



William J. Freund (left), mgr., *Electri-Car div., Victor Adding Machine Co.*, explains direct drive operation of one of his company's products to a group of engineers and golfers.

Careful Fleet Maintenance Prolongs Life of Golf Cars

By WILLIAM J. FREUND

Manager, *Electri-Car Div.,
Victor Adding Machine Co.*

FLEETS of golf cars have outgrown the novelty stage. They have become a new source of income for country clubs. They have brought added pleasure to the game for many golfers. They bring added headaches and problems to pros, club mgrs., supts., club presidents and even non-riding golfers who still do not approve of golf cars.

Among the problems are the decisions on the selection of the machines for safety, performance, minimum degree of effect on the turf, etc. Another problem is that of garage facilities. Also there are bridge problems to be considered at many courses, and in all cases, driver training is an important new responsibility for those in charge of the machines. It must be decided wheth-

*Case Histories Cited to Show How
You Can Get More Mileage From
Battery-Operated Vehicles*

er machines should be leased, rented or owned by members, the pros or clubs themselves.

However, above all the many new considerations that arise with the growth of the electric car fleets across the nation, the greatest need seems to be for information on day-in-and-day-out fleet management and maintenance. Country clubs are learning by experience that there is a tendency to oversimplify the subject. Yet care and maintenance of a properly designed and constructed golf car is not complicated. They do, however, require certain carefully carried out routine items. By rounding up, analyzing, reviewing, studying and condensing field reports, test-fleet pro-

grams and experiences of the largest and most successful operators of fleets of not only electric powered golf cars, but of the largest industrial users of battery powered equipment, we are able to pass on some proved maintenance procedures.

Three Years Service

Why does one pro, who is located in Wisconsin and owns a fleet of electric cars, succeed in getting three years service from one set of batteries in the same make and model of golf car that his neighbor uses who only gets one and one-half seasons wear per set of batteries? It's no secret. He "MANages" his battery charging and maintenance . . . and the word MAN in MANAGEMENT is the most important factor. First, he does not over-charge his batteries. He does not undercharge his batteries. He does not overfill his batteries. He fills them just as full as the instruction manual of the car manufacturer tells him and not as full as the instructions embossed on the top of the battery case. In other words, the most advanced manufacturers of electric cars have discovered that if the batteries are filled to about $\frac{1}{2}$ in. above the plate instead of up to the square part of the cell as advised by the battery manufacturers there is less consumption of water and less gassing of the batteries when they are on charge. In other words, don't overfill batteries. If you were to watch this Wisconsin pro you would see him fill and test his batteries with the same care and cleanliness practiced by a laboratory technician rather than with the technique of a garage mechanic.

He tests his batteries with a hydrometer that has a thermometer on it and corrects his specific gravity readings to the temperature of the electrolyte just like the manufacturer's instruction book told him to do. He sets his charger accurately according to the charging chart provided by the manufacturer. When the charging cycle is complete he again checks specific gravity accurately to see if the car is fully charged or if, because of line voltage drop or temperature change, he needs to give the car additional charging. If the car needs a little additional charging he puts it back on charge for the proper time according to his hydrometer reading (corrected for electrolyte temperature of course) and according to the charging chart.

The result of this careful handling is that he achieves three years life on one set of batteries in his rental fleet. He never sends out an undercharged machine. He never overcharges excessively. He never overfills



Ralph Beach (left), pro at Suburban CC, Pikesville, Md., and Frank Sprogell, past secy. of the PGA, play it the easy way at the PGA National course in Dunedin, Fla., by jeeping around in a golf car.

battery cells. He works clean and quickly. Any fleet owner can do it if he will. He finds that care, cleanliness and accuracy pay off in additional operating success, greater profits and a lower battery replacement cost.

Why does a Florida fleet owner in the business for five years, say with pride: "In the last four years, with 163 cars of six different makes in my fleet, I have never had a car fail to bring back the golfers who took it out from the first tee . . . no matter how many holes they played . . . even if they went as far as 45 holes!"

Learned the Machine

Here's why! He spent a year learning. He learned that some makes of machines can be depended upon to go further than others so he sends out the cars that have the efficient drive mechanisms on the long hauls. He learned that the same appreciation of accuracy and cleanliness with battery care and charging as our Wisconsin pro uses will pay big dividends.

