**GENERAL GUIDANCE ON SELECTING A GENERATOR SET**

Generator sizes (“ratings”) are generally defined in terms of application, maximum power available, hours of usage per year etc. The broad definitions are intended to

cover a wide range of consumer, commercial and industrial uses. Because of this variability, most manufacturers have chosen to adopt the standard definitions in their most

conservative form to minimize the risk of equipment misapplication.

The ISO has developed a standard set of rating definitions. Specifically, ISO 8528 was created for gas & diesel generator sets and was developed with the aim to provide consistency across manufacturers and industries, and to improve communication and understanding between the manufacturer and the customer. ISO 8528 should be considered a minimal standard for all generator set ratings and include:

* Emergency standby power (ESP)
* Prime power (PRP)
* Continuous power (COP)
* Limited running power(LTP)

On–site power generation systems can be classified by type and generating equipment rating. The generating equipment is generally rated using “stand-by” or “prime” power ratings. These ratings definitions are important to understand when considering selecting the equipment, which are typically published by the relevant manufacturer. These also describe maximum allowable loading conditions over time on a generator set. The generator set will provide acceptable performance and life when operated according to the published ratings and maintenance schedules. It is also important to test and operate generator sets at a sufficient minimum load (generally 30% for diesel) to achieve normal temperatures and properly burn fuel as well as

The following explanations describe the most common rating types typically used by the industry.

**Emergency Standby Power Rating (ESP)**

The standby power rating is applicable to emergency power applications where power is supplied for the duration of normal power interruption. No sustained overload capability is available for this rating.

This rating is applicable to installations served by a reliable normal utility source. This rating is only applicable to variable loads with an average power output of 70% of the standby rating over 24 hours of operation for a maximum of 200 hours of operation per year. The standby rating is only applicable to emergency and standby applications where the generator set serves as the back up to the normal utility source.

In installations where operation will likely exceed these limits, the prime power rating should be applied. No sustained utility parallel operation is permitted with this rating. For applications requiring sustained utility parallel operation, the prime power or base load rating must be utilized

Refer to Fuel Stop Power in accordance with ISO3046, AS2789, DIN6271 and BS5514 as well as emergency stand by power (ESP) per ISO 8528.

**Prime Power Rating (PRP)**

The prime power rating is applicable when supplying electric power in lieu of commercially purchased power. The number of allowable operating hours per year is unlimited for variable load applications but is limited for constant load applications as described below under Limited Running Time Prime Power.

In variable load applications the average power output should not exceed 70% of the Prime Power Rating over 24 hours of operation.

A 10% overload capability is available for a period of 1 hour within a 12–hour period of operation, but not to exceed 25 hours per year.

Refer to Prime Power in accordance with ISO8528 and Over Load Power in accordance with ISO3046, AS2789, DIN6271 and BS5514.

**GENERAL NOTES ON GENERATORS**

A generating set is the combination of an engine, alternator, control system and circuit breakers in most cases mounted on a base. There is a huge array of additional items which are often fitted to a generator or in some cases come as standard. Often a fuel tank is integrated into the design as well as the possibility of sound attenuated canopies.

1. Sound attenuation has become a large part of the generating set industry in recent times as the advantages have been noted. The canopy can protect the generating set from the elements, it can dampen the noise produced by the engine when noise is a factor, such as in a residential area.

2. Jacket water heaters are often also fitted to generating sets to allow them to remain on temperature for when they are needed. By keeping the engine block warm, the generator can start up and produce power quicker as it will not have to warm up from cold temperatures.

3. Some other extras often fitted include Automatic Transfer Switches (ATS), Automatic Mains Failure Panel (AMF), Remote administration systems through ethernet/wi-fi/cell-phone networks.

Generators range in size and application. Small generators can be used for camping and be as small as a large briefcase, to generators the size of a small house to run a shopping centre or mine. It all depends on the application that the generating set is needed for. In general an average home will use a generator between the sizes of 5 kVA and 30 kVA depending on the size of the home and what the user would like to provide power too.

Generators can either be for prime power or standby power. In a prime power scenario the application for which the generator is needed does not have any power currently. The generator is being installed for the sole purpose of providing power to the application on a continuous basis. You need to assessed the total connected load and then consider next the portion of the load that is likely to be switched on at any time. A Generator set with an output a little in excess of this figure should be selected to allow for contingencies. Always allow for future expansion. A standby generator is installed along side another power source as an emergency backup. If the mains power or the prime power generator fails, the standby generator will start and provide power for a short period of time. A standby generating set can be smaller than that of a prime power generator because it is used for less time when needed. Hence a standby power generator is rated at 10% above that of the prime power generator. The standby generator can run at this additional 10% for a period of up to 1 hour safely, whilst the generator will continue to run after this period, it is the industry standard to only run at the additional 10% for an hour at a time.

