The Automotive Market is experiencing a renaissance of sorts and wireless power will contribute in many surprising ways!

By Neil Chaulk, CEO – Solace Power Inc.

Will this revolutionary technology be a key tool in shaping the future of the automobile?
There is a deep-rooted tendency in people to take anything new that works well and hold on to it (use it) for a very long time. This tendency is useful, in that it means we are getting the most out of any investment of energy. However, this type of behavioral “inertia” also means that innovation and disruption are not common and sometimes, we get stuck with something for longer than we would like.

This, in my view, is where the automotive world was, before 2020 and the start of the Covid 19 pandemic. The entire automotive supply chain, starting with the OEMs, that emerged in 2022 was very different. The near complete loss of sales for most OEM’s coupled with the success of Tesla forced every part of the supply chain to think deeply about staying relevant in the eyes of consumers. To make things even more challenging, conflict in the Ukraine has resulted in sharply increasing oil prices which, coupled with the drive for increased energy efficiency, has influenced a dramatically accelerated adoption of electric vehicles.

Regardless of whether we agree with the previous statements, the mobility/transportation supply chain is evolving to meet the rapidly changing needs of a consumer market. Consumers are looking for a better work-life balance and are very comfortable with technology and are aware of the potential benefits that are realized when technology is deployed carefully. This is a very “loaded” idea with big implications for the Automotive OEM’s and their supply chain partners. Automobiles will become much more of a “device”, like mobile phones, in the future. No, they are not fitting in the palm of your hand, but they will be feature-rich, configurable, energy efficient and very, very manufacturable. In fact, it is likely that in the future, the automobile will be assembled entirely by robots. These broad market demands will be supported, in part, by removing some of the cables and physical connectors that are used today in certain areas of the vehicle. Embracing a relatively new, disruptive technology such as wireless power, takes some time and we need to ask “Why aren’t wires that deliver power and data disappearing, now that wireless options are commercially available? If cables are so annoying, cumbersome, and inconvenient, why are we still tethered by them?”

Actually, there are several key reasons why physical cables and connectors are still the best default method to connect and transmit data and power. Security of supply is probably the single, most important reason. If you have a cable connected and it’s a reliable one, you will “always” receive predictable, consistent performance, within the performance limits of the specific cable, whether to ensure maximum data throughput or maximum power delivered. However, that high-performing wire comes with restrictions in mobility and other constraints that, sometimes, negatively affect the end-user or some aspect of the device life cycle. Being de-coupled and free of a physical tether can add a great deal of value in many scenarios. So, why don’t we just get rid of wires altogether?

The bottom line is that being “de-coupled”, or wireless, comes at a price, both in cost of electronics and in performance. Think in terms of data, wireless connections will be less secure in most cases and, usually, have limited bandwidth compared to using a high-performing connected medium, such as Cat 8 or fiber optic cables. For power, the outcome is very much the same. The latest technology developments are enabling power delivery at distances and in environments that were previously not possible. However, the performance, (think characteristics such as efficiency), and cost, (think cost of copper vs. cost of electronics for wireless power emitters and receivers), are always better with the physical cable and connector.

From here, we will focus on power, although it’s very common to have both (power and data) be part of any de-coupled solution. The simple answer to the questions posed at the beginning of this article, is that cables are always going to deliver better performance in terms of cost, efficiency, and the potential amount of power deliverable over a given distance. Accepting this, the next logical question becomes ‘why consider wireless power at all?’ The answer to this question is complex and best approached by addressing each contributing reason separately.

As a general comment, sometimes being tethered with a power cable create other problems that can be alleviated by a completely wireless solution. Those use cases are where wireless power companies should focus.

**Manufacturability/Assembly Problems**

Virtually 100% of complex system assembly/manufacturing is done using cables to deliver power. However, in many cases, there is limited space to run cabling or making that physical connection becomes a pain point. Often, attaching a cable to a device during the assembly process, requires a person to complete the task because of the complex motion and, to a robot, complex decision making, involved in completing that connection. Wireless connections, in many use cases, reduce cable clutter, facilitate robotic assembly and
speed up assembly, as well as maintenance and repair, processes. Additionally, these “connector-less” modules can be fully sealed and will not have connector corrosion issues.

Wireless power can also be used to reduce overall manufacturing times by testing while in motion between manufacturing steps. For example, a wirelessly powered infotainment system could be powered and undergo quality testing while moving between stations on the assembly belt. This task would be completed “in transit” while overall assembly and test time are reduced.

**Life Cycle Costs**

The total cost of ownership includes both operating and maintenance costs. To reduce those maintenance costs, for applications where the volume of issues is sufficiently high or the time sensitivity dictates immediate response, a design that allows a simple, fast sub-system replacement may make sense. Wireless power and data with physical connector-less sub-system connection, facilitates this approach, and in principle, such maintenance procedures could even be completed by the consumer.

**Wire and Connector Limitations**

Flexing cables can create failure points due to repeated bending at a specific point in the cable. Connectors that must be repeatedly connected/dis-connected can also fail after a given number of uses. While both potential problems are not that common, they do exist, which clearly represents the possibility to use wireless power as a viable alternative.

