C&D TECHNOLOGIES

SELF DISCHARGE AND INVENTORY CONTROL

The lead acid battery will exhibit a degree of self discharge during periods of disuse and while on open circuit while in inventory. The rate of self discharge is related to the ambient temperature while the total self discharge is related to time.The rate of self discharge for a specific design of battery is a function of grid alloy, plate thickness, spacing (separator thickness) and electrolyte specific gravity. It is the result of an ongoing reaction between the active materials in the plates and the sulfuric acid in the electrolyte. This reaction forms lead sulfate on the plates and generates water replacing the consumed acid. There is also a slight yet continuing corrosion of the positive grid which produces oxygen as a by-product, and the oxygen coming in contact with the negative plate, reacts with the lead and causes the negative plate to further discharge.

As noted in Figure 1, the self discharge rate of the AGM (VRLA) battery is approximately 3.5% per month @ 77 degrees F and will double for each 20°F increase in the battery storage temperature. Obviously the lowest possible storage temperature will result in the longest possible shelf life.

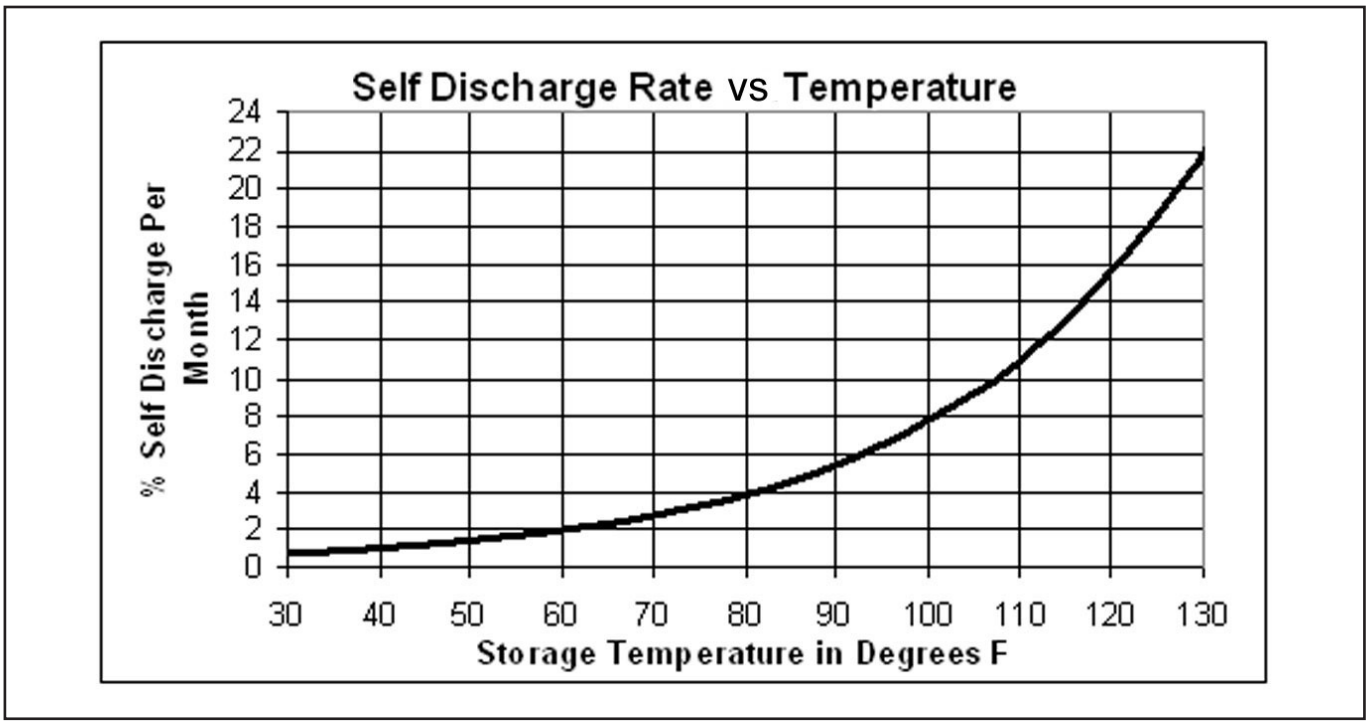

Figure 1

OPEN CIRCUIT VOLTAGE TEST

The open circuit voltage (OCV) of the battery is an indication of the batteries electrolyte specific gravity and state of charge. As seen in Figure 2, the cell's remaining capacity (state of charge) and OCV decline more rapidly at the warmer storage temperatures. For best performance, the battery should not be allowed to self discharge below 75% state of charge or 2.09 volts/cell (6.27 and 12.54 VDC for 3 and 6 cell batteries respectively). At this time, or before battery reaches this voltage, the battery should be given a freshening charge thus reversing the products of self discharge and restoring the rated capacity. This also assures freeze protection to a -25 degrees F while in storage.

