

ARE YOU REALLY PROTECTED IN ALL AREAS?

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There are many areas that a failure can occur within your system whether it is a UPS, Switchgear, Generating Turbine, Telecom or Engine Generator. The inexpensive part, lack of proper maintenance or the lack of understanding of the power support system may cost your company in a big way.

The following are some actual occurrences I have seen in my twenty-three years in the battery business.

IGNORING YOUR BATTERY SYSTEMS' NEEDS

Three years after a new UPS system was installed at one of the most powerful computer centers in the world, my company was awarded a preventative maintenance program. However, we were limited to one inspection a year despite our request for more frequent maintenance as recommended by the IEEE and the battery manufacturer's standards. The facilities manager's reason for the limited maintenance was that he didn't experience any problems at his last facility so why would he have any now since all his batteries were new.

The electrician was supposed to water the 1,880 hungry cells but he had a hard time keeping up with all the other duties he had at the facility. We eventually inherited this task and put water in by the pallet load. With all the water used we explained that something other than normal charging was causing this excessive consumption of water and further testing should be done, but this was ignored. We were told they had two utility feeds to the building and were satisfied that they would not lose both at the same time and did not have backup generators.

Guess what? Along came an outage and the switchgear that was supposed to transfer them to the second substation at the two minute mark did not. The facilities personnel were at lunch when the call came out and although the battery system was sized for only fifteen minutes it ran for seventeen minutes. And you can guess what happened next. One of the eleven most critical UPS systems dropped out and the computer went down. \$4.4 million dollars in revenue was lost plus damage to the computer system and a large amount of data vanished **BUT** the battery lasted longer than they had planned. The customer then assumed that the battery was in excellent condition since it lasted longer than the expected design.

After investigation, the switchgear was found to be mistakenly set at twenty minutes instead of the specified two minutes (maybe a bifocal problem the installer had). The next mistake made was the failure to notify our company of the outage so we could inspect the battery for damage due to the **SEVERE** depth of discharge.

About three weeks after the first outage we received a frantic phone call from the customer. This time the UPS went down instantly and cost them another \$4.4 million plus damages. Thirty minutes after the call we arrived and immediately found the problem. Two of the cells were open within the system due to damage from the previous discharge. This obvious problem would have been easily detected with a proper maintenance program.

Proper maintenance is critical. The use of meters, monitors and visual inspection of the cells is critical to insure the proper operation and protection of your battery system.

Was this company protected? Yes and NO. Had they followed the minimum recommended IEEE maintenance procedures they would have prevented the second outage but not the first.

DANGER RIGHT IN FRONT OF YOUR FACE

A generating company with a plant in the heart of the city of Minneapolis had a battery system that was to supply power to a UPS and an oil lube pump. The battery installed was designed specifically for short-term high-rate discharges that would support the UPS but not the long term discharge required by the oil lube pump.

The maintenance personnel had neither the experience nor the knowledge to identify a failing battery. They neglected to see the shorted cells within their system and their battery went into thermal runaway. The battery was boiling and the customer called the battery representative on the weekend and they were told to continue adding water. Another example of their lack of knowledge was that they were using a turkey baster to add water through the electrolyte withdrawal tubes, rather than filling them through the flame arrestor funnels. Would you like to be next to these cells with a turkey baster filling them while the battery boils? They explained that it took six hours to fill the battery and by the time they got to the other end they had to start over again. It was determined on Monday morning after far too much danger that the battery wasn't going to return to normal by adding water and it was taken off line.

This problem could have been prevented with knowledgeable maintenance personnel.

SPACE SAVING AND COST SAVINGS DON'T QUITE DO THE TRICK

Another generating company in our area called about battery failures at all three of their plants. These batteries back up the oil pumps for the turbines. This is an area that needs long term backup to insure the turbine is lubricated while it cools and spins down. In all cases the batteries that were installed were UPS designed high-rate type batteries with thin plates and high specific gravity. Although they have discharge tables for longer than fifteen minutes they are designed for short term use and were put into this application in error.

The battery room was designed without the consideration of size of the appropriate battery for this application. The sale of the batteries was awarded to the lowest bidder rather than engineering the proper battery for this application. The solution we recommended for this customer is replacement of their battery with the correct type. Their response was that battery replacement was not within their budget. However, is a new turbine in their budget? Because if the battery fails they will have to replace or repair the turbine and that will be much more costly than a battery plant.

At one of their facilities we currently have a temporary battery installed because their existing battery failed. The other plants should address this problem immediately and replace them with the proper long-term discharge style battery. Another recommendation for this type of application is to have parallel batteries installed for added reliability and ease of maintenance.

MELTING FEET

A standby generator at a Nuclear Power plant was supporting the security of the plant. The starting system was a regular diesel starting battery that was on a constant float charge. It was inspected at least quarterly and showed good voltages and specific gravities. The age of the battery was over two years old and normal battery change outs occurred at three years.

