How Wiring Innovation Is Quietly Driving the EV Revolution

BLOG
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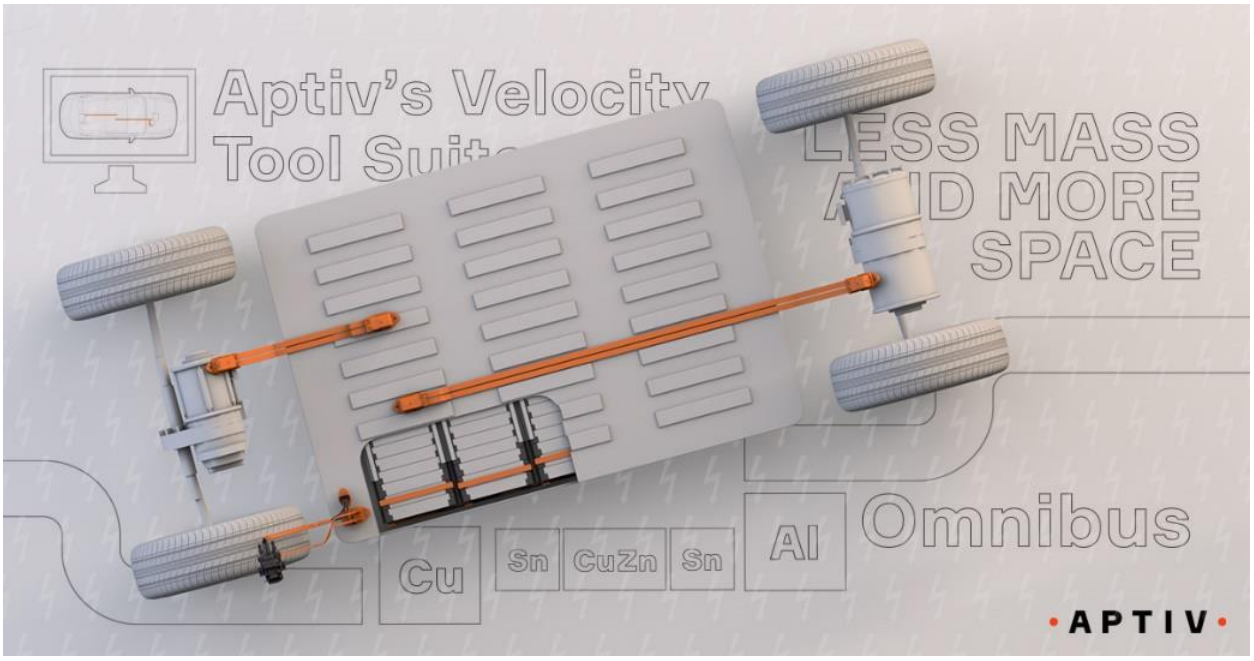

By a wide margin, the No. 1 obstacle to more widespread adoption of electric cars by American consumers is range anxiety. A study recently found that 58 percent of drivers are concerned that they will run out of power before being able to charge their electric car, with another 49 percent citing concerns about the low availability of charging stations.

Original equipment manufacturers (OEMs) are addressing this concern in two ways: creating larger batteries that allow for greater range, and creating more powerful batteries that allow for faster charging. Both approaches have challenges. Yes, batteries can get larger, but they can only get to a certain size before they become too expensive and heavy to be a viable solution.

Making batteries more powerful than today's is not simple. More powerful batteries mean replacing smaller electrical conductors with larger conductors to handle the additional current — and space is tight inside battery packs.

To accomplish either goal, OEMs need to free up enough space both inside and outside of the battery pack to allow for larger batteries — plus other components, technology and hardware. Freeing up space starts with rethinking how OEMs design and utilize every component in their respective architectures, starting with their wiring.

The unexpected hero: low-voltage wiring

Traditional wiring is not the first place one normally looks for electric vehicle (EV) innovation, but recent advancements are having a significant impact on the EV story because they're providing OEMs with two things they desperately need in their EV architectures: less mass and more space.

Aptiv's system engineers know how to reduce the number of cables and splices and how to squeeze out every millimeter of excess cable through precise optimization of the electrical distribution systems in concert with applying new technologies. Take Aptiv's recent innovations in aluminum cabling, for example. Aptiv's PACE Award-winning Selective Metal Coating technology allows OEMs to replace copper wiring with lighter aluminum cabling that is adding up to big benefits for OEMs. How big? With our aluminum cable as part of an optimized architecture, one leading EV company reduced wiring mass in its 2017 model by 10 percent and removed 150 meters of cabling. Similarly, another vehicle customer shed 11 kilograms and 400 meters of cabling from its popular 2018 truck. And yet another customer reduced the mass of the electrical distribution system on its 2018 SUV platform by 15 percent, thanks to Aptiv's optimization efforts, which eliminated 300 meters of cabling.

These numbers don't happen by accident. Aptiv's Velocity Tool Suite enables OEMs to use virtual modeling to optimize gauge size throughout a vehicle, getting components as small as possible while still allowing for the performance, reliability and power that today's electric vehicles require. Every ounce of weight and every meter of cabling eliminated ultimately add more miles to an electric vehicle's range.

The new world of busbars

Another way to make room and reduce mass? Move from round wiring to flat conductors. That's where busbars come in. Derived from the Latin world "omnibus" which translates into "for all" (as in "all the currents in a particular system"), busbars are flattened conductors that are becoming integral to EV architecture.

Today, there are up to two dozen busbars in a battery pack, and that number will rise as battery packs get larger and/or more powerful, while the space inside them remains incredibly tight.

Because these more-powerful batteries are only as good as their ability to charge quickly, we'll soon see more Aptiv busbar innovation outside the battery pack as well, routing high power from charging inlets to batteries and out to other high-power motors and devices.

Just one part of the EV puzzle

Of course, low-voltage and high-voltage wiring are only two areas where innovation is helping accelerate the development of EVs around the world. This same spirit of innovation is happening (and needs to happen) across every aspect of the electric vehicle manufacturing process.

Aptiv's system-level know-how in low-voltage and high-voltage distribution works in conjunction with every other aspect of that process to help fuel that spirit of innovation. As a result, OEMs are finding the room they need to deliver larger, more powerful batteries — and make range anxiety a thing of the past.