

Things *That* Work

Tested by Home Power



We tested two Concorde Sun Xtender batteries, model number PVX-12105. These are 12 volt batteries with a capacity of 105 ampere-hours at a C/20 discharge rate. Each battery is 13 inches (33 cm) long, 6.75 inches (17.15 cm) wide, 9.25 inches (23.5 cm) tall, and weighs 69 pounds (31.3 kg).

Concorde Sun Xtender AGM Batteries

Tested by Richard Perez,
with help from Sam Coleman

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I have always considered sealed batteries to be too delicate for use in renewable energy systems. After a year of testing these Concorde sealed lead-acid batteries, I've changed my mind.

Concorde Sun Xtender Batteries

These lead-acid batteries are of the sealed, absorbed glass mat (AGM) type. This means that they never require watering, and can be operated in almost any position, even on their sides. The hydrogen and oxygen gasses, which form when any lead-acid battery is recharged, are recombined within the sealed cells.

These batteries do have safety vents, in case they are grossly overcharged. The plates are separated by a microfibrinous silica glass mat. The sulfuric acid electrolyte is absorbed and held captive by capillary action between the mat and the electrolyte. The Concorde AGM batteries have been tested by Underwriters Laboratories (UL) for compliance to UL924 and UL1989 standards. They are UL listed, which means you'll have no problems with the electrical inspector.

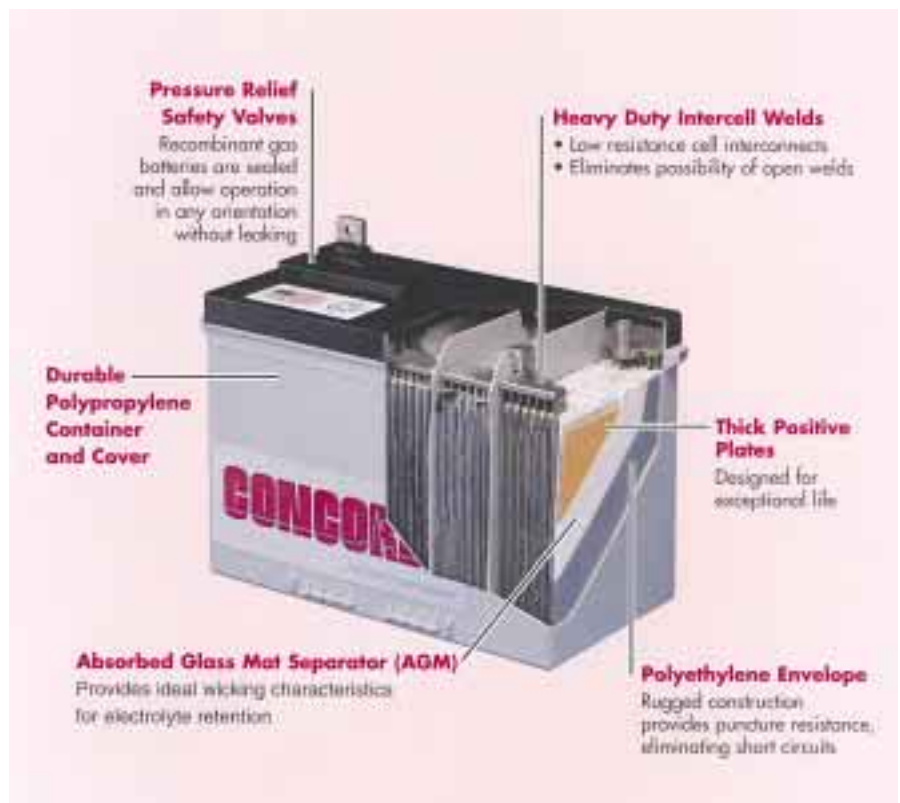
Shipping

The Concorde batteries arrived here in fine shape via United Parcel Service (UPS). Yes, these batteries can be shipped via UPS, and even transported in an aircraft! Since they are sealed, they meet D.O.T. shipping requirements for a nonspillable wet battery, and are exempted from the hazardous materials category. This can be a major advantage over vented wet cells, which must be shipped via freight. Wet cell batteries are classified as hazardous materials, since the sulfuric acid electrolyte can be spilled.

The Test System

In January of 1999, we installed the two batteries in Sam Coleman's cabin system here at Funky Mountain Institute. By wiring the two Concordes in parallel, the resulting 12 VDC battery had a capacity of 210 ampere-hours.

Sam's is a small stand-alone cabin system charged by about 165 watts of photovoltaic (PV) modules. Daily



use on this system averages about 315 watt-hours. In order to assess the performance of the Concorde batteries, we also installed a Cruising Equipment Amp-hour +2 battery ampere-hour meter. We set the RV Power Products Solar Boost 20 PV regulator at 14.2 VDC at 80°F (27°C). This system also has an Exeltech 500 watt sine wave inverter to power 120 VAC appliances.

