

# The core of the matter



Without a doubt, storage systems are key to a successful energy transition. In the past months we have discussed production volumes, delivery times, supply chains and technical support comprehensively. But what about the 'inner qualities' of energy storage solutions? Are they interchangeable today, or what are the differences and features to watch out for? Although invisible from the outside, the battery cells are the core components of any battery storage system. Together with AD Huang, Head of the BYD Battery-Box business, we take a look behind the scenes of the production and shed light on what material, production processes and components make a high-quality battery.



AD Huang

a single safety incident. A key advantage of the BYD battery systems is that we produce all the components in-house. This allows for full quality control over material, production and assembling.

Another key difference is the unique chemical configuration. The positive electrode uses lithium iron phosphate (LFP), while the negative electrode uses graphite, with special additives in the electrolyte to ensure that BYD's batteries are in a superior position in terms of cycle life and safety.

The additives in the electrolyte mainly include EC/EMC/DMC/DEC/VC, etc., and different performance requirements of the battery can be achieved through different proportions of the above additives. For example, by increasing the content of VC in the electrolyte formula, the quality of film formation is improved to optimize the SEI film and improve the cycle life of the battery.

**PES: How exactly does this chemical configuration add to the safety of the battery?**

**ADH:** The structure of lithium iron phosphate (LFP) is extremely stable, and the deintercalation and intercalation of lithium ions have little effect on it. Lithium iron phosphate also has good thermal stability and does not release oxygen at high temperatures. This makes it an excellent choice for energy storage products, as it has superior safety when compared with other materials, such as ternary materials and lithium cobalt oxide materials.

The iron-lithium system used in BYD's graphite has a small expansion degree, and the electrolyte uses a medium-high temperature electrolyte with a high decomposition temperature, making it better suited to high-temperature environments. Additionally, lithium iron phosphate has high thermal stability and a stable structure, making it a reliable and safe choice for energy storage systems. Overall,

**PES: With the need for battery storage systems the market landscape has grown. What are the most important differences that buyers should take into account?**

**AD Huang:** When purchasing a battery storage system, buyers should consider factors such as manufacturer track record, the power output, warranty, safety, and compatibility of the system. On paper, most of the solutions on the market may look very similar, so the manufacturer's experience in your specific use case may be the difference between a successful project and many weeks of troubleshooting.

However, it is also important to consider the battery cell itself, as the core component of

the system. The challenge here is, that with so many brands the buyers don't even have the insight into what battery cells the storage systems brand is using. This is information I would recommend to always ask for, because the battery cells are not only key to the performance but also an important feature for the battery safety.

**PES: You are touching on a hot topic here. We had several safety incidents last year with battery systems. As far as I know BYD batteries were never involved. What is the reason?**

**ADH:** You are correct. There are more than 400,000 Battery-Box systems installed in the market and there hasn't been a report about





these factors contribute to the excellent safety record of BYD's Battery-Box systems.

**PES:** In addition to the chemical component, are there additional materials that support battery safety?

**ADH:** Yes of course. The casing, for example, is very important too. A correctly applied high quality aluminum casing, for example, provides a strong corrosion resistance, a high stability and resistance to environmental challenges.

Additionally, it offers good ductility, high heat dissipation, and is lightweight, making it an ideal material for use in battery systems. The non-magnetic property of aluminum also reduces polarization of the battery.

Moreover, it is recyclable, environmentally friendly and has stable chemical properties, making it a perfect choice for battery storage systems. Therefore, understanding the cell format and type of casing can be crucial in ensuring the safety and longevity of the system.

**PES:** You mentioned the correct application, so I assume the design and production process also plays an important role.

**ADH:** The battery production process is indeed a crucial factor in ensuring the safety and quality of the final product. BYD's battery production process is highly automated, and it involves several key steps that are closely monitored to ensure high quality standards.

The most critical step in the process is the coating quality of the front section. This involves ensuring that the pole piece is even and smooth, with no defects such as material drop, lack of material, scratches, or cracks.

The tab must also have a smooth surface and no wrinkles. Additionally, the length of the tab and FTT welding position must be carefully controlled to ensure proper function.

The subsequent formation process and formation restraint fixture are also important steps in the production process.

**PES:** Can you describe what the production process looks like and what factors are particularly important?

**ADH:** In terms of the actual production steps, the process involves coating, rolling, slitting, die cutting, winding, hot pressing, assembly, helium inspection, curing, and liquid injection with a specific angle at which the ear is bent. The following stage includes infiltration, formation, high-temperature aging, volume separation, DCIR measurement, and more.

To ensure a high-quality product, all raw materials are precisely configured in a certain proportion for production and R&D. Some key aspects that are important to watch during the production process include: process control, temperature control, and other conditions that must be closely monitored.

For example, in the front section, controlling the pole piece parameters is critical, while in the middle section, ensuring uniformity of the lugs, pole core thickness, and welding parameters are important. In the rear stage, the restraint amount, liquid injection amount, chemical composition, and working steps must be carefully controlled as well.

**PES:** How do the materials and production processes influence the lifespan of the battery?

**ADH:** The BYD battery system has a longer lifespan compared to other battery systems. One of the reasons for this, is the actual

technology used inside the cells, as lithium iron phosphate has a stable structure, and the intercalation and deintercalation of lithium ions have little effect on it.

However, the most important difference comes from how the cells are designed and produced. Consistency and uniformity in the production process, proper material selection, scientific proportion configuration, and strict quality control throughout the production process are all critical factors in ensuring the long lifespan of the battery.

**PES:** BYD always invested in advancing LFP, for both energy storage systems and for the automotive sector, even when the majority of car manufacturers were focusing on alternative technologies. What is the reason?

**ADH:** BYD's choice to invest in advancing LFP technology for energy storage and automotive sectors was not only due to the safety of lithium iron phosphate batteries, but also because it is a more sustainable and environmentally friendly solution.

The production of LFP batteries consumes fewer natural resources and does not require cobalt, which is often associated with unethical and environmentally damaging mining practices.

In addition to being more sustainable, LFP batteries also have advantages, such as faster charging and longer lifespan. These benefits have allowed BYD to focus its efforts on pushing the limits of what the technology is capable of, leading to advancements in energy storage and electric vehicle technology.

**PES:** Does the vertical integration also play a role with regards to the quality?

**ADH:** BYD's vertical integration puts them in a unique position as it can connect, in the same organization, market intelligence from the end use of the product to design and manufacture of the most basic elements of a system, and even the raw material extraction.

This not only provides opportunities to achieve process efficiencies but also respond to market needs in the most agile way.

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