



BETTER DECISIONS IN AUTOMATION FOR E-MOBILITY

Supercharging battery production

The automotive industry is gearing up for a future dominated by electric vehicles. ABB Review sat down with B&R's electromobility expert, Ronny Guber, to learn about the important role batteries will play in that future and how B&R automation can significantly improve battery production volumes.

AR Ronny, how does B&R tie into ABB and what is your role in B&R?

RG You'll remember ABB acquired B&R in 2017 to round out the company's automation portfolio. B&R's solutions and services in programmable logic controllers (PLCs), industrial PCs, and servo motion-based machine and factory automation complement ABB's industrial automation offering very well. At B&R, I am the industry segment manager for e-mobility, so our topic for today – the technology for electric-vehicle battery production – falls under my remit.

AR Electric vehicles seem to be taking off now. Is it safe to say the electromobility trend is going strong?

RG Absolutely. The market share of electric vehicles has continued to grow exponentially, even during the global downturn in overall car sales due to the pandemic. Current forecasts predict that by 2036, electric passenger vehicles will surpass internal combustion engine vehicles to make up the majority of all car sales worldwide →01.

AR What's driving that trend?



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RG Consumers are increasingly motivated by sustainability. Many people are ready to make their next car an electric one and their decision hinges on two main factors: price and range. In other words: How much more do I have to pay for an electric car than a conventional one and how far can I go before I need to start looking for a charging station. These happen to be two areas where batteries play a decisive role →02.

AR How so?

RG Batteries account for around a third of an electric vehicle's cost, so producing them efficiently will be crucial to making the price tags more attractive for consumers. And to improve vehicle range,

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Battery producers need to eliminate stop-and-go traffic between processing stations and achieve much faster cycle times.

you need to get the latest battery technology to market as quickly as possible. You also have to adhere to manufacturing tolerances and clean-room conditions that are much more sensitive than for traditional car parts.

AR With electric vehicle sales growing exponentially, will battery production be able to keep up?

RG That's the million-dollar question. And to a large degree, the answer will come down to how well those factories are automated. To reach the necessary capacity and cost efficiency, battery producers will need to eliminate stop-and-go traffic between processing stations and achieve cycle times that are orders of magnitude faster than traditional automotive components. The plants will need to be a continuous blur of high-speed productivity – like a battery production superhighway.

AR And automation technology can make that possible?

RG Yes, that will be the central role of automation technology – particularly intelligent transport systems. These systems allow you to keep the products on the track, so no time is wasted on unnecessary handling. Production can flow

continuously at full speed while processing steps are accomplished in motion. And when you have lightning-fast synchronization with other automation components along the track, you can get dramatic reductions in processing time at each step.

AR Can you put that in numbers?

RG By combining a track system with machine vision, for example, you can identify battery cells in 50 milliseconds as they pass by at 4 meters per second – with no external triggers, lights, or expensive cameras. That would normally take two full seconds with the product stopped, so it's a time savings of 97.5 percent. And there are many other steps in battery cell production, such as tape application, where doing them in motion brings time reductions of up to 90 percent or more.

AR So you increase overall productivity by speeding up the individual steps.

RG Exactly. Not to mention that you eliminate handoffs between transport systems – which would otherwise take nearly a minute for a set of ten cells. When you add up all those seconds and multiply it by the quantities we're talking about, it's an absolute game-changer in terms of parts per minute. But the gains are not just in speed but also in density and availability.

AR How so?

RG With an intelligent track system, you can arrange the manufacturing flow as a network of interconnected production stations. That way, you can coordinate cycle times and have fewer stations, with better utilization at each one. You can eliminate buffers and empty stretches of conveyor that take up space without adding value. By operating slower stations in parallel, you can multiply productivity without multiplying the footprint. With a networked production flow, parts are rerouted automatically around a faulty station, so small interruptions no longer have such an outsized impact on overall equipment effectiveness the way they do with a traditional linear setup.

AR What does that mean for battery production?

RG With numbers like seven times the output per line, we're seeing manufacturers replace four conventional lines with one high-speed line – that's a 75 percent reduction in floorspace. Or, to put it another way, if you have a factory that's two or three times as fast, it's basically like having two or three factories. Ultimately, what that means for battery production is a really outstanding return on investment.

