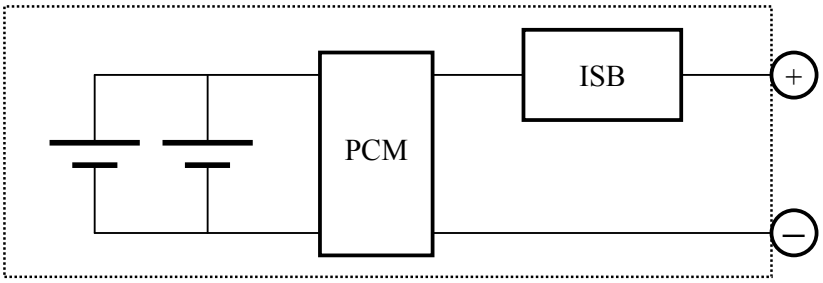
Litepak battery characteristics



The Litepak battery stores its power in a pair of 3.7 V 2.2 Ah Lithium Polymer cells connected in parallel. This provides a 4.4 Ah capacity at nominal 3.7 V

Lithium Polymer characteristics:

- Excellent energy density expressed as milliwatt hour per gram (mWh/g)
- Very low internal resistance – very low energy losses
- Environmental friendly – can be disposed of on a normal land fill site
- Less prone to fire and overheating than normal Lithium-Ion cells
- Maintenance free – do not require burn downs or any other maintenance
- Can be stored full or empty – unlike lead-acid, NiCad and NiMH

There is a Protection Circuit Module (PCM) directly on the internal cell terminals.

PCM characteristics:

- Limits the maximum battery voltage to 4.3 V to prevent over charging
- Limits the minimum battery voltage to 2.5 V to prevent over discharge

Between the PCM and the external positive terminal is a further Intrinsic Safety Barrier (ISB).

ISB characteristics:

- Limits the maximum inrush current from the battery to 7 A
- Limits the maximum continuous current supplied from the battery to 800 mA

All of the above are enclosed in a durable lifetime sealed enclosure depicted by the dotted line.

Overall characteristics:

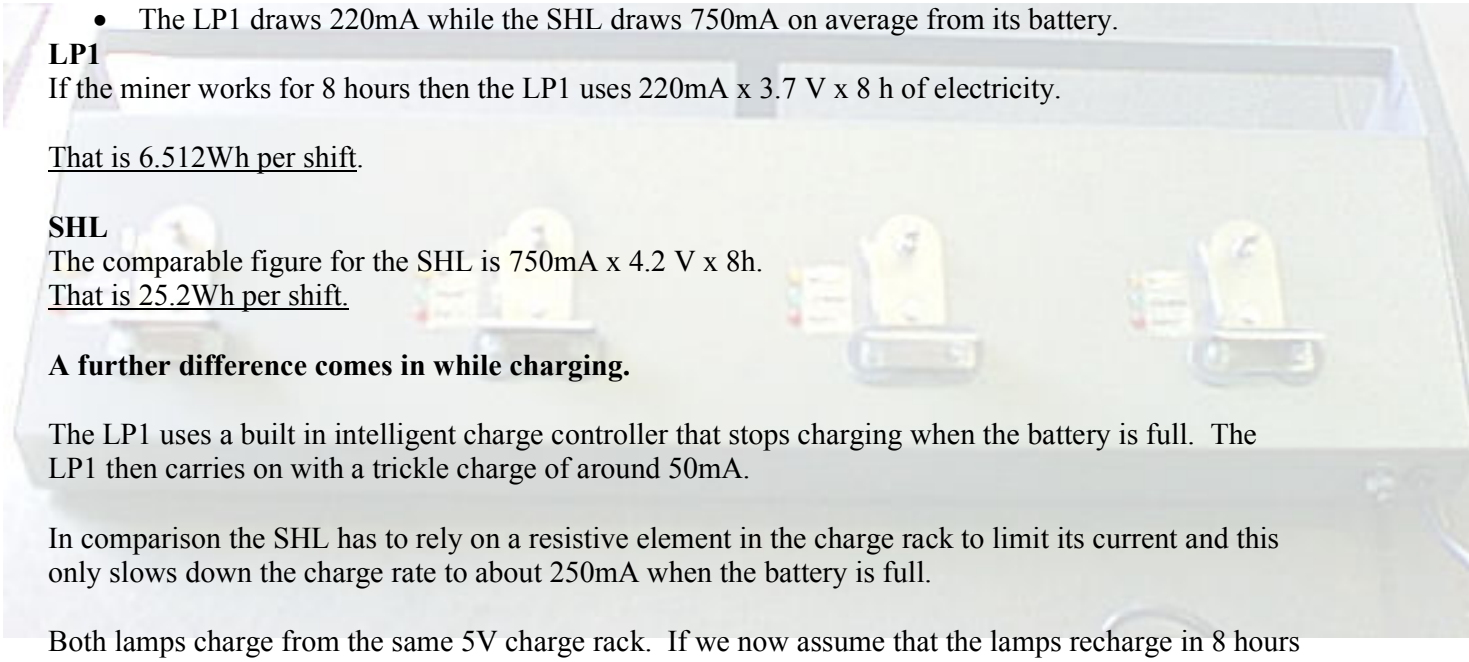
- Enclosure made from a polycarbonate blend with excellent wear resistance characteristics
- Exceptional impact durability
- Static dissipative to IEC60079-11
- Intrinsically safe certified to Ex ia I/IIC T4
- Terminals can be directly shorted without creating any spark, heat or other threat of igniting flammable gasses
- Shorting the terminals has no effect on the battery function or life
- The battery cannot be over charged
- The battery cannot be over discharged
- Charge and discharge rates are internally limited to desirable values

