



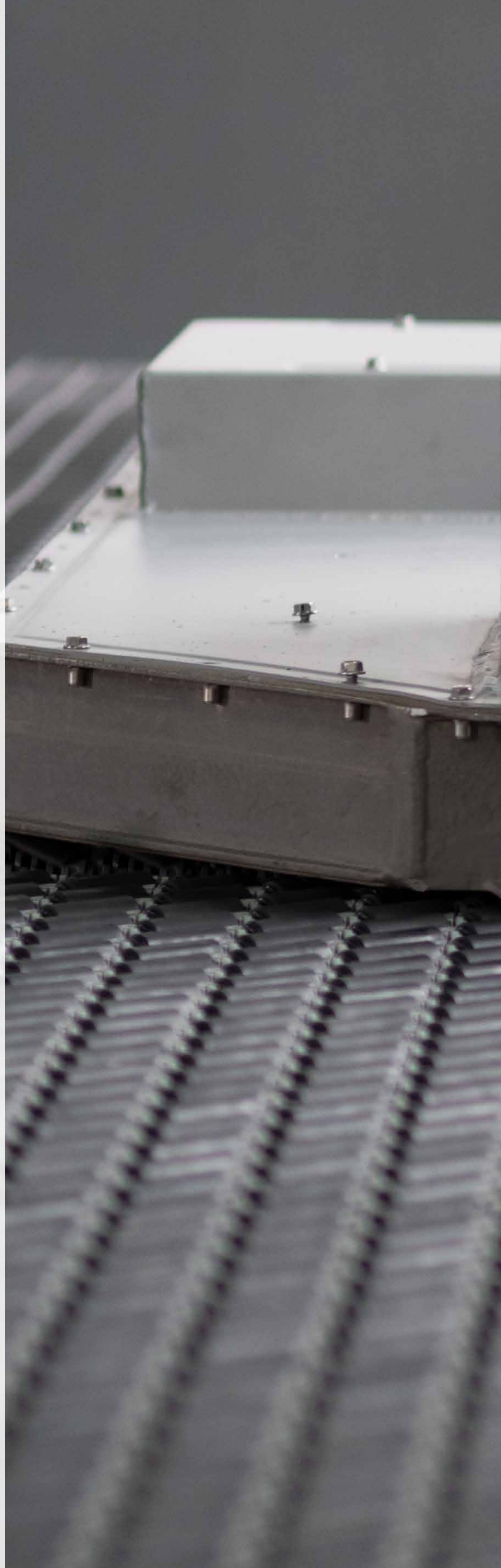
PREPARED FOR YOUR FUTURE

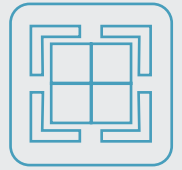
THE PRINCIPLES
BEHIND INTRALOX'S
EV BATTERY-HANDLING
SOLUTIONS



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OUR EXPERTISE. YOUR FUTURE.

At Intralox, we've drawn upon our extensive experience across many industries—including tire and automotive—to help shape the future of electric vehicle (EV) battery handling. We developed this guidebook both to share what we've learned and to encourage your growth and success in this exploding market.

Whether you're converting traditional automotive lines to support EV processes, adding new lines, or building an operation from the ground up, we believe we've identified the principles essential to your success—and we used the same ones to design our solutions. They are:

- **Flexibility**
- **Reliability**
- **Accumulation**
- **Testing**

For this guide, we asked four of our experts to discuss the principle in which they specialize and to explain how it brings value to EV battery operations.

These specialists are deeply familiar with your industry's conveyance challenges: Extreme capacity requirements. Wildly varying product sizes. Corrosive materials. Frequent, complicated maintenance.

What they said in short: Our solutions handle them all, enabling production scalability within your existing space.

They also stated the value of continued input from and expertise of you, our partners. Our best solutions are the ones created with you to solve real challenges you're facing.

Please contact us if you have any questions, concerns, or ideas, and let's keep inventing the future together.

—The Intralox EV Team



Flexibility with Yan Liang



Yan Liang, Business Development Supervisor at Intralox, has 13 years of expertise across the tire, container, food, and packaged goods industries.

Compared to those industries, the EV industry is still in its infancy. It's also growing at an explosive rate. That combination invites frequent product changes. And though there are only three primary EV battery cell shapes, their modules and packs come in many sizes and configurations—with more likely to come.

“In an industry as dynamic as EV, your operation has to anticipate products with different specifications,” Liang says. “Flexibility is all about the ability to adjust your production line to new products.”

