February 2004

MEETING REPORT
Portable Power Conference And Expo
San Francisco, CA USA
September 21-23, 2003
By Dennis Sieminski, P.E.

Around The Industry

Electric Vehicles

Patents

Product News

Previous Issue

ABT ARCHIVE

EXCLUSIVES

MEETING REPORT
BATTCON 2012 International Stationary Battery Conference
Hollywood, CA USA

MEETING REPORT
BCI 124th Convention & Power Mart Trade Fair
Scottsdale, AZ USA

MEETING REPORT
29th Florida Battery Seminar Part 2
Ft. Lauderdale, FL USA

PHOTO REPORT
29th Florida Battery Seminar Part 1
Ft. Lauderdale, FL USA

FEBRUARY 2004

New Zealand's Massey University has signed a large commercialization deal with U.S.-based Anzode Inc. for its revolutionary zinc battery technology developed by Drs. Michael Liu and Simon Hall (left). Also pictured are Anzode's Chris Officer and Massey's Dr. Gavin Clark and Prof. Nigel Long. See story below.

AROUND THE INDUSTRY

Battery Commercialization Deal Signed

The Institute of Fundamental Sciences at Massey University signed a commercialization deal with a United States-based company, Anzode Inc., to take zinc battery technology developed by Dr. Simon Hall and Dr. Michael Liu to the international market.

Massey has granted Anzode an exclusive global licence to the zinc battery technology and agrees to the establishment of the new Massey Anzode

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Nashville, TN
USA

MEETING REPORT
EV2011VÉ Toronto
The End Of The Beginning
Toronto, ONT
Canada

MEETING REPORT
28th International Battery Seminar And Exhibition - PART 2
Ft. Lauderdale, FL USA

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Advanced Battery Technology

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Research Center at the Palmerston North campus.

Taking a “Kiwi approach” and stripping out the clutter in zinc cells, the professors created a technology that lasts four times longer than existing silver-zinc batteries, and their nickel-zinc version lasts two-and-a-half times longer than nickel metal hydride batteries and four times longer than lead-acid batteries.

The technology has been patented in more than 30 countries and territories at a cost to Anzode of $100,000, and has already attracted interest from the U.S. military, a major U.S. consumer electronics firm and the world’s largest manufacturer of electronic components for laptops and cellphones.

CEO Chris Officer established Anzode with another Massey alumnus, Howard Moore, and a third director. The company is backed by New Zealand, Australian, and American angel investors.

Company Launches New Battery Production Factory

Industries International Inc., a rapidly growing manufacturer of telecommunications equipment and lithium batteries, has launched operations at its new battery factory in Shenzhen, China.

The new 15,000 square-foot factory, was initially designed to produce an annual capacity of 8 million lithium-ion cellphone batteries. Lisun Power, a wholly owned subsidiary of Industries International, has significantly increased its original output and this new facility is aimed to cope with the demand from the southern China market.

“Lithium-ion cellphone batteries account for 41% of Lisun Power’s total income, and business is continuing to grow very quickly. The new factory will immediately increase our cell phone battery production capacity by at least 70%,” said Dr. Kit Tsui, chairman and chief executive officer of Industries International.

Tsui continued, “The Zhu Jiang Delta, with Shenzhen and Guangzhou as two of its center points, is one of the hottest economic areas in China. It gathers nearly 80% of China’s raw material suppliers for cellphone batteries. By establishing a branch factory here, we are able to reduce our raw material purchase cost by at least 10-15%. What’s more, a great portion of our cellphone battery clients are actually located in the Shenzhen area. Thus, we will eventually be able to reduce our marketing expenses by an estimated 5%.”

Saft Provides Backup Power for Wafa Oil Field

CEG Elettronica Industriale Spa of Italy has installed 50 Saft rechargeable industrial nickel-cadmium battery systems worth around one million Euros to provide backup power for critical electrical substation and energy distribution

systems at the Wafa oil field project in Libya.

The project required batteries of varying capacities to support critical 110VDC and 110/220VAC UPS power supplies for substations and power distribution systems.

For the 110VDC power backup batteries Saft has supplied SBM cells. Four of the batteries, each comprising a parallel string of 92 SBM 369-2 cells, provide up to three hours of autonomy.

For the 110/220VAC UPS systems Saft has supplied SBM, SLM or SBL cells according to the specific requirement. Two of the batteries, each comprising a parallel string of 92 SBM 625-1 cells, can support 40kVA for 30 minutes followed by 30kVA for 90 minutes.

Rutter Purchases EJE Trans-Lite and Battery Tech

Rutter Technologies of St. John's, Newfoundland, Canada, has signed letters of intent to purchase EJE Trans-Lite Inc. and Battery Tech Inc. in exchange for $851,000 of Rutter common stock.