A simple electricity saving comparison between Litepak 1.0 (LP1) and a standard Halogen lamp (SHL).

There are numerous variables depending on the exact site implementation.

Some mines use 0.75 Amp Halogen globes while others use 1.0 Amp Halogen globes.
Some have auxiliary attachments that normally draw between 100 and 175mA.
For this exercise let us ignore any attachments as they will be the same for both lamps.

- We start the calculation at the light source and use the less consumptive 750mA Halogen globe for our comparison.
- The LP1 draws 220mA while the SHL draws 750mA on average from its battery.



LP1
If the miner works for 8 hours then the LP1 uses 220mA x 3.7 V x 8 h of electricity.

That is 6.512Wh per shift.

SHL
The comparable figure for the SHL is 750mA x 4.2 V x 8h.
That is 25.2Wh per shift.

A further difference comes in while charging.

The LP1 uses a built in intelligent charge controller that stops charging when the battery is full. The LP1 then carries on with a trickle charge of around 50mA.

In comparison the SHL has to rely on a resistive element in the charge rack to limit its current and this only slows down the charge rate to about 250mA when the battery is full.

Both lamps charge from the same 5V charge rack. If we now assume that the lamps recharge in 8 hours it leaves 8 hours of trickle charging per shift.

During 8 hours of trickle charging the LP1 consumes 50mA x 5 V x 8 h of electricity.
That is 2Wh per shift.

The comparable figure for the SHL is 250mA x 5 V x 8h.
That is 10Wh per shift.

The energy consumed by the LP1 is therefore 6.512Wh + 2Wh per shift = 8.512Wh.

The energy consumed by the SHL is therefore 25.2Wh + 10Wh per shift = 35.2Wh.

A further compounding factor is that the power supplies used in the standard charge racks are nominally only between 55 % and 75 % efficient.
We now apply the best figure of 75 % efficiency to the above consumptions.
Total LP1 consumption per shift = 11.35Wh
Total SHL consumption per shift = 46.93Wh

This figure can now be multiplied by the amount of lamps to get a daily figure for the actual site.
For example a site with 3450 lamps should experience the following figures:
Daily consumption with SHL = 46.93 Wh x 3450 = 161.9 kWh usage per day.
Daily consumption with LP1 = 11.35 Wh x 3450 = 39.2 kWh usage per day.
Therefore the example of a 3450 lamp installation saves 122.7 kWh per day or approximately 2872 kWh per month depending on the actual amount of shifts worked by switching from SHL to LP1.