Intralox® solutions are flexible and specifically designed with high roller density to accommodate EV products’ rapidly changing dimensions. Unless your operation uses similarly flexible technology, the nature of these products will continue to create challenges along your entire line.





Liang says that a flexible operation includes:

1. **Expert handling of diverse products while maintaining ideal line speeds**
2. **Swift, effortless product changeovers with minimal manual intervention**
3. **Adaptable production processes, allowing for new integrations as products change**

To enhance flexibility in your EV battery-handling operation, Liang suggests concentrating on:

- **Variable conveyor speeds:** Ensure conveyor designs are optimized to run at different speeds. This adaptability enables seamless integration of various processes, allowing you to accommodate diverse product sizes and assembly demands.
- **Streamlined changeovers:** Introduce user-friendly changeover methods. Design the production line with modular components and standardized connections. This eases and accelerates transitions between battery types or manufacturing steps, minimizing downtime.
- **Automation integration:** Incorporate automation solutions into the production line. These systems can handle repetitive tasks and offer precise process control. They also facilitate quick changes when switching between battery variants, improving efficiency and enhancing adaptability to changing production needs.





Reliability with Joel Picard



Joel Picard has been a Global Account Team Leader at Intralox in the tire, automotive, and industrial sectors for over a decade.

“Reliability is important in all production processes,” Picard says. “But for handling delicate and expensive EV batteries, it matters even more.”

In the context of EV battery handling, reliability means safe runs, robust production processes, and quick recovery when something goes wrong. Buffer space becomes crucial in ensuring a continuous production flow and preventing disruptions.

“When you want to start producing on a larger scale, you have to have a safe and strong production process,” Picard says. “Reliability should be a key focus. The goal is to have EV batteries move seamlessly along the production line.”

Rather than add floor space or conveyors, EV battery productions grow successfully by focusing on throughput. Intralox’s reliable solutions decrease downtime with durable materials and construction, positive drive systems that eliminate mistracking, and easily serviceable modular construction.



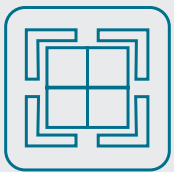


Picard says that a reliable production process includes:

1. **Safe runs, effortless quality control, and effective employee safety**
2. **Adaptability for technology changes, increased throughput, and consistent product quality**
3. **Cost savings due to minimized waste, lower energy consumption, and accelerated time to market**

To enhance reliability in your EV battery-handling processes, Picard suggests concentrating on:

- **Smooth flow:** Optimizing workstation arrangements and processes streamlines operations, minimizes interruptions, and reduces downtime. In turn, this contributes to smoother and more dependable production.
- **Continuous optimization:** Consistently analyzing and refining the entire production process allows for swift adaptation to changes. You can be resilient while ultimately reinforcing reliability.
- **Buffer space:** Incorporating designated storage areas along the production line provides flexibility and prevents minor delays from escalating. This also significantly contributes to maintaining a dependable, consistent production flow.





Accumulation with Christoph Lemm



Christoph Lemm, Engineering Specialist, uses his 25 years of material-handling expertise with Intralox to craft EV battery solutions with our industrial team.

“Effective accumulation not only minimizes downtime but also prevents potential damage,” Lemm says. “EV batteries are fragile, so avoiding contact between them is essential.”

When one piece of equipment has completed its task but the next machine in the production line is unavailable, products need a place to gather and wait.

“You want the other machines to continue,” Lemm says, “so we build a ‘parking space’ between them to collect batteries until the next machine is ready.”

Intralox’s solutions use transformative technology to accumulate your delicate, high-voltage lithium-ion battery packs and modules completely touchlessly. Each product is isolated to protect it from damage.



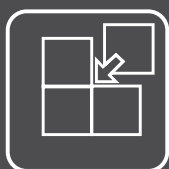


Lemm says that successful accumulation includes:

1. **Consistent product flow that improves throughput**
2. **Increased line efficiency due to optimal resource use, easing overall flow**
3. **Consistent product quality thanks to smoother operations with no-touch accumulation**

To enhance accumulation in your EV battery-handling operation, Lemm suggests concentrating on:

- **Choosing a no-touch method:** Make sure EV batteries aren't physically touched, as they're sensitive and easily damaged. Adopting a no-touch approach safeguards their integrity, preventing any potential damage from even minor contact.
- **Integrating automation:** Simplify otherwise complex productions with automated buffers and accumulation areas. You'll improve overall production control, operation coordination, and efficiency.
- **Minimizing upstream/downstream dependence:** Include buffers when managing resource allocation to prevent burdening specific line sections. Allowing for pauses or adjustments without stopping the entire line is especially important when conveying different battery pack designs, shapes, and contact points.





