

## DISPELLING THE MYTHS ABOUT BATTERY CAPACITY TESTING

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Reliable testing companies with sophisticated battery testing equipment have been available in most parts of the United States for the past 10 years. Battery capacity testing remains an important part of the current IEEE maintenance standards. However, many myths still prevail in the industry. The following myths will be addressed:

1. The battery was tested at the factory, no need to test it onsite.
2. Battery is only good for 100 cycles, don't use them up on testing.
3. If the battery fails during the test there won't be a backup.
4. We know the batteries are good because the facility lost power last week and the system stayed up.
5. The battery can't be taken offline for testing, ours is a 24 hour X 365 day operation.

Before addressing the myths lets review a few fundamental battery facts.

### Battery Life

Battery cells are engineered and manufactured with a finite useful life. Actual battery life, with rare exception, will be less than the manufacturers specified life. Factors such as proper initial charging, ambient temperature, charging voltage, cycling history and maintenance will impact battery life. It is prudent to assume that at any given time the actual capacity of the battery is unknown.

### Battery Maintenance

Routine battery maintenance in accordance with IEEE standards will extend battery life if corrective actions are taken when problem is found. IEEE standards recommend periodic capacity testing.

### Critical system component

A sizeable investment is made on the DC plant to insure that power is available to critical loads at all times. The battery systems are an important part of those systems. Properly designed systems allow for the servicing of all system components, including the battery.

### Battery Failures

The abuse that a wet cell battery system can take without failing is a testament to its rugged design and simplicity. As batteries have evolved from single cell to multiple cell designs with higher power densities some of their ruggedness and simplicity has been lost. VRLA batteries are much less tolerant of abuse than their ancestors. They often fail without adequate warning. A whole new industry has developed around predicting when a VRLA battery will fail.

### **Why did the IEEE Standards Committee recommend capacity testing?**

To answer this question three members of the standards committee were interviewed. The questions and a summary of the answers are listed below:

#### Question #1

Why did the IEEE Standards Committees for standards 450-1995 and 1188-96 include capacity testing?

#### Answers

- Capacity testing is still the only true means of determining capacity.
- Battery capacity cannot be inferred.
- Testing is the only means of determining when a battery should be replaced.
- When a load is applied all components of the system are tested

#### Question #2

What types of battery problems will capacity testing reveal that may be overlooked by routine maintenance practices?

#### Answers

- Routine maintenance will not provide capacity data.
- There is no correlation between voltage and capacity. Lower battery voltage may be an indication of more efficient recombination, and not of a defective battery.
- Trend analysis of Ohmic data may provide some information, but not actual capacity.
- Capacity testing is the only way to find chemical path problems as well as metallic path problems.

- Testing should be performed at rates near actual system loads. For example, a Fifteen-minute test may detect metallic path problems, which will not be found in a three-hour test of the same battery.

### Question #3

Is capacity testing really necessary if all the other maintenance set out in the standards are performed?

### Answers

- Yes – testing is necessary as long as the cost benefit is there. No need to test a 10-year warranted battery, which is 7 years old and shows other signs of degradation.
- Acceptance testing within the first year and periodic testing thereafter is the most accurate way to trend battery life and detect both chemical and metallic path problems.
- Testing is required to insure timely replacement of batteries and avert system failures.
- Testing is an excellent planning and budgeting tool because it can be used to predict end of life.

### Addressing the myths

#### **Myth #1: The battery was tested at the factory, no need to test it onsite.**

Battery manufacturers utilize stringent quality control procedures during the manufacturing process. High current short duration discharge tests are often used to insure internal connection integrity, but actual capacity tests are not performed at the factory. Some Nuclear plant batteries are 100% capacity tested at the factory and a significant fee is charged for this service.

A true capacity test will discharge the entire battery system as one unit. The inter-unit and inter-tier connections are often sources of system failures. Breaking a system into pieces to perform a test may exclude connections, which are potential problems.

Serious problems can occur during transport and installation. Therefore, the battery should be tested on site after installation and initial charging.

#### **Myth #2 Battery is only good for 100 cycles, don't waste them on testing.**

One cycle is insignificant in comparison to a battery failure and the loss of the critical load. To assume everything will work as designed is not prudent when a means of determining the battery's capacity is available.

**Myth #3: If the battery fails during the test there won't be a backup.**

Testing is performed when the system can be taken offline without affecting the operation. A problem must be found before it can be corrected. Equipment used for testing will automatically stop when cell voltages reach a predetermined set point. This prevents cells from being damaged. If serious problems are found the system owner can make a decision to place the system back in service or run without it. When VRLA units are found to be defective they can be replaced immediately. Defective cells can be cabled out of the system until replacements arrive. Properly performed capacity testing does not create problems it reveals problems that already exist.

**Myth #4: We know the batteries are good because the facility lost power last week and the system stayed up.**

This is one of the most commonly heard myths because it sounds so logical. However, last weeks hit is no indication that the system will work the next time it is called upon. Capacity testing is not a pass/fail indicator. A capacity test will determine the overall capacity of the battery and the capacity of each cell in the battery string. When tested as a whole, stronger cells may camouflage problems in weaker cells. Actual AC loads may be less than rated loads.

**Myth #5: The battery can't be taken offline for testing, ours is a 24 hour X 365 day operation.**

The fallacy in this myth almost speaks for itself. If the system is truly critical each component in it must be maintained properly. The battery system is no different than a transfer switch, if not maintained it will eventually fail.

Sophisticated owners use capacity testing to predict "end of life" and to schedule battery replacements during maintenance windows or system shutdowns.

**References:**

**IEEE Std 1188 –1996.** *IEEE Recommended Practice for Maintenance, testing and Replacement of Valve-Regulated-Lead-Acid (VRLA) Batteries for Stationary Applications*

**IEEE Std. 450-1995.** *IEEE Recommended Practice for Maintenance, testing and Replacement of Vented Lead-Acid Batteries for Stationary Applications.*