

# Re-charging, discharging and equalisation of Deep Cycle Batteries

## 1. Charging – Flooded Types

- a. Deep Cycle Batteries in a cycling application require a recharging voltage of 2.43 to 2.45 volts per cell. This is 14.6/14.7 volts for a 12 volt nominal installation and 29.2/29.4 volts in a 24 volt site.
- b. To fully recharge the cells this charging voltage needs to be applied until the charging current tapers to approximately 3% of the total capacity of the battery. E.g. A 220amp/hr bank is considered to be fully charged when the charging current reaches 8 to 10 amps with a charging voltage of 2.43 to 2.45 volts per cell.
- c. It is not necessary to fully charge the batteries after each cycle. If the batteries are working hard then a maximum discharge level of 60% (leaving 40%) for using true Industrial Deep Cycle Batteries you will still achieve a reasonable life. However this is not the recommended depth of discharge for every cycle, which is 50%, but occasional discharges to 60% is acceptable. A recharge back up to 80% to 85% after each cycle is also acceptable provided the cells are fully charged every 4 to 6 weeks. Regular very deep discharges to 80% will result in a reduced battery performance and a reduced life. Both of these systems are the result of high levels of lead sulphate, which diminish the batteries charge acceptance and cause premature positive plate failure.
- d. This recharge should result in some gassing (to mix the electrolyte) and hydrometer levels should be restored to the fully charged state.
- e. During partial recharge (to 80%) only a slight rise in electrolyte temperature should be detected. This would be of the order of 5 degrees Celsius. A full recharge should see a maximum temperature rise of 10 degrees Celsius.
- f. Once the battery is fully charged it can be maintained by applying a charging voltage of 2.24 to 2.25 volts per cell (13.4-13.5 for 12volt and 26.8 to 27.0 for 24volt). This is called a "Float" charge. However it is worth noting that this float charge does cause some deterioration in the cells but this deterioration is often less than the damage caused by the batteries being left in an under charged state.
- g. All charging voltages need to be temperature compensated. That is, as the battery temperature raises the charging voltage needs to be reduced. Most modern quality regulated chargers are temperature compensated.
- h. Care should be taken when working around batteries on charge or when recently charged to levels of hydrogen and oxygen may be present which, if ignited by a mere spark, can cause a dangerous explosion. The wearing of eye protection is essential.

## 2. Discharging

- a. Discharge levels should be as per 1. c above.

## 3. Equalisation Charge

- a. Equalisation charges may be necessary as it is common in lead acid batteries for cell capacities to vary which results in an increasing difference between the state of charge of independent cells within the battery and a corresponding variation in SG readings.
- b. Equalisation charge is a form of over charge which, when applied allows the flatter cells to catch up.
- c. Effectively the charging takes the form of a current limited charge with a higher voltage setting. This results in a continuation of the charge through the battery even when some cells reach a fully charged state and their voltage rises. This allows the remaining cells to continue to receive charge.
- d. Equalisation charging voltages are of the order of 2.6 to 2.7 volts per cell with the current ideally limited to 10% of the C10 rating of the cells.
- e. During Equalisation charges, high levels of gas will be emitted. Ventilation of the surrounding area is essential. Eyewear protection must be worn and care to avoid sparks or flames should be taken.