



## USEFULL INFORMATIONS ABOUT GENERATORS WITH FREQUENTLY ASKED QUESTIONS

### **Q. How large a generator do I need for my home or business?**

**A.** Every home or small business is different. The size of the generator is based on the type of appliances, equipment, pumps, air-conditioners, and other electrical devices requiring power. There are some power requirements that will establish a minimum size generator system:

1) Well pumps usually require 2-3 times the run watts to start the pump. The charts are typically designed for three-phase applications with a note to increase the generator size by a certain percentage for 2-wire or single-phase applications. These charts are based on providing a safety factor for the pumps to reduce any voltage drop during startup of the pump motor which can cause premature failure;

2) Combination heat pump/air-conditioner systems are normally on 60 amp 240v (14400 watts) breakers and use 30 amps (7200 watts) for the heat cycle and the same for the air-conditioning function;

3) Electric furnaces are typically on 50 amp 240v (12000 watt) breakers;

4) Hot water heaters operating on 240v power normally use between 20 amps (4500 watts) and 25 amps (6000 watts) depending on the size and efficiency design;

5) Electric kitchen stoves with oven and top burners are usually on 50 amp (12000 watts) breakers. Combination stoves with a separate top burner are on 30A breakers and the companion oven is on a 30A breaker ;

6) Air-conditioners come in a variety of sizes and ratings which need to be calculated based on the BTU output or stated amperage. A general rule of thumb is 4kw for every ton (24000 BTU's) of air-conditioning. Some of the newer high efficiency pumps-motors use a bit less. A 2-ton unit is rated at 24000 BTU's which normally requires 18- 20 amps (4300 - 4800 watts) to start the unit and 15 amps (3600 watts) to operate it. Another factor you must consider is the type of voltage and the impact on available amperage. Your service panel is normally rated at 200 amps @ 240v and the average home uses approximately 140 to 160 amps of 240v power to operate everything at the same time.

Your larger appliances (well pump, kitchen stove, water heater, electric dryer, electric heater, and heat pump system) will typically use 240v power and the lights and other smaller appliances will use 120v power. It is important to consider this difference in doing the load calculations because the important calculation is to determine just how many amps and watts you will need. For example, if you want to operate your refrigerator (20 amps x 120v = 2400



watts), freezer (20 amps x 120v = 2400 watts), electric hot water heater (20 amps x 240v = 4800 watts), washer (20 amps x 120v = 2400 watts), and electric dryer (30 amps x 240v = 7200 watts) all at the same time you will need approximately 19200 watts to meet the breaker requirements for these appliances. In reality the breakers are typically oversized for safety by 10 to 15% and the above appliances will not all operate at peak at the same time and the above load can be handled with a 15000 watt (15kw) generator set (genset).

The major appliances, pumps, or other motor driven devices that you plan to operate with your generator system need to be considered when calculating the minimum size of a generator. Sizing a generator system requires you to honestly assess your needs and wants.

### **Q. What is the advantage of buying a generator in INTERCON?**

**A.** INTERCON supplies many of the best generator products available in the world today with the highest quality of equipment and final performance

The standard INTERCON Customer Advantage Program gives you protections that make it easier to own a generator system:

- 1) **SALES ENGINEERING SERVICE** - competent and knowledgeable sales engineers to discuss all your requirements and application and to properly help you size and calculate all motor starting requirements;
- 2) **CUSTOMER-FIRST** - single source contact for all parts and warranty assistance on all INTERCON products;
- 3) **EASY-START** - guide and photos for generator electrical connections and controller operation ; and
- 4) **AFTER-SALE SUPPORT**- free lifetime technical trouble-shooting service via phone, fax, or e-mail. We do our best to honor our commitment to providing you with the BEST PRODUCTS, BEST PRICES, and BEST SERVICE.

