Batteries and Charging Considerations

A dependable starting system is essential for quick genset start-up. Batteries are the most common power sources for starting systems, but they can be one of the easiest system components to overlook.

Battery Considerations

Lead-acid batteries reach peak efficiency at 90°F (32°C). As ambient temperature drops, ampere output and recharging efficiency decline, dropping to 40% of rated output at 0°F (-18°C).

Cold Cranking Ampere (CCA) rating is the best yardstick by which to measure a battery's capacity. It indicates the discharge rate (measured in amperes) a fully charged battery will maintain at 0°F (-17.8°C) without terminal voltage dropping below 1.2 volts per cell. Table 1 shows the effects of colder temperatures on battery capacity.

Table 1

Ambient Temperature vs. Battery Output

F°	C°	Percent of 80° F (27°C) Ampere hours output rating
80	27	100
32	0	65
0	-18	40*

*We recommend lead acid batteries on emergency gensets due to their lower up-front cost, maintenance needs, and readily available replacements. Further, some building and/or life safety codes require batteries to be replaced every three years or less regardless of condition. Nickel cadmium batteries can be beneficial in harsh environments or situations where they will likely be unused for lengthy periods. They also tolerate long overcharge intervals better than lead acid batteries and offer a nearly constant voltage output throughout a discharge cycle. This performance comes at a cost, so careful review of the system's overall life cycle costs should occur before nickel cadmium batteries are specified.

Charging Systems

Gensets with engine mounted alternators cannot be relied upon to recharge batteries in standby situations. Charging systems must be used to maintain batteries while the unit is on standby, and fully recharge batteries if genset cycle times are short.

Consider these factors when specifying a charging system:

1. Select a system that recharges batteries quickly in the constant current mode, then automatically switch to maintain charge in a constant voltage mode. Units should be able to recharge completely dead batteries or those with no open circuit voltage. Select a system that offers float and equalize modes, also known as dual rate, which maintains charge with minimal water loss in cells.
2. Match charger capacity to the battery's ampere-hour (AH) capacity. Charger output should be between C/5 and C/20, where C equals the battery's AH capacity. For example, a 10 amp unit can charge batteries between 50 and 200 AH.
3. Consider units that offer short circuit protection. This prevents damage to any DC powered controls, and allows engine cranking without disconnecting the charger.
4. Specify diagnostic functions or alarms. An output voltage sensor is one of the best trouble indicators because it can detect power loss as well as overcharging problems. Consider a time delay on the voltage sensor to prevent false alarms caused by power drains from engine cranking.
5. Make sure chargers can withstand high transient response loads. Input voltage range minimum of +\- 5 Hz is acceptable.
6. Be sure the charger is fed from an emergency feeder circuit if a battery charging alternator is not included with the generator set.

Equipment should meet UL standards. Other industry standards to consider specifying: Transient Voltage Withstand Test 6 per IEEE std. 472-1974 (ANSIc37.90A-1974). Other standards to ensure performance, construction, and safety: UL EGSMA BCES-1, NFPA-110 and NEMA PV-5.