Testing with Enrico Carca



As an Equipment Application Engineer at Intralox, Enrico Carca is closely involved in testing new development projects for EV battery handling.

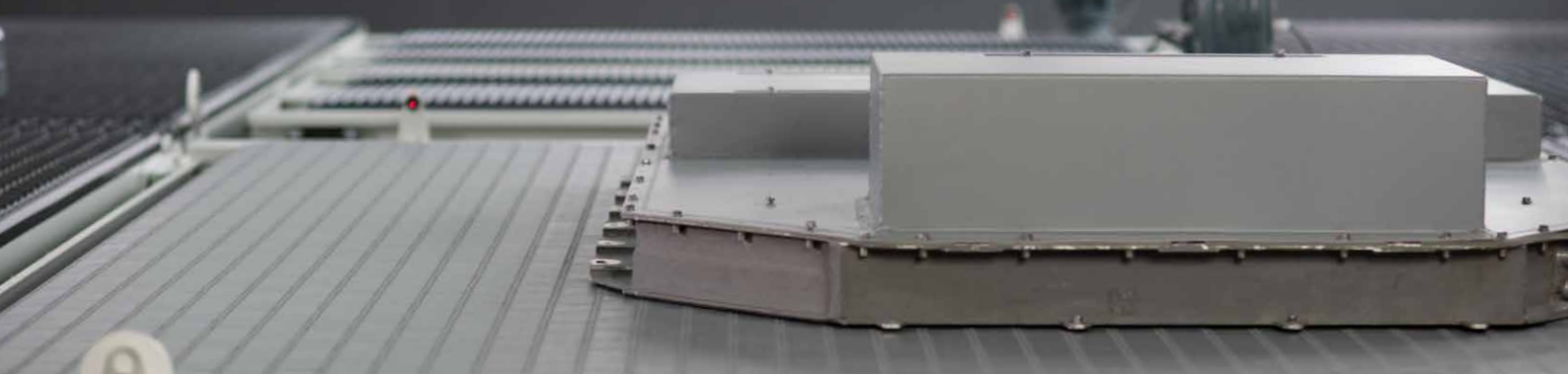
“Testing clears design uncertainties, streamlines solution selection, and brings cost savings and production safety,” Carca says.

Because EV batteries are still evolving as a product, it’s crucial to thoroughly test whether a solution meets all requirements before your operation handles new products.

At Intralox, we’ve set up a loop to test solutions relevant to your specific applications. Whether you need to achieve gentle transfers, no-touch accumulation, sorting and merging, or anything in between—the testing loop shows us how items of any size will behave during production.

“Our testing loop lets us mimic real situations,” Carca says. “Customers get trustworthy feedback and can make sure their batteries work well in real-life production.”



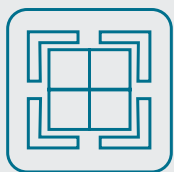


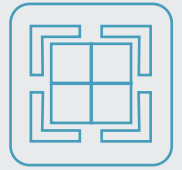
Carca says that successful testing includes:

1. **Anticipating hidden issues to ensure smoother operations**
2. **Selecting the best technologies to boost efficiency and reduce bottlenecks**
3. **Preventing costly investments in the wrong solutions to avoid productivity hurdles**

To enhance testing for new development projects in EV battery handling, Carca recommends considering:

- **Test loops over simulation:** While simulation software can resemble the production process, actual test loops offer more precise information and feedback. This enhances your understanding of real-world scenarios.
- **Collaboration across disciplines:** Encourage cross-functional collaboration among engineering, design, and production teams. By uniting diverse expertise, you ensure a good assessment of the project's feasibility, design compatibility, and practicality.
- **Prioritization of iterative testing:** Embrace repetition so you can work on your prototypes and concepts based on real-world testing outcomes. This feedback loop helps you make improvements and reduce unforeseen challenges during full-scale production.





Your EV Battery-handling Journey

This guidebook is meant to be a brief overview—an outline to help you develop strong, future-ready operations. Our team of experts explored four key areas to help you get started: flexibility, reliability, accumulation, and testing.

Though we discussed these topics as separate concepts, your EV battery-handling operation's success will depend on using them in combination. Each supports the others, so if you incorporate all four as you design and build your system, you can be confident that it'll meet any challenge the market presents.

As you begin—or continue—your journey, our global, industry-specific experts are available to help you through every stage of your project. Your customers depend on the safety and availability of your products, so we ensure you can depend on us by offering a level of support you won't find anywhere else.

Whether you need to fine-tune your existing EV battery-production processes or begin a complete transformation, we're ready to collaborate.

Let's Get Started