AGM vs Gel Batteries
Solar Applications

Technical Bulletin Two

Batteries are the source of energy storage in solar powered systems. If not properly designed the system will not function correctly. In cold weather applications, the poor performance resulting from substandard design is compounded with the risk of freezing the batteries and causing permanent and costly damage. A frequently asked question is which battery should be used, AGM or GEL?

What are the major differences between the performance of AGM and GEL Batteries?

GEL batteries are well suited for very high discharge applications; but tend to lose power faster than an AGM as the temperatures drop below freezing. AGM batteries excel at high current, high power applications particularly in cold temperatures. This makes them a good choice for solar pump applications in northern climates. AGM outsell GEL batteries about 100 to 1 for oil and gas applications, due to price in southern latitudes and cold weather performance in the Northern regions.

BENEFITS	AGM	GEL
Cost	Less	More
Deep cycle life, and resiliency to damage	Good	Best
Best performance when used for both starting, cycling and deep cycle service	Best	Good
Operations in cold temperatures	Best	Good
Ideal for use around electronics	Yes	Yes
Can be placed on its side	Yes	Yes

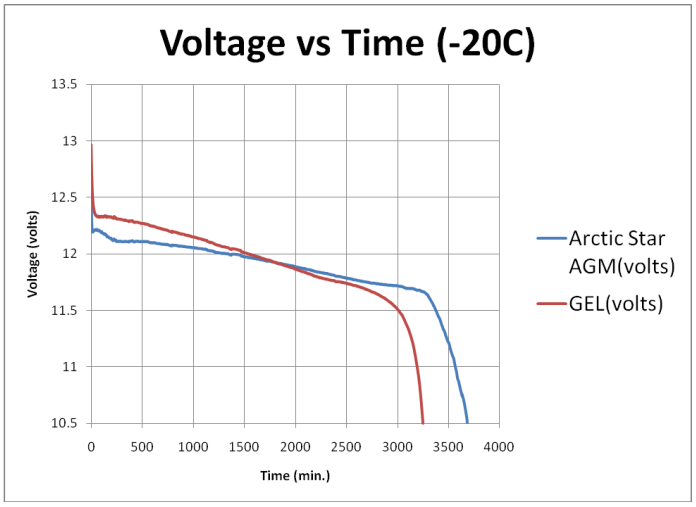
How much of a difference is there in cold climates?

An AGM and a GEL Battery were placed in a scientific freezer for 24 hours until the batteries reached the target testing temperature. A 12 ohm load (approximately 1 Amp) was then placed on the batteries and the voltage monitored and logged until the batteries were completely discharged. At this point the electrolyte would be frozen. A cutoff voltage of 10.5 volts is the standard that indicates a discharged lead acid battery. The test was repeated at both -20 °C (-4^{0}F) and -40 °C (-40 °F) with fresh batteries for each test.

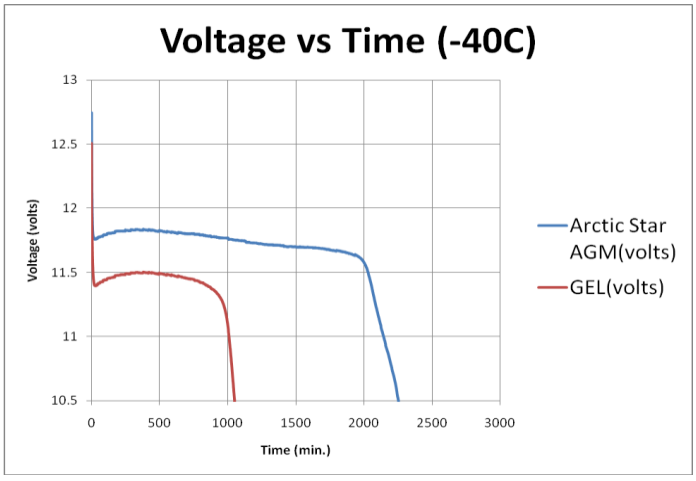
The table and graphs below show the performance of each battery during the test at -20^{0}C (-4^{0}F) and -40^{0}C (-40^{0}F).

	Summary @ -20 °C				Summary @ -40 °C		
Measured Values	AGM	GEL	Diff.		AGM	GEL	Diff.
Average Voltage (volts)	11.86	11.94			11.68	11.42	
Average Current (amps)	0.99	0.99			0.97	0.95	
Time to 10.5V cuttoff (hrs)	61.42	54.17			37.53	17.52	
Power Delivered (W-Hrs.)	719.62	643.32	12%		426.85	190.42	124%
Capacity (A-Hrs)	60.69	53.88			36.53	16.67	

The results show that at -20°C (-4°F) the AGM will last 1.12 times (12%) longer than a GEL when there is no power available from the sun. At -40°C (-40°F) the AGM will last 2.24 times (124%) longer than the GEL.



Many solar applications are not continually drawing power such as the case with a chemical injection system. It is important to consider this when trying to understand the time difference between a GEL and an AGM battery. For instance, if a GEL battery will provide 6 hours of continuous power to a pump at -40°C (-40°F) and the pump has a duty cycle of 10% this means the battery will provide power to the pump without sunlight for 60 hours. The AGM will provide power at -40°C (-40°F) for 134 hours in the same application. This will provide 2.24 times more autonomy than a comparable GEL. Or another way of looking at it, one AGM will provide more power than two GEL batteries at -40°C (-40°F).



In an unheated application in northern climates the AGM is the best battery selection for solar applications.