When the system was tested just prior to the NRC inspection the generator did nothing at all. It didn't even grunt and a state of panic began because they were being inspected in five hours. The reason the battery didn't start was due to corrosion from constant charging. The battery they were using is designed for starting service not float service. The plates are too thin, the gravity too high and the plates corroded off at the crows foot connection at the top of the cell. The battery maintained voltage and gravity but when a high current draw was required the area at the crows foot acted like a fuse and melted off causing an open cell.

Since the time of the melt down, the systems have been changed to either a Stationary Lead Acid or Ni-Cad battery. Both are designed for float service but capable of handling the high current of starting applications.

SUBSTATION BUREAUCRACY

I was in the Air Force Reserve after my years in the Marine Corps and I became so busy in the battery business I left my home unit and was assigned half time reserve status at a Nuclear B-52 base. The electrical shop was run by a Master Sergeant that had cross trained from the MP's to become the Electrical Supervisor (See what is wrong here). The first time I reported to this base he asked me what I did on the outside (Reservists were not appreciated as much then). I told him I owned a battery company and we serviced and installed battery plants. He sent me to the two incoming substations and I was instructed to inspect the battery systems and write a report. I wrote about the severe undercharging of the AGM style batteries that were being used to trip the switchgear. My report also stated that the batteries were in very poor condition and should be replaced immediately due to swelling, cracking and leaking. I wasn't appreciated and when I left after my two weeks he must have filed my report in the circular file because no action was taken.

Sometime during the next year a short somewhere in the system demanded a trip in one of the substations and the battery failed. If you have ever gone camping and someone has put a soda can in the fire, picture a substation switchgear house that looks like that soda can. The fireworks were better than the Fourth of July and now there was a B-52 Nuclear base with only one incoming AC feed. It is extremely important to **LISTEN** when you get a warning because it generally means trouble. I saw the damage the following year when I returned. We changed the batteries in the other substation and adjusted the float voltage to the correct level.

This could have been prevented by having a regular IEEE maintenance program with the proper equipment and training of technicians and acting on the warning.

WE DID OUR PART

A major airline company went through UPS battery hell which cost them enormous amounts of money. This included replacing the UPS, generators and batteries. After installation was complete, I stopped by to see the IS Supervisor and asked about the Telecommunications system for the company. The Telecommunications system was powered by a single string of AGM batteries and a single Telco grade Rectifier. After spending all this money on redundant UPS, batteries and engine generators this department could render all these systems useless. The entire system supported customer flight control. Upon inspection of another facility that controlled the airlines multimillion dollar freight system, the same problem was evident; a single string of batteries and a single rectifier were backing up the telecommunications.

How many people understand that you can't get the data out using the Telecommunications -48VDC system if a rectifier failure occurs? This system does not just plug into the wall because the telecommunications equipment runs on -48VDC only. How fast can you get a replacement rectifier there especially these days with all the heightened security controls?

If the battery fails will it also take the system down? Sometimes yes and sometimes no. If there is an interruption in the AC feed to the rectifier or a rectifier failure and you have a bad battery then you will go down. Because Telecom is usually so reliable most people don't consider it a source for trouble. However if communicating outside your data center is a critical part of your operation you need to look at the Telecommunications department and make sure they follow the same critical procedures to guarantee performance when needed. Upon our recommendation the airline company had us replace this single point of failure with a redundant rectifier and battery system.

EARLY RETIREMENT

A major leasing company with a name we all know had the same situation. The IS staff had a consulting firm come in and evaluate the power system because the UPS they had was getting old. The consultants put in a redundant UPS system but since the Telecommunications department fell under another person's area of responsibility it was not included. We inspected his system and found the battery and rectifiers to be in very poor condition. His personality did not allow him to spend any money to replace anything that was working. This company leases a great deal of equipment all over the world and has approximately 2,000 people on the phone most of the time. The entire communications of the company went through that department along with all the computer information to all the outside sales staff and other remote locations. We recommended to him that the system be replaced because it was unreliable. However the system was backed up by a generator so he didn't feel the need to do anything. Well, he was close to retirement but closer than he thought when the outage occurred.

After the retirement party we installed a redundant rectifier, battery and distribution system along with an IEEE maintenance program to prevent this from happening again.

SUMMARY

In summary there are many areas that can put you out of business in your power support system. Try to learn about each and every one of them to insure you are protected - completely protected. Just backing up one area properly but not another can lead to a very embarrassing and costly situation.

Make sure the maintenance company you are dealing with understands batteries, the proper procedures for inspecting, testing and reporting on the condition of your batteries. As a customer you need to pay attention to the warnings and warning signs and react appropriately. Prevention can save a lot of money and maybe even your job.