### **Q. There are a lot of Third Country manufactured generators advertised and marketed through various low-cost discounters that seem to be a great bargain - are they?**

**A.** INTERCON advises caution when it comes to the low priced imports from Third Countries. In recent years there has been a flood of Asian manufactured gasoline and diesel portable generators using look-alike Honda-type gasoline and Yanmar-type diesel engines packaged in a wide variety of product designs. These units are typically considerably less expensive than the real Honda gasoline generators and the real Yanmar, Hatz, or Kubota diesel



engine powered generator systems. The old adage of "**you get what you pay for**" has never been more true than when dealing with these imported Asian generator systems. **While the initial cost is low and the products are attractively packaged there are some things you should consider before you purchase one:**

- 1) While the engine on some models tend to run ok and under light operating conditions last awhile, they tend not to do so well in high heat or heavy use environments.
- 2) The generator ends tend to be more problematic than the engines. Our experience has been they do not hold up for high use applications especially in hot weather.
3. There is very little support for these units and most generator and engine repair centers will not even consider working on them. Other than the company who sold you the portable gasoline or diesel generator or generator-welder you will find few repair centers that will give you the time of day.
4. We base our observations on our own experience and related problems and the many calls we receive from frustrated customers who saved a buck but paid a price.

**Q. Are any of the Third Countries generator imports considered high quality?**

**A.** Yes. Some of the more industrial quality Cummins, Deutz, and John Deere diesel generator systems seem to be of much higher quality design and feature better components. A majority of these products are designed for 3rd world and non-EPA regulated countries. Are these products of the same quality as the made in European imports? It is too early to know. As for service and parts support, that most likely is another issue and related to the importer of the product in each geographical area or country.

**Q. Is a 3-phase generator suitable for the average homeowner or small business?**

**A.** A majority of generator packagers typically will use an over-sized 12-wire 3-phase 3-pole generator end for single-phase applications and utilize 2-poles for single-phase. This requires that the generator end is sized approximately 1/3rd larger than the rated single-phase output. This approach of using a 12-lead over-sized 3-phase generator system allows the generator system to be used for both single-phase and 3-phase applications depending on customer requirements. (Example: 10kw engine coupled to a 15kw generator end). There are a number of major brand products that are packaged with dedicated 4-lead single-phase only generators. For the most part these are quality products



designed for a specific application. **A note of caution:** Generator packagers who assemble a 10kw engine & 10kw 3-phase generator and utilize this configuration for single-phase applications are selling you a potentially problematic generator configuration because the engine will always be oversized for the single-phase output capability and running light loads will make the engine susceptible to "wet stacking".

**Q. What is the function of the electronic controller on a genset?**

**A.** Most of the engine/generator controllers used today are digital and are designed to provide control of the engine and generator safeties and any autostart function for automatic transfer switch or inverter applications. The controller system, simply described, establishes the bench mark or threshold for safety shutdowns and monitors the operation of the engine and generator functions. The sophistication of a controller is based on the size of the generator and the application. Modern digital controllers for residential or small business applications are typically a simplified LED indicator for any shutdowns and a start-stop button or autostart function and is sufficient for safe effective operation of most gensets.

In the autostart mode the controller can be used to interface with an automatic transfer switch or inverter/battery system as a standby/emergency genset. A more advanced controller provides real time monitoring of volts, hertz, and amperage in addition to the basic engine/generator safeties and autostart functions. Complex controllers typically installed on larger generator systems provide engine safeties and shutdowns for low oil pressure, high temperature, engine start over-crank, over/under-speed (hertz), low coolant level, low fuel level, KVA output, KW output, power factor (PF), engine & generator gauges in real time, and often have a communication capability for remote monitoring and starting.

**Q. What kind of generator should I purchase - gaseous or diesel?**

**A.** There are a number of factors to consider in evaluating the differences between a gaseous (natural gas or propane) powered engine:

**Gaseous powered engines can be summarized as follows for Positive Factors:**

- 1) Quieter engine noise level;
- 2) More emission compliant;



3) More convenient fuel source (natural gas);

4) Gaseous engines do not have a problem with "wet stacking like diesels; less expensive units with air-cooled engines are budget priced.

**There are also some negative LP and NG factors to consider:**

1) More expensive to operate by as much as 3-times the fuel consumption compared to diesels;

2) Shorter life expectancy by a factor of 10 to 1 for air-cooled models and 3 to 1 for water-cooled models compared to diesel powered gensets;

3) More expensive to purchase for models over 30kw:

4) Smaller air-cooled gaseous engines are less expensive than comparable diesels but have a short life expectancy as low as 500-hours depending on engine make and use;

5) Natural gas (NG) begins to derate at +20 degrees above zero and propane begins to derate around -20 degrees above zero;

6) Both NG and propane can become very dangerous if lines are broken.