Physical wires also, in many cases, require the creation of holes in the structure to allow their passage, which often weaken structures and provide opportunities for water intrusion or other maintenance headaches.

**Use Case Enabling – Mainly Mobility, but also Adaptability**

Connectors are designed to have a limited number of mating cycles and for some connectors, that number is relatively low. It’s mainly driven by cost. Sub-systems, that can be easily connected or removed without a physical connector, can be extremely attractive to a consumer. It is extremely satisfying to simply place a piece of tech (phone, toothbrush, etc.) near a power source and have it work, seamless and effortless.

Sometimes, that convenience is worth the cost, in the eyes of the consumer, and wireless power makes it possible.

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In some cases, saving a large amount of energy, requires investing a smaller amount of energy up front to enable the solution. There are use cases, such as powering dimmable glass, where a small investment, (think low watts), in a wireless power coupling to power movable side windows and sunroofs can save 1,000 watts or more by reducing the air conditioning load. In this scenario, connecting wires to movable glass, presents several problems to solve, and wireless power has a well-defined benefit.

It is, in general, an interesting exercise to look at the power requirements for any application and ask yourself “Does delivering power via a wire, create a problem or compromise the use case in any way?”. Enabling Consumer/Operator Installation, Reconfigurability & Maintenance/Replacement

Many consumers and even Fleet Owner/Operators may ask, “Why would I want to service anything that I own? I want the manufacturer or a manufacturers rep to do that.” Well, that kind of thinking is becoming less common (Surprise!). The “right to repair” is increasingly expected, and a growing segment of the population is very comfortable with changing out devices or components for a newer, better version. In fact, many prefer the “do-it-myself” approach, since it seems more efficient and can save costs.
Many consumers also want to feel in control of their technology and the experience of “fixing” something can be empowering. The only caveat is that such a replacement must be easy enough for an untrained person to complete. This makes cables and connectors less than ideal when we try to change out the infotainment system in our automobile, for example. A subsystem, (i.e., infotainment system), that can be simply snapped into place, would save maintenance costs at the dealership level, and would save much more if the consumer could easily take care of it without risk.

This is driven by a number of aspects, including the availability of semiconductor components that can efficiently handle the extremely high power levels at high frequencies. The electronics to make that possible are expensive but for those that desire the convenience of wireless charging, it is worth the investment. Other induction and capacitive based approaches offer other advantages, and business consumers should educate themselves in the advantages and disadvantages of each.

It is critical that the buyer/integrator of wireless power and data solutions be well informed regarding the options. The decision to go with a specific approach will ultimately determine the magnitude of cost savings and impact on the customer experience.

So, while there are undeniable reasons why a cable will always deliver optimal power at greater distances for lower cost, there are other solutions available that enable businesses and consumers to do more. They can take their products further, by considering the possible features/benefits that wireless power can create for their products, and that tethered connections are no longer needed in all cases.

Fleet operators and growing ride-sharing services represent another customer segment where reconfigurable interiors have value. Physical cables and connectors are less than ideal when moving seats, consoles or any other equipment that could be re-arranged to satisfy the vehicle occupant needs. Even cleaning or sanitizing an interior is easier with fully sealed, wireless connector solutions. Reconfigurability is easier and faster with no wear-related maintenance issues that can result from repeated connecting/dis-connecting of physical connectors.

This is not science fiction. It’s already possible, but consumers need to be clear about what they want to be empowered to do with technology and then, manufacturers need to enable it.

Yes, The Specific Wireless Power Technology Matters!

With that said, not all wireless power technologies are equal at delivering power in every application or environment. They are NOT created equal. There is no one technological approach that is best for every use case, and consumers of wireless power technology should be wary of any organization that claims it has a ‘lock’ on the best solution for ‘all your wireless power needs’.

Objectively, Qi is quite good for mobile devices because of the ecosystem that’s been built. That, and its extraordinarily low BOM cost are Qi’s main elements of value. If you are trying to charge an EV, (you need lots of power and you can control the environmental variables sufficiently to make it reliable), a low frequency induction approach is probably best.

This is not science fiction. It’s already possible, but consumers need to be clear about what they want to be empowered to do with technology and then, manufacturers need to enable it.
If you are interested in learning more about Solace Power’s wireless power and data solution options for your application, you can visit us at solace.ca.

**About Solace Power**

Solace Power is a leading developer of intelligent wireless power-based solutions featuring proximity sensing and data. Our patented technology provides industrial grade, decoupled power for a world of new, previously unachievable applications across automotive, defense, medical, industrial automation, and telecommunication. The addition of high-frequency induction capabilities has broadened Solace Power’s scope into high-volume markets where Solace Power has a distinct advantage. Solace Power is proud to have won the 2017 Boeing Silver Level Performance Excellence Award and Deloitte’s Technology Fast 50™/Companies-to-Watch.

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Solace Power  
@SolacePower

info@solace.ca  
www.solace.ca