On his belt driven cars he keeps the belts tight. Sometimes he tightens them each day. Other times he can get along a week or more without tightening the belts. The point is, he keeps them really tight just as the manual advises. He keeps the belts dry. He does not let belt-driven cars stand out overnight where dew and moisture can gather on belts and pulleys to cause slippage. He replaces belts at the first sign of wear before they break and leave the golfers stranded in the middle of their game.

He keeps the chains on his chain driven

ELECTRI-CAR SERVICE RECORD

Make _____ Serial No. _____ Car No. _____

To Be Posted Daily. Club _____ Month _____ Year _____

Date	Spec. Grav. A. M.	Fln. Chg. A. M.	Spec. Grav. P. M.	Nite Chg. Hrs.	Nite Chg. Amps	Holes Used	BRAKES	SPEED	F.W.D.	SPEED	REV.	BODY	COND.	BELTS	TIGHT	CLEAN	BATT.	WATER	BATT.	BAL.	CHG.	Remarks and Instructions	
1																							
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Here is a handy chart for keeping a record of golf car servicing.

models well lubricated on a weekly schedule. He inspects and replaces sprockets before they wear down to pinpoint teeth and begin to cause the chains to slip or jump. He has learned the lesson of preventative maintenance on chain driven machines.

This successful Florida operator knows that certain makes of his machines require replacement brushes in the motors about every nine months. He knows that machines that require replacement brushes also require cleaning and polishing of the commutators every eight or nine months. Thus every set of motor brushes and every commutator is inspected at regular intervals. Cleaning and replacement is taken care of before the motors lose efficiency. The carbon dust from the brushes is blown out of the motor and away from the motor bearings by compressed air at the same time that commutators are polished and brushes are replaced. Thus he forestalls motor inefficient operation.

He has his men trained to check the condition of brakes and to ascertain by "feel" as they garage the car each night whether or not it is running, under a load, in all two, three or four speeds both forward and reverse to verify that switches are in working order and brakes are well

adjusted. This simple, routine test takes but 30 seconds of the cart attendant's time once he is trained in the procedure and is familiar with the machine. Should a brake or switch require service, such service is performed immediately. Thus garaging of cars is also a functional test on an automatic basis.

On belt driven models the check is made each night for slipping belts. He says the belt slipping test is best made as soon as the car comes off the course because when belts and pulleys are hot from service, belts have a tendency to slip more readily than when they have cooled off. He should know because he has proved that simple daily, weekly and semi-annual check routines, consistently followed, will pay off in satisfied riders and larger profits with no refunded rentals because of car failures.

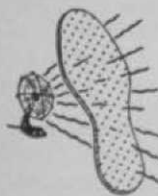
Test Rides on Turf

Our Florida correspondent also course-test-rides each machine once a week after having learned, by experience, that occasionally a car will function fine on the apron of the garage but will reveal breakdown symptoms on the turf and under a load. A log book is kept on each machine wherein is recorded every service item per-

(Continued on page 88)

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Careful Fleet Maintenance Prolongs Golf Car Life

(Continued from page 54)

formed. His cars are dusted daily, washed and waxed as needed. This fleet owner has discovered that most dents and scratches are the result of cart handlers parking the machines in stalls under power. To prevent such damage his machines are pushed by hand into their stalls each night. For models which have a break that locks automatically by spring action, unless the driver has the power on, he has made a fixture which holds the spring tension off so that even these cars can be pushed into their stalls by hand. This extra care pays. Some of this man's machines are over five years old and they still look and run like the proverbial widow's old automobile which never left the garage except for funerals, yet they have gone literally thousands of rounds of golf in the Florida sunshine, salt air and showers.

As electric powered golf cars arrive on the scene in ever increasing numbers in the big industrial centers such as Detroit, Cleveland, Philadelphia, Chicago and the New England States, they are getting new maintenance and management based on the heritage of experienced industrial maintenance engineers who belong to the country clubs of these communities.

There are airline, automotive, food processing and electronic executives who are sharing their experience in maintaining battery-powered industrial trucks with supts, and electric car maintenance men at their country clubs. Sometimes they are impatient teachers. Often they forget that the country club is neither equipped or inclined to be as careful as the industrial plant. Sometimes they lose sight of the fact that golf cars are outside and subject to temperature changes, turf conditions and golfers' temperaments, whereas their inside industrial trucks are little abused.