**Diesel engines have a number of Positive Factors:**

1) Engine life for liquid-cooled 1500rpm engines can approach 20,000 hours if properly serviced depending on the application and environment compared to 5-6000 hours on industrial quality gaseous gensets;

2) Even 3000rpm diesel engines normally have a 10,000 to 15000 hour life expectancy with proper maintenance and service under most conditions;

3) Diesel engines are less expensive to operate. The general rule of thumb for fuel consumption is 7% of the rated generator output (Example: 20kw x 7% = 1.4 gallon per hour at full load). Diesel generators are designed for off-road applications and can operate on dyed or farm/construction diesel fuel which is sold without the road tax and thus is considerably cheaper to purchase;

4) Diesel engines are designed to work under a load for long periods of time and perform better when worked rather than operated under light loads;

5) Diesel engines can operate in sub-arctic conditions with fuel additive;

6) Diesel engines and fuel are safer to operate because of the high flash point of diesel fuel - it is even difficult to start a fire with diesel fuel;



7) Diesel fuel is easier to obtain during a disaster because it is a necessary fuel for the military, trucking industry, and farming operations;

8) Diesel gensets are competitively priced for a comparative sized water-cooled gaseous models with the same features; and

9) The cost of owning a diesel generator system where usage is high is much lower over the long run than gaseous gensets.

**Negative Factors to consider with diesel engines:**

1) Engine noise is usually higher on a diesel compared to a gaseous engine. The use of a properly designed enclosure and sound attenuation system is more critical on a diesel engine system;

2) A diesel engine is subject to "wet stacking" or over fueling if run for long periods of time with ultra light loads (less than 40% of the rated output). "Wet Stacking" causes the engine to smoke and run rough because the injectors become carbonized. Running a heavy load will usually clean up the over-fuel condition and allow the engine to perform properly. Diesel engines operate better and more fuel efficient when loaded (70-80% of the rated output is optimum).

3) In sensitive emission areas diesel engines are prohibited from operating over a prescribed number of hours per year to help reduce pollution levels;

4) Diesel engines require clean moisture free fuel and a bit more maintenance than a comparable gaseous unit;

5) Diesel gensets are typically heavier and require more planning to load and unload than a lightweight gaseous genset; and

6) a quality diesel genset can cost considerably more than an inexpensive air-cooled gaseous light duty standby genset of the same size.

**Q. Do 3000rpm diesel generators last as long as 1500rpm gensets?**

**A.** Generally the 1500rpm engine speed will last longer, use less fuel, and are slightly quieter than the 3000rpm units. Most small diesel portable generators in the 3 to 6kw class are air-cooled 3000rpm engines designed to keep the weight and cost down.



**Q. What does the term "Wet Stacking" mean in a diesel engine?**

**A.** Diesel engines are designed to operate with a load. When a diesel engine operates considerably below the rated output level the engine can start to over-fuel or "Wet Stack". Diesel engines perform most efficiently in the 70-80% range of rated output. When an engine operates for a prolonged period of time below 40% of the rated output it begins to over-fuel. This occurs because the injection tips began to carbonize and disrupt the fuel spray pattern. In commercial generator standby/emergency systems where loads can vary and low output conditions can occur more frequently because of the diverse load applications, an automatic load bank is sometimes used. A load bank will place a "false" load on the generator system to keep the diesel engine properly loaded to prevent a "Wet Stack" condition.

**Q. What kind of maintenance will my diesel generator need?**

**A.** Diesel engines require routine maintenance for long-life service. The normal maintenance requirements are about the same as owning a diesel powered vehicle - oil, oil filter, air filter, and fuel filter. In tropical and cold climates it is advisable to have a water-fuel separation filter system installed. Water or moisture in diesel fuel can be damaging to a diesel engine because the water properties create advanced ignition and accelerated detonation.

The engine will need an oil change every 500 hours depending on the dust conditions where you live. We recommend you change the oil filter every time you change the oil. The filters are normally the screw on type. Air filters need to be changed as required depending on how much dust is in the air. Diesels need a lot of clean air to operate properly and will suction collapse an air filter if it is allowed to get too dirty. We recommend you check the air filter every 200 hours and every 100 hours in dusty environments. Fuel filters are normally changed every 500 hours depending on how clean the fuel and dust conditions. Every diesel engine has a recommended service schedule. Like a diesel powered vehicle regular scheduled service is the key to long-life and performance.