EJE and Battery Tech had over $1 million in combined revenues for the seven months ended Aug. 31 and were profitable, Rutter said.

EJE Trans-Lite Inc., also of St. John's, was founded in 1988 to research and develop portable helicopter landing systems and marine safety lights. It now supplies a diversified line of safety lights for specialized applications. Battery Tech Inc. of City of Industry, California, supplies custom configured lithium battery assemblies solely to EJE Trans-Lite for use in most of its products.

Rutter Technologies Inc. headed by Donald Clarke, chairman and CEO, develops, markets, engineers and manufactures technologies to improve the efficiency and safety of maritime operations. In the year ended August 31, 2003, its revenues rose to $19.8 million from $2.9 million a year earlier.

RBC Develops HRB Cell Technology

RBC Technologies of College Station, Texas, has developed alkaline (Zinc/MnO2 primary) cylindrical cell technology with substantially better performance on high rate discharge than existing alkaline technology.

This "high rate bobbin" (HRB) cell technology represents a major advance in performance and improved balance of power and energy best suited to portable electronic devices, such as personal digital assistants (PDAs), MP3 players, DVD players, and digital cameras.

The figure shows that RBC's HRB cell delivers nearly three times the

performance of a conventional premium alkaline cell in pulse testing that simulates digital camera requirements. HRB could be the new state of the art for alkaline cells to maintain their competitive advantage in standard AAA, AA, C and D cylindrical formats.

RBC Technologies is seeking licensees and commercialization partners for this technology. Contact Dr. Brendan Coffey by email, brendan@rbctx.com.

Arotech Awarded New U.S. Army Battery Contract

Arotech Corp.'s Electric Fuel battery manufacturing subsidiary and the U.S. Army Communications Electronic Command (CECOM) have a contract for the delivery of advanced zinc-air batteries. The contract has a $5.2 million order ceiling for the delivery of BA-8180/U zinc-air non-rechargeable batteries.

The BA-8180/U is a 12/24V, 800WHr non-rechargeable battery pack, approximately the size and weight of a notebook computer. The battery is based on 30 ampere-hours cells developed by Electric Fuel over the last five years with partial funding by CECOM. In extensive field-testing the BA-8180/U battery typically provided four to six times the run time of a BA-5590, a primary lithium battery pack widely used in the military.

Umicore Increases Korean Plant Production

In December Umicore decided for the second time in a year to increase the production capacity of lithium-based cathode material at its plant in Cheonan, South Korea, to more than 3,000 tons per year.

With its Cellcore line of products, Umicore is a leading producer of lithium cobalt dioxide used as the cathode material in rechargeable lithium-ion batteries.

Worldwide consumption of lithium metal oxides, where the metal used is still primarily cobalt, has been growing in line with increased demand for Li-ion batteries. However, the battery industry has voiced concerns about the volatility in the price of cobalt, spurring a renewed interest in alternative compounds using less cobalt. Umicore's additional capacity will have the required flexibility to produce these new compounds.

Valence Signs Agreement with PETC and Mobility

Valence Technology Inc. of Austin, Texas, has a manufacturing agreement with Pacific Energytech Co. Ltd. (PETC), a Taiwanese manufacturer of lithium-ion rechargeable batteries, to produce cylindrical Saphion cells.

Established in 1998, PETC has state-of-the-art production capability in the manufacture of electrodes, and highly automated production lines for both cylindrical and prismatic cells. Valence uses cylindrical Saphion cells

manufactured by PETC for use in its K-Charge Power System.

In other news, Valence has signed license and purchasing and reseller agreements with Mobility Electronics Inc. Under the agreements, the companies will integrate Valence's Saphion lithium-ion technology, N-Charge, with Mobility's power technology to market universal batteries for electronic devices, including digital cameras, portable DVDs, cell phones, and notebook PCs.

Mobility will distribute the new line of universal batteries, manufactured by Valence, through its channels. Valence will purchase intelligent tips and related peripheral powering system (PPS) products from Mobility.

EVI Launches XL Rechargeable Alkaline Battery

Energy Visions Inc. of Toronto, Ontario, Canada, has introduced the new XL™ rechargeable alkaline battery by its subsidiary Pure Energy Visions Inc. XL provides 80% more service life than the original rechargeable alkaline (RAM) battery sold by Pure Energy.

In its first cycle XL can be recharged 50 to 500 (or more) times, depending on the frequency of recharging, resulting in substantial savings for consumers and reduced environmental impact. Using XL and recharging when the batteries are fully drained would cost only Cdn$15. The batteries do not contain toxic cadmium and can also be recharged at any time without suffering from the "memory effect" problem inherent with nickel-cadmium batteries.

LTC Receives Order

Lithium Technology Corp. of Plymouth Meeting, Pennsylvania, has received a follow-on purchase order to produce battery packs for a portable radiation detector manufactured by Sartrex Corp.

