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Two nickels worth of battery power --- The Interview

By Vince Biancomano
Manhasset, NY— Following the introduction of the silver-zinc battery as if on cue, rechargeable nickel-zinc batteries are here to challenge nickel-cadmium and nickel-metal-hydride for high power-density applications. "We're focused on nickel-zinc for its inherent safety, non-toxicity, and power-density," says Dan Squiller, CEO of PowerGenix and the company behind the new battery.

PMDL: Last month, the silver-zinc battery arrived to challenge lithium-ions in the portable electronics market, and now you've just announced the nickel-zinc for power tools and small vehicles. What's happening? And do you see lithium-ion still in the game for some power applications?

DS: Contrary to popular belief, lithium-ion is not going to take over the world. The rechargeable battery market is huge, and it is segmented. There are clearly applications where lithium-ion is the best chemistry in the world when you look at performance and cost. But there are large segments where it is not, and it will not be. So the way to look at nickel-zinc is the next generation replacement for Ni-Cad and nickel-metal hydride.

And the advantage that nickel-zinc has over those two chemistries is simple to understand. Our voltage is 1.6 volts, and nickel-metal-hydride and Ni-Cad are 1.2 volts. So right out of the block, we have a more or less 30 percent energy-density advantage, and 30 percent power density advantage. On the energy-density advantage, NiCd is maybe at 50 W-h/kg, NiMH can get to maybe 60 W-h/kg, and NiZn is over 100 W-h/kg. Lithium-ion is 100 to 150, depending on the labor and cost. On the power-density side, NiCd and NiMH are between 800 to 1000 W/kg, lithium-ion is 1500 to 2600, and NiZn comes in at about 2400. So the message there is that on a power-density metric, NiZn is a very very strong performer compared to anything else on the market.

The cost per watt-hour is about 40 cents for NiZn. The NiCd can go anywhere from 25 to 50 cents, NiMH is maybe 45 cents to 70 cents. It's less than half the cost of lithium-ion. From a performance-cost point of view, that's the niche, there's a lot of white space between where lithium-ion starts to compete with where we and NiMH and NiCd are.

There's two other factors. With NiCd, there's toxicity and recyclability issues. We've been tested against all the RoHS metrics and our cell passes them with flying colors. So we are certifiably "Green." And when Toys 'R' Us and Mattel make announcements that they are not going to be buying any more NiCd cells because of toxicity issues, cadmium poisoning, that's a big deal. This whole "Green" movement is nothing but a tailwind for us and a headwind for NiCd. And NiMH, because of the cost difference between NiZn and the fact that it doesn't have as good a low-temperature performance and a few other metrics, NiZn compares very favorably there. And NiZn is a 100 percent safe chemistry because it has an aqueous electrolyte.

PMDL: So would you say what you're doing is kind of complementary to what silver-zinc is doing for the area it's covering (portables)?

DS: Absolutely. The way to look at it is silver-zinc is a competitor to lithium-ion. Silver-zinc is expensive, its strong point is energy-density, not power-density. We, on the other hand, target nickel-cadmium and nickel-metal hydride. We think our value proposition — cost, toxicity, performance — offers a tremendous difference and we'll see it in a few years.

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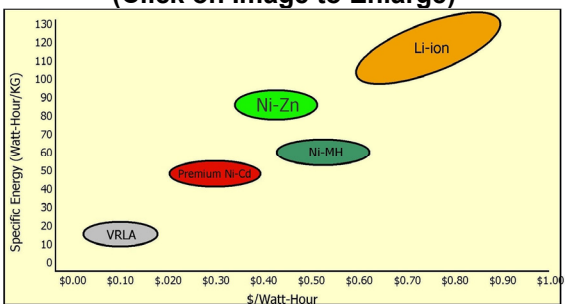

Sources: E-One Moli (Li-ion), EnerSys website (VRLA), Sanyo & BYD websites (NiCd and NiMH), PGX Testing (NiZn and A123)

PMDL: Where are we now (with respect to commercialization)?

DS: The first nickel-zinc battery was invented by Edison, and it actually powered an automobile. Then back before WW II, it powered some trains in Ireland. So the fundamental chemistry is pretty old. The problem is that it was never very economically viable and it had limited rechargability— 25 or 50 times. Back in the early '90s, Evercel brought a prismatic cell to market. But the company failed. Today, we are aware of some work being done in France on nickel-zinc, in fact we have a partnership with them for some military applications. But essentially we have no real competitors (in the rechargeable area). So we've been in this for about 10 years. Only since 2003, where the company was properly funded and a professional management team came in, we became a real company. So we've been at it seriously four to five years. We've got thousands of samples in the marketplace, we have high volume production in China.

