Bioenno Power 12 V LiFePO$_4$ Batteries

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Last year, I was a regular participant in ARRL’s National Parks on the Air (NPOTA) Facebook group. In addition to discussing the various on-air activations, portable equipment and antennas were popular topics. Batteries kept coming up, and a perennial favorite was the BLF line of lithium iron phosphate (LiFePO$_4$) batteries from Bioenno power. These are 12 V deep-cycle batteries, intended to provide continuous power, and are smaller and significantly lighter than conventional lead-acid batteries with equivalent ratings. In other words, they are ideal for powering a portable amateur station. They are, however, quite a bit more expensive than equivalent SLA (sealed lead acid) deep-cycle batteries.

The Bioenno batteries have a built-in module that provides internal cell balancing and protection from overcurrent, overdischarge, overvoltage, and short circuits. This module also includes a charge controller. Note that you’ll need charger designed for use with LiFePO$_4$ batteries, and not one for lead-acid batteries.

According to Bioenno, their LiFePO$_4$ batteries allow for extraction of more than 90% of the rated capacity without damage. They are rated for 2,000 or more charge cycles, while deep-cycle SLA batteries are often rated for 300 to 500 charge cycles depending on how far the battery is discharged. I have seen references that recommend limiting SLA battery discharge to about 50% or less for best life.

Bottom Line

Although they are significantly more expensive than lead-acid batteries with comparable ratings, their light weight and long life make the Bioenno LiFePO$_4$ batteries a good choice for portable operations.

The biggest problem is the triangle wave. Figure 7 shows the triangle wave shape at an amplitude control setting of about 50%. However, as you turn the amplitude higher, the waveshape in Figure 8 results. Notice in Table 2 the manufacturer’s numbers show performance is only up to 3 V for the sine wave and triangle wave.

In a Nutshell

The limitations on the waveform — no amplitude control of the square wave and distortion of the triangle and sine wave if the amplitude is set too high — probably require you to monitor the output of this device with an oscilloscope. But in combination with a pluggable breadboard, such as All Electronics PB-840 (catalog price $7.95) or any in the Jameco catalog (for under $10), along with a 9 or 12 V battery, you now have a quick and inexpensive breadboard test capability.

Considering Which One to Get

Bioenno offers a wide selection of BLF-series LiFePO4 batteries ranging in capacity from 3 Ah (amp-hours) to a whopping 300 Ah. When considering which battery to get, take a look at how much current your radio requires on transmit and receive, what mode(s) you will use, whether you will be operating casually (listening) or transmitting a lot, and how long you want to operate before recharging the battery. Keep in mind that high duty-cycle modes, such as FM or digital, will use battery capacity more quickly than SSB or CW. Online calculators, such as the one at www.4sqrp.com/Battery_Capacity/index.php, can help with planning.

Another point to consider is the maximum current the battery will need to supply. Some of the Bioenno batteries are rated for maximum continuous discharge current of 60 A or more, while others are rated for 10 A or less. A typical 100 W HF transceiver requires around 20 A for full transmit power.

For this review, we ordered two batteries. The BLF-1220A (see Figure 9) is a 12 V, 20 Ah battery rated for 40 A continuous discharge. It measures 6.5 × 4.3 × 3.3 inches and weighs 5.4 pounds. For comparison, a Duracell Ultra 20 Ah SLA deep-cycle battery measures 7 × 6.5 × 3 inches and weighs 13.3 pounds. Like all of the BLF series batteries, the BLF-1220A has red and black wires with Anderson Powerpole connectors for the load (in this case, the radio) and a coaxial power jack for charging.

The second battery is the BLF-1209A, a 12 V, 9 Ah unit rated for maximum continuous discharge current of 12 A. This one measures 4.3 × 3.2 × 3 inches and weighs 2.6 pounds. Again, it’s smaller and less than half the weight of a comparable SLA battery.

We also ordered the companion 14.6 V, 4 A charger, which can be used with either Bioenno battery. There’s no metering, just an LED that indicates red for constant current charging and green for constant voltage charging. The manual cautions that the green light doesn’t necessarily mean that the battery is charged, and recommends always charging for at least 5 hours to ensure a full charge.

