

Supercharging Your Crowd Funded Project:

The Benefits of Using ODM Partners for Li-ion Battery Design

Summary

Rechargeable lithium-ion batteries are being used in an ever-increasing number of products. While lithium-ion batteries offer many compelling design advantages and advancements, the complex design and safety requirements surrounding lithium-ion batteries can easily take on a life of their own and throw your project or budget off-track. When crowd funding a new product that contains a lithium-ion battery, the best option may be to leverage the power of an ODM (Original Design Manufacturer) who can design and customize a superior battery for your product's needs.

Overview of Rechargeable Lithium-Ion Batteries

Lithium-ion batteries, also abbreviated as Li-ion (which includes lithium polymer, LFP, NMC, NCA, etc.) are used for applications that require battery recharging capability. These batteries contain no free lithium metal, but do contain lithium ions and flammable electrolytes.¹ Lithium-ion batteries are becoming ubiquitous in modern consumer products since their introduction in the 1970s, and subsequent commercialization in the 1990s sparked a revolution in battery technology.²

Rechargeable lithium-ion batteries have many applications, some of the most notable being:

- Consumer electrical and electronic devices
- Medical devices
- Motive
- Industrial equipment
- Power storage

Over the years, battery technologies have evolved to provide increasingly greater energy density, greater energy per volume, longer cycle life, and improved reliability.³ Lithium batteries are also anticipated to be a key component in realizing the full potential of renewable energy sources as part of the electrical distribution grid.⁴

Compared to traditional nickel- and lead-based batteries, lithium-ion batteries are space-saving, lightweight, and powerful. Consumers continue to request longer battery life, and lithium-ion batteries deliver.

Manufacturers have developed methods to pack more active material into cells and to make battery components thinner, thereby producing a doubling of energy density since the technology was introduced in 1991.⁵ In other words, lithium-ion batteries offer a lot of power in a small package, compared with other rechargeable battery types.⁶ They also have an excellent power-to-weight ratio.⁷ In fact, lithium-ion batteries can have as much as twice the energy density of nickel-cadmium batteries.⁸

While their advantages are numerous, the technology used to manufacture lithium-ion batteries is sophisticated and exacting. There are inherent risks to address, the most dangerous of which is thermal runaway, which is fundamentally an uncontrolled increase in temperature and pressure in a cell. Such rapid overheating, in worst-case scenarios, can lead to fire or explosion and can cause severe damage to products or people.

It is crucial that every phase of product design and manufacturing incorporate best practices to ensure that a high-quality, safe product is produced. Any shortcuts or carelessness in manufacturing can have serious consequences for consumers and companies alike. To this point, several high-profile incidents have been featured in the news in past the few years.

Another very important scenario to plan for is when a product is damaged either by accident or through misuse. In such cases, the battery can become punctured or crushed, possibly leading to the release of electrolyte material or short-circuiting.⁹ Because of their high -energy content and thermal instability, lithium batteries must be properly designed, tested, used, and stored.¹⁰

Incorporating Lithium-Ion Batteries Into Your Product Design

Developing a product with lithium-ion battery technology presents a unique set of challenges. It is of prime importance that you allow adequate time and resources to devote to this part of your project.

Product Design Considerations

Among the most important considerations for designing products that use lithium-ion batteries are:

- The anticipated work cycle of the product (continual or intermittent)
- The battery's electrical characteristics (voltage, capacity, current, life required)
- The battery's physical characteristics (size, shape, weight)
- Maintenance and end-of-life (charging, storing, disposal)

Designing an efficient, cost-effective, and safe battery for your product requires sophisticated engineering knowledge and precise attention to detail and quality. Different battery models are designed for specific benefits such as rapid discharge, high capacity, or long cycle life.¹¹ Weight and size considerations are also important pieces of the puzzle.

At the top of the list for desired outcomes is maximizing battery capacity usage, and an understanding of the charging characteristics of the battery and the product's requirements are essential in order to design an appropriate and reliable battery system.¹² Lithium-ion battery packs may also require special handling during distribution and disposal.

Manufacturing Options

As a product developer, you have the option of manufacturing the battery in-house, having your battery manufactured by an OEM (Original Equipment Manufacturer) or partnering with an ODM (Original Design Manufacturer).