AR Does B&R offer such intelligent track systems that speed the flow of production?

RG Indeed we do. We have, for example, SuperTrak and ACOPOStrak [2]. The latter's revolutionary design enables adaptive manufacturing systems and promises a new era in flexible and efficient production. ACOPOStrak's electronic diverter is – quite literally – a pivotal component of the sys-

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tem as it lets product flows diverge and converge and allows the shuttles that carry the product components to switch tracks at full speed with no compromise in productivity →03. ACOPOStrak and its diverters are easy to reconfigure as, for example, battery component production requirements change. They also add a new dimension of flexibility for implementing parallel processing, which is a critical aspect of speeding up battery cell production lines.

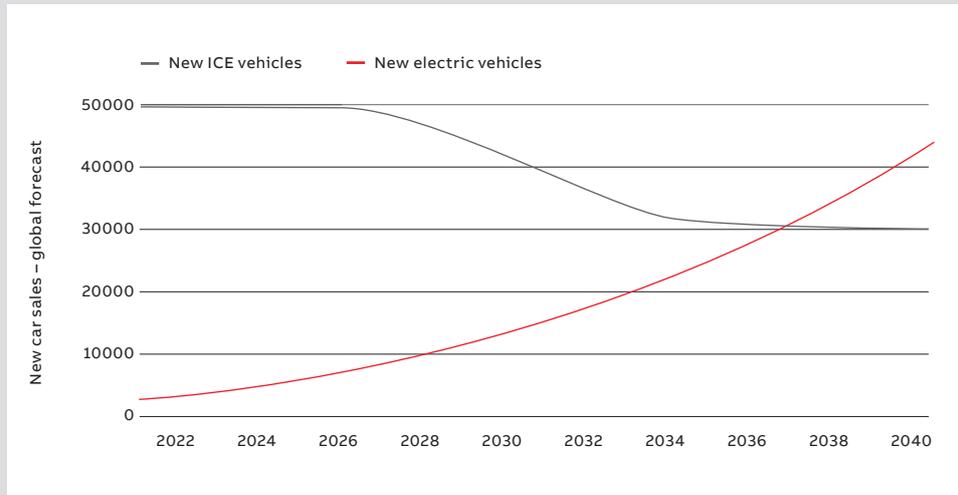
AR I heard that one of B&R's intelligent production systems uses magnetic levitation!

RG Yes, it does! This is ACOPOS 6D, where shuttles with integrated permanent magnets levitate smoothly over the surface of electromagnetic motor segments, carrying production parts [3]

