

Maximum Service, Long Life Assured If Batteries Are Properly Charged

Care in making Hydrometer check prevents premature
damage from overcharging or undercharging

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Mechanically, the electric golf car is quite simple and when maintained properly will operate practically trouble free for years. The motive force consists of batteries, switching mechanism and electric motor. When a golf car does not perform properly, the batteries should be first checked as a likely source of trouble, but this doesn't mean the fault may not lie elsewhere.

A good single-cell voltmeter is an essential tool. The meter should have an easily read scale between 2 and 2.1 volts. Only one-tenth (0.1) of a volt can be the difference between a discharged cell and a fully charged cell. Wide variations in the range between cells is a probable sign of a faulty battery. Immediately after coming off charge, an inaccurate voltage reading may be obtained, so the car should first be driven about 100 yards to remove the surface charge. Then, the check should be made.

Beware False Reading

Battery plates charge and discharge from the outside in. Therefore, a short charging or discharging of a battery will give a false reading on a voltmeter as it shows only surface conditions. Many car manufacturers furnish a "percentage of charge" meter, or one showing "hours to charge." These are really voltmeters and must be read with caution unless the car has been standing for some time, or the condition on the surface of the battery

plates is being read and is not giving a true reading as to its actual charged state.

As a true reading just after a battery comes off charge can't be obtained, the same holds true for a car just coming in from the course. An immediate check is going to read lower than the actual state of charge of the batteries. The experienced person can use the meter to good advantage in deciding whether to send a car out for a second round although he must know the demands of the course's terrain and of his particular car in reading this type of meter.

Avoid Overcharging, Undercharging

Charging procedures are most important in maintaining batteries so they will deliver maximum service. Overcharging or undercharging are extremely harmful and will greatly shorten the life of a set of batteries. Battery chargers have been improved since the advent of the first golf cars. Most now have some sort of control device to aid in properly caring for batteries during their useful life.

Some chargers have a tapering charge (starting at a high rate and tapering to a low rate) that operates in conjunction with a timer so that they shut off when a full charge has been attained. The length of charging time may be predetermined by taking a hydrometer reading as prescribed by the charger manufacturer, and also a percentage of charge voltmeter showing "hours to charge." As has already been pointed out, an immediate reading can be false and a "rest" period is required if a true reading is to be obtained.

Constant overcharging at even a low rate greatly reduces the useful life of batteries. Some chargers operate on a straight timer while others operate with a voltage-sensing voltage regulator which



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activates a time clock for a pre-set period of finishing charge. Either one of these methods, if properly used, will perform adequately.

Valuable Tool

How do we determine if we are following a proper charging procedure? The most overlooked tool in the golf car business is the hydrometer. The cost of a hydrometer is negligible and neglecting its use results in hundreds of thousands of dollars being lost annually in prematurely shortened battery life. This is a startling statement but we know it to be true after working with golf cars for 15 years.

The hydrometer's function is simple — it tells the state of charge in a battery. This is determined by testing the acid concentration. A full charge battery will be one with a hydrometer reading showing the strength of acid that the manufacturer used as finished acid strength when the battery was manufactured. Usually this is shown clearly on the battery connectors and may range from 1.225 to 1.260. After each discharge, during which the reading may drop to as low as 1.100 or 1.125, the acid must be brought back to full strength by charging. At the same time batteries shouldn't be charged any longer than necessary or their useful life is shortened.

Experimentation Helps

A little experimentation with the hydrometer shows what charge should be sufficient to bring the acid gravity up to a prescribed reading and then shut off. This is really not difficult. The checking of a single cell in the entire set shows the approximate condition of charge in all of the batteries. What should be done is to fully charge the batteries in a pre-determined time. Observation of the hydrometer and different charging times shows the number of hours needed at a particular course for nine, eighteen, or thirty-six holes of golf.

Many chargers are said to be automatic, and under ideal conditions they are. The problem is that ideal conditions too often don't prevail. The hydrometer should often be used as a double check on your chargers and in determining charging periods. Charge as few hours

as necessary to bring the batteries up to gravity and no more. Just a few cells in the entire set will give this information if a hydrometer is used.

Test of Quality

The importance of avoiding under-charging should be kept in mind. Golf car service simulates standard battery tests where batteries are purposely subjected to destruction by constantly discharging and charging. The measure of a battery's quality or performance capability is the number of these cycles it can withstand before failure.

Further, the more deeply a battery is discharged during these cycles, the more damage is done internally. It is easily seen that a battery only brought up to a 70 per cent charge, for example, will always be operating in the bottom range of its potential and will be destroyed prematurely. Conversely, a battery is only able to absorb a charge until it has reached 100 per cent or a full charged state. Beyond this, it shows resistance to being charged. This resistance creates a destructive internal heating situation and a corrosion of the positive plate structure.

Life Cycle Factors

The useful life of a set of batteries depends on many factors. Golf cars are being used more now than ever before, and more charging cycles mean shorter life. It is essential from the standpoint of profitable operation that batteries be able to deliver 36 holes of golf during periods when the days are long and cars can be sent out twice a day. It takes only a few of these extra rounds to pay the entire cost of a set of batteries.

Trojan Battery Company has introduced a new golf car battery of 217 ampere hours which compares with batteries having an average of about 170 ampere hours that were used in the past. This added capacity gives nearly 40 per cent more distance. The real advantage of the extra capacity is that it assures many more months of 36-hole car performance. The new battery has the same dimensions as standard golf car batteries except that it is 1½ inches higher. But it will fit in most golf cars.