That's a question you want to ask when you're talking to battery manufacturers. There's no shortage of people who claim they have a wonderful battery chemistry, (that they) are kind of in production. The question is "are you making thousands of cells a day?" And the answer for PowerGenix is, "yes we are."

We are going to be delivering cells for our first customer in late April, and that will be for a power tool application in Asia. And we will be signing an agreement with an electric scooter manufacturer here in March, and delivering D-cells at the end of the year. We will be signing an agreement with one of the largest distributors of consumer batteries for a rechargeable AA, which we think will be industry-changing. It'll have 100 percent compatibility with the throwaway Duracells and Energizers of the world.

If you think about why you don't have a rechargeable AA in your house, it's because the NiMH AA's don't work very well because they have 1.2 volts. You can't put them in flashlights, they don't work very well in electronic devices because they start out at a lower voltage and the power circuitry in the electronic devices will shut the device down sooner than it would with a 1.5 volt battery.

The AA that we have will be in high volume production in Q3, that product will be a blockbuster product. But for the sub-C, which is for power tools and lawn and garden equipment and some military applications, that product is in volume production in China.

PMDL: What about the D-cell for scooters? What's its capability?

DS: That's a 6.5 A-h cell, the first out of the gate. The electric scooters are 24 volts, and the batteries will be in two parallel strings. I believe it's a 30-volt pack.

PMDL: What about the improvement in rechargeability?

DS: At the cell level, our cells will typically cycle 500 times (80 percent capacity retention). But not too many applications use cells individually. So the question is, how does it do in a pack? Right now, our cycling is at 250 cycles. That meets the initial applications for all our target customers.

PMDL: So what does the user have to decide on? Is the user going to have to just worry about cost? Or what the first generation of batteries is going to be like?

DS: A key thing we've done to eliminate the start-up risk is that the cells can be manufactured on NiCd and NiMH production lines. Typically, with a new chemistry, you've got to put in place new production capability—special machines, operators have to be trained.But our nickel electrode is identical to an nickel electrode in a current NiCd or NiMH cell. Our zinc electrode is zinc instead of cadmium or hydride, and it's all rolled into a jelly roll, into a core, put in a can, our electrolyte has some additives in it, but fundamentally it's a potassium hydroxide electrolyte. So we've been able to go the second largest alkaline rechargeable battery manufacturer in China, they're ISO-certified, and say "can you build these for us?" And the answer is "no problem."

So whether you're a large OEM concerned about supply chain risk, or a small customer worried about whether the batteries will be any good, the risk has been minimized because of this manufacturing strategy.

The second thing: If you're a consumer you don't understand NiZn, NiMH, or any of that. What you would understand is some kind of bubble pack of a rechargeable AA that guarantees performance identical to a AA with 150 charge/recharge cycles. Which is a claim that NiMH or no other chemistry can ever make. Right now people buy billions of throwaway AA's. NiMH, they buy $200 million a year, that's nothing. We believe you put a good 1.5-volt, 100 percent compatible battery in front of a consumer, that $200 million dollar market over some time becomes a $1B market.

PMDL: So, again, what about the issue of cost? It's a new technology with big advantages. Won't these batteries be sold at a premium?

DS: The approach we've taken is that fundamentally the battery business is a commodity business, and that if you don't have a cost position in terms of being a long term sustainable, competitive player, you won't succeed. We have a good intellectual property portfolio. But when we go to customers, and they're paying 35 cents a watt-hour for NiCd, we say that pack on your cordless drill can be 30 percent smaller, 30 percent lighter, 15 percent more torque and it's non-toxic and you can label it "Green." Then they say "That's wonderful. We'd like it at the same price as NiCd." So we can negotiate a premium, and the value it provides enables us to command a premium. But our business strategy has to be based on being competitive with the chemistries that are out there today. For NiMH, it's no problem, intrinsically we're a lot cheaper. For NiCd, we have to be able to take advantage of the existing materials, supply chain, and so we're able to do that, and we can come very close to NiCd.

PMDL: How will the user be able to get these batteries?

