

## FAQ - Trojan Deep Cycle Batteries (\*\*\*add to Technical support Section)

### Battery Selection

#### How do I select the right deep cycle battery for my application?

Proper battery selection may require the assistance of a knowledgeable battery sales/service technician. Please contact Europower Battery Centre for assistance from one of our Applications Engineers.

#### What is the difference between a deep cycle battery, a starting battery and a dual-purpose battery?

A deep cycle battery has the ability to be deeply discharged and charged many times during its service life. It is designed specifically for powering electrical equipment for long periods of time. An automotive or starting battery is designed for brief bursts of high current and cannot withstand more than a few deep discharges before failure. This is why it is unable to start your car if you accidentally leave the lights on more than a couple of times. For applications where both engine starting and light deep cycling are required, a dual-purpose battery is often used. This type of battery is neither a starting nor a deep cycle battery but rather a compromise between the two so it performs both functions adequately.

#### Can I use a Deep Cycle battery as a starting battery?

Deep cycle batteries can be used for engine starting but starting batteries should not be used for deep cycle applications. A deep cycle battery may have less cranking amps per pound than a starting battery, but in most cases a deep cycle battery is still more than adequate for the purpose of starting an engine.

#### What are the advantages and disadvantages of Gel, AGM and Flooded Lead Acid/Wet Deep Cycle batteries?

Generally, gel and AGM batteries have about 20% less capacity, cost about two times more, and have a shorter cycle life than comparable flooded lead acid batteries. However, Gel and AGM batteries do not need watering, are safer (no acid spilling out), can be placed in a variety of positions, have a slower self-discharge characteristic, and are more efficient in charging and discharging than flooded batteries (see table below). Gel batteries are more suitable for deep cycling applications whereas AGM batteries are more for light cycling and engine-starting applications.

	Flooded	Gel	AGM
Charge/Discharge Efficiency	89%	98%	99%
Self discharge rate (per month)	13%	1-3%	1-3%
Finish Voltage	15.3-16.0V	14.1-14.4V	14.1-14.7V
Float charge:	13.2-13.7V	13.4-13.8	13.4-13.8V

#### What is better? 24 volt or 48 volt system?

Higher-voltage systems tend to be more efficient and put a lower load on the batteries. Factors other than the battery enter into the system's overall efficiency

## Charging

### How can a battery's state of charge be accurately measured?

The state of charge of a lead acid battery is most accurately determined by measuring the specific gravity of the electrolyte. This is done with a hydrometer. Battery voltage also indicates the level of charge when measured in an open circuit condition. This should be done with a voltmeter. For an accurate voltage reading, the battery should also be allowed to rest for a period sufficient to let the voltage stabilise.

### When do I need to perform an equalisation charge?

Equalising should be performed when a battery is first purchased (called a freshening charge) and on a regular basis as needed. How often this might occur with your battery will vary depending on your application. You will need to monitor your battery voltage and specific gravity to determine when equalisation is needed. For example, it is time to equalise if the measured specific gravity values are below manufacturer's recommended values after charging (recommended value for Trojan Deep Cycle batteries is 1.277 +/- .007 at 80° F). Equalising is also required if the specific gravity value of any individual cell varies 30 points or more. Reduced performance can also be an indicator that equalising is necessary. Equalisation should also be performed when individual battery voltages in a battery pack range greater than 0.15 volts for 6-volt batteries or 0.30 volts for 12-volt batteries.

### Does my deep cycle battery develop a memory?

Lead acid batteries do not develop any type of memory. This means that you do not have to deep discharge or completely discharge a battery before recharging it. For optimum life and performance, we generally recommend a discharge of 20 to 50% of the battery's rated capacity even though the battery is capable of being cycled to 80%.

### Do batteries self-discharge when not in use?

All batteries, regardless of their chemistry, self-discharge. The rate of self-discharge depends on the type of battery, the age of the battery, and the storage temperature the batteries are exposed to. As an estimate, Trojan batteries self-discharge approximately 4% per week at 80° F.