Normally, the generator end (AC alternator) will not require any service unless you live in a dusty environment. In dusty environments we recommend you use a high pressure (50psi) air hose and occasionally blow out the dust from the generator system. Dirt and heavy dust particles can cause shorts in the internal wiring coatings under the right conditions. High heat and dust are the enemy of power generator ends.

**Q. Will the genset I purchase from INTERCON have adequate operating instructions and service manuals?**

**A.** Every genset sold or rented by INTERCON comes complete with an operators manual for the engine, generator, and controller if applicable.



**Q. How are warranties handled by INTERCON?**

**A.** INTERCON tries to sell the highest quality products available and we use only the best off-the-shelf components in our own gensets to minimize any potential warranty problems. INTERCON provides our customers with the factory warranty and terms & conditions on products we distribute. On INTERCON private label we provide you with a 1-year warranty on the product components. The engine & generator warranty period is based on the manufactures warranty and terms and conditions which may be longer.

**Q. What is the difference between standby/emergency use and prime or prime continuous duty applications?**

**A.** A majority of generator products are rated for standby or emergency use. This designation is for generators that will be used less than 500 hours per year and typically for short periods of time when the utility power fails. The prime duty rating is for use when the number of hours per year will exceed 500 and the use is on a regular basis. Prime continuous duty is the rating given for generators that are used 24-hour per day and 7-days per week. These ratings are based on the fact that the generator system will perform at the highest standby rating but when the hours or use exceed the recommended standard for standby the life expectancy can be shortened considerably and the potential for premature failure is increased. It is for this reason that the proper assessment of the application should be declared at the time of purchase. Buying a genset rated for standby duty and using it for prime or prime continuous application is penny wise and pound foolish and will normally void your warranty and cause you premature generator failure. Your generator system should be a long-term investment if properly sized and designed for your application.

**Q. Why do well pumps, air-conditioners, welders, and other electrical motor driven appliances require special consideration when sizing a generator?**

**A.** In general, appliances with electric motors have a much higher start up amperage (LRA) requirement than operating amperage (FLA). A general rule of thumb is a minimum of at least twice the amperage to start a device as to run it. However, some devices can require up to 6 or 7 times the amperage to start as to run. It is for this reason that any residence or business with water wells, large air-conditioners, sump-pumps, or other heavy duty motor applications should consult with a knowledgeable source when sizing a generator system. INTERCON can assist you with all of your motor starting calculations and we can supply you with generator systems designed to provide the best performance and size for heavy duty motor starting applications.



**Q. What are the most important things to consider when purchasing a standby/emergency generator system?**

**A. This is the most frequently asked question. Our answer is several-fold:**

1) A generator is a major purchase and should be amortized over its expected life depending on the use and environment where it will be used. For most residential applications a quality generator will last a life time if used for standby/emergency backup. For this reason we recommend the purchase of a quality genset with suitable features for your application. A cheap or bargain price is sometimes an expensive lesson;

2) If your backup requirements are very occasional and you only need limited power during an outage an inexpensive generator system will most likely meet your needs (air-cooled gaseous gensets);

3) The generator end is the usually the first item to fail with heavy use. The insulation coatings on the windings are based on heat ratings and 'F' is good and 'H' is better. Some major brands manufacture their own generator ends and parts, and repair is usually only available through the manufacturer. INTERCON uses off-the-shelf industrial brands like Mecc Alte, Newage, and Somers because parts are readily available and any qualified service repair center can service the generator end;

4) Controllers are a vital part of most generator systems. The controller monitors the generator engine speed for hertz, the oil pressure and water temperature, and other engine and generator functions. It shuts down the engine if one of the threshold settings for these controls fails. It also provides the autostart function for the automatic transfer switch or inverter if one is used

5) A generator is a mechanical and electrical device that over time will need some service or parts. Make sure you are purchasing a generator system that will be supported in the future from a company that will be there to support you; and finally,

7) know what you intend to operate with your generator and make sure the generator you purchase will handle your load. INTERCON can help you with design considerations, load calculations, and motor starting considerations. In our opinion, these are the most important things you need to consider when purchasing a generator.

**Call and talk to one of our sales engineers for a generator consultation and assistance for sizing and motor starting application. We are here to help: 02 632 9061**