

Jungheinrich expert interview.

Re-used lithium-ion batteries: the missing piece of the puzzle in small to medium-sized warehouses.



 **JUNGHEINRICH**

Lithium-ion batteries

Mature and proven.

Often, even small changes in the warehouse can lead to huge improvements in efficiency. The best example of this: battery technology. Today, we want to discover whether lithium-ion batteries are truly the remedy everyone claims they are and if they remain competitive when re-used, potentially being the first choice in certain scenarios. With these questions – and many more – we consult someone who's bound to have the answers: Michael von Forstner, Director Product Program Li-Ion Life Cycle Management & Assistance Products at Jungheinrich. Read our engaging conversation about the performance, sustainability, costs and reliability of re-used lithium-ion batteries.

OUR EXPERT IN LITHIUM-ION TECHNOLOGY AT JUNGHEINRICH: MICHAEL VON FORSTNER



Michael von Forstner, Director Product Program Li-Ion Life Cycle Management & Assistance Products at Jungheinrich

▶ **Mr von Forstner, we would like to talk to you about the benefits of re-used lithium-ion batteries in our used trucks – particularly compared with lead-acid batteries. Lithium-ion technology is relatively new. What is the current situation?**

Michael von Forstner:

Lithium-ion technology has reached absolute maturity: we already have over ten years of successful experience. In new business, more than half of all customers now rely on lithium-ion technology. The lithium-ion business continues to grow strongly, with lithium-ion technology being the new standard!

▶ **If I am interested in a used forklift truck with a lithium-ion battery: how can I be sure that the truck and the battery meet my requirements?**

Our used trucks usually come directly from the reconditioning plant in Dresden. Here, each incoming truck is thoroughly checked, dismantled, meticulously reconditioned and reassembled. In the end, you can hardly tell the difference between a new and a reconditioned truck. And this also applies to the batteries: the team inspects each battery in detail down to the cell level and decides what action to take. Some batteries are still fully functional and can be reinstalled. For others, we delve deeper: we replace cells, possibly the cabling, maybe even the electronics.

▶ **And when you're finished: is such a battery in the same condition as a new one?**

With our re-used lithium-ion batteries, we guarantee an energy capacity of at least 80% compared with a new battery. And that's really the only difference between a new and a re-used lithium-ion battery. There is no difference in charging behaviour or power output.

► **So, re-used lithium-ion batteries are perfectly adequate for many applications?**

Absolutely. Some customers employ three-shift operation throughout the year. A used truck is not the right choice for them. But for light use or when there is sufficient time for booster charging, a new battery offers no advantage over a re-used one – on the contrary: financially speaking, the re-used lithium-ion battery offers added value.

Maintenance work? No longer an issue.

► **Does a re-used lithium-ion battery require special maintenance – particularly when compared with a traditional lead-acid battery?**

Quite the opposite. Traditional lead-acid batteries need to be regularly refilled with distilled water. Usually, you have to drive to a central filling system, open everything, connect it, fill it up and then close it again – this can take ten minutes. It doesn't seem like much, but it adds up. And it becomes problematic when the maintenance cycles are not observed. If that happens, the water level drops and the battery lifespan suffers greatly. This is not the case with lithium-ion batteries. They are completely maintenance free!

► **That saves time ...**

Not only that! It is also safer. Maintaining a lead-acid battery includes regularly checking the contact points and cleaning the terminals. If there are cable breaks or short circuits, this can, in the worst-case scenario, result in a fire. This is not a concern with lithium-ion batteries; such situations cannot occur.

► **That's surprising. A commonly voiced concern, however, is that lithium-ion batteries in particular can catch fire if they fail ...**

You have to bear in mind: not all lithium-ion batteries are the same. At Jungheinrich, we employ three protective mechanisms. Firstly: each battery is encased in a robust and

secure steel housing. Secondly: if the sensors in the battery management system indicate an issue with a battery cell, the entire battery shuts down immediately. And thirdly: an additional safety mechanism immediately triggers if excessive currents are detected. But the really crucial thing is: we use batteries with a different chemical composition than most electric vehicles, namely lithium iron phosphate (LFP).