### What type of charger should I buy?

An automatic charger offers the greatest convenience. Just plug the battery into the charger and the charger does the rest. Manual chargers, although equally effective at charging batteries, require a greater level of attention. Generally speaking, automatic chargers are priced higher than manual chargers.

### What size charger should I buy?

A properly sized charger takes into account battery capacity and the time interval between charges. In applications where cycling is infrequent, such as weekend RV users, or infrequent or seasonal trolling motor usage, a charger with an output current rating between 10 and 13% of the battery's rated 20-hour capacity will suffice. In applications where battery recharge must be accomplished within 8 to 10 hours, a three stage, automatic charger, rated at 20% of the battery capacity, may be required.

**Example:** A good charging rate for a battery with a 20-hr capacity of 225 amp hr is about 22 to 29 amps. You can of course go slightly higher or lower depending on what is available on the market.

## Maintenance

### When should I water my batteries?

Water is lost during charging. Therefore, the best time to water your batteries is always at the end of the charge cycle. However, if the electrolyte level is extremely low or the plates are exposed to air, add some water to cover the plates before starting the charge cycle.

### How often should I water my batteries?

How often you use your batteries will determine the frequency of watering. For example, the weekend fisherman may find he only needs to water the batteries in his boat once a month. While a maintenance supervisor for a golf course might need to service the batteries in their golf cars every week. Also using batteries in a hot climate may require more frequent watering. It is best to check your new batteries regularly as this will give you a good feel for how often your application will require battery watering.

**WARNING:** A brand new battery may have a low electrolyte level. Charge the battery first and then add water if needed. Adding water to a battery before charging may result in overflow of the electrolyte.

### What is the proper electrolyte level?

Liquid levels should be 1/8 inch below the bottom of the vent well (the plastic tube that extends into the battery). The electrolyte level should not drop below the top of the plates.

### Do you ever add acid to the battery?

Under normal operating conditions, you never need to add acid. Only distilled, deionised or approved water should be added to achieve the recommended levels mentioned above. When a battery is shipped in a dry state or accidental spillage occurs, electrolyte should be added to the battery. Once filled, a battery should only need periodic water addition.

<b>Flooded</b>	Automotive 50-70 in-lbs
	Wingnut 95-105 in-lbs
	LPT 95-105 in-lbs
	Stud 120-180 in-lbs
	LT 100-120 in-lbs>
<b>VRLA</b>	Button 90 to 100 in-lbs
	LT 100-120 in-lbs

**WARNING: Do not overtighten terminals. Doing so can result in post breakage, post meltdown, and fire.**

### Can a battery freeze?

The only way that a battery can freeze is if it is left in a state of partial or complete discharged. As the state of charge in a battery decreases, the electrolyte becomes more like water and the freezing temperature increases. The freezing temperature of the electrolyte in a fully charged battery is -92.0°F. At a 40% state of charge, electrolyte will freeze if the temperature reaches approximately 16.0°F.

### What is the specific gravity of a fully charged battery?

A hydrometer reading of 1.277 or greater indicates full charge for Trojan batteries. This value is based upon a specified temperature of 77 to 80°F. For temperature correction values, see the "Temperature" section of this FAQ. What are common mistakes made by lead acid battery owners? Undercharging: Generally caused by not allowing the charger to restore the battery to full state of charge after use. Continually operating the battery in a partial state of charge, or storing the battery in a discharged state results in the formation of lead sulfate compounds on the plates. This condition is known as sulfation. Both of these conditions reduce the battery's

performance and may cause premature battery failure. Undercharging will also cause stratification.

**Overcharging:** Continuous charging causes accelerated corrosion of the positive plates, excessive water consumption, and in some cases, damaging temperatures within a lead acid battery. Deep cycle batteries should be charged after each discharge of more than 50% of the batteries rated capacity, and/or after prolonged storage of 30 days or more.

**Under-watering:** In deep cycle, lead acid batteries water is lost during the charging process. If the electrolyte level drops below the tops of the plates, irreparable damage may occur. Water levels should be checked and maintained routinely.