DS: Right now, the sales strategy for us is pretty simple. We will sell through OEMs. When you buy a hedge trimmer, (the customer) is not going to know it's got a NiZn battery in it. You may know that the pack is 25 percent smaller than the competitors using NiMH or NiCd, so there will be a value proposition the manufacturer makes. But the consumer probably won't know it's NiZn because they're not that technically proficient. And the same thing with the consumer market. We will for sure have a AA or AAA, and that will be introduced into the market by Energizer or Duracell, others, we hope. We don't have signed agreements with them, but that's the vehicle to introduce it. How they choose to market it, all those questions are still up in the air.

PMDL: You've come out of the gate with an advantage that will compete in terms of energy density, power density, cost. Can the technology be further improved?

DS: One of the huge problems with lithium-ion that has held it back is the safety issue. Sony, before the fires and recalls, were ready to introduce a 2.6 A-h battery, and they had a 2.8 A-h battery on the drawing boards. But because of the problems, they haven't been able to advance that — the limiter had to do with safety. If we move to NiZn, there is no limiter like that. One of the tradeoffs as you increase energy density in a cell, one of the things that takes a hit when you try to do that is cycle life.

more mechanical engineering, we can get that to 2.5 A-h within a year. With some low-risk technology techniques, we can push that to 3 A-h. If you look at the prospects for NiZn, no natural limiters, taking advantage of an alkaline industry that's got a terrific infrastructure in terms of materials and is very sensitive to cost, we've got plenty of headroom there.

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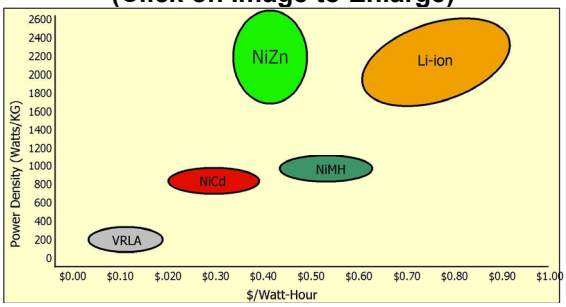

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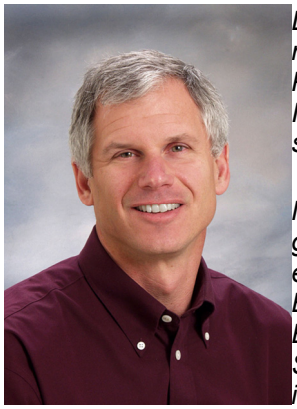
When you talk about power-density, we've kind of figured that out already. The key is making a cell that's low in internal resistance, and that speaks to the fundamental cell design in terms of what kind of attachment techniques you use for tabs, what kind of substrate materials (for example, NiCd uses plated steel). We use copper. The advantage is much lower internal resistance, and consequently much more power. I see no issues there. In terms of energy-density, getting more active material into a confined volume, the same thing that you saw in the NiCd and NiMH when they went from 1 A-h to 1.5 to 1.7 to 2.4, we will do in three years what it took that industry to do in 15 years. And it's because they've already paved the way for us. Another thing, too; when you make a NiZn pack, and you use it in an application, unlike lithium we do not require any kind of electronics to manage the pack. That obviously makes a difference in terms of cost and real-estate savings.

Three other products are following in the footsteps of this first product. Another way to look at it is that it took 5 years to get our first product into high volume production. The second product, which will be the AA, from (start) to high-volume production, will be 9 months. The third product, the D-cell, will be seven or eight months.



Dan Squiller joined PowerGenix as Chief Executive Officer in 2003 with more than 25 years experience in building high technology companies. Previously, he was president of Invensys Power Components, a division of Invensys plc. and a global manufacturer of Powerware UPSs; Teccor power semiconductors; and Lambda power supplies.

Mr. Squiller's experience with early stage companies includes a post as general manager of Indyme Electronics, a provider of telecommunications equipment, and vice president of business development and sales for St. Bernard Software, a provider of enterprise network protection software. Earlier in his career, Mr. Squiller spent 10 years at the San Diego division of Scientific Atlanta, which specializes in high-speed spectrum analysis instrumentation for the commercial and government business sectors. There, he held positions in engineering, marketing, sales, and operations. Mr. Squiller holds a B.S. in Electrical Engineering and an M.A. in Organizational Communication from Ohio University.