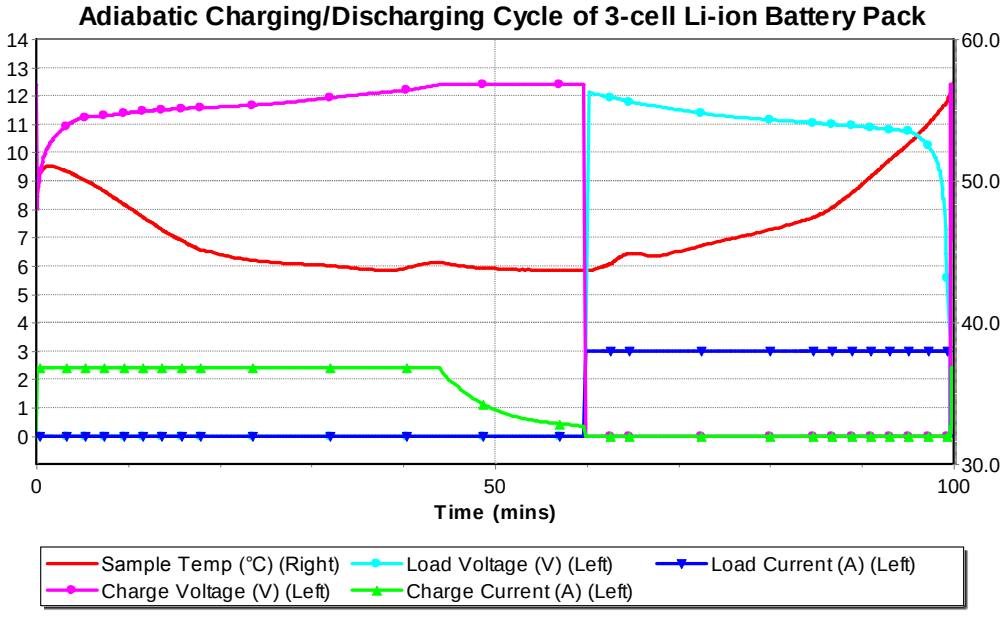
APPLICATION NOTE:

BATTERY LIFE-TIME TESTING WITH BTC

The voltage in fully charged batteries drops as they are used and this is acceptable until it falls below a minimum. The battery then has to be charged again until the potential is restored. This can continue for many (possibly hundreds) of cycles until the battery can no longer be charged due to either some internal mechanical fault or electrolyte limit.

The useful life of a battery can be determined by connecting to a power supply that can do the charging and then connected to an external load, to discharge it. Using charging and load units that are computer controlled, this was done to a Li-ion battery situated inside an adiabatic calorimeter. A screen dump of the calorimeter during this test is shown below. It is equipped with a live video display which monitors the physical state of the battery.

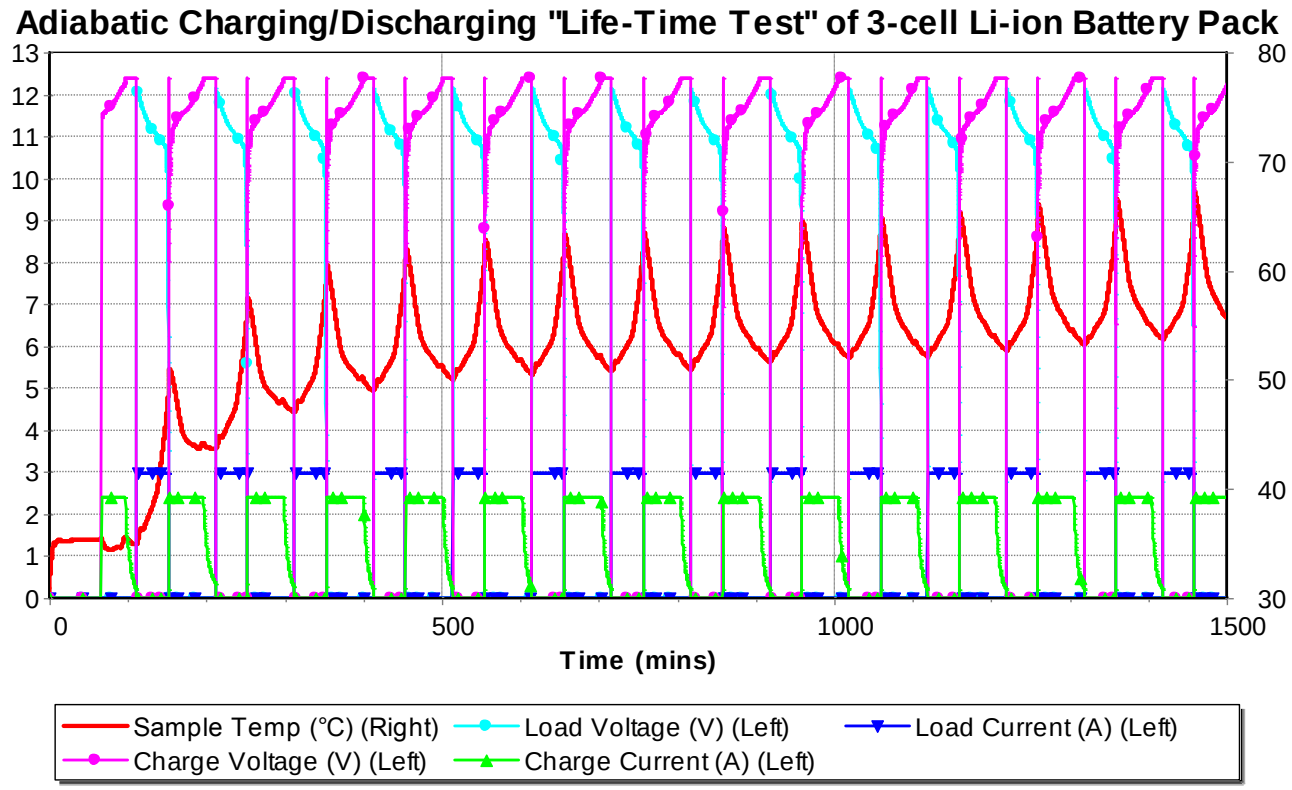
The advantage of the calorimeter is that it is possible to measure the temperature rise due to the charging/discharging processes.



In the example above, the charger is set to power the battery at a rate of just over 2A; the voltage is seen to rise quickly to around 11V and then more slowly to just over 12V. When the maximum is reached, the current starts to fall at a characteristic rate.

The software was set so that when the current was to 0.25A, the connections would be (automatically) switched to the discharge unit and the load on this was set to retain a constant current of 3A; the voltage is seen to fall slowly (over around 30minutes) and then from 10V plummets quickly.

The temperature is seen to fall during charging and then rise when a load is applied.



This procedure was repeated many times over and the results are shown above. Notice that initially the temperature overall rises after each pair of charging/discharging cycles but eventually an equilibrium is reached and a maximum of around 65 °C is observed.