**Over-watering:** Excessive watering of a battery results in additional dilution of the electrolyte, resulting in reduced battery performance. Additionally, watering the battery before charging may result in electrolyte overflow and unnecessary additional maintenance. stratification.

**Overcharging:** Continuous charging causes accelerated corrosion of the positive plates, excessive water consumption, and in some cases, damaging temperatures within a lead acid battery. Deep cycle batteries should be charged after each discharge of more than 50% of the batteries rated capacity, and/or after prolonged storage of 30 days or more.

### **Can I reduce my maintenance by not gassing my batteries?**

You will reduce the frequency of watering, but will cause a condition known as stratification where the specific gravity of the electrolyte is light at the top of the battery and heavy at the bottom. This condition results in poor performance and reduced battery life.

### **How can I tell if a battery is bad?**

To determine if the battery system is experiencing a problem, fully charge the batteries then shut off the charger and remove all electrical loads. Allow each battery in the system to stand on open-circuit for about one hour. Measure the voltage of each battery. If the battery voltage spread exceeds .15 volts for a 6-volt battery, or .30 volts for a 12-volt battery, a problem is indicated. Battery voltage alone does not confirm a problem. When the voltage spread indicates a problem, confirmation is accomplished by taking electrolyte specific gravity readings using a hydrometer. If the specific gravity readings show a spread greater than .030 (30 points), give the batteries an equalisation.

### **What is used to clean a battery and neutralise the electrolyte?**

A solution of baking soda and water. Use 1 lb of baking soda for every gallon of water.

## **Temperature**

### **How does temperature affect the performance of my batteries?**

At higher temperatures (above 77°F) battery capacity generally increases, usually at the cost of battery life. Higher temperatures also increase the self-discharge characteristic. Colder temperatures (below 77°F) will lower battery capacity and prolong battery life. Cooler temperatures will slow self-discharge. Therefore, operating batteries at temperatures at or slightly below 77°F will optimise both performance and life.

### **How do I determine b battery capacity when it is colder/hotter?**

Battery capacity is basically a linear relationship. A good rule of thumb is that for every 15°F above 77°F, capacity is increased by 10% and for every 15°F below 77°F, capacity is reduced by 10%.

### How do I account for temperature when taking my gravity readings?

Temperature will affect specific gravity readings. As temperature increases, the electrolyte solution expands and as temperature decreases the electrolyte solution contracts. As a result, it is a good practice to temperature correct specific gravity readings. Here are the relationships Trojan recommends using:

For every ten degrees above 80°F add 3 points to the hydrometer reading.

**Example:** @ 90°F the hydrometer reads: 1.250 The actual reading:  $1.250 + .003 = 1.253$   
For every ten degrees below 80°F subtract 3 points from the hydrometer reading.

**Example:** @ 70°F the hydrometer reads: 1.250 The actual reading:  $1.250 - .003 = 1.247$

### How do I account for temperature when taking my voltage readings?

Temperature will affect voltage readings. As temperature increases, voltage decreases. Conversely, as temperature decreases, voltage increases. Here are the relationships Trojan recommend using:

For every 10 degrees below 80°F, add .028 volt per cell to the charger voltage setting.

•**Example:** A 12 volt battery @ 70°F. The recommended charging voltage (@ 80°F) is 14.60 volts. The adjusted charging voltage is  $14.60 + (6 \text{ cells} * .028\text{vpc}) = 14.77$  volts.

For every 10 degrees above 80°F, subtract .028 volt per cell to the charger voltage setting.

•**Example:**> A 12 volt battery @ 90°F. The recommended charging voltage (@ 80°F) is 14.60 volts. The adjusted charging voltage is  $14.60 - (6 \text{ cells} * .028\text{vpc}) = 14.43$  volts.

### Is there a maximum temperature for charging my batteries?

When charging lead acid batteries, the temperature should not exceed 120°F. At this point the battery should be taken off charge and allowed to cool before resuming the charge process.