Sartrex, of Concord, Ontario, Canada, demonstrated the GAIA 12V, 7AHr battery pack, complete with battery management system, that powered the detector. Sartrex expects to produce hundreds of units this year for both government and commercial customers.

Cavanna Elected to Ultralife Board

Anthony J. Cavanna has been elected to the board of directors for Ultralife Batteries Inc. of Newark, New York. He was chief financial officer and retired from the position of executive vice president and a director of Trex Company Inc. at the end of 2003.

Cavanna spent 33 years in a variety of positions with Mobil, including group vice president, vice president-planning and finance, vice president of Mobil Chemical, and general manager of its Films Division Worldwide, president and

general manager of Mobil Plastics Europe, and vice president-planning and supply of the Films Division. He formed Trex in 1996 by leading a management buyout from Mobil Chemical.

Cavanna received a B.S. degree in chemical engineering from Villanova University and a M.S. degree in chemical engineering from the Polytechnic Institute of Brooklyn.

Dana and Permo-Drive Sign Vehicle Agreement

Dana Corp. of Toledo, Ohio, and Permo-Drive Technologies Ltd., an Australian firm with North American operations in Ann Arbor, Michigan, have an exclusive licensing agreement for the design, development, and supply of the Permo-Drive Regenerative Drive System (RDS) for use in the U.S. Army's Family of Medium Tactical Vehicles. The Army will introduce a hybrid drive system into its FMTVs as soon as 2006.

Permo-Drive's RDS system is a hydraulic regenerative braking and propulsion system suitable for most medium and heavy-duty vehicles. Energy normally lost during braking can be stored as hydraulic oil under pressure, then selectively released as an acceleration boost to bring the vehicle back to the desired speed. RDS benefits include increases of up to 30% in fuel economy, substantially improved brake life, an improvement in acceleration, and reduced emissions.

Ovonics President and CEO Delivers Keynote Talk

Energy Conversion Devices, Inc. (ECD Ovonics) President and CEO Stanford R. Ovshinsky gave a keynote talk, "New Science and Technology, the Basis of the Hydrogen Economy," at the Materials Research Society (MRS) meeting in Boston.

Ovshinsky showed how the hydrogen economy has already been initiated by electric and hybrid vehicles using Ovonic® nickel metal hydride battery technology, which is the leading choice for these cars. He described how hydrogen as a fuel could be stored in a solid hydride and used instead of high-pressure or liquid hydrogen.

He emphasized the role of materials science as the basis of solving these crucial problems and building up new industries so critically needed and noted that MRS had become the key scientific organization in this endeavor. Founded in 1973, MRS brings together scientists, engineers and research managers from industry, government, academia, and research laboratories to share findings in the research and development of new materials of technological importance.

Stan and Iris Ovshinsky founded their company, ECD Ovonics, in January 1960.

Shanghai to Use Solar Power as Alternative

Shanghai needs supplementary power supply from the remote Three Gorges Hydraulic Power Station 1,000 kilometers away to meet its ever-growing consumption of electricity. Local experts are seeking to tap the sun for energy.

A 6,000 square-meter solar cell factory at the Xinzhuang Industrial Park in the city's suburban Minhang District will go into production this year, according to Shanghai Solar Energy Science and Technology Co.

"The production line will employ the most advanced solar energy technology in the world," said Yuan Xiao, the firm's general manager.

According to Yuan, the factory will be able to produce solar cells with power generating capacity totaling 10,000 kilowatts each year.

The "environment-friendly" electricity from solar cells can either be stored in a special battery or put into immediate use. A three-kilowatt solar electricity system can meet a three-member family's basic demand.

"We are now trying to cooperate with local electricity departments to push use of solar power," said a company official surnamed Lu.

At present, the cost of producing electricity from solar energy is 2 yuan (24 US cents) per kw-hour, just half of the cost of thermal power, industry insiders said.

Nanobatteries Promise Energy Savings

Nanobatteries promise to usher in a new age of convenience, reports Taiwan News. Smaller mobile phones that can operate for a month without recharging and automobiles that run on emission-free electricity are just two of the technology's potential applications.

These innovations, along with new forms of high-capacity energy storage devices for home appliances and consumer electronics, are the results of national research and development programs on nanotechnology presented at a seminar at the government-affiliated Industrial Technology Research Institute (ITRI) in November.

"Taiwan is at the forefront of new energy storage and fuel cell research. Through the application of nanotechnology we are developing the next generation of rechargeable batteries," said Liu Chung-ming, director of ITRI's Materials Research Laboratories.

Liu and other officials at the institute said they have developed high-performance rechargeable batteries for mobile phones, notebook PCs, PDAs, and electric vehicles. Already in the testing stages, these new energy storage

devices are nearing commercial production through joint ventures with several local Taiwanese firms.

