AMERICAN UNIVERSITY OF BEIRUT
ENGLISH DEPARTMENT

English 206
Final Exam
Fall 2005- 2006

Name: _____ **Section:**_____

Instructor: _____ **Time Allowed:** 2 1/2 Hours

Passage A

Military robot runs on Saphion battery

Engineers at Savannah River National Laboratory (SRNL), a U.S. Department of Energy facility in Aiken, S.C., needed batteries to power their robot. They found a solution in Saphion lithium-ion batteries from Valence Technology Inc. in Austin, Texas.

They will use the batteries to power a small fleet of Remotec Andros military vehicles. Andros Mark V-A1 is the largest, strongest robot in the REMOTEC family. Its 3.5-mile-per-hour speed and articulated tracks enable it to maneuver rapidly over rough terrain and obstacles, climb stairs, and cross 2-foot-wide ditches. It is designed for explosives handling, nuclear surveillance and maintenance, hazardous-materials response, and SWAT[1] operations.

Compared to its previous lead-
five-fold increase in the runtime and range of the robot. Andros operators also use the communications capabilities of the K-Charge Power Systems to monitor the temperature, voltage, and state-of-charge of the batteries.

The phosphate cathode material in Saphion technology is safer and more environmentally friendly than metal-oxide cathode materials.

Source: Military & Aerospace Electronics Magazine. (2005, November). *Military & Aerospace Electronics* . Retrieved from http://mae.pennnet.com/Articles/Article_Display.cfm?Section=ARTCL&ARTICLE_ID=241284&VERSION_NUM=2&p=32

[1] SWAT: Abbreviation for Special Weapons and Tactics

Passage B

Valence Technology, Inc.: Company

Is it possible to change the battery industry? At Valence Technology, Inc., we think so.

Everyone knows battery technologies evolve very slowly. The most antiquated is Lead-acid, which has been around for 150 years, while the newest, Lithium-ion, is already 15 years old by now. What has changed, however, is consumer behavior and the need for more mobile power. Additionally, today there is a greater emphasis on environmental friendliness, safety and of course, cost.

Battery technology has not kept pace due largely to the challenges related to bringing a technology from R&D into the hands of customers. As a result, there is a chasm between what technologies can offer and what consumers need. But Valence Technology is changing that. As the only company in the battery industry to commercialize phosphates, we bring safe Lithium-ion power to both small- and large-format applications.

Our phosphate- -ion technology is a break through battery chemistry for mobile computing and for large format applications such as back up

high cycle life, great energy density, no maintenance, superior rate capability and

the traditional Lithium-ion markets such as the consumer and computer industries, but also for emerging markets not currently served by Lithium-ion technology, such as the

-

ion with the safety, environmentally friendly and cost benefits of phosphates.

Saphion Technology: Our goal is to deliver high performance, safe, cost effective storage systems to our customers, and one way we do this is by designing products with

-ion technology utilizes cobalt-

technology incorporates a phosphate based cathode material.

Along with the performance and cycle life advantages of Lithium-ion, this change

not only for the traditional Lithium-ion markets such as the individual consumer and enterprise markets, but also for emerging markets not currently served by Lithium-ion technology, such as the telecom, utility and motive industries.

_____:

High Performance	Long Service Life	Environmentally friendly	Safe/Stable Chemistry
High Rate Capability	Extraordinary Cycle Life	Flexible Form Factor	

incorporation of phosphates as the cathode material. Phosphates are extremely stable in overcharge or short circuit conditions and have the ability to withstand high temperatures without decomposing. When abuse does occur, phosphates are not prone to thermal

characteristics that are fundamentally superior to those of Lithium-ion batteries made with other cathode materials.

exhibit the "memory effect" of Nickel-Cadmium and Nickel-metal Hydride solutions.

maintenance free.

battery application and cell design. It can be used in wound cylindrical, wound prismatic and polymer battery construction types and manufactured to fit smaller applications, such as the N- -
System and the U- Power System.

