# Lifepo4 balancing

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If you"re familiar with lithium batteries, you know that they are made up of cells. This concept isn"t so foreign if you consider that a sealed lead acid (SLA) battery is also made of cells. Both battery chemistries require cell balancing, but what is cell balancing? How does cell balancing happen? How does this affect performance?

Before we go into LiFePO4 cell balancing, here is a quick refresher on building the battery. Different applications have different voltage and amp-hour requirements, and therefore a battery may have as little as one cell, or it may have many cells. For example, it takes 4 x LiFePO4 cells (each with 3.2-volts) to make up a 12.8-volt battery. The lead acid 12-volt equivalent is made up of 6 x 2-volt lead acid cells.

Before the battery is built, it is important to ensure all the LiFePO4 cells are matched – in capacity rating, in voltage, and in internal resistance - and they must also be balanced after manufacturing.

The term balancing comes from the matching of the cells by capacity and voltage, and controlling their voltages through cycling the battery to maintain the balance, or close to equal voltages at all State of Charge (SOC) levels. It is important to note that cell balancing happens before and after a battery is built and must happen throughout the battery"s life for the battery to maintain optimal performance. This is a similar concept to how we maintain balance between individual batteries when we place them into series.

SLA battery packs are not monitored in the same way as lithium, so they aren"t balanced in the same way. A SLA battery is balanced by charging the battery with a slightly higher voltage than normal. Since the battery doesn"t have any internal monitoring, they will need to be monitored by an external device (called a hydrometer) or person as to prevent thermal runaway. This is not done automatically but is usually performed in a routine maintenance schedule.

Passive cell balancing is where the current entering the battery is bled off through resistors. In this scenario, the current enters the battery and fills the cells. If one cell is "full", the resistors take that energy and burns it off (turning it to heat) so that way the current flowing into the full cell is lessened until all cells are balanced.

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Active cell balancing directs the current towards the least full cells first and discharges the "full" cells to charge the "low" cells. In this case, the current enters the battery and instead of filling all cells at the same rate, concentrates on filling the emptier cells until they reach the level of the other cells. Once all cells are equal, the current is directed equally into all cells until fully charged (and fully balanced).

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