However, out of Chicago has come a combination report-check-chart which is also a maintenance training tool that car men everywhere can imitate, duplicate or revise to suit their particular make of electric car and their particular club conditions. It is shown in the accompanying chart.

Takes Error out of Charging

From Philadelphia comes a special battery charger modification developed by a large rental fleet owner and designed to take the element of human error out of the battery checking and charging procedure. By standards of the successful Wis-

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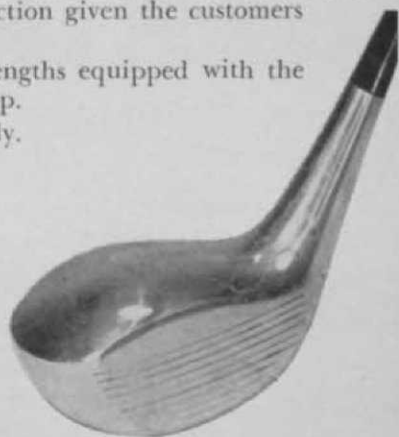
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consin pro in relationship to battery life, this new concept of automation will need at least a two-season test run in order to determine whether or not the idea has the merit claimed for it by its creators.

From Detroit comes a new, annual refurbishing procedure which its proponent, another successful fleet owner, maintains will make life easy at the course.

He says: "With the construction of the cars I buy for my fleet . . . my once-per-season overhaul . . . the once-per-month visit of my service truck to the fleet . . . (and my servicemen work at night when we are sure all of the golf cars are off of the course and available for service work) . . . the fellows at the club don't have much day-to-day maintenance. Water in the battery once a week, charging and brake checking is all they have to do. They can even be a little careless. My cars can take it. I will not tolerate body damage to my machines, however," says the Detroit operator. "You can't smash a rented automobile and expect not to pay damages. Why should a man be permitted to smash a \$1000.00 golf car and not pay damages?"

At Chicago golf courses a new battery recharging and testing procedure developed by one of America's largest food pro-

cessors, and used successfully by this firm on roughly 1450 electric powered industrial trucks, is being tested on several golf courses. Called by the material handling engineer, who conceived and tested this idea as a time saver in industry the "pilot-cell-plan," the procedure promises to eliminate the "balancing" charge now called for in golf car battery charging instructions by all manufacturers and in the instructions issued by the manufacturers of the batteries supplied for electric golf cars. The procedure, if followed according to the food processing engineers who have developed it, also points up automatically any need for battery water without the necessity of a weekly check of all the cells in all of batteries of the machine. Perhaps we can give you more information a year from now on the revolutionary "pilot-cell-plan."

From Indiana comes the news that although battery cables and connections seem to be clean and tight . . . there actually can be a poor connection in the heavy amperage circuit of the electric car. The poor connection can be caused by hidden corrosion which has broken through several strands of the cable up under the insulation or deep inside of the battery connector itself.

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Symptom: Slow Speed

The symptom for such a poor connection is slow speed of an otherwise peppy machine, (providing switches are known to be operating properly), failure of the machine to climb hills that it climbed with ease when it was new, and last and most important, failure of the machine to make as many holes of golf on a single battery charge as it did when it was new, (providing the car is well charged when taken out and the batteries are good and in balanced condition.)

The maintenance man can troubleshoot this condition by running the car about four holes on the course under a load and making it pull up several hills. Then, immediately after this test run, he shall feel all cables and connectors for heat. If hot cables are dissipating power in heat instead of delivery to the motor, such cables should be replaced or such connections should be carefully reviewed and tightened or improved.

A common trouble due to carelessness and unclean battery care is the trouble of corroded cables and poor connections at the battery terminals. The solution: clean the batteries and terminals and replace old cables with new ones. It is well for the maintenance man to remember that he should not pound connections onto battery terminals with a hammer. If battery connectors seem to be tight and require fitting onto the terminals, he should spread the connectors so that they fit easily without the use of a hammer. Hammering on batteries and terminals breaks the plates loose inside of the batteries and is likely to ruin the batteries themselves. Such laboratory cleanliness as followed by the Wisconsin pro will forestall most of the corrosion problems that arise with careless and sloppy battery care.

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