DEALING WITH COMMON BATTERY MAINTENANCE PROBLEMS

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ABSTRACT

From time to time, stationary batteries may exhibit anomalies that require corrective action in the course of their operation. Some of these are easily correctable while others require some detective work to solve. Sometimes a problem is not with the battery, rather it may be the manner in which it is being tested or maintained by the user. This paper will identify some common and some not so common problems the user may encounter. VRLA and VLA battery types will be discussed.

INTRODUCTION

Why do some of the cells in this battery have “milky” electrolyte? Why are the containers (we aren’t supposed to call them “jars” anymore) cracking and crazing? I see “sparkles” on the dark colored plates. What’s causing that? Why are blue and green “fuzz-balls” growing on some of the battery connections? Why are the positive posts sticking up higher than the negative ones? Why are cell voltages all over the place? Why are puddles of acid all over the battery tops? Why do all the batteries in the system look like balloons? Some, all, or likely more than listed here (there’s a long list) occurring on your battery? I get these and many other questions about batteries, maintenance and problems all the time. Read on and you’ll learn how to identify some common ones maintenance people encounter during routine inspections and how to deal with them.

COMMON PROBLEMS EXPLORED

Milky Electrolyte?

Containers used for VLA batteries can be provided to the user in a limited variety of thermoplastic materials. Selection is based on the user’s needs which frequently focus on flammability characteristics of the container material. Among these are SAN (styrene acrylonitrile), poly carbonate and PVC (polyvinyl chloride). From a visual standpoint, the characteristics of the PVC container cause it to appear semi-transparent and yellowish, thus making the electrolyte inside appear to be off-color, or “milky” as one customer put it to me. To someone who is accustomed to seeing PC or SAN containers, they might think there is a problem with the battery. Actually, it’s all good, as some might say. The problem is you won’t find an obvious label on the battery that indicates the type of plastic you’re looking at. You would have to go clean back to the order to find it in most cases. Figure 1 shows a somewhat unique instance where PVC containers (right) were installed along side SAN types in the same battery string. Operationally there is no difference between these materials with one exception; PVC is flame retardant and SAN is not.

Figure 1

Sparkling Positives

Visual inspection criteria include the recommendation for a detailed look at <u>all</u> cell elements in a battery once every 12 months, according to IEEE 450-2010. You're supposed to be looking for color and uniformity of both positive and negative plates. Okay, a quick review; negatives are supposed to be light gray and positives dark brown to black, matte surface appearance. A good bright flashlight is needed here. If you've spotted what appear to be "crystals" or "sparkles" on the positive plates on all cells in the battery, this is not normal and it's not a good thing. See Figure 2. That's lead sulfate on the positive plates. It occurs when a battery has been discharged or is being under charged. Chances are, unless there's been a very recent discharge, the charger is providing too-low a voltage to the battery. Check the float voltage at the battery's main terminals and check *that* against the battery maker's recommended float specification. If it's low, raise the float as needed. It's a very common problem and many don't know how to recognize it. Now you do! What if this is observed on just one cell? Then we have an individual cell that has a problem and will likely need replacement.

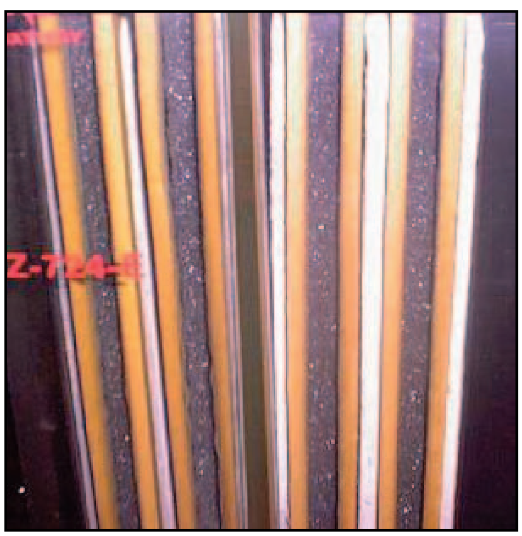

Figure 2

A Not-So Warm and Fuzzy Feeling

Along the lines of periodic visual inspection, there are numerous things to look for and some of them can really jump out at you. Even though that happens, people generally don't always know just what they're looking at. Take the photo provided in Figure 3 for example. You're looking at corrosion that's fairly advanced. It's green and fuzzy looking because electrolyte has come in contact with the copper, under that lead plating on the inter-cell connector, creating copper sulfate. You'll have to deal with this sooner or later. It might as well be the former because these problems are not self-repairing. Those who don't correct these problems just wait until a discharge happens to find out just how badly corroded connections can affect capacity. In extreme situations the excessive I^2R losses blows the connector clean off the battery, leaving a melted stump of a terminal, also known as an open circuit and a dumped load.

