SCR Charger Purchasing Decision Criteria

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This paper discusses the long term impact of low cost chargers on battery health and overall operational costs.

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Since chargers survive 3 battery lifetimes (15- years), a poor choice of chargers will affect 6 to 9 batteries in a 2 or 3 shift operation.

Recharge Time

Not all chargers are designed to return a battery to a fully charged state within 8 hours.

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To fully charge a battery the charger must be capable of returning more than 100% of the energy removed within 8 hours.

Equalize Charge & Automatic Equalizing

Only chargers that take the “guess work” out of assuring a weekly equalize charge are recommended.

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AC line voltages from the electric utility will vary, sometimes by up to 10%. A charger should be designed to accommodate these tolerances to assure consistent battery recharging.

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Without an accurate history of proper charging practices, a battery warranty is worthless.

Real Time Clock

An important feature that not only can assure proper battery charging, but can save electricity costs too.

Service Support

An out of service charger can cost more in lost productivity than the value of multiple chargers.

Introduction

Many new, low cost chargers are appearing on the shores of North America. Their promise of capital cost savings is appealing if you are not aware of the increased operational costs that they can cause. Some of these low cost chargers have design deficiencies, lack of service support, and are indifferent to lifetime battery health. This paper will give you the information you need to make sound charger purchasing decisions that will protect your industrial battery investment.

Price

The price of a charger should not be the deciding factor in your purchasing decision as the charger is only about 10% of your total battery/charger system investment. The quality of a charger is much more important because a typical charger lasts up to three or four battery lifetimes. A single charger can therefore 'touch' up to 12 batteries in a multi shift operation.

Recharge Time

Charger manufacturers establish the recharge capacity of their products by determining the charge rate that is needed to return a fully discharged battery (20% State of Charge) to a fully charged condition (100% State of Charge) within 8 hours without harming the battery. The typical "rule of thumb" when determining how many batteries and chargers are required for an operation is to allow 8 hours for work, 8 hours for recharge, and 8 hours for cool down time.

Some charger manufacturers may try to reduce charger costs by building chargers with components that will not provide the desired DC amp output to recharge a battery within 8 hours. This could result in an unsuspecting customer putting undercharged batteries into service. Another risk is using batteries that have not had sufficient time to cool after charge in order to keep their lift trucks running. These practices will lead to shortened battery life and the premature replacement of batteries which will negate any upfront savings realized from a less expensive charger.

Full Charge

Full charge is closely associated with recharge time and helps explain the inefficiencies of the battery recharge process. Full charge means that the specific gravity of the battery's electrolyte is at the nameplate rating. To accomplish a state of full charge, a charger must return more DC amps to the battery than were taken out due to the inefficiencies of the charger and recharge process.

A charger typically will return 105% to 115% of the amp-hours removed from a fully discharged battery to compensate for recharge inefficiencies. Chargers that have charge rates below 16 amps per 100 amp-hours of battery capacity (16%) rating may not return a battery to a fully charged condition within 8 hours. In fact, they may not be able to return a battery to a fully charged condition in any amount of time. This can lead to shortened battery life and the premature replacement of batteries.

Equalize Charge

One of the most important things you can do to keep a battery in peak condition is to properly equalize the battery. Conversely, one of the fastest ways to cause permanent damage to a battery is to ignore a proper equalize regime.

An equalize charge is an extended finish-rate charge of up to 6 hours that will bring each cell to a relatively consistent voltage level. The equalize charge is critical to a battery's health and capacity performance because routine equalize charging deters the formation of lead sulfate crystals on the negative plates during the discharge process. Lead sulfate crystals impede the negative plate's active material (sponge

lead) ability to absorb acid and create current.

Another reason battery manufacturers require at least one equalize charge per week is because battery cell voltages tend to vary overtime. This can lead to cells with lower voltages being over-discharged (below 20% State of Charge) leading to sulfating and early failure.

Automatic Equalizing

The best way to guarantee that equalization charges are delivered to your batteries as required by the manufacturer is to choose a charger with an automatic equalize setting. The preferred method is to choose a charger with a "real-time clock" feature (see below) so a window of opportunity for charging during a consistent off day or period of time during the week can be set for the charger to automatically provide this crucial equalize charge.

Also, many chargers today are mounted high off the floor or in battery handling equipment, making it difficult to reach the manual equalize button. Even if the charger is accessible, there is a low probability a lift truck operator will remember to push the equalize button once per week or more if required.

Automatic equalizing features that include a real-time clock feature are preferred to "automatic" equalize regimes that use cycle counts as the parameter. Using a count of charge cycles to determine when a battery needs to be equalized may result in the initiation of an equalization charge when there is not sufficient time to complete the charge. This miscalculation will upset the original equalize cycle regime.

Some chargers incorporate automatic equalize feature that will only initiate an equalize charge when a battery remains connected to a charger for an extended period of time. The times vary from 20-30 hours. This is not effective for multiple battery-single charger applications, and many single battery-single charger applications will not have the required charging, equalizing, cool down time (48 hours or more) during a typical work week necessary under this regime to keep a battery in peak condition.

AC Voltage Tolerance

Many inexpensive chargers will not be able to account for varying AC line voltage common and allowable in today's environment. Electric utilities are typically permitted to vary the voltages coming into a facility by +/- 10%.

If a charger is not designed to account for AC Voltage fluctuations, low AC line voltages can reduce the DC output by 10% or more. If not accounted for in the charger's design, these conditions will result in lower charge rates, increased charge time, and undercharged batteries. High AC line voltage will result in an increased DC output levels too high for the battery to accept, or AC fuses may open taking the charger out of service.

Data Logging

A history of proper battery charging practices is critical for your protection and verification of warranty compliance. One way some charger manufacturers take cost out of their product is to eliminate or reduce charger data logging. This may lead to denial of warranty claims which may be more prominent in low cost chargers.

Real Time Clock

As mentioned above, a real-time clock feature in a charger is important for proper equalizing regimes. A real time clock will keep an accurate time so that various other time-based features can be implemented accurately.

For example, to help control electricity costs, some chargers offer “charge block-out” features. This feature allows the owner to block a time period when electricity rates may be highest in order to only charge batteries when electricity rates are low. Of course, this may only be practical in certain applications.

Service Support

Service support is often overlooked but is one of the most critical “features” for maximizing uptime productivity of your charger. Many chargers come with a warranty that appears to cover components and possibly repair labor, but if a service network is not available, you can experience extended charger down times.

As lean purchasing practices have become common, the redundancy of having spare lift trucks, chargers and batteries has become rare. Without this redundancy, if a charger is out of service for an extended time, the true cost of this downtime may be the loss of productivity incurred by having a lift truck sitting idle.

Summary

Chargers and batteries work as a system. Because a charger’s useful life can last through 3 or more batteries, careful consideration of the chargers ability to maintain a battery in top condition is critical to managing near and long-term operational costs.

Disregarding the impact of a charger on a battery throughout its useful life will ultimately lead to premature battery replacements and higher operational costs. Service support should also be considered, because a broken charger can cost more in lost productivity then the cost of multiple chargers.