

# Packaging for Electric Vehicle Battery Recycling - Thinking Inside the Box - By Henrik Bengtsson and Tor Fröjd (June 2023)

**Without a doubt, we are facing an environmental crisis. Though given ambitious targets set by the EU, electric vehicle (EV) production has recently sky-rocketed in Europe. However, with limited resources, companies will soon be struggling with producing EVs at the pace they are demanded. Part of the answer to this challenge is spelled: recycling.**

As an effort to reduce the environmental impact, the conclusion from recent years' transport reports is clear: the demand for EVs has grown and will continue to grow, at an exponential pace. At the same time, the source of the necessary material is limited which calls for efficient resource handling. Therefore, a popular solution is to recycle EV batteries - a process which as of today remains undeveloped in Europe.

Since transports of EV batteries handle dangerous goods, they require safety precautions to meet legal requirements. Today, there have been efforts made to develop packaging solutions. However, these solutions tend to be over-engineered with safety features that are excessive for the majority of batteries, resulting in high costs. Additionally, the packaging developers have put their emphasis on the safety aspect, setting logistical efficiency aside. The result is expensive, bulky boxes of varying sizes. While this may be a safe solution, it describes an operational nightmare for battery recyclers. Therefore, a relevant question for a recycler to ask is:

*“What if you could offer a standardized solution that efficiently handles the batteries, and puts you in control of the*

*supply chain? And what financial benefits can it lead to?”*

To start with, for a standardized packaging solution to be beneficial, it requires stagnated product innovation, where a dominant design emerges. And as the EV market becomes more mature, this describes the current situation well. Next to explore is the packaging size. While a large packaging solution may address the entire market, it might end up shipping a lot of air. If a recycler decides to use this kind of solution, they must enable efficient processes - ensuring high volume. A small box, however, addresses a smaller market share with less variation in size. The solution is more niched and addresses the intended batteries more precisely. Here, it is important for the recycler to ensure they fulfill the customers' needs and instead have effective processes. The decision for size is hence a tradeoff that has to be aligned with the recycler's overall business strategy.

In addition to deciding the measurements of the packaging, there are several other decisions that a recycler has to make. Material, flexibility, and automation compatibility are all important strategic decisions that can be used to further address the target customer.

With a strategically aligned standardized packaging solution, recyclers can improve the efficiency of their supply chains, as well as deliver an increased value to their customers. And even more important, they can reduce their environmental impact - just by thinking inside the box.

This popular scientific article has been derived from the master thesis: *Developing the Electric Vehicle Battery Recycling Supply Chain*, written by Henrik Bengtsson and Tor Fröjd (2023).