Varta and BTI Partner With Xicor

Varta Microbatterie GmbH of Ellwangen, Germany, has selected Xicor of Milpitas, California, as a development partner for the company's battery pack designs. The two are targeting OEM notebook computer applications as well as portable test and measurement equipment. The first implementation of Xicor's X3100 will be in battery packs for portable test equipment supporting the automotive market. Battery Technology Inc. (BTI) also will use the Xicor X3100 for its notebook replacement battery packs.

The X3100 is part of Xicor's battery management solutions that protect and monitor battery packs consisting of four lithium-ion battery cells in series. The X3101 is designed for three lithium-ion cells in series. Both devices provide internal overcharge, over-discharge, over-current protection circuitry, internal EEPROM memory, an internal voltage regulator and internal drive circuitry for external FET devices that control cell charge, discharge and cell voltage balancing.

EaglePicher to Add Fast Battery Chargers

The Commercial Power Solutions division of EaglePicher Technologies, LLC, in Phoenix, Arizona, plans to expand its portfolio of battery and power solutions to include advanced battery chargers. In support of this goal, the division has signed a joint development and license agreement with FaZtech, Inc., of Fremont, Nebraska, to develop, manufacture and market FaZtech's patented Fazt™ fast battery-charging technology.

This new technology is based on a unique, self-regulating circuit design that optimizes the battery charge rate without overheating or damaging the battery. Typical charging time is two to three times faster than with standard chargers. The Fazt charger is one-fourth the size of chargers of comparable power, permitting designs for both on-board and off-board applications. This flexibility enables a portable, lower cost solution, allowing users to extend operating time by up to 25%.

The chargers initially will be targeted to the medium-power (1-10kw) motive industries, such as industrial electric vehicles, golf carts and boats where quick charging, portability and extended battery life are key.

Charger demonstration prototypes currently are being placed in the field for testing. For more information about participating in application testing, contact EaglePicher at customerservice.commpwr@eaglepicher.com.

U.S. Patent Issued for Management Technology

Sustainable Energy Technologies Ltd. of Calgary, Alberta, Canada, has been issued a patent by the United States Patent and Trademark Office covering the company's innovative approach to the integration of batteries with distributed generation technologies as part of grid-connected backup and emergency power systems.

Sustainable Energy's patented technology enables the battery to be controlled independently of, and in parallel with, the primary power source. This results in reduced cycling of the batteries and higher overall efficiencies. Excessive cycling — charging and discharging — shortens battery life and compromises the integrity of the backup power system.

Brent Harris, director of technology development, said, "What this means is that the same inverter platform that is used for a range of grid-interactive applications — solar and small wind power fuel cells, etc. — can be easily and inexpensively upgraded to provide the battery management capability for backup power."

"For example," he added, "the first markets for fuel cells in Japan and Europe will be as part of combined heat and power systems, where there is no need for backup power and batteries are not desired. On the other hand, the first North American markets for fuel cells will likely be in stand-alone premium power systems, where load following is critical. With our approach to battery management, the same inverter platform can be used by the fuel cell developer for all markets, with battery management being added for North American markets."

Flat Battery Fix

Cellphones should be ideal for making emergency calls during a power cut, but if the battery runs flat, you're stuck. Taiwan's Institute for Information Industry suggests that linking several cellphones will muster enough battery power to make a call.

The idea exploits a feature that all cellphones share: they shut down before they lose all power. This keeps irreversible chemical changes from ruining the battery. The Institute wants all future cellphone batteries to have an extra pair of standard-sized electrical contacts which will allow them to be linked in an emergency, and it has designed a connector to do the job.

Batteries Directive Proposal Published

The European Commission has published the proposed new battery directive that will require the collection and recycling of all batteries placed on the EU market. The directive prevents spent batteries from ending up in incinerators or landfills and recovers metals used in batteries.

The existing directive (91/157/EEC) covering batteries has a limited scope since

it only applies to those with a certain mercury, cadmium, and lead content. Those batteries are classified as “hazardous waste” on the basis of the European Waste List. This directive only covers 7% of all portable batteries placed on the EU market annually.

An extended impact assessment of the new directive, carried out by the European Commission, has also been published, identifying the proposed measures as the most sustainable policy options from environmental, economic and social points of view.

The European Commission has also published a series of frequently asked questions (FAQs) on the proposed battery directive at http://europa.eu.int/comm/environment/waste/batteries/031125_qa.pdf.

Grant Helps Make Former Battery Site Usable

The Reporter of Fond du Lac, Wisonsin, says a $100,000 Brownfields grant will be used to finish the site cleanup and renovate a building at a former lead battery factory in Ashford, Wisconsin, where contamination occurred before stricter environmental controls were in place.