In general, generators will run at 1500 RPM, but it is possible to get a generator which runs at 3000 RPM or even higher. Generators which run at higher than 1500 RPM’s should only be used as standby generating sets, operating up to a maximum of 8 hours a day (manufacturer dependant). The reason for this is that the increased RPM for extended periods places strain on all the components of the engine, this can cause the generator to fail after not having run for very long as the heat and strain endured by the higher RPM will quickly erode the integrity of the components of the generator causing engine problems.

Like a motor vehicle, a generator needs to be serviced, as both have an engine has numerous moving parts that need to be maintained in a good condition and oils have additives that break down over time (typically 12 months), to allow the engine to operate as expected. If the generator is not serviced regularly the owner runs the risk of the generator having irreparable harm caused to either the engine or the alternator. A simple analogy for why and how often your generator should be service is this: A diesel vehicle being driven at around 1500 RPM in top gear at 80-100 Km/hr for 250 Hours covers roughly a distance of 15 000 – 20 000 km. Hence if a generator operating at 1500 RPM has ran for 250 Hours, it essentially has “covered” equivalent of 15 000 – 20 000 km, the typical distance for a newer generation diesel vehicle service. For a 3000 RPM it equates to every 100 Hr’s/every 12 months.

Control systems play a large role in the operation of the generator. The control system can be an array of gauges, relays and switches as was common a few years ago, or it can be a digital display as has become the industry standard in recent times. The control panel allows the user to monitor the generator as a whole. The engine performance can be monitored to ensure that it is running at an optimal level, as well as having sensors on the engine to allow the control system to shut the generator down should there be a problem (Such as low oil pressure). The control panel also allows the user to monitor the voltage and amperage input and output allowing the generator to react to under and over voltage problems on an incoming power supply. The complexity and functionality of a generator control panel varies between manufacturers, but most include the above mentioned. Additional items can be integrated into a control panel to allow them to be remotely monitored and controlled, again depending on the manufacturer of the control panel.

The alternator is the component which produces the power. The engine runs and turns the alternator which produces power. A rotating magnet, often referred to as the rotor turns within the static conductors often referred to as the stator. The conductor is comprised of wound coils on an iron core. The magnetic field cuts across the conductors generating the current.

In general domestic generator sets run on petrol, diesel or gas (incl LPG) fuel. Commercial / industrial generators tend to run on diesel / gas.

An aspect often over looked by potential buyers is the actual build quality of the generating set. The amalgamation of the various individual parts into a working generator can be achieved easily, but for a good quality generator to be manufactured takes a little more research and development. From the strength of the steel used to make the base to ensure it doesn’t bend when being transported to the engine mountings, every aspect is important and over looking any of these aspects could result in you receiving a “lemon” generator. When looking at a generator set for any application it is advisable to ensure that the quality of the product is good, that service is available and that spares can be obtained easily.

**Acronyms**

kVA : Kilo Volt Amperes

kW : Kilo Watts

V : Volts

I : Ampere or Current

1Ø : Single Phase (One Phase)

3Ø : Three Phase

ATS : Automatic Transfer Switch

AVR : Automatic Voltage Regulator

Hz : Hertz (Frequency)

Ampere (Amp): A unit measure for the flow (current) of electricity. Typical service to a residence is 100 amps; 200 amps is required for homes with electric heat.

Kilovolt (kV): 1000 volts.

Kilo-volt-ampere (kVA): A measure of electrical load on a circuit or system: single phase = amperes x voltage / 1000 three phase = amperes x voltage x 1.732 / 1000.

Kilowatt (kW): 1000 watts. A measure of electrical load on a circuit or system - related to kVA: single phase = amperes x voltage x power factor / 1000 three phase = amperes x voltage x power factor x 1.732 / 1000.

Kilowatt Hour (kWH): The work performed by one kilowatt of electric power in one hour. The unit on which the price of electrical energy is based. A 1000 watt light bulb operating for one hour would use one kWh.

Single Phase Power: (typically 230V AC in Africa) is carried between two wires: live and neutral and sometimes a third ground wire for safety. The frequency of AC voltage, in SA, is 50 Hz.

Three Phase Power: is very common and is a more efficient use of conductors. Voltage is carried through three conductors 120° out of phase with the other two. Three-phase power provides a more efficient means of supplying large electrical loads like motors and is used more in commercial and industrial applications.

**DE-RATING OF GENERATOR SETS**

Generator sets gerrerly consisit of an interbal cumstions engine (petrol/diesel/gas powered) providing mechanical energy connected to an altentaor/inverter module which produces electrical energy.

There are numerous factors which has a detrimental impect on the system to produce usable electricilty, then four most common being:

* Altitude above sea level (largest impact),
* Temparture,
* Moisture, and
* System losses

