

# Ample Power Company

## Exploding Batteries and Boats

### Introduction

There have been many tons of tons of batteries destroyed from overcharging, so don't feel lonely if you just replaced a relatively new set.

Liquid electrolyte batteries have been around for over a hundred years, so they are understood better than gel batteries which are a relative newcomer.

Are gel batteries that much different than liquid types? It's always difficult to give a yes or no answer to any question more complicated than "do you sleep", but for the gel battery question we tend to favor a "no" answer.

Actual differences are subtle . . . what complicates the subject for many people is the *claim* that gel batteries are sealed.

In 1996, a sailboat operating in the Carribean had an explosion in the battery compartment . . . gel batteries. Fortunately, no one was injured, but the repair bill was significant, and as a result there will now be a flurry of discussions about the place of gel batteries in boats, and you can expect greater scrutiny of electrical systems from the insurance companies. Let's review some basics.

### Using Liquid Batteries

- Liquid batteries should be located in a cool, well ventilated space, preferably not in living quarters because of emissions of arsine and stibine gasses.
- The batteries should be secured so that movement is not possible in expected conditions. This means more than a single nylon strap with plastic buckles routed over the top of the battery. Batteries should not be enclosed so tightly, however, that normal expansion and contraction of the case is impeded.
- The batteries should be mounted in a watertight tray big enough to hold all of the electrolyte in the event of battery case fracture.
- The battery should be maintained with a charging system, (charger, alternator, etc.), that actually measures battery temperature and corrects the applied voltage accordingly.
- An instrumentation system should be connected to the battery that provides alarms for the following abnormal conditions:
  - high battery voltage;
  - low battery voltage;
  - high battery temperature;
  - high battery current; and
  - low state of charge.
- If multi-step charging is used, the systems should be designed so that it trips from the absorption voltage to the float voltage based on Volts and Amps through the battery, rather than just timing the absorption charge.

### Using Gel Batteries

For the most part, gel batteries should be used *exactly* the same as liquid batteries. The possible exception is the requirement for an electrolyte container. First, gel batteries use a tougher case than typical liquid batteries, so case fractures are infrequent, and the electrolyte is much like a paste and will only ooze from a fracture. Obviously, using a container is playing it safe.

### Case by Case Analysis

- Keeping batteries cool is always, well cool! Typically gel batteries don't gas, but in the event they do, the same explosive mixture is produced. Planning for the day that the charging systems fails, and no one is around to hear the alarms from the instrumentation system is prudent . . . provide plenty of ventilation.
- Gel batteries are no more sensitive to temperature than liquid batteries, and might even be less sensitive regarding gas emissions. However, effects from gassing a liquid battery can be hidden by the addition of water to the cells. That can't be done with a gel battery. Conclusion: There is no safety difference related to temperature between gel and liquid batteries, just an economic difference.
- Instrumentation System: Operating any electrical system without alarms is for risk takers, not for the prudent. Battery type makes no difference.

### What Went Wrong?

In the case of the explosion mentioned earlier a plethora of things probably went wrong. From reliable sources we've heard that the batteries weren't secured properly, insufficient ventilation was provided, temperature measurement and compensation was lacking, instrumentation was limited, no alarms for abnormal conditions were present, and multi-step charging was being used without battery state-of-charge controls. While there was an Ample Power Energy Monitor onboard, battery temperature sensors had not been connected, and no alarms had been activated in the Energy Monitor. Had the sensors been wired, and alarms enabled, the Energy Monitor would have sounded and alarm long before an explosion happened!

The first temperature sensing alternator regulator was the original 3-Step unit introduced by Ample Power Company in 1987. Alarms have been available since 1989. Monitor/Regulator interfaces to smartly terminate absorption charging have been offered since 1992.

In 1996, a lot of Ample Power gear could have been purchased for the reported \$100,000.00 repair bill!

**Ample Power products are manufactured by Ample Power Company, 2442 NW Market St., #43, Seattle, WA 98107 – USA** \_\_\_\_\_

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