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Charging Electric Cars with Magnetic Resonance Coupling

Many of you have a phone that is charged on a “platform” on your desk. There is no power cord between your phone and the “platform” - the “platform” and the phone are simply placed in proximity to one another and after a period of time the phone is recharged. This is an example of a new and rapidly developing technology known as Magnetic Resonance Coupling (MRC).

Think of “resonance” as the phenomenon that occurs when a vocalist shatters a glass by sustaining a particular note for a period of time. If the vocalist’s voice generates the same resonant audio frequency as the glass, they “couple”, energy builds up in the glass, and eventually the glass breaks. This is an example of Acoustic Resonance which is one of many forms of “resonance” that includes Mechanical Resonance, Nuclear Resonance and Electromagnetic Resonance.

In the case of MRC, the magnetic fields of two properly designed devices with closely matched resonant frequencies can couple into a single continuous magnetic field enabling the transfer of power from one device to the other at high efficiency and over a distance range that is useful for real-world applications. Magnetic coils with closely matched resonant frequencies are placed in a platform device and a remote device and using power from an electrical source, the coil in the platform device generates electromagnetic waves, allowing the transfer of energy between the platform device and the remote device.

Charging Electronic Car Batteries

This phenomenon can be scaled up to charge electric car batteries. The existing electric car batteries require frequent recharging and the necessary energy sources are not commonplace or readily available making it difficult to rely on electric cars for long distance travel.

Imagine that an MRC unit is placed in the concrete floor of your garage and that your electric car has a corresponding MRC unit attached to it. In this case, rather than “plugging” your car into a power source, you simply pull into your garage and the unit in the garage floor senses your car, turns on automatically, and charges your car.

Take this a little further and imagine that there are MRC units in shopping center parking lots, company parking lots or at other designated parking locations. You drive to the destination, park your car and while you are away from your car the battery is fully

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charged. An MIT spin out, WiTricity, is already working on parking unit charges. (See <http://www.witricity.com/>)

A team at Stanford University has taken this concept even further and is developing a system that embeds the MRC units in highways. For example, you could get on the highway, drive in the designated lane and charge your car while in transit. Obviously, embedding MRC units in highways will require quite a bit of reengineering. The Stanford team claims that their latest system allows 97% efficient transmission of power over a distance of about 6 feet (2 meters).

As the price of oil continues to rise, and countries struggle to shift to electric cars, parking lot MRC units will become commonplace and the highway systems will become a reality. MRC offers an efficient way to transfer power without a physical connection to the ultimate power source, and just as the invention of the automobile led to the creation of gas stations and highways, the growth of electric cars will spawn an elaborate infrastructure to support their efficient use.

Other Uses

MRC won't be limited to cars, although that is probably where it will generate the most impressive results. Cars of the future will undoubtedly include "platforms" that will allow you to charge other electrical devices in your cars while you drive.

MRC will also be used to do such mundane things as powering phones, toys and even magazines.

Toys may soon come with "toy boxes" that can recharge toys by placing them back in the box.

One company has created magazine covers that light up as a charge is applied through a small wireless receiver embedded in the magazine cover. Vendors can lay the magazines on a specially designed display rack and the cover art will illuminate to attract customers.

There are some interesting demos of MRC in the following BBC video at http://news.bbc.co.uk/2/hi/programmes/click_online/9708468.stm

Process Redesign and MRC

If you are engaged in a major business process redesign you might consider where in your processes things need to be plugged in, and where there are opportunities to use MRC to improve performance by improving customer satisfaction, reducing power costs, or reducing downtime waiting for systems to recharge.

- You might consider the advantages of eliminating wires from dangerous situations
- If you are a retail store with a parking lot you might consider providing a charging pad
- If you are a hotel or conference center you might consider



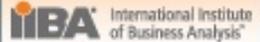
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the value of providing charging units for your guests on bedside stands and conference tables

Wireless power will make a variety of things possible that aren't easy to do today. They will become a major element of the transition from gasoline to electric powered cars and a whole infrastructure will evolve to support wireless power transmission. If you are designing a process which uses power – and what process doesn't – consider whether wireless MRC technology would give you an edge.

'Til next time,

Paul Harmon

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