The award will go toward the completion of the environmental cleanup process started in 1999 through a team effort by the Town of Ashford, Fond du Lac County, Fond du Lac County Economic Development Corp., the U.S. Environmental Protection Agency (EPA), the Wisconsin Department of Natural Resources, and the Wisconsin Department of Commerce. With the addition of the new grant, the cost of the cleanup and building improvements totals about $500,000 thus far.

An area business has offered to buy the former site of Ironsides Premium Battery of Wisconsin Inc. Once the EPA issues a letter of closure for remediation of the site, the property will be available for purchase.

“An investigation found that a small portion of the land, occupied since the 1930s by the battery company, contained high levels of lead and arsenic,” says County Planner Sam Tobias. “The state came in under an emergency response action and hauled away the contaminated soil and cleaned the property. They left in the fall of 2000, but it still wasn’t clean enough. We’ve been working on it ever since.” In addition to the contaminated soil, there are two structures which need decontamination.

Since June 1998, the Brownfields Grant Program has awarded close to $30 million to 72 projects across Wisconsin, resulting in the return of more than 830 acres of abandoned or contaminated sites to useable condition. According to the Wisconsin Ddepartment of Commerce, the awards helped to provide more than 4,000 new jobs.

China Should Control Cellphone Battery Pollution

China should develop new materials and technology for battery power-saving, as pollution generated by used cellphone batteries has become more serious, said an environmental protection expert in Beijing.

Hong Kong Trader reports that Professor Qu Geping, president of the China Environmental Protection Fund (CEPF), made the remarks at a ceremony to kick off a project on saving battery power, co-sponsored by CEPF and a local company that has developed a product that could strengthen the life span of the battery.

The Chinese people's cellphone usage has increased as their standard of living improves, Qu said. In 2000, China produced a total of 60 million cellphone batteries. Chinese cellphone usage reached 240 million by August 2003.

Qu, first director of the State Bureau of Environmental Protection and the first Chinese to win the International Award of 1992 from the United Nations Environmental Program, said used batteries contain large amounts of a substance toxic to both the environment and human beings. Currently, China is trying to decrease the number of waste batteries by replacing the substance.

China has more than 1,400 battery manufacturers, with an annual output of 14 billion batteries, most of which are consumed. In comparison with some developed countries, the battery recycling rate in China is low. Currently, the Chinese government is researching drafting a policy on preventing used battery pollution.

ELECTRIC VEHICLES

Fuel Cell/Electric Hybrid Scooter Patented

Parker Hannifin and Vectrix Corp., a developer of zero-emission vehicle (ZEV) platform technologies, unveiled a prototype of the first fuel cell/electric hybrid scooter during the Fuel Cell Seminar in Miami Beach, Florida.

In anticipation of a growing demand for scooters as urban centers worldwide strive to reduce air and noise pollution, traffic congestion and fossil fuel consumption, Parker has led an international, cross-industry team of manufacturers and suppliers to complete the hybrid scooter demonstrator project in less than six months. The consortium includes ten Parker locations and five outside partners – Vectrix, Giner Electromechanical Systems, LLC (GES), GP Batteries International Ltd., Methanex Corp., and ROBRADY design.

Targeted primarily at white-collar executive commuters, private fleets, and municipalities, the hybrid scooter combines the best of fuel cell and electric features: clean and quiet performance, low emissions, extended range, and reduced operating costs. It is expected to be commercially available in major metropolitan areas in Europe, Asia, and the United States in 2006. Currently,

executive commuter scooters are a $3 billion business in Europe.

The consortium partners plan to commercialize the hybrid scooter's onboard 800-watt direct methanol fuel cell (DMFC) battery charging system, which is expected to extend the product's operating range and free it from the constraints of a fixed power supply.

The patent-pending throttle-induced regenerative braking system captures and redirects energy usually dissipated as heat during braking to provide additional battery charging. The Parker-designed and manufactured high-torque electric motor and controller accelerate from 0 to 50kph in 3.6 seconds, a rate comparable or better than an equivalent weight gasoline-powered scooter.

Volkswagen Powered By UQM Generator

A series hybrid electric Volkswagen New Beetle developed by TNO Automotive, Delft, The Netherlands, was on display at the EVS-20 Exhibition in Long Beach, California, in mid-November. The VW is powered by a 1.2 liter, three-cylinder TDI diesel engine driving a UQM7 42kW permanent magnet generator, from UQM Technologies, which produces the power to recharge a nickel metal hydride battery pack.

In a series hybrid electric vehicle the engine is not connected to the wheels and is used solely to generate the power required for operation. Power and thermal management for the vehicle are performed by a CAN-enabled microcontroller. The vehicle is capable of traveling up to 10 kilometers in all-electric mode and consumes approximately 4.5 liters of fuel per 100 kilometers during hybrid electric operation, reducing fuel consumption by 30 to 35% versus a conventionally powered New Beetle.

