BATTERY CHARGING CARE AND MAINTENANCE

Battery Charging

By far the most important part of routine maintenance is the proper charging of your batteries. When a battery is connected to the charger, DC current is distributed through the battery in a direction opposite to that which occurred during the discharge process. During the charge, the sulfate ions are driven from the positive and negative plates into the electrolyte solution, and the plates are returned to lead peroxide (positive) and sponge lead (negative). The electrolyte begins to increase in specific gravity. Once the output amperage of the charger begins to exceed the number of AHs required for charge completion, the result is generation of oxygen and hydrogen gas, overheating of the battery, and degrading of the positive plates. For this reason, chargers are designed to rapidly reduce the rate at a point where it is assumed the battery is 80% charged. Although deleterious to the battery, some gassing action is necessary to prevent stratification of electrolyte.

If the battery is being charged on a conventional charger, it is important to ensure that the capacity of the charger is correctly matched to that of the battery. Failure to do so will result in permanent damage to the battery, charger, or both. Also, conventional chargers should be equipped with a dependable automatic start/stop control. After approximately four hours of charge, when the battery is at about 80% of its nominal full charge, the charging current is reduced to a lower rate and maintained until charging is complete. When the battery is fully charged, the current should be stopped or reduced to a very low rate.

In many cases a faulty charger is the root of battery charging issues and can cost an operation thousands for a new battery. All that is necessary for routine charging is knowledge that the charger is functioning properly. This is accomplished by periodic inspections performed by Rhino Fork-Truck Centre.

However, a basic knowledge of what is involved in the charging operation, plus a brief description of the more important types of charging and when they should be used, should provide valuable information in the event of charger malfunction or for charging operations not using fully automatic equipment.

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Types of Charging

There are a number of different charging methods, but for purposes of this introduction, only three need explanations. These are: Cycle Charge, Equalizing Charge, and Freshening Charge.

Cycle Charge

This is the complete recharge of a battery after is has been fully or partially discharged during the normal operation. Typically, a cycle charge is based on an eight-hour charging cycle but can, depending on need, be extended.

Equalizing Charge

Each cell of a battery has slight differences in uniformity of construction and content. These slight differences cause some cells to take less charge than the other cells in the battery. After a time, the state of charge of the cells which require more charge than the others will drift back in voltage and specific gravity, and the battery will not deliver its full capacity. To bring the cells with a lower state of charge up to the same level as the others, the battery is given an "equalizing charge." The cells with a higher state of charge will be somewhat overcharged, to bring the cells with a below-normal state of charge up to full charge. Years ago, when lift trucks and mine locomotives were used lightly or sometimes stored during slack seasons, frequent equalizing charges (sometimes weekly) were recommended by battery manufacturers. Today, this inflexible kind of equalizing schedule is not recommended. Instead, the recommended frequency of equalization depends on how often the batteries are cycled and the depth of the cycles. The frequency of equalization can dramatically affect the operational costs of the vehicle. Unnecessary equalizing charges, in addition to consuming electricity, can result in significant loss of battery life caused by unnecessary overcharge. The following examples will give you a good idea of a reasonable battery equalizing schedule for a specific battery operation.

- For batteries that are cycled only once or twice a week to an average depth of 30% to 60%, a monthly equalizing charge is usually sufficient to keep them fully charged.
- Batteries that are discharged regularly—three or more cycles per week to an average discharge depth of 60% to 80% of their rating—can usually be kept healthy by equalizing them every two months.
- Batteries that are cycled four to eight times a month at any depth normally require equalizing about once a month to keep them in healthy condition.
- Batteries that are cycled five or more times a week at an average discharge depth of 60% to 100% may not need equalizing charges unless stored.

Freshening Charge

A freshening charge is used to bring a battery to a fully charged condition before it is placed in service or when it has been standing idle for a short period. It takes about three hours at the finish charge rate (three to six amperes per 100 AH of the battery's six-hour capacity rating).

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Keys to Properly Charging Your Battery

If the battery charging equipment is the counter voltage sensing type and is functioning properly, and if the battery is in a healthy condition, there is little chance your battery will be improperly charged. If some doubt about its operation exists, the following checks are a quick way of insuring that you are properly and fully charging your batteries:

- ·Charging current readings level off to the finishing rate
- ·Charging voltage stabilizes
- ·No rise in specific gravity
- ·Normal gassing
- ·No excessive heat generated in the battery

Overcharging

An excessive amount of charge results in high battery temperature, reducing the battery's service life.

