

Whitepaper

Turn Disruptive Change Into High Tech's "Next Big Thing"

...And How PLM Helps OEMs Capitalize On Disruptive Change

The Battery: Key to “The Next Big Thing”

With increased consumer demand for smart phones, tablets, laptops, digital cameras and home entertainment devices, it would seem as though the entire consumer electronics sector should be enjoying large profits. The truth is many consumer electronics companies are embroiled in a fiercely competitive commoditized market where differentiation of competitive products and compressed time to market (TTM) continues at a dizzying pace.

However, the sectors of wearable high tech devices and mobile electronics are booming and lucrative. The lines are more defined. According to a recent survey by Enterprise Mobility, 72% of IT decision-maker respondents plan to spend more than 20 percent of their 2014 budget on mobility. And 20% - 30% of enterprises will initiate to integrate their existing applications to other devices i.e. wearable computing. (1) Big bets are being placed on what appears to be the righteous path to the electronics promise-land.

The interest in devices for consumers on the move is spearheaded not only by behemoths, such as Google and Sony, but also increasingly smaller innovative product companies.

Compelling new devices have introduced new challenges for the electronic component supply industry to reduce size of parts while battery OEMs are finding revolutionary ways to extend battery life, which — in return — are introducing yet another wave of new product design possibilities.

As it turns out, the lithium battery may be the unsung hero in the revolution for more innovative consumer electronics and opportunity for entrepreneurs to create “the next big thing.” Standby. The singing is about to begin.



Advances in the lithium — found in toys, laptops, mobile devices, and power tools — could soon become the primary energy source for cars and large-scale grids. This common battery may very well not only keep the Energizer Bunny going and going - but completely revolutionize the entire consumer electronics and high tech industry.

Disruptive Technologies Impact Product Design – Redux

New developments in battery technology paradigms are having a disruptive impact on product design in the dynamic consumer electronics sector. New materials are being advanced for batteries — to replace and/or supplement lithium. In particular, technologies such as zinc air batteries, which are cheaper, more abundant, less combustible and lighter than lithium, are appearing. There is also the emergence of bio-batteries that utilize enzymes.

For both design companies and OEMs alike, the challenge is maintaining business rigor and forward looking strategies to keep abreast of tech developments and making well-researched judgment calls about to make a right turn and adopt sweeping new innovations into a product design. Companies without the vision and tools to respond to change and adopt new technologies quickly could lose in this competitive high tech market whose pace of change is breath-taking.

Innovative companies require not only business discipline and foresight, but also solutions, such as product lifecycle management (PLM), that enable them to more efficiently embrace change, reduce cost, and shift product directions quickly to stay competitive.

Back to the Future

There's no doubt that the future of batteries will be disruptive. Take the lithium-ion, which — while small in size — will play a big role in unlocking the future of product design and product development for everyone from OEMs to component manufacturers.

But before you can predict the future, you must understand the past. So let's go back to the future and look at the history of the battery.

Lithium-ion batteries were first proposed in the 1970s and commercially developed in the 1990s. Since then, the market for lithium-ion batteries has grown to \$11 billion (2010) and is expected to reach \$43 billion by 2020. According to the Global Industry Analysts (GIA), the global market for all consumer batteries is forecasted to reach US \$55.4 billion by the year 2017. (2)

Lithium is a “secondary battery,” which means it’s a rechargeable battery while “primary batteries” are non-rechargeable. Secondary batteries account for only 10% of all batteries by volume but represent more than 60% of the global battery market in terms of value. Secondary batteries also include lead-acid, nickel cadmium, nickel metal-hydrate, sodium sulfur, and flow batteries.

According to the 2012 World Batteries Market Report, world demand for primary and secondary batteries is collectively forecast to rise 8.5 percent per year to \$144 billion in 2016.