"The UQM7 generator powering our hybrid electric Volkswagen New Beetle has met all of our expectations, delivering 42kW of continuous power with exceptional energy efficiency from a compact and lightweight machine. We believe the hybrid electric powertrain developed by TNO Automotive for the New Beetle has additional applications for urban distribution trucks, military vehicles, people movers and urban buses, and we are looking forward to pursuing these opportunities," said Salem Mourad, business manager, advanced powertrains, for TNO.

PRODUCT NEWS

Batteries for Diesel Engine Starting

Designed specifically for diesel engine starting and train lighting applications, Crompton brand rail batteries from EnerSys Underground to Overground operate at temperatures as low as -40EC. The combination of high current performance and low voltage drop provides optimum operating characteristics. A comprehensive range covers single cells through to design of complete rafts.

Contact EnerSys Inc., 2366 Bernville Road, Reading, PA 19605, phone: (610) 208-1991, fax: (610) 372-8457.

Component Demand to Reach $4.8 Billion

U.S. demand for battery and fuel cell components is projected to rise 6.8% annually through 2007 to $4.8 billion. Market advances will be fueled by an acceleration in battery output, spurred by strong demand for energy-hungry portable devices such as digital cameras and wireless phones. A shift in production toward advanced, higher-end batteries with improved performance will support associated component market gains. Fuel cell production will expand eightfold, resulting in double-digit increases in demand for electrode assemblies, fuel reformers and processors as well as plates and other components. Battery & Fuel Cell Components, a new study by The Freedonia Group, explores these trends.

Demand for electrical and electronic devices will outpace demand for most other battery and fuel cell component types through 2007. Gains will reflect both increased use of “smart” battery technology and double-digit growth in lithium battery output, boosting demand for safety devices used to provide overcurrent protection.

A healthy fuel cell market environment will also stimulate demand for on-board power conditioning devices, among other components. Battery electrodes will continue to dominate overall components demand as 46% of the market in 2007. Consumption of battery containers and coverings will remain substantial as well, representing nearly one-fifth of all components demand.

Secondary batteries represent the largest battery and fuel cell components market, and will account for more than three-fifths of all demand in 2007. This is predominantly due to greater per-unit demand on a dollar basis for components used in the manufacture of lead-acid batteries, compared to most other battery types.

The 194-page Study #1744 is available for $3,800 from The Battery Bookstore, P.O. Box 650, Boalsburg, PA 16827, phone: (814) 466-6559, fax: (814) 466-2777, or visit www.7ms.com.

SMBus Smart Batteries

The NL202x series of Li-ion battery packs by Inspired Energy have 95Wh of stored energy, one of the highest available in a standard device. Measuring 167.5mm long by 107.3mm wide by 21.0mm high, The SMBus-compatible batteries address the need for higher energy densities in industry-standard configurations for portable devices.

The NL2020 delivers 10.8V and 8.8Ah, and the NL2024 provides 14.4V and

6.6Ah. At 0EC to 50EC, both devices are capable of a 6A continuous drain.

Contact Inspired Energy Inc., 12705 U.S. Hwy. 441 North, Alachua, FL 32615, phone: (888) 546-7747 or (386) 462-3676 or fax: (386) 462-6765.

Global Lithium Industry Market and Future

In recent years the lithium market has grown by 2% to 5% per year, with world demand between 13,000t and 14,000t in 2001. The outlook for consumption of lithium is relatively optimistic, as the diverse nature of its applications tends to insulate it against fluctuations in end-use sectors. According to Roskill's The Economics of Lithium (9th Edition), forecast demand for lithium metals and chemicals in 2006 is 11,250t Li, or 60,000t of lithium carbonate equivalent, reflecting a forecast aggregate rate of growth of 2 to 4% per year.

Features of this forecast are the continued high growth in demand for lithium chemicals for secondary batteries and for a continued decline in demand for lithium carbonate by the aluminum smelting industry.

World production of lithium minerals increased steadily from 6,300t in 1994 to 11,900t in 2000. The main growth in output has come from Chile, where production of lithium carbonate increased from just over 10,000t in 1993 to 35,000t in 2001, an average growth rate of 16.5% per year. Output in Chile was boosted by the start-up of operations of SQM in 1996. Production capacity of lithium minerals was over 50% higher than sales levels in 2001, while the Chilean lithium carbonate producers had a 20% surplus in capacity in the same year. Given the relatively modest growth in demand for lithium, it appears that there is sufficient capacity in the industry for the foreseeable future.

Key trends, issues, and developments in the market are now analyzed in this major new report. It provides a clear insight into all areas of the industry and an authoritative analysis of future prospects for the demand for and availability of lithium on the world market.

This 108-page report is available for $2,800. Contact Roskill Information Services Ltd., 27a Leopold Road, London, SW19 7BB, England, phone: +44 20 8944 0066, fax: +44 20 8947 9568, or email: info@roskill.co.uk.