When working in-house or with an OEM, you are responsible for designing the battery and incorporating it into your overall product design. Both are basically a do-it-yourself approaches, since the OEM is a non-speciality contract manufacturer.

At the other end of the spectrum, you can choose to manufacture through an ODM. The ODM designs your product's battery for you, with your input, and the result is a turn-key solution.

Problems Associated with Poorly-Manufactured Batteries

The manufacturing of lithium-ion batteries is an investment, and it may be tempting to try to conserve resources through a do-it-yourself approach. However, many serious issues may arise when deploying a battery, making this a risky approach.

As batteries become smaller and more powerful, proper design and assembly methods become more critical. Improper assembly can have devastating consequences.¹³ Some of the common problems associated with poorly -manufactured batteries are:

- Performance issues
- Short circuits
- Product recalls
- Product failure
- Injuries

Any one of these problems could be catastrophic to launching and selling your product. There are also numerous safety regulations that must be adhered to, and quality standards that must be upheld to protect everyone in the supply chain.

In addition, batteries that are designed and assembled without specific consideration for your product's needs are likely to be unsuitable for your project, and may even lead to product failure.

While the overall rate of failure associated lithium-ion batteries is very low when compared to the total number of batteries in use, several publicized examples involving consumer electronics such as laptop computers and electronic toys have led to numerous product safety recalls by manufacturers.¹⁴

Special Considerations for Crowd Funded Projects

As a product developer who is utilizing a crowd funding platform, you have extra challenges in addition to those faced by traditional companies. Tight timelines, fulfillment challenges, and building and maintaining your company reputation are at the top of the list, but these represent only a portion of your responsibilities.

Many startups fall behind schedule during their product launch due to unforeseen challenges, often on the manufacturing side. Many also underestimate the added (complexity) of integrating the myriad components of their product into a cohesive unit.

The requirements of designing your own battery are challenging, and the risks associated with using an OEM product are too substantial to ignore. Without the proper solution, your entire product launch may be compromised. Using an ODM manufacturer to create a customized solution for you is a better way to approach this issue.

Benefits of Using an ODM for Battery Design

The benefits of using an ODM (Original Design Manufacturer) for lithium-ion battery design are many:

1. ODMs have experience in overcoming challenges in battery performance.
2. ODMs also have substantial experience in safety testing, which is a crucial factor in lithium-ion battery design.
3. ODMs have experience with quality standards and building a product that will meet your requirements.
4. As your partner in product development, an ODM has a vested interest in the success of your product.

The up-front design time your ODM will devote to your product will greatly reduce the possibility of having battery-related product issues. This is good news for your customers and for your company.

By acknowledging the importance of this part of the design process and taking action to produce the most appropriate battery for your product, you will set yourself above the competition and prevent costly rework. Even more importantly, you will know that you are providing your customers with a safe and reliable product.

Conclusion

ODMs are recommended as the best manufacturing option for crowd funded projects requiring lithium-ion batteries. By using an ODM, you will benefit from having better battery performance and reliability, avoiding costly rework, avoiding batteries that ultimately do not meet your product's needs, and producing an overall safer product.

To learn more, or discuss your project with an ODM, please contact a Tenergy representative via e-mail at sales@tenergy.com, phone at 510.687.0388, or online at www.TenergyBattery.com.

Endnotes

¹ Butler, Ron. "Managing the lithium (ion) battery fire risk." *Industrial Fire Journal*. Hemming Group Ltd., 23 July 2013. 16 July 2016.

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⁷ "Li-Ion Quality Considerations: Batteries and Lights for the Professional Broadcast Industry." *Paguk*. PAG Ltd., 9 March 2011. Web. 17 July 2016.

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¹³ "Lithium-ion Safety Concerns." *Batteryuniversity*. Battery University, n.d. Web. 17 July 2016.

¹⁴ United Laboratories. (2012, October 8). *Safety Issues for Lithium-Ion Batteries*. Retrieved from http://www.ul.com/global/documents/newscience/whitepapers/firesafety/FS_Safety_Issues_for_Lithium-Ion_Batteries_10-12.pdf