Performance

To say that these batteries worked well would be an understatement. I personally expected them to fail rapidly due to overcharging. In my experiences with sealed lead-acid batteries (mostly of the gelled electrolyte type), even a few hours of moderate overcharging was enough to cause the cells to vent and eventually dry out. Not so with these Concordes. During sunny periods, Sam racked up 15 to 20 overcharge ampere-hours daily, with no damage to these batteries.

Why did the Concordes stand up to this overcharging? They have better electrolyte circulation than gelled cells. The electrolyte in gelled cells is semi-solid (a jelly), whereas in AGMs, the electrolyte is a liquid that wicks around in the absorbed glass mat. This ability to circulate helps get the monatomic (single atom) oxygen and hydrogen together so they can recombine into water.

On one particular occasion, the weather had been cloudy for days. When this happens, I fire up the big engine generator and we recharge all the batteries in all the systems. Well, Sam forgot that the 120 VAC charger was still connected to his system, and the Concordes received a gross overcharge. Their voltage went up to over 15.8 VDC, but they were not damaged by this unintentional abuse. They still work, months later. If a gelled cell vents even once, then it rapidly (within a month) loses a large proportion of its capacity. The Concordes weren't damaged because the oxygen and hydrogen recombined within the cell instead of venting.

At night, when Sam was using the inverter to power the TV and VCR, the Concordes held their voltage high during discharge. Rarely did the battery voltage go lower than 12.45 VDC (battery at 85 percent SOC, with a discharge rate of C/26). Average depth of discharge during this year-long test was about 25 ampere-hours. The greatest depth of discharge was 40 ampere-hours. Sam has a well designed and proportioned PV system, and he manages his loads. During periods of low solar insolation, he reduces his energy consumption.

Sam's cabin can only loosely be called a "conditioned environment." During winter nights, after the wood heater goes out, the temperature routinely hovers

around freezing. During hot summer days, the interior temperature of the cabin can reach over 100°F (38°C). The Concordes performed well during these temperature extremes. They hold their voltage well under load even at temperatures around freezing.

The manufacturer rates these batteries to operate from -40°F (-40°C) to 160°F (71°C). The rated capacity of these Concorde AGM batteries is still 80 percent at 32°F (0°C). These batteries perform better in cold temperatures because they have a much lower internal resistance than flooded batteries. The lower resistance allows the electro-chemical reactions of discharging and charging to be more efficient.

One interesting characteristic we noticed was a very low rate of self-discharge. These batteries self discharge only about one-tenth as fast as vented lead-acid cells. The manufacturer rates their self-discharge between one and three percent per month, depending on battery temperature. Regular vented lead-acid cells self discharge about four percent per week.

Here's Sam's comment on these Concorde AGMs: "I've lived on battery-stored energy for seventeen years, and these are the best batteries I've ever used."

Applications for the Concorde AGM Batteries

These are truly sealed cells. They are naturals for use in RVs, and in any RE system which has the batteries located inside the living space. There is no need to provide a vented containment. Concorde has had these batteries tested by the U.S. Navy to MIL-B-8565J. This standard allows only 3.5 percent hydrogen concentration during radical overcharges where the battery reaches over 16 VDC and the temperature is at 131°F (55°C). These batteries produced no more than 0.2 to 1.0 percent hydrogen emission—they are safe to use in living spaces.

I'm going to install two Concorde AGMs on our radiotelephone system's base end. This system only gets visited by a human once a year, and the maintenance-free feature of the Concordes will eliminate battery watering.

Folks who are on grid and using inverters in utility intertie situations will appreciate the Concorde AGMs. The batteries can be installed inside, without containments or venting. They are UL listed, which will please the electrical inspectors and insurance companies.

Thumbs Up!

The Concorde Sun Xtender AGM batteries changed my mind about sealed lead-acid batteries. No longer do I consider sealed cells to be the "weak siblings" of the battery world. These Concordes are as tough as vented

lead-acid cells. They even offer improvements in the areas of low temperature performance and self discharge. And maybe best of all for the experienced battery user, they never require watering. Thumbs up on these Concorde AGMs!

Access

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A note from Advanced Energy Group

We hope you enjoyed the previous article.

We can generally supply the Concorde PVX Series SunExtender battery for about 25% - 30% more than a Trojan L16 and 25% less than a Surrette with comparable amp hours. When you consider there's no maintenance, no outside venting required, virtually no affect from temperature extremes and they last up to 5 times longer than the L16 you can see why we feel this is the best battery.