accessories:

- Oil make-up systems for extensive, continuous prime power operations.
- Air starters when compressed air is available and required to operate in gaseous environments.
- Explosion proof control panels for gaseous environments.
- Exhaust spark arrestors.
- Emergency air shutdown systems.
- Block heaters. (In Northern States and Canada a winterization package could be required).

8.0 Codes:

The API (American Petroleum Institute) have set many of the codes for equipment operating in oil and gas drilling and production locations.

- UL 2200 for entire generator set.
- NEMA codes covering electrical controls in gaseous environments.
- NEMA MG1-32 for alternator winding temperature rise.
- EPA (Environmental Protection Agency)
- ABS (American Bureau of Shipping) International Maritime Organization (IMO) and Safety of Life at Sea (SOLAS) for off-shore drilling and production applications.



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