

LUDO MCGURK TRANSPORT EQUIPMENT LTD.

SPECIALIST ELECTRICAL & ELECTRONIC VEHICLE EQUIPMENT

Vehicle Batteries...

An overview of battery types and their applications

Battery types

Cranking Battery

SLI (Starting-Lighting-Ignition) this is the Engine starter battery and is designed to deliver short bursts of energy to start an engine and is normally made up of a high quantity of thin plates to give a greater surface area = cranking power. These will normally carry at least two specifications:

CCA & Ah

CCA (cold cranking amps), the rate that the battery can crank the engine over for a given length of time, down to a certain voltage, typically at -18°C

There are several different CCA ratings (SAE,EN,DIN,JIS,IEC etc.) all with slightly different procedures to arrive at a CCA rating, not to be confused with CA or MCA which are done at a higher temperature (typically 0°C) and not a cold crank rating.

For example

A battery with a rating of 425CCA (SAE) has the same cranking performance as a battery with a rating of 305CCA (IEC)

Ah (amperhours) the length of time a battery can provide an amount of current over an amount of time, the most common reference is a 20 hour rating.

For example

A 100ah battery can supply 5amps for 20hours (5amp x 20hr =100ah).

Some batteries will also carry a RC (Reserve Capacity) rating, this is the number of minutes a fully charged battery will discharge 25 amps until the battery drops below 10.5 volts

Leisure Battery

Leisure batteries are normally a compromise of SLI & Deep Cycle technology. These generally have fewer plates than a SLI type battery but each plate is thicker to provide more discharge capability. Thicker plates = higher Ah.

They will have a cranking capability, though often not shown on the case, normally just an Ah rating is shown.

For example

A 100ah battery can supply 5amps for 20hours (5amp x 20hr =100ah).

The biggest difference between a 100ah Leisure type battery and a dedicated Deep Cycle battery is the number of cycles the battery is designed to perform.

For example

A 100ah Leisure battery may only have a life expectancy of 100 cycles when taken down to 50% D.O.D (Depth of Discharge), whereas a dedicated 100ah

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Deep Cycle battery may have a cyclic life of 350+ when taken down to 75% D.O.D.

In leisure applications batteries are rarely cycled down to their maximum D.O.D and back so will often last much longer than a rated 100 cycles.

Standby Battery

VRLA (Valve Regulated Lead Acid) & SLA (Sealed lead Acid)

Though there are slight differences between SLA & VRLA they have similar applications and to keep this article simple we will consider them one and the same.

Standby Batteries are designed for UPS (Uninterruptible Power Supply) applications (Alarm Back-Up, Emergency Lighting etc.) though they often are used in cyclic applications they will not perform as well as a dedicated cyclic type battery.

Deep Cycle

Deep Cycle/ Semi-Traction types are designed for cyclic operation and tend not to be a compromise of cyclic and starter type battery.

A true Deep Cycle battery is designed for cyclic application.

They can have a cyclic life of over 500 cycles at a D.O.D of 80%.

The cost will always carry a premium over other types of battery, but in a cyclic application they will out perform and last much longer than other types.

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Construction Types

Lead Acid-Wet/Flooded

This is the most commonly found battery in the Automotive field.

These can be found in SLI, Leisure & Deep Cycle applications, though all share the same characteristics of having free moving electrolyte within, the construction of the plate thickness, the number of plates and the material will differ depending on application.

In recent years there has been a move toward MF (Maintenance Free) batteries that do not require topping up, often with a Labyrinth lid that acts as a recombination path for evaporating electrolyte and as an Anti-Flashback safety feature, they will also leak less when accidentally tipped for a short period of time.

The down side of a sealed lid in a Leisure or Traction application is that during cycling there is a natural evaporation and a lid with accessible cell caps will allow for topping up with De-Ionised Water.

AGM (Absorbed Glass Mat)

The construction of an AGM battery is very similar to that of a "Wet" battery in construction, the difference being the electrolyte is suspended in a glass fibre matting so there is no free movement of the electrolyte & no gassing under normal working conditions, this also has various Health & Safety benefits when used in passenger compartments.

As with wet batteries, an AGM battery can be SLI, Leisure or Deep Cycle.

VRLA/SLA

The construction of VRLA & SLA are very similar to AGM, as they are not ideally suited to our market we won't dwell on them.