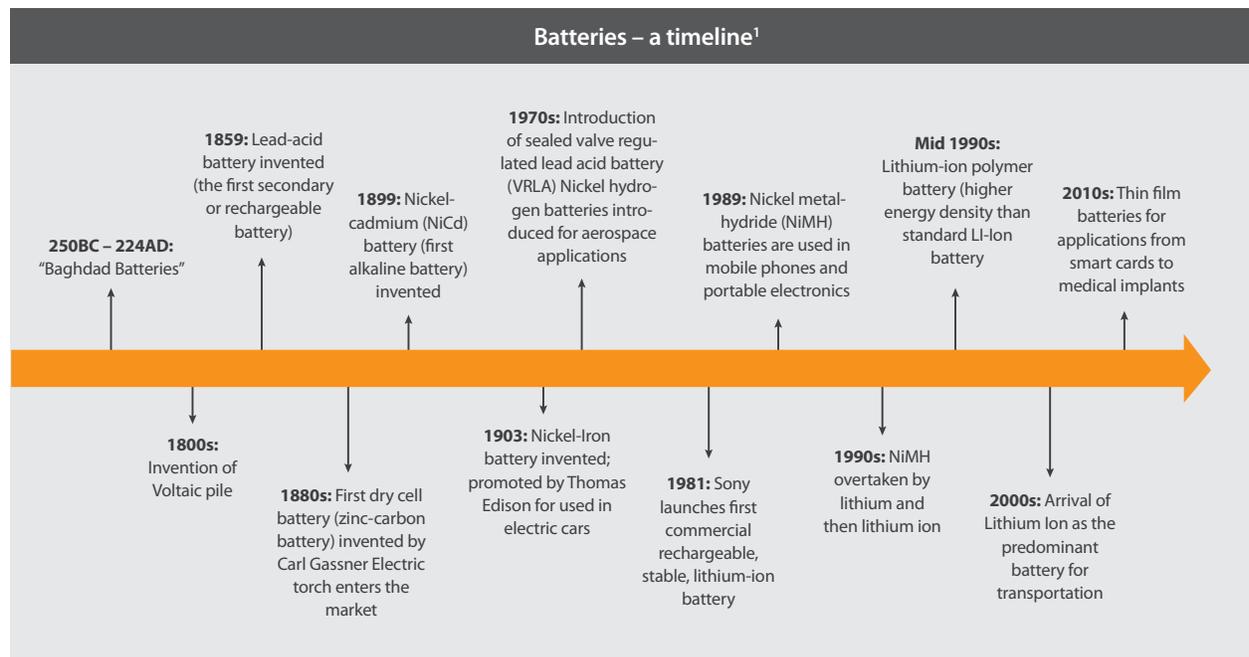
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U.S. and European Players Enter Automotive Battery Market

Companies based out of U.S. and Europe are emerging as strong players in the automotive LIB battery segment. These companies have an increased interest in working with key component sourcing companies from their home country to break reliance on imports from Asia.



Above is the first of four battery trends that will have the potential to impact product designs in the near term.



China is predicted to remain the largest national market for batteries and will also be the fastest growing, bolstered by a large electronics manufacturing segment as well as expanding output and use of motor vehicles. Sales of batteries in India will expand only slightly slower than those in China, as the nation's manufacturing base continues to grow and personal incomes rise.

The report forecasts that sales to consumer markets will post the fastest gains through 2016. Rising incomes in developing nations will drive greater use of basic battery powered devices, while expanding use of portable electronics will fuel demand from the consumer market worldwide. The report went on to note that demand for secondary battery types is expected to rise at a faster rate than sales of primary batteries. (3)

The popularity of portable electronics has grown rapidly, expanding the share of the market held by secondary – especially lithium – battery suppliers. According to a recent Marketresearch.com report, the cost of Li-ion batteries will dip 45% by 2022. Li-ion batteries may lose market share to cheaper molten-salt batteries for large projects but will remain the system of choice for space-constrained projects because of the battery's high energy density.

