

Difference between Different Types of Batteries

Introduction

A lead-acid battery is an electrochemical device that generates voltage & delivers electric current. A battery is considered a primary source of energy used in today's life. It is important to remember that the battery does not store electricity, rather it stores a series of chemicals and electricity is generated through a chemical process. Two different types of lead in an acid mixture react to produce an electrical pressure called voltage. This electrochemical reaction transforms chemical energy into electrical energy and this is the base of all types of batteries. There are different types of battery technology in the market. But today in this white paper we discuss the most common battery technologies which we use in today's market and study the difference between them.

Types of Batteries

- 1) Tall Tubular Conventional Battery (TTC)
- 2) Tall Tubular Maintenance-Free & Short Tubular Maintenance-Free Battery (TTMF & STMF)
- 3) Tubular Gel Battery
- 4) Absorbed glass mat battery (AGM)

Here are some briefs about the above-mentioned batteries:

Tall Tubular Conventional (TTC):

As the name suggests, it is a design in Tube Form for positive plate and grid pasted design for the negative plate to accumulate more active Material as compared to other plate technologies. It is a flooded type battery in which we have liquid electrolyte.



Figure 1 Tall tubular Conventional battery

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Tubular Gel (T-Gel):

Lead-acid cells comprise of plates of lead, which serve as electrodes, suspended in an electrolyte consisting of diluted sulfuric acid. VRLA cells have similar chemistry. "Wet cell" type VLA's contain acid in liquid form. In AGM and Gel type VRLA's, the electrolyte is disabled. In AGM this is accomplished with a fiberglass mat; in Gel batteries or "gel cells", the electrolyte is in the form of a paste-like gel created by adding silica to the electrolyte.



Figure 2 Tubular Gel battery

Tall Tubular Maintenance Free / Short Tubular Maintenance Free:

As the name suggests, a Tall Tubular Maintenance-Free & Short Tubular is a type of an LA (Lead Acid) battery that is typically used for applications that require a consistent current for a prolonged period. Generally, Tall Tubular batteries come in two formats – Flooded LA and VRLA types. VRLA type is further distributed into two segments- AGM & Gel. Our range of TTMF batteries has a product range of 150Ah, 200Ah @ C20 ratings. They are flooded type with Maintenance Free characteristics.



Figure 2 Tall Tubular Maintenance Free battery



Figure 3 Short Tubular Maintenance Free battery

Absorbed Glass Mat Battery (AGM):

Absorbed Glass Mat batteries are built differently than the traditional flooded battery. In AGM batteries (also called starved electrolyte), there is a thin ultra-fine fiberglass mat sandwiched between the plates that are saturated with battery acid to about 95% of what they can hold. This mat is then packed in between the plates and slightly compressed, then welded/soldered in place. As the plates and mats are packed fairly tight, they are almost immune to vibration.



Figure 4 Absorbed Glass Mat battery

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Difference between all of the above-mentioned battery technologies is as mentioned below.

Comparison Between Different Battery Technology

Features	TTC	TTMF / STMF	T-Gel	AGM VRLA
Plate Technology	Tall Tubular Plate	Tall /Short Tubular	Tall Tubular Plate	Flat Pasted Plate
Life w.r.t Application	Deep dischargeable & higher life cycle due to antimony alloy.	Unique Hybrid Alloy abled for High cycle life with low water loss and Corrosion resistant.	Deep dischargeable & higher life cycle due to antimony free alloy	Not good for deep cycle application.
Application	Power Backup Solution- Solar/Inverter/UPS Suitable for Float Application above 1 Hour discharge rate	Power Backup Solution- Solar/Inverter/UPS Suitable for Float Application above 1 Hour discharge rate	Power Backup Solution- Solar/Inverter/UPS Suitable for Float Application above 1 Hour discharge rate	Power Back up Solution- Inverter/UPS Good for float & stand by application
Electrolyte	Free Flow Electrolyte	Free Flow Electrolyte	Electrolyte in-Between Gel	Electrolyte in-between AGM
Separator	Low electrical resistant & high porosity polyethylene material which leads to increase in electrical performance	Low electrical resistant & high porosity polyethylene material which leads to increase in electrical performance	Low electrical resistant & high porosity corrugated sintered PVC material increases electrical performance(T-Gel)	AGM separator used
Water Loss	Low, Water Topping-up frequency is Approx. 3 Months less as compared to competitor batteries.	Very Low due to unique hybrid allows.	Negligible, Low water loss property alloy for longer life & protects thermal runaway	Negligible, Low water loss property alloy for longer life & protects thermal runaway

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Comparison Between Different Battery Technology

Features	TTC	TTMF / STMF	T-Gel	AGM VRLA
Water Top up	Low water top up	No water top up throughout Warranty Life	No water top up throughout Life	No water top up throughout Life
Life Extension	Long life with regular water top up	Life can be extended via top-up	Not Applicable	Not Applicable
Self-Discharge	(Low <3.0%), 2mV/day OCV decay allows battery to hold charge for longer duration of time and quick charge in charger.	Low <2.5%, 2mV/day OCV decay allows battery to hold charge for longer duration of time and quick charge in charger.	Very Low < 2.0%, 2mV/day OCV decay allows battery to hold charge for longer duration of time and quick charge in charger.	Very Low < 2.0%
Spillage	Low Spill-proof, No spillage of Acid under 90 degree tilt for least 45 Minute	Low Spill-proof, No spillage of Acid under 90 degree tilt for least 45 Minute	Spill-proof, No spillage of Acid under 90 degree tilt for least 45 Minute	Spill-proof
Fumes	Low Fumes, Due to Eco-Friendly aqua trap vent plugs ensuring no acidic fumes	Controlled fumes vent plugs with flame arrestor to avoid back fire.	At par with AGM VRLA	At par with Tubular
Recovery in PSOC	Excellent behavior in PSOC condition.	Excellent behavior in PSOC condition.	Excellent behavior in PSOC condition.	Low Performance in PSOC
Operating Temperature Range	`-20 Degrees to +55 Degrees	`-20 Degrees to +55 Degrees	`-20 Degrees to +55 Degrees	`-15 Degrees to +40 Degrees
Terminal Type	L-Type Terminal	L-Type Terminal	L-Type Terminal	Stud Type Terminal

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