

Burning/Exploding E-bike Batteries can be Largely Prevented by Design Changes of the Battery Management Systems (BMSs)

E-bike Batteries are dangerous when not protected against transients AND have no self-test – low-end Chinese battery management systems are the main culprits.

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E-bike Battery fires can become a thing of the past, but not spontaneously. Bottom-up will work: media alert consumers; consumers talk to dealers; their suppliers get the safety message & respond.”

*James Post - battery expert
ECOpro Technology BV*

Technology BV, led by Dutch battery expert [James Post](#), has unveiled a state-of-the-art solution to combat the rising number of e-bike battery fires and explosions. Along with his team of electronic design professionals, he has developed a remedy that can effectively prevent the majority of such incidents.

They identified the root causes and also developed and shared the solution in [Bike Europe](#), the world's foremost e-bike magazine. Following a visit to China Cycle in Shanghai last month, it became apparent that low-end Chinese battery (management system) manufacturers were not inclined to incorporate this remedy into their designs

voluntarily; even when it costs just a few dollars.

The causes of the e-bike battery unsafety

Irresponsible manufacturers save by excluding essential safety components such as "Transient Voltage Suppressors" from battery management systems (BMS). However, this can have disastrous consequences as transient voltages may harm the safety mechanism of the BMS, resulting in the failure to switch off the battery during unsafe situations. Furthermore, no self-test mechanism is present (another cost-saving measure), which means that if the BMS becomes damaged, it goes unnoticed. This combination of no protection and no self-test is extremely hazardous.

The problem in China is huge

The Chinese government mandated the replacement of lead-acid batteries with lithium-ion batteries, which is a commendable step toward environmental protection. However, since the implementation of this change, there has been a surge of over 1,000 e-bike battery fires and explosions each month:

https://www.theepochtimes.com/chinas-300-million-e-bikes-cause-alarming-number-of-fires_4051550.html

Nine deaths in 5 months in New York City were caused by e-bike batteries

Although the issue is most prevalent in China, it is not exclusive to that country. The vast majority of e-bike batteries in China use low-end Chinese BMS without adequate transient protection and self-test, exacerbating the problem. In just the first five months of 2023, nine deaths related to e-bike battery fires were reported in New York City alone

<https://nypost.com/2023/06/03/e-bike-battery-fires-this-year-have-killed-more-in-nyc-than-in-2022-fdny/>

A recent article by The New York Times sheds light on this grim reality:

<https://www.nytimes.com/2023/04/10/nyregion/e-bike-fire-queens-fatal.html>

The solution [to return to safety]

A fully documented solution, including schematics, is available in Bike Europe, an esteemed (e)bike trade magazine, written by James Post and his team. The article is tailored to electronic engineers who can implement the necessary changes to improve e-bike battery safety easily:

<https://www.bike-eu.com/45057/how-to-fix-e-bike-battery-safety-and-prevent-e-bike-battery-fires>

These resources are critical to helping the industry adopt the necessary safety measures and prevent future e-bike battery fires and explosions.

Similarly, a less technical version of the solution is available to the public at large through a LinkedIn article: <https://www.linkedin.com/pulse/e-bike-battery-firesexplosions-can-largely-avoided-includes-post/>

Safe Battery Management Systems are Affordable!

Upgrading an unsafe Battery Management System to a well-protected design with a self-test can cost as little as \$3.50 in high volumes. While this may seem trivial, Chinese manufacturers of low-end BMSs are often reluctant to make the necessary changes, fearing it would hurt their



Electronics-industry veteran since 1975 - James Post is an out-of-the-box thinker, creating innovative solutions for everyday problems

competitive position. As a result, a top-down approach to remedying this issue has proven ineffective.

A Strategy to Encourage the Upgrade of Unsafe Battery Management Systems

To address this issue, it is important for e-bike consumers to convey their desire for change to dealers who, in turn, can approach importers. This will eventually force suppliers to take action. In discussions with importers, it has become apparent that they are willing to pay a few extra dollars to eliminate this problem once and for all. While this approach may offer a long-term solution to the problem, it is important to acknowledge that it may take some time to implement.

It is crucial to reinforce that the primary cause of concern lies with low-end Chinese Battery Management Systems. The root of the issue stems from some companies' decision to prioritize cost savings over safety. Given that copying designs from other companies is commonplace, many of these copycat manufacturers are unaware of the potential hazards associated with their products and may not even fully understand the functions of a BMS. In contrast, Western electronic designers are less likely to overlook critical safety measures, such as protection against damage by transient voltages. Such omissions would be considered a grave mistake by their superiors and not viewed as a smart cost-cutting strategy. Professional Chinese companies, much like their Western counterparts, generally support this initiative to improve battery safety and mitigate the negative reputation that the sector has received.

Public concern: How to recognize and fix a potentially unsafe e-bike battery

As this information becomes public, some e-bike consumers may become concerned about the safety of their batteries. It is important to convey that upgrading to a well-protected BMS system with self-test capabilities can significantly reduce the risk of fires and explosions. That is, when one owns a possibly unsafe battery. Generally, e-bike batteries equipped with three or more pins on the discharge connector are less prone to safety risks as they belong to a higher price category.

In areas where there is strong demand for such upgrades, we are already preparing training modules to assist dealers in recognizing and replacing unsafe BMSs for customers who are unwilling to take risks. However, most e-bike owners who are aware of potential safety hazards associated with their batteries will likely choose to avoid charging their batteries unattended or in locations that pose a fire risk, such as inside a home.

Power banks

Many laptop power banks available today, especially those manufactured by Chinese vendors, are designed to minimize costs and may compromise on safety features. In response to this issue, James Post and his team have developed a safe yet affordable [laptop power bank](#) that

comes with a 5-year pro-rata warranty. They have launched a crowdfunding campaign to support the production of these power banks: <https://www.indiegogo.com/projects/safest-longest-life-affordable-laptop-power-bank/x/28889560#/> Interested readers can take advantage of highly attractive Super-Early-Bird deals until June 18.

For further information please contact james.post@ecopro.technology

James Post, a veteran technologist, specialized in power electronics and batteries. He designs concepts for sustainable, long-life products. He is not afraid to think far out of the box and is known to never give up until a problem becomes a solution.

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