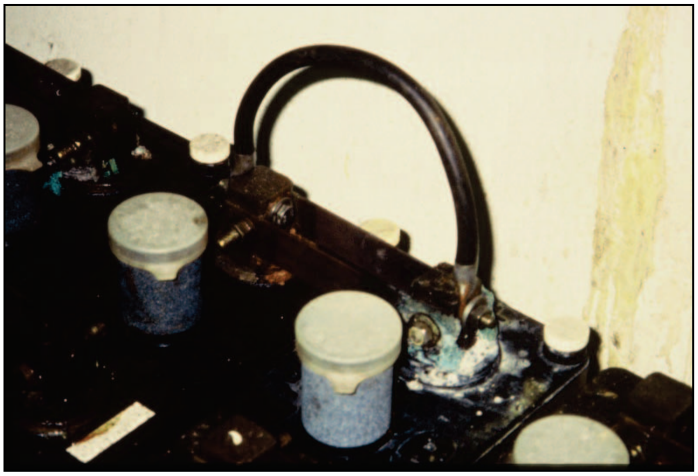

Figure 3

Positive Post Rise

As a battery ages, the positive grids corrode. This is also known as "growth" and it's well understood in the industry. It is the primary determining factor in when it's time to have a retirement party for a battery. In addition to this condition occurring as the battery approaches its end of life, the plates will eventually extend down to the bottom of the cell and at that point, there's nowhere to go but up. Refer to Figure 4. Here's one reason why you'll see the positive terminals pushing up out of the post seal, exposing an unusual amount of lead above the cover. In many cases, the post seal and surrounding area has limited flexibility to allow the added growth. As a result, the cell cover cracks. Don't bother breaking out your ohmic testers or load banks. Batteries that look like this are on death's doorstep. What's not expected is to see this occurring early in battery life. This condition can be accelerated with high operating temperatures, excessive and unnecessary cycling and over charging.

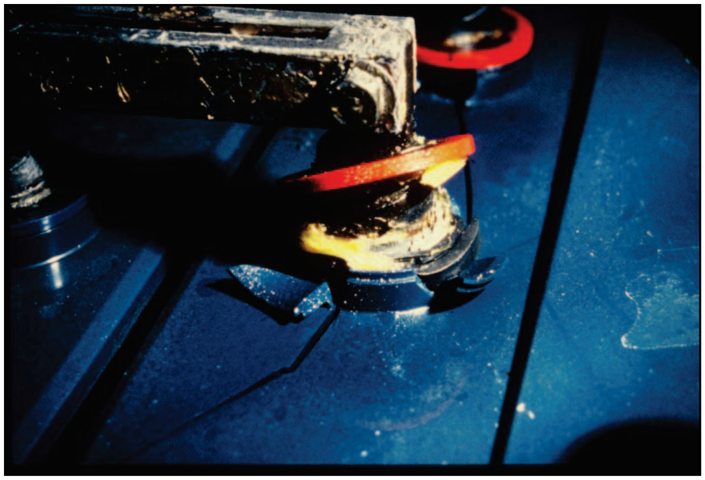

Figure 4

Uneven Cell Voltages

At some point, you may come across a battery that exhibits a wide array of cell voltage deviations as illustrated in Figure 5. The battery is a VRLA type with a set of float voltage readings taken only 20 days after installation. The technician expected +/- .01 volts per cell deviation and instead observed this, thinking the battery was in serious trouble when in fact it was not. The issue here is not the battery, rather, the battery technician's level of training and understanding. Note the allowable deviation by the manufacturer in the upper-left of the figure. A wide range is acceptable early in battery life and is narrowed as it progresses through the first 12 months of service. The higher voltage cells are likely a bit more saturated than their counterparts in the string and that's why they look like this. A quick review of the installation and operation instructions would have revealed this had the technicians looked it up.

