OptiMATE lithium

The battery saving charger

LITHIUM BATTERIES

What is so great about lithium (versus lead-acid) technology?

Lithium Iron Phosphate (**LiFePO4** or **LFP** for short) technology used in motorcycle batteries have a power density 3-4 times higher than lead-acid, in other words, a lithium battery *of the same Amp-hour capacity* as a sealed AGM (absorbed glass mat) lead-acid can deliver 3-4 times higher cranking power. A lithium battery can deliver its rated cranking Amps down to 10% charge remaining where-as a lead-acid battery delivers it's rated cranking Amps at 50% or more charge remaining, below that cranking Amps reduces rapidly. A lithium battery will maintain a higher voltage for longer when delivering current. Lithium is lighter than lead.

How do lithium and lead-acid motorcycle batteries compare?

Lithium technology is expensive. For that reason lithium batteries designed as drop in replacements for lead-acid batteries compare **ONLY in cranking power (starting Amps), but NOT in capacity (Amp-hour)**. To bring the cost closer to lead-acid, lithium battery manufacturers take advantage of the 3-4 times higher cranking power (starting Amps) and reduce the capacity (in Amp-hour) i.e. capacity is typically 3-4 times LESS than a lead-acid battery it is meant to replace. Some lithium battery manufacturers use the term **PbEq** (lead-acid equivalent) to make it easier for a consumer to choose an equivalent lithium replacement, but **it is equivalent only in cranking power (Cranking Amps), not overall capacity (in Amp-hour).** For that reason it can be 5-8 times lighter (kg).

Do I need to change my vehicle's charging system?

If your vehicle charging system delivers a charging voltage between 13.8 and 14.4 Volts it needs no modification. *How-ever, if your vehicle charging system delivers voltage exceeding 14.4V at any engine speed, DO NOT FIT a lithium battery. (TIP: it may also be why your lead-acid battery is failing prematurely.)*
FACT: Lead-acid batteries can accept moderate voltage overcharging where-as lithium batteries cannot. A lithium battery **will suffer damage above 14.4V and will be destroyed if charging voltage exceeds 14.6 Volt.**
TIP: Test charging system voltage with a TS-120N OptiMate TEST Cranking Power & Alternator tester.

What's important to know when choosing a lithium battery?

If your vehicle charging system has been tested as safe for lithium, consider these two facts when making a choice:
1. Lithium motorcycle batteries are typically 3-4 times smaller in capacity (Amp-hour) than the lead-acid battery it will replace. *Why is that important? If your riding pattern is often slow speed, short distance (town / city / rough terrain riding) or you have a low revving motor, a PbEq equivalent Lithium battery may not receive sufficient charge to always deliver the cranking amps you need. Furthermore, if your vehicle is fitted with powered accessories and lights that draw from the battery, reduced battery capacity (Amp-hour) is a disadvantage.*
2. In general lithium motorcycle batteries perform best at temperatures above 0^{o}C.

For use below 0ºC it is important to know how lithium batteries compare to lead-acid batteries when high cranking amps is drawn in really cold conditions.
With lithium engine cranking speed starts slow, but speeds up after 5-10 seconds. *The colder it is the longer it takes.*
Lead-acid: engine cranking speed is highest initially, then it slows down. *The colder it is the sooner that happens.*
Why? The chemical reaction within a lithium battery quickly creates heat within the cells; raising the voltage and thus the ability to deliver higher Cranking Amps. The chemical reaction within a lead-acid battery is slower, by the time the cells heat up the voltage (charge) remaining may be too low to make a difference.
IMPORTANT TIPS: Not all lithium batteries are rated for low temperature use. Check the manufacturer specifications. Increased Amp-hour capacity help overcome cold temperature 'weaknesses' of both lithium and lead-acid batteries.

WHY VEHICLE OWNERS / RACERS USUALLY CONSIDER LITHIUM and our TIPS:

Higher cranking amps: If you start / crank the engine often (e.g. short trips, rough terrain riding) or the vehicle engine compression is high or has large displacement per cylinder (e.g. large V twin) or average riding temperature is low, *choose the largest lithium battery (above recommended size) that can safely fit in the battery compartment.*

Lower weight: Consider why you want to reduce weight. If you race your vehicle it is a very good idea. If you own a large cruiser motorcycle weighing in at 275 kg or more, 'losing' 5 kg makes very little difference!

Higher voltage range: Lithium batteries hold their voltage above 12.8V almost until they are completely discharged. This is good for 'total loss' racing applications. (Total loss = racing vehicle without charging system).

Should I use a lead-acid charger to recharge my flat lithium?

NO! A lead-acid battery charger is designed to deliver high current at low voltage ***that will permanently damage a flat lithium battery.*** The lower the voltage on the lithium battery the lower the charge current has to be. Lithium batteries require a controlled charge at low current to slowly bring the voltage up and rebalance the cells within the battery. **OptiMate Lithium's proprietary 3 step low volt SAVE program** has been recognized by leading lithium battery manufacturers as the best and most effective in the industry.

Can I use a lead-acid charger to maintain my lithium battery?

NOT recommended. Most lead-acid chargers deliver a continuous maintenance charge (voltage always delivered). A continuous maintenance charge will slowly deteriorate the capacity of the battery. OptiMate Lithium's proprietary maintenance program designed specifically for lithium is not continuous. OptiMate re-checks the battery's charge level every hour and will only deliver current if it tested that charge has been lost.

Technical differences between lithium and lead-acid batteries·

	LITHIUM	LEAD-ACID (AGM)
CELLS IN SERIES (CELL VOLTAGE)	4 x (3.2/3.3V)	6 x (2V)
NOMINAL VOLTAGE	12.8 / 13.2V	12V
0 - 100% STATE OF CHARGE RANGE	12.7 - 13.6V	12.0 - 12.8V
CHARGING RANGE for best performance	13.8 - 14.4V	14.0 - 14.5V
LONG TERM MAINTENANCE procedure to prolong battery life and optimize battery performance	Recharge when voltage drops below 13.4V	Always keep fully charged at voltage between 13.4 - 13.6V