They have the distinct advantage of a significantly lower risk of fire. In addition, Our LFP batteries do not contain cobalt. This is a genuine advantage when it comes to sustainability.

More efficient, more effective, more sustainable.

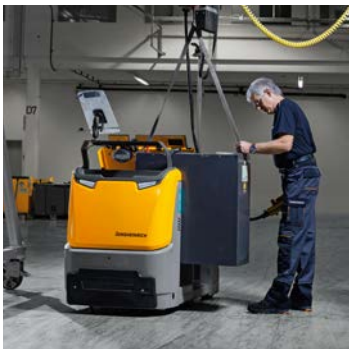
► **Let's discuss the most crucial topic for every warehouse manager: how does the efficiency stack up?**

Every component has an efficiency rate – including batteries. And the efficiency of lithium-ion technology is around 20% higher than that of lead-acid batteries. This means that we save 20% energy with lithium-ion batteries compared with lead-acid batteries.

► **Does this hold true regardless of whether the lithium-ion battery is new or re-used?**

Exactly. With a lithium-ion battery, less energy is generally lost compared with a lead-acid battery – whether your battery is new or re-used by us. And that also means: if you need to put less energy in, you also produce fewer emissions. So, you are operating more sustainably.

This is where the experts come in: careful removal of the lithium-ion battery from a used truck.





// When you choose a used truck with a lithium-ion battery, you also benefit from lower energy consumption and, consequently, lower emissions. //

► **Let's stay on sustainability for a moment. Re-used batteries certainly perform better than new ones, don't they?**

Absolutely! When reconditioning a used truck, around 80 % less CO₂ is emitted compared with manufacturing a new truck. This also applies to a re-used lithium-ion battery: many of its components can be reused since only critical or defective parts are replaced. So, CO₂ emissions are reduced even further if you choose a used truck with a re-used lithium-ion battery.

► **To summarise: lithium-ion batteries excel in their maintenance-free operation, safety and higher level of efficiency. Another immediate observation is that they are significantly smaller. What advantage does this offer our customers?**

The energy density of lithium-ion batteries is considerably higher. This means that the battery has the same capacity but now at only a third of the size. This enables our designers to rethink everything completely. In narrow aisles, every centimetre counts. A smaller truck requires less space. So we can make the aisles narrower and use the space gained for racking. As a customer, you can therefore store more goods in the same space – that's invaluable!

New possibilities in warehouse design.

► **How does charging re-used lithium-ion batteries work? As a customer, do I need a new charging infrastructure?**

There is no generalised approach here. Smaller trucks have an integrated charger. For larger trucks, you will need a stationary charger. It works in a similar way to lead-acid batteries – however, the stationary charger has an additional interface to the battery. But when you buy a forklift truck, the charger is always included.

The advantage is primarily in the charging behaviour: If possible, you should drive a truck with a lead-acid battery until it is empty. It then needs to be connected to the charging column for several hours until fully charged again. It cannot be used during this time. A truck with a lithium-ion battery gives you much more flexibility. You can charge it when it suits you. It usually takes about an hour to fully charge. This can even be done during the lunch break.

A closer look at a used battery stack: only cells that pass all tests can be reused.





You should choose re-used lithium-ion batteries if...

▶ **Let's get specific again. How do I find out which trucks are right for my warehouse needs?**

Most of our customers have three questions. Firstly: new or used? Unless you run a large fleet in three-shift operation, used trucks can be a really smart solution for you. Then: what do I need? For this, you should seek precise advice from us. And finally, the third question: lithium-ion or lead-acid battery? I would now always choose lithium-ion technology. The advantages in daily handling are simply immense: there is no maintenance, you can charge

whenever and as much as you want, you save electricity and therefore costs, and the lithium-ion batteries are safer and last longer. In addition, we give you a two-year warranty!

▶ **Mr von Forstner, thank you very much for talking with us!**