The LiB market is expected to continue to grow at an annual rate of about 10% by capacity volume. The strong demand for electronic devices would also support the demand for Nickel-Metal Hydride (NiMH) batteries to a certain extent (readily available in retail stores in the common sizes AAA and AA, used as small rechargeable batteries). (4)

The Battery's Bright Future

Lithium-ion has the potential to dominate the consumer and automotive markets for a long time into the future due to their high efficiency and energy density, long cycle and calendar life and manageable safety. Further increase in energy density is possible with lithium metal systems, but intrinsic problems with reversibility, cyclability and safety of lithium metal must be overcome to make the systems more viable.

Continuous research and development is taking place to improve the efficiency and reduce the size of lithium-ion batteries. In August 2012, researchers at the Korea Advanced Institute of Science and Technology (KAIST) developed a solid state, thin-film lithium-ion battery, claiming it had the highest energy density ever achieved for a flexible battery.

Another trend revolutionizing the battery industry is the development of an ultra-thin, flexible, lithium polymer battery that could usher in future e-readers and tablets that could be paper thin and partially foldable.

Cloud PLM Enables OEMs to Embrace Change, Shift Direction Fast

The high tech industry is undergoing a sweeping transformation which has meant an increasingly competitive market and more pressure to perform, but also introduces new opportunities within emerging markets.

Game-changing innovations in components, such as batteries, require smart product lifecycle management (PLM) tools that allow design and manufacturing companies at all points in the supply chain to change product design directions and execution on a dime.

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China's Growth

Chinese domestic market is setting the tone for growth in the midsize and large LiB market and growth in smart phones.

Lithium-ion Trends and Business Drivers (continued)

At the accelerating speed that current technology evolves, you need to innovate lightning fast from ideation to production. For example, just recently, a high school student invented a storage device that can charge a cell phone in 20-30 seconds. This eighteen year old's single technological breakthrough has the potential to dramatically change the entire electric car industry.

To deliver new disruptive products and ensure first mover advantage in the highly competitive industry, more and more consumer electronics companies depend on cloud-based product lifecycle management (PLM) solutions to innovate while accelerating time to market.

When component change occurs there's a rapid engineering effort to incorporate, source and purchase the component with subsequent changes in manufacturing line/tooling, cut-ins, and the production floor, itself; then there's dealing with scrap and rework, marketing and servicing.

For 13 years, Arena Solutions, pioneer of cloud-based Product Lifecycle Management (PLM) solutions, has worked with a diverse range of high tech companies, such as Jawbone, Fitbit, Beats Audi, GoPro, and Pinnacle to adopt disruptive change to product design. Arena helps innovative companies streamline product development processes across a globally distributed supply chain to reduce time to market and maximize product release potential.

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Japan Ships LiB Overseas

In small LiBs, Japanese companies like Panasonic and Sony are increasingly shifting production of cylindrical cells in mobile phones overseas to cut costs.

Lithium-ion Trends and Business Drivers (continued)

Emerging Technologies Beyond Lithium-ion			
Battery System	Probability of Success	Advantages	Disadvantages
Li-metal / Sulfur	< 50%	Low cost	Low cycle life, safety issues
Li-metal / Air	< 30%	Low cost	Low cycle life, low efficiency, safety issues
Li-Ion / Flow Battery (Cambridge Crude)	NA	Separation of Energy storage from energy conversion	Pumping of liquids containing dispersed nano particles
Li / Metal polymer (60 C)	< 50%	No liquids	Healing required, low power output, safety issues
Li-metal / Multi electron chemistry	< 50%	High energy density	Low cycle life, low efficiency, safety issues
Sodium / Sulfur (Na/S)	For large vehicles in fleet applications only	Good cycle life, low cost	Works at 300°C
Sodium / Nickel Chloride	For large vehicles in fleet applications only	Good cycle life, reasonable cost	Works at 300°C
Redox flow batteries	< 10%	Low Cost	Low Power output, pumping of liquids
Sodium and Magnesium-ion batteries	< 20%	Low Cost	Low reversibility, lower power output
Supercapacitors / Ultracapacitors	NA	High energy density	Extremely low cycle life

The impact change to a single component can have on product design is the quintessential example of the Butterfly Effect in which change at one place in a nonlinear system can result in large differences in a later state. Arena PLM provides the butterfly net that enables OEMS to capture radical technology change to keep product designs from fluttering out of control.