Overheating

To obtain maximum service life from a battery, it should be charged and operated at electrolyte temperatures below 45˚C. Above this temperature, overheating occurs. Overheating will damage the battery and shorten its normal expected service life. The extent of the damage and loss of service life depend on how high the temperature rises, how often the overheating occurs, and how long the batteries are subjected to high temperatures. A healthy battery charged on a properly functioning charger will have a 5˚C to 10˚C rise in temperature when fully charged from a completely discharged state. What causes a battery to go beyond this range and overheat?

The temperature rise is affected by several variable factors:

- ·Temperature of the battery when put on charge
- ·Age and condition of the battery
- ·Start, intermediate, and finish rate of the charger
- ·The amount of overcharge given the battery

In lift-truck operations, a battery can overheat because of the operating requirements of the truck, as well as the operating environment. If a lift truck requires almost continuous current draws that are higher than normal, the temperature will rise. Ideally, for this operation, a "cool" battery whose temperature is 32˚C or lower should be installed in the truck. However, if the lift-truck operation starts with an overheated battery whose temperature is over 45˚C, the continuous high current draws will tend to make the temperature rise even higher and battery damage is likely.

Typical working environments where batteries must operate in an overheated condition are in a foundry, where ambient temperatures reach 48˚C and higher, and in heavy-duty operations where they must be charged every five to six hours with no time for cooling before a charge. The latter problem can often be alleviated by having more than two batteries per truck. For the former, an inexpensive way to cool the battery is by directing a fan over its intercell connectors; since they conduct about 60% of the heat out of the battery, the battery will cool rapidly. Always charge with battery covers or truck compartments open.

Operating and charging batteries at elevated temperatures is a frequent cause of battery damage and reduced service life. An experienced battery technician, given the levels of operating and charging temperatures and the time span for which they are held, can estimate the percentage of service life lost. The estimated loss, expressed as a percent, can serve as the basis for deciding whether to invest in extra batteries or battery cooling equipment. If this kind of professional judgment is not available in your plant or operation, contact Rhino Fork-Truck Centre for a free quote on service and replacement options.

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Keyed Connectors

Sometimes batteries of several different voltages and AH capacities are charged at the same centralized location. Precautions must be taken to ensure that batteries are charged on chargers with matching voltages and AH ratings. Rather than relying on employees to place the batteries on the correct chargers, we recommend using plugs and connectors of different types or color keys. Contact Rhino Fork-Truck Centre for more information on the various kinds of charging plugs and connectors that are available.

Gassing

When a battery is charging, the electrolytic breakdown of the water in the electrolyte produces oxygen on the positive plate and hydrogen on the negative plate. This is normal; however, if a high charging rate is continued after the battery has been brought to the gassing voltage, the gassing becomes excessive and abnormally large amounts of hydrogen and oxygen are produced. The best indication of excessive gassing is very noticeable bubbling action of the electrolyte.

Hydrogen is a highly combustible gas and will explode on ignition when its concentration in air reaches any level between 4% and 74% (Below 4% the concentration is too weak; above 74% there is not enough oxygen left in the air to support combustion). If you have reason to suspect excessive gassing, troubleshoot the battery and charging equipment. An unusually high usage of water indicates that excessive gassing is occurring.

Undercharging

Undercharging a battery, even to a small degree, if continued, leads to excessive sulfation. The same is true of batteries which have been left standing in an uncharged state for an extended period. High temperatures rapidly accelerate sulfation when batteries are left standing in a partially charged condition. The cells of a sulfated battery will give low specific gravity and open circuit voltage readings. On charge, voltage readings will be unusually high. The battery will not become fully charged after a single normal charge when sulfation has taken place over a prolonged period.

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The Purpose and Frequency of Inspections

The investment in motive power batteries can be considerable. To protect this investment, it is recommended that both batteries and chargers be inspected periodically. This general type of inspection, which is a form of preventative maintenance, should not be confused with the inspection carried out for troubleshooting a battery to pinpoint a specific problem.
If minor problems in batteries and chargers can be identified early, then adjusted or repaired, battery damage can be avoided. A battery inspection often reveals improper routine maintenance and operational procedures, which can lead to extensive battery and vehicle damage. Inspection can also identify batteries in poor condition so they can be replaced immediately or at some suitable time in the future.

Establishing a battery inspection timetable suitable for all users is difficult, because battery usage and the quality of routine maintenance differ from one plant to the next. However, if routine maintenance is average and the batteries are cycled once a day, five days a week, an annual inspection should be sufficient to identify any problems. Contact Rhino Fork-Truck Centre for any questions.

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