BATTERIES

The commercial use of the lead acid battery is over 100 years old. The same chemical principal that is being used to store energy is basically the same as our Great Grandparents may have used. If you can grasp the basics you will have fewer battery problems and will gain greater battery performance, reliability, and longevity. A battery is like a piggy bank. If you keep taking out and putting nothing back soon you will have nothing. Present day chassis battery power requirements are huge. Consider today's vehicle and all the electrical devices that must be supplied. All these electronics require a source of reliable power, and poor battery condition can cause expensive electronic component failure.

Think safety when we working with and around batteries. The hydrogen gas that batteries make when charging is very explosive. Always wear safety goggles when working with batteries. It is best to disconnect the ground cable when doing electrical work on vehicles. Remember you are messing with corrosive acid, explosive gases and 100's amps of electrical current.

The Lead Acid battery is made up of plates, lead, and lead oxide (various other elements are used to change density, hardness, porosity, etc.) with a 35% sulfuric acid and 65% water solution. This solution is called electrolyte, which causes a chemical reaction that produce electrons. When you test a lead acid battery with a hydrometer, you are measuring the amount of sulfuric acid in the electrolyte. If your reading is low, that means the chemistry that makes electrons is lacking. So where did the sulfur go? It is resting on the battery plates. When you recharge the battery, the sulfur returns to the electrolyte.

Basically there are two types of lead acid batteries (along with 3 sub categories); **the two main types are Starting (cranking), and Deep Cycle (marine/golf cart).** The starting battery (SLI starting lights ignition) is designed to deliver quick bursts of energy (such as starting engines) and therefore has a greater plate count. The plates are thinner and have somewhat different material composition. **The deep cycle battery has less instant energy, but greater long-term energy delivery**. Deep cycle batteries have thicker plates and can survive a number of discharge cycles. Starting batteries should not be used for deep cycle applications because the thinner plates are more prone to warping and pitting when discharged. The so-called Dual Purpose Battery is a compromise between the two types of batteries, though it is better to be more specific if possible.

Wet Cell (flooded), Gel Cell, and Absorbed Glass Mat (AGM) are various versions of the lead acid battery. The Wet cell comes in two styles; Serviceable and Maintenance free. Both are filled with electrolyte and are basically the same. The Gel Cell and the AGM batteries are specialty batteries that typically cost twice as much as a premium wet cell, however, they store better and do not tend to sulfate or degrade as easily as wet cell. There is little chance of a hydrogen gas explosion or corrosion when using these batteries; **these are the safest lead acid batteries you can use.** Gel Cell and some AGM batteries may require a special charging rate. There is some common confusion regarding AGM batteries because different manufactures call them by different names; some of the more common names are "sealed regulated valve", "dry cell", "non spillable", and "Valve Regulated Lead Acid" batteries. In most cases AGM batteries will give greater life span and greater cycle life than a wet cell battery. SPECIAL NOTE about Gel Batteries: It is very common for individuals to use the term GEL CELL when referring to sealed, maintenance free batteries, much like one would use Kleenex when referring to facial tissue or "Xerox machine" when referring to a copy machine. Be very careful when specifying a gel cell battery charger, many times we are told by customer they are requiring a charger for a Gel Cell battery and in fact the battery is not a Gel Cell.

AGM: The Absorbed Glass Matt construction allows the electrolyte to be suspended in close proximity with the plates active material. In theory, this enhances both the discharge and recharge efficiency. Common manufacturer applications include high performance engine starting, power sports, deep cycle, solar and storage battery. The larger AGM batteries are typically good deep cycle batteries and deliver their best life performance if recharged before allowed to drop below the 50% discharge rate. When Deep Cycle AGM batteries are discharged to a rate of no less than 60% the cycle life will be 300 plus cycles.

GEL: The Gel Cell is similar to the AGM style because the electrolyte is suspended, but different because technically the AGM battery is still considered to be a wet cell. The electrolyte in a Gel Cell has a silica additive that causes it to set up or stiffen. The recharge voltage on this type of cell is lower than the other styles of lead acid battery. This is probably the most sensitive cell in terms of adverse reactions to over-voltage charging. **Gel Batteries are best used in VERY DEEP cycle application and may last a bit longer in hot weather applications. If the incorrect battery charger is used on a Gel Cell battery poor performance and premature failure is certain.**

CCA, CA, AH and RC. What are these all about? These are the standards that most battery companies use to rate the output and capacity of a battery.

Cold cranking amps **(CCA)** is a measurement of the number of amps a battery can deliver at 0 ° F for 30 seconds and not drop below 7.2 volts. So a high CCA battery rating is especially important in starting battery applications, and in cold weather. This measurement is not particularly important in Deep cycle batteries, though it is the most commonly 'known' battery measurement.CA is cranking amps measured at 32 degrees F. This rating is also called marine cranking amps (MCA). Hot cranking amps (HCA) is seldom used any longer but is measured at 80 ° F. Reserve Capacity (RC) is a very important rating. This is the number of minutes a fully charged battery at 80 ° F will discharge 25 amps until the battery drops below 10.5 volts.