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MEETING REPORT

Portable Power Conference and Expo

San Francisco, CA USA
September 21-23, 2003

by Dennis Sieminski, P.E.
Portable Energy Consulting
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The Portable Power Conference and Expo was produced by IDG (www.idgworldexpo.com) and TIAX (www.tiax.biz) to bring together people who collectively determine power solutions used in portable products, including battery manufacturers, fuel cell developers, power conversion devices, power management semiconductors, and the portable device OEMís power specialists. The conference consisted of presentations, panel discussions, and a vendor exhibition area. In addition, lunches and evening cocktail receptions provided an opportunity to see the exhibits, meet colleagues, talk to presenters, and make new contacts. The conference was host to about 300 attendees and 25 exhibitors.

Several pre-conference tutorials covered a range of topics: Advanced Power Source Technology Update, Smart Batteries, Advanced Capacitors, and Ergonomic Product Design for PDAs and Wireless Handsets.

The main conference featured a presentation on wireless dataís ability to drive growth in handsets by **Donna Dubinsky**, founder and CEO of Handspring Corp. Acer President **J. T. Wang**, spoke on separating the OEM and branded business in portable computers, and Panasonicís CTO, **Dr. Paul Liao**, spoke on design trends in consumer electronic products and their influence on power. Intelís **Kamal Shah** shared details of programs he is working on, including his chairing of the Mobile PC Extended Battery Life Working Group (www.eblwg.com). Topics covered during the balance of the conference can be grouped into several headings: status of the rechargeable battery business, highlights of battery R&D, new developments in small fuel cells, power management trends, and portable product development news with emphasis on portable computers, cell phones and PDAs.

Status of the Rechargeable Battery Business

As **Hideo Takeshita**, vice president of the Institute of Information

Technology, presented extensive data on the rechargeable battery business, including sales by chemistry, size, manufacturer, application, and price, a couple of key points emerged &emdash; Li-ion has become the battery of choice in portable computers and cellphones, displacing NiMH. This trend is apparently continuing in digital audio, video and PDAs. The power tool market is the one exception. NiCd still very much dominates there.

With regard to company leadership, Sanyo has the top market share followed closely by Sony. These two leaders are separated by a sizeable gap from followers MBI, SDI, BYD, and LG Chemical. The average cell price is $3.50, but there is still concern on pricing being soft with Chinese companies still dropping prices as they try to get traction in the marketplace. From the OEM standpoint, the major battery users are Nokia, Motorola, Samsung, Sony, Dell and H-P. The major applications are notebooks and phones. Digital video, audio and PDAs represent the next largest device grouping. The battery industry sees the best opportunity for major growth coming from an entirely different sector than portable products &emdash; transportation. Motor-assisted bicycles, electric scooters and hybrid electric vehicles (HEVs) may offer the rechargeable battery industry a whole new sector to develop. Toyota is developing Li-ion batteries internally, and Sanyo is heavily involved with NiMH for HEVs.

In factoring the direction of the battery business, several salient forces must be considered. Japan-based companies dominate the rechargeable industry, U.S.-based companies dominate the primary business, Li-ion technology will be viable for a very long time to come because no real alternatives are on the horizon, many large consumer electronic companies are vertically integrated in battery technology, Chinese manufacturing seems to offer the least cost globally for mature battery products, and a solution to long runtime for portable devices still remains elusive.

Cell and Battery R&D

Li-ion energy density has shown a two-time improvement in the past decade, enabling some dramatic developments in portable products. However, we are at the end of that cycle, and chances for significant improvements in energy density are not being contemplated. Instead, incremental improvement, with 450Wh/liter, is a future target. Besides energy density, research efforts are focusing on cost, improved safety, and attributes needed for new applications, such as HEVs (e.g., high charge rate acceptance).

Energy density improvements rely on being able to implement new materials like LiFePO4 and LiNiMnCoO2 for cathodes, and Sn-coated carbon and Si-based materials for anodes. The use of modeling is growing as a tool to accelerate product development, e.g., thermal analysis and microkinetics.

Product reports by a number of Li-ion manufacturers show that Li-polymer performance is the same as Li-ion and, in fact, may have better capacity retention at high temperatures and much less thickness change as a function of cycling, state of charge or number of cycles. Thermal problems in portable computers are a major challenge for battery life because cells in battery packs suffer permanent degradation when exposed to high temperatures.

Developments in Small Fuel Cells

Narrow prospects for energy density improvement in batteries and the seemingly insatiable power demand in portable products continues to drive interest in small fuel cells. The conference brought first-time information from two companies that have been quiet on technical developments to date &emdash; Neah Power Systems and Ultracell Inc. &emdash; while updates to previously reported efforts were given by Motorola Labs and MTI Microfuel Cells.