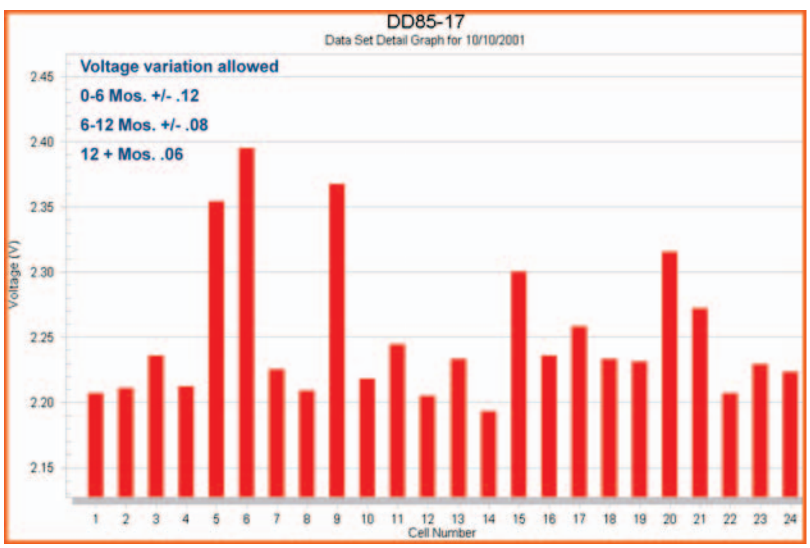

Figure 5

Where's the Electrolyte Coming From?

Must be bad post seals right? Loose flame arrestors? That might be it. Sure, it's easy to just blame the battery. Take a good look at how water additions are being conducted on your site. Carelessness creates major housekeeping problems for VLA battery operators. Another sure fire way to contaminate covers, container and hardware is to be sloppy with the hydrometer. Water spillage that doesn't get cleaned up is one thing, but spreading electrolyte all over the place is an open invitation for connector and terminal corrosion. Cleanup is time consuming and expensive. Electrolyte migrates and acts like tiny resistors to ground that create cell voltage imbalances, grounds and shock hazards. Figure 6 is an example of how a battery should not be maintained from the housekeeping perspective. And, by the way, the vent well is NOT to be used for hydrometer storage, please. Where's the flame arrestor anyway?

Figure 6

Container Bulge

Thought by some to be a condition brought on by increases in internal pressure from gassing, container bulge such as observed in Figure 7 occurs primarily in VRLA batteries due to growth of the positive plates. Tremendous pressure is created here in all directions. There is virtually no room for more than a minimal amount of growth. Cases such as this one occur when batteries are subjected to overcharge, prolonged periods of operation at high ambient temperatures, excessive cycling, significant aging beyond expected life or a combination thereof. Thermal runaway likely occurred here. If you observe container bulge be cautious. A small amount of bulge is normal. When it becomes pronounced, the battery is getting closer to replacement time. The type of battery illustrated in Figure 7 is 12 volts and approximately 12 amp hours in size. It was installed in a small UPS in the same compartment with the heat generating power electronics. It's no wonder it looks like it does due the heat exposure, but this can happen to any VRLA battery at any time, given the right conditions. Figure 8 represents a new battery module and was used for comparison purposes.

Figure 7

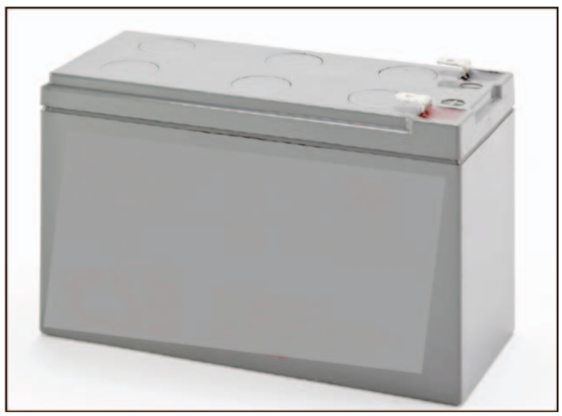

Figure 8

SUMMARY

Just a few examples of common problems were discussed in this paper. There are many more that time did not permit. Many of the issues that can plague a battery go unnoticed or unreported because people do not know a problem exists. Many maintenance people are poorly trained and/or equipped in the ways of battery fundamentals, operation and maintenance. I see these situations frequently. To management, battery maintenance is simply treated as another item on the maintenance punch list with little thought given to the qualifications required of the person performing the work. Companies buy test equipment and put it in the hands of people and still, the battery fails. Training is essential for maintenance people, engineers and technicians so a good understanding of how batteries work can be achieved. It’s extremely difficult to undertake maintenance without proper training. Figuring out what’s wrong with a battery is going to be nearly impossible.

But hey, it’s only a battery right?