Spiral Cell

Batteries with Spiral Cell (6Pack) layout such as the Optima brand are technically an AGM Battery

Gel

The Gel Battery 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 voltages on this type of cell are 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.

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SPECIAL NOTE about Gel Batteries: It is very common for individuals to use the term GEL battery when referring to sealed, maintenance free batteries, much like one would use Hoover when referring to a vacuum cleaner or Xerox when referring to a copy machine.

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Float Voltages

Typically the following float voltages apply:

- Gel types: 12.9 - 13.1V
- Lead Acid: 13.1 - 13.4V
- AGM: 13.1 - 13.3V
- VRLA: 13.5 - 13.8V
- Odyssey: 13.6V

These are typical values; some battery manufacturers may specify slightly different values.

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Testing Procedures

Hydrometers

For batteries with accessible cells, the tried and trusted Hydrometer is a cheap and accurate battery tester, as more batteries become MF and less technicians want the mess and the potential hazard of electrolyte it is almost a forgotten art.

Discharge Testers

High rate discharge testers are still a popular option for cranking batteries, only for being cheap and plentiful, not necessarily accurate, they have their drawbacks, batteries ideally need a reasonable charge to start with and as electronics become more sensitive putting a dead short across the system to test the battery is never going to do the equipment any favours.

The older style of discharge tester with 2 prongs often cause a spark on connection and are a health & Safety hazard if no spark arrestors are fitted.

Digital Testers

Digital testers vary from very basic voltage indication via the use of LED's to sophisticated testers that analyse the CCA rating of the battery, this is done without causing a short on the system or any sparks if used correctly, this makes them safe for the equipment and the user.

As these are testing CCA rating they are not really suitable for Deep Cycle batteries, as they have no testing provision for Ah ratings.

Though I believe there are instant Ah testers on the market, I am yet to see one that is accurate.

Discharge Testers

To test accurately a Deep Cycle/Cyclic type battery it really needs discharging over a length of time with a load that relates to it's Ah rating.

This can be done by creating a low cost "Load Bank" and timing the discharge time.

For example

Amps=Watts/Volts

55w halogen bulb / 12v = 4.58amp (approx)

Therefore a 100ah @ 20hr battery should be able to power a 5amp load for 20 hours

The alternative and more costly is a tester than allows you to set the Ah rating and it will run the discharge test and provide an outcome.

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Which Application?

Often vehicle builders may fit a best compromise battery, sometimes as a price package rather than most suitable, likewise occasionally a lack of awareness from aftermarket suppliers may not provide an ideal battery for the application come time for replacement

Engine Starter/Chassis Battery

Typically the Chassis Manufacturer, not the Vehicle Builder will have fitted this. At time of writing this will more than likely be a conventional "wet" SLI battery, based on cost rather than performance

Providing the vehicle builder has not built any of the auxiliary equipment onto the chassis battery this can be replaced on a like for like basis. If the vehicle performs many stop-start procedures during it's duty then upping to a higher CCA rating is a logical move, typically SLI type AGM batteries have more cranking power than their equivalent wet counterparts and are worth exploring.

Tail Lift Battery

In an ideal installation a tail lift would have it's own dedicated Traction battery to power it. However space & weight limitations mean this is very unlikely and the auxiliary bank will power it.

Auxiliary Battery

There is no set "ideal installation" in auxiliary banks in terms of numbers of batteries and total Ah's. Looking at benefits and drawbacks of each type will assist.

Wet/Flooded Cell

An engine starter battery (SLI) is not going to provide adequate discharge capability though it will have an Ah rating, a 105ah SLI will not perform as well as a 105ah Cyclic application, this is due to depth of discharge limitations of an SLI.

Wet cell Semi-Traction batteries are ideal for a discharge installation, though they do gas during operation which is not advisable in passenger carrying environments.

Gell Batteries

Gel types do not have the same gassing issues as flooded cell batteries and can have better energy delivery than a comparable flooded cyclic battery.

The biggest drawback of a Gel battery is they are very sensitive to overcharging, even a charger designed for AGM & Flooded can overcharge a Gel battery.

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AGM Batteries

AGM Deep Cycle type batteries have the benefits of a Gel type but are not as sensitive to voltage. It is worth noting an AGM SLI battery will not perform as well as an AGM Deep Cycle battery.

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E&OE

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