So ask yourself — when a radical change in the consumer electronics industry appears — will you have the right PLM solution in place to make sure your company can turn on a dime and change product design directions to scale when and where the market demands? Arena streamlines your processes to turn today’s radical disruptive changes into the “next big thing”.

Arena PLM provides a solution that easily accommodates alternatives for hard-to-source parts, and gives flexibility to write a deviation for the period of disruption. When a radical new technology appears, can you turn at the drop of the hat to source an alternative part? Arena PLM gives companies who can a head start.

For over a decade, Arena Solutions, pioneer of cloud-based Product Lifecycle Management (PLM) solutions, has worked with a diverse range of high tech companies, such as Jawbone, Fitbit, Beats by Dr. Dre, GoPro, and Pinnacle, to adopt disruptive change to product design. Arena helps innovative companies streamline product development processes across a globally distributed supply chain to reduce time to market and maximize NPI (new product introduction).

Arena’s family of PLM solutions includes Arena Change Management, which dramatically reduces engineering change order cycle time with a multi-stage voting scheme that shows changes to approved supply chain team members. Arena Change Management allows suppliers anywhere in the world to approve engineering change requests (ECR) and engineering change orders (ECO) from any location. Revisions that include swapping in new parts and components are quick and easy when everyone is aligned.

To deliver new disruptive products and ensure first-mover advantage in this highly competitive industry, more and more consumer electronics companies depend on Arena’s cloud-based product lifecycle management (PLM) solution to innovate while accelerating time to market and cutting costs.

By accelerating time to market up to 20% and reducing ECO cycle times by 70% (your mileage may vary). Arena offers consumer electronics companies a competitive advantage to remain a first mover and capture coveted market share. Change happens fast and manufacturers must react quickly to embrace it. New technological developments impact product design and require OEMs to have the tools in place to streamline design processes. Arena PLM is that tool.

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New Battleground for Battery Materials Makers

Deep pocket chemical conglomerates from U.S. and Europe (BASF, DuPont, 3M, etc.) and Korea (Samsung, LG, etc.) and China promise to shakeup the market and are an emerging threat to the long-dominated battery materials suppliers from Japan.



Lithium-ion Trends and Business Drivers (continued)

Cloud PLM helps OEMs plan with the flexibility to be nimble, make changes quickly and implement based on supply chain availability, tech advances, increased competition and consumer demand. By minimizing costly product errors and shipping delays — especially for a sector with complex products and frequently changing parts, such as batteries — Arena’s cloud PLM solution helps companies get to market first, stake a larger market share, and maximize profit margins.

When component change occurs there’s a rapid engineering effort to incorporate, source and purchase the component with subsequent changes in manufacturing line/tooling, cut-ins, and the production floor, itself; then there’s dealing with scrap and rework, marketing and servicing.

The impact of changing component on product design is the quintessential example of the Butterfly Effect in which change at one place in a nonlinear system can result in large differences in a later state. Arena PLM provides the butterfly net that enables OEMs to capture and embrace radical technological change to keep product designs from fluttering out of control.

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Lithium-ion Trends and Business Drivers (continued)

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About Arena

Arena, the inventor of cloud PLM, provides an all-in-one product development platform that unites PLM, ALM, supply chain collaboration, and QMS for the design and manufacture of complex electronics. With Arena, electrical, mechanical, software and firmware engineers can collaborate with manufacturing and quality teams to manage their bill of materials, facilitate engineering change orders, and speed prototyping. As a result, Arena customers can better meet standards while they ensure regulatory compliance, improve training management, reduce costs, increase quality, and collapse time to market. Arena has been ranked a Top 10 PLM provider and won the coveted Design News Golden Mousetrap Award in 2016. For more information, please visit <http://www.arenasolutions.com>.

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Cloud. Connected. Content. Makes Making Easier.