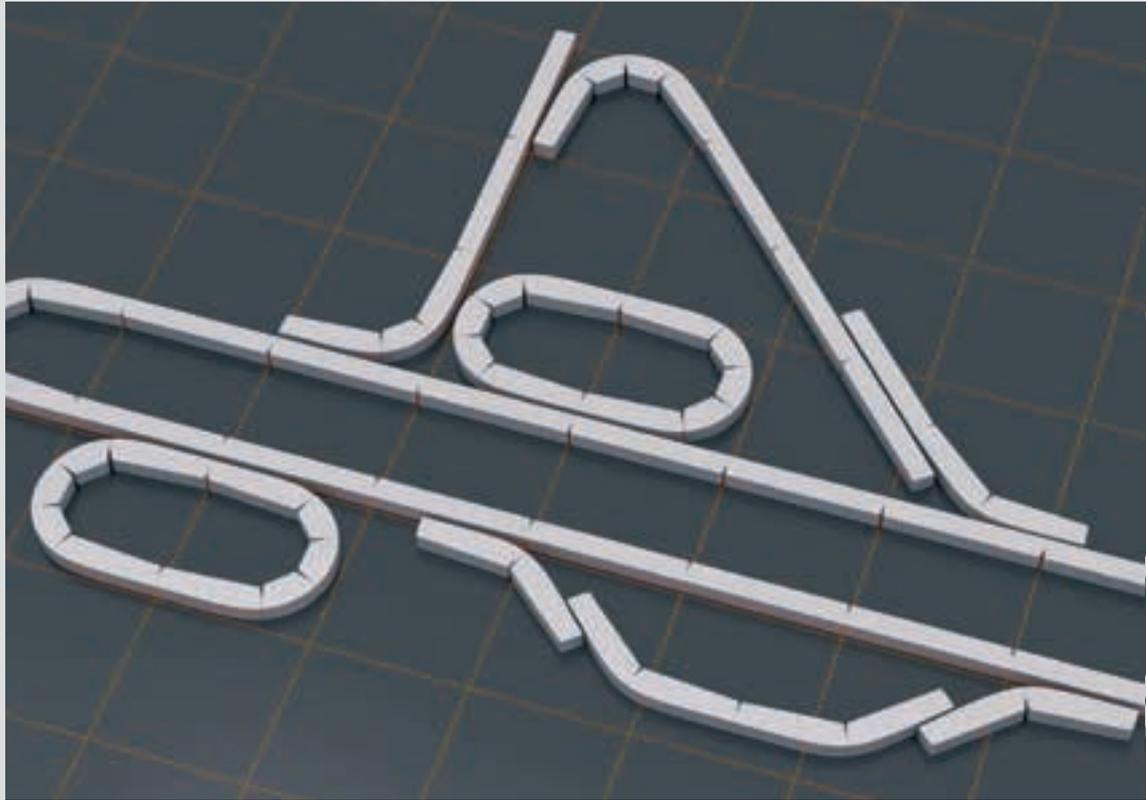
01 Forecasts predict that by 2036, electric passenger vehicles will surpass internal combustion engine (ICE) vehicles to make up the majority of new car sales worldwide [1].

02 Battery cost and capability are important considerations for those thinking of purchasing an electric vehicle.

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→04. These segments can be arranged in any configuration and the shuttles can carry up to 14.4 kg. Because magnetic levitation eliminates contact and, with it, abrasion and particle shedding, ACOPOS 6D is great for the cleanroom conditions needed for battery production. ACOPOS 6D and track systems like ACOPOStrak and SuperTrak complement each other and will be used together in many applications. Both

It's especially important to have simulation-based development, testing and virtual commissioning tools.

ACOPOStrak and ACOPOS 6D can be used for the production of batteries and battery components, but B&R has plenty of other production technology to help attain the productivity needed to meet the huge demand for batteries that will come with the mass adoption of electric vehicles.

AR You also mentioned the importance of time to market, can automation technology help there as well?

RG Absolutely. Since we're discussing designing a whole new battery production system, it's especially important to have tools for simulation-based development, testing and virtual commissioning. That way, you can compare layouts and forecast throughput long before any hardware is involved. The sooner you know what to expect, the better. Then you can move rapidly from conceptual design to deploying an optimized system without risking expensive delays and redesigns.

AR And in terms of software development time?

RG When your goal is to ramp up production as quickly as possible, you need multiple development teams working in tandem. So it's a huge benefit to have a universal engineering environment that supports concurrent development. And if those developers can set up basic machine functions with out-of-the-box software components, they're able to focus their time and energy on implementing the processes that are unique to battery production.

AR Sounds like quite an exciting road ahead for the automotive industry.

RG That's for sure. And what we've talked about so far has mainly focused on the production of



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— 03 ACOPOStrak allows the fast and flexible creation of high-speed production layouts.

— 04 With ACOPOS 6D, magnetically levitated shuttles move production components around at high speed.

individual battery cells. There will be even more opportunities for optimization as cell production moves closer together with the assembly of cells into packs and integration into the car. All signs say that's the way things are headed – and with B&R's full portfolio of integrated automation technology, combined with robotics and ABB automated guided vehicle expertise, we're ready to start making that future a reality today.

AR Ronny, thank you very much for the interview. •

References

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[2] C. Klingler-Deiseroth, "Intelligent transport for production lines," *ABB Review* 2/2018, pp. 68–73.

[3] D. Rovelli, "ACOPOS 6D heralds a new era of productivity," *ABB Review* 4/2021, pp. 10–15.