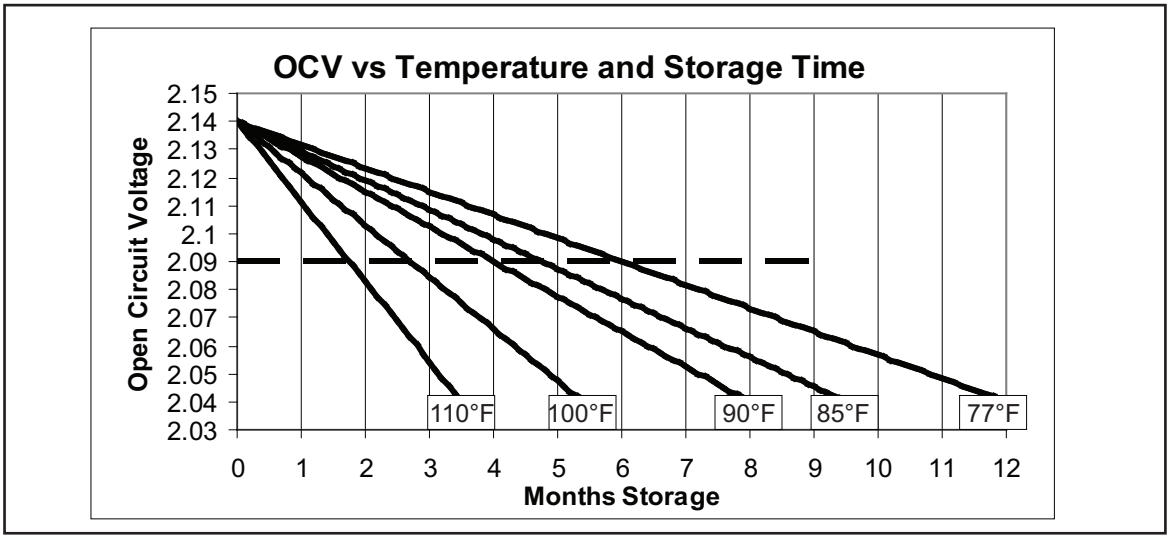

Figure 2

INVENTORY CONTROL

The VRLA battery inventory must be controlled with respect to age, temperature, and state of charge to assure optimum performance when placed in service.The C&D Monoblock VRLA batteries display a shipping code which defines when the battery was shipped from the factory. It is a 4 digit numeric code and interpreted as follows:

MMYY or MM-YY
MM = Month (10 is Oct.)
YY = Year (10 is 2010)

Inventory should be utilized on a FIFO (first in – first out) basis – that is, use the oldest batteries first. Do not expect optimum performance from a battery that has been in inventory for over 18 months, even if it was properly maintained. There is a certain ongoing irreversible deterioration of the cell components even while on open circuit and this may detract from the overall service life of the battery.

Freshening Constant Voltage Charge – VRLA batteries on open circuit should be given a freshening charge at 2.4 volts per cell (7.2 and 14.4 VDC for 3 and 6 cell batteries respectively) for 16 to 24 hours when the open circuit voltage has declined to 2.08 volts per cell (6.24 and 12.48 VDC for 3 and 6 cell batteries respectively) or every 6 months, which ever is sooner, to assure they incur minimal deterioration during periods of disuse. The constant voltage charging of several 12 VDC VRLA batteries in parallel is illustrated in Figure 3.

