Influence of Self Heating on the Performance & Lifespan of Lithium Ion Batteries

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Lithium Ion Batteries have been taken for granted as of late. This project aims to understand and change the way lithium-ion is used to better sustain the usefulness of batteries. Lithium Ion batteries are known for their high charge density, low weight, and recharge-ability. Lithium Ion batteries are also known to discharge rapidly and dangerously. Using them requires heavy knowledge of their volatile composition, and safety precautions. This research investigates whether removing the heat generated by Lithium Ion Batteries improves either the performance in a given charge cycle or the total lifespan, across different current draw conditions. The batteries were tested in a small scale version of what is often seen in modern day vehicles. Using a pump, four Lithium Ion cells, temperature sensors, a current sensor, a voltage probe, and a modulator, the batteries could efficiently be tested in a variety of different test conditions. After testing 253 trials the batteries showed clear results. The research shows that by cooling the batteries by convection with a heat sink the run time can increase by 26% and the lifespan of batteries can increase by 88%. Ultimately, by cooling the batteries a more efficient discharge is possible even at high discharge rates. This research can drastically impact the future of energy storage. Batteries will go to waste less often and batteries will be able to last longer without increasing the size or weight. Ultimately energy will be used more efficiently leading to fewer fossil fuels being consumed.

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