Powering the eosAC, eosMX and Gas Analyzer Using a Generator

Introduction

Eosense's eosAC and eosMX/MX-P are designed to be deployed in remote and challenging environments alongside Picarro and LGR analyzers. As a result, many of these field deployments won't allow users the convenience of grid power, and may be situated in areas unsuitable or difficult for solar or wind powered solutions.

In these cases, using a gasoline powered generator to run the equipment may be the only option. Given the sensitive nature of the instruments being deployed, there are numerous factors to consider when choosing and implementing a generator solution at field sites.

In this application note we will review a few guidelines that can help ensure the best possible generator setup for these analyzer and chamber systems.

IMPORTANT

This application note does not constitute professional electrical advice nor does Eosense take responsibility for any damage to gas analyzers or other equipment being powered. Before proceeding, please consult a qualified electrician and the manufacturer(s) of your other equipment.

eosMX multiplexer

eosAC automated flux chamber

Generator Selection

Generally speaking, the two things to consider when selecting a generator are the maximum output power and the type of AC power supplied by the generator. **For output power, a good idea is to add up the total power required by your system at steady state and multiply by 3 for a safety factor** in case of increased demand during startup or shutdown of the instruments. Table 1 shows an example calculation for a typical Picarro G2000 series analyzer setup, with 12 eosAC automated soil flux chambers and 1 eosMX multiplexer unit.

Table 1: Calculating output power of a system

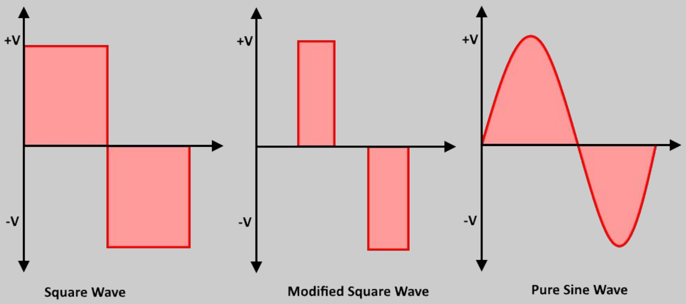
Component	Power Consumption (Steady State)
Picarro G2000 Analyzer	110 W
Pump	80 W
eosMX - Multiplexer	12 W
eosAC - Autochamber	8 W
Total	**210 W**

For this case, a generator with an output of at least 630 W of power should be used. This will provide more than adequate power for the system at steady state, as well as sufficient coverage for increased demand during analyzer and pump startup (while the system is equalizing its pressure and temperature).

The second consideration is how the generator produces its energy. There are two types of generators available: generators that produce square-wave AC power, and generators that produce sine-wave AC power. **For sensitive electrical equipment, like the Picarro and LGR analysers, a pure sine-wave inverter is critical**. Many commercially-available generators produce pure sine wave power (see insert on Page 2 for more information).

SQUARE WAVES & SINE WAVES

Square Wave and Modified Square Wave Generators (sometimes deceptively marketed as "Modified Sine Wave Generators"), while adequate for simple loads like lights and motors, have high harmonic content that can damage sensitive electronics. Pure (or True) Sine Wave Generators produce a waveform that accurately simulates the AC line voltage.



Generator Grounding

There are two critical considerations for grounding the generator. The first is the earth grounding of the generator. Most generators will have a ground lug on their control panel allowing a wire to be attached and run to a grounding rod. For this procedure you will need a copper grounding rod, approximately 2 meters in length, and a length of 16-18 gauge wire. The wire can be attached using an Acorn or Ufer clamp (Figure 1) to the top of the copper grounding rod, and is then attached via screw to the generator panel. The grounding rod should then be inserted fully into the soil near the generator, to provide a path for stray voltage to dissipate. Ideally all 2 m of the rod would be inserted into the soil, however the total depth of penetration will be ultimately be dependent on the field site and soil type.

Figure 1. Examples of grounding clamps. Acorn clamp (left) and Ufer clamp (right)

Secondly, some generators will have a "floating neutral". This means that the earth ground of the generator and the neutral prong are not bonded together as is typical of electrical outlets in homes or businesses. This allows for a potential difference which may cause a dangerous fault condition. There may be a generator option available that does have a bonded neutral (or a switch to select between bonded and floating neutral), but in the case that those generators are not available or cost effective, the neutral and ground will have to be connected. If your generator has an unused output, you may be able to add an external neutral-ground bonding plug (PDF format) otherwise you should have a qualified electrician modify your generator (though this may void the warranty).

Supplying Power to the Equipment

Since the equipment is sensitive to both electrical noise and hard shut downs (i.e. complete power outages), adding an uninterruptible power supply (UPS) is recommended. The UPS will provide buffering against any power surges in the generator system, as well as allow a short window in which the equipment can be safely shut down before the generator is restarted.

The main factor in selecting a UPS is to ensure that it has a sufficient power output for the system to operate in the case of generator failure. In the example shown in Table 1, a UPS with about 630W of output should keep the system going long enough to allow a soft shutdown. Each UPS model has a specific battery capacity, which will dictate the total backup run time. In many cases, a UPS can be sourced that will provide up to hours of backup run time. This amount of leeway helps ensure that users can implement a safe shutdown procedure for their equipment to avoid potential instrument damage and data loss.

Another option is purchasing a "Smart" UPS. These power supplies have hardware and associated software that can instruct the equipment they are coupled to to undergo a soft shutdown before the backup run time is exhausted. For the most part these systems will only work with equipment that is running a Windows-based operating system (i.e. Picarro analyzers), however there are some units that will control Linux-based machines as well (i.e. LGR).

Conclusion

Supplying power for remote and difficult field sites has unique challenges. The suggestions presented here provide base level considerations for safe and effective generator power at sites that are not conducive to using line, solar or wind power.