

Surrette 6-CS-25PS Battery

Tested by Richard Perez

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This big red Surrette battery is a great choice for energy storage in almost any renewable energy system. Its large size reduces battery interconnections. Its case-in-a-case design reduces battery top cleaning, and increases system safety. The high quality of materials and workmanship make it an excellent long-term battery investment.

The Surrette 6-CS-25PS

This is a huge brute of a battery. It is 22 inches long, 11 inches wide, and 18 inches high (56 x 28 x 46 cm). This is a six volt battery, and contains three series-connected lead-acid cells. The battery weighs 256 pounds (116 kg) dry, and 318 pounds (144 kg) wet. Each cell contains almost 2 gallons (7.6 l) of sulfuric acid electrolyte, while the whole battery contains about 5.8 gallons (22 l).

With a 1.280 specific gravity sulfuric acid electrolyte, this battery has a capacity of 820 ampere-hours at the C/20 rate, and 1,025 ampere-hours at the C/100 rate. Most PV systems have an average discharge rate of around C/100.

The Surrette 6-CS-25PS uses a case-in-a-case design. In addition to the outer case, each cell each has its own individual case made out of polypropylene plastic. Each cell contains 25 plates, and each plate has a whopping 0.265 inch (6.73 mm) thickness. Each cell has an electrolyte

reserve of 3.6 inches (91 cm) above the plates. The three individually-cased cells are placed into the outer case, which is made of high density polyethylene plastic.

The interior cells each have distinct terminals which are bolted together within the exterior case to form the series string. Only two terminals are exposed on the outside of the outer case—the major negative and major positive of the interior six volt series string. On top of the red outer case, each cell has its vent/filler hole with cap.

The manufacturer's suggested retail price of a 6-CS-25PS battery is US\$1,358.27. The battery comes with a ten-year warranty against defects in material and workmanship. These batteries are specifically designed to operate in renewable energy systems.

Surrettes are a "Rolls-Royce" battery. They are handcrafted by a small battery company now in its third generation of family management. There are no compromises made in quality or workmanship. This makes them more expensive than other batteries, and best suited for larger, more affluent systems operated by experienced battery users. Due to their long life, I expect them to only be slightly more expensive, in the long run, than the less expensive batteries generally used in RE systems.



The Test System

We installed two Surrrette 6-CS-25PS batteries on the main system at *Home Power* in March of 1997. After six months of operating this battery, we installed two more of the batteries, for a total capacity of 1,640 ampere-hours at 12 VDC. At the time, the main system was charged by about 2,200 watts of PV modules (about 155 amperes at 14 VDC), a 1,000 watt wind generator, and a 6.5 KW backup generator. System instrumentation is extensive and includes computerized analog to digital data acquisition, an E-Meter, a TriMetric, and an Amp-hour +2 meter.

This system cycles between 10 and 13 KWH daily. The major load on the system is the office, which consumes over 75 percent of the energy. Since the office is normally used during daylight hours, we are able to get by on what is generally considered to be an undersized battery for a system of this size. Nighttime loads usually consume under 2.5 KWH from the battery, so the Surrettes are only cycled about 11 percent of their rated capacity nightly, on average. Most of the energy our system produces is used during the day, as it is produced by the PVs.

Installation

I'm not going to say that these huge cells are easy to move. Joe Schwartz and Ben Root did the lugging, and it was tough. When we installed the cells, they were dry, so each battery weighed in at 256 pounds (116 kg). Fortunately there are handles molded into the exterior red case. Without the handles, these cells would have been almost impossible to move.

In our case, dry cells were easier to handle than wet. When one of the cells got knocked over while bouncing up the rough road to our place in the back of Ben's van, there was no mess. The shipping cost is significantly less with dry batteries too. When the manufacturer ships these batteries dry, electrolyte is not included. Once the batteries were in place, we added the sulfuric acid electrolyte, which we obtained from the local battery store (they wondered why we wanted so much of it...).

Wiring the Surrettes into a battery was super simple because the cells are so large. Very few series and parallel interconnects were needed. The terminals on top of the battery are massive—it was easy to bolt on the #4/0 (107 mm²) interconnect and inverter cables. From the battery, we used #4/0 cables to bus the Surrettes into the copper bus bar that encircles the battery room. From there the power is connected via an Ananda power center to the two inverters.

Using the Surrrette 6-CS-25PS Batteries

I've been using battery-stored power since 1970. There

are several characteristics I have come to look for in a battery. Does it hold its voltage high at low states of charge? Does it hold its voltage high during high rates of discharge? Does it recharge efficiently and without undue voltage elevation?

The Surrettes held their voltage over 12.0 VDC when at 50 percent state of discharge and while under moderate loads in the C/50 range. During high rates of discharge (C/5), the battery voltage remained high, well over 12.0 VDC. During our average nightly shallow cycle, the voltage rarely goes below 12.5 VDC. When the Surrettes are recharged, they are almost fully recharged (above 96 percent SOC) before the input voltage reaches 14.8 VDC.

The three battery ampere-hour meters in this system provided much information about how the batteries were used and how they performed. In general, the average nightly depth of discharge was only about 11 percent of the battery's capacity. Deepest depth of discharge was to 64 percent DOD. During the average nightly cycle of 11 percent, these batteries showed recharge efficiencies in the range of 95 to 98 percent, which is very high.

Only during deep discharge cycles to about 50 percent DOD did the battery efficiency drop into the 87 to 88 percent range. We usually have fewer than twenty cycles below 50 percent DOD during a yearly period, all during the winter's cloudy weather. But when the weather here is cloudy, it's usually because a winter storm is moving through, and that means wind power. If all else fails, I start the engine generator so we don't draw the battery down too far.

We currently have over one thousand cycles on these batteries, and they are still performing as they did when they were brand new. According to Surrrette's published information, this battery should deliver more than 5,000 cycles, with an average DOD of 20 percent or less. I expect this set of Surrettes to last at least fifteen years before requiring replacement.

Maintenance has been light and easy on these Surrettes, which are equipped with Hydrocaps. The large cells mean that there are fewer cells to water. The increased electrolyte capacity means that watering can be done less often. We check the electrolyte levels every three months and refill the cells—all four batteries use less than a gallon of distilled water.

Keeping the battery tops clean is ultra easy; there is nothing much to do. A combination of the case-in-a-case design and the Hydrocaps (a factory option) keeps all the electrolyte inside the cells. The only other maintenance we do on these Surrettes is routine equalizing charges.

An Outstanding Battery

The Surrette 6-CS-25PS is a very high quality, deep-cycle battery, ideally suited for use in renewable energy systems. The large cell size reduces battery interconnection and maintenance. The case-in-a-case design increases battery safety while further reducing maintenance. In our almost three-year long test here at Funky Mountain Institute, these batteries have delivered excellent performance. They hold their voltage high during discharge and efficiently accept recharging. All in all, these Surrettes are an outstanding battery.

Access

Author: Richard Perez, Home Power, PO Box 520, Ashland, OR 97520 • 530-475-3179
Fax: 530-475-0836
richard.perez@homepower.com
www.homepower.com

Surrette Battery Distributor in the USA: Rolls Battery Engineering, 8 Proctor St., Salem, MA 01970
800-477-6557 or 978-745-3333
Fax: 978-741-8956
sales@rollsbattery.com
www.rollsbattery.com

Battery Manufacturer: Surrette Battery Company Ltd., PO Box 2020, Springhill, Nova Scotia B0M 1X0 Canada
800-681-9914 or 902-597-3767
Fax: 902-597-8447
jds@surrette.com
www.surrette.com