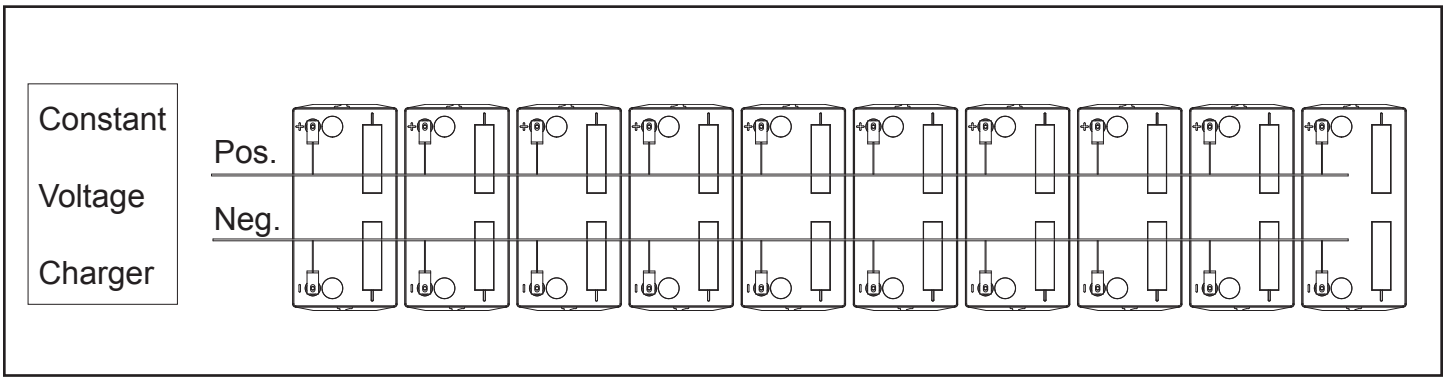

Figure 3

Recovery Constant Voltage Charge – If the battery has been allowed to self discharge to between 2.08 and 2.02 volts per cell a recovery charge may be attempted. This recovery charge is simply the application of the freshening charge of 2.4 volts per cell for an extended period of up to 48 hours. While the battery may recover, as indicated by attaining normal maximum current levels with a decline to minimum, the better indication is its ability to maintain an appropriate open circuit voltage for 30 days after the recovery charge. A battery whose OCV declines to below 2.08 volts per cell within the 30 day period should be considered unfit for service.

Constant Current Charging – Many distributors of lead acid batteries have adjustable constant current chargers which are used to maintain their inventory of automotive batteries. These are usually capable of charging up to 10 of the 12 volt or 20 of the 6 volt batteries connected in series as shown in figure 4.

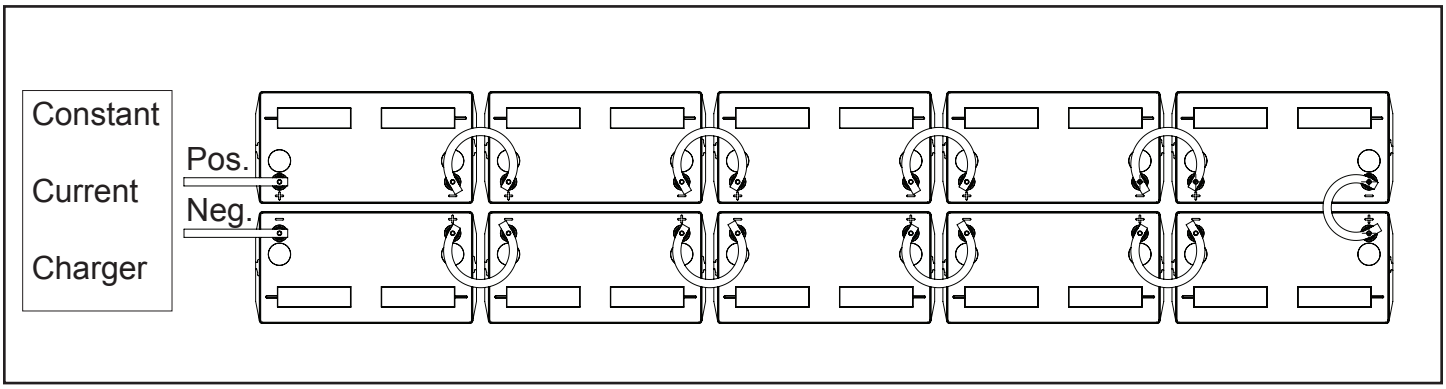

Figure 4

This charging technique may also be used to provide a freshening or recovery charge for VRLA batteries in inventory provided the charging current and time are carefully controlled. Constant current charging at too high a current or for too long a time must be avoided or excessive gassing of the battery and electrolyte dry out could result. This will permanently damage the battery and may void the warranty.

The current to be used is that of the 20 hour rating for the battery. For example, a TEL12-30 has a 20 hour rated capacity of 33 ampere hours at a 1.65 ampere discharge rate to 1.75 volts per cell. The constant current charging rate should be no greater than 1.65 amperes. For a freshening charge the charging time should be limited to 6 hours; for a recovery charge, 16 hours. If the battery is being charged following a discharge at the 5 hour rate or longer, the charging period may be up to 24 hours.

This constant current charging technique should not be used routinely, such as when a battery is in service, because of the application of excessive overcharge and resulting electrolyte dry out.

SERVICE QUALIFICATION TESTING

Prior to placing a VRLA battery in service, it should be functionally tested. As a minimum, the battery open circuit voltage and its capability to sustain a momentary high rate load should be verified as acceptable. These tests are described in the pamphlet Integrity Testing document 41-7264.
When the proper test equipment is available, the impedance or conductance may also be measured and verified as acceptable as described in the pamphlet Impedance and Conductance Testing document 41-7271. If the 100 amp load or conductance tests are failed, and the OCV is near or below minimum, charge the battery and retest prior to placing into service.

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