In the Field

I used the BLF-1220A on a number of NPOTA activations with my Kenwood TS-590S 100 W HF transceiver. To make life easier, I bought several Powerwerx adapters. One goes from the four-pin power connector on my radio to Powerpoles, and another adds automotive-style fuses. I also added a Powerwerx inline meter that measures voltage and current and keeps track of amp hours used and other parameters. These are shown with the BLF-1209A in Figure 10.

I found that my transceiver draws 17.7 A on transmit (100 W output) and about 1.25 A on receive. During a typical NPOTA activation, I operated the radio between 80 and 100 W RF output, about 70% SSB and 30% CW, and usually running stations at a good pace until the pileup stalled and then changing bands or modes. Generally, my activations lasted a couple of hours, and I had plenty of battery power available. One time, I did run out of battery after about 3 1/2 hours and 332 contacts. Of course, it would last longer if I operated more SSB, operated at a slower pace (less transmitting), or turned the output power down a bit.

I was curious to see how the battery would do under really difficult conditions, so I used it at home to power my radio at 100 W during a CW contest. I called CQ and ran stations continuously while keeping an eye on the power monitor (that’s a lot of transmit-

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**Figure 9** — The Bioenno BLF-1220A battery and 14.6 V, 4 A charger.

**Figure 10** — The Bioenno BLF-1209A with Powerwerx inline meter and Powerpole adapters. Using these adapter cables, it’s a breeze to switch among different radios and batteries.
ting). Fully charged, the BLF-1220A indicated 13.1 V under no load and 12.5 V with the 17.7 A load from the radio. The voltage under load stayed quite consistent, dropping to 12.35 V after an hour and 12.15 V after 2 hours. The monitor said I had used 14.4 Ah. During the next 45 minutes, the voltage started to drop off more quickly until it dropped below 11 V and I was done. The meter said I had used about 17 Ah.

I ordered the BLF-1209A primarily to use with an Elecraft KX2. That radio has an internal 2.6 Ah battery which is great for short operations, especially if you run at 5 W output, but I wanted to go all day at 10 W. As it turned out, you can power a 10 W, energy-efficient radio like the KX2 for a very long time with a 9 Ah battery. I never came close to running out of power, and a lighter (1.4-pound) 6 Ah version would be sufficient for a typical day of operating. As a bonus, I had the 9 Ah battery with me the day that the 20 Ah version ran out in the middle of a pileup. I was able to quickly swap in the 9 Ah battery and get back on the air using the Kenwood at about 50 W output. I made another 90 contacts before heading for home.


WEN Rotary Tool Kit with Flex Shaft

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The WEN Products model #2305 rotary tool kit, is compact and works well — it cuts, buffs, grinds, drills, shapes, etches, and does a number of other things. You could use a full-size electric drill for some of these functions, but you would probably need two hands to control it. This unit is lightweight (about a pound and a half, including the cord and plug). If that is too heavy, the kit comes with a flexible extension shaft (42 inches end to end) that attaches to the end of the rotary tool and has a chuck at the other end for the cutting or grinding tool.

A Complete Kit

In addition to the tool and flexible shaft shown in Figure 11, a set of 80 cutting, grinding, and shaping bits with spare chucks and shafts are packed in a plastic accessory box. Some of these are “consumables” — they wear to the point where they have to be replaced. The chuck size is compatible with similar tools from Sears and Dremel, so replacements are readily available in hardware and hobby shops. The motor speed is adjustable from 8,000 to 30,000 RPM for various applications and draws about 1 A under no load.

How Well It Works

I have used similar tools for years, so I had a pretty good idea what to look for in this one. First the chuck — how well does it tighten? If it is not tightened down enough, the shaft of the bit you are using will ride out of the chuck.

You have to tighten the collar over the chuck to ensure this does not happen. This WEN unit has two flat areas on the collar. A mating miniature wrench is supplied to make sure the chuck is firmly in place. To install a chuck and tool on the end of the flexible shaft, an Allen wrench is supplied to hold the inside of the shaft in place as the collar is tightened. Very clear and specific instruction are included in the brief manual included in the kit.

The next question — how hot does it

Bottom Line

A very handy tool set to use around the shack for construction and repairs. The flexible shaft extension increases the possible uses.

Figure 11 — The extension shaft end on the left fits into the chuck area of the tool. On the right, the other end of the extension shaft accepts a chuck and the tool you want to use. The bits supplied with the kit are arranged below the tool, with the chuck tightening wrench on the right.