The advantages of traditional Lithium-ion coupled with the safety features of -ion technology for the future. Our -ion technology utilizes natural, phosphate-based material and offers the greatest combination of performance, safety, cost, reliability and environmental characteristics.

Sources: Adapted and excerpted from:
Valence Technology, Inc.: Company. (2005). Retrieved from http://www.valence.com/Company.asp
Saphion Technology. (2005). Retrieved from http://www.valence.com/saphion.asp

Passage C

Driving Green, Explosion-Free

A recent marketing video from battery maker Valence Technologies makes its point with all the subtlety of a Jerry Bruckheimer film: Unlike the competition's, its batteries don't blow up.

The Texas-based company is so confident of the safety of its product that it shot one with a bullet to see what would happen. Nothing much, it turns out. That's in stark contrast to the other lithium ion battery shown in the video, which explodes in a fiery ball.

It's simple chemistry. Lithium ion batteries are so potent that they've become ubiquitous in laptops and cell phones, but the cobalt oxide used to generate such prodigious amounts of electricity per gram is highly volatile. That's prevented larger-scale uses -- in cars, for example -- because the risk of a deadly explosion has simply been too great.

Not so with Valence's new Saphion battery, which is among a new generation of lithium ion cells that are beginning to crack the transportation market. "It's an enabling technology," said Dean Bogues, Valence's president for North

America and Europe. "We think, as batteries get better, that reliance on batteries to provide energy in your car will get larger."

Lithium ion batteries are more energy-dense than nickel metal hydride cells currently used in most hybrid and electric cars. That means a lithium ion battery can run at a higher power for a longer time than a nickel metal battery of the same weight. But most lithium cells use a cobalt oxide chemistry that can catch fire or explode if the battery is charged or discharged too quickly, or if it is physically damaged.

Products that use a large number of cells present a greater fire and explosion hazard than personal electronic devices that use a single small cell, so engineers have been hesitant to choose lithium ion batteries for automobiles and other "large-format" applications.

Valence is aiming to open up new markets for lithium ion technology by proving that lithium can be safe, a move that would challenge both nickel metal hydride and lithium ion cobalt oxide cells. Saphion cells hold significantly more energy per kilogram than nickel metal hydride cells, and although Saphion carries less energy per kilo than lithium ion cobalt, Valence is betting that many users will trade some energy for enhanced safety.

Saphion cells are drawing notice among hybrid car designers, but there are still some hurdles to overcome, notably price. Tom Gage, president of AC Propulsion, a Southern California electric-vehicle company, said he is impressed by Valence's technology, but he is not ready to switch to Saphion.

AC Propulsion plans to begin converting Toyota Scions into electric vehicles early next year, and expects to use packs made of laptop-size lithium ion cobalt cells. Although the cells require complex battery-management systems to stay within safe operating range, Gage argues that Saphion batteries are still significantly more expensive. But he said he is eager for a lower-priced Saphion cell. "Valence chemistry may yet prove to be one that is adopted on a wider basis," he said. Valence officials hope that as they produce Saphion cells in larger volumes, costs will decline.

One of its first major customers is Segway, which released three Saphion-powered Human Transporters in April of this year. Phil LeMay, the electrical engineering director at Segway, is in charge of keeping tabs on battery technology and oversaw the process that selected Valence as a Segway supplier. LeMay said that he and his team "had been on the lookout for lithium ion because of its inherent benefits, but were looking for chemistries that were safe for large format."

Segway's Human Transporters can be involved in road accidents, and are often charged indoors, so combustible batteries are out of the question. LeMay's group chose Saphion because of "the inherent safety of the chemistry.... A failure in a large-format Saphion battery doesn't propagate to other cells, plus failure is dramatically less dramatic."

The longer range of the Saphion batteries enabled Segway to build its all-terrain XT model. After several months with Saphion Segways on the road, LeMay remains confident about his choice. "We pretty much doubled the range with very little penalty in terms of weight,"
he said.

Source: Shechmeister, Matthew. (2005). Driving Green, Explosion-Free. *Wired News.* Retrieved from http://www.wired.com/news/technology/0,1282,68631,00.html?tw=wn_story_related