Neah Power Systemsí CEO **Dave Dorheim** (www.neahpower.com) outlined the differentiating elements of Neahís small fuel cell technology program &emdash; a three-dimensional 400 micron thick, porous silicon electrode, flowing electrolyte, and on-board oxidant, hydrogen peroxide. The 3-D porous Si is expected to provide more active catalyst sites than typical carbon-based membranes. In addition, flowing electrolyte (as opposed to having it static) eliminates the methanol crossover problem. Carrying the oxidant onboard gives up the weight savings of using oxygen from the air, but the resulting closed system eliminates the very troublesome water management problem, and confers the battery-like advantage of being able to operate in all kinds of environments without concern about contaminants, whether air-borne or liquid. With this approach, Neah believes they can still get a two-to-three-time improvement over standard Li-ion battery runtime. The company recently received a $2 million Advanced Technology Program (ATP) award from the National Institute of Standards and Technology (NIST).

The technical strategy for small fuel cell development at Ultracell, Inc. was explained by CEO **James Kaschmitter**. Fuel reforming is the design path and MEMs is the enabling technology. Ultracellís assessment is that unlocking the high energy density of methanol (MeOH) by converting it to hydrogen via steam reforming avoids the major problems of direct methanol, such as crossover, water management, low efficiency. They believe that the technical problems they face with steam reforming of methanol (e.g., CO generation, high temperatures, expensive catalyst costs) have a much better chance of being resolved. Ultracellís strategy is to press MEMs technology and silicon fabrication to make a fuel processor chip that can deliver high purity hydrogen to conventional fuel cells at low cost and high efficiency. The core technology comes through Ultracellís exclusive license arrangement with Lawrence Livermore National Laboratories.

Alan Soucy, COO of MTI MicroFuel Cells, provided an update on their commercialization efforts, including their partnership with Gillette to develop fuel cartridges and a working arrangement with Intermec on power for portable devices. MTI is pursuing a direct methanol fuel cell.

Motorola Labs has been examining both reformed and direct methanol fuel cells. They have built working models of both in an effort to get a practical handle on the advantages and problems associated with each approach and continue to report on the status of their work at various trade conferences.

BIC Corp. is looking at how to leverage its mature network for fuel cell opportunities. They say that consumersí main experience with fuel cells will be through interaction with the replacement cartridge. They feel they can bring a wealth of knowledge and expertise to this aspect of consumer fuel cell commercialization.

Power Management

What makes power management difficult is that most piecemeal solutions have been applied and now a top-down holistic design approach that incorporates power management in the architecture of the device is necessary. There is opportunity for improvement but also significant difficulty in executing the full array of options. These include processors designed specifically for optimal energy use, dynamic voltage and frequency management, reducing the number of voltages in the system to a minimum, integrated synchronous buck regulators, lowest voltage devices available, shutting down circuits not being used, smart batteries with accurate fuel gauging and low power displays. A breakdown of energy usage shows that 33% goes to the display (with 75% of that backlighting), 10% to the CPU and 10% to the power supply. The PC Extended Battery Life Working Group, started in October 2002 (www.eblwg.org), has four focus areas: usage model research, suppliersí recommendations, alternative power and power management.

Portable Product Developments

Traveling with a portable computer is great. All of your files are at your disposal, you have the ability to do all of your regular work and communicate via email while away from the office. However, the portable falls short when you are traveling and need to access one piece of information quickly and the computer is closed or in your briefcase. Putting a second very small screen on the lid of the computer or providing a wireless connection to the portable with a PDA device is a feature being explored to overcome this deficiency.

With all the interest in wireless connections, developers are asking how useful will wireless be if you canít also cut the wire to AC power.

Intersil is the main supplier of WiFi chipsets. Mobile Internet use for most of the world is below 10% of users, but in Korea and Japan the number is about 80%.

Postage-stamp-size SD cards are becoming the flash memory de facto standard. Introduced at 64MB, next year they will be at 1 Gigabyte with a theoretical 16GB potential and 160MB/sec transfer speed.

How Users Really Feel About Todayís Power Sources, a 60-page marketing study by **Bob Altabet** (Raltabet@cs.com), offers a peek into portable computer ownersí usage. Some facts from the study to think about &emdash; a portable computer is run on batteries 19% of the time, 20% of users own an extra battery, 46% do not know what kind of battery they have, 29% are dissatisfied with runtime. You can draw your own conclusions.

[Editorís Note: Dennis Sieminski (dennissieminski@msn.com), a frequent meeting reporter for ABT, has relocated from Atlanta, where he had worked for AER Energy Resources, to southern California, where he now is in international sales for Noran Engineering.]

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U. S. BATTERY AND FUEL CELL PATENTS

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Official Gazette, Volume 1277 (December 2003)

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Toronto, ONT
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