An amp hour **(AH)** is a rating usually found on deep cycle batteries. The standard rating is an Amp rating taken for 20 Hours. What this means, say for a 100 AH rated battery is this: Draw from the battery for 20 hours and it will provide a total of 100 amp-hours. That translates to about 5 amps an hour. 5 x 20 = 100. However, it's very important to know that the total time of discharge and load applied is not a linear relationship. As your load increases, your realized capacity decreases. This means if you discharged that same 100 AH battery by a 100 amp load, it will not give you one hour of runtime. On the contrary, the perceived capacity of the battery will be that of 64 Amp Hours.

Selecting a Battery – when selecting a new battery remember that engine starting batteries and deep cycle batteries are different. Consider a battery with the greatest reserve capacity or amp hour rating possible. Physical size, cable hook up, and terminal type must be evaluated. A Gel Cell or an Absorbed Glass Mat (AGM) is suggested, rather than a Wet Cell, if the application is a harsh environment or the battery is not going to receive regular maintenance and charging. Freshness of a new battery is very important. The longer a battery sits and is not re-charged the more damaging sulfation build up there may be on the plates. Most batteries have a date of manufacture code on them. The month is indicated by a letter 'A' being January and a number '4' being 2004. C4 would tell us the battery was manufactured in March 2004.

Battery life and performance. The average battery life has become shorter as energy requirements have increased. Only 30% of batteries sold today reach the 48-month mark. In fact 80% of all battery failure is related to sulfation build-up. This build up occurs when the sulfur molecules in the electrolyte (battery acid) become so deeply discharged that they begin to coat the battery's lead plates. Before long the plates become so coated that the battery dies.

The **causes of sulfation** are numerous. They include:

Time. Batteries that sit too long between charges (battery is stored without some type of energy input.)

Deep cycling an engine starting battery. Engine starting batteries are not designed for deep discharge.

Undercharging a battery to only 90% of capacity will allow sulfation of the battery. The 10% of battery chemistry not reactivated by the incompleted charging cycle will cause sulfation.

Low electrolyte level. Battery plates exposed to air will immediately sulfate. Incorrect charging levels and settings.

Parasitic drain. The small trickle discharge when sitting idle with no regular maintenance charging input.

Temperature. As little as 24 hours in hot weather and several days in cooler weather.

Heat. As heat increases, so does internal discharge. A new fully charged battery left sitting 24 hours a day at **110 degrees F for 30 days would most likely not start an engine.**

Cold weather is also hard on the battery. The chemistry does not make the same amount of energy as a warm battery. A deeply discharged battery can freeze solid in sub-zero weather.

Improper charging. Selecting the proper battery charger for the type of battery is critical.

CHARGING- Remember you must put back the energy you use immediately. If you don't the battery sulfates, which affects performance and longevity.

On a vehicle the alternator is a battery charger. It works well if the battery is not deeply discharged. The alternator tends to overcharge batteries that are very low and the overcharge can damage batteries. In fact an engine starting battery on average has only about 10 deep cycles available when recharged by an alternator.

Vehicles – Most pick-up trucks manufactured and equipped with towing packages provide a “maintenance charge” at the vehicle’s trailer lighting and accessory plug often referred to as a 7-way RV, Bargman, or Pollock style plug. The maintenance charge is usually fuse protected (25 Amp) in the vehicle system. It can offer as much as 14.4 Volt charge when the vehicle is running (alternator output). The amperage draw is dependent of usage of the trailer operating system. This is a maintenance charge.

Equipment without an engine and alternator normally uses deep cycle batteries requiring 3 step regulated charging. Note that only special **SMART BATTERY CHARGERS** using computer technology can perform 3 step charging techniques. You don't find these types of chargers in many parts stores. The first step is bulk charging where up to 80% of the battery energy capacity is replaced by the charger at the maximum voltage and current amp rating of the charger. When the battery voltage reaches 14.4 volts this begins the absorption charge step. This is where the voltage is held at a constant 14.4 volts and the current (amps) declines until the battery is 98% charged. Next comes the Float Step. This is a regulated voltage of not more than 13.4 volts and usually less than 1 amp of current. This in time will bring the battery to 100% charged or close to it. The float charge will not boil or heat batteries but will maintain the batteries at 100% readiness and prevent cycling during long term inactivity. Most Gel Cell and AGM batteries require special settings or chargers.

Notice: If you leave your key on without the vehicle running, the operating system of your trailer can drain your vehicle battery along with the equipment trailer battery.

KM Specs: KM 8000TEDD Standard unit equipment.

Battery	NAPA 827: 12V: Top post w/ vertical stud: 63 lbs.: 88 AH (20 Hr. Rating)	88 AH 20 Hour rating
	Sealed, Gelled Electrolyte Is Spillproof & Leakproof For Installation In Virtually Any Position. Gel Design Eliminates Dangerous Spills, Gassing, & Terminal Corrosion For Safer Operation. Maintenance-Free Design Eliminates The Need To Add Water	
	Ideal For Use In A Wide Range Of Deep Cycle Applications. Faster Recharge Time For Quick Efficient Charging. Low Self-Discharge Rate Prevents Capacity Loss from Infrequent Charging. Thick Consistency Of Gel Prevents Damaging Effects Of Vibration.	
Burner	Beckett ADC: 12VDC Oil Burner	7.1 A/h after ignition
Burner Controls	KM C1 Panel	1.6 A/h
Scissor Hoist	Champion 515T	120 A/h 20 Secs full stroke
Spitzlift Winch		70 A/h 10 Secs lift stroke
Light Bar	Soundoff Signal Traffic Master	2.2 A/h